Department of Energy
Albuquerque Operations Office
Los Alamos Area Office
Los Alamos, New Mexico 87544

SEP 30 1996

RECEIVED
SEP 30

CERTIFIED MAIL - RETURN RECEIPT REQUESTED

Mr. Benito Garcia, Bureau Chief
Hazardous and Radioactive Materials
Bureau
New Mexico Environment Department
2044 Galisteo Street, Building A
P. O. Box 26110
Santa Fe, NM 87505-2100

Dear Mr. Garcia:

Subject: Submittal of the Resource Conservation and Recovery Act (RCRA) Part "B" Permit Application for Technical Areas (TA) 14, 15, 36 and 39 Thermal Treatment Units - Los Alamos National Laboratory

The purpose of this letter is to submit one original and two copies, including electronic file, of the enclosed RCRA Part "B" Permit Application for Los Alamos National Laboratory, TA-14, -15, -36, and -39 Thermal Treatment Units. This submittal is in accordance with the New Mexico Environment Department's request to receive this document by September 30, 1996. In addition, a revision to the RCRA Part "A" application is also included in this packet, to be consistent with this Part "B" submittal, i.e., Map 4 showing larger surface area affected.

If there are any questions, please contact Jody Plum, Office of Environment and Projects, at (505) 665-5042.

Sincerely,

G. Thomas Todd
Area Manager

LAAMEP:9JP-042

Enclosures

cc:
See page 2

3845

SEP 3 0 1996

cc w/o enclosures:
Ms. Barbara Hoditschek, Program Manager
Hazardous and Radioactive Materials Bureau
New Mexico Environment Department
2044 Galisteo St., Building A
P. O. Box 26110
Santa Fe, NM 87505
Stuart Dinwiddee
Hazardous and Radioactive Materials Bureau
New Mexico Environment Department
2044 Galisteo Street, Building A
P. O. Box 26110
Santa Fe, New Mexico 87505
Ms. Teri Davis
New Mexico Environment Department
Hazardous and Radioactive Materials Bureau
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Ms. Teri Davis
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Hazardous and Radioactive Materials Bureau
2044 Galisteo Street, Building A
P. O. Box 26110
Santa Fe, NM 87505

bcc w/enclosures:
J. Plum, LAAMEP, LAAO
E. Horst, Scientech, LAAO

bcc w/o enclosures:
H. Haynes, Office of Counsel, LAAO
J. Ellvinger, ESH-19, LANL, MS-K490
H. Noskin, ESH-19, LANL, MS-K490
F. Sisneros, ESH-7, LANL, MS-K999
C. M. Montoya, DX-DO, LANL, MS-P915
R. Lucht, DX-1, LANL, MS-P950
M. Orbesen, DX-2, LANL, MS-C920
K. Uher, DX-2, LANL, MS-C920
J. Rochelle, LC-General, LANL, MS-A187

Contract 9-XV2-139EE-1
Work Release 95-0016 (766969)
Revision 0.0
September 1996

Part A Permit Application Open Burning/Open Detonation Units at Technical Areas 14, 15, 36, and 39

Prepared by:

Los Alamos National Laboratory
Hazardous and Solid Waste Group (ESH-19)
Los Alamos, New Mexico 87545

Document:	**LANL OB/OD Part A**
Revision No.:	**0.0**
Date:	**September 1996**

Part A Permit Application Open Burning/Open Detonation Units at Technical Areas 14, 15, 36, and 39

Prepared by:
Los Alamos National Laboratory
Hazardous and Solid Waste Group (ESH-19)
Los Alamos, New Mexico 87545

September 1996

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Approved OMB No. 2050-0034 Exp. 03/31/96
GSA No. 0248-EPA-01

For EPA Regional Use Only	
Date Received	Month / Day / Year

EPA

United States Environmental Protection Agency
Washington, DC 20460

Hazardous Waste Permit Application Part A

(Read the Instructions before starting)

I. Installation's EPA ID Number *(Mark 'X' in the appropriate box)*

[ ] A. First Part A Submission

[X] B. Part A Amendment # TA-14, -15, -36, and -39, Rev. 0.0

C. Installation's EPA ID Number: NM0890010515

D. Secondary ID Number *(If applicable)*:

II. Name of Facility

LOS ALAMOS NATIONAL LABORATORY

III. Facility Location *(Physical address not P.O. Box or Route Number)*

A. Street:

Street *(Continued)*:

City or Town: LOS ALAMOS

State: NM

Zip Code: 87545

County Code *(If known)*: 028

County Name: LOS ALAMOS

B. Land Type (Enter code): F

C. Geographic Location — LATITUDE *(Degrees, Minutes, & Seconds)*: 35 49 051 — LONGITUDE *(Degrees, Minutes & Seconds)*: 106 14 015

D. Facility Existence Date — Month / Day / Year: 01 01 1943

IV. Facility Mailing Address

Street or P.O. Box: PO BOX 1663

City or Town: LOS ALAMOS

State: NM

Zip Code: 87545

V. Facility Contact *(Person to be contacted regarding waste activities at facility)*

Name *(Last)*: TODD

(First): G THOMAS

Job Title: AREA MANAGER

Phone Number *(Area Code and Number)*: 505-665-5027

VI. Facility Contact Address *(See Instructions)*

A. Contact Address: [ ] Mailing [X] Other

B. Street or P.O. Box: 528 35TH STREET

City or Town: LOS ALAMOS

State: NM

Zip Code: 87544

Please print or type with ELITE type (12 characters per inch) in the unshaded areas only

OMB No. 2040-0042, Approval Expires 11-30-96

EPA I.D. Number (Enter from page 1)	Secondary ID Number (Enter from page 1)
NM089001051 5	

VII. Operator Information (See instructions)

Name of Operator: UNIVERSITY OF CALIFORNIA

Street or P.O. Box: PO BOX 1663

City or Town: LOS ALAMOS

State: NM

ZIP Code: 87545-

Phone Number (Area Code and Number): 505-667-5061

B. Operator Type: F

C. Change of Operator Indicator: Yes [ ] No [X]

Date Changed Month Day Year

VIII. Facility Owner (See instructions)

A. Name of Facility's Legal Owner: US DEPARTMENT OF ENERGY

Street or P.O. Box: 528 35TH STREET

City or Town: LOS ALAMOS

State: NM

ZIP Code: 87544-

Phone Number (Area Code and Number): 505-667-5061

B. Owner Type: F

C. Change of Owner Indicator: Yes [ ] No [X]

Date Changed Month Day Year

IX. SIC Codes (4-digit, in order of significance)

Primary	Secondary
9711 (Description) NATIONAL SECURITY	(Description)
Secondary	**Secondary**
(Description)	(Description)

X. Other Environmental Permits (See instructions)

A. Permit Type (Enter code)	B. Permit Number	C. Description
N	NMR00A384	NPDES Storm Water General Permit
N	NM0028355	NPDES
N	NM0028576	NPDES (Fenton Hill Geothermal Site)
R	NM089001051 5	RCRA (Hazardous Waste Permit)
		RAD. NESHAPs Preconstr. Approvals:
E		Low Level Waste/Mixed Waste Incin.
E		Dual Axis Radiographic Hydrotest Fac
E		Ground Test Accelerator
E		Independent Management Activity

EPA I.D. Number
M0890010515

X. Other Environmental Permits *(continued)*

A. Permit Type	B. Permit Number	C. Description
		RAD. NESHAPS PRECONSTRUCTION APPROVALS (Cont'd)
E		Facilitywide Application for Existent Emissions
E		TA-21, D&D Activity
E		TA-50, Bldg. 83 - Mobile Decontamination Trailer
E		TA-54, TRU Retrieval Domes
		STATE AIR QUALITY PERMITS:
E	AQCR 301	Open Burning
E		TA-11 Fuel Fire Burn
E		TA-36 HE-Contaminated Wood Burning
E		TA-14 HE-Contaminated Material Burning
E		TA-16 HE-Contaminated Material Burning
E		TA-33 & TA-39 LIDAR Test Burning
E	AQCR 702	Beryllium Machining
E	#632	TA-35, Bldg. 213, Beryllium Machining Emissions
E	#634-M-1	TA-3, Bldg. 141, Beryllium Processing Emissions
E	#635	TA-3, Bldg. 39, Beryllium Machining Emissions
E	#741	TA-3, Bldg. 35, Planned Beryllium Machining Emissions
E	#1081-M-1	TA-55, Bldg. 4, Beryllium Machining Emissions
		STATE SEPTIC TANK PERMITS:
E	LA-01	State Septic Tank Permit
E	LA-02	State Septic Tank Permit
E	LA-03	State Septic Tank Permit
E	LA-04	State Septic Tank Permit

EPA I.D. Number
M0890010515

X. Other Environmental Permits *(continued)*

A. Permit Type	B. Permit Number	C. Description
E	LA-05	State Septic Tank Permit
E	LA-06	State Septic Tank Permit
E	LA-07	State Septic Tank Permit
E	LA-08	State Septic Tank Permit
E	LA-09	State Septic Tank Permit
E	LA-11	State Septic Tank Permit
E	LA-12	State Septic Tank Permit
E	LA-13	State Septic Tank Permit
E	LA-14	State Septic Tank Permit
E	LA-15	State Septic Tank Permit
E	LA-16	State Septic Tank Permit
E	LA-17	State Septic Tank Permit
E	LA-18	State Septic Tank Permit
E	LA-19	State Septic Tank Permit
E	LA-21	State Septic Tank Permit
E	LA-22	State Septic Tank Permit
E	LA-23	State Septic Tank Permit
E	LA-24	State Septic Tank Permit
E	LA-25	State Septic Tank Permit
E	LA-26	State Septic Tank Permit
E	LA-27	State Septic Tank Permit
E	LA-28	State Septic Tank Permit
E	LA-29	State Septic Tank Permit
E	LA-30	State Septic Tank Permit

EPA I.D. Number
M0890010515

X. Other Environmental Permits *(continued)*

A. Permit Type	B. Permit Number	C. Description
E	LA-31	State Septic Tank Permit
E	LA-32	State Septic Tank Permit
E	LA-33	State Septic Tank Permit
E	LA-34	State Septic Tank Permit
E	LA-35	State Septic Tank Permit
E	LA-36	State Septic Tank Permit
E	LA-37	State Septic Tank Permit
E	LA-38	State Septic Tank Permit
E	LA-39	State Septic Tank Permit
E	LA-42	State Septic Tank Permit
E	LA-43	State Septic Tank Permit
E	LA-44	State Septic Tank Permit
E	LA-45	State Septic Tank Permit
E	LA-46	State Septic Tank Permit
E	LA-47	State Septic Tank Permit
E	LA-48	State Septic Tank Permit
E	LA-49	State Septic Tank Permit
E	LA-50	State Septic Tank Permit
E	LA-51	State Septic Tank Permit
E	LA-52	State Septic Tank Permit
E	LA-53	State Septic Tank Permit
E	LA-54	State Septic Tank Permit
E	LA-55	State Septic Tank Permit
E	LA-56	State Septic Tank Permit

EPA I.D. Number
M0890010515

X. Other Environmental Permits *(continued)*

A. Permit Type	B. Permit Number	C. Description
E	LA-57	State Septic Tank Permit
E	LA-58	State Septic Tank Permit
E	LA-59	State Septic Tank Permit
E	LA-60	State Septic Tank Permit
E	LA-61	State Septic Tank Permit
E	LA-124	State Septic Tank Permit
E	SF880257	State Septic Tank Permit
E	SF880258	State Septic Tank Permit
E	SF880259	State Septic Tank Permit
E	SF880260	State Septic Tank Permit
E	SF880261	State Septic Tank Permit
E	SF890023	State Septic Tank Permit
E	SF890024	State Septic Tank Permit
E	SF890025	State Septic Tank Permit
E	SF89031R	State Septic Tank Permit
E	SF89032R	State Septic Tank Permit
E	SF89033R	State Septic Tank Permit
E	SF89034R	State Septic Tank Permit
E	SF89035R	State Septic Tank Permit
E	SF89036R	State Septic Tank Permit
E	SF890588	State Septic Tank Permit
E	SF890589	State Septic Tank Permit
E	SF890590	State Septic Tank Permit
E	SF900022	State Septic Tank Permit

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Form Approved OMB No. 2050-0024 Expires 9-30-96
GSA No. 0248-EPA-01

EPA I.D. Number (Enter from page 1)												Secondary ID Number (Enter from page 1)
N	M	0	8	9	0	0	1	0	5	1	5	

XI. Nature of Business (Provide a brief description)

The principal mission of LANL includes the research, design, development, and analysis of weapons components for the nation's nuclear arsenal. This effort is supported by research programs such as nuclear physics, hydrodynamics, conventional explosives, chemistry, metallurgy, radiochemistry, and biology. In addition to its defense program efforts, LANL supports energy research and environmental missions with programs including medium-energy physics; space nuclear systems; controlled thermonuclear fusion; laser research; environmental research; geothermal, solar, and fossil energy research; nuclear safeguards; biomedical research; and space physics. In 1992, LANL expanded its mission in support of environmental management to include development of new programs in the areas of health and biotechnology, environmental technologies, and industrial partnerships.

XII. Process Codes and Design Capacities

A. PROCESS CODE - *Enter the code from the list of process codes below that best describes each process to be used at the facility. Thirteen lines are provided for entering codes. If more lines are needed, attach a separate sheet of paper with the additional information. For "other" processes (i.e., D99, S99, T04 and X99), describe the process (including its design capacity) in the space provided in item XIII.*

B. PROCESS DESIGN CAPACITY - *For each code entered in column A, enter the capacity of the process.*

1. **AMOUNT** - *Enter the amount. In a case where design capacity is not applicable (such as in a closure/post-closure or enforcement action) enter the total amount of waste for that process.*
2. **UNIT OF MEASURE** - *For each amount entered in column B(1), enter the code from the list of unit measure codes below that describes the unit of measure used. Only the units of measure that are listed below should be used.*

C. PROCESS TOTAL NUMBER OF UNITS - *Enter the total number of units used with the corresponding process code.*

PROCESS CODE	PROCESS	APPROPRIATE UNITS OF MEASURE FOR PROCESS DESIGN CAPACITY
	Disposal:	
D79	Underground Injection	Gallons; Liters; Gallons Per Day; or Liters Per Day
D80	Landfill	Acre-feet or Hectare-meter
D81	Land Treatment	Acres or Hectares
D82	Ocean Disposal	Gallons Per Day r Liters Per Day
D83	Surface Impoundment	Gallons or Liters
D99	Other Disposal	Any Unit of Measure Listed Below
	Storage:	
S01	Container (Barrel, Drum, Etc.)	Gallons or Liters
S02	Tank	Gallons or Liters
S03	Waste Pile	Cubic Yards or Cubic Meters
S04	Surface Impoundment	Gallons or Liters
S05	Drip Pad	Gallons or Liters
S06	Containment Building-Storage	Cubic Yards or Cubic Meters
S99	Other Storage	Any Unit of Measure Listed Below
	Treatment:	
T01	Tank	Gallons Per Day or Liters Per Day
T02	Surface Impoundment	Gallons Per Day or Liters Per Day
T03	Incinerator	Short Tons Per Hour; Metric Tons Per Hour; Gallons Per Hour; Liters Per Hour; or Btu's Per Hour
T04	Other Treatment	Gallons Per Day; Liters Per Day; Pounds Per Hour; Short Tons Per Hour; Kilograms Per Hour; Metric Tons Per Day; Metric Tons Per Hour; Short Tons Per Day; or Btu's Per Hour
T80	Boiler	Gallons or Liters
T81	Cement Kiln	Gallons Per Day; Liters Per Day; Pounds Per Hour; Short Tons Per Hour; Kilograms Per Hour; Metric Tons Per Day; Metric Tons Per Hour; Short Tons Per Day; or Btu's Per Hour
T82	Lime Kiln	
T83	Aggregate Kiln	
T84	Phosphate Kiln	
T85	Coke Oven	
T86	Blast Furnace	
T87	Smelting, Melting, Or Refining Furnace	Gallons Per Day; Liters Per Day; Pounds Per Hour; Short Tons Per Hour; Kilograms Per Hour; Metric Tons Per Day; Metric Tons Per Hour; Short Tons Per Day; or Btu's Per Hour
T88	Titanium Dioxide Chloride Process Oxidation Reactor	
T89	Methane Reforming Furnace	
T90	Pulping Liquor Recovery Furnace	
T91	Combustion Device Used in The Recovery Of Sulfur Values From Spent Sulfuric Acid	
T92	Halogen Acid Furnaces	
T93	Other Industrial Furnaces Listed in 40 CFR §260.10	
T94	Containment Building-Treatment	Cubic Yards or Cubic Meters
	Miscellaneous (Subpart X):	
X01	Open Burning/Open Detonation	Any Unit of Measure Listed Below
X02	Mechanical Processing	Short Tons Per Hour; Metric Tons Per Hour; Short Tons Per Day; Metric Tons Per Day; Pounds Per Hour; or Kilograms Per Hour
X03	Thermal Unit	Gallons Per Day; Liters Per Day; Pounds Per Hour; Short Tons Per Hour; Kilograms Per Hour; Metric Tons Per Day; Metric Tons Per Hour; Short Tons Per Day; or Btu's Per Hour
X04	Geologic Repository	Cubic Yards or Cubic Meters
X99	Other Subpart X	Any Unit of Measure Listed Below

UNIT OF MEASURE	UNIT OF MEASURE CODE
Gallons	G
Gallons Per Hour	E
Gallons Per Day	U
Liters	L
Liters Per Hour	H
Liters Per Day	V

UNIT OF MEASURE	UNIT OF MEASURE CODE
Short Tons Per Hour	D
Metric Tons Per Hour	W
Short Tons Per Day	N
Metric Tons Per Day	S
Pounds Per Hour	J
Kilograms Per Hour	R

UNIT OF MEASURE	UNIT OF MEASURE CODE
Cubic Yards	Y
Cubic Meters	C
Acres	B
Acre-feet	A
Hectares	Q
Hectare-meter	F
Btu's Per Hour	I

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GSA No. 1248-EPA-07

EPA I.D. Number *(Enter from page 1)*	Secondary ID Number *(Enter from page 1)*
N M 0 8 9 0 0 1 0 5 1 5	

XII. Process Codes and Design Capabilities *(Continued)*

EXAMPLE FOR COMPLETING ITEM XII (Shown in line number X-1 below): A facility has a storage tank, which can hold 533.788 gallons.

Line Number	A. Process Code (From list above)	B. PROCESS DESIGN CAPACITY 1. Amount (Specify)	B. PROCESS DESIGN CAPACITY 2. Unit Of Measure (Enter code)	C. Process Total Number Of Units	For Official Use Only
X 1	S 0 2	5 3 3 . 7 8 8	G	0 0 1	
1		.			
2		.			
3		.			
4		.			
5		.			
6		.			
7		.			
8		.			
9		.			
10		.			
11		.			
12		.			
13		.			

NOTE: If you need to list more than 13 process codes, attach an additional sheet(s) with the information in the same format as above. Number the lines sequentially, taking into account any lines that will be used for "other" processes (i.e., D99, S99, T04 and X99) in Item XIII.

XIII. Other Processes *(Follow instructions from Item XII for D99, S99, T04 and X99 process codes)*

Line Number (Enter as in seq w/XII)	A. Process Code (From list above)	B. PROCESS DESIGN CAPACITY 1. Amount (Specify)	B. PROCESS DESIGN CAPACITY 2. Unit Of Measure (Enter code)	C. Process Total Number Of Units	D. Description Of Process
X 1	T 0 4				*In-situ Vitrification*
1	X 0 1	70	See D.	2	Units at TA-14 used for open burning/detonation of explosive hazardous waste. Maximum amount treated by open burning is 50 pounds (lbs.) per burn; maximum amount treated by open detonation is 20 lbs./detonation (det).
2	X 0 1	500	See D.	1	Unit near TA-15-184 used for open detonation of explosive hazardous/mixed waste. Maximum amount treated is 500 lbs./det.
3	X 0 1	2,000	See D.	1	Unit near TA-36-8 used for open detonation of explosive hazardous/mixed waste. Maximum amount treated is 2,000 lbs./det.
4	X 0 1	2,000	See D.	2	Unit near TA-39-6 and TA-39-57 used for open detonation of explosive hazardous/mixed waste. Maximum amount treated is 1,000 lbs./det.

EPA I.D. Number (Enter from page 1)	Secondary ID Number (Enter from page 1)
N M 0 8 9 0 0 1 0 5 1 5	

XIV. Description of Hazardous Wastes

A. EPA HAZARDOUS WASTE NUMBER - *Enter the four-digit number from 40 CFR, Part 261 Subpart D of each listed hazardous waste you will handle. For hazardous wastes which are not listed in 40 CFR, Part 261 Subpart D, enter the four-digit number(s) from 40 CFR, Part 261 Subpart C that describes the characteristics and/or the toxic contaminants of those hazardous wastes.*

B. ESTIMATED ANNUAL QUANTITY - *For each listed waste entered in column A estimate the quantity of that waste that will be handled on an annual basis. For each characteristic or toxic contaminant entered in column A estimate the total annual quantity of all the non-listed waste(s) that will be handled which possess that characteristic or contaminant.*

C UNIT OF MEASURE - *For each quantity entered in column B enter the unit of measure code. Units of measure which must be used and the appropriate codes are:*

ENGLISH UNIT OF MEASURE	CODE	METRIC UNIT OF MEASURE	CODE
POUNDS	P	KILOGRAMS	K
TONS	T	METRIC TONS	M

If facility records use any other unit of measure for quantity, the units of measure must be converted into one of the required units of measure taking into account the appropriate density or specific gravity of the waste.

D. PROCESSES

1. PROCESS CODES:

For listed hazardous waste: For each listed hazardous waste entered in column A select the code(s) from the list of process codes contained in item XII A. on page 3 to indicate how the waste will be stored, treated, and/or disposed of at the facility.

For non-listed hazardous waste: For each characteristic or toxic contaminant entered in column A, select the code(s) from the list of process codes contained in item XII A. on page 3 to indicate all the processes that will be used to store, treat, and/or dispose of all the non-listed hazardous wastes that possess that characteristic or toxic contaminant.

NOTE: THREE SPACES ARE PROVIDED FOR ENTERING PROCESS CODES. IF MORE ARE NEEDED:

1. *Enter the first two as described above.*
2. *Enter "000" in the extreme right box of item XIV-D(1).*
3. *Enter in the space provided on page 7, item XIV-E, the line number and the additional code(s).*

2. PROCESS DESCRIPTION: *If a code is not listed for a process that will be used, describe the process in the space provided on the form (D.(2)).*

NOTE: HAZARDOUS WASTES DESCRIBED BY MORE THAN ONE EPA HAZARDOUS WASTE NUMBER - Hazardous wastes that can be described by more than one EPA Hazardous Waste Number shall be described on the form as follows:

1. *Select one of the EPA Hazardous Waste Numbers and enter it in column A. On the same line complete columns B, C and D by estimating the total annual quantity of the waste and describing all the processes to be used to treat, store, and/or dispose of the waste.*
2. *In column A of the next line enter the other EPA Hazardous Waste Number that can be used to describe the waste. In column D(2) on that line enter "Included with above" and make no other entries on that line.*
3. *Repeat step 2 for each EPA Hazardous Waste Number that can be used to describe the hazardous waste.*

EXAMPLE FOR COMPLETING ITEM XIV (shown in line numbers X-1, X-2, X-3, and X-4 below) - A facility will treat and dispose of an estimated 900 pounds per year of chrome shavings from leather tanning and finishing operation. In addition, the facility will treat and dispose of three non-listed wastes. Two wastes are corrosive only and there will be an estimated 200 pounds per year of each waste. The other waste is corrosive and ignitable and there will be an estimated 100 pounds per year of that waste. Treatment will be in an incinerator and disposal will be in a landfill.

Line Number	A. EPA HAZARD WASTE NO. (Enter code)	B. ESTIMATED ANNUAL QUANTITY OF WASTE	C. UNIT OF MEASURE (Enter code)	D. PROCESS (1) PROCESS CODES (Enter code)	D. PROCESS (2) PROCESS DESCRIPTION (If a code is not entered in D(1))
X 1	K 0 5 4	900	P	T 0 3 D 8 0	
X 2	D 0 0 2	400	P	T 0 3 D 8 0	
X 3	D 0 0 1	100	P	T 0 3 D 8 0	
X 4	D 0 0 2				Included With Above

EPA I.D. Number (enter from Page 1)
NM0890010515

Secondary ID Number (enter from Page 1)

'. Description of Hazardous Wastes (Continued)

Line Number	A. EPA Hazardous Waste No. (enter code)	B. Estimated Annual Quantity of Waste	C. Unit of Measure (enter code)	D. Processes (1) Process Codes (enter)			D. Processes (2) Process Description (If a code is not entered in D[1])
1	D001	1,000	P	X01			Open Burning (OB) at Technical Area (TA) 14
2	D003						
3	D005						
4	F005						
5	THIS LINE LEFT INTENTIONALLY BLANK						
6	D001	1,000	P	X01			Open Detonation (OD) at TA-14
7	D003						
8	D005						
9	F005						
10	THIS LINE LEFT INTENTIONALLY BLANK						
11	D001	15,000		X01			OD at TA-15
12	D003						
13	D005						
14	F005						
15	THIS LINE LEFT INTENTIONALLY BLANK						
16	D001	15,000	P	X01			OD at TA-36
17	D003						
18	D005						
19	F005						
20	THIS LINE LEFT INTENTIONALLY BLANK						
21	D001	15,000	P	X01			OD at TA-39
22	D003						
23	D005						
24	F005						

Please print or type in ink. Use only one character per box. Shaded areas only

GSA No. 0248-EPA-07

EPA I.D. Number (Enter from page 1)	Secondary ID Number (Enter from page 1)
N M 0 8 9 0 0 1 0 5 1 5	

XV. Map

Attach to this application a topographic map, or other equivalent map, of the area extending to at least one mile beyond property boundaries. The map must show the outline of the facility, the location of each of its existing and proposed intake and discharge structures, each of its hazardous waste treatment, storage, or disposal facilities, and each well where it injects fluids underground. Include all springs, rivers and other surface water bodies in this map area. See instructions for precise requirements.

XVI. Facility Drawing

All existing facilities must include a scale drawing of the facility (see instructions for more detail).

XVII. Photographs

All existing facilities must include photographs (aerial or ground-level) that clearly delineate all existing structures; existing storage, treatment and disposal areas; and sites of future storage, treatment or disposal areas (see instructions for more detail).

XVIII. Certification(s)

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Owner Signature: G. Thomas Todd	Date Signed: 9.30.96
Name and Official Title (Type or print): G. Thomas Todd, Area Manager, DOE/LAAO	
Owner Signature	Date Signed
Name and Official Title (Type or print)	
Operator Signature: G. Thomas Todd	Date Signed: 9.30.96
Name and Official Title (Type or print): G. Thomas Todd, Area Manager, DOE/LAAO	
Operator Signature: [signature]	Date Signed: 9/25/96
Name and Official Title (Type or print): Dennis J. Erickson, Division Director, LANL ES&H Division	

XIX. Comments

Note: Mail completed form to the appropriate EPA Regional or State Office. (Refer to instructions for more information)

ATTACHMENT 1

EXPLANATION OF PROCESS CODE LISTINGS AND DESIGN CAPACITIES FOR OPEN BURNING/OPEN DETONATION UNITS AT TECHNICAL AREA (TA) 14, TA-15, TA-36, AND TA-39

EXPLANATION OF PROCESS CODE LISTINGS AND DESIGN CAPACITIES FOR OPEN BURNING/OPEN DETONATION UNITS AT TECHNICAL AREA (TA) 14, TA-15, TA-36, AND TA-39

Line 1 X01 Thermal Treatment - Open Burning/Open Detonation

Description	Capacity (pounds per treatment)	SWMU[a] No.	Associated Structure No./Area
TA-14:			
Thermal treatment unit[b] (open burning)	50	14-005	TA-14-23[c]
Thermal treatment unit[b] (open detonation)	20	14-001(g)	TA-14-23
TOTAL X01 at TA-14	**70**		

See footnotes at end of Attachment 1.

EXPLANATION OF PROCESS CODE LISTINGS AND DESIGN CAPACITIES FOR OPEN BURNING/OPEN DETONATION UNITS AT TECHNICAL AREA (TA) 14, TA-15, TA-36, AND TA-39

Line 2 X01 Thermal Treatment - Open Detonation

Description	Capacity (pounds per treatment)	SWMU[a] No.	Associated Structure No./Area
TA-15:			
Thermal treatment unit[d] (open detonation)	500	15-003	TA-15-184
TOTAL X01 at TA-15	**500**		

See footnotes at end of Attachment 1.

EXPLANATION OF PROCESS CODE LISTINGS AND DESIGN CAPACITIES FOR OPEN BURNING/OPEN DETONATION UNITS AT TECHNICAL AREA (TA) 14, TA-15, TA-36, AND TA-39

Line 3 X01 Thermal Treatment - Open Detonation

Description	Capacity (pounds per treatment)	SWMU[a] No.	Associated Structure No./Area
TA-36:			
Thermal treatment unit[d] (open detonation)	2,000	36-004(c)	TA-36-8
TOTAL X01 at TA-36	**2,000**		

See footnotes at end of Attachment 1.

EXPLANATION OF PROCESS CODE LISTINGS AND DESIGN CAPACITIES FOR OPEN BURNING/OPEN DETONATION UNITS AT TECHNICAL AREA (TA) 14, TA-15, TA-36, AND TA-39

Line 4 X01 Thermal Treatment - Open Detonation

Description	Capacity (pounds per treatment)	SWMU[a] No.	Associated Structure No./Area
TA-39:			
Thermal treatment unit[b] (open detonation)	1,000	39-004(c)	TA-39-6
Thermal treatment unit[b] (open detonation)	1,000	39-004(d)	TA-39-57
TOTAL X01 at TA-39	**2,000**		
TOTAL X01	**4,570**		

'anation of Symbols/Abbreviations

[a] SWMU = solid waste management unit.
[b] Unit is used for treatment of hazardous waste.
[c] In Los Alamos National Laboratory's Resource Conservation and Recovery Act Part A permit application (LANL, 1988), this unit is described as being associated with Structure No. TA-14-35.
[d] Unit is used for treatment of hazardous waste and mixed waste.

ATTACHMENT 2

TOPOGRAPHIC MAPS

LIST OF TOPOGRAPHIC MAPS

MAP NO.	MAP TITLE
1	Contour Map Showing All Technical Areas (TA) at Los Alamos National Laboratory (LANL)
2	Contour Map Showing Hazardous Waste Units at Technical Area (TA) 14
3	Contour Map Showing Hazardous and Mixed Waste Unit at Technical Area (TA) 15
4	Contour Map Showing Hazardous and Mixed Waste Unit at Technical Area (TA) 36
5[a]	Contour Map Showing Hazardous Waste Units at Technical Area (TA) 39
6	Location Map of Water Supply Wells, Monitoring Wells, Test Wells, Springs, and Surface Water Sampling Stations
7	Los Alamos National Laboratory (LANL) National Pollutant Discharge Elimination System (NPDES) Outfall Locations
8	Location Map of Technical Area (TA) 57, Fenton Hill Geothermal Site

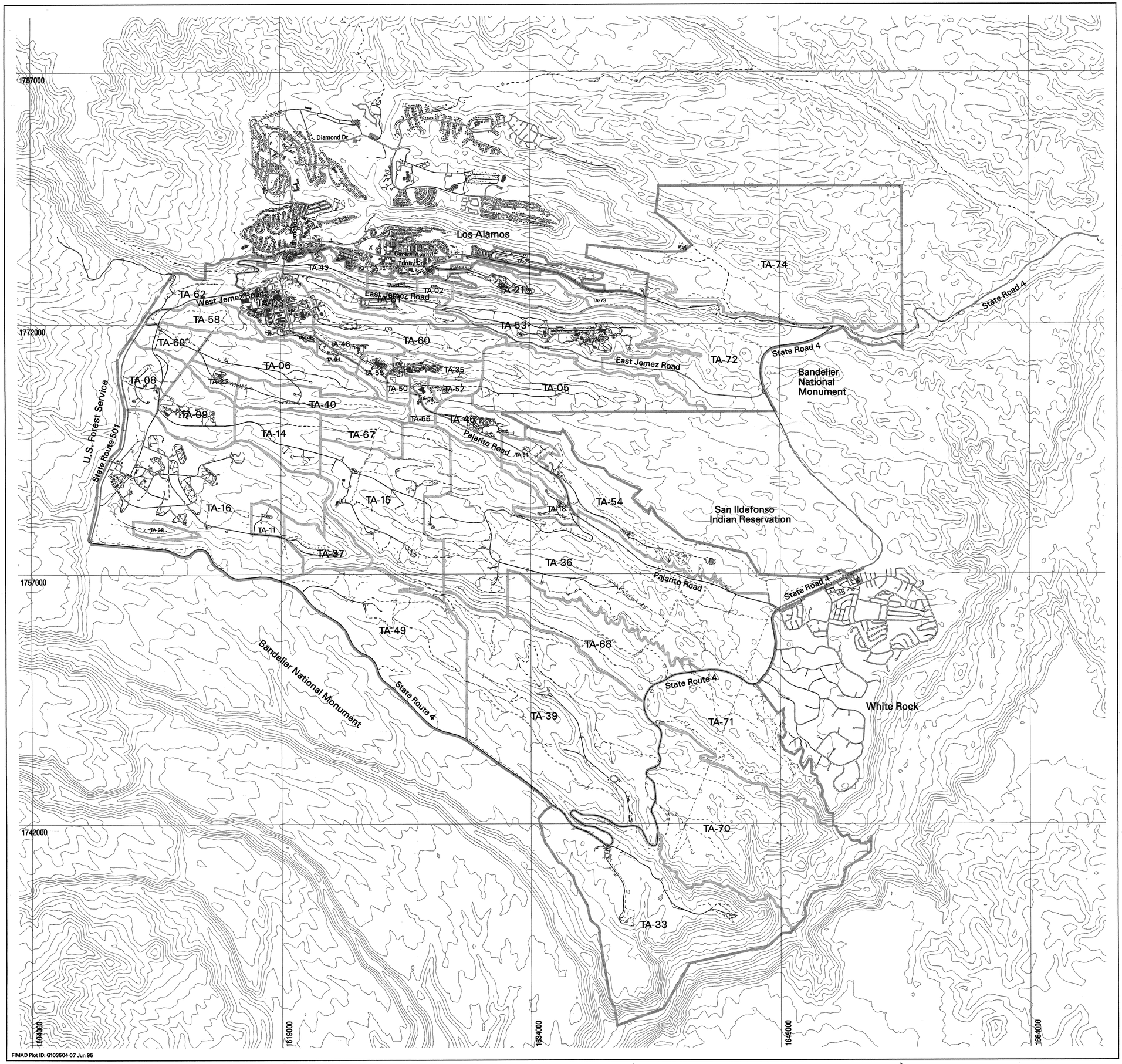
Note: For topographic maps showing LANL's other hazardous and mixed waste units, refer to the "General Part B Permit Application Information for Los Alamos National Laboratory," 1996.

[a] Map 5 has been modified to more clearly delineate the extent of operations at the TA-36 open detonation area.

Map 1: Contour Map Showing All Technical Areas (TA) at Los Alamos National Laboratory (LANL)

- Boundary, LANL
- Boundary, TA
- Contours, 100 foot
- Roads, Dirt
- Roads, Paved
- Trail
- Building

NOTE: TA-57, Fenton Hill Site, not shown



FIMAD Plot ID: G103504 07 Jun 95

3845-A

N

State Plane Coordinate System, New Mexico Central Zone.
1983 North American Datum

Grid provides NM State Plane coordinates in feet.
Grid interval, in 'feet': 15000
Feet per inch on map = 3000

SCALE 1:36000

0 914 1828 2742 3656

METERS

0 3000 6000 9000 12000

FEET

NOTICE: The information on this map is provisional. Feature locations are dependent on scale and symbology and their accuracy may not have been confirmed. Los Alamos National Laboratory boundary is based on legal description established in 1995. Other boundary, structure and utility data are from Los Alamos National Laboratory Engineering Division and Los Alamos County Utility and Engineering Departments. Contour data are from Los Alamos National Laboratory Environmental Restoration Project aerial survey, September, 1991.

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Produced by: Doug Walther

Date: June 07, 1995 FIMAD Plot ID: G103504

LEGEND

- Boundary, TA
- Contour, 10 foot
- Contour, 100 foot
- Fence, Industrial
- Fence, Security
- Road, Paved
- Road, Dirt
- Road/Trail
- Permanent Structure
- Temporary Structure

3845-B

MAP 2:
Contour Map Showing Hazardous Waste Units at Technical Area (TA) 14

N

State Plane Coordinate System, New Mexico Central Zone.
1983 North American Datum

Grid provides NM State Plane coordinates in feet.
Grid interval, in feet: 1000
Feet per inch on map = 250

SCALE 1:3000

0 76 152 228 304

METERS

0 250 500 750 1000

FEET

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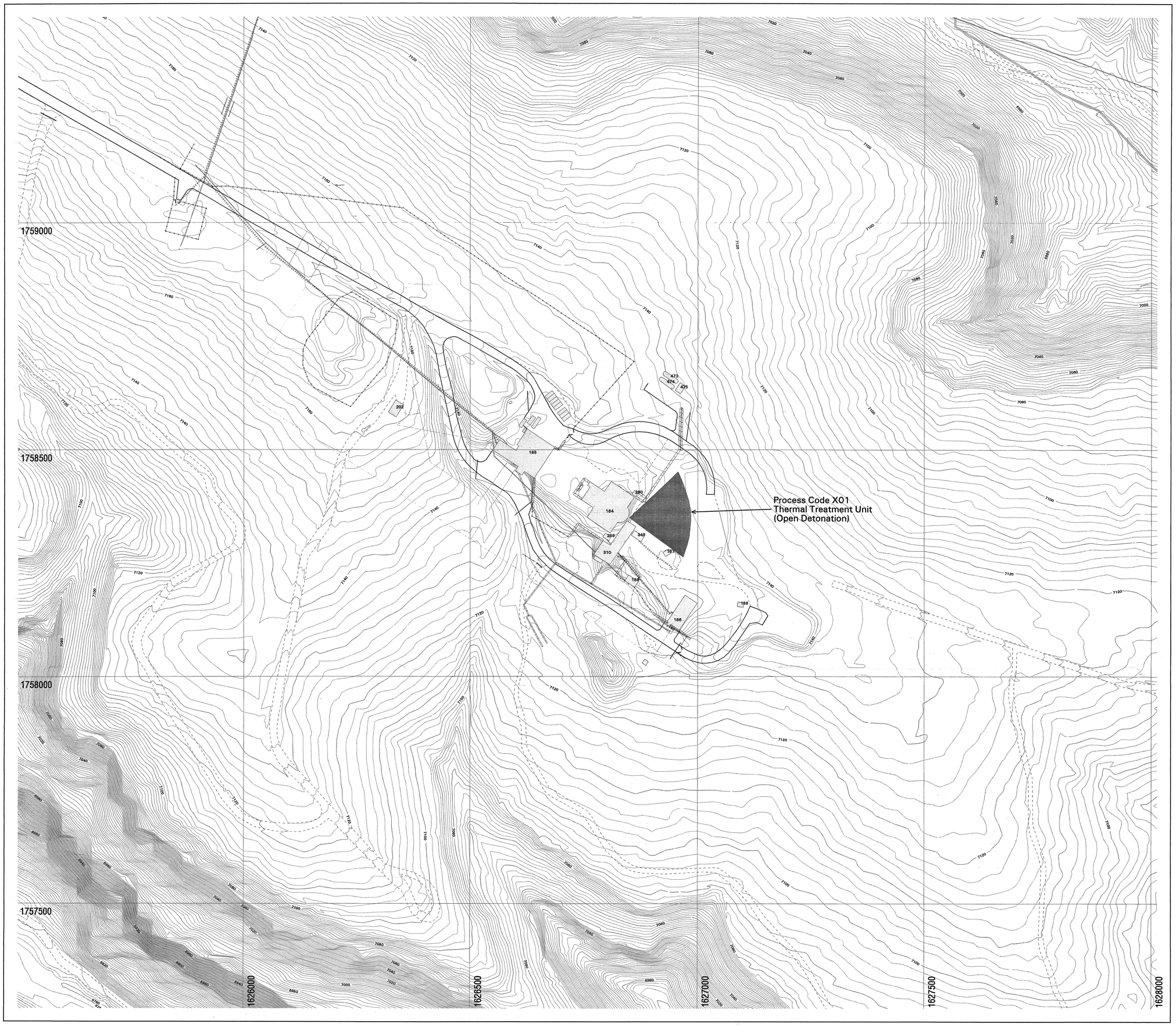
Date: September 19, 1996 FIMAD Plot ID: G105135



LEGEND

- Boundary, TA
- Contour, 2 foot
- Contour, 10 foot
- Fence, Industrial
- Fence, Security
- Power Line >13.2 kV
- Power Line <13.2 kV
- Retaining Wall
- Road, Paved
- Road, Dirt
- Road/Trail
- Sewer Line
- Storm Drain/Culvert
- Telephone Line
- Water Line
- Permanent Structure
- Temporary Structure

3845-C

MAP 3:
Contour Map Showing Hazardous and Mixed Waste Unit at Technical Area (TA) 15

N

State Plane Coordinate System, New Mexico Central Zone.
1983 North American Datum

Grid provides NM State Plane coordinates in feet.
Grid interval, in feet: 500
Feet per inch on map = 100

SCALE 1:1200

0 30 60 90 120

METERS

0 100 200 300 400

FEET

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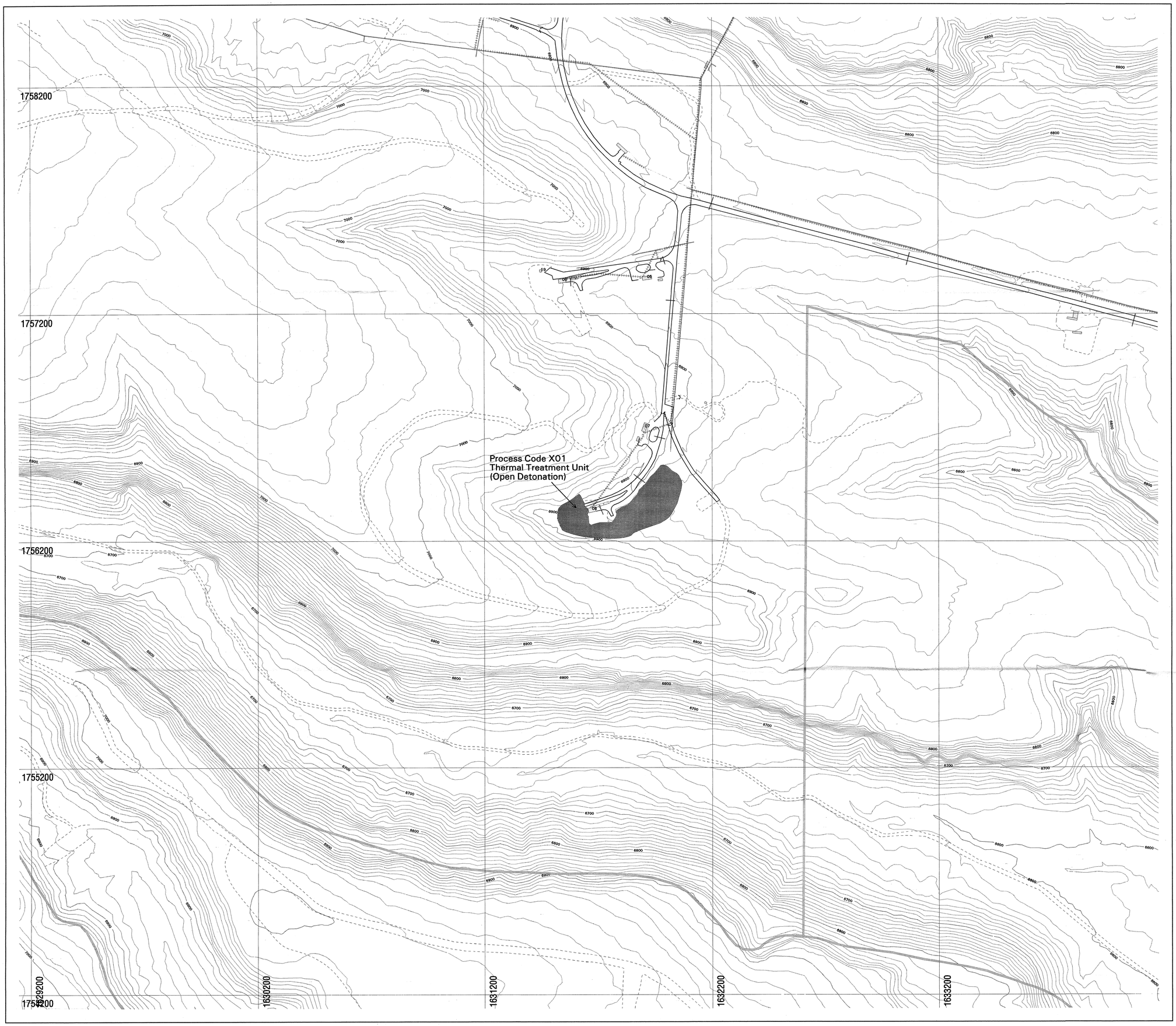

LEGEND

- Boundary, TA
- Contour, 10 foot
- Contour, 100 foot
- Fence, Industrial
- Fence, Security
- Power Line >13.2 kV
- Power Line <13.2 kV
- Retaining Wall
- Road, Paved
- Road, Dirt
- Road/Trail
- Storm Drain/Culvert
- Telephone Line
- Permanent Structure
- Temporary Structure

3845-D

MAP 4:
Contour Map Showing Hazardous and Mixed Waste Unit at Technical Area (TA) 36

N

State Plane Coordinate System, New Mexico Central Zone.
1983 North American Datum

Grid provides NM State Plane coordinates in feet.
Grid interval, in feet: 1000
Feet per inch on map = 200

SCALE 1:2400

0 61 122 183 244

METERS

0 200 400 600 800

FEET

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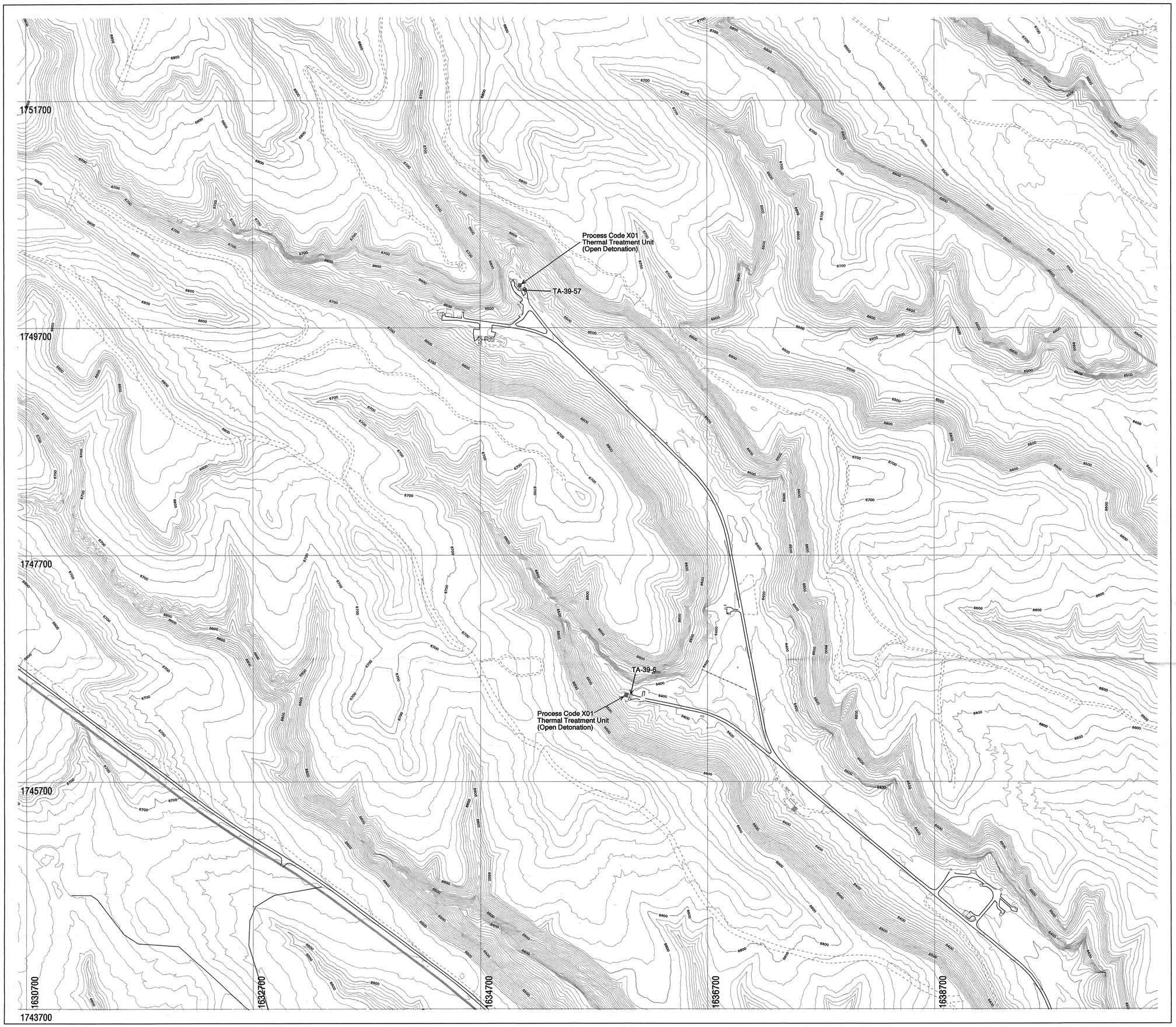
Date: September 24, 1996 FIMAD Plot ID: G105137



LEGEND

- Boundary, Los Alamos National Laboratory
- Boundary, TA
- Contour, 10 foot
- Contour, 100 foot
- Fence, Industrial
- Fence, Security
- Road, Paved
- Road, Dirt
- Road/Trail
- Permanent Structure
- Temporary Structure
- Underground Structure

3845-E

MAP 5:
Contour Map Showing Hazardous Waste Units at Technical Area (TA) 39

N

State Plane Coordinate System, New Mexico Central Zone.
1983 North American Datum

Grid provides NM State Plane coordinates in feet.
Grid interval, in feet: 2000
Feet per inch on map = 400

SCALE 1:4800

0 122 244 366 488

METERS

0 400 800 1200 1600

FEET

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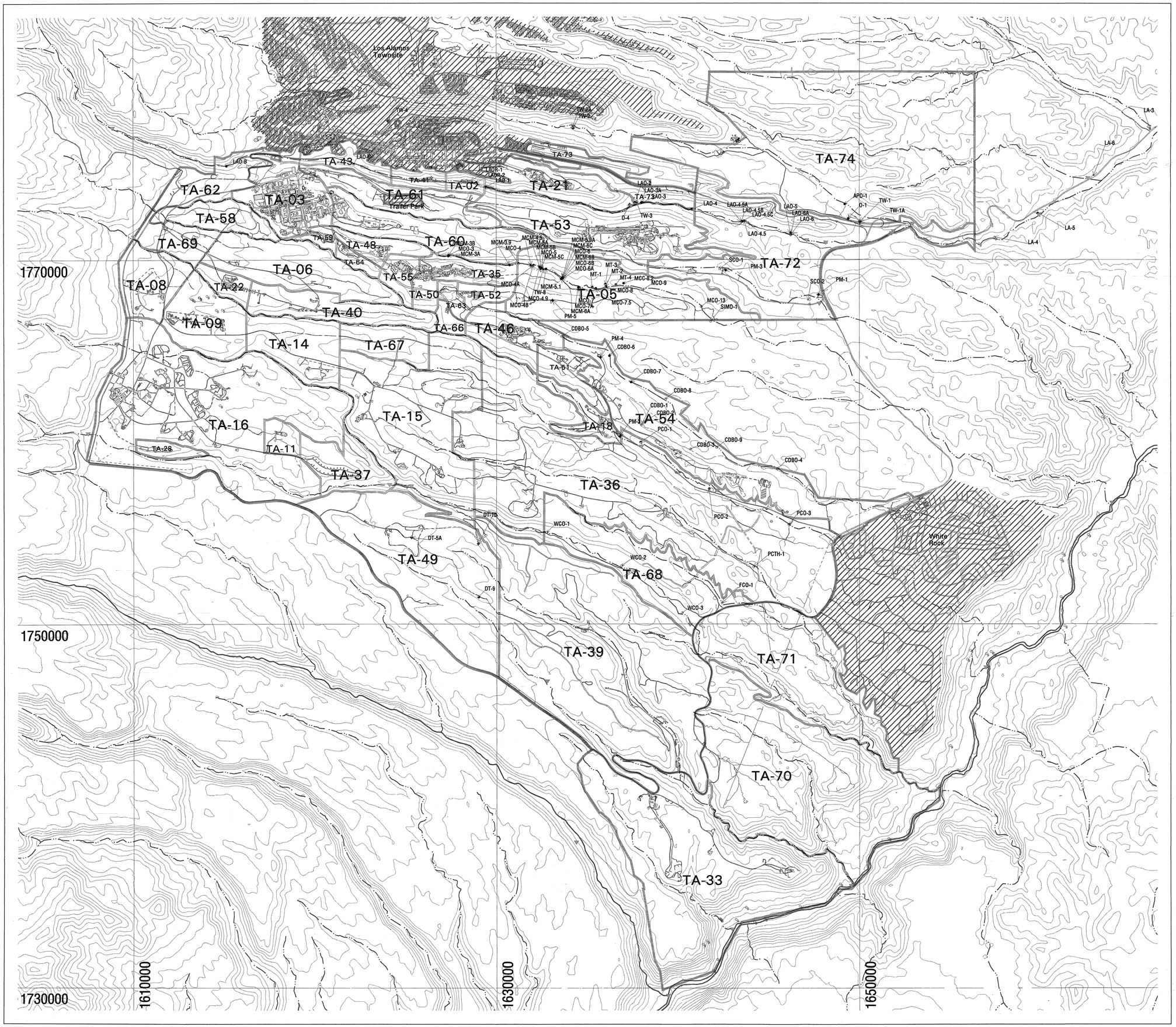
Date: September 19, 1996 FIMAD Plot ID: G105138



LEGEND

- Boundary, Los Alamos National Laboratory
- Boundary, Technical Area (TA)
- Contours, 100 foot
- Roads, Dirt
- Roads, Paved
- Road/Trail
- Stream, Intermittent
- Stream, Perennial
- Building
- Residential Areas

PERCHED ALLUVIAL MONITORING WELLS
(Old wells are pre-1990, new wells installed since 1990 according to EPA guidelines)

- New Dry Well
- Old Dry Well
- New Saturated Well
- Old Saturated Well

MAIN AQUIFER WELLS

- Water Supply Well
- Test Well

OTHER

- LAOR Well
- Abandoned/Plugged Well
- Surface Water Sampling Station
- Spring

3845-F

MAP 6:
Location Map of Water Supply Wells, Monitoring Wells, Test Wells, Springs, and Surface Water Sampling Stations

N

State Plane Coordinate System, New Mexico Central Zone.
1983 North American Datum

Grid provides NM State Plane coordinates in feet.
Grid interval, in feet: 20000
Feet per inch on map = 2500

SCALE 1:30000

0 762 1524 2286 3048
METERS

0 2500 5000 7500 10000
FEET

NOTICE: The information on this map is provisional. Feature locations are dependent on scale and symbology and their accuracy may not have been confirmed. Los Alamos National Laboratory boundary is based on legal description established in 1995. Contour data are from a September 1991 aerial survey. All other data are from various sources and are part of the FIMAD repository.

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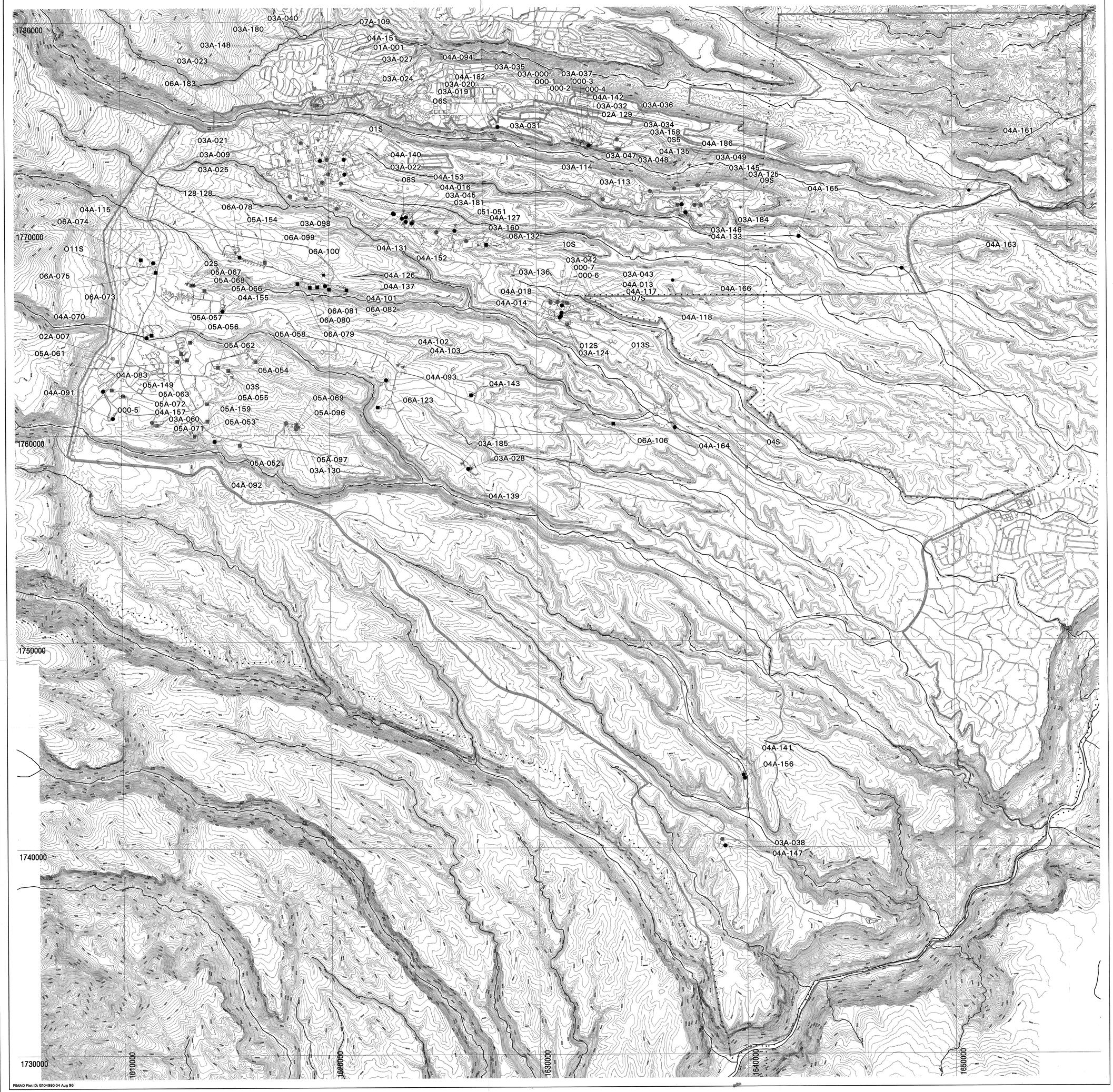
Date: August 04, 1996 FIMAD Plot ID: G104979

NPDES OUTFALL LOCATIONS



NPDES Outfall Locations

LEGEND

- County Boundary
- Drainage
- LANL Boundary
- Roads, Paved
- 100-ft Contours
- 20-ft Contours

OUTFALL CATEGORIES

- 01A
- 02A
- 03A
- 04A
- 05A
- 06A
- Miscellaneous

3845-G

MAP 7:
Los Alamos National Laboratory (LANL)
National Pollutant Discharge Elimination System (NPDES) Outfall Locations

N

State Plane Coordinate System, New Mexico Central Zone.
1983 North American Datum

Grid provides NM State Plane coordinates in feet.
Grid interval, in feet: 10000
Feet per inch on map = 1750

SCALE 1:21000

0 533 1066 1599 2132

METERS

0 1750 3500 5250 7000

FEET

NOTICE: The information on this map is provisional. Feature locations are dependent on scale and symbology and their accuracy may not have been confirmed. Los Alamos National Laboratory boundary is based on legal description established in 1995. Contour data are from a September 1991 aerial survey. All other data are from various sources and are part of the FIMAD repository.

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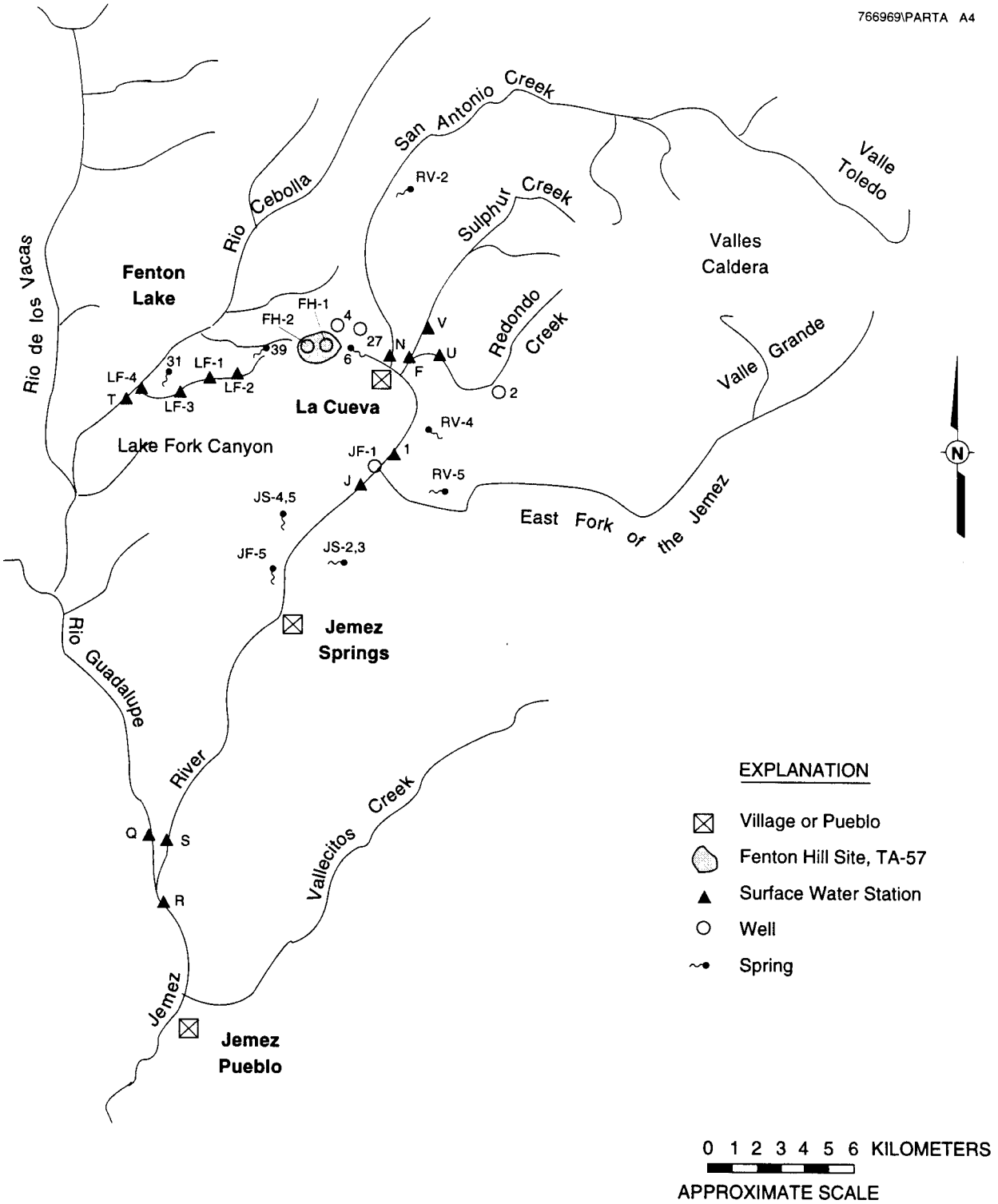
Produced by: Marcia Jones

Date: August 04, 1996 FIMAD Plot ID: G104980

FIMAD Plot ID: G104980 04 Aug 96



Reference: Los Alamos National Laboratory, 1994, "Environmental Surveillance at Los Alamos During 1992," LA-12764-ENV, Los Alamos National Laboratory, Los Alamos, New Mexico.

Map 8

Location Map of Technical Area (TA) 57, Fenton Hill Geothermal Site

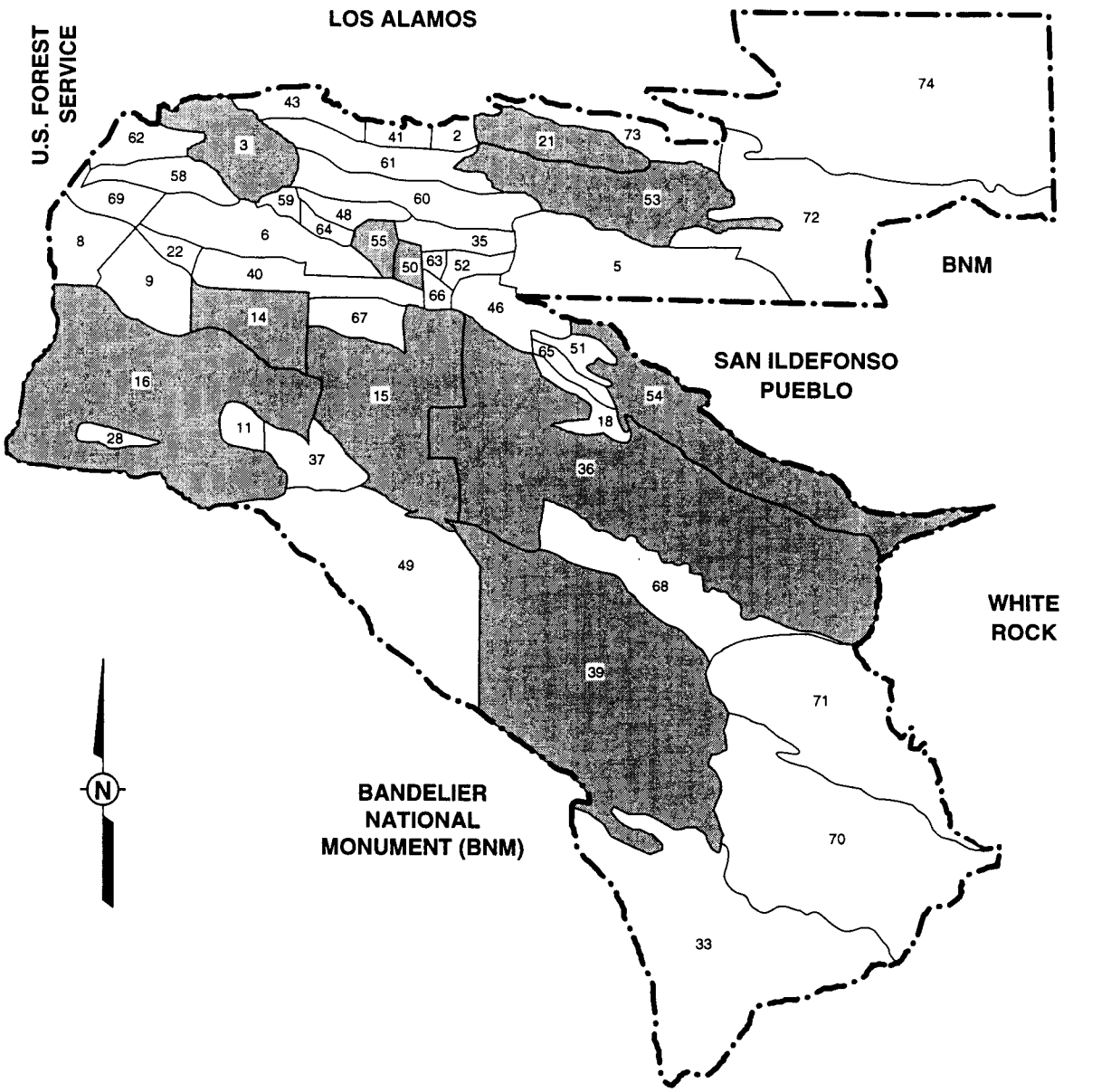
ATTACHMENT 3

FACILITY DRAWINGS

LIST OF FACILITY DRAWINGS

FIGURE NO.	TITLE
1	Location Map of Los Alamos National Laboratory Technical Areas
2	Location Map Showing the Thermal Treatment Units near Technical Area (TA) 14, Building 23
3	Location Map Showing the Thermal Treatment Unit near Technical Area (TA) 15, Building 184
4	Location Map Showing the Thermal Treatment Unit near Technical Area 36, Building 8
5	Location Map Showing the Thermal Treatment Unit near Technical Area 39, Building 6
6	Location Map Showing the Thermal Treatment Unit near Technical Area 39, Building 57

Note: For facility drawings showing Los Alamos National Laboratory's (LANL) other hazardous and mixed waste units, refer to Revision 2.0 of LANL's "Part A Permit Application for Mixed Waste," September 1994.



Shading indicates technical areas in which hazardous waste or mixed waste units are located or planned for construction.

4800 0 4800 FEET
APPROXIMATE SCALE

Modified from: Los Alamos National Laboratory, 1994, "Environmental Surveillance at Los Alamos During 1992," LA-12764-ENV, Los Alamos National Laboratory, Los Alamos, New Mexico.

Figure 1
Location Map of Los Alamos National Laboratory Technical Areas

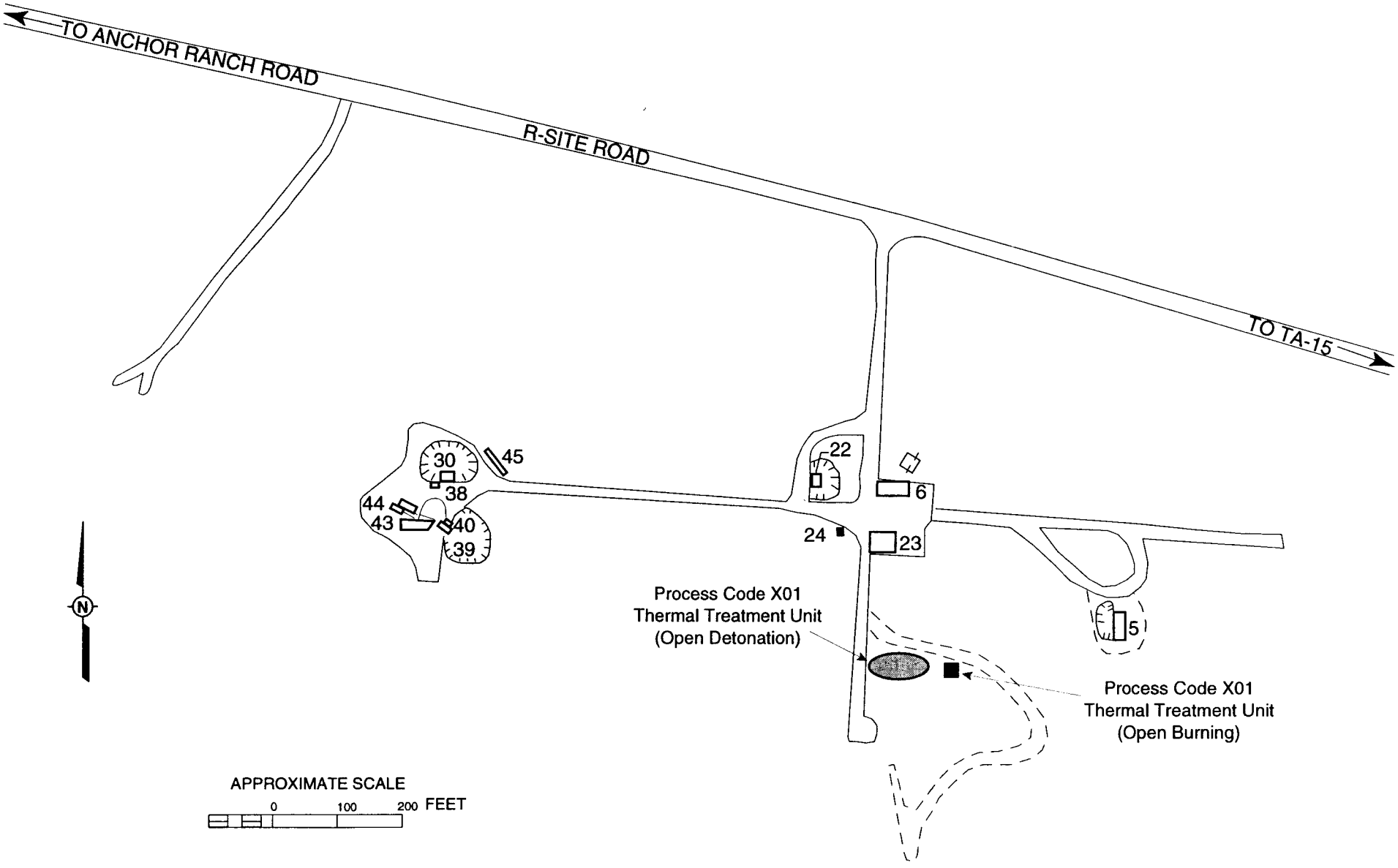


Figure 2
Location Map Showing the Thermal Treatment Units near Technical Area (TA) 14, Building 23

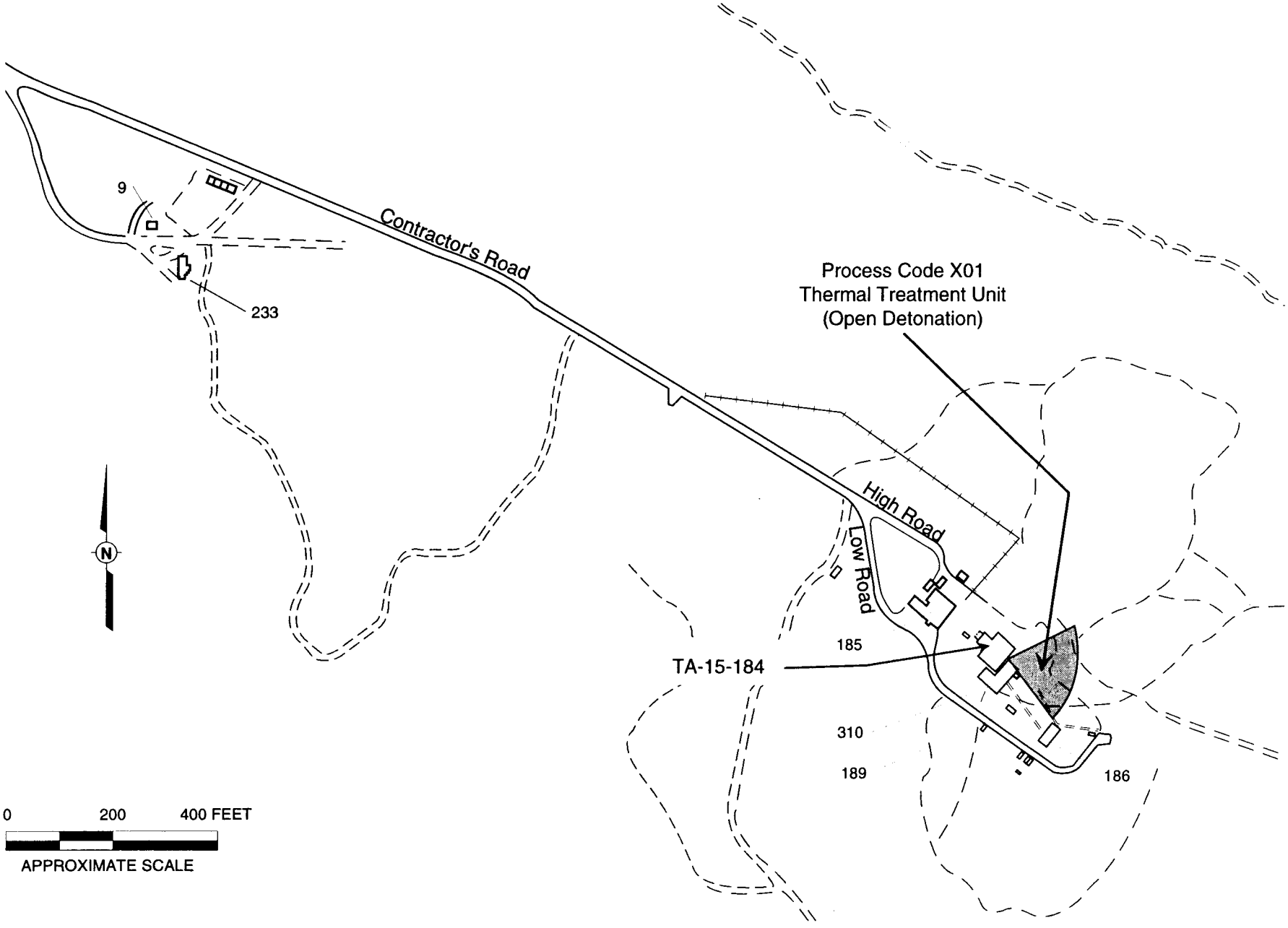


Figure 3

Location Map Showing the Thermal Treatment Unit near Technical Area (TA) 15, Building 184

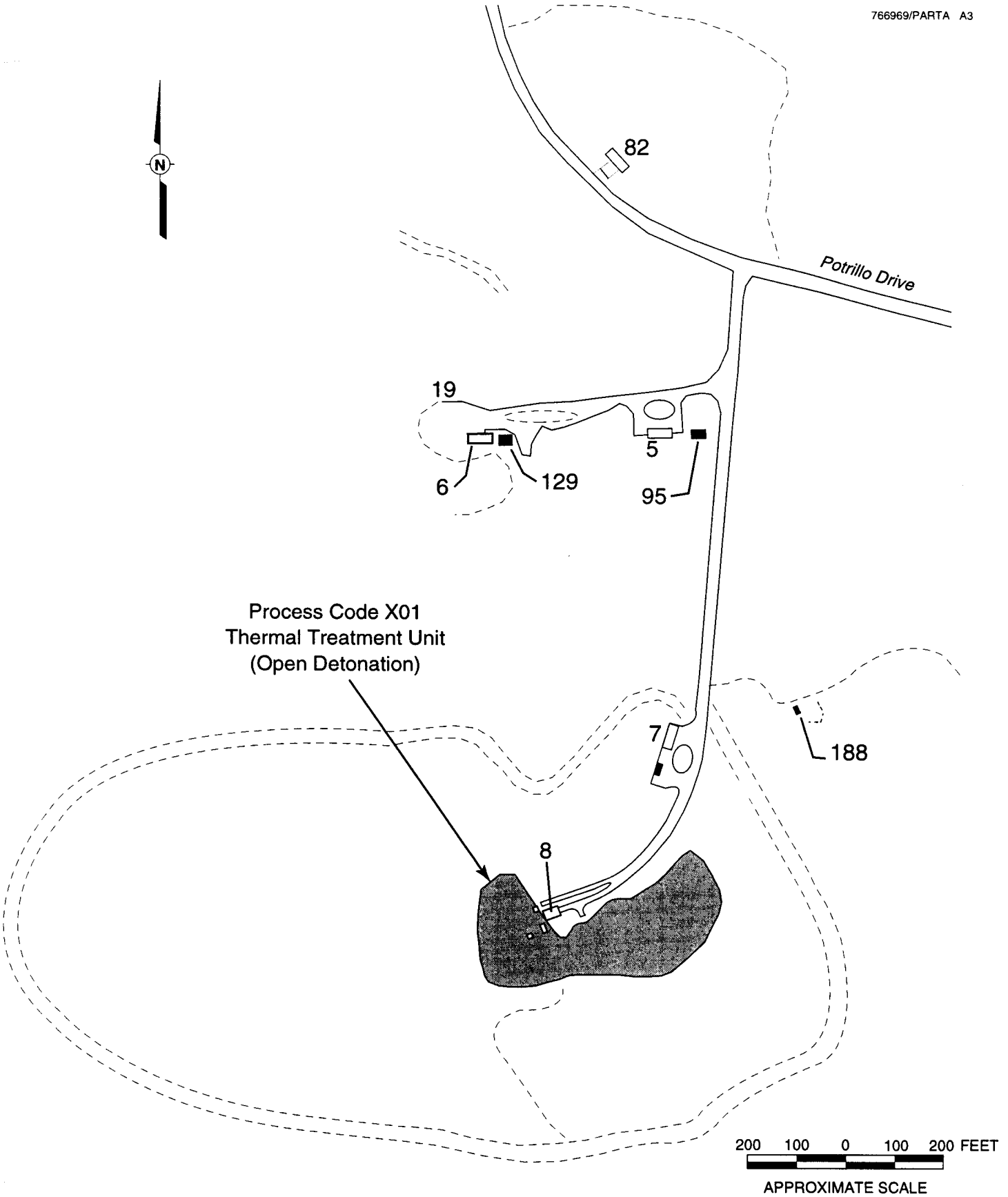


Figure 4
Location Map Showing the Thermal Treatment Unit near Technical Area 36, Building 8

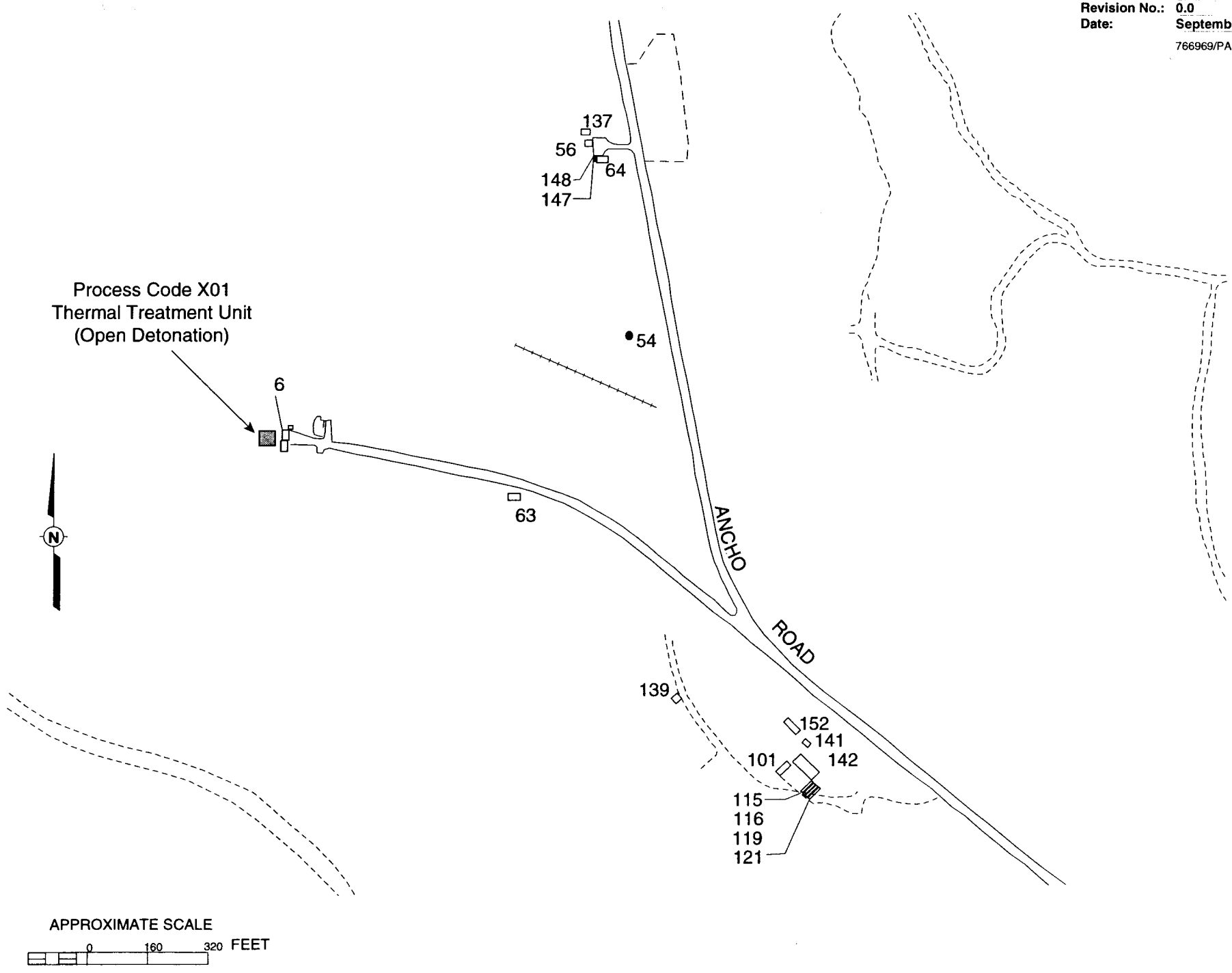


Figure 5
Location Map Showing the Thermal Treatment Unit near Technical Area 39, Building 6

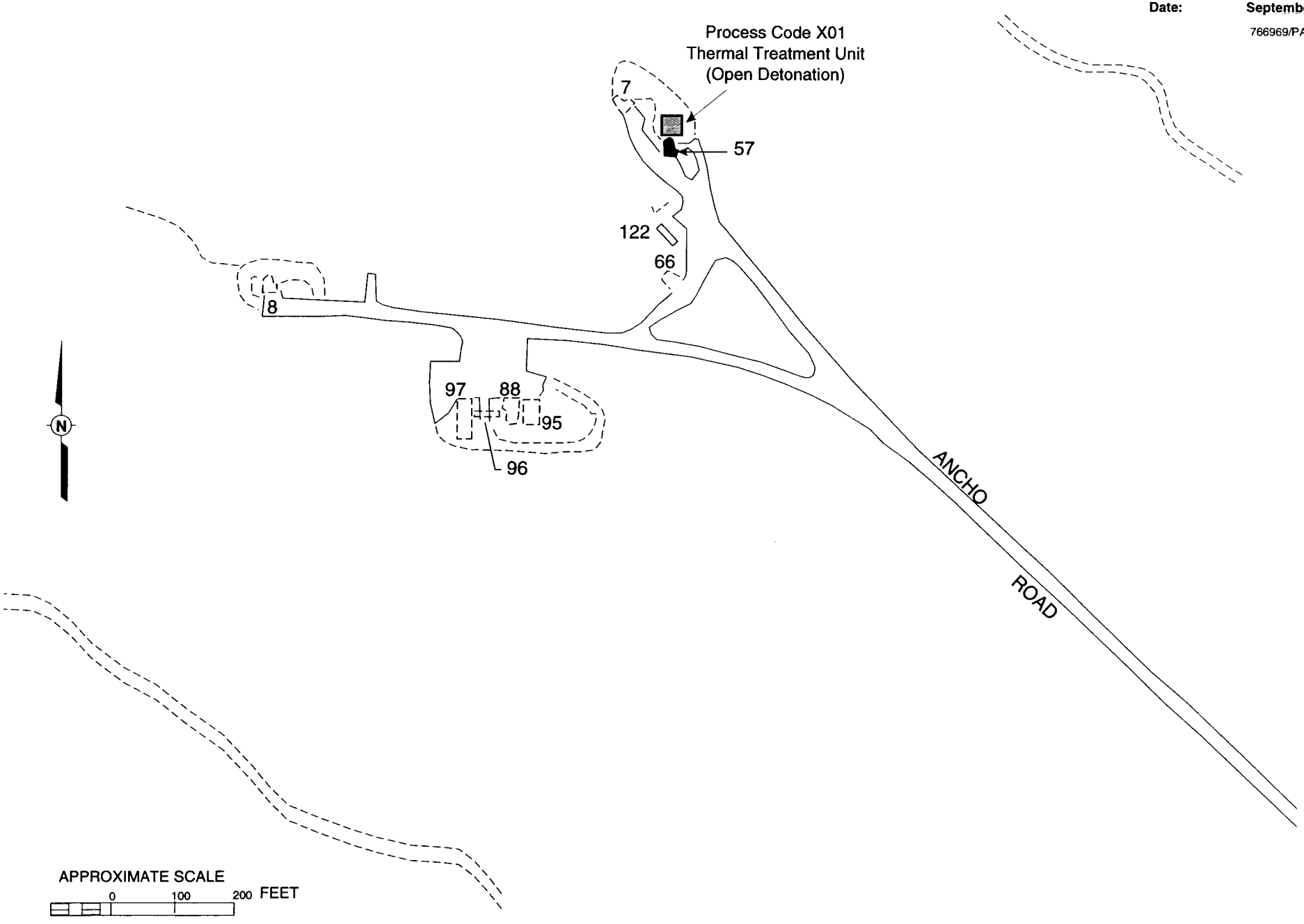


Figure 6
Location Map Showing the Thermal Treatment Unit near Technical Area 39, Building 57

ATTACHMENT 4

PHOTOGRAPHS

LIST OF PHOTOGRAPHS

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TA-14-23, Process Code X01, Thermal Treatment Unit (open burning) 4-1

TA-14-23, Process Code X01, Thermal Treatment Unit (open detonation) 4-2

TA-15-184, Process Code X01, Thermal Treatment Unit (open detonation) 4-3

TA-15-184, Process Code X01, Thermal Treatment Unit (open detonation) 4-4

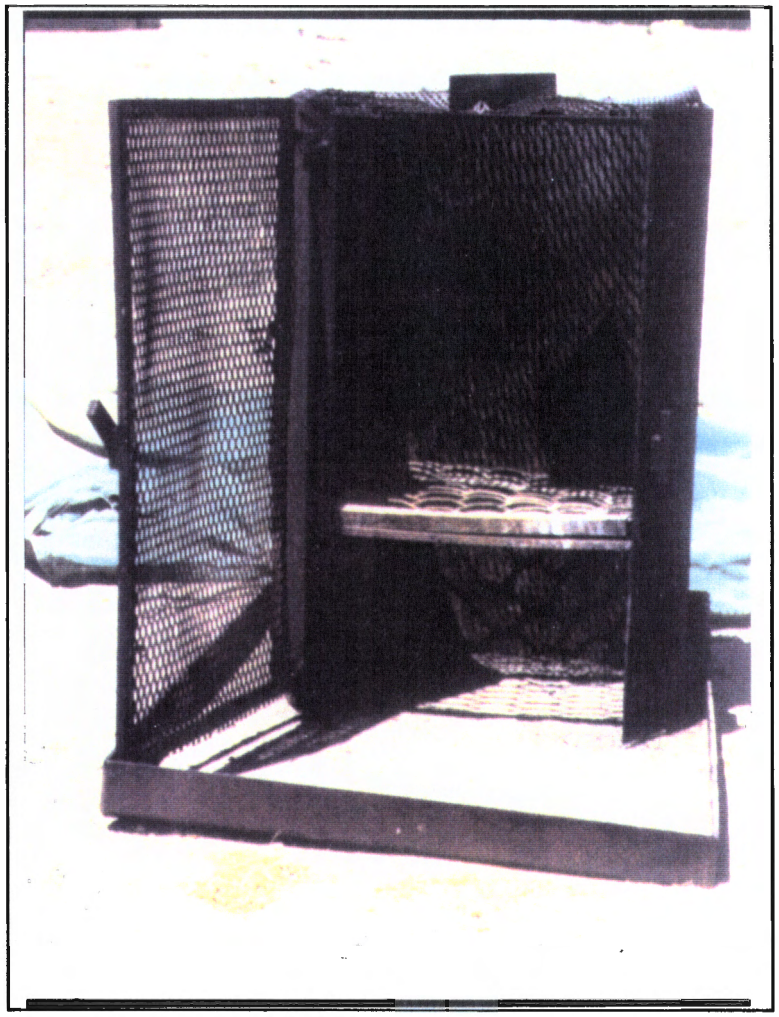
TA-36-8, Process Code X01, Thermal Treatment Unit (open detonation) 4-5

TA-36-8, Process Code X01, Thermal Treatment Unit (open detonation) 4-6

TA-39-6, Process Code X01, Thermal Treatment Unit (open detonation) 4-7

TA-39-57, Process Code X01, Thermal Treatment Unit (open detonation) 4-8

Note: For photographs showing Los Alamos National Laboratory's (LANL) other hazardous and mixed waste units, refer to Revision 2.0 of LANL's "Part A Permit Application for Mixed Waste," September 1994.



TA-14-23, Process Code X01, Thermal Treatment Unit
(open burning)

TA-14-23, Process Code X01, Thermal Treatment Unit
(open detonation)

TA-15-184, Process Code X01, Thermal Treatment Unit
(open detonation)

TA-15-184, Process Code X01, Thermal Treatment Unit
(open detonation)
(View is looking southeast away from TA-15-184)

TA-36-8, Process Code X01, Thermal Treatment Unit
(open detonation)
(View is looking northeast toward TA-36-8)

TA-36-8, Process Code X01, Thermal Treatment Unit
(open detonation)
(View is looking west to bunker)

TA-39-6, Process Code X01, Thermal Treatment Unit
(open detonation)

TA-39-57, Process Code X01, Thermal Treatment Unit
(open detonation)

Document:	LANL OB/OD Part B
Revision No.:	0.0
Date:	September 1996

Part B Permit Application
Open Burning/Open Detonation Units at Technical Areas 14, 15, 36, and 39

Prepared by:
Los Alamos National Laboratory
Hazardous and Solid Waste Group (ESH-19)
Los Alamos, New Mexico 87545

September 1996

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LIST OF ABBREVIATIONS/ACRONYMS

AEHA	U.S. Army Environmental Hygiene Agency
amsl	above mean sea level
cm	centimeter
cm/cm	centimeter per centimeter
cm/hr	centimeters per hour
DOE	U.S. Department of Energy
DX	LANL's Dynamic Experimentation Division
EPA	U.S. Environmental Protection Agency
ESA	LANL's Engineering Sciences and Applications Division
ESH-1	LANL's Health Physics Operations Group
ESH-5	LANL's Industrial Hygiene and Safety Group
ESH-19	LANL's Hazardous and Solid Waste Group
IRF	Inspection Record Form
LACFD	Los Alamos County Fire Department
LANL	Los Alamos National Laboratory
LDR	land disposal restrictions
MSDS	material safety data sheet
20 NMAC 4.1	New Mexico Administrative Code, Title 20, Chapter 4, Part 1
NMED	New Mexico Environment Department
NO_x	nitrogen oxides
NPDES	National Pollutant Discharge Elimination System
OB	open burning

LIST OF ABBREVIATIONS/ACRONYMS
(Continued)

OD	open detonation
PCB	polychlorinated biphenyl
PPE	personal protective equipment
ppm	part per million
QA/QC	quality assurance/quality control
RCRA	Resource Conservation and Recovery Act
RFI	RCRA Facility Investigation
SAL	screening action level
SOP	standard operating procedure
SVOC	semivolatile organic compound
SW-846	EPA's "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods"
SWMU	solid waste management unit
SWPP	Storm Water Pollution Prevention
TA	technical area
TCLP	toxicity characteristic leaching procedure
USCS	Unified Soil Classification System
VOC	volatile organic compound
WAP	waste analysis plan

1.0 INTRODUCTION

This unit-specific Part B permit application has been prepared for submittal to the New Mexico Environment Department (NMED) to meet certain requirements of the New Mexico Hazardous Waste Act and implementing regulations, specifically, the New Mexico Administrative Code, Title 20, Chapter 4, Part 1 (20 NMAC 4.1), revised November 1, 1995. The U.S. Environmental Protection Agency (EPA), Region 6, is also being provided with a copy of this unit-specific Part B permit application. General information applicable to all waste management units at Los Alamos National Laboratory (LANL) is provided in the "General Part B Permit Application Information for Los Alamos National Laboratory" (LANL, 1996a), hereinafter referred to as the LANL General Part B. This unit-specific Part B permit application contains only the information specific to the waste management units addressed herein; the LANL General Part B addresses other permit application requirements and is referenced in this document, as appropriate.

This unit-specific Part B permit application addresses the open burning/open detonation (OB/OD) thermal treatment units at Technical Area (TA) 14, TA-15, TA-36, and TA-39 that have been previously included in LANL Part A permit application submittals. The Part A permit application for hazardous waste (LANL, 1988) was submitted to NMED in November 1988 and included waste management units at the TAs addressed in this unit-specific Part B permit application. The Part A permit application for mixed waste units at LANL (LANL, 1991a) was submitted to NMED in January 1991 and included units at TA-15 and TA-36. These mixed waste management units were also included in Revision 1.0 (LANL, 1993a) and Revision 2.0 (LANL, 1994a) of the Part A permit application for mixed waste. Revisions 1.0 and 2.0 were submitted to NMED in September 1993 and September 1994, respectively. In accordance with direction from NMED, a unit-specific Part A permit application (LANL, 1996b) for the waste management units addressed in this unit-specific Part B permit application is being submitted to NMED, pursuant to 20 NMAC 4.1, Subpart IX, 270.72, revised November 1, 1995. The unit-specific Part A permit application, hereinafter referred to as the OB/OD Part A, is being submitted with this unit-specific Part B permit application as a separate document. Following is a list of the hazardous and mixed waste management units at TA-14, TA-15, TA-36, and TA-39 for which this unit-specific Part B permit application is being submitted.

- **TA-14: Two Thermal Treatment Units**, included in LANL's Resource Conservation and Recovery Act (RCRA) Part A permit application for hazardous waste, comprise an OB unit and an OD unit near TA-14, Building 23 (TA-14-23). These units may be used to treat

hazardous explosive waste by OB and OD, respectively. (A definition of *hazardous waste* is provided in Section 3.0 of this unit-specific Part B permit application.)

- **TA-15: A Thermal Treatment Unit**, included in LANL's RCRA Part A permit application for hazardous waste and in LANL's original RCRA Part A permit application for mixed waste, is an OD unit near TA-15-184. This unit may be used to treat hazardous and/or low-level mixed explosive waste by OD. (Definitions of *low-level mixed waste* and *explosive* are provided in Section 3.0 of this permit application.)

- **TA-36: A Thermal Treatment Unit**, included in LANL's RCRA Part A permit application for hazardous waste and in LANL's original RCRA Part A permit application for mixed waste, is an OD unit near TA-36-8. This unit may be used to treat hazardous and/or low-level mixed explosive waste by OD.

- **TA-39: Two Thermal Treatment Units**, included in the 1988 Part A permit application, are OD units near TA-39-6 and TA-39-57. These units may be used to treat hazardous explosive waste by OD.

In both the Part A and Part B permit applications, a unit to be permitted may sometimes be referred to as a "facility" (e.g., the Drum Prep Facility). The term "facility," as it appears in this context, is used only to denote building names and does not imply the regulatory meaning of "facility" as defined in 20 NMAC 4.1, Subpart I, 260.10, revised November 1, 1995. However, pursuant to 20 NMAC 4.1, Subpart I, 260.10, revised November 1, 1995, the LANL facility as a whole does meet the regulatory definition of a facility.

Table 1-1 provides a list of regulatory references and the corresponding section location in the unit-specific and/or the LANL General Part B permit application(s). Where applicable, regulatory citations in this unit-specific Part B permit application and in the LANL General Part B permit application reference 20 NMAC 4.1, which adopts, with a few limited exceptions, the Code of Federal Regulations, Title 40, Parts 260 to 266, Part 268, and Part 270.

Table 1-1

Regulatory References and Corresponding Permit Application Location

Regulatory Reference[a]				
20 NMAC 4.1, Subpart IX	20 NMAC 4.1, Subparts V and VI[b]	Description of Requirement	Location in this Part B Permit Application	Location in General Part B Permit Application
270.10(a)	--	Permit application	Entire Document	Entire Document
270.10(g)(1)	--	Updating permit application	1.0	1.0
270.11(a)	--	Signatories	12.0	12.0
270.11(d)	--	Certification	12.0	12.0
270.13	--	Contents of Part A permit application	Part A[c]	NA[d]
270.13(a)	--	Activities conducted	Part A	NA
270.13(b)	--	Name, mailing address, and location	Part A	NA
270.13(c)	--	Principal standard industrial classification codes	Part A	NA
270.13(d)	--	Operator information	Part A	NA
270.13(e)	--	Owner information	Part A	NA
270.13(f)	--	Whether located on Indian lands	Part A	NA
270.13(g)	--	New or existing facility	Part A	NA
270.13(h)	--	Scale drawing and photographs	Part A	NA
270.13(i)	--	Description of waste processes	Part A	NA
270.13(j)	--	Specification and quantity of hazardous waste	Part A	NA
270.13(k)	--	List of permits and construction approvals	Part A	NA
270.13(l)	--	Topographic maps	Part A/2.0	NA
270.13(m)	--	Description of nature of business	Part A	NA
270.13(n)	--	Hazardous debris	Part A	NA
270.14(b)(1)	--	General facility description	2.0	2.0
270.14(b)(2)	264.13(a)	Chemical and physical analyses	3.0	3.0
270.14(b)(3)	264.13(b)	Waste analysis plan	3.0	3.0
	264.13(b)(1)	Parameters and rationale	3.0	NA
	264.13(b)(2)	Test methods	3.0	NA
	264.13(b)(3)	Sampling methods	3.0	NA

Refer to footnotes at end of table.

Table 1-1 (Continued)

Regulatory References and Corresponding Permit Application Location

Regulatory Reference[a]				
20 NMAC 4.1, Subpart IX	20 NMAC 4.1, Subparts V and VI[b]	Description of Requirement	Location in this Part B Permit Application	Location in General Part B Permit Application
	264.13(b)(4)	Frequency of analyses	3.0	3.0
	264.13(b)(5)	Waste analysis for off-site facilities	3.0	NA
270.14(b)(4)	264.14	Security procedures and equipment	5.0	NA
270.14(b)(5)	264.15(b)	General inspection requirements	6.0	6.0
	265.377	Monitoring and inspections for thermal treatment units	4.0	6.0
270.14(b)(7)	264 Subpart D	Contingency Plan	7.0	7.0
	264.51	Contingency plan design and implementation	7.0	7.0
	264.52(a) & (c–f)	Contingency plan content	NA	7.0
	264.52(e) & (f)	Contingency plan content	7.0	--
	264.53	Contingency plan copies	NA	7.1
	264.54	Contingency plan amendment	NA	7.13
	264.55	Emergency coordinator	NA	7.1.1
	264.56	Emergency procedures	NA	7.3 - 7.12
270.14(b)(8)	264 Subpart C	Preparedness and prevention	5.0	5.0
	264.31	Design and operation of facility	4.0/5.0	4.0/5.0
	264.32	Required equipment	5.0	NA
	264.33	Testing and maintenance of equipment	5.0	NA
	264.34	Communications/alarm system	5.0	NA
	264.35	Required aisle space	5.0	NA
	264.37	Arrangements with local authorities	NA	5.0/7.0
270.14(b)(9)	264.17	Prevention of accidental ignition or reaction	4.0/5.0	NA
270.14(b)(10)	--	Traffic patterns, volume, and controls	2.0	2.3
270.14(b)(11)(i) & (ii)	264.18(a)	Seismic standard	2.0	2.2.1
270.14(b)(11)(iii)	264.18(b)	Floodplain standard	2.0	2.2.2
270.14(b)(12)	264.16	Personnel training	NA	8.0

Refer to footnotes at end of table.

Table 1-1 (Continued)

Regulatory References and Corresponding Permit Application Location

Regulatory Reference[a]				
20 NMAC 4.1, Subpart IX	20 NMAC 4.1, Subparts V and VI[b]	Description of Requirement	Location in this Part B Permit Application	Location in General Part B Permit Application
270.14(b)(13)	264 Subpart G	Closure and post-closure plans	9.0	9.0
	264.111	Closure performance standard	NA	9.1.1
	264.112(a) & (b)	Written content of closure plan	9.0	9.0
	264.112(c)	Amendment of closure plan	NA	9.1.4
	264.112(d)	Notification of partial and final closure	NA	9.1.2
	264.112(e)	Removal of wastes and decontamination/dismantling of equipment	9.0	NA
	264.113	Time allowed for closure	NA	9.1.3
	264.114	Disposal/decontamination	9.0	NA
	264.115	Certification of closure	NA	9.1.6
	264.116	Survey plat	NA	9.1.10
	264.117	Post-closure care and use of property	NA	9.1.10
	264.118	Post-closure plan; amendment of plan	NA	9.1.10
	264.119	Post-closure notices	NA	9.1.10
	264.120	Certification of post-closure	NA	9.1.10
270.14(b)(19)(i) (vi)(vii) & (x)	--	Topographic maps	Part A	2.1.2
270.14(b)(19)(ii)	264.18(b)	100-year floodplain	2.0	2.2.2
270.14(b)(19)(iii)	--	Surface waters	Part A/4.0	2.1.3
270.14(b)(19)(iv)	--	Land use	NA	2.1.5
270.14(b)(19)(v)	--	Wind rose	NA	2.1.4
270.14(b)(19)(viii)	264.14(b)	Access control	5.0	NA
270.14(b)(19)(ix)	--	Wells	Part A	2.1.3
270.14(b)(19)(xi)	--	Drainage barriers	Part A/4.0	NA
270.14(b)(19)(xii)	--	Location of operational units	2.0	2.1
270.14(b)(20)	--	Other federal laws	NA	11.0
.70.14(c)	264.90(a)	Groundwater monitoring requirements	2.0	2.2.5.1

Refer to footnotes at end of table.

Table 1-1 (Continued)

Regulatory References and Corresponding Permit Application Location

Regulatory Reference[a]				
20 NMAC 4.1, Subpart IX	20 NMAC 4.1, Subparts V and VI[b]	Description of Requirement	Location in this Part B Permit Application	Location in General Part B Permit Application
270.14(d)(1)	--	Requirements for solid waste management units (SWMU)	10.0	NA
270.14(d)(1)(i)	--	Location of SWMUs on topographic map	10.0	NA
270.14(d)(1)(ii)	--	Types of SWMUs	10.0	NA
270.14(d)(1)(iii)	--	Structural description of SWMUs	10.0	NA
270.14(d)(1)(iv)	--	Dates of operation	10.0	NA
270.14(d)(1)(v)	--	Waste types managed at SWMU	10.0	NA
270.14(d)(2)	--	Information on releases from SWMUs	10.0	NA
270.23	264 Subpart X	Miscellaneous units	4.0	NA
270.23(a)	264.601	Detailed unit description	4.0	NA
70.23(b)	264.601	Hydrologic, geologic, and meteorologic assessments	2.0/4.0	2.0
270.23(c)	264.601	Potential exposure pathways	4.0	NA
270.23(d)	--	Demonstration of treatment effectiveness	4.0	NA
	264.602	Monitoring, analysis, inspection, response, reporting, and corrective action	4.0/6.0/10.0	4.0/6.0
	264.603	Post-closure care	NA	9.0
	265 Subpart P	Thermal treatment	4.0	NA
	265.373	General operating requirements	4.0	NA
	265.375	Waste analysis	3.0/4.0	NA
	265.377	Monitoring and inspections	4.0	6.0
	265.381	Closure of thermal treatment units	9.0	NA
	265.382	Open burning; waste explosives	4.0	NA
	265.383	Special waste management practices	NA	NA

Refer to footnotes at end of table.

Table 1-1 (Continued)

Regulatory References and Corresponding Permit Application Location

[a] The New Mexico Administrative Code, Title 20, Chapter 4, Part 1 (20 NMAC 4.1), adopts, with a few limited exceptions, Title 40 of the Code of Federal Regulations (40 CFR), Parts 260–266, Part 268, and Part 270 (1995). 20 NMAC 4.1, Subparts V, VI, and IX, contain equivalent regulations to 40 CFR Parts 264, 265, and 270, respectively.

[b] Where there are no applicable 20 NMAC 4.1, Subpart V, Part 264 standards, 20 NMAC 4.1, Subpart VI, Part 265 standards are used, when appropriate.

[c] Part A = Los Alamos National Laboratory "Part A Permit Application—Open Burning/Open Detonation Units at Technical Areas 14, 15, 36, and 39," Revision 0.0 (LANL, 1996).

[d] NA = not applicable.

2.0 FACILITY DESCRIPTION

The information provided in this section is submitted in accordance with the applicable requirements of the New Mexico Administrative Code, Title 20, Chapter 4, Part 1 (20 NMAC 4.1), revised November 1, 1995. The following subject areas are addressed in this section:

- Site-specific location information for compliance with seismic and floodplain standard requirements [20 NMAC 4.1, Subpart IX, 270.14(b)(11)(i through iii), and 20 NMAC 4.1, Subpart V, 264.18(a and b), revised November 1, 1995];
- Site-specific groundwater monitoring and protection information [20 NMAC 4.1, Subpart IX, 270.14(c), and 20 NMAC 4.1, Subpart V, 264.90(a), revised November 1, 1995];
- Site-specific traffic patterns and control [20 NMAC 4.1, Subpart IX, 270.14(b)(10), revised November 1, 1995].

A Los Alamos National Laboratory (LANL)-wide facility description addressing additional regulatory requirements is provided in Section 2.0 of the "General Part B Permit Application Information for Los Alamos National Laboratory" (LANL, 1996a) (i.e., the LANL General Part B).

2.1. UNIT LOCATION/DESCRIPTION

The hazardous and/or mixed waste management units addressed in this Part B permit application include the following:

- Two thermal treatment units near Technical Area (TA) 14, Building 23 (TA-14-23); one for open burning (OB) of explosives-contaminated materials and one for open detonation (OD) of hazardous explosive waste.
- A thermal treatment unit near TA-15-184 for OD of hazardous and/or low-level mixed explosive waste.
- A thermal treatment unit near TA-36-8 for OD of hazardous and/or low-level mixed explosive waste.
- Two thermal treatment units near TA-39-6 and TA-39-57 for OD of hazardous explosive waste.

The following sections describe the hazardous and/or low-level mixed waste management units addressed in this Part B permit application and the wastes managed or planned at each unit. The locations of these waste management units are shown on Maps 2 through 5 and Figures 2 through 6 of the unit-specific Part A permit application (LANL, 1996b) (i.e., the OB/OD Part A). Maps 2

through 4 of the OB/OD Part A are topographic maps with a scale of 1 inch = 100 feet. Map 5 has a scale of 1 inch = 250 feet.

2.1.1 TA-14 Hazardous Waste OB/OD Thermal Treatment Units

TA-14 is located in the western portion of LANL on the southern edge of Three-Mile Mesa. Mesa-top elevations at TA-14 range from approximately 7,350 to 7,450 feet above mean sea level (amsl). TA-14 was established in 1944 to study small-explosive charges, and since that time has been actively used for the development and testing of explosives (LANL, 1994b). Structures at the site include explosives magazines, a control building, and equipment boxes.

The OB/OD thermal treatment units at TA-14 are located in the vicinity of structure TA-14-23; this area is referred to as Q-Site East. The locations of these units are shown on Map 2 and Figure 2 of the OB/OD Part A. OB operations are conducted in a wire mesh burn cage located adjacent to Firing Mound 3. Hazardous explosive waste treated (i.e., open burned) in the burn cage includes explosives-contaminated materials. The OD treatment area is located approximately 180 feet south of TA-14-23 on Firing Mound 3 and is used to treat (i.e., open detonate) hazardous explosive waste. Mixed waste is not treated at either of these units. Nontreatment-related, experimental test detonations are also performed at TA-14, Q-Site East.

2.1.2 TA-15 Hazardous and/or Low-Level Mixed Waste OD Thermal Treatment Unit

TA-15 is located on a mesa that is bifurcated by Potrillo Canyon. Mesa-top elevations at TA-15 range from approximately 6,800 to 7,280 feet amsl. TA-15 is primarily a firing site with supporting offices where research is conducted with various types of explosives (LANL, 1993b).

The OD thermal treatment unit, located near TA-15-184 at the eastern end of TA-15, extends approximately 150 feet to the northeast and southeast of TA-15-184, as shown on Map 3 and Figure 3 of the OB/OD Part A. Solid and liquid hazardous and/or low-level mixed explosive waste may be treated (i.e., open detonated) at this unit. Nontreatment-related experimental test detonations (i.e., shots) are also currently performed at this location.

2.1.3 TA-36 Hazardous and/or Low-Level Mixed Waste OD Thermal Treatment Unit

TA-36 is spread over several mesa tops between a branch of Pajarito Canyon to the north and Water Canyon to the south. Mesa-top elevations at TA-36 range from approximately 6,380 to

7,120 feet amsl. TA-36 contains several other firing sites and supporting offices where research is conducted with various types of explosives (LANL, 1993c).

The OD thermal treatment unit near TA-36-8 is located in the southern portion of TA-36. The unit includes an irregularly shaped area near TA-36-8, as shown on Map 4 and Figure 4 of the OB/OD Part A. Solid and liquid hazardous and/or low-level mixed explosive waste may be treated (i.e., open detonated) at the unit. Nontreatment-related experimental test detonations (i.e., shots) are also currently performed at this location.

2.1.4 TA-39 Hazardous Waste OD Thermal Treatment Units

TA-39 is located in the southern portion of LANL and includes much of the mesa between Water Canyon on the north and Ancho Canyon on the south (LANL, 1993d). Mesa-top elevations at TA-39 range from approximately 6,500 to 7,000 feet amsl. The area was established in 1959 for testing of explosive materials and has been used continuously for that purpose. TA-39 contains a number of structures located in the north fork of Ancho Canyon (LANL, 1993d). The remainder of TA-39 is unoccupied and serves as a buffer zone for open detonation operations.

The two OD thermal treatment units at TA-39 are associated with structures TA-39-6 and TA-39-57. The locations of these units are shown on Map 5 and Figures 5 and 6 of the OB/OD Part A. These units may be used to treat solid hazardous explosive waste by OD. Nontreatment-related, experimental test detonations are also performed at these locations.

2.2 LOCATION INFORMATION

2.2.1 Seismic Standard [20 NMAC 4.1, Subpart IX, 270.14(b)(11)(i and ii) and 20 NMAC 4.1, Subpart V, 264.18(a)]

The hazardous waste management units addressed in this Part B permit application are exempt from the seismic standards in 20 NMAC 4.1, Subpart IX, 270.14(b)(11), and 20 NMAC 4.1, Subpart V, 264.18(a), revised November 1, 1995, because these units existed prior to January 25, 1985, when the State of New Mexico received hazardous waste authorization.

Similarly, the low-level mixed waste management units addressed in this Part B permit application are exempt from the seismic standards of 20 NMAC 4.1, Subpart IX, 270.14(b)(11), and 20 NMAC 4.1, Subpart V, 264.18(a), revised November 1, 1995, because these units existed on July 25, 1990, when the State of New Mexico received mixed waste authorization.

Consistent with the criteria provided in 20 NMAC 4.1, Subpart IX, 270.10(e) and 270.14(b)(11)(i), and 20 NMAC 4.1, Subpart V, 264.18(a), revised November 1, 1995, the waste management units addressed in this Part B permit application existed prior to the effective date of regulations; thus, seismic standards are not applicable.

2.2.2 Floodplain Standard [20 NMAC 4.1, Subpart IX, 270.14(b)(11)(iii) and 270.14(b)(19)(ii); 20 NMAC 4.1, Subpart V, 264.18(b)]

In accordance with 20 NMAC 4.1, Subpart IX, 270.14(b)(11)(iii), revised November 1, 1995, the OB/OD thermal treatment units addressed in this Part B permit application are not located within the 100-year floodplain boundary. The units at TA-14, TA-15, and TA-36 are located on mesa tops. The units at TA-39 are not on a mesa top; however, a survey conducted in September 1996 indicates that these units are not within the 100-year floodplain boundary (McLin, 1996). Additional information regarding the 100-year floodplain boundary is provided in the LANL General Part B.

2.2.3 Soils

The following sections describe the soils in the vicinity of each of the OB/OD thermal treatment units addressed in this Part B permit application.

2.2.3.1 TA-14 Soils

Soils in the vicinity of the OB/OD thermal treatment units at TA-14 are Carjo loam and are classified in the Unified Soil Classification System (USCS) as loam, clay loam, and clay loam-loam. Color and texture of Carjo soils vary with depth. From 0 to 10 centimeters (cm), these soils are a grayish-brown loam or very fine sandy loam. From 10 to 50 cm, the soils are brown or reddish-brown clay loam or clay. Between 50 and 63 cm, Carjo soils are a light brown, very fine sandy loam. Permeability in the upper (i.e., 0 to 10 cm) and lower (i.e., 50 to 63 cm) regions ranges from 1.5 to 5.0 cm per hour (cm/hr); in the middle region (i.e., 10 to 50 cm), permeability varies from 0.15 to 5.0 cm/hr. The shrink-swell potential is low in the upper and lower regions and moderate in the middle region. Soil pH ranges from 6.3 to 7.8. Available water-holding capacity ranges from 0.14 to 0.21 cm per cm (cm/cm). Vegetation native to Carjo series soils include blue and black grama and ponderosa pine (Nyhan et al., 1978).

2.2.3.2 TA-15 and TA-36 Soils

Soils at TA-15 in the vicinity of TA-15-184 and at TA-36 in the vicinity of TA-36-8 are Nyjack sandy loam and are classified in the USCS as sandy loam, sandy loam-sandy clay, loam, clay loam-loam,

and clay loam. Nyjack soils typically range from a brown loam, a very fine sandy loam, or a sandy loam approximately 10 cm thick to a subsoil of brown clay loam approximately 50 cm thick. The substratum is typically a gravelly sandy loam about 40 cm thick. Permeability rates range from 5 to 15 cm/hr in the top layer to 1.5 to 15 cm/hr in the lower layers. The shrink-swell potential is low in the top layer, with a moderate shrink-swell potential existing in the clay loam layer. Available water-holding capacity is 0.07 to 0.21 cm/cm, and the soil pH ranges from 6.1 to 7.8. Vegetation typical for this soil type is mainly piñon pine, one-seed juniper, and blue grama (Nyhan et al., 1978).

2.2.3.3 TA-39 Soils

Soils in the vicinity of the OD thermal treatment units at TA-39 are Totavi series soils and are classified in the USCS as gravelly loamy sand or sandy loam. Totavi soils are brown, gravelly loamy sand to a depth of approximately 150 cm. The permeability rate in Totavi soils is greater than 51 cm/hr and the shrink-swell potential is considered low. Water-holding capacity varies from 0.06 to 0.08 cm/cm. The pH of Totavi series soils ranges from 6.6 to 7.8. Native vegetation is blue grama, piñon pine, one-seed juniper, and annual grasses and forbs (Nyhan et al., 1978).

2.3 GROUNDWATER MONITORING [20 NMAC 4.1, Subpart IX, 270.14(c) and 20 NMAC 4.1, Subpart V, 264.90(a)]

Requirements for groundwater monitoring and protection specified in 20 NMAC 4.1, Subpart IX, 270.14(c), and 20 NMAC 4.1, Subpart V, 264.90(a), revised November 1, 1995, apply to owners and operators of the following "regulated units" only: surface impoundments, waste piles, land treatment units, and landfills. This document addresses thermal treatment units, which are not regulated units subject to 20 NMAC 4.1, Subpart IX, 270.14(c), revised November 1, 1995.

2.4 TRAFFIC PATTERNS AND CONTROL [20 NMAC 4.1, Subpart IX, 270.14(b)(10)]

The OB/OD thermal treatment units addressed in this Part B permit application are used to treat hazardous and/or low-level waste generated at various TAs at LANL. Waste generated off site may also be treated at these units.

2.4.1 Routes of Travel

The primary traffic routes that may be used to transport hazardous and/or low-level mixed explosive waste to the thermal treatment units at TA-14, TA-15, and TA-36 include State Road 501 (West Jemez Road), Contractor's Road, R-Site Road, and Potrillo Drive (Figures 2-1 through 2-3 in this section and Figure 2-10 in the LANL General Part B). The primary traffic routes that may be used

to transport hazardous explosive waste to TA-39 include State Road 4, State Road 501, Pajarito Road, and Ancho Road (Figures 2-4 and 2-5 in this section and Figure 2-10 in the LANL General Part B).

2.4.2 Traffic Control Signals

Traffic control signals within TA-14, TA-15, TA-36, and TA-39 in the vicinity of the waste management units addressed in this Part B permit application include stop signs, posted speed limits, and other traffic and pedestrian control signs. The locations of existing signs at these TAs in the vicinity of these waste management units are shown on Figures 2-1 through 2-5 of this section.

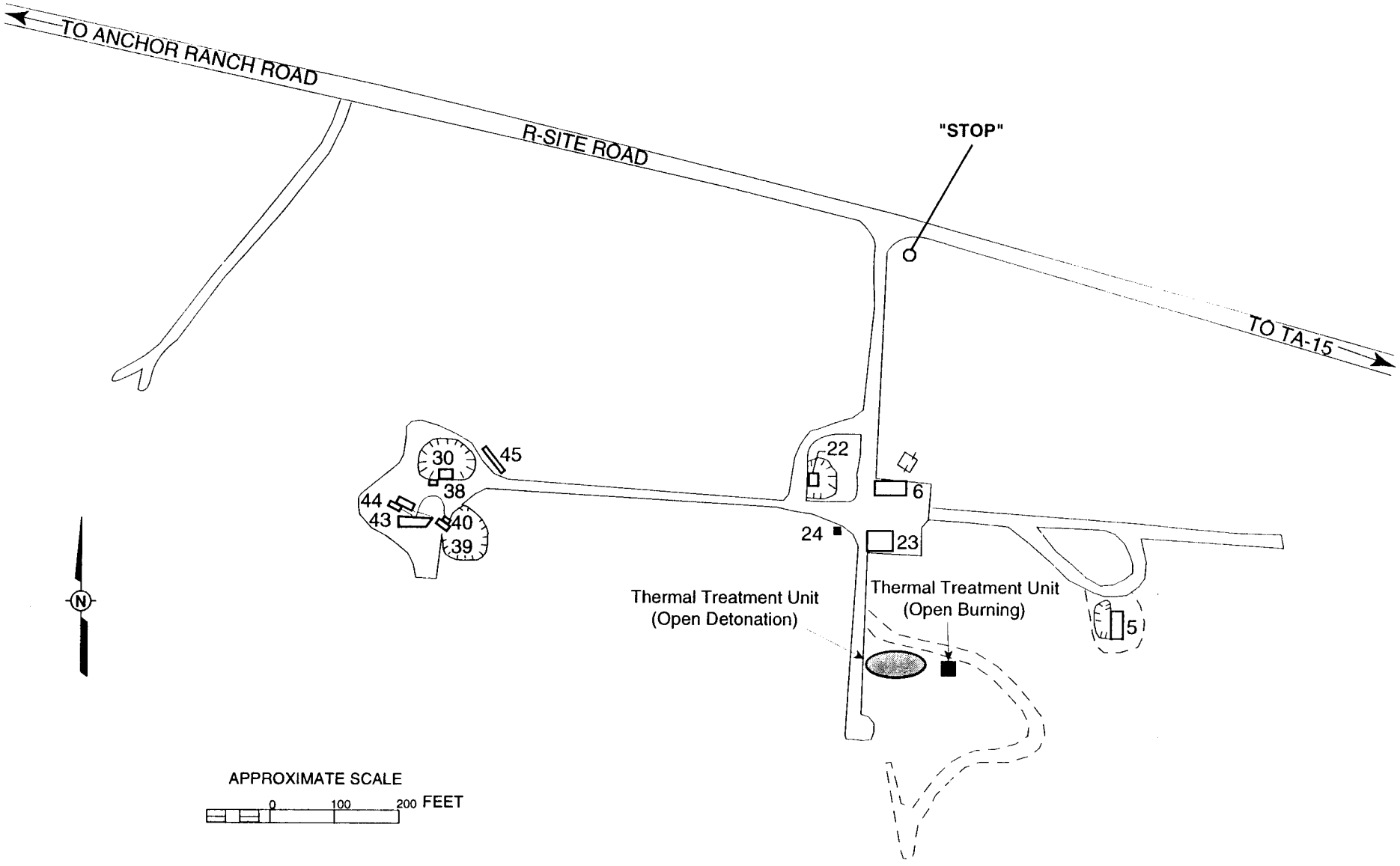


Figure 2-1
Location Map of Access Roads and Traffic Control Signs in the Vicinity of the Thermal Treatment Units near Technical Area (TA) 14, Building 23

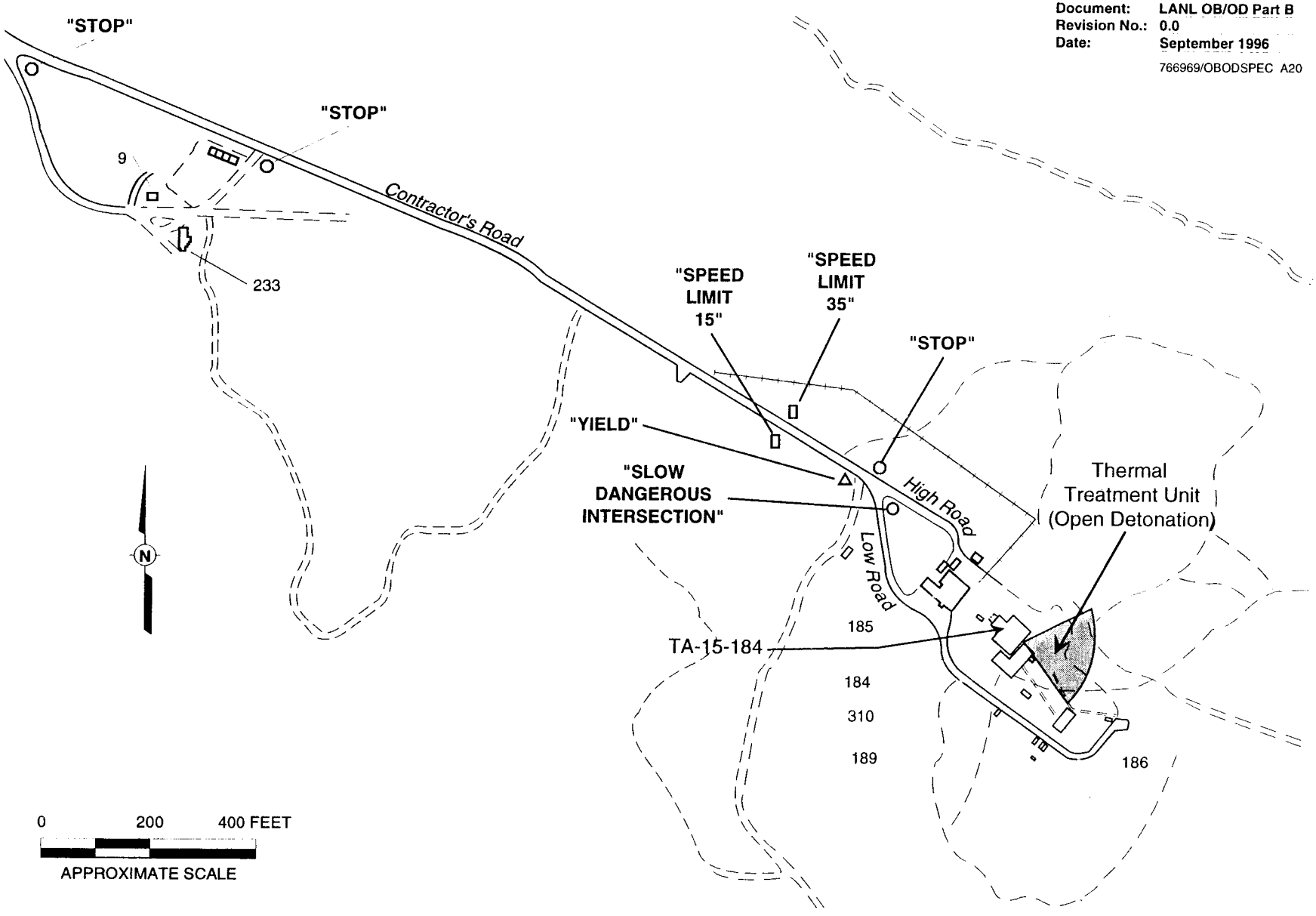


Figure 2-2

Location Map of Access Roads and Traffic Control Signs
in the Vicinity of the Thermal Treatment Unit near Technical Area (TA) 15, Building 184

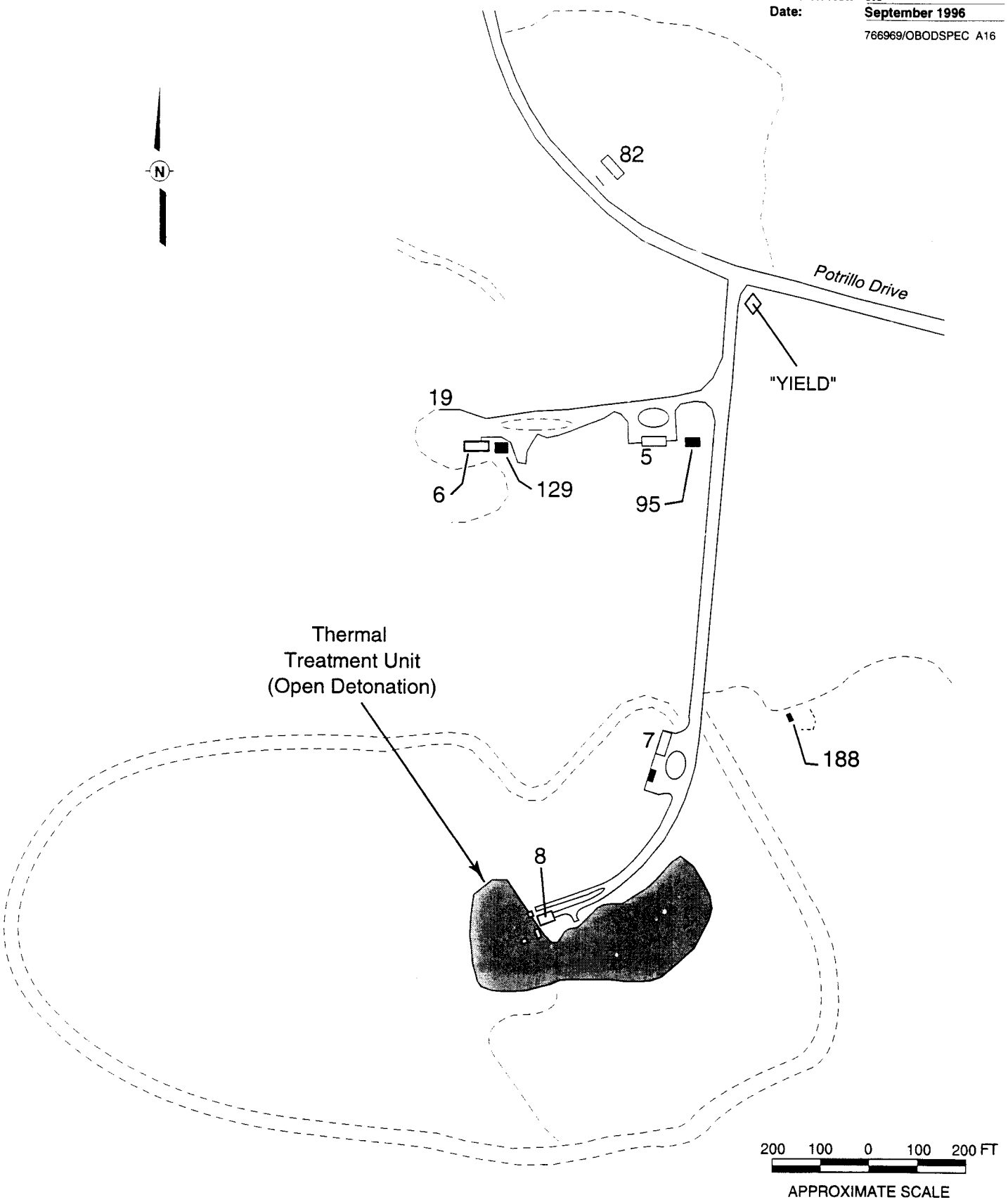
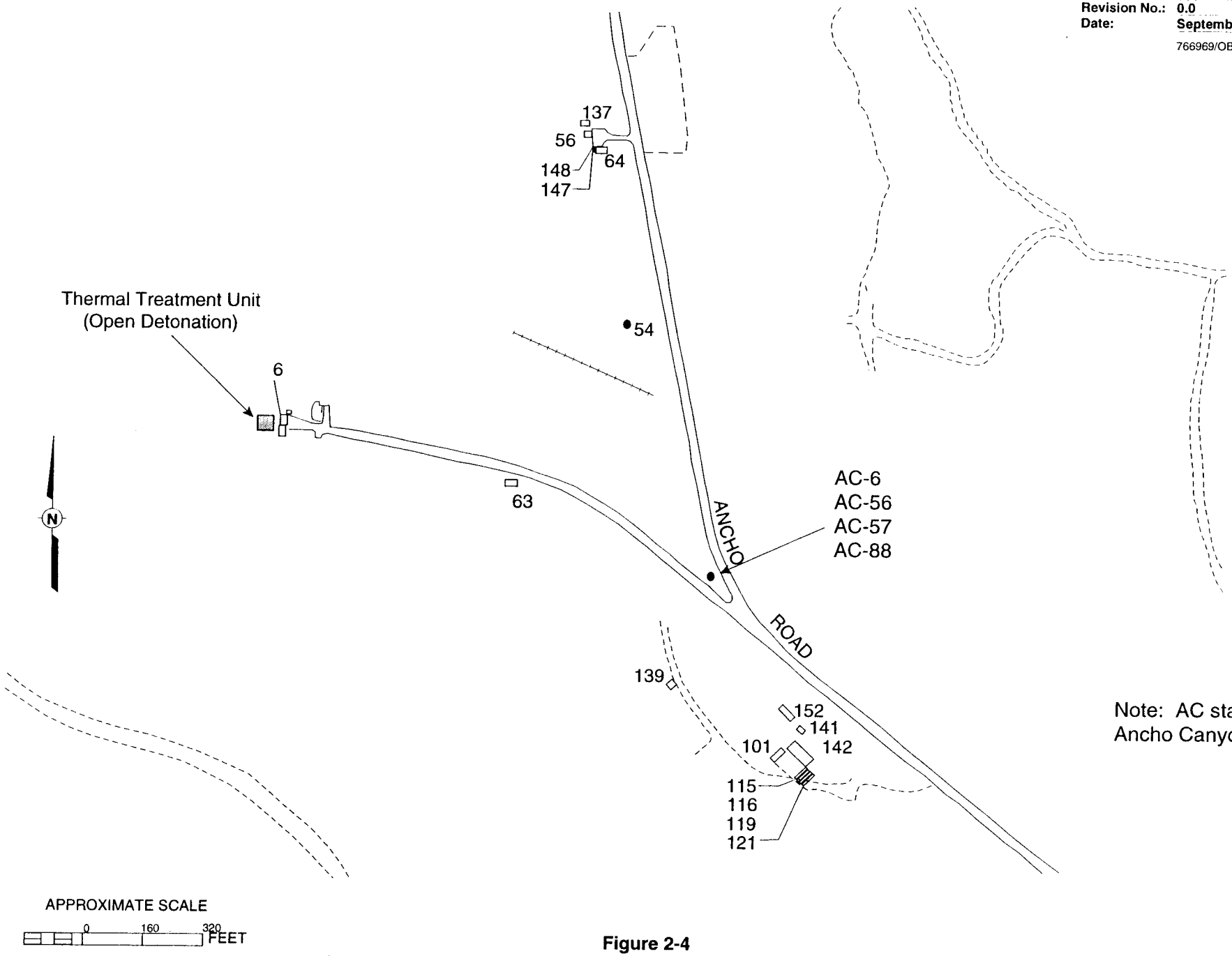


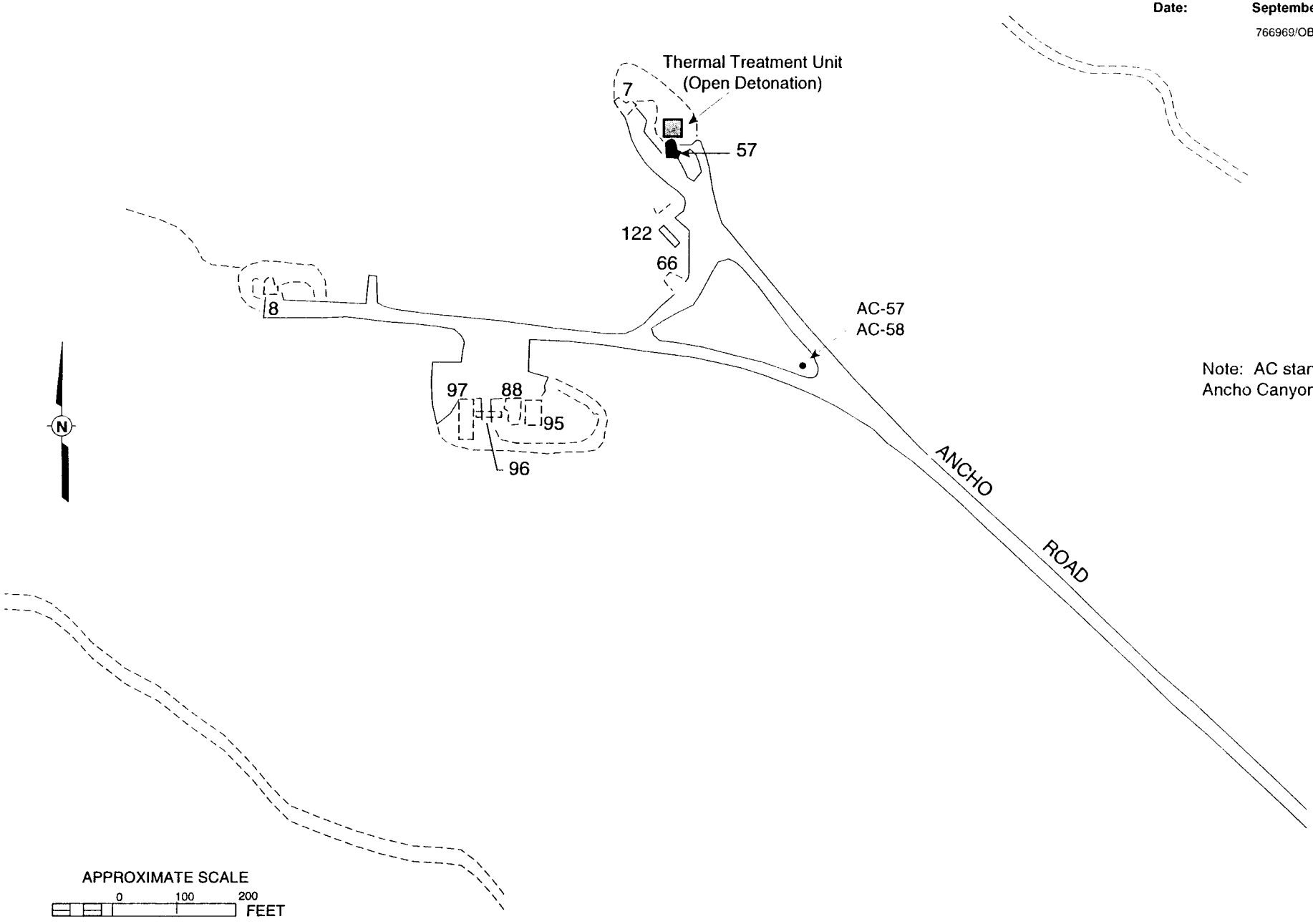
Figure 2-3

Location Map of Access Roads and Traffic Control Signs
in the Vicinity of the Thermal Treatment Unit near Technical Area 36, Building 8



Note: AC stands for Ancho Canyon.

Figure 2-4
Location Map of Access Roads and Traffic Control Signs in the Vicinity of the Thermal Treatment Unit near Technical Area 39, Building 6



Note: AC stands for Ancho Canyon.

Figure 2-5
Location Map of Access Roads and Traffic Control Signs in the Vicinity of the Thermal Treatment Unit near Technical Area 39, Building 57

WASTE ANALYSIS PLAN FOR THERMAL TREATMENT BY OPEN BURNING AND OPEN DETONATION

LIST OF DEFINITIONS

Acceptable knowledge - A term broadly defined to include process knowledge, any waste analysis data, and/or facility records of analysis.

Explosive - Any chemical compound or mechanical mixture which, when subjected to heat, impact, friction, shock, or other suitable initiation stimulus, undergoes a very rapid chemical change with the evolution of large volumes of highly-heated gases that exert pressures in the surrounding medium. The term applies to materials that either detonate or deflagrate.

Hazardous waste - The criteria for establishing a waste as a hazardous waste are provided in the New Mexico Administrative Code, Title 20, Chapter 4, Part 1 (20 NMAC 4.1), Subpart II, revised November 1, 1995. A waste is considered hazardous if it meets the definition of a solid waste described in 20 NMAC 4.1, Subpart II, 261.2, revised November 1, 1995; is not exempt from regulation; and exhibits one or more of the characteristics described in 20 NMAC 4.1, Subpart II, Part 261, Subpart C, revised November 1, 1995, or is listed in 20 NMAC 4.1, Subpart II, Part 261, Subpart D, revised November 1, 1995.

Heterogeneous waste - Waste that is of dissimilar or diverse composition.

Homogeneous waste - Waste that is of uniform composition.

Low-level waste - Low-level waste is defined in U.S. Department of Energy (DOE) Order 5820.2A (DOE, 1988) as "waste that contains radioactivity and is not classified as high-level waste, transuranic waste, spent nuclear fuel, or 11(e)(2) by-product material as defined by this Order. Test specimens of fissionable material irradiated for research and development only, and not for the production of power or plutonium, may be classified as low-level, provided that the concentration of transuranics is less than 100 nanocuries per gram of waste." By-product material, as defined in Section 11(e)(2) of the Atomic Energy Act of 1954, as amended, consists of uranium and thorium mill tailings. Section 11(e)(2) by-product material is not generated at Los Alamos National Laboratory.

Low-level solid mixed waste - Solid waste that has both a hazardous waste component (see definition) and a low-level waste component (see definition).

LIST OF DEFINITIONS
(Continued)

Open burning - The combustion of any material without control of combustion air to maintain adequate temperature for efficient combustion; without containment of the combustion reaction in an enclosed device to provide sufficient residence time and mixing for complete combustion; and without control of emission of the gaseous combustion products.

Open detonation - An explosion in which chemical transformation passes through the material faster than the speed of sound.

Process knowledge - Described in 20 NMAC 4.1, Subpart V, 264.13(a)(2), revised November 1, 1995, as data developed under Subpart II and existing published or documented data on a specific hazardous waste or on hazardous waste generated from similar processes.

Solid physical form waste - Any waste stream in a solid physical form. In this document, use of the term "solid physical form waste" has no additional regulatory meaning.

Solid waste - Any waste stream that meets the definition of a "solid waste" as specified in 20 NMAC 4.1, Subpart II, 261.2, revised November 1, 1995.

Thermal treatment - The treatment of hazardous waste that uses elevated temperatures as the primary means to change the chemical, physical, or biological character or composition of the hazardous waste, pursuant to 20 NMAC 4.1, Subpart I, 260.10, revised November 1, 1995.

3.0 WASTE ANALYSIS PLAN FOR THERMAL TREATMENT BY OPEN BURNING AND OPEN DETONATION

This waste analysis plan (WAP) presents information on the chemical and physical nature of hazardous and/or low-level mixed explosive waste treated at Los Alamos National Laboratory (LANL), Technical Area (TA) 14, TA-15, TA-36, and TA-39. The waste analysis information contained herein is specific to thermal treatment by open burning (OB) or open detonation (OD) (see List of Definitions). The content of this WAP generally follows the guidance provided in "Waste Analysis at Facilities that Generate, Treat, Store, and Dispose of Hazardous Wastes—A Guidance Manual" (U.S. Environmental Protection Agency [EPA], 1994a); and "RCRA Part B Permit Writers' Guidance Manual for Department of Defense Open Burning/Open Detonation Units" (AEHA, 1987).

Hazardous waste is defined and regulated by the New Mexico Administrative Code, Title 20, Chapter 4, Part 1 (20 NMAC 4.1), revised November 1, 1995. Mixed waste contains both a hazardous waste component and a radioactive waste component. This WAP addresses *hazardous waste* and *low-level mixed waste* as defined in the List of Definitions. LANL-wide WAP information is presented in Section 3.0 of the LANL General Part B.

This WAP is organized as follows. Section 3.1 provides information on hazardous and low-level mixed explosive waste-generating processes and activities, including a facility description, identification of wastes managed, and discussion of associated treatment units. Section 3.2 presents waste parameters, including the criteria and rationale for selection. Section 3.3 includes requirements for the characterization of hazardous and low-level mixed explosive waste. Section 3.4 provides verification analysis requirements. Section 3.5 addresses special procedural requirements (i.e., procedures for ignitable, reactive, and incompatible waste and procedures to ensure compliance with land disposal restrictions [LDR] requirements). LANL's waste profiling system is discussed in Section 3.0 of the LANL General Part B.

3.1 FACILITY WASTE-GENERATING PROCESSES, ACTIVITIES, AND IDENTIFICATION OF HAZARDOUS AND LOW-LEVEL MIXED EXPLOSIVE WASTE MANAGED

Hazardous and low-level mixed explosive wastes are generated at LANL primarily from research and development activities. Table 3-1 provides information on potential hazardous and low-level mixed explosive waste treated by OB/OD at LANL, including brief waste descriptions, waste-generating processes, waste-generating locations, the characterization basis for hazardous waste designation (i.e., process knowledge and/or analysis), potential EPA Hazardous Waste Number(s),

potential hazardous constituents in and/or characteristics of the waste, and regulatory limits. Table 3-2 provides information on waste parameters, characterization methods, and rationale for parameter selection.

Explosive waste is generated by the Dynamic Experimentation (DX) and Engineering Sciences and Applications (ESA) Divisions as a result of research and development or testing activities. Low-level mixed explosive waste is generated by the processing and testing of various explosive materials that contain or are contaminated with a radioactive component. The low-level mixed explosive waste at LANL consists predominantly of depleted uranium and explosive components and their breakdown products. The explosive compounds are generally nitrated organic compounds such as trinitrotoluene, nitrocellulose, trinitramines, and pentaerythritoltetranitrate. Metals may also be associated with the explosives. Waste explosive materials may be in the form of discrete pieces, chips, or scraps. Both homogeneous and heterogeneous waste forms exist, as described in the following sections.

3.1.1 Homogeneous Hazardous and Low-Level Mixed Explosive Waste

Homogeneous (i.e., uniform composition) hazardous and low-level mixed explosive waste treated by OB/OD at LANL are described generally in the following paragraphs.

Solid Hazardous and Low-Level Mixed Explosive Waste

Solid hazardous and low-level mixed explosive waste consists of off-specification explosives that may be contaminated with a radioactive component.

Scrap Hazardous and Low-Level Mixed Explosive Waste

Scrap hazardous and low-level mixed explosive waste consists primarily of discrete pieces of explosives left over from research and development activities and testing operations. These wastes may be contaminated with a radioactive component.

Liquid Hazardous and Low-Level Mixed Explosive Waste

Liquid hazardous and low-level mixed explosive waste consists of off-specification liquid explosives that may be contaminated with a radioactive component.

3.1.2 Heterogeneous Solid Hazardous and Low-Level Mixed Explosive Waste

Heterogeneous (i.e., dissimilar or diverse composition) solid hazardous and low-level mixed explosive waste treated by OB/OD at LANL generally consists of material from failed experimental detonations, paper/tissue (wipes), rags, oil, wood, and machine tools. These wastes are contaminated with explosives and possibly a radioactive component.

3.1.3 Description of the OB Unit

The OB thermal treatment unit at LANL addressed in this WAP is located at TA-14 and is currently operating under the requirements of 20 NMAC 4.1, Subpart VI, revised November 1, 1995. This unit consists of a small metal burn cage placed within a metal tray. Combustible, hazardous explosives-contaminated materials that cannot be safely transported to TA-16 are treated (i.e., open burned) in the cage.

3.1.4 Description of the OD Units

The OD thermal treatment units at LANL addressed in this WAP are currently operating under the requirements of 20 NMAC 4.1, Subpart VI, revised November 1, 1995. These units include:

- A thermal treatment unit, located approximately 180 feet south of Building 23 at TA-14 (TA-14-23), used to treat hazardous explosive waste.
- A thermal treatment unit near TA-15-184 used to treat hazardous and/or low-level mixed explosive waste.
- A thermal treatment unit near TA-36-8 used to treat hazardous and/or low-level mixed explosive waste.
- Two thermal treatment units located near TA-39-6 and TA-39-57 used to treat hazardous explosive waste.

Specific design features and operations of these units are fully described in Section 4.0 of this Part B permit application.

Hazardous and low-level mixed explosive wastes are stored only at temporary staging/storage areas at the OB/OD thermal treatment units addressed in this Part B permit application.

3.2 WASTE PARAMETERS [20 NMAC 4.1, Subpart V, 264.13(a)(1)]

Parameter selection and waste characterization of explosive waste is based solely on process knowledge due to the explosive properties of the waste. Chemical and physical characterization is performed prior to treatment of hazardous and/or low-level mixed explosive waste, as required by 20 NMAC 4.1, revised November 1, 1995. Waste parameters are selected to ensure that the characterization will contain all necessary information to properly treat the waste in accordance with general facility standards and LDR requirements. Characterization is performed using the procedures described in Section 3.3.

3.2.1 Proposed Analytical Parameters and Methods [20 NMAC 4.1, Subpart V, 264.13(b)(1), and Subpart IX, 270.14(b)(2)]

Proposed analytical parameters and characterization methods for the hazardous and low-level mixed explosive waste treated by OB/OD at LANL are summarized in Table 3-2. The parameters listed in Table 3-2 were selected based on process knowledge for the various homogeneous and heterogeneous waste forms described in Sections 3.1.1 and 3.1.2. Analytical parameter selection and waste characterization of explosive waste are based solely on process knowledge due to the explosive properties of the waste.

3.2.2 Criteria and Rationale for Parameter Selection [20 NMAC 4.1, Subpart V, 264.13(b)(1)]

Waste analysis parameters were selected to characterize hazardous and low-level mixed explosive waste in conformance with 20 NMAC 4.1, revised November 1, 1995. These parameters are based on knowledge of raw materials and physical/chemical processes of waste-generating activities. The rationale for parameter selection are identified in Table 3-2.

3.3 CHARACTERIZATION OF EXPLOSIVE WASTE

Hazardous and low-level mixed explosive waste is not analyzed at LANL. Only limited types of explosives are used by DX and ESA Divisions, and the composition and reactive characteristics of these materials, used in testing and experiments, are well documented. Additionally, methods contained in "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods" (EPA, 1986), cannot be used for explosive waste due to the explosive properties of these wastes.

Established explosives have fairly consistent chemical composition for successful experimental usage. Attachment 3-1 contains a list of established explosives and their chemical composition. Off-specification explosives contain approximately the same composition as product explosives.

Off-specification explosive waste material has successfully undergone thermal treatment by OB/OD in the past, with no additional or alternative procedures required to effectively treat these wastes. Thus, explosive waste is sufficiently characterized by process knowledge (see Table 3-2). In addition, there are safety considerations that preclude routine analysis of explosive wastes.

Reevaluation of an explosive waste will occur only under the following conditions:

- Use of different raw materials (different formulation) in the product explosive
- A change in the results of the OB/OD process occurs (e.g., a difference in the visible characteristics of the resulting airborne plume or a premature detonation)
- Visual inspections of the waste indicate a change in the waste characteristics.

If plans are made to treat a hazardous or low-level mixed explosive waste that has not previously been treated by OB/OD, LANL will collect sufficient information/documentation for the waste (i.e., Waste Profile Forms, process knowledge, material safety data sheets, or any additional information for acceptable knowledge [see Section 3.3.1]) to ensure that the waste stream can be effectively treated by OB/OD prior to initiating the treatment process.

3.3.1 Acceptable Knowledge [20 NMAC 4.1, Subpart V, 264.13(a)(2), and Subpart IX, 270.14(b)(2)]

Acceptable knowledge, as defined in the List of Definitions, is relied upon to characterize hazardous and low-level mixed explosive waste at TA-14, TA-15, TA-36, and TA-39.

Extensive sampling and analysis of hazardous and low-level mixed explosive waste is constrained or restricted due to dangers associated with managing explosive waste, potential health and safety risks to personnel from exposure to radioactive material, and the chemical and physical nature of hazardous and low-level mixed explosive waste and waste forms (e.g., debris, equipment, and instruments). Factors associated with the difficulty of sampling heterogeneous waste include:

- Waste streams may contain disparate elements and thus require segregation into similar forms
- Large objects cannot be made to fill standard-size sample containers
- Laboratories may not be capable of sampling large objects (EPA, 1992).

3.3.2 Sampling and Analysis for Hazardous and Low-Level Mixed Explosive Waste

The inherent nature of explosive waste makes sampling and analysis dangerous. LANL personnel routinely use established explosives products of consistent and documented chemical composition for research. Historically, explosive waste has successfully undergone thermal treatment by OB/OD with no additional or alternative procedures required. Due to the possible safety and handling dangers associated with explosive waste, LANL will rely on process knowledge to characterize these wastes. Therefore, sampling and analysis of explosive waste will not occur at LANL.

3.4 VERIFICATION ANALYSIS FOR HAZARDOUS AND LOW-LEVEL MIXED EXPLOSIVE WASTE [20 NMAC 4.1, Subpart V, 264.13(a)(3)]

Verification of explosive waste is done through knowledge of process and strict administrative control of the waste generated.

Verification of process knowledge may be performed to confirm the accuracy of the initial waste characterization, to verify that treatment standards have been met, when there is a change in a waste-generating process, or when the generator requests a review. If appropriate, verification analysis for hazardous or low-level mixed explosive waste may be conducted at LANL's or an approved subcontractor's laboratory facilities. Any verification analyses will be conducted in conformance with appropriate methods.

3.5 SPECIAL PROCEDURAL REQUIREMENTS [20 NMAC 4.1, Subpart V, 264.13(b)(6)]

Waste management requirements specific to ignitable, reactive, and incompatible waste, as well as for compliance with LDR regulations, are described below.

3.5.1 Procedures for Ignitable, Reactive, and Incompatible Waste [20 NMAC 4.1, Subpart V, 264.17]

LANL personnel take precautions necessary to prevent accidental ignition or reaction of ignitable and/or reactive waste managed at TA-14, TA-15, TA-36, and TA-39. Wastes treated by OB/OD at LANL are ignitable and/or reactive. Therefore, LANL relies on standard operating procedures for specific safety and handling procedures associated with the disposal of explosive waste. Solid physical form wastes are segregated from any potential liquid-bearing wastes within each waste management unit. Thus, ignitable and reactive wastes will not likely be capable of commingling and, therefore, would not react with other wastes or materials.

3.5.2 Procedures to Ensure Compliance with LDR Requirements [20 NMAC 4.1, Subpart VIII, 268.7(a) and 268.7(b)(3), (4), and (5)]

In accordance with LDR regulations, treatment standards are expressed in two ways: (1) as constituent concentrations in the waste (from either an extract of the waste, as determined by the toxicity characteristic leaching procedure, or from the total volume of the waste, referred to as total waste analysis) or (2) as specified treatment technologies. The specified treatment technology for explosive waste (i.e., ignitable and/or reactive) is deactivation; therefore, verification through analysis is not necessary. LANL will document in its operating record that the appropriate treatment technology has been employed prior to land disposal. An example of LANL's Land Disposal Restrictions Notification Form is provided as Figure 3-2 in the LANL General Part B (LANL, 1996a).

Table 3-1

Descriptions of Hazardous and Low-Level Mixed Explosive Waste Treated by Open Burning/Open Detonation at Los Alamos National Laboratory

Waste Description	Waste-Generating Process Description	Technical Area (TA) Where Waste is Generated	Basis for Characterization	Potential EPA[a] Hazardous Waste Numbers	Potential Hazardous Constituents and/or Characteristics in the Waste	Regulatory Limits[b] (milli-grams per liter)
Homogeneous Wastes						
Solid explosive (off-specification)	Explosives preparation	TA-14, TA-15, TA-36, and TA-39	Process knowledge	D001 D003 D005 F005	Ignitability Reactivity Barium Spent non-halogenated solvents	Not applicable (NA)[c] NA 100.0 NA
Scrap explosive (discrete process explosives)	Research and development activities and testing operations	TA-14, TA-15, TA-36, and TA-39	Process knowledge	D001 D003 D005 F005	Ignitability Reactivity Barium Spent non-halogenated solvents	NA NA 100.0 NA
Liquid explosive (off-specification)	Explosives preparation	TA-14, TA-15, TA-36, and TA-39	Process knowledge	D001 D003 D005 F005	Ignitability Reactivity Barium Spent non-halogenated solvents	NA NA 100.0 NA
Heterogeneous Wastes						
Explosives-contaminated material (material/equipment may include paper, rags, oil, wood, machine tools)	Research and development activities and testing operations	TA-14, TA-15, TA-36, and TA-39	Process knowledge	D001 D003 D005 F005	Ignitability Reactivity Barium Spent non-halogenated solvents	NA NA 100.0 NA

[a] U.S. Environmental Protection Agency.
[b] A solid waste exhibits the characteristic of toxicity if the extract from a representative sample of the waste contains any of the contaminants listed at a concentration equal to or greater than the respective value given in the New Mexico Administrative Code, Title 20, Chapter 4, Part 1, Subpart II, Part 261, Subpart D, revised November 1, 1995.
[c] Not applicable: Refers to the absence of regulatory limits for ignitable and reactive characteristic wastes.

Table 3-2

Parameters, Characterization Methods, and Rationale for Hazardous and Low-Level Mixed Explosive Waste

Waste Description	Parameter[a]	Characterization Method	Rationale
Solid explosive	– Barium – Spent non-halogenated solvents – Ignitability – Reactivity	– Acceptable knowledge[b]	– Determine characteristic for ignitability and reactivity – Determine toxicity characteristic – Determine presence or absence of hazardous constituents
Scrap explosive	– Barium – Spent non-halogenated solvents – Ignitability – Reactivity	– Acceptable knowledge	– Determine characteristic for ignitability and reactivity – Determine toxicity characteristic – Determine presence or absence of hazardous constituents
Liquid explosive	– Barium – Spent non-halogenated solvents – Ignitability – Reactivity	– Acceptable knowledge	– Determine characteristic for ignitability and reactivity – Determine toxicity characteristic – Determine presence or absence of hazardous constituents
Explosives-contaminated material	– Barium – Spent non-halogenated solvents – Ignitability – Reactivity	– Acceptable knowledge	– Determine characteristic for ignitability and reactivity – Determine toxicity characteristic – Determine presence or absence of hazardous constituents

[a] Parameter selection is based on process knowledge for each waste stream. Additional parameters may be selected for each waste stream as necessary.

[b] Acceptable knowledge is broadly defined as process knowledge, waste analysis data (e.g., sampling and analysis), and/or facility records of analysis in the U.S. Environmental Protection Agency (EPA), 1994, "Waste Analysis at Facilities that Generate, Treat, Store, and Dispose of Hazardous Waste—A Guidance Manual," *OSWER 9938.4-03*, EPA, Office of Solid Waste and Emergency Response, Washington, D.C.

ATTACHMENT 3-1

Composition of Established Explosives

Note: The information provided in this attachment is for informational purposes only. The information is from the most current version of a Los Alamos National Laboratory standard operating procedure, which is subject to revision, when necessary.

EXPLOSIVES

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Page 2, Revision 6	Page 6, Revision 4
Page 3, Revision 6	Page 7, Revision 3
Page 4, Revision 8	Page 8, Revision 1

SUBMITTED J. L. Parkinson DATE 8/25/86
J. L. Parkinson, Group Leader, WX-3

APPROVED J. L. Parkinson DATE 8/25/86
J. L. Parkinson, Group Leader, WX-3

APPROVED Wm. A. Bradley DATE 8/26/86
W. A. Bradley, Asst. Division Leader, WX

APPROVED NOT REQUIRED DATE
A. M. Valentine, Group Leader, HSE-1

APPROVED Jack L. Barnstow for W.C.C. DATE 9/16/86
W. C. Courtright, Group Leader, HSE-3
CHG 9/12

EXPLOSIVES

I. Scope

This SOP governs the explosives that may be processed, assembled, transported, and stored at S-Site and Area 27, Able Site, NTS. Restrictions on the use of some of these explosives in processing operations may be imposed in the pertinent individual SOPS.

II. Nature and Uses of Explosives

A. Types

Explosives are compounds that will burn or explode if they are heated, exposed to some type of impact, pinched between moving surfaces, or subjected to an electric discharge or a strong shock. Not all explosives behave in the same way and, because they are not all the same, they have been divided into three classes: (1) primary or initiating, (2) boostering, and (3) secondary (bursting charge) or high explosives.

1. Primary Explosives

   a. Primary or initiating explosives are those explosives that can be detonated with very little energy. They are very sensitive to friction, heat, and impact, and some of them to an electrical discharge, and when involved in a fire they can be expected to detonate without burning. These explosives are used to "trigger" other explosives that are less sensitive and require a little more energy to get started. Explosives such as lead azide and lead styphnate fall into this category.

   b. Primary explosives are not processed at S-Site or Area 27, Able Site, NTS, but are used indirectly. Small quantities are used in squibs that are stored and used in special applications. In addition, some items that contain primary explosives, such as squibs, fuzes, low-energy detonators, and explosive bolts and fasteners, are assembled into test devices.

II. A. (cont.)

2. Booster Explosives

a. Boostering explosives are those explosives that are between the primary explosives and the secondary explosives in sensitivity. They may be set off by heat, friction, or impact, and may detonate when burned in large quantities. These explosives are normally used to detonate secondary explosives. Explosives such as PETN, RDX, HMX, and tetryl fall into this class.

* b. PETN, RDX, and HMX are processed in the first steps of making molding powders for plastic-bonded explosives (PBX) and extrudable explosives such as Extex (XTX).

c. In other S-Site processing operations, boostering explosives are mixed with diluting materials. These explosives mixtures are less sensitive than the boostering explosives themselves and are usually in the class of secondary explosives.

3. Secondary Explosives

a. Secondary or high explosives require more energy for initiation than either primary or boostering explosives. Within this class, some are more sensitive than others. All will detonate if they receive a strong enough shock from an impact or from a boostering explosive. When exposed to a fire, they will burn without detonating unless confined. The normal method of disposal is by burning, and large amounts may be burned at one time. These explosives are used for the bursting charge in conventional ordnance applications. They are used as the principal source of energy in the devices built at S-Site and Able Site, NTS. Explosive such as TNT, baratol, the cyclotols, and many of the PBXs fall into this category.

II. A. 3. (cont.)

b. Most of the explosives processed at S-Site are secondary explosives, and they are normally called high explosives.

B. Health Hazards

* Most of the explosives processed at S-Site present a possible health hazard. For this reason, one must avoid taking them into the body through either the mouth, lungs, or skin. HSE Division is aware of these hazards and keeps site personnel informed of the allowable exposures for the various operating conditions. HSE also helps with the selection of masks and other safety devices where it is determined that such a device is required.

C. Compatibility with Other Materials

1. There are times when an explosive is mixed with another material, which by itself is not an explosive, but the mixing of the two, or just the placing of the two in contact, creates an unsafe situation. Two such materials are said to be incompatible. All situations that will create such a condition are to be avoided.

2. To help assess the compatibility problem, compatibility safety checks are run. The results of these tests are used as a guide in using these materials and often cause the groups to place limitations on just how and where these materials may be used. A list of acceptable materials that may be used in specific applications is available to operating supervisors. When the material in question does not appear on the list or its use is limited and there is a requirement for its use, additional safety compatibility checks should be requested. Form WX-3-111 will be used for this purpose and will be submitted to the Group M-1 general chemistry section. Upon completion of evaluation and testing (if required), M-1 will submit their recommendations and restrictions to the WX-3 group leader, who must approve the usage of the material at S-Site and Area 27, Able Site, NTS.

II. (cont.)

D. Approval for Use

Before any explosive material can be used at S-Site and Area 27, Able Site, NTS, each lot or batch must be identified analytically by the Group M-1 analytical laboratory. Signed copies of the approved Material Release Memorandum must be furnished to THE operating personnel of Groups M-1 and WX-3 before the identified material is processed.

III. Explosives Operations

A. Explosives Area

All activities at S-Site that involve explosives, except transportation to and from other sites and laundry, are conducted in the Explosive Area. Explosives must not be removed from the Explosives Area except for those transported to other locations on WX-3 production orders or Laboratory shipping requests, and those carried out as contamination on issued apparel or explosives transportation vehicles. Transportation of explosives to and from the S-Site Explosives Area must be through the K-Site road gate near Building TA-16-220.

B. Administrative Area

1. Explosives are not allowed in the Administrative Area except for contamination on issued apparel or explosives transportation vehicles. The issued apparel is cleaned in the WX-3 laundry in Building TA-16-193 and, although the quantity of explosives involved is very small, these operations are governed by SOPs. Explosives transportation vehicles must not contain visible amounts of explosives when in the Administrative Area.

III. B. (cont.)

2. All equipment and nonexplosive materials removed from the Explosives Area and brought into the Administrative Area, or taken off-site through the gates at Security Station 560 or Building TA-16-220, must be certified clean of explosives by an S-Site Certifying Agent; exceptions are noted in Item B.1, above. Explosives transportation vehicles must be certified clean before they are sent off-site for maintenance or repairs or are released to another organization; however, routine servicing may be performed at the Building TA-16-195 garage without this certification.

3. Explosives vehicles at NTS must be certified free from explosives contamination by WX-3 personnel before being released to the REECO motor pool for maintenance.

IV. Allowable Explosives at S-Site and Area 27, Able Site, NTS

Explosives that may be processed at S-Site are called allowable explosives and fall into the categories of established explosives, developmental explosives and detonators. In some cases, nonexplosive additives are incorporated into these explosives. These additives are usually included in the allowable explosives in the individual SOP for a given operation.

A. Established Explosives

Some of these explosives are identified by popular names or groups of letters that are widely known in the explosives and propellants industries. The other explosives, PBX and XTX, are identified by material code numbers. These material codes are four-digit numbers that are usually written with PBX or XTX preceding them. The established explosives are listed in Table 1 of this SOP along with their nominal compositions.

IV. (cont.)

* B. Developmental Explosives

These are explosives that have been approved for development according to the procedures in the document "Los Alamos High Explosives Development (HED) Procedures and Authorization". These explosives are identified by an experimental code number of four digits preceded by X. The developmental explosives are listed in Table 2 of this SOP along with their nominal compositions, pertinent references, and weight limit restrictions.

C. Detonators

1. Types of Detonators

a. High Energy

The majority of the detonators handled and assembled into test devices at S-Site and Area 27, Able Site, NTS are the exploding bridge wire (EBW) or flying foil types that can be fired only by high energy electrical pulses. This type of detonator contains boostering explosives, but does not contain primary explosives. They are insensitive to normally encountered static charges and eletromagnetic radiation. As finished items, these detonators are not appreciably more sensitive than the high explosives used at S-Site and Able Site, Area 27, NTS. Detonators approved for use are listed in Table 3 of this SOP.

b. Low Energy

In certain applications, detonators that can be initiated by relatively low levels of energy are used. These detonators contain primary explosives. To preclude the possibility of accidental initiation from static charges or the accidental application of test voltages, all low-energy detonators received at S-Site and Able Site, Area 27, NTS, will be equipped with shorting clips. These shorting clips must remain in place at all times while the detonators are under the jurisdiction of WX-3 personnel.

IV. C. 1. b. (cont.)

Precautions to be taken in the assembly of devices with low-energy detonators are delineated in SOP 11.1.2. Low-energy detonators approved for use at S-Site and Able Site, Area 27, NTS, are listed in Table 3 of this SOP.

2. Approval for Use

Before a new type of detonator may be ordered for use at S-Site and Able Site, Area 27, NTS, its design must be checked by the WX-3 Assembly section leader. Upon his recommendation, the new type detonator will be listed as an approved detonator in Table 3 of the SOP.

3. Transportation and Storage

Detonators must be transported and stored in containers that are designed to prevent propagation from detonator to detonator and container to container. When detonators are installed into devices, they will be transported and stored with the devices.

D. Squibs

Electrically fired squibs are used by WX-3 in the disposal operations covered under SOP Chapter 22. The squibs are transported and stored in the DOT-approved containers in which they are received or in the WX-3-approved container (13Y-100279, SOP 13.1.0). The squibs approved for these operations are DuPont S-94, WX-3 Code Number 225-03, or other similar DuPont S-series squibs.

IV. (cont.)

* E. Munitions

Pending approval by the EDC, munitions with or without their fuze and arming systems can be received and stored at S-Site. The WX-3 HE Transportation and Handling Supervisor or the PMA Supervisor must receive documentation recording EDC approval prior to long-term storage of any munition. In the instance that munitions are received without proper documentation, the munition will be held in short-term storage for a period of thirty days. If written approval has not been given after thirty days, the munition will either be returned or disposed of.

* Addition

NOTE: Signature page for SOP 1.1.0 will become page 9, revision 0, on next general revision.

SUBMITTED		SUBMITTED		SUBMITTED	
	7-9-87				
	DATE		DATE		DATE
APPROVED		APPROVED		APPROVED	
	7-9-87		7/10/87		7/16/87
J. L. PARKINSON	DATE	W. A. BRADLEY	DATE	W. C. COURTRIGHT	DATE

TABLE 1

ESTABLISHED EXPLOSIVES AT TA-16
NOMINAL COMPOSITIONS

Name or Code	Composition
Al ANFO[a]	Ammonium nitrate/fuel oil/aluminum power
AN	Ammonium nitrate
ANFO	Ammonium nitrate/fuel oil
Baratol	76 wt% Barium nitrate/24 wt% TNT
BDNPA	Bis(dinitropropyl) acetal
BDNPF	Bis(dinitropropyl) formal
Black powder	74 wt% Potassium nitrate/15.6 wt% charcoal/ 10.4 wt% sulfur
Boracitol	60 wt% Boric acid/40 wt% TNT
BTX[b]	5,7-Dinitro-1-picrylbenzotriazole
Composition A-3	91 wt% RDX/9 wt% beeswax

[a]For transportation only to and from M- and WX-Division Groups and storage by Group WX-3.
[b]See HED-037, For Transportation Only.
*General revision of Table 1.

Table 1 (Cont)

Name or Code	Composition
Composition A-4	97 wt% RDX/3 wt% beeswax
Composition A-5	98.5 wt% RDX/1.5 wt% beeswax
Composition B and B-3	60 wt% RDX/40 wt% TNT
Composition C-3	88 wt% RDX/12 wt% wax
Composition C-4	91 wt% RDX/2.1 wt% polyisobutylene/1.6 wt% motor oil/5.3 wt% di(2-ethylhexyl) sebacate
Cyclotol, 75/25	75 wt% RDX/25 wt% TNT
Cyclotol, 70/30	70 wt% RDX/30 wt% TNT
DATB	Diaminotrinitrobenzene
DBA-1[a]	AN/$NaNO_3$/TNT/H_2O/thickener
Detasheet C	63 wt% PETN/8 wt% NC/29 wt% elastomeric binder
Detasheet D	75 wt% PETN/25 wt% elastomeric binder
	Note: Although this material may be red in color, it is an explosive and not an inert material.

[a]For transportation only to and from M- and WX-Division Groups and storage by Group WX-3.

Table 1 (Cont)

Name or Code	Composition
DINGU	Dinitroglycoluril
DNPA	2,2-Dinitropropyl acrylate polymer
DNT	Dinitrotoluene
EDC-8[a]	76 wt% PETN/24 wt% Silicone rubber, MS 2420
EDC-28[b]	94 wt% RDX/6 wt% FPC 461
EDC-32[c]	85 wt% HMX/15 wt% Viton A
EDC-37[d]	91 wt% HMX/1 wt% nitrocellulose/8 wt% K-10 liquid
*EDC-38[e]	94.5 wt% HMX/3.5 wt% K-10 Liquid/2 wt% Polyurethane
HBX-1	40 wt% RDX/38 wt% TNT/17 wt% Al/5 wt% Wax/0.5 wt% $CaCl_2$

[a]EDC-8 is the United Kingdom's version of XTX-8003
[b]EDC-28 is the United Kingdom's version of PBX 9407
[c]EDC-32 is the United Kingdom's version of LX-04.
[d]For shipping, storage, and experimental evaluation of quantities less than 5 g and for assembly of finished charges into test devices only.
[e]For shipping, storage, and analytical evaluation of molding powder and assembly of finished pieces into test devices.

*Item added to Page.

APPROVALS:

Larry E Hatler M-1	4-17-86 Date
5/5/13 M-DO	5/13/86 Date
WX-3	5/9/86 Date
HSE-3	5/21/86 Date

Table 1 (Cont)

Name or Code	Composition
High Energy Propellants[a]	Solid propellants generally used in missile systems
HMX	Cyclotetramethylenetetranitramine
HNS	Hexanitrostilbene
K-10[b]	65.3 wt% dinitroethylbenzene/34.7 wt% trinitroethylbenzene
LX-04	85 wt% HMX/15 wt% Viton A
LX-07	90 wt% HMX/10 wt% Viton A
LX-14	95.5 wt% HMX/4.5 wt% Estane 5702 F-1
Methane/oxygen[b]	Explosive mixtures of methane and oxygen gases
NC	Nitrocellulose, cellulose nitrate
Nitromethane	Nitromethane
NQ	Nitroguanidine
NTO*	1,2,4-nitro-triazole-5-one
Octol	75 wt% HMX/25 wt% TNT
PBX-9001	90 wt% RDX/8.5 wt% polystyrene/1.5 wt% dioctyl phthalate

*Item added.

[a]After approval by the Explosives Development Committee.
[b]For shipping, storage, and experimental evaluations on less than 5-g quantities.

Submitted: [signature] Date 5/1/87

APPROVALS:

[signature] 5/1/87
M-1 DATE

[signature] 5/6/87
WX-3 DATE

[signature] 5/6/87

[signature] 5/18/87

Table 1 (Cont)

Name or Code	Composition
PBX-9007	90 wt% RDX/9.1 wt% polystyrene/0.5 wt% dioctyl phthalate/0.4 wt% resin
PBX-9010	90 wt% RDX/10 wt% Kel-F 3700 elastomer
PBX-9011	90 wt% HMX/10 wt% Estane 5703 F-1
PBX-9205	92 wt% RDX/6 wt% polystyrene/2 wt% dioctyl phthalate
PBX-9206	92 wt% HMX/8 wt% Kel-F 3700 elastomer
PBX-9401	94.2 wt% RDX/3.6 wt% polystyrene/2.2 wt% trioctyl phosphate
PBX-9404	94 wt% HMX/3 wt% nitrocellulose/3 wt% chloroethyl phosphate
PBX-9405	94 wt% RDX/3 wt% nitrocellulose/3 wt% chloroethyl phosphate
PBX-9407	94 wt% RDX/6 wt% Exon 461
PBX-9501	95 wt% HMX/2.5 wt% Estane/2.5 wt% BDNPA/F
PBX-9502	95 wt% TATB/5 wt% Kel-F 800
PBX-9503	80 wt% TATB (Class 2)/15 wt% HMX (Class 2)/5 wt% Kel-F 800
PBXW-113	88 wt% HMX/12 wt% rubber/plasticizer binder

Table 1 (Cont)

Name or Code	Composition
Pentolite	50 wt% PETN/50 wt% TNT
PETN	Pentaerythritol tetranitrate
Picric Acid	Du Pont 85 wt% pure
*PYX	2,6-Bis(picrylamino)-3,5-dinitropyridine
RDX	Cyclonite, cyclotrimethylenetrinitramine
Smokeless Powder (Single Base)	Standard military grades. Single or multi-perforated grains of colloided nitrocellulose. Stabilizers, plasticizers, inorganic nitrates, and other modifying agents may also be present.
Smokeless Powder (Double Base)	Standard military grades. Single or multi-perforated grains of colloided nitrocellulose containing nitroglycerin or nitroglycol. Stabilizers, plasticizers, inorganic nitrates, and other modifying agents may also be present.
STRATABLAST C[a]	Slurry blasting explosive
TAGN[b]	Triaminoguanidine nitrate
TAL-1005E[a]	Slurry blasting explosive

*Item added to previous revision.
[a]For transportation only to and from M- and WX-Division Groups and storage by Group WX-3.
[b]For shipping, storage, and experimental evaluation on less than 5-g quantities.

Table 1 (Cont)

Name or Code	Composition
TATB	Triaminotrinitrobenzene
Tetryl	2,4,6-Trinitrophenylmethylnitramine
TNS	Trinitrostilbene
TNT	Trinitrotoluene
TNT/NC	80 wt% TNT/20 wt% NC
*TPM	Tripicrylmelamine
Tritonal	80 wt% TNT/20 wt% aluminum powder
XTX-8003	80 wt% Recrystallized PETN/20 wt% Sylgard 182
XTX-8004	80 wt% RDX/20 wt% Sylgard 182

*Item added to page.

APPROVALS:

M-1	6/22/87 Date
Original Signed by L. A. GRITZO M-DO	6/24/87 Date
WX-3	Date
HSE-3	Date

TABLE 1

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Page 8, Page Revision 0

Submitted: SE Hatler Date 3/10/86

Georgia T. Fritz Date 3/9/86

APPROVALS:

G. E. Larson M-T 3/12/86 Date

L A Gritzo M-DO 3/26/86 Date

3/26

W. C. Mary WX-3 3/28/86 Date

N. C. Cordova HSE-3 5/1/86 Date

4/28

Wm. A. Bradley WX-DO 3/28/86 Date

TABLE 2

DEVELOPMENTAL EXPLOSIVES AT GROUP ~~GMX-3~~ WX-3*

The explosives listed in this table have been approved for development according to the procedures in "Group ~~GMX-3~~ WX-3 High Explosives Development Procedures and Authorization". Any limitations or special instructions relative to these explosives, other than those contained in the ~~GMX-3~~ WX-3 SOP's, will be found in the referenced High Explosives Development Proposal (HED). Any such limitations or instructions must be observed in addition to, and in the same manner as, those in the appropriate SOP's.

Experimental Code Number	Nominal Composition Weight Percent	Reference HED	Weight Limit
X-0001	86.1 HMX/13.9 Indowax 170/175	001	5 pounds
X-0002	89.2 HMX/10.8 Indowax 170/175	001	5 pounds
X-0003	92.1 HMX/7.9 Indowax 170/175	001	5 pounds
X-0004	94.9 HMX/5.1 Indowax 170/175	001	5 pounds
X-0005	97.5 HMX/2.5 Indowax 170/175	001	5 pounds
X-0006	82.6 HMX/17.4 Estane 5740X-2	001	5 pounds
X-0007	86.4 HMX/13.6 Estane 5740X-2	001	1500 pounds
X-0009	93.4 HMX/6.6 Estane 5740X-2	001	1500 pounds
X-0010	96.8 HMX/3.2 Estane 5740X-2	001	5 pounds
X-0011	82.6 HMX/17.4 CPR-1-46A	001	5 pounds
X-0012	86.4 HMX/13.6 CPR-1-46A	001	5 pounds
X-0013	90.0 HMX/10.0 CPR-1-46A	001	5 pounds
X-0014	93.4 HMX/6.6 CPR-1-46A	001	5 pounds
X-0015	96.8 HMX/3.2 CPR-1-46A	001	5 pounds
X-0016	82.6 HMX/17.4 CPR-1-46C	001	5 pounds
X-0017	86.4 HMX/13.6 CPR-1-46C	001	5 pounds
X-0018	90.0 HMX/10.0 CPR-1-46C	001	5 pounds
X-0019	93.4 HMX/6.6 CPR-1-46C	001	5 pounds
X-0020	96.8 HMX/3.2 CPR-1-46C	001	5 pounds

*Title changed from Page Revision 6

SUBMITTED	APPROVED	APPROVED
Date	M. L. BROOKS 10/12/67 Date	R. W. DRAKE 13 October 1967 Date

Table 2, continued)

Experimental Code Number	Nominal Composition * Weight Percent	Reference HED	Weight Limit
X-0021	78.3 HMX/21.7 Halowax 1001	001	5 pounds
X-0022	82.8 HMX/17.2 Halowax 1001	001	5 pounds
X-0023	87.2 HMX/12.8 Halowax 1001	001	5 pounds
X-0024	91.5 HMX/8.5 Halowax 1001	001	5 pounds
X-0025	95.8 HMX/4.2 Halowax 1001	001	5 pounds
X-0026	77.3 HMX/22.7 Halowax 1013	001	5 pounds
X-0027	82.0 HMX/18.0 Halowax 1013	001	5 pounds
X-0028	86.6 HMX/13.4 Halowax 1013	001	5 pounds
X-0029	91.1 HMX/8.9 Halowax 1013	001	5 pounds
X-0030	95.6 HMX/4.4 Halowax 1013	001	5 pounds
X-0031	76.2 HMX/23.8 Halowax 1014	001	5 pounds
X-0032	81.0 HMX/19.0 Halowax 1014	001	5 pounds
X-0033	85.8 HMX/14.2 Halowax 1014	001	5 pounds
X-0034	90.6 HMX/9.4 Halowax 1014	001	5 pounds
X-0035	95.3 HMX/4.7 Halowax 1014	001	5 pounds
X-0036	74.0 HMX/26.0 Halowax 1051	001	5 pounds
X-0037	79.2 HMX/20.8 Halowax 1051	001	5 pounds
X-0038	84.3 HMX/15.7 Halowax 1051	001	5 pounds
X-0039	89.5 HMX/10.5 Halowax 1051	001	5 pounds
X-0040	94.8 HMX/5.2 Halowax 1051	001	5 pounds
X-0041	86.0 HMX/14.0 Epolene LV	001	5 pounds
X-0042	89.1 HMX/10.9 Epolene LV	001	5 pounds
X-0043	92.1 HMX/7.9 Epolene LV	001	5 pounds
X-0044	94.9 HMX/5.1 Epolene LV	001	5 pounds
X-0045	97.5 HMX/2.5 Epolene LV	001	5 pounds

* Item changed from Page Revision 2

SUBMITTED:	APPROVED:	APPROVED:
A. Popolato 3/30/66 Date	M. L. BROOKS 4/1/66 Date	R. W. DRAKE 4/1/1966 Date

(Table 2, continued)

Experimental Code Number	Nominal Composition * Weight Percent	Reference HED	Weight Limit
X-0046	85.9 HMX/14.1 Epolene HD	001	5 pounds
X-0047	89.0 HMX/11.0 Epolene HD	001	5 pounds
X-0048	92.0 HMX/8.0 Epolene HD	001	5 pounds
X-0049	94.8 HMX/5.2 Epolene HD	001	5 pounds
X-0050	97.5 HMX/2.5 Epolene HD	001	5 pounds
X-0051	77.6 HMX/22.4 Chlorowax 70	001	5 pounds
X-0052	82.2 HMX/17.8 Chlorowax 70	001	5 pounds
X-0053	86.7 HMX/13.3 Chlorowax 70	001	5 pounds
X-0054	91.2 HMX/8.8 Chlorowax 70	001	5 pounds
X-0055	95.6 HMX/4.4 Chlorowax 70	001	5 pounds
X-0056	73.0 HMX/27.0 Kel-F Wax 200	001	5 pounds
X-0057	78.3 HMX/21.7 Kel-F Wax 200	001	5 pounds
X-0058	83.6 HMX/16.4 Kel-F Wax 200	001	5 pounds
X-0059	89.0 HMX/11.0 Kel-F Wax 200	001	5 pounds
X-0060	94.5 HMX/5.5 Kel-F Wax 200	001	5 pounds
X-0061	75.5 HMX/24.5 Kel-F Elastomer L1107	001	5 pounds
X-0062	80.4 HMX/19.6 Kel-F Elastomer L1107	001	5 pounds
X-0063	85.3 HMX/14.7 Kel-F Elastomer L1107	001	5 pounds
X-0064	90.2 HMX/9.8 Kel-F Elastomer L1107	001	5 pounds
X-0065	95.1 HMX/4.9 Kel-F Elastomer L1107	001	5 pounds
X-0066	75.5 HMX/24.5 Kel-F Elastomer 3700	001	5 pounds
X-0067	80.4 HMX/19.6 Kel-F Elastomer 3700	001	5 pounds
X-0068	85.3 HMX/14.7 Kel-F Elastomer 3700	001	5 pounds
X-0069	90.2 HMX/9.8 Kel-F Elastomer 3700	001	5 pounds
X-0070	95.1 HMX/4.9 Kel-F Elastomer 3700	001	5 pounds

* Item changed from Page Revision 2

SUBMITTED:	APPROVED:	APPROVED:
A. Popolato 3/30/66 Date	M. L. BROOKS 4/1/66 Date	R. W. DRAKE 4 Apr 1966 Date

(Table 2, continued)

Experimental Code Number	Nominal Composition * Weight Percent	Reference HED	Weight Limit
X-0071	77.0 HMX/23.0 Exon 461	001	5 pounds
X-0072	81.7 HMX/18.3 Exon 461	001	5 pounds
X-0073	86.4 HMX/13.6 Exon 461	001	5 pounds
X-0074	91.0 HMX/9.0 Exon 461	001	5 pounds
X-0075	95.5 HMX/4.5 Exon 461	001	5 pounds
X-0076	85.6 RDX/14.4 Indowax 170/175	001	5 pounds
X-0077	88.7 RDX/11.3 Indowax 170/175	001	5 pounds
X-0078	91.7 RDX/8.3 Indowax 170/175	001	5 pounds
X-0079	94.6 RDX/5.4 Indowax 170/175	001	5 pounds
X-0080	97.4 RDX/2.6 Indowax 170/175	001	5 pounds
X-0081	81.9 RDX/18.1 Estane 5740X-2	001	5 pounds
X-0082	85.7 RDX/14.3 Estane 5740X-2	001	5 pounds
X-0083	89.5 RDX/10.5 Estane 5740X-2	001	5 pounds
X-0084	93.1 RDX/6.9 Estane 5740X-2	001	5 pounds
X-0085	96.6 RDX/3.4 Estane 5740X-2	001	5 pounds
X-0086	81.9 RDX/18.1 CPR-1-46A	001	5 pounds
X-0087	85.7 RDX/14.3 CPR-1-46A	001	5 pounds
X-0088	89.5 RDX/10.5 CPR-1-46A	001	5 pounds
X-0089	93.1 RDX/6.9 CPR-1-46A	001	5 pounds
X-0090	96.6 RDX/3.4 CPR-1-46A	001	5 pounds
X-0091	76.4 RDX/23.6 Halowax 1013	001	5 pounds
X-0092	81.2 RDX/18.8 Halowax 1013	001	5 pounds
X-0093	86.0 RDX/14.0 Halowax 1013	001	5 pounds
X-0094	90.7 RDX/9.3 Halowax 1013	001	5 pounds
X-0095	95.4 RDX/4.6 Halowax 1013	001	5 pounds

* Item changed from Page Revision 2

SUBMITTED:	APPROVED:	APPROVED:
Pobolato 3/20/66	M. L. Brooks 4/1/66	R. W. Drake 4 Apr 1966
Pobolato Date	M. L. BROOKS Date	R. W. DRAKE Date

(Table 2, continued)

Experimental Code Number	Nominal Composition * Weight Percent	Reference HED	Weight Limit
X-0096	85.4 RDX/14.6 Epolene LV	001	5 pounds
X-0097	88.6 RDX/11.4 Epolene LV	001	5 pounds
X-0098	91.7 RDX/8.3 Epolene LV	001	5 pounds
X-0099	94.6 RDX/5.4 Epolene LV	001	5 pounds
X-0100	97.4 RDX/2.6 Epolene LV	001	5 pounds
X-0101	74.5 RDX/25.5 Kel-F 3700	001	5 pounds
X-0102	79.6 RDX/20.4 Kel-F 3700	001	5 pounds
X-0103	84.7 RDX/15.3 Kel-F 3700	001	5 pounds
X-0104	89.8 RDX/10.2 Kel-F 3700	001	5 pounds
X-0105	94.9 RDX/5.1 Kel-F 3700	001	5 pounds
X-0106	76.1 RDX/23.9 Exon 461	001	5 pounds
X-0107	80.9 RDX/19.1 Exon 461	001	5 pounds
X-0108	85.7 RDX/14.3 Exon 461	001	5 pounds
X-0109	90.5 RDX/9.5 Exon 461	001	5 pounds
X-0110	95.3 RDX/4.7 Exon 461	001	5 pounds
X-0111	94.8 HMX/0.0 NQ/5.2 Estane 5740X-2	002	5 pounds
X-0112	85.9 HMX/8.9 NQ/5.2 Estane 5740X-2	002	5 pounds
X-0113	76.7 HMX/18.0 NQ/5.3 Estane 5740X-2	002	400 pounds
X-0114	67.6 HMX/27.1 NQ/5.3 Estane 5740X-2	002	5 pounds
X-0115	58.3 HMX/36.4 NQ/5.3 Estane 5740X-2	002	5 pounds
X-0116	48.9 HMX/45.8 NQ/5.3 Estane 5740X-2	002	5 pounds
X-0117	39.3 HMX/55.3 NQ/5.4 Estane 5740X-2	002	5 pounds
X-0118	29.7 HMX/64.9 NQ/5.4 Estane 5740X-2	002	400 pounds
X-0119	19.9 HMX/74.6 NQ/5.5 Estane 5740X-2	002	5 pounds
X-0120	10.0 HMX/84.5 NQ/5.5 Estane 5740X-2	002	5 pounds

* Item changed from Page Revision 2

SUBMITTED:	APPROVED:	APPROVED:
A. Popolato — Date 3/30/64	M. L. BROOKS — Date 4/1/66	R. W. DRAKE — Date 4/14/1966

(Table 2, continued)

Experimental Code Number	Nominal Composition * Weight Percent	Reference HED	Weight Limit
X-0121	92.9 HMX/0.0 NQ/7.1 Halowax 1013	002	5 pounds
X-0122	84.1 HMX/8.8 NQ/7.1 Halowax 1013	002	5 pounds
X-0123	75.2 HMX/17.6 NQ/7.2 Halowax 1013	002	5 pounds
X-0124	66.2 HMX/26.6 NQ/7.2 Halowax 1013	002	5 pounds
X-0125	57.1 HMX/35.6 NQ/7.3 Halowax 1013	002	5 pounds
X-0126	47.9 HMX/44.8 NQ/7.3 Halowax 1013	002	5 pounds
X-0127	38.5 HMX/54.1 NQ/7.4 Halowax 1013	002	5 pounds
X-0128	29.1 HMX/63.5 NQ/7.4 Halowax 1013	002	5 pounds
X-0129	19.5 HMX/73.1 NQ/7.4 Halowax 1013	002	5 pounds
X-0130	9.8 HMX/82.7 NQ/7.5 Halowax 1013	002	5 pounds
X-0131	92.8 HMX/0.0 NQ/7.2 Exon 461	002	5 pounds
X-0132	84.0 HMX/8.7 NQ/7.3 Exon 461	002	5 pounds
-0133	75.1 HMX/17.6 NQ/7.3 Exon 461	002	5 pounds
X-0134	66.1 HMX/26.5 NQ/7.4 Exon 461	002	5 pounds
X-0135	57.0 HMX/35.6 NQ/7.4 Exon 461	002	5 pounds
X-0136	47.8 HMX/44.8 NQ/7.4 Exon 461	002	5 pounds
X-0137	38.5 HMX/54.0 NQ/7.5 Exon 461	002	5 pounds
X-0138	29.0 HMX/63.5 NQ/7.5 Exon 461	002	5 pounds
X-0139	19.5 HMX/72.9 NQ/7.6 Exon 461	002	5 pounds
X-0140	9.8 HMX/82.6 NQ/7.6 Exon 461	002	5 pounds
X-0142	90.2 HMX/4.6 DATB/5.2 Estane 5740X-2	004	5 pounds
X-0143	85.6 HMX/9.2 DATB/5.2 Estane 5740X-2	004	400 pounds
X-0144	76.3 HMX/18.5 DATB/5.2 Estane 5740X-2	004	400 pounds
X-0145	67.0 HMX/27.8 DATB/5.2 Estane 5740X-2	004	400 pounds

Item changed from Page Revision 7

SUBMITTED:	APPROVED:	APPROVED:
L. Popolato 3/30/66	M. L. Brooks 4/6/66	R. W. Drake 4/8/1966
L. Popolato Date	M. L. BROOKS Date	R. W. DRAKE Date

able 2, continued)

Experimental Code Number	Nominal Composition * Weight Percent	Reference HED	Weight Limit
X-0146	57.7 HMX/37.1 DATB/5.2 Estane 5740X-2	004	400 pounds
X-0147	48.2 HMX/46.5 DATB/5.3 Estane 5740X-2	004	400 pounds
X-0148	38.6 HMX/56.1 DATB/5.3 Estane 5740X-2	004	5 pounds
X-0149	29.1 HMX/65.6 DATB/5.3 Estane 5740X-2	004	5 pounds
X-0150	19.5 HMX/75.2 DATB/5.3 Estane 5740X-2	004	5 pounds
X-0151	9.7 HMX/84.9 DATB/5.4 Estane 5740X-2	004	5 pounds
X-0152	4.9 HMX/89.7 DATB/5.4 Estane 5740X-2	004	5 pounds
X-0154	88.4 HMX/4.5 DATB/7.1 Halowax 1013	004	5 pounds
X-0155	83.9 HMX/9.0 DATB/7.1 Halowax 1013	004	5 pounds
X-0156	74.8 HMX/18.1 DATB/7.1 Halowax 1013	004	5 pounds
X-0157	65.6 HMX/27.2 DATB/7.2 Halowax 1013	004	5 pounds
X-0158	56.4 HMX/36.4 DATB/7.2 Halowax 1013	004	5 pounds
-0159	47.2 HMX/45.6 DATB/7.2 Halowax 1013	004	5 pounds
X-0160	37.9 HMX/54.9 DATB/7.2 Halowax 1013	004	5 pounds
X-0161	28.5 HMX/64.2 DATB/7.3 Halowax 1013	004	5 pounds
X-0162	19.0 HMX/73.7 DATB/7.3 Halowax 1013	004	5 pounds
X-0163	9.6 HMX/83.1 DATB/7.3 Halowax 1013	004	5 pounds
X-0164	4.8 HMX/87.9 DATB/7.3 Halowax 1013	004	5 pounds
X-0165	92.2 HMX/0.0 DATB/7.8 KFE 3700	004	5 pounds
X-0166	87.7 HMX/4.5 DATB/7.8 KFE 3700	004	5 pounds
X-0167	83.3 HMX/8.9 DATB/7.8 KFE 3700	004	5 pounds
X-0168	74.2 HMX/17.9 DATB/7.9 KFE 3700	004	5 pounds
X-0169	65.1 HMX/27.0 DATB/7.9 KFE 3700	004	400 pounds
X-0170	56.0 HMX/36.1 DATB/7.9 KFE 3700	004	5 pounds

Item changed from Page Revision 0

SUBMITTED	APPROVED	APPROVED
A. Popolato 5/20/82	M. L. Brooks 4/1/82	R. W. Drake 4/1/82
A. Popolato Date	M. L. BROOKS Date	R. W. DRAKE Date

Table 2, continued)

Experimental Code Number	Nominal Composition * Weight Percent	Reference HED	Weight Limit
X-0171	46.8 HMX/45.3 DATB/7.9 KFE 3700	004	5 pounds
X-0172	37.6 HMX/54.5 DATB/7.9 KFE 3700	004	5 pounds
X-0173	28.3 HMX/63.7 DATB/8.0 KFE 3700	004	400 pounds
X-0174	18.9 HMX/73.1 DATB/8.0 KFE 3700	004	5 pounds
X-0175	9.5 HMX/82.5 DATB/8.0 KFE 3700	004	5 pounds
X-0176	4.8 HMX/87.2 DATB/8.0 KFE 3700	004	5 pounds
X-0177	99.7 75/25 Cyclotol/0.3 α-nitronaphthalene	003	40 pounds
X-0178	99.6 75/25 Cyclotol/0.4 α-nitronaphthalene	003	40 pounds
X-0179	99.5 75/25 Cyclotol/0.5 α-nitronaphthalene	003	40 pounds
X-0180	92.2 HMX/0.0 NQ/7.8 KFE 3700	002	5 pounds
X-0181	83.5 HMX/8.7 NQ/7.8 KFE 3700	002	5 pounds
X-0182	74.6 HMX/17.5 NQ/7.9 KFE 3700	002	5 pounds
X-0183	65.7 HMX/26.4 NQ/7.9 KFE 3700	002	400 pounds
X-0184	56.6 HMX/35.4 NQ/8.0 KFE 3700	002	5 pounds
X-0185	47.5 HMX/44.5 NQ/8.0 KFE 3700	002	5 pounds
X-0186	38.2 HMX/53.7 NQ/8.1 KFE 3700	002	5 pounds
X-0187	28.8 HMX/63.1 NQ/8.1 KFE 3700	002	5 pounds
X-0188	19.3 HMX/72.5 NQ/8.2 KFE 3700	002	5 pounds
X-0189	9.7 HMX/82.1 NQ/8.2 KFE 3700	002	5 pounds
X-0190	89.11 RDX/9.9 KFE 3700/0.99 Beeswax w/Alox	006	300 pounds
X-0191	93.07 HMX/2.97 NC/2.9 CEF/0.99 Beeswax w/Alox	006	500 pounds
X-0192	85.0 HMX/15.0 Viton	007	1000 pounds

* Item changed from Page Revision 1

SUBMITTED:	APPROVED:	APPROVED:
L. Popolato 3/30/66 Date	M. L. BROOKS 4/1/66 Date	R. W. DRAKE Date

(Table 2, continued)

Experimental Code Number	Nominal Composition Weight Percent	Reference HED	Weight Limit
X-0193	Experimental detonating fuse explosives Compositions range from 73.1 HMX/26.9 Sylgard 182 to 98.9 HMX/1.1 Sylgard 182	008	See footnote
X-0194	Experimental detonating fuse explosives Compositions range from 70 PETN/30 Sylgard 182 to 80 PETN/20 Sylgard 182	008 Phase 3, Addendum 2	20 pounds
* X-0195	55.9 HMX/36.1 DATB/8.0 Estane	004	400 pounds
* X-0196	56.8 HMX/36.6 DATB/6.6 Estane	004	400 pounds
X-0197	88.7 HMX/11.3 Teflon	001	5 pounds
X-0198	67.1 HMX/32.9 Teflon	001	5 pounds
X-0199	88.7 HMX/10.3 Teflon w/wax and Alox	001	5 pounds
X-0200	67.4 HMX/32.6 Teflon w/wax and Alox	001	5 pounds
X-0201	60 TNT/40 RDX	009	200 pounds
X-0202	40 Barium Nitrate/60 TNT	005	800 pounds
X-0204	83.2 HMX/16.8 Teflon	001, Addendum 8	1000 pounds
X-0205	84.2 HMX/15.8 Teflon w/wax and Alox	001, Addendum 8	1000 pounds
X-0206	84.2 HMX/15.8 Nitroso elastomer	011	150 pounds
X-0207	80 HMX/20 Sylgard 182	008	500 pounds
X-0208	80 RDX/20 Sylgard 182	008	500 pounds
X-0209	95.5 HMX/2.5 Elvax 460/2.5 Be-Square 170/175 wax	012	1000 pounds

Footnote: Weight limit for any given composition is 500 grams. Within this limit, material may be replaced as cross-linked batches and are sent for disposal.

* Item changed from Page Revision 3

SUBMITTED: H. L. Flaugh 10-12-71 DATE	SUBMITTED: A. Popolato 10/12/71 DATE	SUBMITTED: DATE
APPROVED: R. R. West 10-19-71 DATE	APPROVED: R. W. Drake 21 Oct 1971 DATE	APPROVED: R. Reider 21 Oct 71 DATE

(Table 2, continued)

Experimental Code Number	Nominal Composition Weight Percent		Reference HED	Weight Limit
X-0210	94.1 HMX/2.95 Estane/2.95 BDNPF		013	1000 pounds
X-0211	LX-07 - 90 HMX/10 Viton A		014	500 pounds
X-0212	90 HMX/10 CPR X9B-78B		015	1000 pounds
X-0213	94.6 HMX/2.0 Estane/2.0 BDNPF/1.4 Be-Square 170/175 wax		016	1000 pounds
X-0214	90 HMX/10 Viton A		017	1000 pounds
X-0215	90.0 HMX/8.5 Viton A/1.5 Beeswax		017	1000 pounds
X-0217	HMX	25 - 94	019	See HED-019, V.C.
	DNPA	0 - 50		
	BDNPF	0 - 50		
	BDNPA	0 - 50		
	Wax	0 - 5		
	Surface Active Agents	0 - 0.25		
X-0218	HMX	90 - 95	020	1000 pounds
	Halowax 1014	0 - 10		
	Hydrocarbon Waxes	0 - 5		
	Alox	0 - 2		
	Estane	0 - 2		
	Surface Active Agents	0 - 1		
X-0219	TATB	0 - 92	021	See HED-021, III.C.
	HMX	0 - 92		
	Kel-F	9 - 15		
X-0220	DATB	40 - 60	022	*See HED-022, V.D.
	Urea-formaldehyde Microballoons	20 - 40		
	Epoxy resin/chlorendic anhydride	10 - 30		
X-0221	RDX	40 - 60	022	*See HED-022, V.D.
	Urea-formaldehyde Microballoons	20 - 40		
	Epoxy resin/chlorendic anhydride	10 - 30		

* Item changed from Page Revision 0

SUBMITTED:	APPROVED:	APPROVED:
A. Popolato — Date	M. L. BROOKS — Date	R. W. DRAKE — Date

(Table 2, continued)

Experimental Code Number	Nominal Composition Weight Percent		Reference HED	Weight Limit
X-0222	DATB	30 - 60	022	See HED-022, V.D.
	Phenol-formaldehyde Microballoons	20 - 50		
	Epoxy resin/chlorendic anhydride	10 - 30		
X-0223	RDX	30 - 60	022	See HED-022, V.D.
	Phenol-formaldehyde Microballoons	20 - 50		
	Epoxy resin/chlorendic anhydride	10 - 30		
X-0224	RDX	74.0	023	4000 pounds - uncoated
	Aluminum	20.0		*2000 pounds - coated
	Be-Square 170/175 wax	5.4		
	Elvax 460	0.6		
	*Coating compounds	0 - 0.5		
X-0225	HMX	94.0	024	1000 pounds
	DNPA	3.5		
	FEFO	2.5		
X-0226	RDX	80 - 90	001	See HED-001, Addendum 9, VI.C.
	Estane	20 - 10		
EDC-8	PETN	76.0	025	See HED-025, IV.E.
	RTV Silicone	24.0		
X-0227	Nitroguanidine	70 - 100	026	1000 pounds
	Kel-F elastomer	0 - 30		
X-0228	Nitroguanidine	70 - 100	026	1000 pounds
	Estane 5703	0 - 30		
X-0229	Nitroguanidine	70 - 100	026	1000 pounds
	DNPA polymer	0 - 18		
	BDNPF/A nitroplasticizer	0 - 12		

* Item added to Page Revision 5

SUBMITTED:	APPROVED:	APPROVED:
A. Popolato 6/15/70 Date	M. L. BROOKS 6/19/70 Date	R. W. DRAKE 24 June 1970 Date

able 2, continued)

Experimental Code Number	Nominal Composition Weight Percent		Reference HED	Weight Limit
X-0230	RDX Be-Square 170/175 wax - Elvax 460	94 6	023	See HED-023 Addendum 1, V.C.
X-0231	HMX Tungsten Exon 461 Plasticizer	5 - 40 40 - 95 0 - 10 0 - 5	027	See HED-027 VI. D.
X-0232	HMX Tungsten Kel-F Plasticizer	5 - 40 40 - 95 0 - 10 0 - 5	027	See HED-027 VI. D.
X-0233	HMX Tungsten Polystyrene Plasticizer	5 - 40 40 - 95 0 - 10 0 - 5	027	See HED-027 VI. D.
X-0234	HMX DNPA CEF Surface-active agents	90 - 95 0 - 10 0 - 5 0 - 0.5	019	See HED-019 VI. D.
X-0235	HMX DNPA BDNPF-BDNPA eutectic Estane Surface-active agents	90 - 95 0 - 10 0 - 10 0 - 5 0 - 0.5	019	See HED-019 VI. D.
*X-0236	TATB Polystyrene/DOP Surface-active agents	≤ 95 ≥ 5 ≤ 1	028	See HED-028 V. D.
*X-0237	TATB Wax/Elvax Surface-active agents	≤ 95 ≥ 5 ≤ 1	028	See HED-028 V. D.

* Item added to Page Revision 2

SUBMITTED:	APPROVED:	APPROVED:
A. Popolato 1/2/69 Date	M. L. BROOKS 1/3/69 Date	R. W. DRAKE 9 January 1969 Date

Table 2, continued)

Experimental Code Number	Nominal Composition Weight Percent		Reference HED	Weight Limit
X-0238	TATB	≤ 95	028	See HED-028 V.D.
	Estane	≥ 5		
	Surface Active Agents	≥ 1		
X-0239	HMX	5 - 40	027	See HED-027 VI.D.
	Tungsten	40 - 95		
	Estane	0 - 10		
	Plasticizer	0 - 5		
X-0240	HMX	95	029	See HED-029 IV.
	Viton	5		
X-0241	Nitroguanidine	90 - 100	026	1000 pounds
	Wax/Elvax	0 - 10	Addendum 1	
*X-0242	HMX	90 - 95	013	5000 pounds
	BDNPF-A	0 - 5	Addendum 2	
	Estane	0 - 5		
	Calcium Stearate	0 - 0.5		
X-0243	DATB	≤ 95	028	500 pounds
	Polystyrene/DOP	≥ 5	Addendum 1	
X-0244	DATB	≤ 95	028	500 pounds
	Polystyrene/TOF	≥ 5	Addendum 1	
X-0245	DATB	≤ 95	028	500 pounds
	Wax/Elvax	≥ 5	Addendum 1	
X-0246	DATB	≤ 95	028	500 pounds
	Estane	≥ 5	Addendum 1	
X-0247	DATB	≤ 95	028	500 pounds
	Kel-F	≥ 5	Addendum 1	

* Item changed from Page Revision 5

MITTED: Salgado 3/9/72 Salgado DATE	SUBMITTED: A. Popolato 3/7/72 A. Popolato DATE	SUBMITTED: DATE
VED: R. West 3/13/72 . WEST DATE	APPROVED: 17 Mar 1972 R. W. DRAKE DATE	APPROVED: 17 Mar 1972 R. REIDER DATE

(Table 2, continued)

Experimental Code Number	Nominal Composition Weight Percent		Reference HED	Weight Limit
X-0248	DATB DNPA/BDNPA-F	≤ 95 ≥ 5	028 Addendum 1	500 pounds
X-0249	RDX Sylgard 182 Barium carbonate	≤ 42.9 (50 v/o) 0-40 0-70	008 Addendum 1	5 pounds
X-0250	RDX Sylgard 182 Cyanuric acid	≤ 57.5 (50 v/o) 0-40 0-70	008 Addendum 1	5 pounds
X-0251	DATB Sylgard 182 Barium carbonate	≤ 42.6 (50 v/o) 0-40 0-70	008 Addendum 1	5 pounds
X-0252	DATB Sylgard 182 Cyanuric acid	≤ 57.1 (50 v/o) 0-40 0-70	008 Addendum 1	5 pounds
X-0253	TATB Dapon M	< 95 < 5	028 Addendum 2	500 pounds
* X-0254	RDX Estane $BaCO_3$	≤ 47.3 ≥ 6.3	HED-030	5 pounds
* X-0255	RDX Estane Oxamide	≤ 66.5 ≥ 8.9 ≥ 24.6	HED-030	5 pounds
* X-0256	RDX Viton $BaCO_3$	≤ 45.7 ≥ 9.4 ≥ 44.9	HED-030	5 pounds

* Item added to Page Revision 1

SUBMITTED: J. Flaugh 10-29-71 DATE	SUBMITTED: P. G. Salgado 10/29/71 DATE	SUBMITTED: A. Popolato 11/15/71 DATE
APPROVED: C. R. West 11-18-71 DATE	APPROVED: R. W. Drake 6 December 1971 DATE	APPROVED: R. Reider 12-6-71 DATE

(Table 2, continued)

Experimental Code Number	Nominal Composition Weight Percent		Reference HED	Weight Limit
X-0257	RDX	≤ 63.5	HED-030	5 pounds
	Viton	≥ 13.0		
	Oxamide	≥ 23.5		
X-0258	RDX	≤ 47.7	HED-030	5 pounds
	Polystyrene	≥ 4.1		
	DOP	≥ 1.4		
	$BaCO_3$	≥ 46.8		
X-0259	RDX	≤ 67.4	HED-030	5 pounds
	Polystyrene	≥ 5.8		
	DOP	≥ 1.9		
	Oxamide	≥ 24.9		
X-0260	RDX	≤ 47.9	HED-030	5 pounds
	Wax	≥ 2.5		
	Elvax	≥ 2.5		
	$BaCO_3$	≥ 47.1		
X-0261	RDX	≤ 67.9	HED-030	5 pounds
	Wax	≥ 3.6		
	Elvax	≥ 3.5		
	Oxamide	≥ 25.0		
X-0262	DATB	≤ 47.0	HED-030	5 pounds
	Estane	≥ 6.3		
	$BaCO_3$	≥ 46.7		
X-0263	DATB	≤ 66.3	HED-030	5 pounds
	Estane	≥ 8.9		
	Oxamide	≥ 24.8		
X-0264	DATB	≤ 45.4	HED-030	5 pounds
	Viton	≥ 9.4		
	$BaCO_3$	≥ 45.2		

SUBMITTED: [signature] 11/1/71 polato DATE	SUBMITTED: [signature] 10/29/71 P. G. Salgado DATE	SUBMITTED: [signature] 10-29-71 H. L. Flaugh DATE
VED: [signature] 11-18-71 R. WEST DATE	APPROVED: [signature] 6 December 197 R. W. DRAKE DATE	APPROVED: [signature] 12-6-71 R. REIDER DATE

(Table 2, continued)

Experimental Code Number	Nominal Composition Weight Percent		Reference HED	Weight Limit
X-0265	DATB	≤63.2	HED-030	5 pounds
	Viton	≥13.1		
	Oxamide	≥23.7		
X-0266	DATB	≤47.4	HED-030	5 pounds
	Polystyrene	≥ 4.1		
	DOP	≥ 1.4		
	$BaCO_3$	≥47.1		
X-0267	DATB	≤67.1	HED-030	5 pounds
	Polystyrene	≥ 5.8		
	DOP	≥ 2.0		
	Oxamide	≥25.1		
X-0268	DATB	≤47.6	HED-030	5 pounds
	Wax	≥ 2.5		
	Elvax	≥ 2.5		
	$BaCO_3$	≥27.4		
X-0269	DATB	≤67.6	HED-030	5 pounds
	Wax	≥ 3.6		
	Elvax	≥ 3.5		
	Oxamide	≥25.3		
X-0270	RDX	50-85	HED-022	200 pounds
	Exon	15-50	Addendum 3	
* X-0271	Barium Nitrate	~76.0	HED-031	2000 pounds
	TNT	~24.0		
	Decylgallophenone or Nitrocellulose	~ 0.5		

* Item added to Page Revision 1

JBMITTED: [signature] 3/28/72	SUBMITTED: [signature] 3/28/72	SUBMITTED: DATE
polatb DATE	P. G. Salgado DATE	
OVED: [signature] 4/3/72	APPROVED: [signature] 12 April 72	APPROVED: [signature] 13 Apr 1972
. R. WEST DATE	R. W. DRAKE DATE	R. REIDER DATE

(Table 2, continued)

Experimental Code Number	Nominal Composition Weight Percent		Reference HED	Weight Limit
X-0272	HMX	≤95	HED-013	500 pounds
	TATB	0 - 10	Addendum 3	
	Estane	0 - 5		
	Calcium Stearate	0 - 0.5		
X-0273	HMX	≤92	HED-021	500 pounds
	DATB	≤92	Addendum 1	
	Kel-F	8 - 15		
X-0274	RDX	0 - 60	HED-032	1000 pounds
	TNT	35 - 100	Addendum 1	
	AN (NH_4NO_3)	0 - 70		
	Compatible surface active agent	0 - 2		
*X-0275	TATB	40	HED-033	50 kg
	TNT	40		
	Aluminum	20		
*X-0276	RDX	59.5	HED-023	50 kg
	Cu	35.9	Addendum 3	
	B^3 wax	4.1		
	Elvax	0.5		
*X-0277	RDX	62.2	HED-023	50 kg
	Fe	33.0	Addendum 3	
	B^3 wax	4.3		
	Elvax 460	0.5		
*X-0278	RDX	42.2	HED-023	50 kg
	$Ba(NO_3)_2$	52.9	Addendum 3	
	B^3 wax	4.4		
	Elvax	0.5		
*X-0279	RDX	54.1	HED-023	50 kg
	$CsNO_3$	40.8	Addendum 3	
	B^3 wax	4.6		
	Elvax	0.5		

*Items changed from Page Revision 3

TED: A. Popolato 4/5/74 DATE	SUBMITTED: H. L. Flaugh 4-5-74 DATE	SUBMITTED: DATE
PROVED: C. R. West 4/8/74	APPROVED: 12 April 1974 DATE	APPROVED: R. Reider 12 April 74 DATE

(Table 2, continued)

rimental de Number	Nominal Composition Weight Percent		Reference HED	Weight Limit
X-0280	RDX Estane	95.0 5.0	HED-013 Addendum 5	250 kg
X-0281	RDX Estane BDNPA/F	95.0 2.5 2.5	HED-013 Addendum 5	250 kg
X-0282	HMX Estane	95.5 4.5	HED-034 Phase 3	500 kg
X-0283	HMX Viton Kel-F elastomer Various plasticizers	≤95.0 2.5 to 10.0 2.5 to 10.0 2.5 to 5.0	HED-029 Phase 3 Addendum 1	500 kg
X-0284	RDX TNT AN (KNO_3) Compatible surface active agents	0 to 60 35 to 100 0 to 70 0 to 2	HED-032 Phase 3 Addendum 2	500 kg
X-0285	HMX Vibrathane	95.5 4.5	HED-034 Phase 3 Addendum 1	500 kg
X-0286	HMX Kraton High-vacuum oil plasticizer	97 ± 0.5 1.35 1.65	HED-035 Phase 3	250 kg
X-0287	HMX Kraton B[9] Wax	97.4 ± 0.5 1.43 1.17	HED-035 Phase 3 Addendum 1	250 kg
*X-0288	HMX Fluorolube MO-10 Cab-O-Sil	≤75.0 ≥22.0 ≤ 3.0	HED-008 Phase 2 Addendum 2	5 kg

*Item added to Page Revision 5

TED: 1-3-75 DATE A. Popolato	SUBMITTED: 1-3-75 DATE H. L. Flaugh	SUBMITTED: DATE
PROVED: 1-8-75 DATE C. R. WEST	APPROVED: 20 January 1975 DATE R. W. DRAKE	APPROVED: 20 Jan 75 DATE R. REIDER

(Table 2, continued)

Experimental Code Number	Nominal Composition Weight Percent		Reference HED	Weight Limit
X-0289	HMX Fluorolube LG-260 Cab-O-Sil	≤75.0 ≥22.0 ≤ 3.0	HED-008 Phase 2 Addendum 2	5 kg
*X-0290	TATB Kel-F 800	95 5	HED-021 Phase 3 Addendum 7	2000 kg
X-0291	TATB Kel-F 800	92.5 7.5	HED-021 Phase 3 Addendum 5	500 kg
X-0292	TATB Vibrathanes	92 → 98 2 → 8	HED-021 Phase 3 Addendum 5	500 kg
X-0293	RDX AN	40 ± 2 60 ± 2	HED-036 Phase 3	45.4 kg
X-0294	RDX AN MAN	40 ± 2 45 ± 2 15 ± 2	HED-036 Phase 3	45.4 kg
X-0295	RDX AN MAN	40 ± 2 30 ± 2 30 ± 2	HED-036 Phase 3	45.4 kg
X-0296	TATB Kraton	90 → 99 10 → 1	HED-021 Phase 3 Addendum 5	500 kg
X-0297	TATB Kel-F 800	97.5 2.5	HED-021 Phase 3 Addendum 5	500 kg
X-0298	HMX Kraton Hyvac oil 930503	97.5 1.12 1.38	HED-035 Phase 3 Addendum 2	250 kg

*Item changed from Page Revision 5

SUBMITTED: H. L. Flaugh 8-12-76 DATE	SUBMITTED: A. Popolato 8/12/76 DATE	SUBMITTED: DATE
APPROVED: M. B. FLETCHER 8-16-76 DATE	APPROVED: R. W. DRAKE 23 Aug 1976 DATE	APPROVED: R. REIDER 24 Aug DATE

(Table 2, continued)

Experimental Code Number	Nominal Composition Weight Percent		Reference HED	Weight Limit
X-0299	DATB Viton A	95 ± 2 5 ± 2	HED-004 Phase 3 Addendum 5	25 kg
X-0300	DATB Estane	95 ± 2 5 ± 2	HED-004 Phase 3 Addendum 5	25 kg
X-0301	RDX Viton A	95 5	HED-029 Phase 3 Addendum 2	100 kg
X-0302	FKM		HED-040 Phase 2	5 kg
*X-0303	RDX Estane Polyester fibers	95.0 4.5 0.5	HED-013 Phase 3 Addendum 7, Rev 1	2000 kg
X-0304	RDX Estane Polyester fibers	95.0 3.5 1.5	HED-013 Phase 3 Addendum 7, Rev. 1	2000 kg
X-0305	TATB Kel-F 800 Fluorolube plasticizer	95.0 2.5 2.5	HED-021 Phase 3 Addendum 5	2000 kg
X-0306	Nitroguanidine Viton A	95.0 5.0	HED-026 Phase 3 Addendum 3	500 kg
X-0307	Nitroguanidine Viton A Fluorolube plasticizer	95.0 4.0 1.0	HED-026 Phase 3 Addendum 3	500 kg
**X-0308	RDX Estane Polyethylene fibers	95.0 4.5 0.5	HED-013 Phase 3 Addendum 7, Rev. 1	2000 kg

*Item changed from Page Revision 5
**Item added to Page Revision 5

[illegible] 10-12-76 DATE	SUBMITTED: A. Popolato 10/12/76 DATE	SUBMITTED:
D: FLETCHER 10-14-76 DATE	APPROVED: for R. W. DRAKE 11/3/76 DATE	APPROVED: R. REIDER

(Table 2, continued)

Experimental Code Number	Nominal Composition Weight Percent		Reference HED	Weight Limit
X-0309 (Destex)	TNT	74.6	HED-041 Phase 3	500 kg
	Aluminum	18.7		
	D-2	4.8		
	Acetylene black (carbon)	1.9		
X-0310	NQ	95.0	HED-026 Phase 3 Addendum 4	100 kg
	Viton LM	5.0		
X-0311	NQ	95.0	HED-026 Phase 3 Addendum 4	100 kg
	Viton 10	5.0		
X-0312	RDX	95.0	HED-013 Phase 3 Addendum 7 Revision 1	100 kg
	Estane	3.5		
	Polyethylene fibers	1.5		
X-0313	NQ	95.0	HED-026 Phase 3 Addendum 4	100 kg
	Viton A-HV	5.0		
X-0314	NQ	95.0	HED-026 Phase 3 Addendum 4	100 kg
	Viton C-10	5.0		
X-0315	NQ	95.0	HED-026 Phase 3 Addendum 4	100 kg
	Viton L-31	5.0		
X-0316	NQ	91.0	HED-026 Phase 3 Addendum 5	1 kg
	RDX	4.0		
	Viton A	5.0		
X-0317	NQ	87.0	HED-026 Phase 3 Addendum 5	1 kg
	RDX	8.0		
	Viton A	5.0		
*X-0318	HNS	80.0	HED-038 Phase 2	0.1 kg
	Sylgard 182	20.0		

*Item added to Page Revision 4

PREPARED: A. Popolato 1/3/78	SUBMITTED: H. L. Flaugh 1-3-77	SUBMITTED: DATE
A. Popolato DATE	H. L. Flaugh DATE	
APPROVED: 1/6/78	APPROVED: 1978	APPROVED: 1/16/78

(Table 2, continued)

Experimental Code Number	Nominal Composition Weight Percent		Reference HED	Weight Limit
X-0319	TATB	50.0	HED-021	100 kg
	HMX	45.0	Phase 3	
	Kel-F 800	5.0	Addendum 10	
X-0320	TATB	60.0	HED-021	100 kg
	HMX	35.0	Phase 3	
	Kel-F 800	5.0	Addendum 10	
X-0321	TATB	75.0	HED-021	100 kg
	HMX	20.0	Phase 3	
	Kel-F 800	5.0	Addendum 10	
X-0322	Fairy Dust 2/1		HED-042	1 kg
			Phase 2	
*X-0323	NQ	95.0	HED-026	100 kg
	Kraton G/Hyvac oil	5.0	Phase 3	
			Addendum 6	
0324	NQ	50.0	HED-026	100 kg
	HMX	45.0	Phase 3	
	Viton A	5.0	Addendum 6	
*X-0325	NQ	60.0	HED-026	100 kg
	HMX	35.0	Phase 3	
	Viton A	5.0	Addendum 6	
*X-0326	NQ	75.0	HED-026	100 kg
	HMX	20.0	Phase 3	
	Viton A	5.0	Addendum 6	
*X-0327	NQ	50.0	HED-026	100 kg
	HMX	45.0	Phase 3	
	Kraton G/Hyvac oil	5.0	Addendum 6	
*X-0328	NQ	60.0	HED-026	100 kg
	HMX	35.0	Phase 3	
	Kraton G/Hyvac oil	5.0	Addendum 6	
X-0329	TATB	96.9	HED-021	227 kg
	Phenoxy	3.1	Phase 3	
			Addendum 5	

*Item added to Page Revision 2

ED: A. P. Torres — DATE 8-15-78	SUBMITTED: A. Popolato — DATE 8/16/78	SUBMITTED: — DATE
OVED: R. J. Daly — DATE 8/23/78	APPROVED: [illegible] — DATE 8/30/78	APPROVED: [illegible] — DATE 9/11/78

(Table 2, continued)

Experimental Code Number	Nominal Composition Weight Percent		Reference HED	Weight Limit
X-0330	TATB Polystyrene/polyphenylene-oxide	97.2 2.8	HED-021 Phase 3 Addendum 5	227 kg
X-0331	TATB Kel-F 800	99.5 0.5	HED-021 Phase 3 Addendum 5	227 kg
X-0332	TATB Kel-F 800	99.0 1.0	HED-021 Phase 3 Addendum 5	227 kg
X-0333	TATB Kel-F 800	98.0 2.0	HED-021 Phase 3 Addendum 5	227 kg
X-0334	NQ HMX Kraton G/Hyvac oil	75.0 20.0 5.0	HED-026 Phase 3 Addendum 6	100 kg
X-0335	NQ HMX Kraton G/Hyvac oil	45.0 45.0 10.0	HED-026 Phase 3 Addendum 6	100 kg
X-0336	NQ Polyvinyl alcohol	95.0 5.0	HED-026 Phase 3 Addendum 6	100 kg
X-0337	NQ Kel-F 800	95.0 5.0	HED-026 Phase 3 Addendum 6	100 kg
X-0338	NQ Viton A	99.5 0.5	HED-026 Phase 3 Addendum 6	100 kg
*X-0339	TATB Kel-F 800 Polyethylene fibers	95.0 4.5 0.5	HED-021 Phase 3 Addendum 5	90.8 kg

*Item added to Page Revision 1

PREPARED: H. P. Torres — DATE 11/13/78	SUBMITTED: A. Popolato — DATE 11/13/78	SUBMITTED: — DATE
APPROVED: R. J. Daly — DATE 11/13/78	APPROVED: R. W. Drake — DATE 11/13/78	APPROVED: L. A. Blackwell — DATE 11/21/78

(Table 2, continued)

Experimental Code Number	Nominal Composition Weight Percent		Reference HED	Weight Limit
X-0340	NO Nylon	95.0 5.0	HED-026 Phase 3 Addendum 4	3 kg
X-0341	TATB HMX Kel-F 800	90.25 4.75 5.0	HED-021 Phase 3 Addendum 10	100 kg
X-0342	TATB HMX Kel-F 800	85.5 9.5 5.0	HED-021 Phase 3 Addendum 10	100 kg
X-0343	TATB HMX Kel-F 800	80.75 14.25 5.0	HED-021 Phase 3 Addendum 10	100 kg
X-0344	TATB HMX Kel-F 800	71.25 23.75 5.0	HED-021 Phase 3 Addendum 10	90.8 kg
X-0345	TATB Kraton G Hyvac oil	97.6 1.68 0.72	HED-021 Phase 3 Addendum 5	90.8 kg
X-0346	Nitromethane	100.0	HED-043 Phase 2	5.0 lb
X-0347	Nitromethane Aluminum powder	80.0 20.0	HED-043 Phase 2	5.0 lb
X-0348	Nitromethane Aluminum powder Polymethyl methacrylate	75.0 20.0 5.0	HED-043 Phase 2	5.0 lb
*X-0349	TATB, Superfine HMX Kel-F 800	90.0 5.0 5.0	HED-021 Phase 3 Addendum 10	90.8 kg
*X-0350	TATB, Superfine HMX Kel-F 800	85.0 10.0 5.0	HED-021 Phase 3 Addendum 10	90.8 kg

*Item added to Page Revision 3

TED: P. Torres 4/20/79 DATE	SUBMITTED: H. L. Flauch 5-9-79 DATE	SUBMITTED: DATE
ROVED: R. J. DALY 5/21/79 DATE	APPROVED: R. W. DRAKE DATE	APPROVED: L. A. BLACKWELL DATE

Table 2 (continued)

Experimental Code Number	Nominal Composition Weight Percent		Reference HED	Weight Limit
X-0351	TATB, Superfine	80.0	HED-021	90.8 kg
	HMX	15.0	Phase 3	
	Kel-F 800	5.0	Addendum 10	
X-0352	TATB, Superfine	75.0	HED-021	90.8 kg
	HMX	20.0	Phase 3	
	Kel-F 800	5.0	Addendum 10	
X-0353	TATB, Superfine	92.5	HED-021	100 kg
	HMX	5.0	Phase 3	
	Kel-F 800	2.5	Addendum 11	
X-0354	TATB, Superfine	87.5	HED-021	100 kg
	HMX	10.0	Phase 3	
	Kel-F 800	2.5	Addendum 11	
X-0355	TATB, Superfine	82.5	HED-021	100 kg
	HMX	15.0	Phase 3	
	Kel-F 800	2.5	Addendum 11	
X-0356	TATB, Superfine	77.5	HED-021	100 kg
	HMX	20.0	Phase 3	
	Kel-F 800	2.5	Addendum 11	
X-0357	TATB, Superfine	82.5	HED-021	90.8 kg
	HMX	12.5	Phase 3	
	Kel-F 800	5.0	Addendum 10	
X-0358	TATB, Superfine	85.0	HED-021	100 kg
	HMX	12.5	Phase 3	
	Kel-F 800	2.5	Addendum 11	
X-0359	TNT	25-75	HED-044	100 kg
	NQ	25-75	Phase 3	
*X-0360	RDX	82.0	HED-046	3 kg
	Polyurethane binder	18.0	Phase 2	
*X-0361	RDX	67.0	HED-046	3 kg
	Aluminum	18.0	Phase 2	
	Polyurethane binder	15.0		

*Item added to Page Revision 2

ITED: H. L. Flaugh 4-14-80 DATE	SUBMITTED: DATE	SUBMITTED: DATE
PROVED: 4/16/80	APPROVED: 5/8/80	APPROVED: 5/9/80

Table 2 (continued)

Experimental Code Number	Nominal Composition Weight Percent		Reference HED	Weight Limit
X-0362	AN-FO	90.0	HED-047	50 g
	Aluminum	10.0	Phase 3	
X-0363	AN-FO	80.0	HED-047	50 g
	Aluminum	20.0	Phase 3	
X-0364	AN	40.4	HED-042	1 kg
	ADNT	52.4	Phase 2	
	KN	7.2	Addendum 2	
X-0365	AN	42.0	HED-042	1 kg
	ADNT	11.0	Phase 2	
	EDD	39.0	Addendum 2	
	KN	8.0		
X-0366	AN	50.0	HED-042	1 kg
	EDD	50.0	Phase 2	
			Addendum 2	
X-0367	AN	44.1	HED-042	1 kg
	EDD	48.1	Phase 2	
	KN	7.8	Addendum 2	
*X-0368	EDD	50.0	HED-048	25 kg
	AN	42.5	Phase 3	
	KN	7.5		
*X-0369	RDX	14.2	HED-048	25 kg
	EDD	40.3	Phase 3	
	AN	40.3		
	Aluminum	5.2		
*X-0370	RDX	12.8	HED-048	25 kg
	EDD	36.2	Phase 3	
	AN	36.2		
	Aluminum	14.8		

*Item added to Page Revision 0

TEST: H. I. Flaugh 9-11-80 DATE	SUBMITTED: DATE	SUBMITTED: DATE
APPROVED: 9/12/80	APPROVED: 10/6/80	APPROVED: 10/16/80

Table 2 (continued)

Experimental Code Number	Nominal Composition Weight Percent		Reference HED	Weight Limit
X-0371	TATB HMX Estane	51.00 46.00 3.00	HED-021 Phase 3 Addendum 13	100 kg
X-0372	TATB HMX Kraton Oil	51.40 46.30 2.30	HED-021 Phase 3 Addendum 13	100 kg
X-0373	TATB HMX Estane	43.00 55.00 2.00	HED-021 Phase 3 Addendum 13	100 kg
X-0374	TATB HMX Kraton Oil	43.00 55.00 2.00	HED-021 Phase 3 Addendum 13	100 kg
X-0375	RDX TNT Al D-2 Wax	45.00 30.00 20.00 5.00	HED-049 Phase 3	100 kg
X-0376	TATB Oil	27.51 72.49	HED-021 Phase 3 Addendum 12	3 kg
X-0377	TATB Oil	46.06 53.94	HED-021 Phase 3 Addendum 12	3 kg
X-0378	TATB Oil	77.35 22.65	HED-021 Phase 3 Addendum 12	3 kg
X-0379	TATB Oil	80.00 20.00	HED-021 Phase 3 Addendum 12	3 kg
X-0380	TATB Oil	85.00 15.00	HED-021 Phase 3 Addendum 12	3 kg

PREPARED: H. L. Flaugh 11-24-80 DATE	SUBMITTED: DATE	SUBMITTED: DATE
APPROVED: R. J. DALY 11/19/80 DATE	APPROVED: R. W. DRAKE DATE	APPROVED: L. A. BLACKWELL DATE

Table 2 (continued)

Experimental Code Number	Nominal Composition Weight Percent		Reference HED	Weight Limit
X-0381	BTX*	80.00	HED-038 Phase 2	3 kg
	Sylgard	20.00		
	*5,7-dinitro-1-picryl-benzotriazole			
X-0382	NQ	50.00	HED-048 Phase 3 Addendum 1	500 kg
	EDD	25.00		
	AN	21.25		
	KN	3.75		
X-0383	BTF	80.00	HED-038 Phase 2 Addendum 1	500 g
	Sylgard	20.00		
X-0384	DATB	80.00	HED-038 Phase 2 Addendum 1	500 g
	Sylgard	20.00		
X-0385	PYX	80.00	HED-038 Phase 2 Addendum 1	500 g
	Sylgard	20.00		
* X-0386	EDD	42.50	HED-048 Phase 3 Addendum 2	227 kg
	AN	36.10		
	KN	6.40		
	Al	15.00		
* X-0387	EDD	49.00	HED-048 Phase 3 Addendum 2	227 kg
	AN	41.60		
	KN	7.40		
	RDX	2.00		
* X-0388	EDD	32.50	HED-048 Phase 3 Addendum 2	227 kg
	AN	27.60		
	KN	4.90		
	NQ	25.00		
	Al	10.00		
* X-0389	TATB	13.46	HED-027 Phase 3 Addendum 3	100 kg
	Tungsten	85.24		
	Polystyrene	0.80		
	DOP	0.50		

*Items added to Page Revision 0

SUBMITTED: H. L. Flaugh	DATE 8-20-81	SUBMITTED:	DATE	SUBMITTED:	DA
APPROVED:		APPROVED:		APPROVED:	

Table 2 (Continued)

Experimental Code Number	Nominal Composition Weight Per Cent		Reference HED	Weight Limit
X-0390	TATB	6.74	HED-027	100 kg
	HMX	6.60	Phase 3	
	Tungsten	85.36	Addendum 3	
	Polystyrene	0.80		
	DOP	0.50		
X-0391	TNT	80.00	HED-050	91 kg
	LiF	20.00	Phase 3	
X-0392	TPM	80.0 vol%	HED-045	3 kg
	RTV-619	20.0 vol%	Phase 2	
X-0393	TPM	70.0 vol%	HED-045	3 kg
	Epoxy	30.0 vol%	Phase 2	
X-0394*	TATB	47.5	HED-021	100 kg
	HMX	48.7	Phase 3	
	Estane	3.8	Addendum 13	
X-0395	PETN	96.5	HED-051	10 kg
	FPC 461	3.5	Phase 3	
X-0396	TATB	70.0	HED-021	100 kg
	HMX	25.0	Phase 3	
	Estane	5.0	Addendum 13	
X-0397	TATB	70.0	HED-021	100 kg
	HMX	25.0	Phase 3	
	Kraton G	5.0	Addendum 13	
X-0398	TATB	70.0	HED-021	100 kg
	HMX	25.0	Phase 3	
	Kraton G	2.24	Addendum 13	
	HyVac Oil	2.76		
X-0399	TATB	95.0	HED-021	100 kg
	Viton A	5.0	Phase 3	
			Addendum 13	

*Items added to page revision 6, X-0394 was inadvertently deleted from page revision 5.

D: 10-26-83 DATE	SUBMITTED: DATE	SUBMITTED: DATE
VED:	APPROVED: 10/26/83	APPROVED:

Table 2 (Continued)

Experimental Code Number	Nominal Composition Weight Per Cent		Reference HED	Weight Limit
X-0400	PETN FPC-461 Exon	99.5 0.5	HED-051 Phase 3 Addendum 1	5 kg
X-0401	PETN Kel-F 800	99.5 0.5	HED-051 Phase 3 Addendum 1	5 kg
X-0402	PETN Kel-F 800	96.5 3.5	HED-051 Phase 3 Addendum 1	5 kg
X-0403	96.5 wt% HMX 1.57 Kraton G 1.93 Hyvac Oil		HED-035 Phase 3	90 kg
X-0404	98.5 wt% HMX 0.67 wt% Kraton G 0.83 wt% Hyvac Oil		HED-035 Phase 3	90 kg
X-0405	90.0 wt% HMX 0.89 Kraton G 1.11 Hyvac Oil		HED-035 Phase 3	90 kg
X-0406	97.2 HMX 1.27 Kraton G 1.53 Hyvac Oil		HED-035 Phase 3	200 lbs
X-0407*	69.8 wt% TATB 25.0 wt% PETN 5.0 wt% Kel-F 800 0.2 wt% Dye		HED-021 Phase 2	3 kg
X-0408*	97.5 wt% HMX 2.5 Vistalon 503		HED-052	150 g
X-0409*	97.5 wt% HMX 2.5 wt% Royalene 100		HED-052	150 g

*Item added to page revision 1.

SUBMITTED: 8-2-84 DATE	SUBMITTED: DATE	SUBMITTED: DATE
APPROVED:	APPROVED:	APPROVED:

Table 2 (Continued)

Experimental Weight Code Number	Nominal Composition Weight Per Cent	HED	Reference Limit
X-0410	97.5 wt% HMX 1.25 wt% Polysar 306 1.26 wt% Tufflo 6026	HED-052	150 g
X-0411	97.5 wt% HMX 1.0 wt% Kraton G 1650 0.25 wt% Vistalon 457 1.25 wt% Tufflo 6026	HED-052	150 g
X-0412	79.0 wt% RDX 21.0 wt% FSL 7210	HED-008	3500 g
X-0413	79.0 wt% PETN 21.0 wt% FSL 7210	HED-008	3500 g
X-0414	84 wt% HMX 12.48 wt% R45M 0.52 wt% IPDI 3.0 wt% Dioctyl Adipate	HED-053	500 kg
X-0415	60 wt% HMX 40 wt% EAK	HED-048 Phase 3 Addendum 3	100 kg
X-0416	40 wt% HMX 60 wt% EAK	HED-048 Phase 3 Addendum 3	100 kg
X-0417	20 wt% HMX 80 wt% EAK	HED-048 Phase 3 Addendum 3	100 kg
X-0418	97.5 wt% HMX 1.12 wt% Kraton G 1650 1.38 wt% Synton PAO 100	HED-035	50 lb Phase 3

SUBMITTED: 8-2-84 DATE	SUBMITTED: DATE	SUBMITTED: DAT
APPROVED:	APPROVED: 8/2/84	APPROVED:

Table 2 (Continued)

Experimental Weight Code Number	Nominal Composition Weight Per Cent	HED	Weight Limit
X-0419	97.5 HMX 2.5 Vistalon 404	HED-052	150 g
X-0420	94% DINGU 5% Exon 461 1% KR138S	HED-055	100 kg
X-0421	20 wt% TATB 80 wt% EAK	HED-048	100 kg
X-0422	97.5 HMX 2.5 Ep Syn 3007	HED-052	150 g
X-0423	97.5 HMX 2.5 Ep Syn 4006	HED-052	150 g
X-0424	79.0 wt% RDX 21.0 wt% NuSil CF1-3500	HED-008	3500 g
X-0425	79.0 wt% PETN 21.0 wt% NuSil CF1-3500	HED-008	3500 g
X-0426	95.0 wt% PYX 5.0% wt% Kel-F 800	HED-054	454 kg
X-0427	77% PETN 23% NuSil CF1-3500	HED-008	3500 g
X-0428	75 wt% PETN 25 wt% NuSil CF1-3500	HED-008	3500 g
X-0429	95 wt% DINGU 5 wt% Exon 461	HED-055	100 kg
X-0430	88% HMX 6% Kraton G-1650 6% Tufflo 6026 oil	HED-035	91 kg
X-0431	75% PETN 25% Nu-Sil CF2-3500	HED-008	3500 g

Table 2 (Continued)

Experimental Code Number	Nominal Composition Weight Per Cent	Reference HED	Weight Limit
X-0432	60% DINGU 40% TNT	HED-055 Add. 1	100 kg
X-0433	79.8% TATB (Micronized) 15.0% HMX (Ball Milled) 5.0% Kel-F 800 0.2% Dye	HED-021	100 kg
X-0434	64.8% TATB 30.0% PETN 5.0% KEl-F 800 0.2% Dye	HED-021 Add. 15	3 kg
X-0435	70% TATB 25% HMX (specially ground to Class E) 5% Estane	HED-021 Phase 3 Add. 13	100 kg
X-0436	90% HMX 7.4% CAB 2.5% NP 0.1% KR 138S	HED-056 Phase 2	3 kg
X-0437	85% HMX 11.2% CAB 3.7% NP 0.1% KR 138S	HED-056 Phase 2	3 kg
X-0438*	80.5% HMX 9.5% BDNPA/F 9.5% Estane 0.5% Calcium Stearate	HED-013 Add.8	100 kg
X-0439*	75% PETN 25% Nu-Sil CF3-3500	HED-008	3500 g
X-0440*	70% PETN 30% Nu-Sil CF3-3500	HED-008	3500 g
X-0441*	58% RDX 34% Viton 8% Calcium Tartrate	HED-057	15 kg

*Item added to page Revision 1

SUBMITTED: 4/28/86 DATE	SUBMITTED: DATE	SUBMITTED: DATE
APPROVED: 4/1/86	APPROVED: 5/2/86 DATE	APPROVED: 6/16/8 DATE

Table 2 (Continued)

Experimental Code Number	Nominal Composition Weight Per Cent	Reference HED	Weight Limit
X-0442	70% RDX 10% Kraton 10% Tufflo 6026 Oil 10% Calcium Tartrate	HED-057	15 kg
X-0443	85% TATB 15% Viton	HED-057	15 kg
X-0444	88% HMX 6% Estane 6% BDNPA/BDNPF	HED-013 Add. 8	100 kg
X-0445	80% PETN 20% Nu-Sil CF3-3500	HED-008 Phase 3 Add. 5	3500 g
X-0446*	50% RDX 35% Viton 15% Calcium Tartrate	HED-057 Phase 3 Add. 1	15 kg
X-0447*	58% RDX 10% Kraton 10% Tufflo 6026 Oil 22% Calcium Tartrate	HED-057 Phase 3 Add. 1	15 kg
X-0448*	80% TATB 20% Viton	HED-057 Phase 3 Add. 1	15 kg
X-0449*	60% RDX 25% Estane 15% Calcium Tartrate	HED-057 Phase 3 Add. 1	15 kg
X-0450*	60.9% TATB 35.0% HMX 4.1% Estane	HED-021 Phase 3 Add. 13	100 kg
X-0451*	78% PETN 22% Nu-Sil CF3-3500	HED-008 Phase 3 Add. 5	3500 g

*Item added to page Revision 0

SUBMITTED: [signature] 7/3/86 DATE	SUBMITTED: DATE	SUBMITTED:
APPROVED: [signature] 7/8/86 DATE	APPROVED: [signature] 7/8/86 W. A. Bradley DATE	APPROVED: [signature] HSE-3 for WCC 8/11 DATE

Table 2 (Continued)

Experimental Code Number	Nominal Composition Weight Per Cent	Reference HED	Weight Limit
X-0452	78% PETN 22% Nu-Sil CF4-3500	HED-008 Phase 3 Add. 5	3500 g
X-0453	78% PETN 22% Nu-Sil CF5-3500	HED-008 Phase 3 Add. 5	3500 g
X-0454	58% RDX 15% Estane 10% CEF 17% Calcium Tartrate	HED-057 Phase 3 Add. 1	15 kg
X-0455	75% PETN 25% Nu-Sil CF5-3500	HED-008 Phase 3 Add. 5	3500 g
X-0456	70% PETN 30% Nu-Sil CF5-3500	HED-008 Phase 3 Add. 5	3500 g
X-0457	78% PETN 22% NuSil CF6-3500	HED-008 Add. 5	3500 g
X-0458	95% TATB (wet aminated) 4.8% Kel-F 800 0.2% Dioctyl Sebacate (Octoil-S)	HED-021 Phase 3 Add. 12	100 kg
X-0459*	95.6% TATB 4.38% EYPEL-F 0.02% 2,2-dichlorobenzoyl peroxide in silicone base (catalyst)	HED-021 Phase 2 Add. 18	3000 g
X-0460*	59% HMX 11.5% Kraton 11.5% TCP 18 CT	HED-057 Phase 3 Add. 1	15 kg

*Item added to Page Revision 1

SUBMITTED: Larry E. Hatler 3/16/87 DATE	SUBMITTED: DATE	SUBMITTED: D
APPROVED: 3/18/87	APPROVED:	APPROVED:

Table 2 (Continued)

Experimental Code Number	Nominal Composition Weight Per Cent	Reference HED	Weight Limit
X-0461	78% PETN 22% NuSil CF7-3500	HED-008 Phase 3 Add. 5	3500 g
X-0462*	97.8% TATB 2.0% Kraton G 1650 0.2% Hypalon 20	HED-021 Phase 3 Add. 12	250 kg
X-0463	97.47% HMX 1.25% Kraton G 1650 1.25% Tufflo 6026 Oil 0.03% Irganox	HED-035 Phase 3	250 kg
X-0464	≤60% TNT ≥40% Calcium Carbonate	HED-030 Phase 1 Add. 1	3 kg
X-0465	≤70% TNT ≥30% Oxamide	HED-030 Phase 2 Add. 1	3 kg
X-0466	≤70% TNT ≥30% Cyanuric Acid	HED-030 Phase 2 Add. 1	3 kg
X-0467	≤70% TNT ≥30% Zinc Oxide	HED-030 Phase 2 Add. 1	3 kg
X-0468	86% TATB 6% Vistanex MML-100 6% Tufflo 6026 2% 032-4500 Microballoons	HED-021 Phase 3 Add. 12	10 kg
X-0469*	CLASSIFIED COMPOSITION	HED-057 Phase 3 Add. 1	10 kg

*Item added to Page Revision 1

SUBMITTED:	SUBMITTED:	SUBMITTED:
DATE 3/8/88	DATE	
APPROVED:	APPROVED:	APPROVED:

Table 2 (Continued)

X-0470*	CLASSIFIED COMPOSITION	HED-057 Phase 3	15 kg
X-0471	75% HMX 25% Emulsion	HED-058 Phase 3	25 kg
X-0472	50% HMX 50% Emulsion	HED-058 Phase 3	25 kg
X-0473	25% HMX 75% Emulsion	HED-058 Phase 3	25 kg
X-0474	100% Emulsion	HED-058 Phase 3	25 kg
X-0475 *	CLASSIFIED COMPOSITION	HED-057 Phase 3	15 kg
X-0476 *	CLASSIFIED COMPOSITION	HED-057 Phase 3	15 kg
X-0477	70% HMX 30% Emulsion	HED-058 Phase 3	25 kg
X-0478	40% HMX 60% Emulsion	HED-058 Phase 3	25 kg
X-0479	30% HMX 70% Emulsion	HED-058 Phase 3	25 kg
X-0480	20% HMX 80% Emulsion	HED-058 Phase 3	25 kg
X-0481	10% HMX 90% Emulsion	HED-058 Phase 3	25 kg
X-0482	78% PETN 22% NuSil CF-2-3550	HED-008 Phase 3 Add. 5	3.5 kg

*Items added to Page Revision 0

Table 2 (Continued)

X-0483	95% NTO 5% Exon 461	HED-059 Phase 2	3.0 kg
X-0484	95% NTO 5% Viton A	HED-059 Phase 2	3.0 kg
X-0485	95% NTO 5% Kel-F 800	HED-059 Phase 2	3.0 kg
X-0486	95% NTO 5% Kraton 1650	HED-059 Phase 2	3.0 kg
X-0487	95% NTO 5% Estane 5703	HED-059 Phase 2	3.0 kg
X-0488	40% NTO 60% TNT	HED-060 Phase 2	3.0 kg
X-0489	50% NTO 50% TNT	HED-060 Phase 2	3.0 kg
X-0490	60% NTO 40% TNT	HED-060 Phase 2	3.0 kg
X-0491*	45% NTO 50% RDX 5% Viton A	HED-059 Phase 2 Add. 1	3.0 kg
X-0492*	45% NTO 50% RDX 5% Estane	HED-059 Phase 2 Add. 1	3.0 kg
X-0493*	45% NTO 50% RDX 5% FPC 461	HED-059 Phase 2	3.0 kg
X-0494*	45% NTO 50% RDX 5% Kel-F 800	HED-059 Phase w Add. 1	3.0 kg
X-0495*	45% NTO 50% RDX 5% Kraton 1650	HED-059 Phase 2 Add. 1	3.0 kg
X-0496*	60% HMX 40% Emulsion	HED-058 Phase 3	25 kg

*Item added to page Revision 0

SUBMITTED: 3/8/88 DATE	SUBMITTED: DATE	SUBMITTED:
APPROVED:	APPROVED: 3/11/88	APPROVED: 3/1

Table 2 (Continued)

X-0497	95% TATB 5% Polysar 306	HED-052 Phase 1	150 g
X-0498	95% TATB 5% Vistalon 404	HED-052 Phase 1	150 g
X-0499	95% TATB 5% Polyvinylidene Fluoride	HED-021 Phase 3	100 kg
X-0500	95% TATB 5% Poly(vinylidene Fluoride/ hexafluoropropylene)	HED-021 Phase 3	100 kg
X-0501	78% RDX 22% CF6-3500	HED-008 Phase 3 Add. 5	3500 g
X-0502*	50% Dinitrotolune 49.7% D-2wax 0.3% Dye	HED-061 Phase 2	3 kg
X-0503*	85% NTO 10% RDX 5% Estane	HED-059 Phase 2 Add. 1	3 kg
X-0504*	85% NTO 10% RDX 5% FPC 461	HED-059 Phase 2 Add. 1	3 kg
X-0505*	85% NTO 10% RDX 5% Kel-F 800	HED-059 Phase 2 Add. 1	3 kg
X-0506*	85% NTO 10% RDX 5% Kraton 1650	HED-059 Phase 2 Add. 1	3 kg
X-0507*	82% HMX 18% Estane	HED-013 Phase 3 Add. 9	100 kg

*Item added to page Revision 0

Table 2 (Continued)

X-0508	81% HMX 15% Estane 4% BDNPA/F Eutectic	HED-013 Phase 3 Add. 9	100 kg
X-0509	88% HMX 5.4% Kraton G 1650 6.6% Tufflo Oil	HED-035 Phase 3 Add. 4	250 kg
X-0510	85% NTO 10% RDX 5% Viton A	HED-059 Phase 2 Add. 1	3 kg
X-0511*	95% HMX 5% Vistalon 404	HED-035 Phase 3 Add. 4	250 kg
X-0512*	88% HMX 12% Vistalon 404	HED-035 Phase 3 Add. 4	250 kg
X-0513*	40% TNT 50% $CaCO_3$ (Calcium Carbonate) 10% Estane	HED-030 Phase 3 Add. 3	500 kg
X-0514*	45% TNT 50% $CaCO_3$ 5% Estane	HED-030 Phase 3 Add. 3	500 kg
X-0515*	40% TNT 50% Cyanuric Acid 10% Estane	HED-030 Phase 3 Add. 3	500 kg
X-0516*	40% TNT 50% Zinc Oxide 10% Estane	HED-030 Phase 3 Add. 3	500 kg
X-0517*	40% TNT 50% Oxamide 10% Estane	HED-030 Phase 3 Add. 3	500 kg
X-0518*	50% PETN 30% Pentaerythritol 20% Sylgard 182	HED-008 Phase 3 Add. 6	10 kg

*Item added to Page Revision 0

Table 2 (Continued)

X-0519	60% PETN 20% Pentaerythritol 20% Sylgard 182	HED-008 Phase 3 Add. 6	10 kg
X-0520	70% PETN 10% Pentaerythritol 20% Sylgard 182	HED-008 Phase 3 Add. 6	10 kg
X-0521	50% TNT 40% $CaCO_3$ 10% Estane	HED-030 Phase 3 Add. 3	500 kg
X-0522*	80% RDX 20% CF6-3500	HED-008 Phase 3 Add. 5	3.5 kg
X-0523*	51% RDX 12.5% Estane 5703 12.5% CEF 24% Cyanuric Acid	HED-057 Phase 3	15 kg
X-0524*	95% TATB 4.8% Kel-F 800 0.2% Hypalon	HED-021 Phase 3 Add. 5	2000 kg
X-0525*	≤70% TNT ≥30% Calcium Carbonate Cab-o-sil	HED-030 Phase 2	2 kg
X-0526*	≤70% TNT ≥30% Calcium Carbonate Talc	HED-030 Phase 2	2 kg
X-0527*	97% TATB 3% Macrolon (Polycarbonate)	HED-21 Phase 3 Add. 12	100 kg
X-0528*	84% HMX 7.6% R45HT 7.6% DOA 0.8% IPDI	HED-053 Phase 3	25 kg

*Item added to Page Revision 0

Table 2 (Continued)

X-0529	≤97.5% HMX ≥ 2.5% Vistalon 503	HED-035 Phase 3 Add. 4	250 kg
X-0530	Kinepak Mixture ≈80% An + sensitizers ≈20% NM	HED 062 Phase 2	3 kg
X-0531	98% TATB 2% Polysar 306	HED 021 Phase 3 Add. 5	250 kg
X-0532	98% TATB 2% Vistalon 404	HED 021 Phase 3 Add. 5	250 kg
X-0533	40% TNT 55-60% Calcium Carbonate 0-2% Talc 1-2% Microballoons	HED-030 Phase 3 Add. 4	500 kg
X-0534	50% TNT 16-24% Calcium Carbonate 25-33% Talc 1-2% Microballoons	HED-030 Phase 3 Add. 4	500 kg
X-0535*	95% TZX 5% OXY-461	HED-064 Phase 2	3 kg
X-0536*	20-30% RDX 50-65% ZnO 14-20% R45HT/IPDI Binder	HED-063 Phase 2	3 kg
X-0537*	≤90% HMX ≥10% R45T/IPDI Type Binder	HED-053 Phase 3 Rev. 1	25 kg
X-0538*	20-80% TATB 20-80% NTO 0-10% Kel-F 800	HED-059 Phase 2 Add. 3	3 kg

*Item added to Page Revision 0

SUBMITTED: [illegible] 4/25/90 DATE	SUBMITTED: DATE	SUBMITTED:
APPROVED: [illegible] 4/30/90 DATE	APPROVED: Wm. A. Bradley 5/2/90 W. A. Bradley DATE	APPROVED: HSE-3

Table 2 (Continued)

Experimental Code Number	Nominal Composition Weight Per Cent	Reference HED	Weight Limit
X-0539	44% RDX (Micronized) 12.5% Estane 5703 12.5% CEF 31% Cyanuric Acid	HED-057 Phase 3 Add. 2	15 kg
X-0540	39% RDX (Micronized) 12.5% Estane 5703 12.5% CEF 31% Cyanuric Acid	HED-057 Phase 3 Add. 2	15 kg
X-0541	69.8% TATB 25.0% PETN 5.0% Kel-F 800 0.2% Blue Dye (Freon Process)	HED-021 Phase 3 Add. 16	100 kg
X-0542	95% TATB 5% L-9267, Fluoroplastic terpolymer (3M)	HED-021 Phase 3 Add. 5	250 kg
X-0543	95% TATB 5% Kel-F 3700	HED-021 Phase 3 Add. 5	250 kg
X-0544	26% TATB 74% Ammonium Nitrate	HED-066 Phase 2	3 kg
X-0545	76% RDX 12% Cellulose Acetate Butyrate (CAB) 7.6% Acetyl Triethyl-citrate (ATEC) 4.0% Nitrocellulose 0.4% Ethylcentralite	HED-056 Phase 2 Add. 2	3 kg

WX-3

STANDARD OPERATING PROCEDURE

FOR

APPROVED DETONATORS (TABLE 3)

Prepared By: _____ **Date** 5/10/93
T. F. Covert, Section Leader, WX-3

Approved By: _____ **Date** 5/11/93
L. A. Stretz, Group Leader, WX-3

Approved By: L. Michael Kelly _____ **Date** 5/13/93
for **W. A. Bradley, Division Operations Coordinator, WX-DO**

Approved By: W. Patterson _____ **Date** 5/14/93
W. Patterson, M-7

Approved By: P. D. Whitehead _____ **Date** 6-23-93
P. D. Whitehead, Safety Officer, HS-5

Los Alamos CONTROLLED DOCUMENT
National Laboratory

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TABLE 3
APPROVED DETONATORS

1.0 High-Energy Exploding Bridgewire (EBW) Detonators

The following EBW, slapper and high energy detonators have been approved for assembly into test devices:

#1E23		#ER-396A	SE1
#1E26	#ER-325	#ER-396B	SE1/31
#1E26B	#ER-312B	#ER-402	RP1
#1E29	#ER-344	#ER-403	RP1/31
#1E30	#ER-349	*#ER-403B	RP2
#1E33	#ER-350		RP80
#1E34	#ER-351		RP84
#1E36	#ER-352		RP87
#1E38 T.F.	#ER-353		
#1E38	#ER-370		
	#ER-371	#MK20	
	#ER-377	#MK22A	
	#ER-380	#MK13C	
	#ER-400		

2.0 The following low energy detonators have been approved for assembly into test devices: 3E1, 3E1A, 3E1D.

3.0 The following low-energy actuators and igniter have been approved for assembly into test devices:

2S/2052	Actuator	*3S/PT06	Actuator
2S/STP/150	Actuator	*4S/152	Actuator
3X/2052	Igniter	*5S/152	Actuator
*6S/PT06	Actuator	*7S/152	Actuator
*8S/2052	Actuator		

Note: To provide safe handling, the actuators and igniter listed above will be assembled into a valve body or an assembly that will provide confinement before they are furnished to WX-3 for subsequent assembly. Shorting plugs will be installed until connected to next assembly.

Approved by Nuclear Explosive Safety Study for use, at NTS, in nuclear explosive assembly.

* Indicates addition.

4.0 DESIGN, OPERATIONS, AND PROCESS INFORMATION

This section presents a brief description of the open burning/open detonation (OB/OD) thermal treatment units addressed in this Part B permit application as well as an overview of the design, general operations, and process information applicable to these waste management units. Information provided in this section is submitted to address the applicable miscellaneous unit requirements of the New Mexico Administrative Code, Title 20, Chapter 4, Part 1 (20 NMAC 4.1), Subpart IX, 270.23, and 20 NMAC 4.1, Subpart V, Part 264, Subpart X, revised November 1, 1995, as well as the requirements for thermal treatment units in 20 NMAC 4.1, Subpart VI, Part 265, Subpart P, revised November 1, 1995. Information that is identical for Technical Area (TA) 14, TA-15, TA-36, and TA-39 is consolidated.

4.1 HAZARDOUS WASTE OB/OD THERMAL TREATMENT UNITS NEAR TA-14, BUILDING 23 (TA-14-23) [20 NMAC 4.1, Subpart IX, 270.23; 20 NMAC 4.1, Subpart V, Part 264, Subpart X; and 20 NMAC 4.1, Subpart VI, Part 265, Subpart P]

This section provides unit descriptions and an overview of the waste management practices for the hazardous waste OB/OD thermal treatment units located near TA-14-23 at Los Alamos National Laboratory (LANL). The OB/OD thermal treatment units at TA-14 include a burn cage for OB of explosives-contaminated items such as paper, tape, debris, and soil, and an OD area for treatment of waste explosives. The OD thermal treatment unit is also used for nontreatment-related experimental test detonations (i.e., shots). The descriptions include the location, the physical parameters, the materials of construction, and the maximum treatment capacity of the OB/OD thermal treatment units. A discussion of waste management practices, including those related to waste packaging and handling, is presented in Section 4.5.

The two thermal treatment units at TA-14 are located approximately 180 feet south of structure TA-14-23 (the control building); this area is also known as Q-Site East. OB treatment operations are carried out in a burn cage located in the eastern portion of Firing Mound 3, adjacent to the OD area. The burn cage is constructed of a semicircular piece of 0.25-inch-thick steel approximately 2 feet wide. The unit has a wire mesh door and a wire mesh top and bottom. The burn cage, which measures approximately 3 feet high and 2 feet in diameter, sits in a steel tray with two-inch raised edges. The burn cage and steel tray rest on bare soil. OB operations are monitored from the control building (TA-14-23).

The OD area, referred to as Firing Mound 3, is a gently sloping, sand-covered area measuring approximately 40- by 75-feet. Following waste placement at Firing Mound 3, detonation operations are conducted from the control building. The locations of the thermal treatment units at TA-14 are shown on Figure 4-1.

A maximum of 50 pounds of explosives-contaminated materials may be burned per treatment at the OB unit. A maximum of 20 pounds of waste explosives may be detonated per treatment at the OD thermal treatment unit.

4.2 HAZARDOUS AND/OR LOW-LEVEL MIXED WASTE OD THERMAL TREATMENT UNIT NEAR TA-15-184 [20 NMAC 4.1, Subpart IX, 270.23; 20 NMAC 4.1, Subpart V, Part 264, Subpart X; and 20 NMAC 4.1, Subpart VI, Part 265, Subpart P]

This section provides a unit description and an overview of the waste management practices for the hazardous and/or low-level mixed waste OD thermal treatment unit located near TA-15-184. The description includes the location, the physical parameters, the materials of construction, and the maximum treatment capacity of the OD thermal treatment unit. A discussion of waste management practices, including those related to waste packaging and handling, is presented in Section 4.5.

The OD thermal treatment unit at TA-15 is located near TA-15-184 and may be used to open detonate solid and liquid hazardous and/or low-level mixed explosive waste. As shown on Figure 4-2, the unit extends approximately 150 feet from the northeast to the southeast of TA-15-184. The area, which covers approximately 17,663 square feet, is generally flat and sand-covered and slopes gently to the southwest. Two steel plates that measure 0.5 foot thick, 5 feet wide, and 20 feet long are located on the ground adjacent to TA-15-184. The plates are laid lengthwise end-to-end with one end against the building. Various small housings for cameras and instrumentation are located at the site. Sand bags are used to protect TA-15-184 and the small housings from the impact of detonations.

The OD thermal treatment unit may be used to treat a maximum of 500 pounds of explosive waste per detonation. The unit is currently used for nontreatment-related experimental test detonations (i.e., shots); however, waste treatment has not yet been conducted.

4.3 HAZARDOUS AND/OR LOW-LEVEL MIXED WASTE OD THERMAL TREATMENT UNIT NEAR TA-36-8 [20 NMAC 4.1, Subpart IX, 270.23; 20 NMAC 4.1, Subpart V, Part 264, Subpart X; and 20 NMAC 4.1, Subpart VI, Part 265, Subpart P]

A description of the hazardous and/or low-level mixed waste OD thermal treatment unit located near TA-36-8 is provided below. The description includes the location, the physical parameters, and the maximum treatment capacity of the OD thermal treatment unit. A discussion of waste management practices, including those related to waste packaging and handling, is presented in Section 4.5.

The OD thermal treatment unit located near TA-36-8 may be used to treat solid and liquid hazardous and low-level mixed explosive waste. The OD thermal treatment unit is an irregularly-shaped, sand- and grass-covered area that measures approximately 550 feet east to west and 300 feet north to south, as shown on Figure 4-3. The area is relatively flat.

The OD thermal treatment unit has a maximum treatment capacity of 2,000 pounds of explosive waste per detonation. The unit is used primarily for nontreatment-related experimental test detonations and may occasionally be used for treatment of hazardous and/or low-level mixed explosive waste.

4.4 HAZARDOUS WASTE OD THERMAL TREATMENT UNITS AT TA-39 [20 NMAC 4.1, Subpart IX, 270.23; 20 NMAC 4.1, Subpart V, Part 264, Subpart X; and 20 NMAC 4.1, Subpart VI, Part 265, Subpart P]

This section provides a description of the hazardous waste OD thermal treatment units associated with structures TA-39-6 and TA-39-57 at TA-39. The description includes the location, the physical parameters, the materials of construction, and the maximum treatment capacities of the thermal treatment units. A discussion of waste management practices, including those related to waste packaging and handling, is presented in Section 4.5.

The OD thermal treatment units at TA-39 are associated with TA-39-6 and TA-39-57 (Figures 4-4 and 4-5). Each of the areas is a relatively flat sand-covered area, measuring approximately 40- by 40-feet, and is located in the canyon bottom. Steep canyon walls rise to heights of 100 feet or more in the immediate vicinity of each OD area, roughly forming a semicircle around each area. The canyon walls serve to attenuate the force of the blasts. The associated control buildings (i.e., TA-39-6 and TA-39-57) are reinforced concrete structures extending partially beneath the detonation areas.

The maximum treatment capacity at each of the TA-39 OD units is 1,000 pounds.

4.5 WASTE MANAGEMENT PRACTICES [20 NMAC 4.1, Subpart V, Part 264, Subpart X]

There are two basic categories of explosives that may be managed at the OB/OD thermal treatment units addressed in this Part B permit application. The first category consists of explosives-contaminated waste; the second category consists of explosive material. Explosives-contaminated waste is further divided into subcategories as follows: (1) make-up room wastes, (2) Type I material, (3) Type II material, and (4) Type III material. These wastes are defined as follows:

- Make-up room waste - Explosives-contaminated waste, such as paper towels, swabs, and similar materials that contain no tangible pieces of explosives but are used in the preparation of shots in the make-up building.
- Type I material - Firing mound debris that is potentially contaminated with explosives and consists of wood scraps, cardboard, burlap, and Plexiglass/Lexan.
- Type II material - Firing site debris that is potentially contaminated with explosives and consists of plastic, glass, styrofoam, electrical cables, and metallic foils used for pin switches.
- Type III material - Firing site debris that is potentially contaminated with explosives and consists of metals such as target plates. Type III material also includes corrective action wastes or wastes generated as a result of investigation or remediation.

The second category (i.e., explosive material) includes the following subcategories: (1) explosives assemblies and explosives that are unsafe to handle; (2) identifiable scrap explosives that are safe to handle; (3) identifiable booster charge scrap; and (4) any other process or cleanup wastes that are believed to be potentially reactive.

Waste to be treated is collected from various accumulation areas located at the facility and transported by appropriately trained personnel in a designated vehicle to the OB/OD thermal treatment unit on the day of planned treatment. The waste is then unloaded from the vehicle and placed at the OB or OD location by qualified technicians/specialists. OB of explosives-contaminated waste consists of placing the waste in the burn cage, coating the waste with starter fluid, and igniting the waste. OD of waste is accomplished by using a predetermined amount of explosive to initiate the detonation. The detonation may create temperatures up to 3,000 degrees Fahrenheit (1,649 degrees Celsius). Initiation for all waste treatment operations will be performed remotely by qualified personnel from inside a control building/bunker. Thermal treatment operations are conducted in

accordance with the most recent, approved versions of LANL standard operating procedures (SOP) (see Appendix A). Other relevant LANL SOPs will also be followed, as appropriate.

Waste containers for explosives-contaminated waste and explosive material generally consist of paper-lined cardboard boxes. Most wastes contaminated with explosives and actual pieces of explosives will not be packaged together. Explosives-contaminated waste will be placed within a paper-lined cardboard box with a lid. Once a cardboard box is filled, it will be closed, sealed with tape, and marked "HE Hazardous Waste." These waste containers will then be stored in an accumulation area.

Pieces of damaged explosives resulting from a misfire, sensitivity experiment, incomplete detonation, or exposure to severe testing will be packaged separately from excess explosives. The waste explosives will be stored in an accumulation area. Exceptions to handling will be done on special items and will be handled safely and appropriately.

4.6 ENVIRONMENTAL PERFORMANCE STANDARDS APPLICABLE TO MISCELLANEOUS TREATMENT UNITS [20 NMAC 4.1, Subpart V, Part 264, Subpart X]

The OB/OD thermal treatment units addressed in this Part B permit application are located in remote areas of LANL and will be operated, maintained, and closed in a manner that will ensure protection of human health and the environment, in accordance with 20 NMAC 4.1, Subpart V, 264.601, revised November 1, 1995. Geologic and hydrologic characteristics of the LANL facility and land use patterns in the Los Alamos area are discussed in Section 2.0 of the LANL General Part B.

The OB/OD thermal treatment units have been designed to facilitate safe handling and treatment of wastes in order to prevent adverse human health and environmental impacts. Design information and waste management practices for these units are detailed in Sections 4.1 through 4.5. The waste analysis plan for these units is included as Section 3.0 of this Part B permit application. A description of emergency response actions to be taken to minimize adverse impacts of unanticipated events are described in the contingency plan (see Section 7.0 of this document and Section 7.0 of the LANL General Part B).

SOPs are followed at the OB/OD thermal treatment units to minimize the potential for environmental contamination that may result from precipitation contacting treatment residues. Residues resulting from treatment activities may consist of metallic shards and occasional pieces of propellants,

explosives, or pyrotechnics. SOPs for the OB/OD thermal treatment units require that the firing-site leader thoroughly survey the area after each detonation and collect all identifiable pieces of explosives. The damaged explosives are then weighed and an estimate of the amount of material remaining at the unit is recorded in the site record logbook. Every effort is made to minimize the quantity of explosive and nonexplosive residues remaining at a unit. SOPs that are applicable for access and operations at the OB/OD thermal treatment units described herein are included as Appendix A.

4.6.1 Protection of Groundwater/Vadose Zone [20 NMAC 4.1, Subpart V, 264.601(a)]

As required by 20 NMAC 4.1, Subpart V, 264.601(a), revised November 1, 1995, the OB/OD thermal treatment units addressed in this Part B permit application are located in remote areas and will be operated in a manner that prevents releases that may have adverse affects to human health or the environment due to migration of waste constituents through the vadose zone to groundwater. The following sections provide information on the potential for adverse effects on human health or the environment as a result of operations at the OB/OD thermal treatment units as well as describe monitoring and reporting efforts that have been or will be undertaken at each unit to assess the impact of operations at each unit.

4.6.1.1 Hydrogeologic Assessment and Potential Pathways and Exposure Routes

Each of the OB/OD thermal treatment units addressed in this Part B permit application is located in a semiarid, temperate, mountain climate. The annual precipitation in the Los Alamos area varies between 33 and 46 centimeters (cm). The evaporation rate of free standing water exceeds the average annual precipitation. Site-specific information for the soils at the OB/OD thermal treatment units, including permeability rates and available water-holding capacity, is provided in Section 2.2 of this Part B permit application. In addition, it is estimated that 600 to 1,200 feet of unsaturated tuff and volcanic rock separate the facility's soil surface from the main aquifer (Figure 2-7 in the LANL General Part B). Collectively, the depth to the uppermost aquifer and the annual moisture deficit significantly limit the potential for contaminants to migrate through the vadose zone to groundwater.

An evaluation of possible waterborne waste transport pathways for groundwater and their potential for migration is included as Attachment 4-1, which lists the possible contaminants of concern and shows their origin and nature.

The only aquifer in Los Alamos capable of municipal and industrial water supply is the main aquifer. No supply wells or test wells are located within the boundaries of TA-14, TA-15, TA-36, or TA-39 or within 3,500 feet of any of the OB/OD thermal treatment units described herein.

4.6.1.2 Monitoring and Reporting

LANL has established an extensive groundwater monitoring system to assess and protect the quality of groundwater in the Los Alamos area. The monitoring network includes test wells, supply wells, gaging stations, observation wells, and other hydrogeologic devices located both inside and outside LANL boundaries. Routine samples are analyzed for toxic constituents, basic water quality, and resource depletion. The results are published in the annual "Environmental Surveillance Report" and the annual "Water Supply Report." Details on the Environmental Surveillance Groundwater Monitoring Plan can be found in the "Groundwater Protection Management Program Plan" (LANL, 1995). In addition, a LANL hydrogeologic plan is currently under development.

4.6.2 Protection of Surface Water/Wetlands [20 NMAC 4.1, Subpart V, 264.601(b)]

As required by 20 NMAC 4.1, Subpart V, 264.601(b), revised November 1, 1995, the OB/OD thermal treatment units addressed in this Part B permit application are located in remote areas and will be operated in a manner that prevents any releases that may have adverse affects on human health or the environment due to migration of waste constituents to surface waters or wetlands. The following sections provide information on the potential for adverse effects to human health or the environment as a result of operations at the OB/OD thermal treatment units as well as describe monitoring and reporting efforts that have been or will be undertaken at each of the units to assess the impact of operations.

4.6.2.1 Hydrologic Assessment and Potential Pathways and Exposure Routes

Net annual precipitation for the Los Alamos area, including the sites of the OB/OD thermal treatment units, is low. In addition, surface waters within LANL are limited to ephemeral, interrupted, or intermittent flows in the canyon bottoms that result from rainfall or snowmelt. The locations of these surface waters, including intermittent streams, are shown on Map 6 of the OB/OD Part A (LANL, 1996b). Drainage from the TA-14, TA-15, and TA-36 sites flows into nearby canyons. Both of the TA-39 sites are located in a canyon bottom.

Canyon bottom surface waters downstream of the firing sites at TA-14, TA-15, and TA-36 eventually flow into Water Canyon, and canyon bottom surface waters downstream of the TA-39 firing site

eventually flow into Ancho Canyon. A gaging station in Water Canyon, located about 2.5 miles upstream of the Rio Grande, recorded a maximum discharge of 0.21 cubic feet per second in the 1995 water year. There was no flow most of the time (LANL, 1996c). Gage ratings for a gaging station in Ancho Canyon, located about 2 miles upstream of the Rio Grande, are to be established.

The OB/OD thermal treatment units included in this Part B permit application are a part of LANL's National Pollutant Discharge Elimination System (NPDES) General Permit for storm water discharges associated with industrial activity (Permit Number NMR00A384). A Storm Water Pollution Prevention (SWPP) Plan, as required by the NPDES General Permit, has been developed for each of the OB/OD thermal treatment units. Each plan is designed to identify any potential pollutants and to provide pollution prevention or control methods to prevent the discharge of pollutants in storm water runoff at the unit and the surrounding area. Under the SWPP Plan, the facility is required to implement best management practices to reduce the likelihood of pollutants entering the storm water discharges. To this end, the following practices have been adopted at each of the OB/OD thermal treatment units:

Good Housekeeping

- Regular maintenance of the area is performed to ensure that it is clean and orderly
- SOPs have been written specifying proper waste handling to minimize the exposure of waste and waste residues to precipitation
- Regular inspections of the area are performed to ensure SOPs are being followed

Spill Prevention and Response

- Personnel are trained in material handling and release notification procedures

Visual Inspections

- Pollution prevention personnel inspect and log information concerning site drainage, erosion, non-storm-water discharges, and changes in adjacent facilities that may affect the potential for storm water pollution.

Under the NPDES General Permit, the measures described in Attachment 4-2 also apply to each of the OB/OD thermal treatment units.

An evaluation of possible waterborne waste transport pathways for surface water and their potential for migration is included as Attachment 4-1, which lists the possible contaminants of concern and shows their origin and nature.

TA-14

Surface waters in the vicinity of the OB/OD thermal treatment units at TA-14 are limited to ephemeral streams in the bottoms of canyons near the site, namely, Cañon de Valle, and Threemile and Pajarito Canyons. Cañon de Valle lies approximately 1,000 feet due south of the TA-14 OB/OD thermal treatment units; Threemile Canyon is roughly 2,000 feet northeast of the units; and Pajarito Canyon is situated approximately 3,000 feet to the north. According to the "RFI Work Plan for Operable Unit 1085" (LANL, 1994b), drainages from the central part of TA-14, including the TA-14 OB/OD thermal treatment units, flow only into Cañon de Valle. If water volume is sufficient, flow from this canyon may reach the Rio Grande.

Contaminants that may potentially be released from TA-14 OD operations may include residual high explosives or lead (LANL, 1994c). Potential contaminants from the TA-14 OD thermal treatment unit may reach nearby surface waters in one or more of the following ways: (1) direct (airborne) deposition from OD operations; (2) transport by surface water runoff; and (3) wind erosion and deposition of contaminated soils. The nature and extent of contamination at the TA-14 firing site is described in Section 4.6.3.1.

Potential contaminants resulting from OB operations at TA-14 may include the following: carbon monoxide (CO), nitrogen oxides (NO_x), methane, ammonia, hydrogen cyanide, sulfur oxides, particulates, and volatile organic compounds (VOC). With the exception of particulate material (i.e., ash), each of these potential contaminants is either a gas or has a relatively high vapor pressure and, thus, would not be expected to contaminate surface waters.

TA-15

The TA-15-184 OD thermal treatment unit is bordered by Potrillo Canyon to the north and Water Canyon to the south. Waters from both of these canyons flow into the Rio Grande. The stream flow in Potrillo Canyon is ephemeral and occurs only as the result of rainfall or snow melt. Water Canyon may receive flow from Cañon de Valle. Contaminants that may potentially be released from the TA-15 OD thermal treatment unit may include beryllium or lead (LANL, 1994d). These contaminants may reach nearby surface waters in one or more of the following ways: (1) direct (airborne)

deposition from OD operations; (2) transport by surface water runoff; and (3) wind erosion and deposition of contaminated soils. The nature and extent of contamination at the TA-15-184 firing site is described in Section 4.6.3.1.

TA-36

The TA-36-8 OD thermal treatment unit is located in the vicinity of the headwaters of Fence Canyon. Fence Canyon waters flow into Potrillo Canyon and then into Water Canyon, which eventually flows into the Rio Grande. The stream flow in Fence Canyon and Potrillo Canyon is ephemeral and occurs only as the result of rainfall or snow melt. A discharge sink, which is geomorphologic feature, has been identified in Potrillo Canyon. The discharge sink absorbs stream flow and traps incoming sediments. Immediately downstream from the sink, there is no evidence of stream flow. It is suspected that surface waters generated from the watershed upstream of the sink do not reach the Rio Grande (LANL, 1993c).

Contaminants that may potentially be released from the TA-36 OD thermal treatment unit are likely to include residual explosives or lead (LANL, 1994e). These contaminants may reach nearby surface waters in one or more of the following ways: (1) direct (airborne) deposition from OD operations; (2) transport by surface water runoff; and (3) wind erosion and deposition of contaminated soils. The nature and extent of contamination at the TA-36 firing site is described in Section 4.6.3.1.

TA-39

The firing sites at TA-39 are located in the bottom of Ancho Canyon and are in close proximity to intermittent streams located there. If the water volume is sufficient, these flows may reach the Rio Grande approximately three miles away. Contaminants that may potentially be released from the TA-39 OD thermal treatment units may include residual explosives or lead (LANL, 1994f; LANL, 1994g). These contaminants may reach nearby surface waters in one or more of the following ways: (1) direct (airborne) deposition from OD operations; (2) transport by surface water runoff; and (3) wind erosion and deposition of contaminated soils. The nature and extent of contamination at the TA-39 firing site is described in Section 4.6.3.1.

4.6.2.2 Monitoring and Reporting

Under the current NPDES Stormwater General Permit, surface water monitoring is not required at these sites. The General Permit expires in October of 1997, and an application for coverage of

these sites under the next tier, Multi-Sector General Permit, will be submitted. The following paragraphs detail surface water reporting and proposed monitoring strategies for the units addressed in this Part B permit application in accordance with the requirements in 20 NMAC 4.1, Subpart V, 264.602, revised November 1, 1995.

TA-14

In order to maintain compliance with the NPDES General Permit, annual site inspections are conducted at TA-14 to evaluate the effectiveness of the SWPP Plan. The inspections are documented in an inspection report that describes any major observations, incidents of noncompliance with the SWPP Plan, corrective actions, and any observations or changes made with respect to the SWPP Plan.

To determine if contaminants have migrated from the OB/OD thermal treatment units at TA-14, the "RFI Work Plan for Operable Unit 1085" (LANL, 1994b) proposes collecting 12 soil/sediment samples from catchments in known drainage areas at the site. These samples will be analyzed for potential contaminants of concern, including explosives, metals (i.e., beryllium, lead, and uranium), and radionuclides (LANL, 1994b). Data from these samples will be compared to SALs and, if appropriate, to naturally occurring background levels for each of the potential contaminants to determine whether a human health or environmental hazard exists. If it is determined that a hazard exists, interim actions to stop or minimize the off-site migration of contaminants will be undertaken. Such interim actions might include removal of contaminated soil/sediment and/or the erection of barriers (LANL, 1994b).

TA-15

In order to maintain compliance with the NPDES General Permit, annual site inspections are conducted at TA-15 to evaluate the effectiveness of the SWPP Plan. The inspections are documented in an inspection report that describes any major observations, incidents of noncompliance with the SWPP Plan, corrective actions, and any observations or changes made with respect to the SWPP Plan.

According to the "RFI Work Plan for Operable Unit 1086" (LANL, 1993b), the TA-15-184 firing site has met the recommended criteria as a potential release site for which corrective actions are to be deferred until the site is decontaminated and decommissioned. Available information has shown

that there is no current health risk to site workers and that hazardous material is not migrating off LANL property. Details on the criteria for this recommendation can be found in the work plan.

TA-36

In order to maintain compliance with the NPDES General Permit, annual site inspections are conducted at TA-36 to evaluate the effectiveness of the SWPP Plan. The inspections are documented in an inspection report that describes any major observations, incidents of noncompliance with the SWPP Plan, corrective actions, and any observations or changes made with respect to the SWPP Plan.

The "RFI Work Plan for Operable Unit 1130" (LANL, 1993c) proposes collecting water and sediment samples from sediment catchment areas identified in Fence, Potrillo, and Water Canyons. The sampling will be conducted to determine contaminant redistribution via surface water runoff. The water samples will be collected in accordance with LANL-ER-SOP-06.13, "Surface Water Sampling" (LANL, 1992a). Quality assurance/quality control (QA/QC) samples will be collected and analyzed in accordance with LANL's Environmental Restoration Program Generic Quality Assurance Project Plan (LANL, 1991b).

TA-39

In order to maintain compliance with the NPDES General Permit, annual site inspections are conducted at TA-39 to evaluate the effectiveness of the SWPP Plan. The inspections are documented in an inspection report that describes any major observations, incidents of noncompliance with the SWPP Plan, corrective actions, and any observations or changes made with respect to the SWPP Plan.

The "RFI Work Plan for Operable Unit 1132" (LANL, 1993d) proposes immediate (i.e., before unit decommissioning) field sampling at and around the active firing sites at TA-39 to characterize the extent of contamination. The primary impetus for conducting field sampling immediately is to evaluate whether contaminants are moving off site. A geomorphic characterization will be conducted prior to field screening and sampling. This characterization will identify major landform features, stream channels, drainage patterns, and sites of active erosion (LANL, 1993d).

A field radiation survey and a field metals survey (using x-ray fluorescence instrumentation) will be conducted prior to actual sampling. These surveys will be conducted on 10- by 10-foot grids within

a 100 foot radius of the center of each firing pad and will include the adjacent stream channels (LANL, 1993d). Samples will then be collected from the stream channels adjacent to the OD thermal treatment units based on the information provided by the geomorphic characterization. In addition, to determine whether contaminants have been transported to the flood plain channel downstream from the OD thermal treatment units, the canyon bottom will be sampled in three locations (LANL, 1993d). Samples will be analyzed for explosives, polychlorinated biphenyls (PCB), SVOCs, petroleum hydrocarbons, metals, cyanide, and radiological analytes (i.e., gamma radiation, uranium, thorium). If it is determined that contamination exists, additional sampling will be performed to establish a more detailed analysis of contaminant distribution and transport pathways (LANL, 1993d).

4.6.3 Protection of Soil Surface [20 NMAC 4.1, Subpart V, 264.601(b)]

As required by 20 NMAC 4.1, Subpart V, 264.601(b), revised November 1, 1995, the OB/OD thermal treatment units addressed in this Part B permit application are located in remote areas and will be operated in a manner that prevents any releases that may have adverse affects to human health or the environment due to migration of waste constituents to the soil surface. The following sections provide information on the potential for adverse effects to human health or the environment as a result of operations at the OB/OD thermal treatment units as well as describe monitoring and reporting efforts that have been or will be undertaken at each of the units to assess the impact of operations at the units.

4.6.3.1 Geologic Assessment and Potential Pathways and Exposure Routes

The texture of the soils in Los Alamos County range from very fine clay and sandy loams to gravelly, sandy loams and stony, clay loams. Soil erosion by storm water or winds can potentially transport contaminants from the OB/OD thermal treatment units to surrounding areas. Natural sediment storage features created by surface water runoff, such as stream bank and bar deposits or drainage channels, may contain heavy metals or explosives residues redistributed from the OB/OD thermal treatment units.

SOPs for the units have been adopted to limit the amount of contamination that may enter or remain in the soil after a detonation. Preventative measures include good housekeeping procedures and using a sufficient charge to ensure complete destruction and effective treatment of the explosives.

TA-14

In June 1993, soil, sediment, and rinsate sampling was performed at the TA-14 firing sites, including the Firing Mound 3 area near TA-14-23. Samples were laboratory-analyzed for TCLP metals, total metals (beryllium, lead, and mercury), VOCs, SVOCs, and explosives residues. The results of the 1993 soil sampling are presented in Attachment 4-3. Potential contamination is believed to be limited to the surface (i.e., the first few inches) of the site. Potential contaminants from OB operations are not likely to impact soils in the area for the reasons previously enumerated in Section 4.6.2.1.

TA-15

In April 1993, soil, sediment, and rinsate samples were collected in the vicinity of TA-15-184. Samples were laboratory-analyzed for TCLP metals, total metals (beryllium, lead, and mercury), VOCs, SVOCs, and explosives residues. The results of the 1993 soil sampling survey are summarized in Attachment 4-4 of this section. Potential contamination is believed to be limited to the surface (i.e., the first few inches) of the site.

TA-36

In August and September of 1992, soil, sediment, and rinsate samples were collected from the TA-36-8 OD area. Samples were laboratory-analyzed for TCLP metals, total metals (beryllium, lead, and mercury), VOCs, SVOCs, and explosives residues. The results of the 1992 soil sampling surveys are summarized in Attachments 4-5 and 4-6 of this section. Potential contamination is believed to be limited to the surface (i.e., the first few inches) of the site.

TA-39

It is anticipated that widespread contamination exists on and around the firing sites at TA-39 and that contaminant transport is active and ongoing. Potential contamination is likely to be limited to the surface (i.e., the first few inches) of the site. Ingestion or dermal contact with the soil on site may pose health risks to the operators of the unit, damage to wildlife that live at the site, and damage to the surrounding vegetation. In addition, contaminated soils/sediments may have been carried via surface water runoff to adjacent stream channels, nearby canyons, and possibly to the Rio Grande.

In March 1993, soil, sediment, and rinsate samples were collected from the TA-39-6 and TA-39-57 OD areas. Samples were analyzed for TCLP metals (i.e., arsenic, barium, cadmium, chromium, lead, mercury, selenium, and silver), total metals (lead, mercury, and beryllium), SVOCs, VOCs, and

explosives residues. The results of the 1993 soil sampling at TA-39 are summarized in Attachments 4-7 and 4-8.

4.6.3.2 Monitoring and Reporting

The following paragraphs detail soil monitoring efforts that have been or are scheduled to be performed at the units addressed in this Part B permit application in accordance with the requirements in 20 NMAC 4.1, Subpart V, 264.602, revised November 1, 1995.

TA-14

Soil sampling for the TA-14 firing sites is described in Sections 4.6.2.2 and 4.6.3.1 of this Part B permit application.

TA-15

A corrective action program will be conducted at the TA-15-184 OD thermal treatment unit to determine if hazardous constituents may be migrating off site. The study will evaluate samples for TCLP metals, beryllium, SVOCs, and explosives.

TA-36

The "RFI Work Plan for Operable Unit 1130" (LANL, 1993c), which includes the area encompassing the TA-36-8 OD thermal treatment unit, proposes conducting a geomorphic survey along Fence, Potrillo, and Water Canyons. The survey will identify sediment catchment areas and establish locations where sediment sampling will occur. Surface sediment samples will be collected from areas in all three canyons from depths of 0 to 6 inches. Sediment samples will be collected in accordance with LANL-ER-SOP-06.09, "Spade and Scoop Method for Collection of Soil Samples" (LANL, 1992b).

TA-39

The proposed field sampling effort for the TA-39 firing sites is described in Section 4.6.2.2 of this permit application. In addition, soil samples will be collected from each firing pad, from adjacent hill slopes, and from adjacent mesa tops. Four surface soil samples will be collected at each of the firing pads. Surface and subsurface (i.e., 10 inches below surface) soil samples will be collected at 150-foot intervals along predetermined transects on the adjacent hill slopes and mesa tops (LANL, 1993d). Samples will be analyzed for explosives, PCBs, SVOCs, petroleum hydrocarbons, metals, cyanide, and radiological analytes (i.e., gamma radiation, uranium, thorium).

4.6.4 Protection of the Atmosphere [20 NMAC 4.1, Subpart V, 264.601(c)]

As required by 20 NMAC 4.1, Subpart V, 264.601(c), revised November 1, 1995, the OB/OD thermal treatment units addressed in this Part B permit application are located in remote areas within LANL boundaries and will be operated in a manner that prevents any releases that may have adverse affects to human health or the environment due to migration of waste constituents to the atmosphere. The following sections provide information on the potential for adverse effects to human health or the environment as a result of operations at the OB/OD thermal treatment units as well as describe monitoring and reporting efforts that have been or will be undertaken at each unit to assess the impact of operations at the units.

4.6.4.1 Meteorologic Assessment and Potential Pathways and Exposure Routes

Surface winds in Los Alamos are light, averaging seven miles per hour. The predominant prevailing wind direction is from the southwest to the northeast. Under normal conditions, resuspension of particulates is limited. Detailed information on winds in Los Alamos is provided in Section 2.1.4 of the LANL General Part B. In addition, the LANL General Part B presents information on wind roses for the Los Alamos area in Section 2.1.4 and on Figures 2-3 and 2-4.

By definition, OD units do not utilize air pollution control equipment. Releases resulting from the treatment of waste at the OD thermal treatment units are not likely to exceed a maximum exposure duration of 15 minutes and would most likely be a one-time exposure for any individual receptor. Various types of explosives mixtures are treated at the OD thermal treatment units. The regulated pollutants produced as a result of these detonations are the criteria pollutants (CO, NO_x, and particulate matter), some heavy metals (lead and depleted uranium), and a small amount of hazardous air pollutants (HAPs - e.g., hydrogen chloride [HCl], hydrogen fluoride [HF]).

An EPA-type gaussian plume model was employed with a puff type release function to simulate the airborne release resulting from the TA-36 thermal treatment unit. The worst-case waste treatment and receptor location were used in the scenario, or a 2,000-lb treatment. Release heights and release fractions for a detonation cloud resulting from a typical 50-lb explosive detonation were determined. Airborne effluents were assumed to be transported directly to the potential receptors, using median dispersion factors for the Los Alamos area. Source terms or the pollutants generated during treatment activities were estimated using published emission factors (AP-42; developed by EPA), mass balance calculations, process knowledge, and engineering estimates. Impacts were evaluated for pollutants generated as a result of treatment and regulated under National and

New Mexico Ambient Air Quality Standards. The results of this analysis indicate that none of the regulated air contaminant concentrations exceed federal or state ambient air quality standards.

4.6.4.2 Monitoring and Reporting

The following paragraphs detail atmospheric monitoring efforts that have been or are scheduled to be performed at the units addressed in this Part B permit application, in accordance with the requirements in 20 NMAC 4.1, Subpart V, 264.602, revised November 1, 1995.

TA-14

Atmospheric monitoring efforts to detect airborne contaminants at TA-14 have not yet been established.

TA-15

Air samplers and other means for detecting airborne contaminants have been deployed at the TA-15 OD thermal treatment unit. Data collected from these measurement devices have indicated that only small amounts of contaminants are aerosolized. The maximum amount of beryllium aerosolized is estimated at 2 percent. Efforts are currently underway to repeat this study and gain additional sampling data for this unit.

TA-36

The "RFI Work Plan for Operable Unit 1130" (LANL, 1993c) proposes field screening to predict potential hazards and health and safety conditions for on-site workers at the TA-36-8 firing site. The plan suggests using a portable flame ionization detector and/or photoionization detector to screen for VOCs. Field-screening data are not yet available.

TA-39

Atmospheric monitoring efforts to detect airborne contaminants at TA-39 have not yet been established.

4.7 OPERATING REQUIREMENTS [20 NMAC 4.1, Subpart VI, Subpart P]

In accordance with the requirements specified in 20 NMAC 4.1, Subpart VI, 265.373, revised November 1, 1995, an entire thermal cycle will be completed for treatment of hazardous and/or low-level mixed waste at each thermal treatment unit (i.e., a noncontinuous [batch] thermal treatment process).

As required in 20 NMAC 4.1, Subpart VI, 265.382, revised November 1, 1995, OD of wastes at any of the OD thermal treatment units will be conducted in a manner that does not threaten human health or the environment. A minimum required distance of 1,750 feet will be maintained between the point of detonation and the property of others.

4.8 TREATMENT EFFECTIVENESS [20 NMAC 4.1, Subpart IX, 270.23(d)]

To address the applicable miscellaneous unit requirement specified in 20 NMAC 4.1, Subpart IX, 270.23(d), revised November 1, 1995, a demonstration of treatment effectiveness must be included for the OB/OD thermal treatment units addressed in this Part B permit application. As indicated in the U.S. Army Environmental Hygiene Agency (AEHA) guidance document titled "RCRA Part B Permit Writer's Guidance Manual for Department of Defense Open Burning/Open Detonation Units" (AEHA, 1987), a demonstration of treatment effectiveness can be based on laboratory or field data. For wastes treated by OD, data demonstrating that any residues or fragments remaining after the detonation are not reactive (i.e., as defined by the Resource Conservation and Recovery Act) should be provided. If any waste remains, it is treated again. The areas are visually inspected and explosive remnants are burned in place in conjunction with safety practices and SOPs.

4.9 IGNITABLE, REACTIVE, AND INCOMPATIBLE WASTES [20 NMAC 4.1, Subpart V, 264.17(a)]

Applicable requirements for the management of ignitable, reactive, and incompatible wastes will be met at the OB/OD thermal treatment units addressed in this Part B permit application. Pursuant to the requirements of 20 NMAC 4.1, Subpart IX, 270.14(b)(9), revised November 1, 1995, a description of the precautions exercised by personnel at the units to prevent accidental ignition or reaction of ignitable, reactive, or incompatible wastes is included in Section 5.0 of this Part B permit application.

4.10 INSPECTION [20 NMAC 4.1, Subpart V, 264.15]

In accordance with the requirements of 20 NMAC 4.1, Subpart V, 264.15, revised November 1, 1995, each of the OB/OD thermal treatment units will be inspected daily when in use (i.e., when wastes are managed at the unit) and weekly when not in use. Inspection parameters are specified in Section 6.0 of this Part B permit application and in Section 6.0 of the LANL General Part B. Inspection records will be maintained by responsible personnel and a copy of the record will be sent weekly, as appropriate, to LANL's Hazardous and Solid Waste Group.

4.11 RECORDKEEPING AND REPORTING REQUIREMENTS [20 NMAC 4.1, Subpart V, Part 264, Subpart E]

The various recordkeeping and reporting requirements applicable to all waste management units at LANL and addressed in this Part B permit application are detailed in Section 4.1 of the LANL General Part B.

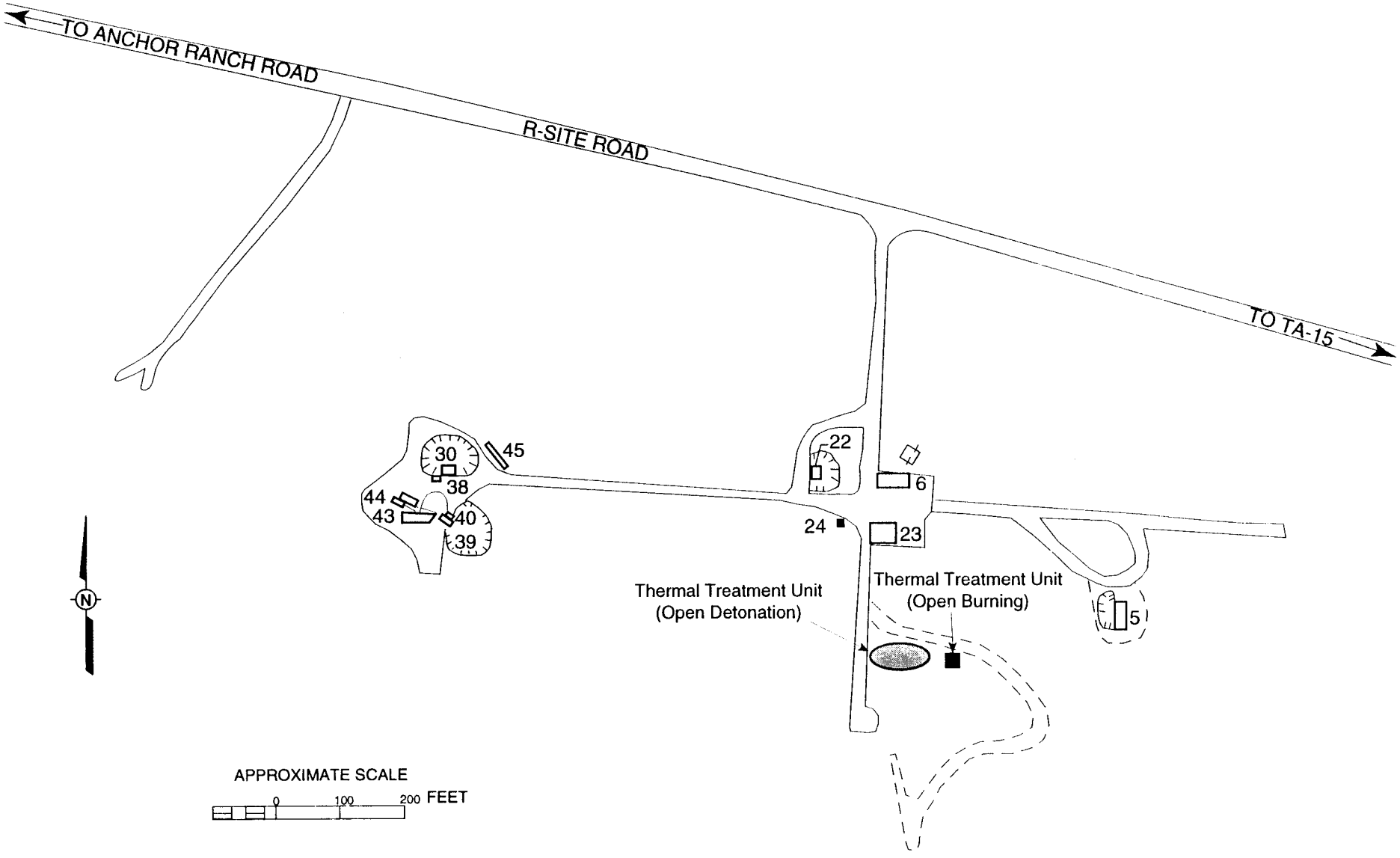

Figure 4-1
Location Map Showing the Thermal Treatment Units near Technical Area (TA) 14, Building 23

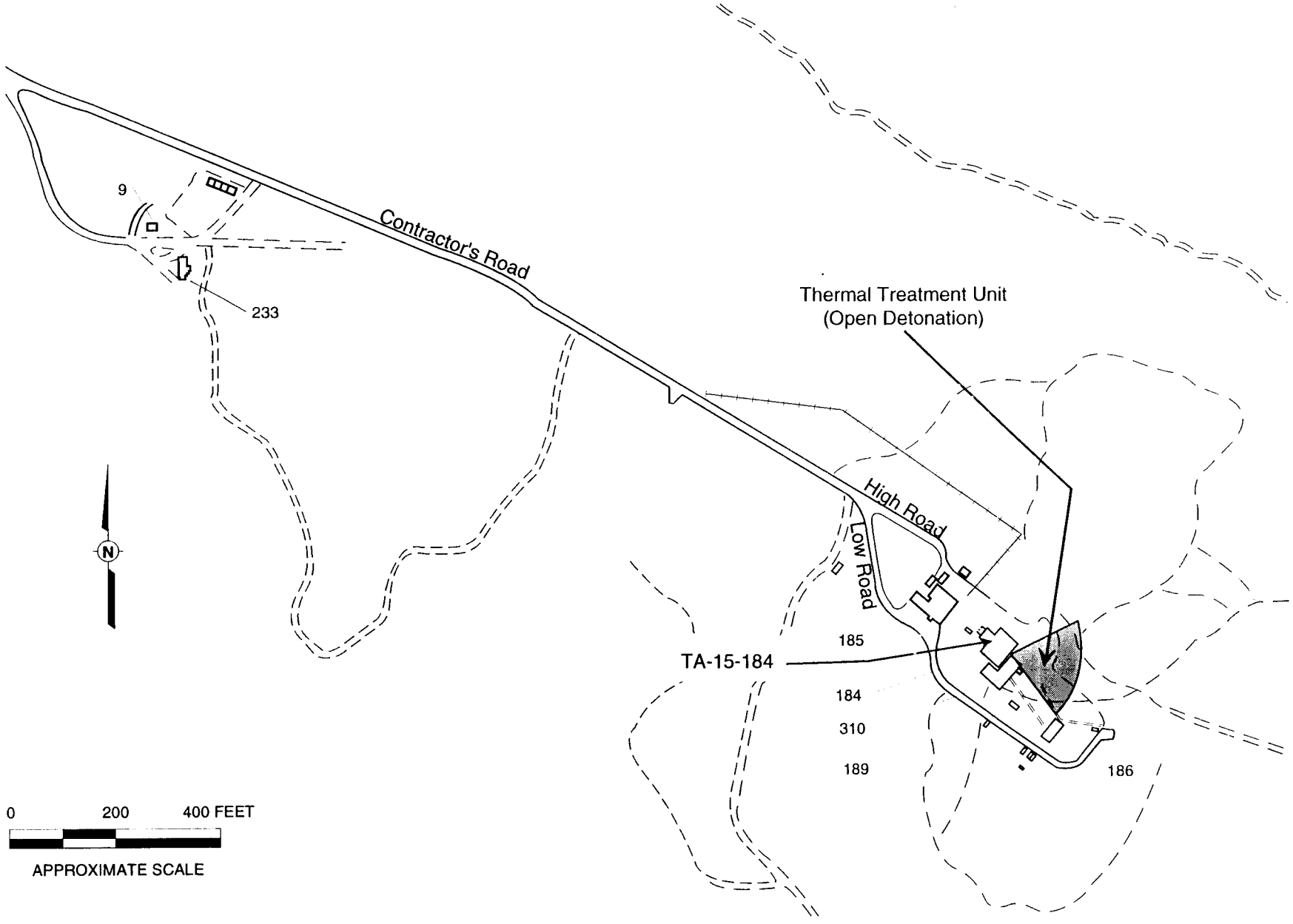

Figure 4-2
Location Map Showing the Thermal Treatment Unit near Technical Area (TA) 15, Building 184

766969/OBODSPEC A36

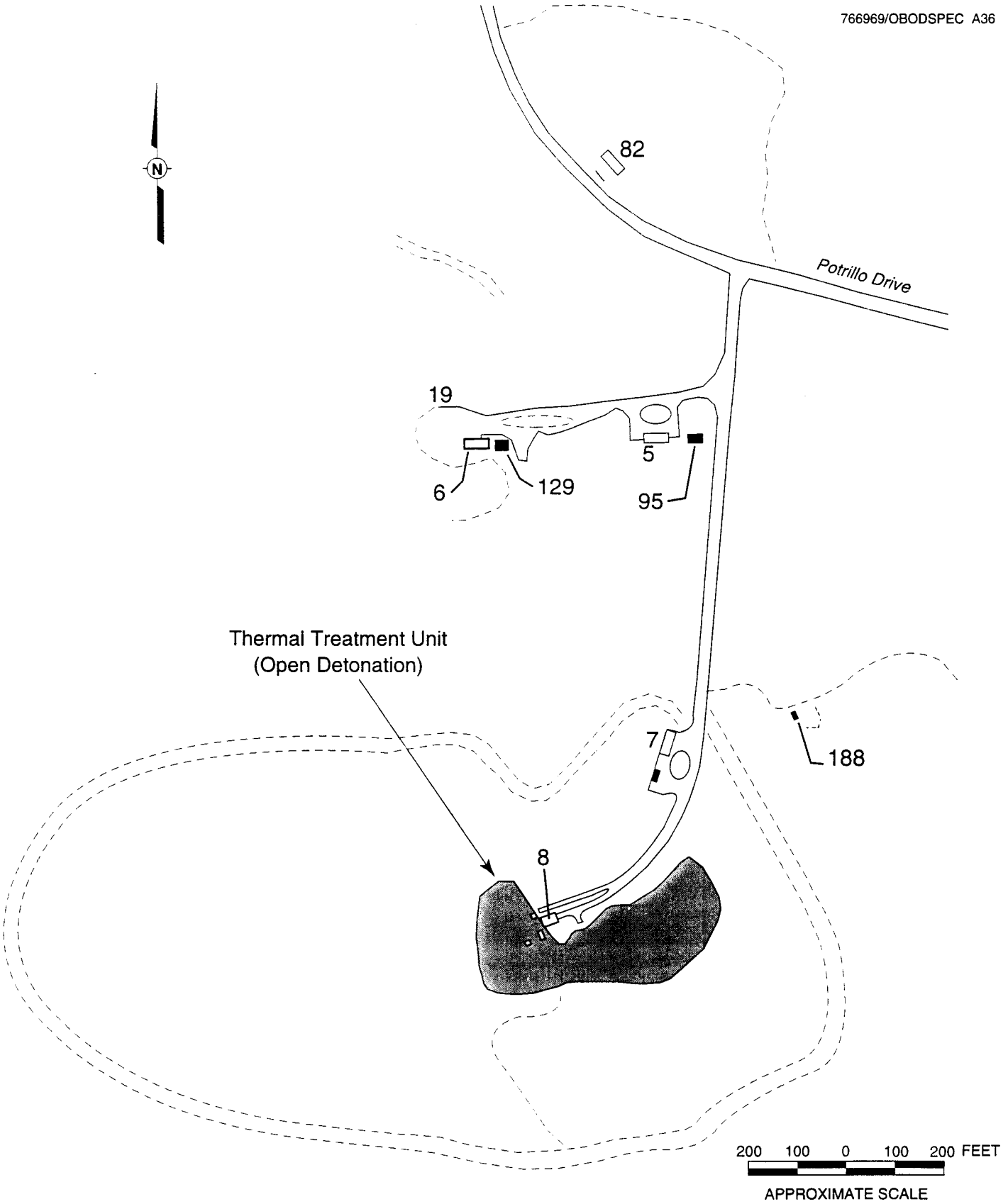

Figure 4-3
Location Map Showing the Thermal Treatment Unit near Technical Area 36, Building 8

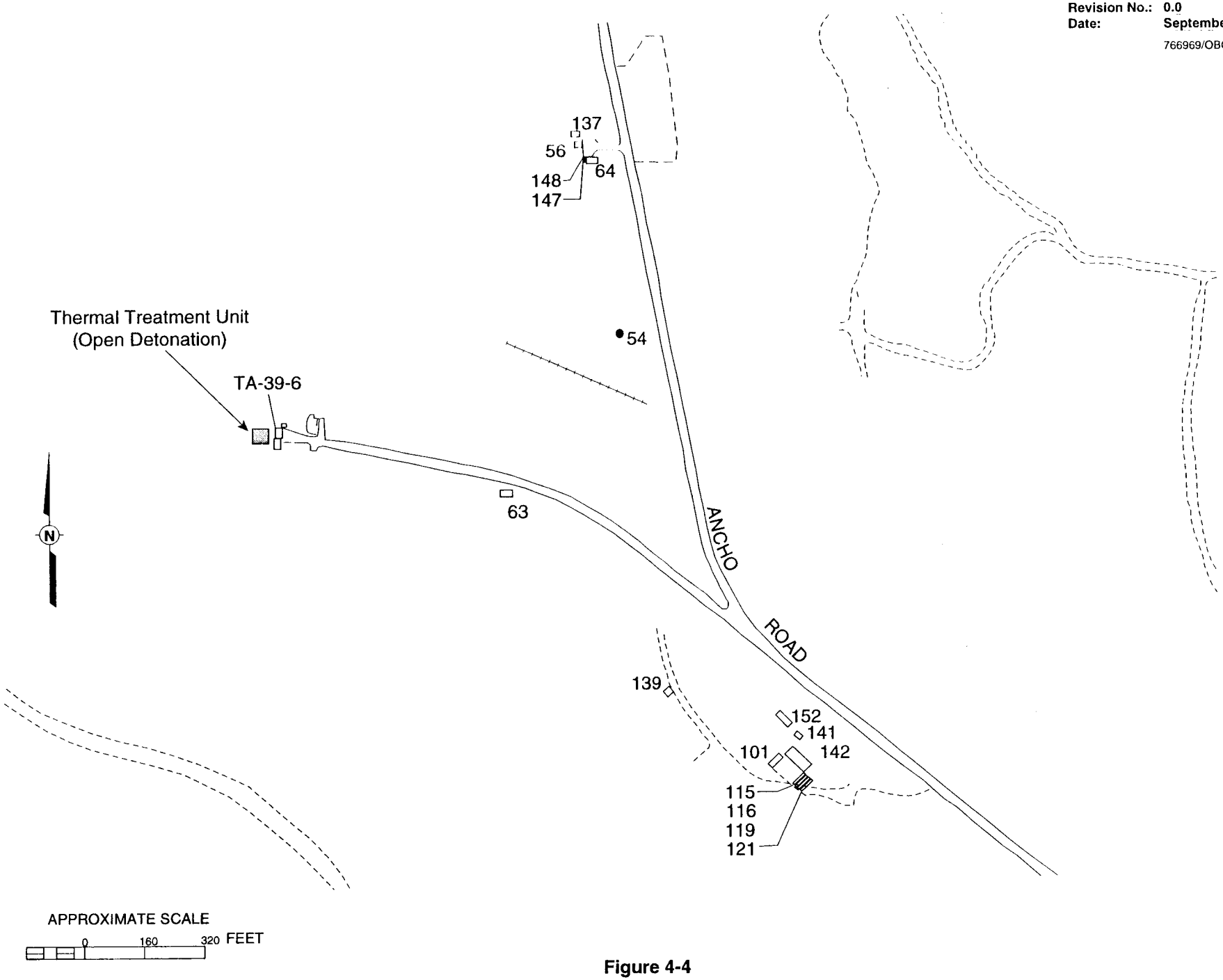

Figure 4-4
Location Map Showing the Thermal Treatment Unit near Technical Area (TA) 39, Building 6

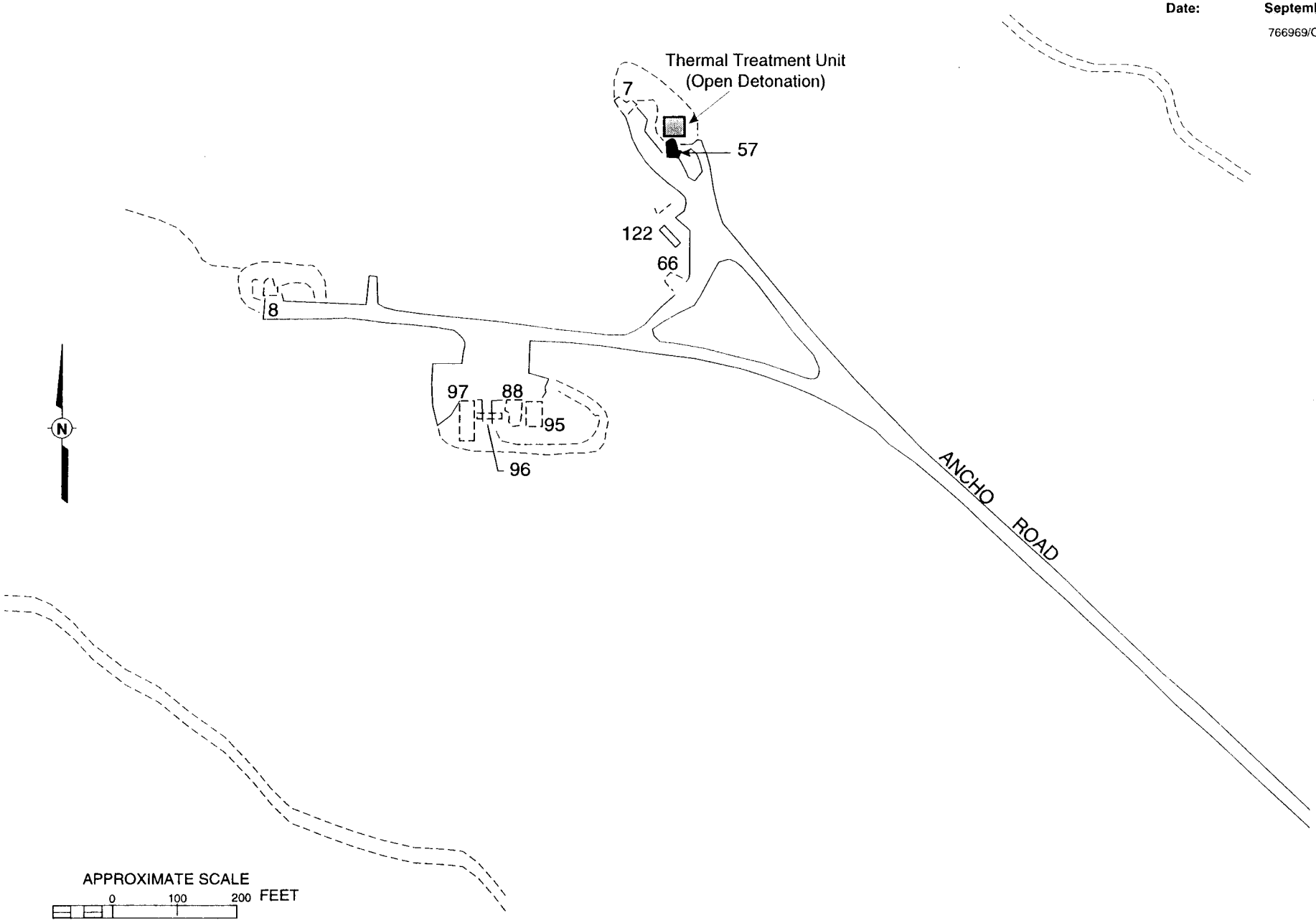

Figure 4-5
Location Map Showing the Thermal Treatment Unit near Technical Area 39, Building 57

ATTACHMENT 4-1

Potential Contaminant Migration Transport Pathways for Surface Water and Groundwater

Attachment 4-1

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1.0 INTRODUCTION

1.1 PURPOSE

This attachment addresses the requirements of the New Mexico Administrative Code, Title 20, Chapter 4, Part 1 (20 NMAC 4.1), Part 264, Subpart X—Miscellaneous Units. The requirements of this subpart applies to owners and operators of facilities that treat, store, or dispose of hazardous waste in miscellaneous units. A model was constructed to simulate the migration of a contaminant that may result from contaminant spills followed by an unusually heavy rainstorm at the open burning/open detonation (OB/OD) thermal treatment units. This model specifically addresses the requirements of Subpart X that deal with potential contaminant migration transport pathways.

Table 1 is a cross-reference guide, listing the requirements of Subpart X and the section where each requirement is addressed, either in the main body of the Part B permit application, or in this attachment.

TABLE 1

Subpart X Cross Reference

Subpart X Requirement	Where Addressed
§ 264.601 Environmental performance standards. A miscellaneous unit must be located, designed, constructed, operated, maintained, and closed in a manner that will ensure protection of human health and the environment. Permits for miscellaneous units are to contain such terms and provisions as necessary to protect human health and the environment, including, but not limited to, as appropriate, design and monitoring requirements, and requirements for responses to releases of hazardous waste or hazardous constituents from the unit. Permit terms and provisions shall include those requirements of subparts I through O of this part, part 270, and part 146 that are appropriate for the miscellaneous unit being permitted. Protection of human health and the environment includes, but is not limited to:	
(a) Prevention of any releases that may have adverse effects on human health or the environment due to migration of waste constituents in the ground water or subsurface environment, considering:	
(1) The volume and physical and chemical characteristics of the waste in the unit, including its potential for migration through soil, liners, or other containing structures;	Part B permit app., Section 4.0; Attachment 4-1, Section 4.0, 6.1
(2) The hydrologic and geologic characteristics of the unit and the surrounding area;	Part B permit app., Section 4.0; Attachment 4-1, Section 3.1, 3.2
(3) The existing quality of ground water, including other sources of contamination and their cumulative impact on the ground water;	Part B permit app., Section 4.0; Attachment 4-1, Section 3.3
(4) The quantity and direction of ground-water flow;	Attachment 4-1, Section 3.1
(5) The proximity to and withdrawal rates of current and potential ground water users;	Part B permit app., Section 2.0
(6) The patterns of land use in the region;	NA

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TABLE 1 (cont.)

Subpart X Cross Reference

Subpart X Requirement	Where Addressed
(7) The potential for deposition or migration of waste constituents into subsurface physical structures, and into the root zone of food-chain crops and other vegetation;	To be addressed during ER Project characterizations for OU 1132
(8) The potential for health risks caused by human exposure to waste constituents;	To be addressed during ER Project characterizations for OU 1132
(9) The potential for damage to domestic animals, wildlife, crops, vegetation, and physical structures caused by exposure to waste constituents;	To be addressed during ER Project characterizations for OU 1132
(b) Prevention of any releases that may have adverse effects on human health or the environment due to migration of waste constituents in surface water, or wetlands or on the soil surface considering:	
(1) The volume and physical and chemical characteristics of the waste in the unit;	Part B permit app., Section 3.2
(2) The effectiveness and reliability of containing, confining, and collecting systems and structures in preventing migration;	Part A
(3) The hydrologic characteristics of the unit and the surrounding area, including the topography of the land around the unit;	Part A Part B permit app., Sections 2.0 and 4.0; Attachment 4-1, Section 3.1, 3.2
(4) The patterns of precipitation in the region;	Attachment 4-1, Section 3.3.1
(5) The quantity, quality, and direction of ground-water flow;	Attachment 4-1, Section 3.2
(6) The proximity of the unit to surface waters;	Part B permit app., Section 4.0; Attachment 4-1, Section 2.0, 3.2
(7) The current and potential uses of nearby surface waters and any water quality standards established for those surface waters;	Attachment 4-1, Section 3.4
(8) The existing quality of surface waters and surface soils, including other sources of contamination and their cumulative impact on surface waters and surface soils;	Attachment 4-1, Section 3.4
(9) The patterns of land use in the region; NA	NA
(10) The potential for health risks caused by human exposure to waste constituents;	To be addressed during ER Project characterizations for OU 1132
(11) The potential for damage to domestic animals, wildlife, crops, vegetation, and physical structures caused by exposure to waste constituents.	To be addressed during ER Project characterizations for OU 1132
(c) Prevention of any releases that may have adverse effects on human health or the environment due to migration of waste constituents in the air, considering:	[response to (c) and its subparagraphs (1) through (7) being prepared by Air Quality Group]

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TABLE 1 (cont.)

Subpart X Cross Reference

Subpart X Requirement	Where Addressed
(1) The volume and physical and chemical characteristics of the waste in the unit, including its potential for the emission and dispersal of gases, aerosols and particulates;	Part B permit app., Section 3.0
(2) The effectiveness and reliability of systems and structures to reduce or prevent emissions of hazardous constituents to the air;	
(3) The operating characteristics of the unit;	
(4) The atmospheric, meteorologic, and topographic characteristics of the unit and the surrounding area;	Attachment 4-1, Section 3.0
(5) The existing quality of the air, including other sources of contamination and their cumulative impact on the air;	
(6) The potential for health risks caused by human exposure to waste constituents;	
(7) The potential for damage to domestic animals, wildlife, crops, vegetation, and physical structures caused by exposure to waste constituents.	
§ 264.602 Monitoring, analysis, inspection, response, reporting, and corrective action. Monitoring, testing, analytical data, inspections, response, and reporting procedures and frequencies must ensure compliance with §§264.601, 264.15, 264.33, 264.75, 264.76, 264.77, and 264.101 as well as meet any additional requirements needed to protect human health and the environment as specified in the permit.	Part B permit app., Section 4.0, 10.0
§ 264.603 Post-closure care. A miscellaneous unit that is a disposal unit must be maintained in a manner that complies with §264.601 during the post-closure care period. In addition, if a treatment or storage unit has contaminated soils or ground water that cannot be completely removed or decontaminated during closure, then that unit must also meet the requirements of §264.601 during post-closure care. The post-closure plan under §264.118 must specify the procedures that will be used to satisfy this requirement.	NA

1.2 SCOPE

Subpart X of 20 NMAC 4.1, Subpart V, Part 264, requires permit applicants to show that they prevent any releases that may have adverse effects on human health or the environment due to migration of waste constituents in the ground water, surface water, soil, or subsurface environment.

This attachment evaluates possible waterborne waste transport pathways and their potential for contaminant migration by use of a simple model. The attachment lists the possible contaminants of concern and shows their origin and nature. It presents scenarios for possible waterborne migration, based on site geology, hydrology, and meteorology.

The model simulates the migration of a contaminant that may result from a contaminant spill followed by an unusually heavy rainstorm at two OD thermal treatment units. Contaminant

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concentrations were then estimated at the point where contaminants mix with runoff from the watershed associated with each OD thermal treatment unit, and where the runoff may reach receptors.

Maximum possible concentrations are estimated for contaminants of concern in the model and compared to Los Alamos National Laboratory (LANL) screening action levels (SAL).

2.0 SITE SELECTION RATIONALE

The OD thermal treatment units at Technical Area (TA) 39-6 and TA-39-57 were chosen for use in this demonstration because of their location. These sites are in the bottom of Ancho Canyon and are in close proximity to intermittent streams. A heavy rainstorm of sufficient volume could possibly transport potential contaminants to the Rio Grande approximately three miles away. It is expected that runoff at these OD thermal treatment units in the canyon bottom have a greater chance of reaching the Rio Grande than runoff from the sites on the mesa tops. For this model, contaminant concentrations were estimated at each OD thermal treatment unit, at State Road 4, and at the Rio Grande.

3.0 SITE CONDITIONS

3.1 GEOLOGY

LANL is located on the Pajarito Plateau on the eastern flank of the Jemez Mountains. This area is dominated by volcanic deposits associated with caldera formation and collapse; these deposits form broad plateaus surrounding the Jemez Mountains. The Pajarito Plateau consists of narrow mesas separated by deep canyons formed by southeast-trending intermittent streams. TA-39 is drained by a number of intermittent streams, tributaries of the main stream channel that runs through Ancho Canyon and joins the Rio Grande in White Rock Canyon. All of the canyons, through which these tributaries flow, contain alluvium of unknown thickness. Other canyons on the plateau with a similar geology and topography (Mortandad, Canada del Buey, and Pajarito) contain alluvial deposits that vary greatly in thickness, from less than 3 feet (ft) thick to greater than 100 ft thick (Devaurs and Purtymun, 1985).

LANL is perched on a plateau consisting of mostly upper Tshirege and lower Otowi members of the Bandelier Tuff. At TA-39, the Bandelier Tuff ranges in thickness from several feet, along the northeastern margin of the site, to 600 feet, just west of TA-39 in Borehole DT9 (Purtymun, 1984).

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3.2 HYDROLOGY

Ancho Canyon heads on the Pajarito Plateau on LANL property near the center of the southern LANL boundary and extends across the property to its confluence with the Rio Grande. The total drainage area of this canyon is approximately 7 square miles (LANL, 1993). The main channel length is approximately 6.9 miles (mi) long. The floor elevation of the canyon starts at just above 7,100 ft and drops to just below 5,400 ft at its confluence with the Rio Grande.

Ancho Canyon contains an ephemeral stream that is within LANL boundaries. It is at a approximately 0.8 mi upstream from the canyon's confluence with the Rio Grande. At this point, perennial flow to the Rio Grande is supported by a perennial spring, known as Ancho Spring. Ancho Canyon has no significant snowmelt runoff (LANL, 1996).

The surface of the main aquifer rises westward from the Rio Grande within the Santa Fe Group into the lower part of the Puye Conglomerate below the central and western part of the plateau. The main aquifer depths below the mesa top range from about 1,200 ft along the western margin of the plateau to about 600 ft at the eastern margin. The main aquifer is separated from the alluvium by 350 to 620 ft of tuff and volcanic sediments. The main aquifer is unconfined in the western part of the plateau and exhibits semiartesian to artesian conditions in the eastern part along the Rio Grande (Purtymun, 1994).

Available hydrologic data indicate that the major recharge area for the main aquifer is west of LANL, presumably in the Jemez Mountains, although this is still being investigated. Water in the main aquifer moves from its major recharge area toward the Rio Grande, where part is discharged into the river through seeps and springs. The hydraulic gradient of the aquifer averages about 60 to 80 ft/mile within the Puye Conglomerate but increases to 80 to 100 ft/mile along the eastern edge of the plateau as the water in the aquifer enters the less permeable sediments of the Santa Fe Group. The rate of movement of water in the upper section of the aquifer varies, depending on the aquifer materials. Aquifer tests indicate the movement ranges from 20 ft/year in the Tesuque Formation to 345 ft/year in the more permeable Puye Conglomerate (Purtymun, 1984). No supply wells or test wells are located within the boundaries of TA-39 or within 3500 ft of the thermal treatment units.

Perched ground water zones, of limited extent, are known to occur below canyon alluvium and above the main aquifer in the Guaje Pumice bed at the base of the Bandelier Tuff and in the

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underlying conglomerates and basalts in parts of Pueblo Canyon, Los Alamos Canyon, and Sandia Canyon. Samples, from these zones, are routinely collected from two test wells and one spring which discharges from one of the zones (LANL, 1995).

Shallow alluvial ground water zones are known to exist in Pueblo Canyon, Los Alamos Canyon, Mortandad Canyon, and Pajarito Canyon. Shallow ground water may exist in parts of Water Canyon, Sandia Canyon, Potrillo Canyon, and Canon de Valle; however, several boreholes and observation wells have failed to confirm its presence. Alluvium in Ancho Canyon probably contains ground water due to recharge from storm runoff. While the extent of saturation in the alluvium is not known at present, it is probably small and occurs seasonally.

3.3 METEOROLOGY

3.3.1 Precipitation

Total annual precipitation, which includes rainfall and water-equivalent snowfall, averages approximately 19 inches (in.) at Los Alamos. Annual precipitation declines eastward, with the normal White Rock precipitation at 13.5 in., and increases westward to more than 25 in. in the Jemez Mountains. The higher precipitation toward the mountains is very noticeable during the summer when thundershowers develop over the mountains. Showers tend to form, or be stronger, over the mountains for much of the year. Winter storms associated with upslope winds drop more snow at higher elevations on the plateau.

Los Alamos precipitation is characteristic of a semiarid climate. Variations in precipitation from year to year are quite large. Annual precipitation extremes range from 6.80 to 30.34 in. over a 71-year period. In 1986, 30.01 in. fell at the North Community site, near the Jemez Mountains.

3.3.2 Temperature

Despite Los Alamos' southern location, temperatures are cool at the 7,400-ft above mean sea level (amsl) elevation. Mean temperatures vary with altitude, averaging 5 degrees Fahrenheit (°F) higher in and near the Rio Grande Valley (6,500 ft amsl) and 5°F to 10°F lower in the nearby Jemez Mountains (8,500-10,000 ft amsl).

Winter temperatures typically range from 15°F to 25°F during the night and from 30°F to 50°F during the day. Cold arctic air masses occasionally invade the Los Alamos area from the N and NE,

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but often a shallow layer of coldest air is dammed to the east by the Sangre de Cristo Mountains. Occasionally, Los Alamos temperatures drop to 0°F or below.

Summers have moderately warm days and cool nights. Afternoon temperatures are in the 70s and 80s (°F) and occasionally reach 90°F. The relatively thin air, light winds, clear skies, and dry atmosphere cause nighttime temperatures to drop to the 50s (°F), even after the warmest day.

3.4 WATER, SOIL, AND AIR QUALITY

Surface water, ground water, soil, and sediments are routinely sampled at LANL as part of the environmental surveillance and environmental restoration activities. Data on the concentrations of various chemical constituents of interest in these media are published annually in the environmental surveillance reports (i.e., Environmental Surveillance at Los Alamos during 1992 (LANL, 1994), and at scheduled times in Environmental Restoration (ER) Resource Conservation and Recovery Act (RCRA) Facility Investigation (RFI) reports.

4.0 POTENTIAL CONTAMINANTS

LANL's Environmental Protection Group (ESH-8) collected surface soil, sediment, and rinsate samples at the TA-39-6 and TA-39-57 OD units for the Corrective Activities Program.

At each site, four transects radiating outward from the center of the detonation were sampled. Sampling plans (Fresquez, 1993) indicate that samples were screened for gross alpha, gross beta, and gross gamma. Samples were analyzed for:

- Toxicity characteristic leaching procedure (TCLP) metals (arsenic, barium, cadmium, chromium, lead, mercury, selenium, and silver)
- Total beryllium, lead, and mercury
- Semivolatile organic compounds (SVOC)
- Volatile organic compounds (VOC)
- Polychlorinated biphenyls (PCB)
- Total uranium (U)
- High explosive (HE) residues (TNT, 2,4-DNT at both sites and HMX, RDX, TETRYL at TA-39-57)

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Summary memos (Fresquez, 1994) discuss the analytical results.

At TA-39-57 no metals were detected above U.S. Environmental Protection Agency (EPA) action levels. Five SVOCs were detected in samples; only 2,4-dinitrotoluene was detected above EPA action levels. Four VOCs were detected at parts per billion levels and were below EPA action levels. No PCBs were detected. The average concentration of total U over this site was 134.2 (+ or - 243.8) milligram per gram (mg/g) compared to an upper limit for total U in background samples in the Los Alamos area of 3.4 mg/g. Some HE residues of HMX and RDX were detected within 80 ft of the detonation area.

At TA-39-6 four soil samples exceeded TCLP-Pb proposed EPA action levels. All other metals analyzed were below EPA action levels. Four different SVOCs were detected below EPA action levels. Five VOCs were detected at parts per billion levels and were below EPA action levels. One soil sample contained traces of PCBs at 1.1 mg/g. No HE residues were detected. Total U in samples ranged in concentration from 0.833 to 72.3 mg/g, with the average concentration over the site being 15.35 (+ or - 21) mg/g.

The results of these sampling events give a limited picture of potential contaminants at the sites. Additional sampling is proposed at these sites to meet ER requirements for potential release site characterization. It is proposed that samples be analyzed for a more complete analytical suite, collected at depth as well as surface levels, and collected at biased locations.

5.0 ACTION LEVELS

The ER Program at LANL takes its primary direction from EPA guidance (EPA, 1989). Subsequent guidance, Corrective Action for Solid Waste Management Units (Subpart S) (EPA, 1990), a proposed regulation under RCRA, presents a methodology for calculating action levels to determine the need for further evaluation of contamination in various environmental media (i.e., ground water, surface water, air, and soil). The action levels are calculated using chemical-specific toxicity values and default exposure parameters. In order to comply with the Hazardous and Solid Waste Amendments Module for the Laboratory, SALs have been developed that follow the Subpart S methodology for exposure parameter defaults but incorporate more recent toxicity values available from the EPA's Integrated Risk Information System data base (EPA, 1993) and Health Effects Assessment Summary Tables, (EPA, 1992), which are updated periodically.

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In deriving SALs for constituents in water, it is assumed that a 70-kilogram (kg) adult ingests water at a rate of 2 liters/day over a 70-year exposure duration. These SALs apply to constituents in both ground water and surface water.

SAL derivations are based on assumptions and equations contained in proposed Subpart S. A complete discussion of assumptions and equations is given in the Installation Work Plan Appendix J (LANL, 1993).

6.0 HYPOTHETICAL SCENARIO

The model simulates contaminant migration resulting from a contaminant spill followed by an unusually heavy rainstorm at two OD thermal treatment units. Contaminant concentrations were estimated at the point where contaminants mix with runoff from the watershed associated with each thermal treatment unit, and where the runoff may reach receptors.

Waste descriptions for the thermal treatment units are listed in Table 10-1 of the Part B Permit Application. For both sites explosives, uranium, mercury, lead, beryllium and dielectric oil containing PCBs are listed.

6.1 CONTAMINANTS OF CONCERN FOR SCENARIO

Contaminants of concern for the thermal treatment units are those that may potentially migrate from the site in quantities above established SALs. Barium dinitrate and 2,4-dinitrotoluene (2,4-DNT) were chosen for this scenario. Barium dinitrate is a major compound present in HE before it is flashed; and 2,4-DNT was one of the SVOCs detected above EPA action levels in the Environmental Protection Group's sampling activities discussed in Section 4.0.

In the scenario it is assumed that barium dinitrate ($Ba[NO3]_2$) and 2,4-DNT are spilled onto the soil surface in amounts and forms that are typical for residues after a detonation. Rainfall in a 2-year 6-hour storm then falls on the spill, completely dissolving the $Ba(NO3)_2$ and dissolving the 2,4-DNT to saturation. The water is then assumed to runoff the spill area without attenuation of the contaminant concentrations and mix at two points downstream with runoff from the storm over a 24-hour period.

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6.2 PRECIPITATION EVENT FOR SCENARIO

A 2-year 6-hour precipitation event will drop 0.82 in. of rain at TA-39-6 and 0.98 in. of rain at TA-39-57 (McLin, 1996; Floodplain Elevations and Flows in Ancho Canyon). Table 2 lists the discharges and the discharge volumes over a 24-hour period, at locations downstream entering the main drainage, resulting from the hypothetical 2-year 6-hour precipitation event .

TABLE 2

Peak Discharges and Discharge Volumes From a 2-year 6-hour Precipitation Event

Cross Section	Peak Discharge (cubic feet per second)	24-Hour Discharge Volume (acre-feet)	24-Hour Discharge Volume (L)
FS-6	1	0.20	246,723
FS-57	3	0.50	616,809
State Road 4	3	0.99	1,221,283
Rio Grande	1	0.50	616,809

6.3 CONCENTRATION CALCULATIONS FOR SCENARIO

For the calculation it is assumed that barium and 2-4DNT spills at TA-39-6 and at TA-39-57. Each consists of 1/2 kg of barium (as soluble $Ba(NO3)_2$) plus pieces of 2,4-DNT with a total surface area each of 0.06 square feet. The mass of 2,4-DNT is sufficient to saturate the rain falling on the surface area of the 2,4-DNT pieces over the entire storm event. The solubility of 2,4-DNT is 240 milligrams per liter. The solution is then diluted as the runoff moves away from the site and is combined with runoff from larger watersheds. Concentrations calculated at the site, at State Road 4, and at the Rio Grande are shown in Table 3.

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TABLE 3

Concentrations Calculated at Open Detonation Thermal Units Technical Area (TA)-39-6 and TA-39-57

Contaminant	TA-39-6 Discharge Point	TA-39- Concentration at Discharge Point	TA-39-57 Discharge Point	TA-39-57 Concentration at Discharge Point	SAL
Barium	FS-6	2.0 mg/l	FS-57	0.8 mg/l	2 mg/l
	State Road 4	0.34 mg/l	State Road 4	0.27 mg/l	
	Rio Grande	0.24 mg/l	Rio Grande	0.20 mg/l	
2,4-dinitrotoluene	FS-6	0.113 µg/l	FS-57	5.4×10^{-2} µg/l	73 µg/l
	State Road 4	0.019 µg/l	State Road 4	1.8×10^{-2} µg/l	
	Rio Grande	0.013 µg/l	Rio Grande	1.4×10^{-2} µg/l	

Footnotes: SAL = screening action levels; mg = milligrams; µg = micrograms; l = liter

7.0 GROUND WATER TRANSPORT

The potential for precipitation to carry contaminants from the canyon bottoms downward to ground water aquifers is low due to the thickness and extreme dryness of the underlying soils and rock. Depth of penetration of the infiltrating waters will depend on the amounts and duration of rainfall and whether the waters intercept a fracture or fault.

Water will be present in the canyon bottom more frequently than during the 2-year 6-hour hypothetical precipitation event. This will dilute the waters that may contribute to ground water, resulting in significantly lower concentrations. Barium will likely precipitate out of the infiltrating waters primarily as sulfate and build up in the upper soil horizon. 2,4DNT will chemically precipitate in the soil horizon and will be degraded in a matter of months. While the canyon bottom is the most likely pathway to ground water aquifers, the concentration of contaminants in these waters will be very low.

Additional sampling will further define constituents of concern and indicate areas where further analysis may be necessary.

Attachment 4-1

8.0 CONCLUSIONS

The calculated concentrations are the results of an unlikely scenario where significant quantities of toxic materials remain on the ground after detonation. The concentrations calculated are higher than any values anticipated as a result of inadvertent releases from thermal unit operations. Under this scenario the concentration of only barium among the contaminants of concern are close to the SALs at one of the points calculated. These calculations ignore topography, degradation, and sorption to soils or sediments, as well as physical mass transport of HE solid particles. It was also assumed that momentary contact with rainwater is sufficient to cause full dissolution or chemical saturation. While these calculations are conservative, they do emphasize the importance of carefully evaluating the results of the planned sampling events.

While the concentrations are, in some cases, close to SALs, it should be noted that the SALs represent concentrations assuming that a 70-kg adult ingests water at a rate of 2 liters per day for 70 years. The numbers given were developed for a single precipitation event lasting 6 hours and occurring, on average, once every two years.

This simple analysis provides a conceptual model for evaluating the potential contribution to surface and ground waters for contaminants that may be present at the sites. More comprehensive modeling including the kinetics of dissolution, degradation, sorption to soils, particle transport, bioaccumulation, and ground water contributions is necessary to define a more accurate picture.

9.0 REFERENCES

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Attachment 4-1

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ATTACHMENT 4-2

Measures Implemented to Comply with the National Pollutant Discharge Elimination System General Permit

Measures Implemented to Comply with the National Pollutant Discharge Elimination System General Permit

Identify members of a Pollution Prevention Team to develop the Storm Water Pollution Prevention (SWPP) Plan and assist in the implementation, maintenance, and revision of the plan.

Provide a description of the potential pollutant sources exposed to storm water, including pollutant sources not associated with waste treatment.

Prepare a drainage map indicating an outline of the drainage area of each storm water outfall. The map includes structural control measures, if any, to reduce pollutant migration; surface water bodies; material storage areas; and other pollutant sources.

Maintain a current inventory of materials exposed to storm water, including a narrative description of materials handled, treated, stored, and disposed of since 1989.

Maintain a description of spills or leaks since 1989 and the actions taken to prevent a reoccurrence.

Maintain a summary of any surface water sampling data from the site.

Prepare a narrative description of the potential pollutant sources associated with loading and unloading operations, outdoor storage, outdoor manufacturing or processing, dust and particulate generating activities, and on-site waste disposal activities.

Prepare a description of the measures and controls implemented to control and reduce the amount of pollutants in the storm water discharges. These measures and controls include:

- Good housekeeping
- Preventive maintenance program for storm water management devices
- Spill prevention and response procedures
- Inspections

- Employee training
- Recordkeeping and internal reporting procedures
- A listing of non-storm-water discharges, sediment and erosion control, and the management of runoff.

Prepare a self conducted comprehensive site compliance evaluation to determine compliance with the site-specific SWPP Plan.

ATTACHMENT 4-3

Results Summary of the Soil Sampling Survey Conducted Over Active Firing Site at Technical Area 14, Building 35

Results Summary of the Soil Sampling Survey Conducted Over Active Firing Site at Technical Area 14, Building 35

In March 1993, 21 soil samples were collected at the 0- to 3-inch depth along four transects radiating outward from the center of the detonation area. In addition, two sediment samples were collected from two downgradient drainage channels from the detonation area. A sample was also collected from the rinsate of the scattered surface debris around the detonation area. The soil and sediment samples were screened for gross alpha, beta and gamma radioactivity. The soil, sediment, and rinsate samples were then analyzed for: toxicity characteristic leaching procedure (TCLP) metals (arsenic, barium, cadmium, chromium, lead, mercury, selenium, and silver); total beryllium, total lead, and total uranium; semivolatile organic compounds (SVOC); and high explosive residues. The results of the analyses are listed below.

- Two soil samples exceeded the proposed TCLP action level of 5 parts per million (ppm). No other TCLP metals were detected in the soil, sediment, or rinsate samples above U.S. Environmental Protection Agency (EPA) action levels.

- Total beryllium concentrations in the soil samples did not exceed the upper limit background concentrations for the Los Alamos area of 2.88 ppm.

- Total uranium in the soil samples ranged from 1.8 to 31.16 micrograms per gram (µg/g) with an average concentration of 5.75 µg/g. Total uranium in the sediment samples averaged 2.59 µg/g. The upper limit background concentration for total uranium in the Los Alamos is 3.4 µg/g. Total uraniuim was detected in the rinsate sample at 12 µg/l.

- One SVOC was detected at three soil sample locations and one sediment sample location. An additional SVOC was detected at one of the soil sample locations, and another SVOC was detected at a separate soil sample location. These SVOCs were detected at concentrations far below EPA proposed action levels.

- High explosive residues were detected in all of the soil and sediment samples collected.

ATTACHMENT 4-4

Results Summary of the Soil Sampling Survey Conducted Over Active Firing Site at Technical Area 15, Building 184

Results Summary of the Soil Sampling Survey Conducted Over Active Firing Site at Technical Area 15, Building 184

In April 1993, soil samples were collected at the 0- to 3-inch depth along four transects radiating outward from the center of the detonation area. Two sediment samples were taken from drainage channels located near and downgradient from the detonation area. A sample was also collected from rinsate of the scattered surface debris from around the detonation area.

Soil and sediment samples were screened for: gross alpha, beta, and gamma radioactivity. The soil, sediment, and rinsate samples were analyzed for toxicity characteristic leaching procedure (TCLP) metals; total beryllium (Be), total gallium (Ga), total mercury (Hg), total lead (Pb), and total thorium (Th); semivolatile organic compounds (SVOC); and high explosive residues. The results are summarized below.

- Two soil samples contained Pb above the U.S. Environmental Protection Agency proposed action level of 5 parts per million (ppm). No other TCLP metals were detected in any sample.
- Some surface soil samples contained Be above the upper limit background concentrations for the Los Alamos area of 2.88 ppm.
- Twenty-one SVOCs were found in soil samples, but most are considered complex compounds derived from plastics.
- Explosives residues were not detected in any of the samples.

ATTACHMENT 4-5

Results Summary of the Soil Sampling Survey Conducted Over Active Firing Site at Technical Area 36, Building 8

Results Summary of the Soil Sampling Survey Conducted Over Active Firing Site at Technical Area 36, Building 8

In March 1994, 24 soil samples were collected at each detonation area at the 0- to 3-inch depth along four directions at various distances away from the center of each pad. A sediment sample was collected from drainage channels located near and downgradient from the detonation areas. A sample was collected from rinsate of the scattered surface debris from around the detonation area. The soil and sediment samples were screened for: gross alpha, beta, and gamma radioactivity. The soil, sediment and rinsate samples were analyzed for toxicity characteristic leaching procedure (TCLP) metals; aluminum, beryllium, copper, and iron; semivolatile organic compounds (SVOC); total uranium and high explosive residues. The results are listed below.

- One soil sample contained Pb above the U.S. Environmental Protection Agency proposed action level of 5 parts per million. No other TCLP metals were detected above regulatory levels in the soil, sediment, or rinsate samples.

- Five SVOCs were detected at seven soil sample locations and at the sediment sample location, but these SVOCs are considered complex compounds derived from plastics.

- High explosives residues were detected in many of the soil samples and in the sediment samples. No high explosives were detected in the rinsate sample.

ATTACHMENT 4-6

Correction of Data for the Soil Sampling Survey Conducted Over Active Firing Site at Technical Area 36, Building 8

REPORT NUMBER: 20618

********** EM-9 ANALYTICAL REPORT **********

Prepared by: D GERTH on 20-Sep-1993

REQUEST NUMBER: 13501 MATRIX: SE ANALYST: MET PROGRAM CODE: M106

OWNER: Philip R. Fresquez GROUP: EM-8 MAIL-STOP: K490 PHONE: 7-0815

NOTEBOOK: R8149 PAGE: 132

CUSTOMER SAMPLES:

TCLP.

CUSTOMER NUM	SAMPLE NUM	ANALYSIS	ANALYTICAL TECHNIQUE	ANALYTICAL RESULT	ANALYTICAL UNCERTAINTY	UNITS	COMPLETION DATE	COMMENT
PF-368-W-20	92.27444	AG	ICPES	< 0.01		MG/L	6/16/93	05261H
PF-368-W-20	92.27444	BA	ICPES	1.6	0.2	MG/L	6/16/93	05261H
PF-368-W-20	92.27444	CD	ICPES	0.034	0.003	MG/L	6/16/93	05261H
PF-368-W-20	92.27444	CR	ICPES	< 0.004		MG/L	6/16/93	05261H
PF-368-W-20	92.27444	PB	ICPMS	0.05	0.02	MG/L	6/16/93	05261H
PF-368-W-40	92.27445	AG	ICPES	< 0.01		MG/L	6/16/93	05261H
PF-368-W-40	92.27445	BA	ICPES	3.	0.3	MG/L	6/16/93	05261H
PF-368-W-40	92.27445	CD	ICPES	0.073	0.007	MG/L	6/16/93	05261H
PF-368-W-40	92.27445	CR	ICPES	< 0.004		MG/L	6/16/93	05261H
PF-368-W-40	92.27445	PB	ICPMS	0.1	0.03	MG/L	6/16/93	05261H
PF-368-W-60	92.27446	AG	ICPES	< 0.01		MG/L	6/16/93	05261H
PF-368-W-60	92.27446	BA	ICPES	1.8	0.2	MG/L	6/16/93	05261H
PF-368-W-60	92.27446	CD	ICPES	0.004	0.002	MG/L	6/16/93	05261H
PF-368-W-60	92.27446	CR	ICPES	< 0.004		MG/L	6/16/93	05261H
PF-368-W-60	92.27446	PB	ICPMS	< 0.03		MG/L	6/16/93	05261H
PF-368-W-100	92.27447	AG	ICPES	< 0.01		MG/L	6/16/93	05261H
PF-368-W-100	92.27447	BA	ICPES	4.	0.4	MG/L	6/16/93	05261H
PF-368-W-100	92.27447	CD	ICPES	0.13	0.01	MG/L	6/16/93	05261H
PF-368-W-100	92.27447	CR	ICPES	< 0.004		MG/L	6/16/93	05261H
PF-368-W-100	92.27447	PB	ICPMS	0.11	0.01	MG/L	6/16/93	05261H
PF-368-W-150	92.27448	AG	ICPES	< 0.01		MG/L	6/16/93	05261H
PF-368-W-150	92.27448	BA	ICPES	2.5	0.3	MG/L	6/16/93	05261H
PF-368-W-150	92.27448	CD	ICPES	< 0.003		MG/L	6/16/93	05261H
PF-368-W-150	92.27448	CR	ICPES	0.005	0.002	MG/L	6/16/93	05261H
PF-368-W-150	92.27448	PB	ICPMS	< 0.03		MG/L	6/16/93	05261H
PF-368-E-20	92.27449	AG	ICPES	< 0.01		MG/L	6/17/93	05261H
PF-368-E-20	92.27449	BA	ICPES	1.5	0.2	MG/L	6/17/93	05261H
PF-368-E-20	92.27449	CD	ICPES	0.028	0.003	MG/L	6/17/93	05261H
PF-368-E-20	92.27449	CR	ICPES	< 0.004		MG/L	6/17/93	05261H
PF-368-E-20	92.27449	PB	ICPMS	0.07	0.02	MG/L	6/17/93	05261H
PF-368-E-40	92.27450	AG	ICPES	0.013	0.001	MG/L	6/17/93	05261H
PF-368-E-40	92.27450	BA	ICPES	0.22	0.02	MG/L	6/17/93	05261H
PF-368-E-40	92.27450	CD	ICPES	< 0.003		MG/L	6/17/93	05261H
PF-368-E-40	92.27450	CR	ICPES	< 0.004		MG/L	6/17/93	05261H
PF-368-E-40	92.27450	PB	ICPMS	< 0.03		MG/L	6/17/93	05261H
PF-368-E-60	92.27451	AG	ICPES	0.018	0.002	MG/L	6/17/93	05261H

PF-368-E-60	92.27451	CD	ICPES	0.007	0.006	MG/L	6/17/93	05261H
PF-368-E-60	92.27451	CR	ICPES	0.007	0.003	MG/L	6/17/93	05261H
PF-368-E-60	92.27451	PB	ICPMS	0.28	0.03	MG/L	6/17/93	05261H
PF-368-E-100	92.27452	AG	ICPES	< 0.01		MG/L	6/17/93	05261H
PF-368-E-100	92.27452	BA	ICPES	4.1	0.4	MG/L	6/17/93	05261H
PF-368-E-100	92.27452	CD	ICPES	0.032	0.003	MG/L	6/17/93	05261H
PF-368-E-100	92.27452	CR	ICPES	< 0.004		MG/L	6/17/93	05261H
PF-368-E-100	92.27452	PB	ICPMS	0.26	0.03	MG/L	6/17/93	05261H
PF-368-E-150	92.27453	AG	ICPES	< 0.01		MG/L	6/17/93	05261H
PF-368-E-150	92.27453	BA	ICPES	0.94	0.09	MG/L	6/17/93	05261H
PF-368-E-150	92.27453	CD	ICPES	< 0.003		MG/L	6/17/93	05261H
PF-368-E-150	92.27453	CR	ICPES	< 0.004		MG/L	6/17/93	05261H
PF-368-E-150	92.27453	PB	ICPMS	< 0.03		MG/L	6/17/93	05261H
PF-368-N-20	92.27454	AG	ICPES	0.012	0.003	MG/L	6/17/93	05261H
PF-368-N-20	92.27454	BA	ICPES	2.2	0.2	MG/L	6/17/93	05261H
PF-368-N-20	92.27454	CD	ICPES	0.041	0.004	MG/L	6/17/93	05261H
PF-368-N-20	92.27454	CR	ICPES	< 0.004		MG/L	6/17/93	05261H
PF-368-N-20	92.27454	PB	ICPMS	0.49	0.05	MG/L	6/17/93	05261H
PF-368-N-40	92.27455	AG	ICPES	< 0.01		MG/L	6/17/93	05261H
PF-368-N-40	92.27455	BA	ICPES	7.	0.7	MG/L	6/17/93	05261H
PF-368-N-40	92.27455	CD	ICPES	0.032	0.003	MG/L	6/17/93	05261H
PF-368-N-40	92.27455	CR	ICPES	< 0.004		MG/L	6/17/93	05261H
PF-368-N-40	92.27455	PB	ICPMS	0.03	0.02	MG/L	6/17/93	05261H
PF-368-N-60	92.27456	AG	ICPES	< 0.01		MG/L	6/17/93	05261H
PF-368-N-60	92.27456	BA	ICPES	1.8	0.2	MG/L	6/17/93	05261H
PF-368-N-60	92.27456	CD	ICPES	0.007	0.003	MG/L	6/17/93	05261H
PF-368-N-60	92.27456	CR	ICPES	0.006	0.003	MG/L	6/17/93	05261H
PF-368-N-60	92.27456	PB	ICPMS	< 0.03		MG/L	6/17/93	05261H
PF-368-N-100	92.27457	AG	ICPES	< 0.01		MG/L	6/17/93	05261H
PF-368-N-100	92.27457	BA	ICPES	6.5	0.7	MG/L	6/17/93	05261H
PF-368-N-100	92.27457	CD	ICPES	0.34	0.03	MG/L	6/17/93	05261H
PF-368-N-100	92.27457	CR	ICPES	0.011	0.004	MG/L	6/17/93	05261H
PF-368-N-100	92.27457	PB	ICPMS	0.03		MG/L	6/17/93	05261H
PF-368-N-150	92.27458	AG	ICPES	< 0.01		MG/L	6/17/93	05261H
PF-368-N-150	92.27458	BA	ICPES	3.6	0.4	MG/L	6/17/93	05261H
PF-368-N-150	92.27458	CD	ICPES	0.034	0.003	MG/L	6/17/93	05261H
PF-368-N-150	92.27458	CR	ICPES	< 0.004		MG/L	6/17/93	05261H
PF-368-N-150	92.27458	PB	ICPMS	< 0.03		MG/L	6/17/93	05261H
PF-368-S-20	92.27459	AG	ICPES	< 0.01		MG/L	6/17/93	05261H
PF-368-S-20	92.27459	BA	ICPES	0.58	0.06	MG/L	6/17/93	05261H
PF-368-S-20	92.27459	CD	ICPES	< 0.003		MG/L	6/17/93	05261H
PF-368-S-20	92.27459	CR	ICPES	0.012	0.001	MG/L	6/17/93	05261H
PF-368-S-20	92.27459	PB	ICPMS	< 0.03		MG/L	6/17/93	05261H
PF-368-S-40	92.27460	AG	ICPES	< 0.01		MG/L	6/17/93	05261H
PF-368-S-40	92.27460	BA	ICPES	2.9	0.3	MG/L	6/17/93	05261H
PF-368-S-40	92.27460	CD	ICPES	0.019	0.002	MG/L	6/17/93	05261H
PF-368-S-40	92.27460	CR	ICPES	0.011	0.001	MG/L	6/17/93	05261H
PF-368-S-40	92.27460	PB	ICPMS	< 0.03		MG/L	6/17/93	05261H
PF-368-S-60	92.27461	AG	ICPES	< 0.01		MG/L	6/17/93	05261H
PF-368-S-60	92.27461	BA	ICPES	3.1	0.3	MG/L	6/17/93	05261H
PF-368-S-60	92.27461	CD	ICPES	0.023	0.005	MG/L	6/17/93	05261H
PF-368-S-60	92.27461	CR	ICPES	0.008	0.001	MG/L	6/17/93	05261H
PF-368-S-60	92.27461	PB	ICPMS	< 0.03		MG/L	6/17/93	05261H
PF-368-S-100	92.27462	AG	ICPES	< 0.01		MG/L	6/17/93	05261H
PF-368-S-100	92.27462	BA	ICPES	2.3	0.2	MG/L	6/17/93	05261H
PF-368-S-100	92.27462	CD	ICPES	0.004	0.002	MG/L	6/17/93	05261H
PF-368-S-100	92.27462	CR	ICPES	0.013	0.001	MG/L	6/17/93	05261H
PF-368-S-100	92.27462	PB	ICPMS	< 0.03		MG/L	6/17/93	05261H
PF-368-S-150	92.27463	AG	ICPES	< 0.01		MG/L	6/17/93	05261H

PF-36B-S-150	92.27462	CD	ICPES	< 0.003		MG/L	6/17/93	05261H
PF-36B-S-150	92.27462	CR	ICPES	0.016	0.005	MG/L	6/17/93	05261H
PF-36B-S-150	92.27463	PB	ICPMS	< 0.03		MG/L	6/17/93	05261H
PF-36B-SED	92.27464	AG	ICPES	< 0.01		MG/L	6/17/93	05261H
PF-36B-SED	92.27464	BA	ICPES	3.4	0.3	MG/L	6/17/93	05261H
PF-36B-SED	92.27464	CD	ICPES	0.004	0.002	MG/L	6/17/93	05261H
PF-36B-SED	92.27464	CR	ICPES	0.006	0.002	MG/L	6/17/93	05261H
PF-36B-SED	92.27464	PB	ICPMS	< 0.03		MG/L	6/17/93	05261H
PF-36B-O-O	92.27465	AG	ICPES	< 0.01		MG/L	6/17/93	05261H
PF-36B-O-O	92.27465	BA	ICPES	1.2	0.1	MG/L	6/17/93	05261H
PF-36B-O-O	92.27465	CD	ICPES	0.018	0.002	MG/L	6/17/93	05261H
PF-36B-O-O	92.27465	CR	ICPES	< 0.004		MG/L	6/17/93	05261H
PF-36B-O-O	92.27465	PB	ICPMS	< 0.03		MG/L	6/17/93	05261H
PF-36B-E60R	92.27466	AG	ICPES	0.019	0.002	MG/L	6/17/93	05261H
PF-36B-E60R	92.27466	BA	ICPES	3.2	0.3	MG/L	6/17/93	05261H
PF-36B-E60R	92.27466	CD	ICPES	0.004	0.005	MG/L	6/17/93	05261H
PF-36B-E60R	92.27466	CR	ICPES	< 0.004		MG/L	6/17/93	05261H
PF-36B-E60R	92.27466	PB	ICPMS	1.1	0.1	MG/L	6/17/93	05261H
PF-36A-RIN	92.27468	AG	ICPES	< 0.01		MG/L	9/20/93	
PF-36A-RIN	92.27468	BA	ICPES	< 0.07		MG/L	9/20/93	
PF-36A-RIN	92.27468	CD	ICPES	< 0.01		MG/L	9/20/93	
PF-36A-RIN	92.27468	CR	ICPES	< 0.01		MG/L	9/20/93	
PF-36A-RIN	92.27468	PB	ICPES	< 0.05		MG/L	9/20/93	
PF-36B-RIN	92.27469	AG	ICPES	< 0.01		MG/L	9/20/93	
PF-36B-RIN	92.27469	BA	ICPES	0.96	0.1	MG/L	9/20/93	
PF-36B-RIN	92.27469	CD	ICPES	0.01	0.01	MG/L	9/20/93	
PF-36B-RIN	92.27469	CR	ICPES	< 0.01		MG/L	9/20/93	
PF-36B-RIN	92.27469	PB	ICPES	0.05	0.05	MG/L	9/20/93	

REPORT NUMBER: 20618 (continued.

********** EM-9 QUALITY ASSURANCE REPORT **********

Prepared by: D GERTH on 20-Sep-1993

REQUEST NUMBER: 13501 MATRIX: SE ANALYST: MET PROGRAM CODE: M106

OWNER: Philip R. Fresquez GROUP: EM-8 MAIL-STOP: K490 PHONE: 7-0815

NOTEBOOK: R8149 PAGE: 132

SUMMARY OF CONTROL STATUS OF OPEN (NON-BLIND) QC SAMPLES RUN WITH THIS BATCH

SAMPLE NUM	ANALYSIS	ANALYTICAL RESULT	ANALYTICAL UNCERTAINTY	UNITS	QC VALUE	QC UNCERTAINTY	COMPLETION DATE	COMMENT
0.27503	AG	2.2	0.2	MG/L	2.	0.08	6/18/93	UNDER CONTROL
00.27503	BA	9.8	1.	MG/L	10.	0.4	6/18/93	UNDER CONTROL
00.27503	CD	10.	1.	MG/L	10.	0.4	6/18/93	UNDER CONTROL
00.27503	CR	9.5	1.	MG/L	10.	0.4	6/18/93	UNDER CONTROL
00.27503	PB	10.	1.	MG/L	10.	0.4	6/18/93	UNDER CONTROL

SUMMARY OF CONTROL STATUS OF BLIND QC SAMPLES RUN WITH THIS BATCH

There were no blind Quality Control materials run with the samples reported above for one of the following reasons:

___ Only qualitative data requested

✓ Only Open (non-blind) QC samples run with this sample batch.

___ No QC samples run with this sample batch.

___ No QC samples for this constituent and matrix type available within EM-9

REPORT NUMBER: 20618

Analyst	Reviewer	Section Leader	QA Officer
9/22/93	9/22/93	9/22/93	9/22/93
Date	Date	Date	Date

The control status of the preceeding data was evaluated using the standard statistical criteria set forth in 'Quality Assurance for Health and Environmental Chemistry: 1991,' LA-12436-MS, Vol. I, pp. 21-22.

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ATTACHMENT 4-7

Results Summary of the Soil Sampling Survey Conducted Over Active Firing Site at Technical Area 39, Building 6

Results Summary of the Soil Sampling Survey Conducted Over Active Firing Site at Technical Area 39, Building 6

In March 1993, 20 soil samples were collected at the 0- to 3-inch depth along four transects radiating outward from the center of the detonation area. Two sediment samples were collected from drainage channels downgradient to the detonation area. A sample was collected from rinsate of scattered surface debris at the detonation area. The soil and sediment samples were screened for gross alpha, beta, and gamma radioactivity. The soil, sediment and rinsate samples were analyzed for toxicity characteristic leaching procedure (TCLP) metals; total lead (Pb), total mercury, and total beryllium; semivolatile organic compounds (SVOC); volatile organic compounds (VOC); and high explosives residues. The results are summarized below.

- Four soil samples contained Pb above 5 parts per million. No other TCLP metals or total metals were detected above action levels in the soil sediment or rinsate samples.
- Total beryllium and total mercury in the soil samples were below U.S. Environmental Protection Agency (EPA) action levels.
- Eight soil samples contained from one to four SVOCs; however, all the SVOCs were far below EPA action levels.
- Five VOCs were detected in soil samples, but were far below EPA action levels.
- No high explosives residues were detected in any of the samples.

ATTACHMENT 4-8

Results Summary of the Soil Sampling Survey Conducted Over Active Firing Site at Technical Area 39, Building 57

Results Summary of the Soil Sampling Survey Conducted Over Active Firing Site at Technical Area 39, Building 57

In March 1993, 21 soil samples were collected at the 0- to 3-inch depth along four transects radiating outward from the center of the detonation area. Two sediment samples were collected from drainage channels downgradient to the detonation area. A sample was collected from the rinsate of scattered debris at the area. The soil and sediment samples were screened for gross alpha, beta, and gamma radioactivity. The soil, sediment, and rinsate samples were analyzed for toxicity characteristic leaching procedure (TCLP) metals; total lead, mercury, and beryllium; semivolatile organic compounds (SVOC); volatile organic compounds (VOC); polychlorinated biphenyls (PCB); and high explosives residues. The results are summarized below.

- No TCLP metals or total metals were detected above action levels in any sample.
- Of five SVOCs detected in soil samples, only one (2,4-dinitrotoluene) was present above the U.S. Environmental Protection Agency (EPA) action levels in three soil samples.
- Four VOCs were detected in soil samples, but were far below EPA action levels.
- No PCBs were detected in any sample.

ATTACHMENT 4-9

Air Quality Impact Modeling

Air Quality Impact Modeling

Air emissions from the open detonation of wood and plastic waste at Technical Area (TA) 14, TA-15, TA-36, and TA-39 are regulated under National and New Mexico Ambient Air Quality Standards. Air emissions from these operations could include criteria pollutants such as carbon monoxide, oxides of nitrogen, particulate matter, sulfur dioxide, and volatile organic compounds. In addition, some hazardous air pollutants such as hydrogen chloride and hydrogen fluoride are emitted as a result of combustion of the binders used to form the high explosives used in the waste treatment. Impacts from operations of this type must meet ambient air standards for all criteria pollutants[1]. In addition the waste had the potential for being contaminated with other regulated hazardous materials such as lead and depleted uranium (dU).

Source terms or the amount of pollutants generated during treatment activities (i.e., detonation) were estimated using published emission factors (AP-42; developed by the U.S. Environmental Protection Agency [EPA]), mass balance calculations, process knowledge, and engineering estimates. In addition, estimates were based on waste profiles containing 90% wood/cardboard/ burlap, 10% plastics/paper, and 0.192 pound (lb.) of dU/lb. of waste detonated.

An EPA-type gaussian plume model was employed with a puff type release function to simulate the airborne release resulting from the explosive treatment of the waste. The worst-case waste treatment and receptor location was used in the scenario, or a 2,000-lb. treatment at TA-36. Multiple treatments were used for comparison to those standards having 7-day or more averaging periods. Release heights and release fractions for a typical 50 lb. explosive "shot" were determined by Church's method and are shown in Table I below[2]. Airborne effluents were assumed to be transported directly to the potential receptors, using median dispersion factors for the Los Alamos area. The modeled concentration values for the above scenario are provided in Table II below.

Table I. Detonation Cloud Height and Material Distribution

Height (meters)	Release Fraction
162	20%
121	35%
81	35%
40	16%
0	4%

[1]Hazardous Air Pollutant (HAP) emission standards are regulated under Title 20, Chapter 2, Part 70 of the New Mexico Administrative Code for the facility at 10 tons per year for any one HAP or 25 tons per year for any combination of HAPs. Subsequently, impacts for hydrogen chloride and hydrogen fluoride releases were not included in this modeling analysis.

[2]"Cloud Rise from High-Explosives Detonations, Sandia Laboratories," H.W. Church, June 1969, TID-4500, (53rd ed., UC-41, Health and Safety, SC-RR-68-903).

Table II. Air Quality Impacts from Explosive Destruction of Waste

Chemical	Ambient Air Quality Standards			Air Concentrations at:	
				Pajarito Road (800 m NNE)	White Rock (2980 m ESE)
Carbon monoxide	8-hour average 1-hour average	0.5 mg/m^3 2.0 mg/m^3	(8.7 ppm) (13.1 ppm)	0.02 mg/m^3 0.16 mg/m^3	0.01 mg/m^3 0.02 mg/m^3
Nitrogen oxides	24-hour average annual arithmetic average	5.0 µg/m^3 1.0 µg/m^3	(0.1 ppm) (0.05 ppm)	5.25E-04 µg/m^3 1.15E-05 µg/m^3	1.96E-04 µg/m^3 4.29E-06 µg/m^3
Particulate matter	24-hour average 7-hour average 30-day average	150 µg/m^3 110 µg/m^3 90 µg/m^3		1.4 µg/m^3 0.39 µg/m^3 0.37 µg/m^3	0.51 µg/m^3 0.15 µg/m^3 0.14 µg/m^3
Sulfur dioxide	24-hour average annual arithmetic average	5.0 µg/m^3 1.0 µg/m^3	(0.1 ppm) (0.02 ppm)	0.054 µg/m^3 0.001 µg/m^3	0.020 µg/m^3 0.000 µg/m^3
Lead	3-month average	0.03 µg/m^3		4.3E-6 µg/m^3	1.6E-6 µg/m^3
Photo Chemical Oxidants (VOC)	1-hour average	245 µg/m^3	0.06 ppm	130 µg/m^3	48 µg/m^3
depleted Uranium	annual maximum	10 mrem		NA	>0.001 mrem

Footnotes:
m NNE = meters north-northeast
m ESE = meters east-southeast
mg = milligrams
m^3 = cubic meters
ppm = parts per million
µg = microgram
VOC = volatile organic compound
mrem = millirem
NA = not applicable

5.0 PROCEDURES TO PREVENT HAZARDS

The information provided in this section is submitted in accordance with the applicable requirements of the New Mexico Administrative Code, Title 20, Chapter 4, Part 1 (20 NMAC 4.1), revised November 1, 1995, for the following subject areas:

- Security procedures and equipment [20 NMAC 4.1, Subpart IX, 270.14(b)(4), and 20 NMAC 4.1, Subpart V, 264.14, revised November 1, 1995];
- Access control [20 NMAC 4.1, Subpart IX, 270.14(b)(19)(viii), revised November 1, 1995];
- Preparedness and prevention requirements [20 NMAC 4.1, Subpart V, Part 264, Subpart C, revised November 1, 1995];
- Procedures, structures, and equipment for preventing hazards [20 NMAC 4.1, Subpart IX, 270.14(b)(8), revised November 1, 1995];
- General waste management practices for ignitable, reactive, and incompatible waste [20 NMAC 4.1, Subpart IX, 270.14(b)(9), and 20 NMAC 4.1, Subpart V, 264.17, revised November 1, 1995].

5.1 SECURITY [20 NMAC 4.1, Subpart IX, 270.14(b)(4) and 270.14(b)(19)(viii); 20 NMAC 4.1, Subpart V, 264.14]

The following describes the security features in place at the thermal treatment units located at Technical Area (TA) 14, TA-15, TA-36, and TA-39 at Los Alamos National Laboratory (LANL), in accordance with the requirements of 20 NMAC 4.1, Subpart IX, 270.14(b)(4) and 270.14(b)(19)(viii), and 20 NMAC 4.1, Subpart V, 264.14, revised November 1, 1995.

In compliance with LANL standard operating procedures (SOP) for the open burning/open detonation (OB/OD) thermal treatment units (see Appendix A for SOPs), manned roadblocks are established along access roads in the vicinity of the OB/OD units to further reduce the possibility of entry into these areas during actual treatment operations. Personnel manning the roadblocks maintain two-way radio contact with administrative controls and firing site personnel and can stop the operation should a breach of security occur. In accordance with 20 NMAC 4.1, Subpart IX, 270.14(b)(19)(viii), revised November 1, 1995, the locations of security fences and entry/access gates in the vicinity of these units are shown on Figures 5-1 through 5-5. Collectively, these security procedures and the security features discussed below prevent the unknowing entry and minimize the possibility for unauthorized entry of persons into the OB/OD thermal treatment units in

accordance with the requirements of 20 NMAC 4.1, Subpart V, 264.14(b)(2), revised November 1, 1995.

The OB/OD thermal treatment units at TA-14, TA-15, TA-36, and TA-39 are located within secured areas at which security is maintained through both administratively controlled and physical barriers. Access to the areas can only be gained through controlled entry stations at TA-16, TA-36, and TA-69 and through key-activated entry gates within TA-15 by persons possessing appropriate security clearance. Entry stations are located on Anchor Ranch Road for access through TA-69 off of West Jemez Road for access through TA-16, and on Potrillo Drive at TA-36 for access through TA-18 and TA-36 via Pajarito Road, respectively. The entry stations are manned by Protection Technology Los Alamos security personnel 24 hours a day. In addition, an 8-foot-high chain-link security fence with razor wire at the top surrounds the entire perimeter of TA-14, TA-15, TA-36, and TA-39. The entire security fence is also inspected on a regular basis by security personnel, and repairs are made, as necessary. Warning signs are posted at the entrance to each OB/OD thermal treatment unit area and can be seen by personnel approaching the area. The legend on the signs indicates "Danger Explosives Area." Signs reading "Authorized Personnel Only" are posted on gates on interior access roads at each TA in the vicinity of a thermal treatment unit. All warning signs are legible from a distance of 25 feet and are written in English and Spanish.

5.2 PREPAREDNESS AND PREVENTION REQUIREMENTS [20 NMAC 4.1, Subpart V, Part 264, Subpart C]

The following sections present how operations at the TA-14, TA-15, TA-36, and TA-39 OB/OD thermal treatment units comply with the preparedness and prevention requirements of 20 NMAC 4.1, Subpart V, Part 264, Subpart C, revised November 1, 1995.

5.2.1 Required Equipment [20 NMAC 4.1, Subpart V, 264.32]

In accordance with the requirements of 20 NMAC 4.1, Subpart V, 264.32, revised November 1, 1995, the thermal treatment units addressed in this Part B permit application are equipped with adequate emergency equipment, which includes internal and external communication equipment; alarm systems; fire extinguishers; and fire control, spill control, and decontamination equipment. Emergency equipment specific to the OB/OD thermal treatment units at TA-14, TA-15, TA-36, and TA-39 is discussed in the following sections and is summarized in Attachment 7-1 of this Part B permit application. LANL-wide emergency equipment, available for use at any of the LANL waste management units, is presented in Section 7.0 of the LANL General Part B.

Alarm systems are in place at the OB/OD thermal treatment units at TA-14, TA-15, TA-36, and TA-39 and are used to alert personnel to clear the areas. The alarm systems, which consist of sirens and red flashing lights, are activated prior to and during treatment operations. The sirens are also sounded at the completion of treatment operations to signal that an area is clear. In addition, emergency "kill" switches are located at the OB/OD thermal treatment units and may be activated by any personnel to halt operations in the event of abnormal or unusual conditions. Fire alarm pull stations are located in TA-15-184, TA-15-185, TA-15-186, and TA-15-310; in TA-36-8; and in TA-39-6 and TA-39-57. These pull stations can be accessed by personnel working at the OB/OD thermal treatment units. Upon activation of the fire alarm system, an audible alarm sounds to alert personnel of emergency conditions. Manual pull stations are connected to the Los Alamos County Fire Department (LACFD) through LANL's central alarm system (see Section 7.0 of the LANL General Part B) at all times.

Paging and conventional telephones are available during treatment operations at the OB/OD thermal treatment units to provide adequate communication and to summon external emergency assistance, if necessary. Telephones are located at the control bunkers and in the control buildings. These telephones have paging capabilities and may be used in an emergency to communicate the location and nature of hazardous conditions to personnel in the area.

Fire extinguishers available for use at the TA-14 OB/OD thermal treatment units are located at TA-14-6 and TA-14-23. Two fire extinguishers are located at TA-14-6, and five fire extinguishers are located at TA-14-23. Two portable Halon fire extinguishers are located in vehicles at TA-15-310. Two fire extinguishers are located in TA-36-8, and a fire extinguisher is located in each control building at TA-39 (TA-39-6 and TA-39-57). In addition, each vehicle used to transport explosives is equipped with a Halon fire extinguisher. Depending on the size of the fire and the fuel source, fire extinguishers may be used by on-site personnel. However, LANL policy encourages immediate evacuation of the area and notification of appropriate emergency personnel.

One fire hydrant is located at the TA-14 entry gate. One fire hydrant is located at the entrance to TA-15-186, which is approximately 200 feet southeast of the OD thermal treatment unit at TA-15-184. One fire hydrant is also located near TA-39-98. Water is supplied to these fire hydrants by a municipal water system through 8-inch pipes at an adequate volume and pressure (i.e., 200 gallons per minute and 90 pounds per square inch static pressure) to supply a water hose in the event of a fire, as required by 20 NMAC 4.1, Part V, 264.32(d), revised November 1, 1995.

Although permanent sources of water (i.e., a fire hydrant) are not available in the immediate vicinity of each thermal treatment unit, arrangements can be made with the LACFD to provide water tanker trucks to the site for use in an emergency. The water tanker trucks are capable of supplying water at adequate volume and pressure for use in fire-suppression activities to meet the requirements of 20 NMAC 4.1, Part V, 264.32(d), revised November 1, 1995. SOPs are in place that describe when and how fire department assistance is to be used.

Spill control equipment is available at TA-14-23, TA-15-184, TA-39-6, and TA-39-57. This equipment consists of various types of sorbents. Spill control equipment is not currently available at the TA-36-8 OD thermal treatment unit. This equipment is available at the lower Slobbovia Site at TA-36 but would not be easily accessible to personnel at TA-36-8.

Eyewash stations are located in TA-14-23, TA-15-185, and TA-36-8. Personnel decontamination equipment available at TA-36-8 includes a portable eyewash station located in the main chamber of TA-36-8. Two self-contained breathing apparatus are also located in TA-36-8. A portable eyewash station is available for use at TA-39-6 and TA-39-57.

Material safety data sheets (MSDS), which provide useful exposure information, are available at the group office. MSDSs, first aid kits, and hearing protection equipment are also available at the OB/OD thermal treatment units located at TA-14, TA-15, TA-36, and TA-39.

5.2.2 Testing and Maintenance of Equipment [20 NMAC 4.1, Subpart V, 264.33]

Communications and alarm systems, and fire protection, spill control, and decontamination equipment located at the OB/OD thermal treatment units addressed in this Part B permit application are tested and/or maintained according to the inspection schedule detailed in Section 6.0 of this document and in Section 6.0 of the LANL General Part B. The frequency of inspection is adequate to assure proper operation in the event of an emergency. Repair and replacement of emergency equipment are performed as required.

5.2.3 Access to Communications or Alarm System [20 NMAC 4.1, Subpart V, 264.34]

Whenever treatment operations are being conducted at the OB/OD thermal treatment units addressed in this Part B permit application, involved personnel have immediate access to an emergency communication device, either directly or through visual or voice contact with another individual. In the event of an emergency, communication equipment at the OB/OD thermal

treatment units allows personnel to contact the Dynamic Experimentation operating group management, the Emergency Management and Response Office, and/or the Central Alarm Station operator (refer to Section 7.2 of the LANL General Part B). In addition to the communications and alarm systems described in this section, two-way radios, pagers, and/or cellular telephones are also used at the OB/OD thermal treatment units to provide additional means of communication between on-site personnel and/or to contact LANL emergency support personnel.

5.2.4 Aisle Space Requirements [20 NMAC 4.1, Subpart V, 264.35]

At the OB/OD thermal treatment units addressed in this Part B permit application, adequate space is maintained to allow the unobstructed movement of personnel and fire protection, spill control, and decontamination equipment in the event of an emergency.

5.2.5 Support Agreements with Outside Agencies [20 NMAC 4.1, Subpart V, 264.37]

Information on support agreements with outside agencies, as required by 20 NMAC 4.1, Subpart V, 264.37, revised November 1, 1995, is presented in Section 5.0 of the LANL General Part B.

5.3 PREVENTIVE PROCEDURES, STRUCTURES, AND EQUIPMENT [20 NMAC 4.1, Subpart IX, 270.14(b)(8)]

Descriptions of the preventive procedures, structures, and equipment at the OB/OD thermal treatment units at TA-14, TA-15, TA-36, and TA-39 are presented below. This information is provided in accordance with the requirements of 20 NMAC 4.1, Subpart IX, 270.14(b)(8), revised November 1, 1995. Adherence to the procedures and proper use of the structures and equipment will help to prevent hazards, prevent undue exposure of personnel to hazardous and low-level mixed waste, and prevent releases to the environment.

At the TA-14, TA-15, TA-36, and TA-39 OB/OD thermal treatment units, large containers of explosives-contaminated waste or explosive materials are typically handled using mechanical equipment such as a truck-mounted crane or a hydraulic lift gate. If the waste is not immediately detonated, it is placed in a temporary staging area, such as a satellite accumulation or less-than-90-day accumulation area, in accordance with generator regulations. Small containers of waste are handled manually or with a dolly. The use of proper handling equipment, appropriate to a container's size and weight, helps to prevent hazards while moving containers at a thermal treatment unit. Additionally, personnel involved in waste handling and container handling operations at the OB/OD thermal treatment units are knowledgeable of the physical and chemical properties

of the waste managed at the site and take additional precautions, as necessary, to ensure that containers are handled safely.

Pursuant to the requirements of 20 NMAC 4.1, Subpart IX, 270.14(b)(19)(xi), revised November 1, 1995, Maps 2 through 5 of the OB/OD Part A show surface contours and drainage around the OB/OD thermal treatment units. Engineering controls (i.e., earthen berms) are in place at the OB/OD units to prevent runoff of wastes from the unit to other areas of the facility or to the environment.

For several reasons, it is not anticipated that there will be any impact to groundwater or other water supplies as a result of treatment operations at the OB/OD thermal treatment units. The depth to groundwater at LANL ranges from 600 feet to 1,200 feet (see Figure 2-7 of the LANL General Part B). Geologic units underlying the area include layers of unsaturated volcanic tuff and ash, the moisture content of which is generally less than 10 percent (DBA, 1995). Because the moisture content is insufficient for moisture migration through the Bandelier Tuff, no impact to groundwater is expected. In addition, all water supply lines are under pressure and are equipped with backflow prevention devices.

Electrical power is supplied to buildings near each of the OB/OD thermal treatment units. Supplied power at these buildings is used to operate lighting and telephone and alarm systems. Operations at the OB/OD thermal treatment units would be discontinued temporarily if electrical power was not restored quickly or if container handling equipment failed.

Safety shoes, safety glasses, and other personal protective equipment (PPE) required in explosives areas are worn by workers during routine operations at the thermal treatment units. Additional appropriate PPE is available should abnormal or unusual conditions require such equipment.

Releases to the atmosphere resulting from treatment activities at the OB/OD thermal treatment units cannot be prevented. However, assuming a conservative scenario of treatment activities at the unit (as discussed in Section 4.6.4 of this Part B permit application), estimated resulting emissions will not exceed regulatory levels and, therefore, will not adversely affect human health or the environment.

5.4 PREVENTION OF ACCIDENTAL IGNITION OR REACTION OF IGNITABLE, REACTIVE, OR INCOMPATIBLE WASTE [20 NMAC 4.1, Subpart IX, 270.14(b)(9), 270.15(c) and (d) and 20 NMAC 4.1, Subpart V, 264.17, 264.176, and 264.177]

This section details the precautions taken to prevent accidental ignition or reaction of ignitable, reactive, or incompatible wastes at the OB/OD thermal treatment units at TA-14, TA-15, TA-36, and TA-39.

Ignitable and/or reactive wastes may be temporarily stored in containers and managed in accordance with generator regulations at the OB/OD thermal treatment units at TA-14, TA-15, TA-36, and TA-39. Containers holding ignitable or reactive wastes are or will be located at least 50 feet from the facility's property line at all times (refer to Maps 1 through 5 of LANL's OB/OD Part A) and will be protected from sources of ignition or reaction. Policies and SOPs are in place at the OB/OD thermal treatment units that minimize the possibility of accidental ignition. In addition, smoking is not permitted in areas where ignitable and/or reactive wastes are managed. Signs indicating "No Smoking Except in Designated Areas" are conspicuously placed at the entrances to the OB/OD thermal treatment units, as required by 20 NMAC 4.1, Subpart V, 264.17(a), revised November 1, 1995. Together, these measures meet the requirements of 20 NMAC 4.1, Subpart V, 264.17(a) and (b) and 264.176, revised November 1, 1995.

Incompatible wastes, if managed at the OB/OD thermal treatment units, are segregated to prevent adverse reactions from occurring through commingling of the wastes. In addition, no incompatible wastes will be mixed, and no waste will be placed in a container that previously held an incompatible waste, as required by 20 NMAC 4.1, Subpart V, 264.177(a) and (b), and 20 NMAC 4.1, Subpart IX, 270.15(d), revised November 1, 1995. If incompatible wastes are managed at any of the OB/OD thermal treatment units, the requirements of 20 NMAC 4.1, Subpart V, 264.177(c), revised November 1, 1995, will also be met. Only containers made of or lined with materials that will not react with and are otherwise compatible with the waste to be managed will be used at the OB/OD thermal treatment units.

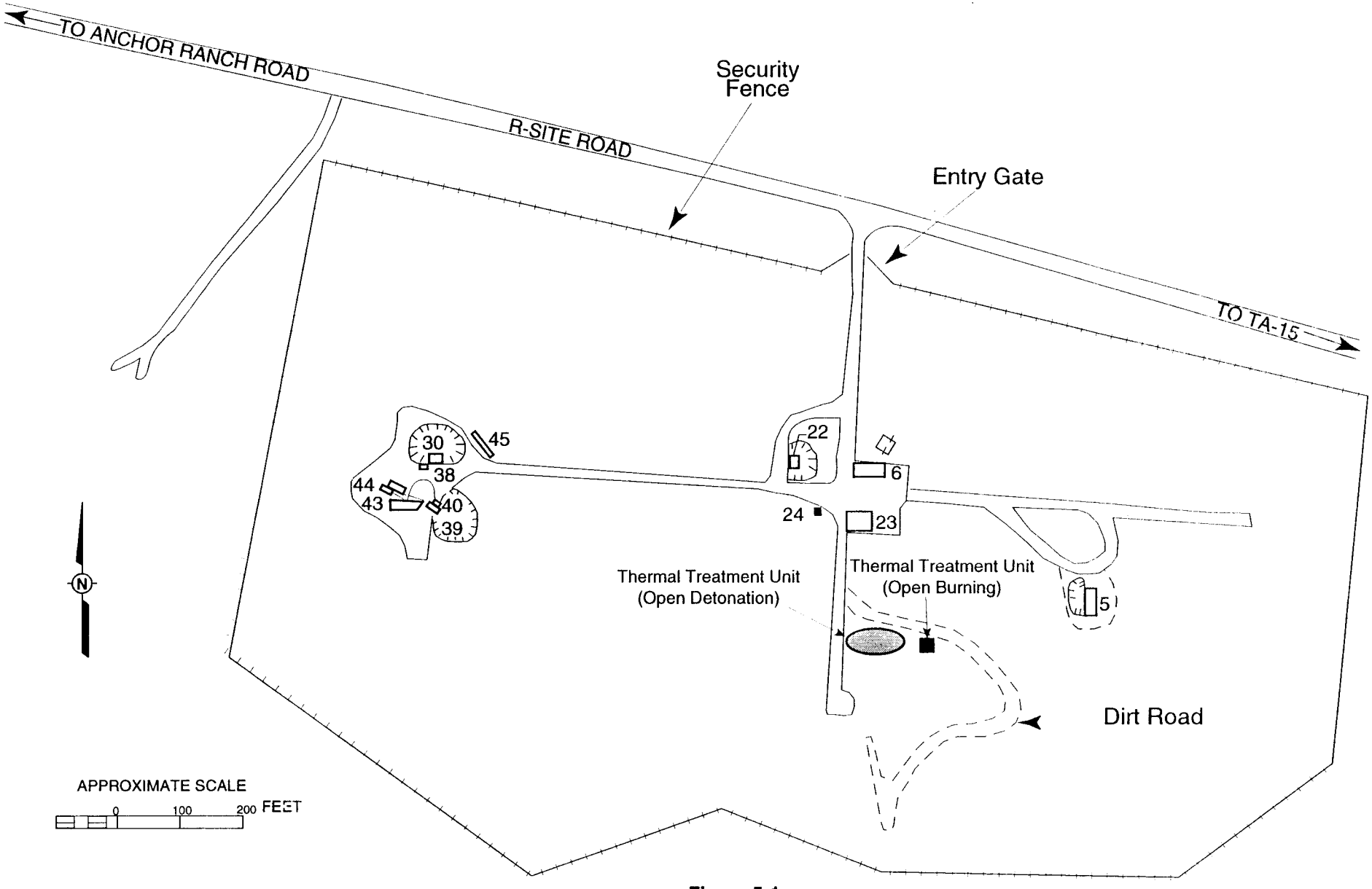

Figure 5-1
Location Map Showing Security Fence and Entry Gates in the Vicinity of the Thermal Treatment Units near Technical Area (TA) 14, Building 23

766969/OBODSPEC A19

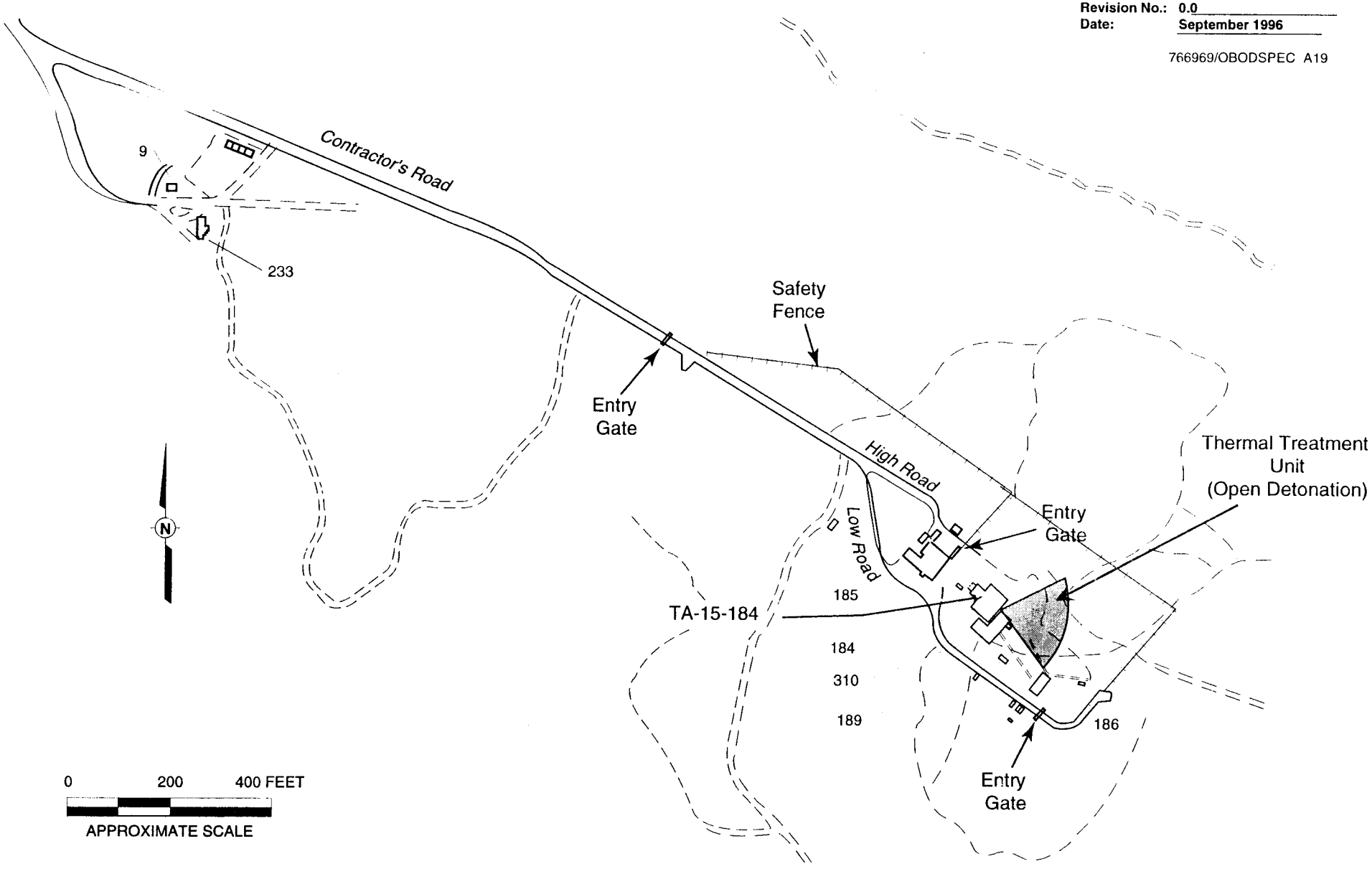

Figure 5-2
Location Map Showing Security Fence and Entry Gates
in the Vicinity of the Thermal Treatment Unit near Technical Area (TA) 15, Building 184

766969/OBODSPEC A17

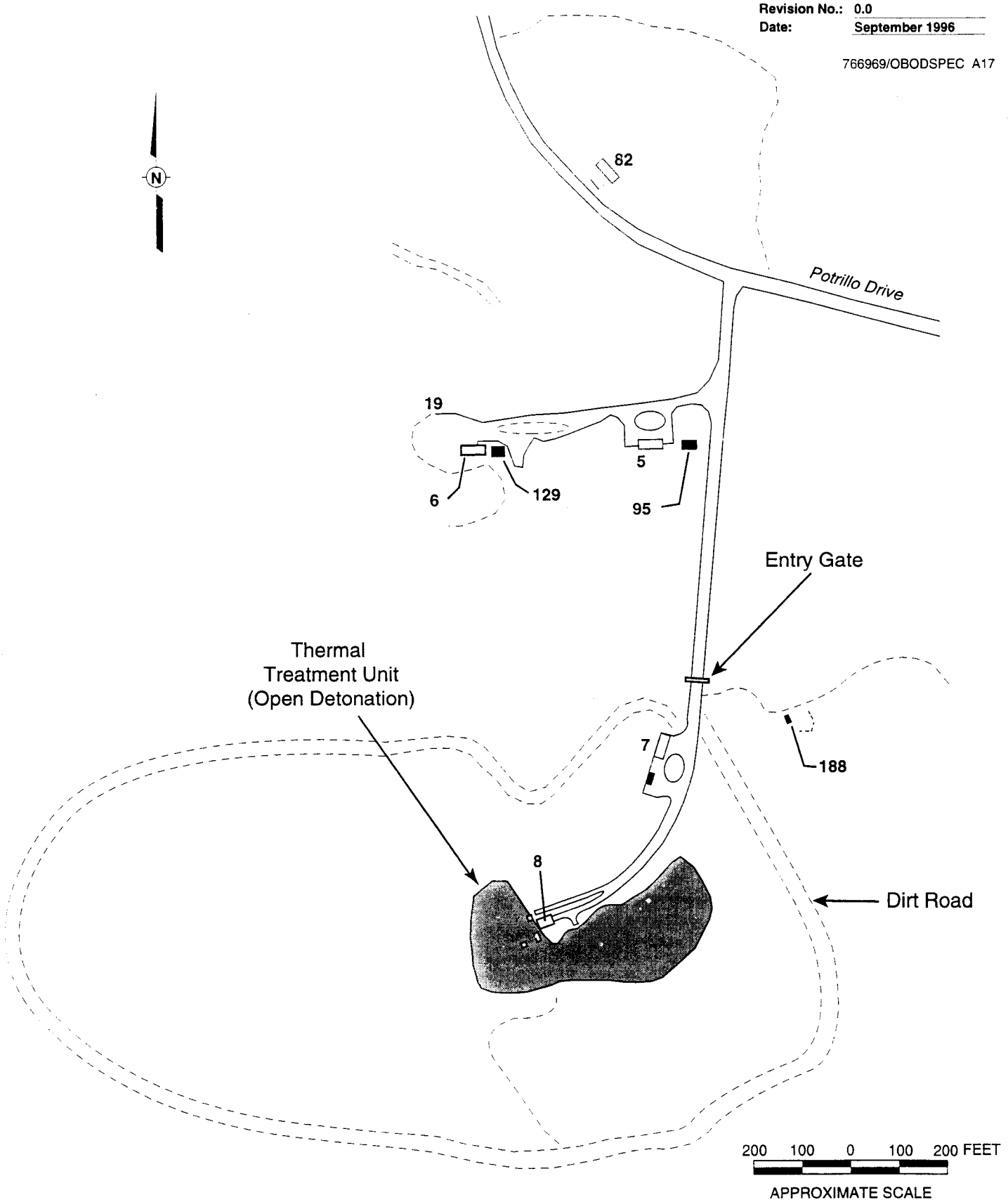

Figure 5-3
Location Map Showing Entry Gate in the Vicinity of the Thermal Treatment Unit near Technical Area 36, Building 8

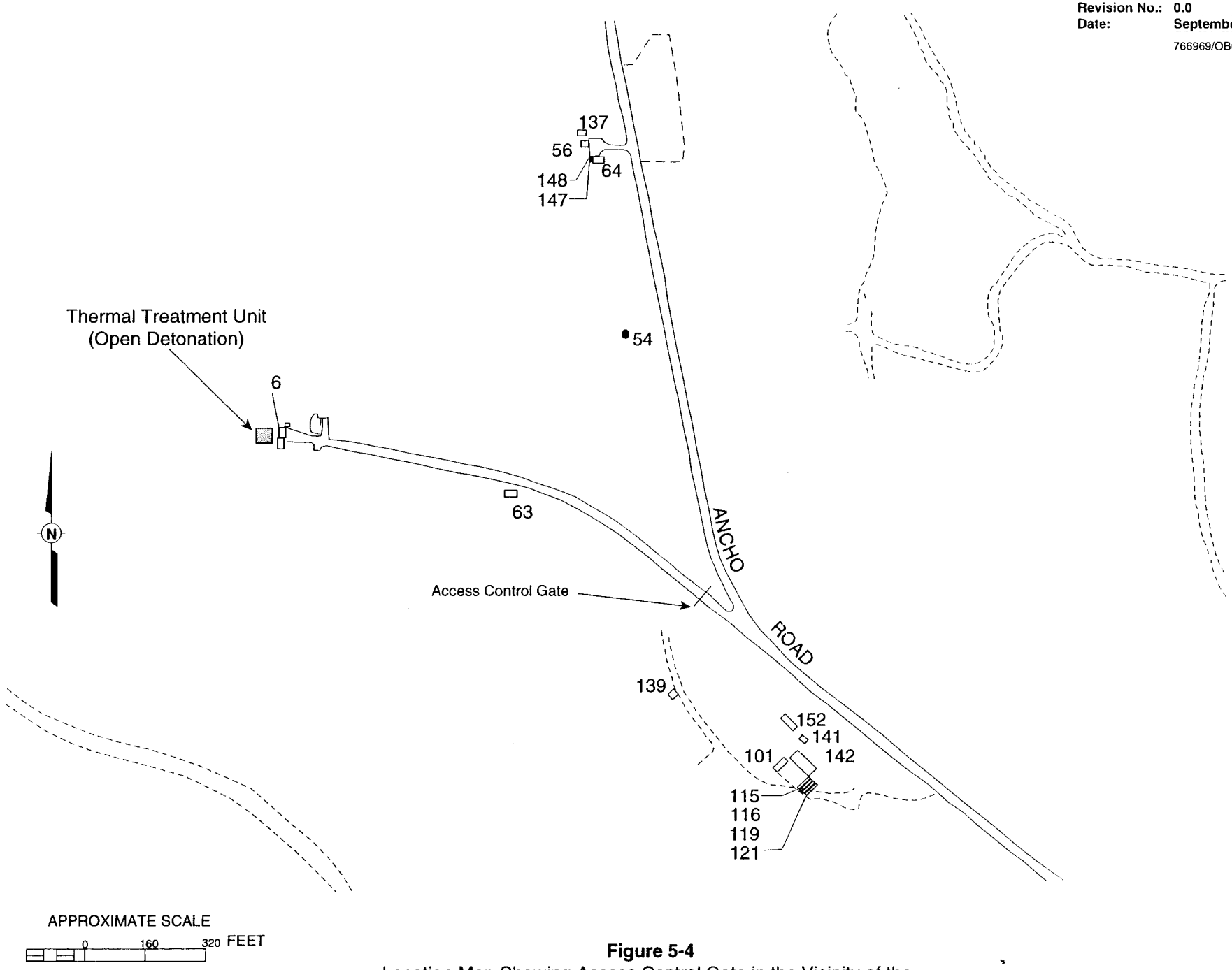

Figure 5-4
Location Map Showing Access Control Gate in the Vicinity of the Thermal Treatment Unit near Technical Area 39, Building 6

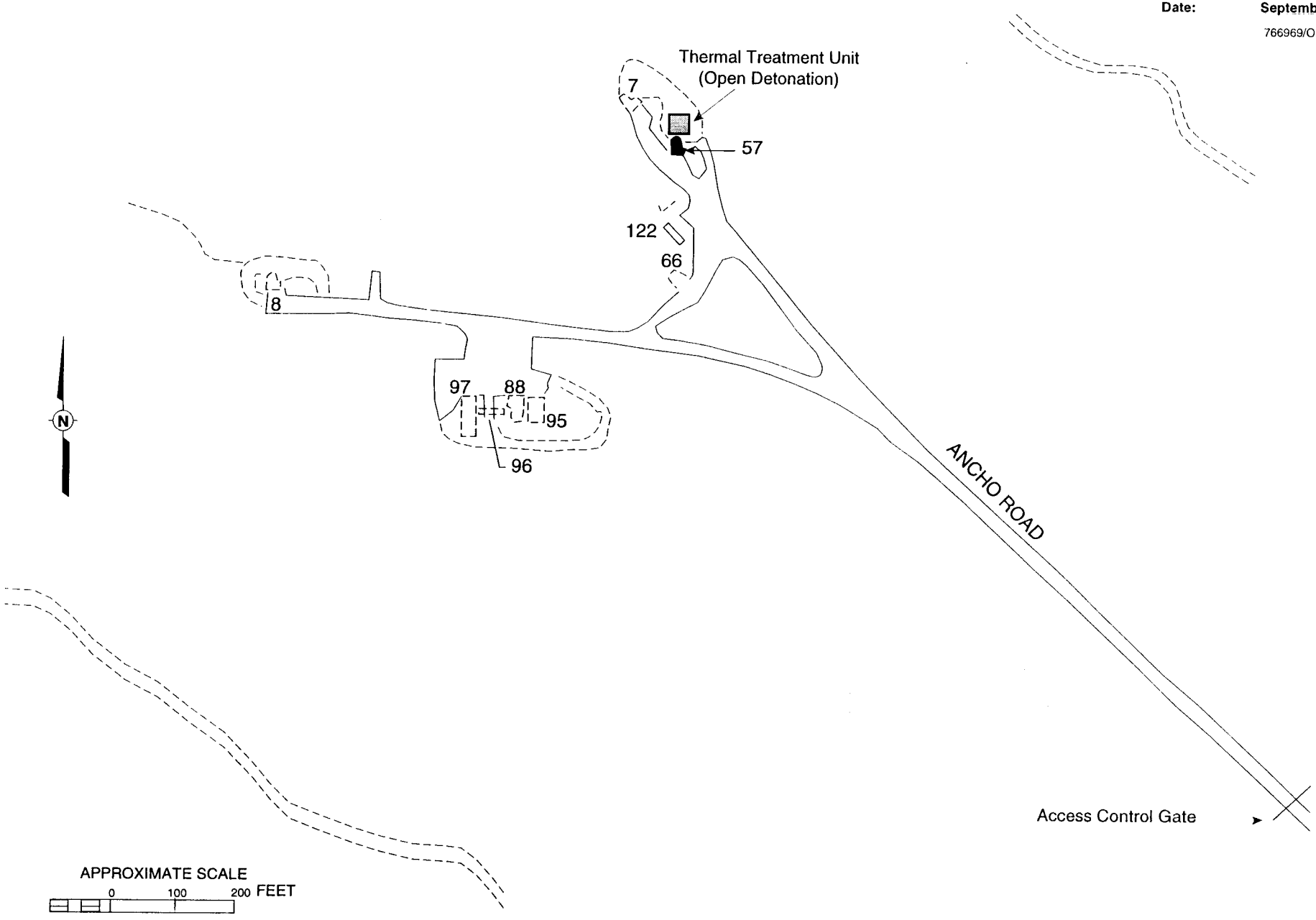

Figure 5-5
Location Map Showing Access Control Gate in the Vicinity of the Thermal Treatment Unit near Technical Area 39, Building 57

6.0 INSPECTION PLAN

In accordance with the New Mexico Administrative Code, Title 20, Chapter 4, Part 1 (20 NMAC 4.1), Subpart V, 264.15, "General Inspection Requirements," revised November 1, 1995, this section presents inspection requirements applicable to the open burning/open detonation (OB/OD) thermal treatment units at Los Alamos National Laboratory (LANL). Pursuant to 20 NMAC 4.1, Subpart V, 264.15(a), revised November 1, 1995, inspection schedules for these units have been developed to identify equipment malfunctions and deterioration, operator errors, and discharges that might cause or lead to a release of hazardous and/or mixed waste and pose a threat to human health and the environment. This inspection plan, which presents general inspection schedules, as specified in 20 NMAC 4.1, Subpart IX, 270.14(b)(5), revised November 1, 1995, is being submitted with this unit-specific Part B permit application. Inspections are conducted often enough to identify problems in time to correct them before they harm human health or the environment.

6.1 GENERAL INSPECTION SCHEDULES AND REQUIREMENTS [20 NMAC 4.1, Subpart IX, 270.14(b)(5) and 20 NMAC 4.1, Subpart V, 264.15(b) and (c)]

In accordance with the requirements of 20 NMAC 4.1, Subpart IX, 270.14(b)(5), and 20 NMAC 4.1, Subpart V, 264.15(b)(1), revised November 1, 1995, a written inspection schedule has been developed at LANL. This schedule is followed for the inspection of monitoring equipment, safety and emergency equipment, security devices, and operating and structural equipment that are important to preventing, detecting, and responding to environmental or human health hazards. A copy of this inspection plan, which includes inspection schedules, and copies of inspection records are maintained at the facility by LANL's Hazardous and Solid Waste Group (ESH-19) and the site operator, as required in 20 NMAC 4.1, Subpart V, 264.15(b)(2) and 264.15(d), revised November 1, 1995.

Inspection schedules outlining the items to be addressed on LANL's Hazardous and Mixed Waste Facility Inspection Record Form (IRF) and inspection frequencies for the OB/OD thermal treatment units are provided in Section 6.2. Pursuant to 20 NMAC 4.1, Subpart V, 264.15(b)(3), revised November 1, 1995, the IRF lists the types of problems to be looked for during an inspection. The IRF and instructions for its completion are provided as Attachment 6-1 of the LANL General Part B. The activities discussed below are addressed according to the specified regulatory requirements as well as to existing LANL inspection requirements for hazardous and mixed waste management units.

6.1.1 Inspection Records [20 NMAC 4.1, Subpart V, 264.15(d)]

Inspection training is provided through LANL's Environment, Safety, and Health Training Group, with guidance from ESH-19. Trained personnel assigned from the operating group that manages the unit conduct inspections and record the information on IRFs. These inspections are retained in inspection logbooks for a minimum of three years from the date of inspection. Copies of the inspection records are forwarded to ESH-19, who maintains copies of the inspection records for a minimum of three years from receipt.

If necessary, ESH-19 may modify the IRF used at LANL or may develop an equivalent form. Because the IRF is a comprehensive form that applies to all categories of both hazardous and mixed waste management units, not all sections of the form apply to all units. The IRF complies with 20 NMAC 4.1, Subpart V, Part 264, revised November 1, 1995, requirements for permitted hazardous waste management units; 20 NMAC 4.1, Subpart VI, Part 265, revised November 1, 1995, requirements; and additional requirements directed by LANL policy. Instructions included with the IRF provide specific guidance for each inspection item listed.

The IRF (Attachment 6-1 of the LANL General Part B) is completed according to the daily and weekly schedules provided in Section 6.2. In the event that the primary inspector is not available to complete the IRF, an alternate is responsible for its completion. Inspections are conducted and recorded in Parts I and II of the IRF for each working day or week (as appropriate) that waste is treated. For each working day or week that waste is not treated, a check mark is placed in the "No Use" block in Part I.

For every item requiring inspection, a response indicating the condition of each item is entered in the column under the appropriate day of the week. The response is either "OK" or "AR" (action required). If the response is "AR," the action required is noted in Part II of the IRF. Multiple "ARs" are numbered. If inspection results indicate that corrective measures are warranted, any and all actions taken (along with time, date, and other pertinent information) are recorded in Part II of the IRF and on all subsequent IRFs until corrective measures are completed. After corrective measures have been completed, the "Condition" column on the IRF is changed to "OK".

6.1.2 Inspection Frequency [20 NMAC 4.1, Subpart V, 264.15(b)(4)]

Inspection frequencies relevant to the OB/OD thermal treatment units are presented in Section 6.2. Inspection frequencies may be increased at the discretion of the operator or ESH-19, if unexpected

malfunctions occur, or if an accelerated deterioration rate of containers, secondary containment systems, and/or equipment is detected.

6.1.3 Actions Resulting From Inspections [20 NMAC 4.1, Subpart V, 264.15(c)]

6.1.3.1 Preventive Action

If any defects, deterioration, damage, or potential hazards are discovered during an inspection, appropriate corrective measures (e.g., transfer of waste from defective container to an appropriate container in good condition, repair or replacement of nonfunctioning equipment and/or systems, or removal of any accumulated liquids) will be completed promptly to minimize further damage and prevent the need for emergency response. Any preventive action taken in response to an inspection will be noted on the IRF.

6.1.3.2 Remedial and Emergency Action

If a hazardous condition is imminent or has already occurred, remedial action will be taken immediately. The situation will be assessed by the group leader (or designee) responsible for the unit. If this assessment indicates that human health or the environment may be adversely affected, the contingency plan (Sections 7.0 of the LANL General Part B and of this Part B permit application) will be implemented immediately. The contingency plan discusses the appropriate responses to emergency situations. Evacuation determinations will be made as outlined in Table 7-4 of the LANL General Part B. In the event the contingency plan is implemented, any sampling, decontamination, and verification will be conducted as specified in that plan.

6.2 INSPECTION SCHEDULE AND REQUIREMENTS FOR OB/OD THERMAL TREATMENT UNITS [20 NMAC 4.1, Subpart V, 264.15(b) and 264.602]

OB/OD thermal treatment units are inspected according to the schedule provided below. Inspection frequencies are adequate based on the deterioration rates of equipment/systems and the probability of harm to human health or the environment if failure of the equipment/systems occurs, or any operator error goes undetected between inspections.

6.2.1 Daily

Daily inspections will be conducted every day of operation (i.e., every day that OB/OD treatment occurs). For daily inspections of the thermal treatment units, the items in the following blocks on the IRF will be addressed, as appropriate:

Block Number	Item(s)
1–5	General information
7	(Un)loading area
13	Structural integrity of containers
14	Covers/lids of containers
16	Labels
18	Detonation pad run on/off control
22	Secondary containment structures
24	Appropriate container segregation
39	Radiation safety (if applicable)
40–48	General information

In addition, OD thermal treatment units will be inspected immediately before placement of wastes onto the site. After the unit can be safely approached following treatment, the area will be surveyed for unexploded ordnance and debris. All monitoring controls, emergency shutdown controls, and alarms or warning systems associated with the thermal treatment units will be inspected and/or tested for proper operating condition prior to the initiation of treatment at the units.

6.2.2 Weekly

Weekly inspections of OB/OD thermal treatment units, to be initiated on the first working day of each week, will address the items in the following blocks on the IRF, as appropriate:

Block Number	Item(s)
1–5	General information
8	Communication equipment
12	Eyewashes/safety showers
15	Warning signs
20	Security
21	Site lighting
25	Hose bibs, water supply
27	Road/work surfaces
28	Wind sock
33	Spill control, fire, and emergency equipment
40–48	General information

7.0 CONTINGENCY PLAN

In the event of an emergency at the open burning/open detonation (OB/OD) thermal treatment units at Technical Area (TA) 14, TA-15, TA-36, or TA-39, the Los Alamos National Laboratory (LANL)-wide contingency plan presented in Section 7.0 of the LANL General Part B will be implemented. Specific information on emergency response resources and release prevention/mitigation at TA-14, TA-15, TA-36, and TA-39 is provided below. Figures depicting evacuation routes and muster areas at each OB/OD thermal treatment unit are also provided in this Part B permit application. In addition, a listing of emergency equipment available for use at each OB/OD thermal treatment unit is included here as Attachment 7-1.

7.1 EMERGENCY RESPONSE RESOURCES

The Dynamics Experimentation (DX) Division is responsible for the hazardous and low-level mixed waste thermal treatment units at TA-14, TA-15, TA-36, and TA-39. DX personnel have been trained in emergency procedures.

7.2 RESPONSIBILITY

At TA-14, TA-15, TA-36, and TA-39, DX Division is responsible for correction of a nonsudden release from a hazardous and/or low-level mixed waste management unit if the correction can be performed safely with normal maintenance and management procedures. Personnel from the Emergency Management and Response Office may provide assistance in mitigating releases. Any correction methods for nonsudden releases that have resulted in an impact to the environment will be coordinated with the New Mexico Environment Department.

7.3 NONSUDDEN RELEASES

In general, the response to a nonsudden release will be (1) to contain the release, (2) to correct the cause of the release, and (3) to clean up any release to a level that protects human health and the environment.

DX Division personnel conduct regularly scheduled inspections at TA-14, TA-15, TA-36, and TA-39 to detect deterioration and/or failure of containment at the hazardous and/or low-level mixed waste OB/OD thermal treatment units addressed in this Part B permit application. If an inspection reveals deterioration or failure, DX Division personnel ensure that maintenance or replacement is performed, as appropriate.

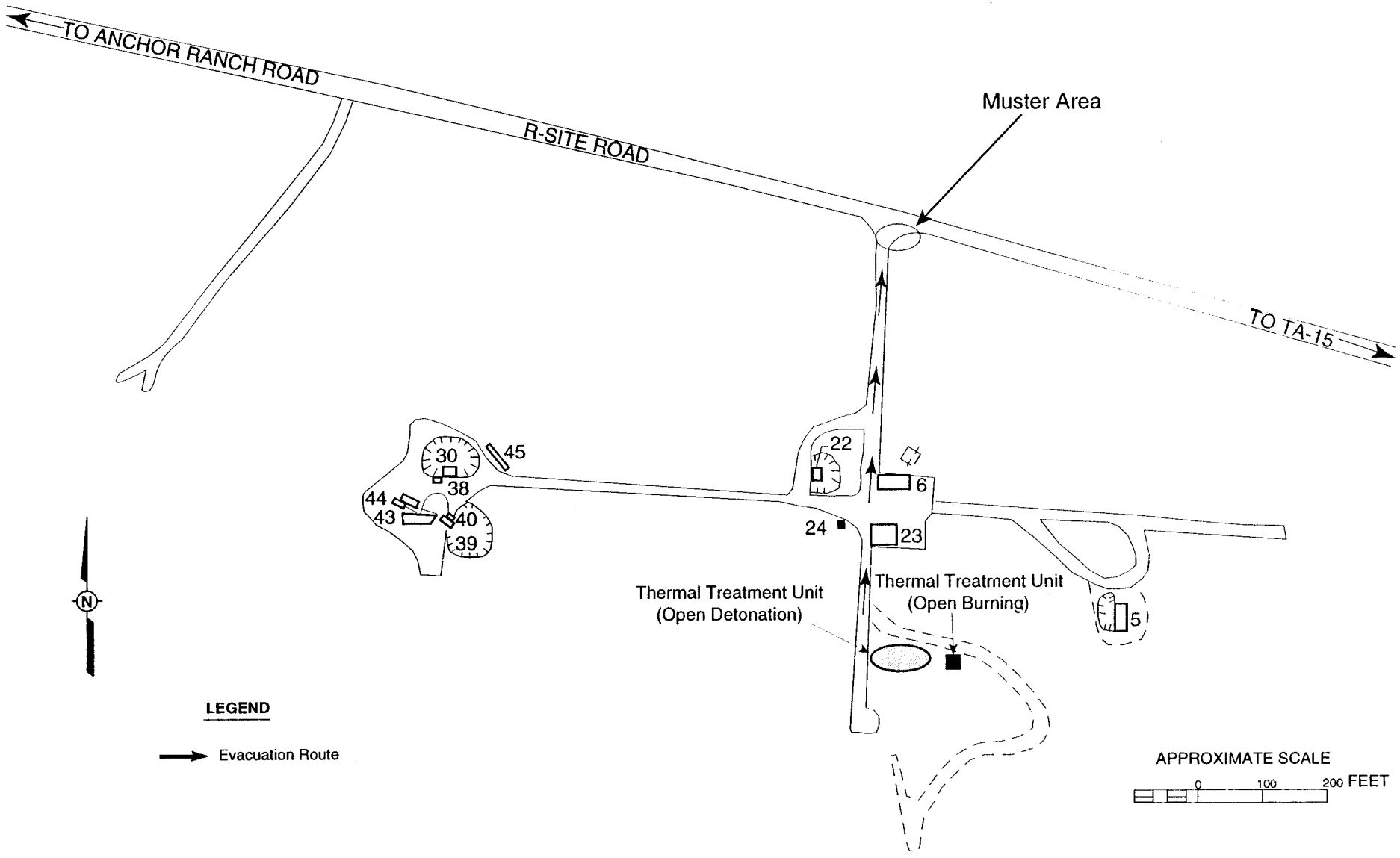

Figure 7-1
Evacuation Route and Muster Area for the Thermal Treatment Units near Technical Area (TA) 14, Building 23

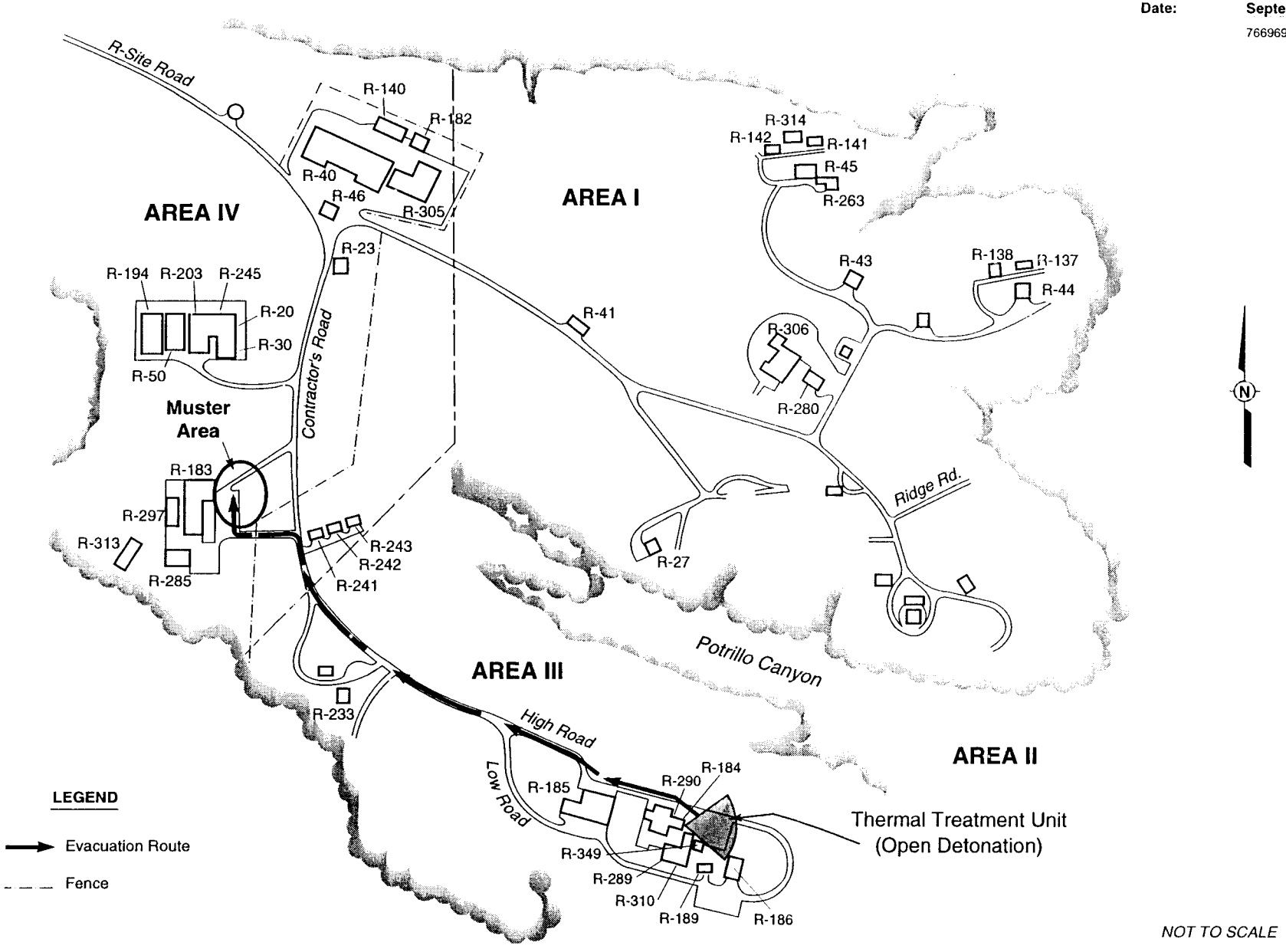

Figure 7-2
Evacuation Route and Muster Area for the Thermal Treatment Unit near Technical Area 15, Building 184

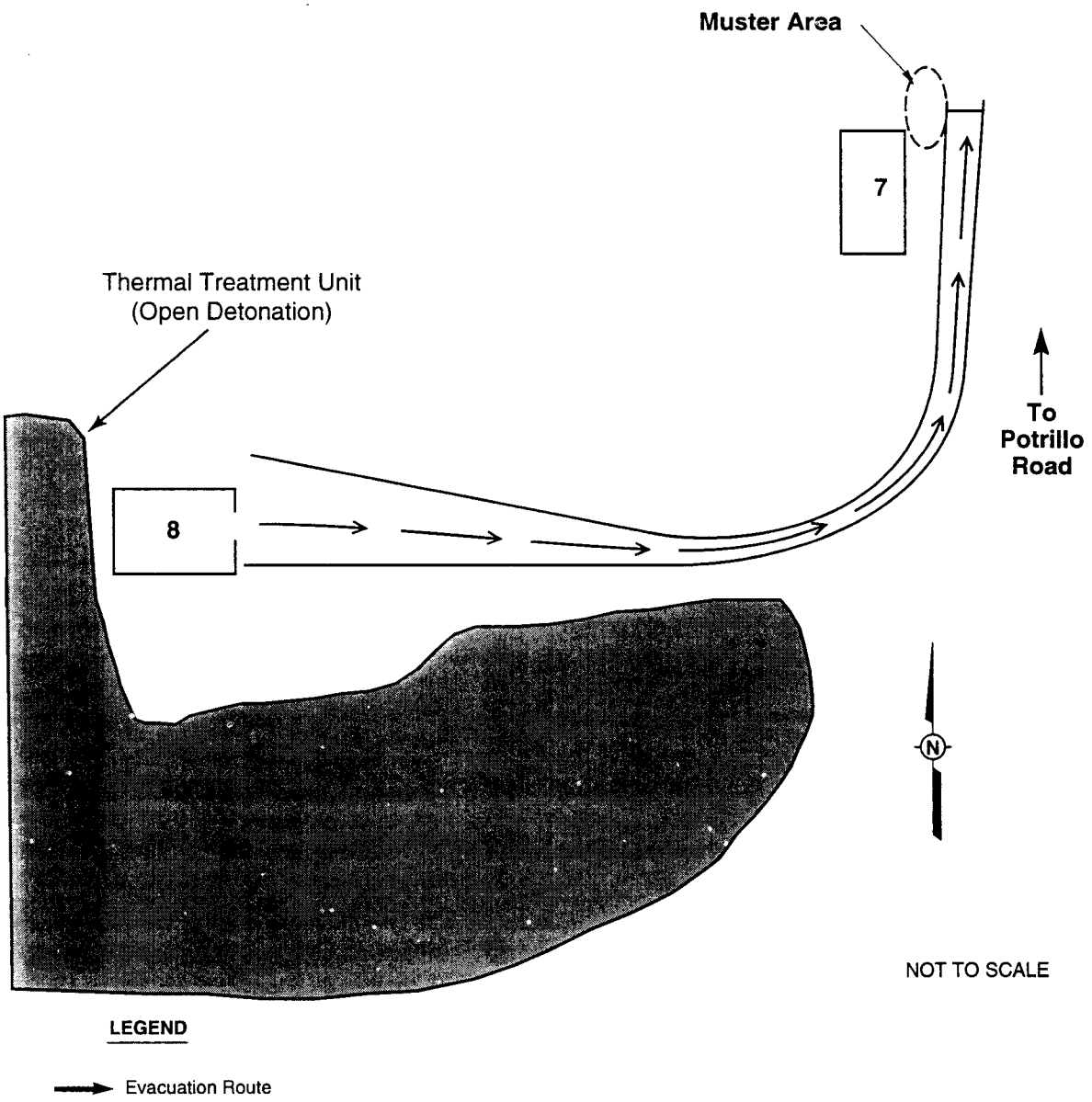

Figure 7-3

Evacuation Route and Muster Area for the Thermal Treatment Unit near
Technical Area 36, Building 8

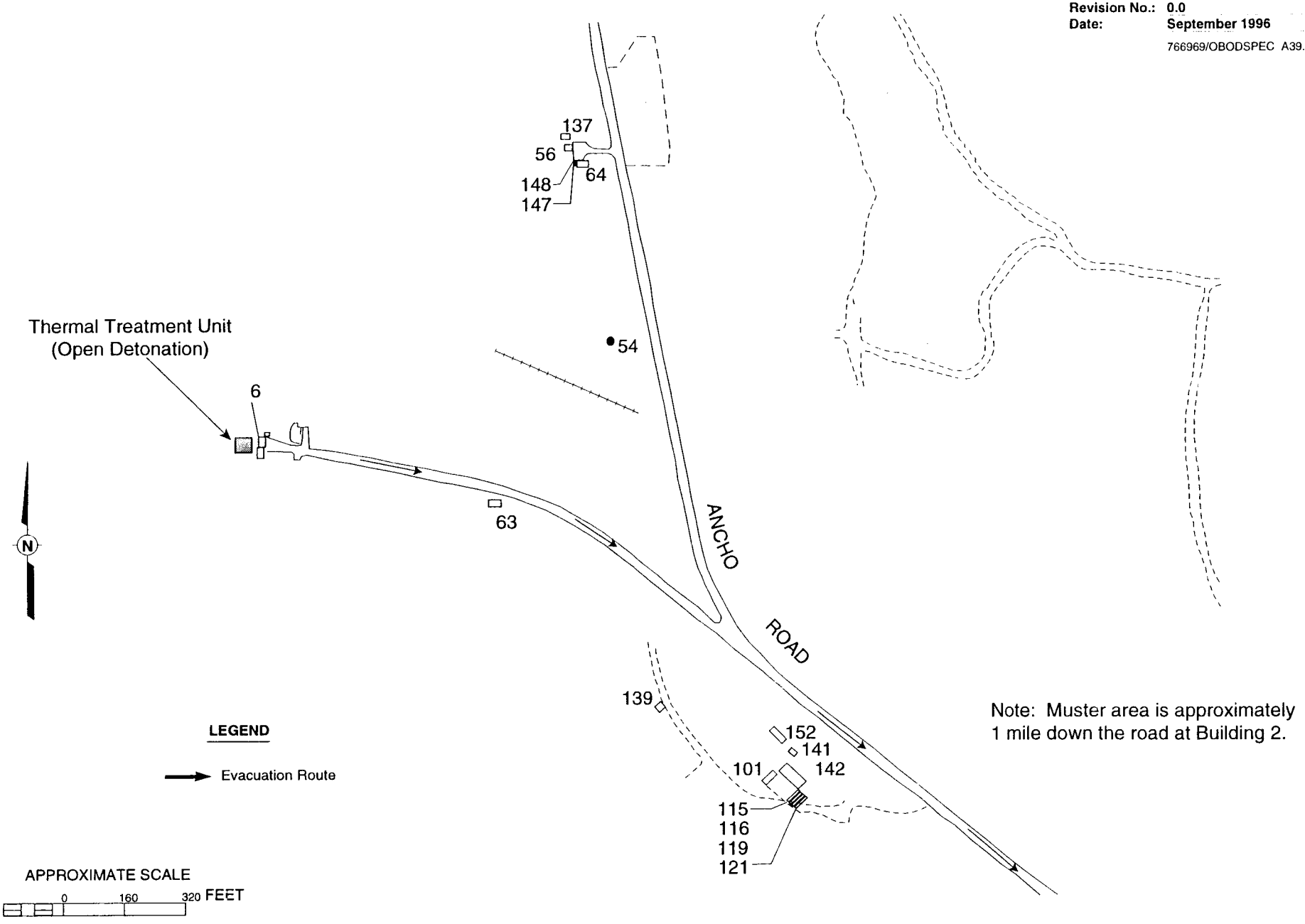

Figure 7-4
Evacuation Route and Muster Area for the Thermal Treatment Unit near Technical Area 39, Building 6

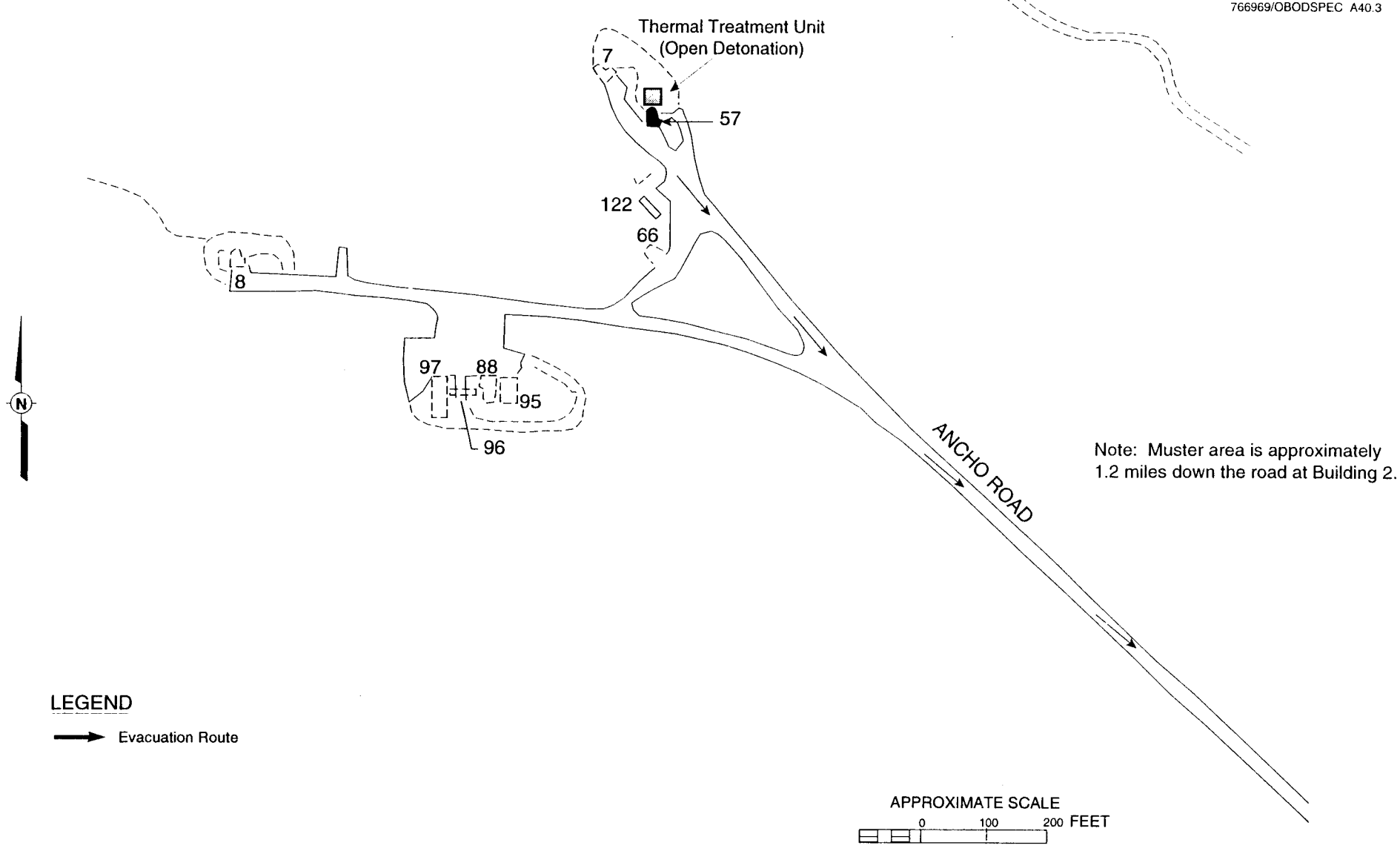

Figure 7-5
Evacuation Route and Muster Area for the Thermal Treatment Unit near Technical Area 39, Building 57

ATTACHMENT 7-1

Emergency Equipment

Attachment 7-1

Emergency Equipment

Emergency equipment available near Technical Area (TA) 14, Building 23 (TA-14-23) for personnel conducting activities at the TA-14 open burning/open detonation (OB/OD) thermal treatment units:

FIRE CONTROL EQUIPMENT:

Fire extinguishers

Locations:
One fire extinguisher is located in each vehicle used to transport explosive material.
Five fire extinguishers are located outside the control bunker (TA-14-23).
Two fire extinguishers are located outside TA-14-6.

Description of General Capabilities:
The fire extinguishers may be used by any employee in the event of a small fire. Fire extinguishers are never used to put out controlled fires at the OB/OD thermal treatment units.

A fire hydrant is located at the TA-14 entry gate.

Description of General Capabilities:
The fire hydrant supplies water at adequate volume and pressure to satisfy the requirements of the New Mexico Administrative Code, Title 20, Chapter 4, Part 1 (20 NMAC 4.1), Part V, 264.32, revised November 1, 1995.

In the event that OB/OD thermal treatment may result in a potential fire hazard, local fire department personnel may be asked to stand by during treatment to control any fires that may be started.

SPILL CONTROL EQUIPMENT

Spill control equipment is located in a storage cabinet outside of TA-14-23.

Attachment 7-1

Emergency Equipment (Continued)

Emergency equipment available near TA-14-23 for personnel conducting activities at the TA-14 OB/OD thermal treatment units (Continued):

COMMUNICATION EQUIPMENT:

Telephones (Centrex and private lines) are located at the control building (TA-14-23). Personnel also have access to two-way radios while at the OB/OD thermal treatment units.

A siren at TA-14 serves as an evacuation alarm.

Description of General Capabilities:
Telephones are used for internal and external communication and have paging capabilities. Two-way radios allow personnel in the field to maintain contact with various operations personnel and may be used to request emergency personnel and equipment, if necessary. The evacuation alarm, which consists of a siren, is used at the treatment unit to alert personnel to clear the area and/or to warn of test operations.

DECONTAMINATION EQUIPMENT:

An eyewash station is located in TA-14-23, Room 104.

Material safety data sheets (MSDS) are available in Room 101 at the control building (TA-14-23).

Description of General Capabilities:
The eyewash station may be used by personnel who receive a chemical splash to the skin or eyes. Specific MSDSs should be obtained prior to working with hazardous and/or mixed waste to determine if the application of water is indicated for decontamination.

PERSONAL PROTECTIVE EQUIPMENT:

First aid kits and hearing protection are located in TA-14-23.

OTHER:

See Attachment 7-1 of the Los Alamos National Laboratory (LANL) General Part B for equipment available in the Hazardous Materials (HAZMAT) Response Group (ESH-10) vehicles and trailers.

Attachment 7-1

Emergency Equipment (Continued)

Emergency equipment available near TA-15-184 for personnel conducting activities at the TA-15 OD thermal treatment unit:

FIRE CONTROL EQUIPMENT:

Fire extinguishers

Locations:
Two vehicular-mounted Halon (ABC) fire extinguishers are located at the control bunker (TA-15-310).

Description of General Capabilities:
The fire extinguishers may be used by any employee in the event of a small fire.

Four fire alarm pull stations are located inside TA-15-184, TA-15-185, TA-15-186, and TA-15-310.

Description of General Capabilities:
Fire alarms may be activated by any employee in the event of a fire to notify the Central Alarm Station (CAS).

One fire hydrant is located near the entrance to TA-15-186.

Description of General Capabilities:
The fire hydrant supplies water at adequate volume and pressure to satisfy the requirements of 20 NMAC 4.1, Part V, 264.32, revised November 1, 1995.

In the event that thermal treatment may result in a potential fire hazard, local fire department personnel may be asked to stand by during OD to control any fires that may be started.

SPILL CONTROL EQUIPMENT:

Various types of sorbents are available at TA-15-185.

Attachment 7-1

Emergency Equipment (Continued)

Emergency equipment available near TA-15-184 for personnel conducting activities at the TA-15 OD thermal treatment unit (Continued):

COMMUNICATION EQUIPMENT:

Telephones (Centrex and private lines) are located at TA-15-310 and at the control building (TA-15-185). Personnel have access to two-way radios while at the treatment unit. TA-15 is equipped with fire and evacuation alarms.

Description of General Capabilities:
Telephones are used for internal and external communication and have paging capabilities. Two-way radios allow personnel in the field to maintain contact with various operations personnel and may be used to request emergency personnel and equipment, if necessary. The fire alarm is activated in the event of a fire to notify the CAS. The evacuation alarm, which consists of horns and sirens, is used at the treatment unit to alert personnel to clear the area and/or to warn of test operations.

DECONTAMINATION EQUIPMENT:

An eyewash station is located at TA-15-185.

MSDSs are available at the group office (TA-15-183).

Description of General Capabilities:
The eyewash station may be used by personnel who receive a chemical splash to the skin or eyes. Specific MSDSs should be obtained prior to working with hazardous or mixed waste to determine if the application of water is indicated for decontamination.

PERSONAL PROTECTIVE EQUIPMENT:

First aid kits and hearing protection are located in TA-15-183.

OTHER:

See Attachment 7-1 of the LANL General Part B for equipment available in the HAZMAT vehicles and trailers.

Attachment 7-1

Emergency Equipment (Continued)

Emergency equipment at TA-36-8 available for personnel conducting activities at the TA-36 OD thermal treatment unit:

FIRE CONTROL EQUIPMENT:

Fire extinguishers

Locations:
1 carbon dioxide (CO_2) fire extinguisher is located in the control bunker (TA-36-8).
1 water (A) fire extinguisher is located in TA-36-8.
A Halon (ABC) fire extinguisher is located in each vehicle (2 total) used to transport explosive material.

Description of General Capabilities:
These fire extinguishers may be used by any employee in case of a fire. The water fire extinguisher is for use on wood or brush fires. The CO_2 fire extinguisher is for use on electrical fires. The Halon fire extinguishers are for use in the event of an uncontrolled fire on the firing mound.

A fire alarm pull station is located in the main chamber of TA-36-8.

Description of General Capabilities:
Manually-operated fire alarms may be activated by any employee in the event of a fire to notify the CAS.

An automatic thermal alarm system is located in TA-36-8.

Description of General Capabilities:
Two alarms are connected to this system. One is located on the ceiling of the main chamber and one is located on the ceiling of the camera room.

In the event that thermal treatment may result in a potential fire hazard, local fire department personnel may be asked to stand by during OD to control any fires that may be started.

Attachment 7-1

Emergency Equipment (Continued)

Emergency equipment at TA-36-8 available for personnel conducting activities at the TA-36 OD thermal treatment unit (Continued):

COMMUNICATION EQUIPMENT:

Telephones and two-way radios

Locations:
3 telephones are located inside the control bunker.
1 telephone is located at the firing mound.
1 two-way radio is located in the make-up building (TA-36-7).
1 two-way radio is located inside TA-36-8.
1 two-way radio is issued to each firing site vehicle.

Description of General Capabilities:
Telephones for internal and external communication are available for use by any employee.

Fire and evacuation alarms

Description of General Capabilities:
The fire alarm is activated in the event of a fire to notify the CAS. The evacuation alarm, which consists of horns and sirens, is used at the treatment unit to alert personnel to clear the area and/or to warn of test operations.

DECONTAMINATION EQUIPMENT:

An eyewash station and MSDSs are available in the main chamber of TA-36-8.

Description of General Capabilities:
The eyewash may be used by personnel who receive a chemical splash to the eyes. Specific MSDSs should be obtained prior to working with hazardous or mixed waste to determine if the application of water is indicated for decontamination.

PERSONAL PROTECTIVE EQUIPMENT:

Two self-contained breathing apparatus are located in TA-36-8. First aid kits and hearing protection are also located in TA-36-8.

OTHER:

See Attachment 7-1 of the LANL General part B for equipment available in HAZMAT vehicles and trailers.

Attachment 7-1

Emergency Equipment (Continued)

Emergency equipment available at TA-39-6 and TA-39-57 for personnel conducting activities at the TA-39 OD thermal treatment units:

FIRE CONTROL EQUIPMENT:

Fire extinguishers

Locations:
One fire extinguisher is located in each vehicle used to transport explosive material. A fire extinguisher is located in each control building (TA-39-6 and TA-39-57).

Description of General Capabilities:
The fire extinguishers may be used by any employee in the event of a small fire. Fire extinguishers are never used to extinguish controlled fires at the thermal treatment units.

Fire alarm pull stations are located in TA-39-6 and TA-39-57.

Description of General Capabilities:
Fire alarms may be activated by any employee in the event of a fire to notify the CAS.

A fire hydrant is located near TA-39-98.

Description of General Capabilities:
The fire hydrant supplies water at adequate volume and pressure to satisfy the requirements of 20 NMAC 4.1, Part V, 264.32, revised November 1, 1995.

In the event that thermal treatment may result in a potential fire hazard, local fire department personnel may be asked to stand by during OD to control any fires that may be started.

SPILL CONTROL EQUIPMENT:

Various types of sorbents are available at TA-39.

Attachment 7-1

Emergency Equipment (Continued)

Emergency equipment at TA-39-6 and TA-39-57 available for personnel conducting activities at the TA-39 OD thermal treatment units (Continued):

COMMUNICATION EQUIPMENT:

Telephones (Centrex and private lines) are located at the control buildings (TA-39-6 and TA-39-57). Personnel also have access to two-way radios while at the thermal treatment units.

Description of General Capabilities:
Telephones are used for internal and external communication and have paging capabilities. Two-way radios allow personnel in the field to maintain contact with various operations personnel and may be used to request emergency personnel and equipment, if necessary.

DECONTAMINATION EQUIPMENT:

Portable eyewashes are available for use at the TA-39 OD treatment units.

MSDSs are available at the control buildings (TA-39-6 and TA-39-57).

Description of General Capabilities:
The eyewash station may be used by personnel who receive a chemical splash to the skin or eyes. Specific MSDSs should be obtained prior to working with hazardous or mixed waste to determine if the application of water is indicated for decontamination.

PERSONAL PROTECTIVE EQUIPMENT:

First aid kits and hearing protection are located in TA-39-6 and TA-39-57.

OTHER:

See Attachment 7-1 of the LANL General Part B for equipment available in the HAZMAT vehicles and trailers.

8.0 PERSONNEL TRAINING PLAN

Personnel working at the open burning/open detonation thermal treatment units at Technical Area (TA) 14, TA-15, TA-36, and TA-39 will be trained appropriately, as discussed in Section 8.0 of the Los Alamos National Laboratory General Part B.

9.0 CLOSURE PLAN

This section describes the activities necessary to close the hazardous and/or low-level mixed waste open burning/open detonation (OB/OD) thermal treatment units at Los Alamos National Laboratory (LANL) Technical Area (TA) 14, TA-15, TA-36, and TA-39 addressed in this Part B permit application. The activities detailed in this section are included to address the closure requirements specified in the New Mexico Administrative Code, Title 20, Chapter 4, Part 1 (20 NMAC 4.1), Subpart IX, 270.14(b)(13), and 20 NMAC 4.1, Subpart V, Part 264, Subparts G and X, revised November 1, 1995. This closure plan addresses closure procedures specific to the OB/OD thermal treatment units.

General closure information applicable to all hazardous and mixed waste management units at LANL and general sampling and analytical procedures to be used during closure activities are presented in Section 9.0 of the LANL General Part B.

9.1 CLOSURE PROCEDURES FOR THE OB/OD THERMAL TREATMENT UNITS [20 NMAC 4.1, Subpart V, 264.112; 20 NMAC 4.1, Subpart VI, 265.381]

The hazardous and low-level mixed waste OB/OD thermal treatment units addressed in this Part B permit application are located at TA-14, TA-15, TA-36, and TA-39 at LANL. Figure 9-1 shows the locations of TAs within LANL. Figures 9-2 through 9-6 show the specific locations of the OB/OD thermal treatment units at the respective TAs. Detailed unit descriptions are provided in Section 4.0 of this Part B permit application. The closure schedule for the OB/OD thermal treatment units is outlined in Table 9-1.

9.2 DESCRIPTION OF WASTE/ESTIMATE OF MAXIMUM WASTE CAPACITY

The following sections provide information on the waste types and quantities managed at the OB/OD thermal treatment units at TA-14, TA-15, TA-36, and TA-39.

9.2.1 TA-14

The thermal treatment units at TA-14 are located near Building 23 (TA-14-23) and are used to treat hazardous explosive waste by OB or OD. The OB thermal treatment unit has a maximum treatment capacity of 50 pounds of waste per burn; the OD thermal treatment unit has a maximum treatment capacity of 20 pounds of waste per detonation. Hazardous waste that may be treated at the TA-14 OB/OD thermal treatment units includes waste generated during research and development

activities and processing and recovery operations at various TAs throughout LANL. Information on the hazardous component of these wastes is provided in Section 3.0 of this Part B permit application.

9.2.2 TA-15

The thermal treatment unit located near TA-15-184 may be used to treat solid and liquid hazardous and/or low-level mixed explosive waste by OD. The OD thermal treatment unit has a maximum treatment capacity of 500 pounds of waste per detonation. Waste that may be treated at the TA-15 OD thermal treatment unit includes waste generated during research and development activities and processing and recovery operations at various TAs throughout LANL. The low-level mixed wastes are classified as mixed waste because they may exhibit Resource Conservation and Recovery Act (RCRA)-toxicity characteristics[1] and have a radioactive waste component. Information on the hazardous waste component(s) is provided in Section 3.0 of this Part B permit application.

9.2.3 TA-36

The thermal treatment unit located at TA-36 adjacent to TA-36-8 is used to treat solid and liquid hazardous and/or low-level mixed explosive waste by OD. The OD thermal treatment unit has a maximum treatment capacity of 2,000 pounds of waste per detonation. Waste that may be treated at the TA-36 OD thermal treatment unit includes waste generated during research and development activities and processing and recovery operations at various TAs throughout LANL. The low-level mixed wastes are classified as mixed waste because they may exhibit RCRA-toxicity characteristics[1] and have a radioactive waste component. Information on the hazardous waste component(s) is provided in Section 3.0 of this Part B permit application.

9.2.4 TA-39

The thermal treatment units located at TA-39 adjacent to TA-39-6 and TA-39-57 are used to treat hazardous explosive waste by OD. Each OD thermal treatment unit has a maximum treatment capacity of 1,000 pounds of waste per detonation. Hazardous waste that may be treated at the TA-39 OD thermal treatment units includes waste generated during research and development activities and processing and recovery operations at various TAs throughout LANL. Information on the hazardous waste component(s) is provided in Section 3.0 of this Part B permit application.

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[1] Use of the term "RCRA-toxicity characteristics" refers to hazardous waste or hazardous constituents as defined in 20 NMAC 4.1, Subpart II, Part 261, revised November 1, 1995.

9.3 REMOVAL OF WASTE

Prior to the initiation of closure activities, wastes will be treated at or removed from the OB/OD thermal treatment unit to be closed. Containers and packaged waste may be removed from the unit manually or with container-handling equipment, depending on the size, shape, and weight of the container. Flatbed trucks or trailers may be used for transport of the wastes. Appropriate shipping papers will accompany the wastes during transport. Remaining hazardous and/or mixed wastes will be moved to an approved on-site storage unit or to an off-site permitted treatment, storage, and disposal facility.

9.4 CLOSURE AND DECONTAMINATION PROCEDURES

To the extent possible, contaminated structures and equipment associated with a OB/OD thermal treatment unit to be closed will be decontaminated (if necessary) and removed. Structures, equipment, and media that cannot be decontaminated will be containerized and managed in compliance with appropriate regulations. Sampling conducted during closure and decontamination procedures will be done in accordance with quality assurance/quality control (QA/QC) procedures (see Section 9.1.8 of the LANL General Part B). Before proceeding with closure activities, the OB/OD thermal treatment unit and associated structures and equipment will be surveyed for radiological contamination, if necessary, and a thorough visual inspection will be conducted for unexploded explosive scrap. Personal protective equipment (PPE) and monitoring requirements will be determined by LANL's Health Physics Operations (ESH-1) and Industrial Hygiene and Safety (ESH-5) Groups, and groups within the Dynamic Experimentation (DX) Division (for explosives handling) following the initial field inspection. Radiation and chemical monitoring will occur throughout closure activities, as appropriate. If any contamination is found, the contaminated material will be decontaminated (if possible) or containerized and taken to an approved storage location at LANL appropriate for the waste type.

Personnel involved in closure activities will wear appropriate PPE, specified by ESH-1, ESH-5, and DX, and will follow good hygiene practices to protect employees from exposure to hazardous and/or low-level mixed waste. The level of PPE required will depend upon the levels of radiological and/or chemical contamination detected, if any. If ESH-1, ESH-5, and DX surveys do not indicate detectable contamination levels, minimum PPE requirements will consist of coveralls, steel-toed footwear, and safety glasses or face shields. If an overhead danger is present, a hard hat will be worn. Workers involved in closure activities will be required to have training and medical monitoring.

Contaminated PPE will either be decontaminated or managed in compliance with appropriate regulations.

Before decontamination activities begin, two samples of clean water and detergent (wash water) solution squeezed from mops and/or sponges prior to use will be collected for analysis of the parameters listed in Table 9-2 to provide a baseline for decontamination verification. Structures and equipment at the OB/OD thermal treatment unit requiring decontamination will be wiped down with wash water solution. Mops and/or sponges will be used to minimize the amount of liquid waste generated as a result of decontamination activities. The washdown solution will be contained using portable berms and/or other containment structures and equipment, as appropriate. Wash water generated from equipment decontamination activities will be contained by the portable berms and/or containment structures.

Used wash water will be collected and transferred to appropriate containers and sampled for the parameters listed in Table 9-2. The wash cycles will continue until the structures and equipment at the OB/OD thermal treatment unit have been cleaned to established levels (see Section 9.6). The used wash water will be managed appropriately in accordance with LANL policy.

Prior to the initiation of closure activities, background soil samples will be collected in the vicinity of the OB/OD thermal treatment unit and analyzed for the parameters listed in Table 9-2. After the structures and equipment have been decontaminated (if possible), removed, and managed, as appropriate, a statistically representative number of soil samples will be collected in the vicinity of the OB/OD thermal treatment unit and analyzed for the parameters listed in Table 9-2. Samples will be collected to a depth of 6 inches and will be spaced to ensure that samples are representative of the entire area covered by the OB/OD thermal treatment unit. Soil sampling will be conducted by the methods described in Section 9.2 of the LANL General Part B. Samples will be analyzed for the parameters listed in Table 9-2. If contamination is found in any of the soil samples as a result of treatment activities, the contaminated soil will be removed to statistically significant levels based on concentrations in the background soil samples.

9.5 DECONTAMINATION EQUIPMENT

Prior to use, reusable decontamination equipment will be rinsed with distilled water. Decontamination equipment rinsate blanks will be collected and analyzed in accordance with QA/QC procedures (see Section 9.1.8 of the LANL General Part B). Reusable protective clothing,

tools, and equipment used during closure activities will be scraped as necessary to remove any residue and cleaned with wash water. Residue and disposable or reusable equipment that cannot be decontaminated will be containerized and managed as appropriate for the waste type. Used wash water will be collected and analyzed for the parameters listed in Table 9-2 and managed appropriately in accordance with LANL policy.

9.6 DECONTAMINATION VERIFICATION

Sufficient sampling and analysis will be required to demonstrate that hazardous waste or hazardous waste residue (or the hazardous waste component[s] of mixed waste or mixed waste residue) is not present at the site after closure. Two samples of clean wash water squeezed from mops and/or sponges prior to use will be collected before initial washdowns of the various equipment and structures associated with the OB/OD thermal treatment unit. The samples will be analyzed for the applicable parameters listed in Table 9-2 to provide baseline data for decontamination verification. Analytical procedures will conform to methods found in the U.S. Environmental Protection Agency (EPA) "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods," (SW-846) (EPA, 1986). Used wash water will also be analyzed for the applicable parameters listed in Table 9-2. Used wash water will be considered contaminated if it shows a significant increase (i.e., determined using statistical methods defined in SW-846) in the analytical parameters over the clean wash water. If subsequent washdowns are deemed necessary, an additional sample of clean wash water squeezed from mops and/or sponges prior to use will be taken for each additional washdown event.

Successful decontamination meets one of the following criteria:

- No detectable hazardous waste or hazardous constituents from treatment activities are found in the final sample.
- Detectable hazardous waste or hazardous constituents from treatment activities in the final sample are removed to statistically significant levels based on baseline concentrations in the clean wash water or established background soil data.
- Detectable hazardous waste or hazardous constituents from treatment activities in the final sample are at or below levels agreed upon with the New Mexico Environment Department.

If detectable hazardous waste or hazardous constituent concentrations from treatment activities do not significantly decrease after several washdowns, LANL will amend this closure plan to address appropriate closure procedures or post-closure care requirements pursuant to 20 NMAC, 4.1, Subpart V, 264.117 through 264.120, revised November 1, 1995.

Table 9-1

Closure Schedule for the Open Burning/Open Detonation Units

Activity	Maximum Time Required[a]
Let contract request for proposals	-90 Days
Notify the New Mexico Environment Department (NMED)	-45 Days
Receive proposals	-30 Days
Select contractor and award contract	-10 Days
Collect background samples (if appropriate)	-5 Days
Final treatment of waste	Day 0
Begin closure activities (perform washdown of structures and/or equipment)	Day 10
Perform initial sampling of the waste management unit	Day 15
Analyze samples	Day 45
Perform additional washdown (if necessary)	Day 50
Perform additional sampling (if necessary)	Day 60
Analyze samples (if necessary)	Day 90
Perform final cleanup (e.g., removal of decontaminated equipment and decontamination wastes)	Day 120
Verify decontamination	Day 150
Submit final report to NMED	Day 180

[a] The schedule above indicates calendar days from the beginning by which activities will be completed. Some activities may be conducted simultaneously and/or may not require the maximum time listed.

Table 9-2

Analytical Parameters and Test Methods[a] for the Open Burning/Open Detonation Units

Parameter	Test Method	Reference[b]
Ignitability	Pensky-Martens closed-cup method	(L, S) SW1010 (L, S) ASTM D93-80
Reactivity	Test method to determine hydrogen cyanide (HCN) released from waste	(L,S) HCN Test Method SW, Section 7.3
	Test method to determine hydrogen sulfide (H_2S) released from waste	(L, S) H_2S Test Method, SW, Section 7.3
Corrosivity	Electrometric (pH of aqueous solution)	(L) SW9040B
Toxicity characteristic	Toxicity characteristic leaching procedure (TCLP) extraction	(S) SW1311
Metals	Graphite furnace atomic absorption (AA) spectroscopy, gaseous hydride AA, or direct aspiration AA	
Arsenic		(L,S) SW7060A, SW7061A
Barium		(L,S) SW7080A, SW7081
Cadmium		(L,S) SW7130, SW7131A
Chromium		(L,S) SW7190, SW7191
Lead		(L,S) SW7420, SW7421
Selenium		(L,S) SW7740, SW7741A
Silver		(L,S) SW7760A, SW7761
Mercury	Manual cold-vapor technique	(L) SW7470A, (S) SW7471A
Volatile organics	Gas chromatography/mass spectrometry (GC/MS)	(L,S) SW8240B
	GC/MS capillary column technique	(L,S) SW8260A
Semivolatile organics	GC/MS	(L,S) SW8250A
	GC/MS capillary column technique	(L,S) SW8270B
Organochlorine pesticides	TCLP extraction and GC	(L,S) SW8080A
Chlorinated herbicides		(L,S) SW8150B

Refer to footnotes at end of table.

Table 9-2 (Continued)

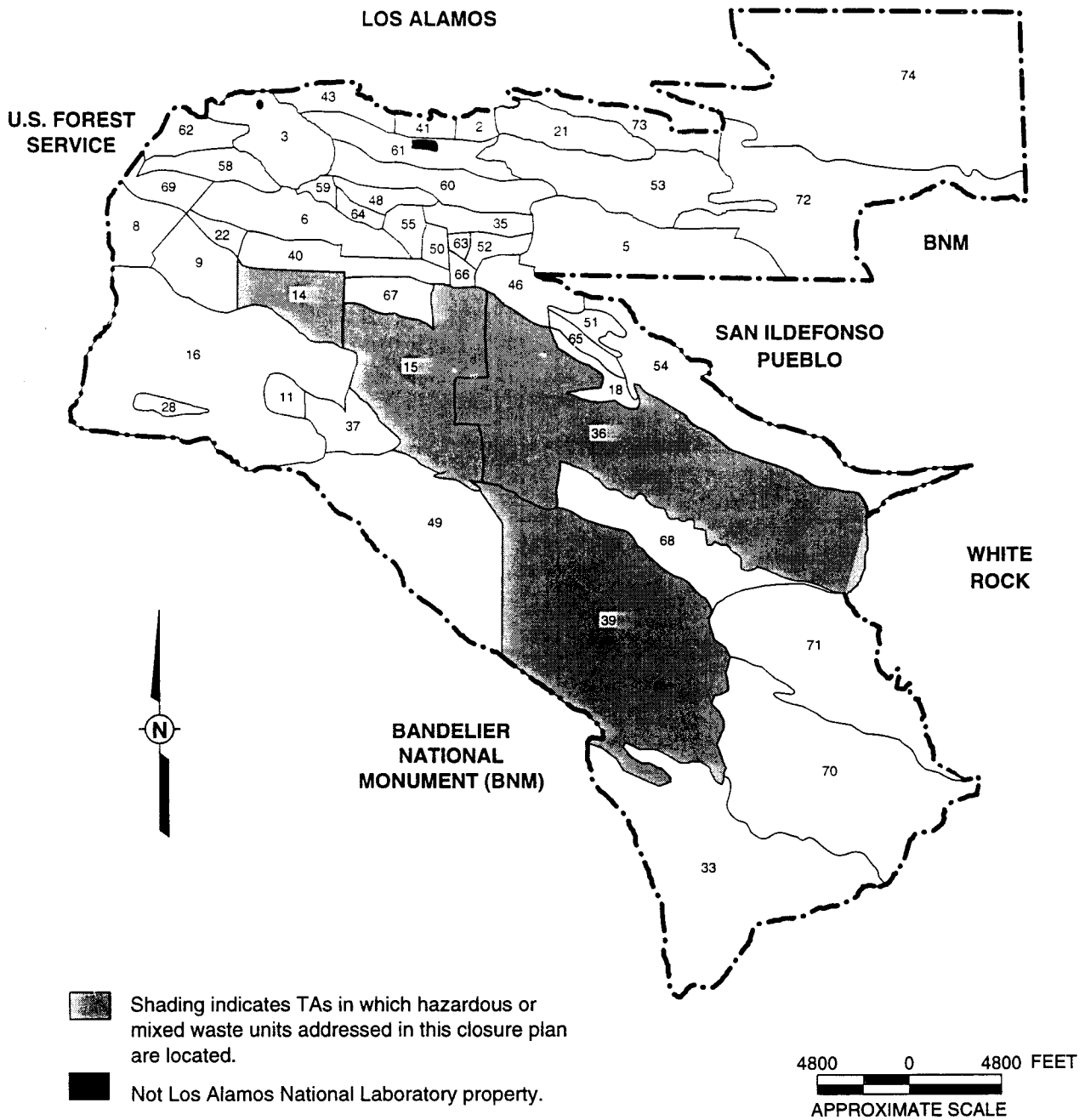
Analytical Parameters and Test Methods[a] for the Open Burning/Open DetonationUnits

Parameter	Test Method	Reference[b]
Total metals[c]	Acid digestion Inductively coupled plasma emission spectroscopy	(L) SW3010A, (S) SW3050A (L,S) SW6010A
Arsenic		(L,S) SW6010A
Barium		(L,S) SW6010A
Beryllium		(L,S) SW6010A
Cadmium		(L,S) SW6010A
Chromium		(L,S) SW6010A
Lead		(L,S) SW6010A
Nickel		(L,S) SW6010A
Selenium		(L,S) SW6010A
Silver		(L,S) SW6010A
Thallium		(L,S) SW6010A
Zinc		(L,S) SW6010A
Mercury	Manual cold-vapor technique	(L) SW7470A, (S) SW7471A
Free liquids	Paint Filter Liquids Test	(S) SW9095

[a] At Los Alamos National Laboratory, current analytical capabilities include limited analyses of mixed waste samples. These analyses include, but are not limited to, gross alpha, beta, and gamma screening.

[b] "ASTM" refers to American Society for Testing and Materials standards.
"SW" refers to U.S. Environmental Protection Agency, 1986, "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods," *SW-846*.
(L) refers to liquid waste.
(S) refers to solid waste.

[c] See also atomic absorption methods.



Shading indicates TAs in which hazardous or mixed waste units addressed in this closure plan are located.

Not Los Alamos National Laboratory property.

Note: TA-57, the Fenton Hill Geothermal Site, is not shown on this figure.

Modified from Los Alamos National Laboratory, 1994, "Environmental Surveillance at Los Alamos During 1992," LA-12764-ENV, Los Alamos National Laboratory, Los Alamos, New Mexico.

Figure 9-1
Technical Areas (TA) Where Open Burning/Open Detonation Units Addressed in the Closure Plan Are Located

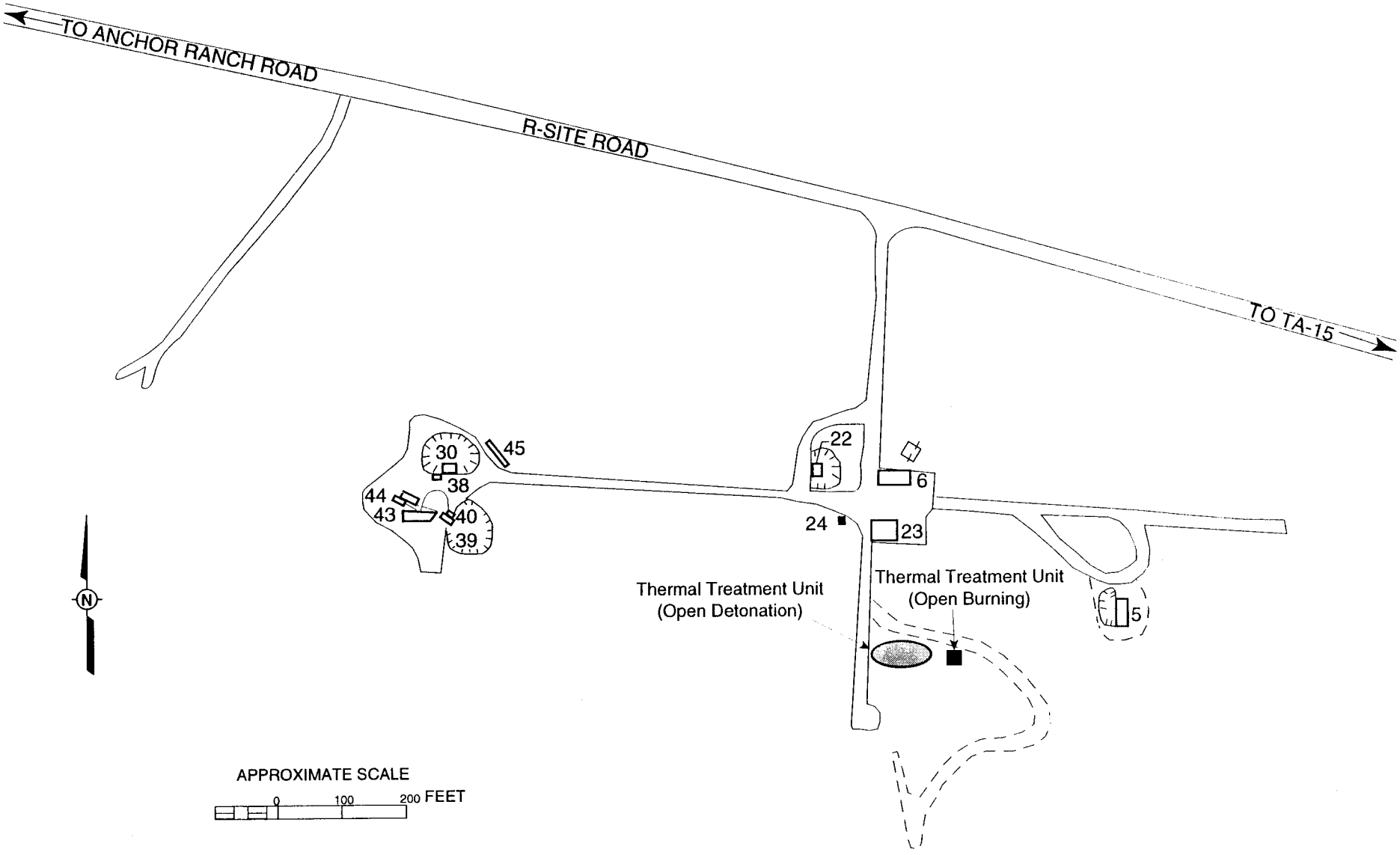


Figure 9-2
Location Map Showing the Thermal Treatment Units near Technical Area (TA) 14, Building 23

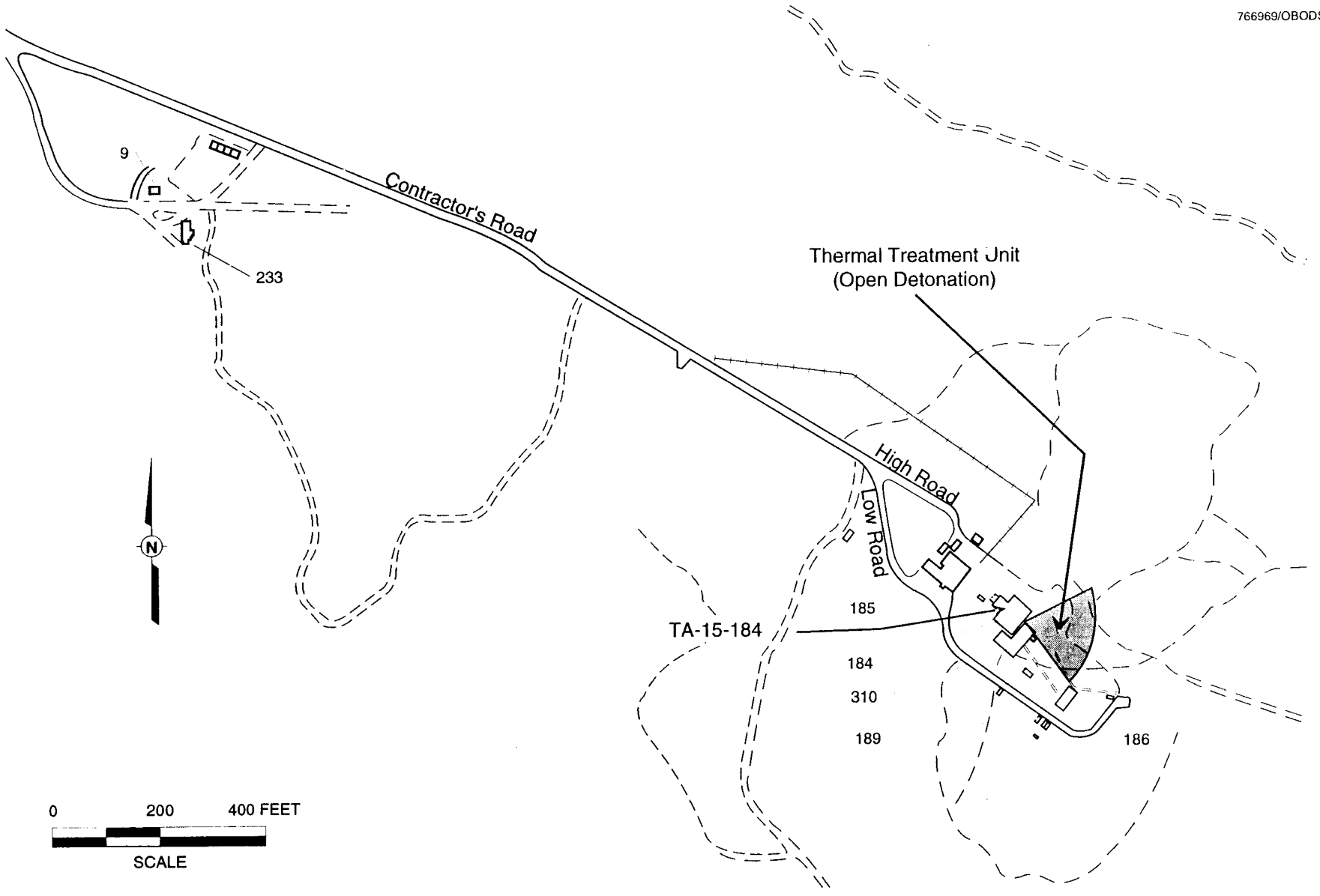


Figure 9-3
Location Map Showing the Thermal Treatment Unit near Technical Area (TA) 15, Building 184

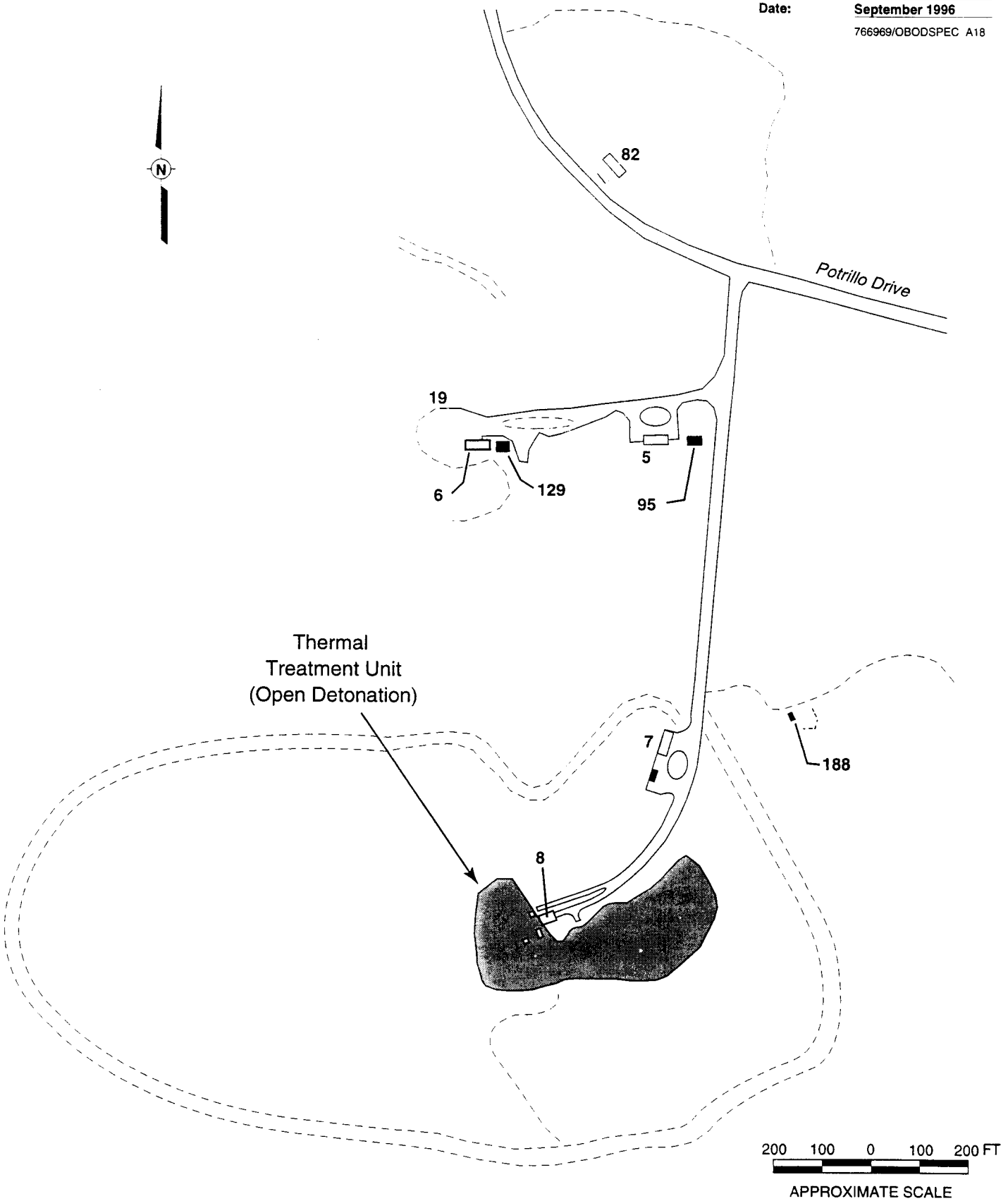


Figure 9-4
Location Map Showing the Thermal Treatment Unit near Technical Area 36, Building 8

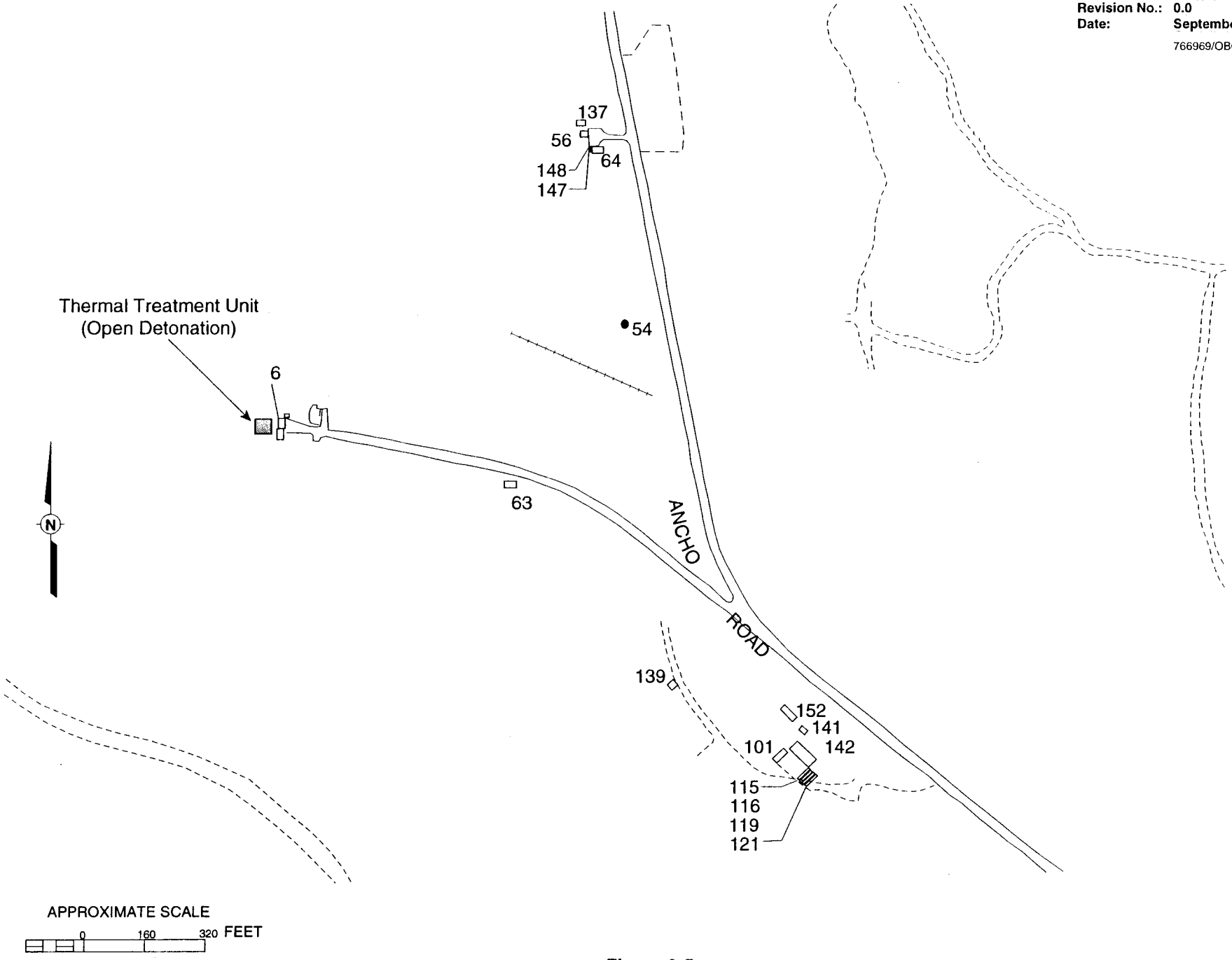


Figure 9-5
Location Map Showing the Thermal Treatment Unit near Technical Area 39, Building 6

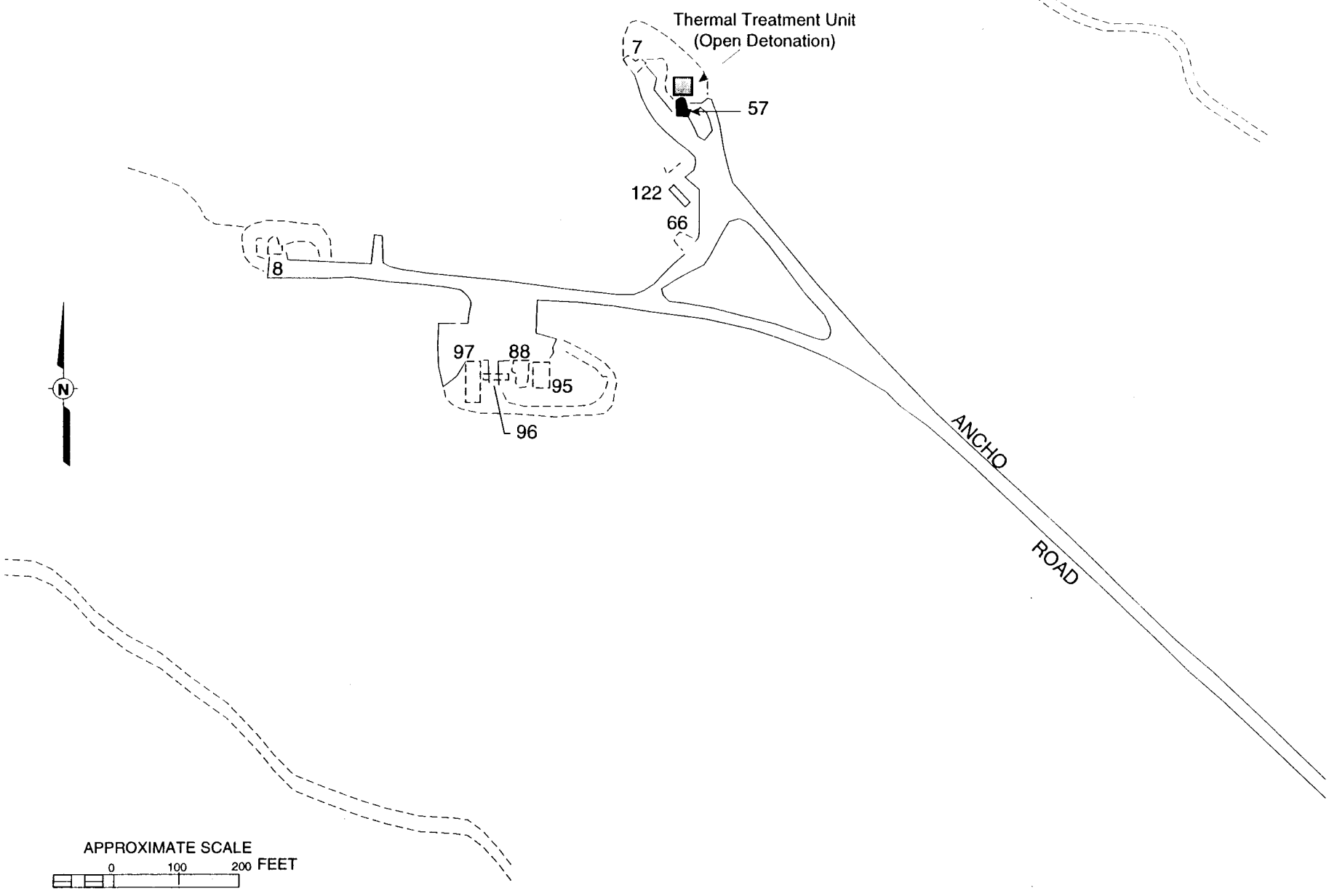


Figure 9-6
Location Map Snowing the Thermal Treatment Unit near Technical Area 39, Building 57

10.0 CORRECTIVE ACTION FOR SOLID WASTE MANAGEMENT UNITS

This section describes selected solid waste management units (SWMU) that have been identified in Technical Area (TA) 14, TA-15, TA-36, and TA-39 at Los Alamos National Laboratory (LANL). Because these TAs encompass large areas and contain a large number of or widely distributed SWMUs, this section addresses only those SWMUs that may reasonably be expected to potentially impact the units included in this Part B permit application. Information on the remaining SWMUs in these TAs is contained in Revision 1.0 of LANL's "Solid Waste Management Units Report" (LANL, 1990), hereinafter referred to as the 1990 SWMU Report, and in the Resource Conservation and Recovery Act (RCRA) Facility Investigation (RFI) work plans for the various operable units encompassing these TAs (see Section 10.1). The information in this section is being submitted in response to regulatory requirements in the New Mexico Administrative Code, Title 20, Chapter 4, Part 1 (20 NMAC 4.1), Subpart IX, 270.14(d), revised November 1, 1995.

LANL uses the definition of a SWMU presented in "Module VIII: Special Conditions Pursuant to the 1984 Hazardous and Solid Waste Amendments to RCRA for Los Alamos National Laboratory, EPA I.D. NM0890010515" (U.S. Environmental Protection Agency [EPA], 1994c), hereinafter referred to as Module VIII. This definition states that SWMUs are "any discernible unit at which solid wastes have been placed at any time, irrespective of whether the unit was intended for the management of solid or hazardous waste. Such units include any area at or around a facility at which solid wastes have been routinely and systematically released."

10.1 SWMU DESCRIPTIONS

Several types of SWMUs are present in TA-14, TA-15, TA-36, and TA-39. These SWMUs include those identified for corrective actions in Module VIII, as modified following a Class III permit modification effective May 19, 1994; SWMUs that are active hazardous/mixed waste management units; and SWMUs identified in the 1990 SWMU Report. Descriptions of the SWMUs are presented in the following sections. These descriptions were compiled from the "RFI Work Plan for Operable Unit 1085" (LANL, 1994b); from the "RFI Work Plan for Operable Unit 1086" (LANL, 1993b); from the "RFI Work Plan for Operable Unit 1130" (LANL, 1993c); from the "RFI Work Plan for Operable Unit 1132" (LANL, 1993d); and from the 1990 SWMU Report. Brief unit and waste descriptions are also provided in Table 10-1. Figures 10-1 through 10-4 show the locations of the selected SWMUs at TA-14, TA-15, TA-36, and TA-39, respectively.

10.1.1 TA-14 SWMUs

SWMUs at TA-14 and in the vicinity of the TA-14 open burning/open detonation (OB/OD) thermal treatment units include pullboxes, firing sites, a burning area, storage areas, a burn cage, a sump, and a septic system.

10.1.1.1 Pullboxes

SWMU Nos. 14-001(a-e) are small structures referred to as pullboxes or pits. Each pullbox measures 26- by 32- by 32-inches and contains a capacitor discharge unit used to initiate a detonation (LANL, 1994b). SWMU Nos. 14-001(a-e) are associated with structures TA-14-25, TA-14-26, TA-14-27, TA-14-28, and TA-14-29, respectively. Waste materials potentially present in or near the pullboxes include various types of explosives, lead, uranium, strontium-90, and beryllium (LANL, 1990).

10.1.1.2 Firing Sites

A firing site [SWMU No. 14-001(g)] is located approximately 75 feet south of structure TA-14-23 (i.e., the control building) at TA-14. The firing area was constructed in 1964 and consists of a three-sided blast shield and a concrete pad. The concrete pad measures six feet square by two feet thick and is overlain with a neoprene shock pad and a 4.5-inch-thick steel plate. Several inches of sand cover the entire pad assembly (LANL, 1994b). Waste materials currently managed or potentially present at this SWMU include various types of explosives, lead, beryllium, strontium-90, and uranium (LANL, 1990).

SWMU No. 14-002(c) is a former firing site control building (TA-14-5) constructed in 1944. The control building measures 11- by 18- by 10-feet; the site originally had a concrete bunker and 0.5-inch steel plate (LANL, 1994b). Two firing pads [SWMU Nos. 14-002(d) and 14-002(e)] are associated with TA-14-5 and are located south of the building, approximately 35 feet apart. Explosives testing on each of the pads was controlled from TA-14-5. Explosives testing at the site ceased in 1961 and the building was converted to a storage building. From 1980 until 1985, the area was the site of slow combustion experiments conducted in a 5-foot-diameter metal sphere (LANL, 1994b). The site has not been used since 1985. Potential contaminants may include various types of explosives as well as lead, uranium, and beryllium (LANL, 1990). SWMU Nos. 14-002(c-e) are identified in Module VIII.

10.1.1.3 Burning Area

An inactive trash burning area [SWMU No. 14-003] is located approximately 600 feet east of TA-14-23 (LANL, 1994b). This SWMU consists of an open dirt area surrounded by a 4.5-foot-high, horseshoe-shaped berm. The area was used in the 1950s and 1960s to burn explosives-contaminated materials (LANL, 1990; LANL, 1994b). Soil samples collected from the area indicate the presence of various metals, including barium and beryllium, as well as cesium-137 (LANL, 1990). SWMU No. 14-003 is identified in Module VIII.

10.1.1.4 Storage Areas

Satellite accumulation areas are or were located at TA-14-22, TA-14-23, and TA-14-35 and have been designated as SWMU Nos. 14-004(a), 14-004(b), and 14-004(c), respectively. These areas are or were used to store scrap explosives and explosives-contaminated items. SWMU No. 14-004(b) is identified in Module VIII. Currently, satellite accumulation areas at TA-14-23 are located in Room 104 and outside along the west wall of the building.

10.1.1.5 Burn Cage

A burn cage is located near Firing Mound 3 at TA-14 and is identified as SWMU No. 14-005 in Module VIII. The unit consists of an approximately 2.5-foot-wide, semicircular piece of 0.25-inch-thick steel with a wire mesh door and wire mesh top and bottom. The burn cage is approximately 3 feet tall and is situated on a steel burn tray. The burn cage has a capacity of approximately 3 cubic feet and is used to burn paper and small laboratory equipment contaminated with explosives (LANL, 1994b). This OB thermal treatment unit currently operates under the requirements of 20 NMAC 4.1, Subpart VI, revised November 1, 1995, and is one of the units for which this Part B permit application is being submitted.

10.1.1.6 Sump

A sump, an associated drainline, and an unpermitted outfall area serving TA-14-23 have been designated as SWMU No. 14-006 in Module VIII. The sump is constructed of steel and concrete and measures approximately 4.5 feet wide, 8.3 feet long, and 4.8 feet deep. The sump, which is now plugged, was formerly used to filter small pieces of explosives from liquid discharged through a drain in TA-14-23. The drainline extends approximately 20 feet from the building and drains down an embankment. Currently, the only discharge to the outfall is rainwater. The sump, filter, and drain may be contaminated with explosives (LANL, 1994b).

10.1.1.7 Septic System

A septic system is located in the central part of TA-14 and formerly served TA-14-6. The septic tank (TA-14-19) was installed in October 1944 and is constructed of reinforced concrete. It measures 4- by 7- by 6-feet and has a capacity of 640 gallons. The septic tank was connected to an overflow drainline that extended 130 feet from the building and drained into a ditch. In 1988, a leach field was installed replacing the drainline. Waste materials suspected or known to have been managed at the unit include photographic darkroom chemicals (e.g., organics, silver, cyanide) and sanitary effluents (LANL, 1994b). The septic tank was disconnected from TA-14-6 in 1992 and remains inactive. The unit is identified as SWMU No. 14-007 in Module VIII.

10.1.2 TA-15 SWMUs

SWMUs at TA-15 and in the vicinity of the TA-15 OD thermal treatment unit include firing sites, septic systems, underground storage tanks, and drainlines and outfalls.

10.1.2.1 Firing Sites

An active firing site is located near TA-15-184. The firing site consists of a chamber (TA-15-184), related equipment in a building complex, and a firing pad. The firing pad is comprised of a 12- by 24- by 0.5-foot steel pad and two bunkers that are used to temporarily stage scrap explosives awaiting detonation. This OD thermal treatment unit operates under the requirements of 20 NMAC 4.1, Subpart VI, revised November 1, 1995, for treatment of explosive waste and is one of the units for which this Part B permit application is being submitted. Potential hazardous constituents at the TA-15-184 firing site include barium, lead, mercury, depleted uranium, thorium, beryllium, and gallium. The firing pad and chamber are designated as SWMU Nos. 15-003 and 15-006(a), respectively, in the 1990 SWMU Report and in Module VIII.

Firing Site H [SWMU No. 15-004(h)] is an inactive firing site located in TA-15. In operation from 1948 until around 1953, Firing Site H was typically used for large-scale explosives tests. Potential constituents at this SWMU include uranium-238, beryllium, lead, and residual explosive material (LANL, 1993b).

10.1.2.2 Septic Systems

A septic system (TA-15-205), comprised of a 610-gallon septic tank and associated plumbing, serves TA-15-184. The unit is identified in the 1990 SWMU Report and in Module VIII as SWMU

No. 15-009(g). The septic system manages sanitary waste but may have also received mixed waste.

A drain connected to a sanitary sewer system serves the camera firing point at TA-15-92. This drain is identified in the 1990 SWMU Report and in Module VIII as SWMU No. 15-010(c). The unit was originally described as a septic system; however, more recent information suggests that the unit is actually a storm drain. The materials managed at this unit are unknown.

10.1.2.3 Underground Storage Tanks

A 1,036-gallon underground storage tank (TA-15-192) was located at TA-15. The tank, which contained propane, was relocated to TA-49 in December 1959. It is not known whether the tank leaked while located in TA-15 (LANL, 1993b). In the 1990 SWMU Report, the tank is designated as SWMU No. 15-013(a).

An additional underground storage tank (TA-15-287) was formerly located just north of TA-15-184. The 15,000-gallon tank was used to store mineral oil; the tank was removed in October 1992. Soil sampling conducted after the tank's removal indicated the presence of total petroleum hydrocarbons at concentrations below 15 parts per million (LANL, 1993b). In the 1990 SWMU Report and in Module VIII, the unit is designated as SWMU No. 15-013(b).

10.1.2.4 Drainlines and Outfalls

A drainline that serves a cooling tower (TA-15-202) is identified as SWMU No. 15-014(l) in the 1990 SWMU Report and in Module VIII. The drainline, located at the base of the cooling tower, drains cooling water into Water Canyon via a permitted outfall. A second drainline [SWMU No. 15-014(d)] is located south of TA-15-185. Hazardous constituents are not anticipated in either of these drainlines (LANL, 1993b).

An outfall [SWMU No. 15-014(e)] is located approximately 20 feet south and 6 feet east of the southeast corner of TA-15-184. The unit is connected via a 6-inch vitrified clay pipe to basement floor drains in TA-15-184 and drains through a 12-inch corrugated metal pipe into Water Canyon. Hazardous constituents are not expected at this outfall (LANL, 1993b).

10.1.3 TA-36 SWMUs

SWMUs at TA-36 and in the vicinity of the TA-36 OD thermal treatment unit include firing sites, storage areas, and waste storage containers.

10.1.3.1 Firing Sites

Two firing sites have been designated as SWMUs at TA-36. Constructed in 1950, the Meenie Firing Site is located at the headwaters of Fence Canyon. The Meenie Site is comprised of a magazine building, a control bunker, and an impact area and has been used for extensive gun testing (LANL, 1993c). Potential constituents at the Meenie Site may include depleted uranium, various heavy metals, plastics, explosives, and various other chemicals. This active firing site is identified in the 1990 SWMU Report as SWMU No. 36-004(b).

An additional firing site is also located at TA-36-8. The TA-36-8 firing site [SWMU No. 36-004(c)] was constructed in 1950 and is located approximately 800 feet south of the Meenie Site. This active firing site has been used for armor-piercing experiments involving the use of various metal penetrators (LANL, 1993c). The site may also operate under the requirements of 20 NMAC 4.1, Subpart VI, revised November 1, 1995, for OD thermal treatment of hazardous and mixed waste, scrap explosives, and unstable gas cylinders and is one of the units for which this Part B permit application is being submitted. Potential contaminants at the TA-36-8 site are the same as those described above for the Meenie Site.

10.1.3.2 Storage Areas

A surface storage area, known as the Boneyard, is located near TA-36-7. The Boneyard is an undeveloped area measuring approximately 500- by 300-feet that was used from the late 1970s until the late 1980s for storage of large waste items that had been used in explosives testing. Waste items stored at the Boneyard included metal drums, cans, cylinders, and scrap metals such as lead sheets, copper, uranium-contaminated steel, and iron. The Boneyard was extensively cleaned up in response to a 1986 field survey and is now used to store nonwaste items (LANL, 1993c). It is identified in the 1990 SWMU Report and in Module VIII as SWMU No. 36-005.

10.1.3.3 Waste Storage Containers

Active satellite waste storage containers at TA-36 are located inside Buildings 5, 7, and 8 and at a firing site near TA-36-8. The units are designated as SWMU Nos. 36-007(b), 36-007(c), 36-007(d), and 36-007(f), respectively, in the 1990 SWMU Report. Each waste storage container consists of

a small corrugated cardboard box lined with plastic. The boxes are used to store small quantities (less than 5 gallons) of explosives-contaminated solid waste items until the waste is treated (LANL, 1993c).

10.1.4 TA-39 SWMUs

SWMUs at TA-39 and in the vicinity of the TA-39 OD thermal treatment units include storage areas and firing sites.

10.1.4.1 Storage Areas

A storage area [SWMU No. 39-002(b)] is located on a concrete pad outside of TA-39-6. The area measures approximately 5 feet square and has been used since 1953 to store small quantities of contaminated paper materials. Chemical contaminants include waste solvents, such as ethanol, acetone, trichloroethane, and copper sulfate; transformer oil; vacuum grease; and photographic wastes. Waste materials are not currently stored in this area and there is no evidence of spills or leaks (LANL, 1993d).

SWMU No. 39-002(d) is a storage area located outside of TA-39-57. The area consists of a gravel pad that has been used since the 1980s to store the same type of wastes described above (LANL, 1993d). Spills or leaks in the area have not been observed or documented. Waste materials are not currently stored in this area.

A storage area [SWMU No. 39-002(f)] is associated with TA-39-88. The storage area, which is located on an asphalt driveway adjacent to the building, has been used since the 1980s to store small volumes of waste solvents, such as ethanol, acetone, trichloroethane, and copper sulfate; transformer oil; vacuum grease; and photographic wastes. Spills or leaks in the area have not been observed or documented. Waste materials are not currently stored in this area (LANL, 1993d).

10.1.4.2 Firing Sites

TA-39 contains one inactive and four active firing sites that have been designated as SWMU Nos. 39-004(a-e) in Module VIII and are associated with structures TA-39-7, TA-39-8, TA-39-6, TA-39-57, and TA-39-88, respectively. The firing sites associated with Buildings 7, 8, and 6 were established in 1953; the firing site associated with Building 57 was established in 1958; and the firing site associated with Building 88 was established in 1978. With the exception of SWMU No. 39-004(b), all of the firing sites are active. Operations at SWMU No. 39-004(b) were

discontinued in 1980 for safety reasons (LANL, 1993d). Each of the active firing sites consists of an open, sand-covered area surrounded by steep canyon walls which serve to attenuate most of the blast. The pads range in size from 500 to 7,700 square feet. Waste materials managed at the sites include uranium, mercury, lead, beryllium, and in the past, dielectric oil containing polychlorinated biphenyls (LANL, 1990). Residual explosives are also likely on and around the firing pads.

Two of the firing sites [SWMU Nos. 39-004(c) and 39-004(d)] are active hazardous waste management units operating under the requirements of 20 NMAC 4.1, Subpart VI, revised November 1, 1995, and are two of the OD thermal treatment units for which this Part B permit application is being submitted.

10.2 RELEASES

Some of the SWMUs listed in Table 10-1 are known or are suspected to have released hazardous waste or hazardous constituents. According to the 1990 SWMU Report, the firing sites at TA-14 [SWMU Nos. 14-001(f) and (g)] have resulted in the release of explosives to the surrounding areas. Uranium has also been detected in these areas (LANL, 1990).

The decommissioned firing site at TA-14 [SWMU Nos. 14-002(c-e)] is suspected to have released hazardous (e.g., explosives, metals) and radioactive materials to the surrounding area although the extent of contamination has not been adequately determined (LANL, 1994b; LANL, 1990).

Soil samples collected from the trash burning area [SWMU No. 14-003] indicate the presence of various metals, including barium and beryllium, as well as cesium-137 (LANL, 1990). The area is also suspected of being contaminated with explosives residues (LANL, 1994b). It is unknown whether contaminants have migrated beyond the area (LANL, 1990).

Samples of ash collected from the burn cage at TA-14 [SWMU No. 14-005] revealed the presence of heavy metals, polynuclear aromatic hydrocarbons, and radionuclides (e.g., cesium-137). It is not known whether the area around the burn cage is contaminated (LANL, 1990).

Soil in the area of the sump, drainline, and outfall at TA-14-23 [SWMU No. 14-006] is suspected to have been contaminated with explosives, although the extent of contamination has not been ascertained.

Barium is known to have been released from SWMU No. 15-003, although the extent of contamination is not known. Analyses of soil samples collected from various locations within the hazard radius of Firing Site H [SWMU No. 15-004(h)] indicate the presence of barium, beryllium, lead, and total uranium above instrument detection limits (LANL, 1993b).

Explosives testing conducted at TA-15-184 [SWMU Nos. 15-003 and 15-006(a)] has resulted in the deposition of explosives residues in the soil surrounding the facility (LANL, 1993b). Two firing sites at TA-36 [SWMU Nos. 36-004(b) and (c)] are also reasonably expected to have released explosives residues, although the nature and extent of contamination, if any, has not been adequately determined.

Samples collected from the Boneyard [SWMU No. 36-005] indicate the presence of various metals (e.g., chromium, lead, silver, and copper) and radioactive isotopes (e.g., thorium-232, uranium isotopes, potassium-40, and cesium-137). Explosives residues and shrapnel from the two firing sites at TA-36 are also present at the Boneyard (LANL, 1993c).

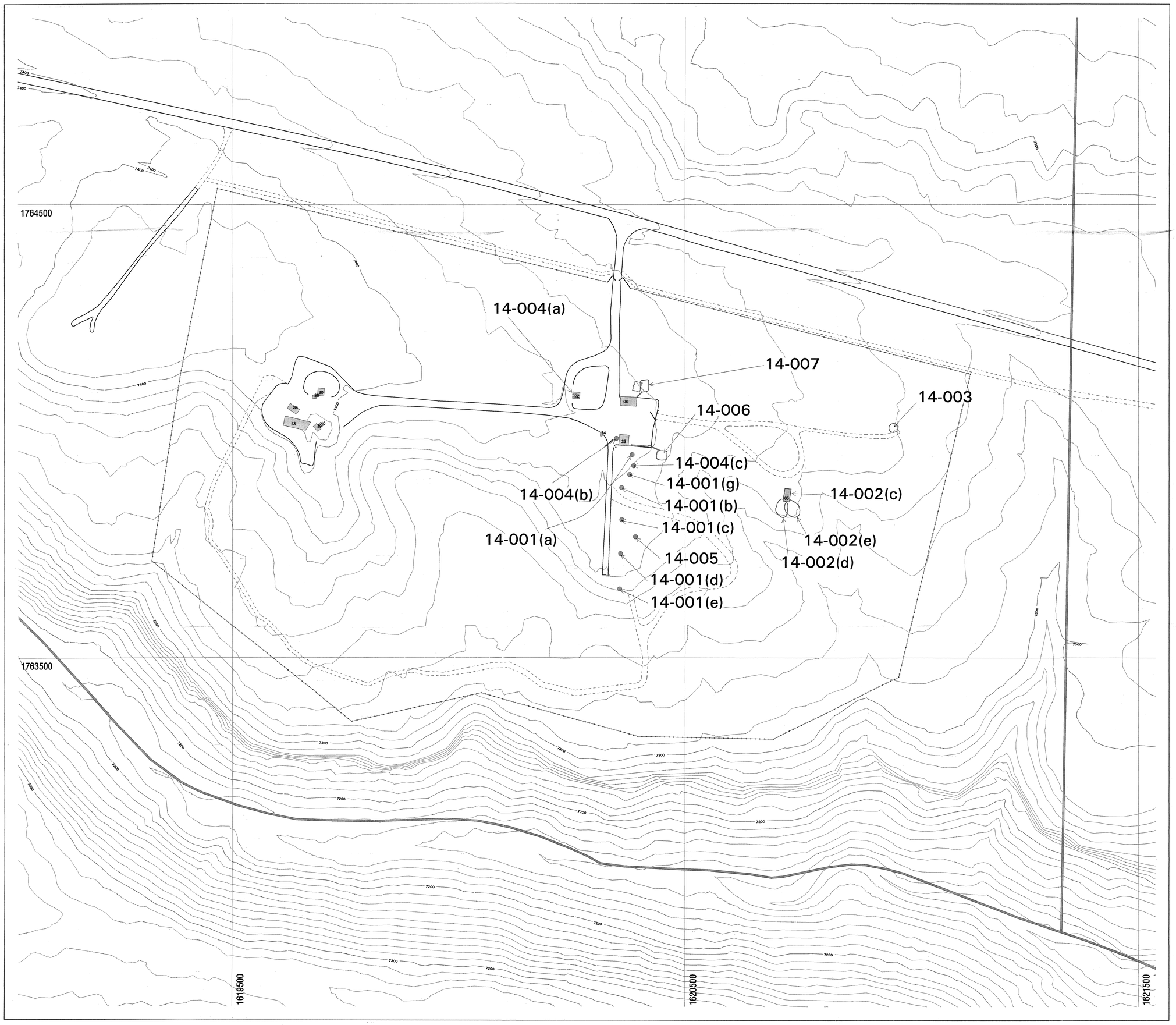
Explosives testing conducted at the firing sites at TA-39 [SWMU Nos. 39-004(a-e)] has most likely resulted in the deposition of explosives residues and heavy metals (e.g., uranium, mercury, lead, beryllium) in the soil surrounding each of the firing areas. The nature and extent of contamination, if any, has not been adequately determined.

10.2.1 Characterization of Releases

Potential releases from SWMUs, if any, are described in the 1990 SWMU Report and in the various RFI Work Plans. The descriptions include the material released and the nature of the release. However, because of the nature of the releases, the exact volume released is not known. The timing of the releases can only be estimated by the period of operation and sampling events.

10.2.2 Corrective Actions

Pursuant to 20 NMAC 4.1, Subpart V, 264.101(a), revised November 1, 1995, corrective actions are required only for releases of hazardous waste or hazardous constituents. The SWMUs will be investigated and remediated, as necessary and with EPA and New Mexico Environment Department approval, during LANL Environmental Restoration Project corrective action activities. Corrective action at the any of the TAs discussed in this section will generally follow the RFI/Corrective Measures Study process.



LEGEND

- Boundary, TA
- Contour, 100 foot
- Contour, 10 foot
- Fence, Industrial
- Road, Dirt
- Road, Paved
- Road/Trail
- Permanent Structure
- SWMU Outline
- SWMU (point location)

3845-H

Figure 10-1:
Solid Waste Management Units (SWMU) in the Vicinity of the Thermal Treatment Units near Technical Area (TA) 14, Building 23

N

State Plane Coordinate System, New Mexico Central Zone.
1983 North American Datum

Grid provides NM State Plane coordinates in feet.
Grid interval, in feet: 1000
Feet per inch on map = 100

SCALE 1:1200

0 30 60 90 120
METERS

0 100 200 300 400
FEET

NOTICE: The information on this map is provisional. Feature locations are dependent on scale and symbology and their accuracy may not have been confirmed. Los Alamos National Laboratory boundary is based on legal description established in 1995. Contour data are from a September 1991 aerial survey. All other data are from various sources and are part of the FIMAD repository.

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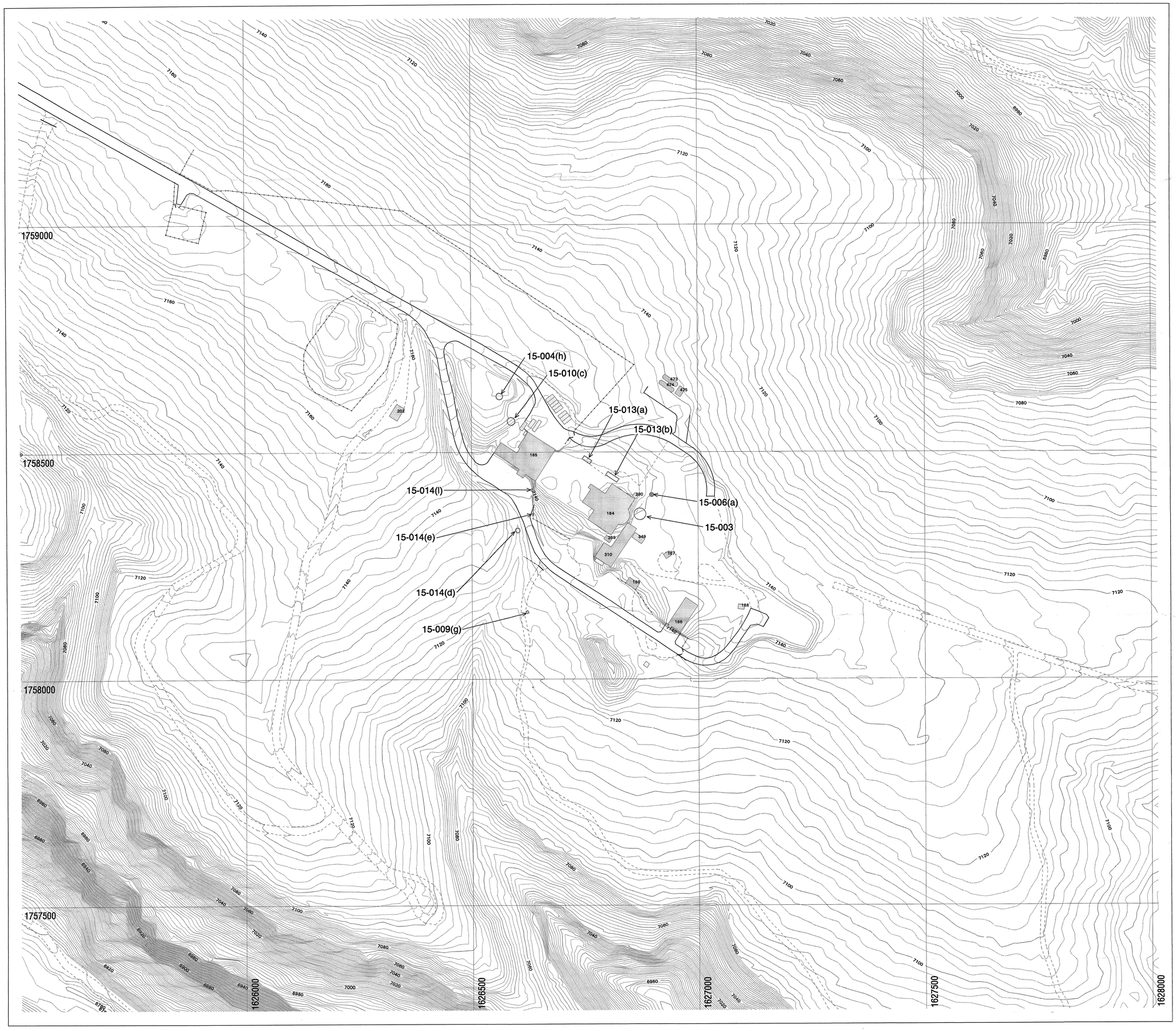
Produced by: Marcia Jones

Date: August 05, 1996 FIMAD Plot ID: G104972



LEGEND

- Contour, 10 ft
- Contour, 2 ft
- Fence, Industrial
- Road, Dirt
- Road, Paved
- Road/Trail
- Permanent Structure
- Temporary Structure
- SWMU Outline
- SWMU (point location)

3845-I

Figure 10-2:
Solid Waste Management Units (SWMU) in the Vicinity of the Thermal Treatment Unit near Technical Area (TA) 15, Building 184

N

State Plane Coordinate System, New Mexico Central Zone.
1983 North American Datum

Grid provides NM State Plane coordinates in feet.
Grid interval, in feet: 500
Feet per inch on map = 100

SCALE 1:1200

0 30 60 90 120

METERS

0 100 200 300 400

FEET

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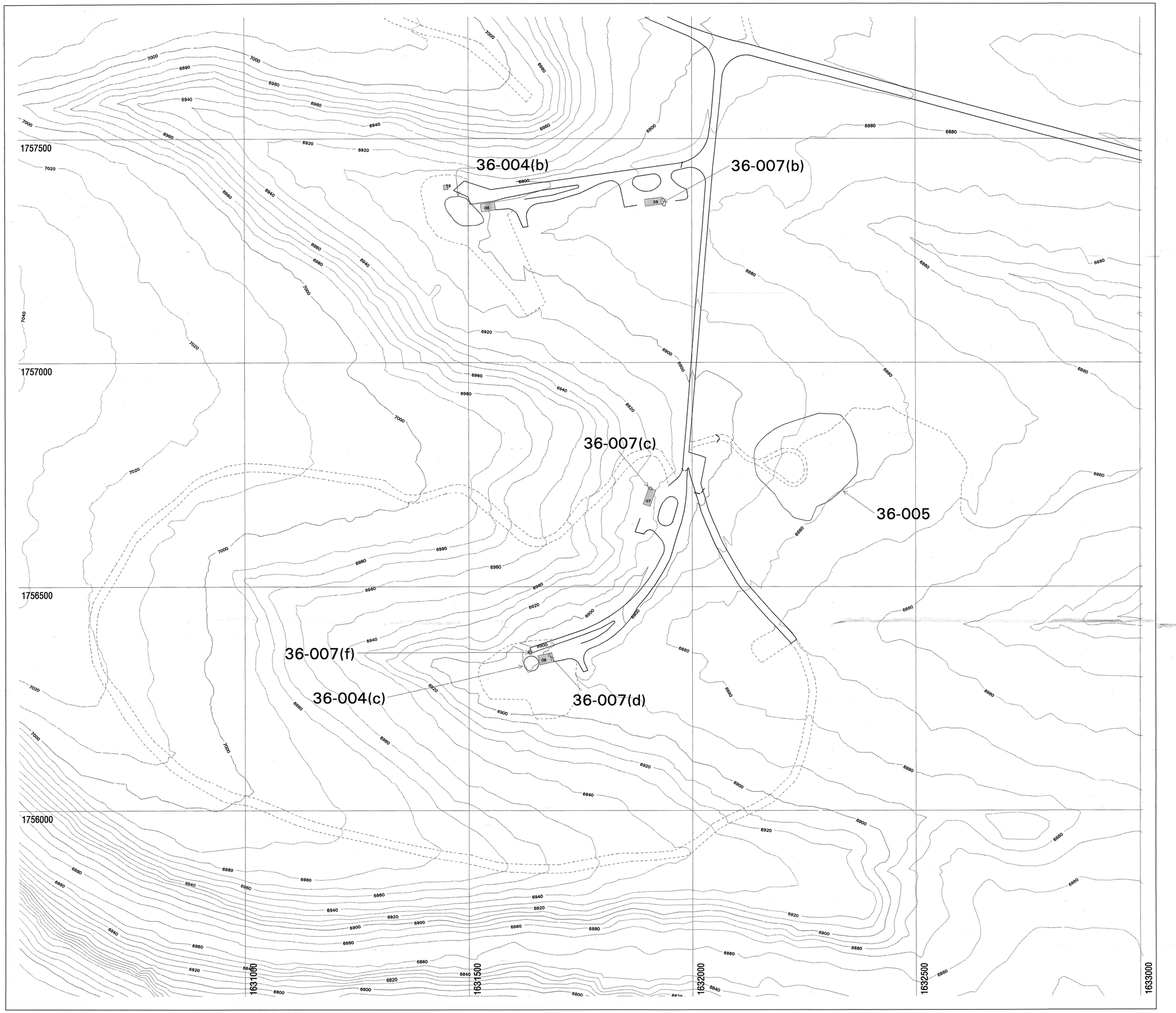
Produced by: Marcia Jones

Date: August 05, 1996 FIMAD Plot ID: G104973



LEGEND

- Contour, 100 ft
- Contour, 10 ft
- Road, Dirt
- Road, Paved
- Road/Trail
- Permanent Structure
- SWMU Outline
- SWMU (point location)

3845-J

Figure 10-3:
Solid Waste Management Units (SWMU) in the Vicinity of the Thermal Treatment Unit near Technical Area (TA) 36, Building 8

N

State Plane Coordinate System, New Mexico Central Zone.
1983 North American Datum

Grid provides NM State Plane coordinates in feet.
Grid interval, in feet: 500
Feet per inch on map = 100

SCALE 1:1200

0 30 80 90 120
METERS
0 100 200 300 400
FEET

NOTICE: The information on this map is provisional. Feature locations are dependent on scale and symbology and their accuracy may not have been confirmed. Los Alamos National Laboratory boundary is based on legal description established in 1995. Contour data are from a September 1991 aerial survey. All other data are from various sources and are part of the FIMAD repository.

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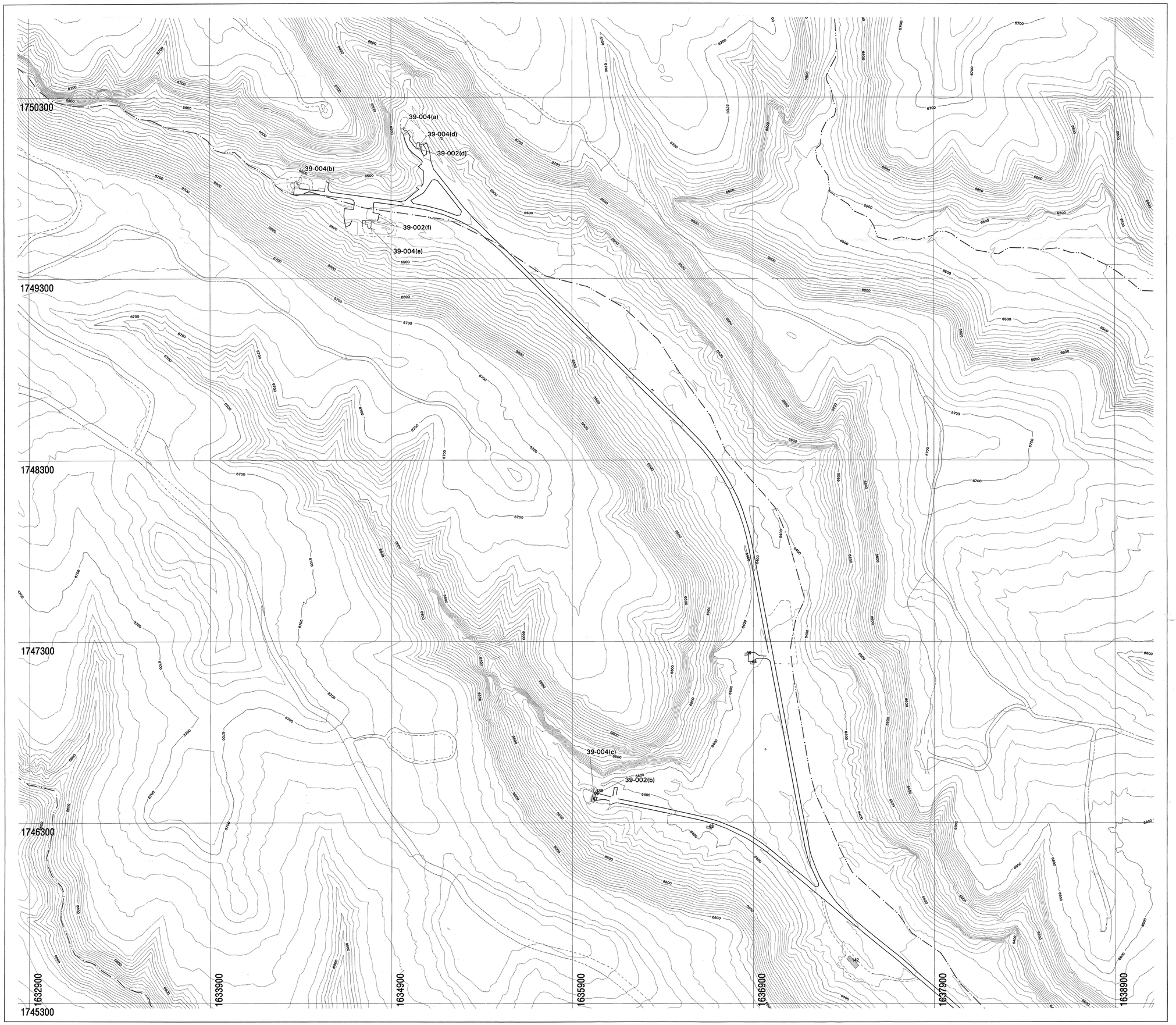
Produced by: Marcia Jones
Date: August 05, 1996 FIMAD Plot ID: G104974



LEGEND

- Contour, 100 foot
- Contour, 10 foot
- Road, Dirt
- Road, Paved
- Road/Trail
- Stream, Intermittent
- Permanent Structure
- SWMU Outline

3845-K

Figure 10-4:
Solid Waste Management Units (SWMU) in the Vicinity of the Thermal Treatment Units near Technical Area (TA) 39, Buildings 6 and 57

N

State Plane Coordinate System, New Mexico Central Zone.
1983 North American Datum

Grid provides NM State Plane coordinates in feet.
Grid interval, in feet: 1000
Feet per inch on map = 250

SCALE 1:3000

0 76 152 228 304
METERS
0 250 500 750 1000
FEET

NOTICE: The information on this map is provisional. Feature locations are dependent on scale and symbology and their accuracy may not have been confirmed. Los Alamos National Laboratory boundary is based on legal description established in 1995. Contour data are from a September 1991 aerial survey. All other data are from various sources and are part of the FIMAD repository.

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Produced by: Marcia Jones

Date: August 04, 1996 FIMAD Plot ID: G104971

Table 10-1

Solid Waste Management Unit (SWMU) Descriptions[a]

SWMU No.	Unit Type	Unit Description	Waste Description
14-001(a)	Pullbox	A 26- by 32- by 32-inch pit associated with Technical Area 14, Building 25 (TA-14-25) and used to house a capacitor discharge unit (CDU)	Various types of explosives, lead, uranium, strontium-90, and beryllium
14-001(b)	Pullbox	A 26- by 32- by 32-inch pit associated with structure TA-14-26 and used to house a CDU	Various types of explosives, lead, uranium, strontium-90, and beryllium
14-001(c)	Pullbox	A 26- by 32- by 32-inch pit associated with structure TA-14-27 and used to house a CDU	Various types of explosives, lead, uranium, strontium-90, and beryllium
14-001(d)	Pullbox	A 26- by 32- by 32-inch pit associated with structure TA-14-28 and used to house a CDU	Various types of explosives, lead, uranium, strontium-90, and beryllium
14-001(e)	Pullbox	A 26- by 32- by 32-inch pit associated with structure TA-14-29 and used to house a CDU	Various types of explosives, lead, uranium, strontium-90, and beryllium
14-001(g)	Firing Site	An active firing site located approximately 75 feet south of TA-14-23 used for open detonations (OD) involving explosives	Various types of explosives, lead, beryllium, strontium-90, and uranium
14-002(c)[b]	Decommissioned firing site	An 11- by 18- by 10-feet building (TA-14-5) that formerly served as the control building for firing pads [SWMU Nos. 14-002(d and e)	Various types of explosives; possibly metals including lead, beryllium, and uranium
14-002(d)[b]	Decommissioned firing site	One of two firing pads associated with TA-14-5 and formerly used for explosives testing	Various types of explosives; possibly metals including lead, beryllium, and uranium

Refer to footnotes at end of table.

Table 10-1 (Continued)

Solid Waste Management Unit (SWMU) Descriptions[a]

SWMU No.	Unit Type	Unit Description	Waste Description
14-002(e)[b]	Decommissioned firing site	One of two firing pads associated with TA-14-5 and formerly used for explosives testing	Various types of explosives; possibly metals including lead, beryllium, and uranium
14-003[b]	Burning Area	Bermed area approximately 600 feet east of TA-14-23 and formerly used to burn explosives-contaminated materials	Various metals, including barium and beryllium; and radionuclides
14-004(a)	Storage Area	Satellite storage area located at TA-14-22	Scrap explosives and explosives-contaminated items
14-004(b)[b]	Storage Area	Satellite storage area located at TA-14-23	Scrap explosives and explosives-contaminated items
14-004(c)	Storage Area	Satellite storage area located at TA-14-35	Scrap explosives and explosives-contaminated items
4-005[b]	Burn Cage	An approximately 3-foot-tall steel and wire mesh unit situated on a steel burn tray	Explosives-contaminated paper and laboratory equipment
14-006[b]	Sump	A 4.5- by 8.3- by 4.8-foot steel and concrete sump, an associated drainline, and an outfall area serving TA-14-23	Various components of the sump may be contaminated with explosives
14-007[b]	Septic System	A 4- by 7- by 6-foot reinforced concrete septic tank system that formerly served TA-14-6	Sanitary wastes and possibly photographic darkroom chemicals (e.g., organics, silver, cyanide)
15-003[b]	Firing Site	A 12- by 24- by 0.5-foot steel pad and two bunkers associated with the TA-15-184 firing site and used for OD involving explosives	Barium, lead, mercury, depleted uranium, thorium, beryllium, gallium, and residual explosives
15-004(h)	Firing Site	Inactive firing site located at TA-15	Uranium-238, beryllium, lead, and residual explosives
15-006(a)[b]	Firing Site	A chamber associated with the TA-15-184 firing site	Barium, lead, mercury, depleted uranium, thorium, beryllium, gallium, and residual explosives

Refer to footnotes at end of table.

Table 10-1 (Continued)

Solid Waste Management Unit (SWMU) Descriptions[a]

SWMU No.	Unit Type	Unit Description	Waste Description
15-009(g)[b]	Septic system	A 610-gallon septic tank and associated plumbing that serves TA-15-184	Sanitary waste and possibly mixed waste
15-010(c)[b]	Drain	A drain serving the camera firing point at TA-15-92	Unknown
15-013(a)	Storage tank	A 1,036-gallon underground storage tank (TA-15-192) that was relocated in 1959	Propane
15-013(b)[b]	Storage tank	A 15,000-gallon underground storage tank (TA-15-287) that was removed in 1992	Mineral oil
15-014(d)	Drainline	A drainline located near TA-15-184	Nonhazardous water
15-014(e)	Outfall	An outfall that receives wash water from floor drains located in TA-15-185	Nonhazardous wash water
15-014(l)[b]	Drainline	A drainline that drains cooling water from TA-15-202 into Water Canyon	Cooling water
36-004(b)	Meenie Firing Site	Active firing site located at the headwaters of Fence Canyon in TA-36	Depleted uranium, heavy metals, plastics, explosives, and various chemicals
36-004(c)	Firing Site	Active firing site in TA-36 located approximately 800 feet south of the Meenie Site and used for armor-piercing experiments and for OD involving explosives	Depleted uranium, heavy metals, plastics, explosives, and various chemicals
36-005[b]	Storage area	A surface storage area located near TA-36-7 that was formerly used to store large waste items used in explosives testing	Metal drums and cans, cylinders, and scrap metals such as lead sheets, copper, uranium-contaminated steel, and iron
36-007(b)	Waste storage container	A small, plastic-lined, corrugated cardboard box located in TA-36-5	Solid waste contaminated with explosives

Refer to footnotes at end of table.

Table 10-1 (Continued)

Solid Waste Management Unit (SWMU) Descriptions[a]

SWMU No.	Unit Type	Unit Description	Waste Description
36-007(c)	Waste storage container	A small, plastic-lined, corrugated cardboard box located in TA-36-7	Solid waste contaminated with explosives
36-007(d)	Waste storage container	A small, plastic-lined, corrugated cardboard box located in TA-36-8	Solid waste contaminated with explosives
36-007(f)	Waste storage container	A small, plastic-lined, corrugated cardboard box located at a firing site near TA-36-8	Solid waste contaminated with explosives
39-002(b)	Storage area	An approximately 5- by 5-foot portion of a concrete pad outside of TA-39-6	Waste solvents (e.g., ethanol, acetone, trichloroethane, copper sulfate); transformer oil; vacuum grease; and photographic wastes
39-002(d)	Storage area	Gravel pad located outside of TA-39-57	Waste solvents (e.g., ethanol, acetone, trichloroethane, copper sulfate); transformer oil; vacuum grease; and photographic wastes
39-002(f)	Storage area	Portion of an asphalt driveway located outside of TA-39-88	Waste solvents (e.g., ethanol, acetone, trichloroethane, copper sulfate); transformer oil; vacuum grease; and photographic wastes
39-004(a)[b]	Firing Site	A 500-square-foot area associated with TA-39-7 and used for explosives test detonations	Residual explosives, uranium, mercury, lead, beryllium, and dielectric oil containing polychlorinated biphenyls (PCB)
39-004(b)[b]	Firing Site	A 1,500-square-foot area associated with TA-39-8 and formerly used for explosives test detonations; operations at this unit were discontinued in 1980	Residual explosives, uranium, mercury, lead, beryllium, and dielectric oil containing PCBs
39-004(c)[b]	Firing Site	A 1,600-square-foot area associated with TA-39-6 and used for OD of explosives	Residual explosives, uranium, mercury, lead, beryllium, and dielectric oil containing PCBs

Refer to footnotes at end of table.

Table 10-1 (Continued)

Solid Waste Management Unit (SWMU) Descriptions[a]

SWMU No.	Unit Type	Unit Description	Waste Description
39-004(d)[b]	Firing Site	A 1,590-square-foot area associated with TA-39-57 and used for OD of explosives	Residual explosives, uranium, mercury, lead, beryllium, and dielectric oil containing PCBs
39-004(e)[b]	Firing Site	A 7,700-square-foot area associated with TA-39-88 and used for OD of explosives	Residual explosives, uranium, mercury, lead, beryllium, and dielectric oil containing PCBs

[a] Information compiled from Los Alamos National Laboratory (LANL) 1990, "Solid Waste Management Units Report"; U.S. Environmental Protection Agency (EPA), 1994, "Module VIII: Special Conditions Pursuant to the 1984 Hazardous and Solid Waste Amendments to RCRA for Los Alamos National Laboratory, EPA I.D. NM0890010515," effective date May 19, 1994; LANL, 1994, "RFI Work Plan for Operable Unit 1085"; LANL, 1993, "RFI Work Plan for Operable Unit 1086"; LANL, 1993, "RFI Work Plan for Operable Unit 1130"; and LANL, 1993, "RFI Work Plan for Operable Unit 1132."

[b] SWMU is identified in EPA, 1994, "Module VIII: Special Conditions Pursuant to the 1984 Hazardous and Solid Waste Amendments to RCRA for Los Alamos National Laboratory, EPA I.D. NM0890010515".

11.0 OTHER FEDERAL LAWS

A discussion of federal laws, as required by the New Mexico Administrative Code, Title 20, Chapter 4, Part 1, Subpart IX, 270.3 and 270.14(b)(20), revised November 1, 1995, is provided in Section 11.0 of the Los Alamos National Laboratory General Part B.

12.0 CERTIFICATION

In accordance with the New Mexico Administrative Code, Title 20, Chapter 4, Part 1, Subpart IX, 270.11(d), revised November 1, 1995, I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

George W. York (Acting DD) for
Robert H. Day
Division Director for Dynamic Experimentation Division
Los Alamos National Laboratory
Operator

9/25/96
Date Signed

Dennis J. Erickson
Division Director for Environment, Safety, and Health Division
Los Alamos National Laboratory
Operator

9/25/96
Date Signed

G. Thomas Todd
Area Manager, Los Alamos Area Office
U.S. Department of Energy
Albuquerque Operations
Owner/Operator

9.30.96
Date Signed

13.0 LIST OF REFERENCES

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DBA, see Daniel B. Stephens & Associates, Inc.

DOE, see U.S. Department of Energy.

EPA, see U.S. Environmental Protection Agency.

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APPENDIX A

STANDARD OPERATING PROCEDURES
APPLICABLE TO OPEN BURNING/OPEN DETONATION THERMAL TREATMENT UNITS

Disclaimer

The standard operating procedures (SOP) in this document are for informational purposes only. These SOPs are the most current available and are amended periodically.

ESA SOP

STANDARD OPERATING PROCEDURE

FOR

PACKAGING AND COLLECTION OF H.E. AND POTENTIALLY H.E. CONTAMINATED WASTE MATERIAL FOR DISPOSAL

Prepared By:_____Date_____
Bart Olinger, Materials Team, ESA-WMM

Approved By:_____Date_____
D. A. Hemphill, Materials Team Leader, ESA-WMM

Approved By:_____Date_____
L. A. Stretz, Group Leader, ESA-WMM

Approved By:_____Date_____
Roger H. Goldie, ESH-5

1.0 SCOPE

This SOP governs the packaging and collection procedures for high explosives (H.E.) wastes and wastes potentially contaminated with H.E. which must be collected and disposed by ESA-WMM H.E. disposal personnel. Potentially H.E. contaminated waste is waste material that has been in direct contact with H.E. or has visible H.E. contamination on it. Tests for H.E. contamination can be done by an authorized certifying agent. Waste materials originating in other groups will be packaged according to this SOP before being processed by ESA-WMM disposal personnel. Most wastes covered by this SOP are considered hazardous and Resource Conservation and Recovery Act (RCRA) requirements apply.

2.0 LOCATION

2.1 All buildings in which H.E. is handled within the S-Site Explosives Area. These facilities have satellite storage areas for storing H.E. and potentially H.E. contaminated waste. The wastes must not accumulate at the satellite storage area to quantities greater than a volume of 55 gallons or 800 pounds maximum.

2.2 Other Laboratory sites requiring disposal services by ESA-WMM disposal personnel.

3.0 EQUIPMENT

3.1 Disposal cans, safety style
3.2 55 gallon oil drums
3.3 Oily waste receptacles (UL-approved)
3.4 Dumpsters
3.5 Cardboard boxes
3.6 Reinforcing cardboard flats
3.7 Colson carts

4.0 MATERIALS

4.1 Plastic bags
4.2 Masking tape
4.3 Cushioning material
4.4 Paper bags
4.5 Cardboard boxes

5.0 GENERAL INSTRUCTIONS

5.1 Packaging

The following rules apply to the packaging of all H.E. contaminated waste materials:

5.1.1 Waste that is wet with oil, solvents, or water will be absorbed in some medium and placed in a plastic bag and boxed. A 55 gallon drum containing absorbent may also be used. Waste in cardboard boxes will be placed in an appropriate container in the designated satellite storage area

5.1.2 The contents of the containers must be clearly identified. Permanent type receptacles, such as Dumpsters, drums, garbage cans, and disposal cans, will have the contents intended stenciled on their sides. Cardboard boxes containing potentially H.E. contaminated waste, other than scrap H.E., must have their contents identified on the outside. Identification by a marking pen is sufficient. Boxes containing scrap H.E. must have an explosives scrap record card (Form WX-3-41) attached to the outside. The card shall be filled out as completely as possible, in regard to the cost account, source, type and approximate weight of the contents. All receptacles containing wastes regulated by the Resource Conservation & Recovery Act (RCRA) must have the words "Hazardous Waste" posted on the outside.

5.1.3 If more than one large piece of scrap H.E. is placed in a box some type of cushioning material such as Kimpak, must be placed between the pieces in such a manner that rubbing or colliding cannot occur during transportation.

5.1.4 Pressed and cast H.E. scrap will be placed in separate boxes. A reinforcing piece of cardboard shall be placed in the bottom of cardboard boxes containing scrap H.E. All cardboard boxes shall be closed and the lid securely taped.

5.1.5 Pieces of H.E. scrap that weigh over 50 pounds shall be placed in a suitably sized H.E. transportation container that has a lid that can be securely closed.

5.1.6 H.E. scrap with boosters or metal attachments will be labeled and packaged separately from other explosives.

5.2 Collection and Transportation

5.2.1 Non-hazardous waste also free of H.E. contamination is to be deposited in the designated Dumpsters outside the principle buildings in the area. Before the contents of these Dumpsters are picked up for disposal as municipal waste, a certification must be given to the driver that the contents are free of H.E. contamination by an authorized certifying agent.

5.2.2 The collection crew shall be instructed in, and expected to follow, the applicable portions of SOP Chapters 12, 13, and 14.

5.2.3 The collection of potentially H.E. contaminated waste materials and scrap H.E. from designated pickup points within the S-Site Explosives Area will be scheduled by the disposal personnel on a basis of good housekeeping policy. A periodic inspection of all active pickup points will be made by the building personnel to ensure that there is no unsafe, untidy buildup of materials at any waste storage point and that the quantity remains below the 55 gallon limit. The disposal personnel will be notified when needed.

5.2.4 Waste material contaminated with explosives and located within the TA-16 exchange area will be loaded and transported to the burning ground by trained disposal or other personnel authorized by the ESA-WMM disposal team.

5.2.5 Combustible trash potentially contaminated with H.E. will be picked up and transported to the Burn Ground incinerator by the disposal personnel when notified. A waste profile must be available at the time of pickup.

5.3 H.E. and H.E. Contaminated Waste Packaging and Storage

5.3.1 Potentially H.E. Contaminated Waste

Potentially H.E. contaminated waste will be segregated as combustible and non-combustible and stored in the satellite storage areas in labeled containers. Waste profiles of the contents of the containers stored there will be kept current.

5.3.2 Scrap Explosives

All scrap H.E., except settling tank waste, will be packaged in cardboard boxes. H.E. machining waste that cannot be flushed into the settling tank will be placed in a plastic bag or suitable container and packaged in cardboard boxes.

5.3.3 Scrap MDF

All scrap MDF will be kept separate from other H.E. scrap. Scrap MDF will be packaged in cardboard boxes. Lengths of MDF that are too long to fit may be coiled into a cardboard box for disposal at the Burn Ground.

5.3.4 Scrap Extrudable Explosives

Bulk extrudable explosives, and experimental plastic test devices containing extrudable explosives, will be kept separate from other H.E. scrap and packaged in plastic bags before they are placed in cardboard boxes. Test devices will be wrapped with Kimpak to prevent them from coming into contact with each other.

5.3.5 H.E. Contaminated Solvents

5.3.5.1 Flammable solvents, including toluene, acetone, and alcohol, will be poured into red disposal cans or 55 gallon drums stenciled FLAMMABLE.

5.3.5.2 Halogenated hydrocarbons, such as trichloroethylene and methyl chloroform (chlorothene) will be poured into white disposal cans stenciled NONFLAMMABLE.

5.3.5.3 Dimethylsulfoxide (DMSO) will be poured into disposal cans stenciled "DMSO only."

5.3.5.4 H.E. contaminated solvents, both combustible and non-combustible, will be burned or flashed in accordance with the appropriate section of SOP 12.3.4.

5.3.6 Floor Sweepings

Potentially H.E. contaminated floor sweepings will be stored with the combustible waste in the satellite storage area.

5.3.7 Potentially H.E. Contaminated Oils

5.3.7.1 Used hydraulic fluids drained from explosive processing equipment and oils, such as Way-lub, vacuum oil, and oils collected from sumps and drip pans, will be stored in disposal cans or 55 gallon drums marked "Hold for Disposal" until the presence or absence of H.E. in the fluid is determined.

5.3.7.2 ESA-WMM maintenance personnel will identify each container, or group of containers if the material has a common source, with an identifying number, and will record the source, the type of fluid or oil, and date of collection.

5.3.7.3 Representative samples of the fluids or oils will be sent to the explosives analytical laboratory and analyzed for H.E.. Fluid containing more than 0.25% of H.E. will be labeled H.E. CONTAMINATED OIL and will be burned at Burn Ground. Oils containing less than 0.25% of HE may also be burned or the material may be disposed of by CST personnel.

5.3.7.4 Drained hydraulic fluid from non-H.E. processing equipment and oils known not to be contaminated will not be sampled for analysis, but will be disposed of by CST personnel after being certified free of H.E. by an authorized certifying agent.

5.3.8 Oily Rags

Each equipment room in the Explosives Area is equipped with an oily waste receptacle. Potentially H.E. contaminated oily rags will be placed in these receptacles. The rags will be packaged in a cardboard box and placed in designated satellite storage area for disposal.

5.3.9 Large Non-Combustible H.E. Contaminated Items

Potentially H.E. contaminated, non-combustible hardware, fixtures, furniture, and equipment that cannot be made H.E.-free with certainty must be heat treated on the flash pad, TA-16-387. Such waste picked up or delivered to the flash pad for treatment must be accompanied with a waste profile.

5.3.10 Residual Ashes

The residual ash that remains on a burning pad after a burn will be disposed of as described in SOP 12.1.0.

5.4 Records

All pickups of scrap H.E. and potentially H.E. contaminated materials will be recorded and stored at the Burn Ground, TA-16-389, along with waste profiles and disposal request forms.

DX-2

STANDARD OPERATING PROCEDURE

FOR

DESTRUCTION OF
HE-CONTAMINATED WASTE AND HE WASTE

6.1.5

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Prepared by: James R. Stine Date: 1/30/96
J. R. Stine, DX-2

Approved by: Judith B Snow Date: 2/8/96
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Approved by: _____ Date: _____
DX-DO

Approved by: _____ Date: _____
ESH-5

Final Approval: _____ Date: _____
Margaret K. Orbesen, Group DX-2 ES&H Officer

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1.0 INTRODUCTION

Group DX-2 performs tests and operations on new high-explosives that have unknown properties and characteristics. These operations generate waste that cannot be sent to Group ESA-WMA for disposal because of its uncharacterized nature or experimental history. These wastes are destroyed at Technical Area (TA) 14 (Q-site East), by either burning or detonation. This SOP is a a prerequisite to DX-2:SOP 6.1, 'Q-Site East (TA-14) Firing Operations'.

2.0 PURPOSE

The purpose of this operation is to safely destroy HE waste and HE-contaminated waste originating in Group DX-2.

3.0 SCOPE

This SOP applies to all DX-2 personnel who perform the burning and detonation operations. These operations shall only be performed by Group DX-2 personnel at TA-14 Q-Site East, Building 23 and the adjacent firing area.

4.0 DEFINITIONS

HE-Contaminated Waste: Materials such as rags; paper; sample containers; Kimwipes; toothpicks; other process and clean-up waste with contaminated residual amounts of energetic material.

HE Waste: Damaged or suspect devices, consolidated or powder explosives that have undergone severe damage during testing, experimental explosives, explosives of temporary interest, newly synthesized compounds, new mixtures, and uncharacterized explosives.

5.0 RESPONSIBILITIES

5.1 Group Leader

- Ensures that the necessary policies, procedures, equipment, training, and manpower are available for this operation and delegates the responsibility for implementation of details to a designated Staff Member.

5.2 Designated Staff Member

- Implements the details for safely performing these operations.
- Chooses, along with the Group Leader, the Firing Site Leader.

5.3 Firing Site Leader

- Has primary responsibility for safe operations.
- Supervises routine burning and detonation operations.
- Trains operators.

5.4 Operator

- Is responsible for safe operations.
- Assists Firing Site Leader in the burning and detonation operations.

5.5 DX-DO Training Generalist

- Provides information on training for this operation. Training is in accordance with the Laboratory's Administrative Requirements (ARs) in the *Environment, Safety, and Health* Manual and the *DOE Explosives Safety Manual,* Chapter V.

6.0 PRECAUTIONS AND LIMITATIONS

6.1 Location, Composition, and Weight Limitations

Location, composition, and weight limitations depend on whether the waste will be destroyed by burning or by detonation. HE-contaminated waste will be burned, and HE waste will be detonated.

6.1.1 Burning Operation

HE-contaminated waste shall be burned in the burn cage (Fig. 1) located near Mound 3. The cage shall be positioned so that it is in full view from the observation ports in Room 101 of Building 23.

Only small samples of HE waste that would pose no hazard to the burn cage or the area, if they should burn rapidly, shall be burned in any one waste-disposal operation.

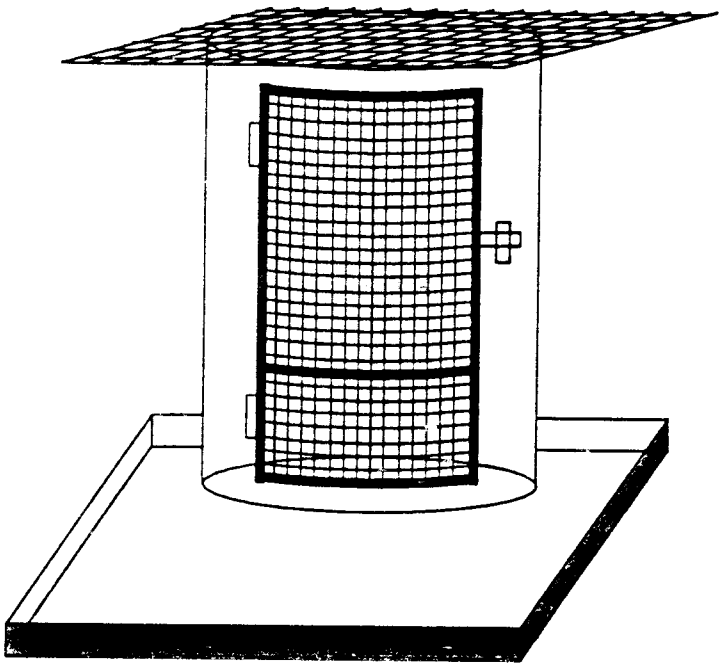

Fig. 1. Burn cage.

6.1.2 Detonation Operation

HE waste shall be destroyed by detonation on Mound 3.

6.1.3 Weight Limitations

Weight limitations are as follows.

Operation	Weight Limitation
Burning	50 lb of combustibles in each burn
Detonation	20-total lb per test

6.2 Personnel Limits

The personnel limits in DX-2:SOP 6.1, 'Q-Site East (TA-14) Firing Operations' shall be followed for this operation.

6.3 Transportation

The requirements for transporting HE-contaminated waste and small samples of HE waste for burning and detonation are listed below.

- Waste shall be transported directly to to the firing mound at TA-14 Q-Site East in accordance

with DX-2:SOP 1.9, 'Packaging and On-Site Transportation of Explosives,' for on-site transportation.

- No quantity greater than that which can be disposed of in a single day shall be transported to TA-14 Q-Site East.

7.0 PROCEDURAL STEPS

7.1 Preparations Before Burning

Follow the procedures below when preparing to burn HE-contaminated waste.

Step	Action
1	• Notify appropriate ES&H contact (See Attachment) no less than 48 hours prior to the scheduled burn.
2	• Clear the area by driving to Q-Site West (TA-14-34) and Mound 5 at Q-Site East to make sure that no unauthorized personnel are within the site. • Alert any personnel at Q-Site West that a burn operation is to occur and inform them of the type of material involved.
3	Make sure that plenty of fuel is available to completely destroy the waste and the containers.
4	• Uncover the burn cage, • Check the burn cage to see that no metal or foreign objects are in the middle section where the waste will be placed, and • Remove any that are found.
5	• Check the bottom, or fuel space, for undestroyed material and • Wrap any that is found in paper and place it on the grate.

Step	Action
6	Open all containers, such as glass or plastic, where a pressure buildup could occur. **Note:** If waste containers are wet, return them to the originator for proper drying. **CAUTION** DO NOT combine materials. Keep all HEs in their separate containers.
7	Place the waste container on the grate, spaced so a good draft will result during burning.

7.2 Burning Operation

Follow the steps below for destroying HE-contaminated waste.

Step	Action
1	Short the end of the composition discharge unit (CDU) detonator cable.
2	Attach two igniters in parallel to the detonator cable and place them in the fuel space.
3	Sprinkle fuel on the HE-contaminated waste to enhance destruction of the waste and aid in ignition. **Note:** Use only volatile hydrocarbons, such as acetone, fuel oil, hexane, as a fuel. **CAUTION** DO NOT use any material that contains metals or halogens in its molecular composition. If in doubt, check with the designated Staff Member in charge of Q-Site East.
4	Cover the top of the burn cage with the wire mesh provided to minimize the escape of burning particles.

Step	Action
5	Fire the ignitors using the firing control unit in Room 101 of Building Q-23 (see DX-2:SOP 6.1, 'Q-Site East (TA-14) Firing Operations.). **Note:** The siren will go through its normal sequence, but the Firing Supervisor may turn the siren off after determining that the burn is progressing satisfactorily.
6	• Wait for at least 10 minutes after visible flaming has stopped and • Then sound the "all-clear" signal. **Note:** If there is still a considerable amount of smoke, the Firing Site Leader must use his judgment about delaying the all-clear signal.
7	In the event of a misfire, do not approach the area until at least 10 minutes have elapsed without any evidence of flames or smoke in the burn cage (See Attachment II).
8	DO NOT use the burn cage for another burn operation for 24 hours.
9	After 24 hours or more, remove the ashes and place in the satellite storage outside Building 23.
10	Cover the burn cage with a tarp.

7.3 Detonation Operation

HE waste that cannot be disposed of by ESA-WMA because of its nature or experimental history shall be destroyed by detonation at TA-14 Q-Site East. The steps below shall be followed for detonating HE waste.

Step	Action
1	Be sure you have a completed test sheet according to see DX-2:SOP 6.1, 'Q-Site East (TA-14) Firing Operations, signed by the designated Staff Member or alternate in charge of firing operations.
2	• Clear the area by driving to Q-Site West (TA-14-34) and Mound 5 at Q-Site East to make sure that no unauthorized personnel are within the site. • Alert any personnel at Q-Site West that a detonation operation is to occur and inform them of the type of material involved.

Step	Action
3	• Inspect Mound 3 and • Rake to remove any foreign materials such as metal fragments or rocks if necessary.
4	Place the HE to be disposed into a cardboard container.
5	Fill the container with less than or equal to 20 lbs total HE weight of bulk explosive, such as nitroguanidine (NQ).
6	Place a booster into the bulk explosive so that it makes good contact. **Notes:** • Consolidated explosives known to be less sensitive to impact than 10 cm on Type 12 tools, 15 cm on Type 12B tools, or resistant to more than 0.05 joules in the 3-mil lead-foil spark test may be removed from their containers, placed gently on clean sand, and fired with a booster taped to the charge or placed in contact with the charge. • More sensitive explosives or experimental HE without impact data will require a safety work permit (SWP).
7	Follow the instructions in DX-2:SOP 6.1, 'Q-Site East (TA-14) Firing Operations' to perform the test.
8	If a misfire occurs, follow procedure outlined in in DX-2:SOP 6.1, 'Q-Site East (TA-14) Firing Operations.'

7.4 Disposing of Waste

Waste generated from these operations shall be packaged and disposed of according to DX-2:SOP 1.5 'Disposal of Hazardous Materials and Contaminated Equipment.' Waste minimization will be handled according to the DX-Division Operations Manual, and AR-10-3.

7.5 Emergency Procedures

In the event of an emergency situation, the Building Emergency Plan (BEP)/ Site Emergency Plan (SEP) shall be followed. The BEP/SEP shall be available in Building Q-23 and the operators shall be familiar with its contents.

8.0 REQUIRED RECORDS

- DX-2:SOP 6.1 , 'Q-Site East (TA-14) Firing Operations'
- Completed and signed Test Sheet (for detonation or burning)
- DX-2 Q-Site East Check List, Burning of HE-Contaminated Waste

9.0 REFERENCES

- DOE Explosives Safety Manual
- Los Alamos Environment, Safety, and Health Manual
- DX-Division Operation Manual
- DX-2:SOP 1.5, Disposal of Hazardous Materials
- DX-2:SOP 1.9, Packaging and On-Site Transportation of Explosives
- DX-2:SOP 6.1, Q-Site East (TA-14) Firing Operations
- Building Emergency Plan/Site Emergency Plan (BEP/SEP)
- AR-10-3

10.0 ATTACHMENTS

I. ES&H Contact List

II. DX-2 Q-Site Check List, Burning of HE Contaminated Waste

Attachment I

ES&H Contact List

The ESH-17 contacts are:

David Jardine	667-3615
Leland Maez	665-1240
Jean Dewart	665-0239

One of these people need to be contacted one to two days prior to each burn at Q-Site.

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Attachment II

DX-2 Q-Site Check List
Burning of HE-Contaminated Waste

Requester _____ Date Burned _____

Charge Code _____

This checklist is intended for use as a safety supplement to DX-2:SOP 6.1.5 "Destruction of HE-Contaminated Waste and Waste HE." All Q-Site users must be familiar with the Group DX-2 SOPs 6.1 and 6.1.5. This checklist should be referred to by the Firing Supervisor subsequent to burning in the burn cage and prior to final arming. In the event of a misfire, follow the checklist on the other side of this page.

OK	N/A	
☐	☐	1) Secure and clear area.
☐	☐	2) Ensure burn cage is clean.
☐	☐	3) Open all glass and plastic containers.
☐	☐	4) Place waste material to be burned on grate.
☐	☐	5) Short end of detonator cable.
☐	☐	6) Attach ignitors to detonator cable and place ingitors near waste material.
☐	☐	7) Sprinkle fuel on waste material.
☐	☐	8) Cover top of burn cage with wire mesh.
☐	☐	9) Connect detonator cable to the Capacitor Discharge Unit (CDU).
☐	☐	10) Start firing sequence.
☐	☐	11) Fire ignitors.
☐	☐	12) Observe burning.
☐	☐	13) Turn off siren; (do NOT sound "all-clear.")
☐	☐	14) Wait 10 min. after flame has stopped and sound "all-clear."
☐	☐	15) Another batch cannot be burned until 24 hours has elapsed.
☐	☐	16) Clean up ashes (after 24 hours) and place in satellite storage outside TA-23.
☐	☐	17) Cover burn cage with tarp.

Signature _____ Date _____
Firing Supervisor

FORM DATE 1/19/96 Approved by: _____ Date _____

In the event of a misfire, the following procedure will be followed:

OK	N/A	
☐	☐	1) Do not sound the "all clear" and DO NOT LEAVE CONTROL ROOM.
☐	☐	2) Check all electrical connections and firing voltage in the control room.
☐	☐	3) Attempt to fire the shot again.
☐	☐	4) If the shot still does not fire, turn off all power to firing system.
☐	☐	5) Notify any any personnel who are at Q-Site of the misfire.
☐	☐	6) Wait a time considered appropriate by firing site supervisor (nominally 10 minutes) while observing the shot for any signs of smoke or activity.
☐	☐	7) If during the waiting period no activity is observed, <u>one</u> person shall approach the burn cage and disconnect the detonator cable from the CDU.
☐	☐	8) Disconnect the ignitor from the detonator cable.
☐	☐	9) Check detonator leads and cable for continuity with an approved meter ohm.
☐	☐	10) If the problem has been identified and corrected, firing operations may be checked by firing one or more ingitors.
☐	☐	11) If the problem cannot be identified, notify the DX-2 group office, secure the area, and await further instructions.

DX-16

STANDARD OPERATING PROCEDURE

FOR

Q-SITE EAST (TA-14) FIRING OPERATIONS

SOP 6.1

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CMKO 1/25/95
John C. Dallman, DX-16 Group Leader

Approved by: Craig F Eberhart Date 2/7/95
DX-DO

Approved by: PDW Paula D. Whitehead Date 3/14/95
ESH-5

Final Approval: M. K. Orbesen Date 3/20/95
M. K. Orbesen, Group DX-16 ES&H Officer

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Q-SITE EAST (TA-14) FIRING OPERATIONS

1.0 INTRODUCTION

High-explosive (HE) firing operations are carried out at Q-Site in Technical Area 14 (TA-14). This site is located south of the R-Site Road between TA-9 and R-Site. In general, Q-Site is administered by Group DX-16. Q-Site East is a relatively small area that contains four buildings: one for general storage of equipment, two for storage of HE, and one that consists of the control room, laboratory, and make-up room.

2.0 PURPOSE

This Standard Operating Procedure (SOP) describes methods to be followed for firing tests and related operations at Q-Site East (TA-14), Buildings Q-6, Q-22, Q-23, and Q-24 and outdoor firing areas located south of the control room. Building Q-5 is condemned and is not approved for any operations.

3.0 SCOPE

This document describes the procedures required for staff members and technicians to perform tests at Q-Site. Technicians are allowed to perform tests at Q-Site without staff member supervision only if, the staff member in charge of Q-Site East has given prior signature approval.

3.1 Facilities and Uses

This SOP covers the facilities in Q-Site East only and does not address the facilities in Q-Site West.

3.1.1. Detonator Magazine Q-24

Detonator Magazine Q-24 (Fig. 1) is a small reinforced concrete structure used primarily for storing Group D explosives (*DOE Explosives Safety Manual,* Chapter II, Sec. 17.4) in the form of detonators and special small assemblies or charges made up of or containing the Group D explosives. This is not a walk-in magazine and is not heated.

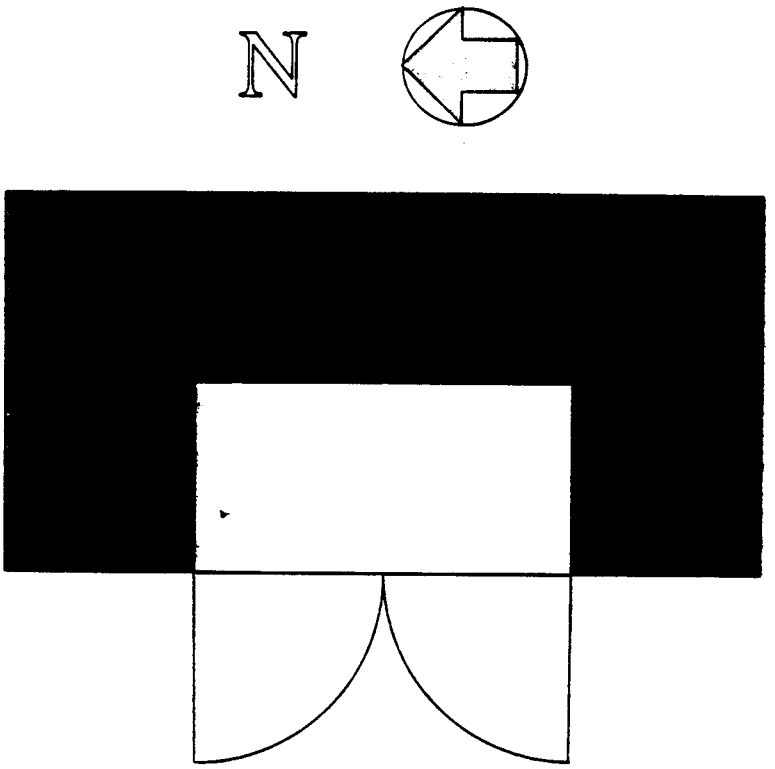

Fig. 1. Floor plan of Building Q-24 at TA-14.

3.1.2. HE Magazine Q-22

Magazine Q-22 (Fig. 2) is an above-ground, earth-covered concrete structure. This magazine is large enough to walk into and has shelves on both sides. It is used for the storage of storage compatible groups C, D, E, F, G, and S explosives. Special explosive assemblies or parts used in various firing experiments may also be stored in this magazine, which is not heated. It has permanently installed explosion proof switches and lights.

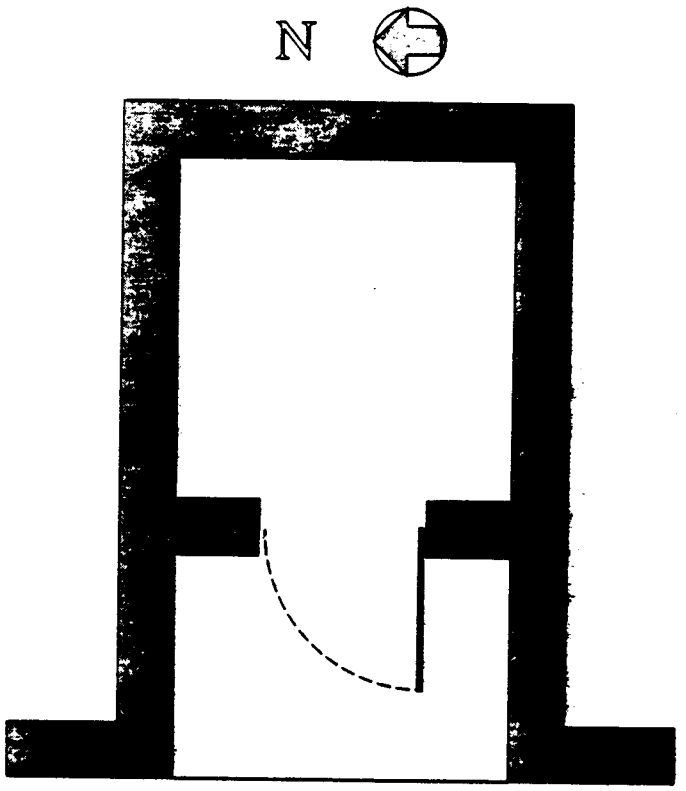

Fig. 2. Floor plan of Building Q-22, TA-14.

3.1.3 Building Q-6

Building Q-6 is a frame structure used to store parts and instruments that are used in various firing experiments. *No explosives are permitted in this building.*

3.1.4 Building Q-23

Building Q-23 is a reinforced concrete structure divided into four rooms (see Fig. 3 for floor plan). The south face is protected by 1/2-in. steel boilerplate. The portholes are protected by sliding steel covers.

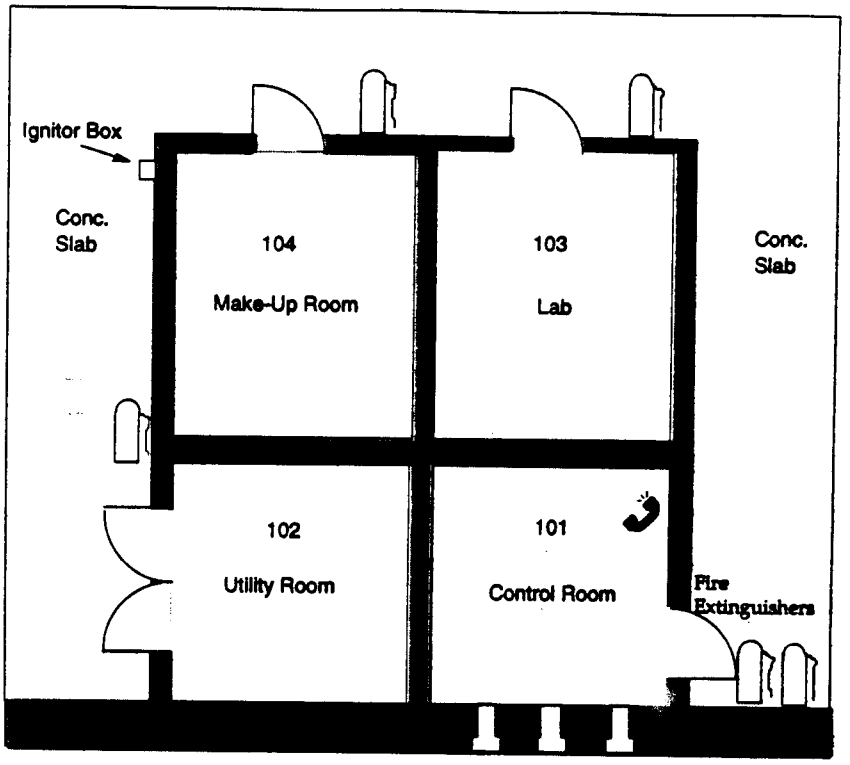

Fig. 3. Floor plan of Building Q-23, TA-14.

3.1.4.1 *Room 101.* Room 101 is the firing control room. Various items necessary for safe firing [locked capacitor discharge unit (CDU) controls and timed interlocks] and the equipment for recording data from the shots are installed in this room. *No explosives are allowed in this room at any time.*

3.1.4.2 *Room 102.* Room 102 is the utility room and is not used for explosives work. This room contains the circuit breaker panels, the hot water tank, and the heating system. *No explosives are permitted in this room.* This room is not to be used for storage.

3.1.4.3 *Room 103.* Room 103 is used as an explosives preparation laboratory. This room also contains a hood with water, gas, and vacuum lines. It is also used for storage of fire-fighting equipment such as hoses, shovels, and hoes. The lights and switches are explosion proof.

3.1.4.4 *Room 104.* Room 104 is the make-up room in which shot components are made up in preparation for firing. Made-up shots or explosive components may be stored in this room during a firing operation involving a large number of shots that may take several days to fire. No HE is to be stored in this room except for on-going experiments where the HE is part of a set-up that cannot be placed in a magazine. The electrical wiring in the room is explosion proof.

3.1.4.5 *Ignitor Box.* The ignitor box is a small steel box attached to the west side of this building and is secured by a padlock. This box is used to store ignitors. This box contains <u>only</u> Group B explosives

3.1.5 Firing Mounds

Besides the structures described, Q-Site East has five firing mounds located along a conduit system extending toward the south from the firing control room. The firing mound consists of a sand-covered area about 50 ft in diameter. This is also the contamination zone for the firing area. Each mound contains a steel-covered underground box (firing pit) that provides 110-volt electrical outlets, conduit connection with the control room, and space for the high-voltage CDU. Figure 4 shows the layout of Q-Site East, and the firing pits are shown as structure numbers 25, 26, 27, 28, and 29.

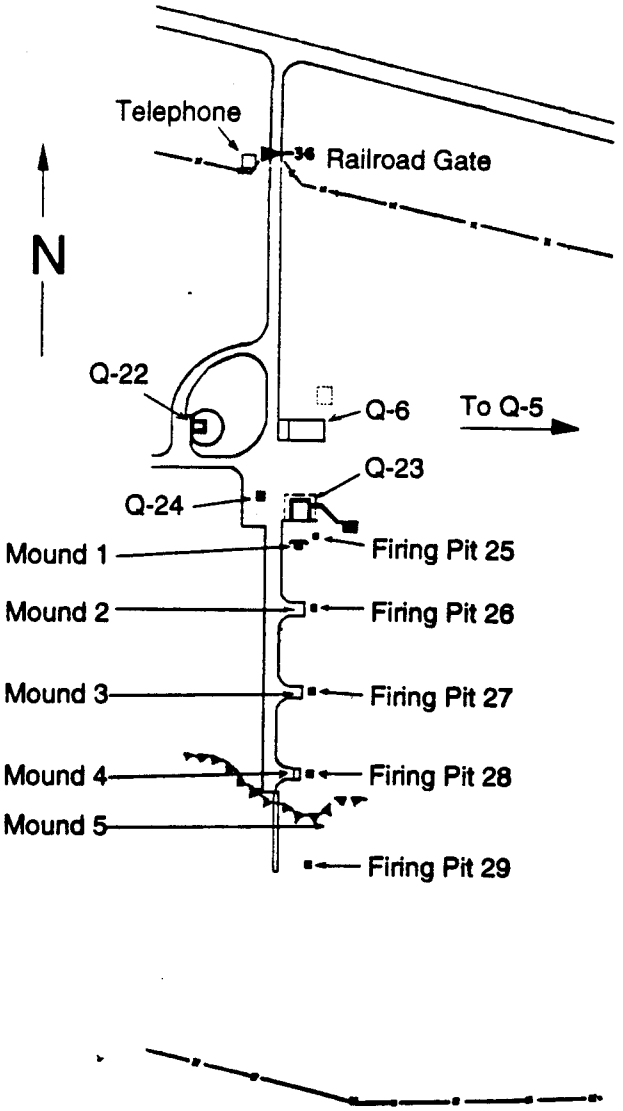

Fig. 1. Q-Site East.

3.1.5.1 *Mound 1.* Mound 1 is shielded on three sides with 3-ft-high, 1/2-in. steel plate backed with sand. In addition to the 110-volt outlet, Mound 1 also has a 220-volt outlet.

3.1.5.2 *Mound 2.* Mound 2 has no shielding but has a heavy steel base plate and is in a direct line with the portholes in Building 23.

3.1.5.3 *Mound 3.* Mound 3 is an open area used for general firing operations.

3.1.5.4 *Mound 4.* Mound 4 is a sand mound with a 2-in.-thick, 6-ft-diameter steel disc sitting on top of it. A shrapnel barrier constructed of large concrete blocks is situated on Mound 4. This barrier is used for shots that may produce shrapnel or metal fragments.

3.1.5.5 *Mound 5.* Mound 5 is located in the canyon and is a reinforced-concrete-lined cut into the side of the hill, which can be sandbagged on the southern (open) face.

4.0 DEFINITIONS

Capacitor Discharge Unit (CDU): A portable, two-point unit with a capacity that may be charged to 2500 volts.

Firing Supervisor: The person in charge of the firing operation. The Firing Supervisor is appointed to the position by the Group Leader and the Group DX-16 staff member for Firing Operations. To qualify for this position, the person must have appropriate training and experience, must work with an existing firing supervisor for a period of 3 months, and demonstrate a thorough knowledge of all the necessary SOPs.

Magazine: A structure used for the long-term storage of explosives.

Operator: A person trained in firing operations who assists the Firing Supervisor.

Tests with Staff Member Supervision: Experimental tests that have not been run before must be supervised by the requesting staff member and require a completed DX-16 Q-Site Shot Sheet (Attachment I), approved by the staff member in charge of Q-Site East.

Tests Without Staff Member Supervision: Tests that have been performed previously and will be performed by a technician. It is not necessary that a staff member supervise the operation. This requires prior signature approval, on the shot sheet, from the staff member in charge of Q-Site East.

5.0 RESPONSIBILITIES

5.1 Group Leader

- Ensures that the necessary policies, procedures, equipment, training, and manpower are available for safe firing operations and delegates the responsibility for implementation of details to a staff member.
- Chooses, along with the staff member in charge of Q-Site East, the Firing Supervisor.

5.2 Staff Member in Charge of Q-Site East

- Chooses, along with the Group Leader, the Firing Supervisors.
- Is responsible for firing operations and types of experiments conducted at Q-Site.
- Makes decisions regarding misfires and off-normal occurrences.

5.3 Firing Supervisor

- Has primary responsibility for safe firing operations.
- Supervises routine firing operations.
- Enforces personnel limits and ensures that all personnel are in safe locations during firing operations.
- Ensures that a Waiver of Personnel Limits at Q-Site (Attachment II) has been approved when observers or other casuals exceed the posted personnel limits.
- Calls the Fire Department and the Group Office for any off-normal fires resulting from a firing operation.
- Trains other operators.
- Ensures the safety of Q-Site.
- Requests maintenance as needed.

5.4 DX-16 Training Coordinator

- Provides information on training for these operations. Training is in accordance with the Laboratory's Administrative Requirements (ARs) in the *Environment, Safety, and Health* Manual and the *DOE Explosives Safety Manual,* Chapter V.

6.0 PRECAUTIONS AND LIMITATIONS

6.1 Explosive Load and Personnel Limits for Buildings

Limitations on explosive loads and personnel are given below for the different buildings covered in this SOP.

Location	Explosive Load Limit	Personnel Limit[a]
Building Q-23		
Room 103 - Laboratory	50 lb including no more than 5 lb scrap HE	• If explosives present, 2 operators, 1 casual • If no explosives present, 6 people[b]
Room 104 - Make-Up Room	50 lb including no more than 5 lb scrap HE	• If explosives present, 2 operators, 1 casual • If no explosives present, 6 people[b]
Steel Box on NW corner of Building	100 ignitors	N/A
Building Q-6	0 lb	No limit

[a]Personnel limits may be waived by the Group DX-16 Staff Member for Firing Operations, Group Leader, or Deputy Group Leader for tests, safety inspections, operational reviews, and demonstrations for visiting groups.

[b]No distinction made between operators and casuals.

6.2 Allowed Explosives

Only explosives that satisfy both of the following criteria can be used in firing operations at Q-Site East:

- Type 12 Drop-Weight Impact >12 cm
- Spark sensitivity >0.1 J for 3 mil foil

Energetic materials to be tested at Q-Site that have not been characterized or are known to be impact or spark sensitive will require that the Group Leader, Deputy Group Leader, or Staff Member in charge of Q-Site give written permission before the material is taken to Q-Site. The handling procedure and precautions for this material must be stated on the Shot Sheet.

The table below gives information about load limits and explosive compatibility allowed in the magazines.

Location	Explosive Load Limit	Explosive Compatibility
Magazine Q-24	• 25 lb	Groups C and D only
Magazine Q-22	• 300 lb including no more than 5 lb of scrap HE	Groups C, D, E, F, G, and S

6.3 Operations Limitations

No more than one firing operation may be carried out at Q-Site East at any one time.

Before starting a firing operation at Q-Site East, Q-Site *West* must be checked for personnel. Any personnel not associated with the testing will be escorted out of the area, and re-admitted after test completion.

6.4 Smoking

Smoking is not permitted at any time in or around any of the buildings, grounds, or firing mounds at Q-Site.

6.5 Flame-Producing Devices

No spark- or flame-producing devices, other than those used in firing or burning operations (such as ignitors), will be allowed in the area unless authorization has been given in an approved Special Work Permit (SWP).

6.6 Fire Protection

All the explosives processing and storage buildings are of concrete construction.

6.6.1 Pyrophoric Materials

When materials of a pyrophoric nature are part of a shot, Q-Site operators request the Fire Department to stand by with the necessary equipment to fight a possible fire in the surrounding woods (see Section 7.2, "Preparations Before Firing").

6.6.2 Fire Fighting Equipment

6.6.2.1 *Fire Extinguishers.* Fire extinguishers are mounted on the east, north, and west walls of Building Q-23 and on the east outside wall of Building Q-6. These fire extinguishers are checked annually by the Fire Department and monthly by the responsible person for Q-Site. The Group DX-16 Engineering Area Coordinator is contacted for the replacement or filling of extinguishers.

6.6.2.2 *Other Tools.* Shovels, long hoses, rakes, and hoes are stored in Room 103 of Building Q-23 for emergency fire fighting. This equipment is intended to quench small fires that are considered normal during firing operations. The Firing Supervisor will call the Fire Department for any off-normal fires. *Firing-site personnel are not to fight any fires involving HE.*

6.7 Maintenance

Weeds and brush are cut and cleared from the firing area and around buildings and magazines when necessary. A standing work order allows this maintenance whenever the brush and weeds present a fire hazard.

Snow and ice are cleared from around Building Q-23 and magazines Q-22 and Q-24 to prevent injury. No operations involving HE are to be performed if snow or ice present a hazard.

6.8 Visitor and Admittance Control

6.8.1 Administrative Gate

This gate will remain locked at all times except during normal firing site operations. The only exception to this will be when an explosive test is left on the firing mound overnight. Then both the Administrative Gate and the Railroad Gate will be closed. In the event of this, the Division Office, Group Office, and Security should be notified, and a sign will be posted on the Administrative Gate.

6.8.2 Railroad Gate

A railroad gate, interlocked to the firing power source, is lowered at the entrance to Q-Site during any firing operation. A sign on this gate requires anyone entering the site, either by vehicle or on foot, to phone for entry from the telephone located on a post near the gate. The Q-Site East control room telephone number is 665-1787 Verbal clearance *must* be obtained from the DX-16 Firing Supervisor or Operator before entering.

6.8.3 Remote Area Access

6..8.3.1 *Access to Building Q-5.* A chain gate located between Q-6 and Q-23 controls access to Q-5. When personnel are at Q-5, the chain will be down; when no one is at the site, the chain will be up.

6.8.4 Warning Signs

The firing area is contaminated with fragments of explosives and is considered hazardous for uninstructed personnel; therefore, two warning signs are posted at the railroad gate shown on the area map (Fig. 1).

6.9 Transportation of HE

Transportation of HE by vehicles to and within this area is covered by DX-16:SOP 1.9, *Transportation Regulations*.

6.10 Make-Up Room Operation (Room 104, Building Q-23)

6.10.1 Permitted Storage, HE

When using the make-up room, only those explosives necessary for the operation in progress will be permitted. Approved detonators are permitted in this room but may not be stored overnight unless they are affixed to a shot assembly in such a manner as to make removal impractical.

6.10.2 Solvents

Any solvents used in this room must be in labeled containers. No more than two flammable solvents are permitted in this room at one time to avoid the unnecessary accumulation of flammable solvents. Only the minimum amount for the operation should be in the lab at any time.

6.10.3 Adhesives or Glues

Only those adhesives and glues on the list of approved adhesives (see Attachment III) can be used for gluing HE assemblies. The permitted adhesives and catalysts may be kept in the make-up room, but should be stored away from the explosives.

6.10.4 Housekeeping

Special care must be taken to see that this room is kept free of loose explosive powder or dust that may be spilled during shot make-up. After a day's operation, or more often if necessary, the room must be swept and the waste deposited in the appropriate HE waste cans.

Only brooms or brushes with no metallic parts and non-metallic dust pans are to be used to clean up spills. If the amount of explosive involved is more than a few grams and/or has an impact sensitivity of less than 10 cm with Type 12 tools and a 3-mil lead foil spark sensitivity of less than 0-0.05 J, the Group DX-16 Staff Member for Firing Operations or the Group Leader shall be informed and their advice obtained before the cleaning operation is performed. Attention should be paid to toxic hazards, as well as explosive hazards, and special protective clothing may be required.

6.10.5 Detonator Circuit Testing

A current-limited detonator current ohm (DCO) meter, meeting criteria set forth in the DOE Explosives Safety Manual, will be used if necessary for exploding bridge wires (EBWs). The meter shall be labeled "For Use on EBW Detonators Only."

6.10.6 Diagnostic Electronics Testing

A volt-ohm meter, such as a Fluke 77, will be used. It shall be prominently labeled "For Non-Initiating Circuits Only."

6.10.7 Low-Voltage Electro Explosive Devices (EED's)

Personnel that will be handling any low-voltage EED's will be properly trained. Training will consist of attending the DOE Explosive Safety Manual class, reading DX-10 SOP 175, OJT with firing site operations and written approval from the DX-16 Weapons Safety Team Leader.

All electrical circuits will be grounded and shorted before continuity is established to the low-voltage EED. The procedure for connecting the CDU to the test assembly is as follows:

1. Check the shorting plug with an approved VOM for continuity. The resistance will be approximately 0.2 ohms.
2. Short the CDU end of the detonator cable with the shorting plug.
3. While using a wrist grounding strap, connect the EED to the detonator cable.
4. Attach the EED to the test assembly.
5. Remove the shorting plug from the detonator cable and connect the shorting plug to the load ring on the CDU.
6. Connect the detonator cable to the CDU.
7. Remove the shorting plug.

6.11 Safety Features

6.11.1 Railroad Gate

The railroad gate at the Q-Site entrance must be closed before the interlock on the control room door will close. Until the interlock is closed, no power will be available to the firing control unit.

6.11.2 Firing Control Unit

During a firing operation, the firing control unit in the control room provides built-in safety features through a timing sequence and a mechanism (the CDU) that will automatically stop the operation by grounding and interlocking the system when certain situations occur.

6.11.2.1 Timing Sequence. The power switch to the firing control circuit is a key switch, and when turned on, the following sequence of events occurs after the "TIMER" button has been pushed.

a. The siren sounds for 30 seconds.
b. The siren is silent for 30 seconds.
c. The siren sounds for 90 seconds.
d. A pilot light indicates "READY."

e. An operator ensures that the proper firing voltage has been selected. For EBWs the voltage is 2000 to 2500 volts DC.

f. The operator may then push the "POWER" and "ARM" buttons and wait for the condensers to charge.

g. The operator ensures that the firing voltage has been attained.

h. The operator may then push the "FIRE" button, and the shot will fire. If this button is not pushed within 10 seconds after the ARM button is pushed, the entire circuit de-energizes and the cycle must be repeated.

6.11.2.2 *Capacitor Discharge Unit.* Characteristics of the CDU are listed below.

a. The CDU may be installed in any one of the firing pits 25 through 29. It is connected to the fire-control unit by a special multiconductor cable.

b. When the "ARM" button on the fire control unit is pushed, power is supplied to the transformer and the rectifier so that the condensers may charge.

c. A voltage divider network allows the condenser voltage to be monitored at the fire control station with a 50-mA calibrated meter.

d. After firing or if a power interruption occurs during the firing sequence, the high-voltage condensers are automatically shorted to ground. The ground circuit is routed through a set of contacts that are normally held closed by a spring. When the power circuit is energized, a solenoid overcomes the spring tension and breaks the ground circuit. The contact assembly is positioned so that, if there is a spring failure and/or a power interruption, the contacts will close and the system will be safely grounded. Timer interlocks prevent the ground circuit from being reopened until the timing and arming sequence has been re-established.

e. The firing control unit and CDU will be on a regular maintenance schedule to be performed by authorized personnel.

6.11.3 Periodic Inspections

Q-Site, including all the grounds, buildings, and rooms will be inspected at least annually for safety, health, and environmental hazards. A memorandum will be written by the leader of the inspecting group outlining any deficiencies. The Group DX-16 Environmental, Safety, and Health (ES&H) Committee will assign a person to ensure that corrections are made.

6.11.4 Viewing Ports

Visual inspection of the firing mounds or the general area may be made through portholes in the firing-room wall facing these mounds. These ports are equipped with three cylinders of 2-in. laminated safety glass to prevent fragments from entering the firing room.

6.11.5 Mound Spacing

The availability of five firing mounds at various distances from the control building provides safe distances for the shots. The most distant mound is located below ground level of the control room and space is cut into the side of the canyon wall to prevent fragments of confined shots from reaching the control room.

6.11.6 Shelter

Building Q-23 is constructed of reinforced concrete with 1/2-in. boilerplate covering the side facing the firing mounds. This type of construction provides more than adequate shelter for personnel from any shot fired according to the provisions of this SOP.

6.11.7 Explosive and Personnel Limits for Mounds

6.11.7.1 Bare or Glass- *or Plastic-Cased Explosives*

Mound Number	Explosive Limit (lb)	Personnel Limit (when HE present)
1	5	The minimum required—not to exceed 3
2	5	The minimum required—not to exceed 3
3	20	The minimum required—not to exceed 3
4	30	The minimum required—not to exceed 3
5	30	The minimum required—not to exceed 3

6.11.7.2 *Metal-Cased Explosives.* Confined metal-clad shots may be fired within the metal and sandbag shield of Mound 1 up to a limit of 1 lb of explosive. Confined shots may also be fired at Mound 5 with a limit of 25 lb, provided the shot is sandbagged on the exposed south side. No metal-confined shots are allowed at the other mounds.

7.0 PROCEDURAL STEPS

7.1 Component Preparation

- Prepare shot components to the subassembly and final assembly stages in the make-up room (Q-23, Room 104).
- Use *only approved* adhesives and catalysts (see Attachment III).

7.2 Preparations Before Firing

Follow these steps when preparing a shot for firing.

Step	Action
1	If a shot involves *pyrophoric materials,* • Notify DX-DO (7-5653) 24 hours before firing so arrangements can be made for the Fire Department to stand-by. • Request confirmation by the Fire Department 1 hour before the shot is fired.
2	Fill out a DX-16 Q-Site Shot Sheet (Attachment I) and obtain approval from the staff member or the alternate in charge of Q-Site.
3	If the Q-site personnel limits will be exceeded, • Fill out a Waiver of Personnel Limits at Q-Site (Attachment II) and • Obtain the approval of the Staff Member for Firing Operations or Group Leader.
4	Observe the weather. No firing operations are allowed during electrical storms or, in some cases, high winds.
5	Obtain the firing key from the DX-16 Group Office safe. **Note:** This key will remain in the Firing Supervisor's possession until it is returned to the safe.
6	• Prepare the appropriate firing mound with all the required diagnostics and blast shielding; • Record the diagnostic wiring on the Shot Sheet (use additional pages if necessary); and • Make sure all diagnostics are working properly.

Continued on next page

Preparations Before Firing (continued)

7	Ensure that • the CDU is in place, • the load ring is shorted, • all necessary cables are connected, and • the detonator cable end is shorted.
8	• Lower the gate at the entrance to Q-site and make sure that it is secured. **Note:** The green light on the firing panel will be lit when the gate is properly secured.
9	• Clear the area by driving to Q-Site West(TA-14-34) and the lower area (Mound 5) to make sure that no unauthorized personnel are within the site. • Alert all personnel at Q-Site West that a firing is to occur and escort them out of the area.
10	Take a head count to be sure all personnel are accounted for.
11	• Make certain that all diagnostic and initiating cables, wires, and connectors do not have any electrical potential. • Check all connections inside the control room, making sure that *no* cables or wires are hooked up to electrical generating devices.
12	• Check the firing mound for any potential structural or mechanical hazards. • Make sure that the mound is safe and stable.
13	• Instruct all casuals and observers to stay in the control room in Building Q-23.

7.3 Setting Up a Shot

To set up a shot use the following steps.

Step	Action
1	Take the shot to be fired out to the appropriate mound. **Note:** When the shot is being set up on the mound, only the minimum number of personnel are allowed on the mound. All other personnel must stay in Building Q-23 Control Room 101.
2	Attach all diagnostic cables (not firing cables) and wires to the shot. If an ohm meter is required, make sure it has been approved for explosives use.
3	Once the shot has been set up, casuals and observers may inspect the shot under supervision of the firing site supervisor or operator.

7.4 Arming a Shot

The Firing Site Supervisor or Operator should follow these steps when arming a shot.

Step	Action
1	Initiate all shots with EBW detonators; other detonators will require an SWP.
2	• Have all personnel go into Building Q-23, Room 101. • Account for all personnel.
3	Bring the detonator out to the appropriate mound unless the shot set-up requires earlier installation.
4	Perform one final check of the shot and mound (see Steps 7, 11, and 12 in Section 7.2 above).
5	Instruct all remaining personnel to go into Building Q-23, Room 101. **Note:** Only the Firing Supervisor, who has the firing key in his possession, does not have to be in the Building.
6	Connect the detonator cable to the detonator.
7	• Make sure the detonator and the receptacle are free from any debris (sand, grit). • Attach the detonator to the shot by screwing down the locking nut, but *only finger tight*. • Make sure the detonator is in contact with the booster explosive.
8	Remove the shorting plug from the CDU.
9	Go into the control room.

7.5 Firing a Shot

The Firing Site Supervisor or Operator should follow the steps listed below when firing a shot.

<table>
<tr><th>Step</th><th>Action</th></tr>
<tr><td>1</td><td>Review the firing check list (see Attachment IV).</td></tr>
<tr><td>2</td><td>Close the control room door.</td></tr>
<tr><td>3</td><td>Unlock the firing control box.</td></tr>
<tr><td>4</td><td>• Start the semiautomatic firing sequence.
• Continually monitor the fire-control system during the sequence until the capacitors are charged to at least 2000 volts (unless specified otherwise).
<table>
<tr><th>IF</th><th>THEN</th></tr>
<tr><td>there is a malfunction</td><td>stop the firing sequence by interrupting the power.</td></tr>
<tr><td>the Firing Supervisor or operator or staff member feels there is a potentially unsafe situation</td><td>the Firing Supervisor or operator will stop all firing operations.</td></tr>
</table></td></tr>
<tr><td>5</td><td>When the capacitors are charged,
• push the "FIRE" button within 10 seconds, thereby firing the shot.</td></tr>
</table>

7.6 Post-Firing Operations

After firing the shot, the Firing Site Supervisor or Operator should follow the procedures below.

Step	Who Does It	Action
1	Firing Supervisor or Operator	• Decides when it is safe to leave the shelter after the shot.
2	Firing Supervisor or Operator	• Sounds the "All Clear" with two or more 5-second blasts of the siren.
3	Firing Supervisor or Operator *(only one person)*	• Approaches the shot area, • Ensures that area is safe, and • Notifies others in shelter of safe condition and that they may approach the area.
4	Firing Supervisor or Operator	• Pick up and place scrap and undetonated explosives in the approved HE waste container in Room 103 of Building Q-23. • Inspect entire firing area for explosives scrap at the end of the day's firing.
5	Firing Supervisor or Operator	At day's end, • inspect area, • lock all of the buildings, and • check doors.
6	Firing Supervisor or Operator	• returns the firing key to the DX-16 Group Office.

7.7 Misfires

In the event of a misfire, follow the procedure listed below.

Step	Who Does It	Action
1	All participants, including observers	Do NOT leave the control room.
2	Firing Supervisor	Checks all electrical connections to the power supply in the control room.
3	Firing Supervisor	Attempts to fire the shot again, if it seems appropriate.
4	Firing Supervisor	If the shot still fails to fire, • turn off all power to the power supply.
5	Firing Supervisor	Establishes a waiting period—at least 30 minutes if the cause of failure is not obvious.
6	Firing Supervisor and Operator	Observe the shot assembly through the viewing ports in the control room, if possible, during the waiting period.
7	Firing Supervisor	If no activity in the shot assembly is evident during this time, • carefully approaches the firing mound.
8	Firing Supervisor	Disarms the shot by disconnecting at the CDU, if possible, or by removing the detonator from the charge or cutting its leads.

Continued on next page

Misfires (continued)

<table>
<tr><td>9</td><td>Firing Supervisor</td><td>Checks the leads for continuity and electrical connections to the firing unit using an approved DCO after disarming the shot.
<table>
<tr><th>IF the trouble</th><th>THEN</th></tr>
<tr><td>has been located and fixed</td><td>check the operation of the unit by firing one or more detonators.</td></tr>
<tr><td>cannot be located</td><td>• secure the site, leaving the barricade down, and
• contact the Group Leader or the DX-16 Staff Member for Firing Operations for further instructions.</td></tr>
</table></td></tr>
</table>

7.8 Cleaning Up Contamination from Firing Operations

Sometimes normal firing activities will result in the incomplete detonation of the explosive and hence in the scattering of explosive in the area next to the shot. For example, the standard gap test, by its inherent nature, will result in half of the shots scattering explosive.

The following steps are taken to minimize this contamination and to reduce the hazard from it.

Step	Action
1	The HE scrap is collected from the shot area after each shot and put in the approved HE waste container kept in Room 103 of Building Q-23.
2	The entire firing area is inspected for explosives scrap at the end of each day's firing.
3	The area is posted with a sign warning unauthorized personnel to remain out of the explosives-contaminated area.
4	No work is permitted in the posted area by service personnel without the written permission (SWP) of the area custodian (see DX-16:SOP 1.7) and the DX-16 Maintenance Coordinator.

7.8.1 Disposal of HE Operational Waste

The HE waste accumulated at Q-Site is disposed of in two ways, as described in DX-16:SOP 1.5: (1) by arranging with ESA-WMA to take away and dispose of such waste and (2) by disposal at Q-Site according to DX-16:SOP 6.1.5 and AR 10-3.

Waste minimization will be handled according to Section 13 of the DX-Division Operations Manual.

7.9 Emergency Procedures

The Building Emergency Plan (BEP) posted in Q-23 in TA-14 shall be followed in the event of an emergency situation. The BEP shall be available in the building, and the operators shall be familiar with its contents.

7.10 Maintenance and Repairs

For maintenance and repairs, all provisions of DX-16:SOP 1.7 shall be observed.

8.0 REQUIRED RECORDS

- Q-Site Shot Sheet
- DX-16 Q-Site Firing Check List
- Adhesive and Potting Materials List
- Waiver of Personnel Limits at Q-Site

9.0 REFERENCES

- DOE Explosives Safety Manual, Revision 6
- Los Alamos Environment, Safety, and Health Manual
- DX-Division Operations Manual
- DX-16:SOP 1.5
- DX-16:SOP 6.1.5
- DX-16:SOP 1.7
- DX-16:SOP 1.9
- SOP M-8-80
- AR 10-3

10.0 ATTACHMENTS

I. DX-16 Q-Site Shot Sheet
II. Waiver of Personnel Limits at Q-Site
III. Adhesive and Potting Materials List
IV. DX-16 Q-Site Firing Checklist

Attachment I
DX-16 Q-Site Shot Sheet

Date _____

Type of shot _____ Time _____

Purpose of shot _____

_____

Experimenter(s) _____ Program Code _____

Technician(s) _____ Disk Name _____

Detonator _____

Booster _____ Dimensions _____

_____

High Explosive _____ Dimensions _____

_____

Weight (grams) _____

Toxic or Radioactive Materials _____

(D-38, Lead, Tritium, Beryllium, etc.)

Fire Dept. Requested Yes ☐ No ☐

If yes, why? _____

HSE Requested Yes ☐ No ☐

If yes, why? _____

Special Procedures or requirements _____

_____

Diagnostics Used (Scope, TIM, Pulse Amp., DDG, Fanout, etc.)

_____

Approved by (Staff Member in charge of Q-Site East or alternate) _____

Approval of Routine Tests: _____

(Use back of sheet for shot results and comments.)

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Attachment II

WAIVER OF PERSONNEL LIMITS AT Q-SITE, TA-14

A waiver of personnel limits at Q-Site (TA-14), Building _____, Room _____ is requested for

- ☐ test
- ☐ safety inspection
- ☐ operational review
- ☐ demonstration
- ☐ training

to be given on _____.

No more than 2 lb of high explosive will be detonated for demonstrations. All visitors will be under the strict supervision of the Firing Supervisor or alternate.

Signature: _____ Date _____

Title: _____

Form Date: 12/7/94 Approved by: _____ Date: _____

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Attachment III

ADHESIVES AND POTTING MATERIALS

Category	Adhesive	Additive or Catalyst	HE Comp. Report #	Remarks
Epoxy	Aerobond 2017	Trimethoxy-boroxine	198	Compatible with HE. Exothermic reaction. Don't make more than 50 g at a time.
	Barco Bond 165 165, 185	Boron trifluoride complex	229	Due to its fast curing reaction this material becomes hot if used in thick sections. It should not be used for potting and large fillets should be avoided.
	VEEP 1579 VEEP 1579T	Versamid 140 DMP-30	232	Not compatible with all HE. May be used on PBX 9502, TATB, and mixtures of TATB and inert materials.
	Epon 828	Versamid 125		Not to be used on HE materials. Exothermic.
	Epon 815	DETA (Diethylene-triamine)		Not to be used on HE materials. Exothermic.
	Torr Seal	Polyamide	250	Can be used on HE as described in report #250. Ideal for vacuum applications, sealing leaks.
Poly-Urethane	Aralhex spray brush, putty, or fillet.	Ferricacetyl-acetonate	223	Compatible with HE. Used for cover bonding. Exothermic in fillet form.

ADHESIVES AND POTTING MATERIALS (Cont)

Category	Adhesive	Additive or Catalyst	HE Comp. Report #	Remarks
	Urethane Encapsulant 7200	Component "B" (polyol mix)	224	Compatible with HE 100% solids. Moisture contamination will cause severe foaming.
	Polad	Adiprene 5333	243	Compatible with HE. Adhesive of choice with Comp. B. Acetone diluent avoids sparks. Do not breathe vapors.
	Polamine 1000 cured polyurethanes		266	Compatible with HE. Slight foaming from moisture. Do not breathe vapors.
	Polycure cured polyurethanes		243	Compatible with HE. Slight foaming from moisture. Do not breathe vapors.
	Cyanacure cured polyurethanes		242	Compatible with HE. Slight foaming from moisture. Do not breathe vapors.
Cyano-acrylate	Eastman 910		67	Compatible with HE. Thin-film activated.
	Eastman 910 with accelerator	Phenylethyl-ethanolamine (chlorothene)	182	Can be used on HE as described in Report #182. Accelerator solution is applied to one surface and left 30 s for chlorothene to evaporate.
	Superbonder 414, 416, 420, 430, and 495		67	Compatible with HE. Limited to 0.004-inch gap fill.

ADHESIVES AND POTTING MATERIALS (Cont)

Category	Adhesive	Additive or Catalyst	HE Comp. Report #	Remarks
	Superbonder 414, 416, 420, 430, and 495			Not approved for HE compatibility. Up to 0.020-inch gap fill with accelerator.
	Threadlocker 242	May use Primer T		Not approved for HE compatibility. Limited to 0.005-inch gap fill.
	Threadlocker 290	May use Primer N		Not approved for HE compatibility. Limited to 0.005-inch gap fill.
Anaerobic	Speedbonder 324 and 325	Activator 707		Not approved for HE compatibility. Up to 0.040-inch gap fill.
	Loctite Depend	Depend Activator		Not approved for HE compatibility. Up to 0.030-inch gap fill.
Rubber	Bondmaster G458			Not to be used on HE. Will bond polystyrene and polyurethane foams. Contains volatile solvents
	Dow Corning 281		138	Compatible with HE. May be thinned with toluene.
RTV Silicones	DC 731, 732 GE 162	Moisture in air	48, 49	Compatible with HE.
	DC 3110 Rubber	S catalyst or F catalyst	144	Compatible with HE. Store in refrigerator.
	Kerr Denture Elasticon	Mixture of stannous octoate and zinc octoate	259	Compatible with HE.

ADHESIVES AND POTTING MATERIALS (Cont)

Category	Adhesive	Additive or Catalyst	HE Comp. Report #	Remarks
	DC Sylgard 184 186; DC Silastic J, E; GE RTV 615 McGhan-Nusil CF7-2615	Pt catalyst	149, 257	Compatible with HE. Store in refrigerator.
Spray	Photo Mount Spra Mount		220	Compatible with HE.
Dry Film	3M 465 and 920		227	Compatible with HE.
General Purpose	Duco Cement		57, 66	Compatible with HE.

Attachment IV
DX-16 Q-Site Firing Checklist

Requester _____ Charge Code _____ Date Fired _____

This checklist is intended for use as a safety supplement to Group DX-16 SOP 6.1 *Q-Site East (TA-14) Firing Operations*.

N/A	OK	
	☐	1) Ensure Q-Site shot sheet is completed.
☐	☐	2) Notify DX-DO (7-5653) to arrange for Fire Department standby if pyrotechnics are involved in the shot.
☐	☐	3) Notify DX-13 and DX-16 group offices if shot is greater than 50 lb.
	☐	4) Lower TA-14 gate and clear the area.
	☐	5) Move all personnel into Bldg. Q-23 and establish a head count.
☐	☐	6) Ensure that there is no electrical potential to the firing mound and check all cables and connections.
☐	☐	7) Take photos as necessary.
☐	☐	8) Verify CDU is shorted with the shorting plug, then arm the shot.
☐	☐	9) Remove CDU shorting plug.
☐	☐	10) Call Q-Site West and inform them of the shot.
☐	☐	11) Retake head count and start firing sequence.
	☐	12) Set correct firing voltage on the Control Panel.
☐	☐	13) Ensure shot diagnostics and rack are powered and in a ready state:

OFF	ON	
☐	☐	DC Power Supply voltage set and connected.
☐	☐	Oscilloscope programmed and reset (recheck after charging).
☐	☐	TIM's, DDG's and Pulse Amplifiers programmed and reset.
☐	☐	VCR programmed and recording.

☐	☐	14) Record shot time on shot sheet.
☐	☐	15) Charge CDU and recheck diagnostics.
☐	☐	16) Fire the shot.
☐	☐	17) Record data from shot diagnostics.
☐	☐	18) Check the area for shot-induced fire.
☐	☐	19) Verify a safe condition on the mound and short CDU.
☐	☐	20) Sound "all clear" when it is safe to leave Bldg. Q-23.
☐	☐	21) Police the area for any unconsumed HE or hazardous debris and dispose of appropriately.

Signature _____ Date _____
Firing Supervisor

DX-16 Q-Site Firing Checklist (Cont)

In the event of a misfire the following procedure will be followed:

N/A	OK		
❑	❑	1)	DO NOT LEAVE CONTROL ROOM.
❑	❑	2)	Check all electrical connections and firing voltage in the control room.
❑	❑	3)	Attempt to fire the shot again.
❑	❑	4)	If the shot still does not fire, turn off all power to firing system.
❑	❑	5)	Wait a time considered appropriate by Firing Site Supervisor (nominally 30 minutes) observing the shot for any signs of smoke or activity.
❑	❑	6)	If during the waiting period no activity is observed, <u>one</u> person shall approach the firing mound pit and disconnect the detonator cable from the CDU.
❑	❑	7)	Remove or disconnect the detonator from the shot.
❑	❑	8)	Check detonator leads and cable for continuity with an approved DCO.
❑	❑	9)	If the problem has been identified and corrected, firing operations may be checked by firing one or more detonators.
❑	❑	10)	If the problem cannot be identified, notify the DX-16 Group Office (7-4411), secure the area, and await further instructions.

Notes or Comments:

M-1

STANDARD OPERATING PROCEDURE

FOR

DESTRUCTION OF
HE-CONTAMINATED WASTE AND HE WASTE

6.1.5

Prepared by: _____ Date: 5/7/93
J. R. Stine, M-1

Approved by: _____ Date: 5/7/93
CCB 5/12/93
John C. Dallman, M-1 Group Leader

Approved by: _____ Date: 5/14/93
M-DO
dcg 5/17/93

Approved by: _____ Date: _____
HS-5

Final Approval: _____ Date: _____
C. B. Bieri, Group M-1 ES&H Officer

This SOP has been approved by M-1 and M-DO. While we await final review from HS and other groups as determined by HS, we are using this SOP as written. If more than 30 days have elapsed without action by reviewing Groups outside M Division, this SOP will be regarded by the M-1 Group Office as having the full force of complete and unqualified endorsement.

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1.0 INTRODUCTION

Group M-1 does tests and operations on new high-explosives that have unknown properties and characteristics. These operations generate waste that cannot be sent to WX-3 for disposal because of its uncharacterized nature or experimental history. These wastes are destroyed at Q-Site East by either burning or detonation.

2.0 PURPOSE

The purpose of this operation is to safely destroy HE waste and HE-contaminated waste originating in Group M-1. This SOP is closely tied to M-1:SOP 6.1.

3.0 SCOPE

This SOP applies to all M-1 personnel who perform the burning and detonation operations. These operations shall only be performed by Group M-1 personnel at Technical Area (TA) 14 (Q-site), Building 23 and the adjacent firing area.

4.0 DEFINITIONS

HE-Contaminated Waste:	Materials such as rags; paper; sample containers; Kimwipes; toothpicks; other process and clean-up waste.
HE Waste:	Damaged or suspect devices, explosives that have undergone severe testing, experimental explosives, explosives of temporary interest, newly synthesized compounds, new mixtures, and some salvage explosives.

5.0 RESPONSIBILITIES

5.1 Group Leader

- Ensures that the necessary policies, procedures, equipment, expertise (training), and manpower are available for this operation and delegates the responsibility for implementation of details to a Line Supervisor.

5.2 Line Supervisor

- Implements the details for safely performing these operations.
- Chooses, along with the Group Leader, the Firing Site Leader.

5.3 Firing Site Leader

- Has primary responsibility for safe operations.
- Supervises routine burning and detonation operations.
- Trains operators.

5.4 Operator

- Is responsible for safe operations.
- Assists Firing Site Leader in the burning and detonation operations.

5.5 M-1 Training Coordinator

- Provides information on training for this operation. Training is in accordance with the Laboratory's Administrative Requirements (ARs) in the *Environment, Safety, and Health* Manual and the *DOE Explosives Safety Manual*, Chapter V.

6.0 PRECAUTIONS AND LIMITATIONS

6.1 Location, Composition, and Weight Limitations

Location, composition, and weight limitations depend on whether the waste will be destroyed by burning or by detonation. HE-contaminated waste will be burned, and HE waste will be detonated.

6.1.1 Burning Operation

HE-contaminated waste shall be burned in the burn cage (Fig. 1) located near Mound 3. The cage shall be positioned so that it is in full view from the observation ports in Room 101 of Building 23.

Only small samples of powder or consolidated HE, experimental HE, propellant, or energetic materials that would pose no hazard to the burn cage or the area, if they should burn rapidly, shall be burned in any one waste-disposal operation.

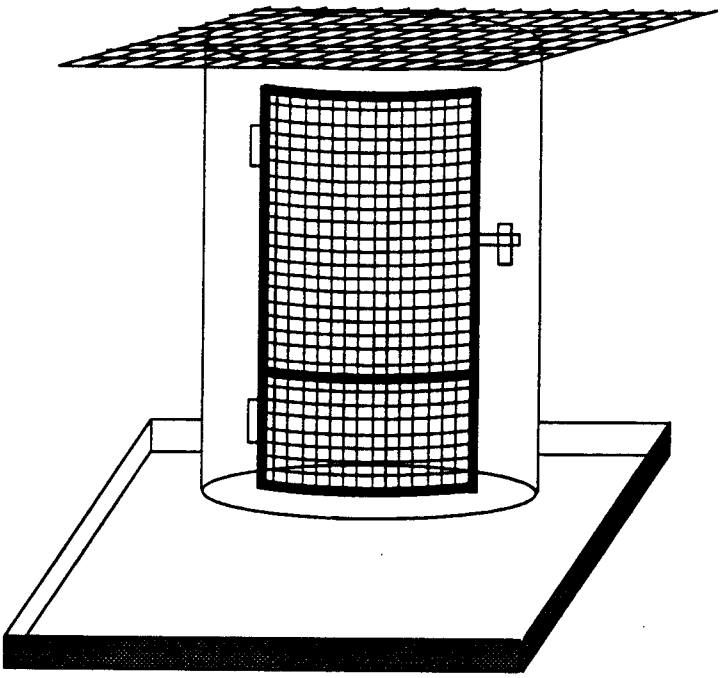

Fig. 1. Burn cage.

6.1.2 Detonation Operation

HE waste shall be destroyed by detonation on Mound 3.

6.1.3 Weight Limitations

Weight limitations are as follows.

Operation	Weight Limitation
Burning	50 lb of combustibles in each burn
Detonation	10 lb per shot

6.2 Personnel Limits

The personnel limits in M-1:SOP 6.1 shall be followed for this operation.

6.3 Transportation

The requirements for transporting HE-contaminated waste and small samples of HE waste for burning and detonation are listed below.

- Waste shall be transported to TA-14 (Q-Site) in accordance with M-1:SOP 1.9 for on-site transportation.
- No quantity greater than that which can be disposed of in a single day shall be transported to Q-Site.
- Operators will be told where HE waste is stored.

6.4 Storage

The following storage precautions shall be taken for materials to be burned and to be detonated:

- HE-contaminated wastes are stored in Magazine AE-208A at TA-9 while awaiting destruction at Q-Site. The waste will be labeled with its contents by the generator and labeled "Hazardous Waste" by the Waste Management Coordinator.
- At Q-Site, the explosive-contaminated waste will be kept in Room 104 of Building 23 while "in process."

7.0 PROCEDURAL STEPS

7.1 Preparations Before Burning

Follow the procedures below when preparing to burn explosive-contaminated waste.

Step	Action
1	• Clear the area by driving to Q-Site West (TA-14-34) and Mound 5 at Q-Site East to make sure that no unauthorized personnel are within the site. • Alert all personnel at Q-Site West that a burn operation is to occur and inform them of the type of material involved.
2	Make sure that plenty of fuel is available to completely destroy the waste and the containers.
3	• Uncover the burn cage, • Check the burn cage to see that no metal or foreign objects are in the middle section where the waste will be placed, and • Remove any that are found.
4	• Check the bottom, or fuel space, for undestroyed material and • Wrap any that is found in paper and place it on the grate.
5	Open all containers, such as glass or plastic, where a pressure buildup could occur. **Note:** If waste containers are wet, return them to the originator for proper drying. **CAUTION** DO NOT combine materials. Keep all HEs in their separate containers.
6	Place the waste container on the grate, spaced so a good draft will result during burning.
7	Place excelsior or similar readily combustible material in the bottom section of the burn cage.

7.2 Burning Operation

Follow the steps below for destroying HE-contaminated waste.

Step	Action
1	Short the end of the detonator cable.
2	Attach one or two ignitors in parallel to the firing cable and place them in the fuel space.
3	Sprinkle fuel on the HE-contaminated waste to enhance destruction of the waste and aid in ignition. **Note:** Use only volatile hydrocarbons, such as acetone, toluene, fuel oil, hexane, as a fuel. **CAUTION** DO NOT use any material that contains metals or halogens in its molecular composition. If in doubt, check with the experimenter in charge of Q-Site.
4	Cover the top of the burn cage with the wire mesh provided to minimize the escape of burning particles.
5	Fire the ignitors using the firing control unit in Room 101 of Building Q-23 (see M-1:SOP 6.1). **Note:** The siren will go through its normal sequence, but the Firing Supervisor may turn the siren off after determining that the burn is progressing satisfactorily.
6	• Wait for at least 10 minutes after visible flaming has stopped and • Then sound the "all-clear" signal. **Note:** If there is still a considerable amount of smoke, the Firing Site Leader must use his judgment about delaying the all-clear signal.
7	In the event of a misfire, do not approach the area until at least 10 minutes have elapsed without any evidence of flames or smoke in the burn cage.
8	DO NOT use the burn cage for another burn operation for 24 hours.
9	After 24 hours or more, remove the ashes and place in the satellite storage outside Building 23.
10	Cover the burn cage with a tarp.

7.3 Detonation Operation

HE waste that cannot be disposed of by WX-3 because of its nature or experimental history shall be destroyed by detonation at TA-14. The steps below shall be followed for detonating HE waste.

Step	Action
1	Be sure you have a completed shot sheet, signed by the experimenter or alternate in charge of firing operations.
2	• Clear the area by driving to Q-Site West (TA-14-34) and Mound 5 at Q-Site East to make sure that no unauthorized personnel are within the site. • Alert all personnel at Q-Site West that a detonation operation is to occur and inform them of the type of material involved.
3	• Inspect Mound 3 and • Rake to remove any foreign materials such as metal fragments or rocks if necessary.
4	Enter the following information on the shot sheet: • Operator conducting shot, • Date and time, • Description of material being destroyed, • Comments on the operation, i.e., detonated easily, difficult to detonate, etc.
5	Place the HE to be disposed of into a cardboard container.
6	Fill the container with a sufficient amount of bulk explosive, such as nitroguanadine.
7	Place a booster into the bulk explosive so that it makes good contact. Notes: • Consolidated explosives known to be less sensitive to impact than 10 cm on Type 12 tools, 15 cm on Type 12B tools, or resistant to more than 0.05 joules in the 3-mil lead-foil spark test may be removed from their containers, placed gently on clean sand, and fired with a booster taped to the charge or placed near the charge. • More sensitive explosives or experimental HE without impact data will require an SWP.
8	Follow the instructions in M-1:SOP 6.1 to fire the shot.
9	If a misfire occurs, allow at least 30 minutes to elapse without any evidence of reaction in the material to be destroyed before approaching the area (see Attachment I).

7.4 Disposing of Waste

Waste generated from these operations shall be packaged and disposed of according to M-1:SOP 1.5. Waste minimization will be handled according to the M-Division Operations Manual.

7.5 Emergency Procedures

In the event of an emergency situation, the Building Emergency Plan (BEP)/ Site Emergency Plan (SEP) shall be followed. The BEP/SEP shall be available in Building Q-23 and the operators shall be familiar with its contents.

8.0 REQUIRED RECORDS

- M-1:SOP 6.1
- Completed and signed Shot Sheet (for detonation or burning)
- M-1 Q-Site Check List, Burning of HE-Contaminated Waste

9.0 REFERENCES

- DOE Explosives Safety Manual
- Los Alamos Environment, Safety, and Health Manual
- M-Division Operation Manual
- M-1:SOP 1.5, Disposal of Hazardous Materials
- M-1:SOP 1.9, Packaging and On-Site Transportation of Explosives
- M-1:SOP 6.1, Q-Site East (TA-14) Firing Operations

10.0 ATTACHMENTS

I. M-1 Q-Site Check List, Burning of HE-Contaminated Waste

II. Hazardous Waste Facility Permit

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Attachment I

M-1 Q-Site Check List
Burning of HE-Contaminated Waste

Requester _____ Date Burned _____

Charge Code _____ Shot No. _____

This checklist is intended for use as a safety supplement to M-1:SOP 6.1.5 "Destruction of HE-Contaminated Waste and Waste HE." All Q-Site users must be familiar with Group M-1 SOPs 6.1 and 6.1.5. This checklist should be referred to by the Firing Supervisor subsequent to burning in the burn cage and prior to final arming. In the event of a misfire follow the checklist on the other side of this page.

OK	N/A	
❑	❑	1) Secure and clear area.
❑	❑	2) Ensure burn cage is clean.
❑	❑	3) Open all glass and plastic containers.
❑	❑	4) Place containers to be burned on grate.
❑	❑	5) Place fuel material in bottom of burn cage.
❑	❑	6) Short end of detonator cable.
❑	❑	7) Attach ignitors to detonator cable and place igniters in fuel material.
❑	❑	8) Sprinkle fuel on waste material.
❑	❑	9) Cover top of burn cage with wire mesh.
❑	❑	10) Connect detonator cable to CDU.
❑	❑	11) Start firing sequence.
❑	❑	12) Fire ignitors.
❑	❑	13) Observe burning.
❑	❑	14) Turn off siren (do NOT sound "all-clear").
❑	❑	15) Wait 10 min. after flame has stopped and sound "all-clear."
❑	❑	16) Another batch cannot be burned until 24 hours has elapsed.
❑	❑	17) Clean up ashes (after 24 hours) and place in satellite storage outside TA-23.
❑	❑	18) Cover burn cage with tarp.

Signature _____ Date _____
Firing Supervisor

FORM DATE 8/7/91 Approved By: _____ Date: _____

In the event of a misfire the following procedure will be followed:

OK	N/A	
❑	❑	1) Do not sound the "all clear" and DO NOT LEAVE CONTROL ROOM.
❑	❑	2) Check all electrical connections and firing voltage in the control room.
❑	❑	3) Attempt to fire the shot again.
❑	❑	4) If the shot still does not fire, turn off all power to firing system.
❑	❑	5) Notify any M-8 personnel who are at Q-site of the misfire.
❑	❑	6) Wait a time considered appropriate by firing site supervisor (nominally 10 minutes) while observing the shot for any signs of smoke or activity.
❑	❑	7) If during the waiting period no activity is observed, <u>one</u> person shall approach the burn cage and disconnect the detonator cable from the capacitor discharge unit (CDU).
❑	❑	8) Disconnect the squib from the detonator cable.
❑	❑	9) Check detonator leads and cable for continuity with an approved detonator current ohm (DCO).
❑	❑	10) If the problem has been identified and corrected, firing operations may be checked by firing one or more ignitors.
❑	❑	11) If the problem cannot be identified, notify the M-1 group office, secure the area and await further instructions.

Attachment II

Hazardous Waste Facility Permit

PERMITTEE: U.S. Department of Energy
University of California Regents
LOCATION: Los Alamos National Laboratory,
Los Alamos, NM 87545

ID NUMBER: NM0890010515

PERMIT NUMBER:
NM 0890010515-1

Pursuant to the Solid Waste Disposal Act, as amended by the Resource Conservation and Recovery Act (RCRA), as amended (42 U.S.C. 6901, *et seq.*), and the New Mexico Hazardous Waste Act (§§ 74-4-1 *et seq.* NMSA 1978], a permit is issued to the U.S. Department of Energy's Los Alamos Area Office and the University of California Regents, doing business as Los Alamos National Laboratory, (hereafter called the Permittee) to operate a hazardous waste incinerator, container storage and tank treatment and storage facility at the location stated above.

The Permittee must comply with all the terms and conditions of this permit. This permit consists of the conditions contained herein including the attachments. Applicable provisions of regulations cited are those which are in effect on the effective date of this permit. New Mexico Hazardous Waste Management Regulations (HWMR-5, as amended 1989). This permit shall become effective in accordance with HWMR-5, Part IX, sections 902.F. and 902.G. and shall run for a period of ten years.

This permit is based on the provisions of HWMR-5. This permit is also based on the assumption that all information contained in the permit application is accurate and that the facility will be operated as specified in the application. The permit application consists of information submitted on March 27, 1986; revised on November 13, 1986 and November 25, 1987; and supplemented on November 8, 1988 and through numerous technical discussions.

Any inaccuracies found in the information may be grounds for the termination or modification of this permit and potential enforcement action.

Signed this 8th day of November, 1989

by _____
Richard Mitzelfelt, Director, N.M.E.I.D.

New Mexico
Health and Environment Department
Environmental Improvement Division

STANDARD OPERATING PROCEDURE

FOR

FIRING OPERATIONS

SOP M-8-5

Because of the transition from M-4 and M-8 to DX-11, this SOP has been reviewed by DX-11 and ESH-5 personnel and is issued without changes for operations at TA-36.

Next Review Date: August 1995

Approved by: C. M. Morf Date: 9-27-94
DX-11

Approved by: Marie Gruchie Date: 9/27/94
DX-DO

Los Alamos

Los Alamos National Laboratory
Los Alamos, New Mexico 87545

SPECIAL WORK PERMIT FOR POTENTIALLY HAZARDOUS ACTIVITIES

Requested by	Organization	Issue Date	Expiration Date
Bruce E. Takala	DX-11	Sept. 23, 1994	Sept 1, 1995

Location of Work (Tech Area, Building, Room Number): TA-36 – all firing sites

SWP I.D. Number: SWP-DX-11-94-21

Work to be Performed
Handling explosives at firing sites.

Extend operations of SOP M-8-5, "Firing Operations," to Sept. 1, 1995

Identified Hazards
Handling explosives during firing operations.

PERSONNEL ASSIGNED

Name	Duties
See attached distribution list	
Name	Duties
Name	Duties

SPECIAL CONTROLS

Safety Measures, Precautions, Personal Protective Equipment, Procedures, etc.

See attached SOP.

APPROVED BY

Group Leader Allan B. Anderson, Group Leader *for* P. M. Murphy DGL	Organization DX-11	Date 9/26/94
Safety Officer Bruce E. Takala, Safety Officer Bruce Takala	Organization DX-11	Date 9/27/94
Supervisor	Organization DX-11	Date
Others Diane Griechen, ES&H Officer Diane Griechen	Organization DX-DO	Date 9/27/94
Roger Goldie, Safety Engineer Roger H Goldie	Organization ESH-5	Date 9/27/94

STANDARD OPERATING PROCEDURE

FOR

FIRING OPERATIONS

Prepared by: John B. Ramsay Date: Dec 2, 1992
J. B. Ramsay

Approved (M-8): J. W. Straight Date: 12/2/92
J. W. Straight

Approved (M-DO): T. R. Neal Date: 12/9/92
T. R. Neal

Approved (HS-5): R. H. Goldie Date: 12/21/92
R. H. Goldie

Implementation: C. M. Montoya Date: 2/17/93
C. M. Montoya, M-8 ES&H Chairman

This SOP has been approved by M-8 and M-DO. While we await final approval from groups in HS or other divisions, we are using the SOP as a completely legitimate instrument. If more than 30 days has elapsed without action by reviewing groups outside M Division, the SOP will be regarded by the M-8 Group Office as having the full force of complete and unqualified endorsement.

1.0 INTRODUCTION

None.

2.0 PURPOSE

Some SOPs involve specific operations, but this one describes the basic procedures and protocols by which a safe environment is ensured for all personnel at TA-36 and TA-14 (Q-Site West) during preliminary preparations, circuit testing, clearance, firing operations, and misfire procedures.

3.0 SCOPE

This SOP presents the procedure for conducting test-firing operations involving explosives at TA-36 (Kappa Site) and TA-14 (Q-Site West). It covers these operations at the six firing sites, Bunkers TA-36-3 (Eenie Site), TA-36-6 (Meenie Site), TA-36-8 (Minie Site), TA-36-12 (Lower Slobbovia), TA-36-107 (IJ Point), TA-14-34 (Q-Site), and at their associated firing mounds. Some unique TA-14 (Q-Site West) operations are covered in a separate SOP, M-8-80, and fragment shots that require clearance along Ridge Road are described in SOP M-8-87. Test-firing operations involving the use of a rocket on the sled track at TA-36-12 are covered in SOP M-8-92.

4.0 DEFINITIONS

4.1 Radio-equipped vehicle: A government vehicle equipped with a two-way radio tuned to the designated M-8 frequency.

4.2 Hand held: A two-way hand held radio.

4.3 Knowledgeable Visitor: A few Non-M-8 LANL employees have work duties that require frequent visits within the M-8 firing areas, and they are knowledgeable of M-8 safety procedures. Only the Group Leader or the Deputy Group Leader may designate a Knowledgeable Visitor. After such designation, this person need not log in or out with the M-8 Group Office to enter the firing areas and may escort other visitors, just as M-8 personnel may.

5.0 FIRING-SITE SAFETY FEATURES AND PERSONNEL RESPONSIBILITIES

The following features cover the operations at all TA-36 firing sites.

5.1 Firing-Area Gate

Access is controlled to the M-8 firing sites by means of a radio-controlled gate located 100 m west of the Group Office Building (TA-36-80).

5.2 Group Office Control of Access Through Firing-Area Gate

M-8 personnel and knowledgeable visitors gain access to the firing areas by using portable actuators to lift the gate barrier. All other individuals must clear through the Group Office before they will be allowed access to the firing area. Group Office personnel instruct visitors on the site hazards, have them read the Visitor Packet, and enter their names in a log. Group office personnel will contact the sites where the visitor wants to go to ensure that conditions are clear. Visitors contact the Group Office by speaker phones at the approach to the gate, and the Group Office raises the gate to allow visitors' vehicles to enter. As each visitor is leaving, he/she will again contact the Group Office at the gate, and the time of departure will be recorded in the log. Non-M-8 personnel accompanied at all times by an M-8 employee or a knowledgeable visitor need not clear through the Group Office.

5.3 Firing-Control Keys

Each firing circuit is locked, and only authorized M-8 Firing-Site Supervisors have keys to these locks attached to their exchange badges. Spare keys are locked in the Group Office key box. The Group Leader, Deputy Group Leader, or Acting Group Leader can authorize a site assistant to use a key temporarily when the site supervisor is absent. Each unit can be operated only with the key.

5.4 Firing-Circuit Test Mode

Before actual firing, but frequently after a charge has been assembled on the firing mound, personnel may want to test various aspects of the firing-control circuits; this may include charging and triggering the CDU. A by-pass system is installed at each firing site except Q-Site. These by-passes, actuated by turning a firing-circuit lock switch to the "Test Mode," permit the CDUs to be charged and triggered without the audible and visual warnings and without closing the interlock systems. Each by-pass system is interlocked with a cable trap door, through which the detonator cables must pass to be connected to the CDU. Thus, connecting a detonator cable to the CDU disables the "Test Mode" by-pass function, thereby preventing the firing of a shot when the warning system is not operating.

5.4.1 Warning signals should generally not be sounded on the horn or siren when any of the firing equipment is being maintained, adjusted, or operated with any intention other than that of indicating that a hazard exists, except that the warning signals may be tested to determine whether they are in operating condition. If a "nonhazard" test involves using the warning signals, this condition should first be announced over the radio.

5.4.2 Various components of the firing-control circuit are modified and improved at infrequent intervals. However, the design logic of the firing circuit shall always include a redundant system (two or more logic operations in series), which inhibits the connection of detonator firing cables or the high-voltage supply cable to the CDU or other firing system during the testing and maintenance phase.

5.4.3 Category II CDUs will follow a different procedure than the one described above. Testing will never be conducted on the mound while explosives are present and never conducted if the Category II CDU is connected to the detonator. Should testing of the firing circuit be required on the firing mound while explosives are present or while the Category II CDU is connected to the detonator, a special work permit to describe the procedure will be required, and permission shall be granted only by the Group Leader.

6.0 PRECAUTIONS AND LIMITATIONS

6.1 Warning Lights

Flashing red lights are located at the entrance to each firing site except IJ Point and Q-Site. They operate automatically when the firing circuit is unlocked. The firing control system indicates that the light and horn circuits have been activated. Routine clearance procedure at IJ Point requires that the access road be blocked by manned vehicle during firing operations; therefore, the alternate procedure does not compromise safe operations. The roadblock system at Q-Site is described in SOP M-8-80.

6.2 Warning Horns

A horn sounds automatically when the firing circuit is unlocked. The horn is loud enough to be heard anywhere within the firing area. Hearing protection should be worn by any person outside the bunker and near the horn because the noise level is above the recommended short-term exposure limit.
Q-Site has only a siren, as described in SOP M-8-80.

6.3 Warning Signs

A warning sign near the firing mound reads:

DANGER

EXPLOSIVES

Return to lights if horn or siren is sounding.

A warning sign is used for blocking the access roads during a clearance procedure and reads:

DANGER

KEEP OUT

High-Explosive Operations in Progress

6.4 Radio Communication During Tests

There is free-channel radio communication among all firing bunkers, the charge preparation rooms, vehicles used for clearance operations, the Group Office, and several offices of M-8 group members whose expertise is often needed during shot operations. During the time that the firing circuit is unlocked, the radio shall be reserved solely for communication concerning the shot being fired and emergencies.

6.5 Telephone Communication During Tests

During the time that the firing circuit is unlocked, the telephone line to the site shall be reserved solely for calls concerning the shot being fired.

6.6 Firing-System Interlocks

The firing-system interlock prevents the connection of detonator cable to the 2500-V CDU, low-voltage (propellant) firing systems, or the high-voltage supply to the short-firing-cable CDU while electronic maintenance and tests are being performed.

Either the detonator cable or the high-voltage supply must be connected manually from within the bunker.

6.6.1 The normal (2500-V) firing units and low-voltage (propellant) firing systems are located inside the firing bunker. The detonator cables are disconnected from the firing system after each shot and are not reconnected for another shot until all personnel are inside shelter, as specified in Secs. 7.2.1 and 7.2.2.

6.6.2 For those shots in which the firing unit must be located adjacent to the shot assembly, the high-voltage power supply shall be located within the firing bunker and the high-voltage supply cable shall be disconnected from the firing unit within the building and not reconnected until everyone is under shelter, as specified in Secs. 7.2.1 and 7.2.2.

6.6.3 The firing-bunker door is interlocked with the firing circuit and, except as provided in SOP M-8-14 (Special Firing Procedure), it must remain secured throughout the firing sequence.

Note: For a full discussion of the operation of the firing units, see Attachment A.

6.7 Sequence Timer for Warnings and Circuit Charging

The timing of warnings and firing-circuit charging is controlled by the fire control system. Four minutes (during which the horn is sounding) are provided as a back-up clearance prompt. A 30-second siren warning is sounded, followed by a 30-second period without the siren sounding. After the siren sounds for 45 seconds, the selected firing unit can be fired. The siren continues to sound during this period. See Sec. 7.5 for the shutdown procedure of the siren.

6.8 Arm Switch

A spring-loaded "Arm Switch" controls the charging of the CDU or arming of the firing system. It enables the high-voltage power supply that is attached to the capacitor bank in the CDU. Pushing the "Arm Switch" disconnects a shunt across the capacitor bank and connects the bank to the high-voltage supply. The high-voltage power supply is interlocked so that pushing the arm switch enables output from the supply. CDUs without this redundancy feature must be evaluated by the M-8 instrumentation section and the M-8 safety committee, and then approved by the Group Leader. The "Arm Switch" also operates a relay enabling the

low- voltage firing systems. These arming relays are energized by the operator actuating the "Arm Switch," as the final event in the timed sequence.

6.9 Camera Room Door

The door to the camera room will be closed whenever the rotating mirror in the smear camera is in operation. No one is permitted in the camera room when the rotating mirror is in operation.

7.0 PROCEDURAL STEPS

7.1 Preliminary Preparations

7.1.1 If, in the opinion of the Firing-Site Supervisor, there is a probability that a fire will be started as a result of a planned shot, the Firing-Site Supervisor will contact the Group Office 24 hours in advance of the scheduled shot time. The Group Office will notify the M-Division Office, which will contact the Fire Department. On the actual shot day, a one-hour warning of the firing time will be called directly to the Fire Department by the Firing-Site Supervisor. If an earlier firing time is desired, the Firing-Site Supervisor must contact the M-Division Office, and the Division Office will contact the Fire Department to reschedule, if possible. The Fire Department must be rescheduled if the prearranged time is delayed by more then 45 minutes. *(Note: communications within one hour of the scheduled shot time are made directly between the Site Supervisor and the Fire Department; otherwise, the M-Division Office should make the contact).* When reporting standby requirements, the Firing-Site Supervisor should give the shot a fire hazard category —low, medium, or high. The Site Supervisor may instruct another individual to handle the communications with the Division Office or Fire Department. The Fire Department will decide the number of tankers to be assigned to the shot. Special consideration should be given to shots involving uranium, copper, or tantalum. During the firing procedure, Fire Department personnel shall remain outside the area cleared for the firing operation until they are cleared for entry.

7.1.2 The Group Office should be notified, preferably 24 hours in advance, if an exceptionally large charge (100 kg or more) is to be fired. The Group Office will notify the M-Division Office.

7.1.3 If the fragment range is expected to include areas under the control of other groups (M-4 or M-6), the involved group shall be contacted through the M-8 Group Office for approval at least 24 hours in advance. Attachment C to this SOP discusses the evaluation of fragment hazards. Large shots at IJ Point with fragments that could affect M-4 operations are addressed in SOP M-8-87.

7.2 Clearance Procedure

All or any combination of sites (one to six sites) may fire under the same clearance operation if the site supervisors determine that no unusual hazards will be created by more than one firing operation under a single clearance.

Under the conditions stated in Sec. 7.2.2, people who are not knowledgeable about M-8 firing procedures may be within the anticipated hazard area. Therefore, it is imperative that the hazard zone be carefully cleared before any potentially hazardous operation is initiated. Only M-8 personnel or people accompanied by an M-8 employee will be allowed to remain within the hazard zone in a safe place. Persons remaining within the hazard zone must be in the firing bunker and not in either a day magazine or a charge preparation room. General maps of the firing sites are presented in Attachment B of this SOP. Each firing site has a map of its immediate area with a scale of
1 in. = 400 ft.

In each case described below, roadblocks will be established by parking a radio-equipped vehicle in the center of the access road, with an individual in radio contact with the firing bunker. The emergency warning lights on the vehicle will be operated throughout the clearance operation. If anyone passes a blockade and enters a hazard zone, the helper manning the roadblock shall immediately notify the Firing-Site Supervisor to "STOP" the firing sequence. The employee manning the roadblock shall remain at his station and shall not attempt to chase the person or persons who have passed the roadblock. The Firing-Site Supervisor shall immediately discontinue the firing sequence and confirm receipt of the message by stating:

"The firing sequence has been stopped at Bunker __."

The Firing-Site Supervisor should then take steps to clear the area again before restarting the firing sequence. Depending on the real extent of the hazard zone, as determined by the Firing-Site Supervisor, one of the following two levels of clearance will be used.

7.2.1 If the charge is bare [surrounded only by a low-density material such as wood, foam, sand, or cardboard, or is covered only by very thin, low-density metal (2-mm aluminum)] and if the Site Supervisor conducting the firing operation determines that the hazard zone is within the boundaries of the particular site, only that firing site need be cleared. A Firing-Site Leader may decide to clear to a larger hazard zone because of atmospheric conditions, because of a larger mass or new energetic compound, etc. This is accomplished by a helper who searches the site in a radio-equipped vehicle and proceeds to a safe position on the site entrance road. The vehicle should be parked, or a sign placed, to physically block vehicular access to the firing mound. The helper doing the clearing will then notify the Site Supervisor by radio that the firing area is clear for firing. The helper shall use the following format for this radio transmission:

"Calling (Name of Site Supervisor) at Bunker (No.) from (Name of helper); the firing area has been cleared to (Location)."

The Site Supervisor will then confirm the transmission as follows:

"This is (Name of Site Supervisor) at Bunker (No.), confirming roadblock at (Location)."

The manned roadblock will remain in place until the Site Supervisor notifies the helper that a safe condition exists.

7.2.2 When the hazard zone extends beyond the boundaries of the site at which the shots to be fired, the following clearance procedure will be used.

The Firing-Site Supervisor will call the Group Office and obtain the number and location of visitors in the firing areas of TA-36 (Kappa Site). The Site Supervisor may then begin the clearance procedure, ensuring that all visitors have been cleared from the hazard zone or moved to a safe location under the aegis of an M-8 employee. Employees and visitors remaining during a shot must stay in the firing chambers, not in a day magazine or a charge preparation room.

Because of the geographic differences of the firing sites, four clearance procedures will be outlined.

- Bunker 12 (Lower Slobbovia)

  The Site Assistant will clear the firing site in a radio-equipped vehicle and proceed to a safe position on the site entrance road. If the hazard zone extends beyond the Main Magazine area (Bldgs. TA-36-9, -10, and -83), the fragment-area warning sign must be placed in the center of the site entrance road while the Main Magazine area is being cleared. After the hazard zone has been cleared, the helper will park the vehicle to block the road and notify the Site Supervisor by radio (using the format specified previously) that the Lower Slobbovia area is clear for firing. The Site Assistant will remain at his vehicle until he is notified by the Site Supervisor that a safe condition exists.

  If it is necessary to fire a shot for which the hazard zone extends 500 m (1600 ft) north-northeast toward Pajarito Road, a special SWP will be required.

- Bunker 3 (Eenie); Bunker 6 (Meenie); and Bunker 8 (Minie)

  Two radio-equipped vehicles will be required. The driver of one vehicle will proceed from Minie Site and clear the Minie-Site area. While Minie Site is being cleared, the driver of the second vehicle will clear Meenie-Site area. After Meenie Site and Minie Site have been cleared, the vehicles will meet at the Potrillo Drive intersection. The drivers will then

proceed separately to the Main Magazine and IJ-Point turnoffs. Eenie Site and Daisy Mae-Kup will be cleared by the person going to IJ-Point turnoff. This may be done by placing the fragment warning sign in the center of Potrillo Drive and searching the site. Eenie Site may also be cleared by contacting Eenie-Site personnel and asking them to clear the site. The person conducting the clearance must not leave the Eenie-Site entrance until the site personnel have informed him that Eenie Site is clear. When the clearance operation has been completed, each operator will park the vehicle or place a sign to block the road, and then he will notify the Firing-Site Supervisor that the area is clear for firing. The same format is followed for radio transmission as given previously. Each assistant will remain at his vehicle until he is notified by the Site Supervisor that a safe condition exists.

For shots that may produce even longer range fragments, the clearance area may include the Bunker 107 (IJ Point) area. In this case, the Ridge Road gate must be double-locked and the area cleared as described below under Bunker 107 clearance. An additional vehicle or sign must be used to block Potrillo Drive at the IJ turnoff while the IJ area is being cleared.

- Bunker 6 (Meenie) and Bunker 8 (Minie)
  When Meenie-Site or Minie-Site personnel are firing a shot that might throw fragments to the adjacent site but that would not throw them to any portion of Potrillo Drive, the clearance operation should follow the outline described above, but it need extend no further than the Meenie/Minie road intersection with Potrillo Drive. A driver in a single vehicle may clear with a sign on the road or radio communication.
- Bunker 107 (IJ Point)
  - Firing operations will normally be limited to those shots whose nondirectional fragment ranges are less than 550 m (1800 ft), to reduce interference with Group M-4's operations. SOP M-8-87 addresses the operations in which longer fragment ranges are expected and in which M-4 firing sites must thus be cleared. Ridge Road at the entrance to IJ Point will be blocked with a sign or manned vehicle while the gate is being locked to ensure that no one can enter IJ Point during this time.
  - The chain link gate between TA-36 and TA-15 on Ridge Road will be locked with a chain and padlock at the start of the clearance procedure. The key for the padlock will be retained by the IJ Firing-Point Supervisor or his assistant during the firing operation. The chain will be removed after the firing operation has been completed or discontinued.

- An M-8 employee in a vehicle equipped with a radio will clear the area adjacent to the firing mound and then proceed to a safe distance along Ridge Road toward the main M-8 (TA-36) area. The road will be physically blocked to prevent access to the IJ Point firing area.
- Fragment shots that require clearance along the IJ-Point/M-4 road beyond the Ridge Road gate are covered in SOP M-8-87.

- Q-Site West (TA-14)
  - Clearance procedures for Q-Site are covered in SOP M-8-80.

7.2.3 Outside of normal working hours, when the firing sites are normally unoccupied, a modified clearance procedure will be used. The Group Office will be informed before 4:00 pm that a firing operation will take place outside of normal hours. The Group Office will notify the M-Division Office about shots fired outside the period 8:00 am to 5:00 pm on workdays, and at any time on weekends and holidays. For a late shot, the Group Office will leave the access gate in the closed position. A sign will be left at the gate actuator located in the Group Office stating which site and site supervisor is conducting a late firing. The site personnel are responsible for leaving the access gate in the open (upright) position after the firing operation has been completed. For shots to be fired before normal working hours, the site personnel shall close the hazard-area access gate before starting the firing sequence. Group Office personnel will notify the Security Communication Office (Station 100) that a firing outside of regular hours is scheduled, and they will give the location and approximate time that the shot will be fired. For weekend and holiday firing activity, when the Group Office is normally not operating, the Firing-Site Supervisor is responsible to verify that Station 100 has been properly notified.

- Hazard zone within individual site boundaries
  If the hazard zone is within a site's boundary, then the procedure outlined in Sec. 7.3.1 shall be followed for shots outside of normal working hours.
- Hazard zone extends beyond the individual firing-site boundary
  Only one Firing-Site Assistant is required to clear the hazard zone for shots fired outside of hours when the hazard zone extends beyond the firing-site boundary. When the Site Supervisor is ready to start the clearance procedure, his assistant will proceed to Lower Slobbovia in a radio-equipped vehicle and clear the entire area to IJ-Point turnoff or beyond, where a roadblock will be set up and maintained until the Site Supervisor notifies the individual that the firing area is in a safe condition. Warning signs will be used to prevent

access into the hazard zones that have been cleared, whenever the individual doing the clearance must leave Potrillo Drive to clear unoccupied areas.

7.2.4 If clear radio contact cannot be maintained between the helper stationed at the roadblock and the Firing-Site Supervisor, a relay may be set up through a telephone or another radio, provided that such action has the prior approval of the Group Leader and that the individual acting as the relay operator is familiar with the M-8 field operations.

7.2.5 To reduce the possibility of confusion or misinterpretations of radio messages, the following are suggested.

- Reserve the use of words such as "hold" and "stop" for emergency communications to have the site supervisor immediately terminate the firing sequence until further notification.
- Use the name of the individual being contacted by radio, in addition to the site designation, during any radio communications involving hazardous operations.
- Refer to M-8 sites by these designations in radio transmissions:

  BUNKER 3 (Eenie Site)
  BUNKER 6 (Meenie Site)
  BUNKER 8 (Minie Site)
  BUNKER 12 (Lower Slobbovia)
  BUNKER 107 (IJ Point)
  BUNKER 34 (Q-Site)
- During confirmation of the radio check and site clearances, proceed in sequence from Lower Slobbovia through to IJ-Point turnoff and Bldg. 80.
- Avoid and curtail nonemergency radio transmissions while any firing operation is in progress. In an emergency situation requiring radio use, all firing operations shall be suspended.

7.3 Firing Procedure

7.3.1 When the Firing-Site Supervisor receives notification that the hazard zone has been cleared, he will secure the firing-bunker door, unlock the firing circuit (thus starting it), and make certain that the horn is operating. Although the fire control system indicates when power is applied to the horn and to the siren, the Firing-Site Supervisor must confirm by listening that they are sounding. If the horn or siren fails to operate, he shall shut down the firing operation without firing. Firing operations with a nonoperational horn or siren may be executed only with explicit Group Leader approval.

7.3.2 He may connect the detonator cable to the firing system and proceed with any other preparatory activities required while the normal firing sequence progresses.

7.3.3 Just before actuating the "Arm Switch," the Firing-Site Supervisor will contact the assistant at each roadblock by radio to ensure clear radio contact. The format of this transmission shall be as follows:

"This is a radio check from BUNKER (No.)"

The helper shall respond:

"Received loud and clear at (Location)."

After the Firing-Site Supervisor has assured himself that all radio checks have been received, he may then proceed to fire the shot at his discretion. If any non-shot-related radio transmission occurs on the M-8 net between the radio check and firing of the shot, the radio check shall be repeated.

7.4 Misfires, Abort Conditions, and Tandem Warhead Test

7.4.1 If the Firing-Site Supervisor pushes the "FIRE" button and the shot fails to fire, he will try, without sounding the "All Clear," to determine whether the failure creates a potential hazard; in other words, a "hangfire." Without terminating the firing sequence, he will look for possible trivial causes (such as an unconnected detonator cable). If a trivial cause is determined, the Site Supervisor may attempt to fire the shot a second time after ensuring that no diagnostics have been jeopardized. If the cause is not located or is not trivial, he will disconnect the firing cables and wait five minutes. After this waiting period, a remote visual inspection will be performed for any sign of reaction (smoke, fire, etc.), either through the camera periscope, or by the person blocking the road. If a low-voltage propellant initiation system is being used, the Site Supervisor should wait 20 minutes. If no evidence is noted, the Site Supervisor will then terminate the firing sequence, as indicated below. If there are any unusual circumstances, conditions, or any indication of reaction, the Group Leader or Group Safety Officer will be contacted for special instructions on terminating the firing sequence. The warning signals should not be continued for longer than ten minutes unless a hazardous condition exists that cannot be safely removed. After finding the apparent cause of the misfire (except for trivial causes) and before attempting to fire the shot a second time, the Firing-Site Supervisor will contact the Group Leader or another Firing-Site Supervisor and review the operation and the corrective measures taken.

7.4.2 Shots involving projectiles (bullets, shaped charges, etc.) fired into targets containing energetic material are covered in SOP M-8-35.

7.4.3 For tandem warhead shots, in which there is a possibility that the first warhead detonates but the second does not, the site supervisor will disconnect the firing cables and wait five minutes. After the waiting period and a remote visual inspection, the Site Supervisor or his designee will inspect the area for damaged explosive.

7.5 Completion of Firing Operations

7.5.1 The firing operation is completed by disconnecting the detonator cables from the firing unit, permitting the siren to sound for an additional 60 seconds to allow time for the shrapnel to fall, and then locking the firing circuit. An "All Clear" of two short blasts of the siren is then sounded.

7.5.2 In an emergency shutdown of the firing operation before the charge is fired, the 60-second sounding of the siren may be omitted.

7.5.3 Notice of completion or cancellation of the firing operation must originate with the Firing-Site Supervisor and be transmitted to all involved personnel. The format for this transmission shall be as follows:

"The shot at BUNKER (No.) is ALL CLEAR and it is now safe to enter."

No one is to leave shelter until he/she receives this notice.

8.0 REQUIRED RECORDS

None.

9.0 REFERENCES

Los Alamos *Environment, Safety, and Health* manual, AR 6-6, "Explosives."

DOE Explosives Safety Manual

Group M-8 Standard Operating Procedures:

SOP M-8-SC, "M-8 Safety Charter"
SOP M-8-14, "Special Firing Procedure"
SOP M-8-35, "Projectile Impact on Energetic Material Targets"
SOP M-8-43, "Allowable Explosives"
SOP M-8-75, "Emergency Plan"
SOP M-8-80, "Firing Operations at TA-14 (Q-Site West)"
SOP M-8-87, "High-Hazard Shots at IJ Point"

10.0 ATTACHMENTS

A. Description and Use of Firing Unit

B. Specifications of M-8 Firing-Site Boundaries (Maps)

C. Evaluation of Fragment Hazards

D. Procedures for Elimination of Unexploded Explosive on the Firing Mound

ATTACHMENT A

Description and Use of Firing Units

Only exploding bridge-wire detonators (EBW) and electrically driven foil detonators are allowed for initiating high explosive during Normal Operations at M-8. Low-voltage initiators are used for propellant systems and experiments, such as the DDT tubes described in SOP M-8-53. EBW detonators require a high-voltage, high-energy electrical source to react with sufficient violence to initiate detonation in an acceptor explosive. The energy source routinely used is a capacitor discharge unit (CDU). Only CDUs approved by M-7 and/or the Explosives Review Committee are allowed for initiating high explosives for Normal Operations at M-8. This appendix describes the two categories of CDUs in current use at M-8. Other Normal Operations at M-8 include the use of two different low-voltage propellant initiators. This attachment also describes these two systems. Other systems may be used only after they are approved in new SOPs or SWPs.

High-Voltage Detonator Systems for High Explosives

Category I

This category is restricted to firing units in which both the CDU and the high-voltage supply are located inside the firing bunker. Generally, they are designed to fire several detonators on long (>5 m) firing cables. The standard 50-point unit is an example. All firing units in current use in this category attach to an external high-voltage supply. Detonator cable connections at the CDU are not made until after the hazard zone has been cleared and the firing sequence has been started. (See SOP main text, Secs. 7.3.1 and 7.3.2.)

Category II

Certain detonator types and shot assemblies must be fired with the CDU less than 2 m from the charge. In firing units allowed under this category, the CDU is located on the firing mound and the high-voltage supply is inside the firing bunker. The control circuit and triggering thyratron are also located in the bunker. When Category-II CDUs are in use, the detonator must be connected to the CDU before the hazard area is cleared of personnel. Because this is inherently a more hazardous operation, the following procedure shall be followed.

1. No detonator cable may be connected to a Category-II CDU unless the Firing-Site Supervisor directly authorizes it.
2. Before giving this authorization, the Firing-Site Supervisor will ensure that
   - the firing and test circuits are off and locked;
   - the high-voltage supply cable is disconnected at its interlock box located on the control panel inside the firing bunker;
   - the measured resistance across the high-voltage connector on the mound-access housing is 50±10 kΩ; and
   - the high-voltage cable from the CDU to the mound-access housing is connected. (This ensures that the safety shunt circuit is connected and operational.)

A shorting plug should be connected (and then removed) to the detonator end of the detonator cable to drain any residual charge. If a shorting plug is not available, a short piece of wire can be used, or an approved volt-ohmmeter (VOM) can be used to probe for residual voltage.

3. After these conditions have been met, the Firing-Site Supervisor may authorize the connection of the detonator cable to the CDU, shorting the detonator connector on the CDU before making the connection, as a final check that the circuit is safe.
4. After the hazard area has been cleared and the firing sequence started, the high-voltage supply may be connected to the CDU from within the firing bunker, as described in the main text (see Secs. 7.3.1 and 7.3.2).

No provisions are made in this procedure for firing units in which the CDU has an internal high-voltage supply. Until such provisions are made, this type of firing unit is not permitted.

Low-Voltage Initiator Systems for Propellants

Type 1. This is a low-voltage (≈50-V) CDU system used primarily to initiate rounds in the 105mm, 120mm, and 5-in. guns, the DDT experiments (SOP M-8-53) and rocket motors for sled track operations (SOP M-8-92). This CDU has an internal supply; however, it is powered through relays controlled by the firing key, arming switch, and firing switch.

Type 2. This is an isolated 115-V ac and 300-V ac output supply used primarily to operate solenoids that fire guns up to 7 in. The output is supplied by a relay controlled by the firing key, arming switch, and firing switch. Thus power cannot unintentionally be applied at the output of the CDU and operation is identical to the high-voltage CDUs. The 115-V ac and 300-V ac outlets use Reynolds 21 and 31 connectors, respectively, so that they cannot be confused. The supplies are interlocked so that voltage cannot be applied during test mode use.

ATTACHMENT B

Specifications of M-8 Firing-Site Boundaries

An agreement among the various M-Division firing groups defines the geographical boundaries of the land controlled by each group. The agreement is that fragments produced by one group will not encroach into the area controlled by another group without prior notification. Section 7.1.3 of this SOP requires that the affected group be given 24 hours' warning of the scheduled shot if the hazard area extends outside the land controlled by M-8. The attached maps show the boundaries separating TA-36 (M-8) from TA-15 (M-4). This boundary is slightly more than 700 m from Eenie Site (Fig. B-1) and 900 m from Meenie Site (Fig. B-2). The 300-m radius and the envelope of the 600- and 900-m radii centered about each site are also shown on maps (Figs. B-1 through B-6). The Q-Site firing radius is 90 m. In addition, each site has a topographic map, with these radii indicated at a scale of 1 in. = 400 ft. IJ Point is 600 m from PHERMEX and 620 m from Bldg. R-280 (Fig. B-5). Two additional hazard zones of 1200 and 1500 m are shown for IJ Point (Fig. B-5).

Pajarito Road lies within 600 m of Lower Slobbovia. Shots that could throw fragments to Pajarito Road are not to be scheduled at Lower Slobbovia without the preparation of a special SOP.

Within M-8, the individual Site Supervisors have access control of the land immediately surrounding their assigned firing sites and, as stated in this SOP, they will clear those areas of personnel during explosive test firings. When there is a possibility that fragments from a shot might fall in an area under the control of another M-8 site, an extended clearance procedure is required; it is detailed in the main text of this SOP. Each Site Supervisor is responsible for the final evaluation of the hazard radii for shots fired under his control.

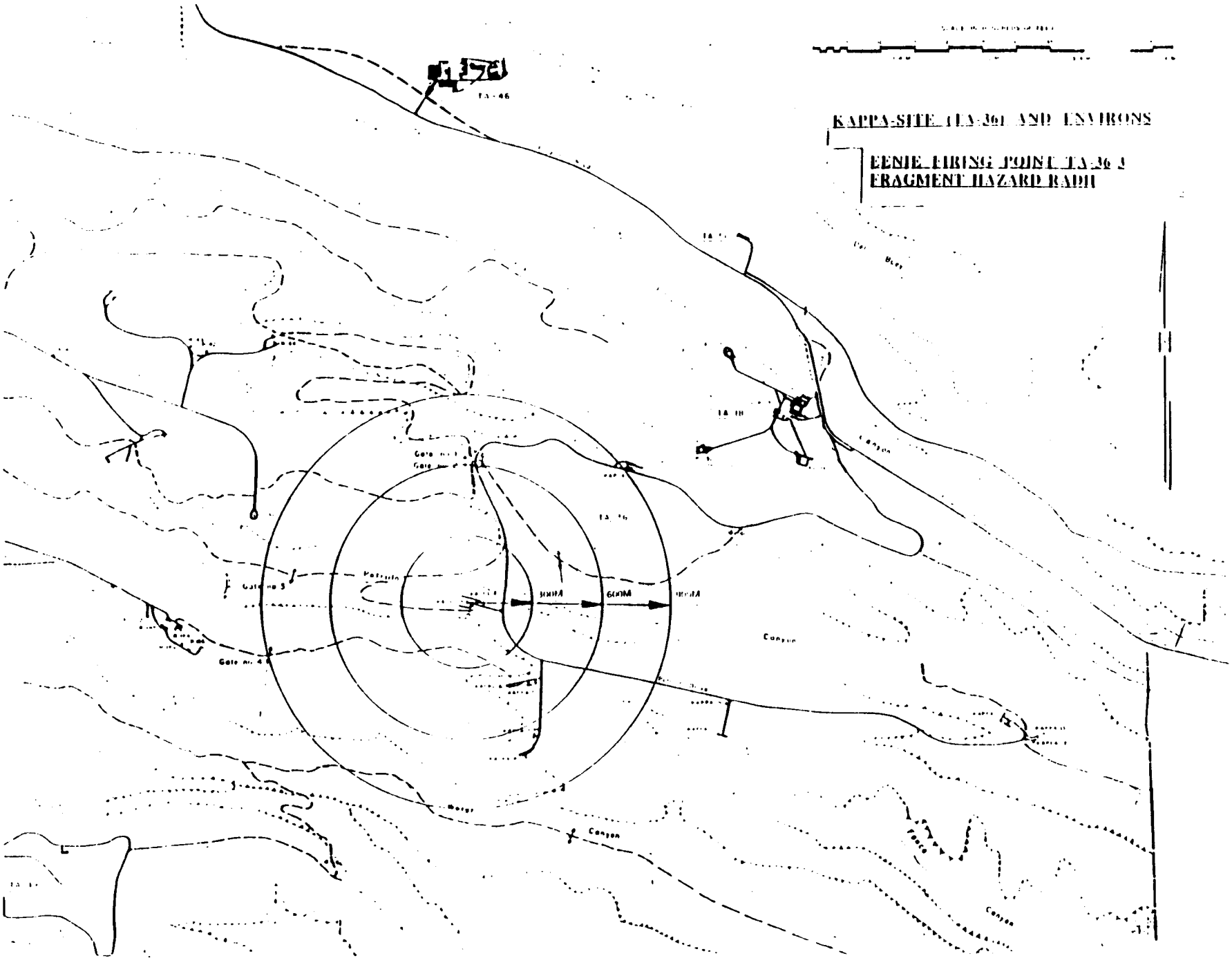

KAPPA-SITE (TA-36) AND ENVIRONS
EENIE FIRING POINT (TA-36-3)
FRAGMENT HAZARD RADII
300M
600M
Canyon

Fig. B-1.

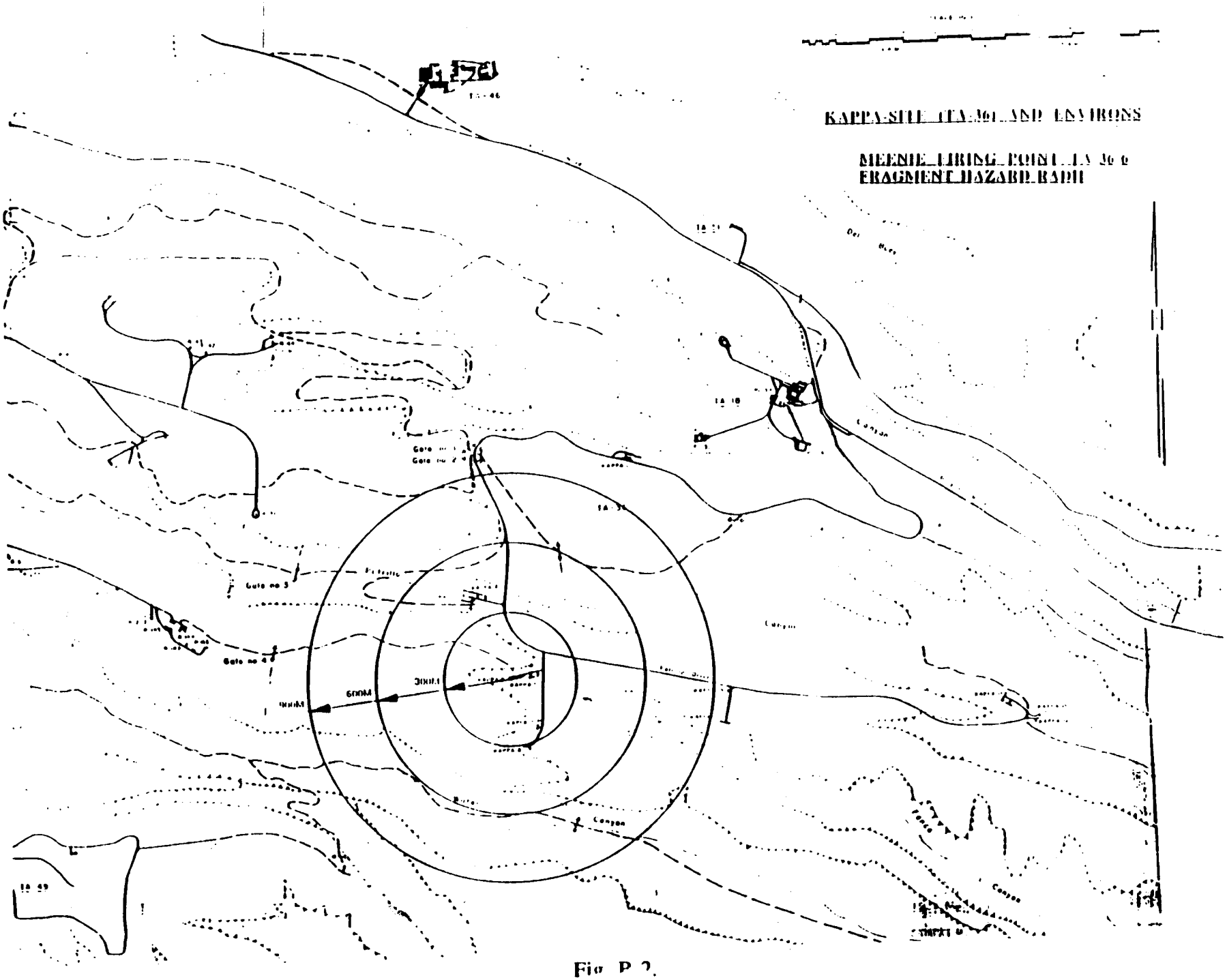

KAPPA-SITE (TA-36) AND ENVIRONS
MEENIE FIRING POINT (TA-36-6)
FRAGMENT HAZARD RADII
600M
300M
Gate no 1
Gate no 2
Gate no 3
Gate no 4
Canyon

Fig. P-2.

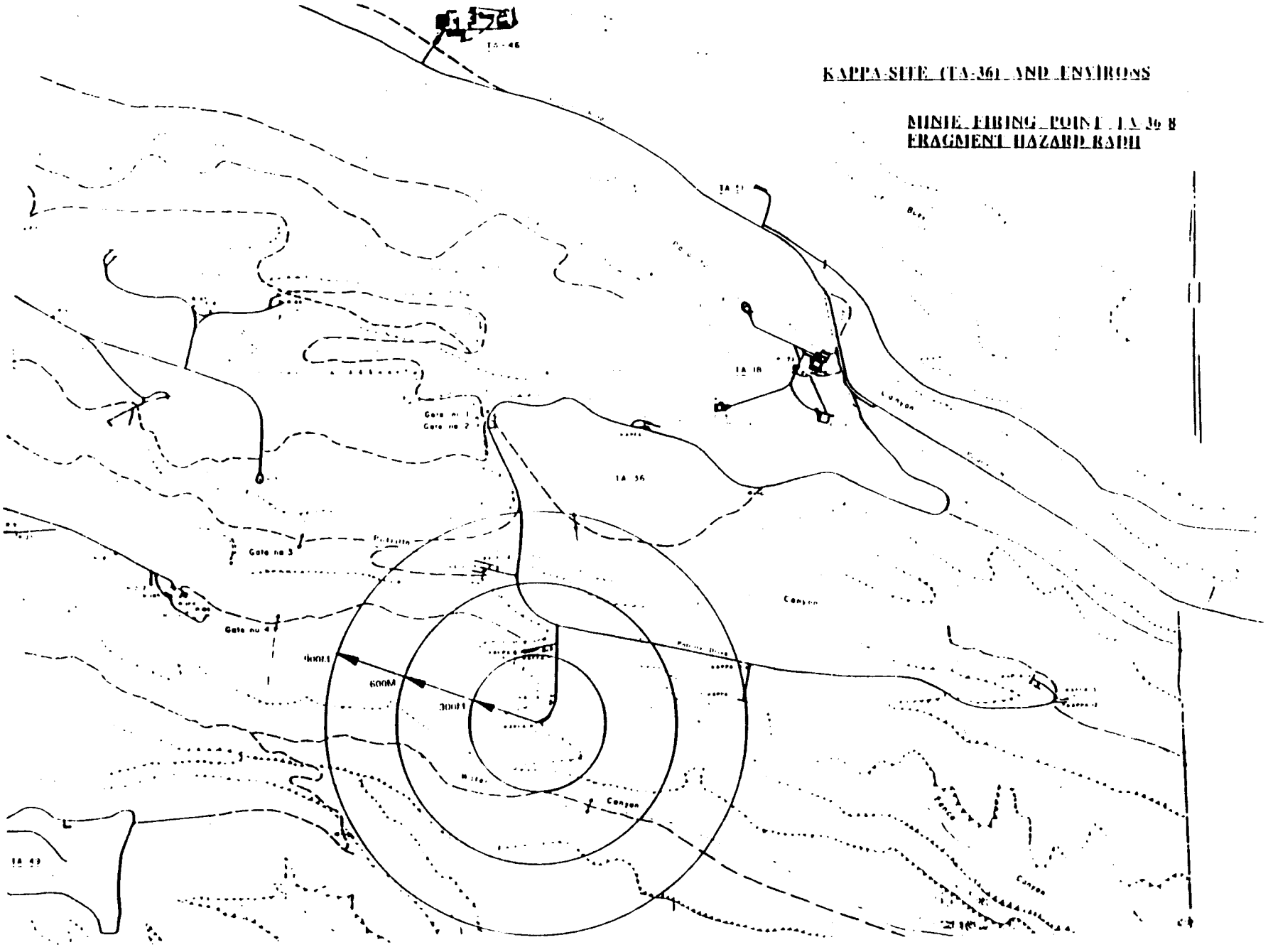

KAPPA SITE (TA-36) AND ENVIRONS
MINIE FIRING POINT, TA-36-8
FRAGMENT HAZARD RADII
TA-46
TA-18
TA-36
TA-49
Gate no 1
Gate no 2
Gate no 3
Gate no 4
Canyon
1000M
600M
300M

Fig. B-3.

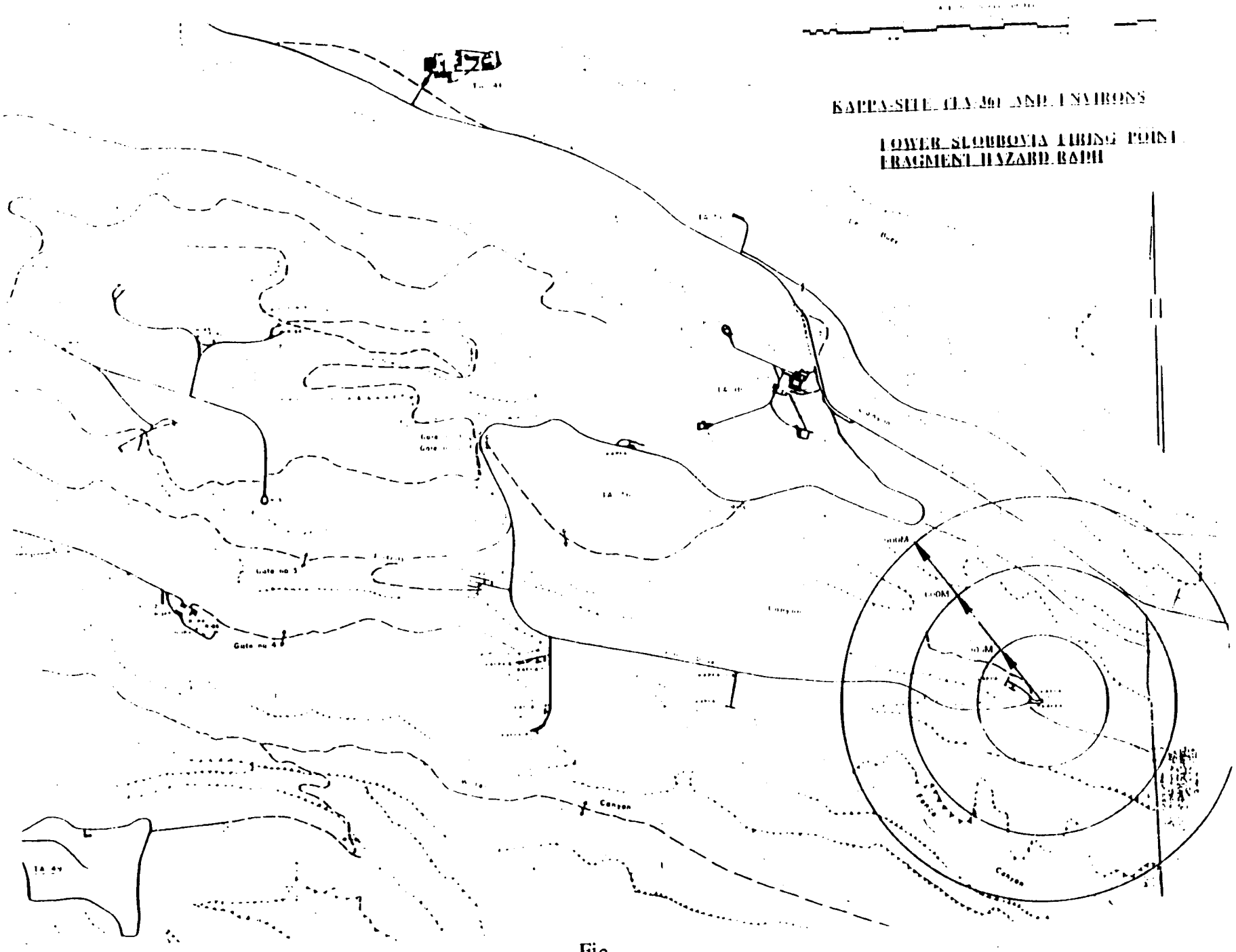

KAPPA-SITE (LA-361 AND ENVIRONS
LOWER SLOBBOVIA FIRING POINT
FRAGMENT HAZARD RADII
Gate no 3
Gate no 4
Canyon

Fig.

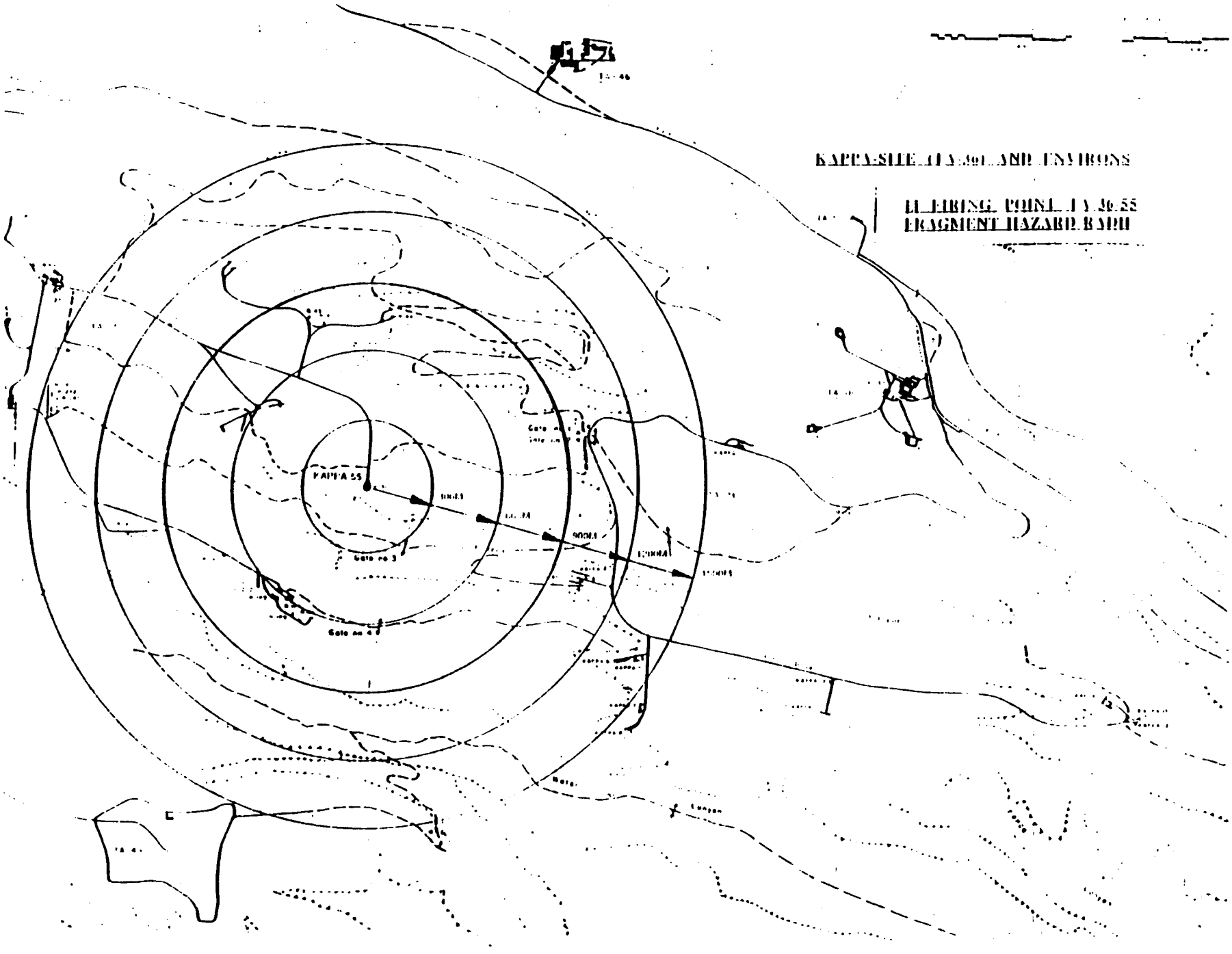
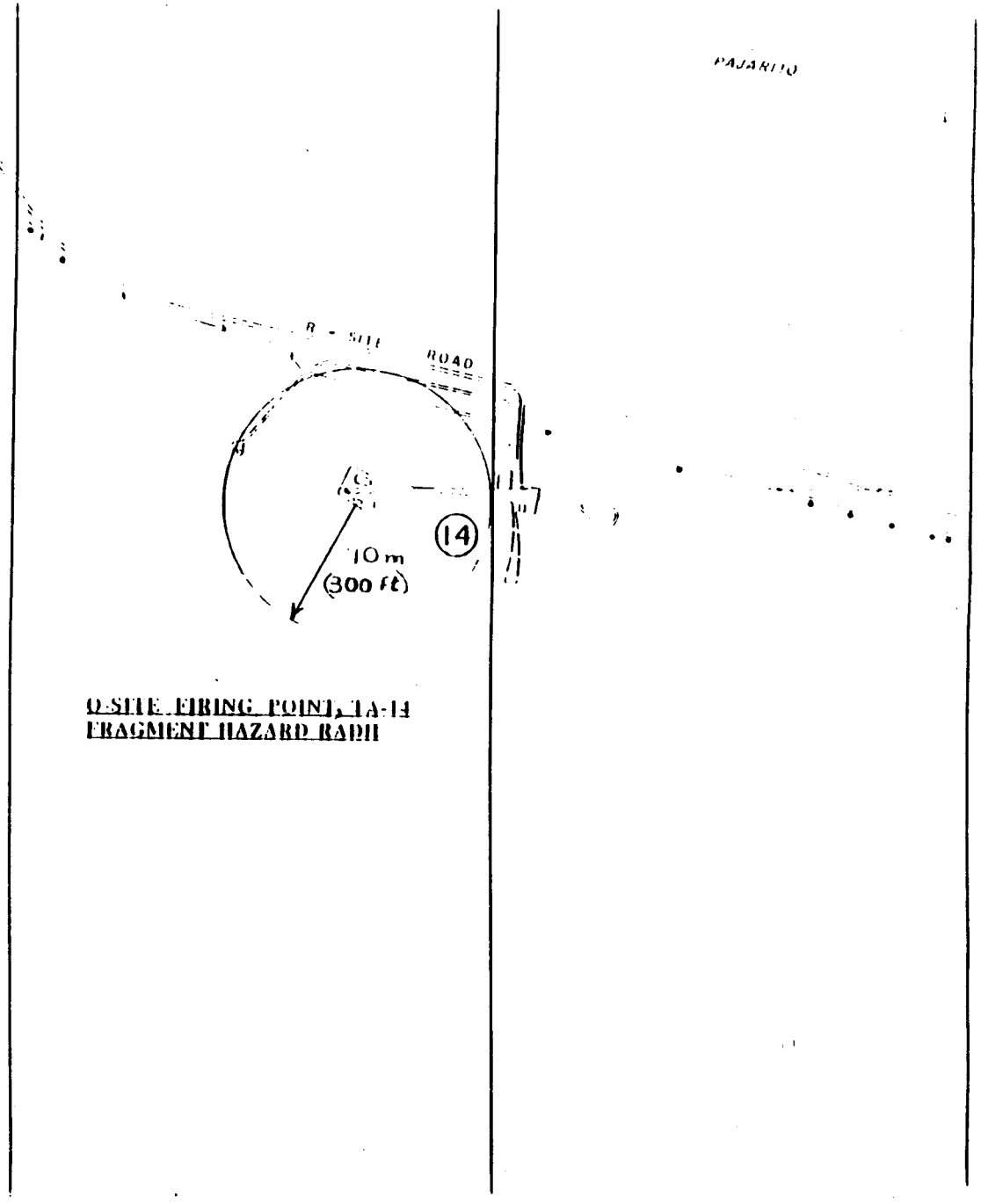

KAPPA-SITE (T.Y.301) AND ENVIRONS
II FIRING POINT (T.Y.36.55)
FRAGMENT HAZARD RADII
KAPPA 55
Gate no 3
Gate no 4

Fig. B-5.



O-SITE FIRING POINT, TA-14
FRAGMENT HAZARD RADII

Fig. B-6.

ATTACHMENT C

Evaluation of Fragment Hazards

The responsibility for evaluating the hazard radius for an explosive shot rests with the Site Supervisor. His evaluation must be based on his practical experience, but this attachment is to be used as a guide by firing-site personnel in this decision.

The precise solution of the range of a ballistic projectile with a defined shape is an extremely complex problem. In addition to the obvious factors, such as velocity, mass, and gravity, the additional factor of aerodynamic drag must be taken into account. For the marksman, the wind velocity (windage) must be corrected; i.e., the aerodynamic drag perpendicular to the line of flight between the muzzle and the target must be calculated. The artillery range officer may also correct for the humidity and the change in air density with altitude when he is trying to hit the desired target. The mathematics describing the ballistic trajectories is extremely complex and requires a computer for the solution.

At first thought, it might seem that gravity's effect on slowing down a fragment would provide a reasonable upper estimate of the hazard range and flight time, as given by

$$t = V_v/g, \tag{1}$$

where t is the time for the fragment velocity to decrease to zero, V_v is the initial velocity in the vertical direction, and g is the gravitational constant. A typical free-surface velocity for an M-8 shot might be 1.5 mm/μs and $g = 9.8\ m/s^2$, giving a vertical flight time of 153 s and a total flight distance of 115 km! Obviously incorrect! Therefore, it is essential that the aerodynamic drag be considered. Fragments from an explosive shot have no predictable shape, and it is impossible to predict the drag with precision.

A sufficiently accurate approximation for our purposes has been given by W. C. Davis (in M-3-QR-78-4). He has shown that the critical parameter for estimating the range is the characteristic length L given numerically by

$$L = \rho_m h, \tag{2}$$

where ρ_m is the density of the metal in grams per cubic centimeter and h is the thickness in millimeters of the fragment measured in the direction of flight. For example, 12 mm of copper, 36 mm of Dural, or 5 mm of tuballoy have a characteristic length of 100 m. The initial velocity affects the flight distance of a fragment driven from a high explosive, but to a much smaller extent than the value of the characteristic length. The height and flight times for fragments driven vertically are given in Table C-I for three values of L and two values of initial velocity.

The calculation of the horizontal range is more complex than for the vertical trajectory. Davis has made a simplifying assumption and has found reasonable agreement with data for bullets. Figure C-1 summarizes the results obtained for initial velocities of 3.1, 1.0, and 0.5 mm/μs. To stay within a 600-m radius from a firing site, the characteristic length at 3.1 mm/μs must be less than 110 m, and for a velocity of 0.5 mm/μs, L must be less than about 200 m.

TABLE C-I

VERTICAL FLIGHT OF PROJECTILES FOR VARYING INITIAL CONDITIONS

L(m)	10	100	100	1000
h (mm) of fragment	1.2-mm copper	12-mm copper	12-mm copper	55-mm tuballoy
V_v (mm/μs)	3.1	3.1	1.0	3.1
y_{max} (m)	58	461	347	3450
t_{up} (s)	1.58	5.0	4.9	15.5
t_{down} (s)	6.5	16.9	13.2	41.7
t_{total} (s)	8.1	21.9	18.1	57.2

In evaluating the hazard radius for a shot, the Site Supervisor should use the results presented here as a guide. Barricades, such as sand-filled boxes and bags, and water-filled containers will substantially reduce the predicted range. Some metals tend to break into small fragments (Dural) and others tend to break into large fragments (nickel). The previous analysis uses only the thickness as a measure of the flight distance, whereas, in actuality, fragments tumble and large fragments will fly farther than small ones. We believe the range estimates presented here are a conservative basis for estimating hazard ranges. If more detailed estimates of fragment range are needed, both Jim Straight and Dave Fradkin have computer codes for range predictions.

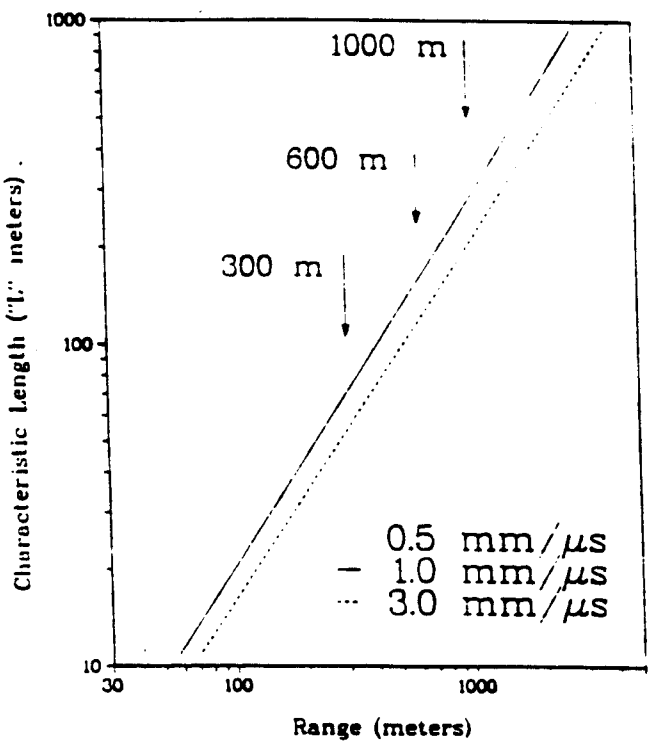


Figure C-1

ATTACHMENT D

Procedure for Elimination of Unexploded Explosive on the Firing Mound

There are instances in which unexploded explosives remain on the firing mound after a normal shot: for example, as a result of the armor/anti-armor program effort at the Laboratory. This attachment describes the steps to be taken to ensure personnel safety in these instances.

When a shot is set up that may leave tangible, unexploded material on the firing mound, the Firing-Site Supervisor will provide for a remote visual surveillance of the firing mound, as described in Section 7.4 of this SOP. The person surveying the scene must be knowledgeable about this shot setup and familiar with the various components of the shot to be able to describe the situation accurately. Often, with this type of shot, the unexploded HE has been set afire, and the HE, as well as any flammable materials, such as wood, sandbags, or Lexan, may be smoldering or ablaze.

If the knowledgeable observer reports no visible fire or smoke, the Firing-Site Supervisor will wait 10 minutes and have a second visual check made of the scene. If there is still no visible fire or smoke, then one person designated by the Site Supervisor shall cautiously approach the firing mound and resurvey the scene. If the person is sure that no smoke or fire is visible, then operations may proceed as usual, except that a careful inspection must be made for unconsumed HE.

If the observer indicates that he or she sees smoke or fire, then the Site Supervisor, along with the observer, shall determine the extent of the problem. The Site Supervisor will then notify the Group Leader, Deputy Group Leader, Safety Officer, or the designated chemistry and HE expert for the group, about the situation. This person will then take appropriate action, as dictated by the particular circumstances, to resolve the problem.

Additional information on how to handle damaged targets containing energetic material is given in SOP M-8-35.

STANDARD OPERATING PROCEDURE

FOR

DISPOSAL OF EXPLOSIVE WASTE AND EXPLOSIVE-CONTAMINATED WASTE

SOP M-8-17

Because of the transition from M-4 and M-8 to DX-11, this SOP has been reviewed by DX-11 personnel and is issued without changes for operations at TA-36.

Next Review Date: August 1995

Approved by: C. M. Mott Date: 9-27-94
DX-11

Approved by: Diane Erickson Date: 9/27/94
DX-DO

Los Alamos

Los Alamos National Laboratory
Los Alamos, New Mexico 87545

SPECIAL WORK PERMIT FOR POTENTIALLY HAZARDOUS ACTIVITIES

Requested by	Organization	Issue Date	Expiration Date
Bruce E. Takala	DX-11	Sept. 23, 1994	Sept 1, 1995

Location of Work (Tech Area, Building, Room Number): TA-36-8, -12, -103

SWP I.D. Number: SWP-DX-11-94-20

Work to be Performed

Disposal of explosive waste and explosive-contaminated waste.

Extend operations of SOP M-8-17, "Disposal of Explosive Waste and Explosive-Contaminated Waste" to Sept. 1, 1995

Identified Hazards

Handling explosive waste and explosive-contaminated waste.

PERSONNEL ASSIGNED

Name	Duties
See attached distribution list	
Name	Duties
Name	Duties

SPECIAL CONTROLS

Safety Measures, Precautions, Personal Protective Equipment, Procedures, etc.

See attached SOP.

APPROVED BY

Group Leader Allan B. Anderson, Group Leader for R. M. Montoya, DX-4	Organization DX-11	Date 9/26/94
Safety Officer Bruce E. Takala, Safety Officer Bruce Takala	Organization DX-11	Date 9/27/94
Supervisor	Organization DX-11	Date
Others Diane Griechen, ES&H Officer Diane Griechen	Organization DX-DO	Date 9/27/94
Roger Goldie, Safety Engineer Roger T. Goldie	Organization ESH-5	Date 9/27/94

STANDARD OPERATING PROCEDURE

FOR

DISPOSAL OF EXPLOSIVE WASTE AND

EXPLOSIVE-CONTAMINATED WASTE

Prepared by:	C. M. Montoya	Date:	1-22-93
Approved (M-8):	J. W. Straight	Date:	1/22/93
Approved (M-DO):	T. R. Neal 1/22/93	Date:	1-22-93
Approved (EM-8):	J. M. Dewart	Date:	1/27/93
Approved (HS-5):	R. H. Goldie	Date:	
Implementation:	C. M. Montoya, M-8 ES&H Chairman	Date:	1-29-93

This SOP has been approved by M-8 and M-DO. While we await final approval from groups in HS or other divisions, we are using the SOP as a completely legitimate instrument. If more than 30 days has elapsed without action by reviewing groups outside M Division, the SOP will be regarded by the M-8 Group Office as having the full force of complete and unqualified endorsement.

1.0 INTRODUCTION

Explosive waste and explosive-contaminated waste are generated as a result of M-8 firing-site operations involving high explosives (HE). A small percentage of the tests conducted by M-8 contain depleted-uranium (DU) components. M-8 may also be requested to dispose of explosive waste from other LANL groups, such as WX-3. Within this document, the materials are defined that comprise explosive waste and explosive-contaminated waste, and procedures are described for their disposal. This SOP governs the activities of all M-8 employees and the Johnson Control (JCI) employee working routinely with Group M-8, in regard to the handling and disposal of explosive waste and potentially explosive-contaminated waste for all M-8 explosives operations. The *DOE Explosives Safety Manual*, LANL ES&H requirements, and appropriate M-8 SOPs are the primary reference documents.

2.0 DEFINITIONS

Explosive waste is identifiable pieces of explosives that are either *excess explosive* or *scrap explosive*.

Excess explosive is identifiable pieces of explosive resulting from assembly operations or from explosive material that is no longer needed for programmatic reasons (and about which a decision has been made to remove it from inventory). This retains its original explosive storage compatibility classification.

Scrap explosive is identifiable pieces of explosive that have been damaged or potentially altered as a result of a misfire or incomplete detonation, or that result from severe test environments.

Potentially explosive-contaminated waste involves tools, objects, and materials used directly with explosives or used in charge preparation rooms or explosives magazines, or it can be *firing-mound debris*. In some cases, this must be destroyed *in situ* because of overriding safety considerations.

Firing-mound debris is material that results from energetic materials tests done by M-8. These materials are potentially contaminated by HE. Firing-site debris can be further divided into the following types.

Type ①: wood scraps, cardboard, burlap, and Plexiglas/Lexan.

Type ②: material such as plastic, glass, styrofoams, electrical cables, and metallic foils used for pin switches

Type ③: metals, such as steel target plates.

TA-36-8 *destruct area* is located at Minie Site. It operates under interim status for treatment by open detonation of explosive waste, in accordance with the standards in Los Alamos National Laboratory's RCRA, Part B Permit Application.

TA-36-12 *burn area*, located at Lower Slobbovia Firing Site, is approved and has been issued a permit by the New Mexico Environment Department (NMED), formerly known as the Environmental Improvement Division (EID), for burning potentially HE-contaminated wood scraps, cardboard, and burlap.

TA-36-12, Area II, is located at Lower Slobbovia Firing Site. Type ② firing-site debris material will be collected and placed in this area.

TA-36-103, Area III is located outside at Dogpatch Site, which is adjacent to Potrillo Drive between the turnoff to Meenie and Minie Firing Sites and the turnoff to the main magazines (ProMoe, Moe, and DetMoe). Type ③ firing-site debris will be collected and stored at this location awaiting final disposition.

Completed burn is when the fire has extinguished itself to the point it is no longer a fire hazard. The Group Leader or Safety Officer make this determination.

3.0 RESPONSIBILITIES

3.1 Site Supervisor

Under the direction of the technical staff member or senior technician supervisor in charge, he is responsible for ensuring that firing-mound debris generated at his particular site is sorted, collected, and placed in the proper area or areas.

3.2 Group Waste Management Coordinator

This individual is available to assist M-8 personnel in determining how the material should be sorted, what area it should be placed in, and what the particular packaging and transportation requirements are to be used.

3.3 Group Leader or Safety Officer

These individuals will determine whether the explosive scrap presents a hazard and what the method of disposal should be, if any questions arise. They will also determine when a burn is completed.

3.4 Qualified Personnel

All M-8 operators (as defined in the M-8 Safety Charter) are qualified. A JCI employee routinely supplied to M-8 as a firing-site mound cleanup person is part of the normal operations and he is in the category of "knowledgeable visitor," which is also defined in the Safety Charter. The JCI employee is allowed to clean up the firing mound and transport debris from the firing mound to the appropriate collection area.

3.5 HE Inventory Coordinator

This individual is responsible for ensuring that HE and HE-contaminated materials sent to WX-3 for incineration are labeled and packaged properly, and that the appropriate documentation has been completed and sent with the materials.

4.0 HAZARDS

Identifiable hazards include the following: Handling and transport of HE and of other materials inseparable from or partially covered with high explosives.

Some explosive tests contain DU material and thus are potentially tainted with HE and/or DU contamination.

Heavy materials include steel plates ≥ 50 lbs.

5.0 PROCEDURES

5.1 Make-Up Room Wastes

Each make-up room has a Hazardous Waste satellite storage area. Explosive-contaminated waste, such as paper towels, swabs, and similar materials that contain no tangible pieces of explosive but are used in the preparation of shots in the make-up building, should be placed in a paper-lined cardboard box with a lid. A separate box for bits, pieces, and small chunks of excess explosive may also be stored at the satellite storage area for disposal at WX-3 by incineration or for detonation at TA-36-8 Minie Site destruct firing area. The paper liner in the boxes shall be closed and sealed with tape and transferred to a box sealed and labeled with the words "Explosive Hazardous Waste." If the boxes are to be transported to WX-3 for incineration, contact the M-8 HE Inventory Coordinator to ensure that the material is properly packaged and the Hazardous Material Transfer form has been properly completed. This material shall not be allowed to accumulate beyond a collective volume of the equivalent of a 55-gal drum. Refer any question to the M-8 Waste Coordinator.

5.2 Scrap Explosive Assemblies and Explosive to be Delivered to Other Groups Only if Authorized

If a group requests that their assembly be returned for their own examination, they must first receive proper authorization. After the authorization has been given, the responsible M-8 individual shall present the problem to the M-8 Safety Officer, who will work through the HE Inventory Coordinator. The HE Inventory Coordinator will arrange with the appropriate person in WX-3 for specific instructions on marking, packaging, and transportation to the receiving group. WX-3 is responsible for transporting explosive off-site onto public roads. If the material is sent to WX-3, it will be packaged and labeled according to hazardous materials packaging and transportation requirements. A Hazardous Material Transfer form shall be filled out by M-8 personnel to accompany the materials when they are transported on public roads to WX-3. The Group Leader or Safety Officer is responsible for determining that the explosive or explosive assembly presents no unusual hazard.

5.3 Scrap Explosive Assemblies and Explosives Unsafe to Handle

When a damaged explosive assembly or explosive on the firing mound is believed to be unsafe to transport or handle, it will be disposed of by detonation on the firing mound or by flash burning the assembly. The disposal method shall be approved by the Group Leader or the Safety Officer. Any heavy metals or foams containing toxic materials that become airborne during burning or detonation are quantified and reported in the monthly materials expended summaries to M-DO and EM-8.

5.4 Identifiable Scrap Explosive that is Safe to Handle

Scrap explosive is essentially damaged explosive and is defined as identifiable explosive pieces resulting from a misfire, an incomplete detonation, or an exposure to severe testing.

Pieces of explosive sufficiently large to be identified, whether resulting from a misfire, sensitivity experiment, incomplete detonation, or severe testing shall be collected in paper bags. Damaged explosive shall be collected separately from excess explosive. The maximum weight of material in one bag will be 110 g ($\approx 1/4$ lb), subject to the hazard level of the material. Paper bags containing the explosive will be placed in cardboard boxes. Individual pieces larger than 2.5 by 2.5 by 2.5 cm ($\approx$1 cu. in.) shall be wrapped before being placed in the box to prevent rubbing during handling and transportation. Except when an individual piece is too large, the maximum weight of material in one box shall be limited to 12 kg. The box shall be sealed with tape to prevent escape of small fragments and shall be labeled with the words "Hazardous Waste." Pieces larger than 15 kg shall be destroyed in place. This weight limit shall be reduced if, in the opinion of the Firing-Site Leader or the M-8 Safety Officer, this large a quantity would create a hazard.

Unless the explosive scrap or damaged explosive is to be delivered to another group, as covered in Sec. 5.2, and if the scrap or damaged explosive is safe to handle, the scrap or damaged explosive shall be destroyed by detonation in the destruct firing area at TA-36-8 using a sufficiently large charge to ensure complete destruction of the scrap. TA-36-8 operates under interim status for treatment by open detonation. (This shall be carried out as described in SOP M-8-5.) Scrap or damaged explosive shall be destroyed as soon after its creation as possible.

When scrap explosive is generated as a result of a misfire or incomplete detonation of a charge on a firing mound, the Firing-Site Leader shall thoroughly search the firing mound and collect all identifiable pieces of explosive. The damaged explosive shall be weighed and an estimate of the amount of material remaining on the mound recorded in the Site Record Log Book. Every effort shall be made to minimize the quantity remaining on the mound.

Also, when damaged explosive is generated, tangible quantities of very small particulate explosives may remain in the firing area after the cleanup. At the discretion of the Site Leader and with the concurrence of the Group Leader, the firing area may be burned with a propane weed burner to complete the cleanup process. A burn permit is required for this operation.

5.5 Identifiable Booster Charge Scrap

When possible, booster explosive like PETN and XTX shall be packaged in separate containers from materials listed in Sec. 5.4 and labeled as "Hazardous Waste." The contents of a box shall be clearly identified. Boxes shall be disposed of as described in Sec. 5.3, if it is unsafe to handle, or in Sec. 5.4, if it is safe to handle.

5.6 Firing-Mound Debris

Before any firing-mound debris is collected for disposal, the Firing-Site Supervisor will ensure that the firing mound is examined for explosive scrap. Scrap explosive shall be handled appropriately (see Secs. 5.2–5.4). This operation shall be carried out before JCI personnel are allowed on the mound, as covered in the following section.

Firing-site debris from firing operations shall be cleaned up either by M-8 personnel or by a JCI cleanup person (or both). This debris shall be transported and placed in the appropriate areas, depending on the type of material (see Sec. 2.0).

Heavy materials such as steel plates ≥ 50 lbs should not be lifted manually by individual M-8 operators and employees. Personnel should utilize the proper lifting equipment or seek assistance, if materials are too bulky or cannot be reasonably handled by one person.

5.6.1 Burning Operation at Burn Area (Type ① Material)

The burn area, which is located near TA-36-12 at Lower Slobbovia, is permitted only for wood, cardboard, burlap sandbags, and small amounts of Plexiglass/Lexan (an acrylic material).

M-8 is permitted to burn identifiable wood scraps, cardboard, burlap from the sandbags, and Plexiglass or Lexan used in shots because they can be contaminated with HE. We are not permitted to burn other plastic and metal, even though they may be contaminated by HE.

The burn area shall be marked with a sign. Access shall be controlled by the Firing-Site Supervisor at TA-36-12 (Lower Slobbovia).

5.6.1.1 Burn Permits. An open burn permit will be obtained annually through EM-8 from the NMED. The Group Leader or his designee shall contact EM-8 to request permission to burn five or more days in advance of the expected burn date.

5.6.1.2 Notification Memo. In advance, the M-8 Safety Officer will send a memo of notification indicating the date, time, and place of the controlled burn to the following personnel:

1. HS-5 safety engineer assigned to TA-36
2. EM-8 Air-Meteorology section leader and coordinator
3. EMO (Emergency Management Office)
4. PA-1 (Public Information Group Leader)
5. Fire Department

5.6.1.3 Fire Department Notification. The Fire Department will be notified again, by telephone, one or more working days in advance of the burn date (date, approximate time of ignition, approximate length of time of burn, and location).

5.6.1.4 Area Control. The safety gate at the entrance to TA-36-12 will be closed and the area will be controlled by the Lower Slobbovia Firing-Site Supervisor. In addition, the safety chain at the entrance to the

road that services the burn area and the sled track will be closed. The entire procedure for burning will be continually monitored by M-8 personnel.

5.6.1.5 Debris Ignition. The firing-site debris will be ignited 3 hours after sunrise, in accordance with NMED requirements.

The Group Leader will determine what ignition fuel or combination of ignition fuel will be used. Paper and/or Kimwipes® with diesel fuel or kerosene will be used to aid in the ignition of the wood. No more than 10 gal of diesel or kerosene will be used. A weed burner or matches will be used to ignite the paper and wood. Only M-8 personnel knowledgeable in explosives operations will be allowed to ignite the pile. Fire Department personnel will be present while the debris is being ignited but they will be located at a safe distance specified by the site supervisor. Firefighters will remain on site until the Fire Department supervisor at the scene determines that they may safely leave the burning material to be watched by our personnel. The Firing-Site Supervisor will determine the location where the Fire Department truck will park. This is usually near the TA-36-12 firing chamber at Lower Slobbovia, which is a safe distance from the burn area. Fire Department personnel will remain on site until the Fire Department supervisor on site determines that their service is no longer required. He will notify the firing-site supervisor before leaving the area.

5.6.1.6 Burn Completion. The Group Leader or Safety Officer will make the determination when the burn is completed.

5.6.1.7 After-Hours Control. If the burn has not been completed at the end of the workday, a minimum of two M-8 employees (knowledgeable in explosive operations) will remain on site until the burn has been completed.

If the burn is not complete, the Fire Department (7-4055), Station 100 (LANL Security Force Communications Center) (7-4673), and the M-Division Office (7-5653) must be notified before the end of the workday, that M-8 personnel will be present through the night to monitor burning debris.

When the burn is complete, the M-Division Office will be notified during normal working hours.

5.6.1.8 Ash and Residue Disposal. The Group Leader will determine when the remaining ash and residue will be collected and sent to the proper waste disposal site at TA-54 with the proper documentation, after the residue is monitored by HS-1 personnel for radioactivity.

5.6.2 Area II (Type ② Materials)

All firing-site debris Type ② material will be collected and placed in Area II. Type ② materials that are not DU contaminated may be sent to WX-3 for incineration or flash burning. The Waste Management Coordinator will be responsible for coordinating the activities between M-8 and WX-3. Type ② materials that have no explosive contamination may be sent to an EM-7 waste disposal site after HS-1 has monitored the material and the proper forms and documentation have been generated for transportation and disposal. There is a dumpster labeled for radioactive materials located at Area II, and Type ② materials that are suspected to be DU

contaminated are placed in the dumpster. The dumpster must be lined with plastic before any cables or materials are placed inside. A copy of a Waste Profile Request form must be on file for Type ② materials before they can be transported for disposal. See Attachment 1 for Disposal Checklist requirements.

5.6.3 Area III (Type ③ Material)

All firing-site debris Type ③ material will be collected and placed in Area III.

To dispose of Type ③ material, the following must be complete.

1. A Waste Profile Request form must be on file for the Type ③ material.
2. A Radioactive Solid Waste Disposal Request must be completed.
3. A Hazardous Material Transfer form must also be completed.

See Attachment 1 for low-level waste disposal requirements.

5.7 Transportation

5.7.1 Vehicle

The bed of the pickup truck used for transporting material to the burn area shall have no joints or cracks but must be of single-piece construction.

5.7.2 Documentation

WX-3 is responsible for transporting explosives off-site onto public roads. A Hazardous Material Transfer form shall be filled out by M-8 to accompany the transported materials on the public road to WX-3.

5.7.3 Transfer and/or Disposal of Contaminated Equipment from TA-36 Explosives Areas

Tools or objects used directly with explosives or used in charge preparation rooms or explosives magazines shall be decontaminated before they are taken into nonexplosives areas or before any repairs are made to them in an explosives-handling area. Any hazardous waste generated during the decontamination process will be packaged, labeled, and transported as "Hazardous Waste," as directed by AR 10-3.

Some tools and other objects are used in the explosives-handling areas of TA-36 but are not used in explosives magazines or charge preparation rooms; some tools and objects are used on the firing mounds but are not used directly on explosives, nor do they contain residue from explosives. These tools may be taken, at the discretion of the group personnel, into any building or room of TA-36 that is not used for the handling or storage of explosives. Items that can be certified as uncontaminated may be sent to Johnson Control salvage or may be buried in the county landfill after being monitored by HS-1 personnel to confirm the lack of radioactive contamination. Radioactive materials shall be packaged and transported to the TA-54 low-level waste landfill for burial after HS-1 personnel monitor them, as directed by AR 10-2 in the LANL *Environment, Safety and Health* manual. Ambiguities in the classification of items shall be resolved, if possible, by the Safety Officer,

along with the site personnel and the staff member in charge of the shot. If doubts remain about the suitability of sending something off-site to be buried, it shall remain at TA-36.

Removal of photographic equipment from explosives-handling areas of TA-36 is described in SOP M-8-9.

Movement of the vehicles assigned to M-8 in and out of the TA-36 area is covered in SOP M-8-1.

6.0 REQUIRED RECORDS

From M-8 shot records, a monthly materials expended report is generated and sent to the M-Division Office. The NMED burn permit is current. Copies are kept of the completed Hazardous Material Transfer forms, the Waste Profile forms for each type of material waste, and the Radioactive Solid Waste Disposal requests. The inspection record form (IRF) is filled out daily by the Minie Firing-Site Supervisor, who hands it in weekly (a copy of each weekly report is sent to EM-8).

7.0 REFERENCES

DOE Explosives Safety Manual, EV/06194, Revision 6, October 1991.

Administrative Requirement (AR) 6-6, "Explosives Disposal," Los Alamos *Environment, Safety, and Health* manual (1992).

AR 10-2, "Low-Level Solid Waste," Los Alamos *Environment, Safety, and Health* manual (1992).

AR 10-3, "Chemical, Hazardous, and Mixed Waste," Los Alamos *Environment, Safety, and Health* manual (1992).

Los Alamos National Laboratory Director's Policy 101, *ES&H Operating Policy* (September 1991).

Los Alamos National Laboratory Director's Policy 102, *Formality of Operations* (September 1991).

M-8 Standard Operating Procedures
M-8-SC: M-8 Safety Charter
M-8-1: Shipping, Receiving, and Transporting of Explosives
M-8-3: Operation of Charge Preparation Rooms
M-8-4: Firing-Mound Operations
M-8-5: Firing Operations
M-8-6: Detonator Magazine Operations
M-8-89: Handling of Depleted-Uranium Components
RCRA Part B Permit Application

8.0 ATTACHMENTS

1. Low-Level Waste Disposal checklist.
2. Inspection Record Form

LLW DISPOSAL CHECKLIST (Revision C) 07/11/91

TA-54 AREA G

RSWD Number _____

INSPECTION SEQUENCE (this checklist must be completed BEFORE accepting waste)

1. Check load for required documentation
2. Verify that all forms are completed properly
3. Verify radionuclide data using Oracle screening program
4. Physically inspect load to verify matches documentation and meets WAC
5. If all WAC met, accept and properly dispose waste

CHECKLIST

FORMS:

- ☐ SCALE SLIP
  - ☐ Truck was weighed
  - ☐ ID on slip matches ID of truck
  - ☐ Clerk's initials on slip
- ☐ WASTE PROFILE REQUEST FORM (WPRF)
  - ☐ Waste description matches waste (observed)
  - ☐ No RCRA hazard codes on WPRF
  - ☐ Form signed by generator
  - ☐ WPRF number assigned by HSE-8
  - ☐ Form signed by HSE-8 reviewer
  - ☐ Form less than one year old
  - ☐ Low-level radioactive waste box checked
- ☐ RADIOACTIVE SOLID WASTE DISPOSAL REQUEST (RSWD)
  - ☐ Current form
  - ☐ Description matches waste (observed)
  - ☐ Description does not describe liquids, gasses, or powders
  - ☐ Number and type of containers appears correct
  - ☐ Waste code is supplied and appears appropriate
  - ☐ If waste code starts with "A", then radionuclide amount in curies or grams is indicated; if "S", radionuclide is identified but no amount indicated.
  - ☐ Rad data screened by Oracle screening program - is low level, not TRU or GTCC
  - ☐ All generator identification information was supplied on form
  - ☐ Generator signed form
  - ☐ HSE-1, 10, 11 signed form
- ☐ HAZARDOUS MATERIAL TRANSFER FORM (HMTF)
  - ☐ Form is present in manifest package

PACKAGING

- ☐ Dumpsters
  - ☐ Dumpster door opened for inspection
  - ☐ All waste packaged or wrapped
  - ☐ Waste appears to meet WAC (no drums, gas cylinders, oil soaked boxes, etc)
  - ☐ Visible boxes appear to be properly labeled
  - ☐ Compactible/non-compactible not apparently mixed in dumpster
  - ☐ Dumpsters locked properly
  - ☐ Dumpster labels and stenciling present and readible
- ☐ Trucks
  - ☐ Waste in containers (boxes, bags, drums, etc) or wrapped in plastic
  - ☐ Containers in good condition and sealed appropriately
  - ☐ Waste appears to meet WAC (no gas cylinders, free liquids, powders, etc)
  - ☐ Visible PN Numbers verified

HSE-7 Receiving Technician: _____ Date: _____

HAZARDOUS WASTE FACILITY INSPECTION RECORD FORM

FACILITY	[ ] <90 DAY. GENERATOR STORAGE [X] TREATMENT. STORAGE. DISPOSAL	START DATE	END DATE
TA-36			

[ ] Containers [ ] Landfill [ ] Surface impoundment [ ] Waste pile [X] Thermal Treatment [ ] Chemical/Bio. Treat.

[ ] Incinerator [X] Misc. Unit [ ] Tank [ ] UST [ ] Land Treatment [ ] Underground Inj.

PART I - Enter condition of item inspected (OK or AR*) in column for day inspected.

ITEM	INSPECTED FOR	SUN	MON	TUE	WED	THU	FRI	SAT
6 NO USE	CHECK IF NO WASTE IS PRESENT							
7 UNLOADING AREA TANKS/CONTAINERS	SPILLS AND DETERIORATION							
8 COMMUNICATION EQUIPMENT (PHONE/RADIO/ALARMS)	PROPERLY FUNCTIONING							
9 TANKS (ALL ABOVE GROUND PORTIONS) MONITORING DATA	DISCHARGE CONTROLS CONDITION. LEAKS. LEVEL (6" FREEBOARD). CORROSION		N/A	N/A	N/A	N/A	N/A	
10 SURFACE IMPOUNDMENTS AND CONTAINMENT	FREEBOARD (2 ft) SUDDEN DROPS IN LEVEL		N/A	N/A	N/A	N/A	N/A	
11 PORTA BERM	LEAKS CONDITION		N/A	N/A	N/A	N/A	N/A	
12 EYE WASH SAFETY SHOWERS	LEAKS. FUNCTIONING		N/A	N/A	N/A	N/A	N/A	
13 STRUCTURAL INTEGRITY OF CONTAINERS/TANKS. VALVES. PIPES. AND FLANGES	DETERIORATION AND LEAKS. CORROSION. DAMAGE							
14 COVER/LID OF CONTAINERS	CLOSED AND SECURED							
15 WARNING SIGNS	POSTED & READABLE (BILINGUAL)							
16 LABELS	"HAZARDOUS WASTE" PRESENT ON ALL CONTAINERS/TANKS							
17 ACCUMULATION START DATE (<90 DAY STORAGE)	PRESENT ON ALL CONTAINERS. TANKS. NONE EXCEED 90 DAYS		N/A	N/A	N/A	N/A	N/A	
18 RUN ON/OFF CONTROL (AREA L. G. H. P) LANDFILLS. DETONATION PADS	INTEGRITY. EROSION PONDING							
19 COVER INTEGRITY (AREA L. G. H. P) LANDFILLS	EROSION. SUBSIDENCE WATER INTRUSION		N/A	N/A	N/A	N/A	N/A	
20 SECURITY	CONDITION. FENCE/GATES/LOCKS							
21 SITE LIGHTING	FUNCTIONS PROPERLY							

ITEM	INSPECTED FOR	SUN	MON	TUE	WED	THU	FRI	SAT
22 CONTAINMENT STRUCTURES	INTEGRITY, STANDING WATER VEGETATION, EROSION							
23 MANAGEMENT OF CONTAINERS.	SEGREGATED ACCORDING TO COMPATIBILITY, 2 FT AISLE SPACE							
24 HOSE BIBS, WATER SUPPLY	LEAKS, FUNCTIONING		N/A	N/A	N/A	N/A	N/A	
25 STORAGE SHED (AREA L)	FLOOR DAMAGE, LIQUID		N/A	N/A	N/A	N/A	N/A	
26 ROAD/WORK SURFACES	CRACKS/POTHOLES							
27 WIND SOCK	DAMAGE, FUNCTIONING							
28 SHAFT COVER AND RAIL	PRESENT, DAMAGE		N/A	N/A	N/A	N/A	N/A	
29 PALLETS	INTEGRITY, DAMAGE		N/A	N/A	N/A	N/A	N/A	
30 TREATMENT TANKS	PROPER OPERATION, LEAKS		N/A	N/A	N/A	N/A	N/A	
31 REFRIGERATOR	DAMAGED CONTAINERS		N/A	N/A	N/A	N/A	N/A	
32 SPILL CONTROL, FIRE, AND EMERGENCY EQUIPMENT	PRESENT, AND IN GOOD WORKING ORDER							
33 INCINERATOR EMERGENCY WASTE FEED CUTOFF/ALARMS	PROPER OPERATING CONDITION		N/A	N/A	N/A	N/A	N/A	
34 INCINERATOR PUMPS VALVES, PIPES, MONITORING CONTROLS	LEAKS/SPILLS/TAMPERING OPERATING WITHIN SPECS.		N/A	N/A	N/A	N/A	N/A	
35 PRESSURE VESSELS (S-SITE)	DETERIORATION AND SAND CONDITION		N/A	N/A	N/A	N/A	N/A	
36 OIL BURN PANS (S-SITE)	DETERIORATION & LEAKS		N/A	N/A	N/A	N/A	N/A	
37 HE BURN PADS (S-SITE)	DETERIORATION VEGETATION, SAND COND., EROSION		N/A	N/A	N/A	N/A	N/A	
38 RADIOACTIVE EMISSIONS	ALPHA, BETA, GAMMA, TRITIUM							
39 DATE	DATE OF INSPECTION							
40 TIME	TIME OF INSPECTION							
41 INSPECTOR	INITIALS OF INSPECTOR							

PART II - For any AR (Action Required) in PART I above, describe below: action required, action taken, date of action. Attach additional sheets if necessary.

42 INSPECTOR	43 GROUP	44 DATE	45 TIME

DX-16

STANDARD OPERATING PROCEDURE

FOR

PACKAGING AND ON-SITE TRANSPORTATION OF EXPLOSIVES

1.9

Prepared by: James R. Stine Date: 3/2/95
J. R. Stine, DX-16

Prepared by: Gordon Jio Date: 3/3/95
G. Jio, DX-16

Approved by: John C. Dallman Date: 3-5-95
John C. Dallman, DX-16 Group Leader

Approved by: Paul A. Fischer Date: 7/14/95
DX-DO

Approved by: Robert H. Gaddis Date: 14 Jun 95
EW 7/12/95 ESH-5

Final Approval: NKO Margaret K. Orbesen Date: 9/7/95
M. K. Orbesen, Group DX-16 ES&H Officer

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1.0 INTRODUCTION

This SOP covers transportation between TA-9 and other TAs accessible without traveling on public roads. Motor vehicle shipments on public highways are governed by Department of Transportation (DOT) regulations and are not addressed in this SOP.

2.0 PURPOSE

This Standard Operating Procedure (SOP) describes the precautions and procedures for safe packaging, repackaging, and on-site transportation operations.

3.0 SCOPE

Only qualified DX-16 personnel may package and repackage explosives coming into or going out of TA-9 and TA-14. These operations may only be performed at TA-9-50 and at TA-14-23 in Rooms 102 and 103. Explosives produced in other buildings at TA-9 can also be packaged in these buildings under this SOP. Repackaging that involves 500 g or less and that is part of normal laboratory operations is covered in other SOPs.

4.0 DEFINITIONS

Box Number: A unique number assigned to any type of container that contains explosives. The Magazine Custodian affixes a label with this number to the container for inventory use.

Cargo Area: Is defined as the wooden box, fixed container, used to transport explosive in.

Hazardous Material Transfer Form (HMTF): Hazardous Material Transfer Form used for transporting between TAs other than TA-9 and TA-14.

5.0 RESPONSIBILITIES

5.1 Group Leader

- Ensures that the necessary policies, procedures, equipment, training, and manpower are available for safe packaging and on-site transportation and delegates the responsibility for implementation of details to a Team Leader.

5.2 Team Leader

- Implements the details for safe packaging and on-site transportation.
- Chooses, along with Group Leader, the Operator.

5.3 Operator

- Is responsible for safe packaging and on-site transportation operations.
- Has a valid New Mexico drivers license.
- Responsible for cleaning of any residual HE and proper disposal.
- Has fire extinguisher training.

5.4 DX-16 Vehicle Maintenance Coordinator

- Requests regular maintenance on DX-16 vehicles.
- Requests as-needed maintenance.
- Visually inspects vehicles and if necessary cleans explosives out of vehicles before they are sent to maintenance.
- Visually inspects and documents on a monthly basis.

5.5 Environment, Safety, and Health (ES&H) Officer

- Documents annual inspection of vehicles.

5.6 DX-DO Training Officer

- Provides information on training for these operations. Training is in accordance with the Laboratory's Administrative Requirements (ARs) in the *Environment, Safety, and Health* Manual and the *DOE Explosives Safety Manual,* Chapter V.

6.0 PRECAUTIONS AND LIMITATIONS

6.1 Personnel and Explosive Load Limits

The personnel and explosive load limits shall be the limits that apply to the operation and to the facility where the operation is performed. Personnel and load limits for specific operations in some locations are provided below.

Operation	Location	Personnel Limits	Load Limits
Packaging and Repackaging Explosives	TA-9, Building 50	3 operators 3 casuals	200 lb
	TA-14, Building 23 Room 103	2 operators 1 casuals	50 lb 50 lb
	Room 104	2 operators 1 casuals	
Transporting Explosives	N/A	2[a]	25 kg (55 lb)/vehicle

[a] No person may ride in the cargo compartment with explosives. Second person may only ride in front passenger seat.

6.2 Protective Clothing

The protective clothing needed varies with the type of material involved. Usually protection against inhalation of dust is of primary importance when packaging explosives. The following protective equipment shall be available:

- Face shields
- Surgical-type rubber gloves (to be worn only once and discarded in an explosives-contaminated waste can)
- Leather-palmed, cotton work gloves (to be worn and discarded in an explosives-contaminated waste container when they become contaminated)
- Respirators if indicated by the MSDS (must be approved for the specific hazard by Group ESH-5)
- Safety glasses
- Shoes with no exposed metal on the sole

6.3 Containers

Only containers meeting specifications given in the *DOE Explosives Safety Manual* will be used for packaging, transporting, or storing explosives. These containers include, but are not limited to, plastic sample bottles, fiberboard containers with Velcro closures, fiberboard drums, and ice cream containers.

Explosives received in containers from manufacturers may be stored and transported in those containers, providing the container has DOT approval and meets the requirements in the *DOE Explosives Safety Manual*. This exemption is made to avoid unnecessary handling of explosives.

6.4 Approved Tools

The tools listed below are approved for a particular operation.

Operation	Approved Tools or Equipment
Opening Shipping Containers	Ferrous hand tools: • Knives • Claw hammers • Scissors • Screwdrivers • Wire cutters • Pry bars
Packaging and Repackaging Explosives	The following tools should be made of reasonably strong and resilient material, such as wood, plastic, paperboard, or rubber: • Scoops • Spatulas • Funnels • Brushes **CAUTION** These tools cannot be made of ferrous material.

Continued on next page

Approved Tools - continued

Operation	Approved Tools or Equipment
Transporting Explosives	Only cargo-carrying vehicles, such as pick-ups and vans, that have a separate cargo section or a built-in box for the explosives may be used. Each vehicle shall be equipped with the following: • Explosives placards (plainly visible from all directions) • Anchored box, tie-down bolts, rings, and straps of adequate strength to securely fasten the explosives • Cargo area with no sharp projections • Chock blocks • Rear-view mirrors on both sides of the vehicle • One fire extinguisher inside the vehicle with a minimum rating of 2A:10BC (see Attachment I)

6.5 Precautions During Inclement Weather

If in the judgement of the operator, inclement weather exists, the following precautions shall be followed.

Activity	Precaution
Packaging explosives inside a permanent building that is protected against lightning	May continue activity.
Loading an unprotected vehicle	Must cease activity.
Transporting explosives incidental to the operations of this SOP, either on foot or in vehicles	Must cease activity if hazardous conditions exist, such as an electrical storm, heavy snow, fog, rain, or ice .

6.6 Vehicle Maintenance

All vehicles used to carry explosives shall receive regular maintenance, and they shall be checked annually to see that such things as brakes, brake lights, and windshield wipers are working properly. Documentation of maintenance is kept by GSA. (Refer to DOE Explosives Manual Chapter II-45, 14.1 Subparagraph B.

Drivers should report a vehicle that is not in good operating condition to the DX-16 Vehicle Coordinator, who will see that it is repaired. (Refer to attached memo.)

Before sending a vehicle for maintenance, it must be thoroughly checked for explosives and cleaned if necessary. Explosives removed during cleaning must be disposed of according to Group DX-16:SOP 1.5.

7.0 PROCEDURAL STEPS

7.1 Packaging and Repackaging Explosives

Follow the procedures below when packaging or repackaging explosives.

Step	Action
1	Familiarize yourself with the MSDS that describes the hazards of the material being packaged or transported.
2	Fill out the HMTF (Attachment II)
3	Observe the building load limits when packaging or repackaging operations at TA-9 or TA-14.
4	Use resilient flooring or mats when handling large or awkwardly shaped pieces of explosives.
5	Before placing explosives in any container, • be sure the container is appropriate for the particular explosive, and • check to see that it is clean and in good condition.
6	Include sufficient lining material to assure that the explosive will not move in the container or come in contact with other explosives in the container.

Continued on next page

Packaging and Repackaging Explosives (continued)

Step	Action
7	Transfer consolidated charges to or from the container one charge at a time.
8	Scoop, instead of pour, bulk explosives from the container unless only small quantities are involved. **CAUTION** NEVER scrape the scoop along the sides or the bottom of the container.
9	Pour the last portion of explosive from the container to completely empty it.
10	DO NOT scrape or pound badly caked bulk explosive to loosen it. **Note:** A Special Work Permit (SWP) may be required before proceeding on badly caked explosives.
11	When transferring liquid explosives, normal methods of liquid transfer may be used.
12	Before transferring volatile liquid explosives, such as nitromethane, that are stored in drums to another container, • connect the two containers with a grounding wire and • connect the drum to the building ground.
13	Close the newly loaded container. **CAUTION** DO NOT use undue force when closing the container.

Continued on next page

Packaging and Repackaging Explosives (continued)

Step	Action
14	Plainly mark the container with the contents and the appropriate explosive labeling before removing it to another location. **Note:** If the container will be stored in a magazine, the Magazine Custodian will label it with the unique box number.
15	Weigh the loaded container. **Note:** The container and its contents shall weigh no more than 25 kg (55 lb).
16	Properly close the container that the explosive has been transferred from if it will be returned to storage. **CAUTION** BE SURE the closure is free of loose explosive before closing the container.
17	• Clean loose explosive from empty containers that will be reused, • Secure the lid, • Label the container "empty," and • Store the container.
18	• Empty containers, straps, paper liners, excelsior, or other packing material from TA-9 and TA-14 that will be stored as explosives-contaminated waste in satellite storage areas near point of generation (same building). • Dispose of waste according to DX-16:SOP 1.5.

7.2 Housekeeping

High standards of housekeeping must be maintained in any operation involving explosives.

Step	Action
1	Clean up minor spills immediately. **Note:** Whether a spill is major or minor is a judgment call of the Operator and will depend on a number of factors: amount, location, type of material, etc. The general guideline for a minor spill is one that can be cleaned up safely with the tools available.
2	For major spills or if a Storage Compatibility Group A or L explosive is involved, • notify the spill coordinator, • move all explosives in the vicinity of the spill to a safe place if it can be done without walking through the spilled explosive. • have the spill cleaned up.
3	Sweep up and deposit any loose explosive in the proper waste receptacle at the end of the operation.
4	Hose down the area into an explosives-approved drain if necessary.

7.3 Transporting Explosives

To transport explosives, operators with a valid New Mexico driver's license shall follow the procedures below

Step	Action
1	Turn off the engine and set the brakes when • the explosives are being loaded or unloaded, • the explosive containers are not secured in the cargo area, • the doors of the building or magazine being served are open, • explosives are present in the loading area around the vehicle, • any part of the explosive load is exposed or not protected by its container, or • the cargo compartment door is open.
2	Chock the rear wheels of the explosive-carrying vehicle.
3	Check the cargo compartment before loading the explosive to see that it is clean and contains no loose items such as tools or pieces of metal.
4	Place the explosives in an enclosed compartment or secure them with tie-downs so they are protected from shifting, sliding, tipping, or excessive jarring during normal, expected use of the vehicle.
5	Make sure all personnel are wearing seat belts.
6	Obey all traffic regulations.
7	Drive no more than 25 mph within a particular TA and no more than 35 mph between TAs.
8	Always be alert for joggers, bicycles, and wild animals on or beside the road.
9	Turn off the engine whenever the loaded vehicle will be idle for more than 2 minutes.
10	Do not leave the vehicle unattended when explosives are inside. **Note:** If an explosives-loaded vehicle must be abandoned because of an emergency, follow the procedures in Section 7.5 below.

Step	Action
11	DO NOT add fuel to the vehicle or have maintenance performed while it contains explosives, except for emergency situations.
12	DO NOT open explosive containers while they are in the vehicle.
13	Unload the vehicle.
14	Check to see that no loose explosive material remains after unloading.
Step	**Action**
15	Clean out any loose explosive material immediately.
16	Dispose of explosive waste according to DX-16:SOP 1.5.

7.4 Disposing of Waste

Waste generated from these operations shall be packaged and disposed of according to DX-16:SOP 1.5. Waste minimization will be handled according to Section 13 of the DX-Division Operations Manual.

7.5 Emergency Procedures

When transporting explosives, circumstances such as mechanical breakdown or a flat tire might require that an explosives-carrying vehicle be temporarily parked beside the road. In such cases, follow the precautions below.

Step	Action
1	Park off the road as far as practical, preferably in a location easily visible from both directions.
2	If parking off the road is not possible, • park where the vehicle can be seen from a distance in both directions and • direct traffic around it.

Step	Action
3	Use emergency flashers if appropriate. **CAUTION** DO NOT carry or use flares.
4	Do not abandon the loaded vehicle unless it is imperative to do so for your safety.
5	Notify the DX-16 Group Office as soon as possible by messenger or radio, and someone there will call for help.
6	Remove the explosives to another properly equipped vehicle before allowing a malfunctioning vehicle to be towed away for repair or before leaving it unattended. These vehicles will be repaired at TA-16.
7	Change a flat tire without unloading the vehicle only if it is parked in a safe position where it will not be hit.

8.0 REQUIRED RECORDS

- MSDS
- HMTF

9.0 REFERENCES

- DOE Explosives Safety Manual
- Los Alamos Environment, Safety, and Health Manual
- DX-Division Operations Manual
- DX-16:SOP 1.5

10.0 ATTACHMENTS

I. Memorandum, HS-5-92-615, "Waiver of DOE Explosives Safety Manual Advisory Standard"

II. HMTF

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Attachment I

Los Alamos

Los Alamos National Laboratory
Los Alamos, New Mexico 87545

memorandum

TO: Distribution

DATE: June 3, 1992

FROM: R. H. Goldie, HS-5

MAIL STOP/TELEPHONE: K489/7-7331

SYMBOL: HS-5-92-615

SUBJECT: **WAIVER OF DOE EXPLOSIVES SAFETY MANUAL ADVISORY STANDARD**

Pursuant to Chapter I, Paragraph 3.2 of the Department of Energy Explosives Safety Manual, a waiver of the advisory standard contained in Chapter II, Paragraph 16.1.2.d (see attached) of that manual is granted. The waiver will allow for vehicles to transport explosives on-site with one fire extinguisher mounted to the vehicle. This is consistent with the requirements of the Department of Transportation and the practice of the U.S. Army.

RHG:seg

Att. a/s

Cy: J. L. Bellows, DOE-AM, w/att., MS A316
R. J. Valdez, DOE, w/att., MS A316
J. B. Ramsay, LANL ERC, w/att., MS J960
G. G. Hill, WX-DO, w/att., MS P945
W. A. Bradley, WX-DO, w/att., MS P945
T. R. Neal, M-DO, w/att., MS P915
D. B. Griechen, M-DO, w/att., MS P915
A. M. Valentine, NWT/OSO, w/att., MS C918
HS-5/OS Reading File, w/att., MS K489
CRM-4, w/att., MS A150

RHG92005.MSW

EXPLOSIVES SAFETY WAIVER

A waiver is granted for conditions described below that do not conform with the advisory standards set forth in the DOE Explosives Safety Manual, DOE/EV/06194-6.

I. Applicable paragraph of DOE/EV/06194-6

Chapter II, Paragraph 16.1.2.d

II. Provision of DOE/EV/06194-6 not being met

Two fire extinguishers with a minimum rating of 2A:10BC, one of which should be mounted outside the vehicle.

III. Discussion

Los Alamos National Laboratory uses vehicles provided by GSA. A recent change in GSA policy requires that an exorbitant fee be paid to alter their vehicles by mounting equipment, such as fire extinguishers, on their exterior. On site movements of explosives are done under controlled conditions at reduced speeds, by qualified drivers, and are well within the response range of the Los Alamos County Fire Department. Further, fire extinguishers mounted to the exterior of vehicle frequently become unserviceable or are found missing. A single properly maintained fire extinguisher rated at least 2A:10BC is adequate for an explosives laden vehicle as fires, other than a minor ones away from the cargo area, will be fled from and not fought.

The use of a single fire extinguisher on explosives laden vehicles conforms to the requirements of the Department of Transportation and the U. S. Army.

IV. Conditions of Waiver

A single fire extinguisher, with a rating of at least 2A:10BC, will be mounted inside the drivers compartment of all vehicles transporting explosives on-site. A second fire extinguisher may be mounted in or on the vehicle at the discretion of the operating group.

V. Terms of Waiver

No corrective actions are proposed or deemed necessary; this waiver will expire three years from the date of signing (May 1995) unless renewed.

J. O. Jackson HS-DO	G. G. Hill WX-DO	T. R. Neal M-DO

LOS ALAMOS
NATIONAL LABORATORY

HAZARDOUS MATERIALS TRANSFER
(Other Than Radioactive)

HM No.	SM No.	Date

GENERAL INSTRUCTIONS: This form is an official shipping document for transporting hazardous material within LANL boundaries. Type or print all entries. Material Safety Data Sheets (*MSDS*) and appropriate Emergency Response Guide information must be attached to this document. Distribution of completed forms is indicated below.

FROM	Name					TO	Name				
	Telephone	Group	TA	Building	Room		Telephone	Group	TA	Building	Room

Item A	No. of Pkgs.	Proper Shipping Name	Hazard Class and Division	UN/NA Number	Packing Group	Net Qty. Wt./Vol.

Additional Description	Gross Weight	Required Labels	Required Placards

Packaging Used	Packaged By	Z Number	Date

Item B	No. of Pkgs.	Proper Shipping Name	Hazard Class and Division	UN/NA Number	Packing Group	Net Qty. Wt./Vol.

Additional Description	Gross Weight	Required Labels	Required Placards

Packaging Used	Packaged By	Z Number	Date

Item C	No. of Pkgs.	Proper Shipping Name	Hazard Class and Division	UN/NA Number	Packing Group	Net Qty. Wt./Vol.

Additional Description	Gross Weight	Required Labels	Required Placards

Packaging Used	Packaged By	Z Number	Date

Item A	Cost Code/Program Code	Item B	Cost Code/Program Code	Item C	Cost Code/Program Code

EMERGENCY RESPONSE TELEPHONE NUMBER: (505) 667-6211

EMERGENCY CONTACT TELEPHONE NUMBERS FOR INTRA-LABORATORY TRANSFERS

Name	Z Number	Group	Telephone Number	Emergency Response Guide Number(s)
Name	Z Number	Group	Telephone Number	Item A____ Item C____ Item B____

SHIPPER'S CERTIFICATION

This is to certify that the above-named materials are properly classified, packaged, marked, and labeled, and are in proper condition for transportation according to the applicable regulations of the Department of Transportation.

Shipper (Signature)	Z Number	Mail Stop	Date

ADDITIONAL TRANSPORTATION INFORMATION

Driver/Transporter	Z Number	Transport Vehicle License Tag Number	
Estimated Date and Time of Arrival	Material Received By	Z Number	Date/Time

Form 1488 (6/93)

ST9051

Los Alamos
NATIONAL LABORATORY
memorandum

EXPLOSIVES TECHNOLOGY & SAFETY
DX-16

To/MS: DX-16 Personnel
Thru: J. C. Dallman, DX-16, C920
om/MS: K. A. Firestone, DX-16, C920
ne/FAX: (505)665-7087(505)667-0500
Symbol: DX-16-94-253
Date: 8/12/94

Disassembly/Disposal/Transfer/Maintenance of Property from DX-16

We are a group with a long history and a lot of historical equipment. The guidelines of the past no longer fit the actions of the present. It is imperative that we follow the guidelines of today when disassembling old equipment, or the salvage and disposal of property. These are guidelines to help in this process.

1. If you are unsure about what is required, ask the ES&H Officer.

2. All items to be salvage or disposed of **must** be monitored by an RCT, even if it goes in the dumpster. The RCT will place a tag, with a number that corresponds with a line item number on an Equipment/Material Pick-up/Transfer (EMPT), on each item . Once the monitoring is complete, boxes will be closed and **sealed** to prevent any addition of unmonitored items. In cases where the equipment was used in or around HE operations, a visual inspection followed by an HE Spot test must be done before leaving the site.

3. All vehicles must be washed, vacuumed, HE Spot tested and monitored by an RCT before being turned over to the GSA Motorpool or salvage.
   a. The only exception to this will be routine maintenance done on vehicles, when maintenance is completed at the S-Site garage. To arrange for maintenance at S-Site, contact Bill McCormick, ESA-12, 667-6316.

4. Equipment being dismantled, that has suspect contamination, must have an RCT on-site **before** work is begun. A Radiological Work Permit (RWP) must be filled out and signed prior to dismantlement. See AR 1-3 for more information. *If you do not know then this procedure is automatic no matter what.*

5. If you are transferring items from a posted contaminated area, you must have them monitored by an RCT before transporting. An example would be the transfer of equipment from TA-14, Q-Site West to any other area.

Distribution:
DX-16 Personnel
DX-16 ES&H File
DX-16 File

Los Alamos
NATIONAL LABORATORY
memorandum

EXPLOSIVES TECHNOLOGY & SAFETY
DX-16

To/MS: Distribution
Thru: J. C. Dallman, DX-16, C920
om/MS: K. A. Firestone, DX-16, C920
ne/FAX: (505)665-7087(505)667-0500
Symbol: DX-16-94-
Date: 8/9/94

EXCESS VEHICLE POLICY - CLEAN-UP REQUIREMENTS

Before any vehicle leaves DX-16 to be excessed it must be put through the following clean-up procedures:

1. Washed
2. Vacuumed inside passenger area and the bed of any truck.
3. An HE spot test must be performed on all vehicles going to salvage or GSA.
4. An Radiological Control Technician (RCT) must be called to monitor all vehicles that are being returned to salvage or GSA. A tag must be placed on the vehicle stating it has been monitored and is clean.

Distribution:
All DX-16 Personnel
ES&H File
DX-16 File

Memo to: M. Orbesen, DX-16, MS C920 1 June 1995

From: R. Goldie, ESH-5, MS K403

Subj: Renewal of Waiver

The Laboratory currently waives a provision of the Department of Energy Explosives Safety Manual, Chapter II, Paragraph 16.1.2.d requiring two fire extinguishers for vehicles transporting explosives (Class 1 materials) on-site. This waiver was originated in 1992 and is due to expire in May 1995 as a result of it having been in place for three years. In that the waiver is required on a continuing basis, it is now being renewed for another three years; this is the maximum time allowed by DOE.

We will provide you a copy of the waiver renewal once it's signed by the ESH Division Office.

Cy: K. Firestone, DX-DO, MS P915
R. Rowan, ESA-WMA, MS C930

Los Alamos
NATIONAL LABORATORY

memorandum

Environment, Safety, and Health Division

To/MS: Distribution

From/MS: Dennis J. Erickson, ESH-DO, MS K491

Phone/FAX: 7-4218 / 5-3811

Symbol: ESH-DO:95-447

Date: July 11, 1995

Subject: **Update of Waiver to DOE Explosives Safety Manual Advisory Standard**

The attached waiver was initially issued in June 1992, and was to expire in 1995. The waiver is still required by Los Alamos National Laboratory operating groups and is updated for a period of three years in accordance with the provisions of DOE Explosives Safety Manual (DOE/EV/06194-7), Chapt I, Paragraph 3.2. The revised expiration date is July 1998.

This waiver will allow properly equipped vehicles with qualified operators to transport explosives on-site with a single fire extinguisher. This waiver is predicated on the assumption that on-site transport is well within the rapid response time of the Los Alamos County Fire Department which provides a level of protection greatly exceeding that of an additional fire extinguisher.

Attachment: a/s

DJE:FB:dts

Distribution
DOE/LAAO-AM, MS A316
DOE/LAAO-ES&H, MS A316
R. H. Day, DD-DX, MS P915
K. A. Firestone, DD-DX, MS P915
R. J. Burick, DD-ESA, MS P945
M. MacRoberts, DD-ESA, MS P945
R. A. Lucht, DX-16/ERC, MS C920
B. C. Hargis, ESH-5, MS K486
F. N. Bolton, ESH-5, MS K403
R. H. Goldie, ESH-5, MS K403
P. D. Whitehead, ESH-5, MS K403
ESH-5/OSS Reading File, MS K403
ESH-DO File, MS K491

EXPLOSIVES SAFETY WAIVER

A waiver is granted for conditions described below that do not conform with the advisory standards set forth in the DOE Explosives Safety Manual, DOE/EV/06194-6.

I. Applicable paragraph of DOE/EV/06194-6

Chapter II, Paragraph 16.1.2.d

II. Provision of DOE/EV/06194-6 not being met

Two fire extinguishers with a minimum rating of 2A:10BC, one of which should be mounted outside the vehicle.

III. Discussion

Los Alamos National Laboratory uses vehicles provided by GSA. A recent change in GSA policy requires that an exorbitant fee be paid to alter their vehicles by mounting equipment, such as fire extinguishers, on their exterior. On site movements of explosives are done under controlled conditions at reduced speeds, by qualified drivers, and are well within the response range of the Los Alamos County Fire Department. Further, fire extinguishers mounted to the exterior of vehicle frequently become unserviceable or are found missing. A single properly maintained fire extinguisher rated at least 2A:10BC is adequate for an explosives laden vehicle as fires, other than a minor ones away from the cargo area, will be fled from and not fought.

The use of a single fire extinguisher on explosives laden vehicles conforms to the requirements of the Department of Transportation and the U. S. Army.

IV. Conditions of Waiver

A single fire extinguisher, with a rating of at least 2A:10BC, will be mounted inside the drivers compartment of all vehicles transporting explosives on-site. A second fire extinguisher may be mounted in or on the vehicle at the discretion of the operating group.

V. Terms of Waiver

No corrective actions are proposed or deemed necessary; this waiver will expire three years from the date of signing (May 1995) unless renewed.

J. O. Jackson	G. G. Hill	T. R. Neal
HS-DO	WX-DO	M-DO

rec, not approved

DRAFT

ESA

STANDARD OPERATING PROCEDURE

FOR

BURN GROUND INCINERATOR OPERATION

Prepared By:_____**Date**_____
Cindy Sandoval, ESA-WMA

Approved By:_____**Date**_____
D. A. Hemphill, Team Leader
Materials Section, ESA-WMA

Approved By:_____**Date**_____
L. A. Stretz, Group Leader, ESA-WMA

Approved By:_____**Date**_____
Roger Goldie, Safety Officer, ESH-5

Los Alamos CONTROLLED DOCUMENT
National Laboratory

Users have the ultimate responsibility to ensure that they are working with the latest revision of the controlled document.

Copy Number

1.0 SCOPE

This SOP and WWX-3 EOP 1409 must be followed when operating the Spronz RL-80-P incinerator. This SOP will discuss waste delivery, inspection, loading, and documentation while the EOP will discuss actual incinerator operations.

2.0 LOCATION

TA-16 burn ground near Building 390. This installation is identified as TA-16-1409 (formerly 16-1150). An Operating Manual is located in Building TA-16-389.

3.0 LIMITS

3.1 Personnel Limits

Normal high explosives (HE) operations require two people at the burn ground. However, due to the nature of the administratively controlled-dumpster trash burned, the incinerator may be safely operated by one person. The maximum number of personnel in the vicinity of the incinerator during operation is five. This number of people will only be present during operational reviews or audits.

3.2 Explosive Limits

This incinerator is intended to burn administratively controlled, potentially HE contaminated trash from explosives processing buildings. Only trace amounts of explosives are associated with this operation (administrative waste). It would not be practical to establish a limit, as confirmation would be virtually impossible.

4.0 EQUIPMENT

Ash scraper, gloves, ash pans, shovels, ash drums, goggles, and ESH approved respirators.

5.0 HAZARDS

The Spronz RL-80-P incinerator is constructed and insulated such that an operator is not exposed to any thermal or effluent hazard during normal operations. Vendor tests indicate an outer shell temperature of 81 to 112°F of during normal operation.

Potential hazards do exist in the following areas.

5.1 Gas Leaks

The incinerator is fueled by propane from a nearby tank. Fittings and valves can wear allowing propane to escape. If an operator detects a gaseous odor, ESA maintenance personnel and the HE unit supervisor should be notified. The incinerator will not be operated until the problem is resolved.

5.2 Loading Door Closure

The loading door may not close completely if waste residue remains in the opening. Should the door not completely close an interlock will prevent the burners from igniting.

5.3 Front End Loader

During incinerator loading the front end loader scoop is elevated to near maximum height. The disposal crew should use extra care to avoid damaging the loading hopper portion of the incinerator. Any damage must be immediately reported to the Disposal unit supervisor.

6.0 OPERATIONS

This incinerator is permitted for administratively controlled solid waste that may be contaminated with trace quantities of high explosives. New Mexico Hazardous Waste Facility Permit No. NM0890010515 lists (6.1 and 6.2) the following authorized and prohibited wastes. The authorized wastes (other than solid burnable trash or contaminated oil) are authorized in trace quantities only. Sections 6.3 to 6.9 involve operating procedures.

6.1 Authorized Wastes

6.1.1 Wastes listed as hazardous waste solely because they are ignitable, corrosive or both (F003).

6.1.2 Wastes listed as hazardous waste solely because they are reactive.

6.1.3 Wastes listed as hazardous wastes solely because they exhibit the characteristic(s) of ignitability, corrosivity, or both.

6.1.4 Wastes listed as hazardous wastes solely because they exhibit the characteristic of reactivity.

6.2 Prohibited Wastes

6.2.1 No hazardous wastes other than those identified in permit paragraph 6.1 above shall be incinerated in this unit.

6.2.2 No off-site (LANL) wastes shall be incinerated.

6.3 Waste Delivery

Administratively controlled waste is normally delivered in dumpsters to the transportainer located near the incinerator. The transportainer can receive 15 to 20 dumpster loads depending on how full the dumpsters are. It is the responsibility of the Disposal unit supervisor to assure transportainer storage capacity is not exceeded and that any waste on the ground after loading is picked up.

6.4 Incinerator Hopper Loading

The incinerator hopper is normally loaded using a front-end loader. Hand loading of scrap from a pickup or truck bed is also permitted. The hopper should not be loaded above the door height.

Waste will be reviewed for lead chunks and large metal parts during the loading operation. Those materials must be removed before burning. Any lead will be kept in Building 390 for CST-7 disposition. Metal pieces should be removed to the flash pad (387). See 7.2 below for documentation requirements.

6.5 Incinerator Loading

More than one hopper load (two maximum) may be loaded into the primary chamber depending on the waste composition. The incinerator must be operated in the manual mode for loading if more than one hopper load is to be burned (see ESA EOP 1409). Two hopper loads would normally only be used with very loose, uncompacted trash and only for the first burn of the day. Reloading of the hopper may be done after the incinerator burn cycle is complete. Chamber loading will not occur until after the two hour cooling cycle is complete.

6.6 Mode of Operation

The incinerator may be operated in the manual or automatic mode. There is very little time differential between the two. When operating in the manual mode, the operator should remain at the control panel only long enough to assure proper burner or thermocouple operation.

6.7 Waste Inspection

The transportainer and hopper loading operations allow some opportunity for visual inspection of the waste. This opportunity will be used to look for and remove restricted waste such as lead chunks.

6.8 Ash and Residue Disposal

Metal residue will be transported to the flashed metal pile (near Pad 387) for disposal. Ash will be placed in drums for disposal by CST-7. During ash removal an ESH approved respirator should be worn.

6.9 Thermocouple Checks

The incinerator control circuitry has been modified to allow burner operation even if a thermocouple fails. As operating temperature is still useful data, the operator shall observe thermocouple operation at a frequency not less than once per 10 runs. This check may be made during a pre-burn check or actual burn. Depending on the time that thermocouple operation is observed the operator should see a change (increase) in temperature or an actual operating temperature (generally between 1150 and 1400°F).

7.0 DOCUMENTATION

7.1 A record of the number of dumpsters delivered and their source will be maintained. Authorized incinerator operators have the right to reject any dumpster having an excess of non-burnable material (excess is at operator's discretion).

7.2 Each batch to be incinerated will be inspected by a knowledgeable individual for the absence of prohibited wastes. A signed record of each inspection will be retained in the facility records. An entry into the facility records sufficient.

7.3 The facility record will also include the type and quantity of any prohibited waste that was removed.

7.4 The facility record will include any maintenance activity and operator training/discussions that involve this incinerator.

7.5 The number of loads burned will be reported to the team leader monthly reporting purposes. An estimated weight of 400 lbs/incinerator load may be used.

7.6 Any operational checks, thermocouple checks, propane quantity checks, and the number of barrels of ash removed and propane tank refills will also be recorded.

8.0 Emergency Procedures

The Spronz incinerator is a commercial design used by small communities, shopping centers, and large stores. During initial evaluations the unit was seen to have few operational problems. Operations at Los Alamos TA-16 did reveal two potential problem areas discussed below.

8.1 Preignition of a hopper load may occur while loading. This situation can occur if flammable material in the waste is overheated by hot ash or brick. The operator in attendance will turn ***OFF*** all power to the incinerator, leave the incinerator area, and inform the Disposal Unit Supervisor of the preignition.

8.2 Should the propane level be too low to sustain a burn there is potential for an air quality violation. To preclude this, the operator will observe and record the propane quantity before each burn. When the propane quantity is at 20% a request will be made to refill the tank. The incinerator will not be operated if the propane tank level is below 10%.

DRAFT

WX-3

STANDARD OPERATING PROCEDURE

FOR

BURN GROUND INCINERATOR OPERATION

Prepared By: M. J. Barr **Date** 5-4-93
M. J. Barr, WX-3

Approved By: D A Hemphill **Date** 5-4-93
D. A. Hemphill, Section Leader, WX-3

Approved By: L A Stretz **Date** 5-5-93
L. A. Stretz, Group Leader, WX-3

Approved By:_____ **Date**_____
W. A. Bradley, Division Operations Coordinator, WX-DO

Approved By:_____ **Date**_____
Group Leader, HS-1

Approved By:_____ **Date**_____
P. D. Whitehead, Safety Officer, HS-5

1.0 SCOPE

This SOP and WX-3 EOP 1409 must be followed when operating the Spronz RL-80-P incinerator. This SOP will discuss waste delivery, inspection, loading, and documentation while the EOP will discuss actual incinerator operations.

2.0 LOCATION

The incinerator is located at the TA-16 burn ground near Building 390. This installation is identified as TA-16-1409 (formerly 16-1150). An Operating Manual is located in Building TA-16-389.

3.0 LIMITS

3.1 Personnel Limits

Normal high explosives (HE) operations require two people at the burn ground. However, due to the nature of the administratively controlled-dumpster trash burned, the incinerator may be safely operated by one person. The maximum number of personnel in the vicinity of the incinerator during operation is five. This number of people would only be present during operational reviews or audits.

3.2 Explosive Limits

This incinerator is intended to burn administratively controlled, only potentially HE contaminated trash from explosives processing buildings. Only trace amounts of explosives are associated with this operation (administrative waste). It would not be practical to establish a limit, as confirmation would be virtually impossible.

4.0 EQUIPMENT

Ash scraper, gloves, ash pans, shovels, ash drums, goggles, and HS approved respirators.

5.0 HAZARDS

The Spronz RL-80-P incinerator is constructed and insulated such that an operator is not exposed to any thermal or effluent hazard during normal operations. Vendor tests indicate an outer shell temperature of 81 to 112°F of during normal operation.

Potential hazards do exist in the following areas.

5.1 Gas Leaks

The incinerator is fueled by propane from a nearby tank. Fittings and valves can wear allowing propane to escape. If an operator detects a gaseous odor, maintenance (WX-12) and the HE unit supervisor should be notified. The incinerator should not be operated until the problem is resolved.

5.2 Loading Door Closure

The loading door may not close completely if waste residue remains in the opening. Should the door not completely close an interlock will prevent the burners from igniting.

5.3 Front End Loader

During incinerator loading the front end loader scoop is elevated to near maximum height. The disposal crew should use extra care to avoid damaging the loading hopper portion of the incinerator. Any damage must be immediately reported to the HE unit supervisor.

6.0 OPERATIONS

This incinerator is permitted for administratively controlled solid waste that may be contaminated with trace quantities of high explosives. New Mexico Hazardous Waste Facility Permit No. NM0890010515 lists (6.1 and 6.2) the following authorized and prohibited wastes. The authorized wastes (other than solid burnable trash or contaminated oil) are authorized in trace quantities only. Sections 6.3 to 6.9 involve operating procedures.

6.1 Authorized Wastes

6.1.1 Wastes listed as hazardous waste solely because they are ignitable, corrosive or both (F003).

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6.1.3 Wastes listed as hazardous wastes solely because they exhibit the characteristic(s) of ignitability, corrosivity, or both.

6.1.4 Wastes listed as hazardous wastes solely because they exhibit the characteristic of reactivity.

6.2 Prohibited Wastes

6.2.1 No hazardous wastes other than those identified in permit paragraph 6.1 above shall be incinerated in this unit.

6.2.2 No off-site (LANL) wastes shall be incinerated.

6.3 Waste Delivery

Administratively controlled waste is normally delivered in dumpsters to the transportainer located near the incinerator. The transportainer can receive 15 to 20 dumpster loads depending on how full the dumpsters are. It is the responsibility of the HE unit supervisor to assure transportainer storage capacity is not exceeded and that any waste on the ground after loading is picked up.

6.4 Incinerator Hopper Loading

The incinerator hopper is normally loaded using a front-end loader. Hand loading of scrap from a pickup or truck bed is also permitted. The hopper should not be loaded above the door height.

Waste shall be reviewed for lead chunks and large metal parts during the loading operation. Those materials must be removed before burning. Any lead will be kept in Building 390 for EM-7 disposition. Metal pieces should be removed to the flash pad (387). See 7.2 below for documentation requirements.

6.5 Incinerator Loading

More than one hopper load (two maximum) may be loaded into the primary chamber depending on the waste composition. The incinerator must be operated in the manual mode for loading if more than one hopper load is to be burned (see EOP 1409). Two hopper loads would normally only be used with very loose, uncompacted trash and only for the first burn of the day. Reloading of the hopper may be done after the incinerator burn cycle is complete. Chamber loading shall not occur until after the two hour cooling cycle is complete.

6.6 Mode of Operation

The incinerator may be operated in the manual or automatic mode. There is very little time differential between the two. When operating in the manual mode, the operator should remain at the control panel only long enough to assure proper burner or thermocouple operation.

6.7 Waste Inspection

The transportainer and hopper loading operations allow some opportunity for visual inspection of the waste. This opportunity shall be used to look for restricted waste types such as lead chunks. As stated in 6.4 above this material should be removed.

6.8 Ash and Residue Disposal

Metal residue shall be transported to the flashed metal pile (near Pad 387) for disposal. Ash will be placed in drums for disposal by EM-7. During ash removal an HS approved respirator should be worn.

6.9 Thermocouple Checks

The incinerator control circuitry has been modified to allow burner operation even if a thermocouple fails. As operating temperature is still a useful data point the operator shall observe thermocouple operation at a frequency not less than once per 10 runs. This check may be made during a pre-burn check or actual burn. Depending on the time that thermocouple operation is observed the operator should see a change (increase) in temperature or an actual operating temperature (generally between 1150 and 1400°F).

7.0 DOCUMENTATION

7.1 A record (facility log book) of the number of dumpsters delivered and their source shall be maintained. Authorized incinerator operators have the right to reject any dumpster having an excess of non-burnable material (excess is at operator's discretion).

7.2 Each batch to be incinerated shall be inspected by a knowledgeable individual for the absence of prohibited wastes. A signed record of each inspection shall be retained in the facility records. An entry into the facility log book is sufficient.

7.3 The facility record shall also include the type and quantity of any prohibited waste that was removed.

7.4 The facility record shall include any maintenance activity by WX-12 or WX-3 and operator training/discussions that involve this incinerator.

7.5 The number of loads burned shall be reported to the section leader monthly for the purposes of reporting. An estimated weight of 400 lbs/incinerator load may be used.

7.6 Any operational checks, thermocouple checks, propane quantity checks, and the number of barrels of ash removed shall also be recorded.

7.7 Each propane tank refill shall also be recorded.

8.0 Emergency Procedures

8.1 Preignition of a hopper load may occur while loading. This situation can occur if flammable material in the waste is overheated by hot ash or brick. The operator in attendance will turn OFF all power to the incinerator, leave the incinerator area, and inform the WX-3 HE Unit Supervisor of the preignition.

8.2 Should the propane level be too low to sustain a burn it is possible an air quality violation could occur. To preclude this, the operator shall observe and record the propane quantity before each burn. When the propane quantity is at 20% a request will be made to refill the tank. The incinerator will not be operated if the propane tank level is below 10%.

EMERGENCY PLAN

TA-14 Building 23

Originator James R. Stine Date 8/8/91

APPROVALS

L E Hatler Date 9/10/91

M-1

Betty H. Harris Date 9/11/91
M-1 EMERGENCY COORDINATOR

Distribution:

F. M. Jackson, M-DO, MS P915
HSE-Div. SOP Office, MS ~~P229~~ K489
R. H. Goldie, HSE-3, MS C930
W. A. Bradley, WX-DO, MS P946
J. S. Griffith, OM-1, K496
J. R. Stine, M-1
L. E. Hatler, M-1
T. Rivera, M-1
L. B. Chapman, M-1
R. D. Steele, M-1
G. A. Buntain, M-1
B. W. Harris, M-1
G. W. Taylor, M-1
TA-9 Branch Shop
M-1 Emergency Plan File

Emergency Plan

TA-14 Building Q-23

1. Building Description

Building Q-23 consists of four rooms; 101 control, 102 utility, 103 lab, and 104 make-up. The building measures 24 x 24 feet and is about 8 feet hight. It is constructed of 2 foot-thick steel reinforced concrete on the south side and 10 inch thick concrete on the other sides.

2. Building Hazards

Q-23 is permanently labeled with a "1" hazard sign. Rooms 103 (lab) and 104 (make-up) can contain up to 50 lbs of high explosive. Room 102 (utility) contains the electrical panels and circuit breakers.

3. Alarm Systems

None

4. Protection Systems

None

5. Emergency Equipment

Carbon dioxide fire extinguishers are outside rooms 101, 102, 103, and 104. Water fire extinguisher is outside room 101. MSDSs are located in Room 103. Two absorbent spill kits are located inside the solvent cabinet outside room 103.

6. Notifications

A. In case of fire, serious injury, or emergencies that pose an immediate threat to life or property:
   - call 911 or 9-911;

- notify the M-1 Group Leader and the General Chemistry Section Leader. The M-1 Group Office will notify M-DO and HSE-3.

B. Incidents that do NOT pose an immediate threat to life or property, but carry the POTENTIAL of such a threat:

- Notify the Emergency Management Office at 7-6211 (7-7080 after hours).
- Notify the Group Office during normal hours.
- Notify the following during off hours:

Jim Stine	672-1314
Greg Buntain	662-6885
Larry Hatler	672-9150
Manny Lopez (utilities)	[illegible]6191

C. Incidents that pose no threat to life or property, but yet may be reportable under DOE Order 5000.3A should be reported to the Emergency Management Office as soon as possible. Copies of DOE Order 5000.3A may be obtained from the Occurrence Reporting Section of EMO (7-6211).

D. Local Notifications:
None.

7. Emergency Planning Zone

Reserved for future use.

8. Actions Required in Event of Specific Major Incidents:

A. Toxic chemical release:

In the event of a toxic chemical spill in which a sufficient quantity of toxic vapors are released, personnel should evacuate upwind. It is important to warn other personnel in the immediate area and at the M-8 portion of TA-14 of the spill. The nature of the emergency will determine how large an area will need to be evacuated, so an assembly area cannot be designated in advance. However, if the wind direction permits, personnel should evacuate at the entrance gate to TA-14. There is a phone at this location and incoming emergence response personnel can be stopped and advised of the nature of the spill. *Under no circumstances will any*

emergency vehicle be permitted into TA-14 until the M-1 senior supervisor has determined that there is no further danger from explosions.

All personnel who might have been exposed to toxic materials should seek medical treatment as necessary.

In the event of a chemical spill without toxic vapors, the Spill Coordinator for Group M-1 will be notified and all personnel will be evacuated from the vicinity of the spill. For small spills, personnel familiar with the material will do whatever they can to confine the spill, if it can be done safely without harm to themselves or others. For large spills, or those involving toxic chemicals HSE-3 will be requested to confine and clean up the spill.

B. Radioactivity release

N/A

C. Nuclear criticality

N/A

D. High energy accident

In the event of an explosion involving high explosives with or without a fire all personnel are to retire to a safe distance and remain there until the danger of an explosion is over. Violent, high-order detonations are unlikely to be followed by additional explosions unless an adjacent vehicle or building containing explosives has been damaged by the initial explosion or from a resultant fire.

Any fire involving substantial quantities of explosives represents an extremely hazardous situation. A violent explosion could occur at any time. Small explosions, unless they result in a fire, will probably be followed promptly, or not at all, by additional explosions.

Remaining in an area threatened by further explosions to help an injured person will probably not mean the difference between life or death to that person, but may well cause injury or death to the rescuer.However, if the wind direction permits, personnel should evacuate at the entrance gate to TA-14.

There is a phone at this location and incoming emergence response personnel can be stopped and advised of the nature of the explosion. *Under no circumstances will any emergency vehicle be*

permitted into TA-14 until the M-1 senior supervisor has determined that there is no further danger from explosions.

9. General Evacuation Procedures

A. Date of evacuation routes/posters in use:
A map of Q-23 is located in the control room (room 101) and was last reviewed July 31, 1991. It shows the exits of Q-23 and the assemble point by the entrance gate to TA-14.

B. Provisions for handicapped employees:
Handicapped personnel are not allowed in explosives containing area if their handicap would endanger themselves or others. Handicapped visitors are allowed in the control room, but only under supervision of the Firing Supervisor. This room is easily accessed by wheelchairs. At this time, no handicapped personnel needing special provisions are employed in Group M-1.

C. Personnel accountability procedures:
The Firing Supervisor will have knowledge of all personnel in the area and a list of all visitors. He will check all personnel at the place of evacuation. The place of evacuation will usually be the entrance gate to TA-14, unless conditions warrant otherwise.

D. Special evacuation/transportation requirements:
The entrance gate to TA-14 is the assembly point for an evacuation. If this gate is down wind of a toxic gas plume, employees are to evacuate to a point up wind of the plume.

10. Emergency Operations

A. In-house Emergency Response Team consists of the Group Leader and the Deputy Group Leader. These people are familiar with the hazards of explosives and should be consulted by the Emergency Response personnel.

B. In-house communications capability - None.

C. Stand-Off Instructions. Personnel should evacuate to the entrance gate to TA-14. This position is provides a safe stand-off distance for nearly all conceivable accidents, and also provides a point of contact with the Emergency Response personnel before entrance to a potentially hazardous area.

11. Consequence Assessment

A. The senior building person present will give the arriving Incident Commander a breifing on current hazards and likely problems. EMO and responding HSE elements, in consultation with building staff/occupants, will conduct more detailed consequence assessment.

B. The consequences of any incident at TA-14 are essentially unpredictable. For this reason, the M-1 Senior Supervisor will assess the likelihood of a continuing hazard after an initial incident. General guidlines for this assessment are given in the M-1 Emergency Plan.

12. Shutdown Procedures

In the event of a fire or explosion in the vicinity of Q-23 the firing system will be shutdown. Under no circumstances, however, should personnel endanger themselves to do so, and no one may re-enter an evacuated building without the M-1 Senior Supervisor's specific permission.

13. Spill and Containment Procedures

A spill control kit is located outside room 102. This kit would be used in the event of a small spill, as long as it could be used without harm to the user or others. For large spills, the spill control coordinator would be notified.

14. Re-entry Procedures

The M-1 Group Leader is responsible for decisions about when the accident site may be re-entered by Group personnel. In general, no one should re-enter during the emergency, but only after sufficient time that all of the M-1 line management can assess each of the hazards.

15. Training

A. Emergency Training: The Firing Supervisor is required to have CPR and First Aid.

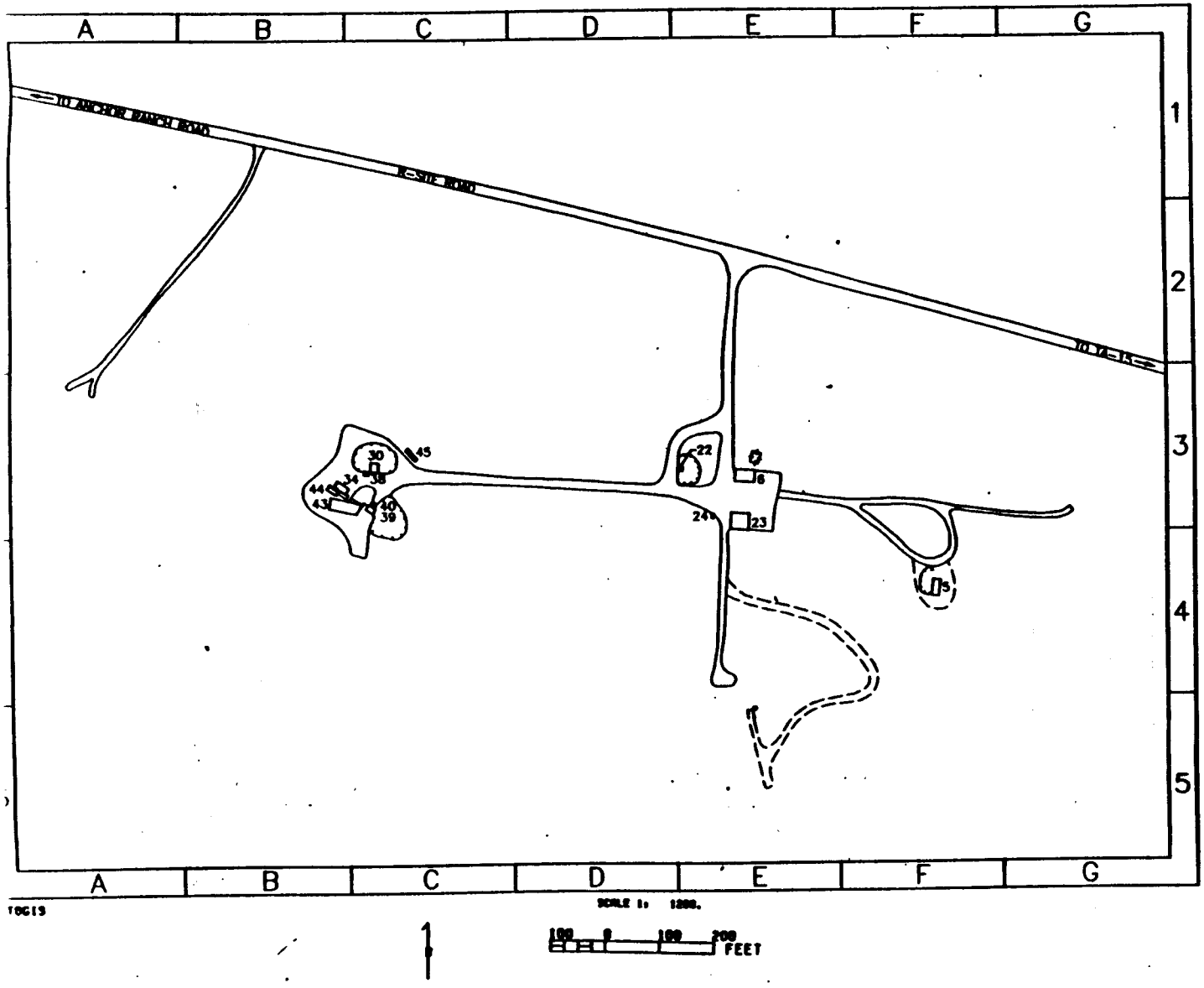
B. Periodic Evacuation Exercises: An emergency / evacuation exercise is performed annually by the M-1 Emergency Coordinator.

CALL LIST

Firing Site Supervisor	Ken Uher	5-4901*	662-7012
Building Manager	Jim Stine	7-4990*	672-1314
Alt. Building Manager	Ken Uher	5-4901*	662-7012
Gen. Chem. Section Leader	Greg Buntain	7-4748*	662-6885
Group Eng. Area Coord.	Bob Shelton	7-4411	662-4484

This document was prepared by James Stine, 8/2/91 Tel: 7-4990

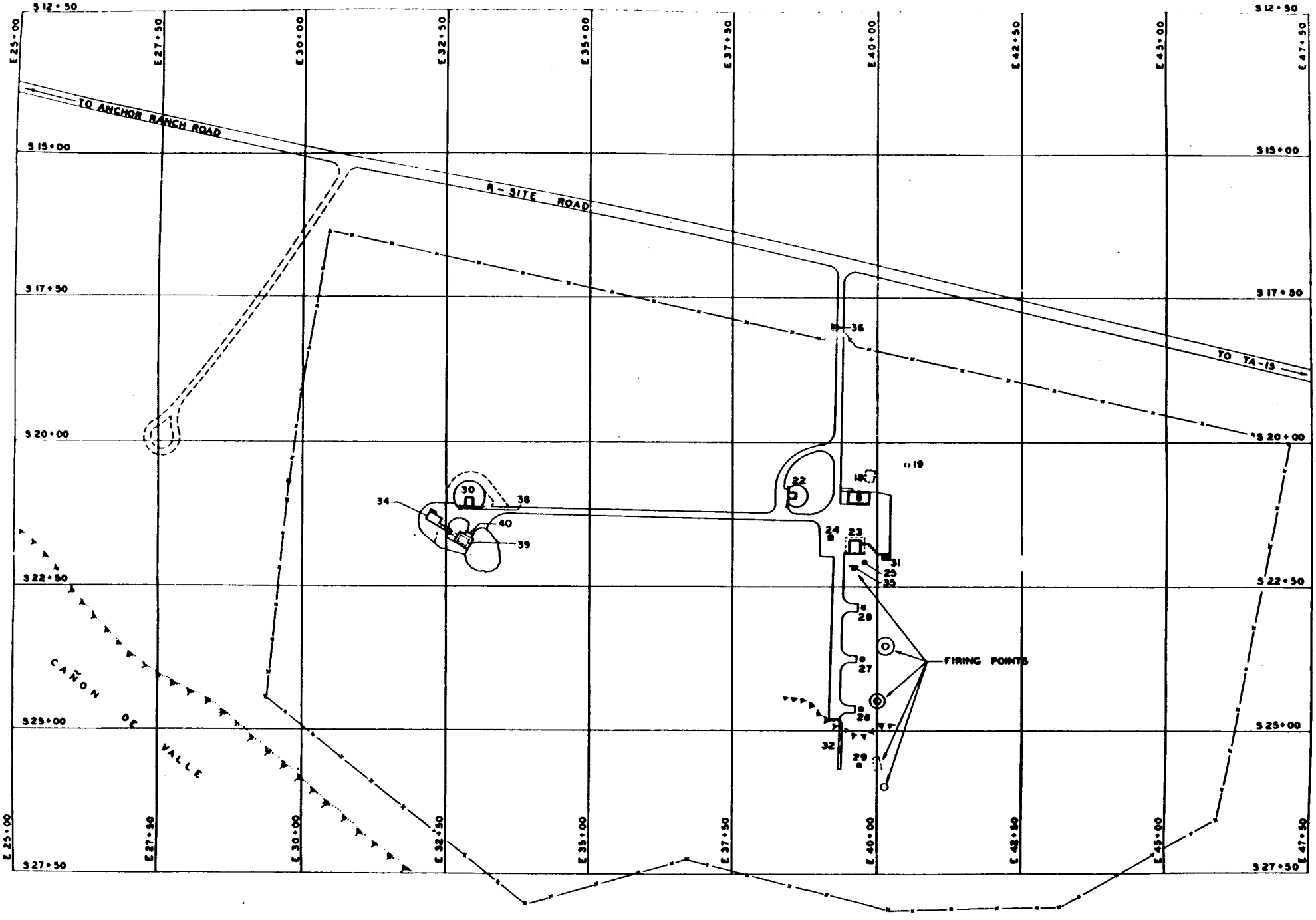
TA-14



STRUCTURE NUMBER INDEX

STRUCTURE TA-NUMBER	STRUCTURE DESIGNATION	STRUCTURE NOMENCLATURE	STRUCTURE LOCATOR SHEET NO.	STRUCTURE LOCATOR MAP KEY
14- 5	0- 5	BUNKER	1	F-4
14- 6	0- 6	STORAGE BUILDING	1	E-3
14- 22	0- 22	MAGAZINE	1	E-3
14- 23	0- 23	CONTROL BUILDING	1	E-3
14- 24	0- 24	EQUIPMENT BUILDING	1	E-3
14- 30	0- 30	EXPLOSIVES PREP. BUILDING	1	C-3
14- 34	0- 34	BULLET TEST FACILITY	1	B-3
14- 38	0- 38	CAMERA BUILDING	1	C-3
14- 39	0- 39	HIGH EXPLOSIVE TEST FAC.	1	C-3
14- 40	0- 40	INSTRUMENTATION BUILDING	1	C-3
14- 43	14- 43	LABORATORY BUILDING	1	B-3
14- 44	14- 44	TRANSPORTAINER	1	B-3
14- 45	14- 45	TRANSPORTAINER	1	C-3

UNIVERSITY OF CALIFORNIA
Los Alamos
FACILITIES ENGINEERING DIVISION
STRUCTURE LOCATION MAP
TA-14
R-SITE
ENG-R S100


S 12+50
S 15+00
S 17+50
S 20+00
S 22+50
S 25+00
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E 25+00
E 27+50
E 30+00
E 32+50
E 35+00
E 37+50
E 40+00
E 42+50
E 45+00
E 47+50
TO ANCHOR RANCH ROAD
A-SITE ROAD
TO TA-15
CAÑON DE VALLE
FIRING POINTS
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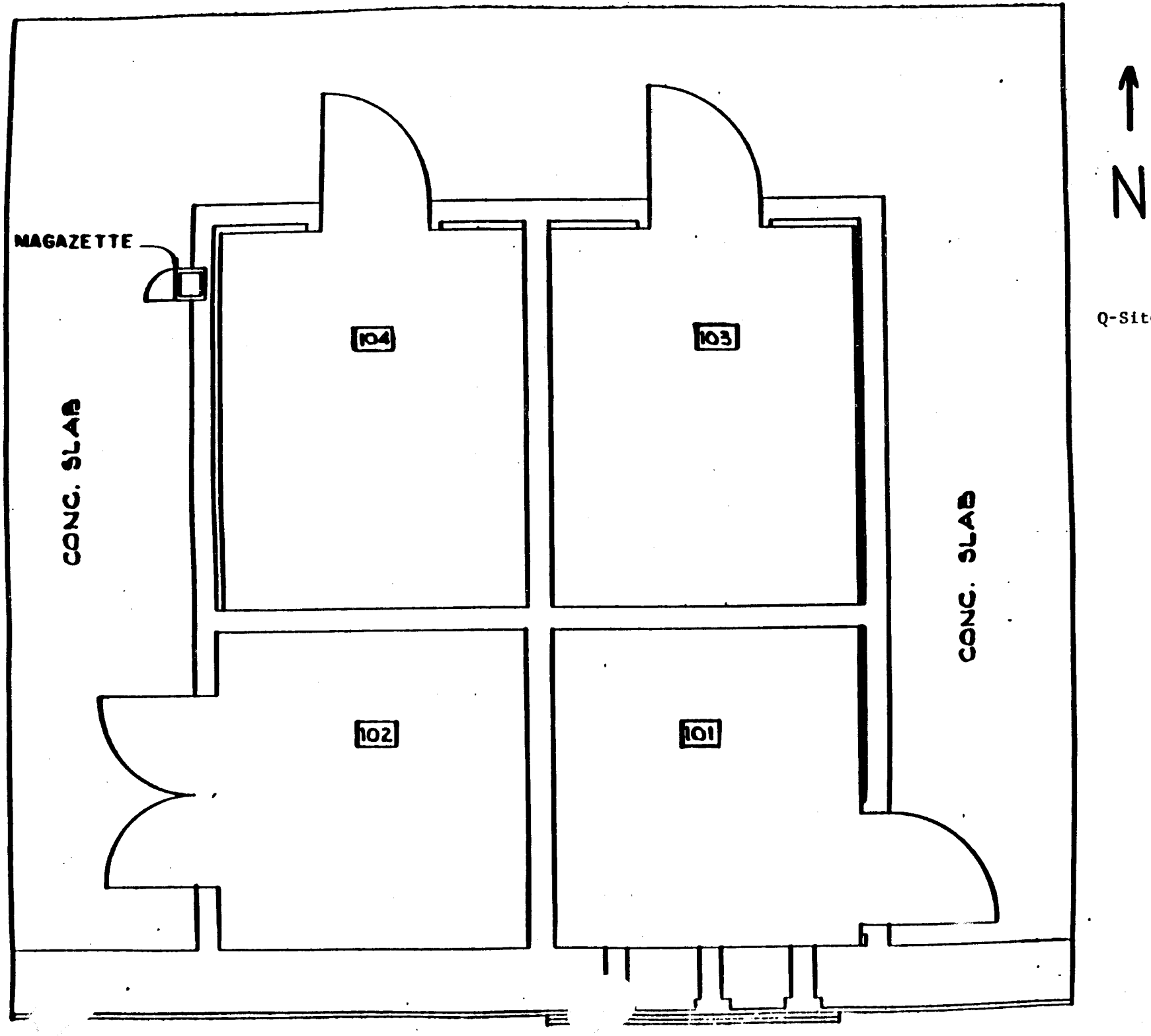

Q-Site TA-14 Q23