JUNE 1990

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Los Alamos National Laboratory

2350 General

Environmental Restoration Program

U. S. Department of Energy Cost Validation

SITE TOUR

June 4 & 5, 1990

12284

Tour Agenda

June 4

9:30 - 10:30 am

LANL Badge Office

TA-3 Acid Waste Lines

Sandia Canyon/Los Alamos County Landfill/Outfalls

10:30-11:30 Airport Landfill

TA-21; MDA-B

11:30-12:30 Lunch/Los Alamos

1:00; TA-22; Bldg. 91-Dry Wells/Outfalls/Water Canyon

2:00-TA-9; MDA-M

3:00-TA-15; MDA-Z

-Phermex

June 5

8:00 meet at TA-59

TA-48; Surface Impoundment

TA-35; Waste Oil Tanks

TA-50; MDA-C

TA-46; Sanitary Lagoon

12:00-1:00 Lunch in White Rock

1:30 TA-39; Ancho Canyon

Firing Site 57

MDA-Y

List of participants for the June 4 & 5 1990 Cost Validation Review Site Tour

Lyle E. Harris, DOE-HQ-EM

Auter Rampertaap, DOE-HQ-EH

Paul Schuman, DOE-LAAO

Beth Sellers, DOE-AL-EHD

John Roberts, Corps of Engineers

Ramona Wagner,Corps of Engineers

Bill Shaughnessy, BDM Corp.

Kelly Bitner, IT Corporation

Shannon Goldberg, Hazwrap

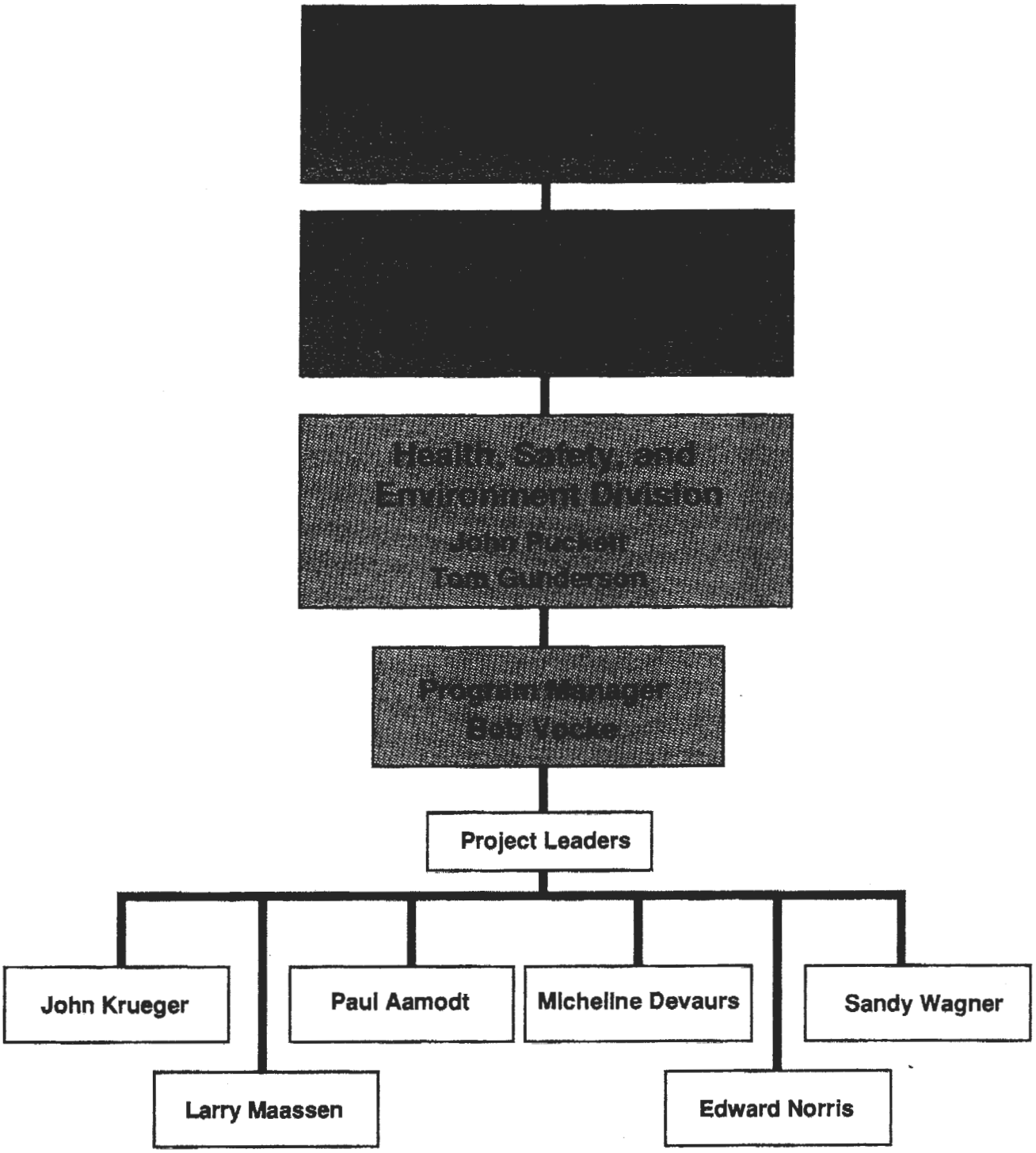
Robert Vocke, LANL HSE-DO/ER

Robert Gonzales, LANL HSE-DO/ER

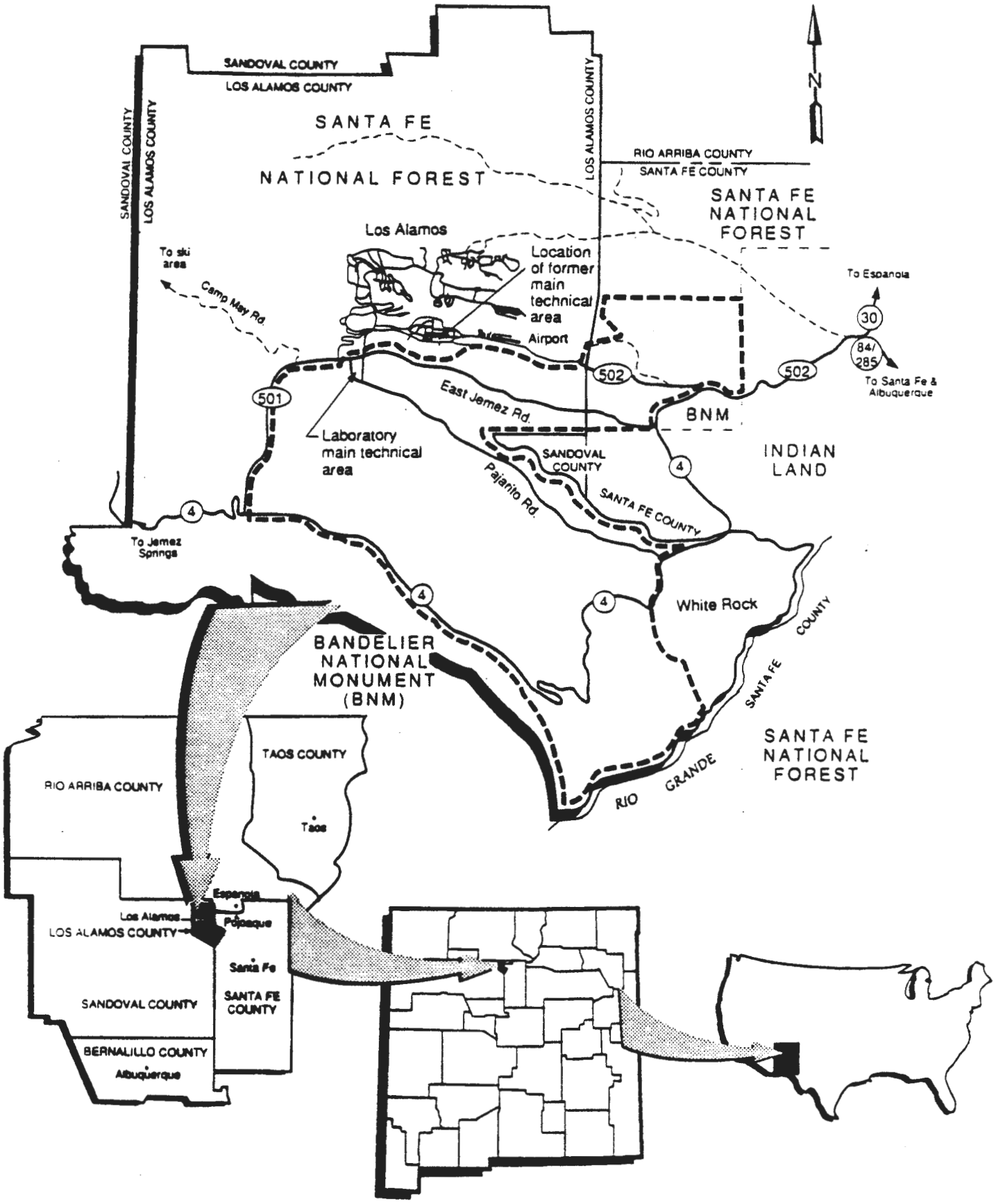
Sandy Wagner, LANL HSE-DO/ER

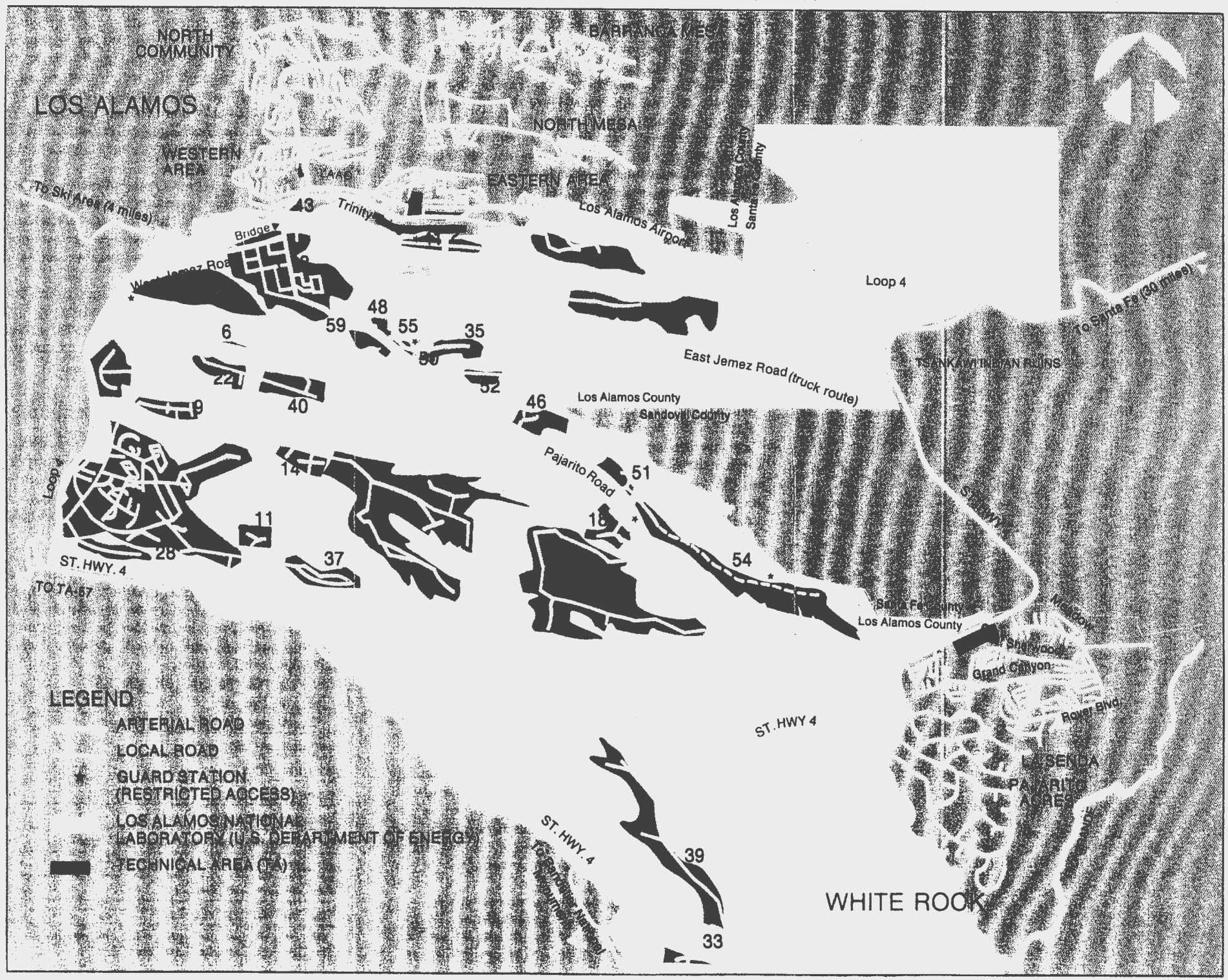
Donald Bohrman, ORNL

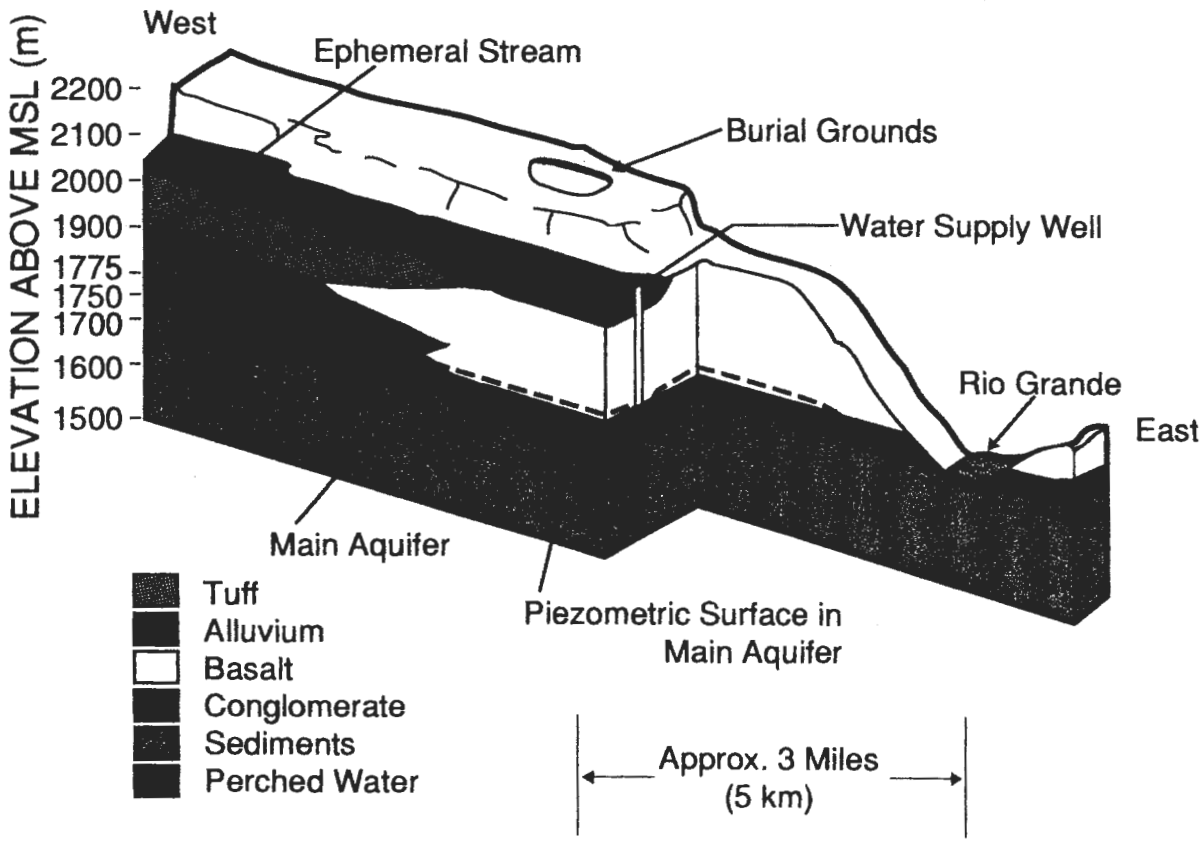
Mark Nickelson, Hazwrap


Health, Safety, and
Environment Division
John Rickert
Tom Gunderson
Program Manager
Bob Vocke
Project Leaders
John Krueger
Paul Aamodt
Micheline Devaurs
Sandy Wagner
Larry Maassen
Edward Norris

IS-12/90-328


SANDOVAL COUNTY
LOS ALAMOS COUNTY
SANTA FE
NATIONAL FOREST
SANDOVAL COUNTY
LOS ALAMOS COUNTY
LOS ALAMOS COUNTY
RIO ARRIBA COUNTY
SANTA FE COUNTY
SANTA FE NATIONAL FOREST
N
Los Alamos
To ski area
Camp May Rd.
Location of former main technical area
Airport
To Espanola
30
84/285
To Santa Fe & Albuquerque
502
502
501
East Jemez Rd.
BNM
Laboratory main technical area
SANDOVAL COUNTY
INDIAN LAND
Pajarito Rd.
SANTA FE COUNTY
4
To Jemez Springs
White Rock
BANDELIER NATIONAL MONUMENT (BNM)
SANTA FE COUNTY
SANTA FE NATIONAL FOREST
RIO GRANDE
RIO ARRIBA COUNTY
TAOS COUNTY
Taos
Espanola
Los Alamos
LOS ALAMOS COUNTY
Pojoaque
Santa Fe
SANDOVAL COUNTY
SANTA FE COUNTY
BERNALILLO COUNTY
Albuquerque


NORTH COMMUNITY
LOS ALAMOS
WESTERN AREA
BARRANCA MESA
NORTH MESA
EASTERN AREA
LAAD
To Ski Area (4 miles)
Trinity
Bridge
West Jemez Road
Los Alamos Airport
Los Alamos County
Santa Fe County
Loop 4
To Santa Fe (30 miles)
TSANKAWI INDIAN RUINS
East Jemez Road (truck route)
Los Alamos County
Sandoval County
Pajarito Road
Loop
ST. HWY. 4
TO TA-57
Santa Fe County
Los Alamos County
Meadow
Sherwood
Grand Canyon
Rover Blvd.
ST. HWY 4
LA SENDA
PAJARITO ACRES
ST. HWY. 4
To Bandelier National Monument
WHITE ROCK
43
48
59
55
35
6
50
22
52
9
40
46
14
51
11
18
28
37
54
39
33
LEGEND
ARTERIAL ROAD
LOCAL ROAD
GUARD STATION (RESTRICTED ACCESS)
LOS ALAMOS NATIONAL LABORATORY (U.S. DEPARTMENT OF ENERGY)
TECHNICAL AREA (TA)


West
Ephemeral Stream
Burial Grounds
Water Supply Well
Rio Grande
East
ELEVATION ABOVE MSL (m)
2200
2100
2000
1900
1775
1750
1700
1600
1500
Main Aquifer
Piezometric Surface in
Main Aquifer
Tuff
Alluvium
Basalt
Conglomerate
Sediments
Perched Water
Approx. 3 Miles
(5 km)

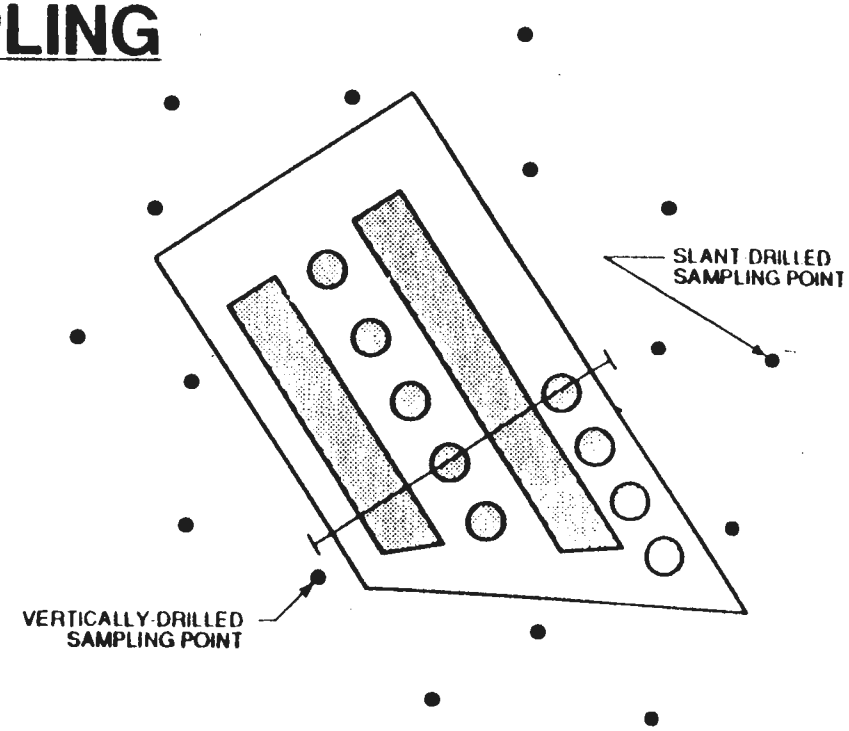
SAMPLING STRATEGIES

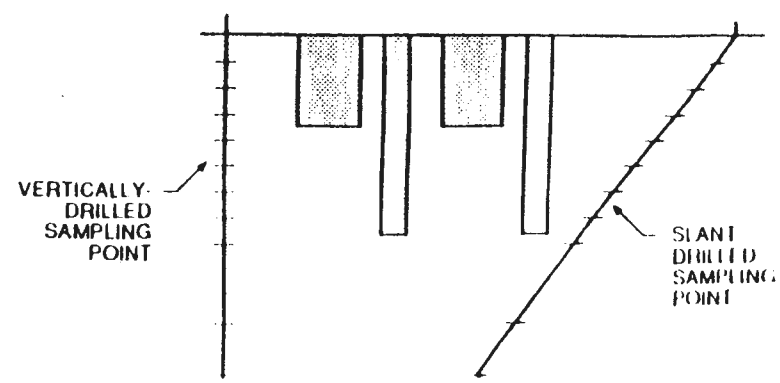
Perimeter Sampling (*25 sites proposed) as time permits -	Los Alamos County Landfill Airport Landfill Material Disposal Area B (TA-21) Material Disposal Area C (TA-50) Material Disposal Area G (TA-54)
Random (*99 sites proposed)	Material Disposal Area M (TA-9) Material Disposal Area Z (TA-15) Material Disposal Area Y (TA-39)
Firing Sites (*37 sites proposed)	Phermex (TA-15) Ancho Canyon (TA-39) Inactive Firing Point E (TA-15)
Canyons (*17 sites proposed)	Sandia Water Mortandad Los Alamos
Outfalls (*121 sites proposed)	Sanitary Lagoon Outfall (TA-46) Building 22 Outfall (TA-22) Surface Impoundment (TA-48)
Drainlines (*111 sites proposed)	Acid Waste Lines Decommissioned Waste Lines
Discrete Units (*130 sites proposed)	Waste Oil Tank Farm (TA-35) Dry Wells (TA-22)

* Remaining SWMU database tasks are yet to be added into the count.

SAMPLING STRATEGY
PERIMETER SAMPLING

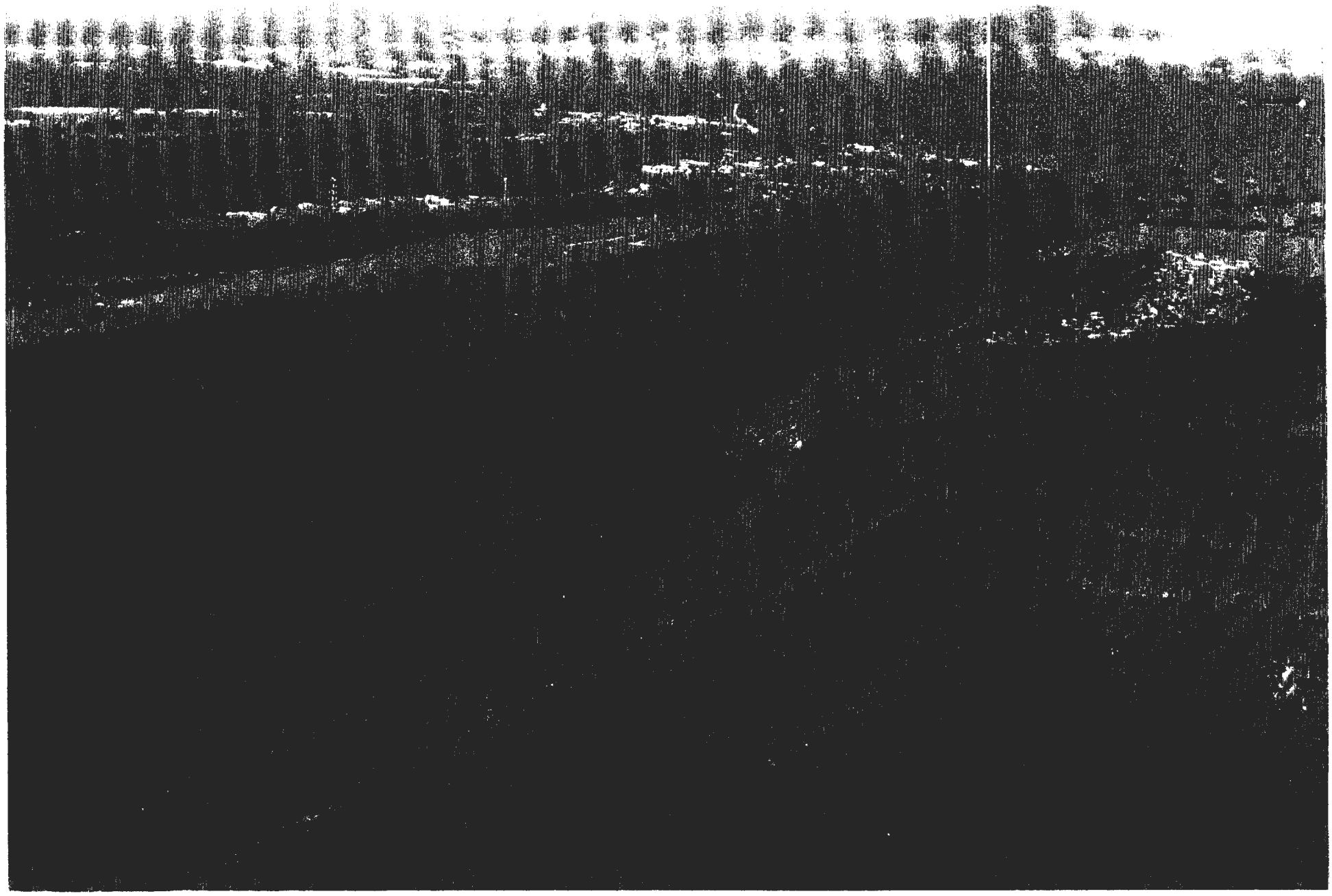
- Assumed for sites where the planned remedial action is in-place stabilization
- Sampling points placed at 30-ft spacing around perimeter of area
- Alternate vertical and slant-drilled sampling points to sample directly below unit
- Sample from surface to total depth as follows:
  - 5-ft intervals from surface to 30 ft
  - 10-ft intervals from 30 ft to total depth
- Total depth of sampling points based on waste form, geology, hydrology, and period of use





Activity Data Sheet Number		Number of Samples
1072	61-005 Los Alamos County Landfill	
	• Planned remedial action - in-place stabilization	
	• 24 Acre landfill, no release controls	
	• Sample analyses: organics, inorganics, metals, radionuclides	4,851
	• 10 Sample points per acre (2,640 samples)	
	• 201 Sampling points around perimeter (approximate 30-ft spacing) (2,211 samples)	
	• Sample from surface to 75 ft total depth; collect samples every 5 ft from 0-30 ft; every 10 ft from 30-75 ft	
	• Alternate vertical and slant-drilled sampling points	
	• Investigation-derived waste characterization samples - 5% of total	243
	• QA Samples - 10% of total	486
	TOTAL	5,580

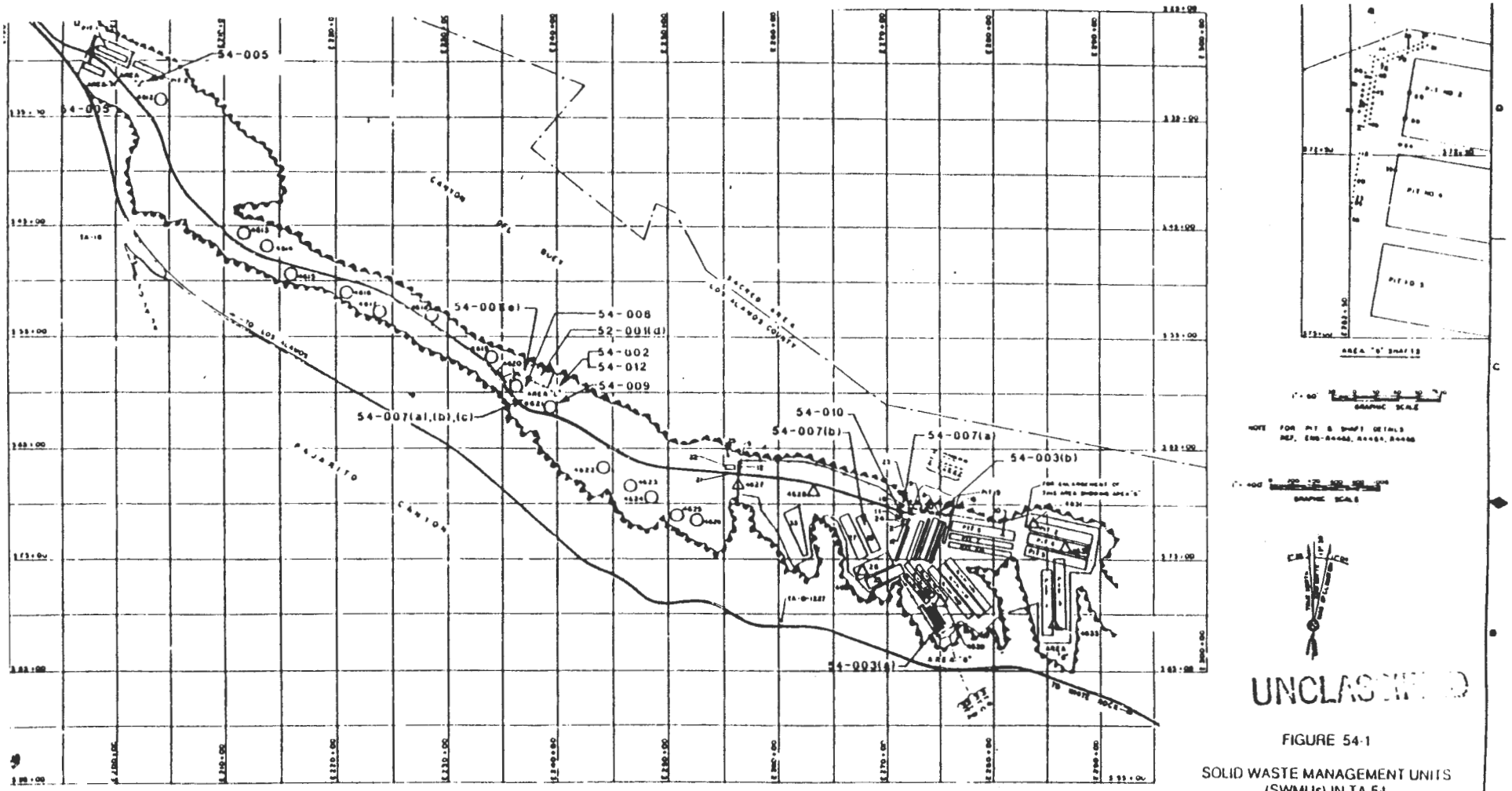
Activity Data Sheet Number		Number of Samples
1073	**73-001 Airport Landfill**	
	• Planned remedial action - in-place stabilization	
	• Includes landfill [73-001(a)]; waste oil pit [73-001(b)]; HE bunker disposal [73-001(c)]	
	• Landfill covered an area of 1.5×10^6 ft^2	
	• Sample analyses: organics, inorganics, metals, radionuclides, explosives	3,753
	• 417 Sampling points around perimeter (approximate 30-ft spacing)	
	• Alternate vertical and slant-drilled sampling points	
	• Sample from surface to 50 ft total depth; collect samples every 5 ft from 0 to 30 ft and every 10 ft from 30 to 50 ft	
	• Investigation-derived waste characterization samples - 5% of total	188
	• QA Samples - 10% of total	376
	TOTAL	4,317



Activity Data Sheet Number		Number of Samples
1107	21-015 Material Disposal Area B	
	• Planned remedial action - in-place stabilization	
	• 6 Acre landfill	
	• Sample analyses: organics, inorganics, metals, radionuclides	1,600
	• 100 Sampling points around perimeter (approximate 30-ft spacing)	
	• Sample from surface to 75 ft total depth at 5-ft intervals	
	• Alternate vertical and slant-drilled sampling points	
	• Investigation-derived waste characterization samples - 5% of total	80
	• QA Samples - 10% of total	160
	TOTAL	1,840

Activity Data Sheet Number		Number of Samples
1147	**50-009 Material Disposal Area C**	
	• Planned remedial action - in-place stabilization	
	• 11.8 Acre area with pits and shafts	
	• Sample analyses: organics, inorganics, metals, radionuclides	1,298
	• 118 Sampling points around perimeter (approximate 30-ft spacing)	
	• Sample from surface to 75 ft total depth; collect samples every 5 ft from 0-30 ft; every 10 ft from 30-75 ft	
	• Alternate vertical and slant-drilled sampling points	
	• Investigation-derived waste characterization samples - 5% of total	65
	• QA Samples - 10% of total	130
	TOTAL	1,493

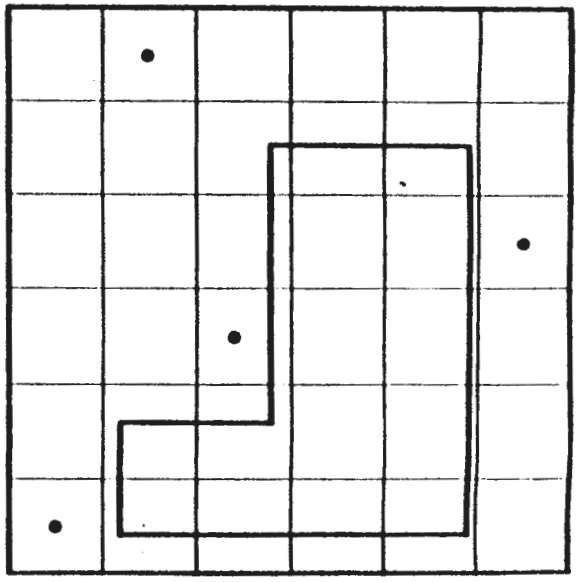
Activity Data Sheet Number		Number of Samples
1153	54-003(a) Material Disposal Area G	
	• Planned remedial action - in-place stabilization	
	• 63 Acre area with pits, shafts, and trenches	
	• Sample analyses: organics, inorganics, metals, radionuclides	~6,413
	• 5 Sample points per acre within the area (3,465 samples)	
	• 268 Sampling points around perimeter (approximate 30-ft spacing) (2,948 samples)	
	• Sample from surface to 75 ft total depth; collect samples every 5 ft from 0-30 ft; every 10 ft from 30-75 ft	
	• Alternate vertical and slant-drilled sampling points	
	• Investigation-derived waste characterization samples - 5% of total	321
	• QA Samples - 10% of total	642
	TOTAL	7,376



STRUCTURE NUMBER	STRUCTURE DESIGNATION	STRUCTURE NOMENCLATURE	REMARKS	APPROXIMATE GRID LOCATION
[illegible]	[illegible]	[illegible] BLDG		[illegible]
[illegible]	[illegible]	[illegible] STATION	NOT [illegible]	[illegible]
[illegible]	[illegible]	[illegible]		[illegible]
[illegible]	[illegible]	[illegible]		[illegible]
[illegible]	[illegible]	[illegible]

SAMPLING STRATEGY
RANDOMLY SAMPLED AREAS

- Assumed for sites where the planned remedial action is clean to acceptable risk-based criteria
- Sample a percentage of an area with a 5 x 5 ft grid
- Percentage of the grid sampled based on:
  - Heterogeneity of waste
  - Distribution of waste
- Stratified random sampling assumed for sites with known structures and expected waste distribution
- Simple random sampling assumed for sites where waste is evenly distributed at site
- Sampling points will be sampled from surface to total depth
  - 5-ft intervals from surface to 30 ft
  - 10-ft intervals from 30 ft to total depth
- Total depth of sampling points based on waste form, geology, hydrology, and period of use

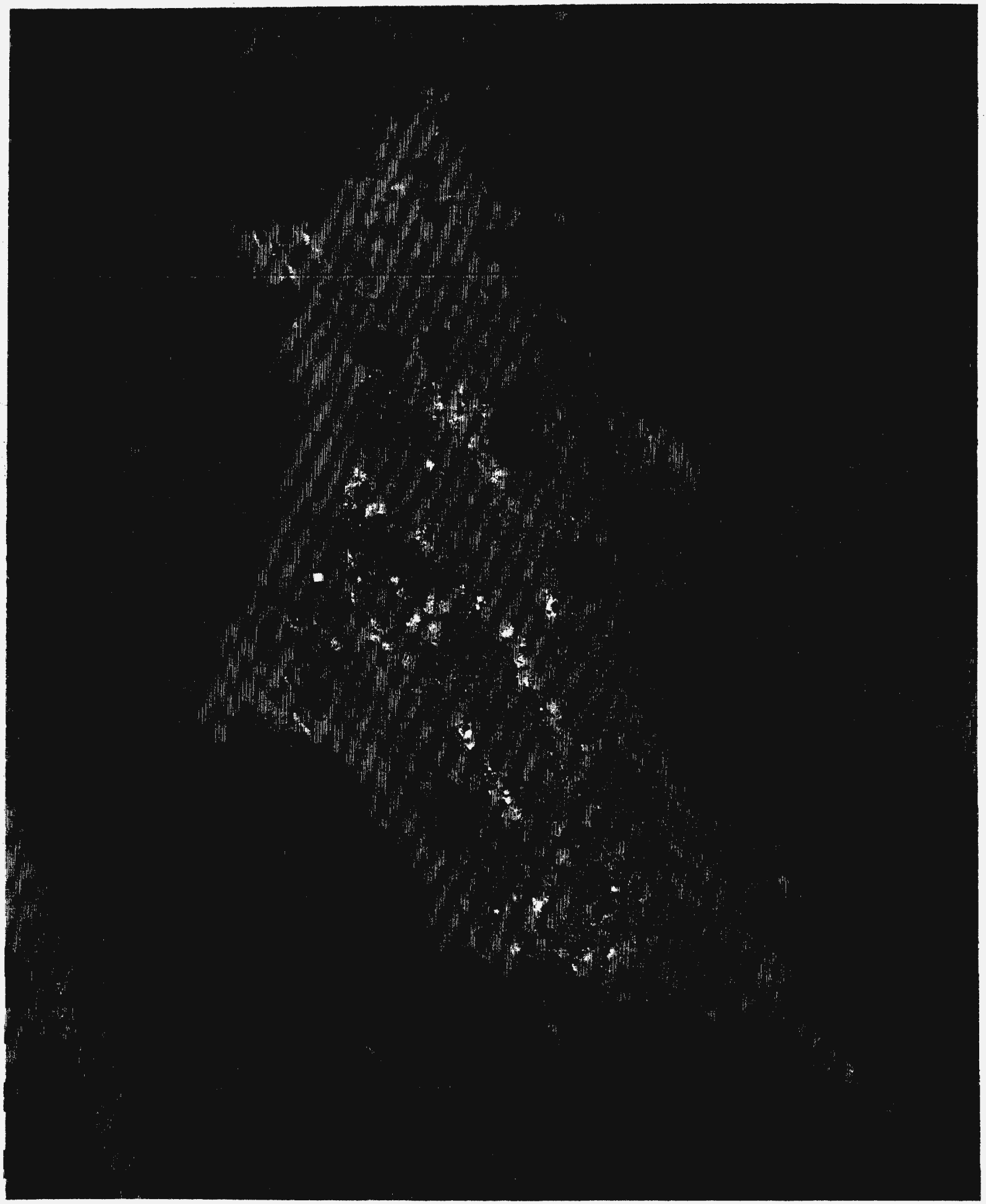


Sheet Number

1157 9-013 Material Disposal Area M

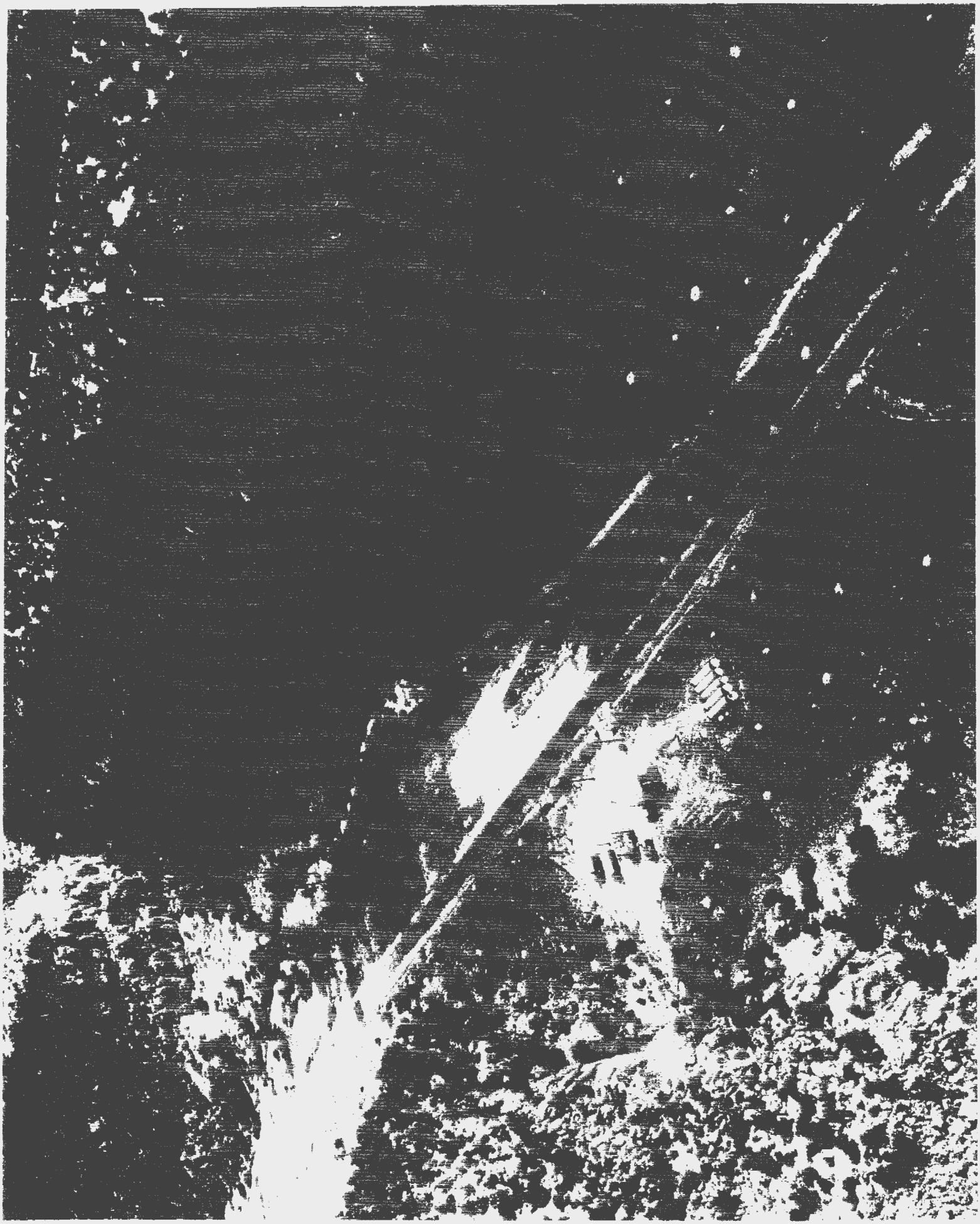
- Planned remedial action - clean to acceptable risk-based criteria
- 3.2 Acre surface disposal area
- Sample analyses: organics, inorganics, metals, radionuclides, asbestos, explosives 1,671
- Sample 10% of a 5 x 5 ft grid
- Includes simple random sampling of soil and authoritative sampling of waste
- 3 Sample depths: surface, 5 ft, 10 ft
- Investigation-derived waste characterization samples - 5% of total 84
- QA Samples - 10% of total 168

TOTAL 1,923

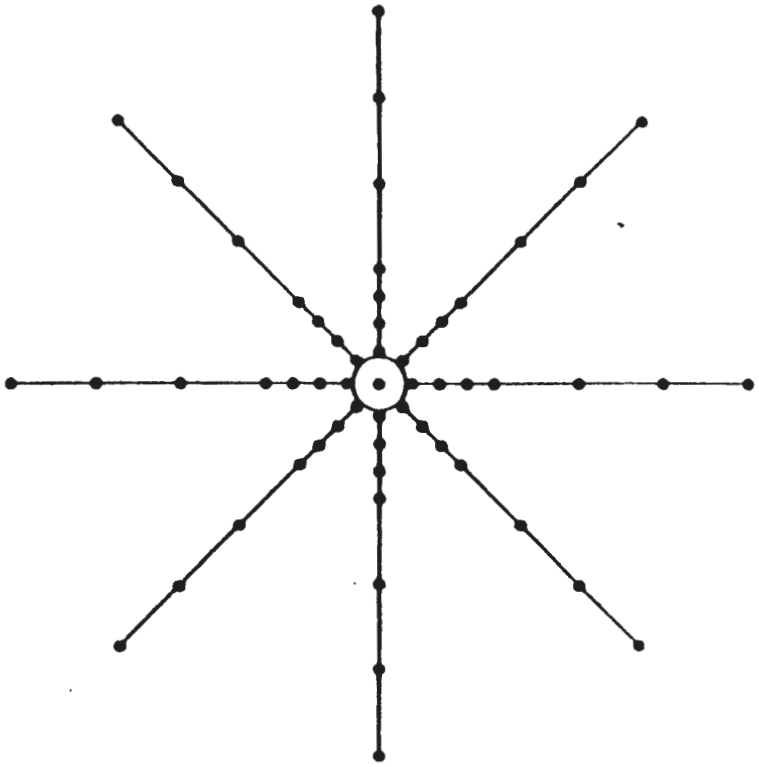


Activity Data Sheet Number		Number of Samples
1088	15-007 (b) Material Disposal Area Z	
	• Planned remedial action - clean to acceptable risk-based criteria	
	• Surface disposal area estimated to cover 3 acres	
	• Sample analyses: organics, metals, inorganics, radionuclides, explosives	468
	• Random sample 1% of a 5 x 5 ft grid	
	• Sample from surface to 50 ft total depth; collect samples every 5 ft from 0-30 ft; and every 10 ft from 30-50 ft	
	• Investigation-derived waste characterization samples - 5% of total	24
	• QA Samples - 10% of total	47
	TOTAL	539

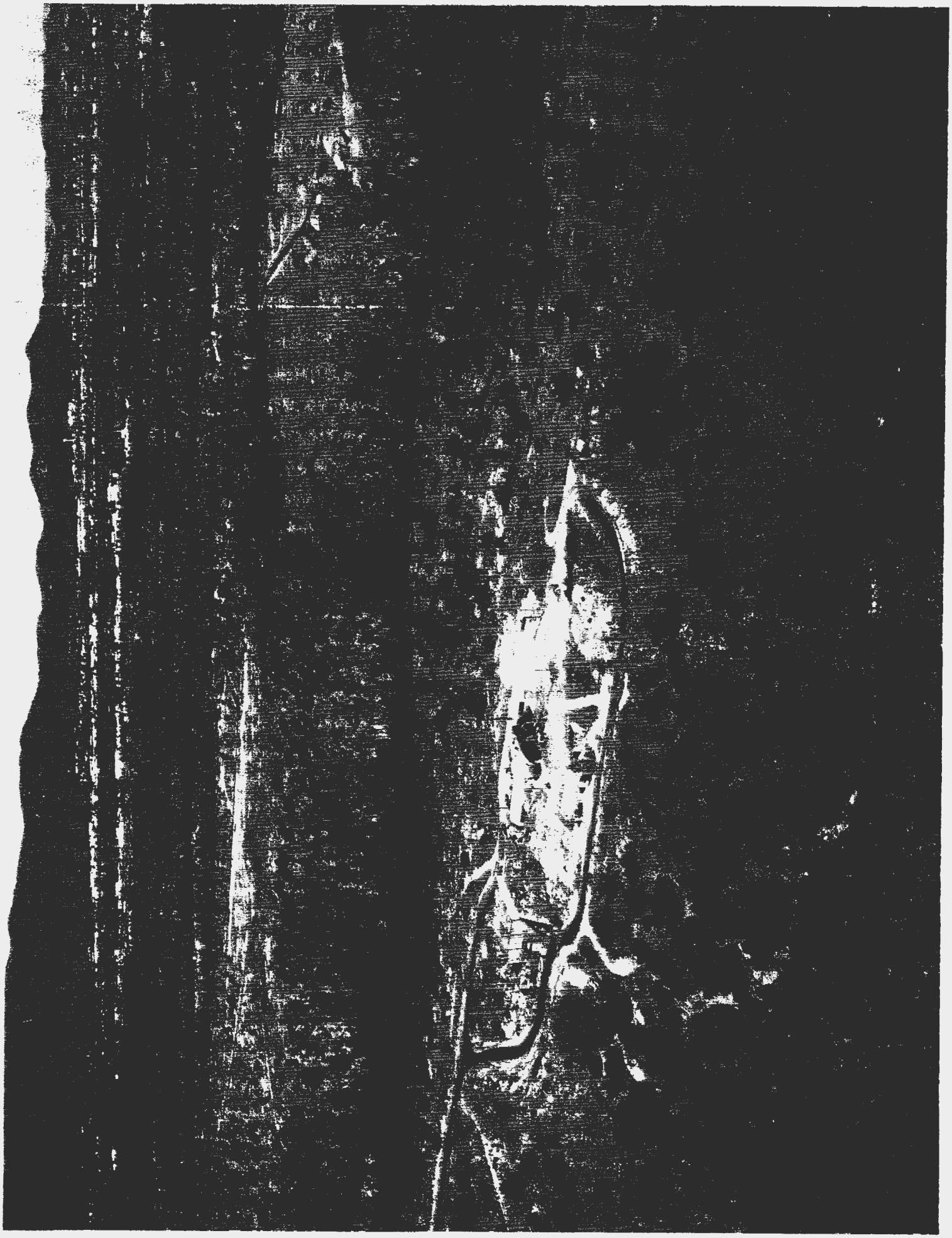
Activity Data Sheet Number		Number of Samples
1132	**39-001 MDA-Y and Nearby Landfills**	
	• Planned remedial action - clean to acceptable risk-based criteria	
	• Consists of five trenches for firing site debris disposal [39-001(a), (b), (c), (d), (e)]	
	• Sample analyses: organics, inorganics, metals, radionuclides, explosives	11,520
	• Covers an area of 6.4×10^5 ft^2	
	• Sample 5% of a 5 x 5 ft grid (stratified random sampling)	
	• Sample from surface to 50 ft total depth; collect samples every 5 ft from 0-30 ft; every 10 ft from 30-50 ft	
	• Investigation-derived waste characterization samples - 5% of total	576
	• QA Samples - 10% of total	1,152
	TOTAL	13,248

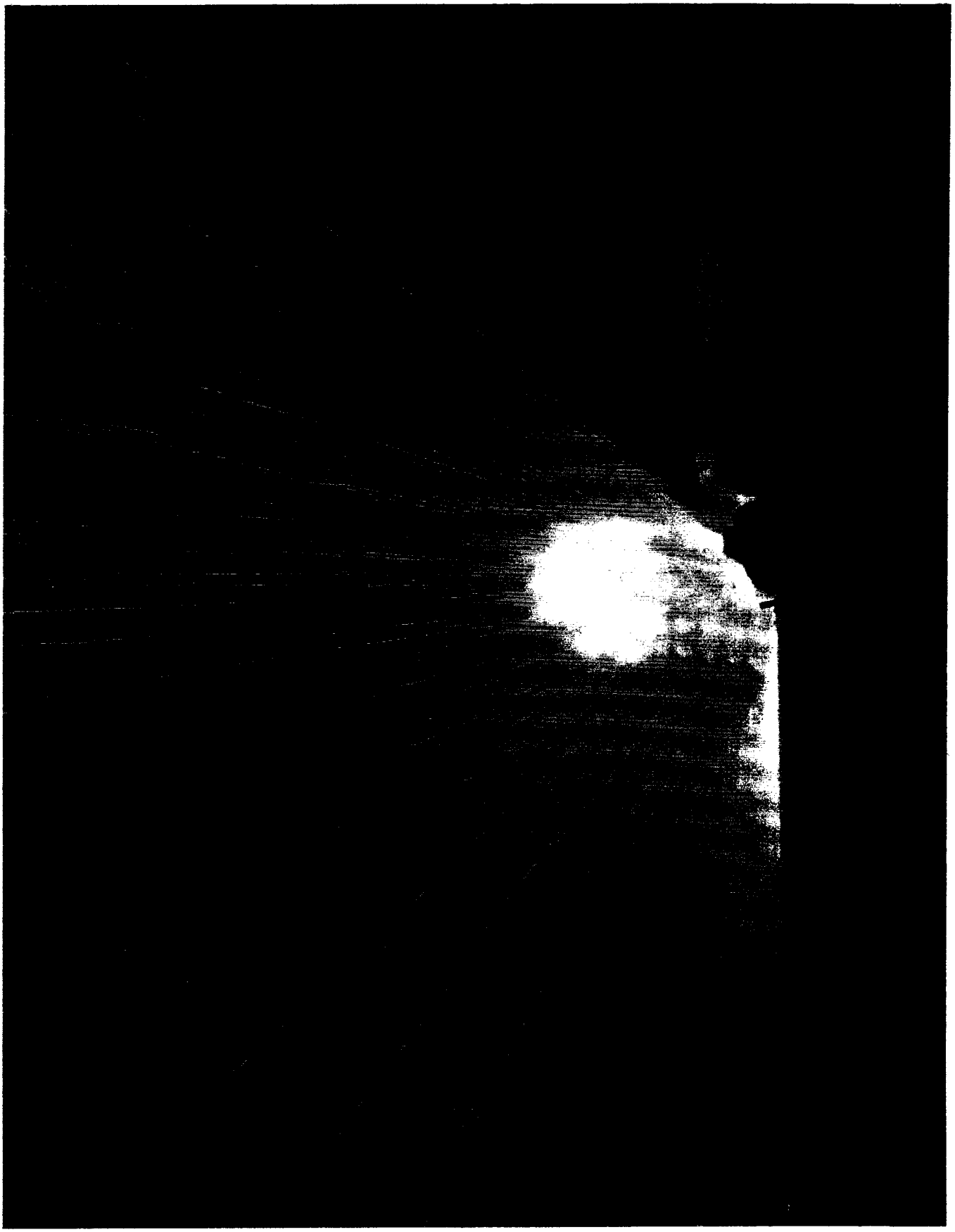


- Sample on 8 lines radiating from site
- Length of lines estimated based on:
  - Historic shot sizes
  - Field investigation data
  - Configuration of site (open or contained)
- Sampling point spacing increases away from site center as follows:
  - 50-ft spacing from site center to 700 ft
  - 100-ft spacing from 700 ft to end of line
- 2 Sample depths: surface and 1 ft
- 1 Sampling point in center of site

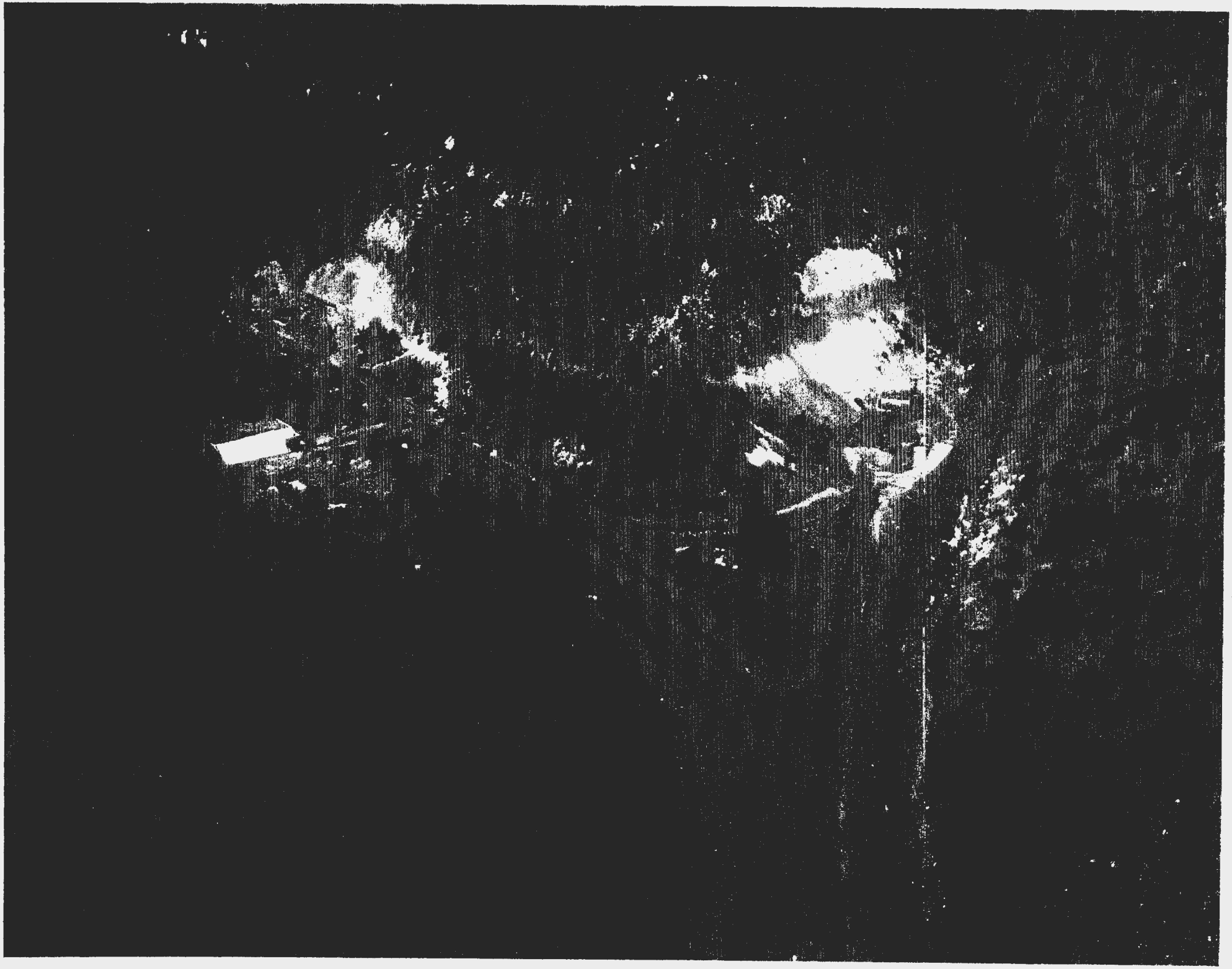


Activity Data Sheet Number		Number of Samples
1086	15-006(a) PHERMEX Firing Site	
	• Planned remedial action - clean to acceptable risk-based criteria	
	• Sample analyses: organics, inorganics, metals, radionuclides, explosives	434
	• Sample along 8 radial lines extending 2,000 ft from site	
	• Sample point spacing: 50 ft from 0-700 ft; 100 ft from 700-2,000 ft	
	• Sample at center of site	
	• 2 Sample depths: surface and 1 ft	
	• Investigation-derived waste characterization samples - 5% of total	22
	• QA Samples - 10% of total	44
	TOTAL	500





Activity Data Sheet Number		Samples
1132	39-004 (d) TA-39-57 Firing Site	
	• Planned remedial action - clean to acceptable risk-based criteria	
	• Sample analyses: organics, metals, radionuclides, explosives, inorganics	274
	• Sample at center of site	
	• Sample along 8 radial lines extending 1,000 ft from site	
	• Sampling point spacing: 50 ft from 0-700 ft; 100 ft from 700-1,000 ft	
	• 2 Sample depths: surface and 1 ft	
	• Investigation-derived waste characterization samples - 5% of total	14
	• QA Samples - 10% of total	28
	TOTAL	316



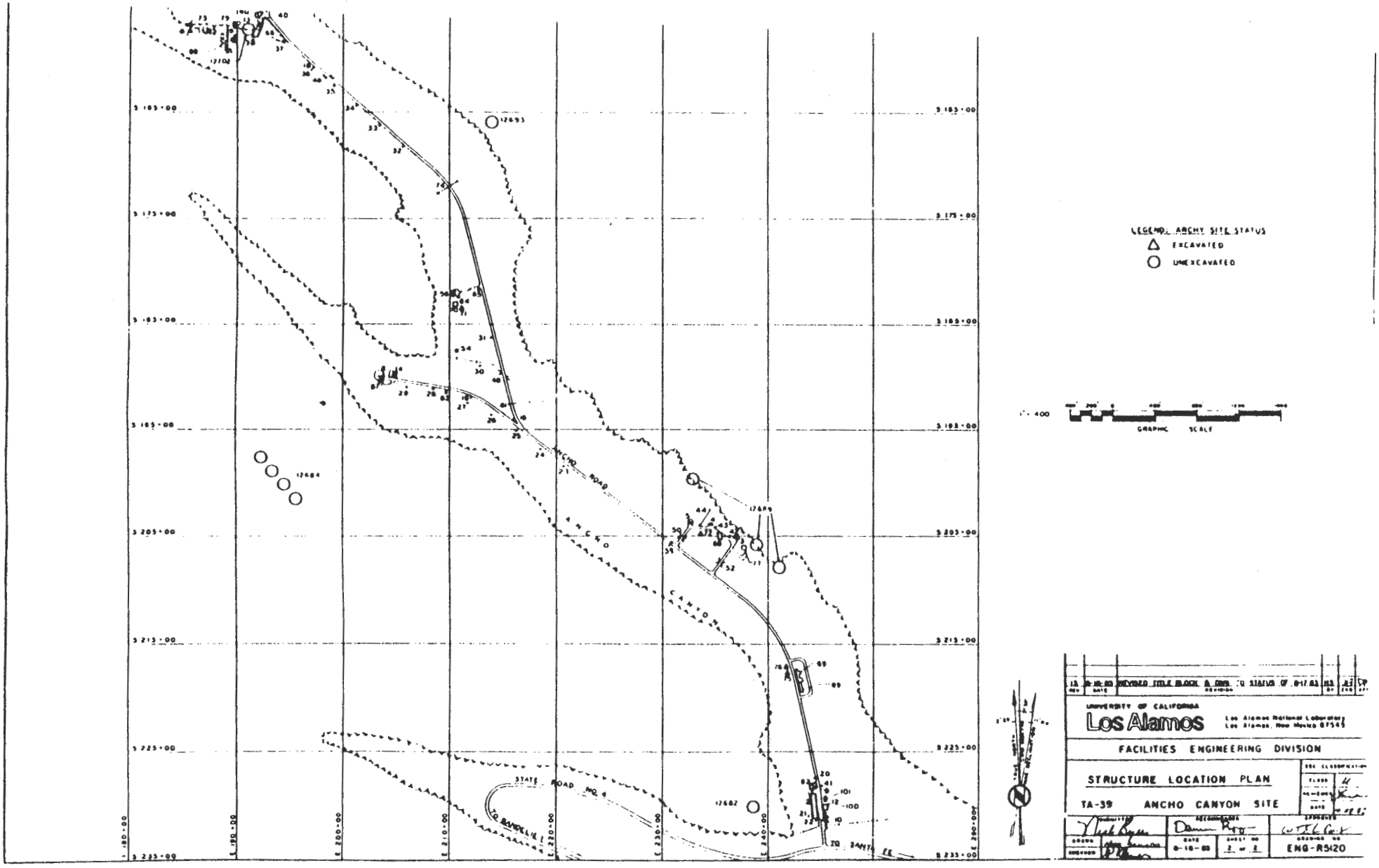
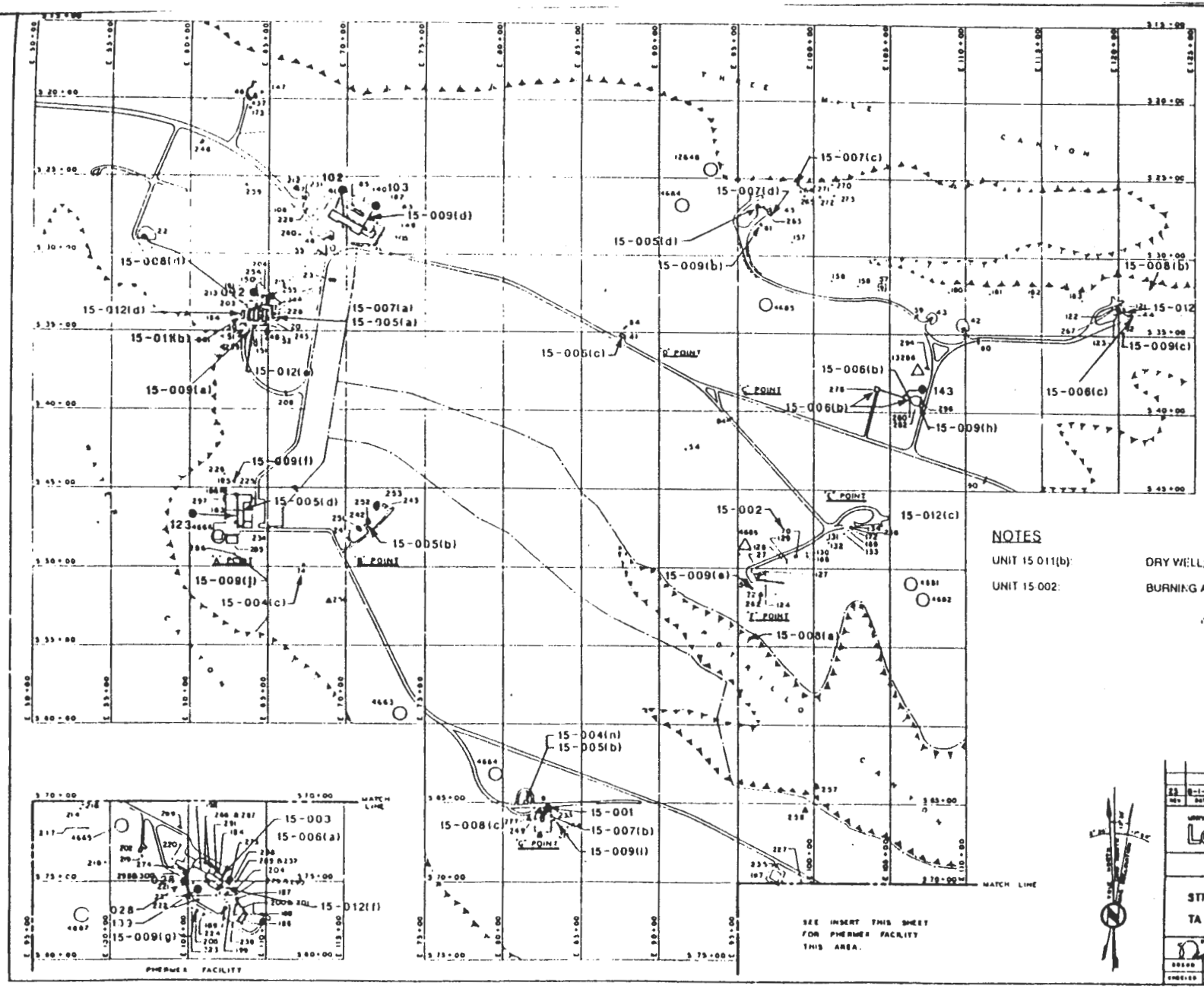


Figure TA-39-1: Structure Location Plan for TA-39 - Ancho Canyon Site
(1983 Drawing from the LANL Technical Area Structure Location Plans)

Activity Data Sheet Number		Number of Samples
1086	15-004 (h) Firing Point E	
	• Planned remedial action - clean to acceptable risk-based criteria	
	• Decommissioned open detonation site	
	• Sample analyses: organics, metals, radionuclides, explosives, inorganics	274
	• Verification sampling	
	• Sample at center of site	
	• Sample along 8 radial lines extending 1,000 ft from site	
	• Sample point spacing: 50 ft from 0-700 ft; 100 ft from 700-1,000 ft	
	• 2 Sample depths: surface and 1 ft	
	• Investigation-derived waste characterization samples - 5% of total	14
	• QA Samples - 10% of total	28
	TOTAL	316



UNCLASSIFIED

EXPLANATION

15-001 SWMU LOCATION

010 LOCATION OF OUTFALL INDICATING ASSOCIATED PIPING AND NPDES SERIAL NUMBERS (SEE APPENDIX A)

NOTES

UNIT 15-011(b): DRY WELL; EXACT LOCATION UNAVAILABLE.

UNIT 15-002: BURNING AREA; EXACT LOCATION UNAVAILABLE

GRAPHIC SCALE

FIGURE 15-1

SOLID WASTE MANAGEMENT UNITS (SWMUs) IN TA-15

REVISED TITLE BLOCK & DWG TO STATUS OF 7-26-88

UNIVERSITY OF CALIFORNIA
Los Alamos
Los Alamos National Laboratory
Los Alamos, New Mexico 87544

FACILITIES ENGINEERING DIVISION

STRUCTURE LOCATION PLAN
TA-15 R-SITE

ENG-R 51

SAMPLING STRATEGY
CANYONS

- Sample on "Major" and "Minor" transects across the canyon

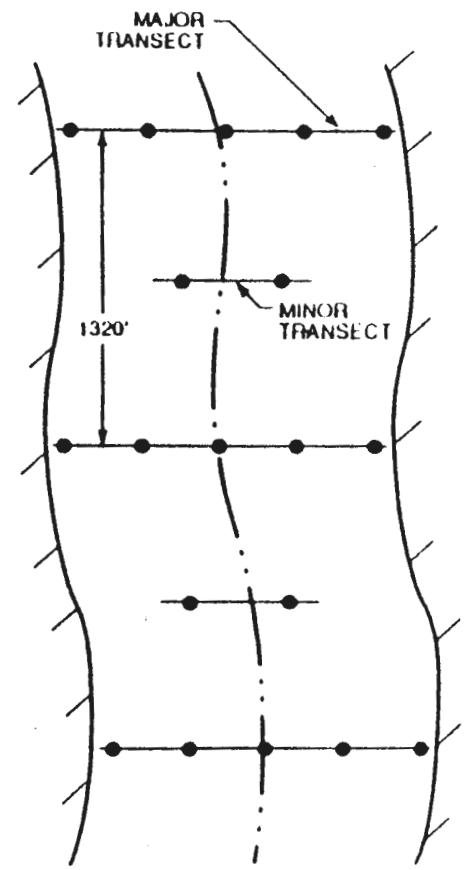
  "Major" transects located every 1,320 ft along the length of the canyon

  - Average 5 samples per transect
  - Minimum of 2 samples on any transect
  - 5-ft intervals from surface to 30 ft
  - 10-ft intervals from 30 ft to total depth

  "Minor" transects located midway between "Major" transects

  - 2 Samples per transect
  - 5-ft intervals from surface to 30 ft
  - 10-ft intervals from 30 ft to total depth

- Total depth of sampling points based on average depth of alluvium in the canyon



Bayo Canyon
Los Alamos Canyon
Sandia
Mortandad Canyon
Pajarito Canyon
Water Canyon
Ancho Canyon

Activity Data Sheet Number		Number of Samples
1049	0-035 (g) Sandia Canyon	
	• Planned remedial action - clean to acceptable risk-based criteria, if appropriate	
	• Sample analyses: inorganics, organics, metals, radionuclides, explosives	2,268
	• 48,000 ft from headwaters to the Rio Grande	
	• Sample on major and minor canyon transects	
	• Major canyon transects are spaced 1,320 ft apart; 5 sampling points per transect	
	• Minor canyon transects are midway between major transects; 2 sampling points per transect	
	• Sample from surface to 50 ft total depth; collect samples every 5 ft from 0-30 ft; every 10 ft from 30-50 ft	
	• Investigation-derived waste characterization samples - 5% of total	114
	• QA Samples - 10% of total	227
	TOTAL	2,609

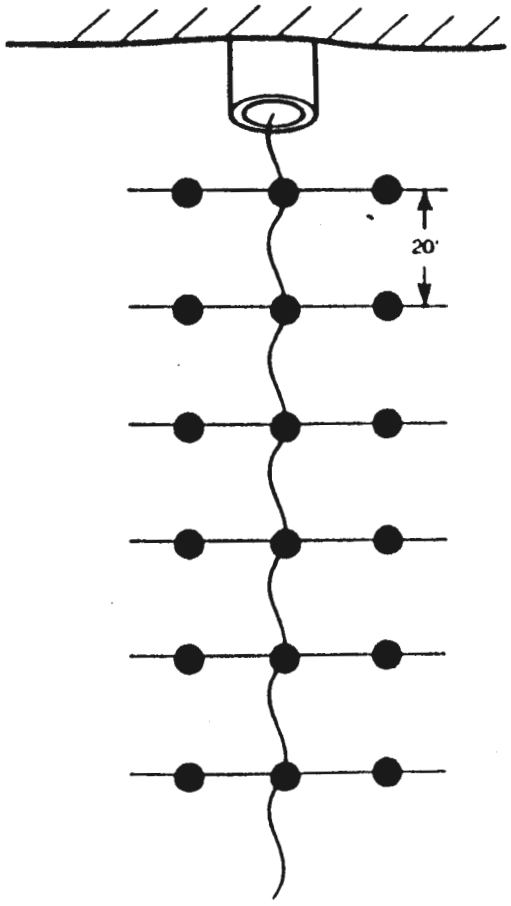
Activity Data Sheet Number		Number of Samples
1049	0-035 (p) Water Canyon	
	• Planned remedial action - clean to acceptable risk-based criteria, if appropriate	
	• Sample analyses: organics, metals, radionuclides, explosives	2,016
	• 64,000 ft from Highway 4 to the Rio Grande	
	• Sample on major and minor canyon transects	
	• Major canyon transects are spaced 1,320 ft apart; 5 sampling points per transect	
	• Minor canyon transects are midway between major transects; 2 sampling points per transect	
	• 6 Sample depths: surface, 5 ft, 10 ft, 15 ft 20 ft, and 25 ft	
	• Investigation-derived waste characterization samples - 5% of total	101
	• QA Samples - 10% of total	202
	TOTAL	2,319

Activity Data Sheet Number		Number of Samples
1049	0-035 (h) Mortandad Canyon	
	• Planned remedial action - clean to acceptable risk-based criteria, if appropriate	
	• Sample analyses: inorganics, organics, metals, radionuclides, explosives	2,205
	• 47,000 ft from headwaters to the Rio Grande	
	• Sample on major and minor canyon transects	
	• Major canyon transects are spaced 1,320 ft apart; 5 sampling points per transect	
	• Minor canyon transects are midway between major transects; 2 sampling points per transect	
	• Sample from surface to 50 ft total depth; collect samples every 5 ft from 0-30 ft; every 10 ft from 30-50 ft	
	• Investigation-derived waste characterization samples - 5% of total	111
	• QA Samples - 10% of total	221
	TOTAL	2,537

Activity Data Sheet Number		Number of Samples
1049	0-035 (f) DP/Los Alamos Canyon	
	• Planned remedial action - clean to acceptable risk-based criteria, if appropriate	
	• Sample analyses: inorganics, organics, metals, radionuclides, explosives	1,932
	• 62,000 ft upstream of the Rio Grande	
	• Sample on major and minor canyon transects	
	• Major canyon transects are spaced 1,320 ft apart; 5 sampling points per transect	
	• Minor canyon transects are midway between major transects; 2 sampling points per transect	
	• Sample from surface to 25-ft depth at 5 ft intervals	
	• Investigation-derived waste characterization samples - 5% of total	97
	• QA Samples - 10% of total	194
	TOTAL	2,223

SAMPLING STRATEGY
OUTFALL AREAS

- Sample on transects across outfall area
- Transects spaced 20 ft apart along length of outfall to canyon bottom
- 3 Sampling points per transect
- 3 Depths per sampling point: surface, 12 inches, 36 inches



Activity Data Sheet Number		Number of Samples
1141	**46-002 Sanitary Lagoon, Filter, and Outfall**	
	• Planned remedial action - clean to acceptable risk-based criteria	
	• Lagoon and filters cover an area of 60,000 ft^2	
	• Sample analyses: organics, metals, inorganics, radionuclides	1,026
	• Stratified random sampling of lagoon and filter: 1% of 5 x 5 ft grid	
	• Stratified random samples from surface to 50 ft total depth; collect samples every 5 ft from 0-30 ft and every 10 ft from 30-50 ft (216 samples)	
	• Outfall length is 1,800 ft	
	• Sample outfall on transects spaced 20 ft apart (810 samples)	
	• 3 Sampling points per transect	
	• 3 Sample depths: surface, 12 inches, 36 inches	

Activity Data Sheet Number		Number of Samples
1141	46-002 Sanitary Lagoon, Filter, and Outfall (continued)	
	• Investigation-derived waste characterization samples - 5% of total	52
	• QA Samples - 10% of total	103
	TOTAL	1,181

Activity Data Sheet Number		Number of Samples
1156	**22-008 Building 52 Discharge Region**	
	• Planned remedial action - clean to acceptable risk-based criteria	
	• Outfall for etching and plating operations	
	• Sample analyses: organics, inorganics, metals, explosives	450
	• Outfall length estimated to be 1000 ft	
	• Sample transects spaced 20 ft apart	
	• 3 Sample points per transect	
	• 3 Sample depths: surface, 12 inches, 36 inches	
	• Investigation-derived waste characterization samples - 5% of total	23
	• QA Samples - 10% of total	45
	TOTAL	518

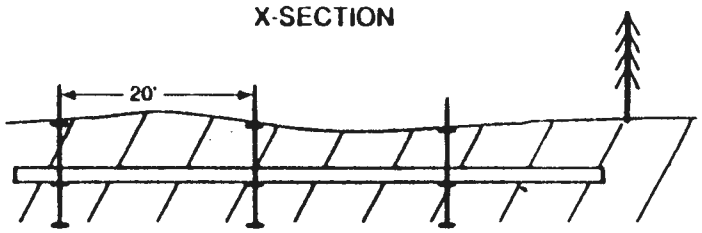
Activity Data Sheet Number		Number of Samples
1129	**48-010 Surface Impoundment**	
	• Planned remedial action - clean to acceptable risk-based criteria	
	• Surface impoundment and outfall total length of 3000 ft	
	• Sample analyses: inorganics, organics, metals, radionuclides	1,350
	• Sample along transects spaced 20 ft apart	
	• 3 Sample points per transect	
	• 3 Sample depths: surface, 12 inches, 36 inches	
	• Investigation-derived waste characterization samples - 5% of total	68
	• QA Samples - 10% of total	135
	TOTAL	1,553

SAMPLING STRATEGY
DRAINLINES

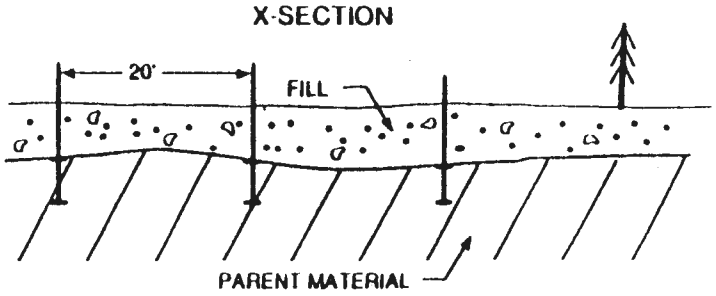
- Sampling points located 20 ft apart along the drainlines

- In-place drainlines
  - 3 Sample depths based on depth of drainline

- Decommissioned drainlines
  - 1 Sample depth at interface of fill and parent material



IN-PLACE DRAINLINES



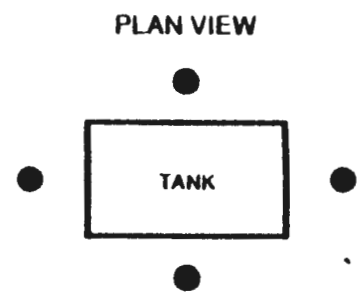
DECOMMISSIONED DRAINLINES

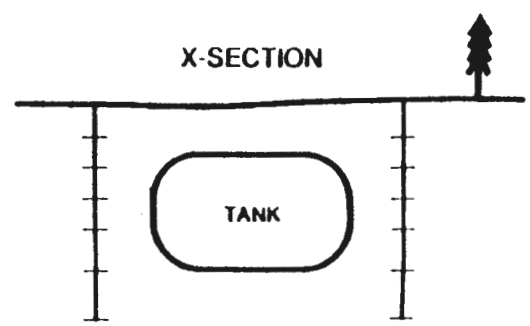
Activity Data Sheet Number		Number of Samples
1072	0-017 Acid Waste Lines	
	• Planned remedial action - no action/institutional controls	
	• 39,000 ft of underground line	
	• Sample analyses: inorganics, organics, metals, radionuclides	1,950
	• Sample points at 20-ft intervals	
	• 1 Sample from each point at interface of clean fill and parent material	
	• Investigation-derived waste characterization samples - 5% of total	98
	• QA Samples - 10% of total	195
	TOTAL	2,243

Activity Data Sheet Number		Number of Samples
1115	**3-038 Decommissioned Industrial Waste Lines**	
	• Planned remedial action - no action/institutional control	
	• 13,000 ft of waste lines	
	• Sample analyses: organics, inorganics, metals, radionuclides	650
	• Sample at 20-ft intervals	
	• 1 Sample depth at fill and parent material interface	
	• Investigation-derived waste characterization samples - 5% of total	33
	• QA Samples - 10% of total	65
	TOTAL	748

SAMPLING STRATEGY
DISCRETE UNITS

- Assumed for discrete underground structures such as tanks, sumps, and pits
- Sampling points placed adjacent to all sides of the structure
- Sample from surface to total depth as follows:
  - 5-ft intervals from surface to 30 ft
  - 10-ft intervals from 30 ft to total depth
- Total depth of sampling points based on waste form, geology, hydrology, and period of use





Activity Data Sheet Number		Number of Samples
1134	35-015 (a) Waste Oil Tank Farm	
	• Planned remedial action - clean to acceptable risk-based criteria	
	• 6 Tanks, a trap and a treatment unit	
	• Sample analyses: organics, metals, inorganics, radionuclides	264
	• 4 Sampling points around each tank	
	• Sample from surface to 50 ft total depth around each tank; collect samples every 5 ft from 0-30 ft; every 10 ft from 30-50 ft (216 samples)	
	• Sample at surface, 5 ft, and 10 ft around trap and treatment unit (24 samples)	
	• Stratified random sampling of 1% of a 5 x 5 ft grid in the 20,000 ft^2 area	

Activity Data Sheet Number		Number of Samples
1134	35-015 (a) Waste Oil Tank Farm (continued)	
	• Random samples collected at 3 depths: surface, 5 ft and 10 ft (24 samples)	
	• Investigation-derived waste characterization samples - 5% of total	14
	• QA Samples - 10% of total	27
	TOTAL	305

Activity Data Sheet Number		Number of Samples
1156	22-006 Building 91 Dry Wells	
	• Planned remedial action - clean to acceptable risk-based criteria	
	• Two 25-ft deep dry wells and outfall	
	• Sample analyses: organics, inorganics, metals, explosives	269
	• 4 Sampling points around the wells	
	• Sample from surface to 50 ft total depth at 5 ft intervals	
	• Outfall length estimated to be 500 ft	
	• Sample outfall on transects spaced 20 ft apart	
	• 3 Sample points per transect	
	• 3 Sample depths: surface, 12 inches, 36 inches	
	• Investigation-derived waste characterization samples - 5% of total	14
	• QA Samples - 10% of total	27
	TOTAL	310

DANIEL B. STEPHENS & ASSOCIATES, INC.
CONSULTANTS IN GROUND-WATER HYDROLOGY

• GROUND-WATER CONTAMINATION • UNSATURATED ZONE INVESTIGATIONS • WATER SUPPLY DEVELOPMENT •

January 5, 1988

Mr. Fred Brown
Hydrogeologist
Los Alamos National Laboratory
Group HSE-8
Los Alamos, NM 87545

Subject: Results of Testing for Hydraulic Properties of Welded Tuff

Dear Mr. Brown:

Please find enclosed the final data report on laboratory analyses for hydraulic properties of 10 cores of welded tuff. This report constitutes completion of the analyses requested.

We are continuing our own in-house research on unsaturated hydraulic conductivity using the additional cores that you provided us. I will report to you the results of the investigation when they have been completed.

We would like to point out that the porosity values we have reported are those computed from degree of saturation to water, and therefore represent the effective porosity to that fluid.

Daniel B. Stephens & Associates, Inc. cannot verify that samples are representative of the formation from which they were collected, and we do not assume any responsibility for interpretations or analyses based on this data.

We are very grateful to provide this service to Los Alamos National Laboratory. Please do not hesitate to call us if you have any questions.

Sincerely yours,

Daniel B. Stephens & Associates, Inc.

Warren B. Cox
Laboratory Manager

WBC:bdf
Enclosure

P.O. BOX 740 SOCORRO, NEW MEXICO 87801 (505) 835-3162