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

11-27

CERTIFIED MAIL - RETURN RECEIPT REQUESTED

NOV 25 1985

Ms. Denise Fort, Director
N.M. Environmental Improvement Division
P.O. Box 968
Santa Fe, NM 87504-0968

Dear Ms. Fort:

The enclosed information is the Department of Energy's official amendment to the Los Alamos National Laboratory's amended Part B hazardous waste permit application submitted to your Division on October 16, 1985. Specifically, the revised Waste Analysis Plan will replace Section 3.0 of the Laboratory's Part B permit application.

The enclosed Waste Analysis Plan will be implemented immediately at appropriate interim authorized hazardous waste facilities or immediately after a final Part B Permit has been issued.

Sincerely,

Harold E. Valencia
Area Manager

Enclosures:
As Stated

cc:
A. Davis, USEPA, Region VI, Dallas, TX
Carlos E. Garcia, ESHD, AL

RECEIVED
DEC 02 1985
HAZARDOUS WASTE SECTION

R-00077A

14866

Project No. 651013
October, 1985

LIBRARY COPY

IT CORPORATION

Volume I - Text, Tables & Figures Rev. 1.0

RCRA PART B PERMIT APPLICATION

Los Alamos National Laboratory
Los Alamos, New Mexico

Prepared for:
Los Alamos National Laboratory
Waste Management Group HSE-8
Los Alamos, New Mexico 87545

Volume I - Text, Tables & Figures

RCRA PART B PERMIT APPLICATION

NOTICE:

Access to the information contained in this Part B Hazardous Waste Application is restricted to those EPA and NMEID personnel requiring access thereto in the performance of their official duties. Any other dissemination of this Part B Hazardous Waste Permit Application or any portion thereof without the express written approval of DOE is prohibited by Section 148 of the Atomic Energy Act, as amended (42 U.S.C. 2168). When not in use, Part B should be filed in a locked repository.

Any use of product trade names in this permit application is not to be construed as an endorsement of the product, either by the IT Corporation or Los Alamos National Laboratory.

TABLE OF CONTENTS

	PAGE
LIST OF TABLES	vii
LIST OF FIGURES	ix
LIST OF APPENDICES	xiii
1.0 INTRODUCTION AND PART A APPLICATION	1-1
1.1 INTRODUCTION	1-1
1.2 REVISED PART A APPLICATION	1-2
2.0 FACILITY DESCRIPTION	2-1
2.1 GENERAL DESCRIPTION	2-1
2.1.1 Thermal Treatment Facilities	2-2
2.1.2 Technical Area 50 (TA-50) Facilities	2-3
2.1.3 Technical Area 54 (TA-54), Area L Facilities	2-4
2.1.4 Topographic Maps	2-6
2.1.5 Wells	2-6
2.1.6 Wind Rose	2-7
2.1.7 Land Use	2-7
2.2 LOCATION INFORMATION	2-8
2.2.1 Seismic Standard	2-8
2.2.2 Floodplain Standard	2-8
2.2.3 Soils	2-8
2.2.4 Geology	2-10
2.2.5 Groundwater	2-14
2.3 TRAFFIC PATTERNS	2-15
2.3.1 General	2-15
2.3.2 Waste Collection Areas	2-16
2.3.3 Routes of Travel	2-17
2.3.4 Traffic Volumes	2-17
2.3.5 Traffic Control Signals	2-17
2.3.6 Road Load-Bearing Capacity	2-18
2.3.7 Road Surfacing from Technical Areas to Transfer, Storage and Disposal Facilities	2-18
3.0 WASTE CHARACTERISTICS AND ANALYSIS PLAN	3-1
3.1 CHEMICAL AND PHYSICAL ANALYSES	3-1
3.1.1 Wastes From Basic and Applied Chemistry R&D Programs	3-2

TABLE OF CONTENTS
(Continued)

	PAGE
3.1.2 Electrochemistry Processing Wastes	3-2
3.1.3 Isotope Separation Wastes	3-2
3.1.4 Shops Department Wastes	3-2
3.1.5 Explosives Wastes	3-3
3.1.6 Chemically Contaminated Equipment	3-3
3.2 WASTE ANALYSIS PLAN	3-4
3.2.1 Identification of Processes Generating Hazardous Wastes and Chemical and Physical Characteristics of the Waste Streams	3-5
3.2.2 Parameters for Analysis and Rationale for Selection	3-6
3.2.3 Test Methods Used to Perform Each Analysis	3-6
3.2.4 Representative Sampling Methods	3-6
3.2.5 Frequency of Analysis	3-6
3.2.6 Quality Control/Quality Assurance	3-7
3.2.7 Disposition of Each Waste Stream	3-7
3.2.8 Waste Analysis Plan Procedures	3-7
3.2.9 Waste Analysis Procedures for Chemicals of an "Unknown" Nature	3-8
3.3 WASTE SEGREGATION	3-9
4.0 WASTE MANAGEMENT PRACTICES AND FACILITIES	4-1
4.1 TA-50 BATCH TREATMENT SYSTEM AND CONTAINER STORAGE AREA	4-1
4.1.1 Current Management Practices	4-2
4.1.2 Secondary Containment Areas	4-4
4.1.3 Batch Treatment System Description and Processes	4-4
4.2 TA-50 CHEMICAL WASTE INCINERATOR	4-6
4.2.1 Secondary Containment Areas	4-7
4.2.2 Current Management Practices	4-8
4.2.3 Waste Incinerator Trial Burn Plan	4-9
4.3 TA-54, AREA L WASTE TRANSFER, PACKAGING, AND STORAGE FACILITIES	4-11
4.3.1 Lab Packs	4-13
4.3.2 Secondary Containment Areas	4-14
4.3.3 Current Container Management Practices	4-15

TABLE OF CONTENTS
(Continued)

	PAGE
4.4 TA-54, AREA L TREATMENT TANKS	4-18
4.4.1 Secondary Containment Areas	4-18
4.4.2 Current Management Practices	4-18
4.5 TA-54, AREA L LAND DISPOSAL SHAFTS	4-20
4.5.1 Current Management Practices	4-20
5.0 GROUNDWATER MONITORING	5-1
6.0 PROCEDURES TO PREVENT HAZARDS	6-1
6.1 SECURITY	6-1
6.2 WARNING SIGNS	6-2
6.3 INSPECTION SCHEDULES AND REQUIREMENTS	6-2
6.3.1 TA-50 Batch Treatment System and Container Storage Area	6-3
6.3.2 TA-50 Waste Incinerator	6-6
6.3.3 TA-54, Area L Waste Transfer, Packaging, and Storage Facilities, Treatment Tanks, and Land Disposal Facilities	6-7
6.4 PREPAREDNESS AND PREVENTION REQUIREMENTS	6-9
6.4.1 Equipment Requirements	6-9
6.4.2 Aisle Space Requirements	6-12
6.5 PREVENTATIVE PROCEDURES, STRUCTURES, AND EQUIPMENT	6-13
6.5.1 TA-50 Batch Treatment System and Container Storage Area	6-13
6.5.2 TA-50 Waste Incinerator	6-14
6.5.3 TA-54, Area L Waste Transfer, Packaging and Storage Facilities, Treatment Tanks, and Land Disposal Facilities	6-16
6.6 PREVENTION OF ACCIDENTIAL IGNITION OR REACTION OF IGNITABLE REACTIVE OR INCOMPATIBLE WASTE	6-18
6.6.1 TA-50 Batch Treatment System and Container Storage Area	6-18
6.6.2 TA-50 Waste Incinerator	6-18
6.6.3 TA-54, Area L Waste Transfer, Packaging and Storage Facilities, Treatment Tanks, and Land Disposal Facilities	6-18
7.0 HAZARDOUS WASTE FACILITIES CONTINGENCY PLAN	7-1
7.1 INTRODUCTION	7-1

TABLE OF CONTENTS

(Continued)

	PAGE
7.1.1 Hazardous Wastes	7-2
7.1.2 Hazardous Waste Facilities	7-4
7.2 HAZARDOUS WASTE EMERGENCY RESPONSE RESOURCES	7-8
7.2.1 Response Groups	7-8
7.2.2 Emergency Equipment	7-10
7.2.3 Communications	7-11
7.3 NONSUDDEN RELEASES	7-12
7.3.1 Responsibility	7-12
7.3.2 Credible Nonsudden Releases	7-13
7.3.3 Nonsudden Release Surveillance	7-13
7.4 SUDDEN RELEASES	7-14
7.4.1 Hazardous Waste Emergency Coordinator (HWEC)	7-14
7.4.2 HWF Emergency Contingency Plan	7-14
7.5 SPECIFIC EMERGENCY RESPONSE PROCEDURES FOR HAZARDOUS WASTE FACILITIES	7-18
7.5.1 Chemical Spills	7-18
7.5.2 Fire	7-20
7.5.3 Explosion	7-21
7.5.4 Exposure	7-21
7.5.5 Flood	7-22
7.6 EVACUATION	7-22
7.6.1 Evacuation Plan	7-22
7.6.2 Process Shutdown	7-24
7.7 SALVAGE AND CLEANUP	7-26
7.8 POST-EMERGENCY ASSESSMENT	7-27
7.9 EMERGENCY RECORDS	7-27
7.10 EMERGENCY REPORTS	7-27
7.11 CONTINGENCY PLAN AMENDMENT	7-28
8.0 PERSONNEL TRAINING	8-1
8.1 OUTLINE OF TRAINING PROGRAM	8-1
8.1.1 Responsibilities	8-1
8.2 TRAINING CONTENT, FREQUENCY, AND TECHNIQUES	8-1

TABLE OF CONTENTS
(Continued)

	PAGE
8.2.1 Internal Training	8-2
8.2.2 On-the-Job Training	8-2
8.2.3 External Training	8-3
8.2.4 Training Coordinator	8-3
8.2.5 Relevance of Training to Job Position	8-3
8.3 EMERGENCY RESPONSE TRAINING	8-3
8.4 IMPLEMENTATION OF TRAINING PROGRAM	8-5
9.0 CLOSURE AND POST-CLOSURE PLAN	9-1
9.1 GENERAL CLOSURE/POST-CLOSURE INFORMATION	9-1
9.1.1 Closure Performance Standard	9-1
9.1.2 Partial and Final Closure	9-1
9.1.3 Closure and Post-Closure Cost Estimates	9-2
9.1.4 Groundwater Monitoring	9-2
9.1.5 Personal Protection	9-2
9.1.6 Certification of Closure	9-2
9.1.7 Post-Closure Care Office	9-3
9.1.8 Security	9-3
9.1.9 Notation of Deed	9-3
9.1.10 Individual Closure and Post-Closure Plans	9-4
9.2 CLOSURE PLAN FOR THERMAL TREATMENT FACILITIES	9-4
9.2.1 Technical Areas 14, 15, 36, and 39 Thermal Treatment Facilities	9-4
9.2.2 Technical Area 16 (TA-16) Thermal Treatment Facilities	9-14
9.3 CLOSURE PLAN FOR TA-50 STORAGE, BATCH TREATMENT, AND INCINERATION FACILITIES	9-22
9.3.1 Batch Treatment System and Container Storage Area	9-22
9.3.2 Chemical Waste Incinerator	9-26
9.4 CLOSURE, PARTIAL CLOSURE AND POST-CLOSURE FOR TA-54, AREA L FACILITIES	9-28
9.4.1 TA-54, Area L Description	9-28
9.4.2 Closure Procedure	9-30
9.4.3 Deocntamination Verification	9-35
9.4.4 Closure Schedule	9-36

TABLE OF CONTENTS

	PAGE
9.4.5 Closure Certification	9-36
9.4.6 Post-Closure	9-37
9.5 SAMPLING AND ANALYTICAL PROCEDURES	9-38
9.5.1 Soil Sampling	9-38
9.5.2 Liquid Sampling	9-40
9.5.3 Sample Handling and Documentation	9-42
10.0 OTHER FEDERAL LAWS	10-1
11.0 CERTIFICATION	11-1
LIST OF REFERENCES	
APPENDICES	

LIST OF TABLES

TABLE NO.	TITLE
1-1	Format Outline and Regulation References
3-1	Los Alamos Waste Inventory Identified by Generation Process and Waste Characterization
3-2	Waste Analysis Parameters and Rationale for their Selection
3-3	Waste Analysis Parameters and Test Methods
3-4	Sampling Methods for Hazardous Wastes to be Analyzed
3-5	Frequency of Analyses and Rationale
4-1	Absorption Capabilities of Vermiculite
6-1	Inspection Schedule for TA-50 Batch Treatment Plant
6-2	Inspection Schedule for TA-50 Waste Incinerator
6-3	Inspection Schedule for TA-54, Area L
6-4	Quarterly Vehicle Inspection Form
6-5	Zia Company Inspection Schedule for Heavy Equipment
6-6	Fire Protection Equipment at Los Alamos Hazardous Waste Facilities
7-1	Summary of Hazardous Waste Facilities
7-2	Hazardous Waste Emergency Response Groups
7-3	Emergency Equipment
7-4	Credible Nonsudden Releases
7-5	Hazardous Waste Emergency Coordinators
7-6	Items Monitored at the Batch Treatment Plant During Emergency Shutdown
7-7	Items Monitored at the Waste Incinerator During Emergency Shutdown
7-8	Evacuation Determination and Reentry
8-1	Los Alamos National Laboratory Training
9-1	Functions of Los Alamos Hazardous Waste Facilities
9-2	Regulated Wastes Detonated at TA-36 Meenie
9-3	Analytical Parameters and Methods for TA-14, TA-15, TA-16, and TA-39
9-4	Ambient Total Metals in Soil
9-5	Analytical Parameters and Methods for TA-36
9-6	Closure Schedule for TA-14, TA-15, TA-36, and TA-39 Thermal Treatment Facilities
9-7	Closure Schedule for TA-16

LIST OF TABLES

(Continued)

TABLE NO.	TITLE
9-8	Analytical Parameters and Methods for 50-1
9-9	Closure Schedule for TA-50 Batch Treatment System
9-10	Analytical Parameters and Methods for TA-54, Area L
9-11	Schedule for Closure of TA-54, Area L Facilities
9-12	Groundwater Sampling Methodology and Monitoring from SW-846
9-13	Checklist of Suggested Items for Field Sampling

LIST OF FIGURES

FIGURE NO.	TITLE
2-1	Location Map
2-2	Los Alamos Technical Areas
2-3	Contour Map Showing the Locations of the TA-50 Batch Treatment System and Container Storage Area and the Waste Incinerator
2-4	Contour Map Showing the Locations of Area L Waste Management Facilities
2-5	TA-54, Area L Waste Management Facilities
2-6	TA-54, Area L Waste Transfer, Packaging, and Storage Building
2-7	TA-54, Area L Waste Storage Pad
2-8	"Lab Pack" Drum - Typical D.O.T. 17H Steel With Removable Head (Lid)
2-9	TA-54, Area L Treatment Tanks Plan
2-10	Two-foot Contour Interval Map of Area L
2-11	Sanitary Sewer Lines at TA-50
2-12	Locations of Test Wells, Springs, Observation Holes, and Surface Water Sampling Stations
2-13	Annual Surface Wind Speed and Direction, 1983, Technical Area 59
2-14	Location of Los Alamos Facilities Relative to the Nearby Fault Traces
2-15	Relationship of Slope, Vegetation and Parent Material to Hackroy, Totavi and Potrillo Soils
2-16	Index Map Showing Major Tectonic Elements of Central-Northern New Mexico
2-17	Physiographic Features of the Jemez Mountains
2-18	East-West Geologic Section Through the Pajarito Plateau
2-19	Generalized Contours on Top of Main Aquifer

LIST OF FIGURES

(Continued)

FIGURE NO.	TITLE
2-20	Schematic Diagram of Los Alamos Hazardous Waste Management Activities
2-21	Los Alamos National Laboratory Boundary and Vicinity
4-1	Location of Batch Treatment Facilities in Building 1 in TA-50
4-2	Flow Diagram of Batch Treatment Systems
4-3	Treatment Development Facility Showing Locations of Chemical Waste Incinerator and Support Facilities
4-4	Incinerator Process Diagram
4-5	Typical Drum Label
5-1	Location of Vadose Zone Monitoring and Core Holes at Area L
6-1	Los Alamos Water Supply System
7-1	Health, Safety, and Environment Division Organization Chart
7-2	Emergency Facilities
7-3	Hazardous Waste Emergency Notification Structure
7-4	Batch Treatment Plant Evacuation Route
7-5	Waste Incinerator Building Evacuation Route
9-1	TA-14 Waste Firing Site
9-2	TA-15 Firing Site
9-3	TA-36 Meenie Firing Site
9-4	TA-39-6 Firing Site
9-5	TA-39-57 Firing Site
9-6	TA-16 Burn Pad Sample Locations
9-7	TA-16 Liquid Burn Pad Sample Locations
9-8	TA-16 Filter Vessel Sample Locations

LIST OF FIGURES

(Continued)

FIGURE NO.	TITLE
9-9	Batch Treatment Facilities Building, TA-50-1
9-10	TA-54, Area L
9-11	Typical Shaft Section, Area L
9-12	TA-54, Area L Covered Concrete Pad Sample Locations
9-13	TA-54, Area L Treatment Tanks Sample Locations
9-14	Veihmeyer Soil Sampler
9-15	Composita Liquid Waste Sampler (Coliwasa)
9-16	Example of Sample Seal
9-17	Example of Sample Label
9-18	Chain of Custody Record
9-19	Hazardous Materials Sample Analysis Request

LIST OF APPENDICES

APPENDIX NO.	TITLE
A	EPA Authorization for Los Alamos to Operate Under Interim Status
B	EPA Request for Los Alamos RCRA Part B Permit Application
C	NMEID Notice of Joint EPA/EID Part B Call-In
D	EPA Request for Los Alamos Part B Addressing Radioactive/ Chemical Mixed Waste
E	Department of the Army, Corps of Engineers, Floodplain Documentation
F	Physical Characteristics of the Bandelier Tuff
F-1	Maps from "TA-3 Traffic Study" Depicting Vehicular Count Movements at Various Intersections
G	Representative Waste Inventory and Analyses
H	Sample Waste Disposal Records
I	Detailed Specifications and Plans for TA-50 Batch Treatment System
I-1	Manufacturers Information on Protective Coating, Primer and Finish
I-2	Manufacturers Information on Containers
J	Incinerator Trial Burn Plan
K	Manufacturers Information on Portable Pumps
L	Los Alamos Procedure for Identification and Segregation of Hazardous Waste
M	Los Alamos Procedure for Handling Bulging or Leaking Drums
M-1	SOP for the Treatment Tanks at Area L, TA-54
M-2	Manufacturers Information on Lorraine Crane and Training Manual
M-3	Hazardous Wastes Disposed at TA-54, Area L in Disposal Shafts
M-4	Guidelines for Construction and Use of Solid Waste Disposal Facilities at Area G, TA-54

LIST OF APPENDICES

(Continued)

APPENDIX NO.	TITLE
M-5	SOP for HSE-7 Chemical Batch Treatment System
M-6	Manufacturers Specifications on Drum Handling Equipment Used at TA-54
N	Groundwater Monitoring Waiver Request
O	Vadose Zone Monitoring Program
P	Portions of the Los Alamos Health and Safety Manual Pertaining to Waste Management Activities
Q	Manual of Fire Protection Policies and Procedures
R	Operational Safety Requirements for the Controlled-Air Incineration Process
S	Controlled-Air Incinerator Process Operating Manual
T	RCRA Contingency Plan Documentation
U	Job Descriptions
V	Personnel Training Information

1.0 INTRODUCTION AND PART A APPLICATION

1.1 INTRODUCTION

This application was prepared for submittal to the Environmental Protection Agency (EPA) and the New Mexico Environmental Improvement Division (NMEID) in order to meet the requirements of the Resource Conservation and Recovery Act (RCRA) for a Part B Permit Application. The EPA authorization for Los Alamos to operate under interim status is included as Appendix A. The EPA formally requested the Part B permit application in a February 22, 1984 letter to the Los Alamos Laboratory Director. Subsequently, the New Mexico Environmental Improvement Division transmitted a joint call-in of the permit application to the Laboratory dated April 23, 1984. These two letters are given in Appendices B and C, respectively. More recently, in a letter of August 7, 1984, the EPA requested a Part B Permit Application from Los Alamos addressing radioactive/chemical mixed waste (Appendix D). This permit application addresses chemical waste only. As necessary, a separate permit application will be submitted to address radioactive/chemical mixed waste.

The format of the Part B application follows an outline provided in "A Guide for Preparing RCRA Permit Applications for Existing Storage Facilities", U.S. EPA, 1982. An outline of the permit application with citations of the regulations covered by each section is shown in Table 1-1. A cross reference of the EPA completeness checklist to sections of the Part B permit application is included as Table 1-2.

Los Alamos National Laboratory (Los Alamos) is a multidisciplinary laboratory (RCRA No. NM0890010515). The principal mission of the Laboratory is the design and development of weapons for the nation's nuclear arsenal; however, considerable research and development (R&D) is directed toward the development of the peaceful uses of nuclear energy including research on controlled thermonuclear reactions, fission reactors, nuclear safeguards, laser fusion, and medium energy physics. Extensive basic research programs in physics, chemistry, metallurgy, mathematics and computers, earth sciences, and electronics support these efforts. Biomedical and environmental research includes programs in molecular biology, radiobiology, cancer therapy, radiology, and industrial hygiene. Expansion into nonnuclear areas is

represented by applied technology development of solar and geothermal energy and superconducting power transmission lines.

Los Alamos is managed by the University of California for the U.S. Department of Energy (DOE) with substantial work performed for the Department of Defense and the Nuclear Regulatory Commission. The University is responsible to DOE's Los Alamos Area Office (LAAO) which reports to the DOE Albuquerque Operations Office (ALO). Although not a primary function, some hazardous waste management and storage occurs at Los Alamos. Los Alamos falls under Standard Industrial Classification (SIC) Code Number 9711, national defense organizations.

Much of this application was prepared from existing documentation at the Laboratory. In addition, new information was developed for this permit application.

1.2 REVISED PART A APPLICATION

The complete RCRA Part A Application Revision is included in the following pages. The original Part A Application was submitted to the EPA in November 1980.

TABLE 1-1. FORMAT OUTLINE AND REGULATION REFERENCES

REPORT SECTION	RCRA REGULATION REFERENCE[1]	NMHWMR REFERENCE
1.0 INTRODUCTION AND REVISED PART A APPLICATION		
1.1 INTRODUCTION		
1.2 REVISED PART A APPLICATION	270.13	302.A.4.a
2.0 FACILITY DESCRIPTION		
2.1 GENERAL DESCRIPTION	270.14(b)(1)	302.A.4.b(1)
2.2 LOCATION INFORMATION	270.14(b)(11), 270.14(b)(19), 264.18(a),(b)	302.A.4.b(1), 206.B.8.a & b
2.3 TRAFFIC PATTERNS	270.14(b)(10)	302.A.4.b(1)
3.0 WASTE CHARACTERISTICS AND ANALYSIS PLAN		
3.1 CHEMICAL AND PHYSICAL ANALYSES	270.14(b)(2), 264.13, 264.73(b)(3)	302.A.4.b(1), 206.B.3, 203.C.2.c
3.2 WASTE ANALYSIS PLAN	270.14(b)(3), 264.13, 261 App. I	302.A.4.b(1), 206.B.3
3.3 WASTE SEGREGATION	264.13	206.B.3
4.0 WASTE MANAGEMENT PRACTICES AND FACILITIES		
4.1 TA-50 BATCH TREATMENT SYSTEM AND CONTAINER STORAGE AREA	270.15, 264.171-173, 264.175, 264.191-192	302.A.4.b(2)(a), 206.D.4.b-d 206.D.4.f, 206.D.5.b & c
4.2 TA-50 CHEMICAL WASTE INCINERATOR	270.19, 264.340-345	302.A.4.b(2)(e), 206.D.8.a-f
4.3 TA-54, AREA L WASTE TRANSFER, PACKAGING, AND STORAGE FACILITIES	270.15, 264.171-173, 264.175	302.A.4.b(2)(a), 206.D.4.b-d, 206.D.4.f
4.4 TA-54, AREA L TREATMENT TANKS	270.16, 264.190-192	302.A.4.b(2)(b), 206.D.5.a-c
4.5 TA-54, AREA L LAND DISPOSAL SHAFTS	270.21, 264.301, 264.309, 264.315-316	302.A.4.b(2)(g), 206.D.10.b, 206.D.10.e, 206.D.10.j & k
5.0 GROUNDWATER MONITORING	264.90(b)(4)	206.D.1.a(2)
6.0 PROCEDURES TO PREVENT HAZARDS		
6.1 SECURITY	270.14(b)(9), 264.14	302.A.4.b(1), 206.B.4
6.2 WARNING SIGNS	264.14(c)	206.B.4.b(3)
6.3 INSPECTION SCHEDULES AND REQUIREMENTS	270.14(b)(5), 264.15, 264.33, 264.174, 264.194, 264.303, 264.347	302.A.4.b(1), 206.B.5, 206.B.9.d, 206.D.4.e, 206.D.5.d, 206.D.10.d, 206.D.8.g
6.4 PREPAREDNESS AND PREVENTION REQUIREMENTS	264.34-35	206.B.9.e-g
6.5 PREVENTIVE PROCEDURES, STRUCTURES AND EQUIPMENT	270.14(b)(8)	302.A.4.b(1)
6.6 PREVENTION OF ACCIDENTAL IGNITION OR REACTION OF IGNITABLE, REACTIVE, OR INCOMPATIBLE WASTE	270.14(b)(9), 270.15(d), 264.17, 264.176, 264.198, 264.312	302.A.4.b(1), 302.A.4.b(2)(a), 206.B.7, 206.D.4.g, 206.D.5.f, 206.D.10.g
7.0 HAZARDOUS WASTE FACILITIES CONTINGENCY PLAN		
7.1 INTRODUCTION		
7.2 HAZARDOUS WASTE EMERGENCY RESPONSE RESOURCES	264.37, 264.52(c), 264.52(e)	206.B.9.h, 206.B.10.h, 206.B.10.f
7.3 NONSUDDEN RELEASES		
7.4 SUDDEN RELEASES	264.51, 264.52(a)	206.B.10.b-d
7.5 SPECIFIC EMERGENCY RESPONSE PROCEDURES FOR HAZARDOUS WASTE FACILITIES	270.14(b)(7), 264.56	302.A.4.b(1), 206.B.10.m
7.6 EVACUATION	264.52(f)	206.B.10.i
7.7 SALVAGE AND CLEANUP	270.14(b)(7), 264.56	302.A.4.b(1), 206.B.10.m
7.8 POST-EMERGENCY ASSESSMENT		
7.9 EMERGENCY RECORDS		
7.10 EMERGENCY REPORTS	270.14(b)(7), 264.56	302.A.4.b(1), 206.B.10.m
7.11 CONTINGENCY PLAN AMENDMENT	264.54	206.B.10.k
8.0 PERSONNEL TRAINING		
8.1 OUTLINE OF TRAINING PROGRAM	264.16(d)(2)	206.B.6.d
8.2 TRAINING CONTENT, FREQUENCY, AND TECHNIQUES	270.14(b)(12), 264.16	302.A.4.b(1), 206.B.6
8.3 EMERGENCY RESPONSE TRAINING	264.16(a)(3)	206.B.6.a
8.4 IMPLEMENTATION OF TRAINING PROGRAM	264.16(b), (c), & (e)	206.B.6.b, c & e
9.0 CLOSURE AND POST-CLOSURE PLAN	270.14(b)(13), 264.112	302.A.4.b(1), 206.D.2.c
9.1 GENERAL CLOSURE/POST-CLOSURE INFORMATION		
9.2 CLOSURE PLAN FOR THERMAL TREATMENT FACILITIES		
9.3 CLOSURE PLAN FOR TA-50 STORAGE, BATCH TREATMENT, AND INCINERATION FACILITIES		
9.4 CLOSURE, PARTIAL CLOSURE AND POST-CLOSURE FOR TA-54, AREA L FACILITIES	270.14(b)(13), 270.21(e), 264.112, 264.310(a) & (b), 264.197, 264.117 & 118	302.A.4.b(1), 206.D.2.c & g, 206.D.2.h, 302.A.4.b(2)(g), 206.D.10.f(1)
9.5 SAMPLING AND ANALYTICAL PROCEDURES		
10.0 OTHER FEDERAL LAWS	270.3, 270.14(b)(20)	302.A.4.b(1)
11.0 CERTIFICATION	270.11	302.B

[1] From Code of Federal Regulations 40.

Please print or type in the unshaded areas only
(fill-in areas are spaced for elite type, i.e., 12 characters/inch).

Form Approved OMB No. 158-R0175

FORM 1 GENERAL

EPA

U.S. ENVIRONMENTAL PROTECTION AGENCY

GENERAL INFORMATION

Consolidated Permits Program

(Read the "General Instructions" before starting.)

I. EPA I.D. NUMBER

F N M 0 8 9 0 0 1 0 5 1 5 D

GENERAL INSTRUCTIONS

If a preprinted label has been provided, affix it in the designated space. Review the information carefully; if any of it is incorrect, cross through it and enter the correct data in the appropriate fill-in area below. Also, if any of the preprinted data is absent *(the area to the left of the label space lists the information that should appear)*, please provide it in the proper fill-in area(s) below. If the label is complete and correct, you need not complete Items I, III, V, and VI *(except VI-B which must be completed regardless)*. Complete all items if no label has been provided. Refer to the instructions for detailed item descriptions and for the legal authorizations under which this data is collected.

LABEL ITEMS

I. EPA I.D. NUMBER

III. FACILITY NAME

V. FACILITY MAILING ADDRESS

VI. FACILITY LOCATION

Department of Energy
Attn: Mr. Harold Valencia
Los Alamos Area Office
Los Alamos, N.M. 87544

II. POLLUTANT CHARACTERISTICS

INSTRUCTIONS: Complete A through J to determine whether you need to submit any permit application forms to the EPA. If you answer "yes" to any questions, you must submit this form and the supplemental form listed in the parenthesis following the question. Mark "X" in the box in the third column if the supplemental form is attached. If you answer "no" to each question, you need not submit any of these forms. You may answer "no" if your activity is excluded from permit requirements; see Section C of the instructions. See also, Section D of the instructions for definitions of bold-faced terms.

SPECIFIC QUESTIONS	MARK 'X' YES	NO	FORM ATTACHED	SPECIFIC QUESTIONS	MARK 'X' YES	NO	FORM ATTACHED
A. Is this facility a publicly owned treatment works which results in a discharge to waters of the U.S.? (FORM 2A)	X		NO	B. Does or will this facility *(either existing or proposed)* include a concentrated animal feeding operation or aquatic animal production facility which results in a discharge to waters of the U.S.? (FORM 2B)		X	
C. Is this a facility which currently results in discharges to waters of the U.S. other than those described in A or B above? (FORM 2C)	X		NO	D. Is this a proposed facility *(other than those described in A or B above)* which will result in a discharge to waters of the U.S.? (FORM 2D)		X	
E. Does or will this facility treat, store, or dispose of hazardous wastes? (FORM 3)	X		YES	F. Do you or will you inject at this facility industrial or municipal effluent below the lowermost stratum containing, within one quarter mile of the well bore, underground sources of drinking water? (FORM 4)		X	
G. Do you or will you inject at this facility any produced water or other fluids which are brought to the surface in connection with conventional oil or natural gas production, inject fluids used for enhanced recovery of oil or natural gas, or inject fluids for storage of liquid hydrocarbons? (FORM 4)		X		H. Do you or will you inject at this facility fluids for special processes such as mining of sulfur by the Frasch process, solution mining of minerals, in situ combustion of fossil fuel, or recovery of geothermal energy? (FORM 4) Geothermal	X		
I. Is this facility a proposed stationary source which is one of the 28 industrial categories listed in the instructions and which will potentially emit 100 tons per year of any air pollutant regulated under the Clean Air Act and may affect or be located in an attainment area? (FORM 5)		X		J. Is this facility a proposed stationary source which is NOT one of the 28 industrial categories listed in the instructions and which will potentially emit 250 tons per year of any air pollutant regulated under the Clean Air Act and may affect or be located in an attainment area? (FORM 5)		X	

III. NAME OF FACILITY

1 SKIP LOS ALAMOS NATIONAL SCIENTIFIC LABORATORY

IV. FACILITY CONTACT

A. NAME & TITLE *(last, first, & title)*	B. PHONE *(area code & no.)*
2 HAROLD VALENCIA	505 667 5105 FTS 843-5105

V. FACILITY MAILING ADDRESS

A. STREET OR P.O. BOX	B. CITY OR TOWN	C. STATE	D. ZIP CODE
3 LOS ALAMOS AREA OFFICE	4 LOS ALAMOS	NM	87544

VI. FACILITY LOCATION

A. STREET, ROUTE NO. OR OTHER SPECIFIC IDENTIFIER	B. COUNTY NAME
5 LOS ALAMOS	LOS ALAMOS

C. CITY OR TOWN	D. STATE	E. ZIP CODE	F. COUNTY CODE *(if known)*
6 LOS ALAMOS	NM	87544	

CONTINUED FROM THE FRONT

[redacted]

7 (specify) NATIONAL SECURITY	7 (specify)

C. THIRD | D. FOURTH

7 (specify)	7 (specify)

VIII. OPERATOR INFORMATION

A. NAME: LOS ALAMOS NATIONAL LABORATORY

B. Is the name listed in Item VIII-A also the owner? ☐ YES ☒ NO

C. STATUS OF OPERATOR (Enter the appropriate letter into the answer box; if "Other", specify.)
F = FEDERAL, S = STATE, P = PRIVATE, M = PUBLIC (other than federal or state), O = OTHER (specify)

D. PHONE (area code & no.): A 505 667 4301

E. STREET OR P.O. BOX: P O BOX 1663 MS 518

F. CITY OR TOWN: LOS ALAMOS | G. STATE: NM | H. ZIP CODE: 87545

IX. INDIAN LANDS: Is the facility located on Indian lands? ☐ YES ☒ NO

X. EXISTING ENVIRONMENTAL PERMITS

A. NPDES (Discharge to Surface Water): 9 N NM0028355	B. PSD (Air Emissions from Proposed Sources): 9 P
C. UIC (Underground Injection of Fluids): 9 U	E. OTHER (specify): 9 NM0028576 (specify) NPDES
D. RCRA (Hazardous Waste): 9 R	E. OTHER (specify): 9 (specify)

XI. MAP

Attach to this application a topographic 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 the map area. See instructions for precise requirements.

XII. NATURE OF BUSINESS (provide a brief description)

The mission of Los Alamos National Laboratory (LANL) is the application of science and technology to solve national problems including weapons development and energy supply and conservation programs, while basic science research complements and strengthens its fundamental technical capabilities. The LANL is owned by the US Department of Energy and operated under contract by the University of California.

XIII. CERTIFICATION (see instructions)

I certify under penalty of law that I have personally examined and am familiar with the information submitted in this application and all attachments and that, based on my inquiry of those persons immediately responsible for obtaining the information contained in the application, I believe that the information is true, accurate and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment.

A. NAME & OFFICIAL TITLE (type or print)	B. SIGNATURE	C. DATE SIGNED
Harold Valencia Los Alamos Area Manager		

COMMENTS FOR OFFICIAL USE ONLY

C

Please print or type in the unshaded areas only
(Shaded areas are spaced for elite type, i.e., 12 characters/inch).

Form Approved OMB No. 158-S80004

FORM 3 RCRA

EPA

U.S. ENVIRONMENTAL PROTECTION AGENCY

HAZARDOUS WASTE PERMIT APPLICATION

Consolidated Permits Program

(This information is required under Section 3005 of RCRA.)

I. EPA I.D. NUMBER

F	N	M	0	8	9	0	0	1	0	5	1	5		1

FOR OFFICIAL USE ONLY

APPLICATION APPROVED	DATE RECEIVED (yr., mo., & day)	COMMENTS

II. FIRST OR REVISED APPLICATION

Place an "X" in the appropriate box in A or B below *(mark one box only)* to indicate whether this is the first application you are submitting for your facility or a revised application. If this is your first application and you already know your facility's EPA I.D. Number, or if this is a revised application, enter your facility's EPA I.D. Number in Item I above.

A. FIRST APPLICATION *(place an "X" below and provide the appropriate date)*

[X] 1. EXISTING FACILITY *(See instructions for definition of "existing" facility. Complete item below.)*

FOR EXISTING FACILITIES, PROVIDE THE DATE *(yr., mo., & day)* OPERATION BEGAN OR THE DATE CONSTRUCTION COMMENCED *(use the boxes to the left)*

C	YR.	MO.	DAY
8	5 7	- -	- -

[ ] 2. NEW FACILITY *(Complete item below.)*

FOR NEW FACILITIES, PROVIDE THE DATE *(yr., mo., & day)* OPERATION BEGAN OR IS EXPECTED TO BEGIN

YR.	MO.	DAY

B. REVISED APPLICATION *(place an "X" below and complete Item I above)*

[X] 1. FACILITY HAS INTERIM STATUS

[ ] 2. FACILITY HAS A RCRA PERMIT

III. PROCESSES – 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. Ten lines are provided for entering codes. If more lines are needed, enter the code(s) in the space provided. If a process will be used that is not included in the list of codes below, then describe the process *(including its design capacity)* in the space provided on the form *(Item III-C)*.

B. PROCESS DESIGN CAPACITY – For each code entered in column A enter the capacity of the process.
1. AMOUNT – Enter the amount.
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.

PROCESS	PROCESS CODE	APPROPRIATE UNITS OF MEASURE FOR PROCESS DESIGN CAPACITY
Storage:		
CONTAINER *(barrel, drum, etc.)*	S01	GALLONS OR LITERS
TANK	S02	GALLONS OR LITERS
WASTE PILE	S03	CUBIC YARDS OR CUBIC METERS
SURFACE IMPOUNDMENT	S04	GALLONS OR LITERS
Disposal:		
INJECTION WELL	D79	GALLONS OR LITERS
LANDFILL	D80	ACRE-FEET *(the volume that would cover one acre to a depth of one foot)* OR HECTARE-METER
LAND APPLICATION	D81	ACRES OR HECTARES
OCEAN DISPOSAL	D82	GALLONS PER DAY OR LITERS PER DAY
SURFACE IMPOUNDMENT	D83	GALLONS OR LITERS

PROCESS	PROCESS CODE	APPROPRIATE UNITS OF MEASURE FOR PROCESS DESIGN CAPACITY
Treatment:		
TANK	T01	GALLONS PER DAY OR LITERS PER DAY
SURFACE IMPOUNDMENT	T02	GALLONS PER DAY OR LITERS PER DAY
INCINERATOR	T03	TONS PER HOUR OR METRIC TONS PER HOUR; GALLONS PER HOUR OR LITERS PER HOUR
OTHER *(Use for physical, chemical, thermal or biological treatment processes not occurring in tanks, surface impoundments or incinerators. Describe the processes in the space provided; Item III-C.)*	T04	GALLONS PER DAY OR LITERS PER DAY

UNIT OF MEASURE	UNIT OF MEASURE CODE	UNIT OF MEASURE	UNIT OF MEASURE CODE	UNIT OF MEASURE	UNIT OF MEASURE CODE
GALLONS	G	LITERS PER DAY	V	ACRE-FEET	A
LITERS	L	TONS PER HOUR	D	HECTARE-METER	F
CUBIC YARDS	Y	METRIC TONS PER HOUR	W	ACRES	B
CUBIC METERS	C	GALLONS PER HOUR	E	HECTARES	Q
GALLONS PER DAY	U	LITERS PER HOUR	H		

EXAMPLE FOR COMPLETING ITEM III *(shown in line numbers X-1 and X-2 below)*: A facility has two storage tanks, one tank can hold 200 gallons and the other can hold 400 gallons. The facility also has an incinerator that can burn up to 20 gallons per hour.

C	D	U	P											1

LINE NUMBER	A. PROCESS CODE (from list above)	B. PROCESS DESIGN CAPACITY 1. AMOUNT (specify)	B. 2. UNIT OF MEASURE (enter code)	FOR OFFICIAL USE ONLY	LINE NUMBER	A. PROCESS CODE (from list above)	B. PROCESS DESIGN CAPACITY 1. AMOUNT	B. 2. UNIT OF MEASURE (enter code)	FOR OFFICIAL USE ONLY
X-1	S 0 2	600	G		5	T 0 3	0.15	D	
X-2	T 0 3	20	E		6				
1	S 0 1	17880	G		7				
2	D 8 0	2613600	A		8				
3	T 0 1	7680	U		9				
4	T 0 4	NA (SEC IIIC)			10				

CONTINUE ON REVERSE

...PROCESSES (continued)

C. SPACE FOR ADDITIONAL PROCESS CODES OR FOR DESCRIBING OTHER PROCESSES (code "T04"). FOR EACH PROCESS ENTERED HERE INCLUDE DESIGN CAPACITY.

Discrete pieces of High Explosives (HE) waste are collected, packaged, and burned at the TA-16 burning ground. HE contaminated equipment, pipe, etc. that have been flash burned at TA-16 have been disposed of at Area P. Two burn pads (388, 399) are used to burn the discrete pieces of HE while pad 387 is used to flash the equipment. Two pressure vessels (401, 406) are used to burn HE sludge from various processing facilities located at the Laboratory. The sludge is collected at various sumps located throughout the HE processing areas and taken directly to the pressure vessels for treatment. The sumps are regulated under NPDES permits. The sludge is placed on layers of sand in the vessels, the water allowed to drain from the bottom into an evaporation pond and the residue on the sand burned. These vessels do not contain an accumulation of liquids; therefore, they are not considered tanks. Sand from burn pads 388 and 399 have been found to be EP toxic for Barium. This sand has in the past been disposed of at Area P. Engineering drawings and location of the sites are included under item V. Design capacities are not applicable as the treatment process is performed on an as-needed basis.

T03

The incinerator at TA-50 Building 37 has been used to burn methanol and ethanol contaminated with transuranic waste. This incinerator was originally built to treat transuranic waste and has been operating since 1979. Mixed waste containing the methanol and ethanol were burned in this incinerator before November 1980.

IV. DESCRIPTION OF HAZARDOUS WASTES

A. EPA HAZARDOUS WASTE NUMBER — Enter the four-digit number from 40 CFR, Subpart D for each listed hazardous waste you will handle. If you handle hazardous wastes which are not listed in 40 CFR, Subpart D, enter the four-digit number(s) from 40 CFR, 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 III to indicate how the waste will be stored, treated, and/or disposed of at the facility.
   For non-listed hazardous wastes: For each characteristic or toxic contaminant entered in column A, select the code(s) from the list of process codes contained in Item III 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: Four spaces are provided for entering process codes. If more are needed: (1) Enter the first three as described above; (2) Enter "000" in the extreme right box of Item IV-D(1); and (3) Enter in the space provided on page 4, 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.

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 other EPA Hazardous Waste Number that can be used to describe the hazardous waste.

EXAMPLE FOR COMPLETING ITEM IV *(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 NO.	A. EPA HAZARD. 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))
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

CONTINUE ON PAGE 3

ued from page 2.
NOTE: Photocopy this page before completing if you have more than 26 wastes to list.

Form Approved OMB No. 158-S80004

EPA I.D. NUMBER (enter from page 1)	FOR OFFICIAL USE ONLY
W M M 0 8 9 0 0 1 0 5 1 5 T/A C 1	W DUP T/A C 2 DUP

IV. DESCRIPTION OF HAZARDOUS WASTES (continued)

LINE NO.	A. EPA HAZARD. 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	50000	P	S01 T03 D80	
2	D002	150000	P	S01 T01 D80	
3	D003	5000	P	S01 T04 D80	
4	D003	5000	P	S01 T03 T01 D80	Lithium Hydride only
5	D004	1000	P	S01 D80	
6	D005	10000	P	D80	Sand from clean out of explosives burn pads.
7	D005	250*	P	S01 D80	
8	D006	250*	P	S01 T01 D80	
9	D007	1000	P	S01 T01 D80	
10	D008	2000	P	S01 D80	
11	D009	1500	P	S01 T01 D80	
12	D010	250*	P	S01 D80	
13	D011	250*	P	S01 T01 D80	
14	D012	250*	P	S01 T03 D80	
15	D016	250*	P	S01 T03 D80	
16		END OF D DESIGNATOR			
17					
18					
19					
20					
21					
22					
23					
24					
25					
26					

ued from page 2.

E: Photocopy this page before completing if you have more than 26 wastes to list.

Form Approved OMB No. 158-S80004

EPA I.D. NUMBER (enter from page 1)	FOR OFFICIAL USE ONLY
W N M 0 8 9 0 0 1 0 5 1 5 T/A C 1	W DUP T/A C 2 DUP

IV. DESCRIPTION OF HAZARDOUS WASTES (continued)

LINE NO.	A. EPA HAZARD. 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	F001	1000	P	S01		D80		
2	F002	1000	P	S01		D80		
3	F003	250*	P	S01		D80		
4	F004	250*	P	S01		D80		
5	F005	250*	P	S01		D80		
6	F006	250*	P	S01		T01	D80	
7	F007	12500	P	S01		T01	D80	
8	F008	1000	P	S01		T01	D80	
9	F009	6000	P	S01		T01	D80	
10	F027	700	P	S01	D80	T03		
11	F028	700	P	D80				
		END OF F DESIGNATOR						
13								
14								
15								
16								
17								
18								
19								
20								
21								
22								
23								
24								
25								
26								

ued from page 2.

E. Photocopy this page before completing if you have more than 26 wastes to list.

Form Approved OMB No. 158-S80004

EPA I.D. NUMBER (enter from page 1)	FOR OFFICIAL USE ONLY
W N M 0 8 9 0 0 1 9 5 1 5 — T/A: 1	W DUP — T/A: 2 — DUP

IV. DESCRIPTION OF HAZARDOUS WASTES (continued)

LINE NO.	A. EPA HAZARD. 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	K044	50000	P	S01 T04 D80	
2	K047	250*	P	S01 T04 D80	
3		END OF K DESIGNATOR			
4					
5					
6					
7					
8					
9					
10					
11					
12					
13					
14					
15					
16					
17					
18					
19					
20					
21					
22					
23					
24					
25					
26					

...tinued from page 2.

NOTE: Photocopy this page before completing if you have more than 26 wastes to list.

Form Approved OMB No. 158-S80004

EPA I.D. NUMBER (enter from page 1)	FOR OFFICIAL USE ONLY
W N M 0 8 9 0 0 1 0 5 1 5 T/A C 1	W DUP T/A C 2 DUP

IV. DESCRIPTION OF HAZARDOUS WASTES (continued)

LINE NO.	A. EPA HAZARD. WASTE NO. (enter code)	B. ESTIMATED ANNUAL QUANTITY OF WASTE	C. UNIT OF MEASURE (enter code)	D. PROCESSES 1. PROCESS CODES (enter)				2. PROCESS DESCRIPTION (if a code is not entered in D(1))
1	P001	250*	P	S01		D80		
2	P002	250*	P	S01		D80		
3	P003	250*	P	S01		D80		
4	P004	250*	P	S01		D80		
5	P005	250*	P	S01		D80		
6	P006	250*	P	S01	T04	D80		
7	P007	250*	P	S01		D80		
8	P008	250*	P	S01		D80		
9	P009	250*	P	S01	T04	D80		
10	P010	250*	P	S01	D80			
11	P011	250*	P	S01	D80			
	P012	250*	P	S01	D80			
13	P013	250*	P	S01	T01	D80		
14	P014	250*	P	S01		D80		
15	P015	6000	P	S01	D80			
16	P016	250*	P	S01		D80		
17	P017	250*	P	S01		D80		
18	P018	250*	P	S01		D80		
19	P020	250*	P	S01		D80		
20	P021	250*	P	S01	T01	D80		
21	P022	250*	P	S01	T04	D80		
22	P023	250*	P	S01		D80		
23	P024	250*	P	S01		D80		
24	P026	250*	P	S01		D80		
25	P027	250*	P	S01		D80		
26	P028	250*	P	S01		D80		

...ued from page 2.
Photocopy this page before completing if you have more than 26 wastes to list.

Form Approved OMB No. 158-S80004

EPA I.D. NUMBER (enter from page 1)	FOR OFFICIAL USE ONLY
W N M 0 8 9 0 0 1 0 5 1 5 T/A C 1	W DUP T/A C 2 DUP

DESCRIPTION OF HAZARDOUS WASTES (continued)

LINE NO.	A. EPA HAZARD. 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	P029	250*	P	S01		T01	D80	
2	P030	250*	P	S01	T01	D80		
3	P031	250*	P	S01	T04	D80		
4	P033	250*	P	S01	T04	D80		
5	P034	250*	P	S01		D80		
6	P036	250*	P	S01		D80		
7	P037	250*	P	S01		D80		
8	P038	250*	P	S01		D80		
9	P039	250*	P	S01		D80		
10	P040	250*	P	S01		D80		
11	P041	250*	P	S01		D80		
12	P042	250*	P	S01		D80		
13	P043	250*	P	S01		D80		
14	P044	250*	P	S01		D80		
15	P045	250*	P	S01		D80		
16	P046	250*	P	S01		D80		
17	P047	250*	P	S01		D80		
18	P048	250*	P	S01		T04	D80	
19	P049	250*	P	S01		D80		
20	P050	250*	P	S01		D80		
21	P051	250*	P	S01		D80		
22	P054	250*	P	S01		T04	D80	
23	P056	250*	P	S01	T01	T04	D80	
24	P057	250*	P	S01		D80		
25	P058	250*	P	S01		D80		
26	P059	250*	P	S01		D80		

nued from page 2.

NOTE: Photocopy this page before completing if you have more than 26 wastes to list.

Form Approved OMB No. 158-S80004

EPA I.D. NUMBER (enter from page 1)	FOR OFFICIAL USE ONLY
W N M 0 8 9 0 0 1 0 5 1 5 — T/A: 1	W DUP — T/A: 2 — DUP

IV. DESCRIPTION OF HAZARDOUS WASTES (continued)

LINE NO.	A. EPA HAZARD. WASTE NO. (enter code)	B. ESTIMATED ANNUAL QUANTITY OF WASTE	C. UNIT OF MEASURE (enter code)	D. PROCESSES 1. PROCESS CODES (enter)				2. PROCESS DESCRIPTION (if a code is not entered in D(1))
1	P060	250*	P	S01		D80		
2	P062	250*	P	S01		D80		
3	P063	250*	P	S01	T04	D80		
4	P064	250*	P	S01	T04	D80		
5	P065	250*	P	S01	T04	D80		
6	P066	250*	P	S01		D80		
7	P067	250*	P	S01		D80		
8	P068	250*	P	S01		D80		
9	P069	250*	P	S01		T04	D80	
10	P070	250*	P	S01		D80		
11	P071	250*	P	S01		T04	D80	
	P072	250*	P	S01		D80		
13	P073	250*	P	S01	T01	T04	D80	
14	P074	250*	P	S01		T01	D80	
15	P075	250*	P	S01		D80		
16	P076	250*	P	S01	T01	T04	D80	
17	P077	250*	P	S01		T04	D80	
8	P078	250*	P	S01	T01	D80		
9	P081	250*	P	S01	T04	D80		
20	P082	250*	P	S01		D80		
21	P084	250*	P	S01		D80		
22	P085	250*	P	S01		D80		
23	P087	250*	P	S01	D80			
24	P088	250*	P	S01		D80		
25	P089	250*	P	S01		D80		
26	P092	250*	P	S01		D80		

EPA Form 3510-3 (6-80)

CONTINUE ON REVERSE

NUMBER (enter from page 1)

N M 0 8 9 0 0 1 0 5 1 5 | T/A/C 1

FOR OFFICIAL USE ONLY

W | DUP | T/A/C 2 | DUP

DESCRIPTION OF HAZARDOUS WASTES (continued)

	A. EPA HAZARD. WASTE NO. (enter code)	B. ESTIMATED ANNUAL QUANTITY OF WASTE	C. UNIT OF MEASURE (enter code)	D. PROCESSES 1. PROCESS CODES (enter)				2. PROCESS DESCRIPTION (if a code is not entered in D(1))
	P093	250*	P	S01	T03	D80		
	P094	250*	P	S01	T03	D80		
	P095	250*	P	S01	T03	D80		
	P096	250*	P	S01	T04	D80		
	P097	250*	P	S01	T03	D80		
	P098	250*	P	S01	T01	D80		
	P099	250*	P	S01	T01	D80		
	P1[illegible]	250*	P	S01	T03	D80		
9	P1[illegible]2	250*	P	S01	T03	D80		
10	P103	250*	P	S01	T03	D80		
11	P104	250*	P	S01	T01	D80		
	105	250*	P	S01	D80			
13	P106	250*	P	S01	T01	D80		
14	P107	250*	P	S01	T04	D80		
15	P108	250*	P	S01	T03	D80		
16	P109	250*	P	S01	T03	D80		
	P110	250*	P	S01	T03	D80		
	P111	250*	P	S01	T03	D80		
	P112	250*	P	S01	T03	T04	D80	
20	P113	250*	P	S01	D80			
21	P114	250*	P	S01	D80			
22	P115	250*	P	S01	D80			
23	P116	250*	P	S01	D80			
	P118	250*	P	S01	T03	D80		
25	P119	250*	P	S01	D80			
26	P120	250*	P	S01	D80			

Form 3510-3 (6-80)

CONTINUE ON REVERSE

...y this page before completing if you have ...

I.D. NUMBER (enter from page 1)	FOR OFFICIAL USE ONLY
M 0 8 9 0 0 1 0 5 1 5 — T/A C: 1	W — DUP — T/A C: 2 — DUP

SCRIPTION OF HAZARDOUS WASTES (continued)

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))
121	250*	P	S01	T01	D80		
122	250*	P	S01	T04	D80		
123	250*	P	S01	T03	D80		
	END OF P DESIGNATOR						

...S. NUMBER (enter from page 1)	FOR OFFICIAL USE ONLY
M 0 8 9 0 0 1 0 5 1 5 — T/A/C 1	W — DUP — T/A/C 2 — DUP

DESCRIPTION OF HAZARDOUS WASTES (continued)

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)				2. PROCESS DESCRIPTION (if a code is not entered in D(1))
U001	250*	P	S01	T03	D80		
U002	1000	P	S01	T03	D80		
U003	250*	P	S01	T03	D80		
U004	250*	P	S01	T03	D80		
U005	250*	P	S01	D80			
U006	250*	P	S01	T04	D80		
U007	250*	P	S01	T03	D80		
U008	250*	P	S01	T03	T04	D80	
U009	250*	P	S01	T03	D80		
U010	250*	P	S01	T03	D80		
U011	250*	P	S01	T03	D80		
U012	250*	P	S01	T03	D80		
U014	250*	P	S01	T03	D80		
U015	250*	P	S01	T03	D80		
U016	250*	P	S01	T03	D80		
U017	250*	P	S01	T03	D80		
U018	250*	P	S01	T03	D80		
U019	250*	P	S01	D80			
U020	250*	P	S01	T03	T04	D80	
U021	250*	P	S01	T03	D80		
U022	250*	P	S01	T03	D80		
U023	250*	P	S01	T03	T04	D80	
U024	250*	P	S01	T03	D80		
U025	250*	P	S01	T03	D80		
U026	250*	P	S01	T03	D80		
U027	250*	P	S01	T03	D80		

I.D. NUMBER (enter from page 1)	FOR OFFICIAL USE ONLY
M 0 8 9 0 0 1 0 5 1 5 — T/A 1	W DUP — T/A 2 DUP

SCRIPTION OF HAZARDOUS WASTES (continued)

A. EPA HAZARD. WASTE NO. (enter code)	B. ESTIMATED ANNUAL QUANTITY OF WASTE	C. UNIT OF MEASURE (enter code)	D. PROCESSES 1. PROCESS CODES (enter)				2. PROCESS DESCRIPTION (if a code is not entered in D(1))
0 2 8	250*	P	S 0 1	T 0 3	D 8 0		
0 2 9	250*	P	S 0 1	T 0 3	D 8 0		
0 3 0	250*	P	S 0 1	T 0 3	D 8 0		
0 3 1	250*	P	S 0 1	T 0 3	D 8 0		
0 3 2	250*	P	S 0 1	T 0 1	D 8 0		
0 3 3	250*	P	S 0 1	T 0 4	D 8 0		
0 3 4	250*	P	S 0 1	T 0 3	D 8 0		
J 0 3 5	250*	P	S 0 1	T 0 3	D 8 0		
J 0 3 6	250*	P	S 0 1	T 0 3	D 8 0		
J 0 3 7	250*	P	S 0 1	T 0 3	D 8 0		
U 0 3 8	250*	P	S 0 1	T 0 3	D 8 0		
3 9	250*	P	S 0 1	T 0 3	D 8 0		
U 0 4 1	250*	P	S 0 1	T 0 3	D 8 0		
U 0 4 2	250*	P	S 0 1	T 0 3	T 0 4	D 8 0	
U 0 4 3	250*	P	S 0 1	T 0 4	D 8 0		
J 0 4 4	1000	P	S 0 1	T 0 3	D 8 0		
J 0 4 5	250*	P	S 0 1	T 0 4	D 8 0		
0 4 6	250*	P	S 0 1	T 0 3	D 8 0		
0 4 7	250*	P	S 0 1	T 0 3	D 8 0		
U 0 4 8	250*	P	S 0 1	T 0 3	D 8 0		
U 0 4 9	250*	P	S 0 1	T 0 3	D 8 0		
U 0 5 0	250*	P	S 0 1	T 0 3	D 8 0		
U 0 5 1	250*	P	S 0 1	T 0 3	D 8 0		
0 5 2	250*	P	S 0 1	T 0 3	D 8 0		
U 0 5 3	250*	P	S 0 1	T 0 3	D 8 0		
U 0 5 5	250*	P	S 0 1	T 0 3	D 8 0		

8 9 0 0 1 0 5 1 5 | 1 | W | DUP | 2 | DUP

DESCRIPTION OF HAZARDOUS WASTES (continued)

A. EPA HAZARD. 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))
U056	250*	P	S01	T03	D80		
U057	250*	P	S01	T03	D80		
U058	250*	P	S01	T03	D80		
U059	250*	P	S01	T03	D80		
U060	250*	P	S01	T03	D80		
U061	250*	P	S01	T03	D80		
U062	250*	P	S01	T03	D80		
U063	250*	P	S01	T03	D80		
U064	250*	P	S01	T03	D80		
U066	250*	P	S01	T03	D80		
U067	250*	P	S01	T03	D80		
U068	250*	P	S01	T03	D80		
U069	250*	P	S01	T03	D80		
U070	250*	P	S01	T03	D80		
U071	250*	P	S01	T03	D80		
U072	250*	P	S01	T03	D80		
U073	250*	P	S01	T03	D80		
U074	250*	P	S01	T03	D80		
U075	250*	P	S01	T04	D80		
U076	250*	P	S01	T03	D80		
U077	250*	P	S01	T03	D80		
U078	250*	P	S01	T03	D80		
U079	250*	P	S01	T03	D80		
U080	3000	P	S01	T03	D80		
U031	250*	P	S01	T03	D80		
U082	250*	P	S01	T03	D80		

Form 3510-3 (6-80)

CONTINUE ON REVERSE

(enter "A", "B", "C", etc. behind the "3" to identify photocopied pages)

NUMBER (enter from page 1) M 0 8 9 0 0 1 0 5 1 5 1

FOR OFFICIAL USE ONLY W DUP 2 DUP

SCRIPTION OF HAZARDOUS WASTES (continued)

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)				2. PROCESS DESCRIPTION (if a code is not entered in D(1))
083	250*	P	S01	T03	D80		
084	250*	P	S01	T03	D80		
085	250*	P	S01	T03	D80		
086	250*	P	S01	T03	D80		
087	250*	P	S01	T03	D80		
088	250*	P	S01	T03	D80		
089	250*	P	S01	T03	D80		
090	250*	P	S01	T03	D80		
U091	250*	P	S01	T03	D80		
U092	250*	P	S01	T04	D80		
U093	250*	P	S01	T03	D80		
094	250*	P	S01	T03	D80		
U095	250*	P	S01	T03	D80		
U096	250*	P	S01	T03	T04	D80	
U097	250*	P	S01	T03	D80		
U098	250*	P	S01	T03	D80		
099	250*	P	S01	T03	D80		
101	250*	P	S01	T03	D80		
102	250*	P	S01	T03	D80		
103	250*	P	S01	T03	D80		
U105	250*	P	S01	T03	D80		
U106	250*	P	S01	T03	D80		
U107	250*	P	S01	T03	D80		
108	250*	P	S01	T03	T04	D80	
U109	250*	P	S01	T03		D80	
U110	250*	P	S01	T03	D80		

U. NUMBER (enter from page 1)	FOR OFFICIAL USE ONLY
N M 0 8 9 0 0 1 0 5 1 5 — T/A C 1	W — DUP — C 2 — DUP

DESCRIPTION OF HAZARDOUS WASTES (continued)

A. EPA HAZARD. WASTE NO. (enter code)	B. ESTIMATED ANNUAL QUANTITY OF WASTE	C. UNIT OF MEASURE (enter code)	D. PROCESSES 1. PROCESS CODES (enter)				2. PROCESS DESCRIPTION (if a code is not entered in D(1))
U 1 1 1	250*	P	S 0 1	T 0 3	D 8 0		
U 1 1 2	250*	P	S 0 1	T 0 3	T 0 4	D 8 0	
U 1 1 3	250*	P	S 0 1	T 0 3	T 0 4	D 8 0	
U 1 1 4	250*	P	S 0 1	T 0 3	D 8 0		
U 1 1 5	250*	P	S 0 1	T 0 3	T 0 4	D 8 0	
U 1 1 6	250*	P	S 0 1	T 0 3	D 8 0		
U 1 1 7	250*	P	S 0 1	T 0 3	T 0 4	D 8 0	
U 1 1 8	250*	P	S 0 1	T 0 3	T 0 4	D 8 0	
U 1 1 9	250*	P	S 0 1	T 0 3	D 8 0		
U 1 2 0	250*	P	S 0 1	T 0 3	D 8 0		
U 1 2 1	250*	P	S 0 1	D 8 0			
1 2 2	250*	P	S 0 1	T 0 3	D 8 0		
U 1 2 3	250*	P	S 0 1	D 8 0			
U 1 2 4	250*	P	S 0 1	T 0 3	D 8 0		
U 1 2 5	250*	P	S 0 1	T 0 3	D 8 0		
U 1 2 6	250*	P	S 0 1	T 0 3	D 8 0		
U 1 2 7	250*	P	S 0 1	T 0 3	D 8 0		
U 1 2 8	250*	P	S 0 1	T 0 3	D 8 0		
U 1 2 9	250*	P	S 0 1	T 0 3	D 8 0		
U 1 3 0	250*	P	S 0 1	T 0 3	D 8 0		
U 1 3 1	250*	P	S 0 1	T 0 3	D 8 0		
U 1 3 2	250*	P	S 0 1	T 0 3	D 8 0		
U 1 3 3	250*	P	S 0 1	T 0 3	T 0 4	D 8 0	
1 3 4	250*	P	S 0 1	T 0 1	T 0 4	D 8 0	
U 1 3 5	250*	P	S 0 1	T 0 4	D 8 0		
U 1 3 6	250*	P	S 0 1	D 8 0			

Form 3510-3 (6-80)

CONTINUE ON REVERSE

J 8 9 0 0 1 0 5 1 5 1 | W | DUP | 2 | DUP

DESCRIPTION OF HAZARDOUS WASTES *(continued)*

	A. EPA HAZARD. 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))
	U137	250*	P	S01	T03	D80		
	U138	250*	P	S01	T03	D80		
	U139	250*	P	S01	T03	D80		
	U140	250*	P	S01	T03	D80		
	U141	250*	P	S01	T03	D80		
	U142	250*	P	S01	T03	D80		
	U143	250*	P	S01	T03	D80		
	U144	250*	P	S01	D80			
	U145	250*	P	S01	D80			
	U146	250*	P	S01	D80			
1	U147	250*	P	S01	T03	D80		
	U148	250*	P	S01	T03	D80		
13	U149	250*	P	S01	T03	D80		
4	U150	250*	P	S01	T03	D80		
	U151	250*	P	S01	D80			
	U152	250*	P	S01	T03	D80		
	U153	250*	P	S01	T03	D80		
	U154	250*	P	S01	T03	D80		
	U155	250*	P	S01	T03	D80		
	U156	250*	P	S01	T03	D80		
	U157	1000	P	S01	T03	D80		
2	U158	250*	P	S01	T03	D80		
3	U159	1000	P	S01	T03	D80		
	U160	250*	P	S01	T04	D80	T03	
	U161	250*	P	S01	T03	D80		
26	U162	250*	P	S01	T03	D80		

EPA Form 3510-3 (6-80)

CONTINUE ON REVERSE

(enter "A", "B", "C", etc. behind the "3" to identify photocopied pages)

NUMBER (enter from page 1)	FOR OFFICIAL USE ONLY
M 0 8 9 0 0 1 0 5 1 5 — T/A C 1	W — DUP — T/A C 2 — DUP

DESCRIPTION OF HAZARDOUS WASTES (continued)

A. EPA HAZ. 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))
U163	250*	P	S01 T03 D80	
164	250*	P	S01 T03 D80	
165	250*	P	S01 T03 D80	
166	250*	P	S01 T03 D80	
167	250*	P	S01 T03 D80	
168	250*	P	S01 T03 D80	
169	250*	P	S01 T03 D80	
U1[illegible]	250*	P	S01 T03 D80	
U1[illegible]	250*	P	S01 T03 T04 D80	
U1[illegible]	250*	P	S01 T03 D80	
U173	250*	P	S01 T03 D80	
U174	250*	P	S01 T03 D80	
U176	250*	P	S01 T03 D80	
U1[illegible]7	250*	P	S01 T03 D80	
U1[illegible]8	250*	P	S01 T03 D80	
U1[illegible]9	250*	P	S01 T03 D80	
U180	250*	P	S01 T03 D80	
U181	250*	P	S01 T03 D80	
U182	250*	P	S01 T03 D80	
U1[illegible]3	250*	P	S01 T03 D80	
U184	250*	P	S01 T03 D80	
U185	250*	P	S01 T03 D80	
U186	250*	P	S01 T03 D80	
187	250*	P	S01 T03 D80	
U188	250*	P	S01 T03 D80	
U189	250*	P	S01 T03 T04 D80	

NUMBER (enter from page 1)

M 0 8 9 0 0 1 0 5 1 5 | F/A | C 1

FOR OFFICIAL USE ONLY

W | DUP | F/A | C 2 | DUP

DESCRIPTION OF HAZARDOUS WASTES (continued)

A. EPA HAZARD. 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 9 0	250*	P	S 0 1	T 0 3	D 8 0		
1 9 1	250*	P	S 0 1	T 0 3	D 8 0		
1 9 2	250*	P	S 0 1	T 0 3	D 8 0		
1 9 3	250*	P	S 0 1	T 0 3	D 8 0		
1 9 4	250*	P	S 0 1	T 0 3	D 8 0		
1 9 6	250*	P	S 0 1	T 0 3	D 8 0		
1 9 7	250*	P	S 0 1	T 0 3	D 8 0		
2 0 0	250*	P	S 0 1	T 0 3	D 8 0		
U 2 0 1	250*	P	S 0 1	T 0 3	D 8 0		
U 2 0 2	250*	P	S 0 1	T 0 3	D 8 0		
U 2 0 3	250*	P	S 0 1	T 0 3	D 8 0		
0 4	250*	P	S 0 1	D 8 0			
U 2 0 5	250*	P	S 0 1	T 0 4	D 8 0		
U 2 0 6	250*	P	S 0 1	T 0 3	D 8 0		
U 2 0 7	250*	P	S 0 1	T 0 3	D 8 0		
U 2 0 8	250*	P	S 0 1	T 0 3	D 8 0		
U 2 0 9	250*	P	S 0 1	T 0 3	D 8 0		
2 1 0	250*	P	S 0 1	T 0 3	D 8 0		
U 2 1 1	250*	P	S 0 1	T 0 3	D 8 0		
U 2 1 2	250*	P	S 0 1	T 0 3	D 8 0		
U 2 1 3	250*	P	S 0 1	T 0 3	T 0 4	D 8 0	
U 2 1 4	250*	P	S 0 1	T 0 3	D 8 0		
U 2 1 5	250*	P	S 0 1	D 8 0			
2 1 6	250*	P	S 0 1		D 8 0		
U 2 1 7	250*	P	S 0 1	T 0 4	D 8 0		
U 2 1 8	250*	P	S 0 1	T 0 3	D 8 0		

...this page before completing it if you have more than 26 wastes to list

I.D. NUMBER (enter from page 1)		FOR OFFICIAL USE ONLY	
M 0 8 9 0 0 1 0 5 1 5	1	W DUP	2 DUP

DESCRIPTION OF HAZARDOUS WASTES (continued)

A. EPA HAZARD. 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))
U 2 1 9	250*	P	S 0 1	D 8 0			
U 2 2 0	1000	P	S 0 1	T 0 3	D 8 0		
U 2 2 1	250*	P	S 0 1	T 0 3	D 8 0		
U 2 2 2	250*	P	S 0 1	T 0 3	D 8 0		
U 2 2 3	1000	P	S 0 1	T 0 3	D 8 0		
U 2 2 5	250*	P	S 0 1	T 0 3	D 8 0		
U 2 2 6	1500	P	S 0 1	T 0 3	D 8 0		
U 2 [illegible] 7	250*	P	S 0 1	T 0 3	D 8 0		
U 2 [illegible]	2000	P	S 0 1	T 0 3	D 8 0		
U 2 [illegible]	250*	P	S 0 1	T 0 3	D 8 0		
U 2 3 1	250*	P	S 0 1	T 0 3	D 8 0		
U 2 3 2	250*	P	S 0 1	T 0 3	D 8 0		
U 2 3 3	250*	P	S 0 1	T 0 3	D 8 0		
U 2 3 4	250*	P	S 0 1	T 0 4	D 8 0		
U 2 3 5	250*	P	S 0 1	T 0 3	D 8 0		
U 2 [illegible]	250*	P	S 0 1	T 0 3	D 8 0		
U 2 3 7	250*	P	S 0 1	T 0 3	D 8 0		
U 2 3 8	250*	P	S 0 1	T 0 3	D 8 0		
U 2 3 9	1000	P	S 0 1	T 0 3	D 8 0		
U 2 [illegible] 0	250*	P	S 0 1	T 0 3	D 8 0		
U 2 [illegible] 2	250*	P	S 0 1	T 0 3	D 8 0		
U 2 4 3	250*	P	S 0 1	T 0 3	D 8 0		
U 2 4 4	250*	P	S 0 1	T 0 3	D 8 0		
U 2 4 6	250*	P	S 0 1	D 8 0			
U 2 4 7	250*	P	S 0 1	T 0 3	D 8 0		
	END OF U DESIGNATOR						

ed from the front.

V. DESCRIPTION OF HAZARDOUS WASTES *(continued)*

E. USE THIS SPACE TO LIST ADDITIONAL PROCESS CODES FROM ITEM D(1) ON PAGE 3.

All entries with an asterick in column IVB on page 3A are generated in labpack quantities only. If a new process/experiment will generate more than the stated quantity, a revised Part A will be submitted.

EPA I.D. NO. *(enter from page 1)*: N M 8 9 0 0 1 0 5 1 5 — Y/N: C: 6

. FACILITY DRAWING

All existing facilities must include in the space provided on page 5 a scale drawing of the facility *(see instructions for more detail).*

VI. 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).*

FACILITY GEOGRAPHIC LOCATION

LATITUDE *(degrees, minutes, & seconds)*	LONGITUDE *(degrees, minutes, & seconds)*
35 49 051	106 14 015

VIII. FACILITY OWNER

☐ A. If the facility owner is also the facility operator as listed in Section VIII on Form 1, "General Information", place an "X" in the box to the left and skip to Section IX below.

B. If the facility owner is not the facility operator as listed in Section VIII on Form 1, complete the following items:

1. NAME OF FACILITY'S LEGAL OWNER	2. PHONE NO. *(area code & no.)*
United States Department of Energy	505-667-5105

3. STREET OR P.O. BOX	4. CITY OR TOWN	5. ST.	6. ZIP CODE
Los Alamos Area Office	C: G Los Alamos	NM	87545

IX. OWNER CERTIFICATION

I certify under penalty of law that I have personally examined and am familiar with the information submitted in this and all attached documents, and that based on my inquiry of those individuals immediately responsible for obtaining the information, I believe that the submitted information is true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment.

A. NAME *(print or type)*	B. SIGNATURE	C. DATE SIGNED
Harold Valencia Los Alamos Area Office		

X. OPERATOR CERTIFICATION

I certify under penalty of law that I have personally examined and am familiar with the information submitted in this and all attached documents, and that based on my inquiry of those individuals immediately responsible for obtaining the information, I believe that the submitted information is true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment.

A. NAME *(print or type)*	B. SIGNATURE	C. DATE SIGNED
Robert N. Thorn Acting Director		

CONTINUE ON PAGE 5

Continued from page 4.

V. FACILITY DRAWING *(see page 4)*

The following drawings are attached to the revised Part A dated 10/31/84.

ENG-R 5277 Sheets 2 & 5 - "S" Site showing location of burn pits area - also relationship of "S" Site to rest of Lab. TA-40 & TA-14 locations where HE waste may be destroyed.

TA-16 - Structure Location Plan - Structural designation of pressure vessels (401, 406) and burn pads (387, 388, 399).

ENG-C-27630 - Pressure Vessel (406)

ENG-C-25937 - Pressure Vessel (401)

ENG-C-5849 - Burn Pads (387, 388, 389).

LA-RV-1-13.1 and LA-RV-P-9 - Batch Waste Treatment System at TA-50-1.

Area L Chemical Storage Facility, TA-54.

Area L Chemical Storage Facility, shed.

ENG-R-5277 Shed 10 - TA-15 and TA-36 - firing points where HE waste may be destroyed.

ENG-R-5277 Sheet 11 - TA-39 firing points where HE waste may be destroyed.

ENG-R-5277 Sheet 5 - TA-14 and TA-40 firing points where HE waste may be destroyed.

1. The following drawings are attached to the revised Part A dated 7/26/84:

   Figure 1 - Technical Area Location Plan

   Figure 4 - TA-50 Structure Location Plan showing location of the Batch Waste Treatment Facility in Building 1 and the controlled air incinerator in Building 37.

   Figure 5 - TA-54 Structure Location Plan showing Area L.

2. The following drawings are attached to the revised Part A dated April 1, 1985:

   TDF (Fig. 4-3 of Part B)

   TDF (Fig. 4-4 of Part B)

   TA-54 Area L Storage Area (2 drawings)

3. The following are new submittals:

   TA-54 Area L Storage Area Drawings, Revised July 25, 1985 (2 drawings)

   Photographs:

   TA-3, SM-40 = Temporary chemical waste storage

   TA-3, SM-102 - South Side, LiH room

   TA-9-39 (2 photographs) - Structure and bilingual sign for storage

   TA-14-23 - Building with bilingual sign

Form Approved OMB No. 158-S80004

V. FACILITY DRAWING *(see page 4)*

3. (cont'd.)

TA-14-23 and 35 - Building 23 with firing pad 35

TA-15, Phermex - Firing pad

TA-16, Area P - Area with bilingual sign

TA-16-387 - Burn pad

TA-16-406 - Storage area (temp)

TA-16-394 - Burn pad

TA-16-401 - Storage area (temp)

TA-16-389 - Building used as control point

TA-16-399 - Burn pad

TA-16-388 - Burn pad

TA-22, TD 96-3 - Temporary storage area with bilingual sign

TA-22, TD 96 - Structure used as storage area (temp)

TA-22, TD 24 - Structure used as storage area (temp)

TA-36-8, Kappa 8 - Firing pad

TA-39, AC-6 - Firing pad

TA-39, AC-57 - Firing pad

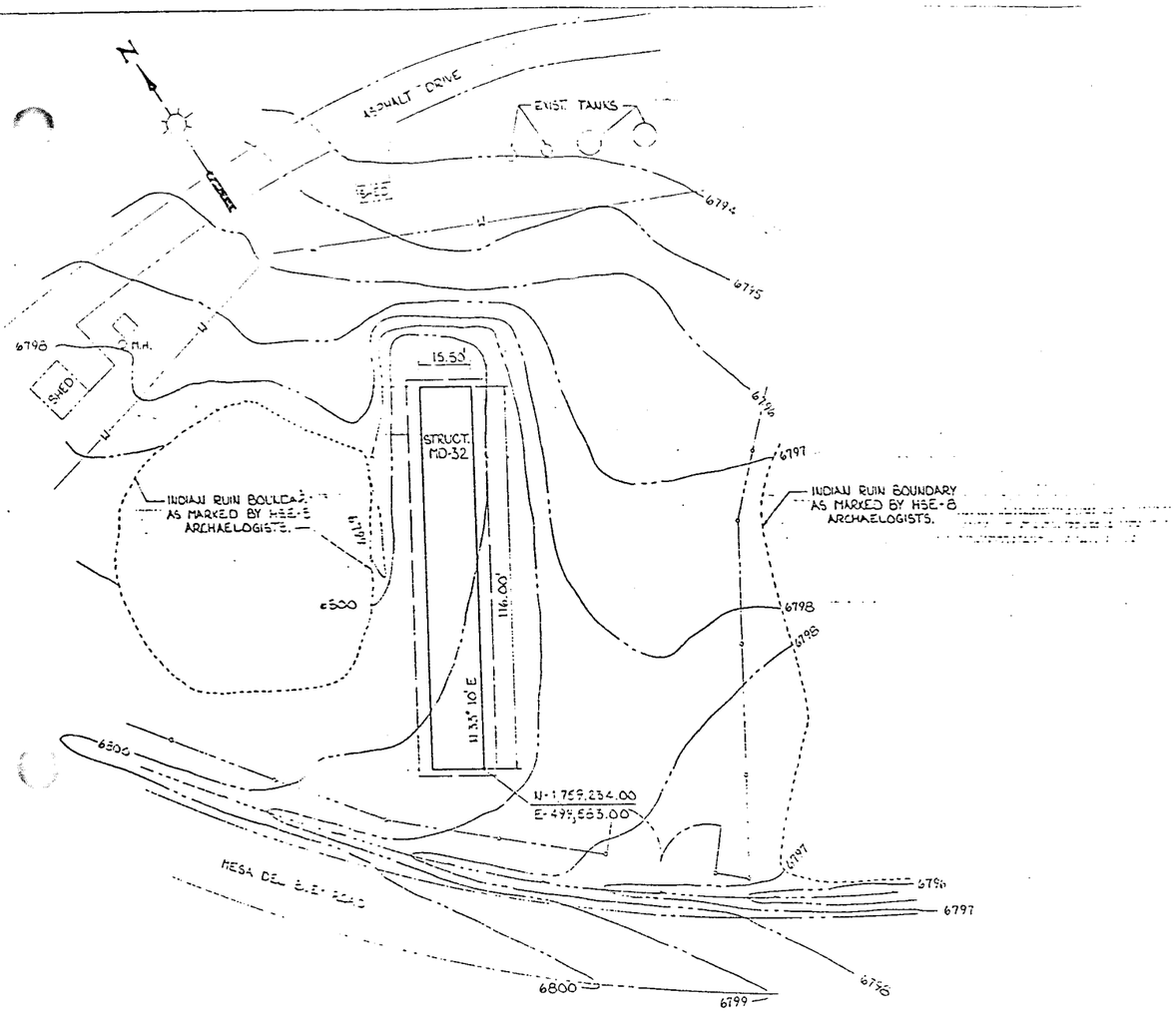
TA-40, DF-2 - Structure used as temporary storage area

TA-50-1 - West side of building with BWT

TA-50-1, Batch Waste Treatment - East doors to BWT (middle of photo, in background)

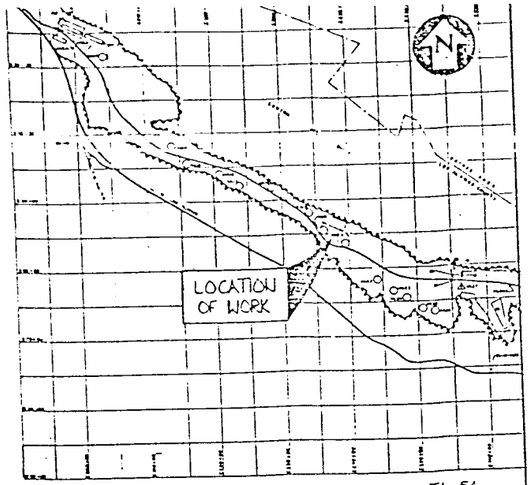
TA-50-37 - TDF facility (east side)

TA-54, Area L (5 photographs)



PLOT PLAN

SCALE: 1" = 20'-0"



LOCATION PLAN

GENERAL NOTES

1. DO NOT SCALE DRAWINGS FOR CONSTRUCTION DIMENSIONS.
2. FIELD VERIFY DIMENSIONS PRIOR TO CONSTRUCTION.
3. REPAIR ALL AREAS DAMAGED DURING CONSTRUCTION TO MATCH EXISTING ADJACENT AREAS.
4. KEEP WORK SITE IN AN ORDERLY CONDITION AND AT PROJECT COMPLETION REMOVE ALL WASTE. LEAVE WORK SITE IN A CONDITION ACCEPTABLE TO THE ENG-1 INSPECTOR. DISPOSE OF REMOVED MATERIALS AS DIRECTED BY ENG-1, UNLESS NOTED.
5. PAINT 3-PART CONC CELL SURFACES WITH 1 COAT PRIMER: ANTI-CORROSIVE 'PLASITE' FOR THOD COLD SET COATING SERIES, F.S. STOCK NO. 2605 TO 0024; 2 FINISH COATS: COLD SET COATING MATERIAL 'PLASITE', LT. GRAY, ZIA STOCK NO. 2605 TO 0033.

   PAINT GALVANIZED BARRIER FENCE METAL WITH 1 COAT PRIMER ALKYD, WHITE 9-712; 2 FINISH COATS OF SHEEDHICE WATER BASE ALKYD GLOSS ENAMEL, GRAY, MLF. 3-6 MILS.
6. COMPACT FILL MATERIAL IN 8" MAXIMUM LIFTS TO 95% DENSITY LABORATORY TEST MAX. DENSITY PER ASTM D1557 METHOD D & FIELD DENSITY PER ASTM D2922 OF ALL FILL MATERIAL.

LEGEND

- NEW CONSTRUCTION
- FUTURE CONSTRUCTION
- ROW BOUNDARY
- EXISTING
- EXISTING WATER LINE

NOTE:
SURVEY-TOPOGRAPHIC INFORMATION WAS OBTAINED FROM SURVEY DRAWING NO. ENG. 54-42.

THIS JOB MUST BE INSPECTED AND ANY CHANGES APPROVED BY PAUL VERNE
ENG-1 PHONE 7-4950

AUTHORIZED BY D.R.R. FORM
HSE-3, 7EE
ENG-1
ENG-4
ENG-4

NO.	DATE	CLASS REV.	REVISIONS	DWN	DES	CHKD	REQ ENG	REQ D.O.	ENG SUP	ENG D.O.

FACILITIES ENGINEERING DIVISION

CHEMICAL STORAGE AREA L

CIVIL: PLOT PLAN

STRUCTURE MD-32 TA-54

DRAWN E. SANCHEZ
DESIGN
CHECKED C. SANCHEZ
RELEASED
DATE

SUBMITTED RECOMMENDED APPROVED

Los Alamos National Laboratory
Los Alamos, New Mexico 87545

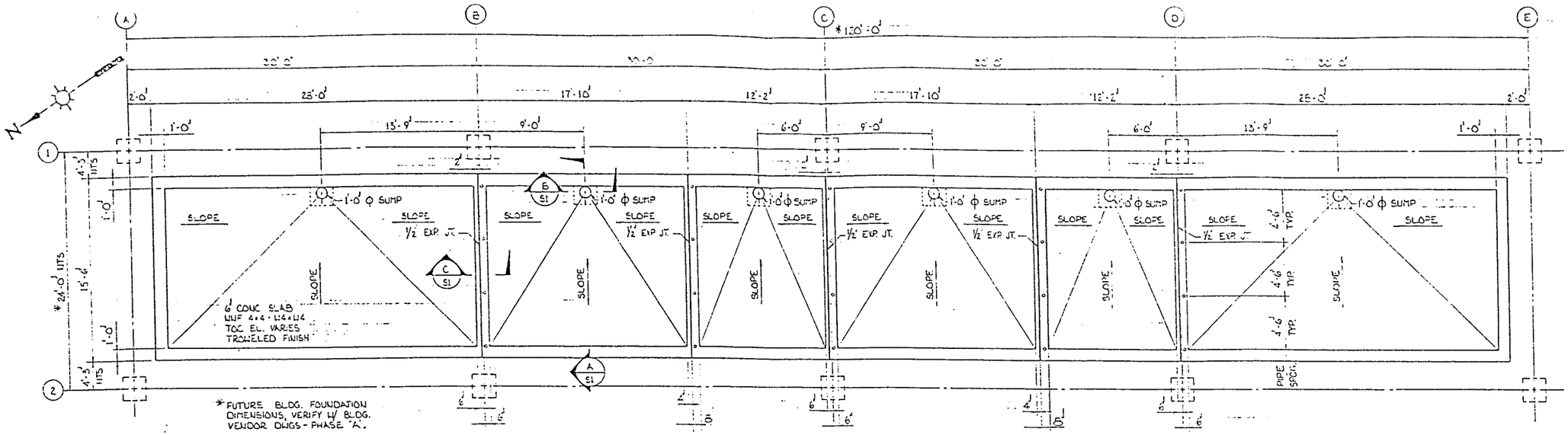
SHEET C1 1 OF 2

CLASSIFICATION REVIEWER DATE

REQUESTING DIVISION/CLASS JOB NO. HSE-DS/ 8204-54
REQUESTING ORG. HSE-7 SAFE

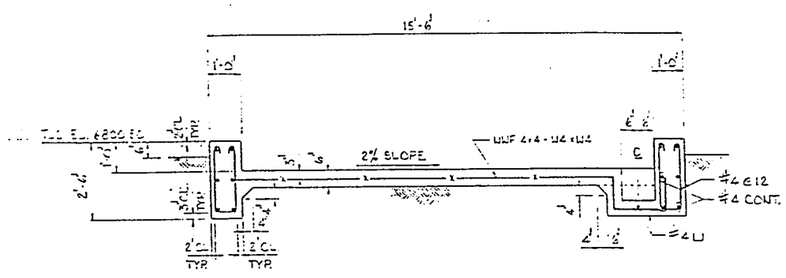
DRAWING NO. ENG-C 44854

REV.



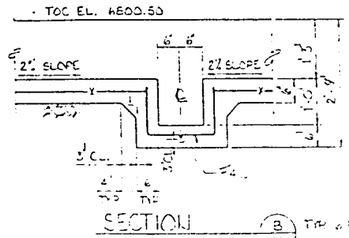
FOUNDATION PLAN

SCALE: 1/4" = 1'-0"



SECTION A / S1

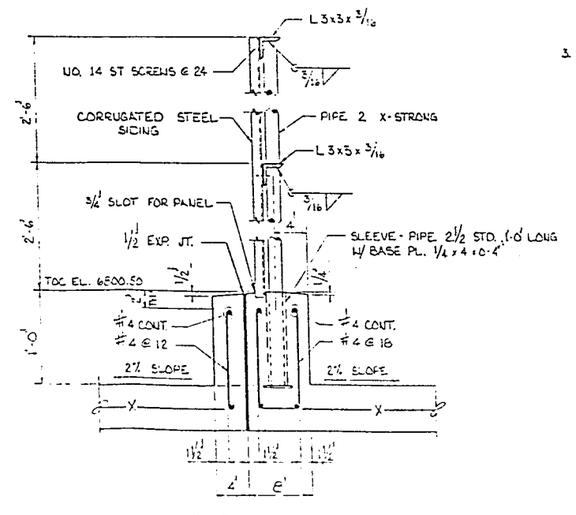
SCALE: 1/2" = 1'-0"



SECTION B / S1

TYP. AT ELEV.

SCALE: 3/4" = 1'-0"



SECTION C / S1

SCALE: 1/2" = 1'-0"

STRUCTURAL NOTES

1. STRUCTURE EXCAVATION - EXCAVATE FOR WALLS & SLABS IN ACCORDANCE WITH ELEVATIONS & DIMENSIONS SHOWN ON THIS DRAWING. EXCAVATION SHALL EXTEND A SUFFICIENT DISTANCE FROM WALLS TO ALLOW FOR PLACING & REMOVAL OF FORMS. OVEREXCAVATION BELOW ELEVATIONS SHOWN SHALL BE RESTORED TO PROPER ELEVATION BY BACKFILLING WITH CONCRETE. THE EXCAVATION SHALL BE INSPECTED BY ENG-1 INSPECTOR PRIOR TO PLACING REINFORCING STEEL.

2. CONCRETE CONSTRUCTION SHALL BE IN CONFORMANCE WITH FACILITIES ENGINEERING DIVISION STANDARD SPECIFICATIONS:
   SECTION 03100 - CONCRETE FORMWORK, 3/4" CHAMFER
   SECTION 03200 - REINFORCING STEEL, GRADE 60
   SECTION 03300 - CAST-IN-PLACE CONCRETE, f'c = 4000 PSI

   FINISH WALLS & SLABS WITH A PREMIXED, SINGLE APPLICATION, SEALER & HARDENER FLOOR FINISH. THE FINISH SHALL BE DELIVERED TO THE JOB SITE IN UNBROKEN CONTAINERS & APPLIED IN ACCORDANCE WITH THE MANUFACTURERS DIRECTIONS.

3. MISCELLANEOUS STEEL - MATERIAL, FABRICATION, ERECTION & PAINTING OF STEEL SHALL CONFORM TO SITE ENGINEERING STANDARD SPECIFICATION SECTION 05120 - STRUCTURAL STEEL.

   BARRIER PANELS SHALL BE 26 GAUGE, 2 1/2 x 1/2 CORRUGATED GALVANIZED STEEL CONFORMING TO ASTM A446 G-90. FASTEN WITH NO. 14 SELF-TAPPING SCREWS.

NO	DATE	CLASS REV.	REVISIONS	DWN	DES	CHK	MFG ENG	MED D.O.	ENG ENG	ENG D.O.

FACILITIES ENGINEERING DIVISION

CHEMICAL STORAGE AREA L

STRUCT: FOUNDATION PLAN

STRUCTURE NO. 32 TA-54

DRAWN	G. SANCHEZ
DESIGN	B. Sanchez
CHECKED	G. SANCHEZ
RELEASED	D. Hickman
DATE	1-9-95

SUBMITTED: G. Sanchez RECOMMENDED: Vince Fabrow APPROVED: [illegible]

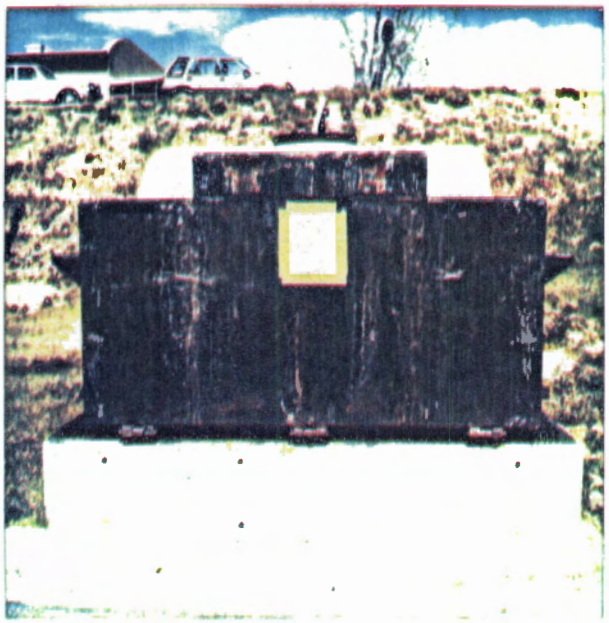
Los Alamos — Los Alamos National Laboratory, Los Alamos New Mexico 87545

SHEET S1 2 OF 2

CLASSIFICATION: U REVIEWER: [illegible] DATE: 7-20-95

REQUESTING DIVISION: FES-DO REQUESTING GROUP: FES-7 LAP JOB NO. 8204-54 PHASE [illegible]

DRAWING NO. ENG-C44856 REV.



TA-3, SM-40

TA-3, SM-102

TA-9-39

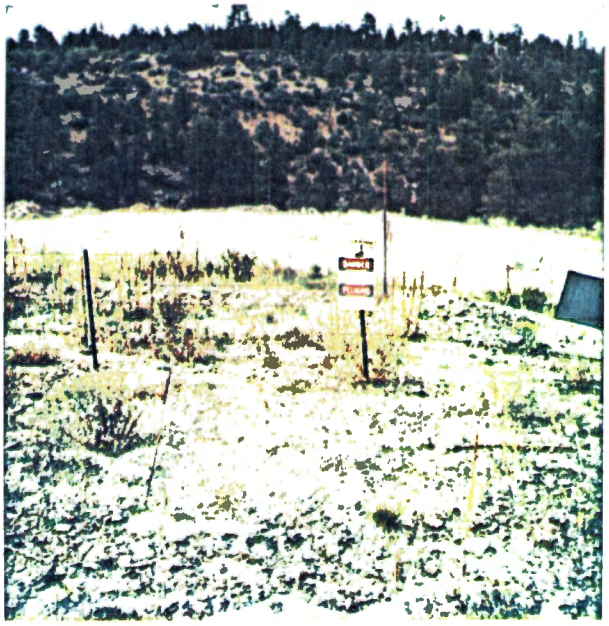
DANGER
UNAUTHORIZED
PERSONNEL
KEEP OUT
PELIGRO
PROHIBIDO
STRUCTURE NO.
TA-9-39
DESIGNATION
MAG. AE-39
1

TA-9-39

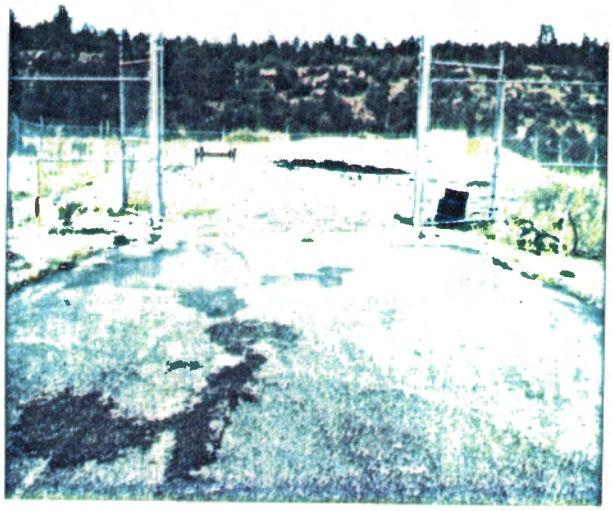
TA-14-23

TA-14-23 and 35

TA-15, Phermex



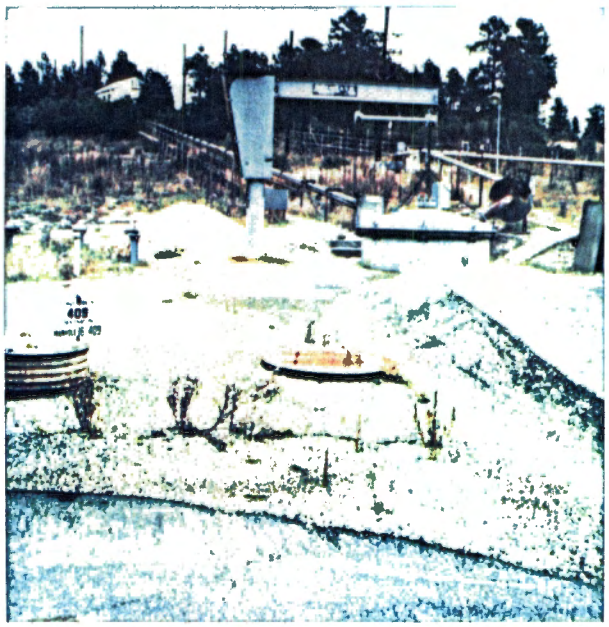
TA-16, Area P



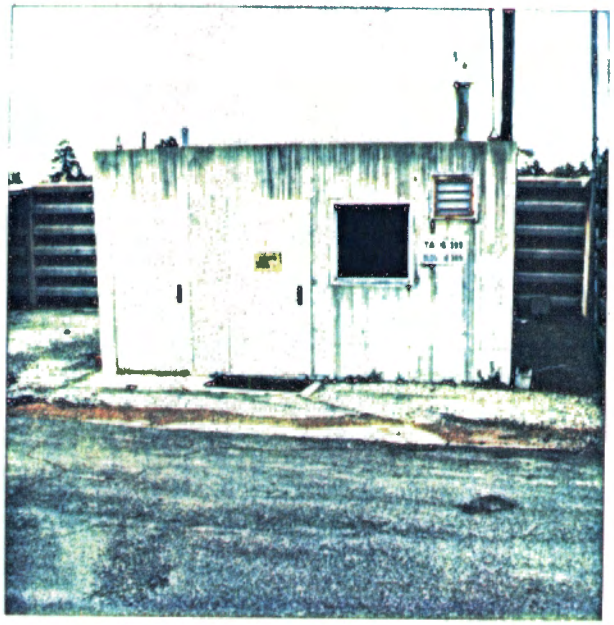
TA-16-387

TA-16-406

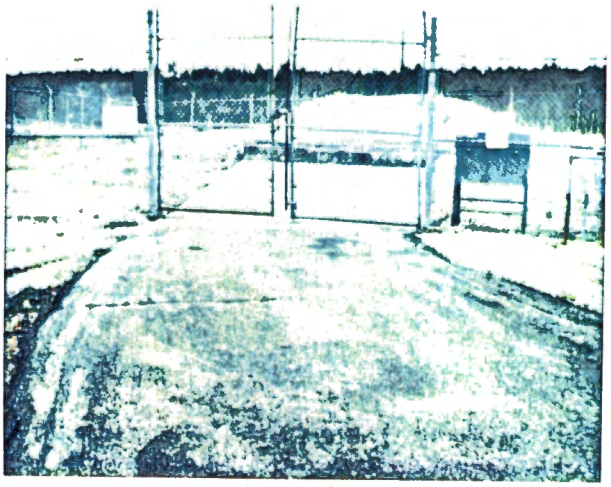
TA-16-394



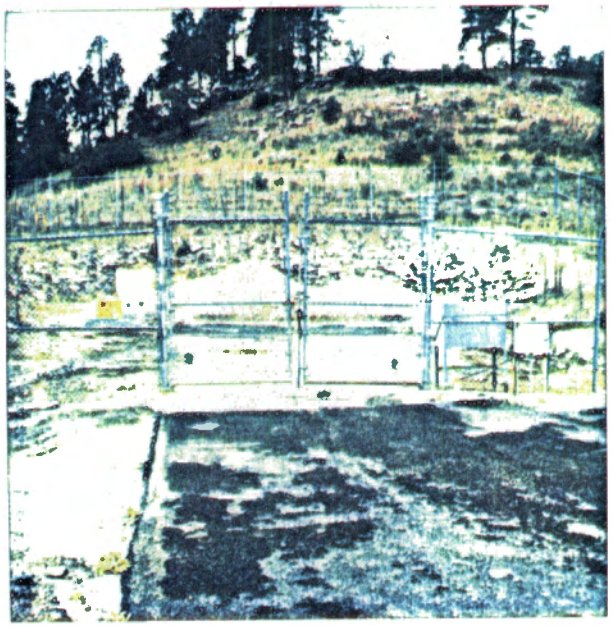
TA-16-401



TA-16-389



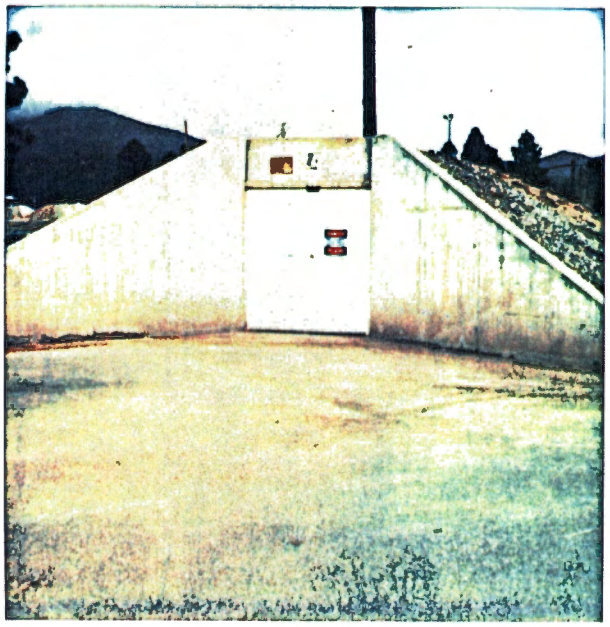
TA-16-399



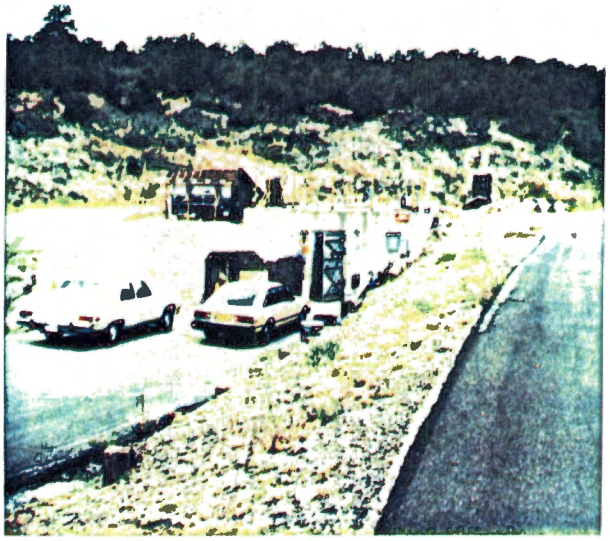
TA-16-388

TA-22, TD 96-3

TA-22, TD 96



TA-22, TD 24



TA-36-8, Kappa 8

TA-39, AC-6

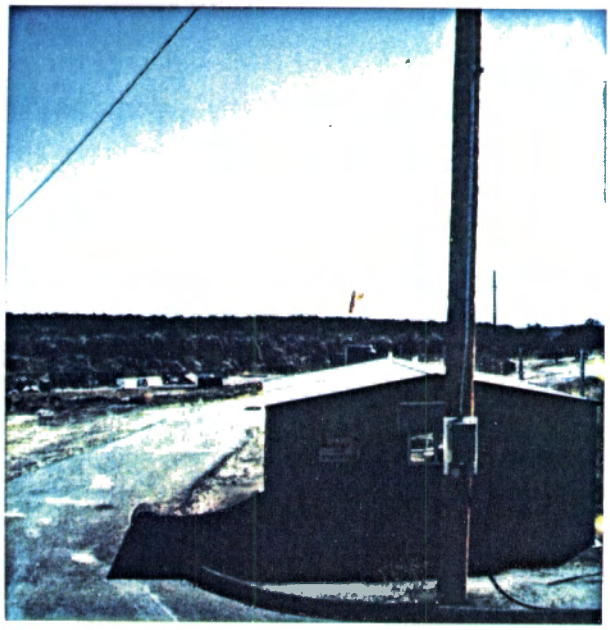
TA-39, AC-57

TA-40, DF-2

TA-50-1

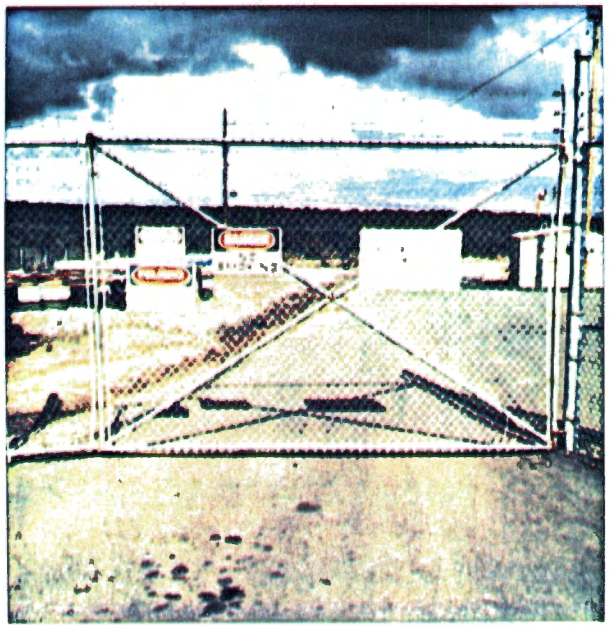
TA-50-1, Batch Waste Treatment

TA-50-37



TA-54, Area L

TA-54, Area L



TA-54, Area L

TA-54, Area L

TA-54, Area L

3164/UPDATE
Drive 5;Reports

SITE CHARACTERIZATION TECHNICAL PLANS FOR THE LOS ALAMOS NATIONAL LABORATORY

October 16, 1984

DRAFT

Environmental Surveillance Group (HSE-8)

Health, Safety and Environment Division

TABLE OF CONTENTS

	Page
Summary and Conclusions	i
Introduction	iv
Priority 1 Sites	1-1
TA-20	1-1
TA-27	1-3
TA-33	1-3
Priority 2 Sites	2-1
TA-4	2-1
TA-5	2-1
TA-6 and 22	2-2
TA-15	2-2
TA-16	2-3
TA-26	2-3
TA-39	2-4
Area S	2-4
Area W	2-4
Priority 3 Sites	3-1
TA-7	3-1
TA-8	3-1
TA-9	3-1
TA-11	3-2
TA-12	3-2
TA-36	3-2
TA-40	3-3
TA-44	3-3
Area M	3-4
Area N	3-4
Area Q	3-4
Area R	3-5
Area X	3-5
Area Z	3-5
Priority 4 Sites	4-1
TA-2 and 41	4-1
TA-14	4-1
TA-28,29 and 37	4-2
TA-46	4-2
TA-47	4-2
TA-56	4-2

DRAFT

Priority 5 Sites 5-1
TA-19 5-1
TA-30 5-1
TA-31 5-1
TA-32 5-2

Completed Actions 6-1
TA-1 6-1
TA-10 6-1
TA-42 6-1
TA-45 6-1
Industrial Waste Line 6-1
Acid, Pueblo and Los Alamos Canyons 6-1

Areas Not Included (Are Under Routine Surveillance) 7-1
TA-3 7-1
TA-18 7-1
TA-21 7-1
TA-35 7-2
TA-43 7-2
TA-48 7-2
TA-49 7-2
TA-50 7-2
TA-51 7-2
TA-52 7-3
TA-53 7-3
TA-54 7-3
TA-55 7-3
TA-57 7-3
TA-59 7-3
Area A 7-4
Area B 7-4
Area C 7-4
Area D 7-4
Area E 7-4
Area F 7-4
Area G 7-4
Area H 7-5
Area J 7-5
Area L 7-5
Area T 7-5
Area U 7-5
Area V 7-5
Hillsides and Canyons 7-5

Munitions Impact Areas 8-1

DRAFT

DRAFT

SUMMARY AND CONCLUSIONS

Through the routine environmental surveillance program at the Los Alamos National Laboratory, indications are that the public is not subjected to any hazard from environmental contamination or releases from present or past Los Alamos activities. However, we do not have a clear understanding of onsite contamination problems due in large part to incomplete environmental records during the frantic early years of the Laboratory. Without this knowledge and perhaps necessary remedial actions, we cannot assure that there will not be transport of environmental contaminants offsite with the potential for harm (real or perceived) to humans or the environment. Detailed environmental studies and remedial actions that began in 1972 have provided the necessary assurance and documentation that present contamination levels on lands released to the public are no hazard to the public.

By means of the site characterization effort, all technical areas and material disposal areas at the Laboratory are being characterized for possible environmental contamination with a goal of remedial action where necessary. Since the mid-60s, indications are that, in decommissioning facilities and sites, all evidence of a facility or site was to be removed so that the area could be released for unrestricted use if desired. This policy requires that all drain lines, other utilities, and any environmental contamination be removed at that time. Thus, it is not likely that any significant environmental problems remain from decommissioning since then. Documentation of this fact has been quite good since the 1970s.

In this document we identify all known technical and material disposal areas, present existing understanding of environmental problems (if any) at each area, and provide a plan for completing the initial assessment (Phase I) and confirmation (Phase II) of the initial assessment. For long-range planning purposes only and using an admittedly rough extrapolation of our present knowledge, we project possible technical assessment (Phase III), remedial actions (Phase IV) and verification (Phase V) schedules. These are summarized in Table I and Figure 1. The priorities listed range from 1 (highest priority) to 5 (no action required).

DRAFT

TABLE I

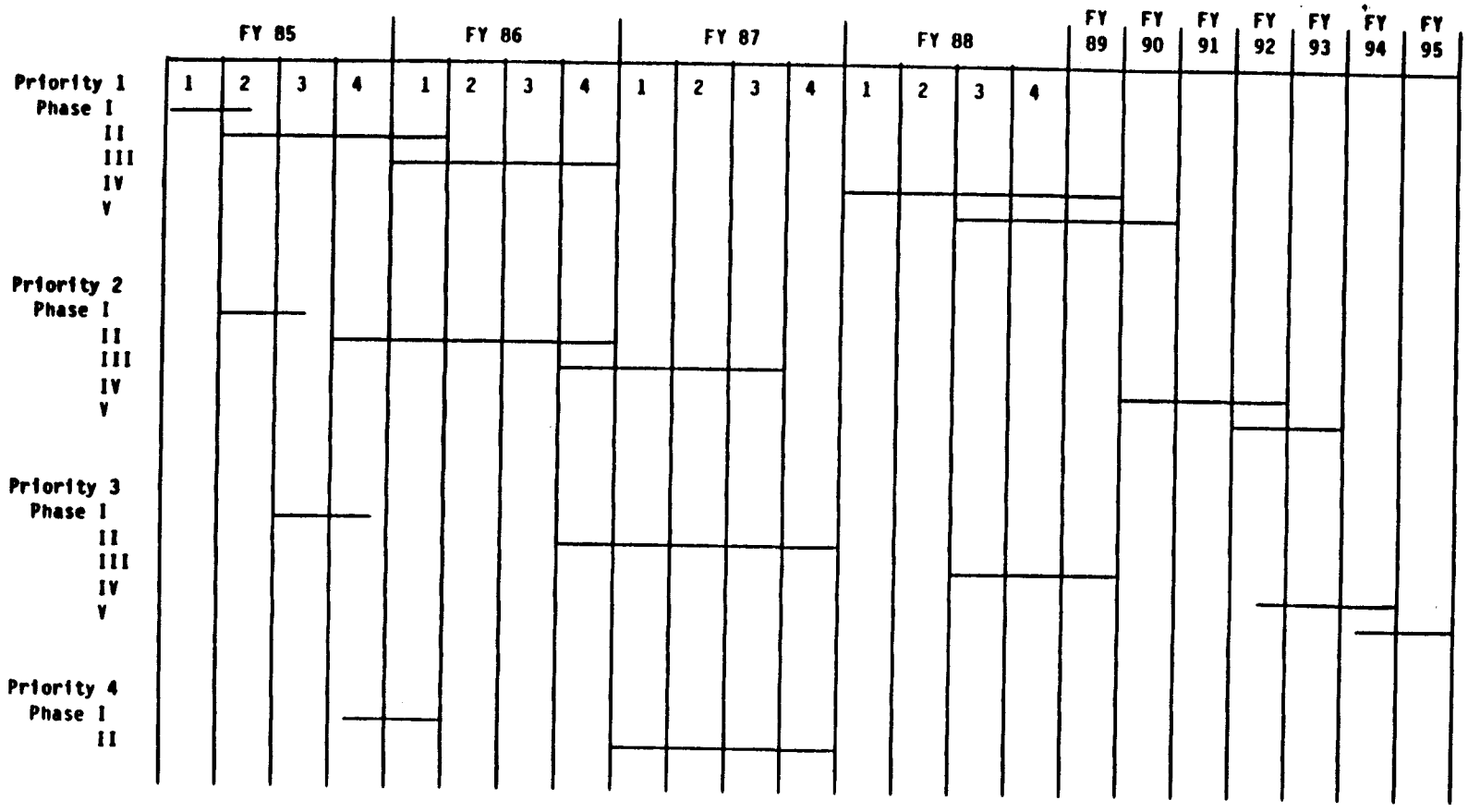
SITE CHARACTERIZATION DATES BY PRIORITY AND ACTION PHASE

	Estimated Completion Period
Priority 1 [a]	
Phase I	10/84 to 2/85
II	1/85 to 6/85
III	10/85 to 10/86
IV	10/87 to 10/89
V	6/88 to 10/90
Priority 2 [b]	
Phase I	1/85 to 5/85
II	7/85 to 10/86
III	7/86 to 7/87
IV	10/89 to 10/92
V	10/91 to 10/93
Priority 3 [c]	
Phase I	4/85 to 9/85
II	7/86 tp 10/87
III	4/88 to 10/89
IV	4/92 to 10/94
V	4/94 to 10/95
Priority 4 [d]	
Phase I	9/85 to 12/85
II	10/86 to 10/87
Total	

(a) TA-20, TA-27, TA-33.
(b) TA-4, TA-5, TA-6 and 22, TA-15, TA-16, TA-26, TA-39, Area S, Area W
(c) TA-7, TA-8, TA-9, TA-11, TA-12, TA-36, TA-40, TA-44, Area M, Area N, Area Q, Area R, Area X, Area Z.
(d) TA-2 and 41, TA-14, TA-28, TA-29, TA-37, TA-46, TA-47, TA-56.

FIGURE 1

SITE CHARACTERIZATION PLANS -ESTIMATED COMPLETION DATES



DRAFT

DRAFT

INTRODUCTION

This report provides priorities and possible schedules for environmental site characterization at the Los Alamos National Laboratory. Technical areas and waste disposal areas are grouped into five categories as given below for evaluation of all forms of environmental contamination and/or hazards.

Category	Criteria
1	Potential for public injury or perceived injury during trespass on DOE property.
2	Potentially contaminated areas that could lead to offsite migration of materials or sites in restricted areas with some HE hazard potential. Short-term migration potential (less than five years) sites would receive higher priority than long-term migration potential (greater than five years) sites.
3	Areas containing unknown amounts of hazardous materials and/or suspected contamination or poorly documented areas.
4	Slight chance that contaminants are present or waste disposal has occurred.
5	No proposed actions.

All areas are considered in the site characterization effort; but those monitored under the routine or special environmental surveillance programs are believed to be reasonably well understood and will not undergo detailed evaluation in this program. Most are active areas that would undergo detailed evaluation upon decommissioning.

DRAFT

In each section there is a brief description of what is presently known about each site followed by an admittedly rough estimate of what remedial actions might be necessary. The initial assessment (Phase I) consists of a thorough records search, extensive interviews, site familiarization, identification of possible contaminant transport pathways, etc. From this initial assessment, a detailed confirmation plan (Phase II) of Phase I would be developed. Phase II includes developing a sampling plan, carrying out that plan, analyzing samples, evaluating the results and reporting on them.

Activities to follow (Phase III - technical assessment to develop remedial action alternatives and costs criteria, Phase IV - remedial action, Phase V - compliance and verification) would be based on the results of Phases I and II. Site priorities could change if results so indicated. Thus, the tentative priorities assigned in this report should not be considered fixed, but a guideline for action.

Laboratory management, under its own initiative, made a commitment in 1983 to begin these site characterization activities. In 1984 characterization for nonradioactive inactive waste disposal sites and other areas with contamination became part of the Comprehensive Environmental Assessment and Response Program (CEARP) being carried out by the Los Alamos National Laboratory (as the lead contractor) under the direction of the Albuquerque Operations Office.

All environmental pathways leading offsite are under close surveillance by the routine environmental monitoring program. As documented in the continuing series of annual monitoring reports, the public is not subjected to any environmental hazards from Los Alamos National Laboratory activities. However, we do not have a clear understanding of onsite contamination problems due in large part to incomplete environmental records during the frantic and unsettled times from 1943 to 1951. This site characterization is a large undertaking in an attempt to remedy these gaps in our knowledge and

to prevent or mitigate any environmental impacts. It is intended that these efforts not usurp personnel and resources from the routine environmental surveillance program, but rather complement that program.

DRAFT

DRAFT

1.0 PRIORITY 1 SITES

The following three sites have known contamination or potential problems that could result in public injury or perceived injury during trespass on DOE property.

TA-20: Sandia Canyon Site

The Sandia site is located along the present truck route to Los Alamos. The east end is marked by the support buildings used for the security force firing range and the west end by where the present road starts to rise out of the canyon bottom to the mesa top (Fig. 1.1). The site was developed for testing of initiators for implosion devices and was actively used for this purpose from the autumn of 1944 to May 1945. Testing involved implosion tests in a steel-lined pit and gun firing in two locations. There are three possible waste disposal areas possibly containing metal scrap, buried gun barrels, and cut-up 3 to 5 inch guns. Contamination would have been polonium (which has decayed away) and possibly uranium. There is a slight possibility of low-level ^{90}Sr contamination, perhaps in an Indian cave as some leaking RaLA sources were reported to have been stored in a cave. Any polonium contamination, if it existed, in any cave would have decayed away. Several equation of state experimentsd using HE were also conducted. One experiment did not detonate fully and scattered HE. Scraps were picked up immediately, and in detailed follow-up surveys, tiny pieces were picked up until no more could be found over a 4-year period (ending in 1973) at which time the "Explosives - Danger - Keep Out" signs were removed. There is no evidence that the area was used by the military for a munitions impact area. With ready public access along a public road, unknown burial location possibilities and possibilities of minor contamination, this site should be investigated in detail.

Possible remedial actions include location and removal of the three material disposal areas and removal of several small areas of surface contamination.

DRAFT

TA-27: Gamma Site

Gamma Site was used from 1946-1948 as a transitional firing site between the shutdown of Alpha and Beta Sites (TA-4 and 5), and the startup of activities at R-Site (TA-15). Probably both depleted and natural uranium were used at this site. Additionally the military did some HE sensitivity testing here (fired 50 caliber bullets into HE, etc.). Also, there are persistent rumors of a 600 ft long 10 ft deep trench dug by a bulldozer for the disposal of some Navy gun barrels, some old live ammunition, and probably some natural uranium. After a number of attempts in the 1960s to find this trench, its location is still unknown. There has been extensive excavation in this area (1949-62) to obtain road base-course materials for Pajarito Road (and others?). On the south side of the road is a fenced-off area where small pieces of HE can occasionally be found on the surface. The extent of uranium contamination is unknown (if any still exists after the considerable excavation) and the concept of buried live ammunition is cause for concern. All of these areas lie close to a heavily traveled road. The location is indicated in Fig. 1-2.

Possible remedial actions include location and removal of the gun barrels and live ammunition and removal of several small areas of uranium contamination. With the possibilities of live ammunition, this work would probably be done by ordnance specialists from the Army in consultation with LAAO and the Laboratory.

TA-33: HP Site

One of the remote sites of the Laboratory, this site has been used for test firing of projectiles and large implosion tests. As a result of these activities, there are scattered debris, pieces of shrapnel, and uranium contamination on the surface. The extent of shrapnel contamination is not well known. After one large test (the last one fired), a piece of shrapnel was found at Bandelier Headquarters.

Shrapnel has been located across a canyon from the firing pads along the border with Bandelier. The extent of the various contaminations is not well known. There is a good possibility that there is an extra disposal trench near waste disposal Area E that has not been identified or marked. This trench would contain metal debris and some uranium contamination.

Also, Area K, a waste disposal sump, is located at TA-33. It potentially contains tritium and uranium contamination. The outfall for septic tank 93 in the same location may be contaminated. The area was marked with a "radioactive" sign in the 1960s--probably for tritium contamination. There is some indication of uranium contamination of the septic tanks. The area is thickly covered with chamisa bushes, which suggests the ground area was disturbed at one time. This chamisa serves as a bedding ground for large animals, e.g., deer. A water outfall in the area provides a probable water source for animals. Cattle have been known to wander into and graze on the land at TA-33. An analysis of tritium hazards to cattle and thus to people suggests the radiological impact would be insignificant. Access to the site was controlled by a guard station, but this station is now inactive so an adventursome member of the public could easily come onto the site. Figures 1-3 and 1-4 indicate locations.

In September 1984 deteriorated wooden catcher boxes for projectiles and the majority of large surface debris (uncontaminated) were removed and buried onsite. Several old structures were removed, contaminated equipment and some contaminated soil were sent to TA-54, and several open shafts were filled.

Further remedial actions might include additional removal of surface contamination, removal of the Area K sump and its potentially contaminated environs, and removal of several structures. Also a sweep of the canyons and Bandelier border should be done to remove shrapnel and possible unknowns. It should be considered whether to take this material to Area G or to expand Area E at TA- 33.

DRAFT

DRAFT

2.0 PRIORITY 2 SITES

The following technical areas and material disposal sites are areas with potential contamination that could result in the offsite migration of materials or are sites in restricted areas with some high explosive hazard potential. Sites with short-term migration potential (less than 5 years) would receive higher priority than sites with long-term migration potential (greater than 5 years).

TA-4: Alpha Site

This was a firing site used from 1944 to 1946. Early tests were varied and not well documented. Most uranium used was probably depleted, but there may have been some natural uranium used. Debris was pushed north to Mortandad Canyon or covered up on site. This site is somewhat accessible to the public (Fig. 2-1.)

Possible remedial actions would likely be removal of uranium contaminated soil.

TA-5: Beta Site

This was used as a firing site from 1944 to 1946. Early tests were varied and not well documented. Half-scale testing on the Fat Man device was done here. Uranium is probably the principal contaminant. The debris was pushed into Mortandad Canyon or covered over. As at Alpha Site, it is somewhat accessible to the public as is shown in Fig. 2-2.

Possible remedial actions include removal of uranium contaminated soil and the few remaining small structures and pieces of equipment.

TA-6 and TA-22: Two-Mile Mesa and TD Sites

DRAFT

The area of these sites is shown in Fig. 2-3. In the early 1950s, three small pits, location unknown, were dug for unknown waste disposal. There are magazines, septic tanks, and an old HE sump in this area, whose conditions are unknown and ought to be investigated.

Possible remedial actions include locating and removing the small waste disposal areas, septic tanks and the HE sump.

TA-15: R-Site

Tons of uranium and multikilogram quantities of beryllium, mercury, and lead have been expended in hydrodynamic testing. Some detailed studies at EF-Site in the 1970s estimated between 3000 to 4500 kg of uranium remained in the 0-5 cm soil layer within 200 m of the firing point and found that some was being transported off EF-site by runoff events. Quantities and the transport phenomena need to be better understood. There are no present estimated quantities for beryllium, lead, and mercury in the environment. (It has been estimated that 100% of the lead and mercury are aerosolized during the tests). TA-15 is shown in Figure 2-4. Ecological study references are given in this section. Further environmental transport studies began in late FY 1984.

Potential remedial actions would include removal of the surface contamination by disposal in a new pit(s) located onsite. The possible volumes are large (>25,000 m^3 of soil) and transport would be considerably more expensive than onsite burial. However, under the current interpretations of the Resource Conservation and Recovery Act (RCRA), the permit applications and 100 year monitoring requirements for an additional disposal area imply costs would be incurred for 100 years - a substantial monitoring liability that may greatly offset cost gains from onsite burial.

DRAFT

With the transport of large volumes of material, public risks from transportation accidents should be factored into any assessment of remedial actions as well as the effect of this much material on the long-range waste management plans.

TA-16: S-Site

This is a rather large site that has incorporated many activities over the years. Former Technical Areas 13, 24, and 25 are now part of this site. Buildings that have been removed had known HE, uranium, strontium, and radium contamination. There are many abandoned buildings contaminated with HE. Poorly documented drain fields full of HE have been removed and others probably exist. Materials disposal Area P needs to be better documented.

Possible remedial actions include implementation of the WX-12 plan for structure removal and extending it to all candidate structures for disposal. The closing of Area P would have to be carefully documented and probably some areas of surface contamination would need removal.

TA-26: D-Site

This site was located near the East Gate to the Laboratory [across the road from the present Philomena's Restaurant (Fig. 2-5)]. The structures were demolished in the mid-1960s. Uncontaminated and possibly slightly

DRAFT

contaminated (uranium and plutonium) concrete debris was pushed over the edge of the cliff onto a shelf on the Los Alamos Canyon wall and then covered with dirt. The environmental status of the contamination is presently unknown.

It is anticipated no remedial actions will be required.

TA-39: Ancho Canyon Site

Many explosive tests have occurred at this remote location. Uranium, lead, mercury, and beryllium were involved in early tests. There is a poorly documented waste disposal pit called Area Y, and the possibility of undocumented pits. Contaminants and their quantities are not known. See Fig. 2-3, 2-6, and 2-7.

Possible remedial actions include cleanup of an inactive test area and significant contamination zones in active test areas. All disposal areas would be located, characterized, and fenced. Include the possibility of removal of one pit.

Area S

This small "disposal" site at TA-11 is really an area for sensitivity tests of HE in the environment. The area is poorly marked, fencing is inadequate. Its location is shown in Fig. 2-8.

Remedial actions, while the experimental use continues, would be limited to new fencing and signs.

Area W

The term "Area W" has been applied to two locations. The real Area W is sodium (slightly contaminated with plutonium and fission products) stored in

two doubly lined vertical tanks buried at an edge of TA-35. The tank tops and valving were entombed in concrete in 1979. A suitable metal placard is installed. There are no actions required. However, the other "Area W" is an abandoned waste treatment facility at TA-35, which is being removed as part of the waste line removal project. In the outfall area from this facility there is known strontium, plutonium, and cesium contamination, which has a good chance for transport to Mortandad Canyon. These locations are shown in Fig. 2-9.

Possible remedial actions would be to build dams to prevent down-canyon movement of significant quantities of surface contamination.

DRAFT

DRAFT

REFERENCES ON URANIUM STUDIES - (MOSTLY DONE AT TA-15)

W. C. Hanson, "Ecological Considerations of Depleted Uranium Munitions," Los Alamos Scientific Laboratory Report LA-5559, (1974).

W. C. Hanson and F. R. Miera, Jr., "Long-Term Ecological Effects of Exposure to Uranium," Los Alamos Scientific Laboratory Report LA-6269 (July 1976).

W. C. Hanson and F. R. Miera, Jr., "Continued Studies of Long-Term Ecological Effects of Exposure to Uranium," Los Alamos Scientific Laboratory Report LA-6742/AFATL-TR-77-35 (June 1977).

W. C. Hanson and F. R. Miera, Jr., "Further Studies of Long-Term Ecological Effects of Exposure to Uranium," Los Alamos Scientific Laboratory Report LA-7162/AFATL-TR-78-8 (July 1978).

G. C. White, J. C. Simpson, and K. V. Bostick, "Studies of Long-Term Ecological Effects of Exposure to Uranium V," Los Alamos Scientific Laboratory Report LA-8221/AFATL-TR-79-101 (May 1980).

DRAFT

3.0 PRIORITY 3 SITES

The following areas have unknown amounts of hazardous materials and/or suspected contamination or are poorly documented areas.

TA-7: Gomez Ranch Site

The only things shown on a 1959 map of this site are two firing pits. No structures were identifed. Notes indicate the site was abandoned in 1945. Nothing else is known. Its location is indicated in Fig. 3-1.

Possible remedial action would be removal of the two pits.

TA-8: Anchor Site West

A large strontium contamination incident was cleaned up in 1954. Cleanup adequacy by today's standards needs to be determined as well as the status of an inoperative septic tank. The site location is given in Fig. 3-1.

Possible remedial actions would be removal of surface contamination and the septic tank.

TA-9: Anchor Site East

This site, where explosives are made, contains 15 industrial waste settling tanks. Many HE contaminated structures have been removed. The site location is shown in Fig. 3-1.

Possible remedial actions include removal of unused waste settling tanks and perhaps some HE drain fields.

DRAFT

TA-11: K-Site

There is documentation referring to a burn pit (which may have been a firing pit that was "removed" in 1956) and of a RaLa contamination incident (with strontium contamination). The present status of the pit and what was used there and the adequacy of the cleanup from the contamination incident is unknown (Fig. 3-1 and 2-8).

Possible remedial actions include excavation of the pit and some surface contamination removal.

TA-12: L-Site

There is an abandoned firing pit and the possibility of some strontium contaminated parts from an old exposure device at this site that was abandoned in 1953. The contamination status of this area is presently unknown. The location is given in Fig. 3-1.

Assume that remedial actions would be excavation of the pit and removal of some surface contamination.

TA-36: Kappa Site

Many explosives tests have been conducted, some of which spread uranium around the firing points. The present extent of the contamination and

determination of any other types of contamination is not known. The contents of a sump pit and the status of waste disposal Area AA (reputed to be two pits containing ash from fires in which tuballoy was burned) need to be determined. Locations are provided in Figs. 3-1 and 3-2.

DRAFT

The firing sites are still active. However, M-Division long-range plans indicate three sites will be retired in the next 5-10 yr. It is anticipated a significant cleanup effort may be required.

TA-40: DF Site

There is a firing pit and a burning pit at this site (Figs. 3-1 and 3-3). The status and possible contamination are not presently well known but should be available when the correct contacts are made.

Possible remedial actions would be excavations of the two pits.

TA-44: Los Angeles Shop

This machine shop in Los Angeles, California, (on the corner of Barranca Street and North Avenue 19) was apparently used when a fire in C-Shop cut down on the machining that could be done at TA-1 in the 1945 era. No contamination is expected, but this needs to be documented.

No remedial actions are anticipated.

DRAFT

Area M

This was designated as a surface disposal area (by the AEC in ~1947) for construction debris. As occurs at dumping areas, other things have been added to the construction debris (the only hazard of which was some asbestos covered pipe) including some uranium-contaminated firing site debris, old chemical bottles, and garbage cans that were probably used to carry explosives. Its location is in an isolated clearing behind a security fence (Fig. 3-4). An initial plan for cleanup was developed in 1984.

Area N

This is a burial pit at TA-15 that is supposed to contain remnants of demolished structures that have been exposed to explosives or chemical contamination. The dates, buildings, and disposal methods (e.g., where the combustibles burned?) are presently unknown. See Fig. 3-5 for its location.

Possible remedial actions include excavation of this pit.

Area Q

This is a pit (~30' x 32') at TA-8 that was used to bury metal such as guns, projectiles imbedded in steel, and some Little Boy bomb parts (classified ?). Its location is identified on maps (see Figs. 3-1 and 3-6) but not by any markers or fences. It is not likely but it cannot be certified that no explosives were buried along with the other components.

There is the possibility of slight uranium contamination of some of the components.

Possible remedial actions include placing a fence and markers or to excavate the pit (by hand to avoid explosives problems) and remove the material to TA-54. The latter action would be preferred.

Area R

This is an old burning ground for waste explosives at S-Site (TA-16). During construction of the 132 Group buildings and a new burning ground, the ground surface from this area was graded and pushed into a nearby canyon. The contamination status is unknown (Fig. 3-7).

No remedial actions are anticipated.

Area X

This disposal site is located at the southeast corner of building TA-35-2 (Figs. 3-1 and 3-8). It contains the tanks, pump pit, and reactor vessel of the LAPRE II reactor. The site is not presently marked. There should be little, if any, contamination at this site.

A possible remedial action would be to move this material to TA-54.

Area Z

This is believed to be a place for firing site debris or a burn pit at TA-15 (R-Site). Its location is indicated in Figs. 3-1 and 3-9.

Remedial actions might be excavation of the pit.

DRAFT

4.0 PRIORITY 4 SITES

The following nine technical areas have a slight chance that contamination in some form might be present or some waste disposal might have occurred. No remedial actions are presently anticipated. Some may be required when the facilities are decommissioned.

TA-2 and TA-41: Omega Site and W-Site

These two sites are located in Omega Canyon (upper Los Alamos Canyon) as shown in Fig. 4-1. TA-2 is the site where the Omega West and former Water Boiler Reactors are located. There have been occasional releases of effluents and other radioactive materials (in small quantities) to the stream bed in the canyon. There may be some localized contamination on this small site. TA-41 has been used over the years as offices for engineering support of weapons activities. Some tritium related work has occurred there. Additionally there is a large vault built into the hillside. There should be very little potential for contamination from these two areas. The stream in Los Alamos Canyon received some effluents (containing trace amounts of plutonium and polonium) from the early days of TA-1. Sediment sampling upstream and downstream of these areas has been part of the routine environmental surveillance program for over six years. Trace amounts of plutonium, ^{90}Sr, and ^{137}Cs are detected on some samples.

TA-14: Q-Site

Removal of TA-14-2 (called a "closed chamber") containing alpha (uranium) and HE contamination occurred in 1973. Apparently, there was an HE contaminated sump associated with this building. One supposes that the cleanup was done well because building TA-14-39 was built where building TA-14-2 had been. This is expected to be confirmed when the appropriate documentation is located (Figs. 4-1 and 4-2).

DRAFT

TA-28, 29, 37: Magazines A, B, and C

These three areas are magazine areas for the storage of high explosives. It is not likely that anything needs to be done, but it should be determined that this indeed is true. Magazine B was abandoned in 1957. The structures are gone. For reference, their locations are shown in Fig. 4-1.

TA-46: WA Site

Small amounts of hazardous materials have been used at this site. The only known environmental releases are of UF_6 gas. No contamination is expected, but this should be verified (Fig. 4-1.)

TA-47: BR-Site

This was the Bruns Railhead in Santa Fe. Apparently it was the end of a spur line for the Santa Fe railroad that was used as a receiving point for materials to be shipped to Los Alamos. It is our present understanding that it was located in the vicinity of the present intersection of St. Michael's Drive and Cerrillos Road in Santa Fe. No contamination is suspected or likely. This needs to be confirmed. A layout drawing of the site is given in Fig. 4-3.

TA-56: Subterrene Basalt Site

This site (which was abandoned in 1976) was used for testing of the earth penetrator concept, which was an attempt to make holes in the earth by melting rock rather than drilling through rock. It is unlikely that there would be any environmental contamination, but this needs to be verified. Its location is indicated in Fig. 4-1.

DRAFT

5.0 PRIORITY 5 SITES

For the following sites, there are no presently planned actions under the site characterization program. Four sites (all in Los Alamos County) have been released to the public and have no expected contamination. No remedial actions are anticipated.

TA-19: East Gate Laboratory

This site (Fig. 5-1) was located east of the main gate (now Philomena's Restaurant) in Santa Fe County. Electronics work was done there. Also sealed sources were used for various purposes, including monkey irradiation experiments with sealed RaLa sources. At one time some low-level uranium contamination was found on some shelves. After it was no longer needed for Laboratory purposes, the buildings were turned over to the Los Alamos Radio Club. The buildings were eventually removed and the site was sold. Since that time various owners have done extensive reshaping of the land surface. No further actions are considered possible or necessary.

TA-30: Electronics Test Area

This site is believed to have been what its name implies--an electronics test area. It was located in the vicinity of the present wellness center in TA-3 and was removed in 1946. There should have been no contamination associated with this area. No drawings have been found indicating the exact location.

TA-31: East Receiving Yard

This site, removed in 1954, was located near the intersection of East Road and Canyon Road in Los Alamos at the location of the present Christian Church (Fig. 5-2). Drawings indicate it was used for receiving shipments to the Laboratory. There should have been no contamination associated with this

DRAFT

area. It would be of some academic interest to see if the septic tank located over the canyon edge has been removed. All of the buildings have been removed.

TA-32: Medical Research Laboratory

This laboratory was located in the area of the present school administration building (Fig. 5-3). It was a barracks type building where some monkey irradiation experiments were done as well as industrial hygiene-type activities. There should have been no significant contamination. It would be of some academic interest to see if the septic tanks (2) associated with this site have been removed. The site was abandoned in 1954 and all buildings were removed.

6.0 COMPLETED ACTIONS

DRAFT

The following sites and areas have undergone extensive characterization between 1972 and 1983. Any necessary remedial actions have been completed. They are included in this list for completeness. All the sites, with the exception of TA-42, are on lands that have been released to the public.

Two sites, TA-10 and Lower Los Alamos Canyon, are placed in the completed action category although final disposition has not yet been made. At TA-10 there is one small location, identified by markers, that has subsurface ^{90}Sr contamination (below 24 ft deep). DOE (Oak Ridge) and Los Alamos County are expected to place a legal restriction on subsurface construction in this small area, which will then complete these actions. The final report for Lower Los Alamos Canyon has been drafted but not issued. It is expected that the recommended action of no remedial action will be implemented.

Since 1974, three former technical areas, TA-1, TA-10, and TA-45, have undergone extensive characterization and, where necessary, remedial action. The activities in these areas have been thoroughly documented and are reported in the references listed below. The locations concerned are shown in Figs. 6-1, 6-2, and 6-3, respectively. No further site-characterization activities are planned for these sites.

The TA-10 and TA-45 efforts were conducted under the Department of Energy's Formerly Utilized Sites--Remedial Action Program (FUSRAP). Evaluation of canyons that received some forms of liquid waste and removal of most remaining portions of a buried industrial waste line in the Los Alamos townsite were also completed under the FUSRAP program. At the conclusion of FUSRAP, results and suggested actions were made in several reports that are referenced in this section. The canyon areas included in the survey are given in Fig. 6-3 and the removed waste line is shown in Fig. 6-4. As a result of the intensive FUSRAP efforts, no further actions, other than

DRAFT

routine environmental surveillance in the canyons, are planned. The extent of these efforts can be shown by the amount of money spent to complete these actions. See Table VI-1.

In 1951 an incinerator facility was built at TA-42 (Fig. 6-5) to reduce the volume of plutonium contaminated wastes. After initial testing, it was realized that the facility could not handle the job it was intended to do and needed major modifications before it could operate properly. It was never used for full-scale operation and was shut down in 1952. The buildings were used for storage and some decontamination work from 1957 to 1969. It was not considered to be attractive for any future use and all structures were removed in 1978. After removal, extensive environmental monitoring was done. After remedial actions were completed, the Los Alamos Area Office of DOE concurred with the LASL recommendation that the area had been decontaminated as to as-low-as-practicable. (There are a few locations on a hillside well beyond any future practical use that have trace amounts of plutonium contamination). We believe no further actions are required at this site (Ref. Harper and Garde).

DRAFT

TABLE VI-1

SURVEY AND REMEDIAL ACTION COSTS

Location	Expenditure	Year(s)
TA-1	$769,000[a]	1975-1976
TA-10	500,000	1977-1982
Industrial Waste Line	200,000	1977
Canyon Studies + TA-45	1,000,000[b]	1977-1982
Total	$ 2,469,000	

[a]Does not include preliminary environmental survey costs.
[b]Does not include costs of initial investigations (begun in 1972) as part of the routine environmental surveillance program.

DRAFT

REFERENCES RELATING TO COMPLETED ACTIONS

A. John Ahlquist, Alan K. Stoker, and Linda K. Trocki, "Radiological Survey and Decontamination of the Former Main Technical Area (TA-1) at Los Alamos, New Mexico, "Los Alamos Scientific Laboratory Report LA-6887 (Dec. 1977).

Los Alamos Scientific Laboratory, "Radiological Survey of the Bayo Canyon, Los Alamos, New Mexico," Department of Energy Report DOE/EV-0005/15 (June 1979).

R. W. Ferenbaugh, Thomas E. Buhl, Alan K. Stoker, and Wayne R. Hansen, "Environmental Analysis of the Bayo Canyon (TA-10) Site, Los Alamos, New Mexico," Los Alamos National Laboratory Report LA-9252-MS (May 1982).

Environmental Surveillance Group, "Formerly Utilized MED/AEC Sites Remedial Action Program, Radiological Survey of the Site of a Former Radioactive Liquid Waste Treatment Plant (TA-45) and the Effluent Receiving Areas of Acid, Pueblo, and Los Alamos Canyons, Los Alamos, New Mexico," Los Alamos National Laboratory Report LA-8890-ENV (USDOE Report DOE/EV-0005/30) (May 1981).

Thomas Gunderson, Thomas Buhl, Richard Romero, and John Salazar, "Radiological Survey Following Decontamination Activities Near the TA-45 Site," Los Alamos National Laboratory Report LA-9831-MS (July 1983).

Thomas C. Gunderson and A. John Ahlquist, "Formerly Utilized MED/AEC Sites Remedial Action Program - Removal of a Contaminated Industrial Waste Line, Los Alamos New Mexico," US Department of Energy Report DOE/EV-0005/14 (April 1979).

Roger W. Ferenbaugh, Thomas E. Buhl, Alan K. Stoker, and Wayne R. Hansen, "Environmental Analysis of Acid/Middle Pueblo Canyon, Los Alamos, New Mexico," Los Alamos National Laboratory Report LA-9409-MS (August 1982).

DRAFT

Roger W. Ferenbaugh, et al., "Environmental Analysis of Lower Pueblo/Lower Los Alamos Canyon, Los Alamos, New Mexico," Los Alamos National Laboratory Report to be issued.

Johnny R. Harper and Raymond Garde, "The Decommissioning of the TA-42 Plutonium Contaminated Incinerator Facility," Los Alamos National Laboratory Report LA-9077-MS (Nov. 1981).

DRAFT

7.0 AREAS NOT INCLUDED

The following technical areas and waste disposal areas are not included in site characterization plans, as they are reasonably well understood under the routine environmental or special surveillance programs. No special characterization is felt necessary at this time. The technical area locations are given in Fig. 7-1 and the material disposal areas in Fig.7-2. Upon decommissioning, required site cleanup would be included in decommissioning costs and as such is beyond the scope of this report.

Presently, known contaminated hillsides and canyons onsite are not included in this site characterization. Additional characterization activities required would be those in late Phase II or early Phase III. These areas will be reconsidered when Phase I activities are completed. Routine surveillance activities indicate no offsite transport (other than that already evaluated in the FUSRAP program) from the canyon system is occurring.

Description

TA-3: South Mesa Site

This is the main technical area for the Laboratory and houses the Laboratory's computing center, Van de Graaff, shops, materials sciences, etc. Contamination potential is rather low.

TA-18: Pajarito Site

Critical assembly studies are conducted here. The main hazards are from direct radiation and not environmental contamination.

TA-21: DP Site

The former plutonium processing plant and some waste treatment facilities were located here. Present hazardous material usage is restricted to enriched uranium and tritium.

DRAFT

TA-35: Ten Site

Former hazardous material usage was principally tritium and strontium. Present hazards would be some tritium and direct radiation. Oil spill problems are under investigation.

TA-43: Health Research Laboratory

There is no contamination expected with this active site. Any possible discharges of hazardous materials are monitored by the Waste Management Group (HSE-7). See Fig. 7-1.

TA-48: Radiochemistry Site

Effluents go to a waste treatment plant at TA-50.

TA-49: Frijoles Mesa

This is an abandoned site that included towers for atmospheric effects studies. Several deep test wells to the aquifer for routine monitoring are located here.

TA-50: Waste Management Site

Treated effluents from waste disposal are under surveillance.

TA-51: Radiation Exposure Facility

No contamination is expected at this small site where animal irradiation experiments were conducted. See Fig. 7-1.

DRAFT

TA-52: Reactor Development Site

The reactor under development at this site was never operated due to changes in programmatic funding. It is presently a site for office buildings. No contamination is expected. Nearby contamination is considered in the TA-4 discussion. See Fig. 7-1.

TA-53: Meson Facility

Liquid effluents from cooling water streams and gaseous effluents (principally activated air) are closely studied.

TA-54: Mesita Del Buey

Burial of radioactive, chemical, classified, and high explosive contaminated waste are presently done here. (Monitoring is done under the DOE Interim Waste Management Program.)

TA-55: PF Site

The new plutonium facility has state-of-the-art effluent control. No releases have been seen nor are any expected.

TA-57: Fenton Hill Site

This geothermal test area is 37 mi. east of LANL and is under close surveillance.

TA-59: OH Site

Industrial hygiene, environmental surveillance, environmental research, and epidemiology groups located here do not have significant environmental pollutants.

DRAFT

Areas A and B

These are inactive rad-waste sites located near TA-21 and are monitored under the Interim Waste Management Program.

Area C

This is an inactive mixed waste site near TA-50. Surface remedial action was completed in 1984. It is presently monitored under the Interim Waste Management Program.

Area D

This is an inactive rad-waste site at TA-33 that is monitored under the Interim Waste Management Program. The site is actually several test shafts that were contaminated principally with ^{210}Po that has now decayed.

Area E

This is an inactive mixed waste site at TA-33 that is monitored under the Interim Waste Management Program.

Area F

This is an inactive mixed waste site near TA-6 that has some potential of HE waste. It is monitored under the Interim Waste Management Program.

Area G

This is the present radioactive waste site at TA-54. It is monitored under the Interim Waste Management Program.

DRAFT

Area H

This is an active mixed waste site at TA-54 used for classified shapes. Some tritium contamination has been associated with this disposal. It is monitored under the Interim Waste Management Program.

Area J

This is an active area at TA-54 for burial of items with suspect HE contamination. These items occasionally have some radioactive contamination. It is monitored under the Interim Waste Management Program.

Area L

This is the present area at TA-54 for disposal of chemical wastes. It is monitored under the Interim Waste Management Program.

Area T

This is an inactive rad-waste site at TA-21 monitored under the Interim Waste Management Program.

Areas U and V

These are inactive mixed waste sites at TA-21 that are monitored under the Interim Waste Management Program.

Hillsides and Canyons

Known contaminated canyons and hillsides are given in Table 7-1 and shown in Figures 7-3 to 7-6.

TABLE 7-1

DRAFT

KNOWN CONTAMINATED CANYONS AND HILLSIDES ONSITE

DP Canyon
Upper Los Alamos Canyon
Mortandad Canyon
Ten-Site Canyon
Potrillo Canyon
TA-1 Hillsides

DRAFT

8.0 MUNITIONS IMPACT AREAS

Although it is beyond Laboratory responsibility and authority, it should be mentioned that there are several munitions impact areas in Los Alamos County. Several areas, such as the head of Bayo Canyon and Rendija Canyon, are in the midst of developed or possible areas to be developed by private individuals. Others, such as Pajarito Canyon, are on present Laboratory property. Control and monitoring of those areas are the responsibility of LAAO, which has an arrangement with ordnance people from Fort Bliss to periodically monitor these areas. Any materials found in the surveys are blown up by the Fort Bliss teams with explosives they bring with them. The Laboratory is not informed about these surveys and does not participate in them.

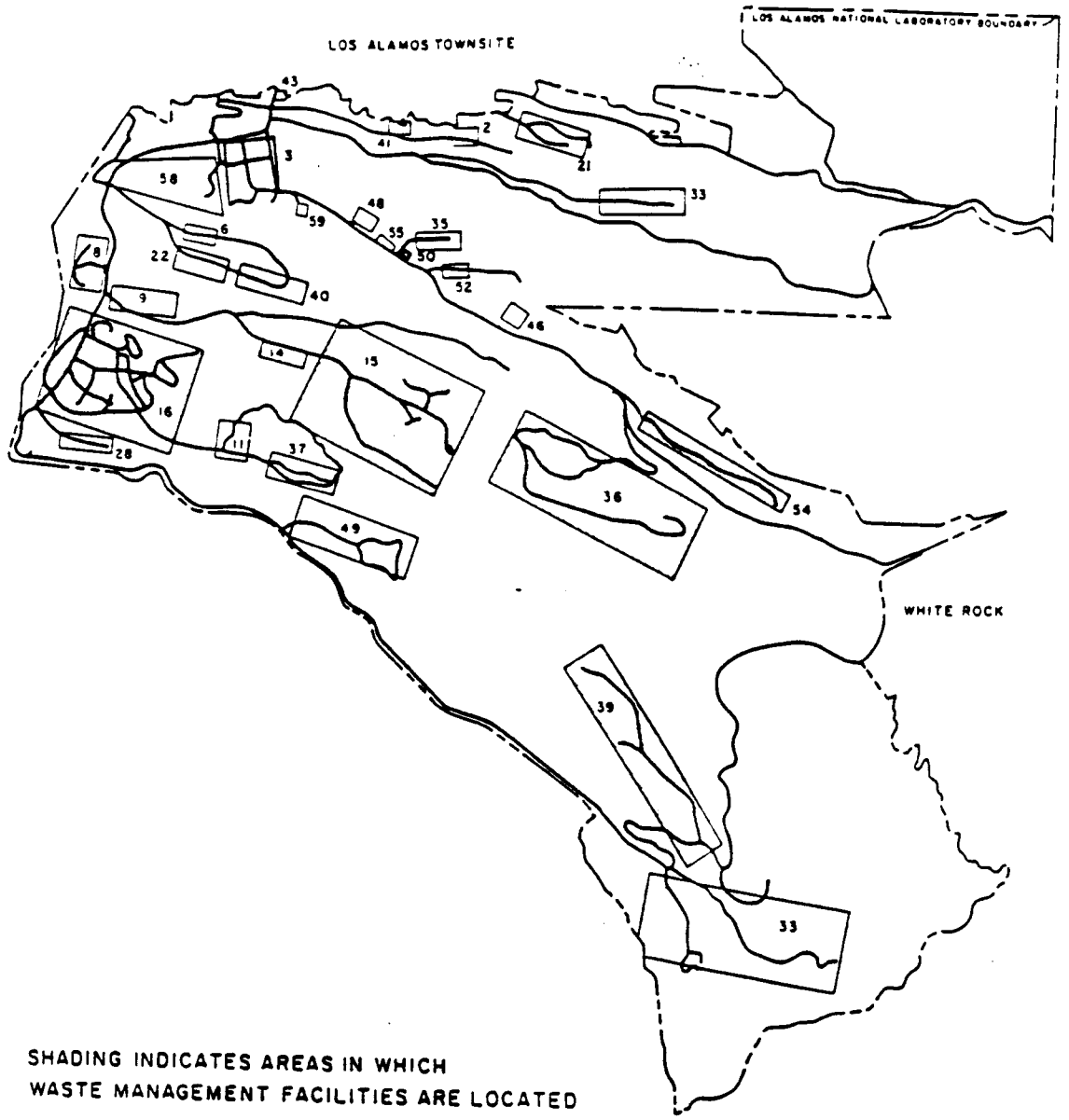
DRAFT

INDEX

		Page
TA-1		6-1
TA-2		4-1
TA-3		7-1
TA-4		2-1
TA-5		2-1
TA-6		2-2
TA-7		3-1
TA-8		3-1
TA-9		3-1
TA-10		6-1
TA-11		3-2
TA-12		3-2
TA-13	now part of TA-16	2-3
TA-14		4-1
TA-15		2-2
TA-16		2-3
TA-17	not built	---
TA-18		7-1
TA-19		5-1
TA-20		1-1
TA-21		7-1
TA-22		2-2
TA-23	now part of TA-9	3-1
TA-24	now part of TA-16	2-3
TA-25	now part of TA-16	2-3
TA-26		2-3
TA-27		1-2
TA-28		4-2
TA-29		4-2
TA-30		5-1
TA-31		5-1
TA-32		5-2
TA-33		1-2
TA-34	not built	---
TA-35		7-2
TA-36		3-2
TA-37		4-2
TA-38	not built	---
TA-39		2-4
TA-40		3-3
TA-41		4-1

DRAFT

TA-42		6-1
TA-43		7-2
TA-44		3-3
TA-45		6-1
TA-46		4-2
TA-47		4-2
TA-48		7-2
TA-49		7-2
TA-50		7-2
TA-51		7-2
TA-52		7-3
TA-53		7-3
TA-54		7-3
TA-55		7-3
TA-56		4-2
TA-57		7-3
TA-58	proposed site	---
TA-59		7-3
Area A		7-4
Area B		7-4
Area C		7-4
Area D		7-4
Area E		7-4
Area F		7-4
Area G		7-4
Area H		7-5
Area I	letter not used	---
Area J		7-5
Area K	(see TA-33)	3-1
Area L		7-5
Area M		3-4
Area N		3-4
Area O	letter not used	---
Area P	(see TA-16)	2-3
Area Q		3-4
Area R		3-5
Area S		2-4
Area T		7-5
Area U		7-5
Area V		7-5
Area W		2-4
Area X		3-5
Area Y	(see TA-39)	2-4
Area Z		3-5
Area AA	(see TA-36)	3-2



SHADING INDICATES AREAS IN WHICH WASTE MANAGEMENT FACILITIES ARE LOCATED

N

4000 0 4000

SCALE

Reference for "Site Characterization Technical Plans for the Los Alamos National Laboratory"

LOS ALAMOS
TECHNICAL AREAS

PREPARED FOR
LOS ALAMOS NATIONAL LABORATORY
LOS ALAMOS, NEW MEXICO

IT CORPORATION

DRAWN BY	MJG 11/26/84	CHECKED BY	APPROVED BY	DRAWING NUMBER 6635.02 A-1

32803

2.0 FACILITY DESCRIPTION

2.1 GENERAL DESCRIPTION

Los Alamos National Laboratory (Los Alamos) is located in Los Alamos County in north central New Mexico (Figure 2-1). The laboratory is approximately 60 miles north-northeast of Albuquerque and 25 miles northwest of Santa Fe. The laboratory, which occupies an area of 43 square miles, and the associated residential areas of Los Alamos and White Rock are situated on Pajarito Plateau. The Plateau consists of a series of finger-like mesas separated by deep east-west trending canyons. The mesa tops range in elevation from approximately 7800 feet at the flank of Jemez Mountain (located to the west of Los Alamos) to about 6200 feet at their eastern extent where they terminate above the Rio Grande Valley. Intermittent streams lie at the bottoms of the east-west trending canyons.

Los Alamos is divided into 32 active Technical Areas (TA's) (Figure 2-2). Hazardous chemical wastes can be generated in virtually all of these areas. Hazardous waste management facilities addressed in this permit application are located in Technical Areas 14, 15, 16, 36, 39, 50 and 54. Hazardous waste management activities occupy only a small portion of the Laboratory. The following waste management facilities located as noted are addressed in this permit application:

- Technical Areas 14, 15, 16, 36, and 39
  - thermal treatment facilities, used to burn or detonate waste high explosives, high explosives-contaminated material and reactives
- Technical Area 50
  - batch treatment system and associated waste container storage area
  - chemical waste incinerator
- Technical Area 54, Area L
  - waste transfer, packaging and storage facilities, used for accumulation, packaging and storage of chemical wastes
  - treatment tanks, used for the neutralization, oxidation and evaporation of various wastes.
  - land disposal facility, Los Alamos' primary chemical waste landfill operation where wastes are buried within shafts

All of the above facilities have interim authority status, with the exception of the TA-50 waste incinerator. These facilities are described in the following sections.

2.1.1 Thermal Treatment Facilities

Facilities used for both the open burning and the detonation of waste high explosives (HE) are located at the Laboratory. Although these facilities are included in the Part A submission, they are not included in the Part B Permit Application because 40 CFR regulations for facilities of this nature have not been promulgated. This Part B Application will be amended when such regulations are in place. These facilities are described in the following sections.

2.1.1.1 Technical Area 16 (TA-16) Thermal Treatment Facilities

The thermal treatment facilities located at TA-16 include three general types. One type consists of a sand pad which is surrounded on at least two sides by a berm or a natural hillside. Waste explosives or explosives-contaminated equipment are placed on these pads and remotely burned using an "electric match" firing device. There are three facilities of this type at TA-16. A second type of thermal treatment facility present at TA-16 consists of a sand-filled metal pan on which five smaller shallow pans lined with fire brick are located. Waste HE fluids are poured into these pans and the HE is remotely ignited, with an "electric match". There is one facility of this type at the Laboratory. About 55 gallons of waste are burned approximately once a month. The third type of facility present at TA-16 is used to burn sludges containing waste HE. These facilities consist of steel cone-shaped vessels having a diameter of about five feet, buried with only the upper three to four feet of the vessel above ground. The steel vessels are filled with sand and gravel and an open fluids drain is located at the bottom of the cone. Sludge HE is gravity fed into the top of the cone, onto the sand and gravel bed. A heavy steel cap is then placed over the top of the cone and hot air is forced into the cone through air ducts. The hot air dries the waste sludge and liquids from the sludge migrate downward through the sand and gravel bed and through the fluids drain. Effluent from these drains is regulated by NPDES permit (NM 0028355). When the remaining explosive material is relatively free of moisture, the steel cap is removed from the cone and the explosive is ignited remotely with an "electric match". There are two

facilities of this type at Los Alamos; both of these are located in Technical Area 16. Explosives are burned at these two facilities at a rate of about one burn per week. Each burn consists of about 750 pounds of waste explosive sludge.

In some cases, the burn pad sand or surface is contaminated by barium (D005), which is a constituent of some HE, prior to flashing or burning. Since the burn pad sand contains EP Toxic barium (see Section 3.0), it is drummed, stored and disposed of as a hazardous waste.

2.1.1.2 Technical Areas 14, 15, 36, and 39 Thermal Treatment Facilities

Waste HE detonation sites are located at Los Alamos in Technical Areas 14, 15, 36, and 39. These sites are used routinely to detonate scrap HE, failed experimental detonations, unneeded classified explosives shapes, other HE determined to be excess, and small quantities of reactive chemicals. These sites consist of firing pads often located within a small canyon. Associated facilities at these sites include bunkers which are occupied by technical personnel during detonations. Prior to all firings, nearby roads are checked and kept clear.

2.1.2 Technical Area 50 (TA-50) Facilities

2.1.2.1 Batch Treatment System and Container Storage Area

The Batch Treatment System is located in Building 1 at Technical Area 50 (Figure 2-3). The system consists of a totally enclosed, vented, 500-gallon pressure vessel equipped with a filtering system, condenser, and vacuum transfer lines. Total system washdown between batches allows for the treatment of incompatible wastes in the facility. Wastes treated in the Batch Treatment System include cyanide, chromate plating solutions, and solutions of acids, bases and heavy metals.

Three waste streams comprise the bulk of the waste treated in the Batch Treatment System, although the system is flexible enough to allow treatment of other wastes that may be generated through new Laboratory projects. These streams are an acid/base waste which contains copper, chromate plating waste, and waste cyanide plating solutions. Los Alamos wishes to obtain a permit to treat hazardous wastes in the batch treatment system.

A chemical waste storage area is located in the same room housing the Batch Treatment System. Storage space consists of a bermed area encompassing 16 square feet. The area is designed to accommodate four 55-gallon waste drums. Wastes are stored in this area prior to treatment in the Batch Treatment System. Only compatible wastes are stored in this area at one time. Although waste residence time in this area is generally only thirty to sixty days, Los Alamos may store waste in this area in excess of 90 days to provide for operational flexibility.

A waste transfer and packaging area is also housed in the room in which the Batch Treatment System is located. This area consists of a small area which is covered with a ventilation hood. Small quantities of wastes are repackaged within this area, when necessary.

2.1.2.2 Chemical Waste Incinerator

The waste incinerator is located in Building 37 at Technical Area 50 (Figure 2-3). The highly modified, controlled air incinerator is rated at a nominal 45 kilograms per hour waste feed throughput. The incinerator was developed as part of a continuing incinerator study and demonstration program being conducted by Los Alamos and is currently permitted to burn PCB-contaminated liquid materials. Modifications to the incinerator include additions of liquid and solid waste feed preparation lines, a continuous ash removal system, a high-efficiency off-gas cleanup system, and backup utility systems. Standard combustion equipment has been modified to permit effective incineration of waste in solid, liquid, slurry, or gaseous form. Particular attention has been given to engineering for proper waste containment, resulting in a system that is safe for evaluating the incineration of hazardous chemicals and certain radioactive waste forms. Los Alamos wishes to obtain a permit to burn RCRA-regulated wastes in this incinerator. Once Los Alamos receives approval to operate the incinerator for the destruction of RCRA wastes, many wastes that are currently landfilled will be incinerated.

2.1.3 Technical Area 54 (TA-54), Area L Facilities

2.1.3.1 Waste Transfer, Packaging and Storage Facilities

A single-story metal building encompassing 196 square feet and a roofed concrete storage pad encompassing 1595 square feet are located in Area L of

Technical Area 54. These facilities are used for the accumulation, packaging and storage of waste containers generated from throughout the Laboratory (Figure 2-4). Area L of Technical Area 54 is an area of about three acres surrounded by an eight-feet-high chain-link and barbed-wire fence (Figure 2-5). Currently active waste management facilities located within this area include four waste treatment tanks and one waste disposal shaft, as well as the transfer, packaging and storage facilities. The metal building has a concrete floor having a design standard load-bearing capacity of 250 pounds per square foot. Three shallow sumps covered by fiberglass grates are located within the floor of the building (Figure 2-6). The storage pad has a concrete floor having a design standard load-bearing capacity of 700 pounds per square foot (Figure 2-7, sheets 1 and 2).

Hazardous waste containers generated at the various Los Alamos laboratories are delivered to the waste transfer, packaging and storage facilities on a routine basis. Wastes are segregated into compatible types and placed upon the three fiberglass grates located in the metal building or within one of the six storage cells on the roofed concrete pad. Wastes packaged in small containers are placed into lab packs (Figure 2-8). Also, vermiculite is added to 55-gallon drums containing liquids in these facilities. Wastes suitable for recycling are consolidated into drums and any damaged or leaking drums are repackaged into larger drums in these facilities. Los Alamos wishes to obtain a permit to operate the waste transfer, packaging and storage facilities.

2.1.3.2 Treatment Tanks

Four 1665-gallon ten-gauge carbon steel tanks are located at Area L of Technical Area 54. The tanks are lined with plastic. These tanks are used to neutralize, oxidize and evaporate wastes. The tanks are located on a bermed concrete pad as shown in Figure 2-9. The waste most commonly oxidized in these tanks is lithium hydride. Ammonium bifluoride (a "non-RCRA" waste) is the waste most commonly evaporated in the tanks. Los Alamos wishes to obtain a permit to treat hazardous wastes in these tanks.

2.1.3.3 Land Disposal Facilities

As of March 1985, land disposal facilities located in Area L include 34 shafts which range in diameter from three to eight feet. Thirty-three of the shafts

have been capped. All of these shafts are about 60 feet deep. When in use, the shafts are covered with a heavy steel cap. When filled, the shafts are capped with a three-feet-thick concrete plug. Each shaft is used for the disposal of a single category of chemical wastes to assure that incompatible chemicals will not mix and react. Los Alamos wishes to obtain a permit to operate the open disposal shafts and future shafts expected to be needed. The approximate number and locations of these future shafts are shown on Figure 2-5.

2.1.4 Topographic Maps

Topographic maps, as required by 40 CFR §270.14(b)(19) (NMHWMR 302.A.4.b.[1]), are presented in Figure 2-3 for the TA-50 facilities and Figure 2-4 for the TA-54 facilities. A topographic map with the legal boundaries of the hazardous waste management facility site is presented in Figure 2-21. In accordance with the note located at the end of 40 CFR §270.14(b)(19) (NMHWMR 302.A.4.b.[1]), maps at a scale of 1" = 400' are provided. Los Alamos requests that EPA accept maps at this scale due to the large size of the various hazardous waste management facilities. Contour lines on these maps are at intervals of ten feet, reflecting the mountainous terrain present at Los Alamos. A second map of Area L at TA-54 at a scale of 1" = 20' and contour interval of two feet is provided (Figure 2-10). The potential for flooding of Laboratory waste management facilities is described in Section 2.2.2. There are no storm sewers in the vicinity of the hazardous waste management facilities; storm water runoff is diverted by ditches and culverts. Sanitary sewage lines in the vicinity of the incinerator are shown in Figure 2-11. No sanitary sewage is generated at Area L.

2.1.5 Wells

The municipal and industrial water supply for the Laboratory and community is from 17 deep wells in three well fields and one gallery. The wells are located on Pajarito Plateau and in canyons east of the Laboratory. Water is pumped from the main aquifer, which lies 350 m (1150 ft) to 260 m (850 ft) below the surface of the plateau. The gallery collects spring discharge from a perched water zone in the volcanics on the flanks of the mountains located west of Los Alamos.

There are no injection wells in the vicinity of Los Alamos. The location of supply wells and the gallery, as well as the locations of test wells, springs, observation holes and surface water sampling stations are shown on Figure 2-12. Surface, well, and spring waters are routinely sampled and analyzed for radionuclides as well as heavy metals, flourides, nitrates, carbonates, biocarbonates, silica, sodium, magnesium and conductivity. Analytical results are published annually by the Los Alamos Environmental Surveillance Group (HSE-8) and copies are submitted annually to the EPA Regional Administrator and the Director of the NMEID.

2.1.6 Wind Rose

An annual wind rose (1983 data) for Technical Area 59, which is located less than one mile northwest of Technical Area 50, is shown in Figure 2-13. The major wind component is from the west-northwest.

The mountainous terrain at Los Alamos produces a distinct daily wind pattern. At night, winds tend to flow downward from the Jemez Mountains generally out of the west-northwest and northwest. During the day, the pattern reverses and light upslope winds come generally from the southeast and south-southeast. Los Alamos is a generally light wind site with an annual average wind speed of 2.8 meters per second. Only twelve percent of wind speeds in 1983 were greater than five meters per second and 38 percent were less than 2.5 meters per second (Los Alamos National Laboratory, 1983).

2.1.7 Land Use

The communities located closest to the Laboratory facilities are Los Alamos, which is located just north of the Laboratory, and White Rock, which is located a few miles to the east-southeast of the Laboratory (Figure 2-1). The total population of Los Alamos County is 19,000 to 20,000. Most of Los Alamos County, as well as adjoining portions of neighboring Sandoval, Rio Arriba, and Santa Fe Counties, is undeveloped. The only significant development in Los Alamos County are the Laboratory facilities and the associated residential communities. Large tracts of land in the Jemez Mountains which lie to the north, west, and south of Los Alamos are held by the U.S. Forest Service and the National Park Service. This land is largely occupied by pine, fir, and aspen forests. Agriculture in the vicinity of the Laboratory is limited to

home gardens and some cattle grazing. In the river valleys to the east, agriculture is limited to the cultivation of relatively small, irrigated plots. Primary crops are corn, chili, tree fruits, and alfalfa.

2.2 LOCATION INFORMATION

2.2.1 Seismic Standard

Consistent with the definition presented in 40 CFR 270.2 (NMHWMR 102.A.29) and the criteria provided in §270.14(b)(11)(i) (NMHWMR 302.A.4.b.[1]) and §264.18 (NMHWMR 206.B.8.a), the Area L chemical waste land disposal facility, TA-50 batch treatment and container storage area, and the TA-50 incinerator are existing facilities and thus seismic design standards are not applicable.

The Area L waste transfer, packaging, and storage facilities and the treatment tanks are not existing hazardous waste facilities according to the definitions given in 40 CFR §270.2 (NMHWMR 102.A.29). Additionally, these facilities are located in Los Alamos County, New Mexico, which is listed in Appendix VI of 40 CFR §264 (NMHWMR 206.B.8). Figure 2-14 shows the location of Los Alamos facilities and the locations of nearby fault traces. This information and that presented in Section 2.2.4 is provided to demonstrate compliance with §264.18(a) (NMHWMR 206.B.8.a). As can be noted from Figure 2-14, no faults or fault traces with Holocene (or other) displacements have been located within 3000 feet of the locations of the pertinent waste management facilities.

2.2.2 Floodplain Standard

A floodplain map of Los Alamos National Laboratory is unavailable. However, personnel from the U.S. Department of the Army, Albuquerque District Corps of Engineers, Engineering and Planning Division, have evaluated the potential for flooding and have concluded that Los Alamos waste management facilities do not lie within the 100-year floodplain (see Appendix E).

2.2.3 Soils

An intensive soil survey of Los Alamos County, New Mexico has been prepared by the USDA, Soil Conservation Service, and Forest Service (1978). This soil survey was published in June 1978 under DOE Contract W-7405-ENG.36. It classifies the soils according to the soil series, soil type, and soil phase.

The principal parent materials of about 95 percent of the Los Alamos soils are Bandelier Tuff, volcanic rocks of the Tschicoma and Puye Formations, the balsaltic rocks of Chino Mesa, and the remnants of the El Cajete pumice. The remaining five percent of the soils were formed from colluvium, alluvium, andesitic rocks of the Paliza Canyon Formation, Cerro Rubio Quartz Latites, and tuffs associated with sediments of Cerro Toledo Rhyolite. Textures of these soils range from very fine sandy loams and clay loams to gravelly, sandy loams and stony, silty clay loams.

The soils in Area L (landfill area, Technical Area 54) are classified as Hackroy sandy loam. These soils consist of shallow, well-drained soils that have formed in material weathered from volcanic tuff on mesa tops (see Figure 2-15).

The Bandelier Tuff is formed by a series of ash flows and ash falls which are described as nonwelded, moderately welded, and welded tuff. The nonwelded, moderately welded and welded tuff grade one into the other, both vertically and horizontally (see Appendix F, "Physical Characteristics of the Bandelier Tuff"; Purtymun, no date).

The following description of the Hackroy soil series is taken from the published soil survey report for Los Alamos County:

> The surface layer of the Hackroy soils is a brown sandy loam, about 10 cm thick. The subsoil is a reddish brown clay, gravelly clay, or clay loam, about 20 cm thick. The depth to tuff bedrock and the effective rooting depth are 20 to 50 cm. Both the Hackroy and the Hackroy-Rock outcrop mapping units exhibit slow permeability and low available water capacities. The Hackroy mapping unit has medium runoff and only moderate water erosion hazard, whereas the Hackroy-Rock outcrop unit has a moderate to severe water erosion hazard and medium to high runoff.
>
> A typical profile of Hackroy sandy loam (one to five percent slope) is described as follows:
>
> A1 0-8 cm, brown sandy loam, brown moist; weak fine subangular blocky structure; hard and friable moist; many fine roots; common fine tubular pores; milkily alkaline; abrupt smooth boundary.

B2 8-25 cm, dark reddish brown clay, dark reddish brown moist; moderate fine prismatic structure; hard and firm moist, sticky and plastic wet; many fine roots; few very fine tubular pores; 3% gravel; continuous clay films on peds; mildly alkaline; abrupt smooth boundary.

B3 25-30 cm, yellowish red gravelly clay, yellowish red moist; moderate fine subangular blocky structure; slightly hard and firm moist, sticky and plastic wet; many fine roots; 25% gravel, slightly calcareous; neutral.

R 30+ cm, tuff bedrock.

The soils are classified in the Unified Soil Classification System as SM, SM-SC, ML, and CL-ML. The Hackroy soils range from a sandy loam (SM) in the top eight centimeters of depth to a clay loam (CL) in depths of from eight to 30 centimeters. Permeability rates range from five to 15 centimeters per hour in the top layers down to 0.5-0.15 centimeters per hour or less in the lower layers. The shrink-swell potential is low. The available water holding capacity is 0.11 to 0.21 centimeters per centimeter and the soil pH is 6.6 to 7.8.

2.2.4 Geology

2.2.4.1 Regional Geology

Los Alamos National Laboratory is located on the east-central edge of the Jemez Mountains. The Jemez Mountains are formed by a complex pile of volcanic rocks along the northwest margin of the Rio Grande rift in north-central New Mexico (Figure 2-16). The immense volume of Pliocene and Quaternary extrusive rocks that represents the Jemez volcanic field covers an area of over 30 miles east-to-west and 50 miles north-to-south and is over 4000 feet in thickness near the center.

The Jemez volcanic field uncomformably overlies the eastern part of the Nacimiento uplift and the southern Chama basin. The Chama basin, the San Juan Basin and the Gallina-Archuleta arch are part of the Colorado Plateau, whereas the Brazos and Nacimiento uplifts (Figure 2-16) are generally included with the Southern Rocky Mountains (Woodward, 1974). These features attained their present structural outlines during the Laramide orogeny of Late Cretaceous and

early Tertiary time. Superimposed on these Laramide structures is the Rio Grande rift that began to form during the Miocene. Volcanism in the Jemez area began in Pliocene time after initial development of the rift with extrusive rocks accumulating along the western margin of the rift contemporaneously with late stages of rifting (Woodward, 1974). Initial eruptions were dominantly mafic to intermediate flows, which probably formed low, coalescing shields. Eruptive activity culminated in the early Pleistocene with explosive, caldera-forming eruptions of ash-flow tuffs, which covered most of the shields and formed two calderas, the largest and youngest of which is the Valles caldera located seven to ten miles west of Los Alamos, New Mexico (Kudo, 1974). Extensive studies of the Jemez volcanism have been performed by Ross et al. (1961), Bailey et al. (1969), Smith and Bailey (1966, 1968) and Smith et al. (1970).

Major tectonic features here are dominated by vertical movements. Minor horizontal shift and compressional features, however, occur in parts of the Colorado Plateau and Southern Rocky Mountain structures. The stratigraphy, structure and tectonics of the Jemez Mountains and surrounding area have been the topics of a large number of reconnaissance and detailed studies (c.f., Dane, 1948; Kelley, 1954, 1955; Griggs, 1964; Woodward et al., 1972, 1973, 1974).

2.2.4.2 Site-Specific Geology

The Los Alamos facilities are located on the western part of the Pajarito Plateau (Figure 2-17), which forms an apron of volcanic and sedimentary rocks around the eastern flanks of the Jemez Mountains. The plateau is aligned approximately north-south and is about 20 to 25 miles in length and five to ten miles wide. It is bounded on the east by White Rock Canyon (which contains the Rio Grande), on the north and northeast by the Puye Escarpment and on the west by Sierra de los Valles. The Pajarito Plateau slopes gently eastward from an elevation of about 7500 feet near the mountains toward the Rio Grande where it terminates at an elevation of about 5400 feet in steep slopes and cliffs formed by down cutting of the river. The plateau has been dissected into a number of narrow mesas by southeastward-trending intermittent streams. The stratigraphy and structural features of the Pajarito Plateau are described in the following sections.

Stratigraphy

The Pajarito Plateau is formed by a series of sediments and volcanic extrusive rocks and is typical of a terrain produced by concurrent sedimentation and volcanism (Figure 2-18). The base of the plateau is represented by the Miocene Santa Fe Group, which in this area consists of friable to moderately well cemented siltstone and sandstones that contains lenses of conglomerate and clay (Purtymun and Johansen, 1974). Some basalt flows are interbedded with the sediments in the unit. The lower part of the Santa Fe is comprised of fine arkosic sand and the upper part is composed of very coarse arkosic sand, latitic gravels and volcanic detritus.

Overlying the Santa Fe Group are the volcanic extrusives of the Tschicoma Formation, which consist of latite, quartz-latite flows and pyroclastic rocks. The Tschicoma has been extruded through the Santa Fe west of Los Alamos, forming the lower part of the Jemez Volcanic Pile. The thickness of the Tschicoma is unknown as the base of the unit is not exposed in the Pajarito Plateau area.

Interfingering with the Tschicoma and overlying the Santa Fe Group are the conglomeratic and fanglomeratic rocks of the Puye Formation. The Puye contains a thin basal conglomerate composed of pebble through small boulder size clasts of quartzite, quartz, granite and volcanic debris in a matrix of coarse sand (Griggs, 1964). Overlying the conglomerate is a thicker fanglomerate comprised of debris that was washed eastward from the volcanic rocks of the Tschicoma Formation. The fanglomerate consists of a series of conglomerates and siltstones with up-to-boulder size clasts in a matrix of silt and sand. Beds of volcanic ash that were water-lain or possibly represent air fall materials are also present within the Puye Formation. The overall thickness of the Puye ranges from about 725 feet in the north-central part of the Pajarito Plateau to 220 to 270 feet along the east edge of the Puye Escarpment to 60 to 80 feet at the north end of White Rock Canyon (Griggs, 1964).

Overlying and interfingering with the conglomerates of the Puye Formation are the basaltic rocks of Chino Mesa. The basalt, which is over 1300 feet thick

near the volcanic vents near Chino Mesa from which it originated (Figure 2-18), thickens southward along the river and thins westward (Griggs, 1964).

The Pajarito Plateau is capped for the most part by the Bandelier Tuff, which ranges in thickness from about 1050 feet along the western edge of the plateau to about 260 feet just west of White Rock, New Mexico. The Bandelier is composed of a basal unit of pebble-size pumice, overlain by a poorly sorted rhyolite tuff breccia and capped by a cliff-forming welded rhyolite tuff.

Structure

The description of the geologic structure presented here was taken primarily from Griggs (1964). The geologic structure of surface rocks in the Los Alamos area is simple, although the structure of underlying rocks may be complex. The regional dip of surface rocks of the Pajarito Plateau is one to two degrees east. Beds of the Santa Fe Group in the easternmost part of the area dip gently to the west.

The rocks of the Pajarito Plateau are broken by several northward-trending normal faults (Figure 2-14). The Pajarito fault zone lies near the western edge of the plateau in the southern part of the area. The Bandelier Tuff at the southern edge of the area and on the east side of the Pajarito fault is downthrown about 300 feet in relation to the tuff on the west side of the fault. The fault farther north splits into two smaller subparallel faults, both downthrown to the east. Displacement decreases northward until both faults die out. The fault planes dip steeply to the east.

Two other normal faults, en echelon to the Pajarito zone, are located to the northeast. These faults are downthrown to the west and the fault planes dip to the west also. The westernmost of the faults extends southward for a short distance subparallel to the northern extension of the Pajarito zone. The Bandelier Tuff is displaced about 50 feet across the en echelon faults. The older Tschicoma Formation, however, may be displaced as much as 500 feet along the easternmost fault. This difference in displacement tends to indicate recurring movement along a pre-Bandelier fault.

2.2.5 Groundwater[1]

The only aquifer of the Pajarito Plateau capable of providing municipal and industrial water supply is in rocks of the Santa Fe Group and Puye Formation. The upper surface of this aquifer rises westward from the Rio Grande through the Santa Fe and into the lower part of the Puye beneath the central and western parts of the plateau (Figure 2-18). The water in the aquifer moves from the major recharge area of the intermountain basins of the Valles Caldera (the apparent western boundary of the aquifer) eastward toward the Rio Grande where a part is discharged into the river through seeps and springs (Figure 2-19). The groundwater flow rate in the upper part of the aquifer is estimated to be about 100 feet per year. The intermountain basins are filled with deposits of clay, sand and gravels which are underlain by volcanic debris resulting from the collapse of the caldera. The sediments and volcanics in the basins are highly permeable and saturated and recharge the main aquifer in the Santa Fe Group.

Minor amounts of recharge may occur in the deep canyons containing perennial streams on the flanks of the mountains. The intermittent streams in canyons which are cut into the plateau add little if any recharge to the main aquifer. Water balance calculations for the area of the Los Alamos facilities indicate that the annual evapotranspiration rate exceeds the annual precipitation rate. Additionally, field investigations have shown that infiltration of precipitation into the Bandelier Tuff is essentially zero. Further, the moisture content of the tuff at the Los Alamos facilities is quite low, varying from about 0.2 to two percent by weight at depths below ten feet. Typically, moisture contents greater than four percent are required to permit migration of moisture in the Bandelier Tuff.

Figure 2-19 shows the locations of a number of wells completed in the Santa Fe and Puye Formations. Also shown are the contours drawn to depict the elevation of the top of the main aquifer and the depths at which water was encountered in the main aquifer at each well location. The gradient on the surface of the aquifer averages about 60 feet per mile beneath the plateau in

[1] The discussion of groundwater conditions in the Los Alamos area was extracted primarily from Purtymun and Johansen (1978) and Griggs (1964).

the Puye Formation with the depth to water decreasing along with the gentle slope of the surface of the plateau from about 1200 feet to the west to about 600 feet to the east. The depth to the water table under the Los Alamos facilities ranges from about 900 to 1200 feet except in the deeper canyons. The gradient of the aquifer steepens to about 100 feet per mile along the eastern edge of plateau because of the lesser permeability of the Santa Fe Group sediments. The aquifer is under water table conditions in the western margin of the plateau and is artesian along the eastern edge and along the Rio Grande.

As expected, wells completed into the high permeability sediments and volcanics of the Santa Fe Group and Puye Formation are very productive. Wells located in the eastern well field, which penetrate about 1600 feet of the fine grained sediments of the Santa Fe Group, yield an average of 500 gallons per minute with a specific capacity of eight gallons per minute per foot of drawdown. Wells in the central part of the plateau, which are completed in the Puye Formation and coarser sediments of the Santa Fe Group, are higher yielding and average 1000 gallons per minute with a specific capacity of about 35 gallons per minute per foot of drawdown.

The chemical quality of water varies among wells due to local conditions within the aquifer. In general, the quality of water is good; total dissolved solids (TDS) range from about 200 milligrams per liter to less than 500 milligrams per liter.

The Tschicoma Formation and the Bandelier Tuff, west of the Pajarito Plateau on the flank of the mountains, contain localized, small bodies of perched water. The Bandelier Tuff contains no perched water beneath the Pajarito Plateau.

2.3 TRAFFIC PATTERNS

2.3.1 General

The rugged topography of alternating mesas and canyons present at Los Alamos limits traffic circulation to only a few major arterial roads. This road system is shown in Figure 2-2 and Appendix N, Figure 2. A total of 132 miles of paved roads are present at Los Alamos.

The main access route to Los Alamos is State Road 4. The majority of traffic to Los Alamos approaches on State Road 4 from the east, although an alternate access route, State Road 4 through the Jemez Mountains, is available.

The pattern of east-west trending canyons at Los Alamos prohibits north-south automobile travel in nearly all portions of the laboratory with the exception of Diamond Drive. Los Alamos Canyon is spanned at Diamond Drive by an 820-feet-long steel arch bridge which was completed in 1951 (Los Alamos National Laboratory, 1984). This bridge provides the main access between the Los Alamos facilities located on either side of Los Alamos Canyon.

Currently, over 9000 people are employed at Los Alamos (including Los Alamos personnel and contractors). Roughly 3500 people commute to the laboratory daily from communities other than Los Alamos and White Rock (Los Alamos National Laboratory, 1982).

2.3.2 Waste Collection Areas

The majority of the hazardous waste is generated at eight technical areas. The eight technical areas include four buildings in Technical Area (TA) Three (TA-3-29, TA-3-39, TA-3-40 and TA-3-66), TA-16, TA-43, TA-46 and TA-48. Wastes from all eight of these locations will be collected routinely.

Chemical wastes can be generated at all of the 32 active Los Alamos technical areas. A schematic diagram of Los Alamos waste management activities is shown in Figure 2-20. Wastes are transported from the generating laboratories and shops to the various waste management facilities on an as-needed basis. The chemical wastes are generally received in small bottles (i.e., a gallon or less) or containers. These are packed in cardboard boxes or drums for transport. The volume of waste received in each instance varies considerably. Because wastes are generated at facilities dispersed throughout the laboratory, waste transport occurs (at least occasionally) on nearly all of the roads located within the Laboratory.

2.3.3 Routes of Travel

As detailed in Section 2.0, the majority of the wastes will be taken from the point of origin to TA-54, Area L Facilities (Waste Transfer, Packaging, Storage and Land Disposal Facilities) and TA-50 (Batch Waste Treatment System and the Chemical Waste Incinerator). As a result, traffic routes which will be used to transport hazardous cargo will be limited primarily to Pajarito Road and Mesita del Buey, with occasional travel on State Road 4 and West Jemez Road.

2.3.4 Traffic Volumes

According to a report entitled "TA-3 Traffic Study", January 10, 1985, the peak traffic periods are between 7:15 and 8:15 in the morning and 4:15 and 5:30 in the afternoon. Although the report is limited to the TA-3 area, a few intersections outside the TA-3 area were examined. Approximately 5,100 people work in the TA-3 area. Consequently, the data presented in the study should reflect the existing traffic conditions at Los Alamos. However, the data for TA-3 will have higher vehicular volumes than the rest of Los Alamos. Maps depicting vehicular traffic count movements at various intersections in the vicinity of TA-3 from the cited document are included in Appendix F-1.

Based on 1984 traffic counts, the Diamond and Jemez intersection had a volume of 3,255 cars during the morning and 2,824 in the afternoon. At the intersection of Diamond and Pajarito, the 1984 afternoon volume was 1,284.

2.3.5 Traffic Control Signals

Traffic flow at the Laboratory is controlled by traffic lights, stop signs, and yield signs. Access to the high-security technical areas is controlled by security guards and is restricted to vehicles having specific identification. Only personnel having appropriate security clearance and identification, or escorted visitors are allowed access to the secured technical areas. Vehicles and personnel entering these technical areas are subject to periodic search by security personnel. Traffic signals and signs located in the vicinity of hazardous waste management facilities are shown in Figures 2-3 and 2-4.

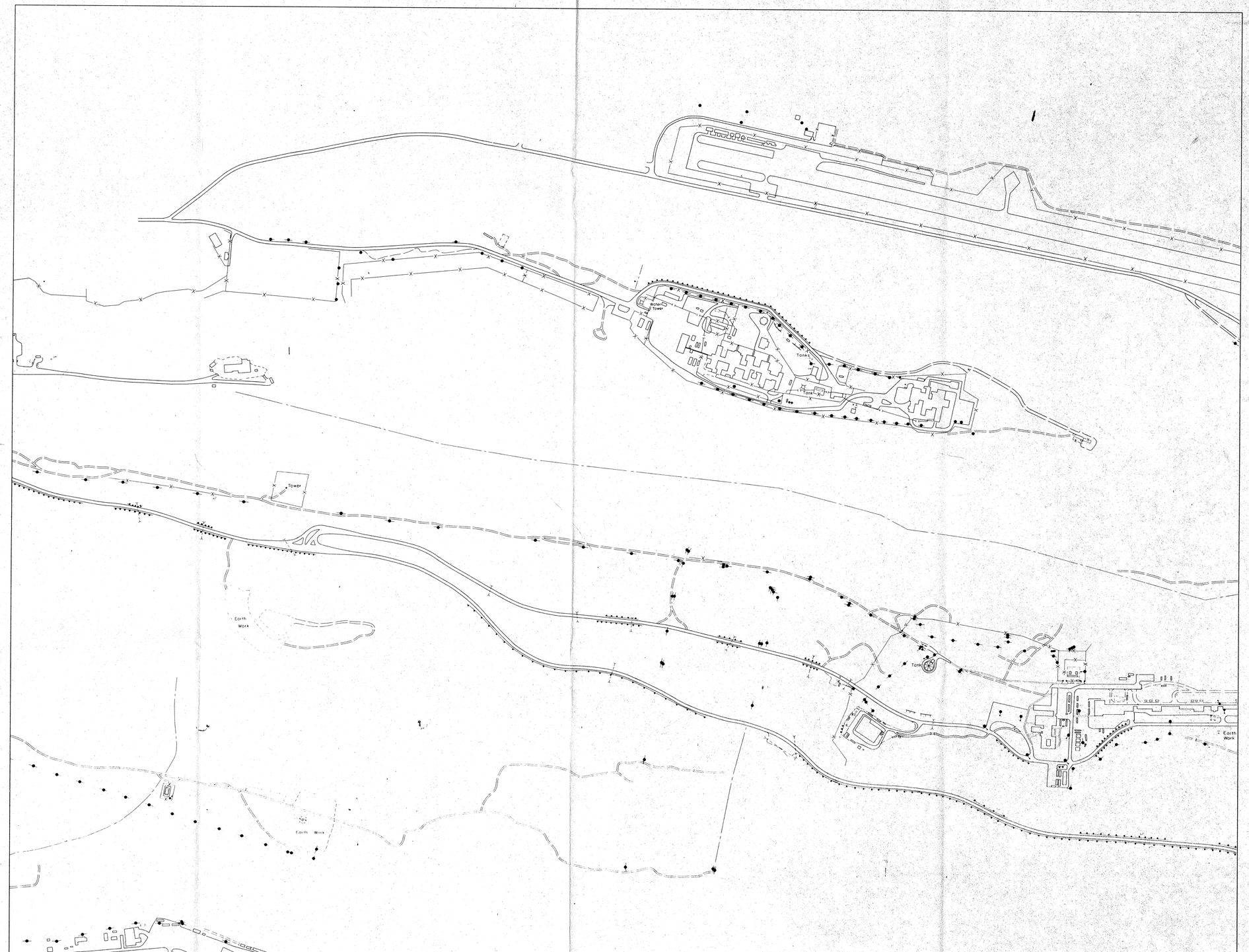
Traffic lights are in place at all major intersections. Traffic signs are used at "T"s throughout Los Alamos.

2.3.6 Road Load-Bearing Capacity

Roads at Los Alamos carrying the greatest traffic volumes include Diamond Drive, Pajarito Road, and East and West Jemez Drive. These roads were constructed with a ten-inch-thick base overlain with a five-inch-thick asphaltic concrete surface. These roads were designed and built in conformance with American Association of State Highway Transportation Officials (AASHTO) specification HS-20. This specification is intended to accommodate truck loading capacities of 32,000 pounds per axle.

2.3.7 Road Surfacing from Technical Areas to Transfer, Storage and Disposal Facilities

The roads from the technical areas to the transfer, storage and disposal facilities are two-lane roads with an asphalt surface.

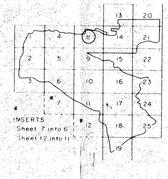


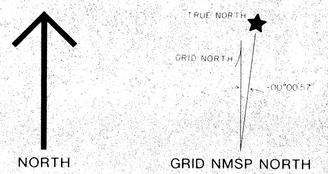
LEGEND

X 93.0	SPOT ELEVATION	N 1,768,000 — NMSP GRID
6900	INDEX CONTOUR	3,989,000 N — UTM GRID
	INTERMEDIATE CONTOUR 10ft.	N 240+00 — LASL GRID
	SUPPLEMENTARY CONTOUR 5ft.	
	CONTOURS THROUGH HEAVY VEGETATION	
	COUNTY LINES – TRANSFERRED FROM USGS 1:24,000 QUADRANGLES	
	DOE BOUNDARY – X & Y COORDINATE DATA PROVIDED BY LASL	
	DOE BOUNDARY – SURVEY DESCRIPTIONS OR RECORD PLATS PROVIDED BY LASL	
	DOE BOUNDARY – TRANSFERRED FROM USGS 1:24,000 QUADRANGLES BASED ON PROJECTED COUNTY LINES	

35	TECHNICAL AREA NO.		TOWER
	BUILDING		PIPE LINE
	FENCE		CUT LINE OR POWER LINE CLEARANCE SCAR
	PAVED ROAD		WATER TOWER
	DIRT ROAD	Tank	TANK
	JEEP TRAIL		POND
	CULVERT	RW	RETAINING WALL
	GUARD RAIL		EARTH DIKES OR BLASTING SHIELDS
	TUNNEL	Earth Work	EARTH WORK OR GRADED AREAS
	EARTHEN BUNKERS		GATE
	POWER POLE		

SHEET LAYOUT





MAPPING COMPLETED BY PHOTOGRAMMETRIC METHODS, UTILIZING 1:30,000, 1:12,000 & 1:13,200 PHOTOGRAPHY, OBTAINED IN NOV. 1976 & JUNE 1980 WITH ZEISS RMK A 15/23 CAMERAS OF 153.42 & 152.43mm C.F.L. RESPECTIVELY, MAPPING BASED ON CONTROL SURVEYS TIED TO THE NEW MEXICO STATE PLANE COORDINATE SYSTEM (CENTRAL ZONE). MAPPING COMPLETED IN ACCORDANCE WITH NATIONAL MAP ACCURACY SPECIFICATIONS.

400 200 0 400 800 1200 1600 FEET

100 50 0 100 200 300 400 500 METER

GRAPHIC SCALE: 1 in.=400 ft. CONTOUR INTERVAL 10 ft.

TECHNICAL AREAS

(7) OMEGA SITE (21) DP–SITE (35) TEN SITE

(63) MPF–SITE

LOS ALAMOS SCIENTIFIC LABORATORY

ROVAY ENGINEERS, INC.
LIBRARY
AERIAL MAPPING
DIVISION

LAB JOB NO. 5682

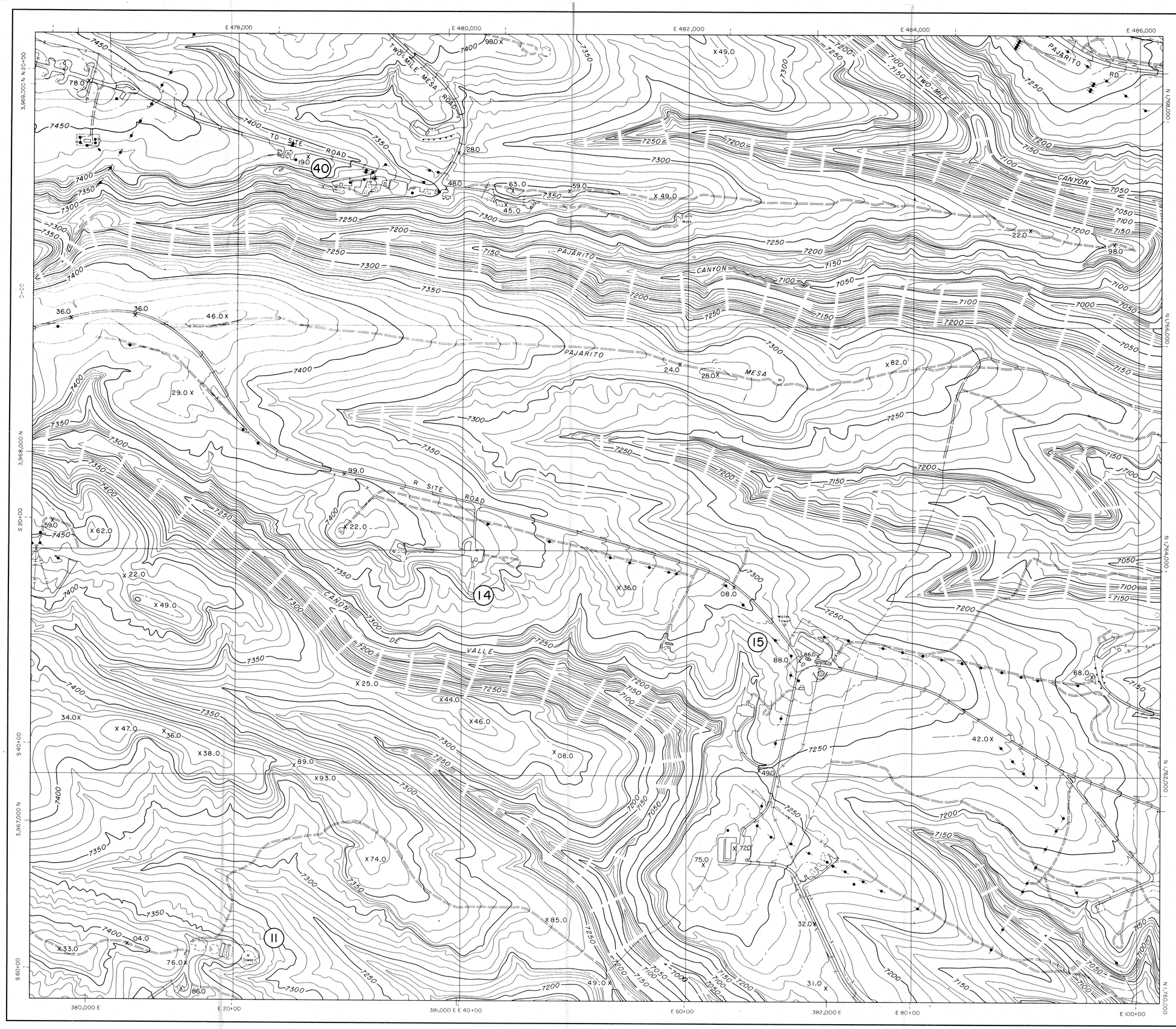
1"=400' SCALE

PLAN / TOPO

SHEET 8 OF 25

MF ENG-R 5277

C-0880

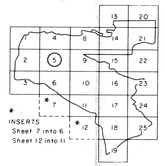


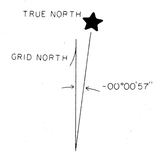
LEGEND

x 93.0	SPOT ELEVATION	N 1,768,000	NMSP GRID
6900	INDEX CONTOUR	3,989,000 N	UTM GRID
	INTERMEDIATE CONTOUR 10ft.	N 240+00	LASL GRID
	SUPPLEMENTARY CONTOUR 5ft.		
	CONTOURS THROUGH HEAVY VEGETATION		
	COUNTY LINES – TRANSFERRED FROM USGS 1:24,000 QUADRANGLES.		
	DOE BOUNDARY – X & Y COORDINATE DATA PROVIDED BY LASL.		
	DOE BOUNDARY – SURVEY DESCRIPTIONS OR RECORD PLATS PROVIDED BY LASL.		
	DOE BOUNDARY – TRANSFERRED FROM USGS 1:24,000 QUADRANGLES BASED ON PROJECTED COUNTY LINES.		

35	TECHNICAL AREA NO.		TOWER
	BUILDING		PIPE LINE
	FENCE		CUT LINE OR POWER LINE CLEARANCE SCAR
	PAVED ROAD		WATER TOWER
	DIRT ROAD	Tank	TANK
	JEEP TRAIL		POND
	CULVERT	RW	RETAINING WALL
	GUARD RAIL		EARTH DIKES OR BLASTING SHIELDS
	TUNNEL	Earth Work	EARTH WORK OR GRADED AREAS
	EARTHEN BUNKERS		GATE
	POWER POLE		EVACUATION ROUTE

SHEET LAYOUT





MAPPING COMPLETED BY PHOTOGRAMMETRIC METHODS, UTILIZING 1:30,000, 1:12,000 & 1:13,200 PHOTOGRAPHY, OBTAINED IN NOV. 1976 & JUNE 1980 WITH ZEISS RMK A 15/23 CAMERAS OF 153.42 & 152.43mm C.F.L. RESPECTIVELY, MAPPING BASED ON CONTROL SURVEYS TIED TO THE NEW MEXICO STATE PLANE COORDINATE SYSTEM (CENTRAL ZONE). MAPPING COMPLETED IN ACCORDANCE WITH NATIONAL MAP ACCURACY SPECIFICATIONS.

400 200 0 400 800 1200 1600 FEET

100 50 0 100 200 300 400 500 METER

GRAPHIC SCALE: 1 in.=400 ft. CONTOUR INTERVAL 10 ft.

TECHNICAL AREAS

11 K–SITE
14 Q–SITE
15 R–SITE
40 DF–SITE

LOS ALAMOS SCIENTIFIC LABORATORY

BOVAY ENGINEERS, INC.
LINBAUGH AERIAL MAPPING DIVISION

LAB JOB NO. 5682
1"=400' SCALE
PLAN / TOPO
SHEET 5 OF 25

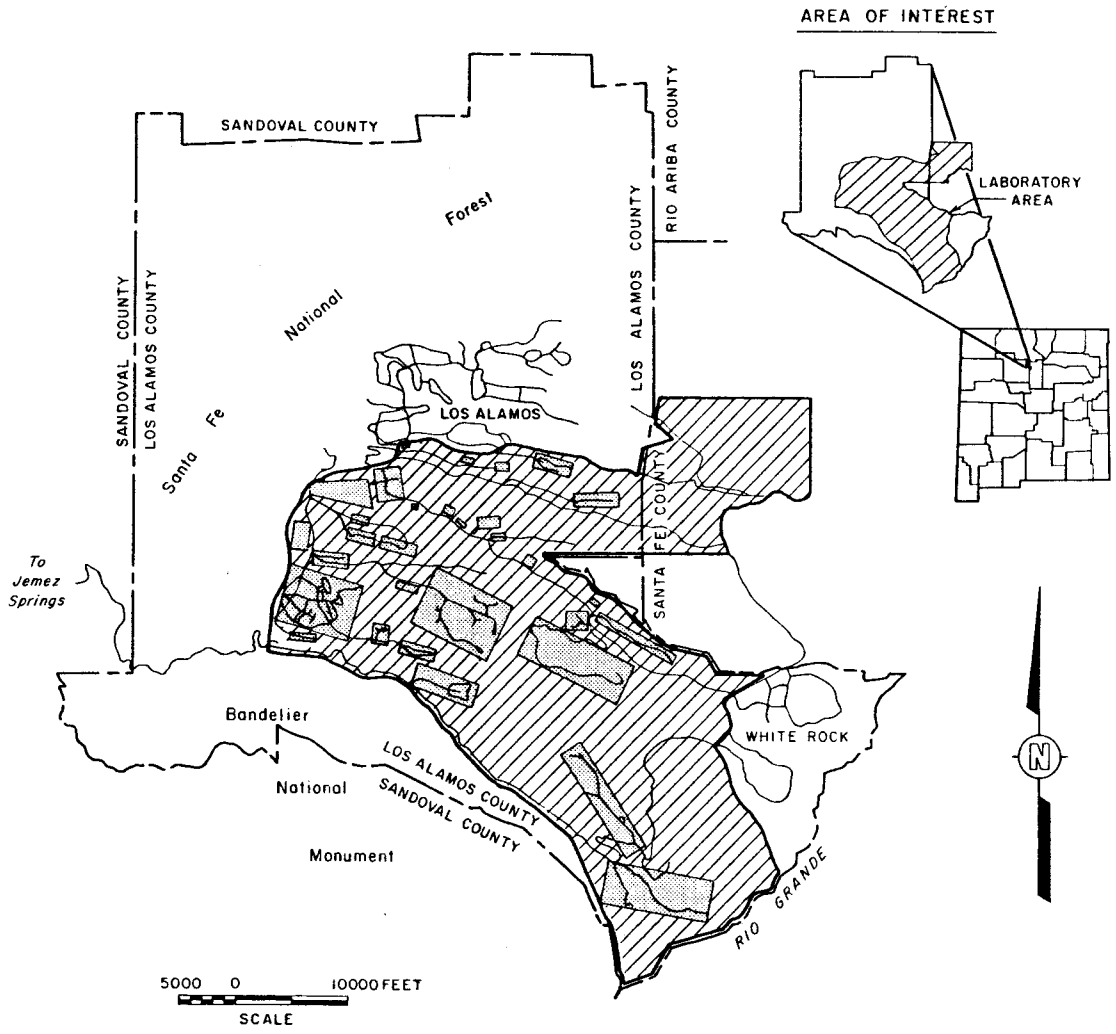


FIGURE 2-1

LOCATION MAP

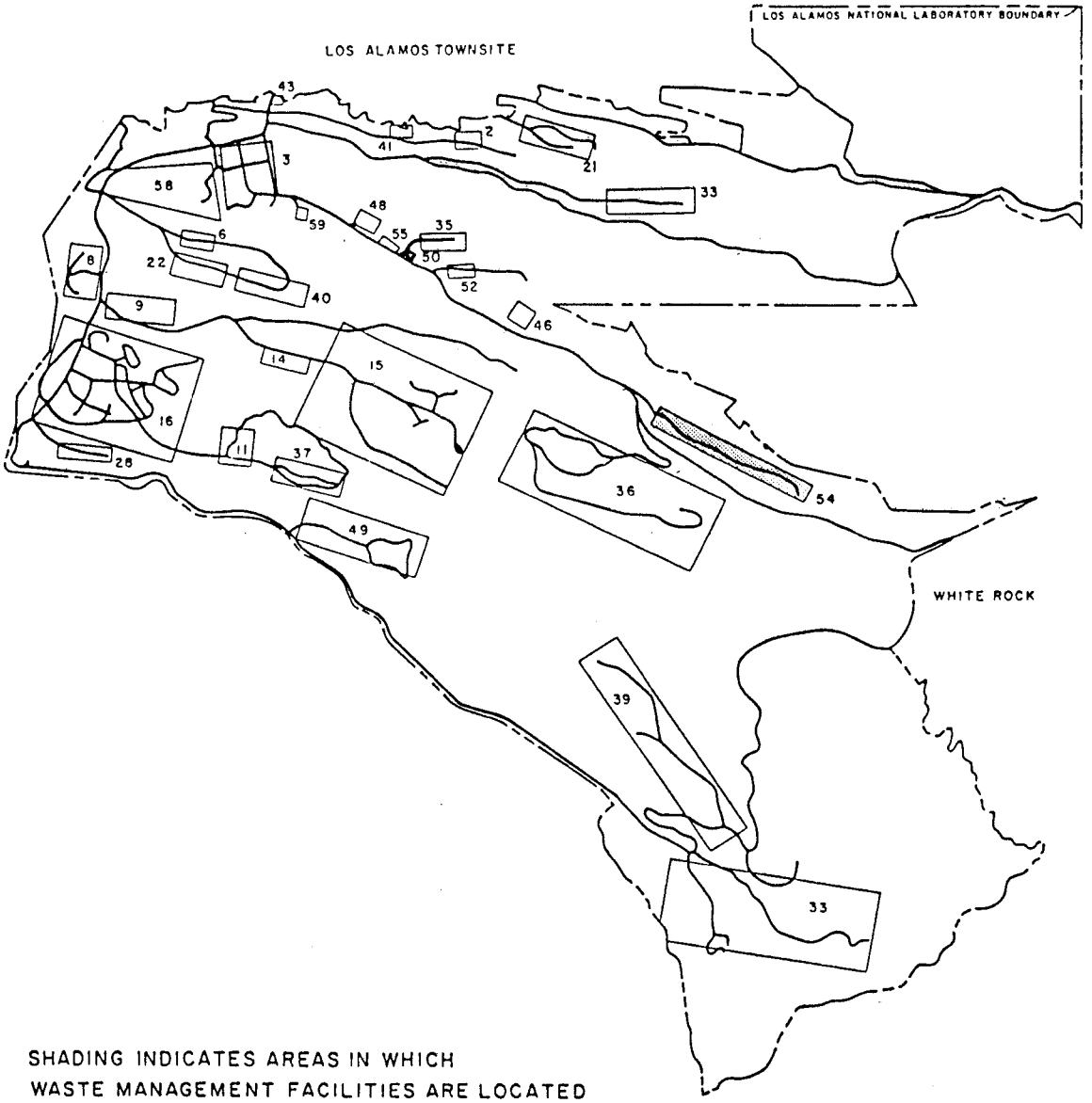
PREPARED FOR

LOS ALAMOS NATIONAL LABORATORY
LOS ALAMOS, NEW MEXICO

IT CORPORATION

DRAWN BY	MJG 9/24/84	CHECKED BY		DRAWING NUMBER 846510-B1
		APPROVED BY		

19 1253 HERCULENE, A&B SMITH CO., PGH., PA



SHADING INDICATES AREAS IN WHICH WASTE MANAGEMENT FACILITIES ARE LOCATED

N

4000 0 4000

SCALE

FIGURE 2-2

LOS ALAMOS TECHNICAL AREAS

PREPARED FOR

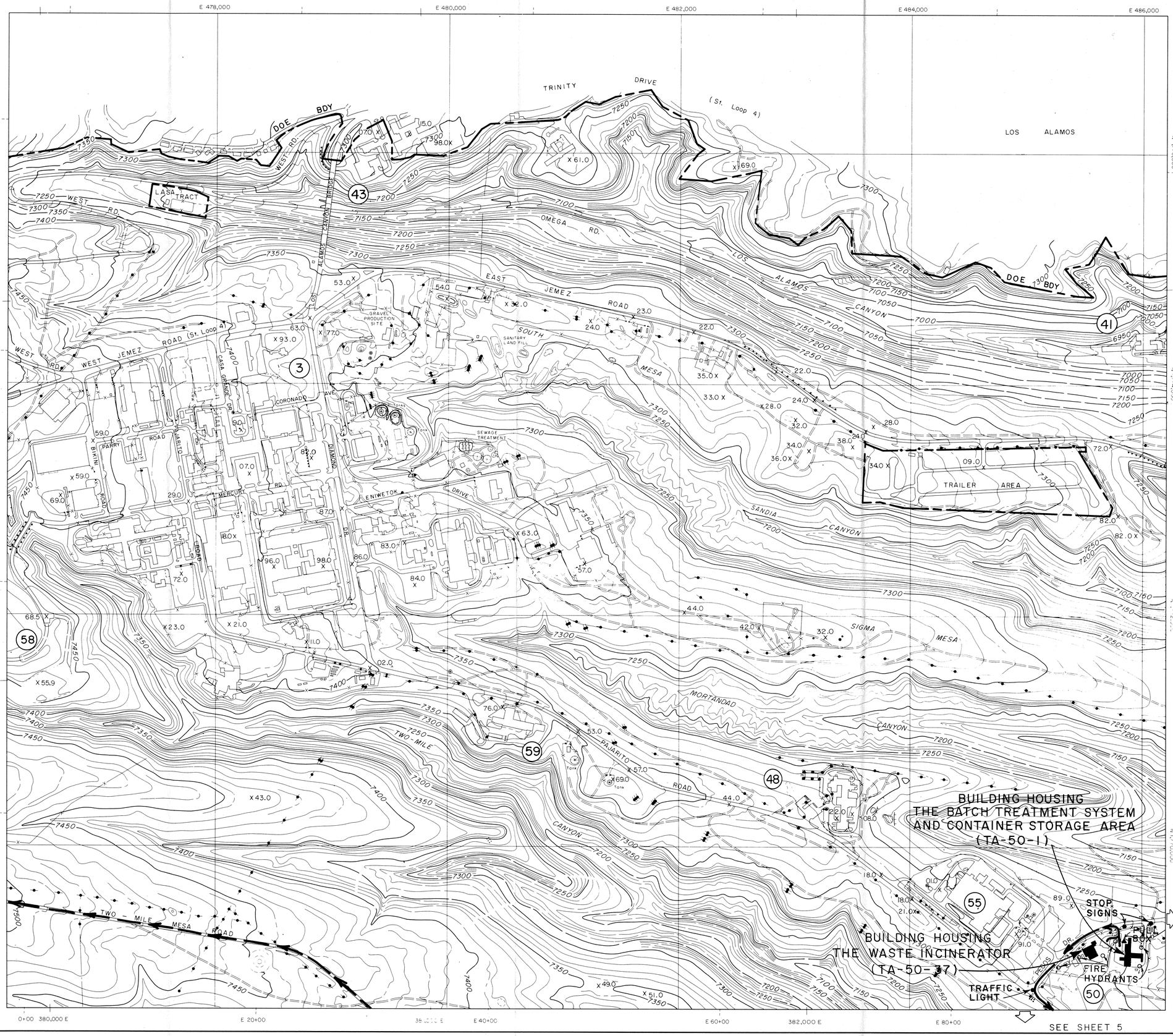
LOS ALAMOS NATIONAL LABORATORY

LOS ALAMOS, NEW MEXICO

IT CORPORATION

DRAWN BY	MJG 11/26/84	CHECKED BY		DRAWING NUMBER 6635.02 A-26
		APPROVED BY		

32803

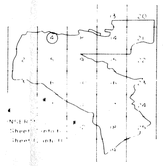


LEGEND

x 93.0	SPOT ELEVATION	N 768,000	NMSP GRID
—6900—	INDEX CONTOUR	3,989,000 N	UTM GRID
	INTERMEDIATE CONTOUR 10ft.	N 240+00	LASL GRID
	SUPPLEMENTARY CONTOUR 5ft.		
	CONTOURS THROUGH HEAVY VEGETATION		
	COUNTY LINES – TRANSFERRED FROM USGS 1:24,000 QUADRANGLES.		
	DOE BOUNDARY – X & Y COORDINATE DATA PROVIDED BY LASL.		
	DOE BOUNDARY – SURVEY DESCRIPTIONS OR RECORD PLATS PROVIDED BY LASL.		
	DOE BOUNDARY – TRANSFERRED FROM USGS 1:24,000 QUADRANGLES BASED ON PROJECTED COUNTY LINES.		

35	TECHNICAL AREA NO.		TOWER
	BUILDING		PIPE LINE
	FENCE		CUT LINE OR POWER LINE CLEARANCE SCAR
	PAVED ROAD		WATER TOWER
	DIRT ROAD	Tank	TANK
	JEEP TRAIL		POND
	CULVERT	Rw	RETAINING WALL
	GUARD RAIL		EARTH DIKES OR BLASTING SHIELDS
	TUNNEL	Earth Work	EARTH WORK OR GRADED AREAS
	EARTHEN BUNKERS		GATE
	POWER POLE		EVACUATION ROUTE

SHEET LAYOUT



NORTH

GRID NMSP NORTH

MAPPING COMPLETED BY PHOTOGRAMMETRIC METHODS, UTILIZING 1:30,000, 1:12,000 & 1:13,200 PHOTOGRAPHY, OBTAINED IN NOV. 1976 & JUNE 1980 WITH ZEISS RMK A 15/23 CAMERAS OF 153.42 & 152.43mm C.F.L. RESPECTIVELY. MAPPING BASED ON CONTROL SURVEYS TIED TO THE NEW MEXICO STATE PLANE COORDINATE SYSTEM (CENTRAL ZONE). MAPPING COMPLETED IN ACCORDANCE WITH NATIONAL MAP ACCURACY SPECIFICATIONS.

GRAPHIC SCALE: 1 in.=400 ft.

CONTOUR INTERVAL 10 ft.

TECHNICAL AREAS

3 SM–SITE	41 W–SITE	50 WM–SITE
43 HRL–SITE	48 RC–SITE	
58 TWO MILE NORTH–SITE	55 PLUTONIUM FACILITY SITE	
59 OH–SITE		

LOS ALAMOS SCIENTIFIC LABORATORY

FIGURE 2-3

CONTOUR MAP SHOWING THE LOCATIONS OF THE BATCH TREATMENT SYSTEM AND CONTAINER STORAGE AREA AND THE WASTE INCINERATOR

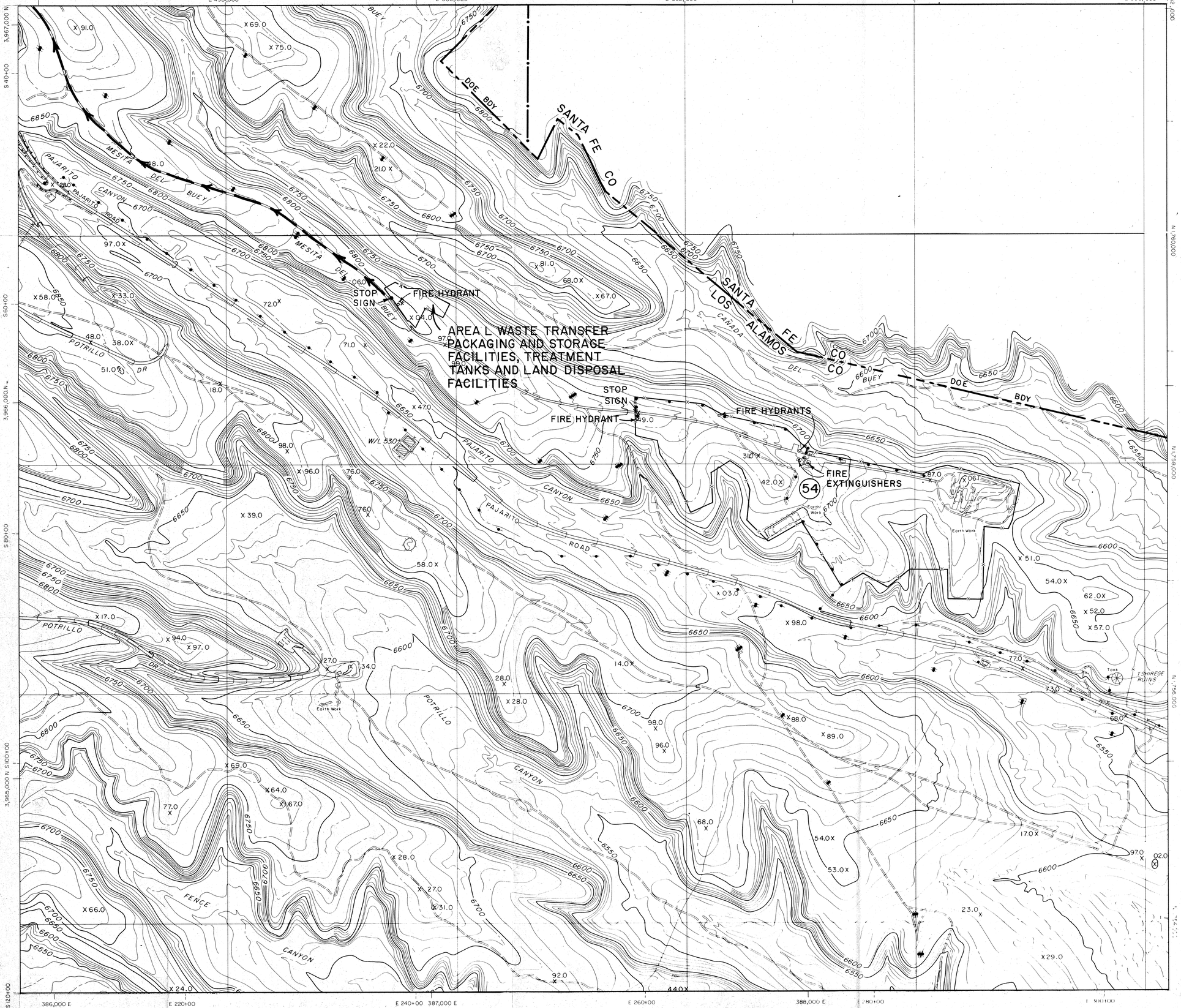
BUVAY ENGINEERS, INC. LABORATORY AERIAL MAPPING DIVISION

LAB JOB NO. 5682

1" =400' SCALE

PLAN / TOPO

SHEET 4 OF 25

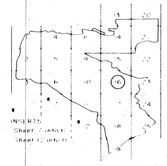


LEGEND

X 93.0	SPOT ELEVATION	N 768,000	NMSP GRID
6900	INDEX CONTOUR	3,989,000 N	UTM GRID
	INTERMEDIATE CONTOUR 10ft.	N 240+00	LASL GRID
	SUPPLEMENTARY CONTOUR 5ft.		
	CONTOURS THROUGH HEAVY VEGETATION		
	COUNTY LINES – TRANSFERRED FROM USGS 1:24,000 QUADRANGLES.		
	DOE BOUNDARY – X & Y COORDINATE DATA PROVIDED BY LASL.		
	DOE BOUNDARY – SURVEY DESCRIPTIONS OR RECORD PLATS PROVIDED BY LASL.		
	DOE BOUNDARY – TRANSFERRED FROM USGS 1:24,000 QUADRANGLES BASED ON PROJECTED COUNTY LINES.		

35	TECHNICAL AREA NO.		TOWER
	BUILDING		PIPE LINE
	FENCE		CUT LINE OR POWER LINE CLEARANCE SCAR
	PAVED ROAD		WATER TOWER
	DIRT ROAD	Tank	TANK
	JEEP TRAIL		POND
	CULVERT	RW	RETAINING WALL
	GUARD RAIL		EARTH DIKES OR BLASTING SHIELDS
	TUNNEL	Earth Work	EARTH WORK OR GRADED AREAS
	EARTHEN BUNKERS		GATE
	POWER POLE		EVACUATION ROUTE

SHEET LAYOUT



NORTH

GRID NMSP NORTH

MAPPING COMPLETED BY PHOTOGRAMMETRIC METHODS, UTILIZING 1:30,000, 1:12,000 & 1:13,200 PHOTOGRAPHY, OBTAINED IN NOV. 1976 & JUNE 1980 WITH ZEISS RMK A 15/23 CAMERAS OF 153.42 & 152.43mm C.F.L. RESPECTIVELY. MAPPING BASED ON CONTROL SURVEYS TIED TO THE NEW MEXICO STATE PLANE COORDINATE SYSTEM (CENTRAL ZONE). MAPPING COMPLETED IN ACCORDANCE WITH NATIONAL MAP ACCURACY SPECIFICATIONS.

GRAPHIC SCALE 1 in = 400 ft

CONTOUR INTERVAL 10 ft

TECHNICAL AREAS

(MD) MD–SITE

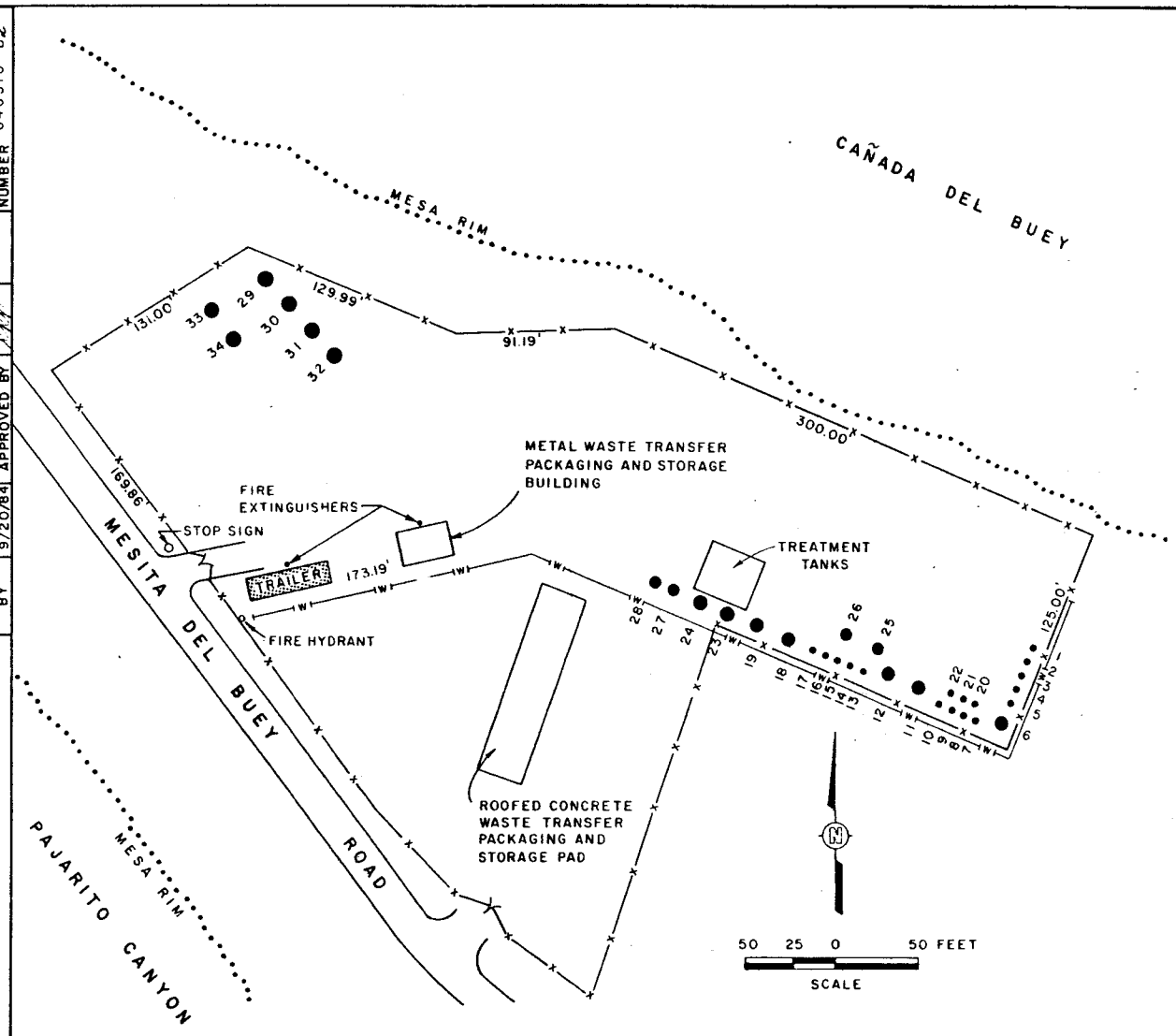
LOS ALAMOS SCIENTIFIC LABORATORY

FIGURE 2-4

CONTOUR MAP SHOWING THE LOCATION OF AREA L WASTE MANAGEMENT FACILITIES

LAB JOB NO 5682
1" = 400' SCALE
PLAN / TOPO
SHEET 16 OF 25

14866-C



AREA L SHAFTS[1]
(INFORMATION CURRENT MARCH 1985)

SHAFT NO.	SHAFT DIAMETER (FEET)	DATE DRILLED	DATE CAPPED	CONTENTS
1	3	4/80	9/83	ORGANICS[2]
2	3	2/75	7/79	ACIDS & BASES
3	3	2/75	11/78	INORGANIC
4	3	2/75	5/80	ORGANIC
5	3	2/75	6/77	WASTE OIL
6	4	6/75	6/79	REACTIVE
7	3	6/75	6/79	REACTIVE
8	3	6/75	6/79	REACTIVE
9	3	6/75	6/79	GAS CYLINDERS
10	3	6/77	6/79	WASTE OIL
11	8	1/78	7/79	WASTE OIL/SOLVENT
12	4	1/78	7/79	WASTE OIL/SOLVENT
13	3	6/79	5/82	INORGANIC
14	3	6/79	5/82	REACTIVE
15	3	6/79	5/82	REACTIVE
16	3	6/79	5/82	GAS CYLINDERS
17	3	6/79	5/82	ORGANIC
18	8	6/79	6/80	WASTE OIL
19	8	4/80	5/82	WASTE OIL
20	3	4/80	9/83	INORGANIC
21	3	4/80	OPEN	GAS CYLINDERS
22	3	4/80	9/83	ORGANIC
23[3]	8	4/82	3/84	WASTE OIL
24[4]	8	4/82	4/84	ORGANIC & WASTE OIL
25	6	9/82	5/85	INORGANIC
26	6	9/82	3/84	ORGANIC
27	4	1/83	2/85	SPECIAL[5]
28	4	1/82	5/85	SPECIAL
29	6	12/83	8/84	ORGANIC
30	6	12/83	8/84	ORGANIC
31	6	12/83	9/84	ORGANIC
32	4	9/84	9/84	ORGANIC
33	6	9/84	2/85	ORGANIC
34	6	2/85	5/85	ORGANIC

NOTES:
(1) ALL SHAFTS ARE APPROXIMATELY 60 FEET DEEP.
(2) SHAFT ONE CONTAINS WASTES NOT IN DRUMS.
(3) PRIOR TO SHAFT 23, LIQUIDS WERE DISPOSED OF IN DRUMS WITHOUT ADDING ABSORBENTS.
(4) MIDDLE SECTION OF THIS SHAFT NOT USED.
(5) USED FOR MISCELLANEOUS WASTE REQUIRING GREATER ISOLATION.

FIGURE 2-5

TA-54 AREA L
WASTE MANAGEMENT FACILITIES

PREPARED FOR

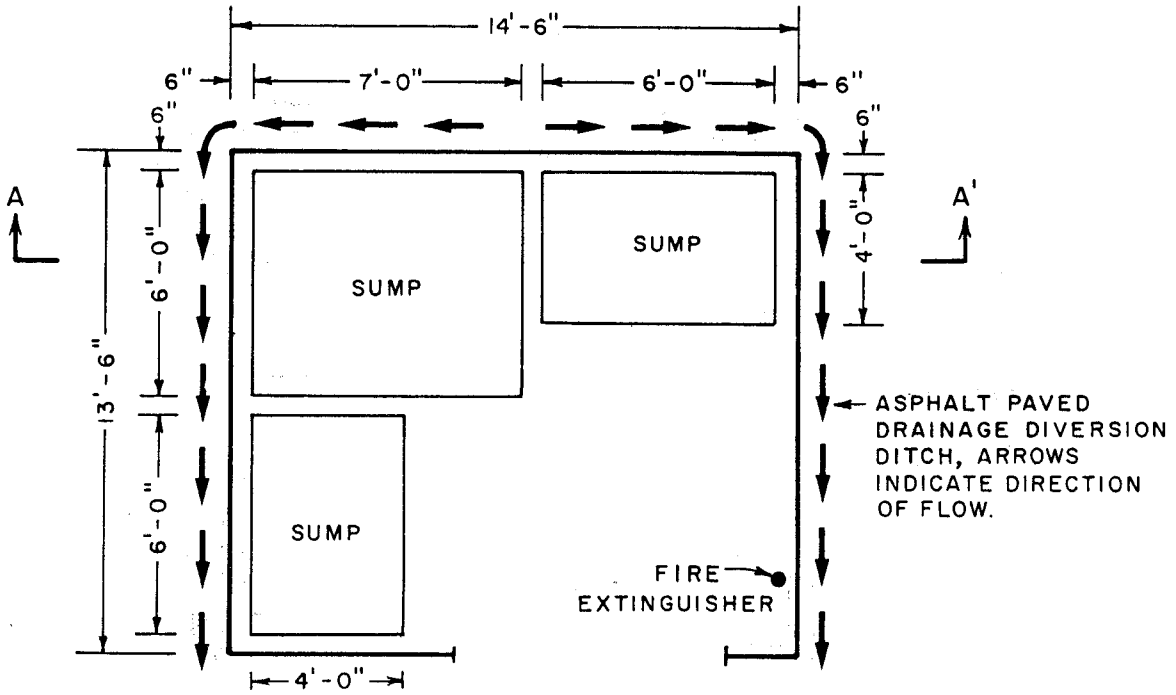
LOS ALAMOS NATIONAL LABORATORY
LOS ALAMOS, NEW MEXICO

IT CORPORATION

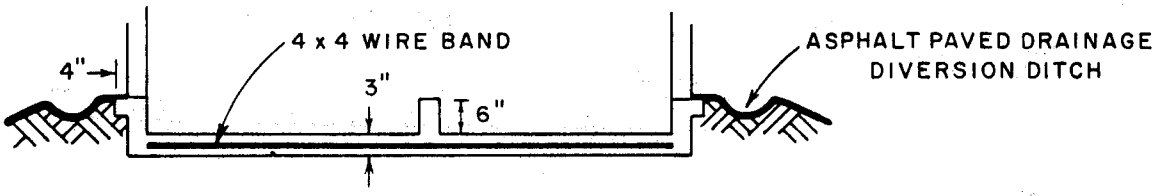
DRAWN BY	L L F	CHECKED BY	J.A.F.	DRAWING NUMBER	846510-B2
	9/20/84	APPROVED BY			

19 1253 HERCULENE, A&B SMITH CO., PGH., PA

DRAWN BY	CHECKED BY	APPROVED BY	DRAWING NUMBER
MYG 3/15		KMD	844510-A2



FLOOR PLAN



FOUNDATION AND SUMP

(Section A-A')

FIGURE 2-6

TA 54, AREA L WASTE TRANSFER, PACKAGING, AND STORAGE BUILDING

PREPARED FOR

LOS ALAMOS NATIONAL LABORATORY

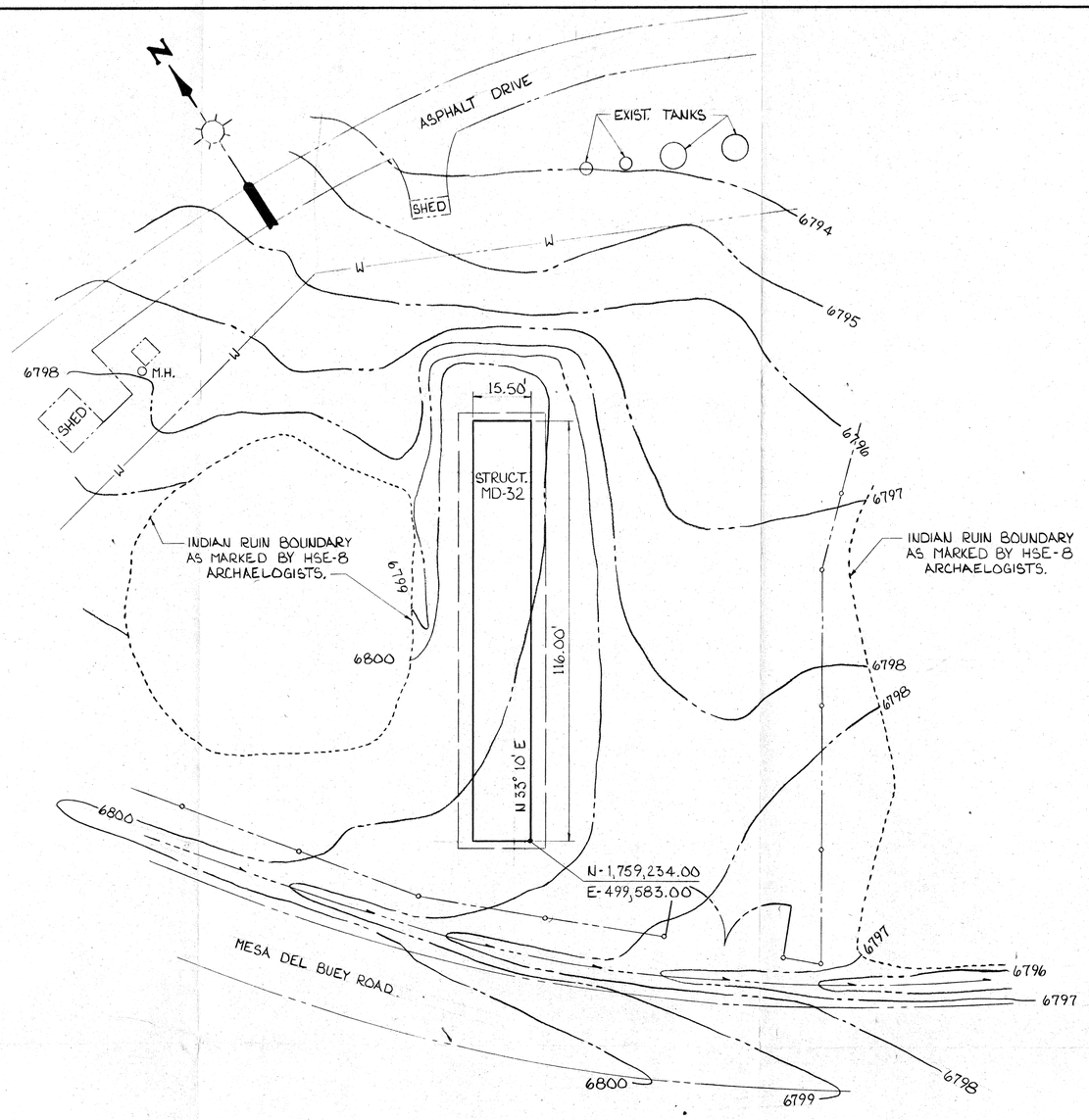
LOS ALAMOS, NEW MEXICO

© 1984 IT CORPORATION
ALL COPYRIGHTS RESERVED

... Creating a Safer Tomorrow

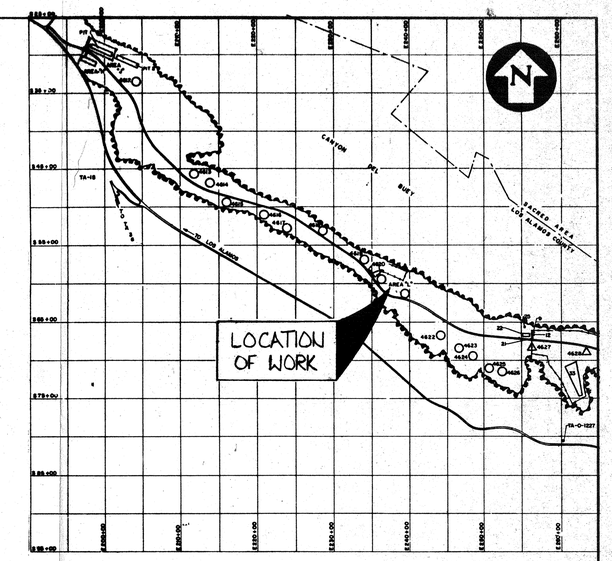
65360

"Do Not Scale This Drawing"



PLOT PLAN

SCALE: 1" = 20'-0"



STRUCTURE MD-32 TA-54

LOCATION PLAN

GENERAL NOTES

1. DO NOT SCALE DRAWINGS FOR CONSTRUCTION DIMENSIONS.
2. FIELD VERIFY DIMENSIONS PRIOR TO CONSTRUCTION.
3. REPAIR ALL AREAS DAMAGED DURING CONSTRUCTION TO MATCH EXISTING ADJACENT AREAS.
4. KEEP WORK SITE IN AN ORDERLY CONDITION AND AT PROJECT COMPLETION REMOVE ALL WASTE. LEAVE WORK SITE IN A CONDITION ACCEPTABLE TO THE ENG-1 INSPECTOR. DISPOSE OF REMOVED MATERIALS AS DIRECTED BY ENG-1, UNLESS NOTED.
5. PAINTING - PAINT CONC. CELL SURFACES WITH 1 COAT PRIMER: ANTI-CORROSIVE, "PLASITE", FOR 7100 COLD SET COATING SERIES, ZIA STOCK NO. 2605 76 0024; 2 FINISH COATS: COLD SET COATING MATERIAL "PLASITE", LT. GRAY, ZIA STOCK NO. 2605 72 0033.

   PAINT UNGALVANIZED BARRIER FENCE METAL WITH 1 COAT PRIMER PPG, WHITE 6-712; 2 FINISH COATS OF SPEEDHIDE WATER BASE ALKYD GLOSS ENAMEL, GRAY, MWF, 3-6 MILS.
6. COMPACT FILL MATERIAL IN 8" MAXIMUM LIFTS TO 95% DENSITY LABORATORY TEST MAX. DENSITY PER ASTM D1557 METHOD D & FIELD DENSITY PER ASTM D2922 OF ALL FILL MATERIAL.

LEGEND

- NEW CONSTRUCTION
- FUTURE CONSTRUCTION
- RUIN BOUNDARY
- EXISTING
- W — EXISTING WATER LINE

NOTE:
SURVEY-TOPOGRAPHIC INFORMATION WAS OBTAINED FROM SURVEY DRAWING NO. ENG. 54-42.

THIS JOB MUST BE INSPECTED AND ANY CHANGES APPROVED BY PAUL VIDRINE
ENG-1 PHONE 7-4656

AUTHORIZED BY D.R.R. FOR:
HSE-3
ENG-1
ENG-4
ENG-4

NO.	DATE	CLASS REV.	REVISIONS	DWN	DES	CHKD	REQ GRP	REQ D.O.	ENG GRP	ENG D.O.

FACILITIES ENGINEERING DIVISION

FIGURE 2-7
TA54, AREA L
WASTE STORAGE PAD

DRAWN	B. SANCHEZ
DESIGN	B. Sanchez
CHECKED	C. SANCHEZ
RELEASED	A. Ferron
DATE	8-9-85

SUBMITTED C. Sanchez RECOMMENDED Bruce Ferron APPROVED J. Dirtz

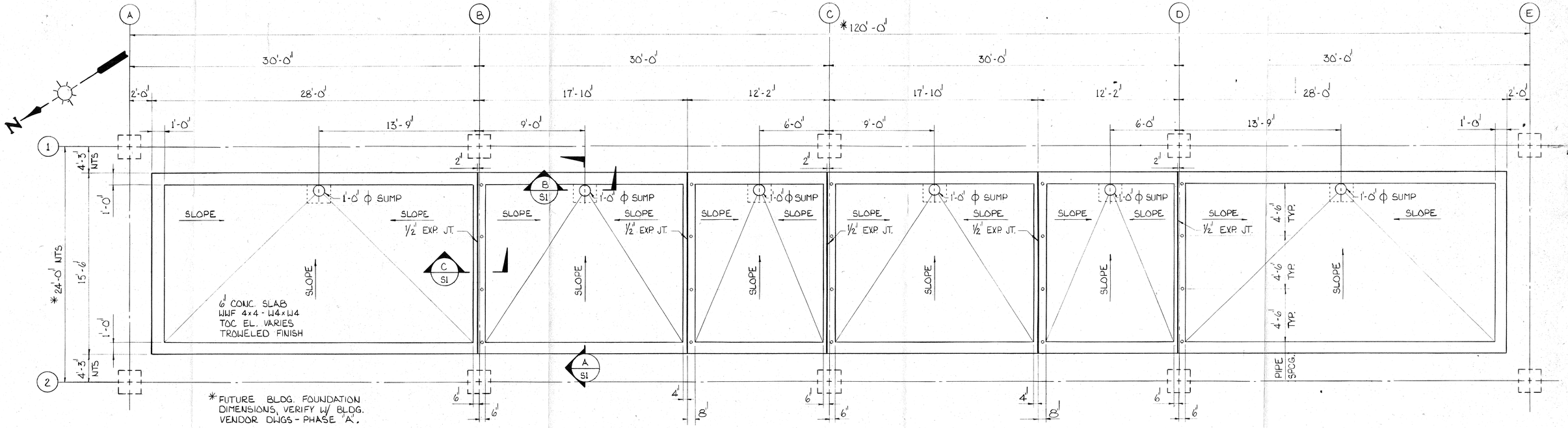
Los Alamos — Los Alamos National Laboratory, Los Alamos, New Mexico 87545

SHEET C1 1 OF 2

CLASSIFICATION U REVIEWER Bruce Ferron DATE 8-8-85

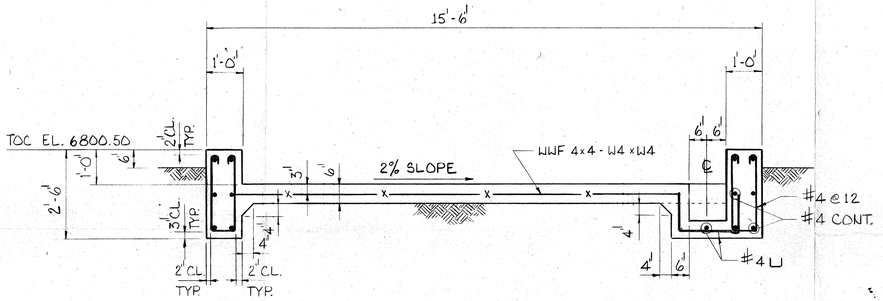
REQUESTING DIVISION HSE-DO
REQUESTING GROUP HSE-7
LAB JOB NO. 8204-54 PHASE "C"
DRAWING NO. ENG-C 44856
REV.

14866-E



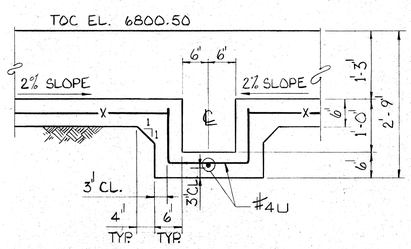
FOUNDATION PLAN

SCALE: 1/4" = 1'-0"



SECTION A / S1

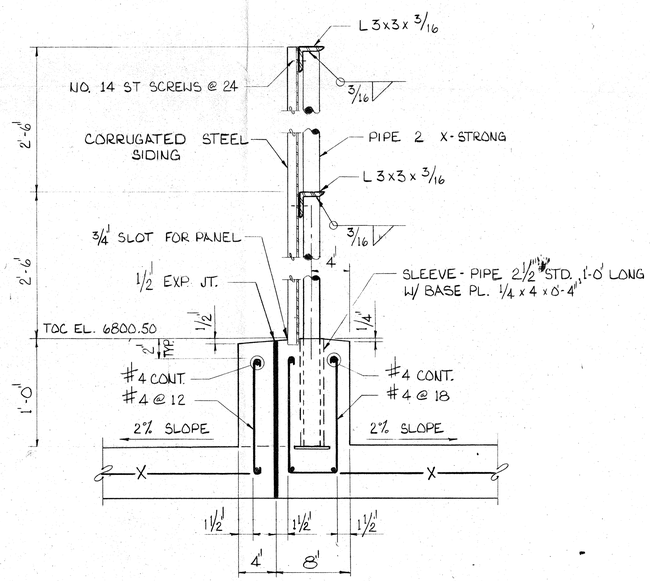
SCALE: 1/2" = 1'-0"



SECTION B / S1

TYP. 6 PLCS.

SCALE: 3/4" = 1'-0"



SECTION C / S1

SCALE: 1 1/2" = 1'-0"

STRUCTURAL NOTES

1. STRUCTURE EXCAVATION - EXCAVATE FOR WALLS & SLABS IN ACCORDANCE WITH ELEVATIONS & DIMENSIONS SHOWN ON THIS DRAWING. EXCAVATION SHALL EXTEND A SUFFICIENT DISTANCE FROM WALLS TO ALLOW FOR PLACING & REMOVAL OF FORMS. OVEREXCAVATION BELOW ELEVATIONS SHOWN SHALL BE RESTORED TO PROPER ELEVATION BY BACKFILLING WITH CONCRETE. THE EXCAVATION SHALL BE INSPECTED BY ENG-1 INSPECTOR PRIOR TO PLACING REINFORCING STEEL.

2. CONCRETE CONSTRUCTION SHALL BE IN CONFORMANCE WITH FACILITIES ENGINEERING DIVISION STANDARD SPECIFICATIONS:
   SECTION 03100 - CONCRETE FORMWORK, 3/4" CHAMFER
   SECTION 03200 - REINFORCING STEEL, GRADE 60
   SECTION 03300 - CAST-IN-PLACE CONCRETE, f'c = 4000 PSI

   FINISH WALLS & SLABS WITH A PREMIXED, SINGLE APPLICATION, SEALER & HARDENER FLOOR FINISH. THE FINISH SHALL BE DELIVERED TO THE JOB SITE IN UNBROKEN CONTAINERS & APPLIED IN ACCORDANCE WITH THE MANUFACTURERS DIRECTIONS.

3. MISCELLANEOUS STEEL - MATERIAL, FABRICATION, ERECTION, & PAINTING OF STEEL SHALL CONFORM TO SITE ENGINEERING STANDARD SPECIFICATION SECTION 05120 - STRUCTURAL STEEL.

   BARRIER PANELS SHALL BE 26 GAUGE, 2 1/2 x 1/2 CORRUGATED GALVANIZED STEEL CONFORMING TO ASTM A446 G-90. FASTEN WITH NO. 14 SELF-TAPPING SCREWS.

NO.	DATE	CLASS REV.	REVISIONS	DWN	DES	CHKD	REQ GRP	REQ D.O.	ENG GRP	ENG D.O.

MF

FACILITIES ENGINEERING DIVISION

FIGURE 2-7
TA54, AREA L
WASTE STORAGE PAD

DRAWN	B. SANCHEZ
DESIGN	B Sanchez
CHECKED	C. SANCHEZ
RELEASED	R. Ferson
DATE	8-9-85

SUBMITTED: C Lovelady
RECOMMENDED: Bruce Ferson
APPROVED: J Watz

Los Alamos — Los Alamos National Laboratory, Los Alamos, New Mexico 87545

SHEET S1 — 2 OF 2

CLASSIFICATION U — REVIEWER Bruce Ferson — DATE 7-25-85

REQUESTING DIVISION: HSE-DO — REQUESTING GROUP: HSE-7

LAB JOB NO.: 8204-54 PHASE "C"

DRAWING NO.: ENG-C 44856

REV.

DRAWN BY	CHECKED BY		DRAWING NUMBER
L.L.F. 4/25/84	APPROVED BY		846184-A3

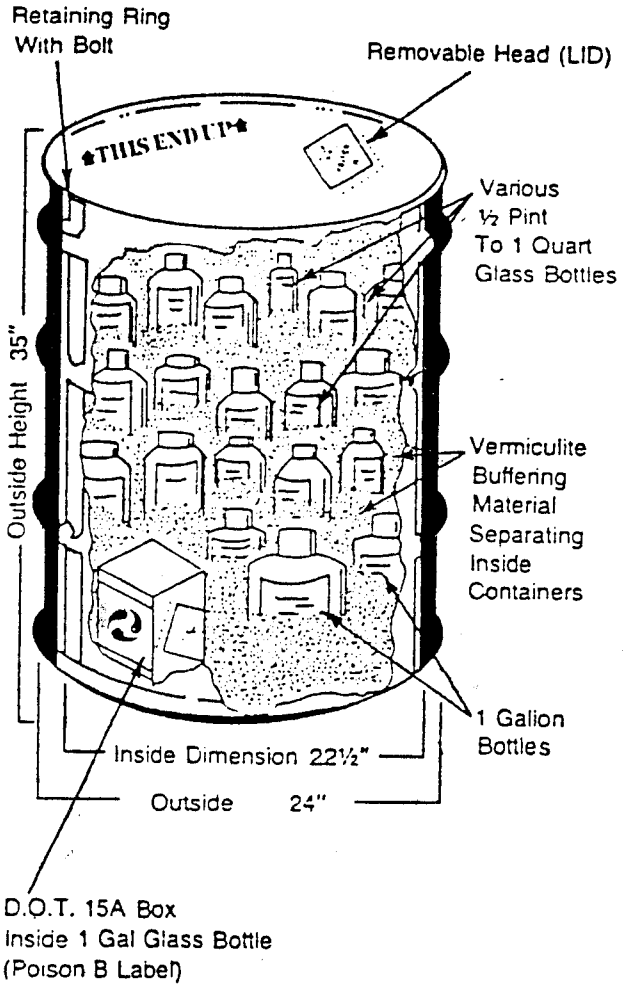


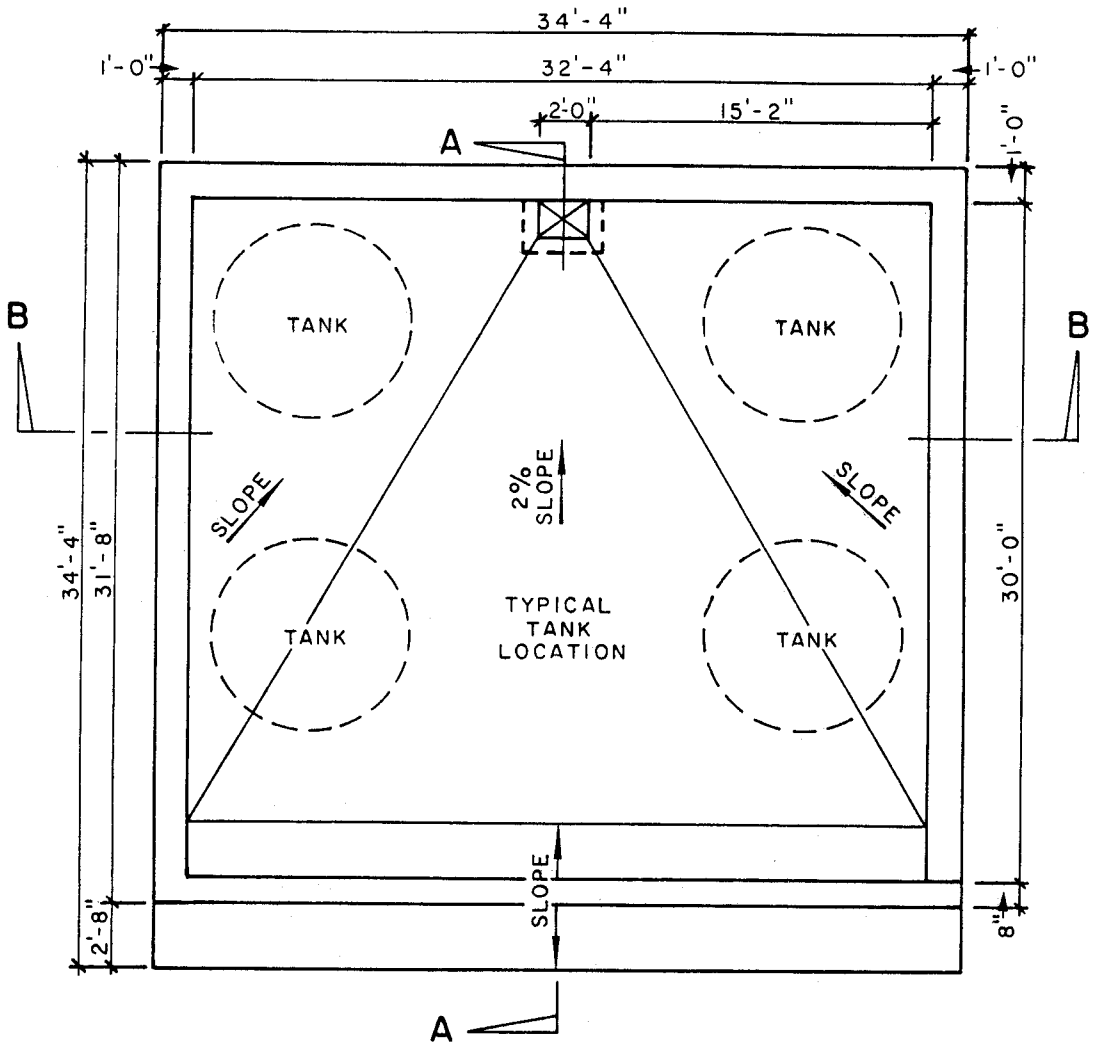
FIGURE 2-8

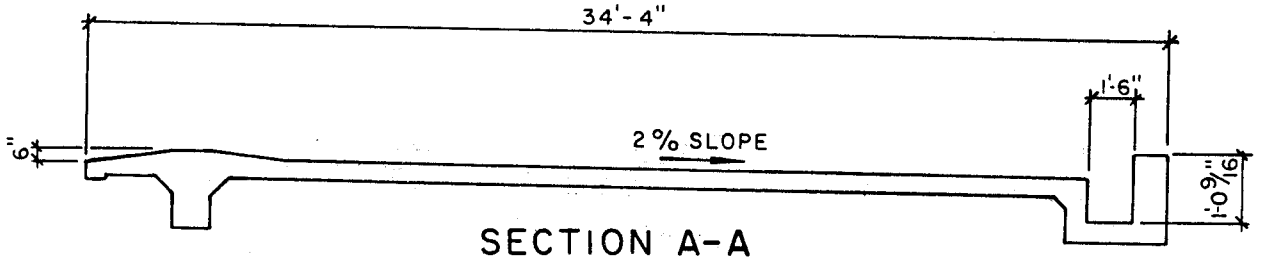
"LAB PACK" DRUM - TYPICAL
D.O.T. 17H STEEL WITH
REMOVABLE HEAD (LID)

PREPARED FOR

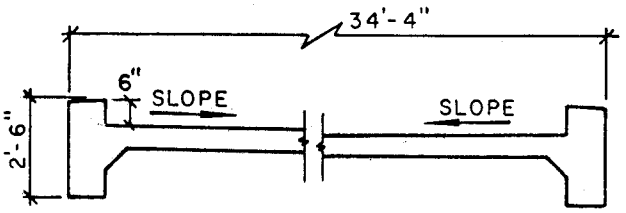
LOS ALAMOS
NATIONAL LABORATORY
LOS ALAMOS, NEW MEXICO

32803





SECTION A-A
NOT TO SCALE



SECTION B-B
NOT TO SCALE

FIGURE 2-9

TA 54, AREA L
TREATMENT TANKS
PLAN

PREPARED FOR

LOS ALAMOS NATIONAL LABORATORY
LOS ALAMOS, NEW MEXICO

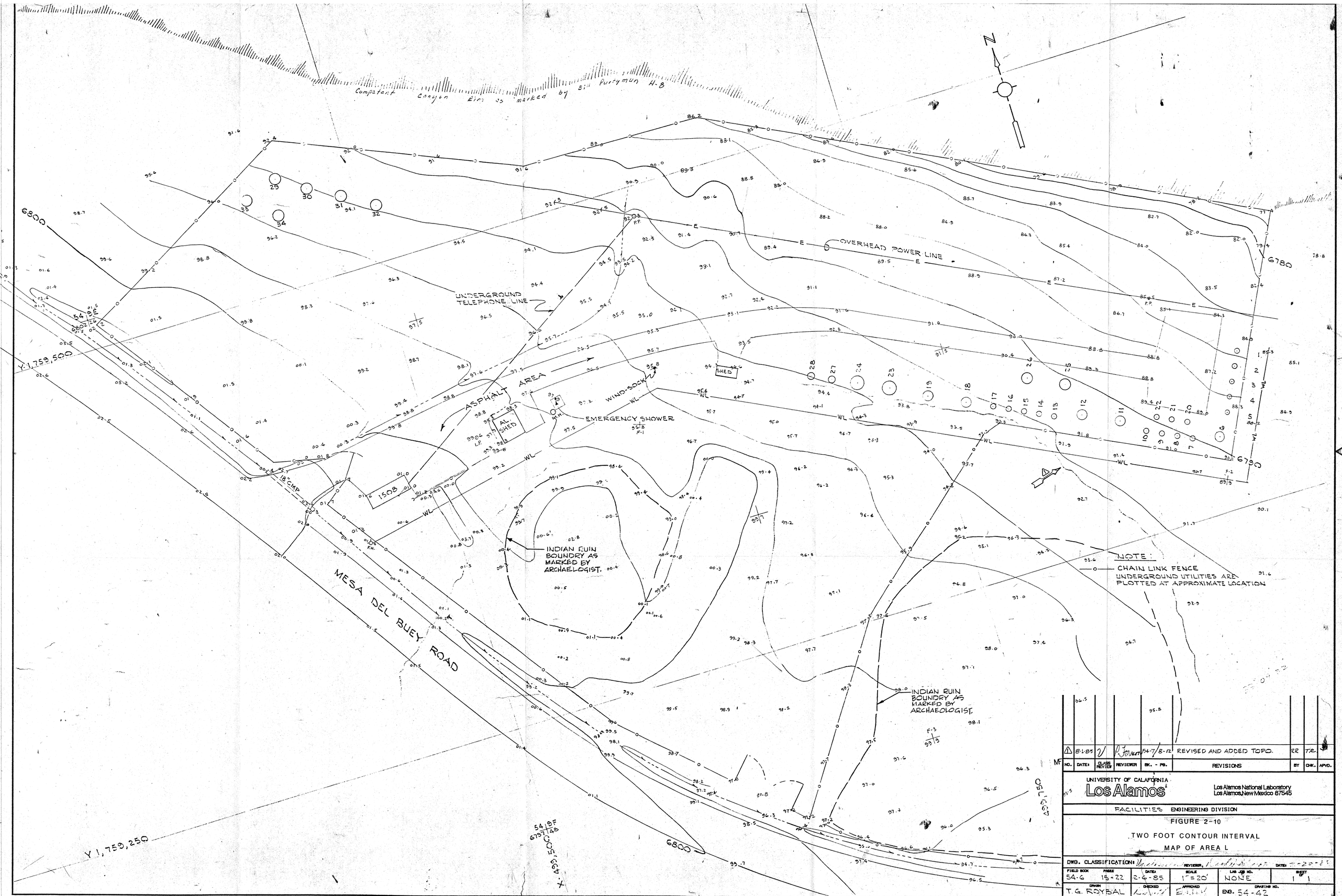
DRAWN BY	LLF 10/11/85	CHECKED BY / APPROVED BY	DRAWING NUMBER

65360

© 1984 IT CORPORATION
ALL COPYRIGHTS RESERVED

"Do Not Scale This Drawing"

IT ... Creating a Safer Tomorrow



NO.	DATE	CLASS REVIEW	REVIEWER	BK. - PG.	REVISIONS	BY	CHK.	APVD.
1	8-1-85	U	[illegible]	54-7/8-12	REVISED AND ADDED TOPO.	RR	TR	

UNIVERSITY OF CALIFORNIA
Los Alamos
Los Alamos National Laboratory
Los Alamos, New Mexico 87545

FACILITIES ENGINEERING DIVISION

FIGURE 2-10

TWO FOOT CONTOUR INTERVAL
MAP OF AREA L

DWG. CLASSIFICATION: [illegible] REVIEWER: [illegible] DATE: [illegible]

FIELD BOOK	PAGES	DATE	SCALE	LAB JOB NO.	SHEET
54-6	15-22	2-4-85	1" = 20'	NONE	1 of 1

DRAWN	CHECKED	APPROVED	DRAWING NO.
T. G. ROYBAL	[illegible]	[illegible]	ENG. 54-42

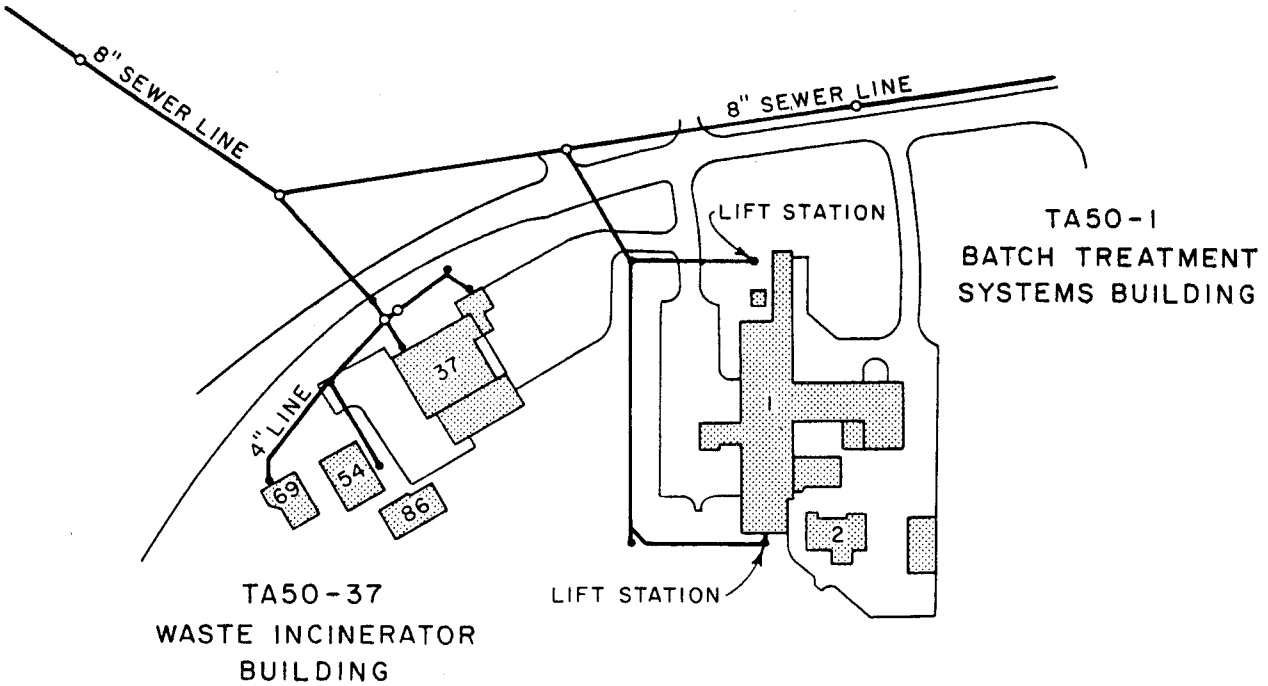


FIGURE 2-11

SANITARY SEWER LINES

AT TA-50

PREPARED FOR

LOS ALAMOS NATIONAL LABORATORY

LOS ALAMOS, NEW MEXICO

DRAWN BY	LLF 4/4/85	CHECKED BY / APPROVED BY	RP		DRAWING NUMBER 84651O-A-26

65360

© 1984 IT CORPORATION
ALL COPYRIGHTS RESERVED

"Do Not Scale This Drawing"

IT ... Creating a Safer Tomorrow

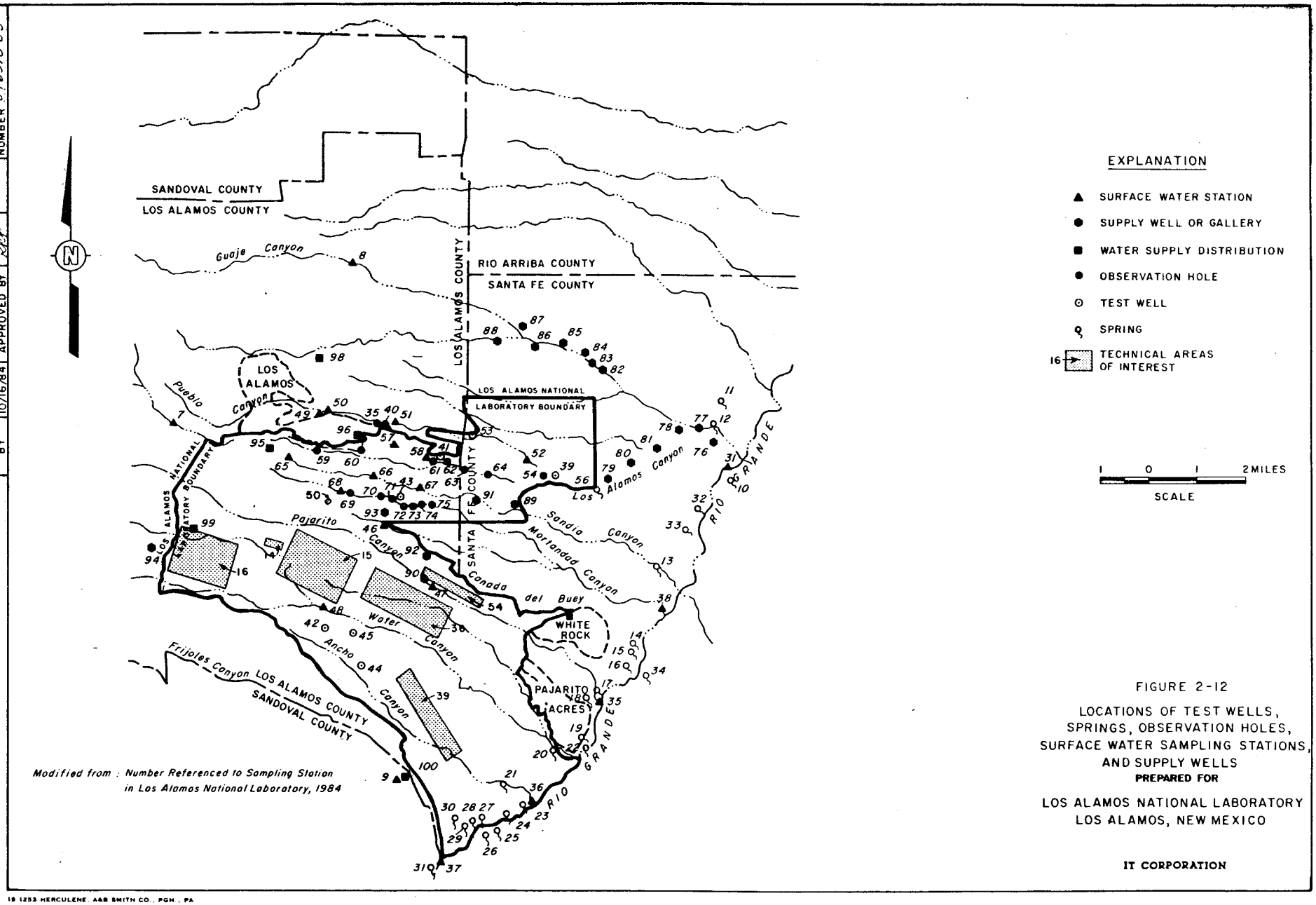


FIGURE 2-12

LOCATIONS OF TEST WELLS, SPRINGS, OBSERVATION HOLES, SURFACE WATER SAMPLING STATIONS, AND SUPPLY WELLS

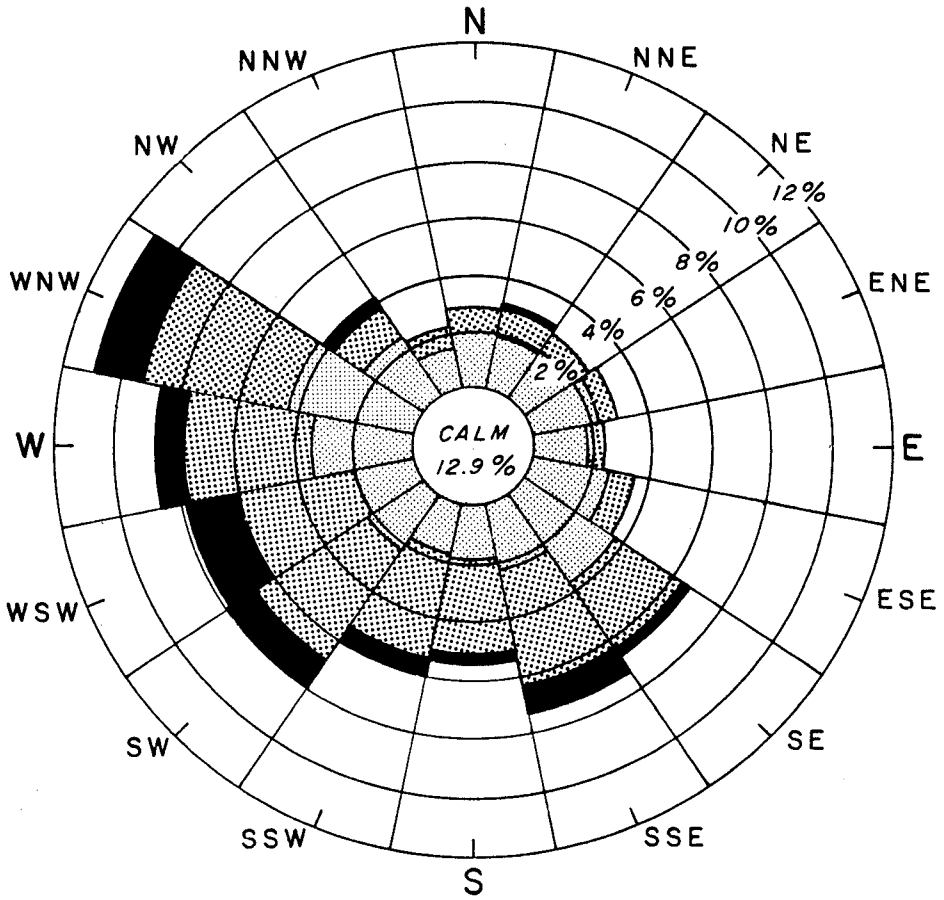
PREPARED FOR

LOS ALAMOS NATIONAL LABORATORY
LOS ALAMOS, NEW MEXICO

IT CORPORATION

DRAWN BY	MJG 10/16/84	CHECKED BY		DRAWING NUMBER 84651083
		APPROVED BY		

19 1253 HERCULENE A&B SMITH CO., PGH., PA



SPEED (m/sec)

- 1-2.5
- 2.5-5
- 5+

(AVG. SPEED = 2.8)

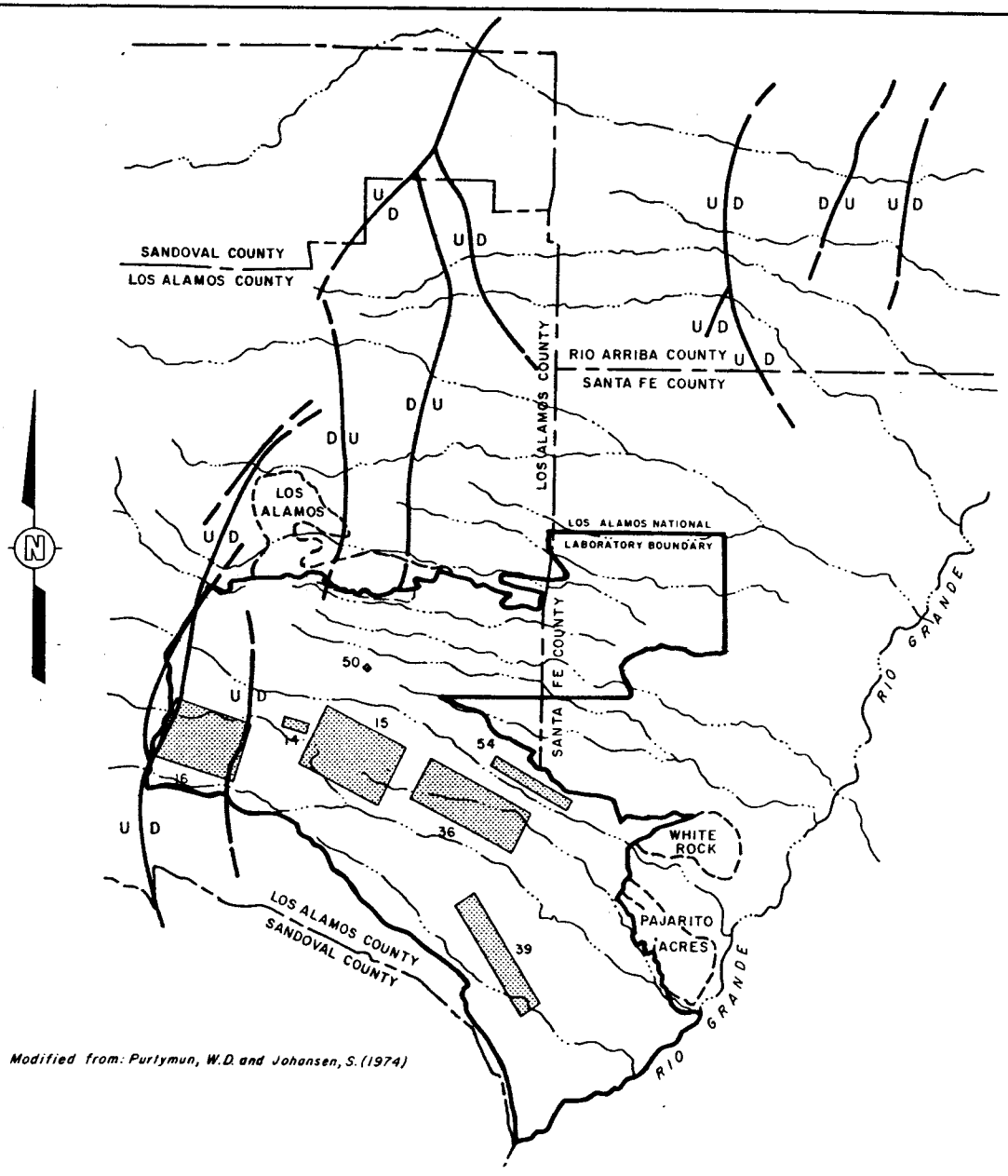
FIGURE 2-13
ANNUAL SURFACE WIND SPEED
AND DIRECTION, 1983,
TECHNICAL AREA 59
PREPARED FOR
LOS ALAMOS NATIONAL LABORATORY
LOS ALAMOS, NEW MEXICO

Modified from: Los Alamos National Laboratory, 1984

IT CORPORATION

DRAWN BY	CHECKED BY	APPROVED BY	DRAWING NUMBER
LLF 9/7/84			846510-A5

32803



Modified from: Purlymun, W.D. and Johansen, S. (1974)

EXPLANATION

U/D MAJOR FAULTS, D INDICATES DOWNTHROWN SIDE, U INDICATES UPTHROWN SIDE

16 TECHNICAL AREAS OF INTEREST

1 0 1 2 MILES

SCALE

FIGURE 2-14

LOCATION OF LOS ALAMOS FACILITIES RELATIVE TO THE NEARBY FAULT TRACES

PREPARED FOR

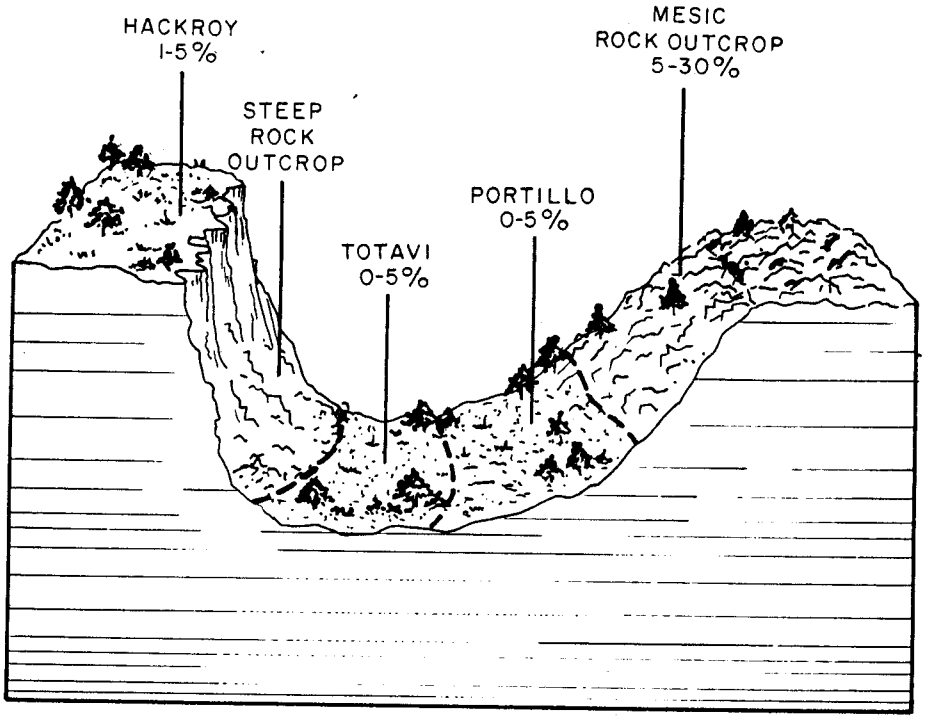
LOS ALAMOS NATIONAL LABORATORY
LOS ALAMOS, NEW MEXICO

IT CORPORATION

DRAWN BY	MJG	CHECKED BY		DRAWING NUMBER	84651O-84
	10/17/84	APPROVED BY			

19 1253 HERCULENE, A&B SMITH CO., PGH., PA

DRAWN BY	MJG 11/28/84	CHECKED BY		DRAWING NUMBER 8465/0-A6
		APPROVED BY		



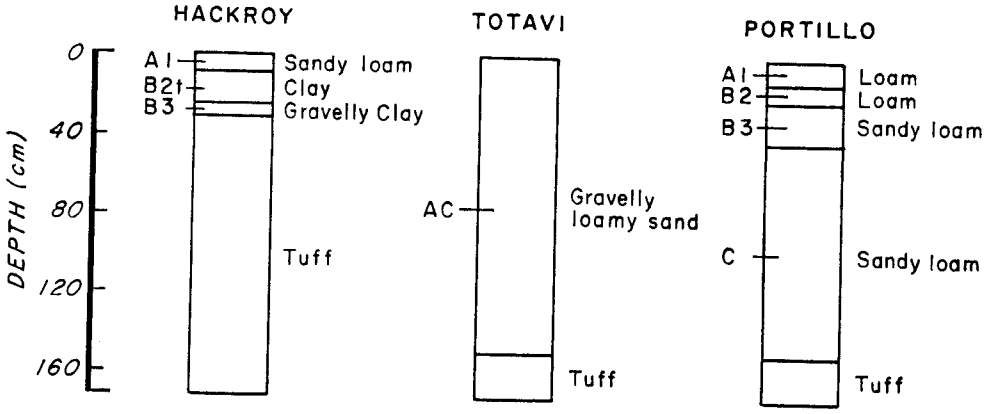


FIGURE 2-15

RELATIONSHIPS OF SLOPE, VEGETATION AND PARENT MATERIAL TO HACKROY, TOTAVI, AND PORTILLO SOILS

Reference; USDOE, 1978

PREPARED FOR

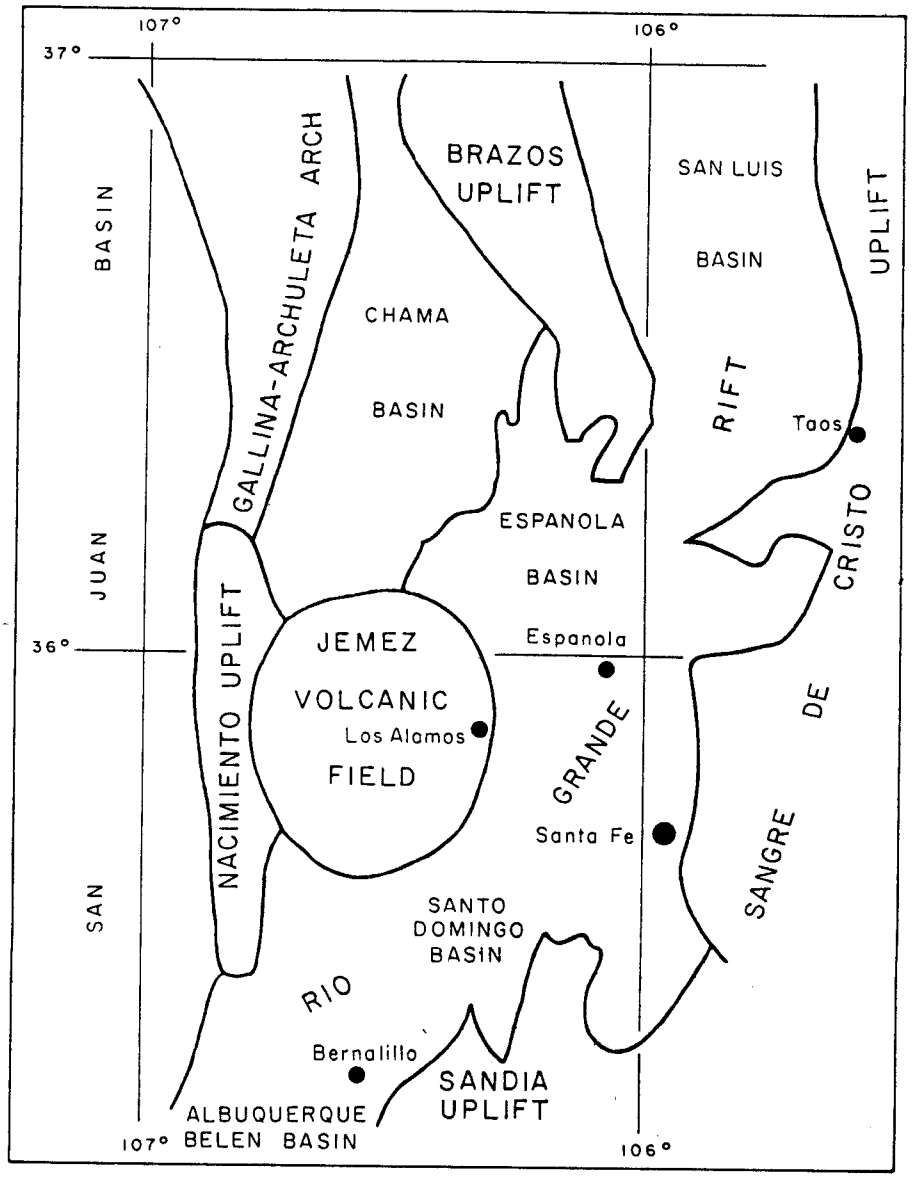
LOS ALAMOS NATIONAL LABORATORY

LOS ALAMOS, NEW MEXICO

IT CORPORATION

32803

DRAWN BY	CHECKED BY		DRAWING NUMBER
I.L.F. 8/15/84	APPROVED BY	KCP	846510-A7



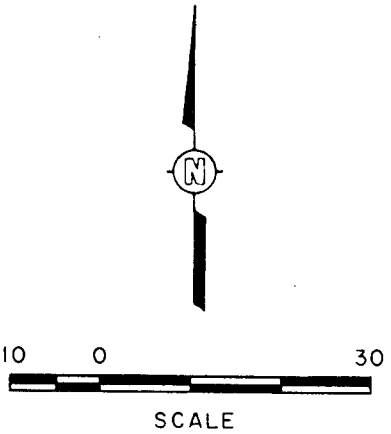
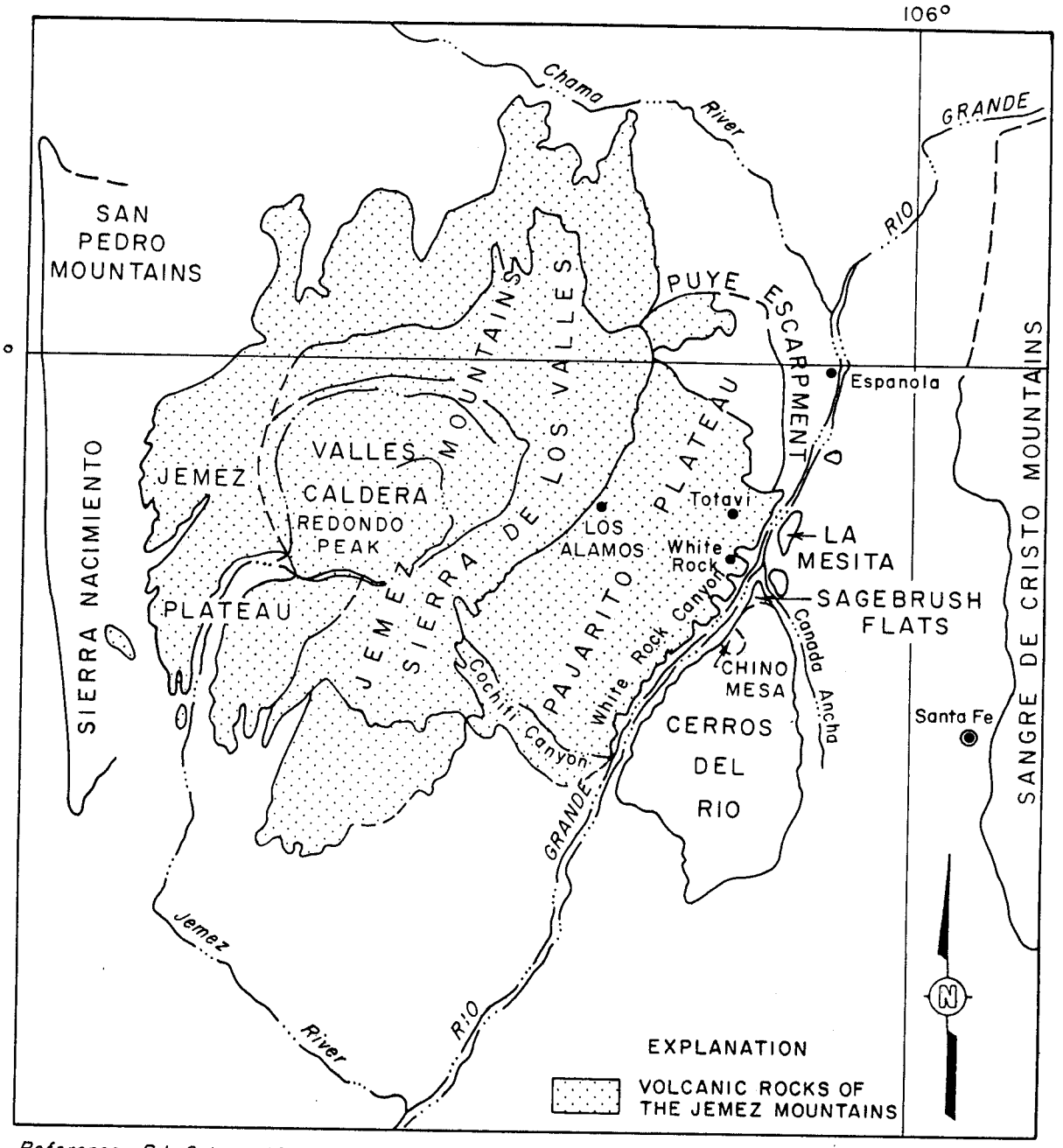


FIGURE 2-16
INDEX MAP SHOWING MAJOR TECTONIC ELEMENTS OF CENTRAL-NORTHERN NEW MEXICO
PREPARED FOR
LOS ALAMOS NATIONAL LABORATORY
LOS ALAMOS, NEW MEXICO

IT CORPORATION

32803



Reference; R.L.Griggs, 1954

5 0 5 10 MILES
SCALE

FIGURE 2-17

PHYSIOGRAPHIC FEATURES OF
THE JEMEZ MOUNTAINS

PREPARED FOR

LOS ALAMOS NATIONAL LABORATORY
LOS ALAMOS, NEW MEXICO

IT CORPORATION

DRAWING NUMBER 846510-A8
CHECKED BY
APPROVED BY
DRAWN BY MJG 9/24/84

32803

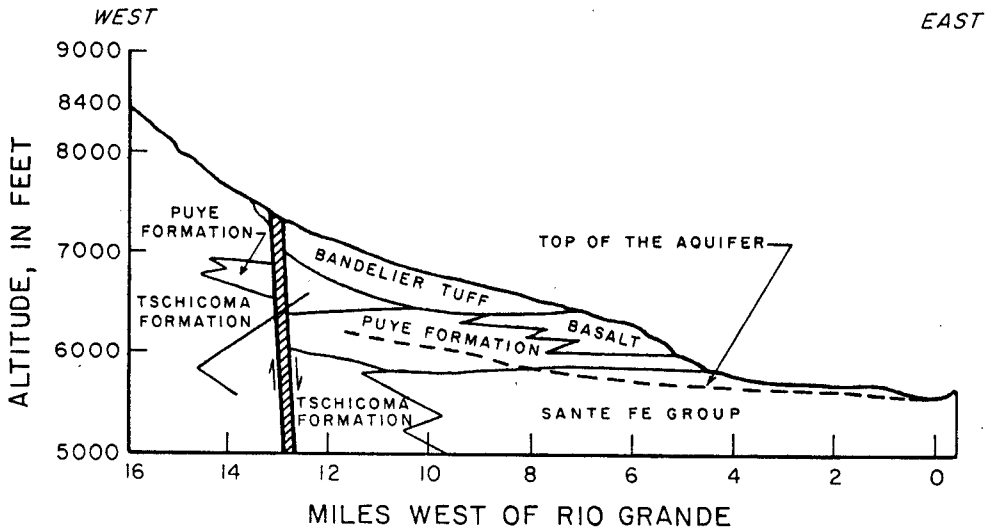


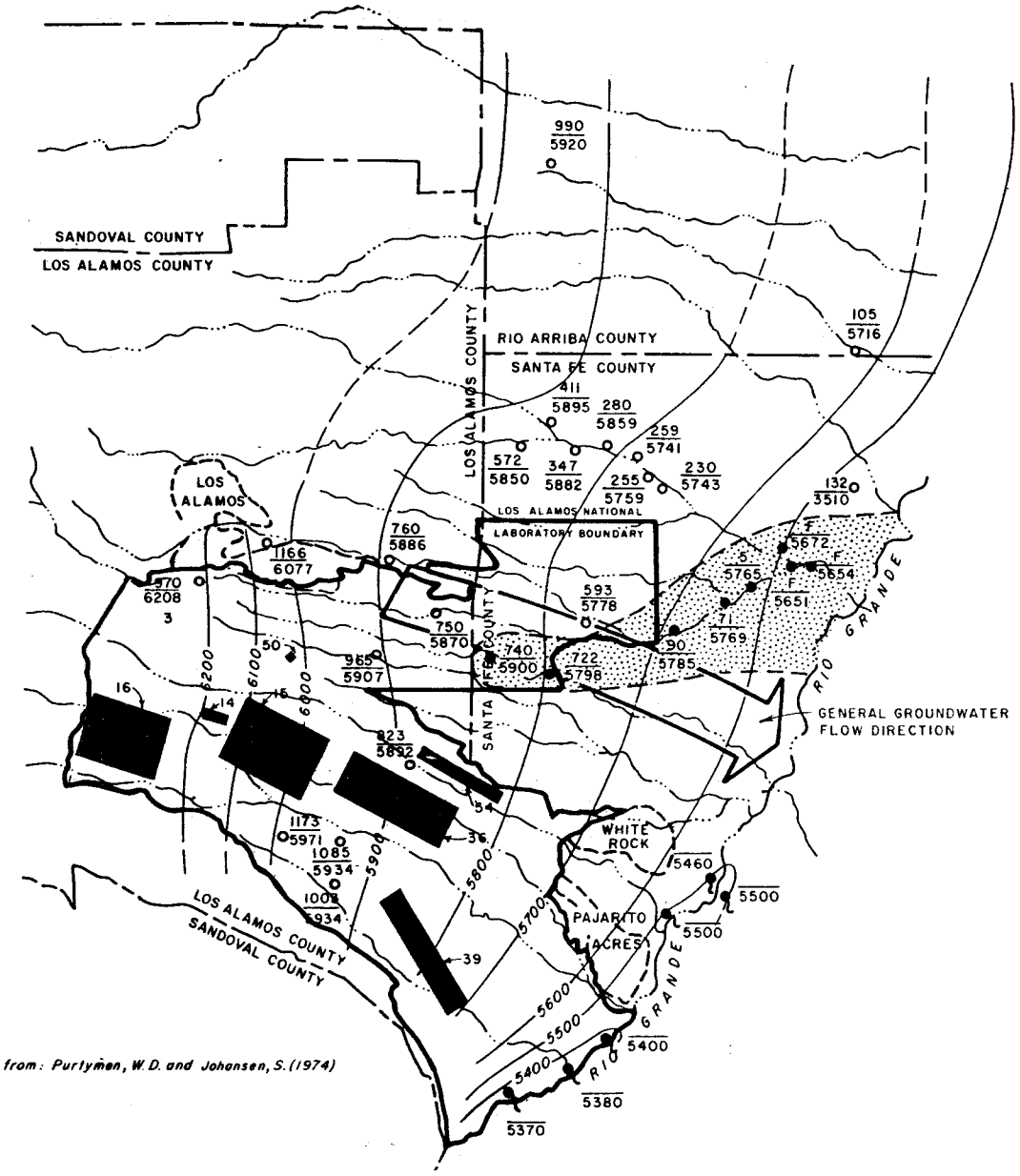
FIGURE 2-18

EAST-WEST GEOLOGIC SECTION
THROUGH THE PAJARITO PLATEAU
PREPARED FOR
LOS ALAMOS NATIONAL LABORATORY
LOS ALAMOS, NEW MEXICO

IT CORPORATION

DRAWN BY LLF 8/16/84 | CHECKED BY | APPROVED BY | DRAWING NUMBER 346510-A9

32803



Modified from: Purtymen, W.D. and Johansen, S. (1974)

EXPLANATION

- WELL COMPLETED INTO AQUIFER UNDER WATER TABLE OR NEAR WATER TABLE CONDITIONS.
- WELL COMPLETED INTO AQUIFER UNDER ARTESIAN PRESSURE
- DEPTH TO WATER (FT.); F, FLOWING / ALTITUDE OF WATER SURFACE (FT.)
- SPRING — ALTITUDE OF WATER SURFACE
- 5900 — WATER-LEVEL CONTOUR ON AQUIFER UNDER WATER TABLE OR NEAR WATER TABLE CONDITIONS; IN FEET ABOVE MEAN SEA LEVEL; CONTOUR INTERVAL 100 FT.
- AREA OF DEEP WELLS COMPLETED INTO AQUIFER UNDER ARTESIAN PRESSURES
- 16 — TECHNICAL AREAS OF INTEREST

NOTE: DEPTH TO WATER AS REPORTED WHEN WELL DRILLED

1 0 1 2 MILES
SCALE

FIGURE 2-19

GENERALIZED CONTOURS ON TOP OF MAIN AQUIFER

PREPARED FOR

LOS ALAMOS NATIONAL LABORATORY
LOS ALAMOS, NEW MEXICO

IT CORPORATION

DRAWN BY	M.J.G. 10/8/84	CHECKED BY		DRAWING NUMBER	846510-B5
		APPROVED BY			

19 1253 HERCULENE, A&B SMITH CO., PGH., PA

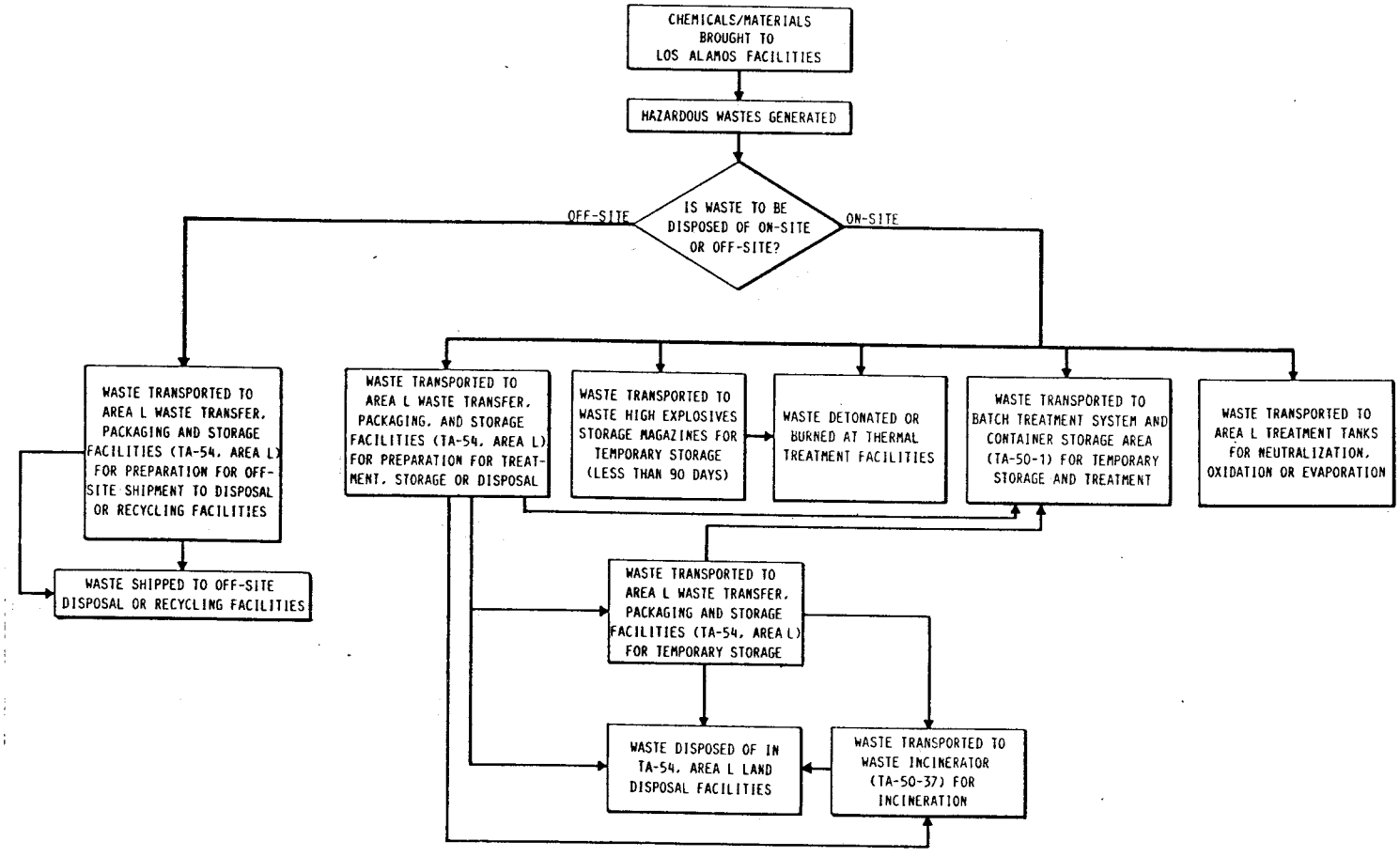


FIGURE 2-20

SCHEMATIC DIAGRAM OF LOS ALAMOS HAZARDOUS WASTE MANAGEMENT ACTIVITIES

PREPARED FOR

LOS ALAMOS NATIONAL LABORATORY

LOS ALAMOS, NEW MEXICO

DRAWING NUMBER 8465/0-86

CHECKED BY

APPROVED BY

DRAWN BY

© 1984 IT CORPORATION
ALL COPYRIGHTS RESERVED

"Do Not Scale This Drawing"

65380

IT ... Creating a Safer Tomorrow

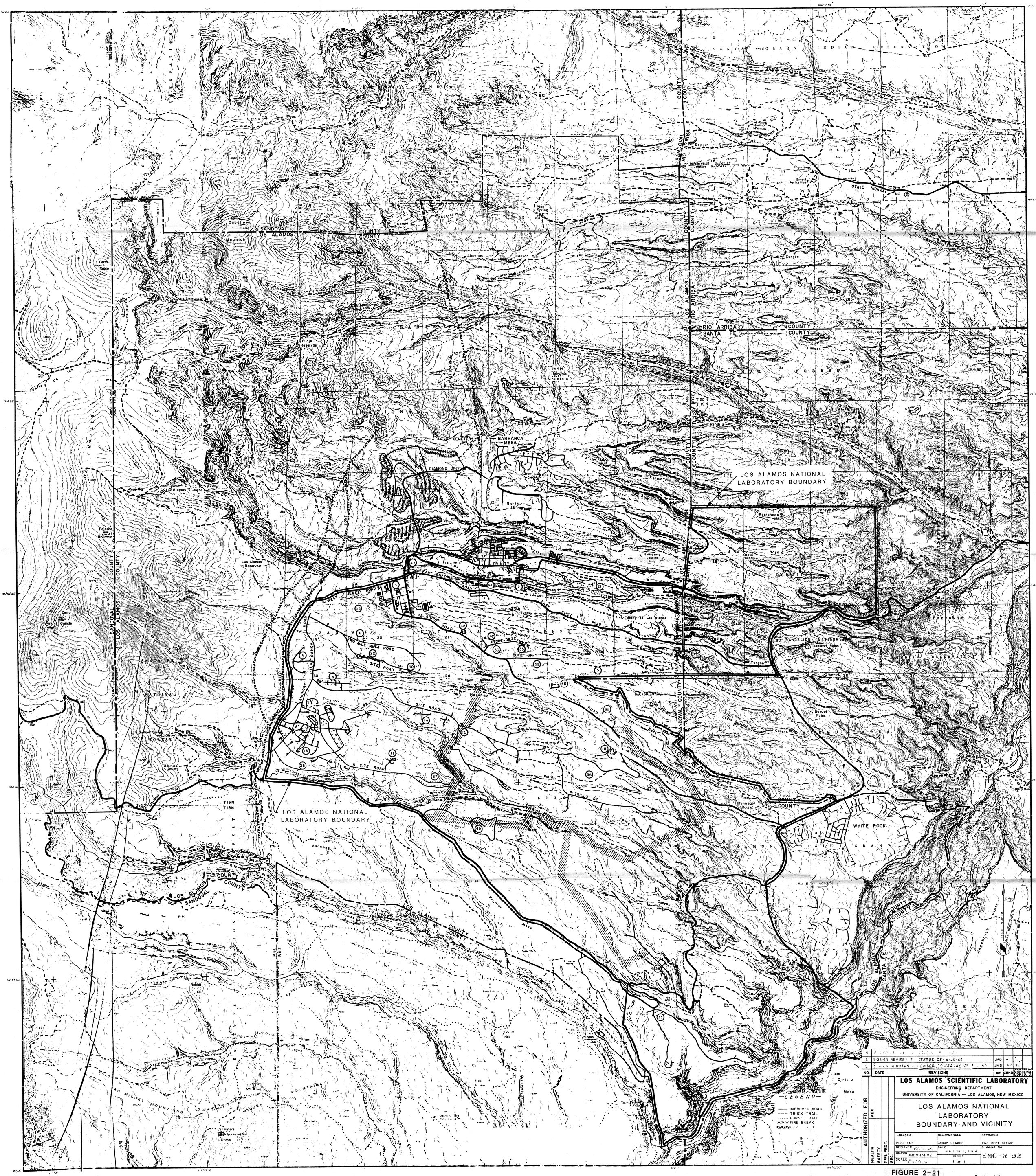


FIGURE 2-21

COPY NO.

3.0 WASTE CHARACTERISTICS AND ANALYSIS PLAN

3.1 CHEMICAL AND PHYSICAL ANALYSES

This section describes the chemical and physical nature of the RCRA-regulated hazardous waste treated, stored and disposed at Los Alamos facilities. This information is provided in response to RCRA Part B Permit Application requirements, as specified in 40 CFR 270.14(b)(2) (NMHWMR 302.A.4.b.[1]) and regulatory requirements, as contained in 40 CFR 264.13 (NMHWMR 206.B.3). The Laboratory complied with RCRA Part A interim authorization, in which all chemicals classified as hazardous and used at Los Alamos were listed. Chemicals not regulated by RCRA, but considered by DOE to be of concern, are not referenced here.

Hazardous waste generated by Laboratory activities is classified into three very general types: (1) wastes from processing operations, (2) wastes from research and development (R&D) activities, and (3) high explosive (HE) waste. Each of these general types has unique characteristics. Processing wastes typically are significant volumes of material that contain a very limited number of contaminants. R&D wastes, however, are typically lesser volumes of a vast number of different laboratory reagents, chemicals, solvents, and other general laboratory waste. In addition, the composition and concentration of contaminants in a given process waste is generally uniform, unless modifications to the process are made. Conversely, the waste species from R&D activities continually vary, depending on the nature of the rapidly changing R&D efforts at the Laboratory. HE wastes consist of a narrow assemblage of chemicals, the concentrations of which may vary. The chemical assemblage, however, remains fairly constant. Los Alamos has developed procedures for the identification and segregation of hazardous wastes (see Section 3.3). Once a waste is identified as a hazardous waste,

it is diverted to the appropriate treatment/disposal method (described in Section 4.0), based on its characteristics as determined by the Waste Analysis Plan (see Section 3.2).

Below is a brief description of the types of wastes generated, treated, stored, and disposed at the Laboratory divided according to activities. Table 3-1 provides an abbreviated form of this information as well as representative estimates of waste volumes.

3.1.1 Wastes from Basic and Applied Chemistry R&D Programs

Primary Laboratory sites for basic and applied chemistry R&D include the Chemistry and Metallurgy Research Building (TA-3-29), Radiochemistry Laboratory (TA-48), Sigma Building (TA-3-66), and the Health Research Laboratory (TA-43). Typical nonradioactive chemical wastes consist primarily of large quantities of partly empty small containers of laboratory reagents, solvents, test samples, and other laboratory wastes. Up to several hundred relatively small quantities of different acids, bases, organics, inorganics, reactive metals, and other chemicals require disposal (see Appendix G for a list of these materials). These R&D wastes represent nearly all of the waste species included in the Los Alamos Part A Permit Application.

3.1.2 Electrochemistry Processing Wastes

The Electrochemistry Section of the MST-6 Materials Technology Group, located at TA-3-66, generates plating solutions containing chromates and cyanides. These are listed reactive and toxic wastes (F007, F009). The Print Circuit Board Shop of the

E-2 Electronic Manufacturing and Technician Resources Group, located at TA-3-40, generates acid/base wastes that are heavily contaminated with copper. These are considered to be hazardous wastes because of their corrosivity (D002).

3.1.3 Isotope Separation Wastes

The Isotope and Structural Chemistry Group, INC-4, generates highly concentrated nitric and sulfuric acid wastes. Both nitric and sulfuric acid wastes are hazardous due to their highly corrosive characteristics (D002). Nitric acid is also considered hazardous because it can be an oxidizer (D001) depending on its concentration. These wastes do not contain hazardous contaminants based on knowledge of the waste-generating processes.

3.1.4 Shops Department Wastes

The Main Shops Department, Building TA-3-39, houses most of the highly versatile machine shop capabilities at the Laboratory. Parts can be machined from almost any known metal or known alloy. Waste materials from machining operations are segregated by metal when generated. (For example, there are containers for aluminum chips and turnings.) The machining operations routinely generate waste lithium metal and lithium hydride, both of which are hazardous due to their reactivity (D003). Again, these materials, when generated, are known and not comingled with other metal wastes. The Main Shops Department also generates waste non-halogenated solvents (F003) and halogenated degreasers (F001) and solvents (F002).

3.1.5 Explosives Wastes

High explosives (HE) waste is generated by the Dynamics Testing (M) and Design Engineering (WX) Division groups in the

course of processing and testing various HE materials. Processing includes pressing, machining, and casting HE. Waste occurs as discrete pieces of HE, as well as chips, machine cuttings, and powder. The chips, cuttings and powder are usually in the form of waterborne suspensions, collected in specially designed accumulating/settling sump tanks. Wastes also consist of materials contaminated with HE; these may include paper, oil, solvents, wood, machine tools, fixtures, etc. Chemically, the wastes consist of HMX, RDX (cyclonite), TNT (2,4,6 trinitrotoluene), PETN (pentoerythritol tetranitrate), ammonium nitrate, barium nitrate, TATB (triaminotrinitrobenzene), nitrocellulose, tetryl, nitroguanidine and various plastic binders. Nearly all the HE waste substances are ignitable (D001) or reactive (D003), and barium nitrate is EP toxic (D005). Residues from HE waste are generated by flashing or burning HE waste at TA-16. These residues are typically present in the uppermost layer of sand that covers the burn pad. The sand from the two pads used to burn pieces of explosives is considered hazardous due to its barium content (D005).

3.1.6 Chemically Contaminated Equipment

In addition to the wastes noted above, various laboratory items that contain chemical residues, or are otherwise chemically contaminated, may be considered hazardous waste. Empty drums, tanks and gas cylinders are typical contaminated items. Generation of this type of hazardous waste occurs throughout the Laboratory facilities and produces a wide variety of waste types.

3.2 WASTE ANALYSIS PLAN

This section describes the waste analysis plan that has been developed and implemented at Los Alamos in accordance with 40 CFR 264.13, General Waste Analysis, and NMHWR 206.B.3.b. The plan

serves to ensure that the characteristics of the waste that require storage, treatment, and disposal at Los Alamos are known well enough to permit proper waste-handling procedures.

First, the waste is sorted generally by type:

- o Waste from processing operations,
- o Waste from research and development, and
- o High explosive (HE) waste.

Information on the waste container label and/or internal shipping ticket is considered. Generator-supplied analytical data, along with a description of the waste, names, and phone numbers of contact persons are examined. The composition of the waste is based ona knowledge of the nature of the basic and applied chemistry R&D programs. In this case, the waste generators are typically chemists who are involved in the testing and analysis of chemicals and the evaluation of reactions. These researchers have detailed knowledge of the raw material that produced the waste and may have analyzed the waste as part of their research activities.

40 CFR 262.11(c)(2) (NMHWMR204.A.3.c[2]) states that a generator may make a hazardous waste determination by "applying knowledge of the hazard characteristic of the waste in light of the materials or the process used." 40 CFR 164.13(a)(2) (NMHWMR 206.B.3.a.[1]) indicates that the detailed chemical and physical analysis of a representative sample of the waste may include "existing published or documented data on the hazardous wastes and/or hazardous wastes generated from similar processes." The waste analysis plan makes use of the fact that the composition of the wastes is known as they are generated. As a result, waste analysis is not performed on all waste streams routinely.

Rather, waste analysis is limited to that required by treatment needs and verification of process or R&D program knowledge.

The Waste Management Group utilizes the fact that the composition of most wastes generated at Los Alamos is known. The composition of the processing operations waste is known due to a detailed knowledge of the raw materials used, the process or operation generating the waste, and results of previous waste analyses. Unless the process or operation changes, the composition of the waste stream remains relatively constant.

The composition of the wastes from research and development (i.e., laboratory waste) is based on a knowledge of the nature of the basic and applied chemistry R&D programs. In this case, the waste generators are typically chemists who are involved in the testing and analysis of chemicals and the evaluation of reactions. These researchers have detailed knowledge of the raw materials that produced the waste, and may have analyzed the waste as part of their research activities.

The composition of the high explosive waste, like the composition of the processing operations wastes, is also known. The Laboratory Waste Management Group is familiar with the generating process, the raw materials used, and previous waste analysis.

Routine analysis are performed on wastes treated internally including laboratory organic wastes incinerated at the TA-50 chemical waste incinerator batch treatment system and process wastes treated in tanks at Area L. These routine analysis are limited to those parameters needed to support the treatment operation.

More detailed analysis are performed on a representative number of the individual waste streams to verify the accuracy of the process and R&D knowledge.

3.2.1 Identification of Processes Generating Hazardous Wastes and Chemical and Physical Characteristics of the Waste Streams

Section 3.1 and Table 3-1 provide a waste inventory of the wastes handled, treated, stored, and disposed at Los Alamos identified by process or operation generating the waste and waste characteristics.

A large variety and number of experiments are performed in the research and development programs. Consequently, from a waste management perspective, detailing individual waste generation "processes" would be an unwieldy task. As a result, research and development program wastes are grouped as a single process or operation. A representative waste inventory and analyses of the wastes are presented in Appendix G.

In Appendix G, the R&D wastes are categorized by EPA Hazardous Waste Number, estimated annual quantity generated, process or disposal code (following the Part A code, that is, S01, D80, T01, T04), waste category or waste type for segregation (that is, organic solvent waste, reactive metals, and compounds, etc.), and the potentially hazardous property of the waste material cited. The information on the R&D wastes presented in Appendix G is based on specific knowledge of the waste generation process, including expected reaction products and knowledge of the nature of the chemical raw materials used. The R&D wastes are not routinely analyzed unless their origin and chemical characteristics are "unknown" or unless they are intended for incineration.

Wastes from process operations typically are generated in significant volumes but contain a very limited number of regulated contaminants. For routinely generated wastes from process operations, representative samples are collected and the wastes are analyzed for parameters relative to treatment.

3.2.2 Parameters for Analysis and Rationale for Selection

The specific routine analysis performed, rationale and frequency are presented in Table 3-2. The parameters for routine analysis are chosen in order to provide sufficient information on the waste's properties to treat, store, and dispose of the wastes under RCRA.

The specific verification analysis performed, rationale and frequency are presented in Table 3-3. Verification analyses are performed periodically to determine the validity of process and R&D knowledge. Common to all verification analyses are a total metals scan, a volatile organic scan, and a semivolatile organic scan.

These three scans cover a majority of the 40 CFR 261 Appendix VIII (NMHWMR 201 Appendix III) hazardous constituents. For R&D laboratory wastes, these scans, along with pH, reactivity, and ignitibility, are adequate to determine if the laboratory waste is properly categorized or if contamination or misrepresentation require changes in handling procedures. The same scans are used to verify the process wastes, determining contamination with regulated metals or organics such as cleaning solvents.

Verification testing of explosives is not performed because testing passes a human risk and contamination by hazardous constituents that could be credibly present would not change the handling or thermal treatment methods. Burn pad sand is analyzed under verification testing to test for regulated metals that may have been included, and organic constituents and cyanide to demonstrate that these constituents are not formed during thermal treatment.

3.2.3 Test Methods Used to Perform Each Analysis

Table 3-4 lists the test methods that are used to test for the parameters. While specific methods are listed, alternate methods from Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, SW-846 (most current edition) can be used, if experienced, the nature of the sample, or improvements in analytical technology warrant the alternate method.

3.2.4 Representative Sampling Methods

Table 3-5 lists the sampling methods that will be used to obtain representative samples. SW-846, Section 1.2, which specifies EPA-approved equipment and procedures for obtaining representative samples, forms the basis of the sampling protocol used at Los Alamos. Alternate methods from SW-846 can be used if the sampling situation or experience demonstrates the alternate method to be more appropriate.

3.2.5 Frequency of Analysis

Table 3-2 defines the frequency for routine analysis and Table 3-5 defines the frequency for verification analysis. The frequency for routine analysis assures adequate data for daily waste handling.

Verification analysis for Basic and Applied Chemistry Wastes are performed on 1 percent of the waste handled based on the number of containers. Wastes to be analyzed are selected to proportionally represent the segregation groups. Within the waste segregation groups, waste samples are randomly selected. Most of the waste generated by R&D are laboratory chemicals in their original container. Roughly 80 percent are organic wastes that are incinerated and therefore routinely analyzed as required by the incinerator permit for organic chloride, trichlorofluoromethane, bromoform, dichlorodifluoromethane, and heat value. Because a majority of the wastes undergo significant routine analysis, verification analysis of 1 percent is adequate to expose contamination or misrepresentation problems.

Laboratory chemicals in unopened battles with seals intact are sometimes disposed of when they exceed their shelf life. These wastes are excluded from routine and verification analysis because the seal guarantees that the wastes are not misrepresented or cross contaminated.

Contamination or misrepresentation for R&D wastes is judged as a difference in regulated characteristics or regulated hazardous constituents, which requires a change in either segregation category, handling procedures, or treatment or disposal methods. If contamination or misrepresentation is determined in a waste, the waste generator will be questioned as to the possible causes for the differences. If no explanation for the differences can be determined, tall wastes of similar character from that generator will undergo verification testing until the adequate knowledge is obtained to consistently and accurately define the waste. Determining waste of similar character is at the discretion of the waste handling group, HSE-7, Solid Waste Operations. Examples of wastes of similar character are wastes

resulting from the same experiment, waste containers of similar appearance, or waste containers showing obvious signs of contamination.

Verification analyses of process wastes are conducted annually or when the process generating the waste has changed.

Again, contamination or misrepresentation is judged as a change in regulated characteristics or regulated hazardous constituents, which requires a change in handling, treatment, or storage of the waste. Should contamination or misrepresentation of a process waste be determined, each following waste batch undergoes verification testing until the waste characterization is consistent with process knowledge.

3.2.6 Quality Control/Quality Assurance

Los Alamos will follow the GC/QA procedures specified in SW-846, Section 10, in regards to its sampling program design, sampling, analysis, and data handling.

3.2.7 Disposition of Each Waste Stream

Los Alamos has identified the type of treatment, storage, or disposal of each hazardous waste stream in its revised Part A Application presented in Section 1.2 of this Part B Application document. Appendix G is an inventory of the waste streams generated by the R&D process.

3.2.8 Waste Analysis Plan Procedures

The purpose of this section is to specify the procedures for characterizing and sampling wastes that are being managed at Los Alamos. The procedural steps follow:

1. When chemical substances are declared to be in excess, the originating group completes a Chemical Waste Disposal Request (see Form H-1 in Appendix H) and sends the form to the Waste Management Group. The request lists the specific chemicals the generating rroup needs to dispose, the quantity and form of the chemicals, and other pertinent information such as the condition of the containers. Most chemicals disposed of are eresidual substances in small reagent size containers with the original detailed label intact.

2. The completed request form and the container label serve as the waste analysis record for the waste to be disposed. Should the label become detached, the waste is handled as an unknown material, as discussed in Section 3.2.9. One percent of the wastes, based on a count of the containers, is sampled for verification analysis.

3. After the Waste Management Group collects the chemical wastes, individual reagent containers are sorted to ensure compatibility (as described in Section 3.3) and are packaged into drums for disposal. The composition of waste in each drum is inventoried by recording data on the known composition of the waste that is placed in the container on a two-page form developed for this purpose (Forms H-2 and H-3 in Appendix H, Los Alamos Hazardous Waste Disposition Record and Chemicals in Lab Pack Drum, respectively).

4. For the processing waste streams (for example, wastes generated by the electrochemistry processing activities), periodic analyses of the waste are performed. Thorough operator knowledge of the waste-generating

process allows analyses of specific processing waste streams to be tailored to provide necessary characterization information in an efficient manner. In addition, the frequency of analysis is based on the possible temporal variation in the waste composition. The waste analysis program developed with these considerations inmind provides the information required to properly treat and dispose of processing wastes.

5. The waste analyses are individually specified by the chief chemist on a case-by-case basis. Two laboratory analyses submittal forms are used for specifying analytical tests on processing wastes (see Appendix H, forms H-4 and H-5). Verification analyses as specified in Table 3-3 is conducted annually or when the waste generation process changes.

3.2.9 Waste Analysis Procedures for Chemicals of an "Unknown" Nature

Occasionally, chemicals of an unknown nature require disposal. These wastes are handled on a case-by-case basis. Often the individual wastes can be characterized by knowledge of the operations and activities that were performed in the specific area in which the waste was generated. If the exact identity of the waste cannot be determined, it is often possible to obtain enough information to restrict the choices of potential waste chemicals to a small population of chemicals.

For purposes of managing unknown wastes, a small volume is defined at Los Alamos National Laboratory as less than one liquid gallon (or approximately four liters). The rationale for the small volume designation is that this is the minimum quantity of

sample that is needed to test if the waste is hazardous. At and below this limit, the sample is actually consumed in the analytical procedure. Small volumes of unknown wastes are not analyzed, but are disposed as prescribed in the following directive to Los Alamos National Laboratory from the New Mexico Environmental Improvement Division (EID).

> It has been deemed acceptable "to not completely analyze small quantities (less than one gallon) of unknown wastes if (1) these wastes are handled with the caution (in terms of potential occupational exposures) accorded the most hazardous substances Los Alamos National Laboratory handles, (2) they are landfilled within 90 days in the disposal shaft(s) reserved for the most potentially mobile and toxic wastes Los Alamos National Laboratory handles; (3) a complete operating record is kept of the disposal of these wastes; and (4) these unknown wastes do not exceed a very small fraction of the wastes handled. Reactive wastes cannot be landfilled, the Los Alamos National Laboratory must at least test these wastes for reactivity, pH, and ignitability prior to lab-packing for disposal.

Larger quantities than one gallon of waste must be analyzed sufficiently to determine if the waste is a pure listed waste or is a regulated hazardous waste by the mixture rule or by its characteristics. It is not sufficient to "define" the waste "in terms of basic parameters such as pH and ignitability." The waste identification scheme of 204.A.3., in other words, must be followed. It is acceptable to bulk unknown wastes, up

to one (absorbed) drum in quantity, after careful compatibility testing, and run analyses on the bulked waste."[1]

Very rarely, larger volumes (greater than 1 gallon or 4 liters of an aqueous waste) of a single unknown waste require treatment or disposal. These wastes are characterized for reactivity, corrosivity, ignitibility, and EP toxicity characteristics.

In addition, proposed Method 8600, Hierarchical Analysis Protocol (FR Vol. 49, No. 191, Monday, October 1, 1984) may be performed to screen for Appendix VIII (NMHWMR 201 Appendix III) constituents, if necessary. These larger volumes of unknown wastes are characterized in sufficient detail to permit assignment of the proper EPA Hazardous Waste Number to the waste. Analyses to characterize unknown wastes are performed in accordance with the procedures given in the most recent EPA test methods manual (currently SW-846, Second Edition).

3.3 WASTE SEGREGATION

To prevent adverse interactions of incompatible chemical wastes and to facilitate recycling or treatment of wastes, chemical wastes will generally be segregated, as discussed in Section 4.0 and Appendix L, into the following basic categories:

- Organics, including solvent wastes such as acetone, benzene, toluene, etc.

[1]October 26, 1984, Letter from Denise Fort, EID to Harold Valencia, DOE/LAAO and Donald Kerr, Los Alamos National Laboratory.

- o Corrosive acidic wastes, including organic and mineral acids, but excluding oxidizers such as nitric or perchloric acid,

- o Corrosive alkaline and caustic wastes,

- o Oxidizers, such as perchloric or chromic acid and non-acidic oxidizers, such as permanganates and chlorates,

- o Reactive metals and compounds, such as sodium, lithium hydride, phosphorous trichloride, etc., and

- o Nonreactive metals, salts and neutral compounds, such as lead, barium salts, etc. and cyanide or sulfide compound containing wastes (in lab pack quantities only).

Appendix L, Procedure for Identification and Segregation of Hazardous Waste, is based on EPA 600/2-80-076, which is "A Method for Determining the Compatability of Hazardous Waste." Additional waste segregation practices are also followed to aid in treating and processing chemical wastes at the Laboratory. These include segregation of all process wastes (as identified in Section 3.1) before processing and segregation of all high explosive wastes from other compounds.

As opportunities for recycling are discovered, potentially recyclable wastes will be separated from the remainder of the chemical wastes. For instance, large quantities of metallic mercury are currently recycled. Additionally, depending on the results of the trial burn for the Laboratory incinerator, further segregation of wastes may become desirable to facilitate incineration procedures.

Table 3-1

LOS ALAMOS WASTE INVENTORY IDENTIFIED BY GENERATION PROCESS AND WASTE CHARACTERIZATION

Process or Operation Generating Hazardous Waste and Waste Generated	Approx. Annual Volume (lbs)	Hazard	Basis for Hazard Designation
Basic and Applied Chemistry R&D Programs			
Chemistry and Metallurgy Research Building Radiochemistry Laboratory Health Research Laboratory - Numerous chemical wastes	Organic 50,000 Inorganic 40,000	Varies[1]	R&D wastes are comprised of numerous listed wastes[1]
Electrochemistry Processing			
Materials Technology Group - Chromate and cyanide solutions	2,000	Toxic, Reactive	Listed waste - F007, F009 - toxic and reactive, could contain 10,000-20,000 ppm cyanide
Printed Circuit Board Shop - Acid/base copper etching/ plating solutions	40,000	Corrosive	D002 - pH can vary from less than 2 to about 11
Isotope Separation			
Isotope and Structural Chemistry Group - Concentrated nitric and sulfuric acid	80,000	Corrosive	D002 - pH is generally less than 2, concentrated nitric acid is also ignitable(D001) per 261.21(a)(4) (NMHWMR 201.B.2.a[4]) as an oxidizer

Revised 11/15/85

Table 3-1

LOS ALAMOS WASTE INVENTORY IDENTIFIED BY GENERATION PROCESS AND WASTE CHARACTERIZATION (continued)

Process or Operation Generating Hazardous Waste and Waste Generated	Approx. Annual Volume (lbs)	Hazard	Basis for Hazard Designation
Shops Department			
Main Shops Department			
- Lithium hydride, lithium metal	3,500	Reactive	D003 - per 261.23(a)(2),(3), (NMHWMR 201.B.4.a[2],[3]) gas and heat upon rapid reaction with water
- Halogenated solvents	1,000	Toxic	Listed waste - F001, F002 - toxic
- Nonhalogenated solvents	1,000	Ignitable	Listed waste - F003 - ignitable
Explosives			
Dynamics Testing and Design Engineering			
- High Explosives	50,000	Ignitable, Reactive	Listed waste - K044 - also D001, D003, may also contain D005 waste
- Contaminated burn pad sand	10,000	Toxic	D005 - sand contaminated and tests EP Toxic for barium per 261.24(a) (NMHWMR 201.B.5.a)

Revised 11/15/85

Table 3-1

LOS ALAMOS WASTE INVENTORY IDENTIFIED BY GENERATION PROCESS AND WASTE CHARACTERIZATION (continued)

Process or Operation Generating Hazardous Waste and Waste Generated	Approx. Annual Volume (lbs)	Hazard	Basis for Hazard Designation
Chemically Contaminated Equipment			
Many LANL Facilities	12,000		Same characteristics as hazardous material contaminants

---

[1]See Appendix G for a representative list of wastes and hazard designations.

Revised 11/15/85

Table 3-2

ROUTINE WASTE ANALYSIS PARAMETERS, FREQUENCY OF ANALYSES AND RATIONALE

Hazardous Waste	Analysis Parameters	Frequency	Rationale
Basic and Applied Chemistry R&D Programs			
Laboratory waste (liquids)	Ignitability, Reactivity, pH, EP Toxicity, Chemical Analysis	Each time an unknown waste requires disposal	Analyses for selected parameters will be performed only for wastes that are unknown from laboratory process knowledge; the diverse nature of laboratory waste precludes identification of all parameters for which each unknown waste will be analyzed, however, sufficient analysis will be performed on unknown containers greater than 1 gal. to enable assignment of the appropriate EPA hazardous waste number.

Revised 11/15/85

Table 3-2

ROUTINE WASTE ANALYSIS PARAMETERS, FREQUENCY OF ANALYSES AND RATIONALE (continued)

Hazardous Waste	Analysis Parameters	Frequency	Rationale
Basic and Applied Chemistry R&D Programs			
	Heat Value, Organic Chlorine, Ash Production Trichlorofluoromethane, Bromoform, Dichloro-difluoromethane	One incinerator feed tank per three months	Laboratory wastes are intended for incineration, if possible, and thus, even if known from process knowledge, they will be analyzed for these incinerator parameters as part of the hazardous waste incinerator permit.
Laboratory waste (solids)	Ignitability, Reactivity, pH, EP Toxicity, Chemical Analysis	Each time an unknown waste requires disposal	Analyses for selected parameters will be performed only for wastes that are unknown from laboratory process knowledge; the diverse nature of laboratory wastes precludes identification of all parameters for which each unknown waste will be analyzed, however, sufficient analysis will be performed on unknown containers greater than 1 gal.

Revised 11/15/85

Table 3-2

ROUTINE WASTE ANALYSIS PARAMETERS, FREQUENCY OF ANALYSES AND RATIONALE (continued)

Hazardous Waste	Analysis Parameters	Frequency	Rationale
Laboratory waste (solids) (cont)			to enable assignment of the appropriate EPA hazardous waste number.
Basic and Applied Chemistry R&D Programs			
	Organic Chlorine[1], Trichlorofluoromethane, Bromoform, Dichlorodifluoromethane	One composite sample of incinerator feed per three months[2]	Laboratory wastes are intended for incineration, if possible, and thus, they will be analyzed for these incinerator parameter as part of the hazardous waste incinerator permit, if process knowledge suggests the potential presence of organic chlorine and if a representative sample can be obtained.
Electrochemistry Processing			
Materials Technology Group - Cyanide and chromate solutions	Cyanide, Chrome	Per batch	Toxic contaminant concentrations can vary widely and proper treatment of waste is assured by frequent analyses.

Revised 11/15/85

Table 3-2

ROUTINE WASTE ANALYSIS PARAMETERS, FREQUENCY OF ANALYSES AND RATIONALE (continued)

Hazardous Waste	Analysis Parameters	Frequency	Rationale
Electrochemistry Processing			
Printed Circuit Board Shop - Acid/base copper etching/plating solutions	pH	Per batch	Same as cyanide, chromate analysis above.
Isotope Separation			
Isotope and Structural Chemistry Group - Nitric and sulfuric acid	pH	Per batch	This waste is hazardous (corrosive, D002) due to its pH. The compositions of these wastes do not change significantly; test is performed to confirm composition; additional analyses will be performed if a process change should affect the waste characteristics.

Revised 11/15/85

Table 3-2

ROUTINE WASTE ANALYSIS PARAMETERS, FREQUENCY OF ANALYSES AND RATIONALE (continued)

Hazardous Waste	Analysis Parameters	Frequency	Rationale
Shops Department			
Main Shops Department - Lithium hydride, lithium metal	None	None	Process knowledge allows identification of material without analysis.
- Halogenated solvents	None	None	Process knowledge allows identification of material without analysis.
- Nonhalogenated solvents	None	None	Process knowledge allows identification of material without analysis
Explosives			
Dynamics Testing and Design Engineering Group - High explosives	None	None	This is a listed hazardous waste (K044) due to its reactivity and ignitability; this material will not be analyzed due to safety considerations; however, process knowledge allows identification of the material.

Revised 11/15/85

Table 3-2

ROUTINE WASTE ANALYSIS PARAMETERS, FREQUENCY OF ANALYSES AND RATIONALE (continued)

Hazardous Waste	Analysis Parameters	Frequency	Rationale
Explosives (cont)			
- Contaminated burn pad sand	EP Toxicity for Metals	Annually, and if formulation of explosives changes	Sand is assumed to be contaminated with EP Toxic barium.
Chemically Contaminated Equipment			
Many Los Alamos Facilities - Empty drums, tanks, gas cylinders, etc.	None	None	Contaminants known and contaminated equipment treated with the same precautions as if it were the actual material.

---

[1]The nature of the waste (e.g., contaminated rags, tissues, etc.) may preclude analysis and process knowledge will have to provide necessary information.
[2]More than one composite sample may have to be taken if wastes are not compatible. A composite is therefore taken for each compatible feed group.

Table 3-3

VERIFICATION WASTE ANALYSIS PARAMETERS, FREQUENCY OF ANALYSES AND RATIONALE

Hazardous Waste	Analysis Parameters	Frequency	Rationale
Basic and Applied Chemistry R&D Programs			
Laboratory wastes (liquids)	pH, total metals, volatile organics, semi-volatile organics, reactivity, ignitability	1% of Waste Containers[1]	Analysis are conducted to determine contamination of chemicals at levels requiring changes in handling practices.
Laboratory wastes (solids)	As for Laboratory Wastes (liquids) plus free liquids determination	1% of Waste Containers[1]	As for Laboratory Waste (liquid) plus the free liquids analysis to demonstrate suitability for landfill disposal.
Electrochemistry Processing			
Materials Technology Group - Cyanide and Chromate Solutions	pH, total metals, volatile organics, semi-volatile organics, cyanide, reactivity[2]	Annually, and if waste generation process changes	Analysis are performed to check for heavy metal and organic solvent contamination. Sulfide generation (reactivity) is determined to assure safe treatment.
Printed Circuit Board Shop - Acid/base copper etching/plating solutions	As for cyanide and chromate solutions	Annually, and if waste generation process changes	As for cyanide and chromate solutions.

Revised 11/15/85

Table 3-3

VERIFICATION WASTE ANALYSIS PARAMETERS, FREQUENCY OF ANALYSES AND RATIONALE (continued)

Hazardous Waste	Analysis Parameters	Frequency	Rationale
Shops Department (cont)			
- Nonhalogenated solvents	As for hologenated solvents	Annually, and if waste generation process changes	As for halogenated solvents. The semi-volatile and volatile organic analysis are adequate to determine the presence of halogenated solvents as well as most regulated organic constituents.
Explosives			
Dynamics Testing and Design Engineering Group - High explosives	None	None	This is a hazardous waste (K044) due to its reactivity and ignitability; this material will not be analyzed due to safety considerations, process knowledge allows adequate identification for thermal treatment.

Revised 11/15/85

Table 3-3

VERIFICATION WASTE ANALYSIS PARAMETERS, FREQUENCY OF ANALYSES AND RATIONALE (continued)

Hazardous Waste	Analysis Parameters	Frequency	Rationale
Explosives (cont)			
- Contaminated burn pad sand	Total metals, volatile and semi-volatile organics, cyanides, free liquids	Annually, and if process changes	Total metal analysis are performed to determine contamination with regulated metals; organic and cyanide analyses are performed to determine if regulated constituents are formed by thermal treatment; free liquids are checked to confirm the adequacy of land filling sand wastes.
Chemically Contaminated Equipment			
Many Los Alamos Facilities - Empty drums, tanks, gas cylinders, etc.	None	None	There are no sampling protocols for sampling contaminated equipment.

---

[1]One percent of laboratory waste containers excludes laboratory chemicals in their original bottles if the bottles have not been opened as demonstrated by an unbroken cap seal. These chemicals are disposed of when their shelf life has been exceeded and there is no chance of contamination.
[2]Reactivity for these wastes is determined as cyanide and sulfide gas generation potential per NMHWMR 201.b.4.a.5.

Revised 11/15/85

Table 3-3

VERIFICATION WASTE ANALYSIS PARAMETERS, FREQUENCY OF ANALYSES AND RATIONALE(continued)

Hazardous Waste	Analysis Parameters	Frequency	Rationale
Isotope Separation			
Isotope and Structural Chemistry Group - Nitric and Sulfuric Acid	pH, total metals, volatile organics, semi-volatile organics, cyanide, reactivity (2)	Annually, and if waste generation process changes	Analyses are performed to check for heavy metal and solvent contamination.
Shops Department			
Main Shops Department - Lithium hydride, lithium metal	Total metals, volatile organics and semi-volatile organics	Annually, and if waste generation processes changes	Analysis are performed to determine contamination by solvents and regulated metal.
- Halogenated solvents	Total metals, volatile and semi-volatile organics, ignitability	Annually, and if waste generation process changes	Analyses determines metals contamination, and contamination by regulated organic constituents. Ignitability is determined to assure the handling practices are safe.

Revised 11/15/85

TABLE 3-4.
WASTE ANALYSIS PARAMETERS AND TEST METHODS

Parameter	Test Method	Reference[1]
Ignitability	Pensky-Martens Closed-Cup Method	(L) SW1010 (L) ASTM D93-80
Reactivity	Numerous methods[3] and tests	(L,S) SW Section 2.1.3
pH	Electrometric	(1) SW9040
EP Toxicity	EP Toxicity Extraction[2] and Graphite Furnace Atomic Absorption Spectrophotometry	(L,S) SW1310
Arsenic		(L) SW7060
Barium		(L) SW7081
Beryllium		(L) SW7091
Cadmium		(L) SW7131
Chromium		(L) SW7191
Lead		(L) SW7421
Selenium		(L) SW7740
Silver		(L) SW7761
	EP Toxicity Extraction[2] and Manual Cold Vapor Technique	(L,S) SW1310
Mercury		(L) SW7470
EP Toxicity	EP Toxicity Extraction and Gas Chromatography	(L,S) SW1310
Organochlorine Pesticides		(L) SW8080
Chlorinated Herbicides		(L) SW8150

Revised 11/15/85

TABLE 3-4.
WASTE ANALYSIS PARAMETERS AND TEST METHODS (continued)

Parameter	Test Method	Reference[1]
Chemical Composition	Any of those methods in this Table plus the following:	
	Chemical analysis for volatile organic compounds using gas chromatography/mass spectrometry	(L) SW8240
	Chemical analysis for semi-volatile organic compounds using gas chromatography/mass spectrometry	
	- with packed column	(L) SW8250
	- with capillary column	(L) SW8270
Heat Value	Bomb calorimeter	(L) A006, ASTM D240
Organic Chlorine	Halide titration of combustion residue	(L,S) A004, ASTM D2361
Trichlorofluoromethane, Bromoform, Dichlorodifluoromethane	Chemical analysis for volatile organic compounds using gas chromotography/mass spectrometry	(L) SW8240
Ash Content	Residue after combustion in muffle furnace	(L) A001, ASTM D482
Cyanide	Distillation and titration	(L) SW9010
Chrome	Colorimetric method for hexavalent chromium	(L) SW7196
Total Metals	Inductive Coupled Plasma Method	
Arsenic		SW 6010
Barium		SW 6010
Beryllium		SW 6010
Cadmium		SW 6010
Chromium		SW 6010
Lead		SW 6010
Nickel		SW 6010
Selenium		SW 6010

Revised 11/15/85

TABLE 3-4.
WASTE ANALYSIS PARAMETERS AND TEST METHODS (continued)

Parameter	Test Method	Reference[1]
Silver		SW 6010
Thallium		SW 6010
Zinc		SW 6060
Mercury	Manual Cold-Vapor Technique	(L)SW 7470(S)SW7471
Volatile Organics	GC/MS Method for Volatile Organics	(L)(S)SW8240
Semi-Volatile Organics	GC/MS Method for Semi-Volatile Organics--Packed Column Technique	(L)(S)SW8250
	or GC/MS Method for Semi-Volatile Organics-Capillary Column Technique	(L)(S) SW8270
Free Liquids	Paint Filter Liquids Test	(S) 9095

---

[1]"A" refers to Sampling and Analysis Methods for Hazardous Waste Combustion, EPA-600/8-84-002, February 1984.

"ASTM" refers to American Society for Testing Material Standards.

"SW" refers to Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, SW-846, 2nd Edition, EPA, July 1982.

"L" refers to liquid waste.

"S" refers to solid waste.

[2]If EP Toxicity (and other analyses) do not permit identification of an unknown chemical waste, digested metal samples (per SW3020) will be analyzed for the metals noted.

[3]Methods for cyanide and sulphide generation are pending. SW-846 methods will be used when they become available. Methods recommended by the USEPA will be used in the interim.

TABLE 3-5
SAMPLING METHODS FOR HAZARDOUS WASTES TO BE ANALYZED

Hazardous Waste	Sampling Method[1]	Description of Sampling
Basic and Applied Chemistry R&D Program		
Laboratory Waste (liquids)	Coliwasa; glass bottle	Samples of unknown wastes in larger containers (e.g., five-gallon can) taken with coliwasa; smaller containers may be sampled by pouring a small quantity of fluid into a glass bottle
Laboratory Waste (solids)	Thief, trier	Thief or trier used for unknown wastes based on waste physical consistency; in some cases (e.g., contaminated equipment) obtaining a representative sample may be impracticable.
Electrochemistry Processing		
Materials Technology Group - Cyanide and Chromate solutions	Coliwasa	Samples taken from drums before solutions transferred to batch treatment system; samples can also be taken from treatment system tank.
Print Circuit Board Shop - Acid/base copper etching/ plating solutions	Coliwasa	See above description
Isotope Separation		
Isotope and Structural Chemistry Group - Nitric and sulfuric acid	Coliwasa	See description for cyanide and chromatic solution sampling

Revised 11/15/85

TABLE 3-5
SAMPLING METHODS FOR HAZARDOUS WASTES TO BE ANALYZED (continued)

Hazardous Waste	Sampling Method[1]	Description of Sampling
Explosives		
Dynamic Testing and Design Engin. Groups - Contaminated burn pad sand	Thief	Samples taken from approximate center of recent explosives burn

[1] Sampling methods are adopted from: Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, SW-846, 2nd Edition, EPA, July 1982.

4.0 WASTE MANAGEMENT PRACTICES AND FACILITIES

The waste management facilities at Los Alamos to be permitted consist of the following, as noted in Section 2.0:

- TA-50 Batch Treatment System, Container Storage Area, and Chemical Waste Incinerator
- TA-54 Waste Transfer, Packaging and Storage Facilities, Treatment Tanks and Land Disposal Facilities

These Laboratory facilities and related hazardous waste processing activities (treatment, storage and disposal) are described in the following sections.

4.1 TA-50 BATCH TREATMENT SYSTEM AND CONTAINER STORAGE AREA

The lower level of Building 1 at TA-50 houses hazardous waste storage and treatment facilities for treating radioactive liquid wastes and non-radioactive RCRA-regulated wastes. The hazardous waste storage and treatment facilities are located in a room with approximately 425 square feet of floor area (Figure 4-1). The storage area consists of a four-foot square, cement pad with eight-inch high curbing capable of holding four drums of waste awaiting treatment. The cement pad is presently in good condition, free of any cracks, gaps or holes. The cement pad is coated with epoxy (see Appendix I) to prevent damage in the event of a spill. The containers are stored on a wooden pallet to prevent contact with standing liquids. The area can easily be inspected and is free of cracks and other signs of deterioration. The treatment facility includes a versatile batch, wet chemical processing system (Figure 4-2), designed to neutralize or treat acids and bases, cyanides and heavy metal-containing solutions.

The batch treatment system consists of a totally enclosed, vented 500-gallon pressure vessel which is lined with a nominal 60-mil (0.060-inch) thick Kynar (polyvinylidene fluoride) carbon-mat-reinforced lining. The pressure vessel is equipped with a sparging loop for treatment gas introduction and an agitator for proper homogenization of tank contents. The vessel is also connected to various plumbing to allow the addition of treatment chemicals under enclosed conditions. The pressure vessel is jacketed and the jacket is designed to be connected to steam, hot water and cold water lines to permit

heating or cooling of the vessel. A vented, 370-gallon blowdown tank is incorporated into the system. This tank ensures that possible overpressuring of the pressure vessel during waste treatment or filling does not result in leaks of hazardous wastes or damage to the treatment system. A vent gas condenser system for pressure vessel venting and a basket/cartridge filter also complement the system. Vacuum transfer lines for pressure vessel loading from drums or from tank trucks complete the mechanical portions of the batch treatment system. All plumbing and hardware that would be subject to corrosion from untreated liquid waste are Kynar lined.

The batch treatment system has a full package of instrumentation to permit continuous or periodic measurement of appropriate treatment parameters. The system and its contents are monitored for pH, oxidation-reduction potential, temperature, pressure and flow volume at appropriate locations in the system. The detailed engineering drawings showing the batch treatment system mechanical components and instrumentation are in Appendix I. Appendix I also contains the detailed specifications and the pressure vessel lining inspection report.

The treatment facility also includes a fume hood area that can accommodate two 55-gallon drums for transfer of liquids from one drum to another under ventilated conditions.

4.1.1 Current Management Practices

Building 1 at TA-50 is fenced and the access gates and building doors are locked and the building patrolled by Los Alamos security personnel during unattended hours. The batch waste treatment system is used primarily to treat the Electrochemistry Processing chromate and cyanide plating solutions and acid/base copper etching/plating solutions. The treatment system is highly flexible, however, and other wastes, particularly heavy metal solutions, may occasionally be treated. Typically, the chromate and cyanide plating solutions are treated in batches of up to 220 gallons several times a year and the copper etching/plating solutions are treated in 400-gallon batches approximately every two months.

Hazardous wastes are currently received in drums; however, connections and necessary equipment are in place for off and on loading trucks by vacuum. Drums are kept closed and stored on a pallet in the curbed storage area until their contents are transferred to the treatment system. Wastes are also stored in containers described in Section 4.3 and Appendix I-2. Only compatible waste are handled or stored at any one time in this area; however, the treatment system is used to treat incompatible wastes with thorough washdown between waste batches. Analyses of wastes are performed both before and after treatment. The wastes that will be treated in the batch treatment system include the electrochemistry processing wastes. The Waste Analysis Plan, Section 3.2, discusses the parameters, rationales, test methods and sampling methods pertinent for characterizing these wastes. The same Waste Analysis Plan will be utilized to characterize these wastes after treatment.

Steel 55-gallon drums will be used to store wastes at the TA-50 container storage area. These drums will meet the U.S. Department of Transportation Specification No. 17C or 17H. Corrosive wastes will be stored in DOT 17C or 17H drums with polyethylene liners. The drums will be handled and transported in the batch treatment and storage areas by hand trucks or forklifts.

After rendering wastes non-hazardous by treatment (see Section 4.1.2), the resulting liquid is sampled by opening of the valves on the treatment tank. The types and frequency of analyses performed and the analytical methods employed are identical to those noted for the wastes prior to treatment (see Section 3.0). This waste is typically discharged to the industrial (radioactive) waste treatment system. These discharges are included in the NPDES permit. Sludges recovered from metals precipitation and other batch treatments are mixed in drums with cement for disposal at TA-54, Area L facilities.

The fume hood area of the batch treatment room is used for transfer of liquids from one drum to another (as, for example, from a damaged drum to a new drum or to collect liquids for incineration, etc.). This area is typically used when a waste generator within the Laboratory cannot transfer liquids without receiving vapor exposures to chemicals such as xylene or toluene.

4.1.2 Secondary Containment Areas

The eight-inch curb which encloses about 150 square feet of floor space beneath the batch treatment system and including the container storage area provides containment for approximately 850 gallons of liquid. This containment volume is greater than the 500-gallon capacity of the batch treatment system and the 220-gallon capacity of the drum storage area, combined (i.e., 720 gallons). Raised floor drains that empty into the industrial (radioactive) sewer system are located within the curbed area. The level of these drains is about one-half inch below the top of the curb; thus, the drains are kept capped to prevent inadvertent release of hazardous materials into the industrial waste sewer. The serrated top of the floor drain has been replaced with a blind flange.

4.1.3 Batch Treatment System Description and Processes

The TA-50 Batch Treatment System is designed to treat and neutralize various types of metal waste streams (cyanide, chromate, heavy metal). Even though the waste streams to be treated in the tank will vary, the specific gravity of all wastes entering the tank will not exceed 1.25. A protective KYNAR lining was chosen for the tank because of its corrosive-resistant capabilities and compatibility with the waste streams to be treated (see Appendix K for the Chemical Resistance Table for compatibility information). The tank shell and liner will be inspected annually (see Section 6.3, Procedures to Prevent Hazards) to ensure that the tank walls and liner have not experienced damage due to corrosion or erosion. The following sections discuss the various types of treatment performed in the batch treatment system.

The reactor tank is supported by four legs that are constructed of lengths of six-inch wide by 0.5-inch thick steel plate welded to form a box. Each leg has a pad with a surface area of 2.5 square feet that rests on the concrete floor of the batch treatment system room. The total weight of the filled tank will not exceed 8,000 pounds (the tank weighs about 2,800 pounds and the weight of the contents will not exceed 5,000 pounds). Thus, each leg will be required to support a load of no more than 2,000 pounds and each pad will exert a load of no more than 800 pounds per square foot on the floor. The concrete floor design load-bearing capacity is approximately 3,000 pounds per square foot; thus, the floor loading is well below the design capacity of the floor.

4.1.3.1 Cyanide Waste Treatment

Batches of up to 220 gallons of waste cyanide solution are treated at one time in the treatment system. Cyanide solutions are received at the facility in 55-gallon drums. After analysis, the solutions are transferred from the drums into the treatment system tank by transfer pump (see Appendix I for pump information). Pump specifications are included in Appendix I (page I-54). However, to provide additional clarity, the vendor information on pumps used is also provided in Appendix I (beginning on page I-67). Based on the volume of the solution and its cyanide concentration, measured amounts of sodium hypopchlorite or a combination of chlorine gas and sodium hydroxide are added to the tank through pipelines and valves. The subsequent series of reactions of these chemicals with the cyanide in solution results in the essentially complete destruction of the cyanide. The end-products of this process are sodium chloride, carbon dioxide and nitrogen, which can be safely released to the environment.

4.1.3.2 Chromate Waste Treatment

Chromate plating solutions are also treated in batches of up to 150 gallons. These wastes are received in 55-gallon drums and transferred to the waste treatment system tank in the same manner as that used for cyanide wastes. Sulfur dioxide gas is introduced into the tank and the pH maintained below 2 by addition of sulfuric acid. Resulting reactions reduce the chromium in the plating solutions from the plus six to the plus three valence state. After reduction of the chromium, sodium hydroxide is added to the tank, raising the pH to about eight and precipitating the chromium as the metal hydroxide. This precipitant is filtered from the tank solution, mixed in a drum with cement and disposed of in TA-54, Area L. The waste liquid is suitable for discharge to the sanitary or industrial waste treatment systems.

4.1.3.3 Acid/Base Heavy Metal Waste Treatment

Acid/base wastes resulting from processes such as copper etching and plating are treated in approximately 400-gallon batches and stored at Area L. These wastes are transferred to the treatment tank in the same manner as other wastes and are neutralized. Sodium hydroxide is used to neutralize waste acids, and hydrochloric or sulfuric acid are the neutralizing agents for

alkaline solutions. In addition to neutralization, acid solutions are treated to remove metals such as copper, arsenic, lead, silver, etc. by appropriate chemical methods. The removal of metals from the acid wastes is accomplished by precipitation and removal of the insoluble metal hydroxide. Treatment and removal of metals is accomplished by the following simplified steps:

1. The pH of the batch is raised to the 9.0 - 10.0 range by the addition of sodium hydroxide.

2. Metal hydroxides will form and settle to the bottom of the tank.

3. The metal hydroxide sludges are then removed from the tank through a hopper located at the bottom.

4. After removal of the hydroxides, the pH is neutralized with sulfuric or hypochloric acid.

5. The neutralized liquid waste is discharged to the sanitary or industrial waste treatment system and any metals sludge is mixed in drums with cement and disposed of in TA-54, Area L.

4.2 TA-50 CHEMICAL WASTE INCINERATOR

The chemical waste incinerator, located in Building 37 at TA-50, is a highly modified, controlled air incinerator rated at a nominal waste feed throughput of 45 kilograms per hour. It is currently permitted to burn radioactive and PCB-contaminated materials. The incinerator has not burned RCRA hazardous wastes to date; however, the Laboratory is proposing to permit the incinerator under RCRA to provide for future operating flexibility and minimization of land disposal. The incinerator and required support activities are located within Building 37, as shown in Figure 4-3. The incinerator and flue gas treatment systems are capable of safely combusting a variety of hazardous wastes including low-level radioactive wastes and transuranic contaminated wastes. Since the incinerator is designed to combust materials contaminated with radioactivity, the incinerator is fitted with glove boxes that permit operation and maintenance of components that have the potential of becoming radioactively contaminated. Personnel access to the incinerator equipment can be achieved with proper protective clothing and respiratory equipment (see Section 6.5.2).

The incinerator process is depicted in Figure 4-4. The incinerator, a controlled air, dual chamber design, is natural gas fired to provide waste ignition and to supply supplemental heat. A detailed description of the incinerator and incinerator process is provided in the trial burn plan (Appendix J); a summary of this information is provided below.

Solid wastes are loaded into the incinerator in batches by a ram feeder. Liquids are loaded by a pump and gaseous wastes fed by gas container pressure or assisted with a vacuum pump. All wastes are charged to the primary combustion chamber operated at a nominal temperature of 760 to 980°C with air controlled to maintain nearly stoichiometric conditions. Unburned volatile components and entrained particles exit the primary chamber to the secondary chamber where excess air and supplemental heat are introduced to promote complete combustion. The secondary chamber is maintained at a nominal temperature of 870 to 1200°C and provides the needed residence time to assure complete combustion.

The flue gas treatment system consists of a quench column, a venturi scrubber, a packed-column scrubber, a condenser, a mist eliminator, a reheater, HEPA filters, an activated carbon adsorber, additional HEPA filters, and an induced draft blower. The purpose of the flue gas treatment system is to remove particulate matter, condense volatile metals and capture acid gases, such as sulfur dioxide, chlorine and fluorine. After purification by the flue gas treatment system, the gas exiting the filters is discharged to the atmosphere through a stack by an induced draft blower.

4.2.1 Secondary Containment Areas

Two 155-gallon KYNAR-lined steel tanks are located in the incinerator facility. These tanks are used for less than 90-day storage of waste and for blending of wastes prior to incineration. The tanks and associated pumps are located within a curbed area having dimensions of 0.42 feet x 9.5 feet x 20.83 feet. Curbing around a door reduces the containment volume by about 8 ft^3. The curbed area can contain approximately 562 gallons of liquid, an amount in excess of the total volume of waste that may be stored in the waste tanks.

4.2.2 Current Management Practices

Building 37 in TA-50 is fenced with access gates locked during unattended hours. Additionally, the building doors are locked when unattended and the area is patrolled by Los Alamos security personnel.

It is intended that the waste incinerator be used to reduce significantly the volume of hazardous waste requiring land disposal at the Laboratory. Incineration, coupled with batch treatment and recycling when feasible, should eventually reduce the volume of landfilled wastes to a minimal level. Some wastes may not be suitable for incineration. These wastes will be identified by actual waste analysis or process knowledge (see Section 3.2) and will be segregated from incinerator-suitable materials (see Section 3.3).

Wastes to be incinerated are stored at the Area L Waste Transfer, Packaging and Storage Facility if storage for greater than 90 days is required. Wastes are transferred to Building 37, TA-50 less than 90 days before they are scheduled for incineration. Solid wastes are received at the incinerator facility in sealed containers which may be opened or sorted as necessary. Prior to incineration, the solid wastes are restricted to an area that has been engineered for proper storage of the material. Liquid wastes are also received in sealed containers. Prior to incineration, the liquid wastes are either retained in the sealed container (if the container is within a shipping cask designed for spill control) or may be transferred by dip tube/pump into the 155-gallon KYNAR-lined holding/blending tanks. Transfer to the holding/blending tanks is made in an enclosure by personnel wearing protective clothing.

The pumps used to transfer wastes into the holding/blending tanks are Moyno brand pumps, model numbers 3L2, SSF and 2L2, SSF. The pumps are constructed of series 300 and 316 stainless steel wettable surfaces with viton seals. The capacity of the pumps at 1200 revolutions per minute are three gallons per minute and ten gallons per minute for the 3L2 and 2L2, respectively. The stainless steel construction of the pumps ensures their compatibility with all hazardous wastes that will be incinerated.

The pH of the circulating flue-gas scrub solution is continuously monitored and adjusted when desired by addition of sodium hydroxide. The specific gravity of the scrub solution is monitored and maintained at or below a value representing the saturation concentration for dissolved solids by removing fluid for treatment at the TA-50 industrial (radioactive) waste treatment system and adding fresh water.

Ash is removed with a vacuum system connected to a gravity ash-dropout and cooling mechanism. Ash cleanup from the cooled incinerator is accomplished using vacuum wands operated through glove ports. The vacuum system is equipped with a high efficiency cyclone, sintered metal filters and a HEPA filter to trap the ash. Ash removed by the cyclone and metal filters is stored prior to packaging/solidification in a dropout hopper. The ash storage is limited to less than 90 days, in accordance with 40 CFR 262.34(a) (NMHWMR 204.B.1) so a RCRA permit is not required for the ash hopper. Since the incinerator is used for volume reduction of transuranic and low-level radioactive wastes, the ash, scrub solution and scrub filter cartridges are handled as suspect radioactive wastes. Ash is first checked to determine its radionuclide content. Ash that is classified as transuranic waste is solidified by mixing with cement and stored for proper disposal. Ash that is classified as low-level radioactive waste is analyzed according to the procedures in Section 3.0 to determine whether or not a hazardous waste component is present. If the waste is also found to be a hazardous waste, it is handled as a mixed waste. Ash that is not found to be radioactive is analyzed according to the plan presented in Section 3.0. If the ash is hazardous waste, it is handled and disposed in accordance with the waste procedures presented in this document. The incinerator scrub solution is transferred to the TA-50 industrial (radioactive) waste treatment system via a closed piping system for treatment (a non-RCRA regulated activity). Thus, the incinerator is used for volume reduction of radioactive and hazardous waste as described above, and the ash is considered potentially to be hazardous waste (40 CFR 261.3 [c][2]) (NMHWMR 201.A.2.c[2]) and is checked for radioactive and hazardous waste contamination and handled appropriately.

4.2.3 Waste Incinerator Trial Burn Plan

Pursuant to RCRA Part B permit application requirements noted in 40 CFR 270.62 (NMHWMR 302.E.2), a trial burn plan (including a quality assurance plan) has

been developed for the Controlled Air Incinerator (CAI) system at Los Alamos. The trial burn and quality assurance plans are in Appendix J and the trial burn plan is summarized below. Startup/ shakedown procedures are not applicable because the Laboratory incinerator is an existing facility.

The principal organic hazardous constituent (POHC) for which the destruction and removal efficiency is to be determined is carbon tetrachloride. Four runs, each consisting of triplicate test periods, will be conducted. Two runs will be with liquid waste feeds containing carbon tetrachloride and two will be with carbon-tetrachloride-containing solid wastes.

The trial burn test is to obtain process data that will permit calculation of POHC destruction and removal efficiency and hydrogen chloride removal efficiency. Additionally, the fate of POHC's treated by the system will be determined, that is, destroyed by thermal oxidation, removed by the air pollution control system or emitted in the stack gases. The trial burn test will also document the test process feed and operating conditions that will be used in establishing operating permit conditions and allow calculation of heat and material balances needed to confirm or assess recorded process conditions. Thus, sampling and analysis procedures are included in the trial burn plan to determine the physical-chemical characteristics of the incinerator feed materials, particularly the POHC concentrations, material feed rates, the composition and flow rates of the stack gases, the amounts of POHC discharged in the stack gases and in the quench-scrubber purge water removed by filters in the air pollution control system and the quench-scrubber water recirculation system. The monitoring procedures are selected to measure concentrations of oxygen in the combustion gases and carbon monoxide in the stack gases. Details and locations of monitoring are in the trial burn plan.

Temperatures are continuously monitored and recorded in over twenty locations throughout the CAI process. All temperatures are continuously recorded on strip charts in the control room. The temperature in the primary chamber is automatically modulated by adjustment of the natural gas supply to the chamber to maintain the desired temperature.

Feed rates of waste liquid are measured using mass flowmeters and direct measurement of the liquid level in the feed tank. The destruction efficiency

calculations will be based on the waste feed volumes determined from these measurements.

An operating log will be completed once each hour for all operations. These logs are a record of operating conditions and provide evidence that the operator has checked and is aware of the actual operating status of the system. The time at which entries are made will be shown, as will the actual instrument reading for each variable. If automatic shutdown occurs, the log will state the nature of the shutdown, the time it occurred and the suspected cause. Additionally, unusual conditions or situations such as spills or leaks will be noted on the log. Further, once each shift the shift supervisor will inspect the facility for malfunctions, deterioration, operator error and discharges that could lead to discharge of hazardous waste constituents to the environment or to a threat to human health. If it is determined that a spill potential exists, corrective action will be taken immediately.

The interim period between completion of the trial burn and receipt of final approval for full operating authority could be several months. During this time, Los Alamos intends to continue operating the incineration system on a full-time basis for volume reduction of radioactive waste.

4.3 TA-54, AREA L WASTE TRANSFER, PACKAGING AND STORAGE FACILITIES

The waste transfer, packaging and storage facilities are used to store and to package or solidify hazardous chemical wastes. When ready, wastes are transported from the facilities either to on-site disposal or treatment facilities or off-site for recycling at a licensed facility. Two structures comprise the Area L waste transfer, packaging and storage facilities. These include a metal building and a roofed concrete pad. A plan view of the metal building is shown in Figure 2-6. The roofed concrete pad plan is shown in Figure 2-7.

These facilities are used to store lab packs in 55-gallon drums. Prior to the containerization of the lab packs into the 55-gallon drums, an identification and appropriate segregation of the hazardous wastes is performed. This may involve the placement of waste in small containers into drums, pouring of liquid waste into drums containing vermiculite, and transfer of waste from one drum to another. All drums and containers are kept closed during storage and

are opened only when chemicals are transferred from one container to another or when lab packs are prepared.

A representative handling/storage load for the metal building consists of the following:

- Four 55-gallon drums as lab packs
- 25 gallons of miscellaneous wastes in assorted small (five-gallon or less) containers

A maximum of eight 55-gallon drums can be stored in the metal building. The volume of liquid waste stored in the building will not exceed 440 gallons (as described in the Part A Application) due to the mix of lab packs and stabilized and free liquids. The small containers will be stored adjacent to the 55-gallon drums on the grates. The small containers will eventually be placed in lab packs and/or the contents transferred to 55-gallon drums.

A total of 304 55-gallon drums can be stored at the roofed concrete pad by stacking drums on pallets on top of the first layer of drums using a forklift. Two 225-gallon storage containers are also located on the pad. These containers are constructed of polyethylene and are designed to facilitate movement with a forklift truck. The containers meet DOT Specification No. E9052. The material of construction, polyethylene, is compatible with any waste that will be stored in them based on vendor chemical suitability data. Vendor information on the 225-gallon containers is contained in Appendix I-2.

[The containers were previously described incorrectly as tanks. This correction has been made in the Part A and B Application (May 1985 submittal). The storage capacity of these containers has been taken into account in the current Part A, in the storage capacity for Area L.]

The 55-gallon drums meet the DOT Specification No. 17C or 17H (small containers are also DOT approved). Corrosive wastes will be stored in DOT drums with polyethylene liners.

Waste handling equipment used at these facilities include the following:

- Hand trucks
- Drum pumps
- Fork lift

The drums will be stored on wooden pallets; the pallets are moved, positioned, and stacked at the roofed storage area by use of a forklift.

The Los Alamos procedure for transferring wastes from containers to the treatment system utilizing the drum pumps is included as Appendix K.

4.3.1 Lab Packs

Lab packs are used at Los Alamos to containerize the laboratory wastes, particularly the laboratory R&D wastes. A typical lab pack (Figure 2-8) consists of a number of containers of compatible wastes (see Section 3.3) and vermiculite enclosed in a 55-gallon drum. Vermiculite was chosen as a stabilizing material for lab packs because of its good absorbing properties, its resistance to attack by most chemicals (Merck and Company, 1983) and the cushioning it provides for inside containers during handling and transportation of lab packs. Vermiculite is attacked by fluorine and hydrofluoric acid; however, this chemical constitutes only very small volumes in individual lab packs, and their containers will be wrapped in magnesium oxide pads. Table 4-1 provides data on the absorption capabilities for a few chemicals. None of the chemicals packaged into lab packs deteriorate vermiculite at ambient temperatures.

Los Alamos laboratory wastes are typically received for disposal in the containers in which the chemical manufacturer originally packaged the material. Thus, inside container/waste compatibility is usually not an issue. Wastes not received in their original containers are placed into empty containers that once contained compatible chemicals or in other suitable containers based on 49 CFR 173, 178, 179. Inside containers are visually checked for signs of leakage and the container lid or top tightened as the containers are placed into lab packs. If simple lid tightening is not thought to be sufficient to correct the leak, the material is transferred to a non-leaking container before it is loaded into the lab pack.

A volume of vermiculite sufficient to absorb the entire aggregate liquid contents of the inside containers is added to the drum initially and as the drum is filled. Addition of the vermiculite in this manner eliminates unfilled voids between containers. After placing the final container in the drum, the remaining drum volume is filled with vermiculite. The required ratio of the volume of liquid waste to that of vermiculite in the lab pack depends on the type of waste to be placed in the drum. However, minimizing vermiculite usage by adding only the required volume of the absorbent to each lab pack would introduce unnecessary complexity to lab pack packaging procedures. Thus, a ratio of about four volumes of vermiculite to one volume of liquid will be maintained in all lab packs. This worst case ratio will ensure that sufficient absorbent volume is present in all lab packs (see Table 4-1 for absorbing capacities of vermiculite). The drums are DOT-approved 17C or 17H drums. Typically, the drums are unlined. When necessary, 83-gallon drums and vermiculite are used to overpack damaged 55-gallon lab pack drums.

4.3.2 Secondary Containment Areas

Three shallow sumps covered by fiberglass grates are located in the concrete floor of the metal building. These sumps are provided to contain any chemical spills that may occur within the building. The concrete floor in the metal building is free of cracks and other signs of deterioration. The approximate dimensions of these sumps are shown in Figure 2-6 and will together contain a liquid volume of about 335 gallons. This secondary containment volume is significantly greater than that required based on the maximum liquid waste storage in the area. The floor slopes generally towards the sumps. The handling of any spilled wastes that collect in the sumps is discussed in Section 6.0. An asphalt-lined run-on control ditch is located outside the building to divert surface drainage away from the building.

The concrete storage pad is divided into six bermed cells. Steel grating lies above the floor of each cell so that waste drums and tanks are elevated several inches above the floor. The floor of each cell slopes toward a sump. The concrete storage pad will be maintained free of unsealed cracks and unchecked deterioration. The six cells have a combined secondary containment capacity of 8570 gallons. This secondary containment volume is significantly greater than that required based on the maximum liquid waste storage in the

area. The containment volume and the maximum liquid waste storage of each cell on the pad is listed below:

Cell[1]	Secondary Containment Volume (gallons)	Maximum Liquid Waste Storage in Cell (gallons)[2]
1	2699	4400
2	1670	2640
3	1098	1570
4	1670	2640
5	1098	1570
6	2699	4400

[1] Numbered left to right as shown in Figure 2-7.

[2] The actual maximum liquid volume will be below these amounts because some of the drums in each cell will be lab packs or contain solid wastes.

The concrete floors at each of these storage areas are presently in good condition, free of any cracks, gaps or holes. The concrete floors are coated with Plasite® epoxy to prevent damage in the event of a spill. The Plasite® epoxy was chosen for its resistance to a wide range of acids, alkalis, solvents and water solutions (see Appendix I-1 for vendor information). The containers at the metal storage building are elevated by use of the metal grates and wooden pallets to prevent contact with free liquids. The containers at the roofed concrete pad are stored on wooden pallets.

4.3.3 Current Container Management Practices

When a chemical waste is ready for disposal, personnel at the generating laboratory contact Group HSE-7. HSE-7 personnel then visit the generating site to package the waste for transport to the waste transfer, packaging and storage facilities at Area L. The wastes are packaged and labeled in compliance with DOT and EPA requirements. The wastes are transported on a three-ton flat-bed truck.

When the HSE-7 personnel pick up the wastes from the generator, a Chemical Waste Disposal Request form (H-1 in Appendix H) is completed. The form lists the chemicals being transported and is carried in the truck during transport. Once the lab wastes are received in the waste transfer, packaging and

storage facilities, they are segregated into compatible chemical groups (e.g., oxidizers, organics, etc.). They are then packed with vermiculite (heavier containers at the bottom) in 55-gallon drums as described in Section 4.3.1, and in accordance with Los Alamos' procedure for identification and segregation of hazardous wastes (Appendix L).

A second form called "Los Alamos Hazardous Chemical Waste Disposal Record" (H-2 in Appendix H) is also completed for each lab pack. This form is used to record information such as:

- Origin, description and quantity of each waste received
- Method of treatment, storage or disposal
- Location of disposal
- List of chemicals in lab packs

The segregation capabilities of the waste transfer, packaging and storage facilities permit storage of up to nine waste types at any one time (six on the concrete pad and three in the metal building).

4.3.3.1 Drum Numbering and Recording System

Each repackaging drum, whether for recyclable or nonrecyclable materials, is stenciled with both the drum type number and a record number the first time any materials are placed inside the drum. The drum type is stenciled as "Los Alamos National Laboratory HW type ___" and the record number is stenciled as "Los Alamos National Laboratory drum number ___". Record numbers are obtained from the drum number log book and the appropriate information is entered in the log book when a number is utilized. In addition, each drum is labeled with a completed EPA hazardous waste label. An example of these labels is shown in Figure 4-5.

Each open drum of nonrecyclable materials has a storage and shipment form that is completed with the requested information on all of the materials which are placed into the drum. The drum record number is also recorded on the form. The form is submitted to the records manager after the drum has been sealed.

4.3.3.2 Hazardous Waste Categories for Repackaging Purposes

The first step in the waste categorization process is to determine if the hazardous waste is suitable for recycling. Depending on the quantity

generated at any one time, various chemicals at Los Alamos are candidates for recycling. In the past, para-xylene (EPA Hazardous Waste No. U239) and metallic mercury (U151) have been handled as recyclable materials. Other relatively clean hydrocarbon solvents received in excess of 40 gallons at one time may also be handled as recyclable material.

Nonrecyclable materials along with vermiculite are packaged into the appropriate lab pack, as described in Section 4.3.1. Waste types are segregated in accordance with Laboratory segregation practices noted in Section 3.3. Materials in each of the storage categories are kept segregated from each other at all times. Even after wastes have been repackaged, drums from different storage categories are kept segregated.

When appropriate, recyclable materials are poured from their original containers (except for 55-gallon drums) into a new 55-gallon drum constructed of a similar material. Pouring is performed in a well ventilated area. Personnel are equipped with appropriate personal protection devices. If greater than 90-day storage of recyclable materials is required, they are stored at the Area L storage facilities.

Any bulging drums are handled in accordance with accepted practice and Laboratory procedures (Appendix M).

Any spills resulting from transfer of materials will be cleaned up in accordance with Section 7.5.1.1.

Other management practices currently followed at Los Alamos as they apply to these facilities include the following:

- Only compatible wastes are handled at any one time.
- Drums are inspected on a weekly basis and prior to their use.
- A maximum of eight 55-gallon drums are handled at any one time in the metal building.
- Appropriate spacing of drums is provided.

4.4 TA-54, AREA L TREATMENT TANKS

Four 1665-gallon ten-gauge carbon steel tanks are also located at TA-54, Area L. The tanks are nine feet in diameter and three feet, six inches high and are constructed of 10-guage carbon steel. Structural support is provided by a 2-inch by 2-inch angle iron stiffening ring on the lip of the tanks. The tanks are flat-bottomed and sit on 4-inch by 4-inch redwood lumber. These tanks are used to neutralize, oxidize and evaporate RCRA-regulated and non-RCRA-regulated wastes. The specific gravity of any liquid placed in the tank will not exceed 1.5.

The four treatment tanks have been coated on the inside and outside with Carboline Phenoline 373 film (see Appendix I-1) to prevent corrosion. This is a modified phenolic coating with excellent chemical, thermal shock, and abrasion resistance.

There is no instrumentation and only one piping connection on each tank. The piping connection is a 2-inch screwed plug in the shell. Level control of the liquids in the tanks is accomplished by visual inspection.

4.4.1 Secondary Containment Areas

The four treatment tanks are located on a bermed concrete pad, as shown in Figure 2-9. The curb is six inches tall and the containment capacity of the bermed area is approximately 3554 gallons; an amount adequate to contain the maximum contents of one of the treatment tanks. The concrete pad is presently in good condition, free of cracks, gaps or holes. The concrete is six inches thick over compacted gravel and the load-bearing capacity is approximately 3,000 pounds per square foot. Only compatible wastes are treated in the tanks on the treatment tank pad at any particular time.

4.4.2 Current Management Practices

The treatment tanks are double-lined with eight-mil polyethylene except when the tanks are being used to treat reactive materials. The liners are not used when reactives are treated to minimize the potential for combustion. The plastic overlaps the tank top and is held in place with an elastic strap similar to a bungee cord.

The purpose of the polyethylene liners is to facilitate the removal of solids remaining after treatment processes in the tanks. The most common exmaple is dry solid residue remaining after solar evaporation. In addition to the polyethylene liner, the interior of the tank is coated with a phenolic film (see Appendix I-1) which is compatible with all wastes placed in the tanks.

The polyethylene liners are replaced at least yearly when the tanks are in use. The old liner is placed in a 17H drum. If hazardous waste was treated in the tank during the life of the liner, then the liner and residue are handled as hazardous waste.

A description of how wastes are introduced into the tanks for treatment and the Standard Operating Procedure for the treatment tanks are provided in Appendix M-1.

The tanks are maintained so that fluid levels are no higher than six inches below the top of the tanks. If rainfall should elevate fluid levels above this level, portable pumps are used to draw down the tanks. Information on the pumps is included in Appendix K. Pumps are washed after use with water or other suitable solvents. The pumps are stored in Area L. In the event that waste must be removed from a tank, drums sufficient to contain the waste will be brought in from other areas. Once filled, the drums will be taken to Area L storage areas.

During periods of precipitation, the tanks are covered. Tank covers are constructed of styrofoam having rigid metal support members and covered with heavy vinyl. Tank covers are secured with boards and clamps.

The tank covers do not normally come in contact with the waste in the tanks; their purpose is to prevent rain water from entering the tanks so that net evaporation is increased. The tank covers are not routinely discarded. If visual evidence or operating records indicate that a cover is contaminated, it is disposed of as hazardous waste.

Both liquid and solid waste are introduced to the treatment tanks through the open top. Grab samples are taken from tanks prior to and after treatment of

wastes (at a minimum). This confirms completeness of treatment prior to removal. Prior to the placement of a new waste into a tank, the old tank liner is removed if the new and old wastes are not compatible.

4.5 TA-54, AREA L LAND DISPOSAL SHAFTS

Area L in TA-54 is the land disposal area for hazardous waste at Los Alamos. Stabilized, drummed liquid waste and lab packs are disposed of in 60-foot deep shafts that range in diameter from three to eight feet. No bulk or non-containerized liquid or reactive waste is placed in the shafts. Thirty-three shafts have been closed and one is currently open for waste disposal (Figure 2-5).

4.5.1 Current Management Practices

Open shafts at Area L are covered with a heavy steel cap. When a sufficient quantity of waste has accumulated at the Area L Container Storage Area, a 15-, 18-, or 22-ton Lorraine crane (see Appendix M-2 for crane information) equipped with drum hooks is moved to the edge of the shaft. The drummed wastes are then lowered from a truck through the open steel cap into the shaft. The shafts are protected by a metal safety cover, with toe guards, which has a railing around the opening. These covers comply with the Health and Safety Manual and the Federal Register for safety over openings and shafts. After wastes are emplaced, a layer of crushed tuff or soil is placed on the waste drums to help minimize the potential for ignition of ignitable wastes, to avoid air spaces, and to ensure complete filling between drums. When a shaft is filled, the steel cap is removed and the shaft is capped with a three-feet-thick concrete cap. Shafts are generally open for a period of one to two years.

The existing shafts are closed units. Only one shaft currently remains open and no additional shafts are planned. A list of the hazardous waste which has been placed in each cell is provided in Appendix M-3. Area L shafts are constructed in the same manner as the Area G Guidelines (memo dated 12/10/80) presented in Appendix M-4.

TABLE 4-1.

ABSORPTION CAPABILITIES OF VERMICULITE

Chemical	Absorption Per 100 Pints of Vermiculite (pints)
Perchloroethylene	2.3
Sulfuric acid, 98%	2.1
Sodium hydroxide, 50%	4.7

Data from Diamond Shamrock Corporation, 1984.

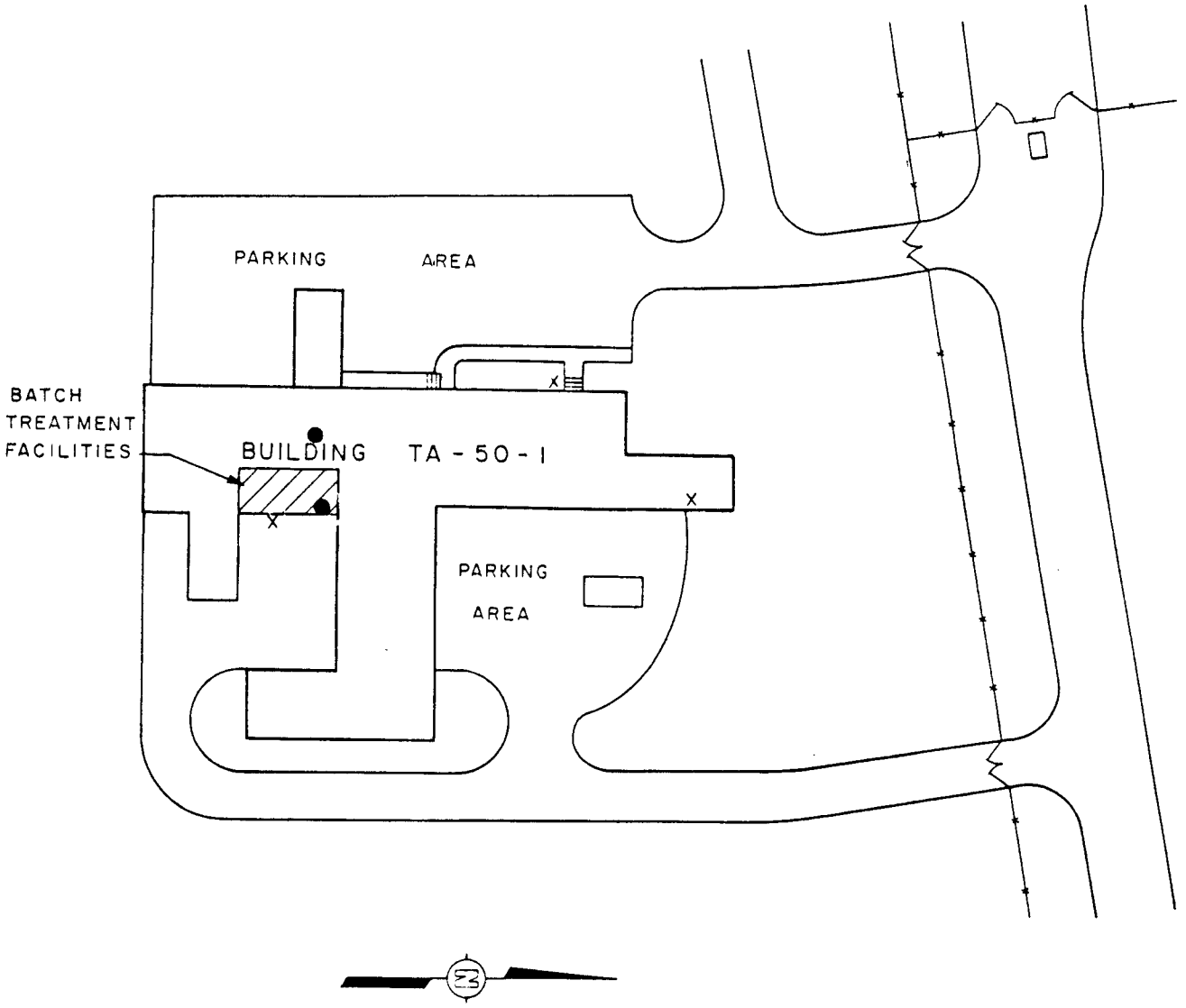


FIGURE 4-1
LOCATION OF
BATCH TREATMENT FACILITIES
IN BUILDING 1 IN TA-50
PREPARED FOR
LOS ALAMOS NATIONAL LABORATORY
LOS ALAMOS, NEW MEXICO

X ALARM PULL BOXES
● FIRE EXTINGUISHERS

IT CORPORATION

DRAWN BY	LLF 10/10/84	CHECKED BY	JSH
		APPROVED BY	RRP

DRAWING NUMBER 846510-A10

32803

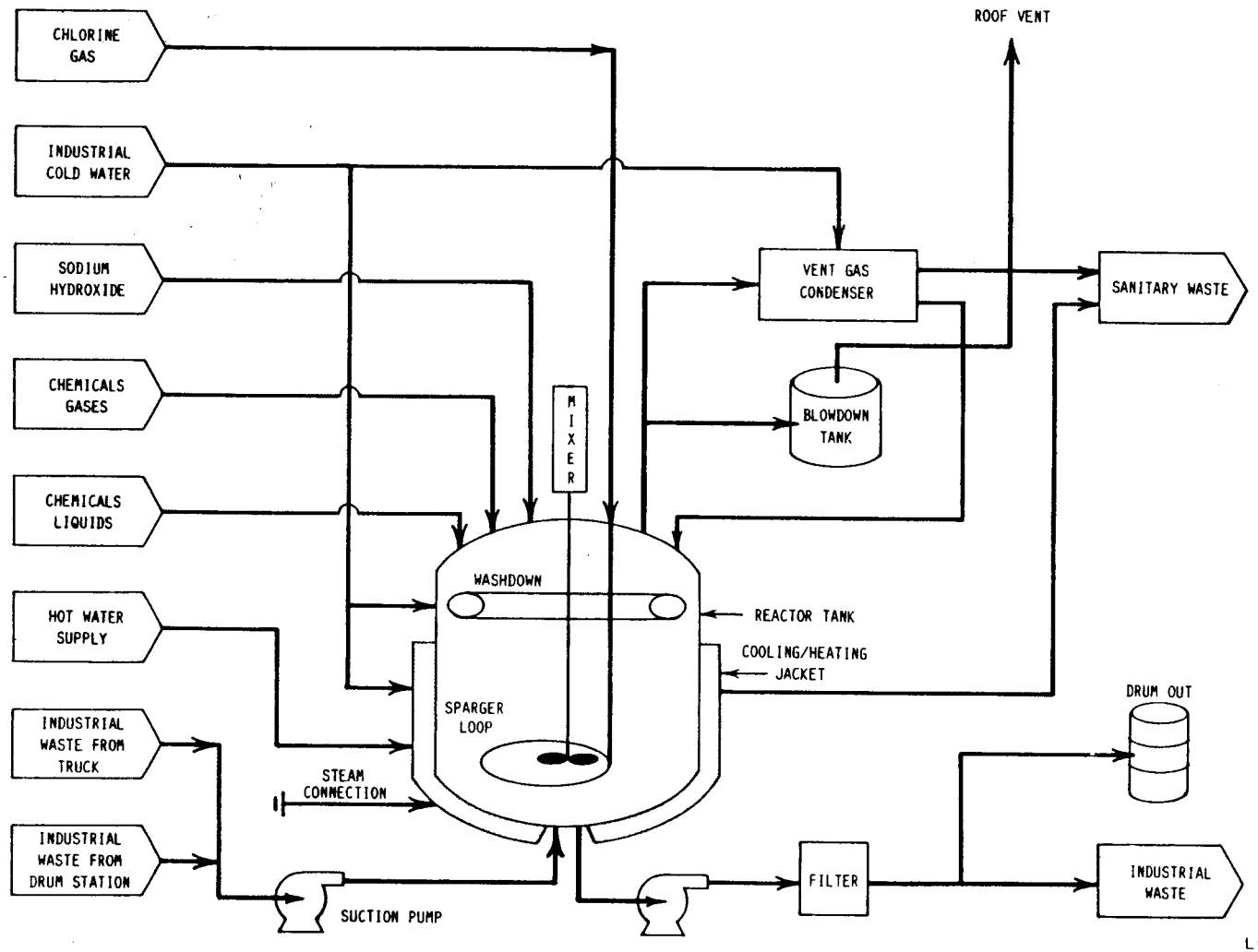


FIGURE 4-2

FLOW DIAGRAM OF BATCH TREATMENT SYSTEM

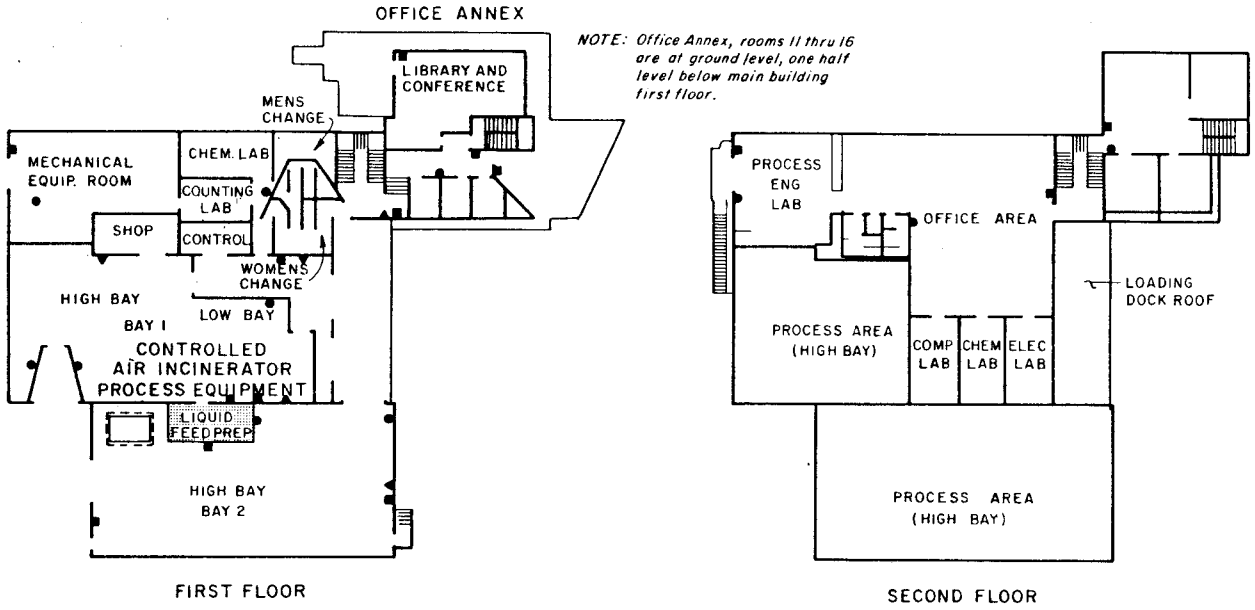
PREPARED FOR

LOS ALAMOS NATIONAL LABORATORY
LOS ALAMOS, NEW MEXICO

IT CORPORATION

DRAWN BY	CHECKED BY	APPROVED BY	DRAWING NUMBER
MJA 4/85			8465/0-87

19 1253 HERCULENE A&P SMITH CO. PGH. PA



NOTE: Office Annex, rooms 11 thru 16 are at ground level, one half level below main building first floor.

TREATMENT DEVELOPMENT FACILITY
TA-50, BUILDING 37

NOTE: All rooms are covered by automatic sprinkler heads Fire water flow activates automatic alarm pull.

▲ EVACUATION ALARM
■ ALARM PULL (FIRE)
● FIRE EXTINGUISHER
HALON SYSTEM

FIGURE 4-3

TREATMENT DEVELOPMENT FACILITY SHOWING LOCATIONS OF CHEMICAL WASTE INCINERATOR AND SUPPORT FACILITIES

PREPARED FOR

LOS ALAMOS NATIONAL LABORATORY
LOS ALAMOS, NEW MEXICO

IT CORPORATION

DRAWN BY	MJG 11/20/84	CHECKED BY		DRAWING NUMBER	8465/0-88
		APPROVED BY			

19 1253 HERCULENE. A&B SMITH CO., PGH., PA

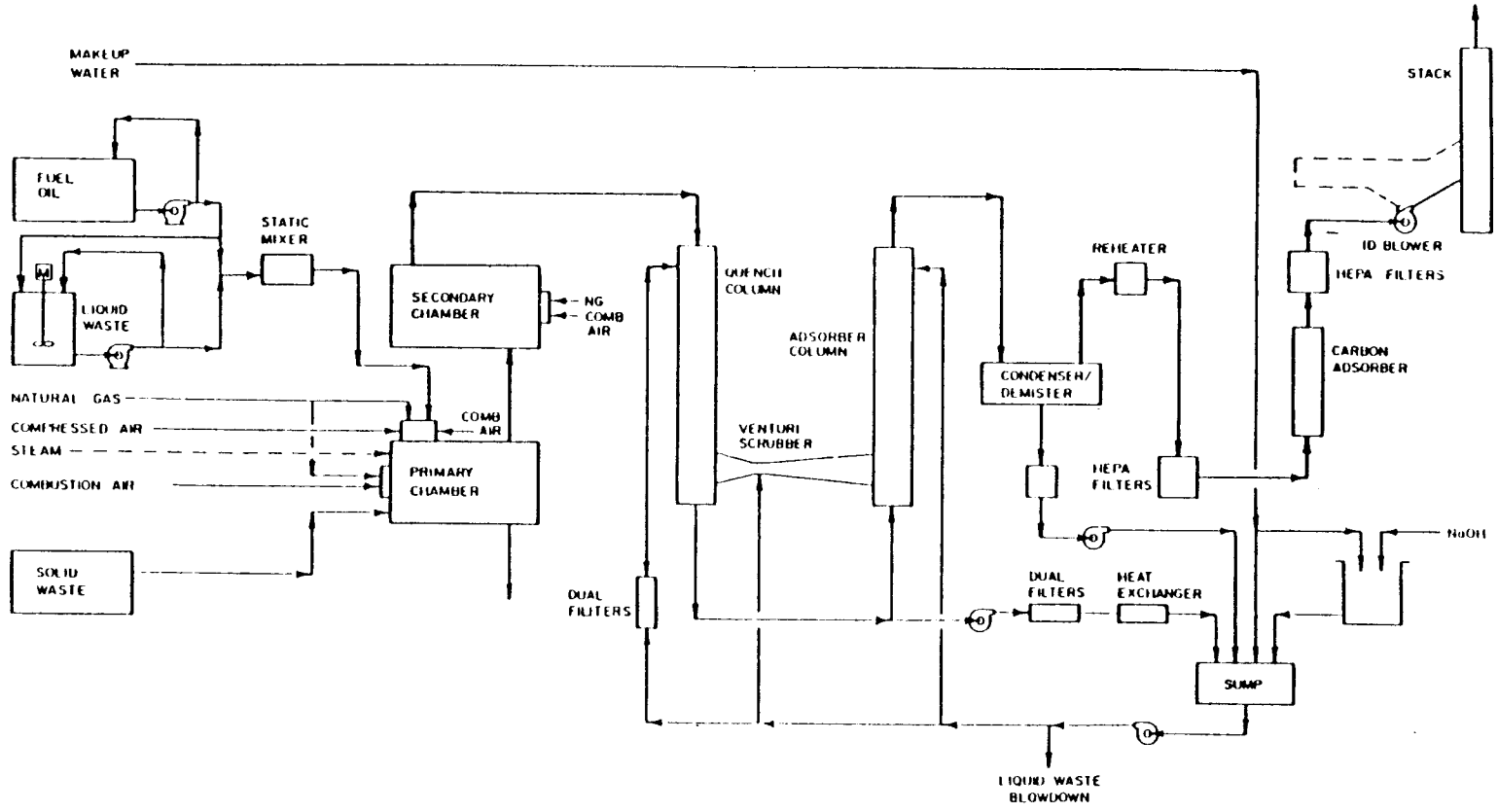


FIGURE 4-4

INCINERATOR PROCESS DIAGRAM

PREPARED FOR

LOS ALAMOS NATIONAL LABORATORY

LOS ALAMOS, NEW MEXICO

© 1984 IT CORPORATION
ALL COPYRIGHTS RESERVED

*Do Not Scale This Drawing

... Creating a Safer Tomorrow

DRAWN BY | CHECKED BY | APPROVED BY | DRAWING NUMBER P4610-A11

DRAWN BY	CHECKED BY		DRAWING NUMBER
	APPROVED BY		846184-A12

HAZARDOUS WASTE

FEDERAL LAW PROHIBITS IMPROPER DISPOSAL

IF FOUND, CONTACT THE NEAREST POLICE, OR
PUBLIC SAFETY AUTHORITY, OR THE
U.S. ENVIRONMENTAL PROTECTION AGENCY

PROPER D.O.T.
SHIPPING NAME_____ UN OR NA#_____

GENERATOR INFORMATION:

NAME_____

ADDRESS_____

CITY_____ STATE_____ ZIP_____

EPA
ID NO._____

EPA
WASTE NO._____

ACCUMULATION
START DATE_____

MANIFEST
DOCUMENT NO._____

HANDLE WITH CARE!

CONTAINS HAZARDOUS OR TOXIC WASTES

STYLE WM-6

© LABELMASTER, CHICAGO, IL 60646

FIGURE 4-5

TYPICAL DRUM LABEL

PREPARED FOR

LOS ALAMOS NATIONAL LABORATORY

LOS ALAMOS, NEW MEXICO

IT CORPORATION

32803

5.0 GROUNDWATER MONITORING

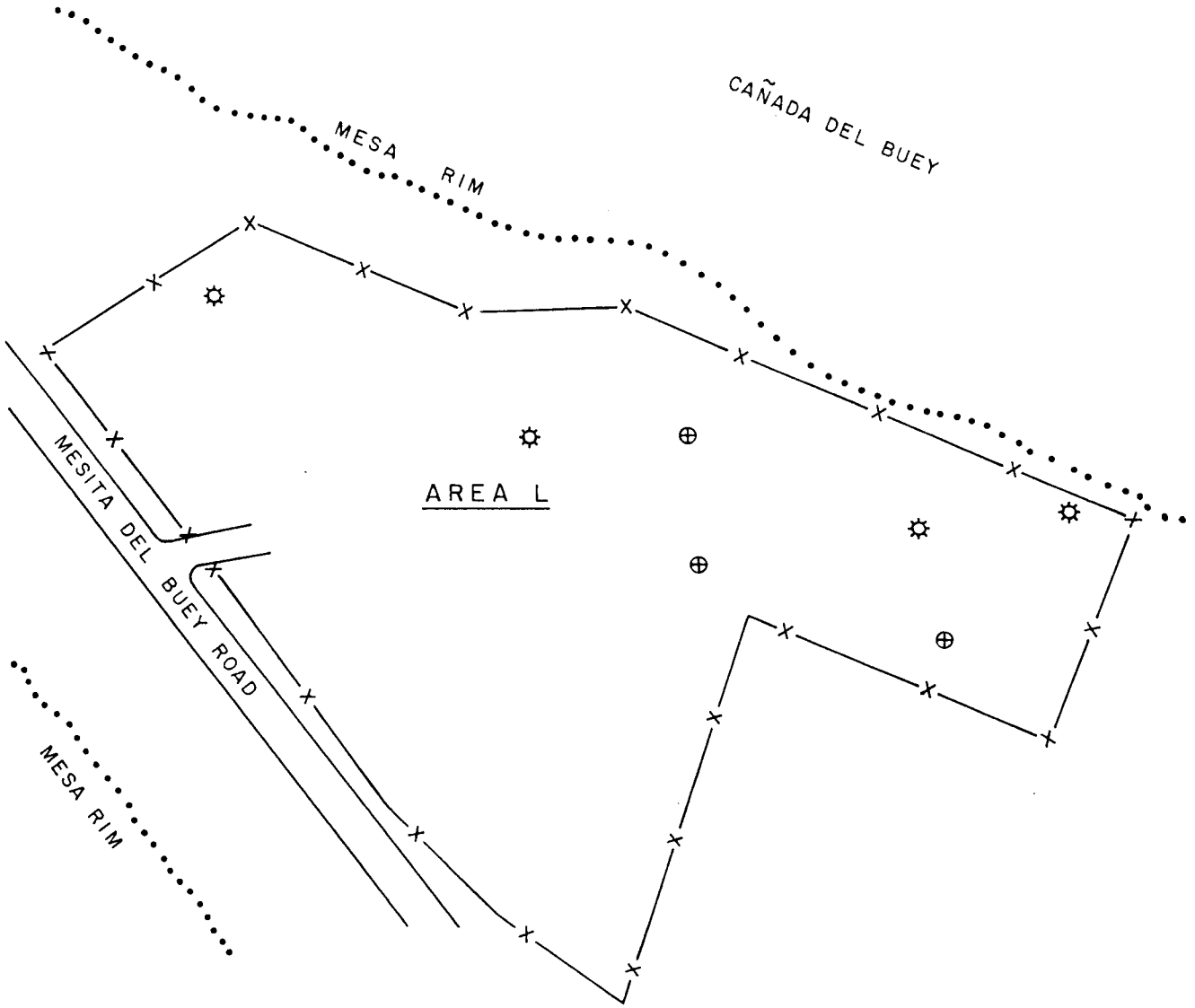
The regulations found in 40 CFR §264, Subpart F (NMHWMR 206.D.1) require the owner or operator of a landfill to implement a groundwater monitoring program to monitor the impact of the facility on the quality of water in the uppermost underlying aquifer. However, 40 CFR §264.90 (b)(4) and New Mexico Hazardous Waste Regulation 206.D.1.a(2) allow the waiver of all or part of the groundwater monitoring requirement if the owner or operator can demonstrate that there is no potential for migration of hazardous waste or hazardous waste constituents from the facility via the uppermost aquifer to water supply wells (domestic, industrial, or agricultural) or to surface water.

Los Alamos National Laboratory has evaluated the potential for migration of hazardous waste constituents from its land disposal facilities (Appendix N). The results of this work indicate that there is essentially no infiltration at the Los Alamos land disposal sites and that there is no recharge to underlying aquifers through the mesa tops in the vicinity of the Laboratory waste management areas (Cushman, 1965). The top of the uppermost aquifer underlying the TA-54 land disposal facilities is 950 feet below the surface at Area L and 850 feet below the surface at Area G. Soil and rock present at these sites, including tuff, volcanics, and sediments, are not saturated above the underlying aquifer so there is no driving force to facilitate infiltration or leaching of wastes from the disposal facilities. The lack of a hydraulic gradient at these sites and the depth to the aquifer indicate that wastes will not reach the aquifer.

This conclusion is supported by analyses of soil samples taken from holes bored horizontally under TA-54 disposal facilities from the wall of one of the adjoining canyons (Purtymun and Rogers, 1980). No indication of movement of contaminants out of disposal pits was found.

In light of these findings, Los Alamos has requested from the New Mexico Environmental Improvement Division (EID) a waiver of the 40 CFR §264 Subpart F (NMHWMR 206.D.1) groundwater monitoring requirements (Appendix M). In place of a new groundwater monitoring program directed specifically at TA-54 land disposal facilities, the Laboratory proposes to continue ongoing chemical and

radiochemical monitoring of the underlying aquifer at two nearby supply wells and at springs in White Rock Canyon near the Rio Grande. The quality of surface water flow is also monitored when it occurs in canyons adjacent to Area L. Current sampling locations are shown in Figure 2-12. To augment data obtained from these monitoring activities, the Laboratory plans to sink additional borings in the tuff to permit vadose zone monitoring (Figure 5-1). Changes in moisture content in the tuff exposed in the borehole will be detected by using a neutron moisture probe to log the holes on a regular basis. Appendix O provides a detailed description of the planned vadose zone monitoring program.



⊕ COREHOLES

✡ MOISTURE ACCESS HOLES

50 0 100 FEET

SCALE

FIGURE 5-1

LOCATION OF PROPOSED VADOSE ZONE MONITORING AND CORE HOLES AT AREA L

PREPARED FOR

LOS ALAMOS NATIONAL LABORATORY
LOS ALAMOS, NEW MEXICO

DRAWN BY	MJG 2/27/83	CHECKED BY / APPROVED BY		DRAWING NUMBER 84610-A13

© 1984 IT CORPORATION
ALL COPYRIGHTS RESERVED

Do Not Scale This Drawing

IT ... Creating a Safer Tomorrow

65360

6.0 PROCEDURES TO PREVENT HAZARDS

The information provided in this section is submitted in accordance with the requirements of 40 CFR §270.14 (NMHWMR 302.A.4.b). The following subject areas are addressed in this section: general security provisions, inspection schedules and requirements; preparedness and prevention requirements; and prevention of accidental ignition or reaction of ignitable, reactive, or incompatible wastes. Guidelines for personnel working in potentially hazardous situations can be found in the Los Alamos National Laboratory Health and Safety Manual (Appendix P).

6.1 SECURITY

All Laboratory hazardous waste facilities are located within fenced areas which are locked during non-working hours. The Protective-Force maintains Laboratory security by manning check stations, patrolling facilities, and locking access gates. This security system will prevent unknowing entry and will minimize the possibility for unauthorized entry of persons or livestock into any of the hazardous waste facilities. In most cases, the Protective-Force is limited to external surveillance of buildings and disposal areas so that potential contact with Laboratory hazards is avoided.

The TA-50 batch treatment system, container storage area, and waste incinerator are located in fenced areas. The fence is an eight-foot chainlink "hurricane" type topped by three strands of barbed wire. The buildings and gates are locked during non-working hours, and externally patrolled by Protective Force guards. All visitors must check in with the reception desk during working hours.

Area L within TA-54 is enclosed by a cyclone security fence with a single 45 degree barbed wire outrigging. The entrance gates are open during weekday working hours only and manned so that access is limited to authorized personnel. The entrance gates are locked by the users (HSE-7) and externally patrolled by the Protective Force once every four hours, from 5 p.m. to 8 a.m. on weekdays, and all day on weekends and holidays.

6.2 WARNING SIGNS

Warning signs are posted at all entrances to hazardous waste facilities and at other appropriate areas. The letters and colors of the signs are chosen to insure 25 foot legibility.

Warning signs are posted in English and Spanish at all entries to the room containing the TA-50 batch treatment system and container storage area. The signs read, "No Entry by Unauthorized Personnel" and "Hazardous Waste Treatment Area."

Warning signs in English are posted on the doors at the TA-50 waste incinerator and read, "Hazard: PCB's." There are no signs posted outside the waste incinerator building since all external doors are locked and access is only with keys and administrative controls. The two doors to the change rooms have electric strike plates for administrative control of access.

Warning signs in Area L read, "Hazardous Chemical Wastes Disposal Area." Signs are in English on all approachable fences and in Spanish on the front gate.

Los Alamos is not in a county which borders Mexico, however, in the interest of safety, Spanish language warning signs are posted in Area L.

6.3 INSPECTION SCHEDULES AND REQUIREMENTS

Fire hydrants, alarms, extinguishers and sprinkler systems at all locations are inspected and maintained according to guidelines in the "Manual of Fire Protection Policies and Procedures" (Appendix Q). The DOE Fire Department and the Zia Company, a captive contractor to the Laboratory, are responsible for inspecting the fire fighting equipment. All other equipment is inspected and maintained by the operating group. Equipment is inspected according to Equipment Inspection Schedules (Tables 6-1 to 6-5). The frequency of inspections is based upon the rate of possible deterioration of the equipment and the probability of an environmental or human health incident if the deterioration, malfunction, or any operator error goes undetected between inspections. Inspection schedules and records are kept at the HSE-7 office for a minimum duration of three years.

6.3.1 TA-50 Batch Treatment System and Container Storage Area

Potential Problems

The batch treatment system and container storage area are routinely inspected for potential problems with safety and emergency equipment, security devices, containers, and container storage facilities. Potential problems are listed on a daily inspection checklist. Potential problems include containment failure, fire, explosion, exposure, deterioration of the batch treatment system, construction materials, and system leakage.

Frequency and Content of Inspection

The batch treatment system and container storage area are inspected according to the schedule in Table 6-1. The batch system is inspected before each use and monitored during operation by the operator. This procedure is adequate to detect any cracks, leaks, corrosion, erosion, or wall thinning. In addition, the batch treatment tank will be periodically inspected for signs of deterioration of the interior walls and seams.

Prior to the interior inspection, the batch treatment tank is emptied by discharging in the normal manner to the industrial (radioactive) waste treatment system as described in Section 4.1.1. After it is empty, the tank must be thoroughly cleaned and checked to be sure it is free of flammable, toxic, and corrosive vapors and materials before entry. If this requires steaming, the tank must be cooled after cleaning and the rinse water checked to be sure it is essentially neutral. Any nearby operations considered hazardous to tank entry are shut down. The atmosphere in the tank must be tested for the presence of combustible or toxic vapors and for oxygen content, and the tank must be isolated by disconnecting or blanking off all lines before entry. Agitators must be fixed so they cannot be started by locking out, disconnecting wires, etc. A blower that provides a minimum of 12 air changes/hour or an air mask or air pack may be used. A ladder is provided, and a harness and lifeline and means of removing an unconscious person are required. A sufficient number of standby men must be present to give aid in case of trouble. Low voltage lighting or approved flashlights are used. Protective clothing or equipment may be required in some instances.

Remedial Action

If any defects, deterioration, damage or hazards are discovered during inspection, appropriate remedial actions including repairs, maintenance and replacement will be completed as soon as practical to preclude further damage and reduce the need for emergency repairs. If a hazard is found imminent or if a hazardous situation already exists, remedial action will be initiated immediately. Any remedial action taken due to an inspection will be noted on the inspection log.

The extent of damage from containment failure is assessed first by the supervisor's observations of the affected area. Upon this visual observation, he will indicate appropriate emergency response procedures, including the call-out list, evacuation, and cleanup. If necessary, the supervisor will also use Laboratory records to determine the chemicals involved. If observations indicate that human health and the environment may be adversely affected, the Contingency Plan will be implemented immediately.

The extent of the release may be further assessed by analyzing soil and water samples down-gradient from the release. Sampling locations are chosen by observations of the released material, if possible. If the release is not observable, sampling locations will be chosen randomly. Guidance in identifying hazardous chemicals is provided by the Safety Group (HSE-3), the Industrial Hygiene Group (HSE-5), the Waste Management Group (HSE-7), and the Environmental Surveillance Group (HSE-8). Table 7-4 contains a list of equipment available for remediation.

If containment failure occurs, wastes will collect in the bermed areas. In the case of a small spill, vermiculite is poured over the spilled liquid. Once the liquid is absorbed, the waste is swept or shovelled and put back into a drum. For a larger spill, the liquid is pumped back into the drums. In either case, once free liquids are removed, the surface is cleaned using cleaners appropriate to the chemicals.

Leaks from the batch treatment system will collect in the eight-inch curb which surrounds the system. The liquid will be collected and handled as though it were the system contents. Cleanup measures will be initiated depending upon the type and extent of the leak.

In the case of exposure, remedial actions include treating the exposed personnel at the HSE-2 Medical Facility (see Section 7.5.4) and determining the cause of exposure by observation, Laboratory records, and/or sampling.

Similar to hazardous waste releases, the extent of damage from fire and explosion is assessed by visual observations, Laboratory records, and if necessary, sampling. Equipment damaged or contaminated by fire, explosion, or spills is identified by visual inspections and sampling, if necessary.

Daily inspections by batch operators will detect malfunctions and deteriorations of the system. Depending upon the potential for release of hazardous wastes, the system can be shut down. The extent of the problem is assessed by visual observation by the system operator, who determines whether process shutdown should be initiated. At any time there is an evacuation, a leak of hazardous waste from the batch treatment system, or a fire or explosion, the addition of hazardous waste or chemicals to the batch tank will be stopped. If the batch is being heated, the steam to the jacket will be shut off; however, if the batch is being cooled, the cooling water will shut off only if there is danger of contamination of the cooling water. The mixer will also not be shut off unless continued operation poses a unique hazard (see Section 7.6.2.1).

Inspection Logs

Inspections of the TA-50 batch treatment system and container storage area are conducted by the operating group according to the checklist in the inspection log (Table 6-1). Results of the inspection, the inspector's name and title, date and time of inspection, and any remedial action taken are recorded on the inspection log sheet. A copy is sent for records to HSE-7 and kept for at least three years. An inspection log is kept near the system at all times. In addition, an operating log will be completed by the process operator. This log is a record of operating conditions and provides evidence that the operator has checked and is aware of the operating status of the system. The time at which entries are made and the actual instrument reading for each variable will be entered into the log. When shutdown occurs, the log will state the nature of the shutdown, the time it occurred, and the suspected

cause. Once each shift, the shift supervisor will inspect the facility for malfunctions, deterioration, operator error, and discharges.

6.3.2 TA-50 Waste Incinerator

Potential Problems

The waste incinerator system building is routinely inspected for potential problems with safety and emergency equipment, security devices, containers, container storage facilities, and loading and unloading facilities. Inspections of specific equipment and systems are conducted with a frequency appropriate to current operations, as well as appropriate to the equipment and systems. Potential problems include containment failure, fire, explosion, exposure, equipment deterioration or malfunction, and leaks from the incinerator. Appendix R contains conditions under which the waste incinerator will be operated.

Frequency and Content of Inspection

The waste incinerator, building, and emergency equipment are inspected according to the schedule in Table 6-2. Standard operating procedures require that process operators "walk through" their operating areas each hour to visually observe, monitor, and record the condition of equipment.

Remedial Action

If any defects, deterioration, damage or hazards are discovered during inspection, appropriate remedial actions including repairs, maintenance and replacement will be completed as soon as practical to preclude further damage and reduce the need for emergency repairs. If a hazard is found imminent or if a hazardous situation already exists, remedial action will be initiated immediately. Any remedial action taken due to an inspection will be noted on the operating log.

Remedial actions in the case of containment failure, fire, explosion, or exposure are identical to the measures at the TA-50 batch treatment system and container storage area. Should any of these problems occur, the waste incinerator can be shut down at the discretion of the operator. Failure of the HEPA filtration system or wet scrubbers, equipment deterioration or mal-

function, or leaks from the waste incinerator will be remedied during and following process shutdown (see Section 7.6.2). The process operator will assess the situation and decide upon which shutdown method will be most efficient. He will supervise the operating area during the shutdown process.

Inspection Logs

General inspections are conducted by the operating group according to checklists associated with the operating log. Results of the inspection, the inspector's name and title, and date and time of inspection are recorded on the inspection log sheet. A copy is sent for records to HSE-7 and kept for at least three years. In addition, process operators will fill out general inspection checklists associated with the operating log at least once every four hours. These checklists are a record of operating conditions and provide evidence that the operator has checked and is aware of the operating status of the system. The time at which entries are made and the actual instrument reading for each variable will be entered into each checklist. When shutdown occurs, the log will state the nature of the shutdown, the time it occurred, and the suspected cause. Once each shift, the shift supervisor will inspect the facility for malfunctions, deterioration, operator error, and discharges. Prestarting inspection procedures, general inspection checklists and the operating log will be kept with the incinerator system during operations.

6.3.3 TA-54, Area L Waste Transfer, Packaging and Container Storage Facilities, Treatment Tanks, and Land Disposal Facilities

Potential Problems

Area L is routinely inspected for potential problems with safety and emergency equipment, security devices, containers, container storage facilities, treatment tanks, and loading and unloading facilities. Potential problems are listed on a weekly inspection checklist. The container storage areas (the metal building and roofed concrete pad) will be inspected weekly. While the landfill is in operation, it will be inspected weekly and after storms to detect any evidence of deterioration, malfunctions or improper operation of run-on and run-off control systems. The treatment tanks will be inspected weekly and after storms to detect any leakage, damage, overflow, or cracks. In addition, the interior of each treatment tank will be inspected yearly for

thin spots or excessive corrosion. Prior to the interior inspection, the treatment tank will be emptied by pumping into drums following normal procedures as described in Section 4.4.2. After it is empty, any liner is removed and the tank must be thoroughly cleaned and checked to be sure it is free of flammable, toxic, and corrosive vapors and materials before entry. If this requires steaming, the tank must be cooled after cleaning and the rinse water checked to be sure it is essentially neutral. Any nearby operations considered hazardous to tank entry are shut down. The atmosphere in the tank must be tested for the presence of combustible or toxic vapors and for oxygen content. A sufficient number of standby personnel must be present to give aid in case of trouble. Protective clothing or equipment may be required in some instances. Potential problems at Area L include containment failure, fire, explosion, and exposure.

Frequency and Content of Inspection

Area L is inspected according to the schedule in Table 6-3.

Remedial Action

If any defects, deterioration, damage or hazards are discovered during inspection, appropriate remedial actions including repairs, maintenance and replacement will be completed as soon as practical to preclude further damage and reduce the need for emergency repairs. If a hazard is found imminent or if a hazardous situation already exists, remedial action will be initiated immediately. Any remedial action taken due to an inspection will be noted on the operating log.

In the case of failure of run-on and run-off control measures (diversion ditches), the HSE-7 Group Leader or his qualified designee will assess the damage by visual observations and sampling and monitoring to determine the type and extent of contamination. Mitigation procedures and repairs, such as sandbagging and building berms, will be instituted immediately.

Remedial action in the case of drum or container failure, fire, explosion, or exposure is handled as described for the TA-50 batch treatment system and container storage area. At the transfer, packaging and storage facilities in Area L, releases from drum or container failure collect in sumps as well as berms.

If leakage, corrosion, overflow or any other damage is detected in the treatment tanks, the contents will be pumped into a drum or another treatment tank. At least 33 empty drums are always available to hold the maximum amount of liquid in a treatment tank in the unlikely event that the tank is completely full and the contents cannot be pumped into another treatment tank. The portable pumps used for emptying the tank are the same pumps used to draw down the tanks (see Section 4.4.2 and Appendix K) and have adequate capacity to fill 55-gallon drums. The pumps and hose used are compatible with the hazardous wastes they handle and are decontaminated after use by flushing with water. The pumps are located at TA-54, Area L.

Inspection Logs

Each inspection is conducted by the operating groups according to the checklist in the inspection log. Results of the inspection, the inspector's name and title, and date and time of inspection are recorded on the inspection log sheet. A copy is sent for records to HSE-7 and kept for at least three years.

6.4 PREPAREDNESS AND PREVENTION REQUIREMENTS

6.4.1 Equipment Requirements

Internal Communication/Alarm Equipment

The following internal communication/alarm equipment is available at Los Alamos to provide emergency instruction for rapid evacuation and to initiate emergency response:

- Centrex telephone system
- Medium range radio nets (30-60 miles)
- Limited range radio nets (3-10 miles)
- Telephone/radio paging
- Two-way hand held radios
- Emergency central alarm system
- Mechanical central alarm system

Since this equipment is laboratory-wide, it allows all personnel to get in contact with emergency coordinators in all areas of the laboratory. All hazardous waste handling personnel have immediate access to internal alarms or emergency communication devices.

The TA-50 batch treatment system and container storage area is equipped with telephones, one pull alarm, one automatic thermal alarm, and one automatic smoke alarm. There is an intercom system at each telephone. In the case of an emergency, the nearest source of communication for personnel handling wastes is the intercom/paging systems on each telephone.

The TA-50 waste incinerator is equipped with telephones throughout the facility. A radio with microphones at remote locations is available. Other communication/alarm equipment available at this facility includes:

- One portable radio
- One radio-equipped vehicle
- Telephone paging system
- Internal telephone communication line
- Two-channel work station intercoms for direct communication from process area to offices and labs
- Eleven pull alarms
- Two automatic thermal alarms

The trailer at Area L is equipped with a telephone. A radio-equipped vehicle is available for use at Area L. These are the nearest communication sources for use in the case of an emergency.

External Communication/Alarm Equipment

The Laboratory has established external communication capabilities with the Los Alamos Police Department and the Los Alamos County Hospital (Section 7.2). The following external communication/alarm equipment is available at Los Alamos:

- Centrex telephone system
- Private telephone lines (if Centrex fails)
- Medium range radio nets (30-60 miles)
- Limited range radio nets (3-10 miles)
- Two National Warning System Stations (NAWAS)

- Direct line from Emergency Operations Centers to KRSN (local radio station)

Emergency Equipment

A list of emergency equipment available at Los Alamos, including types of equipment, locations, and contact phone numbers is shown in Table 7-4.

Emergency vehicles include 18 fire trucks, five ambulances, one rescue vehicle, and evacuation vehicles. Vehicles are inspected quarterly, according to the schedule in Table 6-4. Medical supplies include self-contained breathing apparati, wheel chairs, manual resuscitation, portable oxygen units, blankets, blood supplies, and medical kits.

Heavy equipment includes bulldozers, road graders, tractors, loaders, snowplows, semitrailers, and a portable power generator. Power tools include power saws and fire tools. The Zia Company inspection schedule for heavy equipment is shown in Table 6-5.

Transportation vehicles include trucks, buses, and vans.

Fire protection equipment includes fire alarms, sprinklers, hydrants, fire extinguishers, and halon extinguishing systems. The locations of fire alarms, hydrants, extinguishers, and halon systems are shown in Figures 2-3, 2-4, 2-5, 4-3, 7-12, and 7-13.

Water for Fire Control

The Department of Energy (DOE) is responsible for overall water production, transmission, and storage for the Laboratory and Los Alamos County. DOE has 5,541.3 acre-feet of groundwater rights, plus 1,200 acre-feet of San Juan-Chama Diversion Rights, for a total of 6,741.3 acre-feet. This is considered adequate for projected needs (Long Range Utilities Development Plan, Los Alamos National Laboratory, 1984). Current consumption is approximately 4,603 acre-feet/year. The present water supply comes from seventeen active wells in three well fields (Figure 2-12). The Los Alamos water distribution system is shown on Figure 6-1. Annual pumping is managed to avoid excessive drawdown in any of the well fields. The Pajarito field offers the best opportunities for

further water system development. Storage capacity is adequate to provide water for fire-fighting purposes.

The types of fire protection equipment at Los Alamos hazardous waste facilities are shown in Table 6-6. Appendix Q describes inspection procedures for sprinkler systems, alarms, and extinguishers.

Hydrant flow tests and block valve inspections are performed annually. Pressure regulating valves are inspected and adjusted every 60 days. Appendix Q describes inspection procedures for fire hydrants. Flow rates for hydrants are specified by ENG-4, an experienced fire protection engineering staff, and are dependent upon site needs, including size of building and presence of sprinkler systems. The contact for fire extinguishers is Al Martinez at ENG-4, phone 667-2146, pager 110-0369. For other fire protection systems, the contact is Howard Richardson at ENG-4, phone 667-7702, pager 117-332.

6.4.2 Aisle Space Requirements

Aisle space between waste containers at the container storage areas is adequate to provide access for inspection purposes, and movement of personnel, containers, and equipment.

There are no ramps provided for fork lifts or drum handling equipment at the TA-50 batch treatment and container storage area since they are not required for the existing usage. Drums are placed in the container storage using hydraulically-powered drum tongs on a forklift to lift drums over the containment curb. Thus, there are no barriers which cause material handling problems at this site.

A description of the size and lift capacity of drum handling equipment used at TA-54 is included in Appendix M-6.

Aisles between rows of drums at the Area L transfer, packaging and storage facilities are maintained at a minimum width of two feet to permit access for inspection and handling. Much of the bermed or curbed areas are ramped to facilitate access of forklifts and drum handling equipment.

6.5 PREVENTATIVE PROCEDURES, STRUCTURES, AND EQUIPMENT

Each facility has minimum requirements for safety clothing and apparatus to be used for routine operations which are specified in the facilities' Standard Operating Procedures (SOPs). When non-standard operations or working conditions exist, a special work permit specifying protective equipment and clothing must be obtained from HSE-5, Industrial Hygiene, and HSE-3, Safety, who inspect the site prior to issuing the permit.

6.5.1 TA-50 Batch Treatment System and Container Storage Area

Unloading Operations

Sealed and labeled waste drums are handled with a forklift equipped with a drum handling attachment or with drum carts. In addition, the room is equipped with a hoist mounted on a rail. Waste containers are secured on the truck during transport. Small containers are manually loaded and unloaded.

Run-off/Run-on Control

The storage and treatment area is located inside the building. Adequate storm sewers and gutters are provided to prevent sheet flooding of the building.

Water Supply Contamination

The storage area and treatment process areas are both on a curbed cement floor capable of containing spills. The remainder of the building has drained floors and the water collected by the floor drains is collected in a sump and recycled to the industrial (radioactive) waste treatment systems. Areas for loading and unloading waste containers are paved and spills are immediately cleaned up. Water supply lines are under pressure and have backflow preventers. Depth to the main aquifer at TA-50 is approximately 1,300 feet.

Equipment and/or Power Failure

In general, failure of utilities or equipment does not result in a loss of containment. Leaks from equipment are contained in the curbed floor area or in drip pans.

The batch nature of the operation results in shutdown of the treatment process during utility failure.

The reactor mixer, level indicator and temperature indicator as well as the process analytical instruments are electrically operated. During a power failure, the reactor level can be observed through a 6 inch site port and the reactor temperature can be read from a backup dial thermometer. The analytical equipment is not needed during a power failure as treatment is discontinued until power is restored. If mixing is required during power failure, the reactor can be sparged with inert gas.

Cooling water is used to remove heat from the reactor during neutralization processes. Since the cooling water circulates in an enclosed jacket surrounding the reactor tank and does not contact the reactor contents, the cooling water is discharged to the sanitary sewer system. The treatment process would be discontinued and the source of heat removed should cooling water be lost.

Wind Dispersal Control

Only containerized wastes are handled at the TA-50 batch treatment system and container storage area. The mixing of absorbents with liquid wastes is performed inside the building under a ventilation hood. Liquids are transferred from drums with a tube pump. No wind dispersion occurs under normal operating procedures.

Personnel Protective Equipment

At a minimum, personnel operating the batch treatment process must wear rubber gloves, safety glasses and coveralls. During liquid transfer to and from drums, the operator must wear a face shield. The use of respirators is specified by HSE-5.

6.5.2 TA-50 Waste Incinerator

Unloading Operations

Sealed and labeled drums and large containers are handled with a drum cart or a forklift equipped with a drum handling attachment. Shipping casks are handled with a forklift or a five-ton crane. Small sealed containers are manually loaded and unloaded. Waste containers are secured on the truck during transport.

Run-off/Run-on Control

The treatment area is located inside the building. Adequate storm sewers and gutters are provided to prevent sheet flooding of the building.

Water Supply Contamination

The waste loading and unloading area is paved. The building has concrete floors. Spills are immediately cleaned up. Liquid wastes are either retained in the sealed container (if the container is within a shipping cask designed for spill control) or may be transferred into holding/blending tanks in the hazardous waste feed preparation enclosure. The enclosure has a cement curb with a designed holding capacity greater than the enclosed liquid storage tanks. Water supply lines are under pressure and have backflow preventers. Depth to the main aquifer is approximately 1,300 feet.

The process area is equipped with drains that collect to a process sump. Any fluid collected in the sump is then pumped to the Laboratory's industrial (radioactive) waste treatment plant.

Equipment and/or Power Failure

Detailed procedures for handling equipment and power failures can be found in the Controlled-Air Incinerator Process Operating Manual (Appendix S) which includes standard operating procedures for rapid shutdown of the system while maintaining containment. Back-up systems have been built into the process.

A battery-based uninterruptable power supply provides continuous 120 VAC power to controls associated with the incineration process. Instrument air is backed up by plant air and then bottled nitrogen. A skid-mounted diesel-engine generator, which is kept on idle during operation, provides back-up power source for the incinerator process equipment. The generator connects through an automatic transfer switch which activates if there is a commercial power failure and automatically disconnects when power is restored. In the event of water failure, a pressurized auxiliary water system automatically supplies water to the off gas quench system to remove heat from the incinerator off-gas to allow shut down of the incinerator. Process steam is provided as a snuffing medium to the incinerator fire box should circumstances require immediate shutdown of the incinerator.

Wind Dispersal Control

Only containerized wastes are transferred to and from the building. The transfer of liquid wastes from containers by dip tube/pump is performed in the hazardous waste feed preparation enclosure inside the building. The enclosure is ventilated, the exhaust gases pass through HEPA filters and an activated carbon bed prior to exhausting the atmosphere. Solid wastes are stored in an enclosed area that is maintained at a negative pressure and ventilated through HEPA filters. Solid wastes may be unpacked and sorted. Wind dispersion is not a problem at the TA-50 waste incinerator.

Personnel Protective Equipment

Because of radioactive contamination (low-level and TRU), personnel working in the process area are required to wear, as a minimum, Anti-C (Anti Contamination) clothing. Personnel are required to wear Anti-C booties, caps, coveralls, undershirts, undershorts, and full face masks whenever they are working on any interior components of the incinerator. Surgeons gloves must be worn while working at gloveboxes. The gloveboxes are fitted with PVC gloves. Viton gloves, goggles, Tyvek coveralls, and boots or overshoes must be worn while transferring liquid wastes. Respirators or breathing apparatuses will be assigned if required by the nature of the wastes.

6.5.3 TA-54, Area L Waste Transfer, Packaging and Storage Facilities, Treatment Tanks, and Land Disposal Facilities

At Area L, small bottles and containers of laboratory chemicals are manually loaded and unloaded. Drums are unloaded using a forklift with a drum handling attachment. Drums are lowered into the shaft using drum hooks. Appendices M-2 and M-4 provide additional details.

Run-off/Run-on Control

Area L is located on a long narrow mesa. At Area L, the mesa top trends downward along its length at a slope of 4:100. In addition, the mesa top slopes from its approximate centerline to the mesa walls at a slope of 8:100. Immediately up gradient from Area L, the mesa top is only 200 feet wide, so the drainage area affecting Area L is therefore very small. Annual precipitation at the site is estimated at 14 to 16 inches per year. The 100

year 24 hour precipitation event is four inches. Run-on is handled with earth diversion ditches which divert the water into the adjacent canyon.

Run-off from shafts does not occur because shafts are covered with a steel cap when waste is not being emplaced. When filled, they are covered with a concrete cap. Wastes are kept in closed containers. Any spills at the surface are immediately cleaned up. Thus, the possibility of run-off from the land disposal facilities being contaminated is remote. All other waste management facilities at Area L have run-on and run-off control, as well as secondary containment provisions. Since the possibility of run-off from Area L being contaminated is essentially nil, run-off is simply directed around the perimeter of Area L to prevent erosion.

Water Supply Contamination

Water contamination at Area L is discussed in detail in the Groundwater Monitoring Waiver Application (Appendix N). Water supply lines at Area L are under pressure and have backflow preventers.

Evapotranspiration potential exceeds precipitation, so there is no water migration for leachate formation. The depth to groundwater is 950 feet at Area L. The stratigraphy includes layers of volcanic tuff and ash which are unsaturated and have moisture contents of 0.2 to 2.0 percent by weight, which is insufficient for moisture movement through the Bandelier Tuff (see Section 2.2.5).

In general, containerized wastes are stored on curbed concrete pads at Area L. Free liquids are not placed in the shafts, but are stabilized with vermiculite in 55-gallon drums.

Equipment and/or Power Failure

Power failures do not significantly affect operations and containment at Area L. Loading, unloading and shaft and pit filling are discontinued until equipment failures are corrected. Wastes are kept in sealed containers so equipment failure would not threaten containment.

Wind Dispersal Control

Only containerized or packaged wastes are handled at Area L. A metal cap is placed on shafts at Area L when shifts are completed. Wind dispersion is not a problem because shaft disposal does not lend itself to wind dispersal.

Personnel Protective Equipment

Personnel who handle containers at Area L are required, at a minimum, to wear safety glasses and gloves. Additional clothing and equipment are assigned where personnel are handling open containers. Protective equipment is specified by HSE-3 and HSE-5 by a special work permit.

6.6 PREVENTION OF ACCIDENTAL IGNITION OR REACTION OF IGNITABLE REACTIVE OR INCOMPATIBLE WASTE

6.6.1 TA-50 Batch Treatment System and Container Storage Area

Only compatible and non-ignitable wastes are stored at one time at the TA-50 batch treatment system and container storage area. Each waste volume to be treated in the batch plant is carefully characterized to assure proper treatment. Standard operating procedures (SOP) are prepared for wastes that are routinely received and do not significantly change in character. Operating procedures for unique wastes are prepared after the waste is categorized.

The batch treatment system is designed for complete internal wash down to remove residuals which might be incompatible with future wastes treated.

6.6.2 TA-50 Waste Incinerator

Only compatible wastes are handled in the same holding/blending tank and associated transfer system at one time. Liquid wastes can be fed directly into the incinerator or pumped to waste holding tanks. Residuals are flushed with a compatible solvent which is burned at the completion of each liquids burn. The tanks and transfer system are left empty.

6.6.3 TA-54, Area L Waste Transfer, Packaging and Storage Facilities, Treatment Tanks, and Land Disposal Facilities

Incompatible chemicals are segregated for storage and shaft disposal to prevent interreaction of wastes in the case of a leak.

Containerized wastes are stored in the open air, inhibiting vapor accumulation. Smoking is not allowed and there is normally no ignition source in the area. The stored volatile and flammable wastes are inspected for leakage prior to loading.

Reactive wastes will be placed in the tanks for treatment only. They will not be stored in the tanks. Prior to adding new waste to a tank, the records will be checked to verify that the two waste streams are compatible. If they are not compatible, the second stream will not be placed in that tank until all contents have been removed and the liner has been replaced.

TABLE 6-1

May 1, 1885
Amended: September 18, 1985

INSPECTION RECORD FORM
TA-50, Batch Plant

Inspected by:_____ Date:_____

Type:_____T_____ Time:_____

Item	Inspected for	Condition	Action/Date
DAILY - to be completed every day of operation			
Loading/Unloading	Spills and deterioration of area		
Communication Equipment	Proper functioning		
Piping/Valves	leaks, damage, poor seals		
Gauges - Pressure -Level -Temperature	Functioning and within operational limits		
Containment Structure	Spills, damage		
Eyewash/Safety Showers	Functioning		
WEEKLY - to be completed the first working day of the week			
Containment Structure	Integrity, leaks, paint spalling		
Integrity of Reaction tank	Deterioration, leaks, corrosion		
Containers in Storage - Integrity - Labels	Open drums, leaks, corrosion Present - "Hazardous Waste" label and accumulation date		
Security	Integrity of doors/locks		
Warning Signs	Present, out-of-date, legibility		
Lighting	Proper functioning		
Hood	Functioning, leaking containers (if present)		

Cy: A. Drypolcher, HSE-8, MS K490

TABLE 6-2

August 9, 1985
Amended October 3, 1985

INSPECTION RECORD FORM

FACILITY TA-50-37

Inspected by _____ Date _____

Type _____ Time _____

Item	Inspected for	Condition	Action/Date
DAILY - to be completed every day of operation			
Incinerator/equipment	Deterioration, malfunction		
Pumps, valves, pipes	Leaks		
Loading/unloading area	Spills and deterioration		
Tank by-pass	Leaks, deterioration		
WEEKLY to be completed on the first working day of the week			
Emergency waste feed cutoff system (incinerator)	Proper functioning		
Security	Integrity of doors and locks		
Signs	English/Spanish -Condition		
tank, integrity	Deterioration and leaks		
Container integrity	Deterioration and leaks		
Container covers	Closed and secured		
Containment structures	Integrity, leaks		
Labels on containers	Present -Hazardous Waste		
Tank hi-level alarm	Functioning		
Process gloves	Tears, deterioration		
Warning signs	Present		

cc: A. Drypolcher, HSE-8, MS K490

TABLE 6-2 (continued)

August 9, 1985
Amended October 3, 1985

INSPECTION RECORD FORM

FACILITY TA-50-37

Inspected by _____ Date _____

Type _____ Time _____

Item	Inspected for	Condition	Action/Date
MONTHLY - to be completed by the 10th			
SCBA gear	Deterioration, functioning		
Process floor	Cracks, spalling, coating		
Aisle space	Clear		

cc: A. Drypolcher, HSE-8, MS K490

TABLE 6-2 (continued)

August 9, 1985
Amended October 3, 1985

INSPECTION RECORD FORM

FACILITY TA-50-37

Inspected by _____ Date _____

Type _____ Time _____

Item	Inspected for	Condition	Action/Date
QUARTERLY - to be completed 10th of Oct., Jan., April, July			
Communication equip. (radio, telephones, comm. syst)	Functioning		
Protective clothing	Clean, complete, deterioration		
Medical supplies	Complete, deterioration		

cc: A. Drypolcher, HSE-8, MS K490

TABLE 6-3

May 1, 1985
September 17, 1985

INSPECTION RECORD FORM
FACILITY TA-54, Area L

Inspected by _____ Date _____
Type T, S, D Time _____

Item	Inspected for	Condition	Action/Date
DAILY - to be completed every day of operation			
Communication Equipment	Proper Functioning		
Freeboard (Surface impoundment)	At leaset 1 ft. to prevent overflow		
Treatment Tanks	Level - At least 6" of free-board		
Loading/Unloading	Spills and deterioration		
Run-on/off control	Integrity, erosion and ponding		
WEEKLY - to be completed on the first working day of the week.			
Storage Containers -Integrity	Open drums, leaks, corrosion, aisle space, stack height		
-Labels	Present "Hazardous Waste" and and accumulation date		
Safety shower and eyewash	Leaks, functioning		
Hose bib	Leaks, functioning		
Temporary shaft covers and railing	Damage		
Metal storage shed	Floor damage, liquid accumula-tion		
Road/Work Surfaces	Cracks		
Fence	Integrity, damage		
Gate Lock	Integrity, damage		
Wind Sock	Damage, functioning		
Pallets	Integrity, damage		
Area Warning Signs	Out-of-date, damage, legibility		
Treatment Tanks	Leaks, damage		
Curbs/Pads (Treatment tank)	Rainwater accumulation/removal cracks, damage		
Lighting	Proper functioning		
Refrigerator (If wastes present)	Leaking/damaged containers		
Site Inspection	Dying vegetation or other evidence of leachate migration		
Leach Collection	Evidence of liquid accumulation		
Tanks	Leaks, deterioration		

Cy: A. Drypolcher, HSE-8, MS K490

TABLE 6-3 (continued)

May 1, 1985
Amended: September 18, 1985

INSPECTION RECORD FORM
FACILITY SAFETY INSPECTION
CHEMICAL WASTE OPERATION
TA-54, Area L

Inspected by:_____ Date_____

Type:_____ Time:_____

TO BE COMPLETED BY THE 10TH OF THE MONTH			
Item	Inspected for	Condition	Action/Date
SCBA's	good condition cylinders full		
Electrical Generator	functioning		
Protective Clothing	complete, clean good condition		
Floors in storage building	cracks, spalling		
Spill Equipment (absorbent, shovel, oversize drums)	complete		
Portable Pumps	clogging, corrosion frayed wires		

Cy: A. Drypolcher, HSE-8, MS K490

TABLE 6-3 (continued)

May 1, 1985
Amended: September 17, 1985

INSPECTION RECORD FORM
QUARTERLY/YEARLY SAFETY INSPECTION
CHEMICAL WASTE OPERATIONS
TA-54, Area L

Inspected by_____ Date _____ Type _____

Type:_____ Time:_____

Item	Inspected for	Condition	Action/Date
QUARTERLY - to be completed every quarter			
Fire Extinquisher - Trailer	Expiration date		
Empty Drum Stack	Order, corrosion, leaks		
Cover Integrity	Concrete cracking, subsidence animal intrusion		
Shaft and Pit Markers	Missing, damage		
Weeds	cutting		
YEARLY			
Trailer	integrity, damages		
Overhead Power Line and Poles	sagging, pole damage		
Light and Pole	functioning, damage		
Dumpster	damage		
Treatment Tanks	excessive corrosion		

Cy: A. Drypolcher, HSE-8, MS K490

TABLE 6-4

QUARTERLY VEHICLE INSPECTION FORM

INSPECTED BY: _____ DATE: _____

ITEMS TO INSPECT	VEHICLE NUMBER
1. Brakes, foot	
2. Brakes, parking	
3. Wipers	
4. Washer	
5. Mirrors	
6. Seatbelts	
7. Sun Visors	
8. Door Locks	
9. Horn	
10. Tires	
11. High Beam	
12. Low Beam	
13. Running Lights	
14. Park Lights	
15. Turn Signals	
16. Tail Lights	
17. Brake Lights	
18. Back-up Lights	
19. License Lights	
20. Windshield	
21. Housekeeping	
22. Engine	

TABLE 6-4 (continued)
QUARTERLY VEHICLE INSPECTION FORM

INSPECTED BY: _____ DATE: _____

ITEMS TO INSPECT	VEHICLE NUMBER
Additional Requirements for Explosives Modified Truck	
23. Tie-down Straps	
24. Wheel Chocks	
25. Fire Extinguishers	
26. Spark Arresters	
Additional Requirements for Vacuum Pump Truck	
27. Hose, Visual Inspection	
28. Tank, Visual Inspection	

Comments:

TABLE 6-5

ZIA EQUIPMENT INSPECTION SCHEDULE FOR HEAVY EQUIPMENT

Date _____

EQUIPMENT DESCRIPTION: _____

CHECK:	OK	NO	METER HOURS
MOTOR OIL	____	____	START _____
COOLANT	____	____	FINISH _____
FUEL	____	____	
TIRES	____	____	
LIGHTS	____	____	
TURN SIGNALS	____	____	
BACK-UP ALARM	____	____	
CUTTING EDGE, TEETH	____	____	
INTERIOR CLEAN	____	____	

OTHER: _____

_____

_____

EQUIPMENT PERFORMANCE: OK ____ TROUBLES ____

IF TROUBLES WITH EQUIPMENT, EXPLAIN (IN YOUR OPINION WHAT IS WRONG):

_____

_____

_____

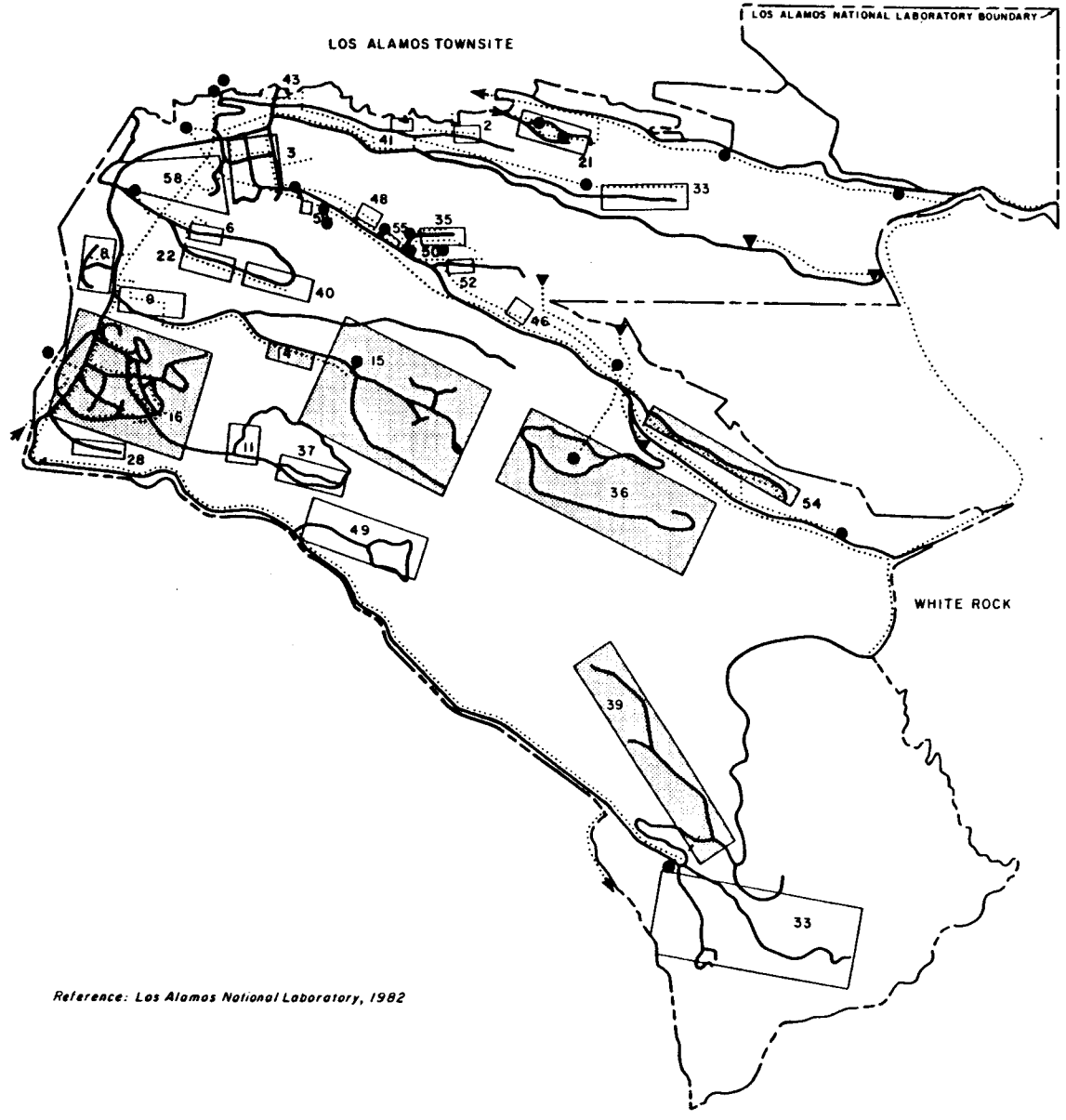
_____

TURN THIS FORM IN TO YOUR FOREMAN AT THE END OF YOUR SHIFT.

TABLE 6-6

FIRE PROTECTION EQUIPMENT AT LOS ALAMOS HAZARDOUS WASTE FACILITIES

	Alarms						
	Pull Box	Automatic Thermal	Automatic Smoke	Automatic Thermal Sprinkler System	Halon Exting. System	Fire Hydrants	Fire Exting.
TA-50 Batch Treatment System	X	X	X	X		X	X
TA-50 Waste Incinerator	X	X		X	X	X	X
TA-54, Area L						X	X



Reference: Los Alamos National Laboratory, 1982

EXPLANATION

- SUPPLY LINES
- STORAGE TANK
- WELL SITE
- 36 TECHNICAL AREAS
- SHADING INDICATES AREAS IN WHICH WASTE MANAGEMENT FACILITIES ARE LOCATED

N

1 0 1 MILE
SCALE

FIGURE 6-1

LOS ALAMOS
WATER SUPPLY SYSTEM

PREPARED FOR

LOS ALAMOS NATIONAL LABORATORY
LOS ALAMOS, NEW MEXICO

IT CORPORATION

DRAWN BY	LLF 10/17/84	CHECKED BY	APPROVED BY	DRAWING NUMBER 846510-B

10 1293 HERCULENE, A&B SMITH CO., PGH., PA

7.0 HAZARDOUS WASTE FACILITIES CONTINGENCY PLAN

This section presents the Los Alamos National Laboratory's Hazardous Waste Facilities (HWF) Contingency Plan (also referred to as the Contingency Plan) as required by 40 CFR §270.14(b)(7) (NMHWMR 302.A.4.b[1]) and specific requirements as stated in 40 CFR §264.51 through §264.56 (NMHWMR 206.B.10) as applicable. A copy of the working Contingency Plan is located in Appendix T.

7.1 INTRODUCTION

The Los Alamos National Laboratory and the resident communities of Los Alamos and White Rock are located in north central New Mexico on the Pajarito Plateau, situated west of the Rio Grande on the eastern slopes of the Jemez Mountains. The Laboratory site covers about 111 km (27,500 acres) in and adjacent to Los Alamos County and includes 32 active Technical Areas (TAs) (Figure 2-2).

The principal mission of the Laboratory is the design and development of weapons for the nation's nuclear arsenal; however, considerable research and development (R&D) is directed toward the development of advanced technology. In executing its research mission, the Laboratory produces hazardous wastes in small quantities, the nature of which varies with changes in the research projects conducted. The potential exists for hazardous waste generation to occur at virtually all of the technical areas.

Overall responsibility for Hazardous Waste Management is with the HSE-7 Waste Management Group in the Health, Safety and Environment (HSE) Division (Figure 7-1). Generators of hazardous wastes are responsible for proper identification, segregation, and documentation of their wastes. Except for HE wastes, packaging, transportation, and final disposition of hazardous wastes are the responsibility of HSE-7 Solid Wastes Operations.

HE wastes are handled by Dynamic Testing (M) and Design Engineering (WX) Division groups whose central purpose is the design and testing of explosives.

Activities within HSE-7 include liquid waste treatment, hazardous chemical waste packaging, transport, treatment, and disposal.

The Laboratory maintains its own response forces to handle emergencies. Emergency resources available to the Laboratory include the DOE Fire Department, the contracted services of the Mason-Hanger Protective Force (security), Zia Co. (maintenance), Los Alamos Medical Center, internal laboratory services including medical facilities, and minor external assistance from the Los Alamos County Police.

7.1.1 HAZARDOUS WASTES

The hazardous wastes generated by the Laboratory activities can be considered as three general types:

- Wastes from research and development,
- Wastes from process operations, and
- High explosive wastes (HE).

In addition to the wastes noted above, various laboratory items that contain chemical residues or are otherwise chemically contaminated are considered hazardous waste.

Table 3-1 lists the hazardous wastes currently generated at the Laboratory, the approximate annual generation rate, and the basis for hazardous waste designation. These wastes are further discussed in the following text.

7.1.1.1 Wastes from Basic and Applied Chemistry R&D Programs

Primary Laboratory sites for basic and applied chemistry R&D include the Chemistry and Metallurgy Research Building (TA-3-29), Radiochemistry Laboratory (TA-48), Sigma Building (TA-3-66) and the Health Research Laboratory (TA-43). Typical hazardous chemical wastes consist of partly empty small containers of laboratory reagents, solvents, test samples and other laboratory wastes. Up to several hundred relatively small quantities of different acids, bases, organics, inorganics, reactive metals and other chemicals require disposal. The variability of research work prohibits limitation on the variety that can occur in this grouping. Conversely, quantities of individual chemical constituents are small.

7.1.1.2 Wastes from Processing Operations

Processing wastes typically are significant volumes of material that contain a very limited number of contaminants. The wastes are recurring resulting from ongoing experiments or materials production. The composition and concentration of contaminants in a given process waste are generally uniform unless modifications to the process are made.

- Electrochemistry Processing Wastes
  The Electrochemistry Section of the MST-6 Materials Technology Group, located at TA-3-66, generates plating solutions containing chromates and cyanides. These are reactive and toxic wastes. The Print Circuit Board Shop of the E-2 Electronic Manufacturing and Technician Resources Group, located at TA-3-40, generates acid/base wastes heavily contaminated with copper. These are considered as hazardous wastes due to their corrosivity.

- Isotope Separation Wastes
  The Isotope and Structural Chemistry Group, INC-4, generates highly concentrated nitric and sulfuric acid wastes. Both nitric and sulfuric acid wastes are hazardous due to their highly corrosive characteristics. Nitric acid is also considered hazardous because it can be an oxidizer depending on its concentration.

- Shops Department Wastes
  The Main Shops Department, Building TA-3-39, houses most of the highly versatile machine shop capabilities at the Laboratory. Parts can be machined from almost any metal, alloy or other materials. The machining operations generate hazardous wastes including lithium metal and lithium hydride, both of which are reactive.

7.1.1.3 Explosives Wastes

High explosives (HE) waste is generated by the Dynamics Testing (M) and Design Engineering (WX) Division groups in the course of processing and testing various HE materials. Processing includes pressing, machining and casting HE. Waste occurs as discrete pieces of HE, as well as chips, machine cuttings and powder. The chips, cuttings and powder are usually in the form of water-borne suspensions, collected in specially designed accumulating/settling sump tanks. Wastes also consist of materials contaminated with HE; these may include paper, oil, solvents, wood, etc. Chemically, the wastes consist of HMX, RDX (cyclonite), TNT (2,4,6 trinitrotoluene), PETN (pentaerythritol

tetranitrate), ammonium nitrate, barium nitrate, TATB (triaminotrinitrobenzene), nitrocellulose, tetryl, nitroguanidine and various plastic binders. Nearly all the HE waste substances are ignitable or reactive and barium nitrate is EP toxic. Residues from HE waste are generated by flashing, burning, or detonating HE waste at TA-14, 15, 16, 36, and 39. These residues are typically present in the uppermost layer of sand that covers the burn pad. The sand from two burn pads is considered hazardous due to its high barium content when barium nitrate is burned on these pads.

7.1.1.4 Chemically Contaminated Equipment

Empty drums, tanks and gas cylinders are typical contaminated items. Generation of this type of hazardous waste occurs throughout the Laboratory facilities and produces a wide variety of waste types. The hazards are the same as those associated with contaminating constituents.

7.1.2 Hazardous Waste Facilities

The safe handling, treatment, and/or storage of hazardous wastes is the responsibility of HSE-7. Daily operations involving hazardous wastes are performed by Solid Waste Operations. HE wastes are an exception, their treatment being the responsibility of M and WX Divisions. HSE-7 is only responsible for residuals from HE treatment when these residuals are determined to be hazardous wastes.

Hazardous Waste Facilities (HWF) currently in operation are summarized in Table 7-1. The locations of the HWF are shown as the shaded areas on Figure 2-2. The flow plan for hazardous wastes within the Laboratory is shown in Figure 2-20.

7.1.2.1 Technical Area 16 (TA-16) Thermal Treatment Facilities

The thermal treatment facilities located at TA-16 include three general types. One type consists of a sand pad which is surrounded on at least two sides by a berm or a natural hillside. Waste explosives are placed on these pads and remotely burned using an "electric match" firing device. There are two facilities of this type at TA-16. A similar pad is used to flash contaminated equipment.

A second type of thermal treatment facility present at TA-16 consists of a large metal pan on a sand pad in which there are five secondary metal pans lined with fire brick. Waste HE fluids are poured into the secondary pans and the HE is remotely ignited, with an "electric match." There is one facility of this type at the Laboratory. About 55 gallons of waste are burned once a month. The third type of facility present at TA-16 is used to burn sludges containing waste HE. These facilities consist of steel cone-shaped vessels having a diameter of about five feet, buried with only the upper three to four feet of the vessel above ground. The steel vessels are filled with sand and gravel and an open fluids drain is located at the bottom of the cone. Sludge HE is pumped into the top of the cone, onto the sand and gravel bed. A heavy steel cap is then placed over the top of the cone and hot air is forced into the cone through air ducts. The hot air dries the waste sludge and liquids from the sludge migrate downward through the sand and gravel bed and through the fluids drain. Effluent from these drains is regulated by NPDES permit (NM 0028355). When the remaining explosive material is relatively free of moisture, the steel cap is removed from the cone and the explosive is ignited remotely with an "electric match." There are two facilities of this type at Los Alamos; both of these are located in Technical Area 16. Explosives are burned at these two facilities at a rate of about one burn per week. Each burn consists of about 750 pounds of waste explosive sludge.

In some cases the burn pad sand or surface is contaminated by barium, which is a constituent of HE, prior to burning. Since the upper layer of the burn pad sand contains EP Toxic barium, it is drummed, stored and disposed of as a hazardous waste.

7.1.2.2 <u>TA-14, 15, 36, and 39 Thermal Treatment Facilities</u>

Waste HE detonation sites are located at Los Alamos in Technical Areas 14, 15, 36, and 39. These sites are used routinely to detonate scrap HE, failed experimental detonations, unneeded classified explosives shapes, other HE determined to be excess, and reactive wastes. These sites consist of firing pads often located within a small canyon. Associated facilities at these sites include bunkers which are occupied by technical personnel during detonations. Prior to all firings, nearby roads are checked and kept clear.

7.1.2.3 TA-50-01 Batch Treatment System and Container Storage Area

The Batch Treatment System is located in Building 1 at Technical Area 50 (Figure 4-1). The system consists of a totally enclosed, vented, 500-gallon pressure vessel equipped with a filtering system, condenser, and vacuum transfer lines (Figure 4-2). Wastes treated in the Batch Treatment System include cyanide, chromate plating solutions, and solutions of acids, bases and heavy metals.

A chemical waste storage area is located in the same room housing the Batch Treatment System. Storage space consists of a bermed area encompassing 16 square feet. The area is designed to accommodate four 55-gallon waste drums. Wastes are stored in this area prior to treatment in the Batch Treatment System. Only compatible wastes are stored in this area at one time. A ventilated hood is provided for transferring wastes between drums.

7.1.2.4 TA-50-37 Chemical Waste Incinerator

The waste incinerator is located in Building 37 at Technical Area 50 (Figure 4-3). The highly modified, controlled air incinerator is rated at a nominal 45 kilograms per hour waste feed throughput. The incinerator was developed as part of a continuing incinerator study and demonstration program being conducted by Los Alamos and is currently permitted by the EPA to burn PCB-contaminated materials. Modifications to the incinerator include additions of liquid and solid waste feed preparation lines, a continuous ash removal system, a high-efficiency off-gas cleanup system, and backup utility systems (Figure 4-4). Standard combustion equipment has been modified to permit effective incineration of waste in solid, liquid, slurry, or gaseous form. Particular attention has been given to engineering for proper waste containment, resulting in a system that is safe for evaluating the incineration of hazardous chemicals and certain radioactive waste forms. The liquid waste blowdown goes to the radioactive waste treatment facility. Samples will be collected as specified in the Incinerator Trial Burn Plan.

7.1.2.5 Technical Area 54 (TA-54), Area L Facilities

Waste Transfer, Packaging and Storage Facilities

A single-story metal building encompassing 196 square feet and a roofed concrete storage pad encompassing 1595 square feet are located in Area L of Technical Area 54. These facilities are used for the accumulation, packaging and storage of waste containers generated from throughout the Laboratory (Figure 2-5). Area L of TA-54 is an area of about three acres surrounded by an eight-foot-high chain-link and barbed-wire fence (Figure 2-5). Currently active waste management facilities located within this area include four waste treatment tanks and one waste disposal shaft as well as the transfer, packaging and storage facilities. The metal building has a concrete floor having a design standard load-bearing capacity of 250 pounds per square foot. Three shallow sumps covered by fiberglass grates are located within the floor of the building. The storage pad has a concrete floor having a design standard load-bearing capacity of 700 pounds per square foot.

Hazardous waste containers generated at the various Los Alamos laboratories are delivered to these facilities on a routine basis. Wastes are segregated into compatible types and placed upon the three fiberglass grates located in the metal building, or within one of the six storage cells on the roofed concrete pad. Wastes, packaged in small containers, are placed into lab packs. Also, vermiculite is added to 55-gallon drums containing liquids in these facilities. Wastes suitable for recycling are consolidated into drums and any damaged or leaking drums are repackaged into larger drums in these facilities. Los Alamos wishes to obtain a permit to operate the waste transfer, packaging and storage facilities.

Treatment Tanks

Four 1665-gallon ten-gauge steel tanks are located at Area L of TA-54. The tanks are lined with plastic. These tanks are used to neutralize, oxidize and evaporate wastes. The waste most commonly oxidized in these tanks is lithium hydride. Ammonium bifluoride (a "non-RCRA" waste) is the waste most commonly evaporated in the tanks.

Land Disposal Facilities

Land disposal facilities located in Area L include 34 shafts which range in diameter from three to eight feet. Thirty-three of the shafts have been capped. All of these shafts are about 60 feet deep. When in use, the shafts are covered with a heavy steel cap. When filled, the shafts are capped with a three-feet-thick concrete plug. Each shaft is used for the disposal of a single category of chemical wastes to assure that incompatible chemicals will not mix and react.

7.2 HAZARDOUS WASTE EMERGENCY RESPONSE RESOURCES

The Laboratory maintains its own response resources to handle emergencies. Interaction with outside agencies is limited for security reasons and because it is impractical to train these agencies to cope with the technical diversity of the Laboratory's operations such that they could safely contribute in an emergency. Response resources include personnel, emergency equipment, and communication systems.

7.2.1 Response Groups

The emergency response groups available to the Laboratory include the DOE Fire Department, the contracted services of the Mason Hanger Protective Force (security), Zia Co. (maintenance), Los Alamos Medical Center internal laboratory services including medical facilities, and minor external assistance from the Los Alamos County Police. The services offered by these response groups are itemized on Table 7-2 and discussed briefly in the following. Each of the emergency response groups retains a current copy of the HWF Contingency Plan.

7.2.1.1 Medical Facilities

The Laboratory maintains its own medical facility, HSE-2 Occupational Medicine, to handle job-related injuries and to monitor employee health. Medical facilities include a staff of six physicians, two physician assistants, ten nurses, six x-ray technicians, and two laboratory technicians.

HSE-2 is supported by HSE-5, Industrial Hygiene. HSE-5 can provide exposure and treatment information via telephone access to Chemtrec and the National Library of Medicine, and via computer access to TOXLINE, CHEMLINE, and the Toxicity Data Bank.

Those cases which cannot be handled at HSE-2 would be forwarded to the Los Alamos County Hospital, where the Laboratory maintains a fully equipped decontamination room. The HSE-2 staff meets with the hospital's emergency staff monthly to go over procedures. In the event that a case is sent to the hospital, staff from HSE-2 provide assistance at the hospital.

7.2.1.2 HSE-3 Safety

HSE-3 reviews and approves fire protection procedures. They may assist in process shutdown and evacuation.

7.2.1.3 HSE-5 Industrial Hygiene

In addition to medical support, HSE-5 provides site field testing to determine the nature (nonradiological) and extent of contamination, provide information on correct handling of chemicals, and specify protective clothing and equipment.

7.2.1.4 HSE-7 Waste Management

Provides cleanup operations and proper disposal of hazardous materials and supervises emergency response operations. Since HSE-7 normally handles hazardous waste, the group is highly trained and equipped. This group represents the nucleus of the hazardous waste emergency response.

7.2.1.5 HSE-8 Environmental Surveillance

Provides field surveys of soils, water, air and biota to determine environmental effects of exposure. The group includes expertise in geohydrology.

7.2.1.6 DOE Fire Department

The DOE Fire Department provides fire protection for the Laboratory as well as the communities of Los Alamos and White Rock. The department includes 98 personnel.

The Fire Department is under direct control of the DOE and fire fighting personnel are DOE employees. In the case of an emergency within the Laboratory, the DOE Fire Department puts itself under the direction of the Laboratory response team.

The Fire Department personnel make regular tours of the Laboratory facilities to detect and discuss hazards associated with individual facilities and are instructed in hazardous material handling and emergency procedures. They are aware of the hazardous waste practices at the Laboratory, and are well equipped to handle any credible emergency situation.

7.2.1.7 Mason & Hanger Protective Force (Pro-Force)

The Pro-Force consists of more than 200 personnel who are responsible for Laboratory security. The security force is provided by Mason & Hanger, Silas Mason, under contract to the Laboratory.

During an emergency, the Pro-Force activities include maintenance of security, direction of traffic within the Laboratory, and control of access to the emergency site. The Pro-Force maintains the necessary equipment to perform these functions such as crowd control equipment, patrol cars, etc.

7.2.1.8 Zia Company

The Zia Company provides a maintenance support force on contract to the Laboratory. This support force is under the Laboratory's direction in an emergency. Also included are 14 eight-man firefighting teams. The Zia Company conducts inspections of Laboratory equipment, maintains equipment, and participates in emergency cleanup.

7.2.1.9 Los Alamos County Police

In keeping with the principle of handling emergencies internally, the Los Alamos County Police have only a minimal interaction with the Laboratory in an emergency. That interaction is limited to traffic control on DOE roads with public access. The limits of interaction are included in a signed agreement, a copy of which is included in the Appendix to this document (Appendix T). There are no agreements with other agencies.

7.2.2 Emergency Equipment

A list of emergency equipment for use at the Laboratory and the location of this equipment can be found in Table 7-3. The equipment immediately available for use is located at TA-54, Area L, the TA-50 batch treatment system and container storage area, and the TA-50 waste incinerator.

In addition, Zia Company, the DOE Fire Department, and HSE-2 maintain emergency equipment. Major emergency facilities are shown in Figure 7-2.

7.2.3 Communications

Effective emergency response at Los Alamos National Laboratory requires an efficient communication system which will integrate all personnel into the emergency response procedure.

There are two central alarm systems (CAS) at the Laboratory; an emergency CAS and a mechanical CAS. The emergency CAS is activated by:

- Telephone communication (9-911)
- Automatic fire alarms
- Manual pull alarms
- Computer interface (to warn of critical events or loss of confinement at selected facilities)
- Break-in security
- Radio communications

The emergency CAS is located in the central control room in Building 4409 at TA-3. The control room is manned 24 hours a day and is equipped with telephones, medium and short range radios, direct line telephones, a National Warning System (NAWAS) station, and an emergency power system. The fire alarm board at the control room gives the location of automatic and pull fire alarms.

The maintenance CAS board, located in Building 223 at TA-3, is manned by Zia personnel 24 hours a day. The maintenance CAS board interfaces with computers which monitor critical equipment throughout the Laboratory. Activation of an alarm triggers a call-out procedure to provide maintenance personnel and management supervision to correct the malfunction. The maintenance CAS does not directly trigger an emergency response.

Internal communication systems at the Laboratory include:

- Centrex telephone system
- Medium range radio nets (30-60 miles)
- Limited range radio nets (3-10 miles)
- Telephone/radio paging
- Two-way hand held radios

Off-site communications with Federal, state, county and other agencies are maintained by the following:

- Centrex telephone system
- Private telephone lines (if Centrex fails)
- Medium range radio nets (30-60 miles)
- Limited range radio nets (3-10 miles)
- Two National Warning System Stations (NAWAS)
- Direct line to KRSN (local radio station)

All alarm systems and internal and external communication systems are available for use by all employees.

Activation of the emergency CAS automatically alerts the DOE Fire Department, the Mason Hanger Pro-Force, and the CAS dispatcher. For hazardous waste emergencies, the CAS dispatcher notifies the HSE-7 Hazardous Waste Emergency Coordinator (HWEC) and notifies upper management of the problem.

HSE-7 has access to all communications systems including a short wave radio base station located at TA-50-1. During normal working hours, communications to support response groups can be handled by HSE-7. During off hours, the HWEC uses the CAS Dispatcher to contact support groups.

7.3 NONSUDDEN RELEASES

Nonsudden releases include those incidences which, if uncontrolled, impact the environment over a long period of time. Such incidences include minor leaks of containers, loss of integrity of secondary containment, incomplete treatment, and leachate migration from disposal areas.

7.3.1 Responsibility

Correction of nonsudden release shall be the responsibility of the HSE-7 Solid Wastes Operations Associate Group Leader and can be handled with normal

maintenance and management procedures. Correction methods for nonsudden releases that have resulted in environmental contamination shall be coordinated with the New Mexico Environmental Improvement Division (NMEID).

7.3.2 Credible Nonsudden Releases

Credible nonsudden releases, their detection and correction are given in Table 7-4. Not all failures can be predicted. In general, the response to nonsudden release will (1) contain the release, (2) correct the cause of the release, and (3) clean up any release to a level that protects health and the environment.

7.3.3 Nonsudden Release Surveillance

In addition to routine inspection and site-specific sampling and testing, the Laboratory maintains an area-wide environmental monitoring network maintained by HSE-8. Routine monitoring for radiation, radioactive materials, and chemical substances on the Laboratory site helps to fulfill the Laboratory's policy to protect the general public, employees, and the environment.

Monitoring and sampling locations for various types of measurements are organized into three main groups. Regional monitoring stations are located within the five counties surrounding Los Alamos County. They are placed up to 80 kilometers (50 miles) from the Laboratory, and serve to determine background conditions. Perimeter stations are located within approximately four kilometers (2.5 miles) of the Laboratory boundary, and document conditions in residential areas surrounding the Laboratory. On-site stations are within the Laboratory boundary, and most are accessible only to employees during work hours.

The types of routine surveillance conducted at these stations includes radiation measurements and collection of air particulates, waters, soils, sediments, and foodstuffs for subsequent analysis.

Additional samples are collected to gain information about particular events such as major runoff events and nonroutine releases. Data are used for comparison with standards, background radiation levels, and dose calculations.

7.4 SUDDEN RELEASES

This section deals with incidents involving sudden release such as spills, fires, or explosions which pose a significant threat to human health or the environment and includes the release of hazardous materials and hazardous wastes. Hazardous materials are chemical substances that become a regulated waste as the result of the incident and can include hazardous raw materials that are spilled, products of combustion, and products of uncontrolled reactions.

7.4.1 Hazardous Waste Emergency Coordinator (HWEC)

The HWEC is responsible for coordinating all emergency response measures involving sudden releases of hazardous wastes with the exception of the thermal treatment facilities at TA-14, 15, 16, 36, and 39. HE waste handling is the responsibility of M and WX divisions, who have developed Standard Operating Procedures (SOPs) based on safe handling practices designed to eliminate the risk of fire and explosions. Unplanned detonation or combustion of HE renders the HE waste nontoxic. In some cases, residuals contain barium. Cleanup of barium contaminated areas due to unplanned detonations shall be coordinated with the HWEC.

The HSE-7 Group Leader or his designee is the primary HWEC. The list of the primary and secondary HWECs and their telephone numbers is on Table 7-5. Either the primary HWEC or a secondary HWEC is on call to provide coverage 24 hours a day, 365 days per year.

The HWEC can be reached during working hours by contacting the HSE-7 office (7-4301) or the CAS Dispatcher during off hours.

The HWEC shall respond to all incidents involving the release of hazardous wastes including spills, fires, or explosions; assess the possible hazards to human health or the environment; and use whatever response group or emergency equipment needed to control and contain the wastes.

7.4.2 HWF Emergency Contingency Plan

This section defines the guideline used to initiate the HWF Emergency Contingency Plan and the resulting actions taken.

7.4.2.1 Guidelines for Implementation

The decision to implement the HWF Emergency Contingency Plan depends upon whether or not an imminent or actual incident could threaten human health or the environment. The following guidelines shall be used by the HWEC in making the decision whether or not to institute the HWF Emergency Contingency Plan.

The HWF Emergency Contingency Plan could be implemented in the following situations involving hazardous wastes or hazardous materials:

Spills

- A hazardous waste or hazardous material spill cannot be contained with secondary containment or application of absorbents,
- Precipitation threatens to move spilled material off site,
- A hazardous waste or hazardous material spill causes the release of flammable material, creating a fire or explosion hazard,
- A hazardous waste or hazardous material spill results in toxic fumes which threaten human health, or
- An earthquake or other natural disaster threatens containment integrity.

Explosions

- An unplanned explosion involving hazardous wastes occurred (except at TA-14, 15, 16, 36, and 39), or
- An imminent danger exists that an explosion involving hazardous wastes or hazardous material could occur.

Fires

- Any fire involving hazardous wastes or hazardous material (except planned burning of HE waste), or
- Any building, grass, forest, nonhazardous waste fire that threatens to ignite hazardous wastes.

7.4.2.2 Emergency Notification

Immediately upon discovery of an imminent or actual incident involving hazardous wastes or hazardous materials, the HWEC will be notified first. In the case of fire involving hazardous wastes or hazardous materials, this is superceded by the Laboratory fire alarm system. A fire is reported by dialing

9-911, activation of automatic alarms, or activation of a fire pull box. All fire alarms simultaneously alert the CAS Dispatcher, the DOE Fire Department, and the Mason and Hanger Pro-Force. For fire involving hazardous wastes, hazardous materials, or hazardous waste facilities, the CAS Dispatcher shall contact the HWEC (Figure 7-3).

During off hours, all incidents involving hazardous wastes or hazardous materials shall be reported to the CAS Dispatcher, who will contact the on-call HWEC.

The HWEC shall proceed to the incident and assess the nature of the problem. On an as-needed basis, the HWEC shall contact response groups directly or instruct the CAS Dispatcher to contact them. Table 7-2 shows the assistance available from each emergency response group. The HWEC will use this list as criteria to determine which groups to contact in an emergency.

Each response group maintains an on-call person and/or a call-down procedure to answer emergencies.

Because the initial observer may not be able to recognize the involvement of hazardous materials, the HWEC shall be notified of any incident as described in Section 7.4.2.1. The HWEC shall use whatever means available including the assistance of other response groups, computer data searches, and sampling to determine if a hazardous waste is generated. HSE-5 and HSE-8 have the expertise to determine the nature and extent of contamination, the chemicals involved in the incident, and the characteristics of the hazardous waste.

7.4.2.3 <u>HWEC Actions</u>

Upon notification of an incident, the HWEC shall:

1. Proceed directly to the site;

2. Assess the nature of the incident, and quantities and types of hazardous wastes or hazardous materials involved; and

3. Based on the guidelines in Section 7.4.2.1 of the Contingency Plan, determine if implementation of the HWF Emergency Contingency Plan is warranted.

Upon the decision to implement the HWF Emergency Contingency Plan, the HWEC shall perform, in this order, the following actions:

1. Assess the hazards to human health and the environment including both direct and indirect effects such as generation of toxic, irritating, or asphyxiating gases, hazards of runoff of fire water or treatment chemicals. The HWEC will use the guidelines in Section 7.4.2.1 to assess the hazards to human health and the environment. If any of the criteria under Section 7.4.2.1 are met, evacuation of the immediate area will be initiated.

2. Determine if evacuation of the local area is advisable, and if so, immediately notify appropriate response groups and/or the Los Alamos County Police.

3. Notify required response personnel by phone, radio, or through the CAS Dispatcher in the case of a spill or incident other than fire. In the case of fire, since the fire fighters have already responded, he shall confirm that the Fire Department Officer-in-Charge is aware of the hazardous waste or hazardous materials involvement and the special hazards associated with the wastes.

4. Warn the remaining personnel of imminent or actual hazards using the radio and/or the PA system.

5. Notify the New Mexico Environmental Improvement Division (505) 827-9329, and the National Response Center (800) 424-8802, reporting:

   - Name and telephone number of the reporter

   - Name and address of the facility

   - Time and type of incident

   - Name and quantity of materials involved, to the extent known

   - The extent of injuries, if any

   - The possible hazards to human health or the environment outside the facility

6. Advise the response groups as needed to minimize personnel exposure and expedite control; and

7. For the Batch Treatment Plant and Controlled Air Incinerator, where the emergency stops operations, the HWEC must monitor for leaks, pressure buildup, gas generation or equipment ruptures. The instruments that are monitored during shutdown and what they are monitored for are shown on Table 7-6 for the Batch Treatment Plant and Table 7-7 for the Incinerator.

Once control of the emergency is established, the HWEC shall:

1. Arrange for site cleanup
2. Provide for treating, storing, or disposing of recovered wastes, contaminated soil or contaminated surface waters
3. Provide for decontamination of equipment as needed
4. Replace and/or repair equipment as needed
5. Conduct testing as needed to verify successful cleanup
6. Within 15 days of the incident, submit to the Regional Administrator and Environmental Improvement Division the report described in Section 7.10.

7.5 SPECIFIC EMERGENCY RESPONSE PROCEDURES FOR HAZARDOUS WASTE FACILITIES

The following section summarizes the guidelines for handling emergencies.

7.5.1 Chemical Spills

Hazardous wastes are handled and stored in small containers, lab packs, 55-gal. drums, and dumpster tanks. The individual volumes handled are small. Handling of hazardous materials may involve truckload quantities of material such as solvents, fuels, acids, and bases.

The general steps in handling hazardous wastes are:

- Containment including spreading of absorbents or forming of temporary dikes,
- Waste pickup and packaging in sound containers, and
- Decontamination followed by testing to assure adequate clean-up.

The emergency preparedness procedures related to flammable organic solvent spills call for stabilization of the spilled material with the organic solvent spill kit. Other chemical spills are to be stabilized using the acid and caustic spill kits or by the addition of absorbents such as vermiculite. Personnel protective equipment will be worn during spill control and cleanup. The stabilized material will be treated as hazardous waste. Runoff which might occur from spills outside containment areas during precipitation must be contained and handled as a hazardous waste unless analyzed and found to be nonhazardous. Temporary dikes can be constructed to contain runoff.

7.5.1.1 Spill Control Procedures

Vermiculite will be used to control all chemical spills except hydrofluoric acid spills. Vermiculite is compatible with all chemicals except fluorine and hydrofluoric acid. Hydrofluoric acid is only handled in very small volumes, in small containers, so that a spill would be limited to a very small volume (less than 1 gallon). A hydrofluoric acid spill will be neutralized by carefully adding calcium hydroxide to the spill. After an excess of calcium hydroxide has been added and the reaction has ceased, the resulting solution will be cleaned up using vermiculite. Vermiculite and calcium hydroxide are stored at all the TSD facilities at the Laboratory.

Type 17H 55-gallon drums will be used to collect all spilled material and contaminated absorbent. There are many drums of this type, located at all TSD facilities at the laboratory. For corrosives, the drums will be lined with polyethylene drum liners. The list of emergency equipment (Table 7-3) shows the equipment available at each area to be used to control a spill. The ultimate disposition of any contaminated absorbent or waste material will be decided by HSE-7 according to permit conditions and RCRA standards. The material will be temporarily stored at TA-54, Area L.

Decontamination will be accomplished at the spill site. After the spilled material has been absorbed by vermiculite, the material will be drummed. If the spill occurs on a cemented area, water or an appropriate solvent will be used to clean the area and this liquid will be adsorbed onto vermiculite and drummed.

A composite sample will be taken of the vermiculite used to adsorb the final waste water. No contamination should be present in this sample. If contamination is present, the procedure will be repeated (i.e., clean the area and collect and analyze a composite sample). The composite sample will be taken from a drum using a thief or trier as specified in SW-846.

If the spill occurrs on soil, any free liquid present will be adsorbed onto vermiculite and the resulting material will be drummed. The contaminated soil will be dug up and drummed. For a spill of less than one gallon, the visibly contaminated dirt plus a sufficient amount of dirt around the spill site will be dug up. For a spill of more than one gallon, the contaminated dirt plus the perimeter dirt will be drummed and a sample taken of the perimeter dirt using the same method as discussed for the vermiculite sample.

There will be no sampling for a spill in a sealed storage area. Once all visible signs of contamination have been removed, it will be simple to verify any remaining contamination because the floors are sealed with epoxy. In addition, sealed storage areas have secondary containment structures that will control potential spills. At closure, if there is any residual contamination, it will be removed.

If a spill is from a known source, the waste will be analyzed for materials present in that container. Analytical procedures specified in Table 7-9 will be used. If the spill is from an unknown source, the chemical composition will be determined by using the parameters and test methods specified in Table 3-3.

7.5.2 Fire

Depending on the size of the fire and fuel source, portable ABC fire extinguishers may be used to put out fires. However, the Laboratory is discouraging the use of portable fire extinguishers by employees and encouraging the immediate evacuation and notification of the DOE Fire Department. The person fighting the fire must wear appropriate protective equipment. If the fire spreads or increases in intensity, all personnel should evacuate to an upwind point at least 100 yards away from the fire. For any fire involving hazardous waste, the HWEC must be contacted immediately, and he will alert all

necessary emergency preparedness personnel. The DOE Fire Department is automatically alerted when the CAS is activated. The HWEC should remain near the site, but at a safe distance, so he can advise the personnel responding to the fire of the known hazards. The HWEC is familiar with RCRA provisions, spill response, and emergency actions (Section 8.0) and therefore, is qualified to advise firefighting personnel of the potential hazards involved. Upon arrival at a fire, the Fire Department Officer-in-Charge will be in command of fire fighting. He will accept and evaluate the advice of Los Alamos personnel and emergency preparedness organization members, but he will retain the responsibility to select the fire fighting methods and tactics. The HWEC will be in overall control of the Laboratory's emergency response efforts until the emergency is terminated.

7.5.3 Explosion

In the case of explosions, all personnel will immediately evacuate the area. Any injured personnel will be immediately transported to the Medical Department for treatment. The HWEC must be contacted immediately upon activation of the CAS, and then he must alert all necessary emergency response personnel. The DOE Fire Department is notified automatically upon CAS activation. The HWEC will remain near the disposal site, but at a safe distance, so he can advise the personnel responding to the explosion of the known hazards.

Upon arrival at the disposal site, the Fire Department Officer-in-Charge will be in command of fire fighting. He will accept and evaluate the advice of Los Alamos personnel and emergency preparedness organization members, but he retains the responsibility to select the fire fighting methods and tactics. The HWEC will be in overall control of the Laboratory's emergency response efforts until the emergency is terminated.

7.5.4 Exposure

Chemical material in the eye or on the skin will be washed either with the entire contents of the portable eye wash station or for at least 15 minutes. The eyelids will be held open during washing. The injured person will then be quickly transported to the Medical Department for evaluation. If possible, the chemical material involved in the injury will be ascertained and the information given to the Medical Department.

Other potential chemical exposures will necessitate evacuation if anyone notices any of the following conditions:

- Irritation of the eyes, breathing passages or skin,
- Difficulty in breathing, or
- Nausea, light-headedness, vertigo, or blurred vision.

The affected person will be transferred to the Medical Department and the HSE-5 Group representative will attempt to ascertain what, if any, chemical exposure occurred and what corrective measure is appropriate.

7.5.5 Flood

The U.S. Army Corps of Engineers has documented that Los Alamos National Laboratory's waste management facilities are not located within the 100-year floodplain. Appendix T contains this documentation.

7.6 EVACUATION

A facility will be evacuated upon the voice command of "evacuate the area," or upon the sounding of the evacuation alarm, or upon the fire alarm.

7.6.1 Evacuation Plan

Emergency situations may warrant the shutdown and evacuation of an area(s) or building(s) in order to protect personnel and property, to anticipate the emergency condition, or to enhance the appropriate response. Table 7-8 shows the criteria for evacuation, persons responsible for initiating evacuations, and reentry conditions. The TA-54, Area L evacuation route is shown in Figure 2-4. Building evacuation routes for the TA-50 batch treatment system and TA-50 incinerator building are shown in Figures 7-4 and 7-5. The evacuation route for TA-50 is shown in Figure 2-3.

To initiate building evacuation, the evacuation alarm is sounded and/or the public address system is used. The evacuation alarm, which is more suitable for evacuation of the whole facility, is a steady, continuous, audible signal. This alarm cannot be silenced and reset by site personnel. The Fire Alarm Maintenance Section at 667-4027 and the Fire Department Platoon Chief at 667-7026 can silence and reset the alarm.

To evacuate a portion of the building, the public address system is more appropriate. The PA system will notify the occupants of the area to be evacuated, and additionally, will advise personnel in the rest of the facility of the existence of a problem in that specific area.

Upon initiation of an evacuation, either via the PA or evacuation alarm, all personnel are to leave the specified area and go to the muster area, turning off all equipment that could contribute to the hazard if left unattended.

In the event of an evacuation of only a portion of the building, one of the out buildings, or outlying work areas, the Group Leader will designate a control point at the closest and/or the most convenient location. This area will be outside the affected area and will serve as a muster point and provide control of the affected area to prevent further spread of the hazard.

Sweep Team personnel will remain in the area for a visual inspection of all the affected work areas, laboratories, and offices. At least two persons will do the sweep to insure that if an injured person is found or if a single person is fighting a small fire, turning off equipment or activating fire suppression systems, one sweep team member can give assistance while the other reports to the muster area or control point to obtain additional aid.

If the building is evacuated during normal working hours, the secretary will remove the personnel attendance roster that is posted near the secretary's desk, take it to the muster area, call roll, and report the personnel accounting to the Group Leader. During second or third shift operations, the lead engineer will be responsible for evacuation and roll call. The evacuation procedure follows:

- Group Leader determines cause and probable extent of hazard.
- Group Leader will sound the evacuation alarm or make an announcement on the PA system.
- Group Leader will designate an assembly area if other than muster area.
- Group Leader will notify the on-call HWEC.

- Personnel will shut down equipment that might contribute to the hazard.
- Personnel will activate fire suppression systems.
- Personnel will not remain in affected area except to assist injured personnel.
- Personnel will report to the muster area or designated control point.
- Roll call (general evacuation) or personnel accounting (partial evacuation).
- Building or Area sweep by assigned personnel.

For a small scale evacuation, the Group Leader takes control. For a large-scale evacuation, the CAS will be activated, the HWEC will be notified and will be responsible for the evacuation.

7.6.2 Process Shutdown

Personnel are instructed to shut down equipment prior to evacuating a building unless an immediate building evacuation is announced. To ensure efficient shutdown, training and exercises in process shutdown are required. In the case of an immediate evacuation, a selected team may shutdown designated equipment in an evacuated area. The team will be equipped with the proper equipment, clothing and breathing apparatus. If present, HSE-1, HSE-3, and HSE-5 will provide advice and assistance. Process shutdown procedures only apply to the TA-50 batch treatment system and waste incinerator. Process shutdown procedures are as follows.

7.6.2.1 TA-50 Batch Treatment System

The Batch Treatment System will be operated in accordance with current standard operating procedures (Appendix T). If a fire or evacuation alarm sounds during the operation of the Batch Treatment System, the operating crew will initiate a process shutdown. Because the process is a batch treatment, cessation of treatment is adequate to bring the process to a safe condition. In general, the process shut should include the following:

- Shutdown of the waste pump discontinuing waste transfer or circulation,

- Shutdown of treatment chemical feeds,
- Shutdown of steam to the reactor jacket, if any,
- Shutdown cooling water only if there is a risk of contamination of the water with waste (continued cooling removes residual heat from the system), and
- Allow the reactor mixer to operate unless its operation poses a unique hazard (operation helps remove heat and prevents stratification).

7.6.2.2 TA-50 Waste Incinerator

If a fire or evacuation alarm sounds during the operation of the controlled air incineration process, the operating crew will initiate a process shutdown in accordance with the current Standard Operating Procedures (Appendix T). Three logic sequences are provided to shut down the process in a safe and orderly manner.

- Controlled Shutdown - initiated when there is potential for significant damage to minor process components. This is also the normal shutdown mode at the completion of a run. When controlled shutdown is initiated, feeding of waste to the incinerator is stopped and a programmable set-point generator is activated that directs remote set-point inputs to the temperature controllers, causing a gradual decrease in chamber temperatures. Switches internal to the set-point generator cause an orderly-timed shutdown of process components.
- Fast Shutdown - initiated for conditions that could likely result in loss of containment or damage to major process components. Waste feeding is stopped. Following a two-minute timed interval following the last feeding of solid waste (immediate, if feeding liquid waste), the upper and lower chamber burners are shut down and the system valves and dampers are positioned so as to maintain a negative pressure in the system while minimizing flow through the system. Snuffing steam is introduced into the lower chamber. The two-minute delay when feeding solid waste allows for the ignition of pyrolitic gases formed immediately after feeding.
- Scram Shutdown - initiated at the discretion of an operator. The chain of events are identical to the fast shutdown except that the sequence is not delayed when feeding solid waste. Scram buttons are located at

the incinerator and in the control room.

The last two shutdown modes are potentially destructive to the incinerator refractory and are initiated only when the consequences of not shutting down are greater than the consequences to the incinerator during a scram or fast shutdown. It is the responsibility of the operating personnel and the process lead engineer to assess any situation and initiate the proper process shutdown sequence.

7.7 SALVAGE AND CLEANUP

The affected area will be surveyed by appropriate representatives from HSE Groups before salvage, cleanup and return to normal operations. Visual inspections of the affected area will be supplemented by sampling to determine whether cleanup is complete. After determination of any existing hazards from toxic or hazardous gases or fumes, electrical hazards, or other unsafe conditions, personnel or selected teams, equipped with proper breathing apparatus and protective clothing, will reenter the area to perform designated tasks to affect decontamination, repairs, and salvage to allow the return to normal operations. After an emergency, the HWEC will:

- Provide for treating, storing, or disposing of recovered waste, contaminated soil or surface water, or any other material that results from a release, fire, or explosion. Contaminated material will be treated as a hazardous waste and temporarily stored at Area L. HSE-7 will be responsible for determining the final disposition of the waste. This determination will be made in compliance with the permit and RCRA standards.

- Remain at the site to ensure that no waste that may be incompatible with the released material is treated, stored, or disposed of until cleanup procedures are completed.

- Ensure that emergency equipment is cleaned and fit for its intended use before operations are resumed. Equipment will be visually inspected and sampled to determine the type and degree of contamination and appropriate cleanup measures will be used.

Prior to resuming operations, appropriate local authorities will be notified that cleanup procedures are completed and emergency equipment is cleaned and fit for its intended use.

Damage assessment and recovery shall be performed within the reporting and investigative requirements of DOE Order 5484.1 (Appendix T). The HWEC has general responsibility for coordinating post-emergency actions, particularly during the time period immediately after the emergency. Such actions include cleanup operations, repair of vital equipment, or interim hazard-removing operations (such as demolition of unstable walls). The services of the affected operational organizations, HSE Division, the Zia Company, and other on-site talent will also be utilized to estimate cleanup costs and operational impact. The HWEC declares the end of the emergency; an Incident Report is filled out, and the HSE-7 Group Leader and his staff review emergency actions.

7.8 POST-EMERGENCY ASSESSMENT

When the emergency is over, the causes of the emergency and the effectiveness of the response are investigated, in order that future emergencies may either be prevented, or that the response to them may be more effective. Following each event requiring the implementation of the HWF Contingency Plan, the HWEC shall meet with representatives of all response functions to determine the adequacy of the response.

7.9 EMERGENCY RECORDS

The details of any incident that requires implementation of the HWF Emergency Contingency Plan must be noted in that facility's log book. This record must include the time, date, and full description of the incident.

7.10 EMERGENCY REPORTS

Any emergency that requires implementation of the HWF Emergency Contingency Plan will be reported in writing within 15 days to the EPA Regional Administrator and to the New Mexico Environmental Improvement Division (EID).

The report shall include the following data:

- Name, address, and phone number of owner or operator
- Name, address and phone number of the facility
- Date, time, and type of incident (e.g. fire, explosion, spill)
- Name of material involved

- Quantity of material involved
- Extent of injuries (if any)
- Assessment of actual or potential hazards to human health or the environment
- Estimated quantity and disposition of material recovered from the incident

7.11 CONTINGENCY PLAN AMENDMENT

The Contingency Plan shall be reviewed by the HSE-7 Group Leader and immediately amended if determined to be inadequate to handle nonsudden and sudden releases, and whenever:

- The HWF permit is revised
- There is significant change in the design or operation of the HWF (i.e., waste quantities handled, handling techniques, or final disposition)
- The list of emergency coordinators changes
- The list of emergency equipment significantly changes
- Operating experience, drills, or technical review demonstrates the plan is inappropriate
- Actual implementation of the plan demonstrates inadequacies

The Contingency Plan shall have a cover sheet (Appendix T) noting the date of the last amendment. Each amendment date shall be initiated by the HSE-7 Group Leader authorizing the changes. Amendments shall be issued to all HWF Contingency Plan holders and shall include a cover letter that describes the plan changes and rationale for those changes.

TABLE 7-1

SUMMARY OF HAZARDOUS WASTE FACILITIES
LOS ALAMOS NATIONAL LABORATORIES

Technical Area and Building or Area Designation	Wastes Handled	Activity Description
TA-14, 15, 16, 36, and 39	HE	Thermal treatment facilities used to burn waste high explosives and high explosives contaminated material
TA-50-01	Electrochemistry wastes Isotope separation wastes	Chemical batch treatment by neutralization, metal precipitation, and cyanide destruction. Includes associated waste container storage area
TA-50-37	Combustible liquids and solids, including chlorinated and fluorinated hydrocarbons, and carcinogenic materials	Waste incineration with flue gas treatment
TA-54 Area L	Shops department wastes Wastes from Basic and Applied Chemistry R&D programs	Wastes are segregated and stored prior to treatment, incineration, recycle, shipment offsite, or disposed at Area L

TABLE 7-2

HAZARDOUS WASTE EMERGENCY RESPONSE GROUPS

Laboratory Controlled Response Group	Emergency Telephone	Assistance Available
HSE-2 Occupational Medicine	667-7878 (8 am - 5 pm) 988-0539 off-duty hours	Emergency medical treatment
HSE-3 Safety		Reviews and approves fire protection procedures. May assist in process shutdown and evacuation
HSE-5 Industrial Hygiene		Site evaluation - field testing to determine the nature and extent of contamination (nonradiological)
		Specify protective clothing and equipment
		Information services regarding hazards of wastes and treatment for exposure
HSE-7 Waste Management		Hazardous waste cleanup, handling, treatment, and disposal
HSE-8 Environmental Surveillance		Field surveys to determine spread of contamination and adequacy of clean up
		Meterological information
		Geohydrologic support
HSE-9 Health and Environmental Chemistry		Chemical analytical services
DOE Fire Department	9-911	Firefighting personnel and equipment
		Ambulance and parametic service
Mason & Hanger Protective Force (Pro Force)	667-4437	Traffic Control
		Security

TABLE 7-2
(Continued)

Laboratory Controlled Response Group	Emergency Telephone	Assistance Available
Zia Company	667-6196	Maintenance personnel and equipment
Non-Laboratory Controlled		
Los Alamos County Police	662-4176	Traffic control on DOE roads with public access
Los Alamos Medical Center*	662-4201	Medical Services

*Medical services related to hazardous wastes injuries provided under the direction of HSE-2.

TABLE 7-3

EMERGENCY EQUIPMENT

EMERGENCY EQUIPMENT AT THE TA-50 BATCH WASTE TREATMENT FACILITY (BWTR)

Fire Control Equipment:

2 fire extinguishers (B,C)

Description of General Capabilities:
These are portable units of approximately 9 to 15 pounds capacity used in wet chemical laboratory applications. May be used by any employee in the event of fire.

East wall of Batch Waste Treatment Room (BWTR)
West wall of adjoining room (Rm. 24) to west of BWTR

Fire alarm pull box

Description of General Capabilities:
Manually operated fire alarm which may be activated by any employee in the event of fire to notify Central Alarm Station.

Located on east wall immediately outside BWTR
1 automatic thermal alarm

Sprinkler system

Description of General Capabilities:
The sprinkler system is an automatic system which delivers a maximum of 200 psi of water spray through shower heads placed at locations which maximize fire suppression range capability. In the event of fire, this system should function automatically, requiring no manual assistance.

2 sprinkler heads in ceiling of BWTR, set off at 212°F

Communication Equipment:

Telephones

Description of General Capabilities:
Telephones for internal communication at the Laboratory and off-site communication with Federal, State, County and other agencies are available. A Centrex telephone system and a private telephone line (if Centrex fails) are available for use by all employees.

Located in Room 24 and at the BWTR
Telephones equipped with building-wide paging system

Evacuation alarm, single tone horn

Description of General Capabilities:
The evacuation alarm activates the central alarm system, which automatically activates the emergency response procedures.

TABLE 7-3
(Continued)

Spill Control Equipment:

Eight-inch curb around reactor, receiving tanks, and storage area
Absorbent kept onsite

Description of General Capabilities:
The curbing and enclosed containment volume has been designed to satisfy containment requirements specified in 40 CFR 261.

Decontamination Equipment

Safety shower located next to reactor tank outside curbed area
Eye wash
Located on south wall next to hood

Description of General Capabilities:
Safety showers and eye washes are used by personnel who receive a chemical splash to skin or eyes. Specific material safety data sheets for the chemical should be obtained prior to working with the chemical to determine if the application of water is indicated for decontamination.

TABLE 7-3
(Continued)

EMERGENCY EQUIPMENT AT THE TA-50 WASTE INCINERATOR

Fire Control Equipment:

13 fire extinguishers (9C-CO; 4 A-water)

Description of General Capabilities:
These are portable units of approximately 9 to 15 pounds capacity used in wet chemical laboratory applications. May be used by any employee in the event of fire.

Manually operated fire alarm may be activated by any employee in the event of fire to notify Central Alarm Station.

The sprinkler system is an automatic system which delivers a maximum of 200 psi of water spray through shower heads placed at locations which maximize fire suppression range capability. In the event of fire, this system should function automatically, requiring no manual assistance.

Halon Extinguishing Systems are indicated to supplement automatic sprinkler systems which protect high value equipment, or suppress special hazardous operations or occupancies.

Location:
1 Mechanical Equipment Room 111
2 High Bay Room 112
2 High Bay Room 114
1 South of Library and Conference Room
1 Chemistry Laboratory Room 107
1 Process Engineering Laboratory Room 209
1 Office Area Room 202
1 Room 21

11 Fire Alarm Pull Boxes connected to the CAS
Location:
1 Mechanical Equipment Room 111
1 High Bay Room 112
2 South of Library and Conference Room
2 High Bay Room 114
1 East of women's changing room
1 Process Engineering Laboratory
1 Office Area Room 202
2 Room 21

Automatic thermal alarm on inlet and exhaust of ventilation system
Automatic thermal sprinkler system throughout offices

4 Fire Hydrants
Location:
1 Northwest corner of Building 84
1 West of Building 69
1 Northeast of Building 37

Halon Extinguishing System, manual and ultraviolet in Room 115

TABLE 7-3
(Continued)

Communication Equipment:

Telephones throughout building with building-wide paging system

Description of General Capabilities:
Telephones for internal communication at the Laboratory and off-site communication with Federal, State, County and other agencies are available. A Centrex telephone system and a private telephone line (if Centrex fails) are available for use by all employees.

Radio located in Room 202

Spill Control Equipment:

Absorbent kept onsite
PCB room is bermed to handle all liquids stored
Have Spill Prevention and Containment Plan

Description of General Capabilities:
Containment is designed to handle all liquids stored. Absorbent is used in the event of a small spill.

Decontamination Equipment:

Showers
Emergency eyewash

Description of General Capabilities:
Safety showers and eye washes are used by personnel who receive a chemical splash to skin or eyes. Specific material safety data sheets for the chemical should be obtained prior to working with the chemical to determine if the application of water is indicated for decontamination.

TABLE 7-3

(Continued)

EMERGENCY EQUIPMENT - HSE-7 CONTROLLED

Spill Control Equipment: Located at TA-54--Area G

Heavy equipment available for emergencies may include
- 2 scrapers
- 1 bulldozer
- 1 tractor (front end loader)

Shovels
Absorbents (vermiculite) in combustibles storage shed

Description of General Capabilities:
The following pieces of heavy equipment will be used in the event of large spills. Small spills will be absorbed with absorbent.

Decontamination Equipment:

Small decontamination pit for heavy equipment
Showers (MD-11)

Other:

Change room with protective clothing (MD-11)
2-3 dozen respirators (particulates) (MD-11)
2 self-contained, portable air masks (MD-11)
2 emergency generators, portable
3 vehicles are available for evacuation of personnel:
- 2 sanfu
- 1 Jeep (with emergency equipment, e.g., coveralls, booties, tape, rope)

TABLE 7-3
(Continued)

EMERGENCY EQUIPMENT AT TA-54, AREA L

Fire Control Equipment:

1 fire hydrant located 30 feet south of site entrance to site
1 CO fire extinguisher located inside trailer at west end of site (B,C)
1 CO fire extinguisher located inside storage shed (B,C)
1 freeze-proof faucet located immediately east of shed

Description of General Capabilities:
These are portable units of approximately 9 to 15 pounds capacity used in wet chemical laboratory applications. May be used by any employee in the event of fire.

Spill Control Equipment:

Shovels
Oversized drums
Absorbent inside storage shed
Heavy equipment from Area G available for any emergencies at Area L
Bermed storage area

Description of General Capabilities:
The following pieces of heavy equipment will be used in the event of large spills. Small spills will be absorbed with absorbent.

Communications Equipment:

2-way radios are available to all personnel when in area
2-way radios are in all vehicles used for moving hazardous waste
Telephone located inside trailer

Description of General Capabilities:
External and internal Laboratory communications which may be used in emergency situations are listed.

Decontamination Equipment:

1 emergency shower and eye wash located immediately east of shed

Description of General Capabilities:
Safety showers and eye washes are used by personnel who receive a chemical splash to skin or eyes. Specific material safety data sheets for the chemical should be obtained prior to working with the chemical to determine if the application of water is indicated for decontamination.

Other:

2 self-contained, portable air masks located inside trailer

TABLE 7-3
(Continued)

SUPPLEMENTARY EMERGENCY EQUIPMENT

ZIA COMPANY (667-6196)

Equipment	Number
A. Transportation	
1. Pickups, 1/2 through 3/4 ton	183
2. Trucks 1 through 3 ton	25
3. Powerwagon (E-20781 with welder (PN-30256) mounted on vehicle, CC-135	1
4. Buses (11-passenger)	2
5. Stationwagens	11
6. Vans, panels, and carryalls	24
B. Special Equipment	
1. Road grader, Champion, self-propelled blade, with radio	1
2. Grader, John Deere, self-propelled, with radio	1
3. Loaders, bucket, Melroe, Bobcat, 1/3 cubic yards	3
4. Loader, bucket, Michigan, 2-3/4 cubic yards	1
5. Loader, Fiat-Ellis, 3 cubic yards	1
6. Loader, bucket, Michigan, 2-1/2 cubic yards	1
7. Loader, bucket, Michigan, 3-1/4 cubic yards	1
8. Loader, bucket, Yale, 3 cubic yards, with radio	1
9. Loader, bucket, backhoe, International, 1-1/2 cubic yards	1
10. Loaders, bucket, backhoe, Case, 7/8 cubic yards	2
11. Loader, backhoe, Ford, 1 cubic yard	1
12. Snowplows, Bombardier, with blade	2
13. Bulldozer, D-8, Crawler	1
14. Bulldozers, TD-25, International	2
15. Scraper, Terex, self-propelled	1
16. Scraper, Fiat-Ellis, self-propelled	1
17. Bulldozer, 280, rubber-tired, with radio	1
18. Semitrailers	5
19. Lights, camp (electrical, plant, portable, 1000 to 5000 watts)	4
20. Power saws	14 (approx)
21. Flusher, street, 3000-gallon Truck, tanker, 500-gallon, International	1
22. Mobile transceivers (2-way, KOB-753)	64

TABLE 7-3
(Continued)

ZIA COMPANY (667-6196)

Equipment	Number
B. Special Equipment (cont)	
23. Mobile transceivers (2-way, fire network)	7
24. Handsets (2-way)	8
25. Pageboys (1-way)	235
26. Welders, mounted on trailers and trucks	32
27. Fire tools (hand)	150 (approx)
C. Supplies	
1. Food	
Box lunches	150
D. Other Supplies	
1. Bedding	
Blankets	60
Bedrolls (disposable)	50
(from U.S. Forest Service in Santa Fe)	
2. Butane gas (25-gallon tanks)	4
3. Fuel and lubricants	
4. Miscellaneous supplies	
Manpower	
A. Fire Bosses	
1. Crew bosses	3
2. Straw bosses	12
B. Service Bosses	
1. Transportation boss	1
C. Specialists	
1. Cat bosses	2
2. Bulldozer operators	14
3. Clerks	10
4. Dispatchers	3
5. Mechanics	17
6. Power saw operators	8
7. Radio and telephone operators	10
8. Truck drivers	13
9. Tool sharpener	4

TABLE 7-3
(Continued)

ZIA COMPANY (667-6196)

Manpower (cont)	Number
7. Radio and telephone operators	10
8. Truck drivers	13
9. Tool sharpener	4
D. Firefighters	
1. Organized crews (approximately 8 men per crew)	14 crews

TABLE 7-3
(Continued)

EMERGENCY EQUIPMENT AT THE DOE FIRE DEPARTMENT
(9-911)

8 1000-gallons-per-minute pumper trucks
5 Minipumper trucks
5 1500-gallon tank trucks
4 Modular ambulances
1 Rescue vehicle
69 Self-contained breathing apparati
Various firefighting equipment
Emergency Medical Technician (EMT) medical equipment
98 Personnel with 81 hours MTA training
1 75-foot elevated platform

TABLE 7-3
(Continued)

EMERGENCY RESOURCES AT THE MEDICAL FACILITY (HSE-2)
(667-7878) 8 am - 5 pm
(988-0539) off-duty hours

Manpower

6 (2 casual) physicians
2 physician's assistants
10 (1 part-time) nurses
3 (2 casuals) x-ray technicians
2 laboratory technicians

Special Equipment - Portable

1 Radio base station (HSE-Div. net, being installed)
3 Walkie talkies (HSE-Div. net)
1 Portable cardiac monitor and defibrillator
1 Crash cart - emergency equipment
1 Portable physicians bag - drugs
1 Portable suction unit
5 Portable stretchers
1 Ambulance stretcher with straps
6 Wheel chairs
1 Manual resuscitator
6 Portable oxygen units
Several intravenous holders and solutions
6 Otoscope/opthalmoscope sets
1 Portable sphygmomanometer
10 Stethoscopes
Many contamination apparel
1 Eye irrigation system
Many inflatable limb traction splints
3 Industrial first aid kits
Many extrication and cervical collars
Many crutches and canes
Many suture sets

Supplies

Bedding and pillows
Rescue blankets
Burn blankets
Thermal/icing pouches
Multitrauma dressing and bandages

TABLE 7-3
(Continued)

EMERGENCY RESOURCES AT THE MEDICAL FACILITY (HSE-2)
(667-7878) 8 am - 5 pm
(988-0539) off-duty hours

Special Facilities - Nonportable

Completely equipped medical clinic with emergency lighting system, x-ray machine, and ambulance entrance. Contamination showers, protective clothing, and wound counters. Suction unit, electrocardiograph (12 lead), pulse rate monitor/recorder, primary response trauma kits are included.

Transportation

1970 Plymouth Sedan

TABLE 7-4

CREDIBLE NONSUDDEN RELEASES

Location	Credible Releases	Detection	Correction
TA-14, 15, 16, 36, 39	Toxic material leaching	Sand and soil samples	Removal and proper treatment or disposal of contaminated sand and soil
	Wind dispersion (prevented by procedures)	Visual	Operating procedures prohibit treatment under adverse weather conditions
TA-50-1	Incomplete treatment	Analysis	Continue or modify treatment (notify EID of modification and revise permit as required)
	Failure of containment	Inspection for leaking containers and tanks, inspect secondary containment for integrity	Maintenance or replacement of containment
Transport	Leaking containers	Inspection prior to transfer	Repackage in sound container
TA-50-37	Incomplete treatment	Analysis and stack monitoring	Modify treatment procedure prior to continuing (notify EID of modification and revise permit as required)
	Failure of containment	Inspection for leaking containers and tanks, inspect secondary containment for integrity	Maintenance or replacement of containment
TA-54 Area L	Failure of containment	Inspection for leaks, inspect secondary containment for integrity	Maintenance or replacement of containment
	Toxic material migration from disposal shafts	Vadose zone monitoring	Develop in agreement with the NM EID a detection monitoring program and corrective action program in compliance with 40 CFR 264.99 and 264.100

TABLE 7-5
HAZARDOUS WASTE EMERGENCY COORDINATORS

(To be notified in succession)

Primary Coordinator	Laboratory Telephone	Telephone	Home Address
Ray Garde, HSE-7 Group Leader	7-7920/4301	753-7737	2560 Aeby Lane, Espanola, NM
Secondary Coordinators			
1. Lud Emelity, HSE-7 Deputy Group Leader	7-5839/4301	662-7993	388 El Conejo, Los Alamos, NM
2. J. L. Warren, HSE-7 Associate Group Leader	7-5398	662-9639	1082 Big Rock Loop, Los Alamos, NM
3. Jerry Buchholz Associate Group Leader	7-4301	672-3647	316 Potrillo Drive, White Rock, NM
4. Lee Borduin Associate Group Leader	7-7391	455-2882	Rt. 1, Box 92G, Santa Fe, NM
5. Karen Balo Section Leader	7-6095	672-1369	400 Kolleen Court, White Rock, NM
6. W. M. Sanders Section Leader	7-4301	672-1931	214 Rover, White Rock, NM
7. R. A. Koenig Staff Member	7-7391	662-2458	971 Alamo Road, Los Alamos, NM
8. B. R. Myers Staff Member	7-6095	672-9509	83 Mimbres, White Rock, NM

TABLE 7-5
(Continued)

Secondary Coordinators	Laboratory Telephone	Telephone	Home Address
9. D. G. Vance Staff Member	7-4301	None at present	Rt. 14, Box 750, Santa Fe, NM
10. M. D. Salazar Staff Member	7-6095	753-4423	Rt. 2, Box 124, Espanola, NM
11. N. W. Weeks Tech. Supervisor	7-6094	662-5366	2176 37th, Los Alamos, NM
12. W. D. Moss Fac. Equip. Oper.	7-6094	662-5124	2932 Woodland, Los Alamos, NM
13. D. L. Volz Fac. Equip. Oper.	7-6094	662-3287	2146-C 43rd St., Los Alamos, NM
14. D. F. Salazar Fac. Equip. Oper.	7-6904	852-2456	P.O. Box 922, San Juan Pueblo, NM
15. L. D. Williams Fac. Equip. Oper.	7-6904	753-5782	P.O. Box 3754, Fairview, NM
16. L. L. Hupke PCB Disposal Coord.	7-7316	753-6984	P.O. Box 905, Los Alamos, NM
17. C. L. Gilley Matr. Tech.	7-7391	662-4051	2173 B. 36th St., Los Alamos, NM
18. R. J. Payne Fac. Oper.	7-4301	672-9744	128 Aragon, Los Alamos, NM

TABLE 7-6

ITEMS MONITORED AT THE BATCH TREATMENT PLANT
DURING EMERGENCY SHUTDOWN

Item	Monitored For
Piping/Valves	Leaks, damage, poor seals
Gauges	Acceptable range

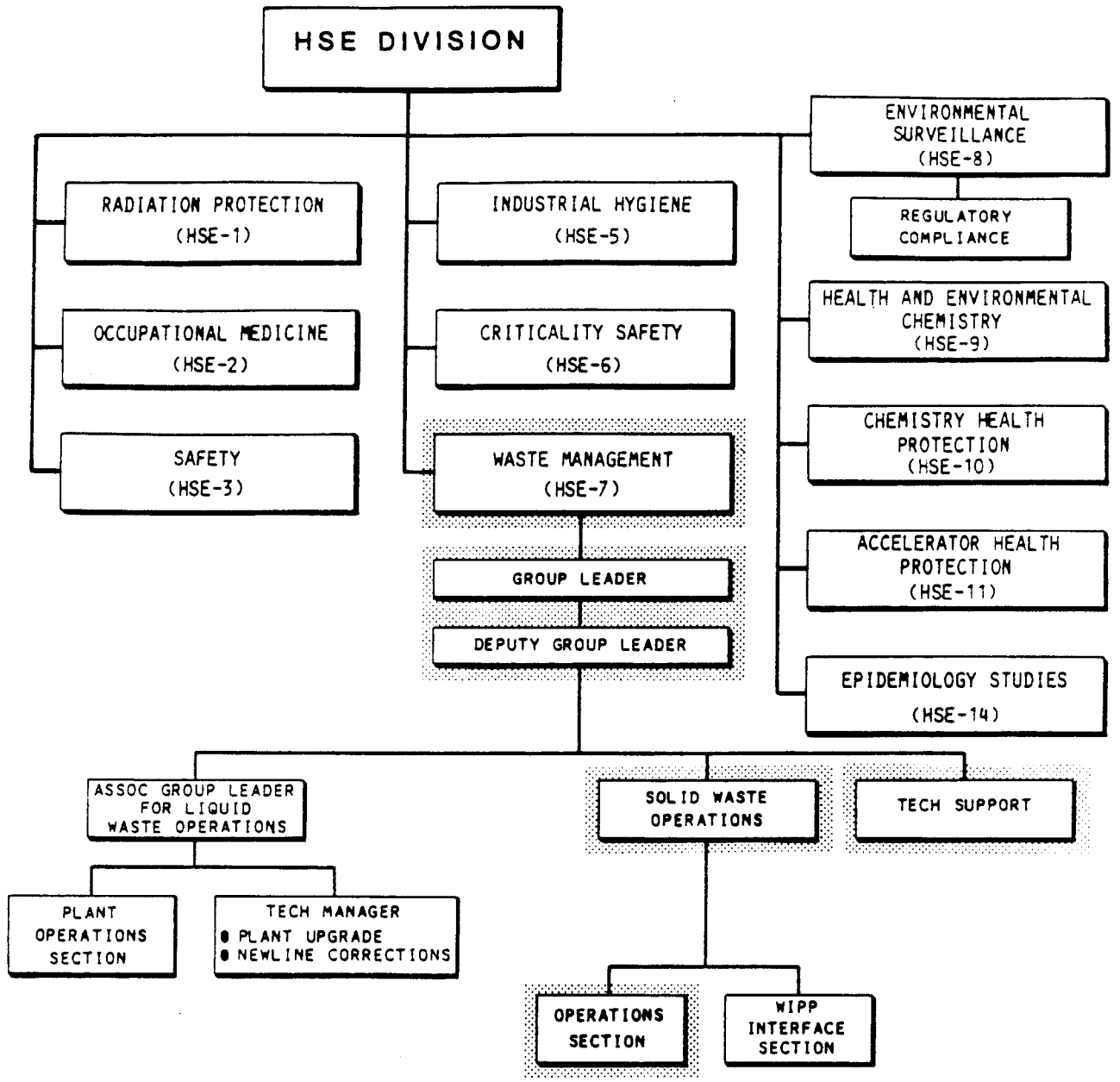
TABLE 7-7
ITEMS MONITORED AT THE WASTE INCINERATOR
DURING EMERGENCY SHUTDOWN

Item	Monitored For
Incinerator/Equipment	Functioning
Pumps, valves, pipes	Leaks
Tank by-pass	Leaks
Emergency waste feed cutoff system	Functioning
Tank hi-level alarm	Functioning

TABLE 7-8

EVACUATION DETERMINATION AND REENTRY

Reason for Evacuation	Determination Made By	Reentry Conditions
Fire	Fire or Evacuation Alarm; Group Leader; Alternate; Lead Engineer, Senior Staff Member present, or HWEC	Following survey by the Chief Fire Officer, HSE-1 and/or HSE-5, and R&D Supervision
Explosion	Same as above	Same as above plus HSE-3
Loss of Ventilation	Group Leader, Alternate, Senior Staff Member, Lead Engineer, or Senior Technician	Following survey by HSE-1 and/or HSE-5, and R&D Supervision
Loss of Electric Power	Same as above	Same as above
Extensive Contamination	Same as above or HSE-1 Representative	Same as above
Airborne Contamination	Same as above or Rad Monitor	Same as above
Escape or Release of Toxic or Hazardous Gas or Fumes	Group Leader, Alternate, Senior Staff Member, Lead Engineer, Senior Technician, or HWEC	Same as above plus HSE-5
Bomb Threat	HSE-3 or Protective Force Representative, R&D Section Leader, Alternative, Senior Staff Member or Lead Engineer	Following determination by HSE-3 or Protective Force Representative and R&D Supervision



NOTE: SCREENED BOXES INDICATE PRIMARY RESPONSIBILITY FOR CHEMICAL WASTE MANAGEMENT

FIGURE 7-1

HEALTH, SAFETY AND ENVIRONMENT DIVISION MANAGEMENT CHART

PREPARED FOR

LOS ALAMOS NATIONAL LABORATORY
LOS ALAMOS, NEW MEXICO

DRAWING NUMBER 846510 A24

CHECKED BY / APPROVED BY

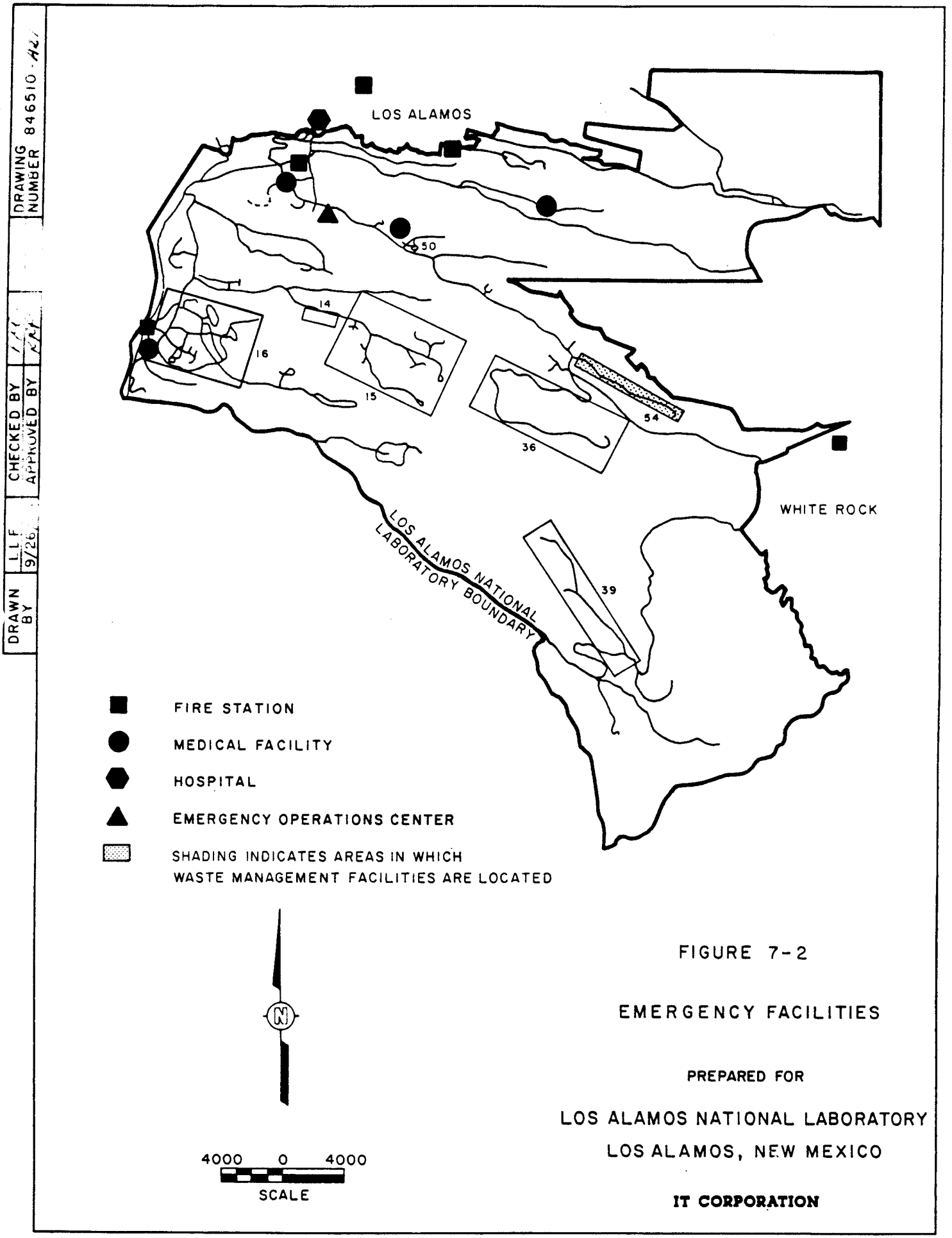
DRAWN BY

© 1984 IT CORPORATION
ALL COPYRIGHTS RESERVED

IT ... Creating a Safer Tomorrow

65360

"Do Not Scale This Drawing"



19 1253 HERCULENE. A&B SMITH CO., PGH., PA LT1530-1079

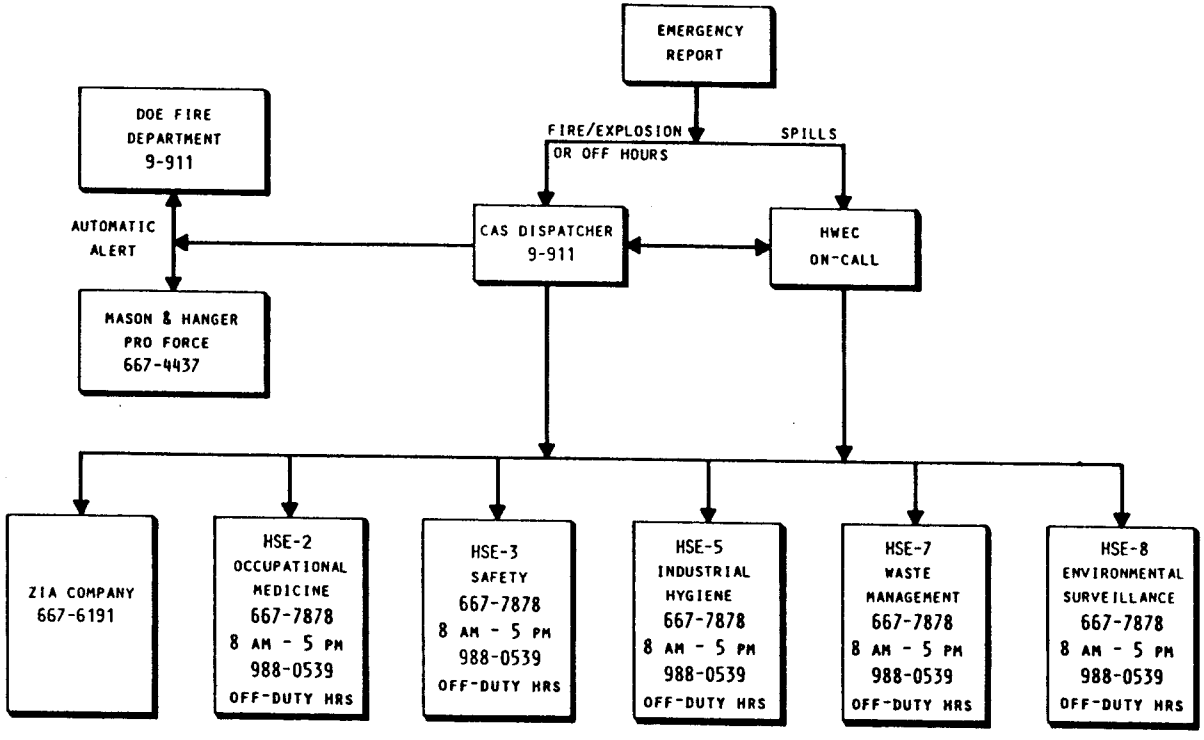


FIGURE 7-3

HAZARDOUS WASTE
EMERGENCY
NOTIFICATION STRUCTURE

PREPARED FOR

LOS ALAMOS NATIONAL LABORATORY
LOS ALAMOS, NEW MEXICO

IT ...Creating a Safer Tomorrow

DRAWN BY LLF 3/14/85 | CHECKED BY | APPROVED BY | DRAWING NUMBER 81651D-810

© 1984 IT CORPORATION
ALL COPYRIGHTS RESERVED
"Do Not Scale This Drawing"

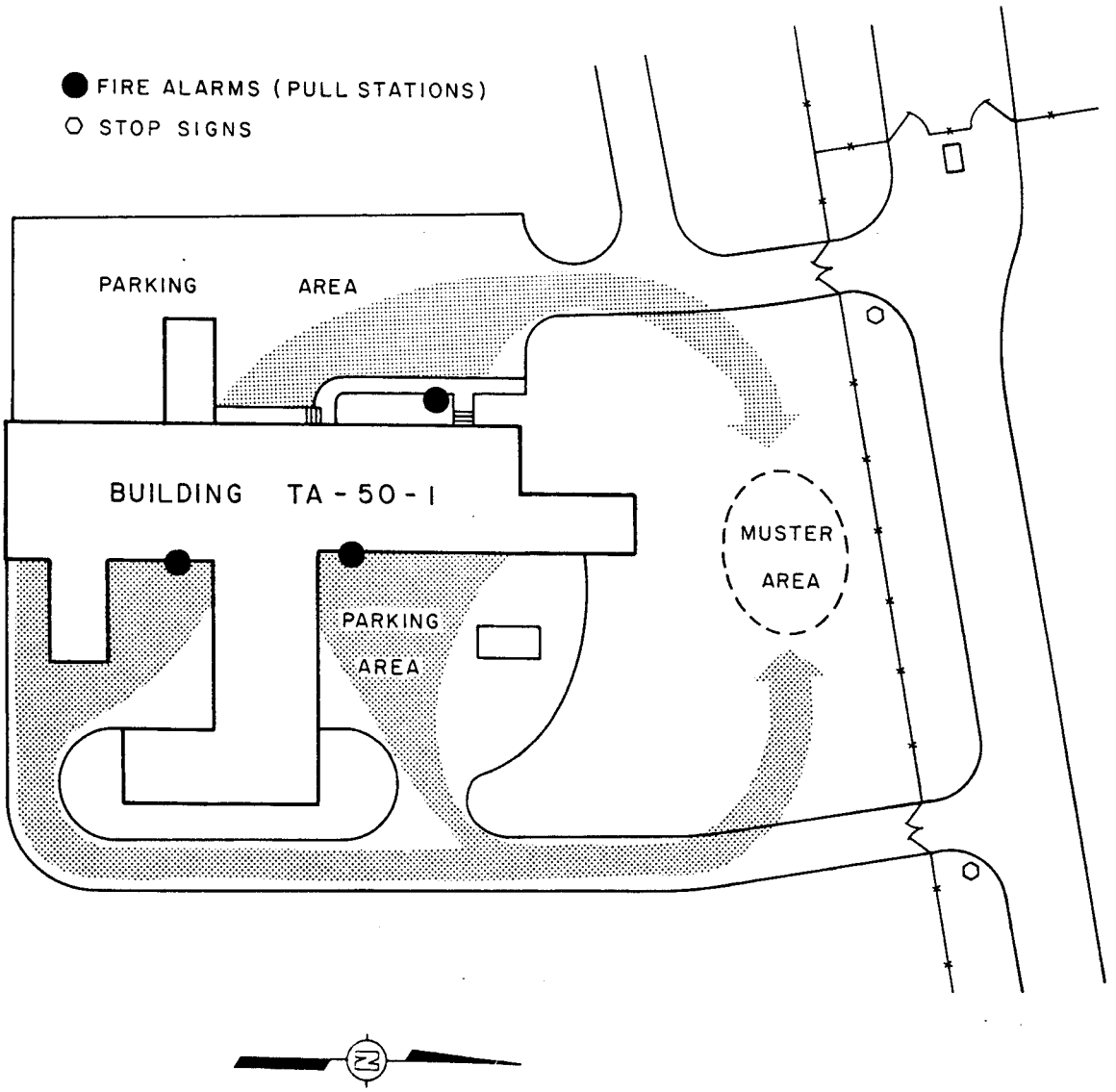


FIGURE 7- 4

TA-50,
BATCH TREATMENT PLANT
EVACUATION ROUTE

PREPARED FOR

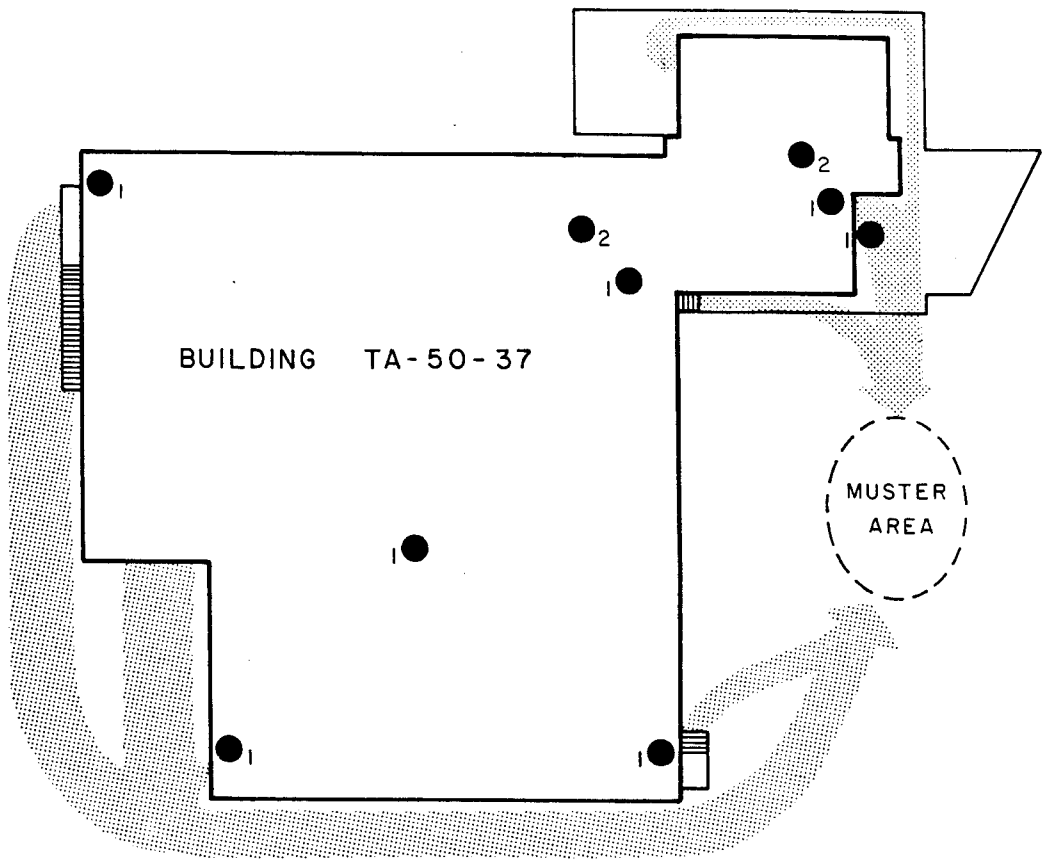
LOS ALAMOS NATIONAL LABORATORY
LOS ALAMOS, NEW MEXICO

IT CORPORATION

DRAWN BY	LIF 10/10/84	CHECKED BY		DRAWING NUMBER	846510-A22
		APPROVED BY			

32803

DRAWN BY	L.L.F. 10/12/84	CHECKED BY	LLF	DRAWING NUMBER 846510-A23
		APPROVED BY	KCP	



● FIRE ALARM PULL
1 1st FLOOR
2 2nd FLOOR

FIGURE 7-5

TA-50
WASTE INCINERATOR BUILDING
EVACUATION ROUTE

PREPARED FOR

LOS ALAMOS NATIONAL LABORATORY
LOS ALAMOS, NEW MEXICO

IT CORPORATION

32803

8.0 PERSONNEL TRAINING

This section describes the personnel training program for Los Alamos National Laboratory's facilities in accordance with the regulatory requirements of §264.16 (NMHWMR 206.B.6). These requirements are submitted with the Part B Application, as specified in §270.14(b) (12) (NMHWMR 302.A.4.b.[1]).

The information presented outlines the personnel training programs at the Laboratory. The primary objective of the program is to prepare persons to safely operate and maintain those areas containing hazardous wastes.

8.1 OUTLINE OF TRAINING PROGRAM

8.1.1 Responsibilities

Figure 7-1 presents the organization of Health, Safety, and Environment Division. HSE Division handles all waste management activities except for high explosives treatment, which is handled by the WX and M Divisions. Individuals who are directly involved with waste management are in Health, Safety, and Environment Group 7 (HSE-7). The Environmental Surveillance Group is responsible for RCRA compliance. Personnel in the Occupational Medicine (HSE-2), Safety Group (HSE-3), Industrial Hygiene Group (HSE-5), and Environmental Surveillance Group (HSE-8) are trained in their specialties to provide emergency response support. Job descriptions for the Laboratory's hazardous waste management personnel are included in Appendix U.

8.2 TRAINING CONTENT, FREQUENCY, AND TECHNIQUES

Past training was conducted by a training contractor, J. T. Baker Chemical Company.

A new training program is being instituted at the Laboratory. It will include a combination of internal training courses, on-the-job training, and courses taught by outside contractors.

Records of each individual's formal training are maintained in the HSE Division office. Training records of current employees are kept until closure of the facility. Records of former employees are kept for at least three years from the date the employee last worked at the facility.

The training outline is on file in the HSE Division Office and is available for review by all hazardous waste management and handling personnel, emergency response personnel, and all regulatory agencies. Training records and procedures are reviewed by the DOE and the EPA and during internal audits/inspections. Provisions are made for updating and reviewing courses, as necessary, to ensure RCRA Part B compliance.

The training coordinator will work with the group leaders of HSE-2, 3, 5, 7, and 8, WX, and M Divisions to ensure that all employees receive the proper level of training. All new employees will receive training within six months of their date of hire or transfer. Personnel will not work in unsupervised positions until they successfully complete the training course.

8.2.1 Internal Training

The personnel training courses developed at the Laboratory emphasize the safe handling of hazardous wastes. Program instructors are trained in hazardous waste management procedures and RCRA provisions. The Laboratory's internal training program is designed to provide training commensurate with the employee's responsibilities. Three versions of a course are offered (intensive, limited, overview) so that the program can be molded to fit each employee's needs.

An outline of the Los Alamos National Laboratory Training Program can be found in Appendix V. Table 8-1 shows the employees who will participate in each of these courses and the level of the course they will be required to take.

8.2.2 On-the-Job Training

Appropriate personnel will participate in on-the-job training programs. These programs are designed to give field demonstrations of Laboratory procedures for hazardous waste handling, inspections, and hazardous waste transportation requirements. As shown in Table 8-1, personnel responsible for directing on-the-job training participate in the RCRA Provisions course so that they are familiar with hazardous waste management procedures as they relate to RCRA. An outline of on-the-job training programs can be found in Appendix V.

8.2.3 External Training

In addition to internal training, appropriate personnel will participate in contractor-taught courses. Those personnel who will participate in the external training program are shown in Table 8-1. These contractor-taught courses will serve to supplement the internal training program.

8.2.4 Training Coordinator

The personnel training program is directed by Dr. Wayne Hansen. As Associate Division Leader for the Health, Safety, and Environment Division at Los Alamos National Laboratory, Dr. Hansen is knowledgeable about hazardous waste management facilities and practices and emergency procedures. Dr. Hansen's resume can be found in Appendix V.

8.2.5 Relevance of Training to Job Position

Dr. Wayne Hansen, the training coordinator, is responsible for coordinating the internal and external training courses and for assuring that all waste management and handling personnel receive the required training. Job descriptions for each position related to hazardous waste management are provided in Appendix U. The training program provides employees with training relevant to their positions within the organization. Supervisors and staff receive training appropriate to their degree of handling hazardous waste (e.g., reporting and other procedures required for compliance). For example, management responsibilities for compliance with RCRA are assigned to the HSE-7 Group Leader, who receives training in RCRA provisions. Material handlers are trained to maintain proper and safe operating procedures and to respond effectively to spills and other emergencies. Table 8-1 shows how training is applicable to job position. In Appendix U, duties for each job description are matched to a Los Alamos training course to demonstrate that training is adequate for all postions.

8.3 EMERGENCY RESPONSE TRAINING

The outside professionals (Zia Company and the Protective Force) assist the Hazardous Waste Emergency Coordinator (HWEC) (Table 7-6) as soon as they arrive on the scene of the emergency. These people are trained in their specialties (i.e., heavy equipment operations, traffic control). Zia Co. personnel are also trained in personal safety. At all times during an

emergency, these contractors are under the direct supervision of the HWEC and other trained Laboratory personnel. All actions taken by contractors during an emergency must be approved by the HWEC. These contractors do not perform activities other than those for which they are trained (heavy equipment operations, contructing dikes).

In order to ensure maximum protection of life and property and to mitigate the consequences of an emergency situation, it is imperative that all HSE personnel, WX and M personnel involved in waste handling and emergency response be knowledgeable about appropriate building and operating area emergency procedures. These groups will participate in the Laboratory's formal training program.

In addition to the Laboratory's formal program (Table 8-1), division and group leaders and immediate supervisors are responsible for providing education and training in emergency response procedures. Periodic unannounced emergency drills and exercises are used to familiarize employees with emergency procedures. Training is also provided through prominent instruction displays and through presentations and discussions in safety meetings.

Each new or transferred employee is indoctrinated by his immediate supervisor regarding the general emergency procedures and those specific procedures related to his/her work area. Each employee is advised of changes to any emergency procedures and is given an annual review of procedures affecting his/her work area. The review may be given separately in writing or included in an overall indoctrination.

Specialized training is given to those employees assigned special functions or specific emergency duties (see Table 8-1). Emergency response personnel (HSE-2, 3, 5, and 8, the DOE Fire Department, Laboratory Emergency Coordinators, and Area Spill Coordinators) participate in the formal Laboratory training program and are required to attend courses on spill response, the RCRA contingency plan and RCRA provisions. All waste handling personnel (HSE-7, WX, and M) also participate in the formal training program in which they are instructed in emergency procedures pertinent to their work area. The emergency procedures instruction in which hazardous waste management and

handling personnel and emergency response personnel are required to participate will ensure a coordinated response to hazardous waste emergencies.

8.4 IMPLEMENTATION OF TRAINING PROGRAM

The Los Alamos National Laboratory introductory training program (Table 8-1) is offered at six-month intervals, when needed, to ensure that all employees receive training within six months of their date of hire or transfer. Employees will not work in unsupervised positions until they have been trained.

All hazardous waste management and handling personnel must attend annual refresher courses. These courses are intended to update personnel on Laboratory procedures and provide them with an overview of their introductory training.

In addition, a complete Respirator/SCBA course is taught annually, where appropriate, and must be successfully completed by hazardous waste handling personnel.

Group leaders, along with the training coordinator, will ensure that all personnel participate in the introductory and annual training programs.

TABLE 8-1. LOS ALAMOS NATIONAL LABORATORY TRAINING

Course Content	High Explosives Handling Technicians	High Explosives Handling Staff	Incineration Technicians	Incineration Staff	Chemical Waste Technicians	Chemical Waste Staff	Associate Group Leaders	HSE-7 Group Leader	Training Coordinator, On-the-job Trainers	Occupational Medicine, Safety Group, Industrial Hygiene Group, Environmental Surveillance Group, DOE Fire Department, Hazardous Waste Emergency Coordinators, Area Spill Coordinators	Course Type
RCRA Provisions	L	I	L	I	L	I	L	L	L	L	IC, EC
Personal Safety	I	I	I	I	I	I	L				IC, EC
Respirator/SCBA*			I	I	I	I					IC
Hazardous Waste Handling and Operations											
a) Batch Treatment					I	I	O				OJT
b) Incineration			I	I	O	O	O				OJT
c) Detonation/Burning HE	I	I				O	O				OJT
d) Landfill Disposal					I	I	O				OJT
e) Reactives					I	I	O				EC, OJT
f) Acids/Bases					I	I	O				EC, OJT
g) Organics - General			I	I	I	I	O				EC, OJT
h) Inorganics - General					I	I	O				EC, OJT
Spill Response*			I	I	I	I	I	I		I	IC
RCRA Contingency Plan*	L	I	L	I	L	I	I	I		O	IC
Recordkeeping/Inspections	I	I	I	I	I	I	O				IC, EC, OJT
On-Site/Off-Site Transportation	L	L			I	I	L				OJT

*Class taught internally only; others may be taught by any combination of internal/external classes.

I = Intensive L = Limited O = Overview

IC = Internal Classroom Instruction

EC = External Classroom Instruction (contractor taught)

OJT = On-the-Job Training

9.0 CLOSURE AND POST-CLOSURE PLAN

9.1 GENERAL CLOSURE/POST-CLOSURE INFORMATION

Introduction

This section is submitted in accordance with the requirements of 40 CFR 264.110 through 120 (NMHWMR 206.D.2.a[1] through 206.D.2.j[2]), 264.178 (NMHWMR 206.D.4.i) and 270.14(b)(13) (NMHWMR 302.A.4.b[1]). This plan identifies all steps that will be necessary to close the facility at the end of its operating life or to partially close the facility at any point during its intended operating life.

Hazardous waste treatment, storage, and disposal facilities at the Los Alamos National Laboratory consist of container storage, chemical treatment, controlled air incineration, thermal treatment, and landfill disposal. The functions of the individual hazardous waste facilities are outlined in Table 9-1.

9.1.1 Closure Performance Standard

The closure plans have been designed to meet the following performance standards:

- Protect human health and the environment
- Prevent the escape of hazardous waste, hazardous waste constituents, leachate, contaminated rainfall, or waste decomposition products to the ground or surface waters or atmosphere
- Minimize future maintenance

9.1.2 Partial and Final Closure

The Laboratory's hazardous waste facilities are to be closed in the year 2100. All hazardous wastes will be recycled, treated, and/or disposed of prior to closure.

Partial closure of TA-54, Area L land disposal shafts has been performed as each shaft was filled to capacity (see Section 9.4.1.3). Additionally, partial closure of treatment facilities may occur to accommodate upgrading of

facilities to handle new wastes or to use new technology. If such modification of waste management is anticipated, a permit modification will be sought prior to implementation.

9.1.3 Closure and Post-Closure Cost Estimates

Federal facilities are exempt under 40 CFR 264.140(c) (NMHWMR 206.D.3.a[3]) from the requirements for closure and post-closure cost estimates and financial assurance. These data are therefore not included.

9.1.4 Groundwater Monitoring

Los Alamos National Laboratory has applied for a ground water monitoring waiver (see Appendix N) in accordance with the provisions of 40 CFR 264.90 (b)(4) (NMHWMR 206.D.1.a[2]). Groundwater monitoring is only applicable to the landfill operations at Area L. The waiver request is based on the determination that average annual precipitation is equaled or exceeded by runoff and evapotranspiration resulting in negative percolation rates. Past free liquids disposed of at this site are of inadequate volume to threaten the first aquifer 290 meters (950 feet) below Area L. Therefore, groundwater monitoring at the disposal sites is only as described in Appendix N. Vadose zone monitoring at Area L is to be performed as described in Appendix O.

9.1.5 Personal Protection

Good industrial hygiene practices shall be followed during all phases of closure and post-closure to protect employees from exposure to hazardous waste constituents. Normal Los Alamos National Laboratory operating procedures require that the Laboratory's Industrial Hygiene Group (HSE-5) survey a site prior to personnel entry and specify protective clothing and respiratory protection equipment. Contaminated protective clothing and protection equipment shall be treated as hazardous and either decontaminated or disposed of on-site or off-site by a permitted commercial disposal firm in compliance with appropriate regulations (40 CFR 260 et seq. and NMHWMR-2).

9.1.6 Certification of Closure

When final closure of a facility has been performed, a certificate, attested to by a registered professional engineer and signed by the appropriate Department of Energy official in accordance with 40 CFR 264.115 (NMHWMR

206.D.2.f) shall be submitted to the Regional Administrator or the Director of the New Mexico Environmental Improvement Division, as appropriate stating that the facility has been closed in accordance with an approved closure plan.

9.1.7 Post-Closure Care Office

The following is the office to which contact may be made concerning the facility during the post-closure care period.

Area Manager
Los Alamos Area Office
U.S. Department of Energy
Los Alamos, New Mexico 87544
(505) 667-5105

A copy of the closure plan will be maintained at this office until the time of closure. The facility copy of the closure plan will be updated by the Area Manager or his designee. This office will also assure that other copies of the closure plan are updated as needed by maintaining a list of holders of the plan and by issuing plan modifications to all holders of the plan.

9.1.8 Security

Low-level radioactive wastes have been handled and buried at TA-54. TA-54 will therefore be under the permanent care of the Department of Energy (DOE) or other authorized federal agency. Fences and site security (as described in Section 4.0) will be maintained in perpetuity to prohibit public access and to meet DOE requirements for radiation protection.

9.1.9 Notation of Deed

Notice to local land authority as per 40 CFR §264.119 (NMHWMR 206.D.2.i) and notation of deed as per §264.120 (NMHWMR 206.D.2.j[1]) shall be performed. Land plats for Los Alamos facilities will be provided to the local land authority indicating that the lands have been used for hazardous waste management activities. However, the past use of the site precludes any circumstances under which the deed for disposal areas will be transferred to the public domain. The land will remain federally owned in the care of the DOE or other authorized federal agency.

9.1.10 Individual Closure and Post-Closure Plans

Details of the closure and post-closure plans for individual Los Alamos hazardous wastes facilities are included in the following sections.

9.2 CLOSURE PLAN FOR THERMAL TREATMENT FACILITIES

9.2.1 Technical Areas 14, 15, 36, and 39 Thermal Treatment Facilities

High explosives (HE) detonation sites are located at Los Alamos in Technical Areas 14, 15, 36, and 39. These sites are used routinely to detonate scrap high explosives (HE), failed experimental detonations, unneeded classified explosives shapes, other HE and reactive wastes determined to be excess. A site at TA-36 has also been used to detonate reactive wastes and other assorted regulated wastes. These sites consist of firing pads often located within a small canyon. Associated facilities at these sites include bunkers which are occupied by technical personnel during detonations.

9.2.1.1 TA-14 Firing Site Description

The waste firing site at TA-14 is located just south of Control Building TA-14-23 (Figure 9-1). Four additional firing points are located south of the waste detonation site, but these have not been used for waste detonations. The waste detonation firing site consists of a three-sided blast shield that directs the impact of detonations away from the control building. At the base, the shield is a two-foot thick by six-foot square concrete pad overlaid with a neoprene shock pad, a 4.5-inch steel plate and several inches of sand. Wastes are placed on the pad and detonated from the Control Building. Detonations at this firing site are limited to small pieces. Just southeast of the firing pad is a small wire cage used to burn paper, tape, cotton swabs and other trash items that have contacted HE and are suspected of being contaminated.

The firing site is located on a mesa top and the topography around the firing site is generally flat, sloping gently to the south.

9.2.1.2 TA-15 Firing Site Description

The firing site at TA-15 is occasionally used to detonate regulated wastes and is located at the end of Building TA-15-184, the Phermex Chamber (Figure 9-2). The site is normally used for test detonations, but unneeded classified

shapes and scrap HE have also been detonated. The firing site is underlain with two massive steel plates 0.5-foot thick by 5 feet wide by 20 feet long. The steel plates are laid lengthwise end-to-end with one end against the Phermex Building. There are various small housings for cameras and instrumentation around the firing pad. The Phermex Chamber and small housings are protected from detonations with sand bags.

The firing site is located on a mesa top and the topography of the area is generally flat with a gentle slope to the southwest.

9.2.1.3 TA-36 Firing Site Description

The firing site at TA-36 used for waste detonation is designated as Meenie Site and is located west-southwest of Control Building 8 (Figure 9-3). The site is a flat area covered with sand. To the south of the detonation site is an instrument chamber.

In addition to the HE wastes associated with explosives studies, reactive wastes and other regulated wastes have been detonated or included in HE detonations.

TA-36 Meenie Site is located in a small canyon.

9.2.1.4 TA-39 Firing Site Description

Two sites normally used for test detonations have been used for HE waste detonations at TA-39. These detonation sites are those located at Firing Point 6 and 57 (Figures 9-4 and 9-5). The sites are all similar and consist of a sand pad located at the bottom of a narrow canyon. The canyon walls rise steeply 220 to 270 feet near the detonation sites and contain debris thrown by the detonations. The drainage channel is approximately in the center of the canyon floor and drains to the southwest.

9.2.1.5 Estimate of Maximum Waste in Treatment

Wastes are not stored at the detonation site, but are held in short-term storage (less than 90 days) at the generation point and moved to the site just before detonation. The maximum HE waste in treatment at any one time is 45 kg (100 lbs).

9.2.1.6 Description of Waste Handled

All the detonation sites have been used to detonate waste HE and some of the sites have been used to burn paper, tape, and other trash items assumed to be contaminated with HE. HE considered to have been burned or detonated include HMX, RDX (cyclonite), TNT (2,4,6-trinitrotoluene), PETN (pentaerythritol tetranitrate), ammonium nitrate, barium nitrate, TATB (triaminotrinitrobenzene), nitrocellulose, tetryl, nitroguanidine, and various plastic binders.

The detonation site at TA 36-Meenie has been used to detonate other regulated wastes that represented handling or storage risks. The wastes so detonated are listed in Table 9-2 and were small volumes, usually residual laboratory chemicals in small packages or leaking gas cylinders.

9.2.1.7 TA-14, 15, 36 and 39 Closure Procedure

Closure for each site is similar. A sampling survey is conducted using a grid to determine the area of possible contamination. A surface sample is taken at each grid point, and vertical soil sampling is done at one-foot intervals to bedrock or to a maximum depth of three feet for the initial survey. If the initial grid sample analysis indicates vertical contamination at the maximum sample depth, additional sampling at one-foot intervals will be performed to determine the depth of contamination. If contamination is determined on the surface, additional sampling will be conducted by reducing the grid distance by one-half and taking additional site samples, dictated by terrain, until the contaminated area is defined. If significant contamination is found at the outside grid samples, the limits of the grid will be expanded to determine the outside parameter of contamination. The contaminated soil is then removed and handled as a regulated waste. The adequacy of decontamination is determined by additional sampling. Sampling, analysis, and documentation procedures are defined in Section 9.5.

TA-14 Sampling and Analysis Survey

The TA-14 waste detonation site will be separated into 40-foot by 40-foot grid squares extending 60 to 140 feet from the detonation point (Figure 9-1). The grid is offset to the south because deflection from the blast shield directs the debris in that direction. The grid is small in size because the site is used for the detonation of small HE pieces.

Composite soil samples will be taken representing the intersection of grid lines. Additional composite sediment samples will be taken in the drainage channel at the approximate locations shown in Figure 9-1. If channel sediment samples show contamination of regulated constituents, additional samples will be taken along the channel at 30-foot intervals. One additional composite soil sample will be taken at the burn cage location.

Four background composite samples will be taken; one to the north, east, south, and west of the site at a distance greater than 1500 feet from the detonation site. The exact sites for background samples will be field selected based on similar topographic and geologic characteristics to the detonation site and the lack of possible interference of other operating Laboratory sites. Two background sediment samples will be taken from the drainage channel upstream of the detonation site. If there is no sediment channel site outside the grid, background samples may be taken from similar nearby drainage channels. Care will be taken in selecting these background sample sites to preclude influences of other operating sites.

Field relocation of grid points may be required by topographic features. In such a case, the sample will be taken as closely as possible to the grid point and the new location will be documented.

Each grid point will be represented by a composite sample made up of four core samples taken ten feet along each grid line from the grid intersection. Background soil samples will be a composite of four cores with the same orientation as grid samples.

Sediment samples will be a composite of four sediment samples taken from the channel and evenly spaced over a ten-foot line following the channel. The burn pit center composite sample will be made up of four core samples taken from the center of each quarter of the pit.

Vertical soil sampling will be done at the topsoil, then at one-foot intervals to bedrock or to a maximum depth of three feet for the initial survey. Core samples shall include soil depth segments from 0.5 foot to one foot, 1.5 feet to two feet, and 2.5 feet to three feet.

Soil and sediment samples will be analyzed for the constituents listed in Table 9-3. Barium is a possible contaminant because it is in several HE mixtures. The other toxic metals are included to ensure that these materials were not included in past detonations. A scan for volatile and semivolatile organics is conducted to ensure that residual from solvents used in HE preparation are not present.

Analysis is not conducted for HE constituents because these are a regulated waste based on reactivity and detonation or burning renders them nonreactive. Furthermore, none of the HE materials used at this site are 40 CFR 261, Appendix VIII constituents. Analysis and Quality Assurance/Quality Control will follow methods defined in Test Methods for Evaluating Solid Wastes, USEPA SW-846, most current edition (SW-846).

The closure regulation HWMR 206.C.2.e requires that all facility equipment and structures must have been properly disposed of or decontaminated by removing all hazardous waste and residues. The closure regulation specific to thermal treatment (HWMR 206.C.11.e) states that the owner or operator must remove all hazardous waste and hazardous waste residues from the thermal treatment process or equipment. The above regulations both relate decontamination to equipment, and the term residue is not defined. The regulation HWMR 201.A.2.c.(2) states that any solid waste generated from the treatment of solid waste is a hazardous waste except as provided in HWMR 201.A.2.c.(3), which states that solid waste described in HWMR 201.A.2.c.(2) is not a hazardous waste if, in the case of any solid waste, it does not exhibit any of the characteristics of a hazardous waste identified in HWMR 201.B. Those characteristics include ignitability, corrosivity, reactivity, and EP Toxicity. The intent of these closure regulations is to guarantee that a closed area possesses no risk to human health or the environment.

The definition as to what constitutes contamination of the detonation site based on the above-cited regulations is not clear. Barium is the most probable regulated constituent expected to be found at a detonation site. According to HWMR 201.a.2.C.(3), the residue would not be a regulated waste

for barium or other metals unless the concentration exceeded the EP Toxicity limit. There are no limiting concentrations for hazardous constituents other than those listed as EP Toxic.

If a significant increase of hazardous constituents over background is used to determine the residue which must be removed, then it is conceivable that the large quantities of soil around the detonation site would have to be removed, even though the concentration of hazardous constituents would not pose a risk to human health or the environment. The comparison against background samples is further complicated by validity of the background samples. The detonation site is located on a mesa, and the area survey of this site and other detonation sites include the mesa's surface and, in some cases, a canyon floor. Developing background constituent concentrations levels which account for rapid changes in geology, as well as the effects of erosion and deposition, is not practical.

Should contamination removal be based solely on a significant increase of a hazardous constituent, the soil may not be a regulated waste per HWMR 201.A.2.c.(3) and may be handled and disposed of as an unregulated waste. The cost of removing the contamination may not afford any additional protection to human health or the environment.

Basing the determination of contamination of total metals on EP Toxicity limits is not valid. As shown in Table 9-4, the mean ambient background concentration for total metals for soils exceeds the EP Toxicity limit for several metals. It is possible that background concentration of EP Toxic metals may exceed the limit.

As a result of these considerations, the following contamination criteria are selected. On completion of the analytical survey, the Laboratory will prepare a risk assessment for each constituent showing significant increase over background concentrations. A significant increase will be determined using statistical methods described in SW 846. The risk assessment will determine the threshold concentration for each constituent that represents a significant risk to human health and the environment and will take into account all possible pathways. Soils containing regulated constituent levels above the threshold concentration will be considered contaminated.

A copy of the completed risk assessment, along with pertinent backup data, will be provided to the NMEID for review and approval of the threshold values. Should NMEID find the threshold contamination levels inadequate, the Laboratory will negotiate threshold values agreeable to both parties.

TA-15 Sampling and Analysis Survey

The TA-15 waste detonation site will be divided into a grid on 75-foot grid centers near the detonation site center expanded to 150-foot centers at a distance of 150 feet or greater from the center (Figure 9-2). Because TA-15 has been used for major detonations, the grid is expanded to cover an extensive area.

Composite sediment samples will be taken in the drainage channels at the approximate locations indicated in Figure 9-2. The location of the samples will be documented.

Four background samples (north, east, south and west) at a distance greater than 3000 feet from the detonation site and two background channel sediment samples will be taken. Considerations for selecting background sample sites are as discussed for TA-14.

Composite sampling, analysis, and determination of contamination are the same as discussed for TA-14.

TA-36 Sampling and Analysis Survey

The TA-36 waste detonation site will be divided into a grid on 75-foot centers near the site center expanded to 150-foot centers at a distance of 150 feet or greater from the center (Figure 9-3). The center of the grid is at the firing point. Composite soil samples will be taken representing the intersection of grid lines. A composite sediment sample will be taken in the drainage channels at the approximate locations indicated in Figure 9-3.

Background samples and determination of contamination are the same as discussed for TA-14. Soil background samples will be taken at a distance greater

than 3000 feet from the detonation site. The samples will be analyzed for the constituents given in Table 9-5, which include the regulated waste detonated at this site.

TA-39 Sampling and Analysis Survey

TA-39 waste detonation sites will be separated into 75-foot grids extending down the canyon floor from the detonation site (Figures 9-4 and 9-5). Composite soil samples will be taken representing the intersection of grid lines. Sediment samples will be taken in the drainage channels at the approximate locations shown on the figures. The exact locations of the sediment samples will be documented.

Four background samples (north, east, south and west) at a distance greater than 3000 feet from the detonation sites and two background channel sediment samples will be taken. Because the debris from detonations may have been confined to the canyon floor by the steep canyon walls, the four background samples may be taken from the floors of similar adjacent canyons that are not affected by other laboratory operations. The northernmost firing point is near the head of the canyon and may have contaminated the channel sediment throughout the canyon. Background samples for sediment will be taken from an adjacent canyon.

The determination of contamination is the same as discussed for TA-14.

9.2.1.8 Decontamination

The decontamination procedure is similar for all sites. The approach to decontamination depends on the extent of contamination, as determined by the sampling survey. If the sampling survey indicates that these are no contaminated areas, no further action will be taken at the site except that the burn cage at TA-14 well be removed and hauled to Area L for storage and ultimate landfill disposal on-site, or shipment off-site to a permitted disposal site. Where sites have small concrete pads covered with sand, such as TA-14, the sand will not be tested, but will be placed in barrels and taken to Area L for storage and disposal. The sand pad at TA-15 will be tested for contamination is part of the grid because of its size, The pads of TA-36 and TA-39 have no concrete pad or other base, and will be handled similarly to

other potentially contaminates soil areas. Should a small soil area be affected, the contaminated soil will be removed with hand shovels or a backhoe, loaded into drums, and transferred in a truck to Area L for storage and ultimate landfill disposal, or shipped off-site to a permitted disposal site.

Large contaminated soil volumes will dictate the use of sealed and covered dump trucks. The Laboratory, therefore, reserves the option of shipping the contaminated soil for off-site disposal, because Area L is not equipped to handle large volumes. In this event, the Laboratory will contract with a permitted transporter and disposal site contractor who will provide sealed gondola trucks and provide for decontamination of those trucks at the disposal site.

Personnel involved in sampling and decontamination will wear rubber gloves, safety glasses, and coveralls. Personnel involved in dust-generating activities, such as digging and filling drums, will wear dust masks to prevent inhalation of contaminated dust. The Laboratory's Industrial Hygiene Group, HSE-5, will review the site survey analytical data and recommend additional protective clothing.

Small equipment used to pick up soil will be scraped and brushed clean, and the accumulated dust will be placed in drums for transport to Area L. The equipment will be wrapped in sheet plastic and sealed with tape, then transported to the HE decontamination slab at TA-16-400.

The decontamination pad at TA-16-400 is used to wash down equipment used in handling HE. The cleaning water is collected in a sump and then hauled to the TA-16 burn pad area with a vacuum truck. At the burn pads, the water is filtered in two sand filters, the filter residual is burned, and the filtered water discharged under a NPDES permit. Residues from the filter are disposed of at Area L. The equipment will be decontaminated by washing with detergent and water at TA-16-400. No testing for decontamination of equipment will be conducted because the regulated substances present are not acutely toxic and washing with detergent is adequate for safe handling.

The Laboratory recognizes that should extensive contamination have occurred, the closure plan presented here may be impractical. Should the detonation site analytical survey prove this to be true, the Laboratory will provide the survey data the Director of NMEID within 30 days of the completion of the analytical work. Within 60 days of submission of the survey data, the Laboratory will provide an amended closure plan. The plan may also be amended under other circumstances as per [HWMR 206.C.2.c(2)].

9.2.1.9 Decontamination Verification

Decontamination of the site will be demonstrated by additional sampling. Removal of contaminated soil will leave an exposed surface. The disturbed surface will be resampled on the same grid used to define the contaminated area. Analysis and the determination of contamination is as previously discussed, and an analysis will be conducted only for those constituents that caused the area to be contaminated.

9.2.1.10 Closure Schedule for TA-14, TA-15, TA-36, and TA-39

The year of closure is 2100. The following closure schedule allows closure of the four thermal treatment areas in a consecutive manner, that is, on completion of the initial site sampling survey at the first site, the survey will be initiated at the second site. All four sites will be closed together but will by necessity be at different stages of closure. The time required for individual closure steps are shown in Table 9-6.

Contracting for analytical services will include all four sites. The sampling survey will have to be staggered from site to site for efficient use of time and must be completed at all sites before complete data is available to allow contracting for decontamination. The analytical survey for the four sites will take a cumulative 570 days and is limited by sample analysis. Decontamination will also be staggered. Decontamination followed by decontamination verification will take a cumulative 1010 days for four sites. Total closure time is 1580 days, or 4.3 years.

There is no time allowed for removal or treatment of the final volume of wastes because there is no waste on-site except just before treatment. Closure will not commence until the last wastes from the source generator has been received and treated, and further acceptance of waste will cease.

Contracts for analytical work and soil removal are expected to exceed $100,000. Because laboratory policy requires that the work be put out for bid, 90 days are allowed to solicit and process the bids.

The location of the site is prone to snow cover in the winter months. Depending on the date NMEID approves the closure plan, the sampling survey may be delayed until the site is free of snow and the ground is thawed adequately to allow the soil sampling. The schedule includes a weather contingency to allow for weather delays.

Because of the extensive sampling survey required and the projected decontamination time, approval of a closure time greater than 180 days [HWMR 206.C.3.d.(2)] is requested per [HWMR 206.C.2.d(2)(b)(1)].

9.2.1.12 Post-Closure Care

Post-Closure care plans are not required for thermal treatment facilities.

9.2.1.13 Closure Certification for TA-14, 15, 36, and 39 Waste Detonation Sites

An independent registered professional engineer and the owner/operator of the facility shall witness the closure and ensure that the closure follows this plan. Upon completion of closure, the engineer and the DOE shall prepare a letter certifying that the area has been closed in accordance with this plan. The letter shall be dated and signed by each party and stamped by the registered engineer, and the original copy submitted by the DOE to the Director of the NMEID. One copy shall be maintained at the DOE offices and one copy maintained by the HSE-8 Regulatory Compliance Section.

9.2.2 Technical Area 16 (TA-16) Thermal Treatment Facilities

The thermal treatment facilities located at TA-16 include three general types. One type consists of a sand pad on which explosives or explosives-contaminated equipment are placed and remotely burned using an "electric match" firing device. The burn pad is a 30 by 30-foot square concrete pad covered with two inches of sand. Each pad is located at the center of a 100 by 100-foot square area enclosed with a cyclone fence. The concrete slopes

from the center to the edge. The pads are dedicated to wastes that can be burned without detonation, although unplanned detonations have occurred. The pads used for waste burning are designated as TA-16-387, TA-16-388, and TA-16-399.

A second type of thermal treatment facility present at TA-16 consists of a sand-filled metal pan on which five smaller shallow pans lined with fire brick are located. Waste HE-contaminated fluids are poured into the smaller pans and the HE is remotely ignited with an "electric match." The outside pan is roughly 12 by 12-foot square and is filled with sand to six inches below the lip. The smaller pans are approximately two by three-foot rectangular pans. There is one facility of this type at the Laboratory. About 55 gallons of waste are burned approximately once a month.

The third type of facility at TA-16 is used to burn sludges containing waste HE. These facilities consist of steel cone-shaped vessels having a diameter of about eight feet, buried with only the upper three to four feet of the vessel above ground. The steel vessels are filled with sand and gravel and an open fluids drain is located at the bottom of the cone. Sludge HE is gravity fed from vacuum trucks into the top of the cone, onto the sand and gravel bed. A heavy steel cap is then placed over the top of the cone and hot air is forced into the cone through air ducts. The hot air dries the waste sludge and liquids from the sludge migrate downward through the sand and gravel bed and through the fluids drain. Effluent from these drains is regulated by NPDES permit (NM 0028355). When the remaining explosive material is relatively free of moisture, the steel cap is removed from the cone and the filter surface residue is ignited remotely with an "electric match." There are two facilities of this type at Los Alamos, and both are located in Technical Area 16. Explosives are burned at these two facilities at a rate of about one burn per week. Each burn consists of about 750 pounds of waste explosive sludge.

9.2.2.1 Estimate of Maximum Waste in Treatment

HE wastes are not stored at this site, but are held in short-term storage (less than 90 days) at the generation point and moved to the site just before a scheduled burn. The maximum waste in treatment at one time is 340 kg (750

lbs). Residual barium contaminated sand may be stored in drums on the site. The maximum volume of sand stored is two cubic meters (550 gal).

9.2.2.2 Description of Waste Handled

The burn pads are used to burn scrap HE, equipment, and trash that have contacted HE and are considered to be contaminated. HE thought to have been burned included HMX, RDX (cyclonite), TNT (2, 4, 6 trinitrotoluene), PETN (pentaery thritol tetranitrate), ammonium nitrate, barium nitrate, TATB (triaminotrinitrobenzene), nitrocellulose, tetryl, nitroguanidine and various plastic binders. These wastes are transferred to the site by trucks. Trash and HE scrap are containerized. Large equipment is wrapped to ensure containment.

The pan burning pad handles waste oils and solvents that are considered contaminated with HE. Small volumes are handled in metal containers, and the contents are poured by hand into the burn pans. Larger volumes are delivered with a vacuum truck and drained through a hose into the pans.

The waste handled at the sand filter is HE-contaminated wastewater delivered to the site with a vacuum truck and drained from the truck through a hose into the filter.

Burning HE wastes can leave a residual that is EP Toxic for barium. The concentration of barium in the residual varies with the concentration of barium nitrate in the waste.

9.2.2.3 TA-16 Closure Procedure

For each pad, an analytical survey will be conducted to determine the nature and extent of contamination. Decontamination of the facility will include removal of contaminated soil and cleaning of equipment. Adequate decontamination will be verified by additional sampling and analysis.

SAND PAD SAMPLING AND ANALYSIS SURVEY

The sand on the sand pad is to be handled as a regulated waste and not sampled. One composite soil sample will be taken six inches off each edge of each pad to determine if surface drainage has moved contamination off the

pad. The composite will be three soil cores, one on the pad centerline and two, ten feet from centerline. To determine if unplanned detonations have caused significant contamination, twelve composite soil samples will be taken at each pad. These composite samples will be made up of three cores each taken in each direction at 25-foot intervals, the first sample 25 feet off the pad edge. One core will be taken on the centerline, the other two at the pad ends. The sampling locations are shown in Figure 9-6.

At the liquid burn pans, the sand in the large pan and the fire bricks will be handled as a regulated waste and need not be sampled. Soil samples will be taken around the pan perimeter as shown in Figure 9-7 to determine if materials have splashed out of the pan and caused contamination. Composite soil samples of three cores will be taken along each edge of the large pan six inches and 1.5 feet off the pan edge.

The sand and gravel in the soil filters will be considered a regulated waste, packed in drums and transported to Area L for disposal. Composite soil sampling will be conducted outside the filters as shown in Figure 9-8 to determine if contamination outside the vessel has occurred. Each composite will be three cores equally spaced to represent a quadrant of the circumference of the vessel. Cores will be taken six inches and 1.5 feet off the vessel edge.

If contamination is found at the outside samples, the limits of the sampling area will be expanded by the same distance intervals to determine the outside perimeter of the contamination. If any soil sample shows contamination, additional sampling will be conducted at the sampler's discretion to determine the extent of contamination.

Six background samples will be taken around the site no closer than 600 feet from any pad. The exact sites for background samples will be field selected based on similar topography characteristics and geologic structure to the site and the lack of possible interference of other operating Laboratory sites.

Field relocation of sample points may be required by topographic features. In such a case, the sample will be taken as closely as possible to the designated sample point and the new location will be documented.

Soil and samples will be analyzed for the constituents listed in Table 9-3. Barium is a possible contaminant because it is in several HE mixtures. The other toxic metals are included to ensure that the materials were not included in past burns. A scan for volatile and semivolatile organics is conducted to ensure that residual from solvents used in HE preparation are not present. Analysis is not conducted for HE constituents because these are a regulated waste based on reactivity, and detonation of burning renders them nonreactive. Furthermore, none of the HE materials used at this site are 40 CFR 261 Appendix VIII constituents. Analysis, Quality Assurance, and Quality Control will follow methods defined in SW 846.

9.2.2.4 TA 16 Decontamination

Sand from the burn pads, liquid burn pans, and the filters will be manually shoveled into drums and transported to Area L for disposal. The pads, pans, and equipment will be scraped, swept, or brushed clean, the resulting residue picked up and placed in drums for disposal at Area L.

A small trench will be dug around the burn pads, with a sump at one corner. The trench and sump will be lined with sheet plastic. The pads will then be scrubbed with a warm Liquinox or Alconox solution in water. The run off from the pad collected in the sump will be sampled, then bailed into drums and transported to Area L where the solution will be evaporated in open treatment tanks.

Residue from this evaporation will be landfilled. Section 9.5 describes sampling procedures for this water. The washing will be repeated until decontamination is demonstrated. The clean pads will be treated as an nonregulated waste and left in place or, if removed, the resulting rubble used as landfill.

The same procedures will be used for the liquid burn pans. The sand and any fire brick will be removed manually with shovel and containerized for disposal at Area L. The remaining pans will be scraped, swept, and/or brushed to remove residuals. The residuals will be placed in drums for transport to Area L. The pans will then be washed internally with the warm Liquinox or Alconox

solution, the dirty wash water sampled to determine decontamination, then transported to Area L in drums for evaporation. Washing will be repeated until decontamination is demonstrated by testing the wash water. The decontaminated pan is a nonregulated waste and will be sold as scrap or landfilled.

The filter vessels will be manually emptied of sand and gravel with shovels, and the sand and gravel will be placed in drums for disposal at Area L. Residues will be removed by scraping, wiping, and/or brushing, and the residues placed in drums for disposal at Area L. The internal walls of the filter vessels will be washed with warm Liquinox or Alconox solution in water. The wash water will be drained from the bottom of the vessels through existing drain piping into drums. The dirty water will be sampled to determine the adequacy of decontamination. The washing will be repeated until decontamination is demonstrated. The wash water will be evaporated in treatment tanks at Area L. The decontaminated vessels are not a regulated waste and con be landfilled or disassembled and sold as scrap.

Soil decontamination is similar for all burn pads. The approach to decontamination depends on the extent of contamination, as determined by the sampling. If the sampling survey indicates that there are no contaminated soil areas, no further action will be taken at the site. Should a small soil area be affected, the contaminated soil will be removed with shovels or a backhoe, loaded into drums, and transferred in a stake truck to Area L for storage and ultimate landfill disposal.

Large contaminated soil volumes will dictate the use of sealed and covered dump trucks. The Laboratory reserves the option of shipping the contaminated soil for off-site for disposal because Area L is not equipped to handle large volumes. In this event, the Laboratory will contract with a permitted transporter and disposal site contractor who will provide sealed gondola trucks and provide for decontamination of the trucks at the disposal site.

Personnel involved in soil sampling and soil decontamination will wear rubber gloves, safety glasses, and coveralls. Personnel involved in dust-generating activities, such as digging and filling drums, will wear dust masks to prevent

inhalation of contaminated dust. Personnel washing down equipment will wear rubber gloves, neoprene acid/solvent-resistant coveralls, rubber boots, and a face shield, The Laboratory's Industrial Hygiene Group, HSE-5, will review the site survey analytical data and recommend additional protective clothing.

Small equipment used to pick up soil will be scraped and brushed clean, and the dust accumulated will be placed in drums for transport to Area L. The equipment will be taken to the decontaminated liquid burn pan, which will function as a trough to collect run-off wash water. The backhoe will be scraped and brush-cleaned, the shovel positioned over the liquid burn pan. The shovel and small equipment will be washed with warm Liquinox or Alconox in water solution. The wash water will be placed in drums for transport to Area L where the water will be evaporated in open tanks.

The residues from evaporating wash water at Area L will be placed in drums and disposed of at Area L.

The Laboratory recognizes that should extensive contamination have occurred, the closure plan presented here may be impractical. Should the site analytical survey prove this to be true, the Laboratory will provide, the Laboratory will provide the survey data to the Director of NMEID within 30 days of the completion of the analytical work. Within 60 days of submission of the survey data, the Laboratory will provide an amended closure plan. The plan may also be amended under other circumstances as per [HWMR 206.C.2.c.(2)].

9.2.2.5 Decontamination Verification

Decontamination of the site soil will be demonstrated by additional sampling. Removal of contaminated soil will leave an exposed surface. The disturbed surface will be resampled in the same places used to define the contaminated area. Analysis and the determination of contamination are as discussed in Section 9.2.1.7, and an analysis will be conducted only for those constituents that caused the area to be contaminated.

For washed surface, a minimum of two samples of the clean Liquinox of Alconox solution will be sampled and, along with the wash water samples, analyzed for the constituents shown as discussed in Section 9.2.2.3. Equipment will be

considered contaminated if the dirty wash water analyses show a significant increase over the clean wash solution. A significant increase is determined using statistical methods defined in SW 846.

9.2.2.6 Closure Schedule for TA-16

The year of closure is 2100. All pads and equipment at TA-16 will be closed at the same time. Closure activities will observe the schedule given in Table 9-7.

Because wastes are not stored on site and closure will not start until the last wastes are treated, no time is allowed for treatment or removal of final wastes.

Contracts for analytical work and soil removal are expected to exceed $100,000. Laboratory procedures require that the work be put out for bid, 90 days are required to solicit and process the bids.

The location of the site is prone to snow cover in the winter months. Depending on the date NMEID approves the closure plan, the sampling survey may be delayed until the site is free of snow and the ground is thawed adequately to allow the core sampling. The schedule includes a weather contingency to allow for this potential delay.

Because of the extensive sampling survey required and the projected decontamination time, approval of a closure time greater than 180 days [HWMR 206.C.2.d(d)] is requested per [HWMR 206.C.2.d(2)(b)(1)].

9.2.2.7 Closure Certification for TA-16

An independent registered professional engineer and the owner/operator of the facility shall witness the closure and ensure that the closure follows this plan. Upon completion of closure, the engineer and the DOE shall prepare a letter certifying that the area has been closed in accordance with this plan. The letter shall be dated and signed by each party and stamped by the registered engineer, and the original copy submitted by the DOE to the Director of the NMEID. One copy shall be maintained by the HSE-8 Regulatory Compliance Section.

9.2.2.8 Post-Closure for TA-16

Post-closure plans are not required for thermal treatment facilities.

9.3 CLOSURE PLAN FOR TA-50 STORAGE, BATCH TREATMENT AND INCINERATION FACILITIES

9.3.1 Batch Treatment System and Container Storage Area

The Batch Treatment System is located in Building 1 at Technical Area 50 (Figure 9-9). The system consists of a totally enclosed, vented, 500-gallon pressure vessel equipped with a filtering system, condenser, and vacuum transfer lines. Total system wash-down between batches allows for the treatment of incompatible wastes in the facility. Wastes treated in the Batch Treatment System include cyanide, chromate plating solutions, and solutions of acids, bases, and heavy metals. The batch treatment equipment is mounted on a crack-free concrete floor curbed to contain the contents of the process equipment should a leak occur.

A chemical waste storage area is located in the same room housing the Batch Treatment System. Storage space consists of a bermed area encompassing 16 square feet. The area is designed to accommodate four 55-gallon waste drums. Wastes are stored in this area before treatment in the Batch Treatment System. Only compatible wastes are stored in this area at one time. Although waste residence time in this area is generally only 30 to 60 days, the Laboratory may store waste in this area in excess of 90 days to provide for operational flexibility.

A waste transfer and packaging area is also housed in the room in which the Batch Treatment System is located. This area consists of a small area that is covered with a ventilation hood. Small quantities of waste are repackaged within this area, when necessary.

9.3.1.1 Estimate of Maximum Waste in Storage

The maximum inventory of hazardous wastes in storage or treatment at the TA-50 storage and Batch Treatment Facilities is estimated at three cubic meters (800 gal.)

9.3.1.2 Description of Waste Handled

Three waste streams comprise the bulk of the waste treated in the Batch Treatment System, although the system is flexible enough to allow treatment of other wastes that may be generated through new Laboratory projects. These streams area an acid/base waste that contains copper, chromate plating waste, and waste cyanide plating solutions. Treatment includes of acids and bases, decomposition of cyanides, and precipitation of metals.

Upon completion of treatment, the resulting solution is filtered and the filtered liquid discharged to an industrial sewer, which flows to the wastewater treatment plant at TA-50-1. The effluent from the wastewater treatment plant is discharged under an NPDES permit. Metal sludges recovered in the filters are taken to Area L for storage and disposal.

9.3.1.3 Closure Procedures and Decontamination

Within the chemical treatment room in TA-50 is a curbed area for storage. The area is designed to accommodate four drums of liquid waste requiring treatment before disposal. The treatment facility in TA-50 consists of versatile wet chemical processing equipment capable of neutralizing acids and base, oxidizing cyanides, and precipitating heavy metals. Wastes in storage at the initiation of closure will be treated using the standard operating procedure (SOP) for the waste, and no more waste will be received.

Following the treatment of the last waste, the system will be washed down using the facility's wash-down system, and the resulting liquid discharged to the industrial wastewater sewer. This is consistent with normal operating procedures for system wash-down between treating noncompatible wastes and acknowledges that analytical procedures associated with previous treatment have reduced hazardous constituents to a level allowable for discharge. Following wash-down, the system filter cartridges will be replaced with new cartridges. The used cartridges will be placed in drums and transferred to Area L for disposal. The equipment will then be filled with a Liquinox or Alconox solution in water and circulated and flushed for two hours. Following circulation the solution will be sampled to verify decontamination, then pumped into drums and transported to the evaporation tanks at Area L. Although this fluid might be safely discharged to the industrial sewer, it

will be handled at the Area L evaporation tanks to avoid any disruptive effects Liquinox and Alconox might have on the treatment plant. If analysis of the solution indicates contamination, additional washings will be conducted until decontamination; The filter cartridges will be removed, placed in drums, and disposed at Area L.

When internal decontamination is complete, the outside of the equipment will be scrubbed and rinsed with a warm solution of Liquinox or Alconox in water. The cleaning solutions will accumulate in the curbed area and will be pumped into drums with a small manually operated drum pump. Samples of this solution will be taken from the drum to verify decontamination. Wash-down will be repeated until decontamination is verified. The drummed liquid will be transported to Area L for evaporation.

Upon successful external decontamination, the equipment will be disassembled and internally inspected. Any residual matter found will be scraped or brushed off the area where the residue occurred, then washed and rinsed. Dry residues will be placed in drums for disposal at Area L. Liquids from washing and rinsing will be placed in drums and transported to Area L for evaporation. Cleaned equipment will be removed from the building and handled as a nonregulated waste.

Following removal of the batch treatment equipment, the floor within the curbed area and the waste handling hood will be washed and rinsed with a warm Liquinox and Alconox solution in water. The wash water will be packed up and put in drums using a drum pump, rags and/or mops, wringing the excess water into a drum. This water will be sampled to demonstrate decontamination.

Ultimately, residues from evaporation of dirty wash waters at Area L will be placed in drums and landfilled at Area L. The only regulated constituents credibly expected in these residues are metal.

Personnel involved in disassembly and handling of equipment will wear protective equipment to include as minimum protection: acid/solvent-resistant coveralls, head protection, neoprene-coated gloves, and boots. Wrists and ankles are to be taped to protect against upward and inward splash. As a

minimum protection, face shields will be worn. Full face respirators will be used if specified by the Laboratory's Industrial Hygiene Group, HSE-5, following a field inspection.

Spills occurring during equipment disassembly will be contained in the curbed area and will be picked up with mops. No decontamination of container handling equipment is anticipated during closure because the wastes are inside containers and no contact is expected between wastes and handling equipment.

Protective clothing, coveralls, face shields, and boots worn during the wash down will be rinsed in clean water while the items are within the curbed area. The rinse water will be handled with the dirty water from the external wash down. Following internal and external decontamination, the equipment will be considered free from regulated wastes. Protective clothing will be worn by personnel disassembling the equipment. The protective clothing and tools used during disassembly will be washed with detergent and water, and the water discharged to the industrial waste water sewer. Mops and rags used for clean-up will be placed in drums for disposal at Area L.

9.3.1.4 Decontamination Verification

Before the first wash down, two samples will be taken of the clean Liquinox or Alconox solution in water and analyzed for the constituents listed in Table 9-8.

One additional clean solution sample will be taken for each additional wash down event. These analytical results provide background data for decontamination verification.

"Dirty" wash down solutions will also be analyzed for the constituents listed in Table 9-8. analytical procedures will conform to methods found in SW 846. Equipment will be considered to be contaminated if the "dirty" wash solutions show a significant increase in the listed constituents over the clean wash solutions. A significant increase is determined using statistical methods defined in SW 846.

The constituents listed in Table 9-8 include regulated constituents normally treated in the plant, and additional metals which may have been inadvertently included in treated solutions. A scan for volatile and semivolatile organics is performed to ensure that solvents commonly used within the Laboratory have not contaminated the equipment.

9.3.1.5 Closure Schedule

The year of closure for the TA-50-1 Batch Treatment Plant is 2100. Closure will observe the schedule given in Table 9-9.

The contracts for equipment disassembly is expected to exceed $100,000. Laboratory policy requires that the work be put out for bid; 90 days are required to solicit and process the bids.

Because of the time required for equipment disassembly, approval of a closure time greater than 180 days [HWMR 206.C.2.d.(2)] is requested per [HWMR 206.C.2.d.(2)(b)(1)].

9.3.1.6 Closure Certification

An independent registered professional engineer and the owner/operator of the facility shall witness the closure and ensure that the closure follows this plan. Upon completion of closure, the engineer and the DOE shall prepare a letter certifying that the facility has been closed in accordance with this plan. The letter shall be dated and signed by each party, stamped by the registered engineer, and the original copy submitted by the DOE to the Director of the NMEID. One copy shall be maintained at the DOE office and one copy maintained by the HSE-8 Regulatory Compliance Section.

9.3.1.7 Post-Closure

Post-closure plans are not required for container storage facilities or treatment facilities.

9.3.2 Chemical Waste Incinerator

The waste incinerator is located in Building 37 at Technical Area 50. The highly modified, controlled air incinerator is rated at a nominal 45 kilograms per hour waste feed throughout. The incinerator was developed as part of a

continuing incinerator study and demonstration program being conducted by Los Alamos and is currently permitted to burn PCB-contaminated liquid materials. Modifications to the incinerator include additions of liquid and solid waste feed preparation lines, a continuous ash removal system, a high-efficiency off-gas cleanup system, and backup utility systems. Standard combustion equipment has been modified to permit effective incineration of waste in solid, liquid, slurry, or gaseous form. Particular attention has been given to engineering for proper waste containment, resulting in a system that is safe for evaluating the incineration of hazardous chemicals and certain radioactive waste forms.

9.3.2.1 Estimate of Maximum Waste in Storage

The maximum inventory of hazardous wastes at the TA-50 waste incinerator is estimated at ten cubic meters (2640 gallons).

9.3.2.2 Closure Plan

All remaining wastes will be incinerated before shutting down the incinerator. If for some reason it is not possible to incinerate all the waste on site, it will be sent to a designated treatment and disposal facility. Once all the waste inventory has been properly disposed of, the facility will be decontaminated as follows: First, the entire incineration system (incinerator, all relevant lines and pumps, and the air pollution control system) will be cleaned. The two incinerator chambers, including all attached refractory and residual solid residue, will then be sealed and sent to a designated treatment and disposal facility. Next, the remaining components of the system will be steamed for a minimum of 24 hours, after which they will be visually inspected, may be dismantled, and will be disposed of in an appropriate manner. The manner of disposal will depend on any residual radionuclide contamination as well as any residual hazardous waste contamination. All radioactive components will be decontaminated to the extent practicable and disposed of according to appropriate regulations.

A detailed description of decontamination procedures upon closure is not possible at this time since the equipment may be contaminated with transuranic (TRU) and low-level radioactive wastes. Decommissioning will follow

Laboratory guidelines and procedures for handling radioactive contaminated equipment. Exact procedures are a function of the degree of contamination at the time of closure.

Upon the decision to close the facility, the equipment and building will be surveyed to determine the nature and levels of both radioactive and hazardous chemical contamination. Using the Laboratory guidelines and procedures, a decommissioning document will be prepared describing in detail the methods and procedures for decontamination, demolition, packaging, and disposal. All materials generated from decontamination and demolition will be treated as radioactive wastes and disposed of in accordance with DOE radioactive waste management guidelines.

Characterization of the final delivery of hazardous waste may require up to 30 days. An estimated 60 days will be required to schedule and process the final wastes received.

The survey to determine the nature and level of contamination and to prepare the decommissioning document is estimated to take one year. Decommissioning and final disposal are estimated to take up to two years.

9.3.2.3 Post-Closure

Post-closure plans are not required for incineration facilities.

9.4 CLOSURE, PARTIAL CLOSURE AND POST-CLOSURE FOR TA-54, AREA L FACILITIES

9.4.1 TA-54, Area L Description

TA-54, Area L consists of a waste transfer, packaging, and storage facility, land disposal shafts, and liquid treatment tanks (see Figure 9-10).

The treatment, storage, and disposal facilities consist of a single-story metal building encompassing 196 square feet and a roofed concrete storage pad encompassing 1,595 square feet. These areas are used for the accumulation, packaging, and storage of waste containers which are generated throughout the laboratory and delivered to the facility routinely. They are segregated into compatible types and placed upon the three fiberglass grates inside the metal building or within one of the six storage cells on the roofed concrete pad.

Wastes in small containers are put into lab-packs. Wastes suitable for recycling are consolidated into drums, and any damaged or leaking drums are repackaged into larger drums in this area.

Four 1,665-gallon, 10-gauge steel tanks are located at Area L. They are lined with plastic and used to neutralize, oxidize and evaporate waste. The tanks are located on a bermed concrete pad. The waste most commonly oxidized in these tanks is lithium hydride. Aqueous ammonium biflouride solution (a "non-RCRA" waste) is the waste most commonly evaporated in the tanks.

As of August 1985, land disposal facilities at Area L include 34 shafts that range in diameter from 3 to 8 ft. Thirty-three of these shafts have been capped, all of which are approximately 60 ft deep. When in use, the shafts are covered with a heavy steel cap; when filled, they are closed using a 3 ft thick concrete plug (Figure 9-11). Each shaft is used for the disposal of a single category of waste, which is accumulated on site and packaged into 55-gallon drums.

9.4.1.1 Estimate of Maximum Waste in Storage and Treatment

The maximum amount of waste in storage or treatment at Area L is 17,650 gallons at the transfer, packaging, and storage area, and 5,700 gallons in the treatment tanks.

9.4.1.2 Description of Waste Handled

A wide variety of wastes generated throughout the Laboratory are brought to Area L, including wastes from basic and applied chemistry R&D programs (small quantities of different acids, bases, organics, inorganics and reactive metals), processing wastes (sludge resulting from treatment either at Area L or at TA 50-1 Batch Treatment Plant), and chemically contaminated equipment to be landfilled.

9.4.1.3 Partial Closure

Because 33 of the 34 existing shafts have been capped, partial closure has occurred at Area L. Closing of individual shafts occurs as they are filled, and the dates of shaft closings are in Figure 9-10. These shafts were filled to three feet below the lowest edge of the shaft rim with waste, and the void

spaces around the waste filled with crushed tuff as the wastes were placed in the shaft. The remaining three feet of the shaft were filled with noncontaminated concrete. The top of the concrete cap is slightly rounded, extending 0.5 feet above the land surface and overlapping the edge of the shaft two to six inches. A brass identification marker is placed in the center of the cap during the final pour.

In the past, a small surface impoundment was operated within Area L to evaporate nonregulated waste. Because no verification exists that regulated waste had not been put in the pit, analysis of the pit residue and soil cores extending below the pit was required under a NMEID Compliance Order/Schedule dated May 7, 1985. Should this analysis determine the presence of hazardous constituents, the impoundment will be closed as a regulated site, constituting partial closure. The results of the analytical work for the impoundment will be complete in December 1986.

The remaining shaft will be closed when filled as compatible wastes are generated. There is no anticipated date for closure of this shaft before final closure of Area L.

9.4.2 Closure Procedure

Cleanup and closure for treatment and storage facilities at Area L will be done in sequential order, culminating in the disposal of any residues or contaminated material by permitted landfill in the existing land disposal facility or by shipment to an off-site permitted disposal site, followed by closure of the on-site land disposal facility. Before decontamination, all wastes in storage in either the roofed storage pad or the metal building will either be treated or disposed of on-site or off-site. Given the diversity of wastes handled, it is not possible to estimate the exact wastes on hand at the initiation of closure and, therefore, the final disposition of the wastes. In general, recyclable wastes will be reused internally or recycled to users off-site. Organic wastes will be burned at the CAI (Controlled Air Incinerator) at TA-50-37. Any wastes compatible with permitted treatment at the TA-50-1 Batch Treatment Plant or the Area L treatment tanks will be so treated. The remaining wastes will be disposed of on-site at the disposal facility that is permitted at the time or transported off-site to a permitted disposal facility.

Following removal or treatment of the wastes on-site at the start of closure, the two storage facilities will be decontaminated by washing with Liquinox or Alconox in water. The resulting wash solutions will be evaporated in the four treatment tanks. When the wash water has evaporated, the residual in the tanks and the tank liners will be removed, placed in drums, and either land-filled at a permitted on-site facility or transported off-site to a permitted disposal facility.

The tanks will then be decontaminated by washing and the decontaminated tanks handled as a nonregulated waste.

Finally, the remaining open shafts will be closed by capping with concrete. Additional concrete will be added to previous caps to extend the overlap of the shaft cover to prevent surface drainage from undercutting the cap. The existing topography of the site will be preserved and the disturbed area will be revegetated.

The closure steps are discussed in more detail in the following text.

9.4.2.1 Waste Removal

The waste on-site at the start of closure includes containerized wastes, as well as liquids and residues in the treatment tanks. Containerized wastes will be handled with hand trucks or forklifts. Trucks of adequate size will be used to move containerized wastes to off-site treatment facilities, and a forklift is suitable to move wastes to the treatment tanks at Area L. All wastes shipped off-site will be manifested in accordance with HWMR 203. The waste transporter will have an EPA identification number in accordance with HWMR 205.B.

9.4.2.2 Storage Area Decontamination

All floor surfaces within the roofed concrete storage pad, as well as any equipment present, will be washed down using a solution of Liquinox or Alconox in warm water. Areas will be scraped or brushed clean as necessary to remove any residues. The floor of the concrete pads are sloped to sumps, and wash water will flow into them. The water in each cell will be tested using the sampling and analytical procedures described in Section 9.5. Afterwards, the

water will be removed from each sump with a vacuum truck or pumped into drums with a hand pump and transferred into the treatment tanks to be evaporated. This washing procedure will be repeated until decontamination of the cells is demonstrated by testing of the wash water. Following decontamination, the building and equipment will be handled as a nonregulated waste. The inside of the vacuum truck, if used, will be rinsed when its service is complete and the rinse water will be placed in evaporation tanks.

The same procedure will be used for the metal building. All equipment, as well as the walls and floor, will be washed and the wash water will be channeled into one of the three floor sumps. The fiberglass grates covering each sump and the sumps themselves will be washed down. The wash water will be sampled and analyzed to determine adequate decontamination. Every effort will be made to minimize the volume of wash and rinse water generated by decontamination.

9.4.2.3 Treatment Tank Decontamination

When all liquid has been evaporated from the treatment tanks, the plastic liner with any dry residue will be removed and placed in the existing land disposal facility or placed in drums for transport to an off-site disposal facility.

The tanks will be scraped and brushed to remove residue and the residue will be collected and placed in drums. The tanks and the concrete pad on which the treatment tanks are placed will be washed with a Liquinox or Alconox solution in water. The wash water will be contained within the curbed concrete pad, sampled, and analyzed. If the wash water is free of significant concentrations of regulated constituents, as described in Section 9.4.3, the water will be removed with a vacuum truck and transported to an industrial sewer which drains to the water treatment plant at TA-50-1. If the water contains significant concentrations of hazardous constituents, one of the treatment tanks will be double lined with sheet polyethylene plastic and the water pumped into the tank for evaporation. Wash-down of the tanks and pad will be repeated until the wash water is free of significant contamination. The plastic liner and residue from the final evaporation will be removed and handled as per the previous tank residue.

9.4.2.4 Soil Decontamination

Soil sampling, which will be conducted to determine if hazardous wastes have been tracked outside of contaminant areas, will be taken in the manner described in Section 9.5. Composite soil samples will be collected around the edge of the roofed concrete pad asphalt apron, as shown in Figure 9-12, and also at the bermed concrete pad beneath the treatment tanks, as shown in Figure 9-13. Composite soil samples will be taken at each edge of the asphalt apron around the metal building. Each composite shall be made up of three cores taken six inches off the asphalt edge and equally spaced to cover the edge. A composite soil sample will be taken for each of the two groupings of disposal shafts, each composite consisting of four samples taken at the four corners of the shaft lines.

If contamination is found in these samples, the limits of the sampling area will be expanded by establishing a sampling grid to determine the outside parameter of the contamination. Sampling will be continued at the sampler's discretion to determine the extent of contamination.

Four background soil samples will be taken on the outside of the fenced boundary at Area L. They will be taken on top of the mesa, preferably on in each of four different directions. The exact sites for these samples will be field selected based on similar topographic and geologic characteristics and the lack of possible interference of other operating Laboratory sites.

Soil and sediment samples will be analyzed for the constituents listed in Table 9-10. Analysis and quality assurance/quality control will follow methods defined in SW-846 and noted in Section 3.0.

The approach to soil decontamination depends on the extent of contamination determined by the sampling. If the sample survey indicates that there are no contaminated soil areas, no further soil decontamination action will be taken at the site. Should the soil be contaminated, it will be disposed of in the land disposal facility on-site or placed in drums to be transported off-site for disposal at a permitted facility.

9.4.2.5 Personnel Protection

Personnel washing down equipment will wear rubber gloves, neoprene acid/solvent resistant coveralls, rubber boots, and a face shield. The Laboratory's Industrial Hygiene Group (HSE-5) will review the site survey analytical data and recommend additional protective clothing.

9.4.2.6 Equipment Decontamination

Shovels, drum trucks and other equipment used for decontamination will be scraped and brushed to remove residue, and the residue collected and placed in drums for disposal on or off-site at a permitted disposal site for regulated wastes.

The equipment will be placed on a plastic sheet that is bermed to contain liquids and washed with water and detergent. Larger equipment such as backhoes and forklifts will also be washed. No testing will be performed on this water and washing is considered adequate to decontaminate the equipment. The wash water will be allowed to evaporate and the plastic and residue will be packed in drums for disposal as a regulated waste.

9.4.2.7 Shaft Closure

Following the decontamination of pads and equipment and removal of contaminated soil, any open shaft will be closed by filling the empty volume of the shaft with crushed tuff up to three feet from the lowest edge of the rim. The top three feet will be capped with uncontaminated concrete. The top of the concrete cap will be rounded and extend at least 0.5 foot above the land surface and overlap the edge of the shaft by six inches.

Following capping of the final shaft, a trench will be dug around each shaft at the site. The trench will be a minimum of 1.5 feet from the edge of the shaft. Additional concrete will be added to extend each cap out to fill the trench. The concrete added shall be sloped to prevent ponding of water on the cap.

9.4.2.8 Site Drainage

The areas around the shafts will maintain the current slopes, as shown in Figure 2-4. Disturbed areas will be lightly mulched with pea gravel and

planted with turf-forming grasses and bunch grasses to prevent wind and sheet wash erosion. The grass will be fertilized and irrigated with sprays through two growing seasons.

Site drainage controls described in Section 6.5.2 will be maintained through closure and post-closure.

9.4.3 Decontamination Verification

Soil samples will be analyzed for the constituents shown in Table 9-10. These combined tests are adequate to screen for all but a handful of regulated constituents which, if handled at Area L, would have been present in small volume laboratory-size containers.

The criteria for determining contaminated soil are the same as discussed in Section 9.4.2.4. Regulated constituent concentrations will be compared to background concentrations. A risk assessment will be prepared for each regulated constituent showing a significant increase over background concentration. A significant increase will be determined by using statistical methods described in USEPA SW 846. The risk assessment will determine the threshold concentration for each constituent that represents a significant risk to human health and the environment, and will take into account all possible pathways. Soils containing levels of contamination above the threshold will be considered contaminated.

A copy of the completed risk assessment, along with pertinent backup data, will be provided to the NMEID for review and approval. Should NMEID find the threshold contamination levels inadequate, the Laboratory will negotiate threshold values agreeable to both parties.

Decontamination of the site soil will be demonstrated by additional sampling. Removal of contaminated soil will leave an exposed surface. The disturbed surface will be resampled in the same places used to define the contaminated area. Analysis and the determination of contamination is as previously discussed, and an analysis will be conducted only for those constituents that caused the area to be contaminated.

A minimum of two samples of the clean Liquinox or Alconox solution will be sampled as background for wash water and, along with the wash water samples, analyzed for the constituents shown in Table 9-10. The area will be considered contaminated if the wash water analyses show a significant increase in constituents over the clean wash solution. A significant increase is determined by using statistical methods defined in USEPA SW-846.

9.4.5.4 Closure Schedule

The year of closure is 2110. Closure activities will observe the schedule given in Table 9-11.

Contracts for analytical work and, if necessary, soil removal are expected to exceed $100,000. The Laboratory is required by policy to put the work out for bid, and ninety days are required to solicit and process the bids.

The location of the site is prone to snow cover in the winter months. Depending on the date NMEID approves the closure plan, the closure may be delayed until the site is free of snow and the ground is thawed adequately to allow the soil sampling and other closure operations. The schedule includes a weather contingency to allow for this potential delay.

Because of the time required for wash water evaporation and the projected decontamination time, approval of a closure period greater than 180 days [HWMR 206.C.2.d(2)] is requested per [HWMR 206.C.2.d.(2)(b)(1)].

9.4.5 Closure Certification

An independent registered professional engineer and the owner/operator of the facility shall witness the closure and ensure that the closure follows this plan. Upon completion of closure, the engineer and the DOE shall prepare a letter certifying that the area has been closed accordingly. The letter shall be dated and signed by each party and stamped by the registered engineer, and the original copy shall be submitted by the DOE to the Director of the NMEID. One copy shall be maintained at the DOE offices and one copy maintained by the HSE-8 Regulatory Compliance Section.

9.4.6 Post-Closure

Post-closure activities include the following items:

1. Within 90 days after closure is complete, the EPA, NMEID, DOE and the County of Los Alamos shall be furnished with a survey plat indicating the location and dimensions of the closed pits and shafts. The plat shall be prepared and certified by a professional land surveyor. It will be filed with Los Alamos County and shall include a note, prominently displayed, which states the owner's or operator's obligation to restrict disturbance of the site in accordance with 40 CFR 264.117(c) [NMHWMR 206.D.2.g(3)]. In addition, the EPA, NMEID, DOE and County of Los Alamos shall be provided the records of type, location and quantities of wastes stored. Information for waste stored before the promulgation of hazardous waste regulations shall be estimated based on available records.

2. The property deed shall be noted or documented to comply with the requirements of 40 CFR 264.120 (NMHWMR 206.D.2.j).

3. The site shall be inspected semi-annually or more frequently as determined necessary, checking:

   (a) the cover system for integrity, settlement and erosion

   (b) the site drainage system for any blockages or evidence of poor function

   (c) the integrity of the fence, gate and lock

   (d) the conditions of surveyed benchmarks

4. Repairs shall be made to any of the items mentioned in activity No.3, should the inspection reveal conditions requiring further attention for the proper function of the closure system.

5. Post-closure care activities shall be performed for 30 years as required by 40 CFR 264.117(a)(1) [NMHWMR 206.D.2.g(1)(a)].

6. Records shall be kept of inspections, repairs, sampling and analytical results for the duration of post-closure care activities.

9.4.6.1 Post-Closure Groundwater Monitoring

For the groundwater monitoring program, samples will be obtained from six observation wells, three in Canada del Buey and three in Pajarito Canyon, installed in response to the NMEID Compliance Order/Schedule dated May 7, 1984. Sampling and analysis will be performed starting on November 30, 1985, and repeated quarterly for the first year. The sampling methodology and monitoring for the groundwater monitoring program are contained in the USEPA SW-846 revisions and will be used by LANL in their program. The applicable

section numbers can be found in Table 9-12. The samples will be analyzed for the parameters outlined in HWMR 206.C.1.c(2). For each of the indicator parameters in 206.C.1.c(2)(c), at least four replicate measurements will be obtained for each sample. The initial background arithmetic mean and variance must be determined by pooling the replicate measurements for the respective parameter concentrations or values in samples obtained from upgradient wells during the first year.

9.4.6.2 Post-Closure Care Office

Copies of records of inspections, repairs, sampling and analytical results for the duration of post-closure care activities are to be kept at the DOE Los Alamos Operations office, HSE-8 Regulatory Compliance office, and the TA-54 Operations office. The name, address and phone number of the person and/or office to contact about the facility during the post-closure care period is:

Harold Valencia
Area Manager, Los Alamos Area Office
U.S. Department of Energy
Los Alamos, New Mexico
Phone: (505) 667-5288

9.5 SAMPLING AND ANALYTICAL PROCEDURES

The following sections define procedures and methods for sampling, analysis and documentation applicable to closure and post-closure plans. While the procedures and method are specific, any applicable procedure or method given in SW-846 may be used if conditions or experience shows the alternate method to be more appropriate.

9.5.1 Soil Sampling

The sampling procedures outlined below are used to determine the amount of hazardous material deposited on a particular area of land or to determine the leaching rate of the material and/or determine the residue level on the soil. Adequate preparation ensures that proper sampling is accomplished. A checklist of items required for field sampling is given in Table 9-13.

Surface soil samples will be collected with a trowel or scoop. To sample below 3 in. (8 cm), samples will be collected with a Veihmeyer soil sampler (Figure 9-14).

9.5.1.1 Cleaning and Storage of Sampler

It is important to clean samplers after each site is sampled. The samplers will be washed with a warm Liquinox or Alconox solution, rinsed several times with tap water, rinsed with distilled water, drained of excess water, and air-dried or wiped dry. Lack of cross-contamination is of particular importance in these samples, because they will be taken for regulatory purposes. One-quart glass containers will be used for the samples because they are compatible with the waste. Sampling will be conducted in accordance with procedures given in Samplers and Sampling Procedures for Hazardous Waste Streams, EPA 600/2-80-018 and SW 846.

Samples will be taken, placed in bottles, sealed, tagged, and immediately packed in vermiculite, sawdust, or, if refrigeration is required, an insulated container with ice. One sample for every ten samples will be either duplicated or split. The duplicated or split sample will be identified by a code so that its source is not available to the analytical laboratory, but analytical results can be compared to its twin.

9.5.1.2 Sampling Procedures

Trowel or Scoop

- Take small, equal portions of sample from the surface or near the surface of the material to be sampled.
- Combine the samples in a glass container.
- Cap the container, attach a label and seal, record in field log book, and complete the sample analysis request sheet and chain-of-custody record.

Veihmeyer Sampler

- Assemble the sampler by screwing in the tip and drive head on the sampling tube.
- Insert the tapered handle (drive guide) of the drive hammer through the drive head.
- Place the sampler in a perpendicular position on the soil to be sampled.

- With the left hand holding the tube, drive the sampler into the ground to the desired sampling depth by pounding the drive head with the drive hammer. Do not drive the tube further than the tip of the hammer's drive guide.

- Record the length of the tube that penetrated the ground.

- Remove the drive hammer onto the drive head. In this position, the hammer serves as a handle for the sampler.

- Rotate the sampler at least two revolutions to shear off the sample at the bottom.

- Lower the sampler handle (hammer) until it just clears the two ear-like protrusions on the drive head and rotate about 90 degrees.

- Withdraw the sampler from the ground by pulling the handle (hammer) upwards. When the sampler cannot be withdrawn by hand, as in deep soil sampling, use a puller jack and grip.

- Dislodge the hammer from the sampler, turn the sampler tube upside down, tap the head gently against the hammer, and carefully recover the sample from the tube. The sample should slip out easily.

- Store the core sample in a 1,000 or 2,000 ml (1 qt or 1/2 gal) sample container.

- Label the sample, affix the seals, record in the field log book, complete sample analysis request sheet and chain-of-custody record, and deliver the samples to the laboratory for analysis.

9.5.2 Liquid Sampling

The Coliwasa sampler will be used to sample water solutions before washing the area for background parameters and to sample the wash water used after cleaning equipment. Its simple design makes it easy to use and allows the rapid collection of samples, which minimizes chances of exposure of the sample collector to potential hazards from the waste. The recommended model of the Coliwasa is shown in Figure 9-15, the main parts consisting of the sampling tube, the closure-locking mechanism and the closure system.

9.5.2.1 Cleaning and Storage of Sampler

The sampler must be clean before use. The used sampler must be washed with a warm detergent solution (Liquinox or Alconox), rinsed several times with tap water, rinsed with distilled water, drained of excess water, and air-dried or wiped dry. A necessary piece of equipment for cleaning the tube of the Coliwasa is a bottle brush that fits tightly inside the diameter of the tube. The brush is connected to a rod of sufficient length to reach the entire length of the sampler tube. Using this ramrod and fiber-reinforced paper towels, the Coliwasa tube may be quickly cleaned. Improper cleaning of sample equipment will cause cross-contamination of samples. Lack of contamination is of particular importance in these samples, because they will be taken for regulatory purposes. Clean samples should be stored in polyethylene plastic tubes or bags in a clean and protected area.

9.5.2.2 Sampling Procedures

- Assemble the glass Coliwasa sampler.
- Make sure that the Coliwasa sampler is clean.
- Check to make sure the sampler is functioning properly. Adjust the locking mechanism, if necessary, to make sure the neoprene rubber stopper provides a tight closure.
- Wear necessary protective clothing and gear and observe required sampling precautions.
- Put the sampler in the open position by placing the stopper rod handle in the T-position and pushing the rod down until the handle sits against the sampler's locking block.
- Slowly lower the Coliwasa sampler into the liquid at a rate that permits the levels of the liquid inside and outside the sampler tube to be about the same. If the level of the liquid in the sampler tube is lower than that outside the sampler, the sampling rate is too fast and will result in a non-representative sample.
- When the sampler stopper hits the bottom of the liquid container, push the sampler tube downward against the stopper to close the sampler. Lock the sampler in the closed position by turning the T-handle until it is upright and one end rests tightly on the locking block.

- Slowly withdraw the sampler from the container with one hand while wiping the sampler tube with a disposable cloth with the other hand.

- Carefully discharge the sample into a glass container by slowly opening the sampler. This is done by slowly pulling the lower end of the T-handle away from the locking block while the lower end of the sampler is positioned in the glass container.

- Cap the glass container, attach a label and seal record in the field log book, and complete the sample analysis request sheet and chain-of-custody record.

- Unscrew the T-handle of the sampler and disengage the locking block. Clean the sampler on-site or store the contaminated parts of the sampler in a plastic storage tube or bag for subsequent cleaning. Store used rags in plastic bags for subsequent disposal.

9.5.3 Sample Handling and Documentation

Soil and liquid samples will be analyzed either internally or at a commercial laboratory. In either case, each sample will be labeled, sealed and accompanied by a chain-of-custody and a sample analysis request form.

The sample container must be sealed with a gummed paper seal attached to the container in such a way that the seal must be broken in order to open the container. The seal and sample tag must be completed with a waterproof pen. An example of a sample seal is shown in Figure 9-16.

The sample label is necessary to prevent misidentification of samples and shall include, if applicable, the grid number referenced to positions staked on the site perimeter. The "field information" in the case of soil sampling, shall include observations such as the soil texture and surface appearance, ambient temperature and cloud cover at time of sampling, and precipitation conditions 24 hours before sampling. An example of a sample label is shown in Figure 9-17.

The chain-of-custody form is necessary to trace sample possession from the time of collection and must accompany every sample. This record becomes especially important when the sample is to be introduced as evidence in a court

litigation. This is a two-page record with the original accompanying shipment and the "copy" retained by the Laboratory. An example of this form is shown in Figure 9-18.

A separate closure sampling field log book will be kept and will contain all information pertinent to field surveys and sampling. The log book shall have bound and consecutively numbered pages in 8-1/2 by 11-inch format. Minimum entries include:

a. Purpose of sample (routine sampling, special sampling)

b. Location of sampling (coordinates referenced to staked field points, if soil sample)

c. Name and address of person making log entry

d. Type of process producing waste

e. Number and volume of sample taken

f. Description of each sampling location, sampling methodology, equipment used, etc.

g. Date and time of sample collection

h. Sample destination and transporter's name (name of laboratory, UPS, etc.)

i. Map or photograph of the sampling site, if any

j. Field observations (ambient temperature, sky conditions, past 24-hour precipitation, etc.)

k. Field measurements, if any (pH, flammability, explosivity, etc.)

l. Collector's sample identification number(s)

m. Signature of person responsible for the log entry

Sampling situations vary widely. No general rule can be given as to the extent of information that must be entered in the log book. A good rule, however, is to record sufficient information so that someone can reconstruct the sampling situation without relying on the collector's memory.

The sample shipment and chain-of-custody record is accompanied by a sample analysis request sheet (Figure 9-19). The request sheet has two parts: field and laboratory. The field portion of this form must be completed by the person collecting the sample and include most of the pertinent information noted in the log book. The laboratory portion is intended to be completed by the laboratory personnel when the sample is received.

TABLE 9-1

SUMMARY OF HAZARDOUS WASTE FACILITIES
AT LOS ALAMOS NATIONAL LABORATORY

Facility	Treatment	Storage	Disposal
TA-14	Thermal	none	none
TA-15	Thermal	none	none
TA-16	Thermal	none	none
TA-36	Thermal	none	none
TA-39	Thermal	none	none
TA-50	Batch Chemical Incineration	container	none
TA-54	Solidification Neutralization Oxidation Evaporation	container	landfill

TABLE 9-2

REGULATED WASTES DETONATED AT TA 36 MEENIE

Hazardous Waste Code	Name	Hazard
P006	Aluminum Phosphide	
P009	Ammonium Picrate	R
P022	Carbon Disulfide	
P031	Cyanogen	
P033	Cyanogen chloride	
P048	2, 4,-Dinitrophenol	
P054	Ethylenimine	
P056	Fluorine	
P063	Hydrogen Cyanide	
P064	Isocyanic Acid (nethyl isocyanate)	
P065	Mercury Fulminate	R,T
P069	2-Methil Actonitrile	
P071	Methyl Parathion	
P073	Nickel Carbonyl	
P076	Nitric Oxide	
P077	P-Nitroaniline	
P081	Nitroglycerine	R
P096	Phosphine	
P107	Strontium Sulfide	
P112	Tetranitromethane	R
P122	Zinc Phosphide (10%)	
U006	Acetyl Chloride	
U008	Acrylic Acid	
U020	Benzenesulfonyl Chloride	C,R
U023	Benzene	C,R,T
U033	Carbonyl Oxyfluoride	R,T
U042	2 Chloroethyl Vinyl Ether	

TABLE 9-2

REGULATED WASTES DETONATED AT TA 36 MEENIE
(Continued)

Hazardous Waste Code	Name	Hazard
U044	Chloroform	
U045	Chloromethane	I,T
U075	Dichlorodifluoromethane	
U092	Dimethylamide	I
U096	alpha, alpha Dimethylbenzylhydro-peroxide	R
U108	1,4-Dioxane	
U112	Ethyl Acetate	I
U113	Ethyl Acrylate	I
U115	Ethlene Oxide	I,T
U117	Ethyl Ether	I
U118	Ethylmethacrylate	
U113	Hydrazine	R,T
U134	Hydrogen Fluoride	C,T
U135	Hydrogen Sulfide	
U171	Nitropropane	I
U205	Selenium Disulfide	R,T
U213	Tetrahydrofuran	I
U217	Thallium Nitrate	I
U234	sym-Trinitrobenzene	R,T

TABLE 9-3

ANALYTICAL PARAMETERS AND METHODS FOR TA 14, TA 15, TA 16 AND TA 39

EPA Hazardous Waste Number	Metals	EP Toxic Regulated Concentrations	EPA Analytical Method[1]
D004	Arsenic	5.0 mg/l	6010
D005	Barium	100.00	6010
D006	Cadmium	1.0	6010
D007	Chromium	5.0	6010
D008	Lead	5.0	6010
D009	Mercury	0.2	7470 or 7471
D010	Selenium	1.0	6010
D011	Silver	5.0	6010
--	Nickel	-	6010
Organic Scan			
GC/MS for volatiles			8240
GC/MS for semivolatiles			8250 or 8270
Other			
Cyanide			9010
Nitrates			9200

[1]Analytical methods are taken from Test Methods for Evaluating Solid Waste, EPA SW 846, and may be superceded by more current or alternate methods from SW 846.

TABLE 9-4

AMBIENT TOTAL METALS IN SOIL

PARAMETER	Mean Ambient Background[1] Western U.S.	Eastern U.S.
Matrix Type	Soil	Soil
Aluminum	5.4	3.3
Chromium	38	36
Barium	560	500
Beryllium	0.6	0.6
Cobalt	8	7
Copper	21	14
Iron	20,000	15,000
Nickel	16	13
Manganese	390	290
Zinc	51	36
Boron	22	32
Vanadium	66	46
Silver	-	-
Arsenic	6.1	5.4
Antimony	150	-
Selenium	0.25	0.39
Thallium	-	-
Mercury	0.055	0.096
Tin	10	10
Cadium	1	1
Lead	18	14
Ammonia	-	-
Cyanide	-	-
Sulfide	-	-

[1]Ambient background concentrations apply only to soil matrix samples. Values obtained from "Geochemistry of Some Rocks, Soils, Plant, and Vegetables in the Conterminous United States" United States Geological Survey Professional Paper 574 F, 1975.

TABLE 9-5

ANALYTICAL PARAMETERS AND METHODS FOR TA 36

EPA Hazardous Waste Number	Metals	EP Toxic Regulated Concentrations	EPA Analytical Method[1]
D004	Arsenic	5.0 mg/l	6010
D005	Barium	100.00	6010
D006	Cadmium	1.0	6010
D007	Chromium	5.0	6010
D008	Lead	5.0	6010
D009	Mercury	0.2	7470 or 7471
D010	Selenium	1.0	6010
D011	Silver	5.0	6010
--	Nickel	-	6010
--	Zinc	-	6010
--	Thallium	-	6010
--	Selenium	-	6010
Organic Scan			
GC/MS for volatiles			8240
GC/MS for semivolatiles			8250 or 8270
Total Organic Halogen			9020 or 9022
Other			
Cyanide			9010
Soil pH			9045
Sulfides			9030
Nitrates			9200

[1]Analytical methods are taken from Test Methods for Evaluating Solid Waste, EPA SW 846, and may be superceded by more current or alternate methods from SW 846.

TABLE 9-6

CLOSURE SCHEDULE FOR TA-14, TA-15, TA-36, AND TA-39
THERMAL TREATMENT FACILITIES

Activity	Maximum Time Required
Contract for sampling and/or analytical services	90 days
Conduct the first sampling survey	30 days
Analyze the first samples	60 days
Determine contaminated areas	20 days
Conduct the second sampling survey	30 days
Analyze the second samples	60 days
Determine contaminated areas	20 days
Contract for decontamination, if necessary	90 days
Remove soil, if necessary	180 days
Decontaminate equipment	7 days
Weather delay contingency	90 days
Conduct verification samples	20 days
Analyze samples	30 days
Total	727 days

TABLE 9-7

CLOSURE SCHEDULE FOR TA-16

Activity	Maximum Time Required
Contract for sampling and/or analytical services	90 days
Conduct first soil sampling survey	30 days
Analyze first soil samples	60 days
Determine area of contamination	20 days
Conduct second soil sampling survey	30 days
Analyze second samples	60 days
Determine areas of contamination	20 days
Contract for decontamination, if necessary	90 days
Decontaminate pads and equipment, if necessary	30 days
Soil removal, if necessary	180 days
Weather delay contingency	90 days
Conduct verificaiton samples	30 days
Analyze samples	60 days
Total	790 days

TABLE 9-8

ANALYTICAL PARAMETERS AND METHODS FOR 50-1

EPA Hazardous Waste Number	Metals	EP Toxic Regulated Concentrations	EPA Analytical Method[1]
D004	Arsenic	5.0 mg/l	6010
D005	Barium	100.00	6010
D006	Cadmium	1.0	6010
D007	Chromium	5.0	6010
D008	Lead	5.0	6010
D009	Mercury	0.2	7470 or 7471
D010	Selenium	1.0	6010
D011	Silver	5.0	6010
--	Nickel	-	6010
--	Zinc	-	6010
--	Thallium	-	6010
--	Selenium	-	6010
Organic Scan			
GC/MS for volatiles			8240
GC/MS for semivolatiles			8250 or 8270
Other			
Cyanide			9010
pH			9045
Nitrates			9200

[1]Analytical methods are taken from Test Methods for Evaluating Solid Waste, EPA SW 846, and may be superceded by more current or alternate methods from SW 846.

TABLE 9-9

CLOSURE SCHEDULE FOR TA-50 BATCH TREATMENT SYSTEM

Activity	Maximum Time Required
Treatment of final wastes	30 days
Internal wash down	14 days
External wash down	7 days
Contract for disassembly	90 days
Disassemble equipment	180 days
Floor wash down	30 days
Final Cleanup	14 days
Total	365 days

TABLE 9-10

ANALYTICAL PARAMETERS AND METHODS FOR TA 54 - AREA L

EPA Hazardous Waste Number	Metals	EP Toxic Regulated Concentrations	EPA Analytical Method[1]
D004	Arsenic	5.0 mg/l	6010
D005	Barium	100.00	6010
D006	Cadmium	1.0	6010
D007	Chromium	5.0	6010
D008	Lead	5.0	6010
D009	Mercury	0.2	7470 or 7471
D010	Selenium	1.0	6010
D011	Silver	5.0	6010
--	Nickel	-	6010
--	Beryllium	-	6010
Organic Scan			
GC/MS for volatiles			8240
GC/MS for semivolatiles			8250 or 8270
Other			
Cyanide			9010
Nitrates			9200
Sulfides			9030
pH (liquids)			9040
Soil pH			9045

[1]Analytical methods are taken from Test Methods for Evaluating Solid Waste, EPA SW 846, and may be superceded by more current or alternate methods from SW 846.

TABLE 9-11

SCHEDULE FOR CLOSURE OF TA-54, AREA L FACILITIES

Activity	Maximum Time Required
Contract for sampling and/or analytical services	90 days
Treat or remove final wastes from transfer packaging and storage areas	90 days
Decontaminate waste packaging, transfer and storage areas	30 days
Evaporate waste water from treatment tanks	180 days
Dispose of tanks and residue	180 days
Conduct first soil sampling survey	30 days
Analyze first soil samples	60 days
Conduct second soil sampling survey if needed	30 days
Analyze second soil samples if needed	60 days
Contract for soil decontamination	90 days
Remove soil	90 days
Weather delay contingency	90 days
Conduct verification samples	30 days
Analyze samples	60 days
Close shafts	20 days
Establish ground cover	760 days
TOTAL	1890 days

TABLE 9-12

GROUNDWATER

SAMPLING METHODOLOGY AND MONITORING
FROM SW-846

	Second Edition Section No.
Sampling Methodology	1.4
Groundwater Sampling	1.4.6
Monitoring	3.0
Groundwater	3.1

TABLE 9-13

CHECKLIST OF SUGGESTED ITEMS FOR FIELD SAMPLING

Quantity	Item	Use	Supplier
1	Field log book	To keep sample records	Office supply stores
1	Disposable towels or rags	To clean sampling equipment	Terry towels or equivalent; available at chemical supply houses
6	Large polyethylene bags	To store waste papers, rags, etc.	Plastic supply houses
12	Polyethylene bags	To store sample containers	Plastic supply houses
4	Waterproof pens	To complete records and labels	Stationery stores
1	Apron, oil and acid proof	Protective garment	McMaster-Carr Co. P.O. Box 4355 Chicago, IL
1	Face mask	Protective garment	MSA 400 Penn Center Blvd. Pittsburgh, PA 15235
1	Liquinox or Alconox Detergent	Used to clean sampler	

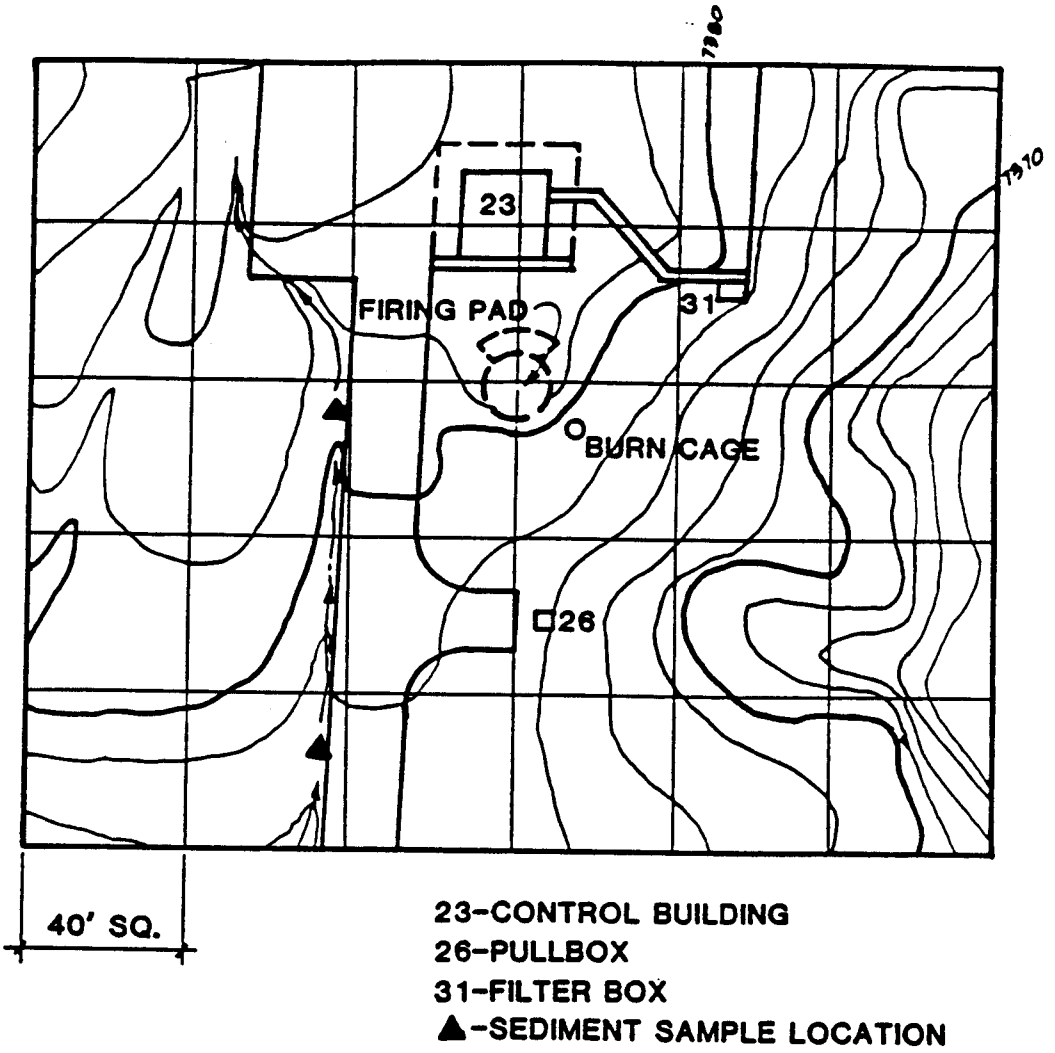


FIGURE 9-1 TA 14 WASTE FIRING SITE

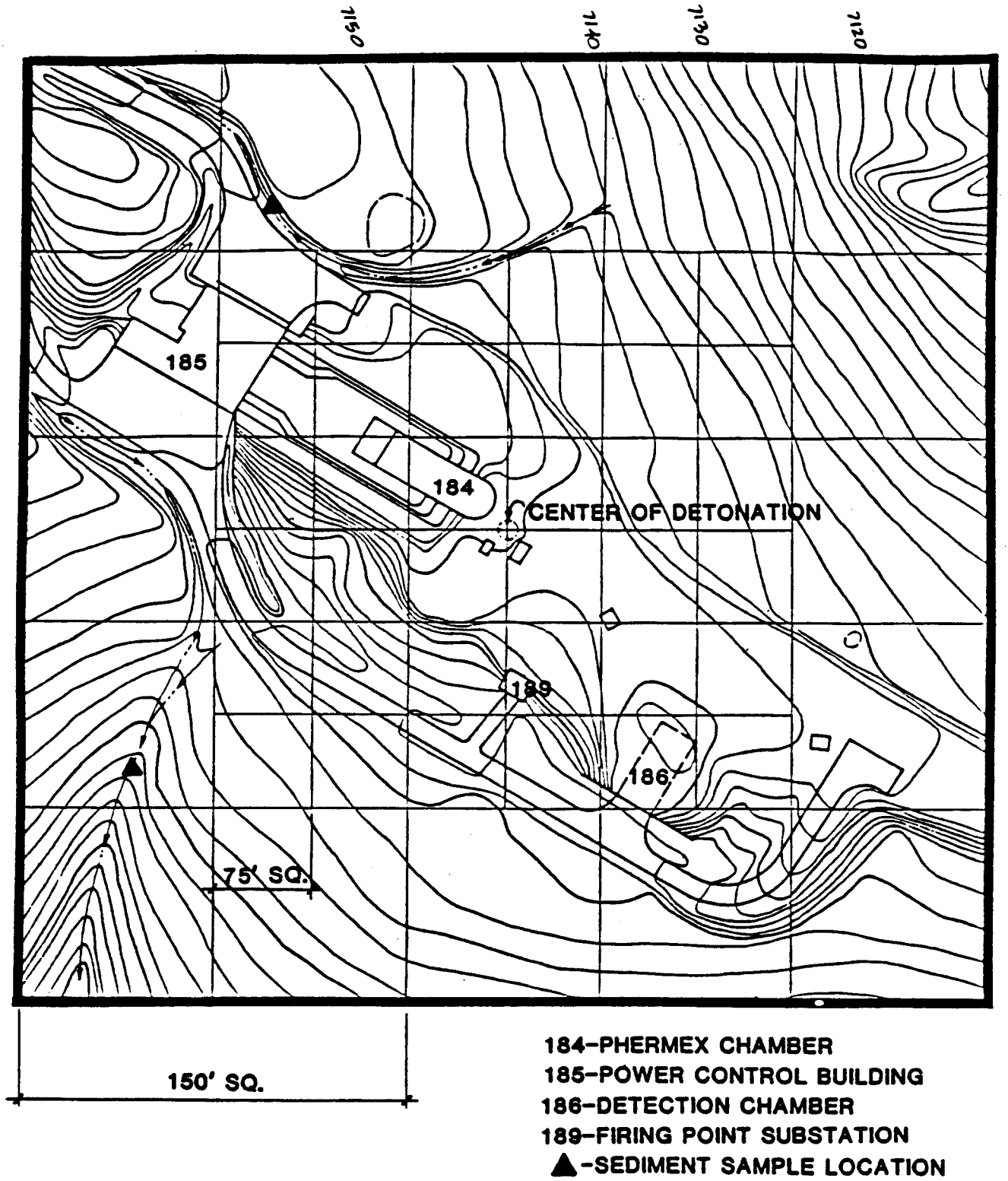


FIGURE 9-2 TA 15 FIRING SITE

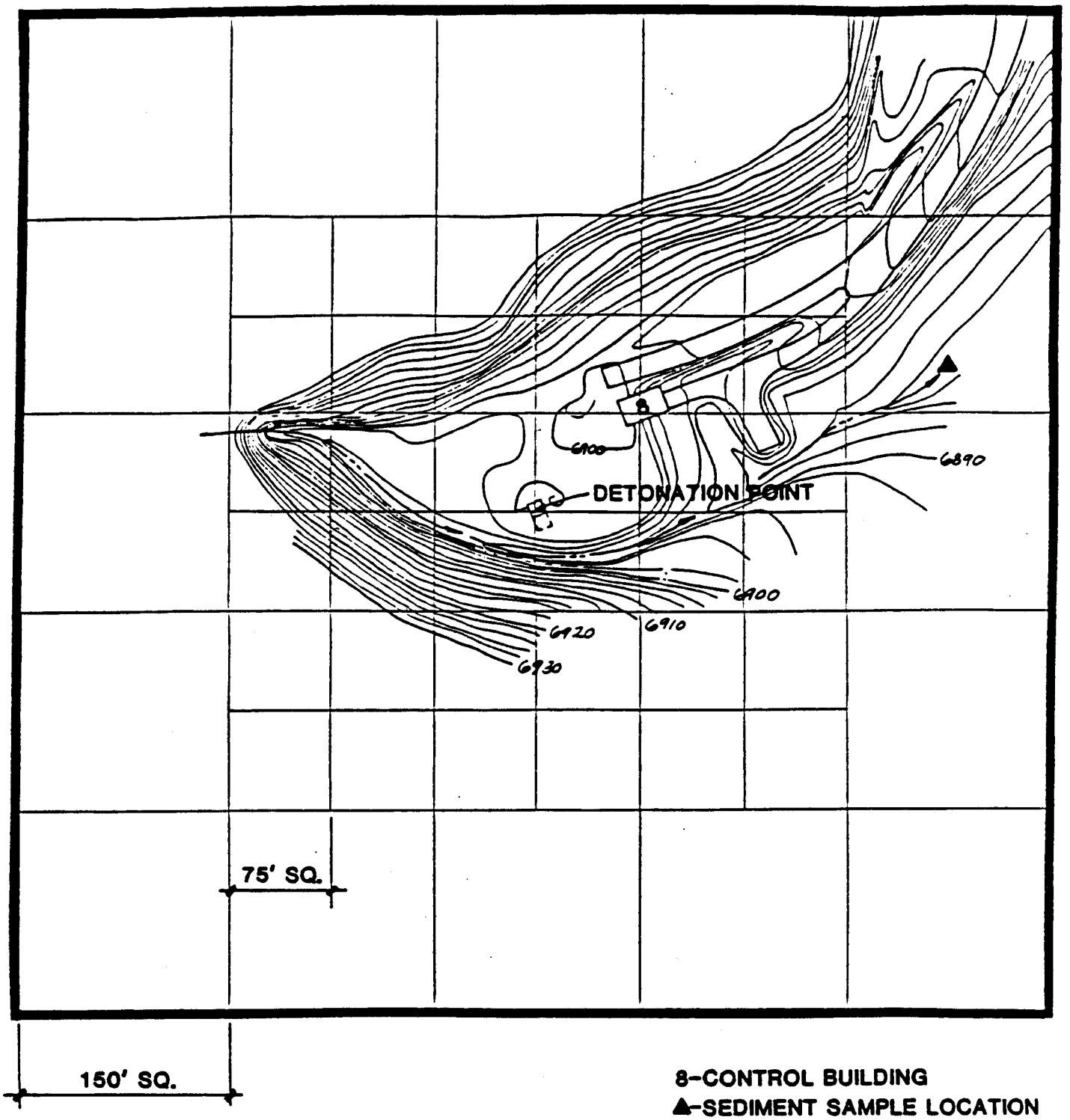


FIGURE 9-3 TA 36-MEENIE FIRING SITE

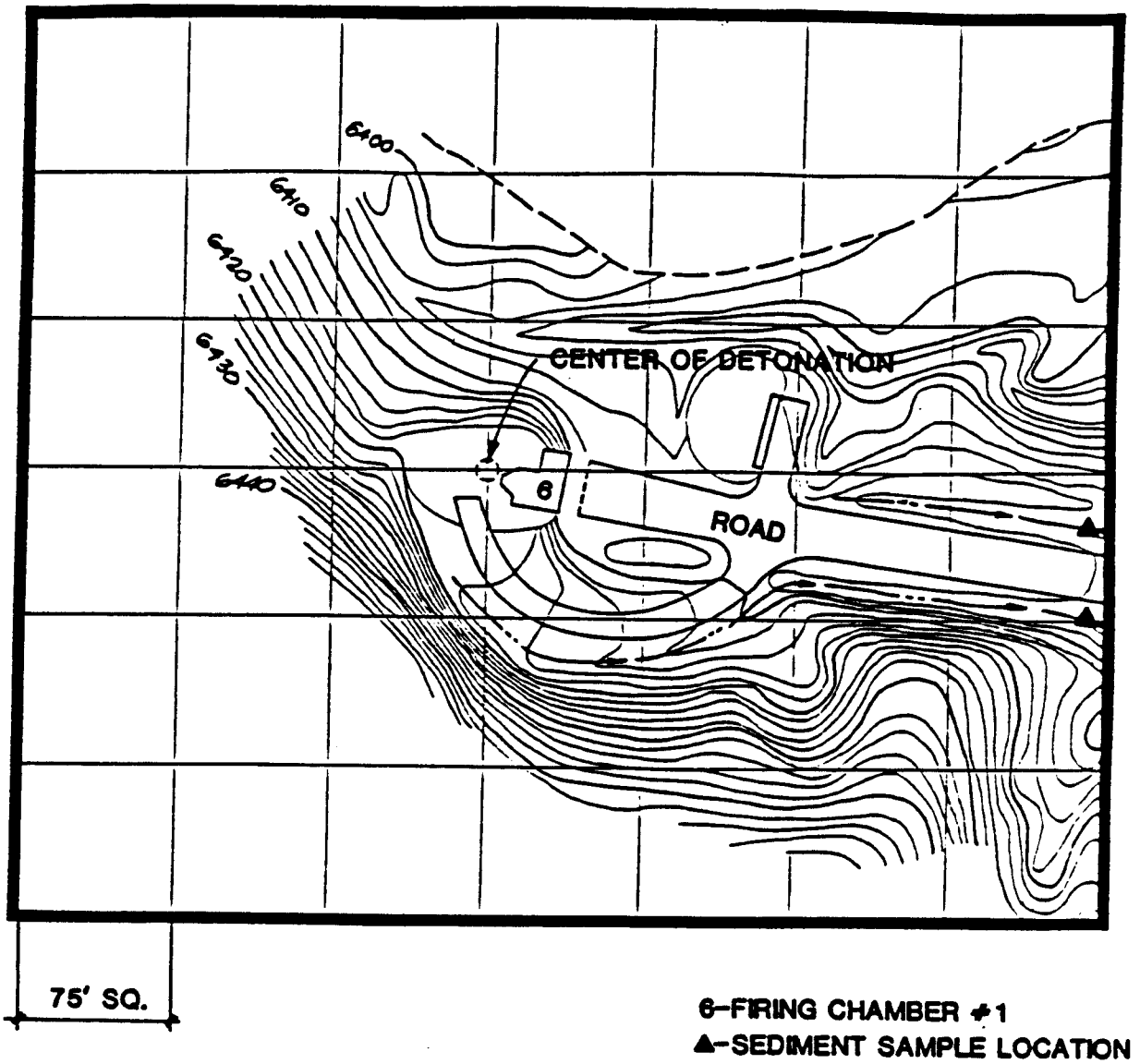
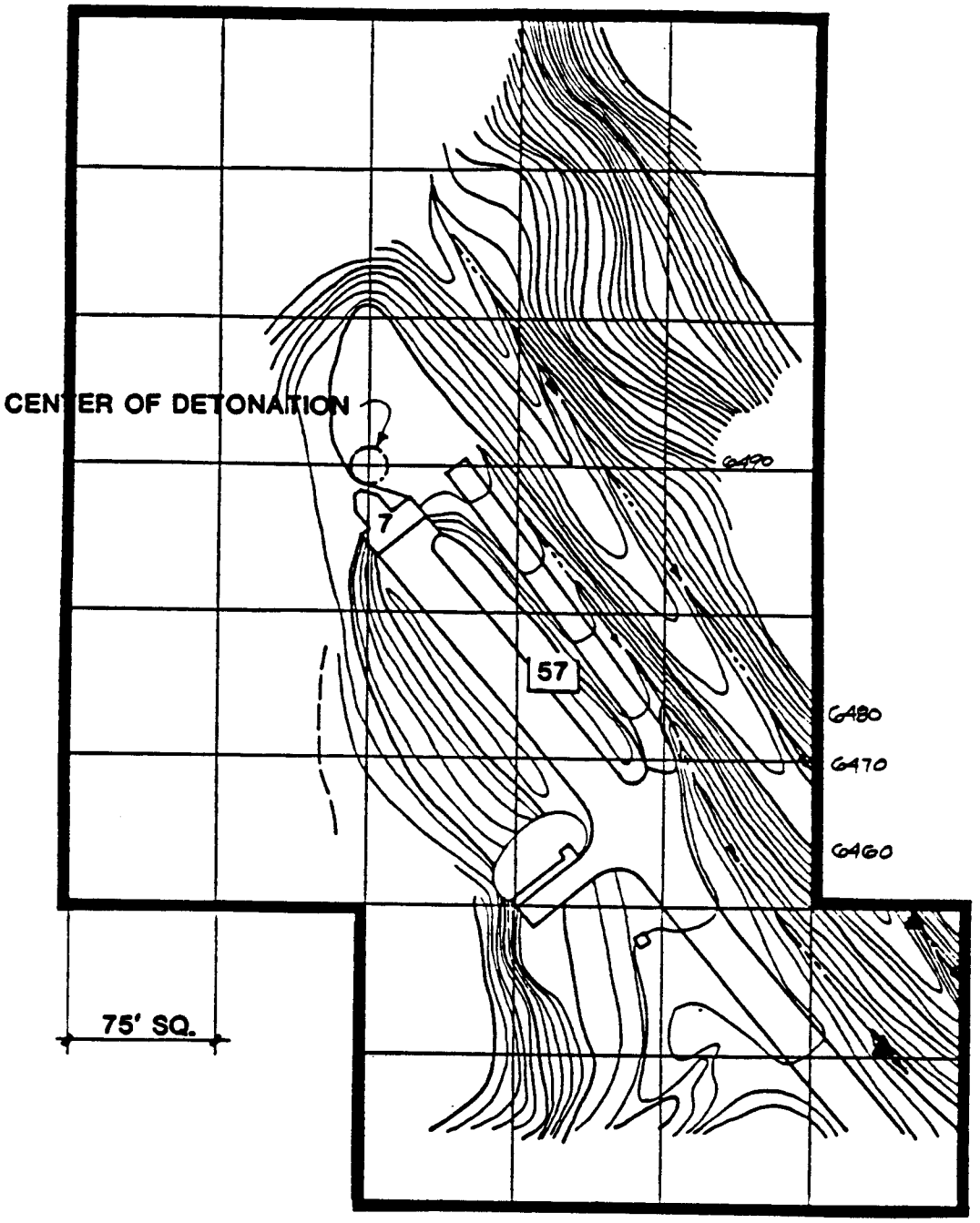


FIGURE 9-4 TA 39-6 FIRING SITE



7-FIRING CHAMBER #2
57-FIRING CHAMBER
▲-SEDIMENT SAMPLING LOCATION

FIGURE 9-5 TA 39-57 FIRING SITE

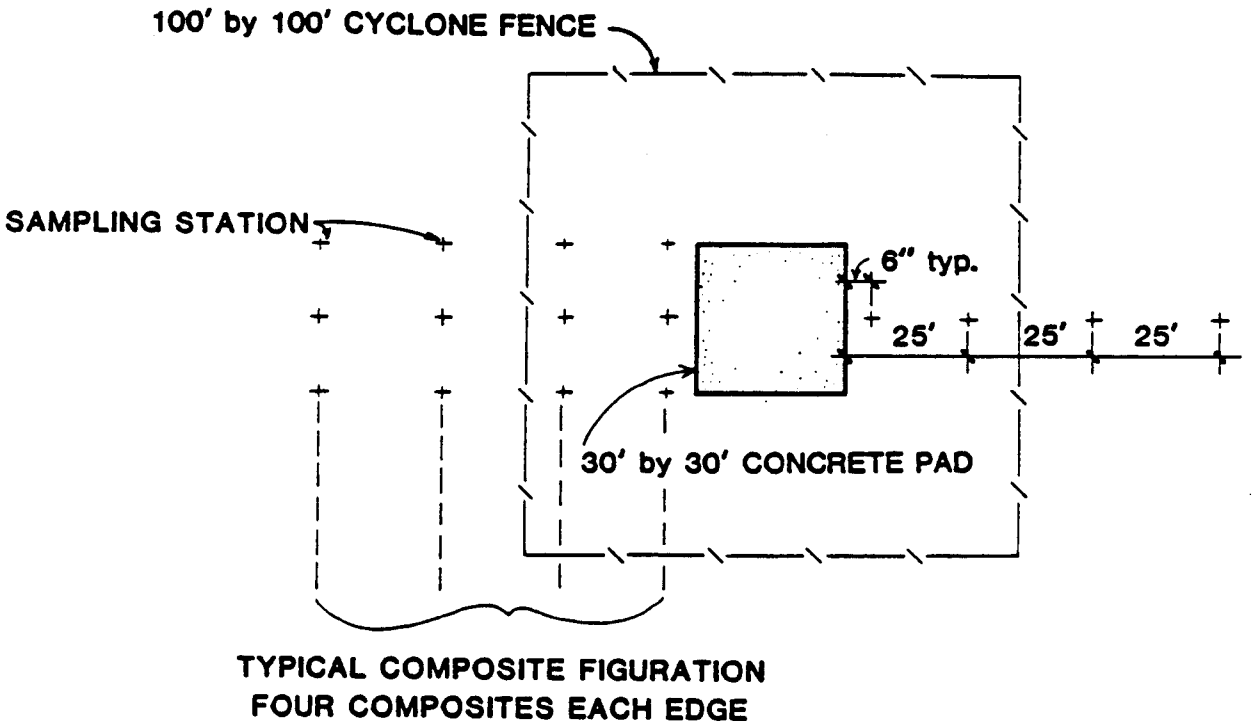


FIGURE 9-6 TA 16 BURN PAD SAMPLE LOCATIONS

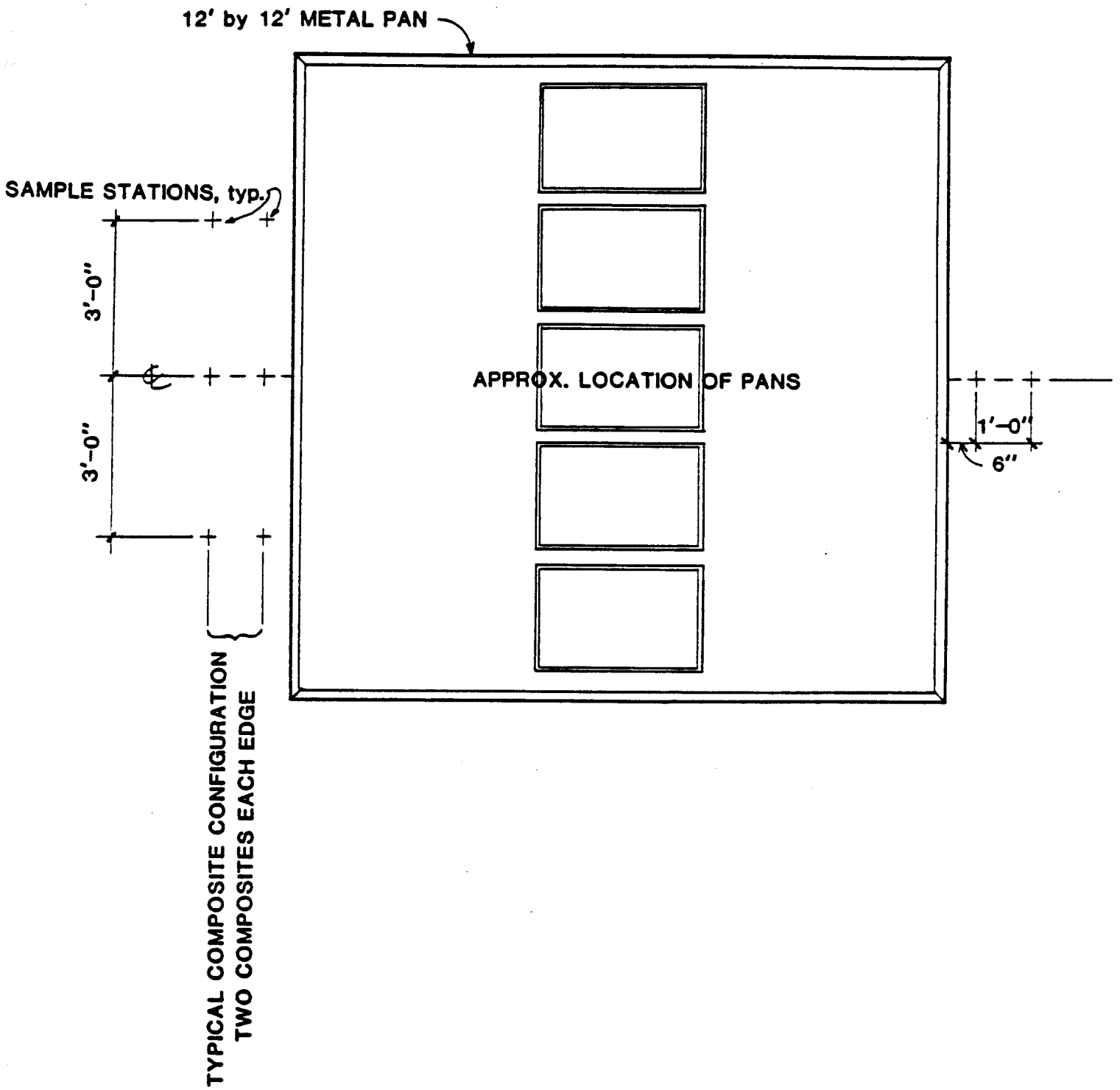


FIGURE 9-7 TA 16 LIQUID BURN PAD SAMPLE LOCATIONS

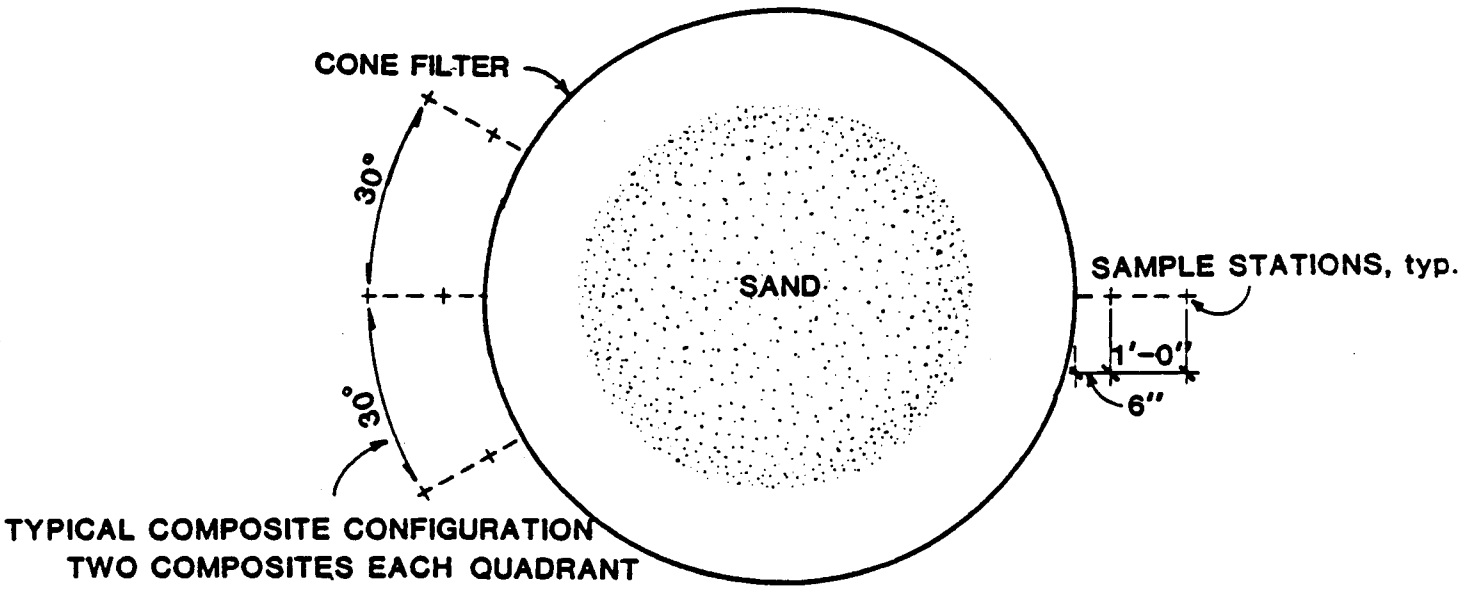


FIGURE 9-8 TA 16 FILTER VESSEL SAMPLE LOCATIONS

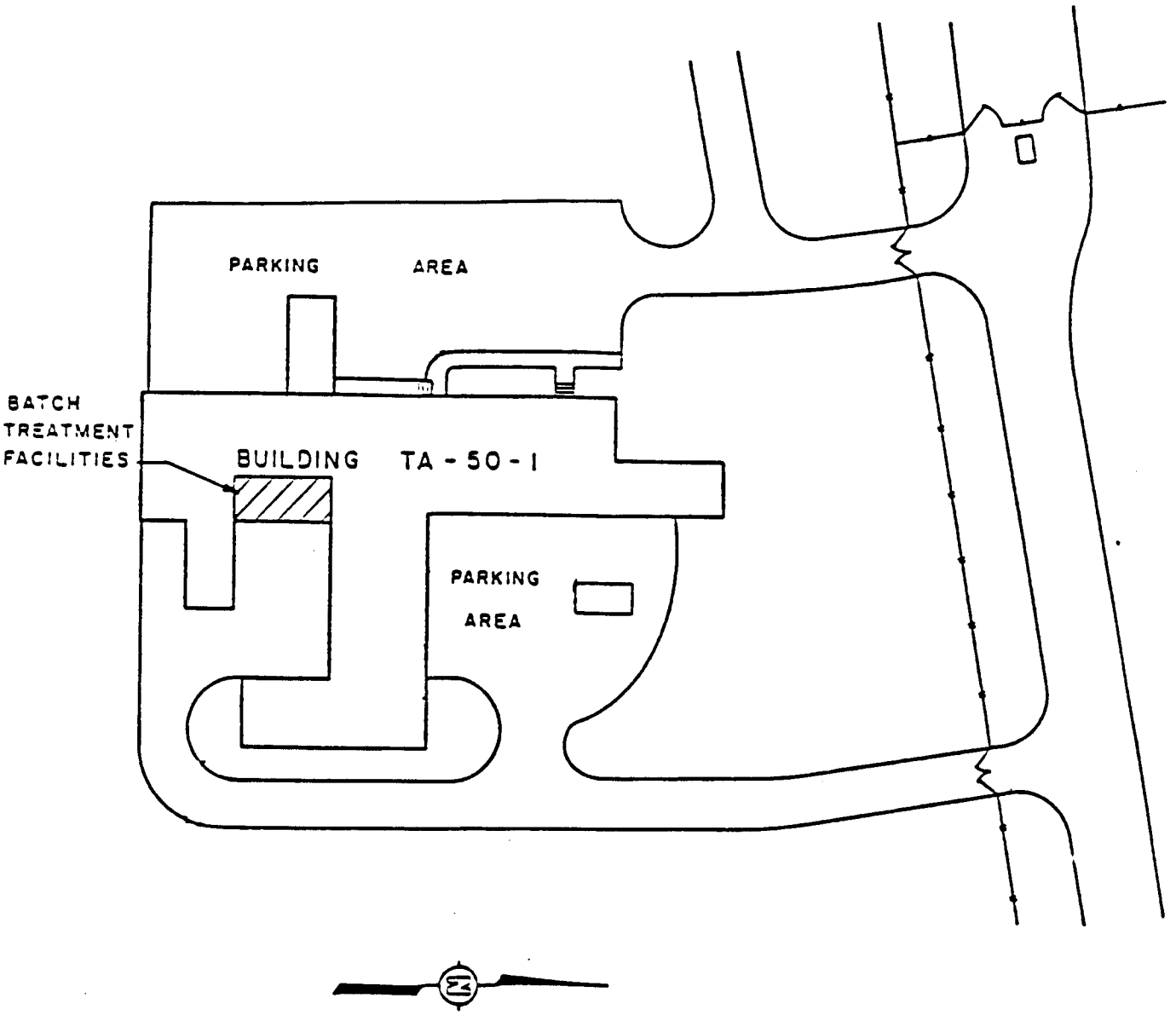
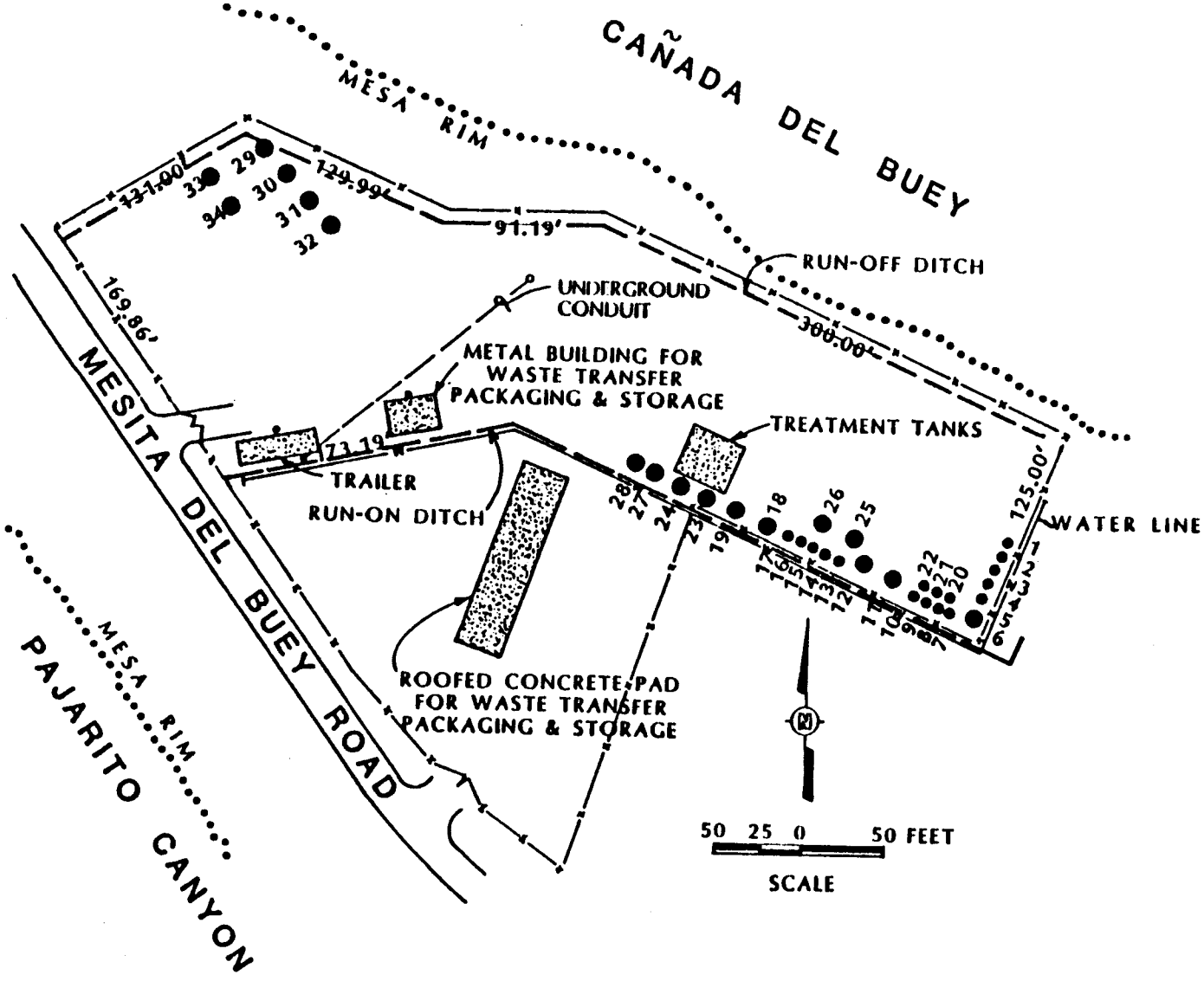


FIGURE 9-9 BATCH TREATMENT FACILITIES BLDG. TA 50-1



AREA L SHAFTS (1)

(INFORMATION CURRENT MARCH, 1985)

SHAFT #	SHAFT DIAMETER (FEET)	DATE DRILLED	DATE CAPPED	CONTENTS
1	3	4/80	9/83	ORGANICS
2	3	3/75	7/79	ACIDS & BASES
3	3	3/75	10/78	INORGANIC
4	3	3/75	5/80	ORGANIC
5	3	3/75	6/77	WASTE OIL
6	4	6/75	6/79	REACTIVE
7	3	6/75	6/79	REACTIVE
8	3	6/75	6/79	REACTIVE
9	3	6/75	6/79	GAS CYLINDERS
10	3	6/77	6/79	WASTE OIL
11	8	1/78	7/79	WASTE OIL/SOLVENT
12	4	1/78	7/79	WASTE OIL/SOLVENT
13	3	6/79	5/83	INORGANIC
14	3	6/79	5/83	REACTIVE
15	3	6/79	5/83	REACTIVE
16	3	6/79	5/83	GAS CYLINDERS
17	3	6/79	5/83	ORGANIC
18	8	6/79	6/80	WASTE OIL
19	8	4/80	5/83	WASTE OIL
20	3	4/80	9/83	INORGANIC
21	3	4/80	OPEN	GAS CYLINDERS
22	3	4/80	9/83	ORGANIC
23 (2)	8	4/83	3/84	WASTE OIL
24 (2)	8	4/83	4/84	ORGANIC & WASTE OIL
25	6	9/83	5/85	INORGANIC
26	6	9/83	3/84	ORGANIC
27	4	1/83	2/85	SPECIAL (4)
28	4	1/83	5/85	SPECIAL
29	6	12/83	8/84	ORGANIC
30	6	12/83	8/84	ORGANIC
31	6	12/83	9/84	ORGANIC
32	4	9/84	9/84	ORGANIC
33	6	9/84	3/85	ORGANIC
34	6	2/85	5/85	ORGANIC

(1) ALL SHAFTS ARE APPROXIMATELY 60 FEET DEEP

(2) PRIOR TO SHAFT 23 EXCEPT SHAFT 5, LIQUIDS WERE INFUSED OF IN DRUMS WITHOUT ADDING ABSORBENTS

(3) MIDDLE SECTION OF THIS SHAFT NOT USED

(4) USED FOR MISCELLANEOUS WASTE REQUIRING GREATER ISOLATION

FIGURE 9-10 TA 54-AREA L

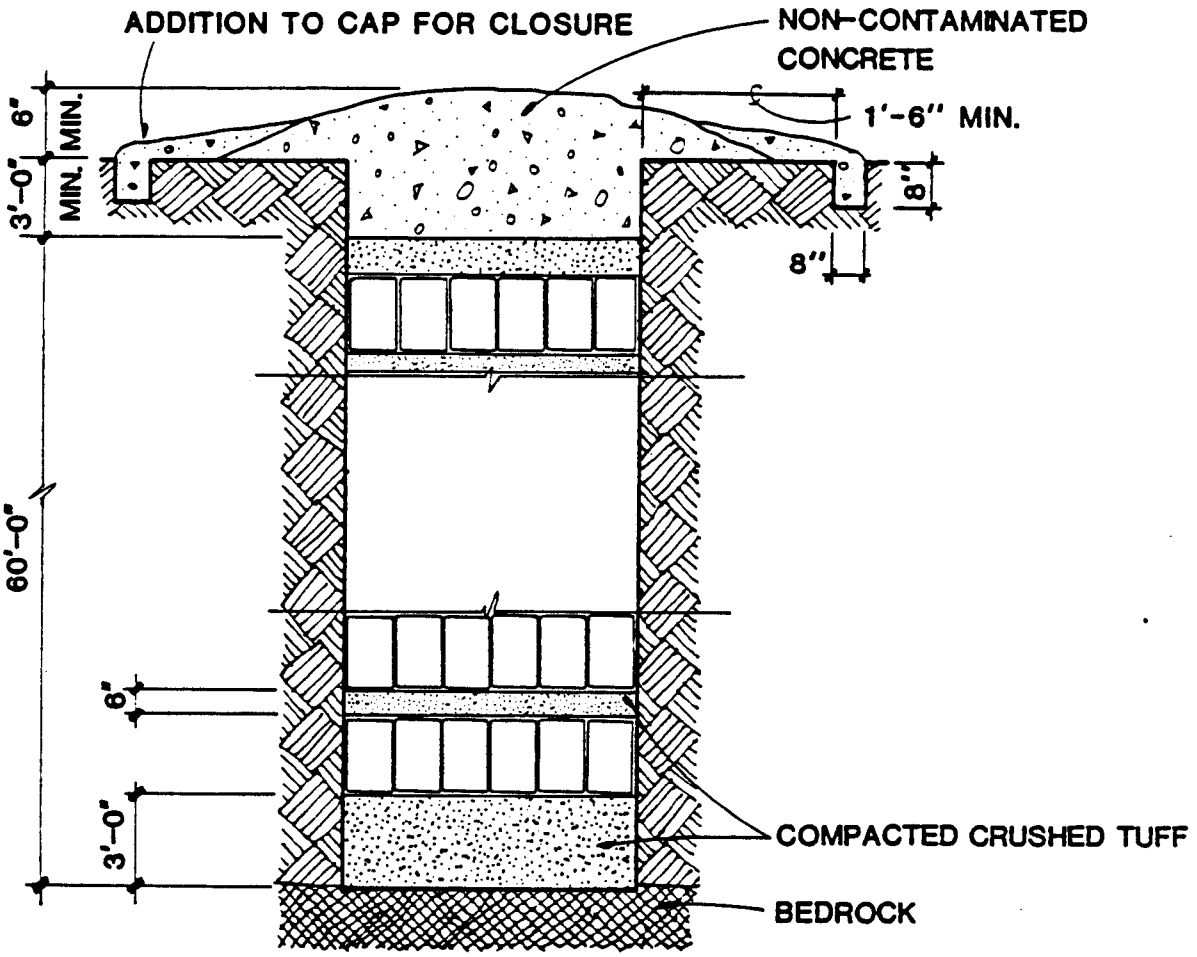


FIGURE 9-11 TYPICAL SHAFT SECTION AREA L

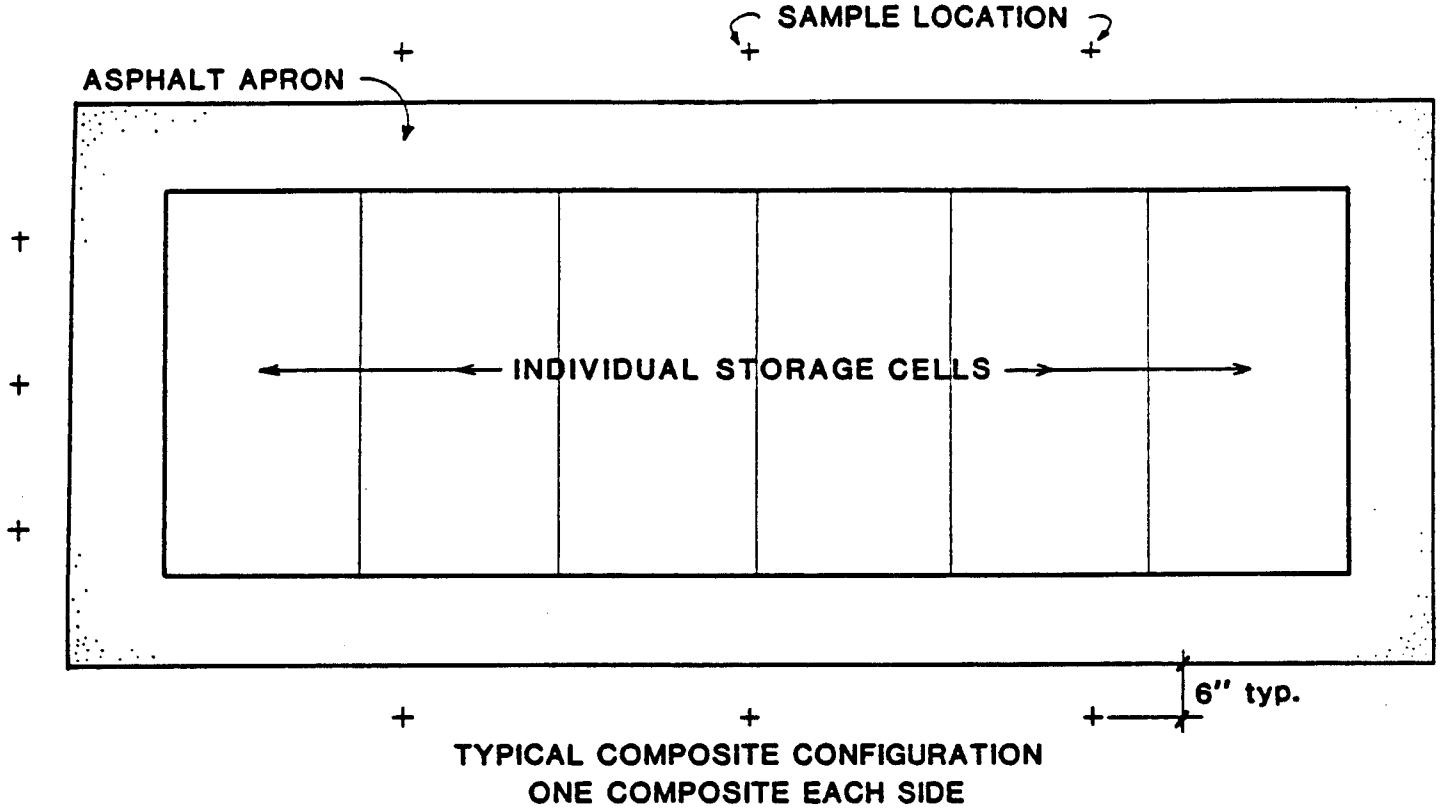


FIGURE 9-12 TA 54-AREA L COVERED CONCRETE PAD SAMPLE LOCATIONS

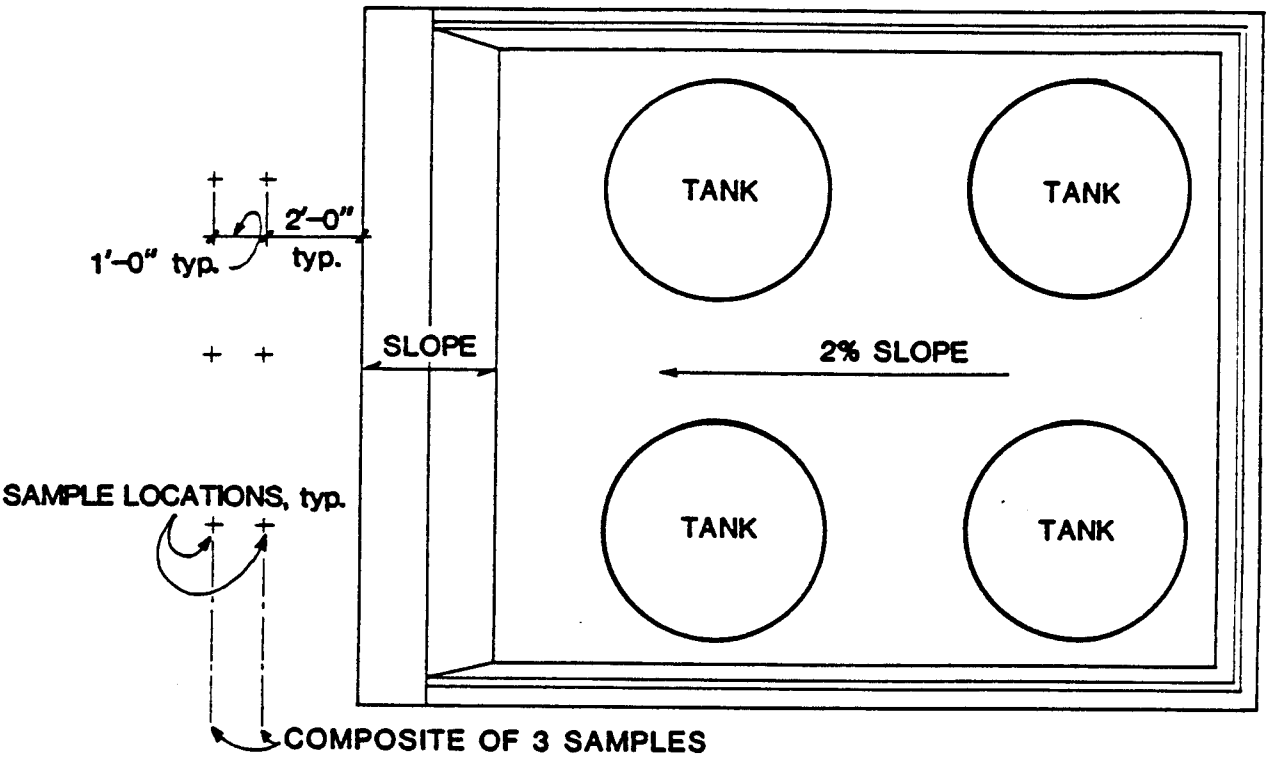


FIGURE 9-13 TA 54-AREA L TREATMENT TANKS SAMPLE LOCATIONS

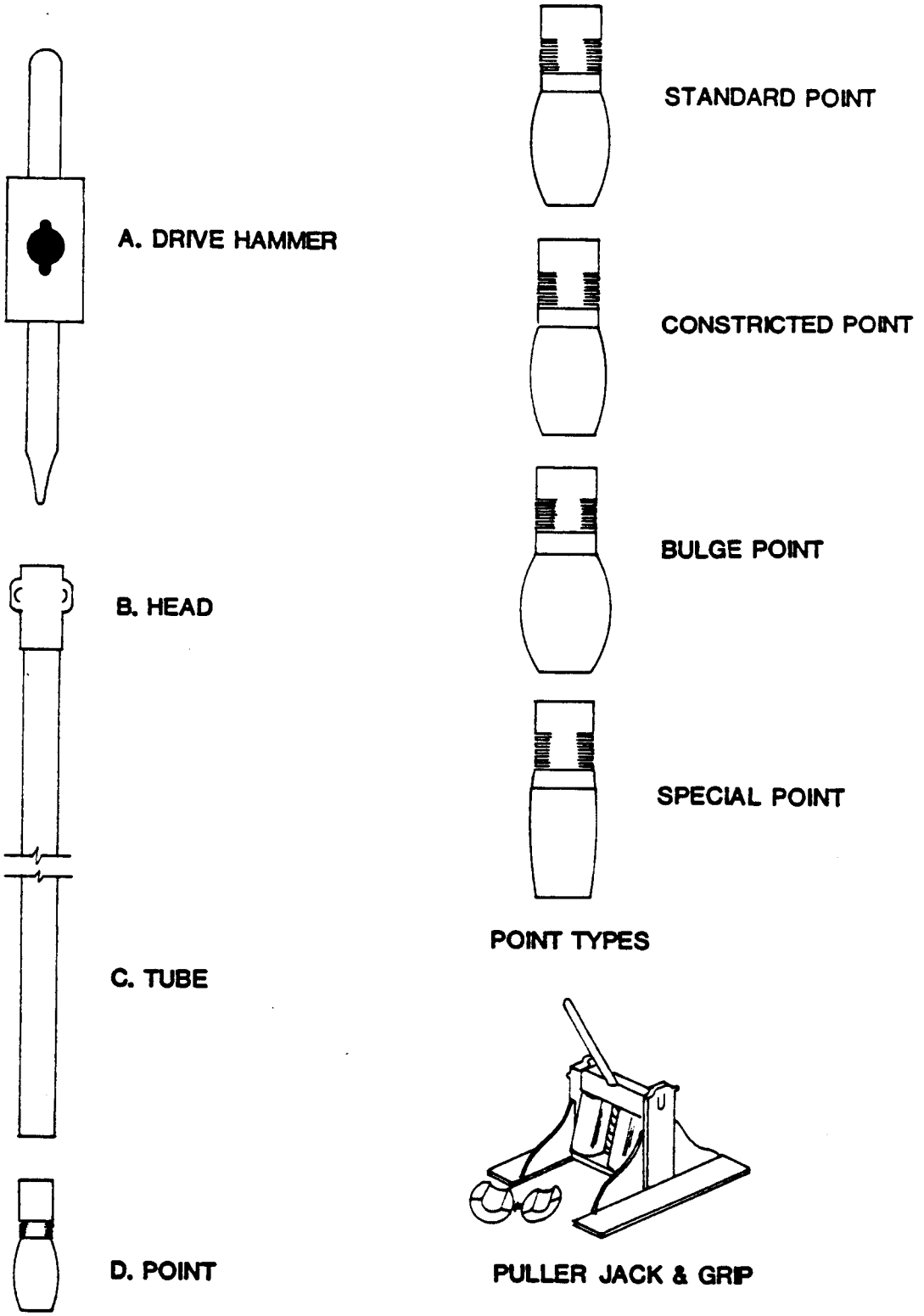


FIGURE 9-14 VEIHMEYER SOIL SAMPLER

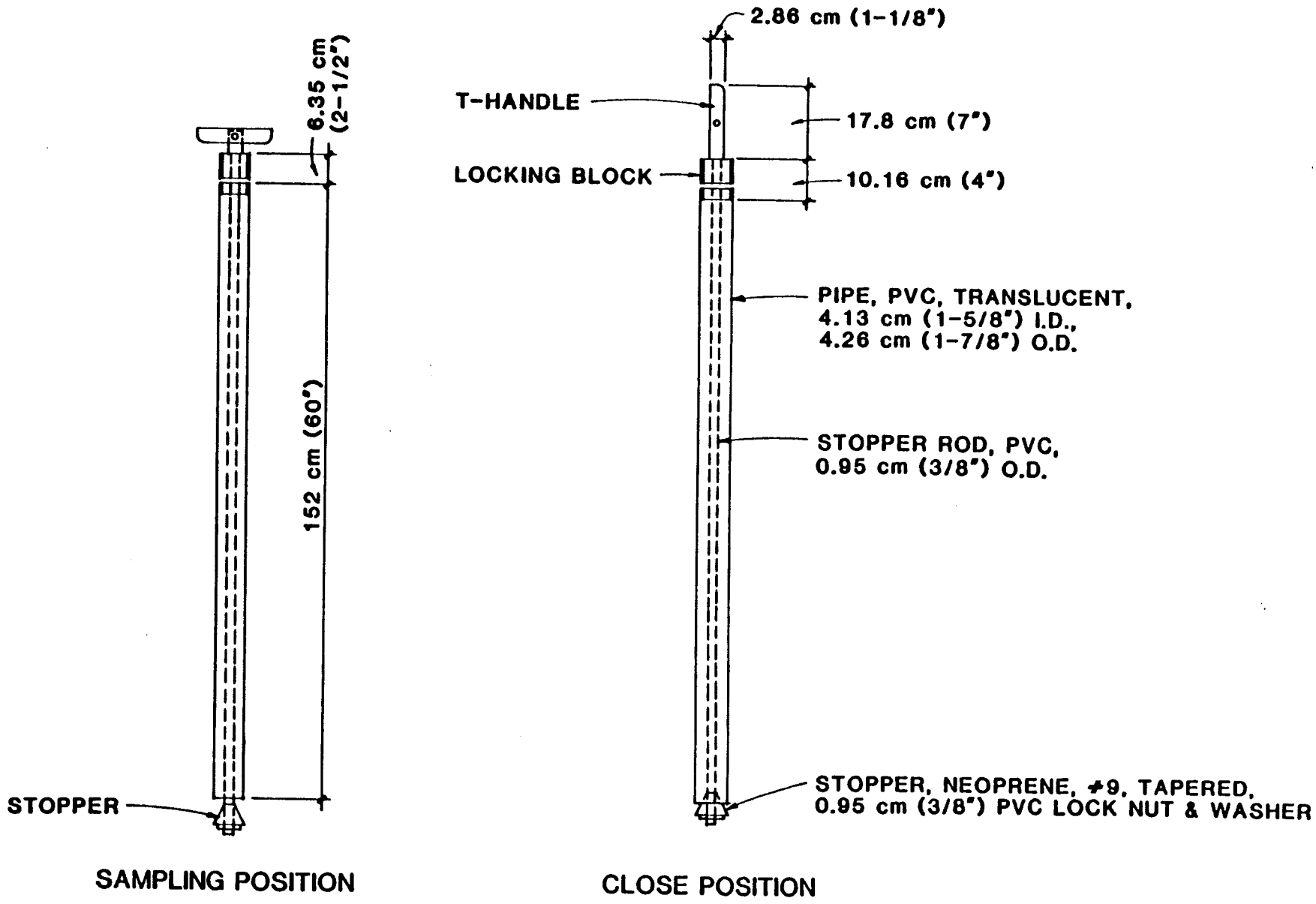


FIGURE 9-15 COMPOSITE LIQUID WASTE SAMPLER (COLIWASA)

FIGURE 9-16

EXAMPLE OF SAMPLE SEAL

OFFICIAL SAMPLE SEAL

Collected by _____ Collector's Sample No._____
(Signature)

Date Collected_____ Time Collected_____

Place Collected_____

_____

_____

FIGURE 9-17
EXAMPLE OF SAMPLE LABEL

OFFICIAL SAMPLE LABEL

Collector_____ Collector's Sample No._____

Place. of Collection_____

_____

Date Sampled_____ Time Sampled_____

Field Information_____

_____

_____

FIGURE 9-18
CHAIN OF CUSTORY RECORD

Hazardous Materials
Collector's Sample No.___

Location of Sampling: __Producer __Hauler
__Disposal Site
__Other:_____

_____

Company's Name _____Telephone (___)_____

Address_____
number street city state zip

Collector's Name_____Telephone (___)_____
signature

Date Sampled_____Time Sampled_____hours

Type of Process Producing Waste_____

Waste Type Code_____Other_____

Field Information_____

_____

_____

Sample Allocation:

1. _____
name of organization

2. _____
name of organization

3. _____
name of organization

Chain of Possession:

1. _____ _____ _____
signature title inclusive dates

2. _____ _____ _____
signature title inclusive dates

3. _____ _____ _____
signature title inclusive dates

FIGURE 9-19

HAZARDOUS MATERIALS SAMPLE ANALYSIS REQUEST

PART I: FIELD SECTION

Collector_____ Date Sampled_____ Time_____ hours

Location of Sampling_____
name of company, disposal site, etc.

Address_____
number street city state zip

Telephone (____)_____ Company Contact_____

HML NO.. (Lab only)	COLLECTOR'S SAMPLE NO.	TYPE OF SAMPLE*	FIELD INFORMATION

Analysis Requested_____

Special Handling and/or Storage_____

PART II: LABORATORY SECTION

Received by _____ Title_____ Date_____

Sample Allocation: ___HML ___LBL ___SRL Date_____

Analysis Required_____

*Indicate whether sample is sludge, soil, etc.:**Use back of page for additional information.

10.0 OTHER FEDERAL LAWS

The Los Alamos National Laboratory, Los Alamos, New Mexico (LANL) has reviewed and is in compliance with the following federal laws:

1. The Fish and Wildlife Coordination Act of 1934 (PL 121 and amendments). An act to promote the conservation of wildlife, fish and game, and for other purposes.

   (PL 85-624) An act to amend the Act of March 10, 1934, to provide for more effective integration of a fish and wildlife conservation program with Federal water-resource developments, and for other purposes.

   (PL 89-72) An act to provide uniform policies with respect to recreation and fish and wildlife benefits and costs of Federal multiple-purpose water resource projects, and for other purposes.

2. The National Historic Preservation Act of 1966 (PL 89-665 and subsequent amendments). An act to establish a program for the preservation of additional historic properties throughout the Nation, and for other purposes.

3. The Wild and Scenic Rivers Act of 1968 (Public Law 90-542 and subsequent amendments). An act to provide for a National Wild and Scenic Rivers System, and for other purposes.

4. The Coastal Zone Management Act of 1972 (PL 92-583 and subsequent amendments). An act to establish national policy and develop a national program for the management, beneficial use, protection, and development of the land and water resources of the Nation's coastal zones, and for other purposes.

5. The Endangered Species Act of 1973 (PL 93-205 and subsequent amendments). An act to provide for the conservation of endangered and threatened species of fish, wildlife, and plants, and for other purposes.

Further information will be provided at the request of the EPA Region VI or the New Mexico Environmental Improvement Division.

Los Alamos is also in full compliance with the Federal Water Pollution Control Act of 1977 and the Clean Air Act and its subsequent amendments. Los Alamos has on-going programs in support of the National Historic Preservation Act and the Endangered Species Act.

11.0 CERTIFICATION

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.

_____ _____

Robert N. Thorn
Acting Director
Los Alamos National Laboratory
Operator

Date Signed

_____ _____

Harold E. Valencia
Area Manager, Los Alamos Area Office
U.S. Department of Energy
Albuquerque Operations
Owner

Date Signed

LIST OF REFERENCES

Bailey, R. A., R. L. Smith and C. S. Ross, 1969, Volcanic Rocks in the Jemez Mountains, New Mexico, U.S. Geologic Survey Bulletin 1274-P, 29 pp.

Dane, C. H., 1948, Geologic Map of Part of Eastern San Juan Basin, Rio Arriba County, New Mexico, U.S. Geological Survey Oil and Gas Investigations Preliminary Map 78.

Griggs, R. L., 1964, Geology and Groundwater Resources of the Los Alamos Area, New Mexico, U.S. Geological Survey Water-Supply Paper 1753.

Kelley, V. C., 1954, Tectonic Map of a Part of the Upper Rio Grande Area, U.S. Geologic Survey Oil and Gas Investigations Map OM-157.

Kelley, V. C., 1955, Regional Tectonics of the Colorado Plateau and Relationship to the Origin and Distribution of Uranium, University of New Mexico Publications on Geology, No. 5, 120 pp.

Kudo, A. M., 1974, "Outline of the Igneous Geology of the Jemez Mountains Volcanic Field," New Mexico Geological Society Guidebook, 25th Field Conference, Central-Northern New Mexico, pp. 287-289.

Los Alamos National Laboratory, 1984, Environmental Surveillance at Los Alamos During 1983, LA-10100-ENV.

Los Alamos National Laboratory, 1982, Long-Range Site Development Plan, LANL Engineering Division.

Los Alamos National Laboratory, Health, Safety, and Environment Division Emergency Plan.

Los Alamos Scientific Laboratory, 1978, Soil Survey of Los Alamos County, New Mexico, Informal Report LA-6779-MS.

Merck and Company, Inc., 1983, The Merck Index, 10th Edition, Merck and Co., Inc., Rahway, New Jersey.

Purtymun, W. D. and S. Johansen, 1974, "General Geohydrology of the Pajarito Plateau," New Mexico Geological Society Guidebook, 25th Field Conference, Central Northern New Mexico, pp. 347-349.

Ross, C. S., R. L. Smith and R. A. Bailey, 1961, "Outline of the Geology of the Jemez Mountains, New Mexico," New Mexico Geolgoical Society Guidebook, 12th Field Conference, Albuquerque County, pp. 139-143.

Smith, R. L. and R. A. Bailey, 1966, "The Bandelier Tuff - A Study of Ash-Flow Eruption Cycles from Zoned Magma Chambers," Bulletin of Volcanology, series 2, v. 29, pp. 83-104.

Smith, R. L. and R. A. Bailey, 1968, "Resurgent Cauldrons," Geologic Society of America Memoir 116, pp. 613-662.

Smith, R. L., R. A. Bailey and C. S. Ross, 1970, Geologic Map of the Jemez Mountains, New Mexico, U.S. Geological Survey Miscellaneous Investigations Map I-571.

Woodward, L. A., W. H. Kaufman and J. B. Anderson, 1972, "Nacimiento Fault and Related Structures, Northern New Mexico," Geological Society of American Bulletin, v. 83, pp. 2383-2396.

Woodward, L. A., W. H. Kaufman, J. B. Anderson and R. K. Reed, 1973, Geologic Map and Sections of the San Pablo Quadrangle, New Mexico, New Mexico Bureau of Mines and Mineral Resources Geologic Map 26.

Woodward, L. A. and R. Martinez, 1974, Geologic Map and Sections of the Holy Ghost Spring Quadrangle, New Mexico, New Mexico Bureau of Mines and Mineral Resources Geologic Map 29.

Woodward, L.A., 1974, "Tectonics of Central-Northern New Mexico," New Mexico Geological Society Guidebook, 25th Field Conference, Central-Northern New Mexico, pp. 123-129.

Project No. 651013
October, 1985

LIBRARY COPY

IT CORPORATION

Volume II – Appendices Rev. 1.0

RCRA PART B PERMIT APPLICATION

Los Alamos National Laboratory
Los Alamos, New Mexico

Prepared for:
Los Alamos National Laboratory
Waste Management Group HSE-8
Los Alamos, New Mexico 87545

Volume II – Appendices

RCRA PART B PERMIT APPLICATION

Any use of product trade names in this permit application is not to be construed as an endorsement of the product, either by the IT Corporation or Los Alamos National Laboratory.

APPENDIX A

EPA AUTHORIZATION FOR LOS ALAMOS TO OPERATE UNDER INTERIM STATUS

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION VI
1201 ELM STREET
DALLAS, TEXAS 75270

August 11, 1982

Los Alamos Scientific Laboratory
Attn: William Crismon
Los Alamos Area Office
Los Alamos, New Mexico 87544

Re: EPA ID Number: NM0890010515
Facility Location: Los Alamos Area Office
Los Alamos, New Mexico

This is to acknowledge that the Environmental Protection Agency has completed processing the information submitted in your Part A Hazardous Waste Permit Application. It is the agency's opinion, based on the assumption that the information submitted is complete and accurate, that you as an owner or operator of a hazardous waste management facility, have met the requirements of Section 3005(e) of the Resource Conservation and Recovery Act (RCRA) for interim status. EPA has not verified the information submitted. If it is determined that the information is incomplete or inaccurate, you may be asked to provide additional information or in certain circumstances it may be determined that you do not qualify for interim status. In addition, this notice does not preclude a citizen from taking legal action under the provisions of Section 7002 of RCRA.

A facility not meeting the requirements for interim status under Section 3005 of RCRA may be required to close until such time as a Hazardous Waste Permit is issued. Interim status may also be terminated, according to procedures in 40 CFR, Part 124, if the owner or operator fails to furnish additional information which EPA requests in order to process a permit application.

As an owner or operator of a hazardous waste management facility, you are required to comply with the interim status standards as prescribed in 40 CFR, Parts 122 and 265, or with state rules and regulations in those states which have been authorized under Section 3006 of RCRA. In addition, you are reminded that operating under interim status does not relieve you from the need to comply with all applicable state and local requirements.

The enclosure to this letter identifies the processes your facility may use, their design capacities and the types of waste your facility may accept during interim status. This information was obtained from Part "A" of the Permit Application. If you wish to handle new wastes, change processes, increase the design capacity of existing processes, or change ownership or operational control of the facility, you may do so only as provided in 40 CFR, Sections 122.22 and 122.23.

If you have any questions concerning this letter, please contact Jack Paul at 214/767-9400 or write Environmental Protection Agency, Mail Code 6E-P, 1201 Elm Street, Dallas, Texas 75270.

Sincerely yours,

Allyn M. Davis

Allyn Davis
Director, Air and Waste Management Division (6AW)

Enclosure

cc: New Mexico Health and
Environmental Department
Scott Nicholson

CONDITIONS OF OPERATION DURING INTERIM STATUS

Date prepared: August 11, 1982

The information shown below is based solely on the information that the owner and operator of this facility submitted in Part A of the Hazardous Waste Permit Application. This is not a determination by EPA that this facility is an environmentally acceptable facility for treating, storing or disposing of the hazardous wastes listed below.

I. Facility name, location and EPA identification number:

Name: Los Alamos Scientific Laboratory

Location: Los Alamos Area Office

Los Alamos, New Mexico

EPA ID No: NMO 89 001 0515

II. EPA considers the following to be the owner or operator of the facility and therefore the person(s) who must comply with the requirements set forth in 40 CFR Parts 122 and 265:

Owner's name: United States Department of Energy

Operator's name: Los Alamos National Scientific Laboratory

III. During the period of interim status, the facility may use only the following processes for treating, storing or disposing of hazardous waste, up to the design capacities that are indicated:

Process Code	Design Capacity Amount	Unit of Measure
D80	100.	Acre-feet
D83	4,000.	Gallons
T04	15,008.	Gallons per day

IV. During the period of interim status, the facility may handle only the hazardous wastes with the following EPA Hazardous Waste Numbers, and/or solid wastes exhibiting hazardous characteristics with the following EPA Hazardous Waste Numbers:

D000	D001	D002	D003	F001	F002	F003	F004	F005	F006	F007
F008	F009	P032	P035	P039	P040	P053	P073	P074	P075	P076
P077	P083	P090	P095	P098	P104	P106	P107	P113	P115	P120
P121	P122	U001	U002	U003	U004	U009	U011	U012	U013	U014

EPA Region VI, Dallas, TX 75270
(214) 767-2765

U017	U019	U020	U021	U023	U031	U032	U037	U044	U048	U052
U056	U057	U063	U068	U069	U070	U071	U072	U075	U077	U080
U081	U088	U092	U095	U108	U112	U115	U117	U122	U123	U127
U131	U134	U135	U138	U144	U145	U147	U151	U154	U156	U159
U160	U161	U166	U167	U168	U170	U188	U189	U190	U191	U194
U196	U197	U204	U207	U209	U210	U211	U213	U216	U217	U218
U219	U220	U226	U228	U229	U231	U239	D006	D007	D009	D010
D012	K044	P015	P018	P130	P105	U010	U022	U043	U045	U093
U102	U157	U201	U223							

P030

APPENDIX B

EPA REQUEST FOR LOS ALAMOS RCRA PART B PERMIT APPLICATION

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION VI
INTERFIRST TWO BUILDING, 1201 ELM STREET
DALLAS, TEXAS 75270

FEB 22 1984

CERTIFIED MAIL: RETURN RECEIPT REQUESTED

Donald Kerr
Laboratory Director
U.S. Department of Energy
Los Alamos Area Office
Los Alamos, New Mexico 87544

Re: NM0890010515

Dear Mr. Kerr:

This letter constitutes a formal request for your Part B permit application for a hazardous waste facility permit under the Resource Conservation and Recovery Act for the above referenced facility. This request is made under the authority of 40 CFR 270.10(e)(4).

The requirements for a Part B permit application are given in 40 CFR Parts 264 and 270. To assist you in preparing a Part B permit application, I have enclosed some guidance material. Please provide one (1) original and three (3) copies of your Part B permit application to the Environmental Protection Agency's Region VI office no later than September 1, 1984. In your application, if any of the information is being submitted under a claim of confidentiality, please indicate this fact in the cover letter and by separating out the confidential information. (For more details on confidentiality, see 40 CFR Part 2.) Should you decide to withdraw your Part A permit application which you filed in November 1980, please contact this office within thirty (30) days from the receipt of this request.

Any questions regarding this request or the Part B permit requirements should be directed to Mr. Strad Will at (214) 767-3451 or Mr. Will Focht at (214) 767-9878. Also, we will be happy to meet with you to discuss the requested Part B application in more detail. You may also wish to contact Mr. Ray Sisneros of the New Mexico Environmental Improvement Division (NMEID) at (505) 984-0020 regarding NMEID's permitting requirements.

Sincerely yours,

Allyn M. Davis

Allyn M. Davis, Director
Air and Waste Management Division

Enclosure (Permit Applicants Guidance Manual)

cc: Raymond Sisneros, Manager
Environmental Improvement Division

0 5 4 4 0 9 2 4

APPENDIX C

NMEID NOTICE OF JOINT EPA/EID PART B CALL-IN

HEALTH & ENVIRONMENT department

STATE OF NEW MEXICO

ENVIRONMENTAL IMPROVEMENT DIVISION
P.O. Box 968, Santa Fe, New Mexico 87504-0968
(505) 984-0020
STEVEN ASHER, Director

TONEY ANAYA
GOVERNOR

JOSEPH GOLDBERG
SECRETARY

TED GUAMBANA
DEPUTY SECRETARY

JOSEPH F. JOHNSON
DEPUTY SECRETARY

April 23, 1984

CERTIFIED MAIL
RETURN RECEIPT REQUESTED

Mr. Harold Valencia
Area Manager
U.S. DOE Los Alamos National Laboratories
Los Alamos Area Office
Los Alamos, New Mexico 87544

Re: EPA ID Number NM0890010515

Dear Mr. Valencia:

This letter constitutes a formal notice of joint Part B call-in by the New Mexico Environmental Improvement Division (EID), Hazardous Waste Section. This is in reference to the U.S. Environmental Protection Agency's (EPA) formal request for your Part B permit on February, 1984. By notice of this letter, EPA will be the lead agency for the processing of your Part B application and, upon Final Authorization of the New Mexico program (January, 1985), EPA will transfer your permit application (at whatever point of progress) to EID for final processing.

EPA and EID are presently working on coordinating the processing of your permit application. Therefore, please submit a copy of your upcoming EPA Part B submission to our office at the following:

Mr. Peter H. Pache, Acting Program Manager
Hazardous Waste Section
New Mexico Environmental Improvement Division
P.O. Box 969
Santa Fe, New Mexico 87504

If you have any questions concerning the processing of your permit, please contact either Strad Will of EPA at (214) 767-3451 or Peter H. Pache of EID at (505) 984-0020, Ext. 340.

Sincerely,

Peter H. Pache
Acting Program Manager
Hazardous Waste Section

cc: Strad Will, EPA
Susan Stark, EPA

APPENDIX D

EPA REQUEST FOR LOS ALAMOS PART B ADDRESSING RADIOACTIVE/CHEMICAL MIXED WASTE

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION VI
INTERFIRST TWO BUILDING, 1201 ELM STREET
DALLAS, TEXAS 75270

August 7, 1984

Mr. Harold Valencia
Department of Energy
Albuquerque Operations
Los Alamos Area Office
Los Alamos, New Mexico 87544

Dear Mr. Valencia:

Recent developments regarding the Environmental Protection Agency (EPA)/Department of Energy (DOE) Memorandum of Understanding (MOU) have complicated the situation between EPA Region VI and the call-in of Los Alamos National Scientific Laboratory's (LANSL) Resource Recovery and Conservation Act (RCRA) Part B permit application. The radioactive-mixed hazardous wastes, as defined in the MOU, are subject to regulation under RCRA and were to be included in the submission of a Hazardous Waste Compliance Plan. EPA Headquarters has indicated that DOE agreed to include these wastes in the RCRA Part B permit application. As you know, EPA Region VI called-in LANSL's Part B on February 22, 1984, with a subsequent due date of September 1, 1984.

There are several important issues which have yet to be resolved in a manner agreeable to both EPA and DOE. Such as: which radioactive-mixed hazardous wastes are subject to regulation under RCRA, and authorized state participation in the permitting of these wastes. With the inclusion of these wastes in the Part B, security clearances for EPA and State officials will be essential to complete the review of the Part B.

Security clearances require at least six (6) months to process, as a result, those recently applied for by EPA and State officials will not be granted by September. Additionally, it does not appear that EPA and DOE will resolve the stated problems in a timeframe which allows LANSL to submit a complete Part B on September 1, 1984. Therefore, Region VI feels it is mutually beneficial to extend the due date for LANSL's Part B permit application to May 1, 1985. This extension should grant DOE and EPA adequate time to come to an agreement and provide sufficient time to LANSL to submit a complete Part B.

This letter, also, constitutes a formal request for your Part B permit application for those radioactive-mixed hazardous wastes designated by EPA and DOE to be subject to regulation under the Resource Conservation

1 of 2

and Recovery Act. This request is being made by EPA, as agreed upon by DOE, under the authority of 40 CFR 270.10(e)(4). If any of your information will be submitted under a claim of confidentiality or is considered classified, please include this fact in the cover letter and separate out the classified and/or confidential information.

Please provide one (1) original and three (3) copies of your RCRA Part B permit application to the Environmental Protection Agency Region VI office no later than May 1, 1985.

Any questions regarding this request or the Part B requirements should be directed to Ms. Jamie Wright at FTS 729-2614. We will be happy to meet with you to discuss the requested Part B in more detail.

Sincerely yours,

Allyn M. Davis

Allyn M. Davis, Director
Air and Waste Management Division

cc: Peter Pache, Program Manager
New Mexico Environmental Improvement Division

Steven Asher, Director
New Mexico Environmental Improvement Division

APPENDIX E

DEPARTMENT OF THE ARMY, CORPS OF ENGINEERS, FLOODPLAIN DOCUMENTATION

DEPARTMENT OF THE ARMY
ALBUQUERQUE DISTRICT, CORPS OF ENGINEERS
P. O. BOX 1580
ALBUQUERQUE, NEW MEXICO 87103-1580

November 20, 1984

REPLY TO
ATTENTION OF:

Engineering and Planning Division
Planning Branch

Mr. M. L. McCorkle
Mail Stop: E518
Los Alamos National Laboratory
Los Alamos, New Mexico 87545

Dear Mr. McCorkle:

In response to your letter of October 15, 1984 (HSE8-84-913) to Mr. Boyd Lare. I am providing the following four flood plain evaluations:

a. TA-54, area L is not in a 100-year flood plain.

b. TA-54, area G is not in a 100-year flood plain except for the "burial pits." The burial pits will collect rain that falls into the pits. Rainwater will drain, collect, and be confined to the lowest depressions in the pits.

c. TA-16, "S" site burn pits are not in a 100-year flood plain except for the northern portion of pad 388. More detailed site data are needed to accurately evaluate the flood plain at pad 388. There is a two-foot diameter culvert under the access road and adjacent to the northern edge of the pad. This culvert is subject to clogging by debris during intense thunderstorms such as the storm which would produce the 100-year flood plain.

d. TA-40, HE scrap burn pits are not in a 100-year flood plain.

The above flood plain information is based upon a September 5, 1984 site visit made by Mr. Boyd Lare and Mr. Thomas Ryan of my staff and on topographic information provided by Los Alamos National Laboratory from Lab. Job No. 5682 Plan/Topo Sheet No.s 2, 5, and 16.

If you should need further evaluation of TA-16, please call Mr. Boyd Lare at 766-3225 to discuss additional data needs.

Sincerely,

John J. Cunico, P.E.
Chief, Planning Branch
Engineering and Planning Division

APPENDIX F
PHYSICAL AND HYDROLOGIC CHARACTERISTICS OF THE BANDELIER TUFF

PHYSICAL CHARACTERISTICS OF THE BANDELIER TUFF

The Bandelier Tuff is formed by a series of ash flows and ash falls which are described as nonwelded, moderately welded, and welded tuff. The nonwelded, moderately welded, and welded tuff grade one into the other both vertically and horizontally.

The upper Tshirege Member is about 250 m thick along the western edge of the Pajarito Plateau and thins eastward to less than 15 m. Individual moderately welded and welded ash flows in the upper part of the Tshirege Member range from 6 to 40 m thick. Some of the uppermost ash flows are beveled off by erosion eastward across the plateau. Outliers of tuff overlie the Puye formation along Puye Escarpment. Most all ash flows thin eastward from the source area (Sierra de los Valles). Nonwelded ash flows of the Otowi Member may be as much as 90 m thick near the center of the plateau.

I. Welding

The welding process of an ash flow tuff begins after emplacement. The major factors affecting welding are heat at the time of emplacement, amount of volatiles in the mass, rate of cooling, and thickness of the ash flow. The degree of welding ranges from incipient stages marked by the cohesion of glassy fragments, to complete welding marked by the cohesion of the surfaces of glassy fragments accompanied by their deformation and the elimination of pore space.

Zonal variation of welding occurs vertically within individual flows or within a series of flows that have cooled as a single unit. Single ash flows or series of ash flow that have cooled as a unit may show a greater degree of welding near the center than near the upper and lower contacts. A series of ash flows that have been emplaced in rapid succession may cool as a single unit with the greatest degree of welding near the center.

Variation of welding occurs horizontally within individual flows with greater degree welding near the mountains (the source area). The degree of welding becomes less eastward across the plateau.

The tuffs in the Los Alamos area are classified according to the degree of welding--i.e., nonwelded, moderately welded, and welded tuffs. Welding results in increased cohesion and deformation of the glassy fragments in the tuff. Nonwelded tuff has high porosity, only slight cohesion of the glassy fragments, and crumbly fracture; moderately welded tuff has lesser porosity, moderate cohesion, slight deformation of the glassy fragments, and a somewhat brittle fracture; and welded tuff has lower porosity, good cohesion, a high degree of deformation by flattening of glassy fragments, and a brittle fracture.

The degree of welding influences most of the physical characteristics of the individual ash-flow tuff units.

The following shows a large range in porosity in each of the variations of tuff indicating that welding is only one of several factors determining porosity.

	Range in porosity (percent by volume)
Nonwelded tuff	40 to 60
Moderately welded tuff	30 to 55
Welded tuff	15 to 40

The surface of exposed tuff (nonwelded to welded) becomes "case hardened" as it is exposed to the weather. In this process, due to the porosity of the tuff, moisture is absorbed and some minerals are dissolved. The minerals are returned to the surface by evaporation as the tuff dries out where they are precipitated to form a rind. This rind forms a protective surface which resist the erosion of the surface by wind and water. However, exposed pumice fragments weather out rapidly leaving small cavities in tuff surface.

II. Density

The density of nonwelded tuff is lower than in welded tuff. This is due to the compaction of the matrix (glass shards and ash) and closer arrangement of the quartz and sanidine crystals, and rock fragments in a welded tuff. The specific gravity of the tuff matrix averages about 1.55. The range in bulk density of nonwelded to welded tuff depends on the porosity (i.e., the larger a porosity, the smaller the density).

The following table shows a comparison of the densities of pumice and the tuff (nonwelded towelded) with other rock types.

Rock Type	Range in density (gm/cm^3)
Pumice (nonwelded)	< 1.0
Nonwelded tuff	1.02-1.52
Moderately welded tuff	1.15-1.84
Welded tuff	1.52-2.16
Granite	2.64-2.76
Marble	2.60-2.84
Sandstone	2.14-2.36
Basalt	2.4 -3.1

III. Bearing Capacities

The bearing capacities of a tuff are dependent upon the density of tuff (i.e., the greater bearing capacities occur with the tuff of greater density). The density of the tuff is related to welding (i.e., density of the tuff increases from nonwelded tuff to welded tuff).

Data are available on the bearing capacities of the moderately welded tuff. The following table shows the relationship of density change to the resistance to crushing of a moderately welded tuff.

Density (gm/cm^3)	Resistance to Crushing (kg/m^2)
1.73	2.4×10^5
1.74	3.7×10^5
1.77	3.9×10^5
1.79 (probably with pumice inclusion)	3.4×10^5
1.81	4.8×10^5
1.83	5.6×10^5

Rock inclusions of pumice, rhyolite, and latite are found in the tuff. The frequency of occurrence of the rock fragments differs in individual ash flows and at different locations within the same ash flow.

The pumice fragments may be as much as 5 cm in length and 2 cm in diameter. The pumice is soft and friable. Pumice fragment inclusion in a small sample of the tuff would decrease the bearing capacity as failure would most likely occur within the pumice fragment. The rhyolite and latite fragments are dark gray, hard, and may be as much as five to seven cm across. These large rock fragments would add strength to the matrix of tuff.

The following table is a comparison of the bearing capacities of a moderately welded tuff (density 1.73 and ~ 1.82 g/cm^3) and miscellaneous rock type. The bearing capacity is computed as 1/5 of rupture strength of the material.

Rock Type	Bearing Capacity (kg/m^2)
Moderately welded tuff (1.73 g/cm^3)	4.7×10^4
Moderately welded tuff (1.82 g/cm^3)	1.1×10^5
Sandstone	3.4×10^5
Limestone	8.4×10^5
Marble	1.1×10^6
Granite	1.4×10^6

IV. Thermal Conductivity

The thermal conductivity of the tuff is inversely related to porosity, thus, the thermal conductivity of the nonwelded tuff would be less than a welded tuff as more pore space is available for insulation.

The only data available on the thermal conductivity was made of a moderately welded tuff in one area investigated. The following table is a comparison of the thermal properties of the tuff and miscellaneous rock types. A decrease in thermal conductivity increases the insulating value.

Rock Type	Range of Thermal Conductivity $\left(\frac{\text{cal, gm-cm}}{\text{hr x cm}^2 \text{ x oC}}\right)$
Moderately welded tuff	0.38-0.47
Limestone	4.9-11
Sandstone	9.9-20
Marble	17-25
Granite	16-35

V. Mineral Composition

The tuff is rhyolitic in composition and contains small rock fragments of rhyolite, latite and devitrified pumice and crystals and crystal fragments of sanidine and quartz, in a matrix of glass shards and welded ash. Dark minerals are scarce although traces of crystal fragments of biotite, hornblende, and pyroxene have been observed.

Seven samples of a moderately welded tuff were analyzed petrographically by C. S. Ross (written communication, July 7, 1960). Ross recalculated the proportions of phenocrysts in terms of proportion by weight. The results of all seven were similar, one of which is presented here:

Pore space	about 30 percent by volume
Phenocrysts	about 20 percent by weight
Sanidine	12 percent by weight
Quartz	6 percent by weight
Magnetite	1 percent by weight
Pyroxene	± 0.5 percent by weight

The ground mass is typical devitrified welded tuff. The devitrification products are very fine grained, but show typical cristobalite feldspar structure. Cavities contain radial groups of feldspar and tridymite. The rocks contain a few fragments of altered andesite, and some brown birefracting clay like material (probably montmorillonite).

VI. Chemical Composition

The color of the tuff ranges from very light gray to medium dark gray. Some units range from pinkish gray to light pink. Large fragments of pumice that appear much darker than the matrix in some units enchance the color of the tuff. Moderately welded units are generally lighter in color than the welded units. The coloring is inherent in the tuff and probably the result of minor changes in the chemical constituents and heat of emplacement.

In general the tuff is composed namely of silica and alumina. The range in chemical constituents is shown on the following table.

Chemical Constituents	Range (in percent)
Silica (SiO_2)	72.0-78.2
Alumina (Al_2O_3)	11.2-13.8
Ferric oxide (Fe_2O_3)	1.1-2.1
Ferrous oxide (FeO)	.21-.75
Magnesium oxide (MgO)	.02-.33
Calcium oxide (CaO)	.26-1.17
Sodium oxide (Na_2O)	3.5-4.5
Potassium oxide (K_2O)	4.2-4.7
Water (H_2O)	.15-2.8
Titanium oxide (TiO_2)	.10-.32
Phosphorous oxide (P_2O_5)	.10-.07
Manganese oxide (MnO)	.00-.98
Carbon dioxide (CO_2)	<.05

VII. Joints

Joints and joint systems are prominent in the Tshirege Member. The joints divide the rocks into polygonal blocks, many of which are prismatic or columnar.

The joints can be classified into two groups, master joints and minor joints. The term "master joint" signifies those joints that are numerically predominant, are most persistent in length, and pass through several groups of beds.

The master joints can be traced vertically across two or more units of the Tshirege Member. They are vertical or near vertical, dipping more than 80°. The overall vertical trends of the individual master joints are relatively straight; however, they curve slightly through individual units and upon entering a unit of different degree of welding, may be deflected slightly.

The minor joints dip at angles from about 40° to 80° and in most instances, intersect the master joints. These joints are not as persistent as master joints.

Master joint systems in Mortandad Canyon display orientation differences of about 60°. Joint systems mapped at Mesita del Buey also indicate orientation differences of 60°. The angular differences between these joint systems suggest that these sets are conjugate tension joints caused by shrinkage during cooling of the rocks.

HYDROLOGICAL CHARACTERISTS OF THE BANDELIER TUFF

The natural moisture content of the tuff forming the mesas between the eastward-trending canyons is generally less than five percent of volume. Thus, movement of moisture is under unsaturated conditions. The low moisture content of the tuff is caused by the protective cap of clay soil derived by weathering of the tuff near the surface and low rainfall and high evaportranspiration. The hydrologic characteristics of the tuff depend largely upon the degree of welding of the individual ash flows.

I. Hydrologic Effects of Soil

The surfaces of the finger-like mesas which form the Pajarito Plateau are covered by a clayey soil derived by weathering of the underlying tuff of the Tshirege Member. The soil is thickest near the axes of the mesas and thins toward the edges where the tuff is exposed. Thick sections of soil have also developed along slow draining arroyos cut into the surfaces of mesas and in relatively flat areas where water collects and stands, allowing some infiltration into the tuff. The greatest known thickness of soil is at Frijoles Mesa where 2.7 m was logged in a shallow test hole located in a relatively flat area.

Petrographic examination of the soil derived from the Tshirege Member was made by Staritzky of the Los Alamos Scientific Laboratory. He found that the size distribution of the "sand" fraction (greater than 50 microns in diameter) varied between 15 and 38 percent, the "silt" fraction (2 to 50 microns in diameter) varied between 58 and 73 percent, and the "clay fraction" (less than 2 microns in diameter) varied between 4 and 12 percent. Mineralogically, the principal constituents of the soil were quartz and feldspar, and the most important secondary constituents are the clay minerals, montmorillonite and illite. Montmorillonite is know to have the highest base-exchange capacity (85 to 100 millequivalents per 100 grams) and illite the next highest (25 to 30 millequivalents per 100 grams) among the clay minerals.

A study of the natural distribution of moisture in soil and in near surface tuff was made at Frijoles Mesa during a 2-year period. The moisture content in the soil cover, including the transition zone from the soil to weathered tuff, varied according to prevailing weather conditions. The moisture content was highest in March and April as the result of late winter snows and thawing and was generally lowest in the months of August through October owing to high evapotranspiration rates. Water from precipitation rarely infiltrated through the undisturbed soil cover into the underlying tuff and only in an extremely low moisture range (less than 5 percent moisture by volume) within the upper 1 m of the tuff.

The upper two units of moderately welded tuff (thickness about 36.5 m) at Frijoles Mesa blow air through open joints in response to a declining atmospheric pressure; therefore, the soil cover, which prevents most of the precipitation from infiltrating into the underlying tuff, also impedes the exchange of air from the atmosphere to the tuff.

II. Hydrologic Characteristics of Nonwelded, Moderately Welded and Welded Tuff

The hydrologic characteristics of tuff related to porosity, specific yield, specific retention, pore size distribution and hydrologic conductivity were determined of in six units of the Tshirege Member at Frijoles Mesa. These hydrologic characteristics were determined in the laboratory under saturated conditions. As saturated conditions rarely occur in the tuff, these parameters may be of only general interest.

The porosity of the tuff at Frijoles Mesa ranged from 19 to 54 percent by volume; the lowest porosities are in the welded tuffs. Specific yield and specific retention decrease with a decrease in porosity. Specific yield is greater than specific retention in a nonwelded tuff (high porosity); however, as the porosity decreases the difference becomes smaller and low porosity specific retention in a welded tuff may be greater than specific yield.

The relationship of porosity to pore size depends on the degree of welding, thickness of the flow, and position in the flow. The larger pore sizes and greater porosities are near the top of the flow and decrease vertically through the flow. This is due to the larger pores formed by escaping gases near the top and compaction and baking of the middle and lower portion of the flow as it cools.

The hydrologic conductivity is indirectly related to porosity depending upon pore size and the degree of interconnection of the pores. The permeability of the tuff matrix decreases with depth for the same reasons that the porosity decreases.

Hydrologic characteristics of the Tshirege Member of the Bandelier Tuff, as determined in the laboratory are shown in the following table.

Hydrologic Characteristics of the Tshirege Member at Frijoles Mesa

Hydrologic Characteristics						
Unit	Depth below surface of mesa (m)	Degree of welding	Porosity (percent)	Specific yield (percent)	Specific retention (percent)	Range of Hydrologic Conductivity (m/day)
6	0- 19.5	Moderate	38-54	18-34	16-27	0.004-0.25
5	19.5- 20.1	None (sand)	-	-	-	1.4-2.4
4	20.1- 41.1	Moderate	33-54	11-43	12-22	0.012-0.53
3	41.1- 53.3	Nonwelded	48	34	14	0.9
2	53.3- 83.5	Welded	19-37	.6-26	11-21	0.003-0.08
1B	83.5-152.7	Nonwelded	-	-	-	50-2.1

III. Movement of Water

The Tshirege Member is dry beneath the surfaces of the finger-like mesas. The moisture content of the tuff generally is less than 5

percent by volume, even though the specific retention ranges from 11 to 27 percent. Beneath the canyons which contain perennial or intermittent streams, the moisture content of the tuff may be as much as 60 percent by volume; however, the water movement through the tuff is as unsaturated flow. Test holes drilled through alluvium and into the tuff in Water and Mortandad Canyons penetrated thick sections (up to 55 m) of wet tuff (up to 60 percent moisture by volume); however, no free water moved into the test holes.

Instruments were used to measure moisture content of the bore wall in holes constructed in the tuff beneath the stream channel in upper Mortandad Canyon. These holes contained no free water, although the welded tuff beneath the stream contained as much as 25 percent moisture by volume. Specifically constructed moisture access holes in the tuff underlying water perched in the alluvium in lower Mortandad Canyon had moisture contents of the tuff as much as 45 percent by volume but the rock yielded no free water. The welded and nonwelded tuff in the canyon are transmitting water (high moisture content) downward by gravity into the tuff by unsaturated flow. There is some lateral movement by capillarity.

The water in the tuff moves as unsaturated flow. The majority of the pores are of capillary size. The energy relationship with moisture content of a moderately welded tuff was determined by Abrahams (Fig. 1). The saturated moisture content of the tuff was about 41 percent by volume. When moisture contents are below 4 percent there is no movement of water; from 4 to 8 percent moisture is redistributed by diffusion; from 8 to 23 percent distribution is by gravity and capillarity, and above 23 percent the movement is by drainage from gravity.

A study of the movement of water through the tuff was made at Mesita del Buey by adding water to an infiltration pit. The amount of water added was equivalent to 110 years of precipitation on the Pajarito Plateau. The movement of water from an infiltration pit was monitored by a series

of moisture access tubes set in the tuff and a neutron-scattering moisture probe and scaler. The average infiltration rate from a $1m^2$ pit under a constant head of 23 cm of water averaged about 0.34 m/day for a period of about 160 days. The wetted front moving into the tuff was sharpest during the first part of the test. After about 2 months of infiltration moisture had moved downward more than 4.5 m; moisture content ranged as follows: 35 percent by volume at 0.6 m below the pit, 30 percent at 0.9 m, 25 percent at 4 m, and 20 percent at 4.6 m.

IV. Hydrologic Effects of Welding

The uppermost ash flow at Frijoles Mesa exhibits zonal variations of welding in a single cooling unit which causes vertical changes in porosity. The moderately welded flow is about 24 m thick near the center of the mesa. The greatest porosities are in the upper and basal parts of the flow. Lesser porosities (zone of denser welding) are in the lower one-third of the flow, and pore size decreases with increased depth. The following table presents the hydrologic characteristics at different intervals in a single ash flow tuff.

Hydrologic Characteristics of an Ash-Flow Tuff at Frijoles Mesa

Height above base of flow (m)	Porosity (percent)	Specific yield (percent)	Specific retention (percent)	Hydrologic Conductivity (m/day)		Pore Size distribution (percent of porosity)	
				vert.	horiz.	>.01 mm	<.01 mm
17.9	54	35	19	10.082	-	-	-
14.3	50	34	16	0.12	0.12	39	61
14.3	54	38	16	0.25	0.21	26	74
12.2	51	34	17	0.16	0.16	20	80
8.8	49	28	21	0.041	-	-	-
6.7	41	24	17	0.004	0.082	20	80
6.1	47	27	20	0.082	0.082	15	85
5.8	42	23	19	0.041	0.033	-	-
3.6	38	18	20	0.037	0.041	-	-
0.3	51	33	18	0.041	-	17	83
0.3	49	24	25	0.037	0.082	20	80

A decrease in porosity in an ash flow tuff results in a decrease in specific yield and as the specific yield decreases, the specific retention increases proportionately (Fig. 2). The hydrologic conductivity is related to pore size and pore-size distribution rather than porosity. The permeability of the tuff matrix decreases at increased depth with a general decrease in the percentage of pore sizes greater than 0.1 mm.

Variations in vertical and horizontal permeability in the lower one third of the flow may be due to movement and compaction of the ash flow as it cooled. Movement of flow as it cools could result in elongation of the pores in a horizontal plane, and the greatest permeability probably is in this direction. Three of the five horizontal hydrologic conductivities in the lower one third of the flow are greater than the vertical conductivities; however, the conductivity measurements were taken in random directions and no attempt was made at orientation to the probable direction of movement of the flow.

V. Hydrologic Effects of Joints and Contacts

Joints and the fractures in the tuff are capable of transmitting fluid. The interconnection of the joint system is an important aspect of the hydrologic regime.

Joints in moderately welded to welded tuff of the Tshirege Member range from closed to open. Locally the amount of opening is as much a 5 cm; however, the majority of joints are open less than 1 cm. All joints terminating at the base of the soil zone, which covers the surfaces of the mesas, are filled with a light-brown clay. The depth of clay filling varies from 0.9 to 1.2 m below the soil zone at Mesita del Buey and Frijoles Mesa. The joint openings are plated with clay to depths of 21 m at Frijoles Mesa. Some of the joints are filled or plated with a light-gray clay. The light-gray clay is derived from weathering of the tuff and is composed of minerals leached from the tuff by water. This clay was precipitated along the joint openings prior to the development

of the soil zone. The joints are interconnected and master joints transect one or more flows. Joints are more numerous and open in ash flows of moderately welded to welded tuffs than in nonwelded tuff.

Joints in the moderately welded to welded tuffs will transmit depending upon availability of large volumes of water and the amount of opening and the degree of interconnection between different joint systems. More than 15,000 m^3 of drilling fluid was lost while drilling 300 m of Bandelier Tuff at Frijoles Mesa. Most of the loss was in the upper 150 m in the Tshirege Member which here consist of moderately welded to welded tuff in which open joints are numerous. During grouting of a casing in a large diameter hole at Frijoles Mesa (a 76 cm dia., 15.2 m depth casing filled with water to prevent collapse), the bottom seal in the casing ruptured and the water from within the casing drained into the formation within 3 hours. The number and orientation of joints in the hole were determined before the casing was installed. A joint near the bottom was open 1 to 3 cm for about 1.2 m. The 6.9 m^3 of water moved into the joint and downward into the joint systems of the underlying flow. Observation of another large-diameter hole 15.2 deep and located 7.6 m to the north failed to disclose a trace of the water.

The experiment at Mesita del Buey indicated that water from the infiltration pit (42 m^3 of water equivalent of 110 years of precipitation on the Pajarito Plateau) moved downward through a moderately welded tuff into a pumice zone which is more porous and permeable. Movement in the pumiceous zone was lateral. Infiltration into a moderately welded tuff underlying the pumice zone was from near the center of the saturated area in the pumiceous lense. The moisture content of the upper moderately welded tuff was much lower than the underlying pumiceous zone, which indicates that specific retention of the pumice zone is greater.

Vertical infiltration through the Tshirege Member would be affected by zonal variations of welding as well as by horizontal contacts between flows.

Vertical changes in hydrologic conductivity caused by contacts between flows tend to perch infiltrating water. In the stream channel in Mortandad Canyon, water is returned to the surface from underflow in the alluvium and in a moderately welded tuff at the contact with a nonwelded tuff.

Industrial wastes discharged into surface water in Acid Canyon move into the joints and tuff of the Tshirege Member, are perched on the top of the Otowi Member, and then move laterally along the contact into a seep area at the junction of Acid and Pueblo Canyons.

Results of an infiltration experiment in the soil near TA-50 indicated that precipitation that is not removed by surface drainage infiltrates into the soil on the mesas of the Pajarito Plateau; however, the downward movement of this water is impeded or stopped by the dense transition zone between the soil and tuff and the water is returned to the atmosphere by evapotranspiration. During this experiment, the amount of water added to the soil was equivalent to 50 years of precipitation on the Pajarito Plateau.

REFERENCES

Abrahams 1961: J. H. Abrahams, J. E. Weir, and W. D. Purtymun, "Distribution of Moisture in Soil and Near-Surface Tuff on the Pajarito Plateau, Los Alamos County, New Mexico," US Geol. Prof. Paper 424-D (1961).

Cooper 1965: J. B. Cooper, W. D. Purtymun, and E. C. John, "Records of Water Supply Wells Guaje Canyon 6, Pajarito Mesa 1, and Pajarito Mesa 2, Los Alamos, New Mexico, Basic Data Report," US Geol. Survey Open-File Report (July 1965).

Cushman 1965: R. L. Cushman, "An Evaluation of the Aquifer and Well Characteristics of the Municipal Well Fields in Los Alamos and Guaje Canyons near Los Alamos, New Mexico," US Geological Survey Water Supply Paper 1809-D (1965).

Griggs 1964: R. L. Griggs, "Geology and Ground Water Resources of the Los Alamos Area, New Mexico," US Geological Survey Water Supply Paper 1753 (1964).

Nyhan 1978: J. W. Nyhan, L. W. Hacker, T. E. Calhoun, and D. L. Young, "Soil Survey of Los Alamos County, New Mexico," Los Alamos Scientific Laboratory report LA-6779-MS (1978).

Purtymun 1971: W. D. Purtymun and W. R. Kennedy, "Geology and Hydrology of Mesita del Buey," Los Alamos Scientific Laboratory Report LA-4660 (1971).

Purtymun 1973: W. D. Purtymun, "Underground Movement of Tritium from Solid Waste Storage Shafts," Los Alamos Scientific Laboraotry LA-5286-MS (May 1973).

Purtymun 1974: W. D. Purtymun, F. C. Koopman, S. Barr, and W. E. Clements, "Air Volume and Energy Transfer Through Test Holes and Atmospheric Pressure Effects on the Main Aquifer," Los Alamos Scientific Laboratory report LA-5725-MS (1974).

Purtymun 1975: W. D. Purtymun, "Geohydrology of the Pajarito Plateau with Reference to Quality of Water: 1949-1972," Los Alamos National Laboratory Informal Report (December 1975).

Purtymun 1978: W. D. Purtymun, M. L. Wheeler, and M. A. Rogers, "Geologic Description of Cores from Holes P-3 MH-1 through P-3 MH-5, Area G, Technical Area 54," Los Alamos Scientific Laboratory report LA-7308-MS (May 1978).

Purtymun 1980A: W. D. Purtymun and H. Adams, "Geohydrology of Bandelier National Monument, New Mexico," Los Alamos Scientific Laboratory report LA-8461-MS (July 1980).

Purtymun 1980B: W. D. Purtymun, R. J. Peters, and J. W. Owens, "Geohydrology of White Rock Canyon of the Rio Grande from Otowi to Frijoles Canyon," Los Alamos Scientific Laboratory report LA-8635-MS (December 1980).

Purtymun 1984: W. D. Purtymun, "Hydrology of the Main Aquifer with Reference to Location of Additional Water Supply Wells," Los Alamos National Laboratory report LA-9957-MS (January 1984).

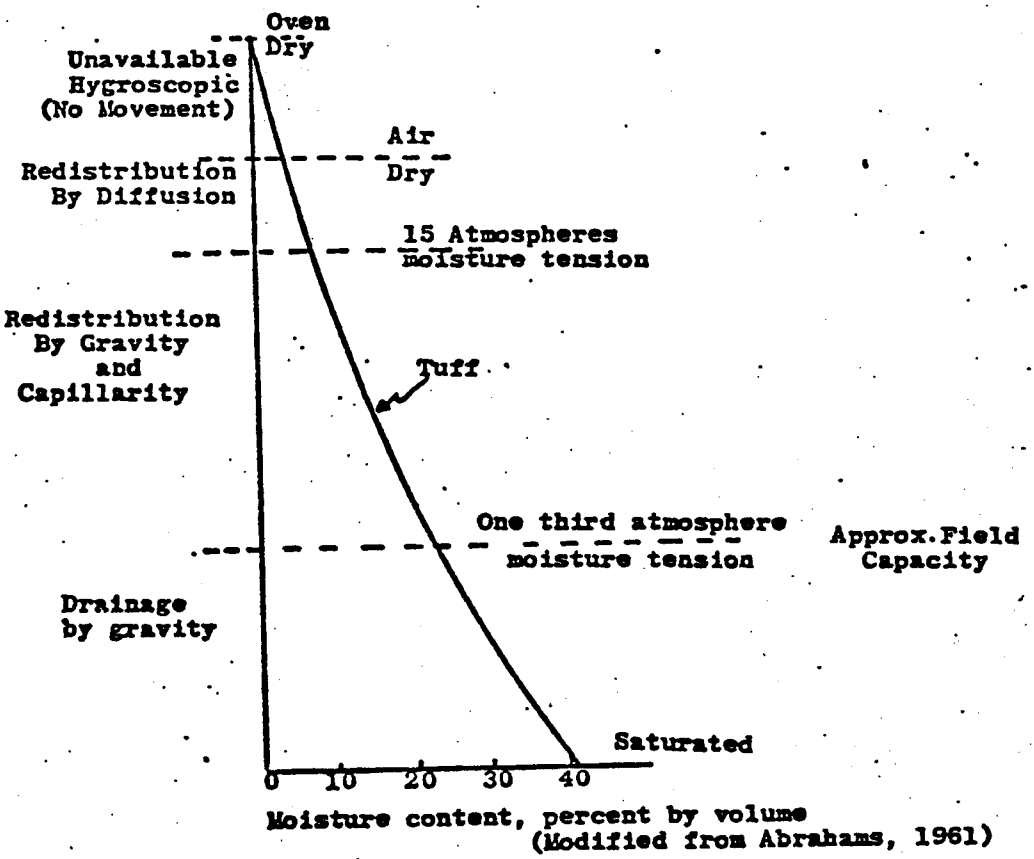


Figure 1. Energy relationships with moisture content of tuff.

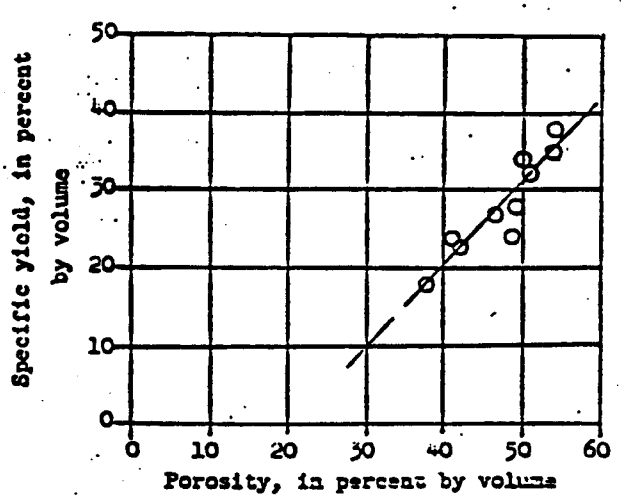


Figure 2. Relationship of specific yield to porosity of the tuff.

APPENDIX F-1

MAPS FROM "TA-3 TRAFFIC STUDY" DEPICTING VEHICULAR COUNT MOVEMENTS AT VARIOUS INTERSECTIONS

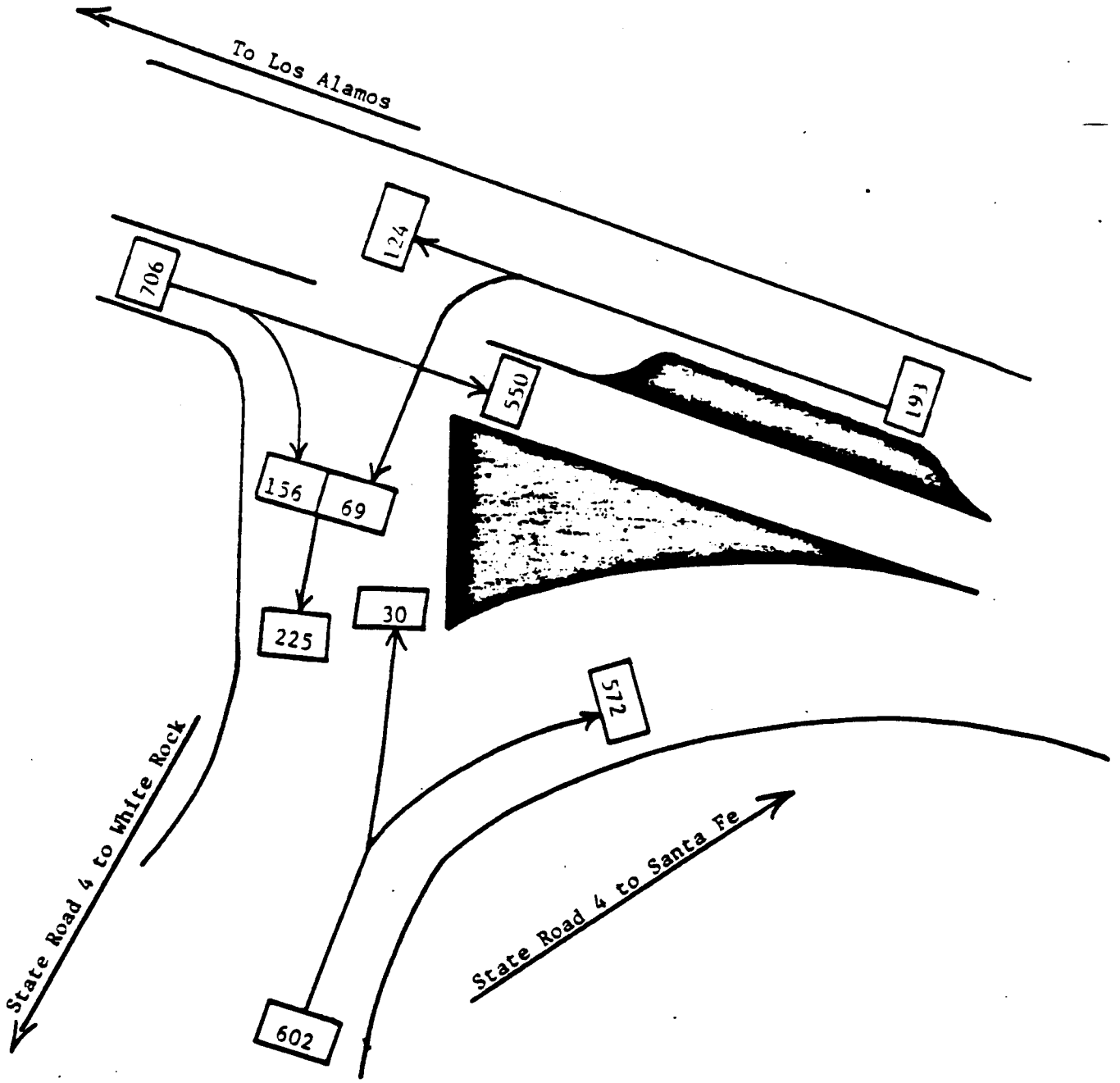
4/14/83
98

TRAFFIC ENGINEERING DEPARTMENT
OF LOS ALAMOS COUNTY

Vehicular traffic count movements at the intersection of the White Rock Wye. Evening

Date of Survey: 4/13/83
Taken for 1 hours
from: 4:30 to 5:30 pm
Day of Week Wednesday
Weather: Cloudy
Road surface: dry
Survey taken by:
Holcomb & Haas

Indicate North
by arrow



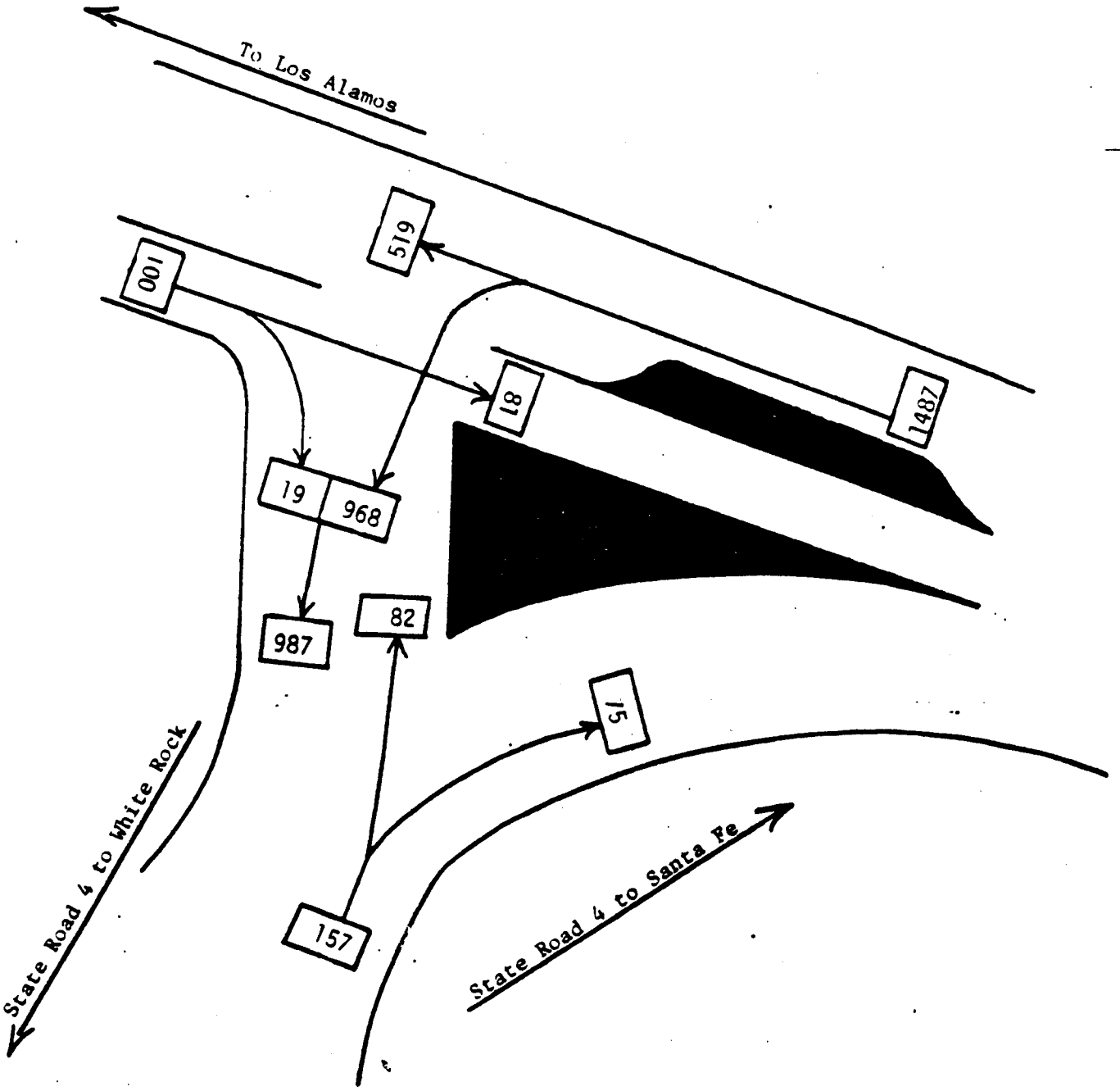
5/12/83

TRAFFIC ENGINEERING DEPARTMENT
OF LOS ALAMOS COUNTY

Vehicular traffic count movements at the intersection of the White Rock Wye.

Date of Survey: 5/9/83
Taken for 1 hours
from: 7:00 to 8:00
Day of Week Monday
Weather: Clear
Road surface: dry
Survey taken by:
Holcomb & Haas

Indicate North
by arrow



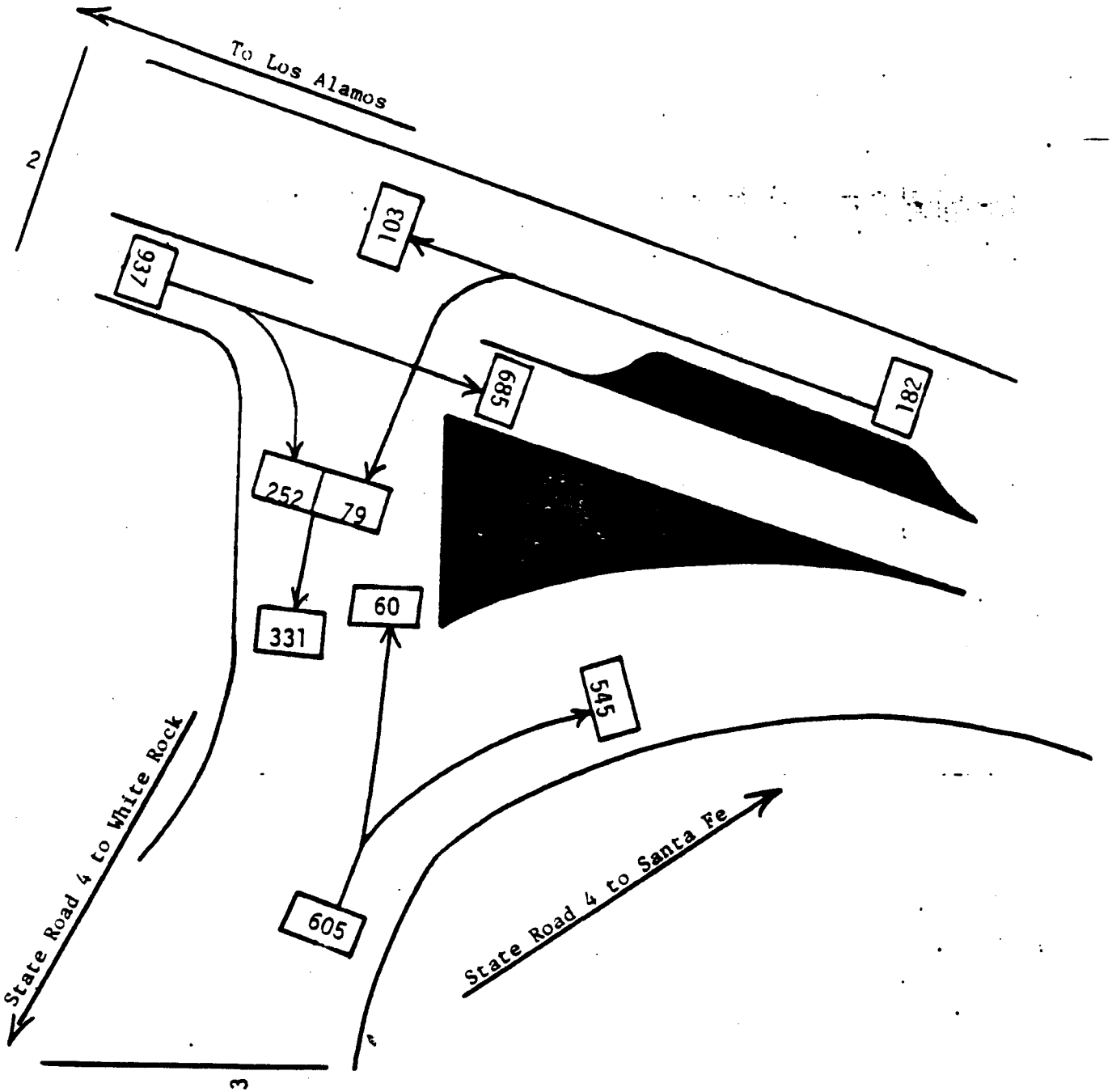
5/10/83
GB

TRAFFIC ENGINEERING DEPARTMENT
OF LOS ALAMOS COUNTY

Vehicular traffic count movements at the intersection of the White Rock Wye.

Date of Survey: 5/6/83
Taken for 1 hours
from: 4:30 to 5:30 pm
Day of Week Friday
Weather: Clear
Road surface: dry
Survey taken by:
Holcomb & Haas

Indicate North
by arrow



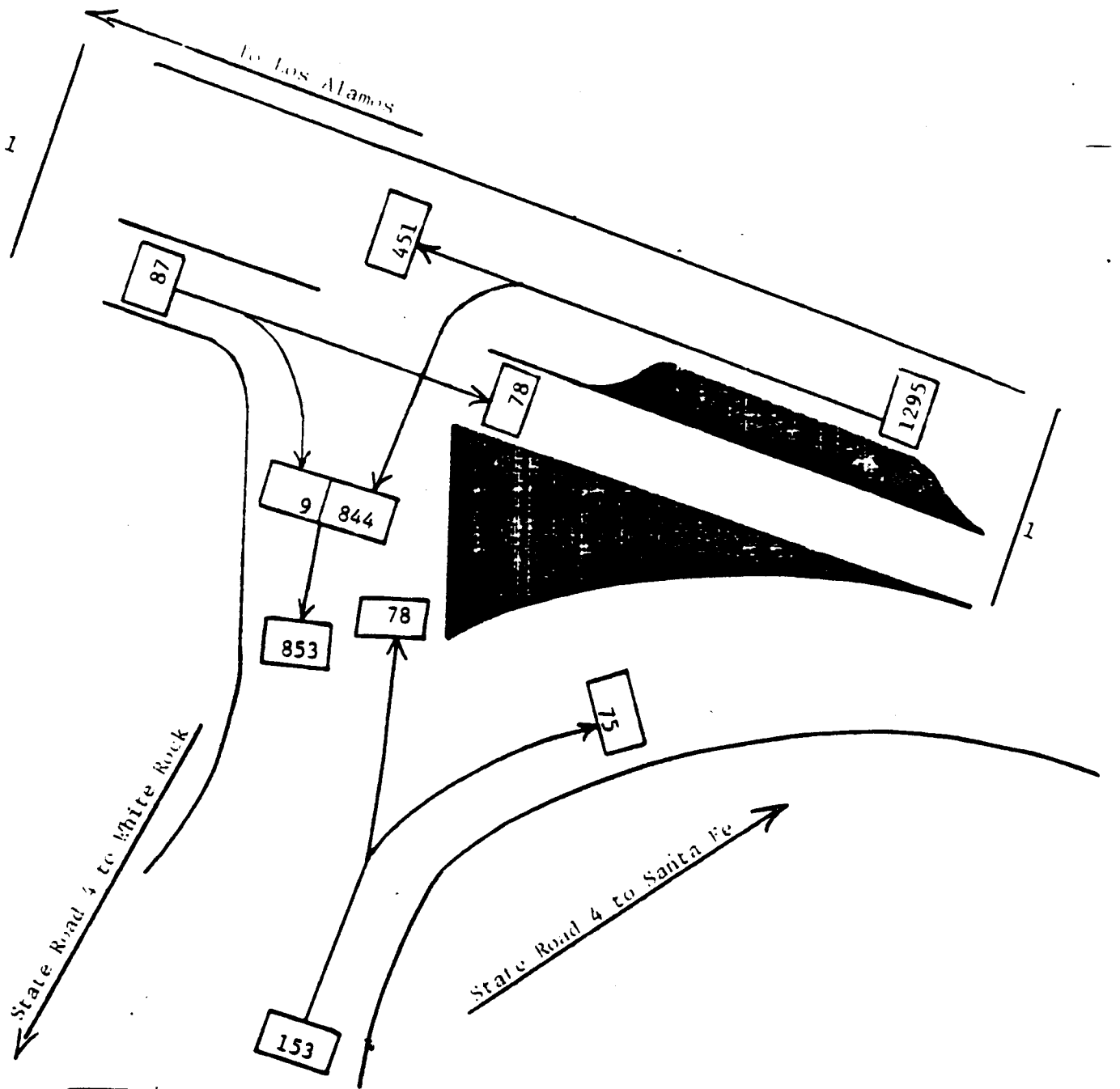
4/21/83
GB

TRAFFIC ENGINEERING DEPARTMENT
OF LOS ALAMOS COUNTY

Vehicular traffic count movements at the intersection of the White Rock Wye.

Date of Survey: 4/18/83
Taken for 1 hours
from: 7:15 to 8:15 am
Day of Week Monday
Weather: Clear
Road surface: dry
Survey taken by:
Holcomb & Haas

Indicate North
by arrow



APPENDIX G

REPRESENTATIVE WASTE INVENTORY AND ANALYSES

APPENDIX G

REPRESENTATIVE WASTE INVENTORY AND ANALYSES

EPA Hazardous Waste Number	Estimated Annual Quantity of Waste (lb)	Process/Disposal Codes (1)	Waste Type for Segregation (2)	Waste Materials (3)
P001	250(4)	S01, D80	O	Warfarin (H)
P002	250(4)	S01, D80	O	1-Acetyl-2-thiourea (H)
P003	250(4)	S01, D80	O	Acrolein (H)
P004	250(4)	S01, D80	O	Aldrin (H)
P005	250(4)	S01, D80	O	Allyl alcohol (H)
P006	250(4)	S01, T04, D80	R	Aluminum phosphide (H)
P007	250(4)	S01, D80	O	Muscimol (H)
P008	250(4)	S01, D80	O	4-Aminopyridine (H)
P009	250(4)	S01, T04, D80	R	Ammonium picrate (R)
P010	250(4)	S01, D80	M	Arsenic acid (H)
P011	250(4)	S01, D80	M	Arsenic pentoxide (H)
P012	250(4)	S01, D80	M	Arsenic trioxide (H)
P013	250(4)	S01, T01, D80	M	Barium cyanide (H)
P014	250(4)	S01, D80	O	Benzenethiol (H)
P015	6000	S01, D80	M	Beryllium dust (H)
P016	250(4)	S01, D80	O	Bis(chloromethyl) ether (H)
P017	250(4)	S01, D80	O	Bromoacetone (H)
P018	250(4)	S01, D80	O	Brucine (H)
P020	250(4)	S01, D80	O	Dinoseb (H)
P021	250(4)	S01, T01, D80	M	Calcium cyanide (H)
P022	250(4)	S01, T04, D80	O	Carbon bisulfide (H)
P023	250(4)	S01, D80	O	Chloroacetaldehyde (H)
P024	250(4)	S01, D80	O	p-Chloroaniline (H)
P026	250(4)	S01, D80	O	1-(o-Chlorophenyl) thiourea (H)
P027	250(4)	S01, D80	O	3-Chloropropionitrile (H)
P028	250(4)	S01, D80	O	Chloromethylbenzene (H)
P029	250(4)	S01, T01, D80	M	Copper cyanide (H)
P030	250(4)	S01, T01, D80	M	Cyanide salts (H)
P031	250(4)	S01, T04, D80	M	Cyanogen (H)
P033	250(4)	S01, T04, D80	M	Cyanogen chloride (H)
P034	250(4)	S01, D80	O	2-Cyclohexyl-4,6-dinitrophenol (H)
P036	250(4)	S01, D80	O	Dichlorophenylarsine (H)
P037	250(4)	S01, D80	O	Dieldrin (H)
P038	250(4)	S01, D80	O	Diethylarsine (H)
P039	250(4)	S01, D80	O	Disulfoton (H)
P040	250(4)	S01, D80	O	Thionazin (H)
P041	250(4)	S01, D80	O	Paraoxon (H)
P042	250(4)	S01, D80	O	Epinephrine (H)
P043	250(4)	S01, D80	A	Isoflurophate (H)
P044	250(4)	S01, D80	O	Dimethoate (H)
P045	250(4)	S01, D80	O	Thiofanox (H)
P046	250(4)	S01, D80	O	Phentermine (H)
P047	250(4)	S01, D80	O	Dinitrocresol (H)
P048	250(4)	S01, T04, D80	O	2,4-Dinitrophenol (H)
P049	250(4)	S01, D80	O	2,4-Dithiobiuret (H)
P050	250(4)	S01, D80	O	Endosulfan (H)
P051	250(4)	S01, D80	O	Endrin (H)
P054	250(4)	S01, T04, D80	O	Ethylenimine (H)
P056	250(4)	S01, T01, T04, D80	G	Fluorine (H)
P057	250(4)	S01, D80	O	Fluoroacetamide (H)
P058	250(4)	S01, D80	O	Fluoroacetic acid, sodium salt (H)
P059	250(4)	S01, D80	O	Heptachlor (H)
P060	250(4)	S01, D80	O	Hexachlorohexahydro-exo, (H) exo-dimethanonaphthalene

REPRESENTATIVE WASTE INVENTORY AND ANALYSES (Continued)

EPA Hazardous Waste Number	Estimated Annual Quantity of Waste (lb)	Process/Disposal Codes (1)	Waste Type for Segregation (2)	Waste Materials (3)
P062	250(4)	S01, D80	A	Tetraphosphoric acid, hexaethyl ester (H)
P063	250(4)	S01, T04, D80	CN	Hydrogen cyanide (H)
P064	250(4)	S01, T04, D80	A	Isocyanic acid, methyl ester (H)
P065	250(4)	S01, T04, D80	R	Mercury fulminate (R, T)
P066	250(4)	S01, D80	O	Methomyl (H)
P067	250(4)	S01, D80	O	1,2-Propylenimine (H)
P068	250(4)	S01, D80	O	Methylhydrazine (H)
P069	250(4)	S01, T04, D80	CN	2-Methyllactonitrile (H)
P070	250(4)	S01, D80	O	Aldicarb (H)
P071	250(4)	S01, T04, D80	O	Methyl parathion (H)
P072	250(4)	S01, D80	O	2-Naphthylthiourea (H)
P073	250(4)	S01, T01, T04, D80	M	Nickel tetracarbonyl (H)
P074	250(4)	S01, T01, D80	CN	Nickel cyanide (H)
P075	250(4)	S01, D80	O	Nicotine and salts (H)
P076	250(4)	S01, T01, T04, D80	G	Nitric oxide (H)
P077	250(4)	S01, T04, D80	O	p-Nitroaniline (H)
P078	250(4)	S01, T01, D80	G	Nitrogen dioxide (H)
P081	250(4)	S01, T04, D80	R	Nitroglycerine (R)
P082	250(4)	S01, D80	O	Dimethylnitrosamine (H)
P084	250(4)	S01, D80	O	N-Nitrosomethylvinylamine (H)
P085	250(4)	S01, D80	O	Schradan (H)
P087	250(4)	S01, D80	M	Osmium tetroxide (H)
P088	250(4)	S01, D80	O	Endothall (H)
P089	250(4)	S01, D80	O	Parathion (H)
P092	250(4)	S01, D80	M	Phenyulmecuric acetate (H)
P093	250(4)	S01, D80	O	N-Phenylthiourea (H)
P094	250(4)	S01, D80	O	Phorate (H)
P095	250(4)	S01, D80	O	Phosgene (H)
P096	250(4)	S01, T04, D80	G	Phosphine (H)
P097	250(4)	S01, D80	O	Famphur (H)
P098	250(4)	S01, T01, D80	CN	Potassium cyanide (H)
P099	250(4)	S01, T01, D80	CN	Potassium silver cyanide (H)
P101	250(4)	S01, D80	CN	Acrylonitrile (H)
P102	250(4)	S01, D80	O	Propargyl alcohol (H)
P103	250(4)	S01, D80	M	Selenourea (H)
P104	250(4)	S01, T01, D80	CN	Silver cyanide (H)
P105	250(4)	S01, D80	O	Sodium azide (H)
P106	250(4)	S01, T01, D80	CN	Sodium cyanide (H)
P107	250(4)	S01, T04, D80	S	Strontium sulfide (H)
P108	250(4)	S01, D80	O	Strychnidin-10-one, and salts (H)
P109	250(4)	S01, D80	O	Sulfotepp (H)
P110	250(4)	S01, D80	O	Tetraethyl lead (H)
P111	250(4)	S01, D80	O	Tetraethyl pyrophosphate(H)
P112	250(4)	S01, T04, D80	R	Tetranitromethane (R)
P113	250(4)	S01, D80	M	Thallic oxide (H)
P114	250(4)	S01, D80	M	Thallium selenite (H)
P115	250(4)	S01, D80	M	Thallium sulfate (H)
P116	250(4)	S01, D80	O	Thiosemicarbazide (H)
P118	250(4)	S01, D80	O	Trichloromethanethiol (H)
P119	250(4)	S01, D80	A	Vanadic acid, ammonium salt (H)
P120	250(4)	S01, D80	M	Vanadium pentoxide (H)
P121	250(4)	S01, T01, D80	CN	Zinc cyanide (H)
P122	250(4)	S01, T04, D80	R	Zinc phosphide (R, T)
P123	250(4)	S01, D80	O	Toxaphene (H)

REPRESENTATIVE WASTE INVENTORY AND ANALYSES (Continued)

EPA Hazardous Waste Number	Estimated Annual Quantity of Waste (lb)	Process/Disposal Codes (1)	Waste Type for Segregation (2)	Waste Materials (3)
U001	250(4)	S01, D80	O	Acetaldehyde (I)
U002	1000	S01, D80	O	Acetone (I)
U003	250(4)	S01, D80	O	Acetonitrile (I, T)
U004	250(4)	S01, D80	O	Acetophenone (T)
U005	250(4)	S01, D80	O	2-Acetylaminofluorene (T)
U006	250(4)	S01, T04, D80	R	Acetyl chloride (C, R, T)
U007	250(4)	S01, D80	O	Acrylamide (T)
U008	250(4)	S01, T04, D80	A	Acrylic acid (I)
U009	250(4)	S01, D80	O	Acrylonitrile (T)
U010	250(4)	S01, D80	O	Mytomycin-C (T)
U011	250(4)	S01, D80	O	Amitrole (T)
U012	250(4)	S01, D80	O	Aniline (I, T)
U014	250(4)	S01, D80	O	Auramine (T)
U015	250(4)	S01, D80	O	Azaserine (T)
U016	250(4)	S01, D80	O	3,4-Benzacridine (T)
U017	250(4)	S01, D80	O	Benzal chloride (T)
U018	250(4)	S01, D80	O	1,2-Benzanthracene (T)
U019	250(4)	S01, D80	O	Benzene (I, T)
U020	250(4)	S01, T04, D80	R	Benzenesulfonyl chloride (C, R)
U021	250(4)	S01, D80	O	Benzidine (T)
U022	250(4)	S01, D80	O	3,4-Benzopyrene (T)
U023	250(4)	S01, T04, D80	R	Benzotrichloride (C, R, T)
U024	250(4)	S01, D80	O	Bis(2-chloroethoxy) methane (T)
U025	250(4)	S01, D80	O	Dichloroethyl ether (T)
U026	250(4)	S01, D80	O	Chlornaphazine (T)
U027	250(4)	S01, D80	O	2,2 Oxybis-2-chloropropane (T)
U028	250(4)	S01, D80	O	Bis(2-ethylhexyl) phthalate (T)
U029	250(4)	S01, D80	G	Methyl bromide (T)
U030	250(4)	S01, D80	O	4-Bromophenyl phenyl ether (T)
U031	250(4)	S01, D80	O	n-Butyl alcohol (I)
U032	250(4)	S01, T01, D80	M	Calcium chromate (T)
U033	250(4)	S01, T04, D80	G	Carbon oxyfluoride (R, T)
U034	250(4)	S01, D80	O	Chloral (T)
U035	250(4)	S01, D80	O	Chlorambucil (T)
U036	250(4)	S01, D80	O	Chlordane (T)
U037	250(4)	S01, D80	O	Chlorobenzene (T)
U038	250(4)	S01, D80	O	Chlorobenzilate (T)
U039	250(4)	S01, D80	O	4-chloro-m-cresol (T)
U041	250(4)	S01, D80	O	Epichlorohydrin (T)
U042	250(4)	S01, T04, D80	O	Chloroethyl vinyl ether (T)
U043	250(4)	S01, T04, D80	G	Chloroethene (T)
U044	1000	S01, D80	O	Chloroform (T)
U045	250(4)	S01, T04, D80	G	Methyl chloride (I, T)
U046	250(4)	S01, D80	O	Chloromethoxymethane (T)
U047	250(4)	S01, D80	O	β-Chloronaphthalene (T)
U048	250(4)	S01, D80	O	o-Chlorophenol (T)
U049	250(4)	S01, D80	O	4-Chloro-o-toluidine, hydrochloride (T)
U050	250(4)	S01, D80	O	Chrysene (T)
U051	250(4)	S01, D80	O	Creosote (T)
U052	250(4)	S01, D80	O	Cresols (T)
U053	250(4)	S01, D80	O	Crotonaldehyde (T)
U055	250(4)	S01, D80	O	Cumene (I)
U056	250(4)	S01, D80	O	Cyclohexane (I)

REPRESENTATIVE WASTE INVENTORY AND ANALYSES (Continued)

EPA Hazardous Waste Number	Estimated Annual Quantity of Waste (lb)	Process/Disposal Codes (1)	Waste Type for Segregation (2)	Waste Materials (3)
U057	250(4)	S01, D80	O	Cyclohexanone (I)
U058	250(4)	S01, D80	O	Cyclophosphamide (T)
U059	250(4)	S01, D80	O	Daunomycin (T)
U060	250(4)	S01, D80	O	DDD (T)
U061	250(4)	S01, D80	O	DDT (T)
U062	250(4)	S01, D80	O	Diallate (T)
U063	250(4)	S01, D80	O	Dibenzanthracene (T)
U064	250(4)	S01, D80	O	Dibenzopyrene (T)
U066	250(4)	S01, D80	O	1,2-Dibromo-3-chloropropane (T)
U067	250(4)	S01, D80	O	Ethylene dibromide (T)
U068	250(4)	S01, D80	O	Methylene bromide (T)
U069	250(4)	S01, D80	O	Dibutyl phthalate (T)
U070	250(4)	S01, D80	O	o-Dichlorobenzene (T)
U071	250(4)	S01, D80	O	m-Dichlorobenzene (T)
U072	250(4)	S01, D80	O	p-Dichlorobenzene (T)
U073	250(4)	S01, D80	O	3,3-Dichlorobenzidine (T)
U074	250(4)	S01, D80	O	1,4-Dichloro-2-butene (T, I)
U075	250(4)	S01, T04, D80	G	Dichlorodifluoromethane (T)
U076	250(4)	S01, D80	O	1,1-Dichloroethane (T)
U077	250(4)	S01, D80	O	Ethylene dichloride (T)
U078	250(4)	S01, D80	O	1,1-Dichloroethylene (T)
U079	250(4)	S01, D80	O	1,2-Dichloroethylene (T)
U080	3000	S01, D80	O	Dichloromethane (T)
U081	250(4)	S01, D80	O	2,4-Dichlorophenol (T)
U082	250(4)	S01, D80	O	2,6-Dichlorophenol (T)
U083	250(4)	S01, D80	O	1,2-Dichloropropane (T)
U084	250(4)	S01, D80	O	1,3-Dichloropropene (T)
U085	250(4)	S01, D80	O	1,2:3,4-Diepoxybutane (I, T)
U086	250(4)	S01, D80	O	N,N-Diethylhydrazine (T)
U087	250(4)	S01, D80	O	O,O-Diethyl-s-methyl-dithiophosphate (T)
U088	250(4)	S01, D80	O	Diethyl phthalate (T)
U089	250(4)	S01, D80	O	Diethylstilbestrol (T)
U090	250(4)	S01, D80	O	Dihydrosafrole (T)
U091	250(4)	S01, D80	O	3,3-Dimethoxybenzidine (T)
U092	250(4)	S01, T04, D80	O	Dimethylamine (I)
U093	250(4)	S01, D80	O	Dimethylaminoazobenzene (T)
U094	250(4)	S01, D80	O	7,12-Dimethylbenzanthracene (T)
U095	250(4)	S01, D80	O	3,3-Dimethylbenzidine (T)
U096	250(4)	S01, T04, D80	R	γ-γ-Dimethylbenzylhydroperoxide (R)
U097	250(4)	S01, D80	O	Dimethylcarbamoyl chloride (T)
U098	250(4)	S01, D80	O	1,1-Dimethylhydrazine (T)
U099	250(4)	S01, D80	O	1,2-Dimethylhydrazine (T)
U101	250(4)	S01, D80	O	2,4-Dimethylphenol (T)
U102	250(4)	S01, D80	O	Dimethyl phthalate (T)
U103	250(4)	S01, D80	O	Dimethyl sulfate (T)
U105	250(4)	S01, D80	O	2,4-Dinitrotoluene (T)
U106	250(4)	S01, D80	O	2,6-Dinitrotoluene (T)
U107	250(4)	S01, D80	O	Di-n-octyl phthalate (T)
U108	250(4)	S01, T04, D80	O	1,4-Dioxane (T)
U109	250(4)	S01, D80	O	1,2-Diphenylhydrazine (T)
U110	250(4)	S01, D80	O	Dipropylamine (I)
U111	250(4)	S01, D80	O	Di-n-propylnitrosamine (T)
U112	250(4)	S01, T04, D80	O	Ethyl acetate (I)

REPRESENTATIVE WASTE INVENTORY AND ANALYSES (Continued)

EPA Hazardous Waste Number	Estimated Annual Quantity of Waste (lb)	Process/Disposal Codes (1)	Waste Type for Segregation (2)	Waste Materials (3)
U113	250(4)	S01, T04, D80	O	Ethyl acrylate (I)
U114	250(4)	S01, D80	O	1,2 Ethanediylbiscarbamodithioc acid (T)
U115	250(4)	S01, T04, D80	O	Ethylene oxide (I, T)
U116	250(4)	S01, D80	O	Ethylene thiourea (T)
U117	250(4)	S01, T04, D80	O	Ethyl ether (I)
U118	250(4)	S01, T04, D80	O	Ethyl methacrylate (T)
U119	250(4)	S01, D80	O	Ethyl methanesulfonate (T)
U120	250(4)	S01, D80	O	Benzo(j,k)fluorene (T)
U121	250(4)	S01, D80	O	Trichlorofluoromethane (T)
U122	250(4)	S01, D80	G	Formaldehyde (T)
U123	250(4)	S01, D80	A	Formic acid (C, T)
U124	250(4)	S01, D80	O	Furan (I)
U125	250(4)	S01, D80	O	Furfural (I)
U126	250(4)	S01, D80	O	Glycidylaldehyde (T)
U127	250(4)	S01, D80	O	Hexachlorobenzene (T)
U128	250(4)	S01, D80	O	Hexachlorobutadiene (T)
U129	250(4)	S01, D80	O	Hexachlorocyclohexane (T)
U130	250(4)	S01, D80	O	Hexachloropentadiene (T)
U131	250(4)	S01, D80	O	Hexachloroethane (T)
U132	250(4)	S01, D80	O	Hexachlorophene (T)
U133	250(4)	S01, T04, D80	R	Hydrazine (R, T)
U134	250(4)	S01, T01, T04, D80	G	Hydrogen fluoride (C, T)
U135	250(4)	S01, T04, D80	G	Hydrogen sulfide (T)
U136	250(4)	S01, D80	A	Cacodylic acid (T)
U137	250(4)	S01, D80	O	Indeno (1,2,3) pyrene (T)
U138	250(4)	S01, D80	O	Methyl iodide (T)
U139	250(4)	S01, D80	O	Iron dextran (T)
U140	250(4)	S01, D80	O	Isobutyl alcohol (I, T)
U141	250(4)	S01, D80	O	Isosafrole (T)
U142	250(4)	S01, D80	O	Kepone (T)
U143	250(4)	S01, D80	O	Lasiocarpine (T)
U144	250(4)	S01, D80	M	Lead acetate (T)
U145	250(4)	S01, D80	M	Lead phosphate (T)
U146	250(4)	S01, D80	M	Lead subacetate (T)
U147	250(4)	S01, D80	O	Maleic anhydride (T)
U148	250(4)	S01, D80	O	Maleic hydrazide (T)
U149	250(4)	S01, D80	O	Malononitrile (T)
U150	250(4)	S01, D80	O	Melphalan (T)
U151	250(4)	S01, D80	M	Mercury (T)
U152	250(4)	S01, D80	O	Methacrylonitrile (I, T)
U153	250(4)	S01, D80	G	Methanethiol (I, T)
U154	250(4)	S01, D80	O	Methanol (I)
U155	250(4)	S01, D80	O	Methapyrilene (T)
U156	250(4)	S01, D80	O	Methyl chlorocarbonate (I, T)
U157	1000	S01, D80	O	3-Methylcholanthrene (T)
U158	250(4)	S01, D80	O	4,4-Methylenebis[2-chloroaniline] (T)
U159	1000	S01, D80	O	Methyl ethyl ketone (I, T)
U160	250(4)	S01, T04, D80	R	Methyl ethyl ketone peroxide (R, T)
U161	250(4)	S01, D80	O	Methyl isobutyl ketone (I)
U162	250(4)	S01, D80	O	Methyl methacrylate (I, T)
U163	250(4)	S01, D80	O	N-Methyl-N-nitro-nitrosoguanidine (T)
U164	250(4)	S01, D80	O	Methylthiouracil (T)

REPRESENTATIVE WASTE INVENTORY AND ANALYSES (Continued)

EPA Hazardous Waste Number	Estimated Annual Quantity of Waste (lb)	Process/Disposal Codes (1)	Waste Type for Segregation (2)	Waste Materials (3)
U165	250(4)	S01, D80	O	Naphthalene (T)
U166	250(4)	S01, D80	O	1,4-Naphthalenedione (T)
U167	250(4)	S01, D80	O	1-Naphthylamine (T)
U168	250(4)	S01, D80	O	2-Naphthylamine (T)
U169	250(4)	S01, D80	O	Nitrobenzene (I, T)
U170	250(4)	S01, D80	O	p-Nitrophenol (T)
U171	250(4)	S01, T04, D80	O	2-Nitropropane (I)
U172	250(4)	S01, D80	O	N-Nitrosodi-n-butylamine (T)
U173	250(4)	S01, D80	O	N-Nitrosodiethanolamine (T)
U174	250(4)	S01, D80	O	N-Nitrosodiethylamine (T)
U176	250(4)	S01, D80	O	N-Nitroso-N-ethylurea (T)
U177	250(4)	S01, D80	O	N-Nitroso-N-methylurea (T)
U178	250(4)	S01, D80	O	N-Nitroso-N-methylurethane (T)
U179	250(4)	S01, D80	O	N-Nitrosopiperidine (T)
U180	250(4)	S01, D80	O	N-Nitrosopyrrolidine (T)
U181	250(4)	S01, D80	O	2-Methyl-5-nitrobenzenamine (T)
U182	250(4)	S01, D80	O	Paraldehyde (T)
U183	250(4)	S01, D80	O	Pentachlorobenzene (T)
U184	250(4)	S01, D80	O	Pentachloroethane (T)
U185	250(4)	S01, D80	O	Pentachloronitrobenzene (T)
U186	250(4)	S01, D80	O	1,3-Pentadiene (I)
U187	250(4)	S01, D80	O	Phenacetin (T)
U188	250(4)	S01, D80	O	Phenol (T)
U189	250(4)	S01, T04, D80	R	Phosphorous sulfide (R)
U190	250(4)	S01, D80	O	Phthalic anhydride (T)
U191	250(4)	S01, D80	O	2-Picoline (T)
U192	250(4)	S01, D80	O	Pronamide (T)
U193	250(4)	S01, D80	O	1,3-Propane sulfone (T)
U194	250(4)	S01, D80	O	n-Propylamine (I, T)
U196	250(4)	S01, D80	O	Pyridine (T)
U197	250(4)	S01, D80	O	p-Benzoquinone (T)
U200	250(4)	S01, D80	O	Reserpine (T)
U201	250(4)	S01, D80	O	Resorcinol (T)
U202	250(4)	S01, D80	O	Saccharin and salts (T)
U203	250(4)	S01, D80	O	Safrole (T)
U204	250(4)	S01, D80	M	Selenious acid (T)
U205	250(4)	S01, T04, D80	R	Selenium disulfide (R, T)
U206	250(4)	S01, D80	O	Streptozotocin (T)
U207	250(4)	S01, D80	O	1,2,4,5-Tetrachlorobenzne (T)
U208	250(4)	S01, D80	O	1,1,1,2-Tetrachloroethane (T)
U209	250(4)	S01, D80	O	1,1,2,2-Tetrachloroethane (T)
U210	500(4)	S01, D80	O	Tetrachloroethylene (T)
U211	250(4)	S01, D80	O	Carbon tetrachloride (T)
U212	250(4)	S01, D80	O	2,3,4,6-Tetrachlorophenol (T)
U213	250(4)	S01, T04, D80	O	Tetrahydrofuran (I)
U214	250(4)	S01, D80	M	Thallium acetate (T)
U215	250(4)	S01, D80	M	Thallium carbonate (T)
U216	250(4)	S01, D80	M	Thallium chloride (T)
U217	250(4)	S01, T04, D80	M	Thallium nitrate (T)
U218	250(4)	S01, D80	O	Thioacetamide (T)
U219	250(4)	S01, D80	O	Thiourea (T)
U220	1000	S01, D80	O	Toluene (T)

REPRESENTATIVE WASTE INVENTORY AND ANALYSES (Continued)

EPA Hazardous Waste Number	Estimated Annual Quantity of Waste (lb)	Process/Disposal Codes (1)	Waste Type for Segregation (2)	Waste Materials (3)
U221	250(4)	S01, D80	O	Toluenediamine (T)
U222	250(4)	S01, D80	O	o-Toluidine hydrochloride (T)
U223	1000	S01, D80	R	Toluene diisocyanate (R, T)
U225	250(4)	S01, D80	O	Bromoform (T)
U226	1500	S01, D80	O	1,1,1-Trichloroethane (T)
U227	250(4)	S01, D80	O	1,1,2-Trichlorethane (T)
U228	2000	S01, D80	O	Trichloroethylene (T)
U230	250(4)	S01, D80	O	2,4,5-Trichlorophenol (T)
U231	250(4)	S01, D80	O	2,4,6-Trichlorophenol (T)
U232	250(4)	S01, D80	O	2,4,5-Trichlorophenoxyacetic acid (T)
U233	250(4)	S01, D80	O	Silvex (T)
U234	250(4)	S01, T04, D80	R	syn-Trinitrobenzene (R, T)
U235	250(4)	S01, D80	O	Tris (2,3-dibromopropyl) phosphate (T)
U236	250(4)	S01, D80	O	Trypan blue (T)
U237	250(4)	S01, D80	O	Uracil mustard (T)
U238	250(4)	S01, D80	O	Ethyl carhamate (T)
U239	1000	S01, D80	O	Xylene (I)
U240	250(4)	S01, D80	O	2,4-D, salts and esters (T)
U242	250(4)	S01, D80	O	Pentachlorophenol (T)
U243	250(4)	S01, D80	O	Hexachloropropene (T)
U244	250(4)	S01, D80	O	Thiram (T)
U246	250(4)	S01, D80	M	Bromine cyanide (T)
U247	250(4)	S01, D80	O	Methoxychlor (T)

(1) S01 - Temporary Storage; D80 - Landfill Disposal; T01 - Tank Treatment; T04 - Thermal Treatment

(2) O - Organic Solvent Waste; R - Reactive Metals and Compounds; M - Non-reactive Metals, Salts and Compounds; A - Acids; CN - Cyanide Waste; G - Gases

(3) Potential hazardous property of a waste material cited is indicated as follows: (T) toxic; (I) ignitable; (R) reactive; (C) corrosive; (H) acutely hazardous

(4) Waste is generated in lab pack quantities only.

APPENDIX H

SAMPLE WASTE DISPOSAL RECORDS

Los Alamos

Los Alamos National Laboratory
Los Alamos, New Mexico 87545

CHEMICAL WASTE DISPOSAL REQUEST

Disposal Form Number(s)
This information is to be filled in by H-7 personnel.

Requested by	Telephone number	Group	Date

Location: Tech Area , building, area/wing, room number.

Number of Containers	Volume of Containers	Chemical Name	Solid(S) Liquid(L) Gas(G)	Hazards	Removed

Reviewed for disposal by

Other useful information

HS Form Number 10 - 3A (12/82) *Mail this form to Waste Management (H-7), Mail Stop E516*

H-1

FORM H-1

FORM H-2

Los Alamos

Los Alamos National Laboratory
Los Alamos, New Mexico 87545

LOS ALAMOS HAZARDOUS CHEMICAL WASTE DISPOSAL RECORD

1 Form Number	L = Lab Pack S = Secondary N = Other
H 8	

2 Date
M M D D Y Y

PRIMARY WASTE

3 Origin Of Waste					4 HSE-7	5 RCRA	6 WASTE	7 Storage
Group	TA	Bldg.	Wing	Room	Code	Code	Code	Code

8 Waste Description

9 Numbers Of Waste Packages						10 Gross Volume	L = Liter G = Gallon M = Meter 3 F = Feet3	11 Gross Weight	K = Kilogram P = Pound T = Ton
Plastic	Card Board	Drums		Wooden Crates			Units		Units
Bags	Boxes	No.	Gal.	No.	Volume - ft. 3				

12 Treatment Code(s)	13 Disposal/Treatment Performed By	14 Disposal Code	15 Disposal Date
			M M D D Y Y

16 Disposal Location					
TA	Shaft	Pit	Post(s)	Layer	Pond

HSE-7 Representative(s)

SECONDARY WASTE

17 HSE-7 Code	18 RCRA Code	19 Waste Code	20 Waste Description

21 Numbers Of Waste Packages				22 Gross Volume	L = Liter G = Gallon M = Meter3 F = Feet3	23 Gross Weight	K = Kilogram P = Pound T = Ton
Drums					Units		Units
No.	Gal.	No.	Gal.				

24 Treatment Code(s)	25 Disposal/Treatment Performed By	26 Disposal Code	27 Disposal Date
			M M D D Y Y

HSE-7 Representative(s)

28 Disposal Location					
TA	Shaft	Pit	Post(s)	Layer	Pond

HS Form Number 10-3B (3/84)

FORM H-3

CHEMICALS IN LABPACK DRUM

ANALYSES PERFORMED

Tested For	Original Concentration	Final Concentration *(After Treatment)*

FORM H-4

LABORATORY ANALYSES

SAMPLE SUBMITTED BY				DATE:	
ORIGIN OF SAMPLE (S)					
GENERAL DESCRIPTION RANGE OF ACTIVITY					
DATE SAMPLE COLLECTED					
Test/Analysis	Result/Conc	By (Initials)	Test/Analysis	Result/Conc	By (Initials)
REMARKS:					

APPROVED: _____ Chief Chemist DATE: _____

Lab Copy
H7-LAB-35

LABORATORY ANALYSES

SAMPLE SUBMITTED BY				DATE:	
ORIGIN OF SAMPLE (S)					
GENERAL DESCRIPTION RANGE OF ACTIVITY					
DATE SAMPLE COLLECTED					
Test/Analysis	Result/Conc	By (Initials)	Test/Analysis	Result/Conc	By (Initials)
REMARKS:					

APPROVED: _____ Chief Chemist DATE: _____

Lab Copy
H7-LAB-35

FORM H-5

LABORATORY ANALYSES

SAMPLE SUBMITTED BY:									
ORIGIN OF SAMPLE(S)							DATE:		
DATE SAMPLED		DATE BEGUN	METHOD	ANALYZED BY	DESCRIPTION		DATE BEGUN	METHOD	ANALYZED BY
Test/Analysis	Result/Conc				Test/Analysis	Result/Conc			
REMARKS:									

H7-LAB-35A

APPROVED: _____ DATE: _____
Chief Chemist

Lab Copy

APPENDIX I

DETAILED SPECIFICATIONS AND PLANS FOR TA-50 BATCH TREATMENT SYSTEM

-0089C

CONTRACT NO. DE-AC32-80AL13151

CONSTRUCTION SPECIFICATION
FOR
UPGRADING OF INDUSTRIAL LIQUID WASTE TREATMENT PLANT

MODIFICATION SPECIFICATION NO. 3

UPGRADING OF BATCH WASTE TREATMENT SYSTEM

REVISED

May 24, 1983

by

Los Alamos National Laboratory

CONSTRUCTION SPECIFICATION
FOR
UPGRADING OF INDUSTRIAL LIQUID WASTE TREATMENT PLANT

MODIFICATION SPECIFICATION NO. 3
UPGRADING OF BATCH WASTE TREATMENT SYSTEM

SUBMITTED _____ DATE 2-24-83
The Ralph M. Parsons Company

RECOMMENDED _____ DATE 2/24/83
Los Alamos National Laboratory

APPROVED _____ DATE 2/24/83
U.S. Department of Energy

REVISION _____ for DATE 5/25/83
Los Alamos National Laboratory
for (Technical Manager)
(Engineering Manager)

I. DESCRIPTION OF WORK

The work consists of furnishing, installing, and constructing a Batch Waste Treatment System, including treatment vessels, heat exchanger, pumps, piping, valves, platforming, floor curbing, partition walls, modifications to existing fume hood, drum and truck loading and unloading stations, power, and instrumentation as indicated on the drawings and in accordance with this Specification.

II. TECHNICAL PROVISIONS

Reference is made to Specifications for Upgrading of Industrial Liquid Waste Treatment Plant, Invitation No. DE-FB32-81AL16099, May 8, 1981, and all Amendments and Changes, and as follows:

1.0 GENERAL REQUIREMENTS

General Requirements shall be in accordance with Division 1.0, except as follows:

a. Par. 1.2 Work to be Performed by Others. Add as follows:

3. Demolition and removal of all existing equipment, furnishings, facilities, and services in Room 24 of Bldg. WM-1 at TA-50 as required to interface with the construction.

b. Par. 1.3.2 Schedule. Delete second sentence and Par. 1.3.2.1, 1.3.2.2, 1.3.2.3, and 1.3.2.4. Add the following: The Contractor shall provide, as a minimum, three weeks written notice to the Contracting Officer prior to commencing work within Room 24 of Bldg. WM-1 at TA-50, to allow for required demolition and removals by the Government.

c. Par. 4.4 Descriptive Submittal List. Delete all Submittal Package Nos. except 10001, 30101, 90601, 150301, 150302, 151101, and 151102.

2.0 NOT USED

3.0 CONCRETE

3.01 Cast-In-Place Concrete

Cast-In-Place Concrete shall be in accordance with Subdivision 3.01.

4.0 NOT USED

5.0 METALS

5.01 Structural Steel and Miscellaneous Metals

Structural Steel and Miscellaneous Metals shall be in accordance with Subdivision 5.01.

6.0 NOT USED

7.0 NOT USED

8.0 DOORS AND WINDOWS

8.01 Metal Doors and Frames

Metal Doors and Frames shall be in accordance with Subdivision 8.01.

8.02 Not Used

8.03 Not Used

8.04 Hardware

Hardware shall be in accordance with Subdivision 8.04.

8.05 Not Used

9.0 FINISHES

9.01 Not Used

9.02 Gypsum Wallboard

Gypsum Wallboard shall be in accordance with Subdivision 9.02.

9.03 thru 9.05 Not Used

9.06 Special Coating

Special Coating shall be in accordance with Subdivision 9.06. All new non-stainless steel surfaces, the north wall of Room 24, and the curbed floor area shall be special coated.

9.07 Not Used

9.08 Not Used

10.0 NOT USED

11.0 NOT USED

12.0 NOT USED

13.0 SPECIAL CONSTRUCTION

13.01 Not Used

13.02 Not Used

13.03 Pressure Vessels

Pressure Vessels shall be in accordance with Subdivision 13.03, except as follows:

a. Par. 2.1.2 Technical Requirements. Add as follows:

Tag No.	Name	Data Sheet
[redacted]		
TK-21	Reactor	13.03-11
TK-22	Blowdown Tank	13.03-12

b. Add Par. 2.7 Kynar Lining, as follows:

Surfaces to be lined shall be free from all sharp corners, edges, and projections, and shall have inside edges of nozzles and corners rounded to a radius of at least 1/8 inch. Kynar (polyvinylidene fluoride) lining shall consist of alternate layers of carbon veil or mat and Kynar dispersion compound, with a final Kynar dispersion seal coat. The lining shall be not less than 0.060 inches thick, and the final seal coat shall be not less than 0.010 inches thick, as determined by visual comparator and/or micrometer reading. The lining shall extend through all nozzles and cover the raised faces of all flanges. The finished lining shall be pinhole free when tested with a dc Spark Tester at 3000 Volts. Test results shall be documented and submitted to the Contracting Officer for approval.

c. Add Data Sheets 13.03-10, 13.01-11, and 13.03-12, as included herein.

13.04 thru 13.12 Not Used

13.13 Heat Exchangers

Heat Exchangers shall be in accordance with Subdivision 13.13 as included herein.

14.0 NOT USED

15.0 MECHANICAL

15.01 Piping

Piping shall be in accordance with Subdivision 15.01, except as follows:

a. Add the following services to Class AD: treated industrial waste, chemical gas, chemical liquid, acid vent, vent.

b. Add the following service to Class ND: chlorine.

c. Add Class NV in accordance with Piping Material Specification included herein.

d. Par. 3.7.4 Color Codes. Add the following identification colors:

Lettered Legend	Identification Band Color	Service Legend Color
Industrial Waste	Yellow	Black
Treated Industrial Waste	Yellow	Black
Chemical Gas	Yellow	Black
Chemical Liquid	Yellow	Black
Acid Waste	Yellow	Black
Acid Vent	Yellow	Black
Vent	Yellow	Black

e. Par. 3.10 Pressure Testing. Add as follows: Piping for compressed air and chemical gas shall be pneumatically tested per ANSI B31.1, Par. 137.4.5, because water is detrimental to these systems. All other piping shall be hydrostatically tested.

f. Add Piping - Specialty Items as included herein.

15.03 thru 15.09 Not Used

15.10 Control Instrumentation

Control Instrumentation shall be in accordance with Subdivision 15.10 except as follows:

a. Delete Par. 2.5 through 2.9.

b. [redacted]

Replace Data Sheet Nos. identified in sub-paragraph (2) with 43, 44.

c. Delete Par. 2.11 through 2.15.

d. Par. 2.16 Pressure Control Valves. Delete Tag Nos. and Data Sheet Nos. shown. Add as follows:

Tag No.	Data Sheet No.
PCV-226	45

e. Par 2.17 Pressure Gages. Delete Tag Nos. and Data Sheet Nos. shown. Add as follows:

Tag No.	Data Sheet No.
PI-203	46
PI-225	46

f. Par. 2.18 Safety and Relief Valves. Delete Tag Nos. and Data Sheet Nos. shown. Add as follows:

Tag No.	Data Sheet No.
PSV-205	47

g. Par. 2.19 Temperature Instruments. Delete Tag Nos. and Data Sheet Nos. shown. Add as follows:

Tag No.	Data Sheet No.
TE/TT-198A	48, 49

The flanged thermowell shall be Hastelloy rather than stainless steel. The Contractor shall coordinate the length of the element and well with the tank and agitator construction to assure no interference.

h. Par. 2.20 Bi-Metal Dial Thermometers. Delete Tag Nos. and Data Sheet Nos. shown. Add as follows:

Tag No.	Data Sheet No.
TI-263	50

i. Par. 2.21 Solenoid Valves. Delete Tag Nos. and Data Sheet Nos. shown. Add as follows:

Tag No.	Data Sheet No.
ZZ-222	51
ZZ-223	51

j. Par. 2.22. Revise title and first paragraph to read "Level and Temperature Indicator Receivers". Delete Tag Nos. and Data Sheet Nos. shown. Add as follows:

Tag No.	Data Sheet No.
LI-198	52
TI-198A	52

k. Add as follows:

2.23 RUPTURE DISCS

The Contractor shall provide rupture discs as specified herein and on the following Data Sheets:

Tag No.	Data Sheet No.
RD-227	53

Rupture discs shall have seals, discs, liners, covers, and retaining rings bolted together as one unit, and shall include the required ASME Code data on a permanently attached tab.

2.24 pH AND ORP ANALYZERS

The Contractor shall provide pH and ORP (oxidation reduction potential) analyzers as specified herein and on the following Data Sheets:

Tag No.	Data Sheet No.
AE-199A (pH)	54
AE-199B (ORP)	54
AIT-199A (pH)	54
AIT-199B (ORP)	54

The pH and ORP analyzers shall consist of the following components:

(1) Electrode station with pre-amplifier (transmitter) and probe.

(2) Monitor (microprocessor) and local indicator readout.

(3) Interconnecting cable and mounting hardware as specified on the Data Sheet.

The monitor and local indicator readout, and the electrode station with pre-amplifier, shall be housed in a NEMA 4 enclosure.

The electrical input power source to the AIT unit shall be 120V, 60 Hz, single phase. The enclosure shall have provisions and hardware for mounting on a flat plate.

Interconnecting cable shall be 20 feet long with 3/4 inch NPT connections. The cable inner and outer jacket insulation shall be non-PVC and flame retardant.

The pH analyzer shall be capable of display from 0.00 to 14.00 by four digit direct readout. Sensing range shall be 4.00 to 10.00 pH and adjustable to a minimum span of -0.5 to 2.0 units with an isolated output range of 4 to 20 madc. The analyzer shall have an accuracy and repeatability of plus or minus 0.5 percent of full scale.

The ORP analyzer shall be capable of display from -1400 to +1400 mv by four digit direct readout, with a minimum span of 200 mv and an isolated 4 to 20 madc output. The analyzer shall have an accuracy and repeatability of plus or minus 0.5 percent of full scale.

The analyzers and accessories shall be prepared for delivery in accordance with ANSI C83.66. Hardware and wiring shall be in accordance with the National Electric Code ANSI C1.

2.25 TIMING RELAYS

The Contractor shall provide timing relays in accordance with the following Data Sheet:

Tag No.	Data Sheet No.
KC-224	55
KC-278	56

2.26 SIGHT FLOW INDICATORS

The Contractor shall provide sight flow indicators in accordance with the following Data Sheet:

Tag No.	Data Sheet No.
FI-272	54
FI-273	54
FI-274	54

2.27 LEVEL TRANSMITTERS

The Contractor shall provide level transmitters as specified herein and on the following Data Sheets:

Tag No.	Data Sheet No.
LE/LT-198	58

The transmitter shall be remote mounted from the probe. The probe shall be a Kynar-coated capacitance type. The transmitter shall be a blind device installed in a NEMA 7 explosion-proof case with a 4-20 madc output. The probe length shall be approximately 66 inches. The Contractor shall coordinate the length of the probe with the tank and agitator construction to assure no interference.

2.28 RESTRICTING ORIFICES

The Contractor shall provide restricting orifices in accordance with the following Data Sheet.

Tag No.	Data Sheet No.
RO-199	59

1. Add Data Sheets 15.10-1, sheets 43 through 59, as included herein.

15.11 Agitators

Agitators shall be in accordance with Subdivision 15.11, except as follows:

a. Par. 2.1 Description. Add as follows:

Tag No.	Name	Data Sheet
[redacted]		
M-21	Reactor Agitator	15.11-05 1 of 2
M-21	Induction Motor	15.11-05 2 of 2

b. Add Data Sheets 15.11-04, sheets 1 and 2, and 15.11-05, sheets 1 and 2, as included herein.

15.12 Diaphragm Pump

Diaphragm Pumps shall be in accordance with Subdivision 15.12 as included herein.

16.0 ELECTRICAL

16.01 Interior Electrical Work

Interior Electrical Work shall be in accordance with Subdivision 16.01.

16.02 Not Used

III. DRAWINGS

The Contract Drawings are:

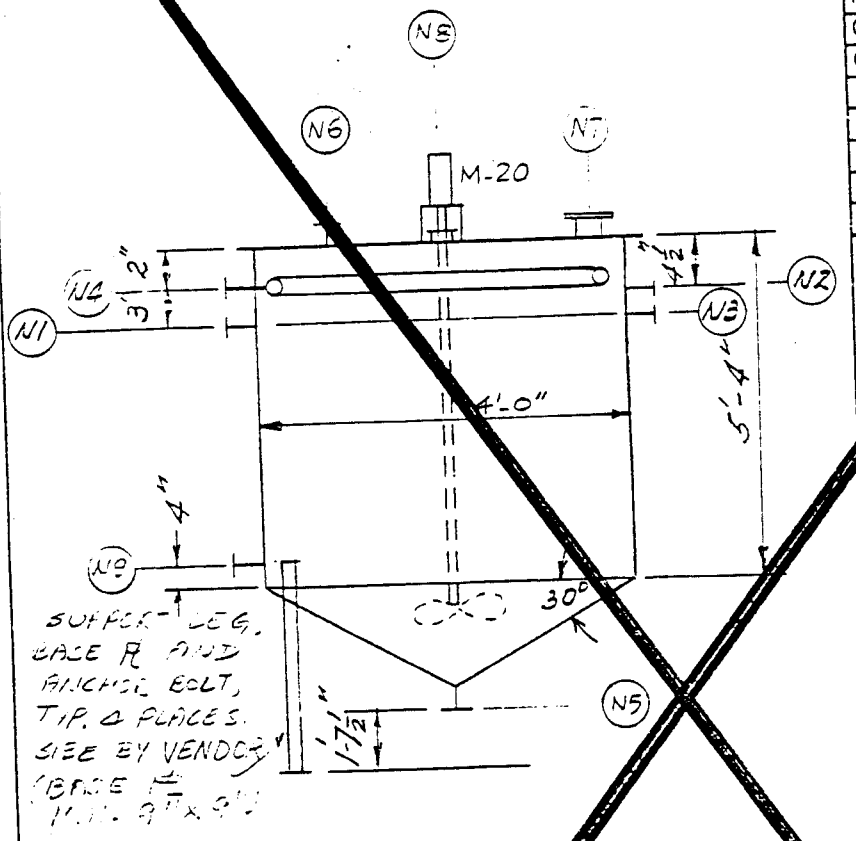
Drawing No.	Title
LA-RV-A-16	Reflected Ceiling Plan and Partial Floor Plans and Details
LA-RV-S-22	Upgrading of Batch Waste Treatment System Platform Framing Plan and Details
LA-RV-MP-9, Rev. 1	Piping and Instrument Diagram, Batch Waste Treatment System
LA-RV-P-19, Rev. 1	Batch Waste Treatment Piping Plan and Sections

Drawing No.	Title
LA-RV-E-27, Rev. 1	Batch Waste Treatment and Exhaust Air Filtration Plans and Diagrams
LA-RV-I-8	Instrument Symbols and General Notes
LA-RV-I-9	Instrument Installation Details
LA-RV-I-10	Instrument Installation Details
LA-RV-I-13, Rev. 1	Instrument Location Plan, Batch Waste Treatment System

REVISIONS	NO.	DATE	BY	CK	APP	DESCRIPTION
	C	2/16/83	[illegible]	[illegible]		INITIAL ISSUE

I-12

REVISIONS



NOTES:

1. FLANGES & NOZZLE NECKS ON TOP TO BE 304L S.S.
   TOP TO BE 304L S.S., FLAT, BOLTED, W/ TOP MOUNTED MIXER.
2. NOZZLE SIZES SHOWN ARE MINIMUM REQ'D FOR PROCESS. ACTUAL SIZES SHALL BE DETERMINED BY VENDOR FOR ADEQUATE LINING.
3. SPRAY HEADER: 1" SCH 40 304L S.S. PIPE W/ 1/8" Φ HOLES 4" APART @ 45° IN THE LOWER QUADRANT FACING THE WALL.
4. BAFFLES : AS DETERMINED BY AGITATOR VENDOR.

TA-ED

Opr Temp 200 °F	Press ATM	psig	
Design Temp 225°F	Press 15	psig	
Ext Temp AMB °F	Press ATM	psig	
New Ltd by BY CONTR	BY CONTR	psig	
Crsn Allow S —	Hds [illegible]	N —	
Code Stamp YES			
Code ASME SEC VIII DIV			
PWHT NONE	X-Rayed NE ET-E		
Allow Stress @ Design Temp BY CONTR			
Joint Eff Shell 85%	Hds 85%		
Hydrotest (Horiz) 25.5	psig		
MATERIALS: SA			
Shell SA-285-C W/ KYNAR LINING			
Heads SA-312-TP 304L			
Support SA-36			
Trays —			
Bolts SA-193-B7	Nuts SA-194-2H		
Flanges C.S. KYNAR LINED NOTE 1			
Nozzle-Necks C.S. KYNAR LINED (NOTE 1)			
Gaskets PER PIPING SPEC.			
Capacity 500 GAL.			
Weights BY CONTR	Fab		
Trays	Empty		
Opr	Test		
Paint YES, PER SPEC			
Insulation YES, PERSONNEL PROTECTION			
Fireproofing NONE			
Access Supplied & Inst by Fabricator: YES NOTE 3			
Vessel Davit NO	Mark No. —		
Ladder & Platform Clips — NO			
Pipe Support & Guide Clips NO			
Insulation Supports NO			
Fireproofing Supports NO			

Openings NOTE (2)

Item	No.	Size	Service
N1	1	1½"	IND. WASTE INLET
N2	1	1"	WATER INLET
N3	1	1½"	CHEM. LIQUID INLET
N4	1	1"	SPRAY WATER
N5	1	3"	PUMP SUCTION
N6	1	2"	VENT
N7	1	10"	SOLID CHARGING PORT
N8	1	[illegible]	MIXER MOUNT
N9	2	[illegible]	LEVEL ELEMENT

ASA Rating & Facing NE [illegible] KYNAR [illegible]

NOTE 2

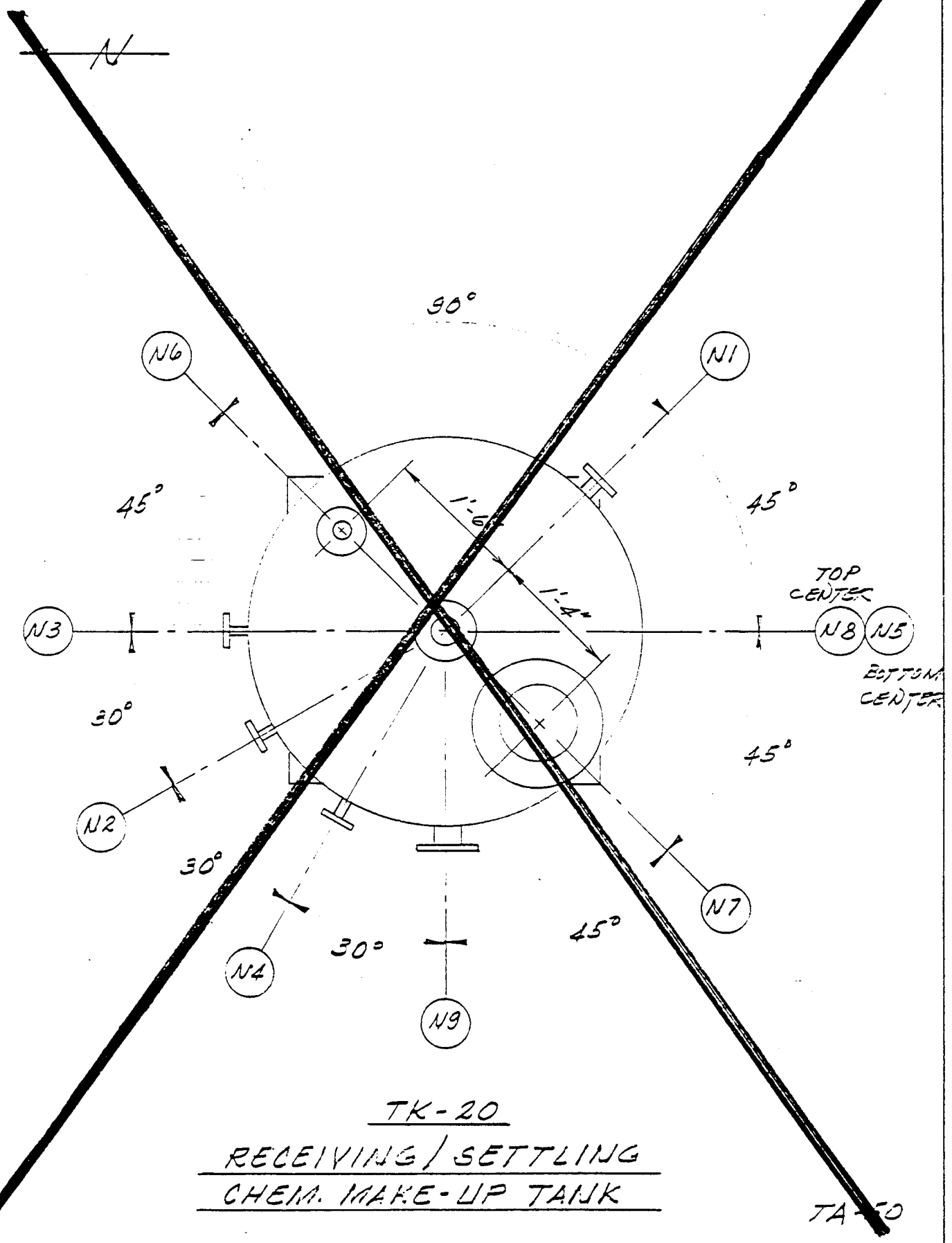
RMP DATA SHEET THE RALPH M. PARSONS COMPANY	VESSEL (PLAIN) WITH NOTES TK-20 RECEIVING/SETTLING CHEM MIXER TANK	SHEET 1 OF 2	JOB NUMBER 60-[illegible]
		NUMBER 13.08-10	REV C

DC-

ENG-VS-205

This data sl and the design it covers are the property of THE RALPH M. PARSONS COMPANY. They are merely loaned and on the borrowers' express agreeme at they will not be reproduced, copied, loaned, exhibited, nor used except in the limited way and private use permitted by any written consent given by the lender to the borrower.

ENGAGE 3



TK-20

RECEIVING / SETTLING

CHEM. MAKE-UP TANK

TA-50

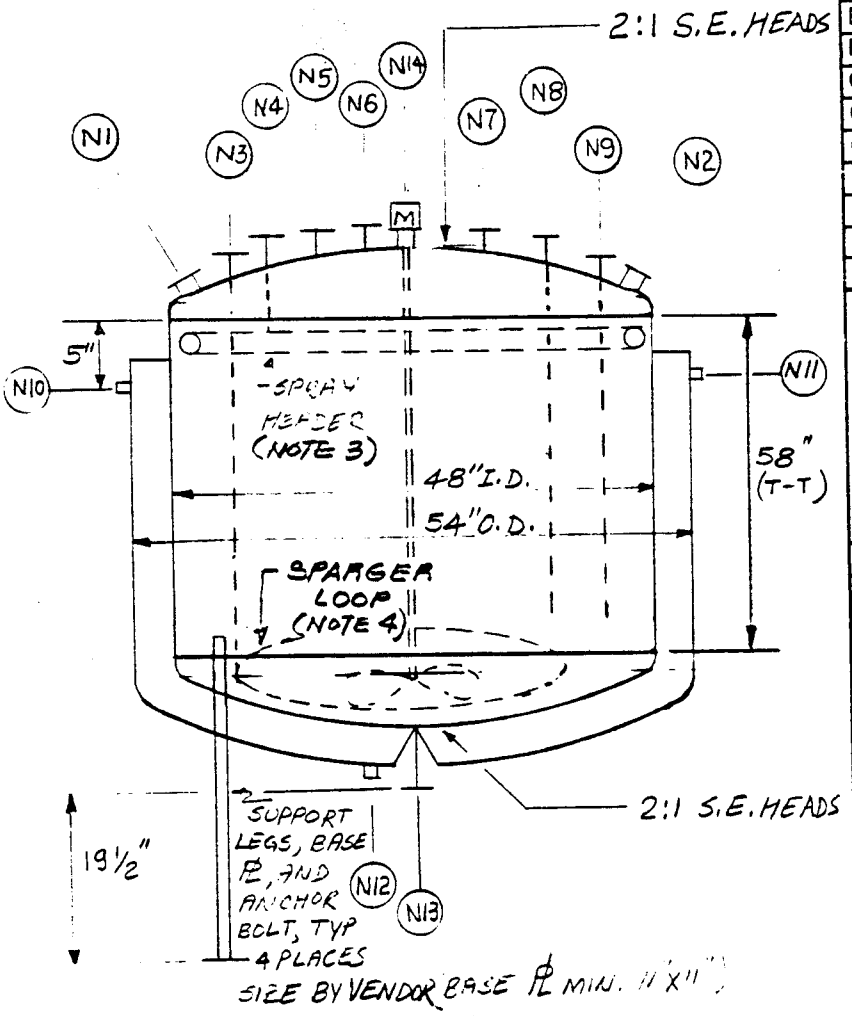
THE RALPH M. PARSONS COMPANY	SHEET	OF	JOB NUMBER	DOCUMENT NO.	REV.
	2	2	4089-0001	13.03-10	0

Mark Board Certificate of Compliance

I-14

REVISIONS	NO.	DATE	BY	CK	APP	DESCRIPTION
	0	2/16/83	J.S	NJ		REVISED ISSUE

REVISIONS	NO.	DATE	BY	CK	APP	DESCRIPTION



Opr Temp	250 °F	Press	ATM psig
Design Temp	275 °F	Press	50 psig
Ext Temp (NOTE 1)	°F	Press (NOTE 2)	psig
New Ltd by	BY CONTR.	@	BY CONTR. psig
Crsn Allow S	—	Hds	— N
Code Stamp	YES		
Code	ASME SEC VIII, DIV. 1		
PWHT	NONE	X-Rayed	YES, RT-3
Allow Stress @ Design Temp	BY CONTR.		
Joint Eff Shell	85%	Hds	85%
Hydrotest (Horiz)	75.		psig

MATERIALS: SA	
Shell	SA-285C W/ KYNAR LINING
Heads	SA-285C W/ KYNAR LINING
Support	SA-36
Trays	—
Bolts	SA-193-B7 Nuts SA-194-2H
Flanges	C.S. W/ KYNAR LINING
Nozzle-Necks	C.S. W/ KYNAR LINING
Gaskets	PER PIPING SPEC

Capacity	500 GAL.
Weights	BY CONTR. Fab
Trays	Empty
Opr	Test
Paint	YES, PER SPEC.
Insulation	YES, PERSONAL PROTECTIO
Fireproofing	NONE
Access Supplied & Inst by Fabricator	YES
Vessel Davit	NO Mark No.
Ladder & Platform Clips	NO
Pipe Support & Guide Clips	NO
Insulation Supports	NO
Fireproofing Supports	NO

Openings NOTE (5)

Item	No.	Size	Service
N1	1	6"	SIGHT & SOLID CHARG. PORT
N2	1	6"	SIGHT PORT
N3	1	1"	CHEMICAL GASES INLET
N4	1	1"	SPRAY WATER
N5	1	1 1/2"	CHEM. LIQ & ACID WASTE INL
N6	1	2"	ACID VENT
N7	1	1 1/2"	IND. WASTE RECIAC
N8	1	3"	TEMP. ELEMENT
N9	1	3"	LIQUID LEVEL ELEME
N10	1	2"	STEAM INLET
N11	1	1"	HOT WATER HEATING OUTL
N12	1	1"	HOT WATER HEATING INL
N13	1	3"	IND. WASTE INLET/OUTL
N14	1	BY VENDOR	MIXER MOUNT
M1	1	MIN. 24"	COVER HEAD (SEE SHT. 2

NOTE 6

ASA Rating & Facing	150# E.F. KYNAR

LINED EXCEPT AS NOTED.

NOTES

1. JACKET: AMBIENT ; SHELL : 250°F
2. JACKET : ATMOSPHERIC ; SHELL : 50 PSIG
3. SPRAY HEADER : 1" KYNAR PIPE W/ 1/8" Φ HOLES 4" APART, @ 45° IN THE LOWER QUADRANT FACING THE WALL.
4. SPARGER LOOP: 1" KYNAR PIPE W/ 1/8" Φ HOLES 4" APART, 30° DOWN, STAGGERED IN VERTICAL. THE LOOP SHALL BE REMOVABLE FOR MAINT.
5. NOZZLE SIZES SHOWN ARE MINIMUM REQ'D FOR PROCESS. ACTUAL SIZE SHALL BE DETERMINED BY VENDOR FOR ADEQUATE LINING.
6. ONE NOZZLE MIN. EACH.

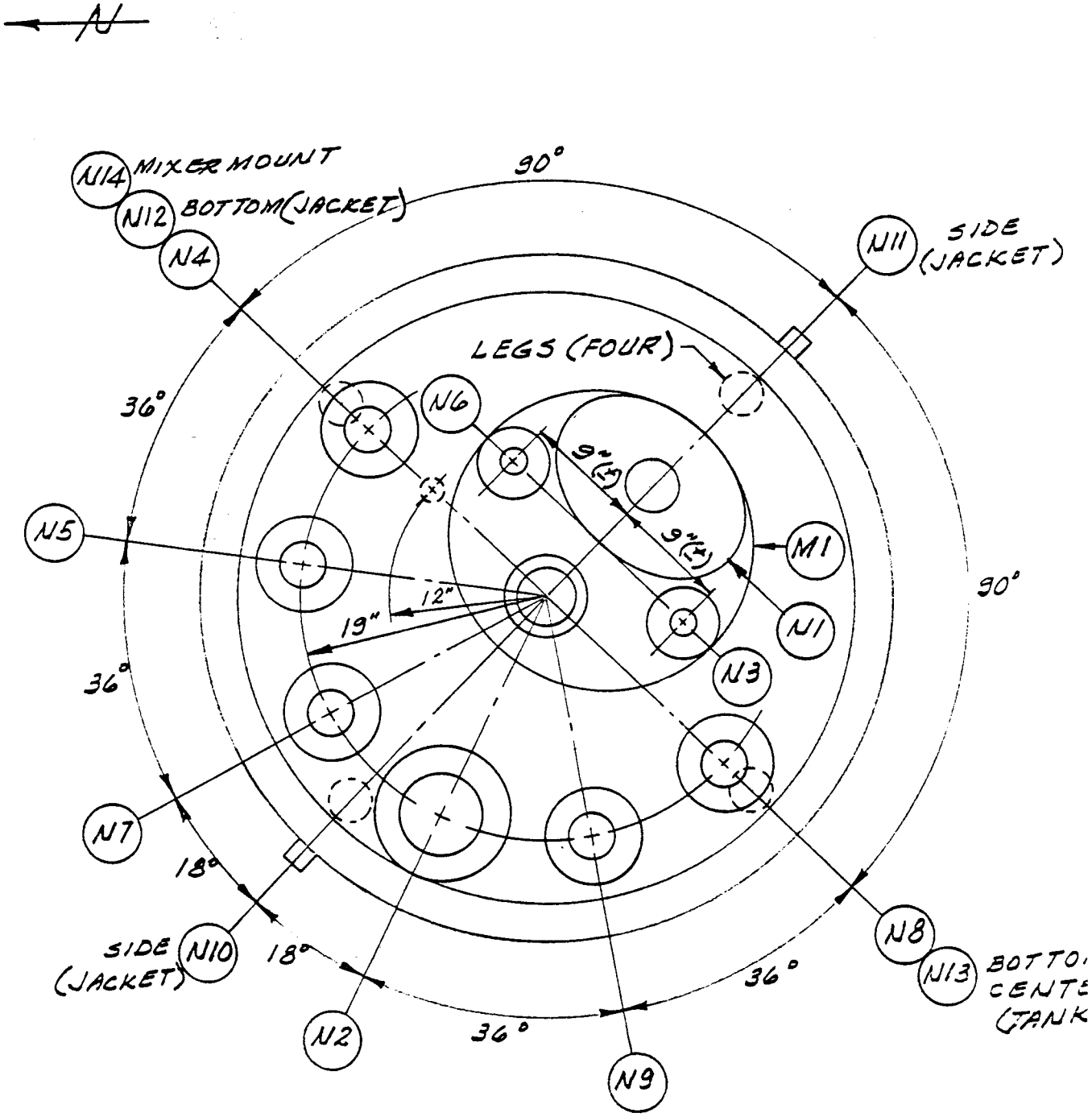
RMP DATA SHEET
THE RALPH M. PARSONS COMPANY

VESSEL (PLAIN) WITH NOTES
TK-21
REACTOR

SHEET	OF	JOB NUMBER
1	2	6080-01
NUMBER		REV
13.03-11		C

This data sheet and the design it covers are the property of THE RALPH M. PARSONS COMPANY. They are merely loaned and on the borrowers' express agreement that they will not be reproduced, copied, loaned, exhibited, nor used except in the limited way and private use permitted by any written consent given by the lender to the borrower.

REVISIONS	NO.	DATE	BY	CK	APP	DESCRIPTION	REVISIONS	NO.	DATE	BY	CK	APP	DESCRIPTION



TK-21

REACTOR

TA-50

RMP DATA SHEET THE RALPH M. PARSONS COMPANY	ORIENTATION NOZZLES, ~~LADDERS AND PLATFORMS~~ FOR: TK-21 REACTOR	SCALE NONE	JOB NUMBE 6089-(
		DOCUMENT NUMBER 13.03-11	

SHT 2

This data sheet and the design it covers are the property of THE RALPH M. PARSONS COMPANY. They are merely loaned and on the borrower's express agreement that they will not be reproduced, copied, loaned, exhibited, nor used except in the limited way and private use permitted by any written consent given by the lender to the borrower.

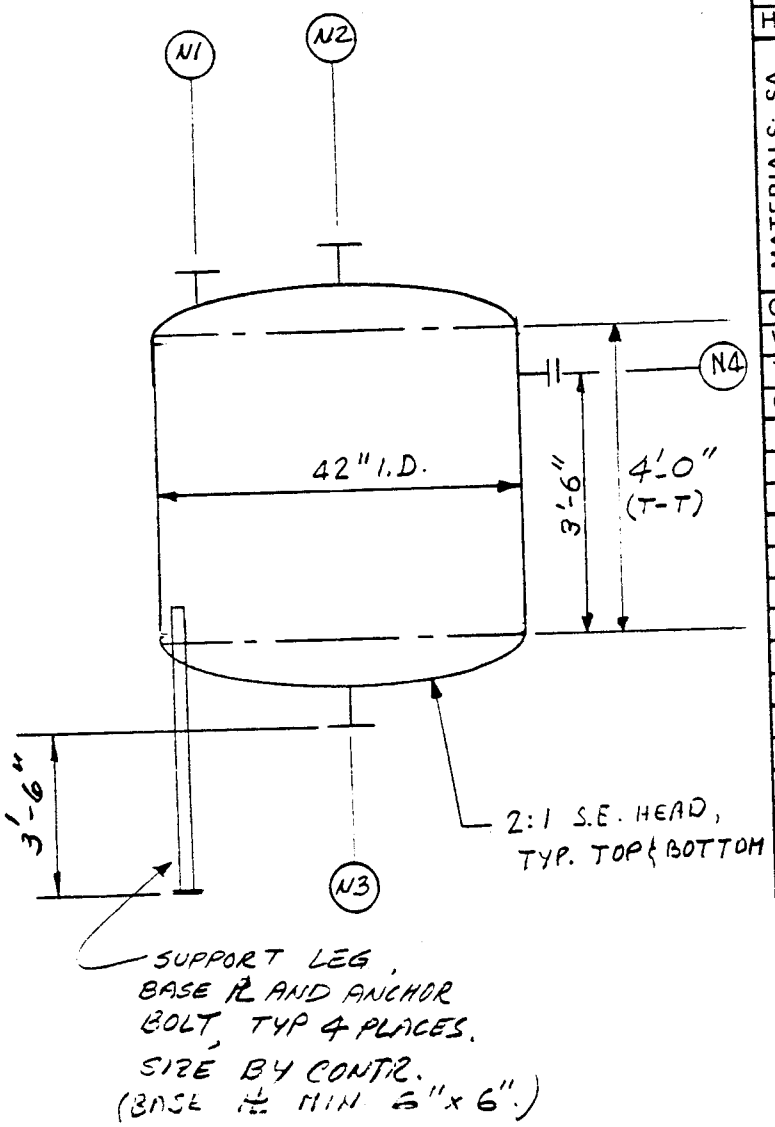
REVISIONS	NO.	DATE	BY	CK	APP	DESCRIPTION
	0	2/16/83	J.S.	NB		INITIAL ISSUE

REVISIONS	NO.	DATE	BY	CK	APP	DESCRIPTION

Opr Temp 250 °F	Press ATM psig		
Design Temp 275 °F	Press 50 psig		
Ext Temp AMB °F	Press ATM. psig		
New Ltd by BY CONTR	@ BY CONTR psig		
Crsn Allow S 1/8"	Hds 1/8"	N 1/8"	
Code Stamp YES			
Code ASME SEC VIII, DIV. 1			
PWHT NONE	X-Rayed YES, RT-3		
Allow Stress @ Design Temp BY CONTR.			
Joint Eff Shell 85%	Hds 85%		
Hydrotest (Horiz) 75. psig			

MATERIALS: SA	
Shell	SA-285C
Heads	SA-285C
Support	SA-36
Trays	—
Bolts SA-193-B7	Nuts SA-194-2H
Flanges	SA-105
Nozzle-Necks	SA-53-B
Gaskets	PER PIPING SPEC.

Capacity 370 GAL.	
Weights BY CONTR	Fab
Trays —	Empty
Opr	Test
Paint YES. PER SPEC	
Insulation NO	
Fireproofing NONE	
Access Supplied & Inst by Fabricator:	
Vessel Davit NONE	Mark No.
Ladder & Platform Clips	NO
Pipe Support & Guide Clips	NO
Insulation Supports	NO
Fireproofing Supports	NO



Openings

Item	No.	Size	Service
N1	1	1½"	GAS INLET
N2	1	2"	GAS OUTLET
N3	1	1"	DRAIN
N4	1	4"	HANDHOLE W/ BLIND FL

ASA Rating & Facing 150# R.F

UNLESS NOTED OTHERWISE

TA-50

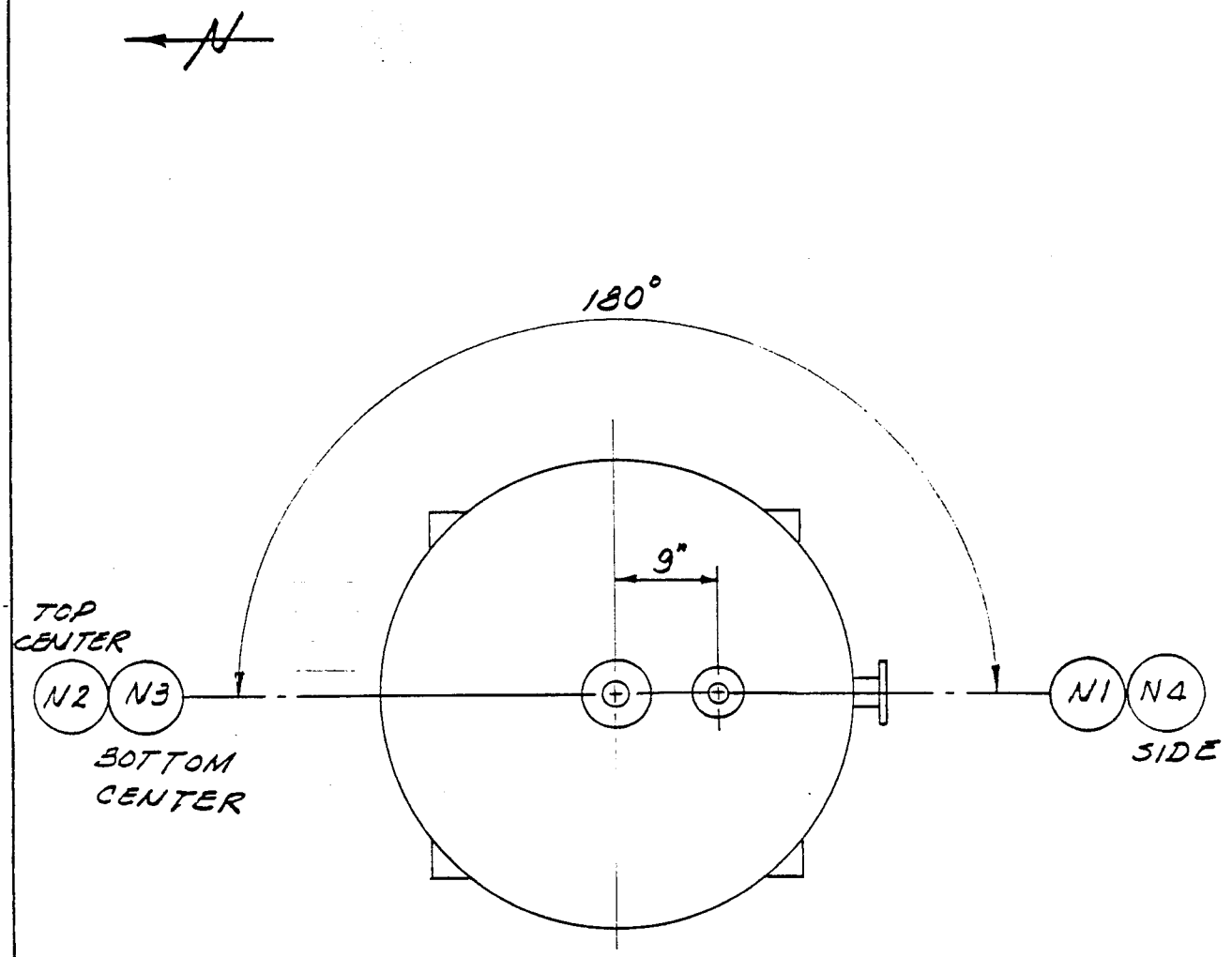
RMP DATA SHEET
THE RALPH M. PARSONS COMPANY

VESSEL (PLAIN) WITH NOTES
TK-22
BLOW DOWN TANK

SHEET 1 OF 2 | JOB NUMBER 6089-000
NUMBER 13.03-12 | R 1

This data sr and the design it covers are the property of THE RALPH M. PARSONS IPANY. They are merely loaned and on the borrowers' express agreeme ... ley will not be reproduced, copied, loaned, exhibited, nor used except in the limited way and private use permitted by any written consent given by the lender to the borrower.

ENG-GE-3



TK-22
BLOW DOWN TANK

TA-50

RMP THE RALPH M. PARSONS COMPANY	SHEET	OF	JOB NUMBER	DOCUMENT NO.	REV.
	2	2	6089-0001	13.03-12	0

0084C

CONTRACT NO. DE-AC32-80AL13151

CONSTRUCTION SPECIFICATION
FOR
UPGRADING OF INDUSTRIAL LIQUID WASTE TREATMENT PLANT

DIVISION 13 SPECIAL CONSTRUCTION

SUB-DIVISION 13.13

DOUBLE PIPE HEAT EXCHANGER

PART 1 GENERAL

1.1 SCOPE OF WORK

The Contractor shall furnish all labor, materials, equipment and services to manufacturer, procure, inspect, install, and test double pipe vent gas condenser as indicated on the drawings and specified herein.

1.1.1 Furnished Equipment

The Contractor shall furnish the condenser as a complete unit, including support frame, special features, and accessories as specified herein.

The Contractor shall furnish to the Contracting Officer documents in accordance with Section 1.3.

Standard equipment and design are requested provided the performance requirements of this Specification are met. Engineering, fabrication, and quality assurance and control shall result in equipment capable of operation at specified design conditions.

1.1.2 Related Work

The following associated work shall be performed by the Contractor:

Emplacement, final alignment verification, and piping installation.

Work performed per this Sub-Division shall be coordinated with work accomplished per the following Sub-Divisions:

15.01 Piping

1.2 REFERENCE DOCUMENTS

The Contractor shall comply with codes and standards referenced in this Specification.

American National Standards Institute (ANSI)

ANSI B16.5 - 1977	Steel Pipe Flanges, Flanged Valves and Fittings

American Society of Mechanical Engineers (ASME)

Section VIII, Division 1 - 1980	Unfired Pressure Vessels
Section IX - 1980	Welding and Brazing Qualifications

American Society of Testing Materials (ASTM)

ASTM A 53-1980	Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated Welded and Seamless
ASTM A 268-1980	Specification for Seamless and Welded Ferritic Stainless Steel Tubing for General Service

1.3 SUBMITTALS

1.3.1 Shop Drawings and Product Data

The Contractor shall submit to the Contracting Officer drawings, completed data sheets, parts lists, performance curves, inspection and test results installation and operating instructions, code data sheets, certificate of compliance, and recommended spare parts list with prices in accordance with Attachment "Data Requirements List".

PART 2 PRODUCTS

The condenser shall meet the technical and performance requirements outlined herein and on the data sheet "Double Pipe Heat Exchanger", Tag No. CD-2. In the event of conflict between this Specification and the data sheets, the data sheet information shall govern.

2.1 CONDENSER DESIGN

2.1.1 The fouling factor shall be as shown on the data sheet.

2.1.2 Nozzles shall be as follows:

Corrosion allowance for tube nozzles shall be equal to 1.5 times the corrosion allowance specified for the pipes. This allowance shall be added to the nozzle thickness required by the ASME Code.

2.1.3 All welds shall be by the shielded metal-arc, inert gas tungsten arc, or submerged arc process, unless otherwise approved by the Contracting Officer. Provide all seams with full penetration butt welds, double welded wherever possible.

2.1.4 Flange connections shall be per ANSI B16.5.

2.1.5 The Contractor shall advise the Contracting Officer of any shop remedial measure made to minor defects in materials as permitted by the ASME Code for Pressure Vessels. Information furnished shall include the type and extent of the defect, method of repair, location on exchanger, and the name of the inspection agency's inspector approving the repair. The Contractor shall require all fabricators to furnish this information. Correction of major defects will be performed only if approved by the Contracting Officer. Approval does not relieve the Contractor of responsibility.

PART 3 EXECUTION

3.1 FABRICATION REQUIREMENTS

3.1.1 Materials for double pipe condenser shall be as specified on the data sheet, this Specification, or any alternates or deviations specifically approved by the Contracting Officer.

3.1.2 Deposited weld metal for all pressure containing welds shall have: 1) a chemical composition within the range of the base material ASTM specification and 2) mechanical properties at ambient, design and operating temperatures that are within the range of the base material ASTM specification.

3.1.3 All welding procedures and welder qualifications shall be in accordance with Section IX of ASME Code and shall be submitted to the Contracting Officer and approval obtained before any welding is begun.

3.1.4 Tagging of Equipment

The nameplate for the exchanger shall be of 24 US Standard Gauge (minimum) stainless steel and shall be securely attached. The nameplate shall include as a minimum the manufacturer's name, design pressure and temperature (maximum fluid temperature), test pressure, corrosion allowance, dry and wet weight, manufacturer's serial number, date of fabrication and equipment item number.

3.1.5 Painting and Surface Preparation

Stainless steel surfaces shall not be painted. Carbon steel surfaces except heat transfer surfaces shall be painted using the Vendor's standard materials.

Standard paint used shall remain intact at operating temperature of carbon steel surfaces to which it is applied. All exposed surfaces shall receive a coat of rust preventative such as Exxon Chemical Co. Rust Ban 392 or Approved Equal.

3.2 SHIPPING AND STORAGE

Flange closures shall consist of a rubber gasket and a full size 1/4 inch thick exterior plywood cover. This cover shall be bolted in place by a minimum of four full size bolts. All drilled and tapped holes shall have metal or plastic plugs and all exposed pipe ends shall be capped.

Equipment shall be boxed or crated for full protection against damage during transport and yard handling. Exchangers shall be prepared to prevent damage from the elements and temperatures ranging from minus 40 deg F to plus 120 deg F.

The Contracting Officer reserves the right to inspect the equipment at the manufacturer's plant.

3.2.1 Receipt Inspection

The Contracting Officer will inspect the equipment and documentation specified herein upon receipt at the site to determine if the equipment as received has suffered damage during shipment. The inspection will include appurtenances shipped separately or together with the equipment.

3.2.2 Storage

The Contractor shall allocate sufficient storage space and employ protective measures to protect the equipment and appurtenances specified herein from any damage due to natural elements or the Contractor's equipment. Particular care shall be taken to prevent damage to flange faces, seal surfaces, and all interfacing parts or surfaces between equipment piping, or structures. The Contractor shall allocate equipment storage space in an area segregated from fabrication operations and maintained free from debris. Temporary structures, supports, cribbing, or bracing may be provided and employed by the Contractor to prevent damage to the equipment and appurtenances specified herein.

The Contracting Officer reserves the right to inspect, without notice, all equipment storage areas, protective measures, and temporary structures used to store equipment.

3.2.3 Handling

The Contractor shall provide and use suitable devices to handle without damage the equipment and appurtenances specified herein from receipt through installation. The Contractor shall be responsible for providing suitable access into the facility for handling devices with equipment for installation.

3.3 INSTALLATION

Installation of equipment shall be in accordance with the piping drawings and the Vendor's installation instructions. The Contractor shall be responsible to provide necessary foundations, brackets, anchorings, bolts, studs, and nuts for proper installation, and interfacing with equipment.

3.4 PRESSURE TESTING

The condenser shall be hydrostatically tested in accordance with Section VIII of ASME Code with clean water at a minimum temperature of 60°F in the shop.

(1) Vents shall be provided at all high points of the test set up to purge air pockets when the condenser is filling.

(2) The hydrostatic test pressure shall be maintained for a minimum of 10 minutes to verify that no leaks exist.

(3) Leakage of temporary gaskets and seals, installed for the purpose of conducting the hydrostatic test and which will be replaced or discarded later, is permitted provided the leakage does not exceed the capacity to maintain system test pressure for the required length of time or does not mask leaks from other joints.

(4) No visual weeping or leakage is permitted from any condensers assembly joint. If weeping or leakage occurs, proposed repair method shall be submitted to the Contracting Officer. After approval repairs shall be done and equipment retested per above procedure.

3.5 ACCEPTANCE

Equipment, materials, and workmanship not in accordance with the requirements specified herein shall be corrected by the Contractor.

UPGRADING OF INDUSTRIAL LIQUID WASTE TREATMENT PLANT

DATA REQUIREMENTS LIST

	DESCRIPTION	CHECK IF REQ'D.	* WHEN REQ'D.	NO. OF COPIES REQ'D.	REFERENCE	** REQ'd. FOR
1.	Outline Drawings, Cross-Section Drawing	X	BFR		1.3.1	ACO
2.	Parts Lists	X	WS		1.3.1	INFO
3.	Performance Characteristics	X	BFR		1.3.1	ACO
4.	Inspection and Test Results	X	PS		1.3.1	ACO
5.	Installation, Operating, and Maintenance Instructions	X	PS		1.3.1	INFO
6.	Data Sheets	X	BFR		1.3.1	ACO
7.	Recommended Spare Parts w/prices	X	PS		1.3.1	INFO
8.	Certificate of Compliance	X	WS		1.3.1	ACO
9.	Code Data Sheets	X	WS		1.3.1	ACO
10.	Weld Repair Procedures	X	BU		3.4	ACO

* "AC" - As Completed
"BC" - Before Contract can be awarded
"BU" - Before Use (of procedure or by personnel)
"BFR" - Before Fabrication Release
"PS" - Prior to Shipment
"WS" - With Shipment

** "ACO" - Approval by Contracting Officer
"INFO" - Information

PARSONS	SHEET 7 OF 7	JOB NUMBER 6089	DOCUMENT NO. 13.13	R

ENG-GE-3 (11/82)

REVISIONS	NO.	DATE	BY	CK	APP	DESCRIPTION
	0	2/16/83	J.S.	MJ		INITIAL ISSUE

REVISIONS	NO.	DATE	BY	CK	APP	DESCRIPTION

Service: VENT GAS CONDENSER — Item No.: CD-2
Type: DOUBLE PIPE HEAT EXCHANGER — Order No.:
Mfr Type No.: — Mfr:

OPERATING CONDITIONS		SHELL SIDE	TUBE SIDE
Fluid Circulated		IND. COLD WATER	ACID GAS VENT
Total Fluid Entering	lb/hr	5500.	220.
Liquid	lb/hr	5500.	—
Vapor	lb/hr	—	220.
Noncondensables	lb/hr	—	
Steam	lb/hr	—	
Fluid Vaporized or Condensed	lb/hr	—	220.
Gravity Liquid at 60 °F		1.0	1.0
Molecular Weight – Vapor			
Viscosity at 60 °F	Cp	1.0	
Viscosity at °F	Cp		
Temperature – In	°F	70	210
Temperature – Out	°F	110	210
Inlet Pressure	psig	60	ATM

DESIGN CONDITIONS		SHELL	TUBES
Pressure	psig	85	50
Temperature	°F	160	240
Max Allowable Pressure Drop	psi		
Computed Pressure Drop	psi		
Hydrostatic Test Pressure	psig	130	75
Nozzle Size	In.	In 1" Out 1"	In 2" Out 2"
Nozzle Rating & Facing		150# R.F.	150# R.F.
Required Corrosion Allowance	In	1/8"	1/8"
Duty 220,000	Btu/hr	Fouling Factor – Minimum Shell	Tube
Transfer Rate – Clean 300		Fouling Factor – Actual Shell (0.0005 OVERALL)	Tube
Transfer Rate – Spec Service		Surface – Per Unit 6.0	sq ft
MTD (Corrected)	°F	Surface – Total 6.0	sq ft

MATERIALS AND CONSTRUCTION

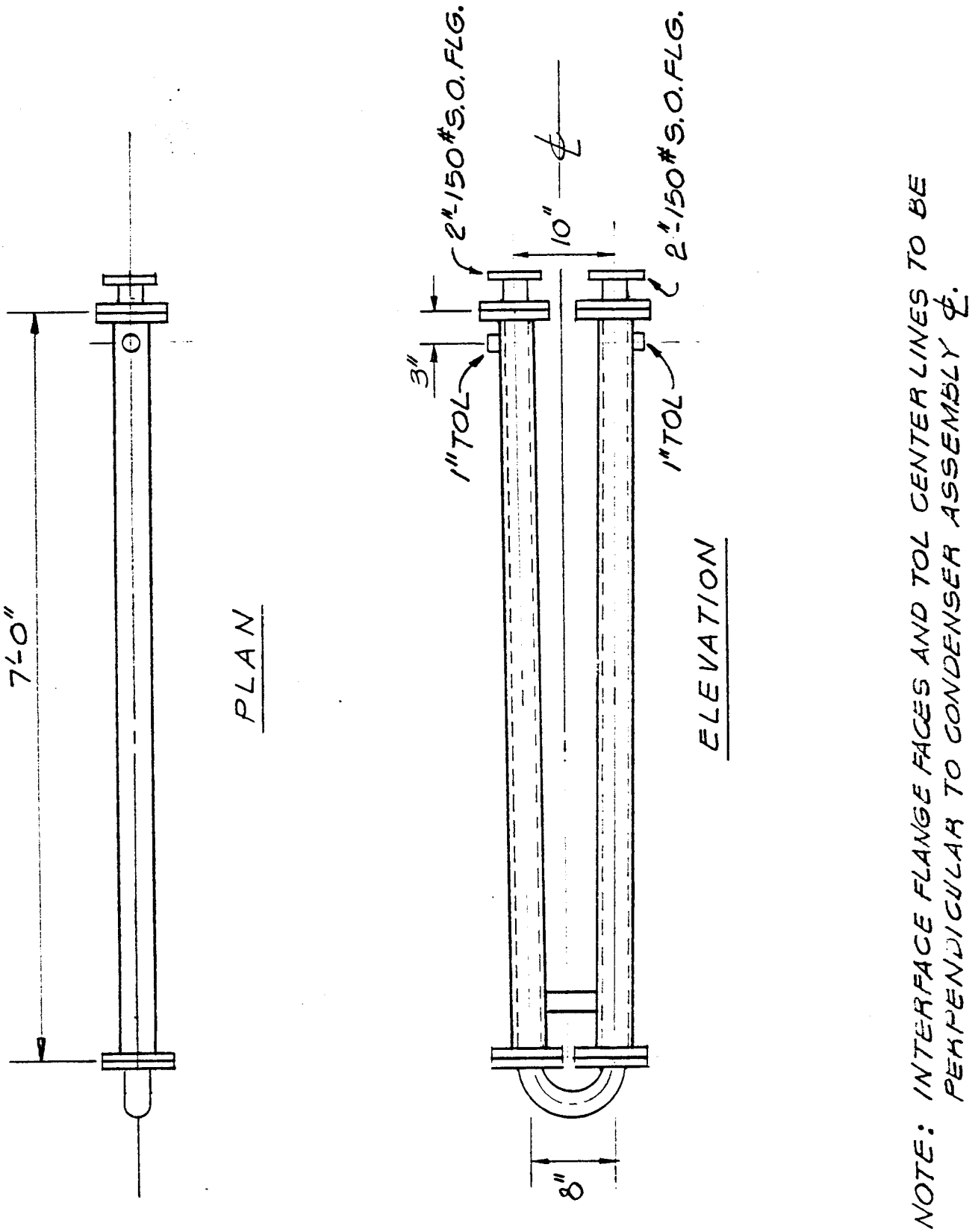
No. of Units ONE	Tubeside Arrangement: NOTE 3	Parallel	Series
Setting	Shellside Arrangement: NOTE 3	Parallel	Series
Shell Diameter (IPS) 4"	Sched Wall 40	Overall Length 8 FT	
Tube – Diameter (IPS)	OD 2" BWG 16	Sched Wall	
Fins – No. —	Height — Thickness —	Finned Length —	
Weight – Each Unit	Bundle Only	Each Unit Full of Water	

PART	MATERIAL	PART	MATERIAL
Shell	ASTM A 53	Tubes	ASTM A 268 304L
Shell Cover		Fins	
Gasket, Shell Side	SEE PIPE SPEC. 15.01	Gasket, Tube Side	SEE PIPE SPEC
Bolts	SA-193-B7		SA-194-2H

Notes: ~~(1) Stress Relieved Parts Marked SR – Radiographed Parts X-R~~
~~(2) ASME "UPV" Code, Section VIII Latest Edition, Code Stamp and Certificates Required~~.
(1) DOUBLE PIPE U-TUBE EXCHANGER, TUBE LENGTH APPROX. 7' FLANGE TO FLANGE COUNTER-CURRENT

RMP DATA SHEET THE RALPH M. PARSONS COMPANY	DOUBLE PIPE HEAT EXCHANGER CD-2	SHEET 1 OF 2	JOB NUMBER 6089-0001
		DOCUMENT NUMBER 13.13-1	REV 0

This data sheet and the design it covers are the property of THE RALPH M. PARSONS COMPANY. They are merely loaned and on the borrowers' express agreement they will not be reproduced, copied, loaned, exhibited, nor used except in the limited way and private use permitted by any written consent given by the lender to the borrower.



VENT GAS CONDENSER

CD-2

PARSONS	SHEET	OF	JOB NUMBER	DOCUMENT NO.	REV
	2	2	6089-01	13.13-1	

SERVICE: Industrial Waste	CLASS NV PAGE 1 OF 2

RATING:	150# ANSI	CORROSION ALLOWANCE:	None
FACING:	Flat Faced	PRESSURE LIMIT:	B16.5
MATERIAL:	Carbon Steel - Kynar Lined	TEMPERATURE LIMIT:	300°F

CODE NUMBER	ENCODER	SIZE FROM	SIZE TO	DESCRIPTION	NOTES	REV
		1"	6"	----------PIPE---------- Carbon Steel, Schedule 40 Lined with Kynar, 160# ANSI Screwed Cast Steel Flanged Ends ASTM A53 Grade B		
		1"	6"	----------FITTINGS---------- Cast Steel Flanged Fittings, 150# ANSI Lined with Kynar, Molded Raised Face		
		1/2"	6"	----------DIAPHRAM VALVES---------- 150# FF Kynar Lined Cast Carbon Steel Hand Wheel Operated with TFE Diaphrams		
		1"	6"	----------CHECK VALVES---------- 150# RF Cast Steel, Kynar Lined		
				---------CONNECTIONS FLANGED---------- For Pressure Connection, Use 1" Flanged		
		1"	6"	----------COMPANION FLANGES---------- 150# ANSI, Forged Steel, Screwed, Chamfered ASTM A 105, ASTM A 181		
		1"	6"	---------(BLIND) FLANGES---------- 150# ANSI Forged Steel Blind Flanges (Use with Kynar Full Face Blind Spacer ASTM A 105, ASTM A 181		
				----------REDUCING FLANGES (LOOSE)------- Kynar Lined 150# ANSI Cast Steel ASTM A 105, ASTM A 181		
				----------FLANGES KYNAR---------- Solid Kynar 2" Thk with Stainless Steel Backup Washers		
				----------GASKETS---------- Viton A, 1/16" Thickness 60 Durometer		
				----------BOLTING---------- Hex Head Machine Bolt with Hex Nut, Chrome Moly Steel ASTM A193 Grade B7 ASTM A194 Grade 2H		

SERVICE Industrial Waste

CLASS NV

PAGE 2 OF 2

CODE NUMBER	ENCODER	SIZE FROM	SIZE TO	DESCRIPTION	NOTES	REV
		1" - 6"		----------BRANCHES---------- Use Full or Reducing Kynar Lined Flanged Fittings		

----------SPACERS----------

Use Standard Full Face or Reducing Full Face Kynar Spacer of 1/2" Minimum Thickness when Mating Kynar Lined Piping Items with all Other Types of Flanged Piping

NOTES:

1. All spool assemblies involving lined piping shall be fabricated from Kynar lined carbon steel pipe w/150# steel flanges and flanged cast steel Kynar lined fittings

2. Manufacturers suggested bolt torque shall be used in assembling flange joints.

3. No gaskets required between flanges with molded raised faces.

4. The following pressure limitations shall be followed for diaphram valves at 100°F.

Size	Max. Pressure	Size	Max. Pressure
1/2"-1"	200 psig	3"&4"	150 psig
1 1/2 - 2	175 psig	6" only	125 psig

PARSONS

2 of 2

JOB NUMBER	DOCUMENT NO.	REV.
6089-1	15.10	

ENG-PT-1B (4/81)

PIPING – SPECIALTY ITEMS

SP

This symbol on P&ID or isometric denotes a piping specialty item not specified in the piping material specification. These items are as follows:

ITEM	SIZE	DESCRIPTION
13	3/4"	3/4" pipe size Combination Filter and Lubricator Unit. 5 micron filter Acceptable Model Model No. C4D-600-MIE-AU C.A. Norgren Co., or equal
15	1-1/2"	Quick Disconnect Socket - 316 stainless steel, female (ANPT) socket, automatic shut-off Acceptable Model Transamerica Delaval Fig. No. EC-250B24 w/Vitron "A" O-Rings or equal
16	1-1/2"	Quick Disconnect Nipple - 316 stainless steel, male (ANPT) nipple, automatic shut-off Acceptable Model Transamerica Delaval Figure No. EC-255A24 with Vitron O-Rings, or equal
17	1-1/2	Flexible Metal Hose - 316 stainless steel innercore, 321 stainless braid, heavy wall innercore, annular corrugations and close pitch with one hex male nipple on each end. Length 10'-0" long. Acceptable Model Titeflex 5920606241200 or equal
18	1"	Quick Disconnect Socket - 316 stainless steel, female (ANPT) socket, automatic shut-off Acceptable Model Transamerica Delaval Figure No. EC-250B16 with Vitron O-Rings, or equal

PIPING – SPECIALTY ITEMS

SP

This symbol on P&ID or isometric denotes a piping specialty item not specified in the piping material specification. These items are as follows:

ITEM	SIZE	DESCRIPTION
19	1-1/2"	Basket Cartridge Filter - Single filter housing with interchangeable cartridge or basket - bag type filter element. Housing material shall be 304L stainless steel and shall be designed and constructed to the ASME Code Sect. VIII, Div. 1 for pressure vessels. Max. flow thru filter shall be 20 GPM with allowable pressure drop when clean of 1 psi. The inlet and outlet nozzles shall be 150# FF flanges. Design pressure 150 PSIG @ 200°F. Acceptable Model AMF-CUNO 7PC1, or equal.

This data sheet and the design it covers are the property of THE RALPH M. PARSONS COMPANY. They are merely loaned and on the borrowers' express agreement that they will not be reproduced, copied, loaned, exhibited, nor used except in the limited way and private use permitted by any written consent given by the lender to the borrower.

REQUISITION NO.

Reference Specification Sheet No.

VENDOR FOXBORO (OR APPROVED EQUAL)

Model No. E17DM-1SM81E

GENERAL

1 Description: ☐ Recorder ☒ Indicator ☐ Blind ☐ Controller ☒ Transmitter

2 Case: ☐ Rectangular ☐ Circular ☒ Standard ☐ Other

3 Case Color: ☐ Black ☒ Standard ☐ Other

4 Mounting: ☐ Flush ☐ Surface ☒ Yoke

5 No. Points Recording ____ Indicating ____

6 Chart Type: ☐ 12-in. Circular ☐ Other

7 Chart Range ____ Number ____

8 Scale Range ____ Type ____

9 Chart Drive: ☐ Spring ☐ Electric ☐ Pneumatic

10 Chart Speed ____ Wind ____

Volts ____ Hertz ____ Explosion Proof

11 Air Pressure ____

12 Other ____

TRANSMITTER

13 Type: ☐ Pneumatic ☒ Electric

14 Output: ☐ 3-15 psi ☒ 4-20 mA DC ☐ Other

15 ____

CONTROLLER

16 Type: ☐ Pneumatic ☐ Electric ☐ Other

17 Prop ____ % ☐ Auto-Reset ☐ Rate Action ☐ Other

18 Output: ☐ 3-15 psi ☐ 4-20 mA DC ☐ Other

19 On Measurement Increase Output: ☐ Increases ☐ Decreases

AUTO MANUAL SWITCH

20 No. Positions ☐ External ☐ Internal ☐ Integral

SETPOINT ADJUSTMENTS

21 Manual: ☐ Internal ☐ External

22 Remote: ☐ Pneumatic ☐ Electric

23 Control Point Span: ☐ Fixed ☐ Adjustable

24 Other ____

STATIC PRESSURE OR RECEIVER ELEMENT

25 Type ____ Material ____

26 Range ____

27 For other elements see Tag No. ____ on Sheet No. ____

DIFFERENTIAL UNIT

28 ☐ Flow Rate ☐ Level ☐ Pressure

28a Suppression ☐ Yes ☒ No

29 ☐ Mercury ☐ Bellows ☒ Diaphragm

30 Others ____

31 Material: Body 316 SS; Diaphragm or Bellows HASTELLOY C276

32 Body Rating 1500 psig @ 60°F

33 Differential Range AS NOTED

34 Differential Connection ☐ ¼-in. ☐ ½-in. ☒ Other NOTE

ACCESSORIES

35 Filter and Regulator ____

36 Air Supply Gauge ____

37 Local Indicator YES

38 Charts and Inkset ____

39 Mounting Yoke ____

40 Pulsation Dampener ____

41 Mercury ____

42 Lubricator and Isolation Valve ____

43 Integrator ____

44 Primary Measuring Element ____ Type ____

45 Alarm Switch ____ ☐ Hermetically Sealed ☒ Explosion Proof ☐ General Purpose

Notes: 3" 150# FLANGED CONNECTION
SEE SHEET ENG-IN-0611B
TAG NO 21T-207
* VENDOR TO PROVIDE 1- MOORE INDUSTRIES INC
24VDC POWER SUPPLY MODEL PPS/24D [illegible]

RMP DATA SHEET
THE RALPH M. PARSONS COMPANY

DIFFERENTIAL PRESSURE INSTRUMENTS

SHEET 43 | JOB NUMBER 6083

DOCUMENT NUMBER 15-10-1 | REV 0

ENG-IN-0611A

DC-

REQUISITION NO.	VENDOR [illegible] APPROVED EQUAL
Reference Specification Sheet No.	Model No. E17DV-[illegible]M314

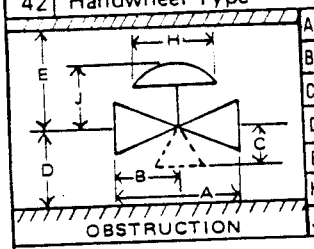
Rev	Tag No.	Item No.	P&ID No. and Section	Differential Range	Static Pressure Range	Scale or Chart Range	Measurement Increase Output	Service
	[illegible]	1	[illegible]	0-[illegible] "H2O	[illegible]	(1) 0-100%	INCR	TK-20 RING/SETTLING [illegible] MAKE-UP TANK [illegible] GAL

Notes: (1) VENDOR TO FURNISH OPTIONAL METER

RMP DATA SHEET THE RALPH M. PARSONS COMPANY	DIFFERENTIAL PRESSURE INSTRUMENTS LEVEL	SHEET 44	JOB NUMBER [illegible]-3
		DOCUMENT NUMBER [illegible]-1	REV 0

ENG-IN-0611B-G

	REQUISITION NO.			VENDOR CASHCO (OR APPROVED EQUAL)		
1	Tag No.		PCV-226			
2	Item No.		1			
3	Model No.		TYPE D			
4	Service		PLANT AIR TO TRANS PUMP			
5	Line No.		1/2"-CA125-1129NE			
6	P&ID No./Section		LA-RV-MP9/C9			
	SERVICE CONDITIONS					
7	Fluid	Units	AIR	SCFM		
8	Min Flow	Max Flow	20			
9	Normal Flow	Sizing Flow	40			
10	Inlet Press Max	Norm	125	100		
11	△P Max	△P For Valve Sizing		0-100 PSI		
12	Temp Max	Norm °F		AMB		
13	sp gr @ 60° F	@ Opr Temp	12×10^{-3}	12×10^{-3}		
14	Viscosity @ Opr Temp	cp	≈ 1.84×10^{-2}			
	BODY					
15	Body Size	Port Size	3/4"	(1)		
16	Type of Body					
17	Material		BRONZE			
18	End Connections		SCREWED			
19	Bonnet		STD			
20	Lubricator	Isolating Valve	—	—		
21	Packing or Seal		—			
22	Position Indicator		—			
23	Guiding		—			
24	No. of Ports		ONE			
25	Valve Characteristic		—			
26	Trim Matl: Cage ☐ Disc ☐ Ball ☐		STD			
27	Trim Matl: Plug ☐ Shaft ☐ Shaft ☐		STD			
28	Trim Matl: Seat ☐ Seal ☐		STD			
29	Trim Matl:					
30	C_v for Sizing Flow	Furn C_v				
	NOISE DATA					
31	Line Size	Pipe Schedule	3/4"	XS		
32	Insulation		—			
33	Sound Pressure Level dBA		—			
	ACTUATOR & ACCESSORIES					
34	Actuator Type		SELF REG.			
35	Fail Position		CLOSED			
36	Close @	Open @	—	—		
37	△P For Actuator Sizing		—			
38	Positioner Required	W/Filter Rgltr	—	—		
39	Bypass	Gauges	—	—		
40	For Input Signal of		—			
41	Output Shall Be		ADJ. 0-100 PSI			
42	Handwheel Type		—			



A	FACE TO FACE
B	FACE TO CENTER
C	FACE TO CENTER
D	CLEARANCE
E	CLEARANCE
H	ACTUATOR DIA
J	ACTUATOR HEIGHT

Notes: (1) BY VENDOR

PARSONS
SPECIFICATION

CONTROL VALVES

SHEET 45

JOB NUMBER 6039

DOCUMENT NUMBER 15.10-1

DC-

ENG-IN-0211 (4/81)

This document and the design it covers are the property of PARSONS. They are merely loaned and on the borrower's express agreement that they will not be reproduced, copied, loaned, exhibited, nor used except in the limited way and private use permitted by any written consent given to the lender to the borrower.

REQUISITION NO.	VENDOR DRESSER/ASHCROFT (OR APP'D EQUAL)
Reference Specification Sheet No.	Model No. 1279SS

1 Type: ☒ Indicating ☐ Receiver ☐ Other ____

2 Mounting: ☐ Surface ☐ Local ☐ Flush

3 Dial Diameter 4 1/2"

4 Dial Color: ☐ Black ☒ White BLACK

5 Case Material: ☐ Cast Iron ☐ Aluminum ☒ Phenol ☐ Other ____

6 Ring Type: ☐ Screwed ☐ Hinged ☐ Slip ☒ Other SNAP

7 ☐ Liquid Filled Case ☐ Glycerine Fill ☐ Other ____

8 Pressure Element: ☒ Bourdon ☐ Bellows ☐ Other ____

9 Element Material: ☐ Bronze ☐ Steel Type 316SS ☐ Stainless Steel ☐ Other ____

10 Socket Material: ☐ Bronze ☐ Steel Type 316SS ☐ Stainless Steel ☐ Other ____

11 Connection - NPT ☐ ¼ - in. ☒ ½ - in. ☒ Bottom ☐ Back

12 Movement: ☐ Bronze ☒ Stainless Steel ☐ Nylon ☐ Other ____

13 Blowout Disk ☒ Yes ☐ No

Rev	Tag No.	Item No.	P&ID No. and Section	Range (1) Tube	Range (1) Dial	Operating Pressure PSIG	Service	Accessories
	PI-203	1	LA-RV-MP -9/K6	0-100	0-600	0-60	REACTOR TK-21 TO SURGE TANK PRESSURE	
	PI-225	2	1/C9	0-200	0-200	100 TO 125	PLANT AIR TO TRANSFER PUMP	

Notes: (1) SCALES TO BE IN METRIC EQUIVALENTS

RMP DATA SHEET THE RALPH M. PARSONS COMPANY	PRESSURE GAUGES	SHEET 46	JOB NUMBER 6059-3
		DOCUMENT NUMBER 15.10-1	REV 0

ENG-IN-1211A-G

	REQUISITION NO.		VENDOR CLOSEST 1OR APPROVED EQUAL		
1	Tag No.	PSV-205			
2	Item No.	8			
3	Model No.	JMBUC			
4	Service	REACTOR			
		VENT			
5	Line or Equipment No.	1" AV-1125-AD			
6	P&ID No./Section	LA-RV-MP.9/K7			
	SERVICE CONDITIONS				
7	Fluid	STEAM			
8	Required Capacity / Units	400 / #/HR			
9	Maximum Capacity				
10	Mol Wt or sp gr @ Opr Temp	18			
11	Viscosity @ Opr Temp cp	0.018			
12	Press psig: Norm / Relieving	ATM /			
13	Temp °F: Norm / Relieving	210 / 240			
14	Spring Set Press (psig)	50			
15	Accumulation %	10			
16	Back Press—Constant	10 PSIG			
	Varies: From / To				
17	Bubble Tight @ 90% Set Press	COMMERCIAL			
	BASIS OF SELECTION				
18	Code	ASME SECTION VIII DIV. I			
19	Fire				
20	Other				
21					
	ORIFICE AREA				
22	Calculated sq in				
23	Selected sq in				
24	Orifice Designation				
	GENERAL				
25	Seat Type	FULL NOZZLE			
26	Design Type	SAFETY RELIEF			
27	Bonnet	CLOSED			
28					
	BODY				
29	Material	CARBON STEEL			
30	Size Inlet / Outlet	1" / 1½"			
31	Flange Rating ANSI	SCREWED			
32	Type Facing				
33					
	TRIM MATERIAL				
34	Seat and Disk	304 SS			
35	Guide & Ring(s)	316 SS			
36	Spring	CARBON STEEL			
37	Bellows	—			
	ACCESSORIES				
38	Cap	YES			
39	Lever Plain / Packed	NO / NO			
40	Gag	YES			
41	Other	—			
42	Code Stamp (ASME)	NOT REQ			

Notes:

RMP DATA SHEET THE RALPH M. PARSONS COMPANY	RELIEF VALVES	SHEET 47	JOB NUMBER 604
		DOCUMENT NUMBER 15,125-	REV

ENG-IN 0311-G

REQUISITION NO.

Reference Specification Sheet No.

VENDOR ROSEMOUNT (OR APPROVED EQUAL)

Model No. 444 RL2 U1A1NA

GENERAL

1 Description ☐ Recorder ☐ Indicator ☒ Blind ☐ Controller ☒ Transmitter

2 Case ☐ Rectangular ☐ Circular ☒ Standard ☐ Other ____

3 Case Color ☐ Black ☒ Standard ☐ ____

4 Mounting ☐ Flush ☐ Surface ☐ Yoke

5 No. Points....Recording — Indicating —

6 Chart Type — -in. ☐ Strip ☐ 12-in. Circular ☐ Other —

7 Chart Range and No. —

8 Scale Range and Type —

9 Revolutions per Day — or Inches per Hour —

10 Pen or Pointer Speed — Seconds Full Scale Travel

11 Printing Speed — Seconds per Point

12 Balancing ☐ Electronic ☐ Mechanical ☐ Manual ☐ Other ____

13 Volts * 24 Hz dc

TRANSMITTER

14 Type ☐ Pneumatic ☒ Electric

15 Output ☐ 3-15 psi ☒ Other 4-20 MAdc

16 ____

CONTROLLER

17 Type ☐ Pneumatic ☐ Electric ☐ Other ____

18 Prop ____ % ☐ Auto-Reset ☐ Rate ☐ On-Off ☐ Other ____

19 Output ☐ 3-15 psi ☐ 4-20 mA DC ☐ Other ____

20 On Measurement Increase Output: ☐ Increases ☐ Decreases

21 Electric Switch Type ____ ; On Measurement Increase Contacts: ☐ Open ☐ Close

22 Contact Rating Amps ____ Volts ____

AUTO MANUAL SWITCH

23 No. Positions ____ ☐ External ☐ Internal ☐ Integral

SETPOINT ADJUSTMENTS

24 Manual ☐ Internal ☐ External

25 Remote ☐ Pneumatic ☐ Electric

26 Control Point Span ☐ Fixed ☐ Adjustable

27 ☐ Other ____

MEASUREMENT

28 ☐ Thermocouple Type ☐ J(IC) ☐ K(CA) ☐ T(CC) ☐ Other ____ ☐ Reference Junction Compensation ☐ Automatic Standardization

29 ☐ Radiation Type

30 ☒ Resistance Bulb Type Material ☐ Nickel ☒ Platinum ☐ Other ____

31 ☐ Other Type ____

32 Range ____ to ____ ☐ °F ☐ °C

33 Other ____

ACCESSORIES

34 Filter and Regulator ____

35 Air Supply Gauge ____

36 Charts and Inkset ____

37 Zener Diode ____

38 Alarm Contacts ____

39 Other ____

Notes:
1. TRANSMITTER INTEGRAL PART OF RTD AND WELL
2. ZERO AND SPAN ADJUSTABLE
3. SEE FORM 1612B-G FOR RANGE, RTD, WELL

TAG NO. TT-198A

VENDOR TO PROVIDE 1- MOORE INDUSTRIES INC 24VDC POWER SUPPLY MODEL PPS/24DC/200MA/CT/STD

RMP DATA SHEET THE RALPH M. PARSONS COMPANY	TEMPERATURE INSTRUMENTS (POTENTIOMETER, PYROMETER AND RESISTANCE)	SHEET 48	JOB NUMBER 6089-3
		DOCUMENT NUMBER 15.10-1	REV

ENG-IN-1612A-G

REQUISITION NO.	VENDOR Rosemount (or Approved Equal)
Reference Specification Sheet No.	Model No. 88G81E C6050066 (See Note)

Rev	Tag No.	Item No.	P&ID No. & Sect	Range °F	Type of ~~TC~~ RTD ~~Rec Bulb~~ Plat.	Scale and Chart	No. Points	Meas Incr Output	Service
	TE/TT-198A	1	MP-9 K-7	0-400	4-wire 100 ohm	—	—	INCR	Reactor Tank TK-21 Temp.

Notes: Well to be suitable for element. Well to be flange mounted straight style, 3" 150# raised face Hastelloy material

RMP DATA SHEET THE RALPH M. PARSONS COMPANY	TEMPERATURE INSTRUMENTS (POTENTIOMETER, PYROMETER, AND RESISTANCE)	SHEET 49	JOB NUMBER 6069-3
		DOCUMENT NUMBER 15.10-1	REV

REQUISITION NO.	VENDOR ASHCROFT (OR APPROVED EQUAL)
Reference Specification Sheet No.	

GENERAL

1 Bulb Type: ☒ Threaded ☐ Plain ☐ Union ☐ Other _____

2 Case Material: ■ Manufacturer Standard ☐ Other _____

3 Dial Size 5" Color WHITE

4 Form: ☐ Straight ☐ Angle ☐ Fixed ☒ Adjustable

5 Bulb or Union Thread Size: ■ ½-in. ☐ ¾-in.

6 Manufacturer Model No. 50 EI 42 E

WELL

7 Construction: ☐ Built-up ■ Drilled Bar Stock ☐ Other _____

8 Material: ☐ 304 SS ☒ 316 SS ☐ Other _____

9 Process Connection: ☐ 1-in. NPT ☒ Other ½" NPT

10 Lag Extension T: ☒ None ☐ Shown Below ☐ 3-in.

11 Manufacturer Model No. * LIGHT DUTY TAPERED

Rev	Tag No.	Item No.	P&ID No. & Sect	Range	Opr Temp	Stem Length	*T Dim	Type Connection	Line Size and Spec	Service
	TI-263	1	LA-RY MP-9/M3	0° TO 100° C	≈ 80°C	*	—	—	1"-ICW 1121-NE	WASTE WATER

Notes:

* T Dimension is lag length.

* ½" MNPT SCREWED WELL "U" DIMENSION 2½"
STEM LENGTH OF ELEMENT MUST BE SELECTED FOR THIS "U" DIMENSION

RMP SPECIFICATION	INDICATING BIMETAL THERMOMETERS	SHEET 50	JOB NUMBER 0C29-3
		DOCUMENT NUMBER	REV

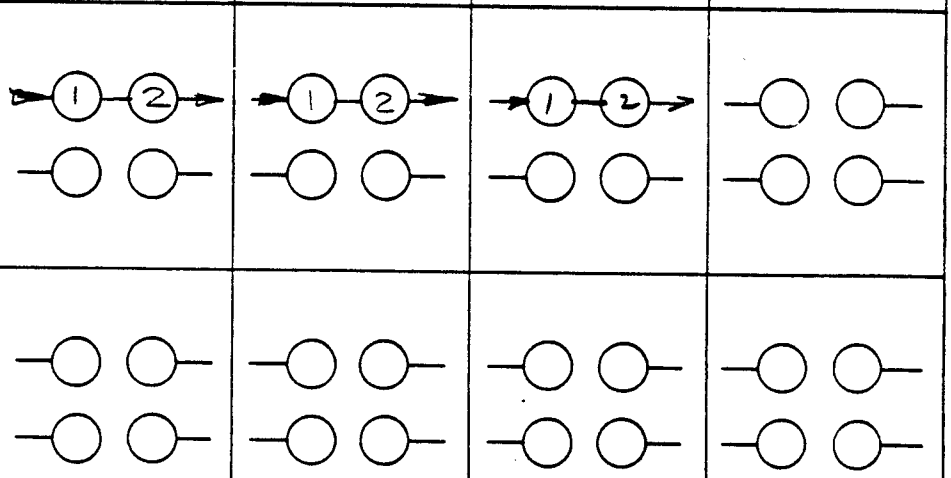
This specification sheet and the design it covers are the property of THE RALPH M. PARSONS COMPANY. They are merely loaned and on the borrower's express agreement that they will not be reproduced, copied, loaned, exhibited, nor used except in the limited way and private use permitted by any written consent given by the lender to the borrower.

	REQUISITION NO.				VENDOR ASCO (OR APPROVED EQUAL)					
1	Tag No.		EZ-222		EZ-223		22-278			
2	Item No.		1		2					
3	Model No.		HT8211D89MO		→		HB8211C87MO			
4	Service		ICW TO		ICW TO		SEAL WATER			
			CONDENSER		REACTOR		TO REACTOR MIXER			
5	Line No.		1"-ICW-1120-NE		1"-ICW-1123-NE					
6	P&ID No./Section		LA-RV-MP9/H4		LA-RV-MP-9/H5		MP-9/J-7			
	SERVICE CONDITIONS									
7	Fluid	Units	WATER	GPM	WATER	GPM	WATER	GPM		
8	Flow Normal	Maximum	11.0	15.0	11.0	15.0		.5		
9	Pressure in Normal	Maximum	60		60		60			
10	ΔP Normal	Maximum	2		2		2			
11	Temperature Normal	Maximum	70	80	70	80	70			
12	Visc @ Opr Temp Cp	Sp Gr	1.0	1.0	1.0	1.0		1.01		
13	Gas or Vapor Mol Wt		—		—					
14	S.G./VIS-CP@ F T		1.0		1.0					
	BODY									
15	Body Size	Port Size	1"	1"	1"	1"	1/2"	5/8		
16	Type of Body		2 WAY		2 WAY		2 WAY			
17	Material		316 SS		→		316SS			
18	End Connections		SCRD		→		SCRD			
19	Direct Lift	Internal Pilot	YES	—	YES	—	YES	—		
20	Packing or Seal		—		—		—			
21	Manual Operator		YES		YES		YES			
22	Reset		—		—		—			
23	Material Plug	Seat	SS	BUNA N	SS	BUNA N	SS	BUNA N		
24	Cv for Maximum Flow	Furnished Cv	8	11.2	8	11.2		"		
25										
	ACTION									
26	Normally Closed or Normally Open		CLOSED		CLOSED		CLOSED			
27										
	SOLENOID		All Solenoids Shall Be Designed for Continuous Duty							
28	Voltage DC or AC & Hz		120V 60 HZ		→		115V 60HZ			
29	~~Amps~~ WATTS Pull In	Hold	15.4		→		—	—		
30	Enclosure		NEMA 4		→		NEMA 4			
31	Electrical Connections and Size		1/2" FNPT		→		1/2" CONDUIT			
32	Coil		CLASS H		CLASS H		CLASS H			
33	Connections (Reference Sketch)		1 INLET		→		1 INLET			
34	" " "		2 OUTLET		→		2 OUTLET			
35	" " "									
36	" " "									

Notes:

37 Energized

38 Deenergized



RVP SPECIFICATION	SOLENOID VALVES	SHEET 51	JOB NUMBER 6097-3

This specification sheet and the design it covers are the property of THE RALPH M. PARSONS COMPANY. They are merely loaned and on the borrower's express agreement that they will not be reproduced, copied, loaned, exhibited, nor used except in the limited way and private use permitted by any written consent given by the lender to the borrower.

REQUISITION NO.	VENDOR FISCHER PORTER (OR APPROVED EQUAL)
Reference Specification Sheet No.	Model No. 51 EG 1212 ** B

Rev	Tag No.	Item No.	P&ID No. & Section	Chart Range	Scale Range **	Measurement Increase Output	Service
	LT-198	1	MP-9 K-8	#	0-66"	INC	REACTOR TANK LEVEL
	TI-198A	2	MP-9 K-8		0-400F	INC	REACTOR TANK TEMP

CONTRACTOR TO COORDINATE RANGE BASED ON FINAL LENGTH OF LEVEL PROBE TAG NO TE-198A

RMP DATA SHEET
THE RALPH M. PARSONS COMPANY

RECEIVER INSTRUMENTS

SHEET 52 | JOB NUMBER 60K9-3
DOCUMENT NUMBER 15.10-1 | REV

ENG-IN-1611B-G

	REQUISITION NO.			VENDOR BS&B SAFETY SYSTEMS (OR APPROVED EQUAL)		
1	Tag No.		RD-227			
2	Item No.					
3	Model No.		B			
4	Service		REACTOR VENT			
5	Line or Equipment No.		1"-AV-1112-NE			
6	P&ID No./Section		LA-RY-MP-9/K6			
	SERVICE CONDITIONS					
7	Fluid		STEAM VAPOR			
8	Required Capacity	Units	400 #/HR			
9	Maximum Capacity					
10	Mol Wt or Sp Gr @ Operating Temp		18 (APPROX)			
11	Viscosity @ Operating Temp Cp		0.018			
12	Pressure psig: Normal	Relieving	ATM			
13	Temp °F: Normal	Relieving	210 240			
14	Back Pressure - Constant		ATM			
	Varies: from	to				
15	Bursting Pressure, Desired psig		60			
16	Bursting Pressure, Minimum psig		57			
17	Bursting Pressure, Maximum psig		63			
	BASIS OF SELECTION					
18	Code					
19	Fire					
20	Other		PSV PROTECTION			
21						
	SAFETY HEADS					
22	Size		1"			
23	Type		QUIK-SERT FA-7R			
24	Inlet Connection - Type		WELD NECK FLG			
25	Inlet Connection - Rating		1"-150# RF			
26	Inlet Connection - Material		304L SS			
27	Outlet Connection - Type		WELD NECK FLG			
28	Outlet Connection - Rating		1"-150# RF			
29	Outlet Connection - Material		304L SS			
30	Bolting		ANSI			
31	Gauge Tap		—			
32	BORE		SCHED. 40			
	RUPTURE DISK					
33	Disk Type		B			
34	Disk Material		316 SS			
35	Vacuum Support Material		NO			
36	Seal Material		TEFLON			
37	Protective Ring Material		—			
38	Lining		TEFLON			
39	Coating		—			
40	Knife Blade Material		—			
41	Gasket Material		—			
42						
	ACCESSORIES					
43	Spare Disks		2 REQ'D			
44	Code Stamp (ASME) on Handle		YES			
45	Excess Flow Valve		—			
46						
47						

Notes: RUPTURE DISC AND SAFETY HEAD BY VENDOR
CONTRACTOR TO ASSEMBLE PARTS AND INSTALL BETWEEN PIPE FLANGES

RMP DATA SHEET THE RALPH M. PARSONS COMPANY	RUPTURE DISKS	SHEET 53	JOB NUMBER 6037-3
		DOCUMENT NUMBER 15.10	REV C

H.C.H

REQUISITION NO. | VENDOR BECKMAN (OR APPROVED EQUAL)

Reference Specification Sheet No.

MODEL Nº 942, pH MONITOR CONSISTING OF COMPONENTS AS FOLLOWS:

P&ID LA-RV-MP-9, REV 1

1 - MODEL 942 ANALYZER PN646949-pH, WITH PN636199 INTEGRAL PREAMPLIFIER

TAG Nº AIT-199A, ANALYZER

TAG Nº AE-199A, SUBMERSIBLE ELECTRODE STA./PREAMP

SERIES III ELECTRODE STATION 300-2-0-20-3-1-3-0

INCLUDING:

316 SS FLOW CHAMBER AND DOME ASSY

#19036 GOLD LABEL DOUBLE JUNCTION REFERENCE ELECTRODE

#19501 PH GLASS ELECTRODE, GENERAL PURPOSE

#19590 RTD THERMOCOMPENSATOR

POWER SUPPLY 120V ±5% 60HZ SINGLE PHASE

RANGE PH: ADJUSTABLE FROM 0-14

OUTPUT: 4-20 MA dc INTEGRAL (WITH ANALYZER) TRANSMITTER

HIGH IMPEDENCE CABLE #646983 20FT

1 - SAME AS ABOVE EXCEPT TAG NOS AE-199B AND AIT-199B WITH A MEASURING ELECTRODE FOR OXIDATION REDUCTION POTENTIAL (ORP) MEASUREMENT

ANALYZER #615300 -1400 TO +1400 mV (ADJUSTABLE)

RMP DATA SHEET THE RALPH M. PARSONS COMPANY	pH/ORP ANALYZER	SHEET 54	JOB NUMBER 6089-3
		DOCUMENT NUMBER 15-10-1	REV 0

ENG-IN-0112-G

REQUISITION NO. | VENDOR ALLEN-BRADLEY (OR APPROVED EQUAL)

Reference Specification Sheet No.

TAG NO : KC-224

P & ID : LA-RV-MP-9, REV 1/H6

TIMING RELAY

SERVICE : WATER FLOW SOLENOID VALVE CONTROL

MODEL NO : 700-RTA20V200-A1

CONTACTS : 2 N.O. CONTACTS, CLOSE INSTANTANEOUS

2 N.C. CONTACTS, TIMED OPENING

TIMING RANGE : 1 TO 64 MINUTES

8 PROGRAM KEYS ARE PROVIDED FOR

THE FOLLOWING RANGES:

0.015 TO 1, 0.06 TO 4, 0.25 TO 16 & 1-64 MIN

UL LISTING : CLASS I DIV. 2 & GROUPS A, B, C & D

POWER REQMNTS : 120 V & 60 HZ

CONTACT RATING : 120 VAC 5 AMPS

This document and the design it covers are the property of PARSONS. They are merely loaned and on the borrower's express agreement that they will not be reproduced, copied, loaned, exhibited, nor used except in the limited way and private use permitted by any written consent given to the lender to the borrower.

PARSONS	TIMING RELAY	SHEET 55	JOB NUMBER 6089-3
		DOCUMENT NUMBER	REV

REQUISITION NO.	VENDOR ALLEN-BRADLEY (OR APPROVED EQUAL)
Reference Specification Sheet No.	

TIME DELAY RELAY WITH SEC
CONTAINED POTENTIOMETER

TYPE : SOLID STATE
INPUT VOLTAGE : 115VAC 60 HZ

TIME DELAY (MAX) - 30 SEC. (MIN) - 0.5 SEC.
CONTACTS (TDOAE) TIME DELAY OPEN AFTER ENERGIZING

AC RATING MAKE (30 AMPS) BREAK (2 AMPS)

MODEL : ALLEN-BRADLEY 8525-NSB

TAG. NO. RC-278

RMP DATA SHEET THE RALPH M. PARSONS COMPANY	TIMING RELAY	SHEET 56	JOB NUMBER 6084-3
		DOCUMENT NUMBER	REV

REQUISITION NO.	VENDOR PENBERTHY - OUDAILLE (OR APPD EQ)
Reference Specification Sheet No.	

REV 1,

TAG NOS: FI-272 FI-273 FI-274

P&ID : LA-RV-MP-9 ZONE M, N & O - 7, 8 & 9

SIGAT FLOW INDICATORS

MODEL No: SFR-1 ROTATOR STYLE-3 REQ'D

SERVICE: COOLING WATER DISCHARGE VENT GAS CONDENSER

FLUID: WATER

S.G.: 1.0

TEMP:

LINE No: 1½"-AW-1111-AD 1"-ICW-1121-NE & 1"-HWHR-1124-NE

PHYSICAL LENGTH = 4 1/4 INCHES, 5½ INCHES

CONNECTION: SCREWED 1" NPT-F, 1½" NPT-F *

ROTATOR MAT'L: TEFLON PADDLE WHEEL

ANSI RATING: 150 #

SIGHT GLASS: TEMPERED

BODY MAT'L: 316 SS

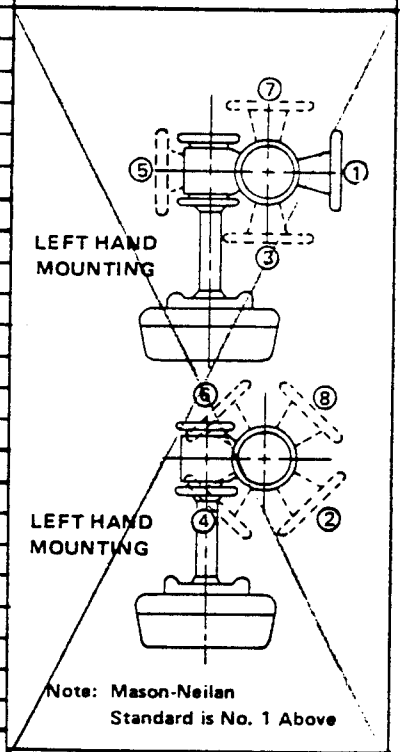
* FI-272 - 1½"
FI-273, 274 - 1"

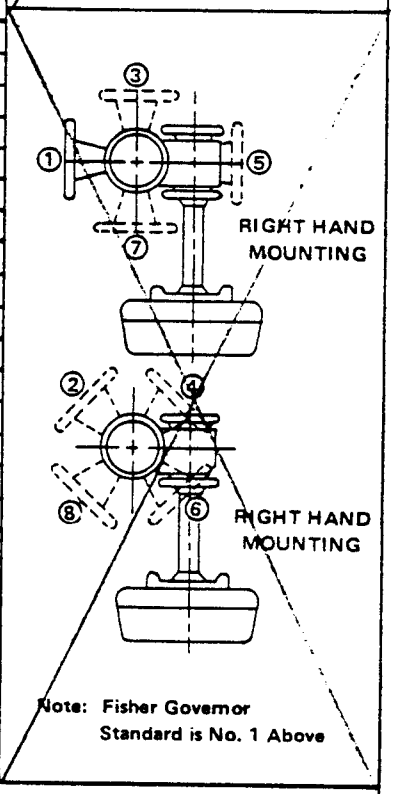
PARSONS SPECIFICATION	SIGHT FLOW INDICATORS	SHEET 57	JOB NUMBER 6089-3
		DOCUMENT NUMBER 15.10-1	REV 0

This document and the design it covers are the property of PARSONS. They are merely loaned and on the borrower's express agreement that they will not be reproduced, copied, loaned, exhibited, nor used except in the limited way and private use permitted by any written consent given to the lender to the borrower.

	REQUISITION NO.				VENDOR MAGNETROL (OR APPROVED EQUAL)			
1	Tag No.		LE/LT-198					
2	Item No.		1					
3	Model No.		82-7002-001					
4	Service		REACTOR TANK LEVEL					
5	Vessel or Equipment No.		TK-21					
6	P&ID No./Section		MP-9 K-8					
7	Type		CAPACITANCE TYPE					
	SERVICE CONDITIONS							
8	~~Upper~~ Fluid		TREATED WATER					
9	~~Lower~~ Fluid							
10	sp gr ~~Upper~~	sp gr ~~Lower~~						
11	Press Max	Norm (psig)	AMB					
12	Temp Max	Norm (°F)	240	210				
13								
14								
	~~BODY~~ PROBE		41-1001-001X					
15	Material		KYNAR COATED					
16	Size & Type Connections		3"-150# FLANGE R.F. 316 SS					
17	Top Connection ~~Location~~		NOZZLE TOP OF TANK					
18	Bot Connection ~~Location~~							
19	Case Mounting							
20	Flange Orientation							
21	Rotatable Head							
22	LENGTH		66"					
	FLOAT OR DISPLACER							
23	Diameter or Length, in.							
24	Extension, in.							
25	Material							
26	Torque Tube Material							
27	Air Fin							
28								
	TRANSMITTER							
29	Type		ELECTRIC					
30	Output		4-20 MADC					
31								
	CONTROL							
32	Type							
33	Proportional %	Reset						
34	Output							
35	On Level Increase, Output							
36								
	ACCESSORIES							
37	Filter & Regulator							
38	Gauge Glass Connections							
39	Gauge Glass							
40	Purge Connection							
41	Electric Switch							
42	CABLE 500F		37-3112-020		20FT			
43								

ORIENTATION





Notes:

RMP DATA SHEET
THE RALPH M. PARSONS COMPANY

LEVEL INSTRUMENTS

SHEET	JOB NUMBER
58	6084-3

DOCUMENT NUMBER | REV

REQUISITION NO.	VENDOR DANIEL INDUSTRIES (OR APPROVED EQUAL)

	ORIFICE PLATE		ORIFICE FLANGE	
1	Concentric: ☒ Other	7	Taps: Flange ☐ Pipe ☐ Other —	
2	Make to ASME Standard ☒ Other	8	Rating & Facing 150# FLAT FACE	
3	Plate Material: 316 SS ☐ Other HASTELLOY	9	Type: Weld Neck ☒ Other SLIP ON	
4	RTJ Ring Matl & Type	10	Material: Steel ☒ Other	
5	Bore Maximum Rate ☐ Nearest 1/8 in. ☒	11	Tap Size 1/2 in. NPT ☐ Other —	
6	Stamp to ISA Standard ☒ Other	12	Flanges by Mat'l Control ☐ — ☐	

13	Tag Number			RD-199						
14	Item Number			1						
15	Service			REACTOR						
				TK-21 PH						
16	Line No.			1" HW-HR-1124-NE						
17	P&ID No./Section			MP-9 M-7						
	SERVICE CONDITIONS									
18	Fluid			LIQUID						
19	Flow Units									
20	Full Scale Flow	Opr	Base							
21	Norm Flow	Opr	Base							
22	Press (psia)	Opr	Base	AMB						
23	Barometric Pressure (psia)									
24	Temperature °F	Opr	Base	210						
25	sp gr @ 60° F & Base Press									
26	sp gr @ Opr Conditions									
27	Supercomp Factor @ Opr Press									
28	Vapor, Gas Mol.Wt.									
29	Viscosity @ Opr Temp (cp)									
30	Steam Qual	Superheat °F								
31	Weep Hole Required									
32	Viscosity Correction (Fc)									
33	Liquid Compressibility Factor (Fp)									
34	Density (lbs/ft^3)	Opr	Base							
35	Compressibility	Opr	Base							
36	Cp/Cv									
37	Specific Volume (ft^3/lb)									
	MEASURING STATION DATA									
38	Actual Orifice ID in.			3/4"						
39	Line Flange ID in.			STD						
40	Orifice Plate Thickness in.			1/8"						
41	Seal sp gr @ 60° F			—						
42	Meter Type			—						
43	Diff Range in H_2O Dry			N/A						
44	Static Range psia			—						
45	Chart or Scale Range			—						
46	Chart Multiplier (C)			—						
47	Beta Ratio d/D			.75						
48	Manometer Correction (Fm)			—						
49	Flow Equals			—						
50	Line:	Size	Sched	1"	STD					

Notes:

1. Volume rates of flow are expressed at 60° F for liquids and on base conditions for gases and vapors.
2. Vents and drains (weep holes) when specified shall conform to ¶20 (i) of the ASME "Flow Measurement" Chap 4, PTC 19.5, 4-1959
3. "F" equals flow pen reading; "P" equals static pressure pen reading.

RMP DATA SHEET THE RALPH M. PARSONS COMPANY	ORIFICE PLATES	SHEET 59	JOB NUMBER 6089-3
		DOCUMENT NUMBER 15.10-1	REV

ENG-IN-1511-G

REVISIONS	NO.	DATE	BY	CK	APP	DESCRIPTION
	C	[illegible]	J.C	[illegible]		INITIAL ISSUE

REVISIONS	NO.	DATE	BY	CK	APP	DESCRIPTION

For LOS ALAMOS NATIONAL LAB. Site LOS ALAMOS, NEW MEXICO
Unit TA-50 (RLM-1) Service AGITATOR - RECEIVING/SETTLING TANK
Item No. M-20 Quantity ONE
Mfr Size/Type /TURBINE Serial No.
Item No. (Motor Driver) M-20 Furn By VENDOR Mtd By VENDOR
Other

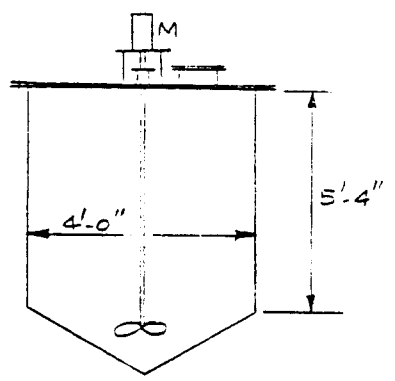
MIXING CONDITIONS

Mixer Function TO MAINTAINE SOLIDS IN SUSPENSION AND MIX THE CONTENTS
Final State Reqd: ☐ Complete Uniformity ☒ 98 % Uniformity ☒ Off Bottom Susp ☐ Other
Withdrawal Rate gpm Batch Blending Time hrs Solids Settling Velocity fpm

COMPONENTS

	1st Cmpnt	2nd Cmpnt	3rd Cmpnt	Mixture
Type of Liquid NOTE 1				
Type of Solid				
Specific Gravity @ 60 °F				1.5
Viscosity cp @ 60 °F				500
% of Mix ☐ Vol ☐ Wt				
Component Temp DESIGN °F	225	225	225	
Solids Size				

APPLICATION SKETCH



MIXER DWG
VESSEL DWG TK-20

MIXER DESIGN

☒ Top Entry ☐ Side Entry ☐ Bottom Entry Wetted Parts Material HASTELOY C
Impeller: Type TURBINE No. ONE No. of Blades
Diameter in. Stabilizer Off Bottom in.
Speed rpm Pumping Capacity 20-30 gpm Tip Speed fpm
Shaft: Diameter in. Length in. bhp 1st Critical rpm
Coupling Type Location
Seal LIP SEAL Style
Seal Lubricator Style
Mixer Mount: ☒ Closed Tank Flange Mounted ☐ Open Tank Beam Mounted
☐ Center Mounted ☐ Angle Riser Mount ☐ Off Center Mount in.
Mounting Flange Size in. Rating psig Facing
Design Loads: Vertical Downward Load lbs
Bending Moment ft.- lbs Torque in.-lbs
Other

Gear Type
Mfr Ratio
Service Factor
Maximum Case Horsepower

VESSEL DESCRIPTION

Material SHELL CARBON STEEL KYNAR LINED/TOP 304L S.S.
Type CYL VERTICAL Diameter 4' Height 5'-4"
Top ☐ Open ☒ Closed ☒ Flat ☐ Dished Max Manway Dia in.
Bottom ~~☐ Flat~~ ~~☐ Dished~~ 120° CONE BOTTOM Max Head Room Avail ft
Capacity 30~ gal Normal 500 gal Maximum
Liquid Level 5' (NOTE 2) ft Normal 5' ft Maximum
Pressure ATMOSPHERIC psig Normal 15 psig Maximum
Agitator Flange Size in. For ☐ Mixer Support ☐ Shaft Seal
Baffles No. Width in. Height Off Wall in.
Other

WEIGHTS

Mixer lbs
Driver lbs
Shaft & Impeller lbs
Total lbs

MOTOR DRIVER

Mfr
rpm hp
Data Sheet

Notes 1. NITRIC ACID, HYDROCHLORIC ACID, FLUOROBORIC ACID, VARIOUS BASES, CYANIDES, CYANATES, CHROMATES AND CADMIUM SOLUTIONS AT VARIOUS CONCENTRATIONS.
2. MINIMUM CAPACITY 100 GAL (SEE SHT 2 OF 2 FOR SKETCH)

AMP DATA SHEET THE RALPH M. PARSONS COMPANY	RECEIVING/SETTLING TANK MIXER/AGITATOR M-20	SHEET 1 OF 2	JOB NUMBER 600	DOCUMENT NUMBER 15.11-04	REV C

ENG-RE-404 DC-

This data and the design it covers are the property of THE RALPH M. PARSONS COMPANY. They are merely loaned and on the borrowers' express agreement that they will not be reproduced, copied, loaned, exhibited, nor used except in the limited way and private use permitted by any written consent given by the lender to the borrower.

REVISIONS	NO.	DATE	BY	CK	APP	DESCRIPTION	REVISIONS	NO.	DATE	BY	CK	APP	DESCRIPTION
	0	2/16/83	JJ	[illegible]		INITIAL ISSUE							

DESIGN DATA AND ACCESSORY EQUIPMENT

No. of Identical Units ONE Tag No. M-20

Service RECEIVING/SETTLING TANK AGITATOR

Nameplate: 1.5 (ESTIMATED) hp 480 V 3 Phase 60 Hz (SEE BELOW) Service Factor

[illegible] (3) r/min(syn) CONST Duty _____ Locked-Rotor kVA

Insulation Class: A ☐ B ☐ F ☐ H ☐ _____ °C Ambient

Sealed ☐ Encapsulated ☐

Area Classification: Class (I) (II) (III), Group (A) (B) (C) (D), Division (1) (2)

Atmospheric Mixture _____ T-Rating _____ °C Unclassified ☐

Enclosure: Weather-Protected Type (I) (II) Totally Enclosed Fan-Cooled ☒

Totally Enclosed Nonventilated ☐ Explosionproof ☐

Location: Indoor ☒ Outdoor ☐ Dusty ☐ Altitude 7200 FT

Bearing type: Ball ☐ Sleeve ☐ Forced-Feed Lubrication ☐

Specification: NEMA Standard MG 1 ☒ API RP 541 ☐

Sound Pressure Level Requirements: _____

Starting: Full Voltage ☐ Reduced Voltage ☐ _____ % of Voltage

Unloaded ☐ Loaded ☐ Capacitors for Power Factor Correction ☐

Mounting Method: Horizontal ☐ Vertical ☒

Stainless Steel Nameplate ☒ Filter for WP (I) (II) ☐

Drain Plugs ☐ Thermal Temperature Switches ☐ Thermocouples ☐

Resistance Temperature Detectors ☐ Bearing Temperature Detectors ☐

Space Heaters ☐ _____ V _____ W _____ Phase

Differential Protection ☐ Surge Protection ☐ Oversized Terminal Box ☐

INFORMATION BELOW TO BE COMPLETED BY VENDOR

Motor Mfr _____ Type _____ Style No. _____

Full Load, r/min _____ Weight _____ Frame No. _____

Bearing Mfr _____ Bearing No. _____

Starting Torque _____ Locked Rotor Torque _____

Locked Rotor Amperage _____

Pull Up Torque _____

Full Load Torque _____

Breakdown Torque _____

Accelerating Time in Seconds (0 – Full Speed) _____

Tests (When Specified) _____

Stall Time at Zero r/min _____ Seconds

Number of Consecutive Starts _____

LOAD	FULL	¾	½
Amperes			
Efficiency, %			
Power Factor			
Speed, r/min			

Safe Time-Current Curve ☐

Speed-Torque Curve ☐

Notes: 2. FOUR SPEED, TWO WINDING, HAVING SPEEDS 2/3, 1/2, AND 1/5 OF HIGH SPEED. STARTER SHALL BE FOUR SPEED TWO WINDING NEMA SIZE 1.

PARSONS DATA SHEET	INDUCTION MOTOR M-20	ACCOUNT NUMBER SHT 2 OF 2	JOB NUMBER 6029[illegible]
		DOCUMENT NUMBER 15.11-04	REV 0

ENG-EE-101 (6/81) DC–

This document and the design it covers are the property of PARSONS. The, not be reproduced, copied, loaned, exhibited, nor used except in the limited way and private use permitted by any written consent given to the lender to the borrower. merely loaned and on the borrower's express agreement that they

REVISIONS	NO.	DATE	BY	CK	APP	DESCRIPTION	REVISIONS	NO.	DATE	BY	CK	APP	DESCRIPTION
	0	2/16/83	J.C.			REVISED ISSUE							

For LOS ALAMOS NATIONAL LAB — Site LOS ALAMOS, NEW MEXICO
Unit TA-50 (WM-1) — Service AGITATOR - REACTOR
Item No. M-21 — Quantity ONE
Mfr — Size/Type / TURBINE — Serial No.
Item No. (Motor Driver) M-21 — Furn By VENDOR — Mtd By VENDOR
Other

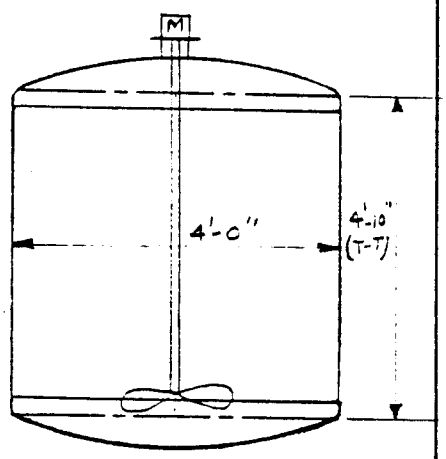
MIXING CONDITIONS

Mixer Function TO MAINTAIN SOLIDS IN SUSPENSION - GAS DISPERSION (NOTE 3)
Final State Reqd: ☐ Complete Uniformity ■ 98 % Uniformity ■ Off Bottom Susp ☐ Other
Withdrawal Rate — gpm Batch Blending Time ____ hrs Solids Settling Velocity ____ fpm

COMPONENTS

	1st Cmpnt	2nd Cmpnt	3rd Cmpnt	Mixture
Type of Liquid (NOTE 1)				
Type of Solid				
Specific Gravity @ 60 °F				1.5
Viscosity cp @ 60 °F				500
% of Mix ☐ Vol ☐ Wt				
~~Component~~ DESIGN Temp °F	225	225	225	
Solids Size				

APPLICATION SKETCH



MIXER DWG
VESSEL DWG TK-21

MIXER DESIGN

■ Top Entry ☐ Side Entry ☐ Bottom Entry Wetted Parts Material HASTELOY C
Impeller: Type TURBINE No. ONE No. of Blades
Diameter ____ in. Stabilizer ____ Off Bottom ____ in.
Speed ____ rpm Pumping Capacity 20-20 gpm Tip Speed ____ fpm
Shaft: Diameter ____ in. Length ____ in. bhp ____ 1st Critical ____ rpm
Coupling Type ____ Location
Seal DOUBLE MECH. Style BY VENDOR
Seal Lubricator IND. WATER (NOTE 4,5) Style
Mixer Mount: ■ Closed Tank Flange Mounted ☐ Open Tank Beam Mounted
☐ Center Mounted ☐ Angle Riser Mount ☐ Off Center Mount ____ in.
Mounting Flange Size ____ in. Rating ____ psig Facing
Design Loads: Vertical Downward Load ____ lbs
Bending Moment ____ in.- lbs Torque ____ in.-lbs
Other

Gear Type
Mfr ____ Ratio
Service Factor
Maximum Case Horsepower

VESSEL DESCRIPTION

Material SA-285 C W/ KYNAR LINING
Type CYL VERTICAL Diameter 4' Height 4'-10"
Top ☐ Open ☐ Closed ☐ Flat ■ Dished Max Manway Dia ____ in.
Bottom ☐ Flat ■ Dished Max Head Room Avail ____ ft
Capacity 300 gal Normal 250 gal Maximum
Liquid Level 2'-7" (NOTE 2) ft Normal ____ ft Maximum
Pressure ATMOSPHERIC psig Normal 50 psig Maximum
Agitator Flange Size BY VENDOR in. For ☐ Mixer Support ☐ Shaft Seal
Baffles No. ____ Width ____ in. Height ____ Off Wall ____ in.
Other

WEIGHTS

Mixer ____ lbs
Driver ____ lbs
Shaft & Impeller ____ lbs
Total ____ lbs

MOTOR DRIVER

Mfr
rpm ____ hp
Data Sheet

Notes 1. NITRIC ACID, HYDROCHLORIC ACID, FLUOROBORIC ACID, VARIOUS BASES, CYANIDES, CYANATES, CHROMATES AND CADMIUM SOLUTIONS AT VARIOUS CONCENTRATIONS.
2. MINIMUM LIQUID VOLUME 100 GAL. (SEE SHT 2 OF 2 FOR CONT.)

RMP DATA SHEET
THE RALPH M. PARSONS COMPANY

MIXER/AGITATOR
M-21
REACTOR - AGITATOR

SHEET	OF	JOB NUMBER
1	2	6089-01

DOCUMENT NUMBER	REV
15.1-05	1

This data sheet and the design it covers are the property of THE RALPH M. PARSONS COMPANY. They are merely loaned and on the borrowers' express agreement that they will not be reproduced, copied, loaned, exhibited, nor used except in the limited way and private use permitted by any written consent given by the lender to the borrower.

REVISIONS	NO.	DATE	BY	CK	APP	DESCRIPTION	REVISIONS	NO.	DATE	BY	CK	APP	DESCRIPTION
	0	2/16/83	J.S	[illegible]		INITIAL ISSUE							

DESIGN DATA AND ACCESSORY EQUIPMENT

No. of Identical Units ONE Tag No. M-21

Service REACTOR AGITATOR

Nameplate: 1 (ESTIMATED) (SEE NOTE 6) hp 460 V 3 Phase 60 Hz (SEE SPEC) Service Factor

r/min(syn) _____ Duty _____ Locked-Rotor kVA

Insulation Class: A ☐ B ☐ F ☐ H ☐ _____ °C Ambient

Sealed ☐ Encapsulated ☐

Area Classification: Class (I) (II) (III), Group (A) (B) (C) (D), Division (1) (2)

Atmospheric Mixture _____ T-Rating _____ °C Unclassified ☐

Enclosure: Weather-Protected Type (I) (II) Totally Enclosed Fan-Cooled ■

Totally Enclosed Nonventilated ☐ Explosionproof ☐

Location: Indoor ■ Outdoor ☐ Dusty ☐ Altitude 7200 FT

Bearing type: Ball ☐ Sleeve ☐ Forced-Feed Lubrication ☐

Specification: NEMA Standard MG 1 ■ API RP 541 ☐

Sound Pressure Level Requirements: _____

Starting: Full Voltage ☐ Reduced Voltage ☐ _____ % of Voltage

Unloaded ☐ Loaded ☐ Capacitors for Power Factor Correction ☐

Mounting Method: Horizontal ☐ Vertical ■

Stainless Steel Nameplate ■ Filter for WP (I) (II) ☐

Drain Plugs ☐ Thermal Temperature Switches ☐ Thermocouples ☐

Resistance Temperature Detectors ☐ Bearing Temperature Detectors ☐

Space Heaters ☐ _____ V _____ W _____ Phase

Differential Protection ☐ Surge Protection ☐ Oversized Terminal Box ☐

INFORMATION BELOW TO BE COMPLETED BY VENDOR

Motor Mfr _____ Type _____ Style No. _____

Full Load, r/min _____ Weight _____ Frame No. _____

Bearing Mfr _____ Bearing No. _____

Starting Torque _____

LOAD	FULL	¾	½
Amperes			
Efficiency, %			
Power Factor			
Speed, r/min			

Locked Rotor Torque _____

Locked Rotor Amperage _____

Pull Up Torque _____

Full Load Torque _____

Breakdown Torque _____

Accelerating Time in Seconds (0 – Full Speed) _____

Tests (When Specified) _____

Safe Time-Current Curve ☐

Speed-Torque Curve ☐

Stall Time at Zero r/min _____ Seconds

Number of Consecutive Starts _____

Notes:

3) VENDOR TO INCLUDE IN HIS SHOP DRAWING SUBMITTAL GAS DISPERSION SCHEME PROPOSED TO THOROUGHLY MIX GASES FROM THE VESSEL VAPOR SPACE INTO THE LIQUID.

4) SEAL WATER AVAILABLE IS 0.5 G.P.M @ 60 PSIG

5) VENDOR TO PROVIDE STRAINER, REGULATOR (IF REQ'D), FLOW INDICATOR-SWITCH W/ N.C. CONTACTS ON NO FLOW AND C.S. SEAL WATER PIPING.

6) FOUR SPEED, TWO WINDING, HAVING 2/3, 1/2, AND 1/3 OF HIGH SPEED. STARTER SHALL BE FOUR SPEED TWO WINDING NEMA SIZE 1.

PARSONS DATA SHEET	INDUCTION MOTOR M-21	ACCOUNT NUMBER SHT 2 OF 2	JOB NUMBER 6089-0001
		DOCUMENT NUMBER 15.11-05	REV 0

ENG-EE-101 (6/81)

This document and the design it covers are the property of PARSONS. They merely loaned and on the borrower's express agreement that they not be reproduced, copied, loaned, exhibited, nor used except in the limited way and private use permitted by any written consent given to the lender to the borrower.

0083C

CONTRACT NO. DE-AC32-80AL13151

CONSTRUCTION SPECIFICATION
FOR
UPGRADING OF INDUSTRIAL LIQUID WASTE TREATMENT PLANT

DIVISION 15 MECHANICAL

SUB-DIVISION 15.12

DIAPHRAGM PUMPS

PART 1 GENERAL

1.1 SCOPE OF WORK

The Contractor shall furnish all labor, materials, equipment and services to manufacture, procure, install, inspect, test and accept a double diaphragm pump as indicated on the drawings and specified herein.

1.1.1 Furnished Equipment

The Contractor shall furnish the pump as a complete unit, including air valve, silencer, baseplate, special features, and accessories as specified herein.

The Contractor shall furnish to the Contracting Officer documents in accordance with Section 1.3.

Standard equipment and design are requested, provided the performance requirements of this Specification are met. Engineering, fabrication, and quality assurance and control shall result in equipment capable of operation at specified design conditions.

1.1.2 Related Work

The following associated work shall be performed by the Contractor:

Emplacement, shimming, grouting, final alignment verification, piping installation and compressed air system.

Work performed per this Sub-Division shall be coordinated with work accomplished per the following Sub-Divisions:

3.01	Cast-In-Place Concrete
15.01	Piping

1.2 REFERENCE DOCUMENTS

The Contractor shall comply with codes and standards referenced in this Specification.

American National Standards Institute (ANSI)

ANSI B16.5 - 77	Steel Pipe Flanges, Flanged Valves and Fittings

US Department of Labor

Occupational Safety and Health Administration (OSHA)

29 CFR 1910 - 79	Occupational Safety and Health Standards for General Industry

1.3 SUBMITTALS

1.3.1 Shop Drawings and Product Data

The Contractor shall submit to the Contracting Officer drawings, completed data sheets, parts lists, performance curves, inspection and test results, installation, operating and maintenance instructions, certificate of compliance and recommended spare parts list with prices in accordance with Attachment "Data Requirements List".

PART 2 PRODUCTS

2.1 DESCRIPTION

The pumps shall meet the technical and performance requirements outlined herein.

2.1.1 Performance Characteristics

The pump shall be capable of flowing strong acids at 200°F (hydrochloric, sulfuric and fluroboric acid; 20% concentration) at 15 to 40 gpm with a maximum of 60 feet total differential head. Adjustable pressure compressed air will be supplied. Maximum air pressure will be 125 psig.

2.1.2 Material of Construction

2.1.2.1 Wetted Parts. Pump housing wetted with the process liquid shall be Kynar. Non-wetted parts shall be cast iron.

2.1.2.2 Valves. Valves shall be ball type, Teflon with Teflon seats.

2.1.2.3 Diaphragm. Diaphragm shall be Teflon.

2.1.3 Flanges

Pump flange connections shall be 2" 150# per ANSI B16.5, flat face Kynar lined.

2.1.4 Sound Level

Pump sound level shall not exceed 85 db as defined per OSHA.

PART 3 EXECUTION

3.1 FABRICATION REQUIREMENTS

3.1.1 Tagging of Pumps

The nameplate shall be of 24 US Standard Gauge (minimum) stainless steel and shall be securely attached to the pump. The nameplates shall include, as a minimum, the manufacturer's name, pump model, standard dimension designation, serial number, size, unit weight, impeller diameter (maximum and installed), materials of construction, horsepower rating, maximum design pressure for 40 deg C (100 deg F) service as shown on the pump data sheet, and equipment item number. The direction of rotation shall be marked on the pump.

3.1.2 Painting and Surface Preparation

Stainless steel surfaces shall not be painted. Carbon steel surfaces shall be painted using the Vendor's standard materials.

Standard paint used shall remain intact at operating temperature of the surfaces to which it is applied. All exposed surfaces shall receive a coat of rust preventative such as Exxon Chemical Co. Rust Ban 392 or Approved Equal.

3.2 SHIPPING AND STORAGE

All components shall be completely assembled and match-marked, as required, at the assembly area prior to shipment.

Flange closures shall consist of a rubber gasket and a full size 1/4 inch thick exterior plywood cover. This cover shall be bolted in place by a minimum of four full size bolts. All drilled and tapped holes shall have metal or plastic plugs and all exposed pipe ends shall be capped.

Pump shall be boxed or crated for full protection against damage during transport and yard handling. Pump shall be prepared to prevent damage from the elements and temperatures ranging from minus 40 deg F to plus 120 deg F.

3.2.1 Receipt Inspection

The Contracting Officer will inspect the equipment and documentation specified herein upon receipt at the site to determine if the equipment as received has suffered damage during shipment. This inspection will include appurtenances shipped separately or together with the equipment.

3.2.2 Storage

The Contractor shall allocate sufficient indoor, non-heated storage space and employ protective measures to protect the equipment and appurtenances specified herein from any damage due to natural elements or the Contractor's equipment. Particular care shall be taken to prevent damage to flange faces, seal surfaces, and all interfacing parts or surfaces between equipment piping, or structures. The Contractor shall allocate equipment storage space in an area

segregated from fabrication operations and maintained free from debris. Temporary structures, supports, cribbing, or bracing may be provided and employed by the Contractor to prevent damage to the equipment and appurtenances specified herein.

The Contracting Officer reserves the right to inspect, without notice, all equipment storage areas, protective measures, and temporary structures used to store equipment.

3.2.3 Handling

The Contractor shall provide and use suitable devices to handle, without damage the equipment and appurtenances specified herein from receipt through installation. The Contractor shall be responsible for providing suitable access into the facility for handling devices with equipment for installation.

3.3 INSTALLATION

Installation of equipment shall be in accordance with the piping drawings and the manufacturer's installation instructions. The Contractor shall be responsible to provide necessary foundations, anchorings, bolts, studs, and nuts for proper installation, and interfacing with equipment.

3.3.1 Foundations

The structural drawings will define the size, type, elevation, location, and material of equipment foundations and the size, type, location, and material of anchorings to be provided. Grouting, if required, shall provide full bearing support. Anchor bolts shall be provided with sufficient length to allow for double nuts above the face of base rings, base plates, or saddles. Double nuts shall be provided and installed on all anchor bolts.

3.3.2 Appurtenances

The Contractor shall be responsible for the lubrication and installation of all necessary appurtenances, blind flanges, studs, nuts, seals, gaskets, connectors, and clips, including removal of test gaskets, seals, bolts, or connectors, and installation of service gaskets, seals, bolts, or connectors, when such appurtenances are not installed prior to shipment. Installation of all such appurtenances shall be in accordance with the installation instructions.

3.4 PRESSURE TESTING

The pump shall be hydrostatically tested at 1.5 times the design pressure with clean water at a minimum temperature of 60 deg F.

(1) The hydrostatic test pressure shall be maintained for a minimum of 10 minutes and during pump examination for leakage.

(2) Leakage of temporary gaskets and seals, installed for the purpose of conducting the hydrostatic test and which will be replaced or discarded later, is permitted provided the leakage does not exceed the capacity to maintain system test pressure for the required length of time or does not mask leaks from other joints.

(3) No visual weeping or leakage is permitted from any pump assembly joint nor external component. If weeping or leakage occurs, defective part(s) shall be replaced with new ones, and pump shall be retested and inspected as above.

3.5 ACCEPTANCE

Equipment, materials, and workmanship not in accordance with the requirements specified herein shall be corrected by the Contractor.

UPGRADING OF INDUSTRIAL LIQUID WASTE TREATMENT PLANT

DATA REQUIREMENTS LIST

	DESCRIPTION	CHECK IF REQ'D.	* WHEN REQ'D.	NO. OF COPIES REQ'D.	REFERENCE	** REQ'd. FOR
1.	Outline Drawings, Cross-Section Drawing	X	BFR		1.3.1	ACO
2.	Parts Lists	X	WS		1.3.1	INFO
3.	Performance Characteristics	X	BFR		1.3.1	ACO
4.	Inspection and Test Results	X	PS		1.3.1	ACO
5.	Installation, Operating, and Maintenance Instructions	X	PS		1.3.1	INFO
6.	Data Sheets	X	BFR		1.3.1	ACO
7.	Recommended Spare Parts w/prices	X	PS		1.3.1	INFO
8.	Certificate of Compliance	X	WS		1.3.1	ACO

* "AC" - As Completed
"BC" - Before Contract can be awarded
"BU" - Before Use (of procedure or by personnel)
"BFR" - Before Fabrication Release
"PS" - Prior to Shipment
"WS" - With Shipment

** "ACO" - Approval by Contracting Officer "INFO" - Information

H-P HYDRO-PURE SYSTEMS COMPANY
WATER TREATMENT EQUIPMENT
75 BLOOMFIELD AVENUE-DENVILLE, N.J. 07834-(201) 627-1315

November 15, 1983

Brown-Olds Corp.
Mechanical/Industrial Contractors
P.O. Drawer 9158
El Paso, TX 79983

Attention: Mr. Ariel Gutierrez

Subject: Upgrading of Industrial Liquid Waste Treatment Plant, Los Alamos National Laboratory
Brown-Olds P.O. #: E-65076
Hydro-Pure Job No: 20831

Dear Ariel,

This letter shall serve to confirm our telephone conversation (11/10/83) in regards to the Kynar lining application to vessel TK-21, for the above specified job.

The vessel is being fabricated per the specification and approved submittal as follows:

Operating Temperature:	250 F
Jacket Design Pressure:	50 psig
Jacket Operating Pressure:	50 psig

If the jacket is actually operated with 50 psig saturated steam (approximately 300 F) the Kynar lining system cannot be guaranteed. The maximum allowable pressure for the jacket must not exceed 20 psig.

Please take the appropriate action and confirm to H-P.

If you require any clarifications , and/or additional information please do not hesitate to call.

Sincerely,

Larry Wnek
Project Manager

LW:vg

Enclosure

02:11/15.831
file: cust. corr.

H-P HYDRO-PURE SYSTEMS COMPANY
WATER TREATMENT EQUIPMENT
75 BLOOMFIELD AVENUE-DENVILLE, N.J. 07834-(201) 627-1315

August 2, 1981

AUG 10 1983

Brown-Olds Corp.
Mechanical/Industrial Contractors
P.O. Box 740
Los Alamos, NM 87544

Attention: Mr. Tom Preckett

Subject: Upgrading of Industrial Liquid Waste Treatment Plant, Los Alamos National Laboratory
Brown-Olds P.O. #: E-65076
Hydro-Pure Job No: 20831

Dear Tom,

Per our telephone conversations of August 4, 1983, H-P would like to clarify the following items prior to formal approval:

1. Nozzle type (Vessel TK-21) - Due to the fact that this vessel is to be Kynar lined, a corrosion allowance is not required. Therefore, all listed nozzles (further detailed on H-P Dwg. C-20831-C01 and corresponding data sheet #N/C01.831) are to be schedule 40 with slip-on type flanges.

2. Vessel heads - Cold formed heads, which are in complete compliance with the ASME code Section VIII, are to be utilized. The vessel manufacturer requests the option of not using stress relieved heads, due to the fact that the heads are under 1-1/2" in thickness.

3. Welding tests and Inspection - All welding, including tests and inspection, has been bid in complete compliance with the ASME code Section VIII, as is normally performed on vessels in this industry. Therefore, we request that the extensive examination (above and beyond normal code requirements) of welds by the liquid penetrant method, which we were unaware of at bid time, be waived. By the elimination of this testing, less time will be required by the tank manufacturer to complete the fabrication of the vessels, which will keep in line with our present offering, otherwise an expected delay of 4 weeks may be encountered.

4. Film type for radiograph inspection to be: Type AA Film.

HYDRO-PURE SYSTEMS COMPANY

Please advise H-P as soon as possible regarding these items so that the tank shop may continue with material purchases. We request a response in regards to the types of heads to be utilized (item #2) as soon as possible, due to the long delivery associated with these items. Please note that this request for using these types of heads is in accordance with the specification where written approval from the Contracting officer is required.

A delay in correspondance regarding these items may consequently result in a delay in the overall delivery to the job site.

If you require any clarifications , and/or additional information please do not hesitate to call.

Sincerely,

Larry Wnek
Project Manager

LW:vg
Enclosure

cc:
Brown-Olds Corp.
Mechanical/Industrial Contractors
P.O. Drawer 9158
El Paso, TX 79983

Attention: Mr. Ariel Gutierrez

01:8/2.831
file: cust. corr.

NOTES

DIAMETER.....	48"	STRAIGHT SIDE ...	58"		
MATERIALS OF CONSTRUCTION:		HEAD(S).....	SA-285C	SHELL(S).....	SA-285C
		FLANGES.....	SA-105	NOZZLE NECKS.....	SA-53-B
		CLIPS.....	N/A	VESSEL ATTACHMENTS..	SA-36
		BOLTS.....	SA-193-B7	NUTS.....	SA-194-2H
HEAD THICKNESS....	3/8"	SHELL THICKNESS..	5/16"	CORROSION ALLOWANCE.	NONE
TYPE HEADS.....	2:1 ELLIPTICAL				
DESIGN PRES.....	50 PSIG	TEST PRESSURE....	75 PSIG	OPERATING PRES.....	ATM
DESIGN TEMP.....	275 F	TEST TEMP.....	AMB	OPERATING TEMP.....	250 F

OUTER JACKET DESIGN DATA:

DIAMETER.....	54"	STRAIGHT SIDE ...	56-1/2"		
MATERIALS OF CONSTRUCTION:		HEAD(S).....	SA-285C	SHELL(S).....	SA-285C
		FLANGES.....	SA-105	NOZZLE NECKS.....	SA-53-B
		CLIPS.....	N/A	VESSEL ATTACHMENTS..	SA-53-B
		BOLTS.....	SA-193-B7	NUTS.....	SA-194-~~B~~2H
HEAD THICKNESS....	3/8"	SHELL THICKNESS..	1/4"	CORROSION ALLOWANCE.	NONE
TYPE HEADS.....	2:1 ELLIPTICAL BOTTOM ONLY, 3" X 1" ROLLED BAR TOP ONLY.				
DESIGN PRES.....	50 PSIG	TEST PRESSURE....	75 PSIG	OPERATING PRES.....	50 PSIG
DESIGN TEMP.....	275 F	TEST TEMP.....	AMB	OPERATING TEMP.....	250 F

NOZZLE/SPOOL/CONNECTION SCHEDULE:

ITEM	SIZE	TYPE	RATING	FUNCTION	DESCRIPTION
N1	6"	FF	150 #	SOLID CHARGE	PAD FLANGE WITH COVER (BLIND FLG)
N2	6	FF	150 #	SIGHT PORT	SCH 40 WITH COVER (BLIND FLG)
N3	~~2~~	FF	150 #	CHEM GASES INLET	PAD FLANGE
N4	3	FF	150 #	SPRAY WATER	SCH 40
N5	3	FF	150 #	CHEM & ACID INLET	SCH 40
N6	2	FF	150 #	ACID VENT	PAD FLANGE
N7	~~2~~	FF	150 #	IND WASTE	SCH 40
N8	3	FF	150 #	TEMP ELEMENT	SCH 40
N9	3	FF	150 #	LIQ LEVEL ELEMENT	SCH 40
N10	2	COUP	3000#	STEAM INLET	1/2 COUPLING
N11	~~1-1/2~~	COUP	3000#	HOT WATER OUTLET	1/2 COUPLING
N12	~~1-1/2~~	COUP	3000#	HOT WATER INLET	1/2 COUPLING
N13	3	FF	150 #	IND WASTE CONNECT	SCH 40
N14	6	FF	150 #	MIXER MOUNT	PAD FLANGE
N15	24	FF	150 #	MANWAY COVER	SCH 40 (32 " COVER)

1. NUMBER OF VESSELS TO BE FABRICATED: ONE (1)

2. IDENTIFICATION OF VESSELS (TAG NOS.): TK-21

3. DIMENSIONS AND DEGREES OF ORIENTATION TO BE HELD TO A TOLERANCE OF ±1/8".

4. DIMENSIONS ARE TO FACE OF STEEL (INSIDE WALL OF VESSEL FOR DIMENSIONS INSIDE TANK AND OUTSIDE WALL OF VESSEL FOR DIMENSIONS OUTSIDE OF TANK).

5. ALL NOZZLES ARE TO HAVE A DIMENSION OF 6" FROM VESSEL TO FLANGE FACE UNLESS OTHERWISE NOTED. (PAD FLANGES).

6. FOR MANHOLE SUPPLY; COVER, GASKETS, AND FASTENING HARDWARE.

7. EXTERIOR PAINTING AND SURFACE PREPARATION: STAINLESS STEEL SURFACES SHALL NOT BE PAINTED. CARBON STEEL SURFACES SHALL BE PAINTED USING THE VENDOR'S STANDARD MATERIALS BUT SHALL BE IN ACCORDANCE WITH THE FOLLOWING:

   SURFACE PREPARATION- POWER TOOL CLEAN IMMEADIATELY PRIOR TO PRIMING. SURFACES SHALL BE FREE OF MILL SCALE, RUST, DIRT, DUST, OIL, GREASE, WELD SPLATTER, AND ANY FOREIGN MATTER.

   PRIME COAT-STANDARD PRIME COAT MATERIAL WHICH SHALL CONTAIN RUST INHIBITORS; MINIMUM DRY FILM THICKNESS SHALL BE 1.5 MILS.

8. LINING: KYNAR, 60 MILS
   SUPPLIED:

9. INTERIOR SURFACE PREPARATION: INTERIOR SURFACES, IF UNIT IS TO BE LINED, ARE TO BE PREPARED PER THE LINING MANUFACTURES REQUIREMENTS AND RECOMMENDATIONS (WELDS GROUND SMOOTH, SPLATTER REMOVED, ETC.).

10. IF THE VESSEL(S) ARE TO BE LINED, AFTER EXTERIOR PAINTING, PAINT ON THE OUTSIDE SHELL IN THREE OBVIOUS PLACES, WITH 6" LETTERS: "LINED VESSEL DO NOT WELD OR BURN".

11. ALL OPENINGS SHALL BE COVERED AND PROTECTED. FLANGE CLOSURES SHALL CONSIST OF OF RUBBER GASKET WITH FULL FACE, 1/4" THICK, PLYWOOD COVER FASTENED WITH AT LEAST FOUR (4) FULL SIZE BOLTS. THREADED OPENINGS SHALL BE PROTECTED WITH METAL OR PLASTIC INSERTS OR CAPS. OTHER METHODS OF PROTECTION MUST BE APPROVED BY HYDRO-PURE.

    ITEMS SHIPPED LOOSE ARE TO BE BOXED OR CRATED FOR FULL PROTECTION DURING SHIPMENT.

12. VESSEL IS TO BE BUILT IN ACCORDANCE WITH LATEST EDITION OF SECTION VIII A.S.M.E. CODE WITH STAMP.

13. LIFTING LUGS TO BE LOCATED BY TANK MANUFACTURER AND OF VESSEL MANUFACTURERS STANDARD DESIGN WITH A 2" DIAMETER HOLE.

14. BOLT HOLES TO STRADDLE CENTERLINE OF FLANGE CONNECTIONS.

15. SUPPLY ALL FASTENING HARDWARE (STUDS, NUTS, ETC.) AND GASKETS AS CALLED FOR BY DRAWING(S).

16. HYDRO-PURE TO BE NOTIFIED FOR: WITNESS HYDRO STATIC TESTING AND INSPECTION, IN ADDITION FORWARD ALL COPIES OF CERTIFICATIONS TO HYDRO-PURE.

17. SIESMIC REQUIREMENTS: ZONE 2, 'I' = 1.5; 'S' = 1.5

ADDITIONAL DETAILS (OR REFERENCE DRAWINGS):

A. LEGS: FOUR (4) EACH 6 X 6 X 1/2 WITH 11 X 11 X 1 PAD WITH 1-1/8" HOLE FOR 1" BOLT.
B. NAMEPLATE BRACKET/STAMPING: DRAWING 20831-_____

*** END ***

ender: Write or type message, pull out yellow sheet, mail the other two by folding in half and inserting in #771 DU-O-VUE envelope.

KAREN

FORM 187-3 Available from [illegible] Inc., Townsend, Mass. 01470 NO CARBON PAPER REQUIRED: Type or write on original — impression will automatically appear on copies beneath.

FROM

BROWN-OLDS CORPORATION
P. O. Box ~~[illegible]~~ 740
LOS ALAMOS, NM 87544
Job ~~#1055~~ ~~P. O. #30082~~
1045

Message
Reply

DATE: 6/6/84

FILE NO.

PRIORITY
- ☐ URGENT!
- ☐ SOON AS POSSIBLE
- ☐ NO REPLY NEEDED

ATTENTION: ISAAC SUAZO

TO

LANL
TA-50

SUBJECT: TEST REPORTS
KYNAR LINED TANK
TK-21

MESSAGE

ATTACHED PER YOUR REQUEST ARE CERTIFICATION REPORTS ON THE TESTING OF THE KYNAR LINING OF TK-21.

SIGNED: R Young

DATE OF REPLY:

REPLY TO:

REPLY

SIGNED:

SENDER: MAIL RECIPIENT WHITE AND PINK SHEETS.

RECIPIENT: WRITE REPLY. RETURN WHITE TO SENDER. KEEP THIS PINK COPY.

Hrsl

HYDRO-PURE SYSTEMS COMPANY

75 BLOOMFIELD AVENUE
DENVILLE, N.J. 07834

PHONE: 201-627-1315

BROWN-OLDS CORPORATION
MAY 2 0 1983
P.O. BOX 8739
ALBUQUERQUE, NM 87198

TRANSMITTAL NO: 06

DATE: 05/23/84

TO:
BROWN OLDS CORPORATION
P.O. BOX 8739
ALBUQUERQUE, NM 87198

ATTN: MR. ARIEL GUTIERREZ

JOB:
H-P 20831
B-O PO E-65076

ITEM NO.	REV	DRAWING/DOCUMENT TITLE	QUANT	TYPE	CODE
1	---	KYNAR CERTIFICATION OF VESSEL TK-21	ONE	COPY	I

L. Wnek

LARRY WNEK
PROJECT MANAGER

A. APPROVAL
C. CERTIFIED
F. FOR FABRICATION
I. FOR INFORMATION
P. PRELIMINARY

FILE: L:03,TR/06.831

Electro CHEMical
ENGINEERING & MFG. CO.
Corrosion Specialists
965-9061 (Area Code 215)
750 BROAD STREET, PO BOX 509 • EMMAUS, PENNSYLVANIA 18049-0399

REC'D MAY 10 1984

May 8, 1984

Hydro Pure Systems Company
70 Bloomfield Avenue
Danville, New Jersey 07834

Attention: Larry Wnek

Re: Purchase Order 20831-4719
ELECTRO CHEMICAL Sales Order Y-1394

Gentlemen:

This is to certify that Reactor Vessel TK-21 has been lined with a nominal 60 mil thick KYNAR* laminate lining reinforced with carbon cloth, and that the lining has withstood a 5000 volt spark test without a burn through.

Very truly yours,

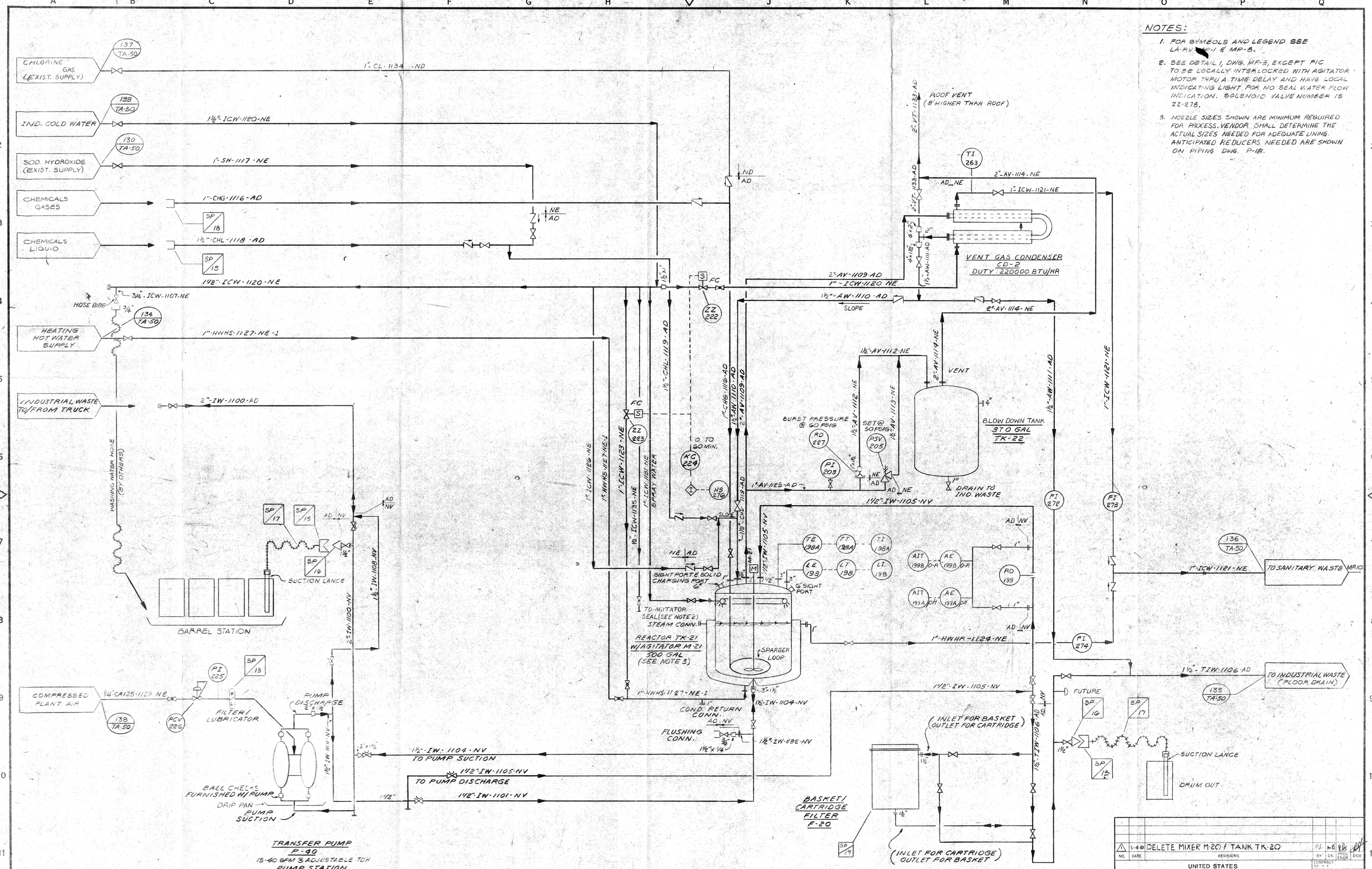
ELECTRO CHEMICAL ENGINEERING & MFG. CO.

Ernest V. Rohrbach

Ernest V. Rohrbach
Customer Service

EVR:tac
In duplicate

*tm of Pennwalt Corp.



NOTES:

1. FOR SYMBOLS AND LEGEND SEE LA-RV-MP-1 & MP-8.
2. SEE DETAIL 1, DWG. MP-3, EXCEPT FIC TO BE LOCALLY INTERLOCKED WITH AGITATOR MOTOR THRU A TIME DELAY AND HAVE LOCAL INDICATING LIGHT FOR NO SEAL WATER FLOW INDICATION. SOLENOID VALVE NUMBER IS ZZ-278.
3. NOZZLE SIZES SHOWN ARE MINIMUM REQUIRED FOR PROCESS. VENDOR SHALL DETERMINE THE ACTUAL SIZES NEEDED FOR ADEQUATE LINING. ANTICIPATED REDUCERS NEEDED ARE SHOWN ON PIPING DWG. P-18.

NO.	DATE	REVISIONS	BY	CK.	PROJ. ENGR.	DOE
1	5-8-85	DELETE MIXER M-20 & TANK TK-20	PS			

UNITED STATES
DEPARTMENT OF ENERGY
LOS ALAMOS AREA OFFICE — LOS ALAMOS, NEW MEXICO

UPGRADING OF INDUSTRIAL LIQUID WASTE TREATMENT PLANT

PIPING AND INSTRUMENTATION DIAGRAM BATCH WASTE TREATMENT SYSTEM

BLDG. WM-1 TA-50

CONTRACT NO. A. E.
DRAWN J. SMITH
CHECKED
A. E. APPROVED
DESIGN
PROJ. ENGR.
CHIEF ENGR.
SCALE NONE
DATE 2-24-83

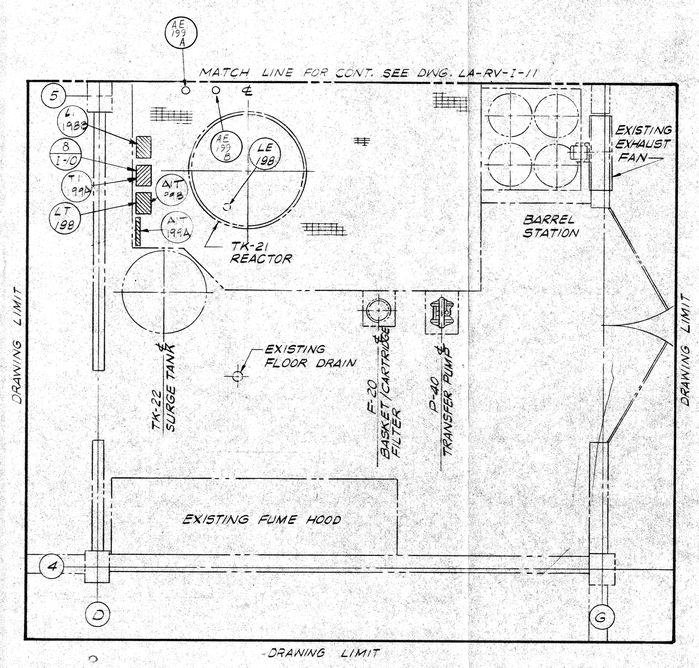
SUBMITTED — ARCHITECT-ENGINEER
RECOMMENDED — CASL
APPROVED — DOE

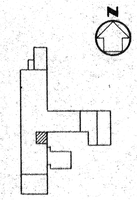
THE RALPH M. PARSONS COMPANY
PASADENA, CALIFORNIA

DRAWING NO. LA-RV-MP-9
SHEET OF

14866-H

AUTHORIZED FOR	
HEALTH	
SAFETY	
FIRE PROT.	
SEC.	





KEY PLAN
NTS

AUTHORIZED FOR	
HEALTH	
SAFETY	
FIRE PROT.	
SEC.	

NO.	DATE	REVISIONS	BY	CK	PROJ. ENGR.	DOE
1	7-84	AS BUILT				

UNITED STATES
DEPARTMENT OF ENERGY
LOS ALAMOS AREA OFFICE — LOS ALAMOS, NEW MEXICO

UPGRADING OF INDUSTRIAL LIQUID WASTE TREATMENT PLANT

INSTRUMENT LOCATION PLAN
, BATCH WASTE TREATMENT SYSTEM
BASEMENT

BLDG WM-1 TA-50

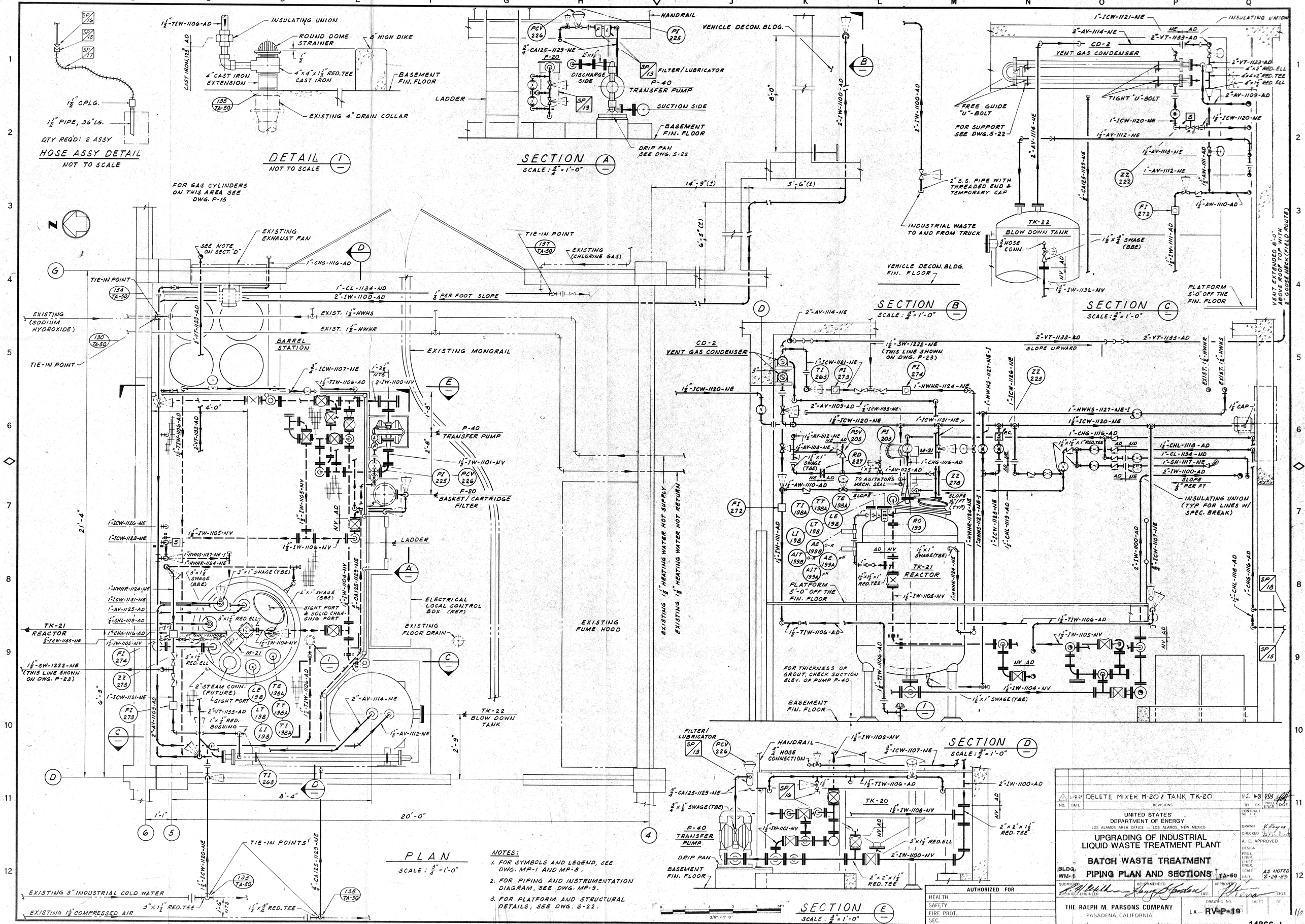
CONTRACT NO. A. E.
DRAWN LUP
CHECKED
A. E. APPROVED
DESIGN EBERLY
PROJ. ENGR.
CHIEF ENGR.
SCALE 3/8"=1'-0"
DATE 2-24-83

SUBMITTED: ARCHITECT-ENGINEER
RECOMMENDED:
APPROVED: DOE

THE RALPH M. PARSONS COMPANY
PASADENA, CALIFORNIA

DRAWING NO. LA-RV-I-13.1 SHEET 37

14866-I


HOSE ASSY DETAIL
NOT TO SCALE
QTY REQD: 2 ASSY
1½" CPLG.
1½" PIPE, 36" LG.
DETAIL 1
NOT TO SCALE
INSULATING UNION
ROUND DOME STRAINER
8" HIGH DIKE
4" CAST IRON EXTENSION
4"x4"x1½" RED. TEE CAST IRON
BASEMENT FIN. FLOOR
EXISTING 4" DRAIN COLLAR
SECTION A
SCALE: ¾" = 1'-0"
HANDRAIL
FILTER/LUBRICATOR
P-40 TRANSFER PUMP
DISCHARGE SIDE
SUCTION SIDE
LADDER
DRIP PAN SEE DWG. S-22
VEHICLE DECON. BLDG.
SECTION B
SCALE: ¾" = 1'-0"
SECTION C
SCALE: ¾" = 1'-0"
CD-2 VENT GAS CONDENSER
TK-22 BLOW DOWN TANK
FREE GUIDE "U"-BOLT
FOR SUPPORT SEE DWG. S-22
TIGHT "U"-BOLT
2" S.S. PIPE WITH THREADED END & TEMPORARY CAP
INDUSTRIAL WASTE TO AND FROM TRUCK
VEHICLE DECON. BLDG. FIN. FLOOR
PLATFORM 5'-0" OFF THE FIN. FLOOR
VENT EXTENDED 8'-0" ABOVE ROOF TOP WITH 2" GOOSE NECK (FIELD ROUTE)
FOR GAS CYLINDERS ON THIS AREA SEE DWG. P-15
EXISTING EXHAUST FAN
SEE NOTE ON SECT. "D"
TIE-IN POINT
EXISTING (SODIUM HYDROXIDE)
EXISTING (CHLORINE GAS)
EXISTING MONORAIL
BARREL STATION
P-40 TRANSFER PUMP
F-20 BASKET/CARTRIDGE FILTER
LADDER
ELECTRICAL LOCAL CONTROL BOX (REF)
EXISTING FLOOR DRAIN
EXISTING FUME HOOD
TK-21 REACTOR
TK-22 BLOW DOWN TANK
BASEMENT FIN. FLOOR
FOR THICKNESS OF GROUT, CHECK SUCTION ELEV. OF PUMP P-40
SECTION D
SCALE: ¾" = 1'-0"
SECTION E
SCALE: ¾" = 1'-0"
TK-20
P-40 TRANSFER PUMP
DRIP PAN
PLAN
SCALE: ¾" = 1'-0"
TIE-IN POINTS
EXISTING 3" INDUSTRIAL COLD WATER
EXISTING 1½" COMPRESSED AIR
EXISTING 1½" HEATING WATER HOT SUPPLY
EXISTING 1½" HEATING WATER HOT RETURN
NOTES:
1. FOR SYMBOLS AND LEGEND, SEE DWG. MP-1 AND MP-8.
2. FOR PIPING AND INSTRUMENTATION DIAGRAM, SEE DWG. MP-9.
3. FOR PLATFORM AND STRUCTURAL DETAILS, SEE DWG. S-22.
DELETE MIXER M-20 & TANK TK-20
UNITED STATES DEPARTMENT OF ENERGY
LOS ALAMOS AREA OFFICE — LOS ALAMOS, NEW MEXICO
UPGRADING OF INDUSTRIAL LIQUID WASTE TREATMENT PLANT
BATCH WASTE TREATMENT
PIPING PLAN AND SECTIONS
BLDG. WM-1
TA-50
AS NOTED
2-24-83
AUTHORIZED FOR
HEALTH
SAFETY
FIRE PROT.
SEC.
THE RALPH M. PARSONS COMPANY
PASADENA, CALIFORNIA
LA-RV-P-19
14866-J

APPENDIX I

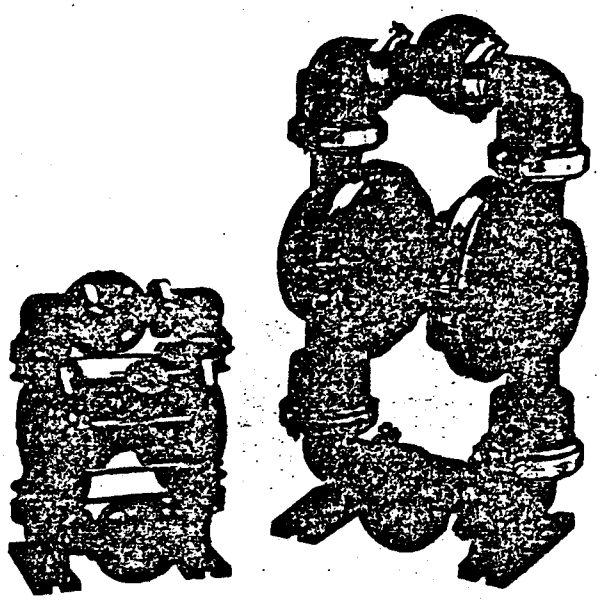
DETAILED SPECIFICATIONS AND PLANS FOR TA-50 BATCH TREATMENT SYSTEM

Note: Manufacturers specifications for pump to include in Appendix I. Add to end of Appendix. New information begins with page I-67.

The Wilden

Available in Two Sizes

THE PUMP THE CHEMICAL PROCESS INDUSTRY HAS DEMANDED



M2 Champ
1" Flanged Inlet/Outlet

M8 Champ
2" Flanged Inlet/Outlet

A CORROSION-RESISTANT, SEALLESS, VIRTUALLY INDESTRUCTIBLE, INJECTION-MOLDED, SOLID . . .

PVDF OR POLYPROPYLENE WILDEN PUMP

The Wilden Champs operate on pressure to 100 psi with variable flow from 0 to 130 GPM. Broad application potential with special appeal to the chemical process industry.

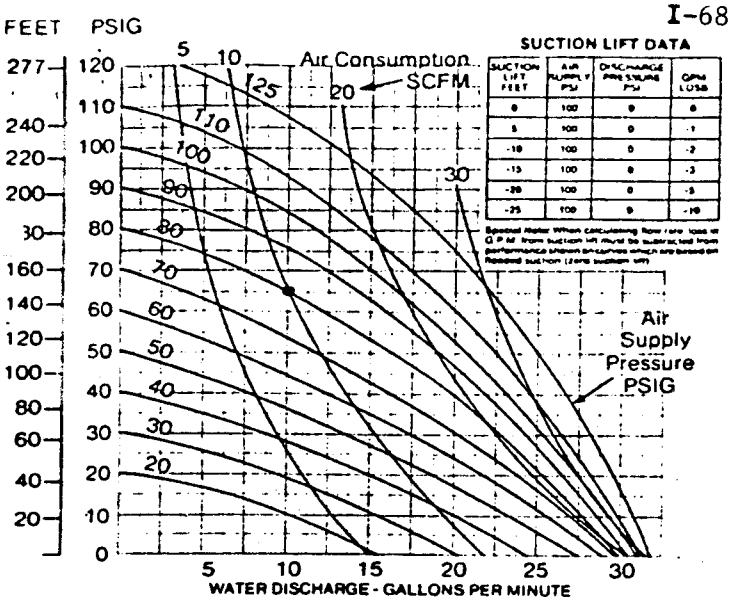
- Self Priming
- High Suction Lift
- Can Run Dry
- Variable Speed & Pressure
- No Pressure Relief Required
- Sealless/Packingless Construction
- Easily Portable
- Low Maintenance
- Ferric Chloride
- Etching Solutions
- Planting Solution
- Acids/Bases
- Photo/Graphic Solutions
- Textile/Dye Solutions
- Solvents
- Pickling Solutions
- Aqua Regia
- Drum Pumping

"Our Business is making tough pumping jobs simple."

WILDEN PUMP® & ENGINEERING CO.

22069 Van Buren Street / Colton, CA 92324 / (714) 783-0621 / Telex (714) 676-452

Copyright 1981 Wilden Pump & Engineering, Colton, CA



SUCTION LIFT DATA

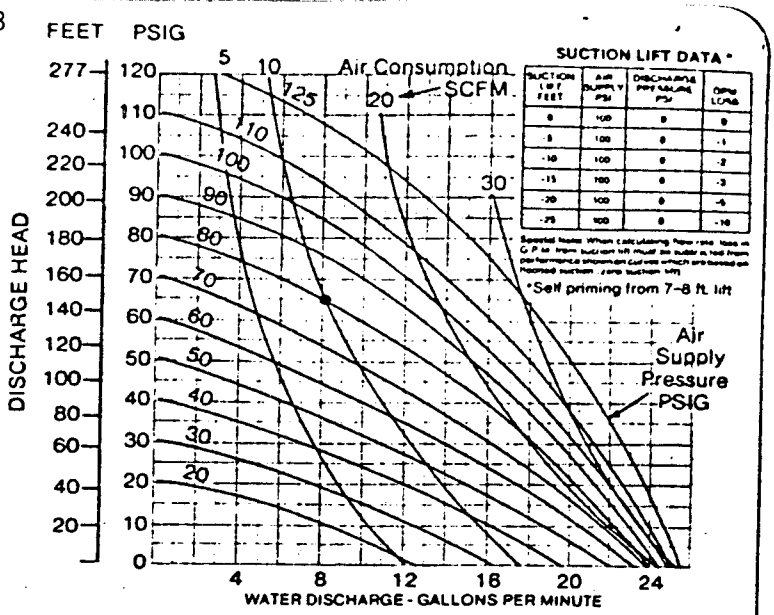
SUCTION LIFT FEET	AIR SUPPLY PSI	DISCHARGE PRESSURE PSI	GPM LOSS
0	100	0	0
5	100	0	-1
-10	100	0	-2
-15	100	0	-3
-20	100	0	-5
-25	100	0	-10

Special Note: When calculating flow rate loss in G.P.M. from suction lift must be subtracted from performance shown on curves which are based on flooded suction (zero suction lift)

WILDEN MODEL M-2 SPECIFICATIONS AND PERFORMANCE

Height ..... 14"
Width ..... 10½"
Depth ..... 8 7/16"
Weight (Polypropylene) ..... 20 lbs
PVDF ..... N/A
Air Inlet ..... ¼" NPT
Inlet ..... 1" Flanged
Outlet ..... 1" Flanged
Suction Lift ..... 15' Dry 25' Wet
Max. Size Solids ..... ⅛" Dia.

Example: *With 80 PSIG inlet pressure and 10 SCFM air consumption, water discharge is 10 GPM against a head of 85 PSIG.*



SUCTION LIFT DATA*

SUCTION LIFT FEET	AIR SUPPLY PSI	DISCHARGE PRESSURE PSI	GPM LOSS
0	100	0	0
-5	100	0	-1
-10	100	0	-2
-15	100	0	-3
-20	100	0	-4
-25	100	0	-10

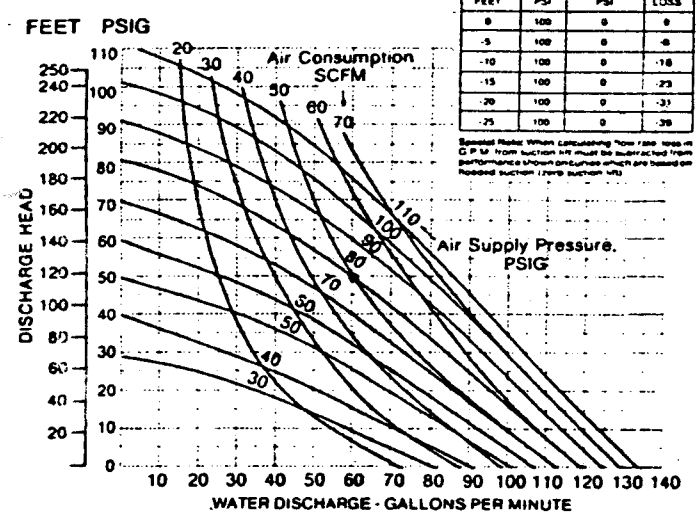
Special Note: When calculating flow rate loss in G.P.M. from suction lift must be subtracted from performance shown on curves which are based on flooded suction (zero suction lift)

*Self priming from 7-8 ft. lift

WILDEN MODEL M-2 T SPECIFICATIONS AND PERFORMANCE

Height ..... 14"
Width ..... 10½"
Depth ..... 8 7/16"
Weight (Polypropylene) ..... 20 lbs
PVDF ..... N/A
Air Inlet ..... ¼" NPT
Inlet ..... 1" Flanged
Outlet ..... 1" Flanged
Suction Lift ..... 7'-8' Dry 25' Wet
Max. Size Solids ..... ⅛" Dia.

Example: *To pump 8 GPM against a discharge pressure of 65 PSIG requires 60 PSIG and 10 SCFM air consumption.*
CAUTION: *Do not exceed 125 PSIG air supply pressure.*



SUCTION LIFT DATA

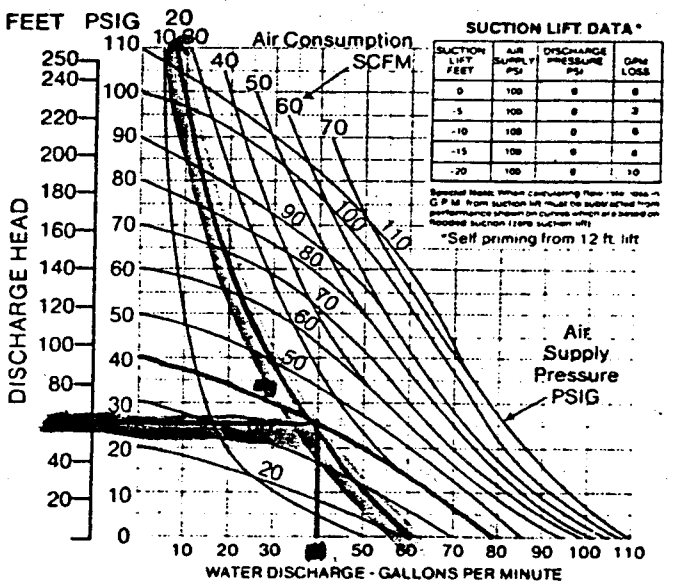
SUCTION LIFT FEET	AIR SUPPLY PSI	DISCHARGE PRESSURE PSI	GPM LOSS
0	100	0	0
-5	100	0	-6
-10	100	0	-16
-15	100	0	-23
-20	100	0	-31
-25	100	0	-39

Special Note: When calculating flow rate loss in G.P.M. from suction lift must be subtracted from performance shown on curves which are based on flooded suction (zero suction lift)

WILDEN MODEL M-8 SPECIFICATIONS AND PERFORMANCE

Height ..... 30⅜"
Width ..... 19½"
Depth ..... 13⅜"
Weight (Polypropylene) ..... 60 lbs
PVDF ..... 100 lbs
Air Inlet ..... ½" NPT
Inlet ..... 2" Flanged
Outlet ..... 2" Flanged
Suction Lift ..... 20' Dry 25' Wet
Max. Size Solids ..... ¼" Dia.

Example: *To pump 60 GPM against a discharge pressure of 50 PSIG requires 80 PSIG and 50 SCFM air consumption.*
Caution: *Do not exceed 125 PSIG air supply pressure.*



SUCTION LIFT DATA*

SUCTION LIFT FEET	AIR SUPPLY PSI	DISCHARGE PRESSURE PSI	GPM LOSS
0	100	0	0
-5	100	0	-3
-10	100	0	-6
-15	100	0	-8
-20	100	0	-10

Special Note: When calculating flow rate loss in G.P.M. from suction lift must be subtracted from performance shown on curves which are based on flooded suction (zero suction lift)

*Self priming from 12 ft. lift

WILDEN MODEL M-8 T SPECIFICATIONS AND PERFORMANCE

Height ..... 30⅜"
Width ..... 19½"
Depth ..... 13⅜"
Weight (Polypropylene) ..... 60 lbs
PVDF ..... 100 lbs
Air Inlet ..... ½" NPT
Inlet ..... 2" Flanged
Outlet ..... 2" Flanged
Suction Lift ..... 12' Dry 18' Wet
Max. Size Solids ..... ¼" Dia.

Example: *To pump 28 GPM against a discharge pressure of 40 PSIG requires 50 PSIG and 20 SCFM air consumption.*
Caution: *Do not exceed 125 PSIG air supply pressure.*

e Wilden "Champ" is tested and proven for handling corrosive, abrasive, or viscous liquids and slurries for the Chemical Process Industry. Engineered in response to your requests for a iable, non-metallic, sealless, positive displacement pump, the "Champ" adds emphasis to the versatility of the Wilden Air Operated Diaphragm Pump line.

RELIABILITY, CORROSIVE RESISTANCE, AND SAFETY were key words in the "Champ" Research and Development Program.

RELIABILITY was insured by the decision to build the non-metallic wetted parts around the proven Wilden Air Valve System, and to incorporate the time tested Wilden M-2 and 8 diaphragms in the "Champ" design.

ORROSIVE RESISTANCE centered on selection of materials. Wilden engineers spent many months analyzing the broad range of available thermoplastic, thermoset, and other non-tallic equipment and evaluation of their field experience as well as discussions with material suppliers and plastics fabricators led to the selection of PVDF and Polypropylene as the st suitable materials to complement the versatile Wilden Diaphragm Pump System.

POLYPROPYLENE has good chemical resistance, moderate heat resistance, and exceptional flex fatigue resistance at a reasonable cost.

PVDF (polyvinylidine fluoride), while higher in cost, offers exceptional chemical resistance, higher temperature resistance, and excellent mechanical properties.

These materials in combination with either the patented Wilden Teflon® diaphragm or any one of four elastomeric materials offer the broadest possible range of compatibility with ls and solvent.

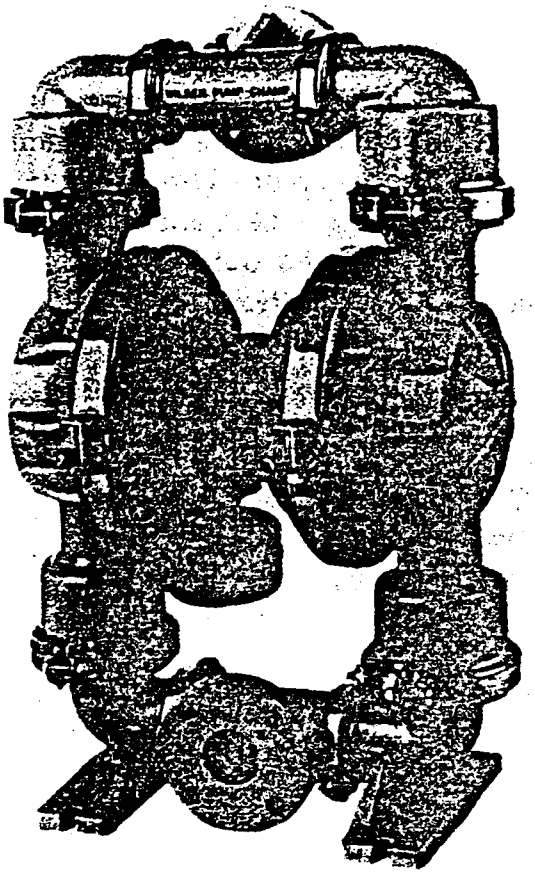
ITY is evident in the rugged appearance of the "Champ". The massive ribs of the water chambers, the large flanges with sturdy, specially designed stainless steel clamp bands, and ck wall sections are testimony to the efforts of Wilden engineers.

We proudly present the "Champ", a pump we build with care and pride to handle your most difficult assignments. We ask your cooperation in carefully selecting the appropriate erials for your specific applications. Many factors affect the chemical and mechanical properties of materials. These include, but are not limited to exposure time, extremes of tempera- and pressure, frequency of temperature and/or pressure cycling and attrition due to abrasive particles. Wilden Air Diaphragm Pumps are also available in four sizes in Aluminum, Cast 316 Stainless Steel and Hastelloy C® for those applications where polypropylene and PVDF are not appropriate.

ERATURE LIMITS: Polypropylene +32°F – 150°F; PVDF 200°F.

ON: Temperature limits are based upon mechanical stress only. Certain chemicals will significantly reduce maximum safe operating temperatures. Consult engineering ts for chemical compatibility and temperature limits. M-2 Polypropylene is glass filled and not suitable for handling hydrofluoric acid.

M-8 "CHAMP"



IF IT POURS IT PUMPS

WILDEN PUMPS

AIR OPERATED DOUBLE DIAPHRAGM POLYPROPYLENE/KYNAR®

MODEL M8 "CHAMP"

"OUR ONLY PRODUCT"

REPAIR PARTS LIST AND OPERATING INSTRUCTIONS

INSTALLATION INSTRUCTIONS

The Wilden "Champ" is a Wilden model M-8 pump (2 inch) with all wetted parts of injection molded polypropylene or Kynar* (PVDF) material. Performance and operation of the "Champ" are essentially the same as other Wilden model M-8 pumps of metal construction subject to temperature and chemical compatibility of the material being pumped with polypropylene and Kynar.

The M-8 Champ comes standard with aluminum/brass non-wetted parts. Optional cast iron/brass non-wetted parts are available. The M-8 Champ should not be used for submersible applications unless both wetted and non-wetted portions are compatible with the material being pumped.

The M-8 Champ has 150 psi American Standard two inch pipe flange inlet and outlet ports. In permanent installations, the pump should be attached to plant piping through flexible couplings on both the inlet and outlet ports to reduce pipe vibration due to the reciprocating nature of the pump. To further reduce vibration, a surge suppressor may be installed immediately adjacent to the discharge port.

Suction pipe size should be at least 2" diameter or even larger if highly viscous material is to be pumped. If suction hose is used, it must be of a noncollapsible, reinforced type as the M-8 is capable of pulling a high vacuum. Discharge piping should be at least 2". It is critical, especially on the suction side of the pump, that all fittings and connections are air tight or a reduction or loss of pump suction capability will result.

*Kynar (PVD Resin) is a registered trademark of Pennwalt Corp.

THE M-8 PUMP WILL PASS ¼" DIAMETER SOLIDS. WHENEVER THE POSSIBILITY EXISTS THAT LARGER SOLID OBJECTS MAY BE SUCKED INTO THE PUMP, A STRAINER SHOULD BE USED ON THE SUCTION LINE.

The inlet to the air valve is ½" NPT. The compressed air line to the pump should be at least ½". The air line should be large enough to supply the volume of air necessary to achieve the desired pumping rate (see M-8 pump performance curve.) Use air pressure up to 110 psig depending upon pumping requirements.

CAUTION: DO NOT EXCEED 125 PSIG AIR SUPPLY PRESSURE.

Pump discharge rate can be controlled by:

1. Limiting the volume and/or pressure of the air supply to the pump (preferred method). The use of a gate valve or needle valve installed at the air inlet to the pump is suggested for this purpose.
2. Throttling the pump discharge by installing a valve in the discharge line of the pump when the need to control the pump from a remote location exists. When the pump discharge pressure equals or exceeds the air supply pressure, the pump will stall out; no bypass or pressure relief valve is needed and pump damage will not occur.

Sound level can be reduced below 90 dba by attaching our optional muffler at pump air exhaust port.

Temperature Limits: Polypropylene – 150°F
Kynar* (PVDF) – 200°F

Caution: Maximum temperature limits are based upon mechanical stress only. Certain chemicals will significantly reduce maximum safe operating temperatures. Consult engineering guide for chemical compatibility and temperature limits.

OPERATING INSTRUCTIONS

A. The model M-8 comes with a built-in oil reservoir. This should be kept filled with a 10 weight motor oil. If the pump is placed in a permanent installation, the use of an air line oil lubricator is suggested. No alterations should be made to the pump. In cold weather operation or conditions of high discharge pressure, the air valve may freeze due to moisture in the air line. if this occurs the use of ehtylene glycol type anti-freeze or other deicer such as Tannergas can be substituted for the 10 weight oil.

B. Make sure air line to pump is free from dirt or other foreign matter. The air valve screen P/N 20E (see air valve diagram) will generally collect any particles too large to pass through the pump's air system. If pump performance drops off, check this screen for clogging.

C. Turn on air supply to pump. CAUTION: Make sure air supply pressure to pump does not exceed 125 psig. If it does, a pressure regulator should be installed and set at a maximum of 125 psig.

D. Pumping volume (gpm) can be set by counting the number of strokes per minute. The M-8 pumps approximately .77 gallons per stroke. A stroke is ½ cycle or one air exhaust.

When pump is used for moving thick materials, check stroke rate to determine that pump is not operating at a faster rate than material is capable of flowing, or cavitation will occur. If pump is operating at a speed too fast for available flow, reduce the volume of air to the pump until stroke rate approximates discharge volume.

E. Always flush pump after use if material being pumped will pack or solidify. The pump can be turned upside down and all liquid will drain out.

F. For pumps fitted with teflon diaphragms, limit suction inlet pressure to 10 psig maximum.

CAUTION: WEAR SAFETY GLASSES. WHEN DIAPHRAGM FAILURE OCCURS, MATERIAL BEING PUMPED MAY BE FORCED OUT AIR EXHAUST.

TROUBLE SHOOTING

Pump will not run or runs slowly

1. Check air inlet screen for dirt.
2. Check for sticking air valve, flush air valve in solvent.
3. Check for worn out air valve. If piston face in air valve is shiny instead of dull, air valve is probably worn beyond working tolerances and must be rebuilt by Wilden or replaced.
4. Check center block O-rings. If worn excessively they will not seal and air will simply flow through pump and out air exhaust. Use only Wilden O-rings as they are of special construction.

Pump runs but little or no product flows

1. Check for pump cavitation; slow pump speed down to match thickness of material being pumped.
2. Check for sticking valve balls. If material being pumped is not compatible with pump elastomers, swelling may occur; replace ball and seats with proper elastomers.
3. Check to make sure all suction connections are air tight, especially clamp bands around intake balls.

Pump air valve freezes

Check for excessive moisture in compressed air. Either install dryer for compressed air or use an anti-freeze such as Tannergas or Killfrost in lieu of SAE 10W oil.

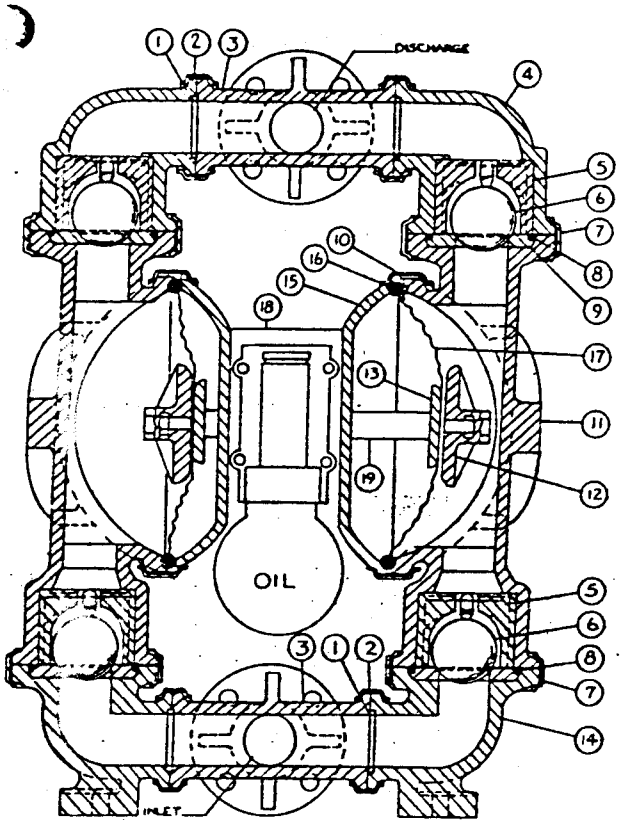
Air bubbles in pump discharge

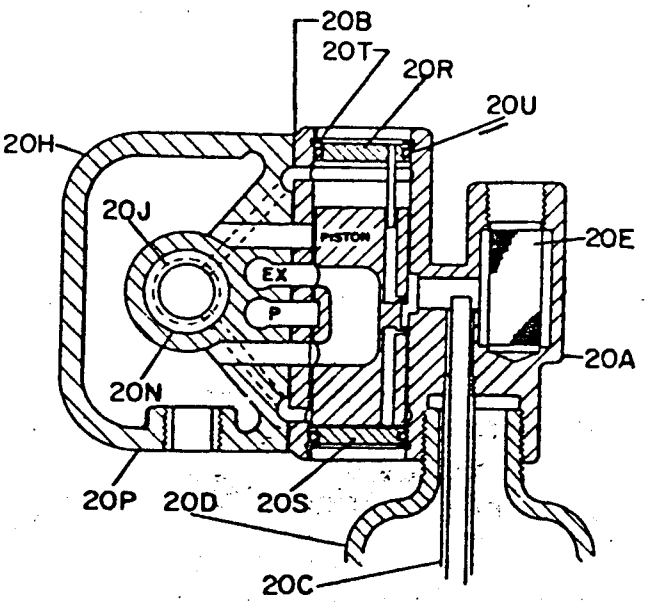
1. Check for ruptured diaphragm.
2. Check tightness of clamp bands, especially at intake manifold.

Product comes out air exhaust

1. Check for diaphragm rupture.
2. Check tightness of piston plates to shaft
3. Insure Piston O-Ring is in place, if required on model involved.

WILDEN AIR OPERATED DOUBLE DIAPHRAGM PUMP MODEL M-8 "CHAMP"





AIR VALVE ASSEMBLY, P/N 20

PARTS LIST

Drawing Index No.		Part Numbers for* M8/PT/TF/TF/PT
1	Manifold O-Ring	PT32B
2	Clamp Band, Small	P32
3	Manifold "T" Section	P33
4	Discharge Elbow	P36
5	Ball Guide Bushing	P41C
6	Valve Ball	TF41
7	Clamp Band, Medium	P39
8	Valve Seat O-Ring	PT40B
9	Valve Seat	P40
10	Clamp Band, Large	P30
11	Water Chamber	P35
12	Piston Outer W/Lug	PT21B
13	Piston Inner	T21C
14	Inlet Elbow	P37
15	Air Chamber	22
16	Teflon Diaphragm O-Ring	TF24A
17	Diaphragm	TF24
18	Air Valve Assembly	B20
19	Shaft	T21A

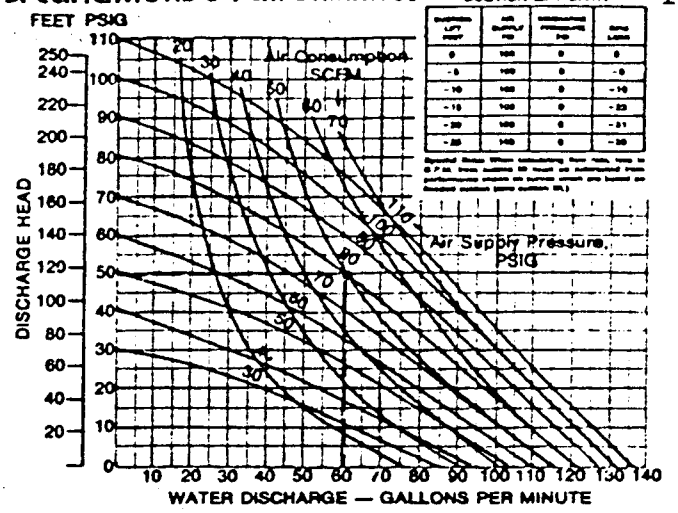
M-8 STANDARD AIR VALVE PARTS LIST

P/N	
20A	Valve Body & Piston (ii)
20B	Valve Gasket
20C	Capillary Rod
20D	Oil Bottle
20E	Valve Screen
20H	Center Block Assembly (iii)
20JH	O-Ring (7 each)
20N	Block Bushing
20P	Block Gasket (2 each)
20R	Valve Cap w/Guide Pin
20S	Valve Cap
S20T	Snap Ring (2 each)
20U	Valve Cap O-Ring (2 each)

(i) P/N 20 includes 20A through 20U
(ii) P/N 20A includes only 20E, 20R, 20S, 20T and 20U.
(iii) P/N 20H includes only 20N and 20JH.

NOTE: *Part numbers shown are for polypropylene pumps fitted with teflon diaphragms. See M-8 prices sheet for specific part number information on standard parts as well as on parts of other plastic and elastomeric materials or configurations.

SPECIFICATIONS & PERFORMANCE



SUCTION LIFT DATA

0	100	0	0
-5	100	0	-5
-10	100	0	-10
-15	100	0	-15
-20	100	0	-21
-25	100	0	-26

WILDEN® MODEL M-8®

Height ..... 30⅜"
Width ..... 19½"
Depth ..... 13⅜"
Weight .....
..... POLYPROPYLENE 60 lbs.
..... KYNAR® 100 lbs.
Air Inlet ..... ½" N.P.T.
Inlet ..... 2" Flanged
Outlet ..... 2" Flanged
Suction Lift ... 20' Dry
25' Wet
Max. Size Solids ¼" Dia.

Example: *To pump 60 gpm against a discharge pressure of 50 psig, requires 80 psig and 50 scfm air consumption.*

CAUTION: Do not exceed 125 psig air supply pressure.

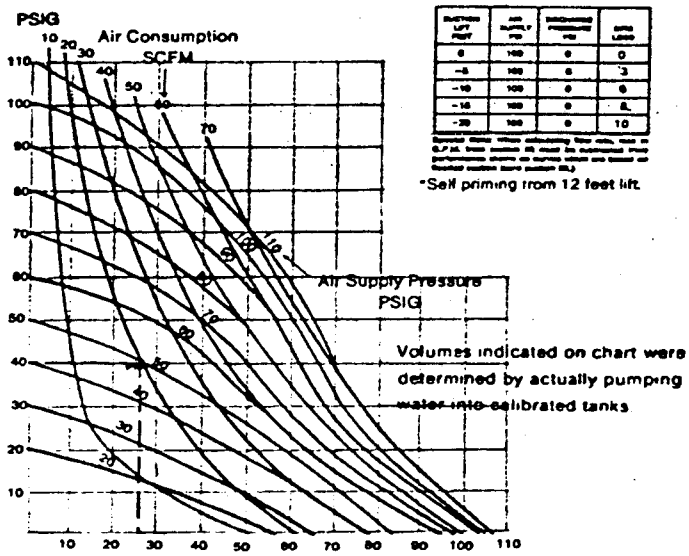
SPECIFICATIONS & PERFORMANCE
TEFLON DIAPHRAGMS

WILDEN® MODEL M-8®

Height ..... 30⅜"
Width ..... 19½"
Depth ..... 13⅜"
Weight .....
..... POLYPROPYLENE 60 lbs.
..... KYNAR® 100 lbs.
Air Inlet ..... ½" N.P.T.
Inlet ..... 2" Flanged
Outlet ..... 2" Flanged
Suction Lift ... 12' Dry
18' Wet
Max. Size Solids ¼" Dia.

Example: *To pump 28 gpm against a discharge pressure of 40 psig, requires 50 psig and 20 scfm air consumption.*

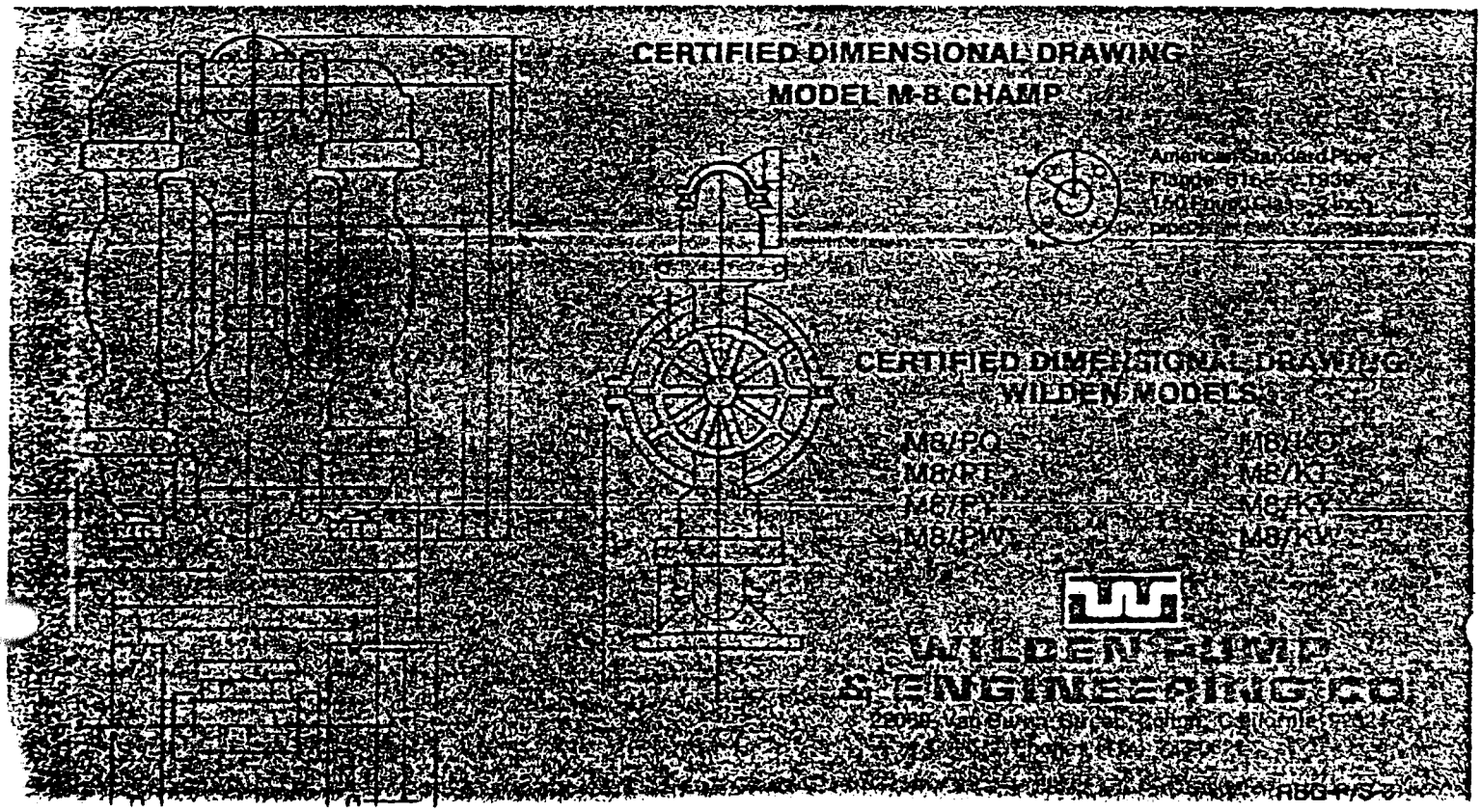
CAUTION: Do not exceed 125 psig air supply pressure.



SUCTION LIFT DATA*

0	100	0	0
-5	100	0	-3
-10	100	0	-6
-15	100	0	-8
-20	100	0	-10
-25	100	0	-12

*Self priming from 12 feet lift.



WILDEN PUMP & ENGINEERING CO.
22069 VAN BUREN STREET, P.O. BOX 845, COLTON, CALIFORNIA 92324 / (714) 783-0621

February 27, 1981

(INTERIM) M8 "CHAMP" ASSEMBLY/DISASSEMBLY INSTRUCTIONS

The M8/PT/TF/TF/PT pump is essentially a standard Wilden M8 pump with injection molded wetted parts. The air valve, center assembly and diaphragms are standard proven Wilden components. Principal differences other than material include: 150 psi American Standard pipe flanges instead of threaded inlet and discharge ports; increased external dimensions; ten sets of clamp bands as compared with six; and the use of O-rings for seals. Performance and operation is the same as a metal construction M8 with one exception. The maximum temperature for the polypropylene is limited to 150 degrees Fahrenheit and 200 degrees Fahrenheit for the KYNAR^R PVDF Resin.

Dismantling and assembly is also very comparable to other Wilden pumps with a couple of minor variations. First, the inlet and discharge manifolds are obviously an assembly of three molded parts, two O-rings and two sets of clamp bands rather than a single casting. We would suggest that these components be treated as a single part when possible during diaphragm changes or other maintenance requiring dismantling of the pump. If it is necessary to disassemble the manifolds, the customer should plan on replacing the Teflon O-ring seals. If disassembled, the manifolds should be completely reassembled and the manifold clamp bands securely fastened prior to reinstalling the manifolds on the pump center assembly. A key factor during reassembly of the manifolds is correct alignment. The two flange surfaces which mate with the water chambers must be parallel and in the same plane. The inlet or discharge flange face should be perpendicular to the clamp band flanges.

To dismantle the manifolds, simply remove the clamp bands. To reassemble a manifold, first install the O-rings in the O-ring grooves on each of the manifold elbow sections, and place one elbow in a soft jawed vise with the smaller flanged surface horizontal. Next, the manifold "T" section may be placed in position and the clamp band installed. Insure that the flanged surfaces remain aligned while tightening the clamp band bolts. Correct, if necessary, by tapping the parts firmly with a rubber or plastic mallet. Now place the remaining elbow in position and install the second clamp band. As the clamp band is tightened, use a straight edge to insure that both of the larger flanges remain in the same plane.

Another significant difference is that the plastic pumps have removable ball cages in place of the cast-in fingers in the metal parts. Prior to reassembling a pump, insure that the ball cages are installed in each discharge elbow and the bottom of each water chamber. If required, the ball cage should be seated by tapping with a rubber or plastic mallet so that the surface of the ball cage is flush with the flange surface.

over . . .

The polypropylene and KYNAR pumps have removable ball seats with a step around the outer circumference which forms an O-ring groove when the seat is placed in the inlet elbow or top of the water chamber. When assembling the inlet and discharge manifolds to the center assembly, place the seats in the top of the water chambers and inlet elbows, and place an O-ring on the groove. Place the center assembly on the inlet manifold carefully aligning the flanges. Install both clamp bands and alternately tighten the bands maintaining correct flange alignment by tapping with a rubber or plastic mallet as required. Install the top manifold using the same technique.

Another tip which will minimize leakage problems is not to attempt to reuse the Teflon O-ring seals. The O-rings are intentionally distorted during the assembly process conforming to the exact shape of the O-ring groove and opposite flange, and may not be reusable.

Upon completion of our printed literature, copies will be mailed to you. If you have any questions or comments regarding these instructions or the plastic pumps, please do not hesitate to call.

The results of our research and testing conducted with the "Champ" have been excellent, and have exceeded our expectations. We trust your experience will be similar.

ADT:vv

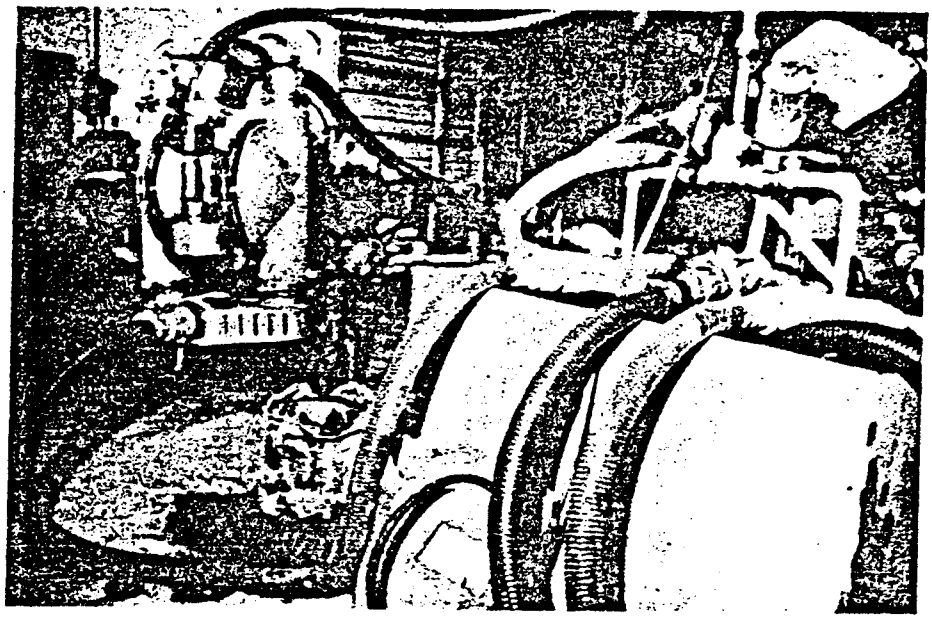
SUGGESTED SPARE PARTS

WILDEN M-8 "CHAMP" WITH TEFLON

QUANTITY	PART NUMBER	DESCRIPTION
4	TF24	Diaphragm (Teflon)
4	TF24B	Back-up Diaphragm (Neoprene)
4	TF41	Valve Balls (Teflon)
8	KT40B	Valve Seat O-ring (Teflon)
8	KT32B	Manifold O-ring (Teflon)
2	20B	Air Valve Gasket
4	20P	Block Gasket
1	T21A	Shaft w/studs
7	20JH	Bushing O-rings

NOTE: Frequency replacement may vary depending on severity of service.

WILDEN PUMP & ENGINEERING CO.
22069 VAN BUREN STREET, P.O. BOX 845, COLTON, CALIFORNIA 92324 / (714) 783-0621



INFORMATION BULLETIN
PUMP TEST PROCEDURE

The following is an explanation of the procedure used to test every pump manufactured and shipped by Wilden Pump and Engineering Company.

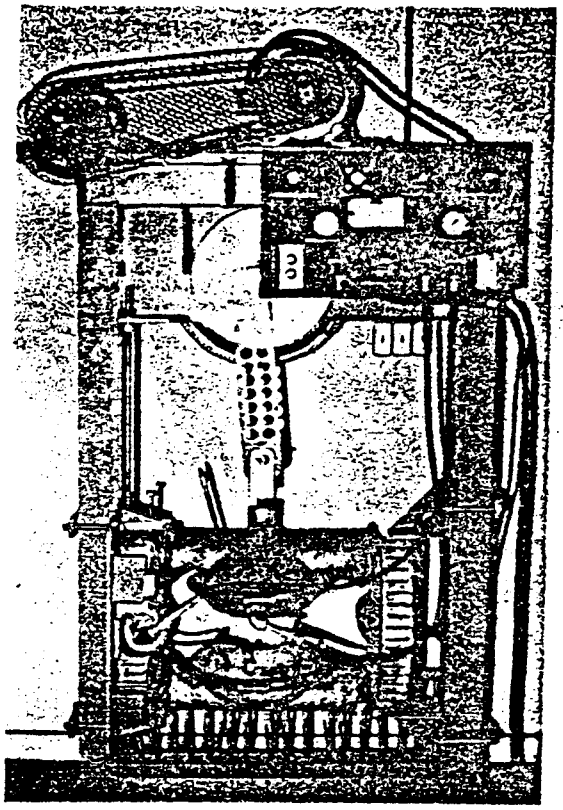
1. 90 to 100 PSI air is applied to the pump to verify that the air valve and the pump is shifting properly.

2. Hoses are hooked up to the suction and discharge manifolds. The pump is then operated by pumping water into a recirculating tank. Self-priming characteristics are verified and the pump is stalled out with a shut-off valve in the discharge line. The pump is allowed to set under pressure to check for any leaks in the casting and the air valve is tested at near-stall conditions for proper function.

3. The pump is then pressurized with an external pump to check for leaks in the intake manifold.

4. After every pump built by Wilden is tested in the above procedure, it is then sealed, painted and shipped to a distributor for resale.

WILDEN PUMP & ENGINEERING CO.
22069 VAN BUREN STREET, P.O. BOX 845, COLTON, CALIFORNIA 92324 / (714) 783-0621

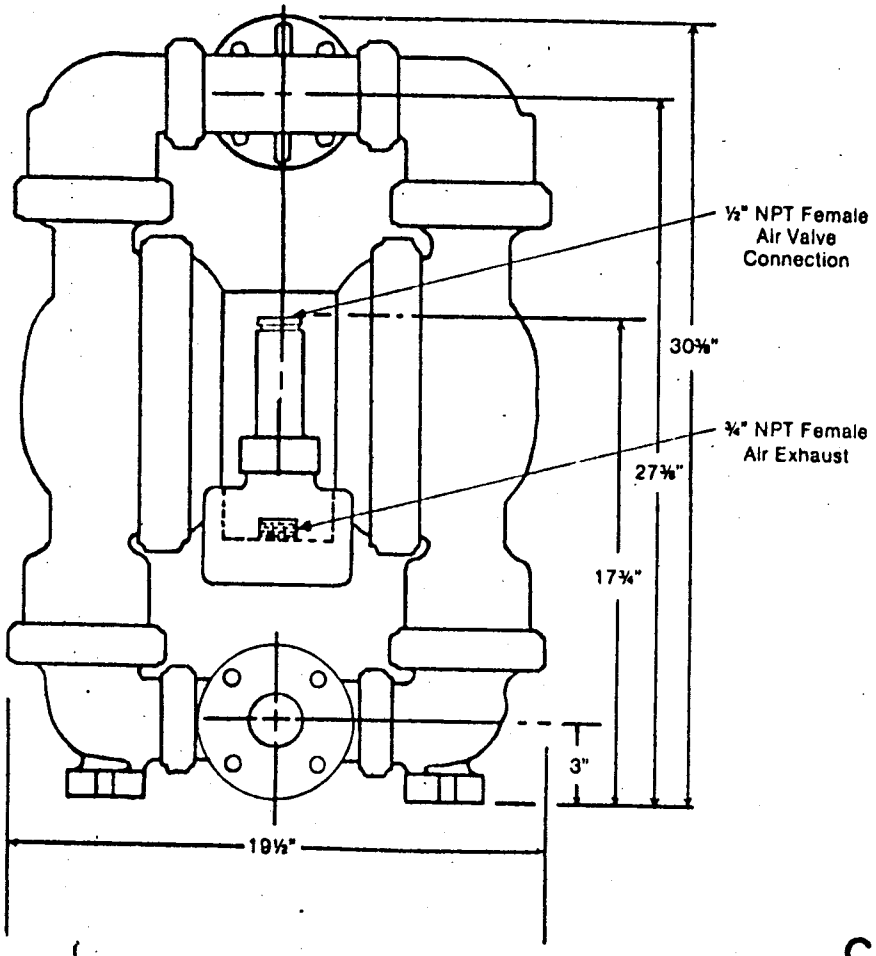


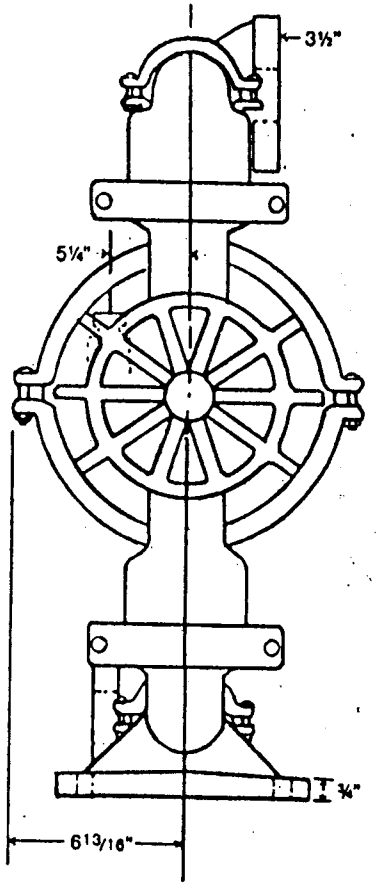
INFORMATION BULLETIN
DIAPHRAGM TESTING PROCEDURE

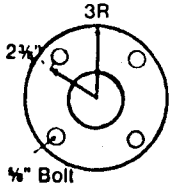
Wilden Pump and Engineering Company continuously tests the diaphragms for the pumps on the tester shown in the photo above. Through the use of this unique tester, we have been able to continually develop better, longer lasting diaphragms for the Wilden Pumps.

A specially modified pump is used in the horizontal position. The diaphragms are stroked mechanically by an electric motor connected through a cam and shaft arrangement to the diaphragms. The cycle rate is set at 200 rpm's and a 50 psi head of air is used to provide a working load on the diaphragms. An elapsed time counter is attached to a pressure-sensitive switch so that power is cut off when diaphragm failure occurs.

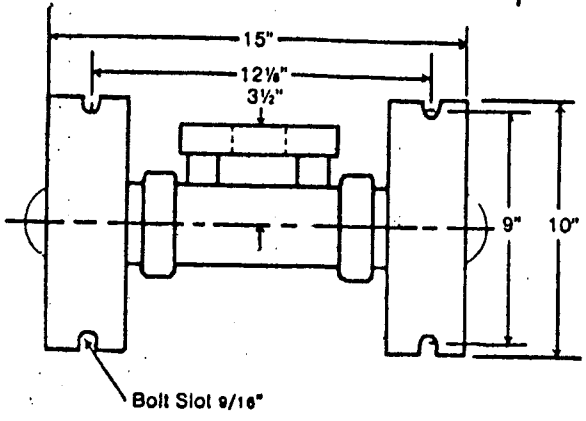
This unique tester, which can be used to test all diaphragm types and sizes, is one more way for Wilden Pump and Engineering to assure the finest quality for its pumps and parts.







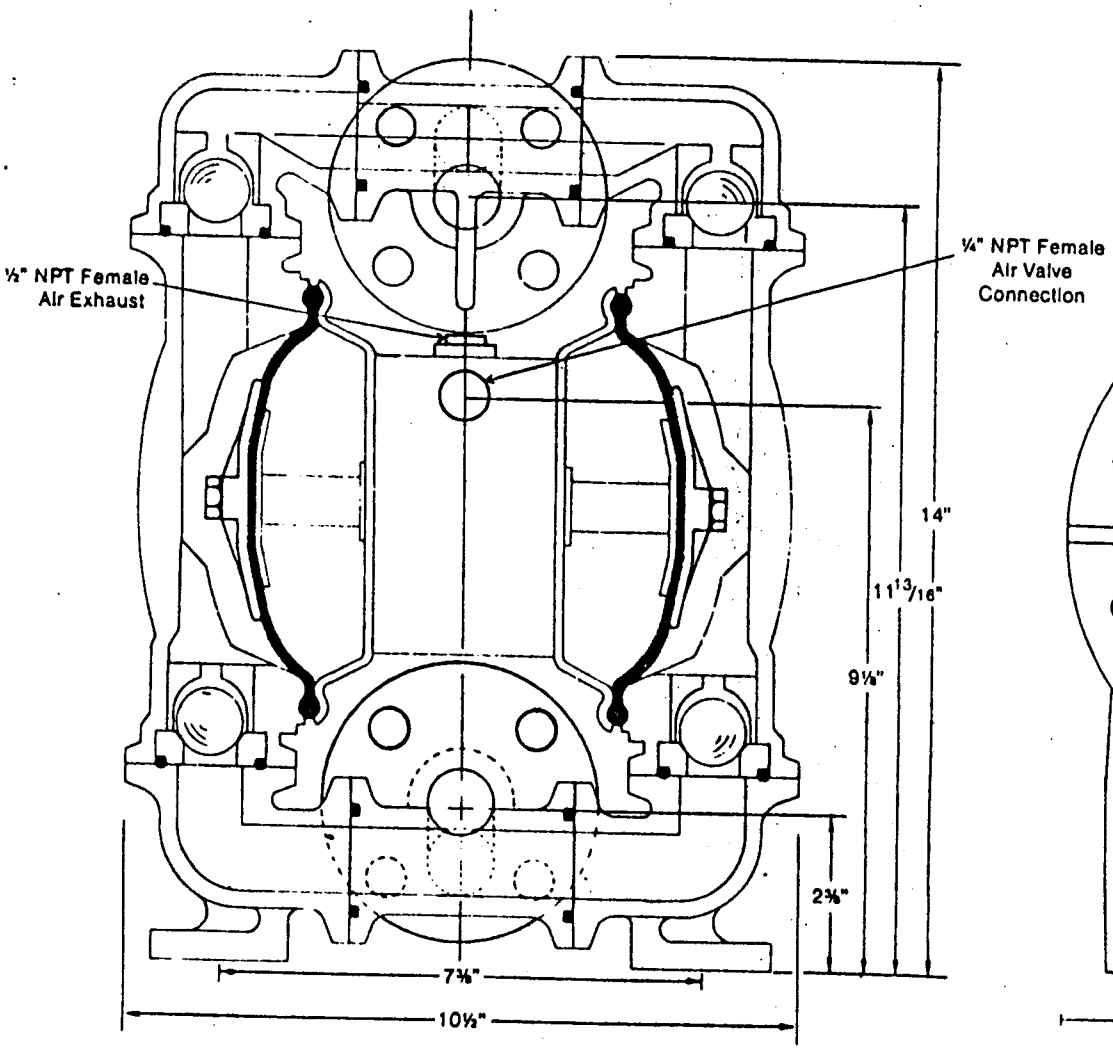
American Standard Pipe Flange B16E - 1939 - 150 Pound Class - 2 inch pipe.

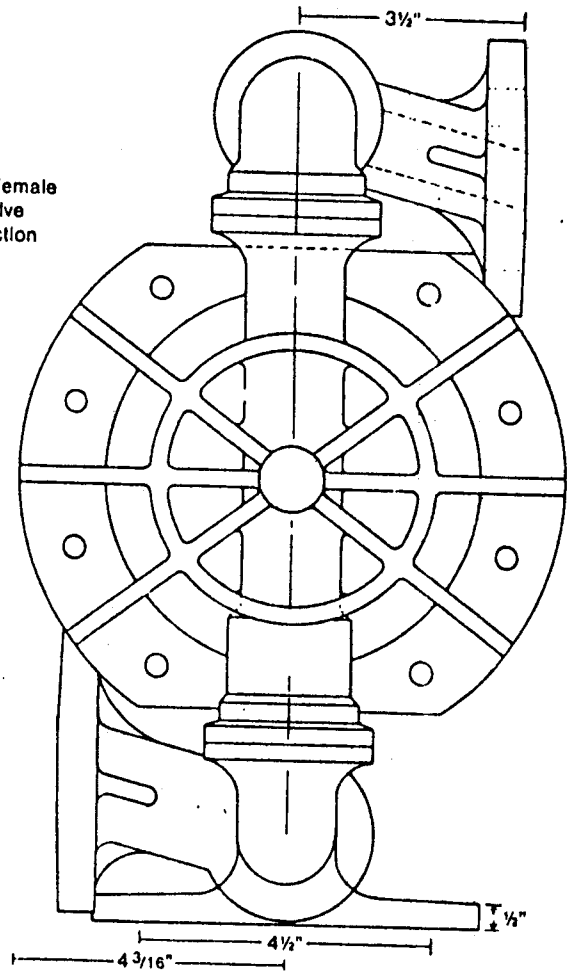


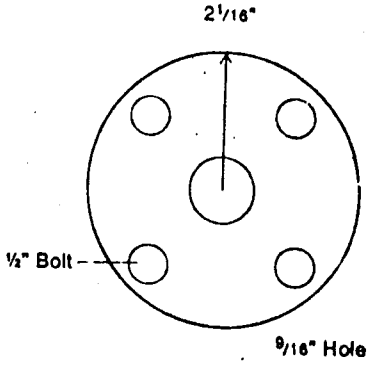
CERTIFIED DIMENSIONAL DRAWING
WILDEN MODELS
MODEL M-8 CHAMP

M8/PO	M8/KO
M8/PT	M8/KT
M8/PY	M8/KY
M8/PW	M8/KW

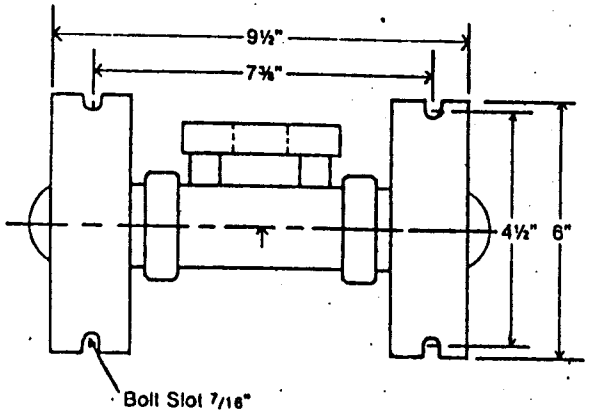
* Copyright Wilden Pump and Engineering, 1983







American Standard Pipe Flange 150 Pound Class – 1 inch pipe. 3 130" bolt circle.



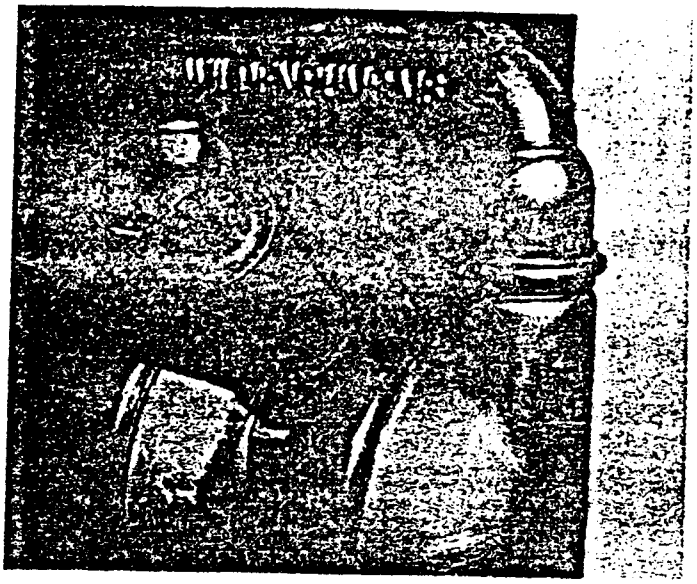
CERTIFIED DIMENSIONAL DRAWING

WILDEN MODELS
MODEL M2 CHAMP

M2/PO M2/PT

WILDEN PUMP & ENGINEERING CO.
22069 VAN BUREN STREET, P.O. BOX 845, COLTON, CA 92324
(714) 783-0621
Telex 676-452

WILDEN PUMP & ENGINEERING CO.
22069 VAN BUREN STREET, P.O. BOX 845, COLTON, CALIFORNIA 92324 / (714) 783-0621



NOISE CONTROL
WILDEN AIR OPERATED DOUBLE DIAPHRAGM PUMPS

All Wilden pumps can be ordered with an optional, large volume muffler.

This muffler reduces the exhaust sound level to below 90 decibels; the level which is generally accepted by OSHA as a cut-off for eight hours of continuous operator exposure.

Following are the db reading for all three Wilden models with and without a muffler.

MODEL	WITH MUFFLER	WITHOUT MUFFLER
M-4	81 db	108 db
[redacted]	[redacted]	[redacted]
M-15	89 db	115 db

The above readings were made at a distance of one meter from the pump and a height of one and one-half meters above the exhaust part of the pump.

AIR PUMP CO.
AREA CODE 313 PHONE 234-8694
P.O. BOX 4389 • FLINT, MICHIGAN 48504

SHOULD YOUR WILDEN AIR DRIVEN PUMP GIVE YOU TROUBLE BECAUSE OF "ICING" PLEASE READ THIS:

FREEZE UP OF EXHAUST PORTS OF AIR DRIVEN MACHINERY HAS BEEN A PROBLEM FOR MANY YEARS BLAMED ON TO THE MACHINE; WHEREAS ITS CAUSE IS THE INHERENT WATER VAPOR IN ALL COMPRESSED AIR SYSTEMS. 5412 PPM @ 100°F AND 100 PSIG AND ONLY 125 PPM @ 5°F AND 100 PSIG.

WHEN THE AIR EXPANDS FROM ONE PRESSURE TO ANOTHER LOWER PRESSURE IT REQUIRES HEAT AND THEREFORE PRODUCES A REFRIGERATION EFFECT IN ACCORDANCE WITH THE EQUATION PV/T = pv/t. THIS MAY FREEZE THE WATER OUT OF THE COMPRESSED AIR AND CLOG THE EXHAUST PORT.

SINCE THE INLET PRESSURE, VOLUME AND TEMPERATURE VARY ON ALMOST EVERY APPLICATION, IT REALLY FURTHER CONFUSES THE PROBLEM WHEN ONE AIR SYSTEM HAS A PRESSURE DEWPOINT OF 130°F BECAUSE OF INADEQUATE AFTERCOOLING AND THEN THE NEXT HAS A PRESSURE DEWPOINT OF 35°F. BECAUSE OF GOOD COMMERCIALLY AVAILABLE REFRIGERATED DRYER EQUIPMENT.

THE VARIABLES IN LOAD, AIR QUALITY AND AMBIENT TEMPERATURES ARE SO COMPLEX THAT IT ISN'T POSSIBLE TO MAKE A BLANKET STATEMENT AS TO WHEN FREEZE UP TEMPERATURES WILL OCCUR; HOWEVER, IF WE REMOVE WATER FROM THE COMPRESSED AIR DOWN TO 22°F. @ ATMOSPHERIC PRESSURE, WE ARE BELOW THE LIQUID STATE OF WATER WHICH FREEZES TO CAUSE THE ICE AND THUS THE CLOGGED PORT.

THE SOLUTIONS AVAILABLE ARE THE FOLLOWING AND ANY STEP BEYOND WHAT YOU ARE DOING TO YOUR COMPRESSED AIR MIGHT SOLVE YOUR PROBLEM, BUT WITH STEP 10 BEING MONEY BACK GUARANTEED TO SOLVE IT.

ON PUMP:

1. ETHYLENE GLYCOL IN THE OIL BOTTLE.
2. REMOVE AIR EXHAUST BALL CHECK AND COME OUT OF EXHAUST WITH ELBOW AND 6" OF STRAIGHT PIPE.
3. PUT AIR LINE LUBRICATOR (FILLED WITH ETHYLENE GLYCOL) IN AIR SUPPLY LINE.
4. TRY "KILL FROST" IN PUMP OIL BOTTLE AND AIR LINE LUBRICATOR.

ON AIR SYSTEM:

5. AIR COOLED AFTERCOOLER WITH SEPARATOR.
6. WATER COOLED AFTERCOOLER WITH SEPARATOR.
7. 25°F DEWPOINT DEPRESSANT (SALT) DESICCANT TYPE DRYER.
8. 50°F DEWPOINT DEPRESSANT GENERAL SUPER DRY DESICCANT DRYER.
9. REFRIGERATED TYPE COMPRESSED AIR DRYER 35°F DEWPOINT AT PRESSURE.
10. COMBINATION REFRIGERATED AND DESICCANT TYPE COMPRESSED AIR DRYER PRODUCING 5°F PRESSURE DEWPOINT @ 100 PSI.

Roy R. Haedt

Effective Date April 1, 1983

WILDEN PUMP & ENGINEERING CO.
22069 VAN BUREN STREET, P.O. BOX 845, COLTON, CALIFORNIA 92324 / (714) 783-0821 / Telex 678-452

MODEL M 8

POLYPROPYLENE PUMP PARTS

for Models:

M8/PO/ M8/PW/
M8/PT/ M8/PY/

(Suggested U.S. List Prices)

DESCRIPTION	Qty. Per Pump	M8/PO/		M8/PT/		M8/PW/		M8/PY/	
		P/N	Price	P/N	Price	P/N	Price	P/N	Price
Air Valve Assembly	1	B20	375.00	←		N/A		N/A	
Air Valve Body & Piston	1	B20A	175.00	←		W20A	180.00	←	
Air Valve Screen	1	20E	5.00	←					
Air Valve Cap w/Guide (Top)	1	20R	6.00	←		20RB	10.00	←	
Air Valve Cap (Bottom)	1	20S	5.00	←		20SB	9.00	←	
Snap Ring	2	S20T	2.00	←					
Air Valve Cap O-ring	2	20U	.50	←					
Air Valve Gasket	1	20B	1.00	←					
Lubricator Capillary Rod Assy.	1	20C	18.00	←					
Lubricator Oil Bottle	1	20D	26.00	←		W20D	32.00	←	
Center Block Assembly	1	20H	140.00	←		W20H	210.00	←	
O-ring	7	20JH	.50	←					
Block Bushing	1	20N	30.00	←					
Check Body	1	20K8	6.00	←		W20K8	12.00	←	
Nipple	1	20FS	5.00	←					
Check Ball	1	20M	2.00	←					
Block Gasket	2	20P	1.00						
Shaft	1	21A	45.00	T21A	45.00	21A	45.00	T21A	45.00
Piston, Inner	2	21B	25.00	T21C	20.00	21B	25.00	T21C	20.00
Piston, Outer w/Lug	2	P21B	125.00	PT21B	85.00	P21B	125.00	PT21B	85.00
Piston O-ring	2	N/R		N/R		N/R		N/R	
Air Chamber, Tapped (Replaced by 22B)				←					
Air Chamber, Counter Sunk	2	22B	60.00	←		W22B	86.00	←	
Water Chamber	2	P35	345.00	←					
Clamp Band (Large)	2	P30	45.00	←					
Clamp Band (Medium)	4	P39	25.00	←					
Clamp Band (Small)	4	P32	20.00	←					
Discharge Elbow	2	P36	125.00	←					
Inlet Elbow	2	P37	140.00	←					
Manifold "T" Section	2	P33	145.00	←					
Ball Guide Bushing	4	P41C	35.00	←					
Valve Seat	4	P40	20.00	←					
Valve Seat O-ring (Buna N)	4	P40B*	1.00	N/R		P40B*	1.00	N/R	
Manifold O-ring (Buna N)	4	P32B**	1.00	N/R		P32B**	1.00	N/R	
Valve Seat O-ring (TFE)	4	N/R*		PT40B	4.00	N/R*		PT40B	4.00
Manifold O-ring (TFE)	4	N/R**		PT32B	3.00	N/R**		PT32B	3.00
Teflon Diaphragm O-ring	2	N/R		TF24A	10.00	N/R		TF24A	10.00
Teflon Back-up Diaphragm (Neoprene)	2	N/R		TF24B	20.00	N/R		TF24B	20.00
Expanded Teflon Gasket Kit	1	N/R		TF4/8GK	25.00	N/R		TF4/8GK	25.00

* Check first to see if pump was supplied originally with Valve Seat O-rings of Teflon, P/N PT40B.
** M8/PO and M8/PW which have Nordel or Viton diaphragms are fitted with P/N PT32B, Manifold O-rings of Teflon.

* Copyright Wilden Pump & Engineering, 198

RBG-P-5

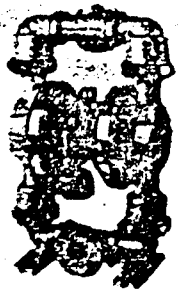
Effective Date April 1, 1983

WILDEN PUMP & ENGINEERING CO.
22069 VAN BUREN STREET, P.O. BOX 845, COLTON, CALIFORNIA 92324 / (714) 783-0621 / Telex 676-452

MODEL M 8

KYNAR PUMP PARTS for Models:

M8/KO/ M8/KW/
M8/KT/ M8/KY/



(Suggested U.S. List Prices)

DESCRIPTION	Qty. Per Pump	M8/KO/		M8/KT/		M8/KW/		[redacted]	
		P/N	Price	P/N	Price	P/N	Price	P/N	Price
Air Valve Assembly	1	B20	375.00	←		N/A		N/A	
Air Valve Body & Piston	1	B20A	175.00	←		W20A	180.00	←	
Air Valve Screen	1	20E	5.00	←					
Air Valve Cap w/Guide (Top)	1	20R	6.00	←		20RB	10.00	←	
Air Valve Cap (Bottom)	1	20S	5.00	←		20SB	9.00	←	
Snap Ring	2	S20T	2.00	←					
Air Valve Cap O-ring	2	20U	.50	←					
Air Valve Gasket	1	20B	1.00	←					
Lubricator Capillary Rod Assy.	1	20C	18.00	←					
Lubricator Oil Bottle	1	20D	26.00	←		W20D	32.00	←	
Center Block Assembly	1	20H	140.00	←		W20H	210.00	←	
O-ring	7	20JH	.50	←					
Block Bushing	1	20N	30.00	←					
Check Body	1	20K8	6.00	←		W20K8	12.00	←	
Nipple	1	20FS	5.00	←					
Check Ball	1	20M	2.00	←					
Block Gasket	2	20P	1.00	←					
Shaft	1	21A	45.00	T21A	45.00	21A	45.00	T21A	45.00
Piston, Inner	2	21B	25.00	T21C	20.00	21B	25.00	T21C	20.00
Piston, Outer w/Lug	2	K21B	265.00	KT21B	140.00	K21B	265.00	KT21B	140.00
Piston O-ring	2	N/R		N/R		N/R		N/R	
Air Chamber, Tapped (Replaced by 22B)				←					
Air Chamber, Counter Sunk	2	22B	60.00	←		W22B	86.00	←	
Water Chamber	2	K35	1125.00	←					
Clamp Band (Large)	2	P30	45.00	←					
Clamp Band (Medium)	4	P39	25.00	←					
Clamp Band (Small)	4	P32	20.00	←					
Discharge Elbow	2	K36	465.00	←					
Inlet Elbow	2	K37	495.00	←					
Manifold "T" Section	2	K33	410.00	←					
Ball Guide Bushing	4	K41C	65.00	←					
Valve Seat	4	K40	50.00	←					
Valve Seat O-ring (Buna N)	4	P40B*	1.00	N/R		P40B*	1.00	N/R	
Manifold O-ring (Buna N)	4	P32B**	1.00	N/R		P32B**	1.00	N/R	
Valve Seat O-ring (TFE)	4	N/R*		PT40B	4.00	N/R*		PT40B	4.00
Manifold O-ring (TFE)	4	N/R**		PT32B	3.00	N/R**		PT32B	3.00
Teflon Diaphragm O-ring	2	N/R		TF24A	10.00	N/R		TF24A	10.00
Teflon Back-up Diaphragm (Neoprene)	2	N/R		TF24B	20.00	N/R		TF24B	20.00
Expanded Teflon Gasket Kit	1	N/R		TF4/8GK	25.00	N/R		TF4/8GK	25.00

* Check first to see if pump was supplied originally with valve seat O-rings of teflon, P/N PT40B.
** M8/KO and M8/KW which have Nordel or Viton diaphragms are fitted with P/N PT32B, Manifold O-rings of Teflon.

* Copyright Wilden Pump & Engineering, 1983

APPENDIX I

Note: Specification for Epoxy Coating used on floor. New information begins on page I-84.

0053C

ENGGE 3

CONSTRUCTION SPECIFICATION
FOR
UPGRADING OF INDUSTRIAL LIQUID WASTE TREATMENT PLANT

DIVISION 9 FINISHES

SUB-DIVISION 9.06 SPECIAL COATING

PART 1 GENERAL

1.1 SCOPE OF WORK

The Contractor shall furnish and apply special coatings in accordance with the contract drawings and this Specification. The Contractor shall apply the special coatings where indicated per the Room Finish Schedule.

1.2 RELATED WORK SPECIFIED ELSEWHERE

(1) CAST-IN-PLACE CONCRETE, Subdivision 3.01
(2) STRUCTURAL STEEL AND MISCELLANEOUS METALS, Subdivision 5.01
(3) METAL DOORS AND FRAMES, Subdivision 8.01
(4) PAINTING, Subdivision 9.07
(5) PIPING, Subdivision 15.01

1.3 REFERENCE DOCUMENTS

1.3.1 Codes and Standards

The Contractor shall comply with the applicable federal, state, and industry regulations and other codes and standards referenced in this Specification.

American National Standards Institute (ANSI)

ANSI N101.2	Protective Coatings (Paints) for Light Water Nuclear-Reactor Containment Facilities

American Society for Testing and Materials (ASTM)

ASTM D 659-74	Standard Method of Evaluation Degree of Chalking of Exterior Paints
ASTM D 714-56 (1974)	Standard Method of Evaluating Degree of Blistering of Paints
ASTM D 772-47 (1975)	Standard Method of Evaluating Degree of Flaking (Scaling) of Exterior Paints

Steel Structures Painting Council (SSPC)

SSPC-SP1-63	No. 1 Solvent Cleaning
SSPC-SP2-63	No. 2 Hand Tool Cleaning
SSPC-SP3	No. 3 Power Tool Cleaning
SSPC-SP5-63	No. 5 Blast Cleaning White Metal
SSPC-SP6-63	No. 6 Commercial Blast Cleaning

National Fire Protection Association (NFPA)

NFPA No. 30	Flammable and Combustible Liquids Code

0053C

ENGGE 3

CONSTRUCTION SPECIFICATION
FOR
UPGRADING OF INDUSTRIAL LIQUID WASTE TREATMENT PLANT

DIVISION 9 FINISHES

SUB-DIVISION 9.06 SPECIAL COATING

ENG-GE-3

PART 1 GENERAL

1.1 SCOPE OF WORK

The Contractor shall furnish and apply special coatings in accordance with the contract drawings and this Specification. The Contractor shall apply the special coatings where indicated per the Room Finish Schedule.

1.2 RELATED WORK SPECIFIED ELSEWHERE

(1) CAST-IN-PLACE CONCRETE, Subdivision 3.01
(2) STRUCTURAL STEEL AND MISCELLANEOUS METALS, Subdivision 5.01
(3) METAL DOORS AND FRAMES, Subdivision 8.01
(4) PAINTING, Subdivision 9.07
(5) PIPING, Subdivision 15.01

1.3 REFERENCE DOCUMENTS

1.3.1 Codes and Standards

The Contractor shall comply with the applicable federal, state, and industry regulations and other codes and standards referenced in this Specification.

American National Standards Institute (ANSI)

ANSI N101.2	Protective Coatings (Paints) for Light Water Nuclear-Reactor Containment Facilities

American Society for Testing and Materials (ASTM)

ASTM D 659-74	Standard Method of Evaluation Degree of Chalking of Exterior Paints
ASTM D 714-56 (1974)	Standard Method of Evaluating Degree of Blistering of Paints
ASTM D 772-47 (1975)	Standard Method of Evaluating Degree of Flaking (Scaling) of Exterior Paints

Steel Structures Painting Council (SSPC)

SSPC-SP1-63	No. 1 Solvent Cleaning
SSPC-SP2-63	No. 2 Hand Tool Cleaning
SSPC-SP3	No. 3 Power Tool Cleaning
SSPC-SP5-63	No. 5 Blast Cleaning White Metal
SSPC-SP6-63	No. 6 Commercial Blast Cleaning

National Fire Protection Association (NFPA)

NFPA No. 30	Flammable and Combustible Liquids Code

1.4 SUBMITTALS

The Contractor shall submit the following to the Contracting Officer in accordance with the "Data Requirements List".

1.4.1 Materials List

Before commencing work under this Subdivision, the Contractor shall furnish to the Contracting Officer for approval, a complete list of special coating materials to be used on the project, and printed recommendations of the Manufacturer of the special coatings, relating to the requirements for surface preparation, thinning, mixing, handling, application, and storage of materials. Also included shall be a list of approved form release agents which are certified by the special coating Manufacturer to be compatible with his coating products. A list of such form release agents shall be made available to the Contracting Officer preparatory to the concrete work.

1.4.2 Samples

The Contractor shall submit coating samples on 9" x 9" hardboard for approval. The samples shall be clearly marked with the Manufacturer's name and product identification, and shall be submitted in sufficient time to allow for approval and, if necessary, disapproval and resubmittal without causing any delay of the project. Color chips of finish special coatings shall be submitted showing the range of Manufacturer's standard colors.

1.5 PRODUCT DELIVERY, STORAGE, AND HANDLING

1.5.1 Delivery and Handling

The Contractor shall deliver all materials to the job site in original, new, and unopened packages and containers bearing Manufacturer's name and label, and the following information: name of material; Manufacturer's stock number and date of manufacture; contents by volume for major pigment and vehicle constituents; thinning instructions; application instructions, color name and number; and shelf life.

1.5.2 Storage

The Contractor shall store all special coatings, including, primers and fillers, in an enclosed area with adequate ventilation. Each type of coating material shall be stored in a separate area within the room or space. All containers shall be kept closed until ready for mixing procedures. The Contractor shall not damage the containers, labels, and tags. No materials shall be used which have been stored beyond the indicated shelf life. Special coating materials shall be stored at temperatures between 40°F and 90°F. Closed container storage instructions shall conform to NFPA No. 30, Chapter V.

1.6 SAFETY PRECAUTIONS

1.6.1 General

The Contractor shall comply with the safety precautions specified hereinafter during the time of mixing, preparation, installation and drying periods of the special coatings.

ENG-GE-3

In addition to the safety requirements specified herein, which shall be considered as minimum, the Contractor shall submit to the Contracting Officer additional safety procedures as may be required for the installation of the work.

Work shall not begin prior the Contracting Officer's approval of the submittal.

1.6.2 Acid Etching

When hydrochloric acid and water solution etching of surfaces is required the Contractor shall:

(1) Mix and apply the solution in accordance with the coating manufacturer's recommendations.

(2) Require that all employees wear proper protective clothing and equipment to prevent acid burns to skin and eyes, and irritation to nose and throat.

(3) Provide adequate ventilation during the application and drying period, and prevent drippage of acid solution onto personnel and equipment.

(4) Arrange for the provision of an on the spot water supply in each location where acid is used.

1.6.3 Sandblasting

When sandblasting of surfaces is required the Contractor shall:

(1) Provide respirators of types approved by the U.S. Bureau of Mines, selected to provide protection for the specific hazard.

(2) Provide cartridge type respirators where concentration of the injurious material is so low that damage will be produced only by long continued or repeated exposure.

(3) Exclude all employees not properly equipped with respiratory equipment from the sandblasting area. Dust respirators may be acceptable for inspectional or temporary conditions when combined with proper eye protection.

(4) Barricade the sandblasting area and post adequate warning signs.

1.6.4 Ventilation

The Contractor shall provide adequate ventilation during the application and drying periods of the special coatings as follows:

(1) A three-minute air change of the area shall be provided with proper air pattern maintained to uniformily flow downward through the area.

(2) The vapors shall flow naturally downward into the air pattern. Drafty overhead supply (due to poor distribution) or crossroom currents (due to outside atmospheric effects, open doors, windows, etc.) shall be prevented. Floor level exhausters shall be used to prevent the accumulation of explosive vapors.

(3) Air flow pattern shall be checked before application is started of any sealer, primer or coating.

(4) Fans used as exhausters shall be explosion-proof.

(5) Fans used as blowers to force fresh air under pressure into an area, need not be explosion-proof.

(6) Ventilation and fan capacities shall be sufficient in volume to prevent the accumulation of explosive vapors above 20% of the lower explosive limit of the solvents of the special coatings being applied.

(7) Fumes from operations inside buildings shall be exhausted directly to the atmosphere. Ventilation shall be continued for a minimum of 6 hours after application of each coating.

(8) Welding burning, flame or spark producing work shall be prohibited near the intake or exhaust outlets from or to such ventilation.

1.6.6 Electrical Equipment

The Contractor shall comply with the following:

(1) All metal receptacles (drums, pots, cans, etc.) used in the transfer of special coatings, including their primers and solvents from one container to another shall be bonded together by means of portable bonding cable, clamp type. Prior to start of work, the spray nozzle shall be effectively bonded to the paint pot and the paint pot shall be provided with a positive static ground.

(2) All energized lighting luminaires, switches, electric motors and other electrical equipment shall be of the explosion-proof type in the immediate area and in the vicinity of where air mixtures in the explosive range might possibly collect. All extension cords shall be of the one-piece type. Connecting sockets shall not be used.

(3) All metal parts of apparatus used in systems for the removal of vapor, including fans, ducts, etc., shall be electrically grounded in an effective and approved manner.

(4) All lighting luminaires, motors and other electrical equipment used in direct connection with this work shall be inspected. Defective equipment shall be removed and replaced with non-defective equipment.

1.6.7 Health and Fire Hazard Control Measures

The Contracting Officer will check all phases of the work from the standpoint of the hazards involved during all actual performance of the work.

The Contractor shall provide fire extinguishers.

The Contractor shall furnish all equipment and supplies required to conform to the following:

(1) Fresh air hoods or masks shall be worn by all personnel applying special coatings and by any other persons entering the immediate area. Approved filter respirator may be used by personnel when the concentrations of organic vapors are within permissible limits.

(2) Personnel handling and applying the special coatings shall wear plastic or acid-resistant type gloves.

(3) The Contractor shall arrange for a suitable area outside of permanent buildings for storage and mixing of the protective coatings. This area shall be situated so that these materials will not be exposed to any danger of fire. Adequate ventilation shall be provided at each storage and mixing area so as to prevent collection of flammable air mixtures.

(4) Only explosion-proof electric motors or air driven mixers shall be used for mixing the solvents and materials.

(5) Barricades or other markings acceptable to the Contracting Officer shall be installed around all special coating work. In the event the barricaded area is large in size and other crafts are involved, the barricaded area is to be cleared of other crafts until the coating is completed and properly dried.

(6) Welding, burning, flame or spark producing devices shall be prohibited inside the barricaded area. Spark-proof tools, such as nonferrous paint scrapers shall be used.

(7) Smoking, open flame or lights shall be prohibited inside the barricaded area and the Contractor will so post all entrances as well as conspicuous locations within the area.

(8) Tennis shoes or protective shoe covers are to be worn by all personnel within the immediate application area.

(9) In case of any power failure affecting the lighting or ventilation of any operation the personnel involved are to cease work immediately and evacuate the work area. Explosion proof emergency lighting shall be provided at all interior areas.

PART 2 PRODUCTS

2.1 DESCRIPTION

The Contractor shall apply special coatings, to floor, wall, and ceiling surfaces in accordance with the contract drawings and Specifications. The special coatings shall meet the performance tests in accordance with ASTM D 659, ASTM D 714, and ASTM D 772. The special coating materials shall consist of poly-amide and/or epoxy-amide surfacers, fillers, and epoxy hi-build enamels. Special coating systems of these materials shall be applied to the following surface types in accordance with the Manufacturer's instructions and the contract drawings:

(1) Coating A - concrete floors

(2) Coating B - concrete walls and concrete masonry unit

(3) Coating C - plaster walls and gypsum wallboard

(4) Coating D - structural steel, decking, carbon steel; doors and frames.

2.2 SPECIAL COATING SYSTEMS

The following special coating systems are based on Ameron protective coatings. Other manufacturers (such as Keeler and Long, Carboline, or Tnemec) of coating materials Approved Equal for nuclear coating systems may be used. The components of the coating systems shall be the products of one manufacturer.

2.2.1 Coating A - Concrete Floors

2.2.1.1 Primer/Sealer. Primer/Sealer shall be Nu-klad 108, or Approved Equal.

2.2.1.2 Intermediate Coat. Intermediate coat shall be Amercoat 66, polyamide-cured catalyzed epoxy, or Approved Equal; medium gray in color, with a dry film thickness of 5 mils.

2.2.1.3 Topcoat. Topcoat shall be 2 coats of Amercoat 66, polyamide-cured catalyzed epoxy, or Approved Equal; white in color, with a total 2 coat dry film thickness of 10 mils.

2.2.2 Coating B - Concrete Walls and Concrete Masonry Units

2.2.2.1 Primer/Sealer. Where a curing compound or form release agent has been used, the primer/sealer shall be Nuklad 105, or Approved Equal.

2.2.2.2 Filler. Filler shall be Nu-klad 114, or Approved Equal, where required.

2.2.2.3 Intermediate Coat. Intermediate coat shall be Amercoat 66, polyamide-cured catalyzed epoxy, or Approved Equal; medium gray in color, with a dry film thickness of 5 mils.

2.2.2.4 Topcoat. Topcoat shall be Amercoat 66, polyamide cured epoxy, or Approved Equal; white in color, with a dry film thickness of 5 mils.

2.2.3 Coating C - Plaster Walls and Gypsum Wallboard

2.2.3.1 Sealer. Sealer shall be Amercoat 66, polyamide-cured catalyzed epoxy or Approved Equal, with 2 quarts of thinner per one gallon of paint; the color shall be gray.

2.2.3.2 Topcoat. Topcoat shall be Amercoat 66, polyamide-cured catalyzed epoxy, or Approved Equal; the color shall be white with a dry film thickness of 5 mils.

2.2.4 Coating D - Structural Steel, Decking, Carbon Steel; Doors, and Frames

2.2.4.1 Primer for System with Sandblasting Preparation. Primer shall be Dimetcote 6, inorganic zinc primer, or Approved Equal.

2.2.4.2 Primer for System without Sandblasting Preparation. Primer shall be Amercoat 71, epoxy primer or Approved Equal. This preparation shall be used for doors and frames and for the sprinkler system. Cleaner for galvanized metals shall be Galvaprep, or Approved Equal.

2.2.4.3 Intermediate Coat. Intermediate coat shall be Amercoat 66, polyamide-cured catalyzed epoxy, or Approved Equal; medium gray in color with a dry film thickness of 5 mils.

2.2.4.4 Topcoat. Topcoat shall be Amercoat 66, polyamide-cured catalyzed epoxy, or Approved Equal, red in color for sprinkler system and white in color for other items, with a dry film thickness of 5 mils.

PART 3 EXECUTION

3.1 GENERAL

3.1.1 Inspection

The Contractor shall examine the substrates, adjoining construction, and the conditions under which the work is to be installed. The Contractor shall not proceed with the work until unsatisfactory conditions have been corrected. The Contractor shall co-ordinate the work with the work of other trades such that application of the special coatings does not hinder the progress or the quality of related work.

3.1.2 Environmental Conditions

The Contractor shall apply the special coatings only when the surfaces to coated and the surrounding air temperature is at or above 40 deg. F, or as otherwise recommended by the manufacturer. This temperature shall be maintained during application of coatings and for a minimum of 18 hours after application.

3.1.3 Protection

The Contractor shall provide suitable coverings to protect surfaces not requiring coating; place materials which might constitute fire or explosion hazard into metal containers and remove from premises at the close of each days work; and take every precaution to avoid damage by fire or explosion.

3.2 SURFACE PREPARATION

3.2.1 General

The Contractor shall prepare surfaces to receive special coatings. The Contractor shall thoroughly clean off substances that may interfere with proper adhesion. He shall coat or cover dry surfaces only. The Contractor shall fill dents, cracks, hollow places, open joints, and other irregularities with a filler suitable for the purpose and, after setting, sand to a smooth finish. The Contractor shall prime surfaces not more than 8 hours after cleaning. No more than 160 hours shall elapse between the installation of the first and successive coats.

3.2.2 Cementitious Surfaces

The Contractor shall perform the work as follows:

3.2.2.1 Preparation. Prepare cementitious surfaces of concrete and cement plaster to receive special coatings by removing efflorescence, chalk, dust, dirt, grease, oils, and by roughening if required to remove glaze. Use abrasive blast cleaning methods if recommended by coating system manufacturer.

3.2.2.2 Alkalinity and Moisture Content. Clean concrete surfaces with an alkaline wash of tri-sodium phosphate in a concentrate specified and where required by the manufacturer of the specified materials. Do not apply special coatings over surfaces where the moisture content exceeds that permitted in the manufacturer's printed directions.

3.2.2.3 Acid Etch. Moist cured concrete shall be acid etched with one part 30 percent hydrochloric acid and two parts water, then neutralized with a rinse of potable water. The Contractor shall not apply the coating system until surfaces are thoroughly dry.

3.2.3 Ferrous Metal Surfaces

The Contractor shall clean and prepare surfaces by one of the following methods in accordance to the coating manufacturer's instructions for the metal substrate and applications required.

Clean non-galvanized, ferrous surfaces, which have not been shop-coated, of oil, grease, dirt, loose mill scale, and other foreign substances by solvent or mechanical cleaning, complying with SSPC-SP1. Blast clean steel surfaces as recommended by the coating system manufacturer and in accordance with SSPC-SP5 & SSPC-SP6. Hand tool cleaning shall be done in accordance with SSPC-SP2. Power tool cleaning shall be in accordance with SSPC-SP3.

3.2.4 Non-Ferrous Metal Surfaces

The Contractor shall clean non-ferrous and galvanized surfaces in accordance with the special coating system Manufacturer's instructions for the type of service, metal substrate, and application required.

3.3 MATERIALS PREPARATION

3.3.1 Mixing

The Contractor shall mix and prepare special coating materials in strict accordance with the Manufacturer's directions; stir all materials before application, and as required during the application of the materials to maintain a uniform consistency. If necessary, the Contractor shall strain before using. He shall not mix special coatings of different Manufacturers together.

3.4 APPLICATION

3.4.1 General

The Contractor shall provide a 24 hr written notice prior to application of special coatings in each room. The Contractor shall apply special coatings with brush, roller, spray, or other acceptable practice in accordance with the Manufacturer's directions; use brushes and rollers best suited for the type of material being applied; apply materials with care to a uniform thickness, showing no runs, holidays, sags, crawls, or other defects. He shall finish surfaces uniform in sheen, color, and texture; allow coats to cure thoroughly before succeeding coats are applied as specified by the coating materials Manufacturer; coat surfaces behind movable equipment and furniture the same as similar exposed surfaces; and coat all surfaces as indicated on the contract drawings and in this Specification.

3.4.2 Topcoat

Topcoat for Coating A, B, C, & D, specified hereinbefore shall be applied in accordance with the Manufacturer's application instructions.

ENG-GE

3.4.3 Primer/Sealer

The Contractor shall use Primer/Sealer specified hereinbefore. Oil or wax-based curing compounds and form release agents shall be removed by sandblasting. Apply the primer/sealer as soon as practical after cleaning to prevent foreign material (oil, salt, etc) from entering the concrete while it is porous. Apply the primer/sealer in accordance with the Manufacturer's recommendations.

3.4.4 Primer for System with Sandblasting Preparation

Primer specified hereinbefore shall be applied at a dry film thickness of 2-1/2 mils.

3.4.5 Primer for System without Sandblasting Preparation

Primer specified hereinbefore shall be applied at a dry film thickness of 2 mils.

3.4.6 Filler

Filler for concrete walls and ceilings, specified hereinbefore shall be used to fill small holes and voids so as to provide a smooth surface on which to place a topcoat.

3.5 PROTECTION AND CLEAN UP

3.5.1 Protection

(1) The Contractor shall protect work of other trades, whether to be painted or not, against damage by the special coating and plastic sheet work; leave all such work undamaged; and correct any damaged by cleaning, repairing or replacing, and recoating, as required.

(2) The Contractor shall provide "Wet Paint" signs to protect newly coated finishes; and remove temporary protective wrappings provided by others for protection of their work after completion of special coating operations.

3.5.2 Clean-up

(1) During the progress of the work, the Contractor shall remove from the site all discarded paint materials, rubbish, cans, and rags at the end of each work day and clean all coating equipment, brushes, sprayers, etc. as recommended by the manufacturer, at the end of each day's work.

(2) Upon completion of special coating work, the Contractor shall clean window glass and other special coating spattered surfaces; and remove special coating spatters by proper methods of washing and scraping, using care not to scratch or otherwise damage finished surfaces. The Contractor shall not use cleaners containing chlorides on stainless steel.

(3) At the completion of work the Contractor shall touch-up, restore, and/or recoat surfaces of unacceptable work.

3.6 FINAL ACCEPTANCE

Materials, workmanship, and installation not in accordance with the requirements of this specification shall be replaced or repaired by the Contractor.

APPENDIX I-1

MANUFACTURERS INFORMATION ON PROTECTIVE COATING, PRIMER AND FINISH

PLASITE

TECHNICAL BULLETIN

7100
July 1984
(Replaces March 1980)

PLASITE 7100 HI-RESISTANT PROTECTIVE COATING

TYPE: A cross linked epoxy-phenolic cured with an alkaline curing agent and formulated with particular attention to wide chemical resistance and ease of handling.

INTENDED USE: PLASITE 7100 is an ideal heavy maintenance coating due to its thixotropic qualities and excellent edge coverage. PLASITE 7100 is similar in vehicle formulation to PLASITE 7122 but has a different pigment ratio and lower solids. It has lower comparative gloss and higher build characteristics. PLASITE 7122 is generally superior for immersion service. Refer to ZONE OF USAGE below.

CHEMICAL RESISTANCE: Excellent chemical resistance to a wide range of acids, alkalies, solvents and water solutions. Refer to CHEMICAL RESISTANCE on Page 2.

TEMPERATURE RESISTANCE: Dry film basis is 400°F for short periods; 250°F continuous. Continuous immersion temperatures depend on particular reagent.

SURFACE PREPARATION: Steel surfaces shall be prepared by blasting as required by ZONE OF USAGE. Refer to PRIMERS on Page 2.

APPLICATION: PLASITE 7100H is formulated for standard production spray equipment. PLASITE 7100B is formulated for brush and roller application and should be force cured for immersion service. Refer to last page for details on APPLICATION PROCEDURE.

COLORS: Standard colors are green, light gray, medium gray, black, white, tile red, clear. Special colors are available.

FILM THICKNESS PER COAT: A 6 to 7 mil film is easily produced in one multi-pass spray coat. A 2 to 4 mil film may be produced in one "flow on" brush coat.

COVERAGE: 769 mil ft^2/gallon ± 4% theoretical. For estimating purposes, 90 ft^2/gallon will produce a 6 to 7 mil film (20% loss included). Two coats will produce a 12 to 15 mil film for immersion service.

DRYING TIME: Surface will normally be tack free in 2 to 3 hours at 70°F.

CURING TIME: 5 to 7 days at 70°F to 90°F. Refer to page 2 for force curing.

PHYSICAL SPECIFICATIONS

PIGMENTS: Titanium dioxide, inerts and tinting colors.

SOLIDS: 60% by Weight; 48% ± 2% by Volume depending on color.

POT LIFE: Approximately 24 hours at 70°F.

SHELF LIFE: 24 months minimum at 70°F. Material in stock should be turned upside down every 3 to 6 months.

SPRAY VISCOSITY: 16 ± 7 seconds Ford Cup #4 depending on color.

SHIPPING WT.: Approximately 12 lbs./gallon.

ELECTRICAL RESISTANCE: 3.9 x 10^{12} ohm-cm Volume Resistivity. ASTM D257-66.

ABRASIVE RESISTANCE: 61 Milligrams loss average, 1000 Cycles Taber CS-17 Wheel, 1000 Gr. Wt. Lt. Gray Color.

HARDNESS: Barcol 55.

THERMAL SHOCK: Unaffected in 5 cycles, -70°F to +200°F.

FLEXIBILITY: ½" bend, Zuhr Conical Mandrel, 15 mil film.

NOTE: Above tests were conducted on film cured at 150°F.

ZONE OF USAGE

A ZONE: Includes immersion service for process, transportation and storage vessels, as well as exteriors of high temperature equipment, sumps, sewers, exhaust ducts, concrete bases and floors, or other surfaces subject to combinations of high temperature and heavy spills of corrosive chemicals. SSPC-SP5 blast and a film thickness of 12 to 15 mils required.

B ZONE: Interior process areas where structural steel, floors, equipment, ducts and other surfaces subject to attack by strong fumes, occasional spills and splashes at intermediate temperatures. SSPC-SP5 or SSPC-SP10 blast and a film thickness of 12 to 15 mils required. With surface preparation as indicated, the finish coating is considered self-priming although, if desired, a heavy duty primer may be incorporated as part of the system.

C ZONE: Interior and exterior area surfaces subject to fumes of fairly high concentration at ambient temperatures. Heavy or medium duty primer over SSPC-SP6 or SSPC-SP7 blast and a total film thickness, primer and topcoat, of 7 to 10 mils required.

D ZONE: Process plant exteriors subject to chemical atmosphere and weathering. Medium duty primer over SSPC-SP7 or SSPC-SP3 surface preparation and a total film thickness, primer and topcoat, of 6 to 8 mils required.

WISCONSIN PROTECTIVE COATING CORP.
614 Elizabeth Street
P.O. Box 216
Green Bay, WI 54305
414-437-6561

Represented by:

SURFACE PREPARATION

STEEL

High Temperature & Immersion Service (A & B Zones as described under ZONE OF USAGE.)

1. All sharp edges shall be ground to produce a radius and all imperfections, such as, skip welds, delaminations, scabs, slivers and slag shall be corrected prior to abrasive blasting. All skip welds shall be welded solid.
2. Degrease surface prior to sandblasting. Organic solvents, alkaline solutions, steam, hot water with detergents or other systems that will completely remove dirt, oil, grease, etc. may be used. Prebaking of old tanks is required.
3. The surface shall be blasted to an SSPC-SP5 or NACE-1 white metal surface using a 5/16″ or 3/8″ blast nozzle supplied with 80 to 100 psi. An anchor pattern or "tooth" in the metal shall correspond to approximately 20 to 25% of the total film thickness of the coating.
4. Contaminated grit shall not be used for the finish work.
5. The grit used shall be a sharp silica sand, steel slag grit similar or equal to BLACK BEAUTY® BB1240 or any other abrasive that has a sharp, hard cutting surface, properly graded, dry and of best quality. The grit shall be of proper size to obtain the specified anchor pattern.
6. The anchor pattern shall be sharp and no evidence of a polished surface is allowed.
7. Remove all traces of grit and dust with a vacuum cleaner or by brushing. Care must be taken to avoid contaminating the surface with fingerprints or from detrimental material on the workers' clothes.
8. The surface temperature shall be maintained at a minimum of 5° above the dew point to prevent oxidation of the surface. The coating shall be applied within the same day that the surface has been prepared.

Service in Corrosive Atmospheres (B, C & D Zones as described under ZONE OF USAGE.)

1. Degrease as described in Item 2 under A & B Zones.
2. Remove all loose mill scale, rust scale, and old paint scale by one of the following methods:
   a. Near White Metal Blast Cleaning: (B Zone) SSPC-SP10 or NACE-2.
   b. Commercial Blast Cleaning; (C Zone) SSPC-SP6 or NACE-3.
   c. Brush-Off Blast Cleaning; (C & D Zones) SSPC-SP7 or NACE-4.
   d. Power Tool Cleaning; (D Zone) SSPC-SP3.

When utilized, inhibitive primer should be applied as soon as possible after surface preparation.

NOTE: The above specification numbers are from the Steel Structures Painting Council Surface Preparation Specifications, 4400 Fifth Ave., Pittsburgh, PA 15213 and National Association of Corrosion Engineers, P.O. Box 218340, Houston, TX 77218. D Zone application surface preparation as in above Paragraph 2(d) must result in a relatively rough surface. If the steel is new and this type of surface preparation does not leave a reasonably rough surface on the steel, then the heavy film system is not recommended.

CONCRETE

A ZONE: All concrete surfaces require whip blasting for immersion service. Fully cured concrete must be blasted to provide a hard, firm, clean and neutral surface for coating. All concrete surfaces must be filled and sealed with PLASITE 9028M1 or PLASITE 9028M2, applied in accordance with PLASITE Bulletin 9028. All surface imperfections, "bug holes", etc. must be completely repaired before application of PLASITE 7100. PLASITE 9028M1 and 9028M2 are not recommended for food service.

B ZONE: Severity of expected service will dictate minimum concrete surface preparation. Severe service (strong fumes, spillage, etc.) will probably require A Zone surface preparation and PLASITE 9028M1 or PLASITE 9028M2 filling and sealing before application of PLASITE 7100.

GALVANIZED SURFACE

The surface shall be clean and grease free and properly etched with a standard solution such as PARKER® #37 as produced by Occidental Chemical Company, Parker Division, or a phosphating solution. After the surface is properly etched, it should be thoroughly rinsed with water and thoroughly dried prior to coating application. No inhibitive primer is required providing the galvanized surface is continuous.

ALUMINUM

Surface shall be clean and grease free with a blast produced anchor pattern or "Tooth" as described earlier under "STEEL". In addition, the blasted surface shall be given a chemical treatment such as ALODINE® 1200S as produced by Amchem Products, Inc., Ambler, PA or IRIDITE® 14-2 as produced by Allied-Kelite Division of the Witco Chemical Corporation, Des Plaines, IL. For immersion, blasting with sharp grit followed by the chemical surface treatment is required.

NOTE: On metallic surfaces prepared only by chemical etching the total coating film thickness applied should be restricted to only half the film normally applied to blasted surfaces. This reduced film thickness should be considered during selection of the coating for the service and the type of surface preparation performed.

WOOD, TRANSITE AND SIMILAR SURFACES

Normally these materials need no surface treatment provided they are free of grease, oil and dirt and are dry. It is generally recommended that the first coat be diluted one part of recommended PLASITE Thinner to one part of material and brush applied.

TECHNICAL BULLETIN

7100-ACP
MARCH 1984
(Replaces November 1980)

PLASITE 7100-AC HEAVY DUTY PRIMER - HI-RESISTANT ANTI-CORROSIVE PRIMER

TYPE: A cross-linked epoxy-phenolic, amine cured, combined with the proper modifying agents and Strontium Chromate inhibitive pigmentation.

INTENDED USE: Primarily as a combination inhibitive and high chemical resistant metal primer. It is an established fact that the paint or coating system chemical resistance is no better than the material next to the substrate. PLASITE No. 7100-AC Primer was designed to be used in combination with coatings of the high chemical resistant type.

CHEMICAL RESISTANCE: Excellent chemical resistance to spills and fumes of a wide range of acids, alkalies and solvents.

TEMPERATURE RESISTANCE: Dry temperature basis is 400°F for short periods, 350°F continuous.

SURFACE PREPARATION: Steel surfaces may be prepared by blasting or power tools as required by ZONE OF USAGE and SURFACE PREPARATION on Page 2.

APPLICATION: PLASITE 7100-AC Primer as formulated can be applied by standard production spray equipment or by brush and roller. Refer to Page 2 for details on application.

COLORS: Standard primer color is Moss Green.

FILM THICKNESS PER COAT: A 1½ to 3 mil DFT may be applied in one coat by any of the following methods: roller. spray or brush. A 2 mil minimum DFT is normally required.

COVERAGE: 625 mil ft.^{2}/gallon ± 4% (theoretical). 250 to 166 ft.^{2}/gallon will produce the 2 to 3 mil DFT recommended for use under a chemical resistance top coat for Zone B applications (20% loss included). 333 to 250 ft.^{2}/gallon will produce the 1.5 to 2 mil DFT required for use under a chemical resistant top coat for Zones C and D applications (20% loss included).

DRYING TIME: At 70°F the 2 mil film will normally be tack free in 3 to 4 hours and may be overcoated by spray application at this time. If the top coat is to be applied by brush, then it is recommended that the primer dry for at least 8 hours.

CURING TIME: 5 to 7 days at 70°F to 90°F. This coating should not be applied when air temperature or temperature of surface to be coated is below 50°F. Within 24 hours after coating is applied a minimum substrate temperature of 70°F is required for proper polymerization.

SOLIDS: By weight, 59% ± 2%; by volume, 39% ± 2%.

POT LIFE: Approximately 24 hours at 70°F.

SHELF LIFE: At 70°F 24 months. Material in stock should be turned upside down every 3 months.

SPRAY VISCOSITY: At 70°F 20 ± 7 seconds Ford Cup #4.

SHIPPING WT.: Approximately 12 lbs./gallon.

ZONE OF USAGE

B ZONE: Interior process areas where structural steel, floors, equipment, ducts and surfaces subject to attack by strong fumes, occasional spills and splashes at intermediate temperatures. Sandblasting to near white metal preferred for long life followed by 2 to 3 mils DFT PLASITE 7100-AC with top coat of appropriate PLASITE finish coating.

C ZONE: Interior and exterior areas of surfaces subject to fumes of fairly high concentration at ambient temperatures. Commercial blast surface preparation combined with PLASITE 7100-AC and appropriate PLASITE high resistant finish coat.

D ZONE: Process plant exteriors subject to chemical atmosphere and weathering. Good power tool cleaning or brush-off blast cleaning with the use of PLASITE 7100-AC Primer and appropriate PLASITE high resistant finish coat.

THINNERS

PLASITE 7100-AC Primer normally may be applied by brush as received. PLASITE 71 Thinner recommended to adjust spray viscosity and the amount required will vary depending on air and surface temperature and application equipment. Normal spray application conditions will require addition of approximately 10 to 20% PLASITE 71 Thinner by volume. Airless spray equipment and above normal temperatures require additional thinning.

It is recommended that the amount of thinner included on each order amount to approximately 20% of the coating order.

WISCONSIN PROTECTIVE COATING CORP.
614 Elizabeth Street
P.O. Box 216
Green Bay, WI 54305
414-437-6561

Represented by:

carboline®

PHENOLINE® 373 Primer & Finish

SELECTION DATA

GENERIC TYPE: Modified Phenolic. Part A & Part B mixed prior to application.

GENERAL PROPERTIES: A low cost medium build modified phenolic tank lining having excellent all-around chemical, thermal shock and abrasion resistance. Cures to a hard, tough yet flexible film. A 3 coat system at 5 mils per coat can be used on steel or concrete. Phenoline 373 is acceptable under 21 CFR 121.2514 (FDA) for direct food contact surfaces, in appropriate colors, as recommended.

RECOMMENDED USES: Phenoline 373 is an effective and economical lining system for steel and concrete tanks containing dilute acids, caustic, salt or solvents. Also for tanks storing or processing wet, or dry food products. A system consisting of Phenoline 373 Primer and Phenoline 373 Finish is used for lining tanks of ocean-going chemical carriers because of resistance to wide range of chemicals and food products. Phenoline 373 Finish can be used to protect floors from splash and spillage of corrosives.

NOT RECOMMENDED FOR: Exposure to strong mineral and organic acids.

CHEMICAL RESISTANCE GUIDE:

Exposure	Immersion	Splash and Spillage
Acids	Very Good	Excellent
Alkalies	Excellent	Excellent
Solvents	Excellent	Excellent
Salt	Excellent	Excellent
Water	Very Good	Excellent

TEMPERATURE RESISTANCE: (Non-immersion)
Continuous: 180°F (82°C)
Non-continuous: 200°F (93°C)

Immersion temperature resistance depends on exposure. Consult Carboline Chart #18, Chart #42 or the Technical Service Department for specific recommendations. Metal tanks operating above 140°F (60°C) must normally be insulated.

FLEXIBILITY: Fair

WEATHERING: Good (Chalks)

ABRASION RESISTANCE: Excellent

SUBSTRATES: Apply over properly prepared steel, concrete, stainless steel, aluminum or others as recommended.

TOPCOAT REQUIRED: None for Phenoline 373 Finish. Phenoline 373 Primer may be topcoated with epoxies, modified phenolics or other generic types as recommended.

COMPATIBILITY WITH OTHER COATINGS: Phenoline 373 Finish is normally used over Phenoline 373 Primer or other modified phenolics and catalyzed epoxy primers as recommended.

SPECIFICATION DATA

THEORETICAL SOLIDS CONTENT OF MIXED MATERIAL:

	By Volume
Phenoline 373 Primer & Finish	75 ± 2%

RECOMMENDED DRY FILM THICKNESS PER COAT:
(Typical System)

1 coat Phenoline 373 Primer	5 mils (125 microns)
1 coat Phenoline 373 Finish Green	5 mils (125 microns)
1 coat Phenoline 373 Finish Gray	5 mils (125 microns)

THEORETICAL COVERAGE PER MIXED GALLON*:
1200 mil sq. ft. (29.4 sq. m/l @ 25 microns)
240 sq. ft. at 5 mils (5.9 sq.m/l @ 125 microns)

***NOTE:** Material losses during mixing and application will vary and must be taken into consideration when estimating job requirements.

SHELF LIFE: 2 years minimum

COLORS: Phenoline 373 Primer — White 0810 only
Phenoline 373 Finish — Green 4339, Gray 2790

GLOSS: Medium

ORDERING INFORMATION

Prices may be obtained from Carboline Sales Representative or Main Office. Terms — Net 30 Days.

SHIPPING WEIGHT:	1's	5's
Phenoline 373 Primer	14 lbs. (6.5 kgs)	70 lbs. (31.8 kgs)
Phenoline 373 Finish	15 lbs. (6.8 kgs)	75 lbs. (34.1 kgs)
Phenoline Thinner	9 lbs. (4.1 kgs)	45 lbs. (20.4 kgs)

FLASH POINT: (Pensky-Martens Closed Cup)

Phenoline 373 Primer Part A	72°F (22°C)
Phenoline 373 Primer Part B	40°F (4°C)
Phenoline 373 Finish Part A	66°F (19°C)
Phenoline 373 Finish Part B	71°F (22°C)
Phenoline Thinner	77°F (25°C)

Aug 77-N

To the best of our knowledge the technical data contained herein are true and accurate at the date of issuance and are subject to change without prior notice. User must contact Carboline to verify correctness before specifying or ordering. No guarantee of accuracy is given or implied. We guarantee our products to conform to Carboline quality control. We assume no responsibility for coverage, performance or injuries resulting from use. Liability, if any, is limited to replacement of products. Prices and cost data if shown, are subject to change without prior notice. NO OTHER WARRANTY OR GUARANTEE OF ANY KIND IS MADE BY THE SELLER, EXPRESS OR IMPLIED, STATUTORY, BY OPERATION OR LAW, OR OTHERWISE, INCLUDING MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE.

line Thinner #2 or Toluol.

Steel: For immersion service, dry abrasive blast to a White Metal finish in accordance with SSPC-SP 5-63 to a degree of cleanliness in accordance with NACE #1 to obtain a 2 to 3 mil (50-75 microns) blast profile. For a non-immersion service, dry abrasive blast to a commercial finish in accordance with SSPC-SP 6-63 to a degree of cleanliness in accordance with NACE #3 to obtain a 2 to 3 mil (50-75 microns) blast profile.

Concrete: Remove fins and other protrusions by stoning, sanding or grinding. Concrete must be cured at least 28 days at 70°F (21°C) and 50% R.H. or equivalent time. Remove form oils, incompatible curing agents and hardeners by abrasive blasting.

IMMERSION SERVICE: Abrasive blast to open all voids and obtain a surface similar to medium grit sandpaper (horizontal surfaces may be acid etched). Blow or vacuum off sand and dust.

NON-IMMERSION SERVICE: Horizontal surfaces must be acid etched or abrasive blasted to remove laitance. For other surfaces blow off with compressed air to remove dust.

Phenoline 373 Finish can be applied over a recommended surfacer.

MIXING: Mix separately, then combine and mix in the following proportions:

	1 Gal	5 Gal
Phenoline 373 Primer or Finish Part A	.8 Gal.	4 Gal.
Phenoline 373 Primer or Finish Part B	.2 Gal.	1 Gal.

Thin up to 18% by volume with Phenoline Thinner

POT LIFE: 1½ hours at 75°F (24°C) and less at higher temperatures. Pot Life ends when coating loses body and begins to sag.

APPLICATION TEMPERATURES:

	Material	Surfaces
Normal	65-85°F (18-29°C)	65-85° (18-29°C)
Minimum	55°F (13°C)	50°F (10°C)
Maximum	90°F (32°C)	110°F (43°C)

	Ambient	Humidity
Normal	65-85°F (18-29°C)	30-70%
Minimum	50°F (10°C)	0%
Maximum	110°F (43°C)	85%

SPRAY: Use adequate air volume for correct operation. Hold gun 8-10 inches from the surface and at a right angle to the surface.
Use a 50% overlap with each pass of the gun. On irregular surfaces, coat the edges first, making an extra pass later.

NOTE: The following equipment has been found suitable, however, equivalent equipment may be substituted.

Conventional: Use 3/8" I.D. Mat'l. Hose.

Mfr. & Gun	Fluid Tip	Air Cap
Binks #18 or #62	66	66PE
DeVilbiss P-MBC or JGA	E	704
	Approx. .070"I.D.	Approx. 9-10 cfm @ 30 psi

Airless: Use a 3/8" I.D. Mat'l. Hose.

Mfr. & Gun	Pump*
DeVilbiss JGB-507	QFA-514
Graco 205-591	President 30:1 or Bulldog 30:1
Binks Model 500	Mercury 5C

*Teflon packings are recommended and available from pump manufacturer. Use a .019-.025" tip with 2200 psi.

BRUSH: Brush application is recommended for touch-up only. Brush out well using full strokes and avoid rebrushing.

RECOAT AND CURE TIME:

Temperature	Primer Minimum	Finish Minimum	Primer & Finish Maximum*	Final Cure for Immersion*
50°F (10°C)	6 days	72 hours	30 days	60-120 days
60°F (16°C)	3 days	36 hours	14 days	15-60 days
75°F (24°C)	36 hours	18 hours	7 days	7-30 days
90°F (32°C)	12 hours	12 hours	4 days	5-15 days

*If maximum recoat time is exceeded and recoat is necessary, special surface preparation may be required. Force curing is recommended for all tank linings. Final cure temperatures below 60°F (16°C) are not recommended for tank linings. Final cure requirement varies depending on exposure.

CLEAN UP: Use Carboline Thinner #2 or Xylol.

STORAGE CONDITIONS:
Temperature: 40-110°F (4-43°C) Humidity: 0-100%

NOTE: Excessive film thickness or poor ventilating conditions require longer dry times and in extreme cases may cause premature failure. Excessive humidity or condensation on the surface during curing may result in a surface haze or blush; any haze or blush should be removed by water washing before recoating.

For more detailed information please consult specific Carboline Application Guides.

CAUTION: CONTAINS FLAMMABLE SOLVENTS. KEEP AWAY FROM SPARKS AND OPEN FLAMES. IN CONFINED AREAS WORKMEN MUST WEAR FRESH AIRLINE RESPIRATORS. HYPERSENSITIVE PERSONS SHOULD WEAR GLOVES OR USE PROTECTIVE CREAM. ALL ELECTRIC EQUIPMENT AND INSTALLATIONS SHOULD BE MADE AND GROUNDED IN ACCORDANCE WITH THE NATIONAL ELECTRICAL CODE. IN AREAS WHERE EXPLOSION HAZARDS EXIST, WORKMEN SHOULD BE REQUIRED TO USE NONFERROUS TOOLS AND TO WEAR CONDUCTIVE AND NONSPARKING SHOES.

UNIVERSI[redacted]

Date of Request	[redacted]
2/5/85	STOCK ISSUE ITEMS IN LABORATORY WAREHOUSES

Requested By	Telephone	Group	Mail Stop	Realistic Date Req.
H. PATTERSON	7-6095	HSE7	J592	ASAP

Acct. Code	Program Code	Exp. Code	Job Order No.	Cap. Equip. Code	Correspondence to	Telephone	Mail Stop
5707	W57W				H. PATTERSON	6095	J592

Deliver to (Name)	Area	Building	Room	Telephone	Mail Stop
K. Balo	TASY	AREAL			

KNOWN AVAILABLE EXCESS LISTS HAVE BEEN REVIEWED

Purchase approved by (Signature)	Z Number	Typed Name	Foreign Country
H. Patterson	82174	H. PATTERSON	
		Title: STAFF	Auth. Level $ K
			ACT-1 Use Only

SHADED AREAS FOR MATERIALS MANAGEMENT USE ONLY

Screened for Excess	Date	Date Assigned	Buyer	Telephone
				(505) 667–

Invoice Terms	Required Shipping Date	Date of Order	SOCIO ECONOMIC SOURCE
			☐ Yes ☐ No

TO

PURCHASE REQUEST NUMBER

Y 2691

Quoted By	Telephone	Date	Quote Number

F.O.B.	Ship Via:
From	

ITEM	TYPE COMPLETE DESCRIPTION OF REQUIREMENTS OR SPECIFICATIONS	QTY.	UNIT	UNIT PRICE	EXTENSION
1	CARBOLINE- PHENOLINE 373- PRIMER	2	GAL.	$64.50	
2	CARBOLINE-PHENOLINE 373- FINISH	4	GAL	$62.80	
	(IN BLACK IF POSSIBLE OR DARKEST				
	COLOR AVAILABLE)				
	For Evaporation Tanks 9' Dia - 3½ High				
	Please Rush!!				
	Use Purchase Request Supplementary page if additional space is required.				
	PAGE OF PAGES				

SUGGESTED SOURCES (Sole source over $2.5K requires written justification)	Total Estimated Cost	Previous P.O. Number
JAMES COOKE + HOPSON CO.	$400 00 XX	

Important handling or delivery information. QA? Hazards? Remarks.

125 EUBANK N.E.

ALBUQUERQUE, N.M. 87123

Telephone: 292-7100 Contact:

Items	Total Cost	Account	Program	Loc.	Sor.	Exp.	Paren.	Job Order	Ord.	Proc.	Wk.	Surp.	Source	Accept

Bids Requested				Bids Received				Bids Rejected			Seller's Number	Ex.	Due Date	Ship Date
S	D	W		B	S	D	W	Small	Disadvantaged	Woman				

Sandia National Laboratories

PURCHASE REQUEST

copies to MAT-12, MS-274. Return ruined or unused copies to MAT-12. Do Not Destroy. DO NOT USE FOR STOCK ISSUE ITEMS IN LABORATORY WAREHOUSES.

Date of Request	Requested by	Group	Mail Stop	Telephone	Realistic Date Reqd.	Date/Time Stamp
1-9-~~84~~ 85	A. Balo	HSE-7	J592	7-6095	1-25-84	

Code	Program Code/J.O.	Capital Equip. Code	Correspondence to	Mail Stop
07	W57W		Keren A. Balo	J592

Deliver to (name)	Area	Building	Room	Telephone	Mail Stop
Keren A. Balo	54			7-6095	J592

KNOWN AVAILABLE EXCESS LISTS HAVE BEEN REVIEWED

Purchase approved by (signature)

Typed Name: John L. Warren

Title: Assoc. Grp. Ldr.

Authority Level: $ 10 K

SHADED AREAS FOR MATERIALS MANAGEMENT USE ONLY

Screened for Excess	Date	Buyer	Date Assigned	Telephone

Invoice Terms	Negotiated Shipping Date	Date of Order	Blanket Purchase Agreement

TO

PURCHASE REQUEST NUMBER M 4713

Quoted By	Telephone	Date	Quote Number	SOCIO ECONOMIC SOURCE
				☐ Yes ☐ No

F.O.B.	Ship Via	Ship From

ITEM	TYPE COMPLETE DESCRIPTION OF REQUIREMENTS OR SPECIFICATIONS	QUAN.	UNIT	UNIT PRICE	EXTENSION
	3ft-6 inches High ~~2mDS~~ 9/25/81				
	Tank, 10 gauge carbon steel, 9 ft. diameter, 3'6" high,	4	ea.		
	with a 2"x2" angle iron stiffening ring at the lip,				
	2" screwed plug for drain mounted in shell.				
	THESE ARE THE EVAPORATION TANKS				
	(Use a plain sheet of paper for continuation pages.				

SUGGESTED SOURCES (Sole source over $2.5K requires written justification)

Canyon Steel

Albuquerque, NM

Talk to Garrett (873-0160)

Total Estimated Cost: $2480

Previous P.O. No.

State important handling or delivery information. QA handling?

Please call 24 hours ahead of delivery as we need to have equipment available to off-load the tanks.

Item	Total Cost	Account	Program	Loc.	Sor.	Exp.	Paren.	Job Order	Ord.	Proc.	Wk.	Surp.	Source	Accept

Bids Requested				Bids Received				Bids Rejected				Solicit No.	Ex.	Due Date	Ship Date
B	S	D	W	B	S	D	W	Small	Disadvantaged	Women					

Group	Site	Building	Room	For	Foreign Country	ACT-1 Use

1833 (2/81)

REQUESTER

[redacted]	[redacted]	J592	7-6095	1/23/85	Date/Time Stamp
Program Code 5707	Program Code/J.O. W57W	Capital Equip. Code	Correspondence to R. Garcia	Mail Stop J592	
Deliver to (name) H. Patterson	Area TA-54	Building Area L	Room	Telephone 7-6095	Mail Stop J592

OWN AVAILABLE EXCESS LISTS HAVE BEEN REVIEWED

Typed Name: Harry Patterson

Title: Staff Member

Authority Level: $ 1K K

LOADED AREAS FOR MATERIALS MANAGEMENT USE ONLY

Screened for Excess	Date	Buyer	Date Assigned	Telephone
Price Terms		Negotiated Shipping Date	Date of Order	Blanket Purchase Agreement

PURCHASE REQUEST NUMBER: M 4721

Quoted By	Telephone	Date	Quote Number	SOCIO ECONOMIC SOURCE ☐ Yes ☐ No
F.O.B.	Ship Via		Ship From	

ITEM	TYPE COMPLETE DESCRIPTION OF REQUIREMENTS OR SPECIFICATIONS	QUAN.	UNIT	UNIT PRICE	EXTENSION
-	4" x 4" redwood lumber in 10 foot lengths	32	ea.	0.78/ linear foot	
	Please Rush				
	(Use a plain sheet of paper for continuation pages.)				

SUGGESTED SOURCES (Sole source over $2.5K requires written justification)

The Rock Builders Supply

Meadow Lane

Alamos, NM 87544

672-3871

Total Estimated Cost: $250.00

Previous P.O. No.

State important handling or delivery information. QA handling? _____

Total Cost	Account	Program	Loc.	Sor.	Exp.	Paren.	Job Order	Ord.	Proc.	Wk.	Surp.	Source	Accept

Requested		Bids Received				Bids Rejected							
	D	W	B	S	D	W	Small	Disadvantaged	Woman	Seller's No.	Ex.	Due Date	Ship Date

Site	Building	Room	For	Foreign Country	ACT-1 Use

3 (2/81)

REQUESTER

JOB NUMBER: 161
PO: 1-NAB-M47217 VENDOR: WHITE ROCK BUILDERS SUPPLY 1-NAB-M4721-
SUBSEQUENT RECEIPT NUMBER: 1
FOB: DESTINATION RR NUMBER: DR NUMBER:
DATE RECD: 22-JAN-85 DATE WORKED: 23-JAN-85 SHIP FROM: WHITE ROCK NM
PACKING LIST: SLPS

FGT CHARGES: PPD ROUTING: 00

CARRIER: Vendor's Truck FGT BIL: SLPS WEIGHT: 1,200

GROUP: HSE-7 PIECES: 16

SITE: TA54 REGSTR: PATTERSON CLERK: THOMAS RIGGS

BUILDING: AREA L ROOM:

ACCT CODES: 5707 -2574 -0-1-10-

****

ITEM NO.	SUB-ITEM	DESCRIPTION	RECD	UNIT	STAT	UNIT COST
001		4" X 4" REDWOOD LUMBER IN 10 FOOT LENGTHS	32	EA	C	$7.80

RECEIVING REPORT TOTAL $249.60

Rec. by Tom Montoya
1-23-85

U.S. GOVERNMENT PRINTING OFFICE: 1981—779-297

Los Alamos National Laboratory

PURCHASE REQUEST

Requester: Retain pink, send all other copies to MAT-12, MS-27h. Return ruined or unused copies to MAT-12. Do Not Destroy. DO NOT USE FOR STOCK ISSUE ITEMS IN LABORATORY WAREHOUSES.

Date of Request	By	Group	Mail Stop	Telephone	Realistic Date Reqd.	Date/Time Stamp
/85	Harry Patterson	FSE-7	J592	7-6095	3/15/85	

Expense Code	Program Code/J.O.	Capital Equip. Code	Correspondence to	Mail Stop
5707	W57W		Rosila Garcia	J592

Deliver to (name)	Area	Building	Room	Telephone	Mail Stop
H. Patterson	TA-54	22	104	7-6095	J592

KNOWN AVAILABLE EXCESS LISTS HAVE BEEN REVIEWED

Purchase approved by (signature): H. P. Patterson

Typed Name: Harry Patterson

Title: Staff Member

Authority Level: $ 1K K

MATERIAL MANAGEMENT USE ONLY

Assigned for Bidding | Date | Buyer | Date Assigned | Telephone

Invoice Number | Anticipated Shipping Date | Date of Order | Purchase Order Number

PURCHASE REQUEST NUMBER M4715

Quoted By | Telephone | Date | Quote Number | ECONOMIC SOURCE ☐ Yes ☐ No

Ship Via | Ship From

	TYPE COMPLETE DESCRIPTION OF REQUIREMENTS OR SPECIFICATIONS	QUAN.	UNIT	UNIT PRICE	EXTENSION
1.	Plastic Bag Liner to fit a nine foot diameter tank with 3 1/2 foot sides. Should have excess for tie down. 8 mil thick. For Evaporation Tanks (9' Dia - 3 1/2' High)	6	ea.		
	See PR. M4715 date 1/9/85				
	Brad. Please call ahead and confirm shipping arrangements and charges!!				

Use a plain sheet of paper for continuation pages.

SUGGESTED SOURCES (Sole source over $2.5K required written justification)

Packaging Research Design Corp.

12717 Pecos Ave.

Hill Springs, LA 70739

Ph: (504) 261-1474

Total Estimated Cost: $225.00

Previous P.O. No.: M4715 1/9/85

State important handling or delivery information. CA handling? _____

Account	Program	Loc.	Ser.	Exp.	Rcpn.	Job Order	Sec.	Proc.	Wk.	Surp.	Source

Date Received	Date Rejected	Reason	Exp. Due Date	Ship Date

Foreign Country | ACT-1 Use

*U.S. GOVERNMENT PRINTING OFFICE: 1983-679-728

UNIVERSITY OF CALIFORNIA — LOS ALAMOS NATIONAL LABORATORY

PURCHASE REQUEST

Date of Request	INSTRUCTIONS: Requester retains pink copy and sends all other copies to MAT-10, MS P274. Return ruined or unused copies to MAT-12, MS P274. DO NOT DESTROY. DO NOT USE FOR STOCK ISSUE ITEMS IN LABORATORY WAREHOUSES.
8/21/83	

Requested By	Telephone	Group	Mail Stop	Realistic Date Req.
Harry Patterson	7-6095	HSE-7	J592	ASAP

Acct. Code	Program Code	Exp. Code	Job Order No.	Cap. Equip. Code	Correspondence to	Telephone	Mail Stop
5707	W57W1				Rose Garcia	7-6095	J592

Deliver to (Name)	Area	Building	Room	Telephone	Mail Stop
Harry Patterson	TA-54	Area L		7-6095	J592

KNOWN AVAILABLE EXCESS LISTS HAVE BEEN REVIEWED

Purchase approved by (Signature): Karen A. Balo

Z Number: 92928

Typed Name: Karen A. Balo

Title: Section Supervisor

Auth. Level: $ 1K K

Foreign Country

ACT-1 Use Only

SHADED AREAS FOR MATERIALS MANAGEMENT USE ONLY

Screened for Excess	Date	Date Assigned	Buyer	Telephone
				(505) 667-

Invoice Terms	Required Shipping Date	Date of Order	SOCIO ECONOMIC SOURCE
			☐ Yes ☐ No

TO

PURCHASE REQUEST NUMBER

Y 2695

Quoted By	Telephone	Date	Quote Number

P.O. No. | Ship Via:

Ship From

ITEM	TYPE COMPLETE DESCRIPTION OF REQUIREMENTS OR SPECIFICATIONS	QTY.	UNIT	UNIT PRICE	EXTENSION
1.	CARGO NET - 20 feet x 20 feet 168 braided strand -	1	ea.		
	1/2" border treated to resist UV radiation				
	For Evaporation Tanks (9' Dia - 3½' High)				
	PLEASE RUSH!!				
	Use Purchase Request Supplementary page if additional space is required.				

PAGE OF PAGES

SUGGESTED SOURCES (Only source over $2.5K requires written justification)

NYLON NET COMPANY

Dept. P.O. Box 592

Memphis, TN 38101

Telephone: (901) 774-1500

Contact: Dee

Total Estimated Cost: $1050.00

Previous P.O. Number

Important handling or delivery information. QA? Hazards? Remarks

Items	Total Cost	Account	Program	Loc.	Sor.	Exp.	Paren.	Job Order	Ord.	Proc.	Wk.	Surp.	Source	Acct.

Bids Requested	Bids Received	Bids Rejected	Seller's Number	Ex.	Due Date	Ship Date

APPENDIX I-2

MANUFACTURERS INFORMATION ON CONTAINERS

CHEC
CHEMICAL HANDLING EQUIPMENT CO., INC.

PRICE BULLETIN

"TUFF-TANK 225" & "TUFF-TANK 225W"
DOT Authorized Mini-Bulk Containers

No. 104T Date January 1, 1984 Superseding Bulletin Dated 1/1/83

U.S. Department of Transportation Approved Container (DOT E-9052)
and U.S. Coast Guard Approved Container

"TUFF-TANK 225" For Transporting and Storing Hazardous Liquids
"TUFF-TANK 225W" For Transporting and Storing Hazardous Liquid Wastes**

Standard Specifications

- Rotationally molded container made of tough polyethylene. (FDA Approved)
- 225 gallon capacity (850 liters)
- Molded-in bottom sump, for near complete drainage.
- Large recessed fill opening, 7" dia., with heavy duty buttress type threads.
- Injection molded polyethylene fill cap, 7" dia., with Hypalon elastomer seal. Cap has integral locking ring.
- Built-in, recessed, top mounted discharge outlet with 1" dia. suction pipe and foot valve with strainer mounted in depressed sump.**
- Quick-Disconnect coupling, 1" dia. polypropylene, with captured lever lock cap at discharge outlet for quick and safe connection to pumping source. **
- Rugged steel wire mesh enclosure to secure and protect polyethylene container. Enclosure is made of 2 guage wire mesh on all four sides and bottom, welded to rigid steel corner posts and to channel iron grid base support structure. Heavy duty self aligning stacking legs allow stacking of containers three high. Enclosure is painted with corrosion resistant epoxy paint in OSHA yellow color. Enclosure is manufactured to meet the Material Handling Institute Specifications for Industrial Metal Containers.
- Overall Dimensions - 48" long x 40" wide x 42" high
- Weight of Unit (Empty) - 360 lbs.
- Rated Gross Weight (DOT Approved) - 3850 lbs.
- Rated Maximum Liquid Weight (DOT Approved) - 15.3 lbs./gal.

** "TUFF-TANK 225W" for hazardous liquid wastes has a 2" dia. suction pipe, quick disconnect fitting and cap, but no foot valve.

PRICES

1 through 5 units	$975.00 ea.
6 through 10 units	945.00 ea.
11 through 19 units	895.00 ea.
20 through 39 units	825.00 ea.
40 or more units	795.00 ea.

Prices are FOB Detroit, Michigan

(OVER)

CHEC CHEMICAL HANDLING EQUIPMENT CO., INC.
20505 WOODINGHAM DRIVE, DETROIT, MICHIGAN 48221, PHONE 313/861-7555

316 Stainless tank → too high not in market anymore can't compete

ACCESSORY ITEMS

ALTERNATE MATERIAL INNER TANKS

Interchangeable with Polyethylene Inner Tank

316 Stainless Steel ..... consult factory for price
Mild Steel ..... consult factory for price

FILLER CAP ACCESSORIES

Each "TUFF-TANK 225" comes standard with one polyethylene filler cap with Hypalon elastomer seal and locking ring.

EXTRA FILLER CAP, with Hypalon Seal $32.00

VITON SEAL in place of Hypalon Seal .... add 38.00

SUCTION/PRESSURE RELIEF DEVICE, EPT 16.00

LOCKING CABLE, vinyl coated stainless steel cable with cast locking lugs 9.00

CLEANING HEAD

316 Stainless Steel multi-nozzle spray head and 1" dia. stainless pipe secured to standard filler cap with stainless steel fasteners. Included in cap are polypropylene quick disconnect fitting and EPT suction relief device. Cleaning Head attaches to "TUFF-TANK" filler neck.

Price 885.00

MIXER HEAD

316 Stainless Steel Mixer, 27" long shaft with 4" dia. stainless steel propeller, attached to standard filler cap. A 1/3 HP air motor powers the mixer head. Mixer head attaches to "TUFF-TANK" filler neck.

Price 965.00

HOSE/VALVE ASSEMBLY

(For connecting "TUFF-TANK 225" to "CHEC-Mate II" Automatic Liquid Metering System, or any other pumping source.)

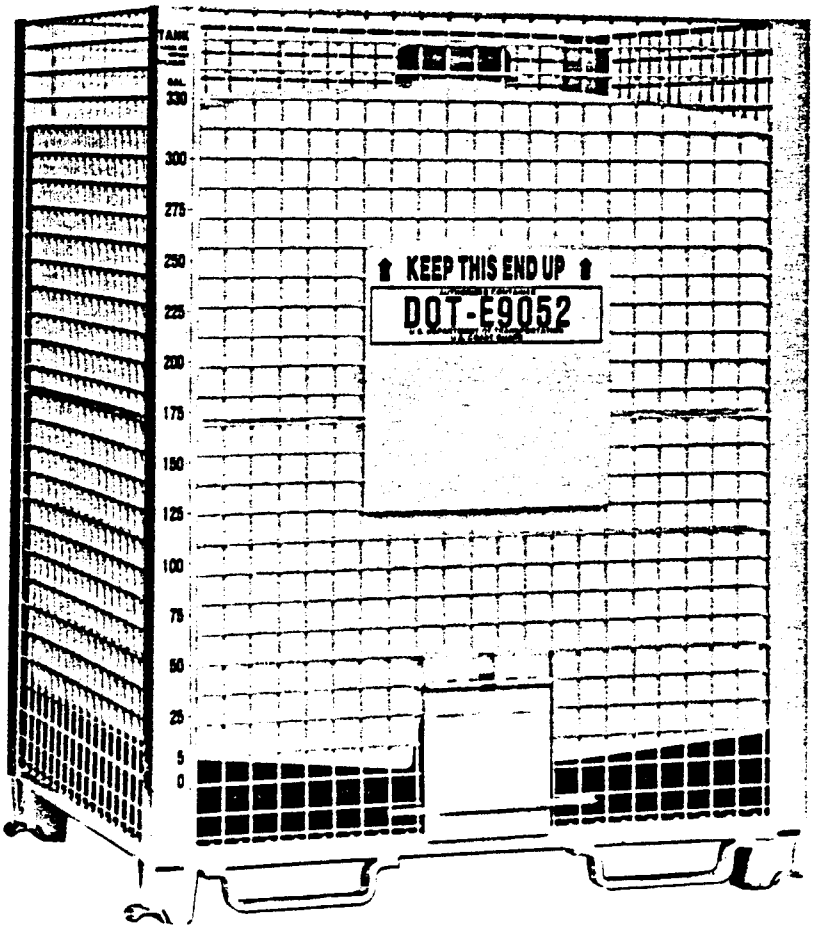
12' of reinforced polyethylene hose, 1" dia., with 1" polypropylene ball valve and quick disconnect fittings, to mate with "TUFF-TANK 225"

Price 395.00

Pat Norton
220 gal
330 gal

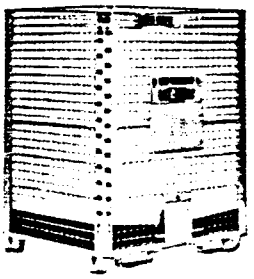
ALL PRICES ARE FOB: DETROIT, MICHIGAN

If you handle hazardous liquids you need the innovative new TUFF TANK System.



CHEC

TUFF TANK vs. DRUMS
Compare for yourself.

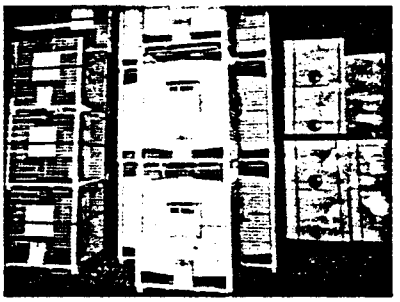


Look at the TUFF TANK. Then look at a 55-gallon drum. TUFF TANK is square. The drum is round.

That might seem like a little thing at first. But it's the shape that makes TUFF TANK the modern way to handle hazardous liquids. And it's the shape that makes the 55-gallon drum obsolete.

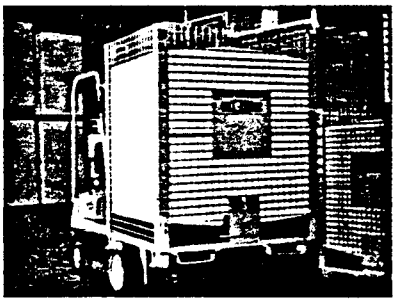
Let's take a look at the facts.

TUFF TANKS stack higher than drums. And handle easier.



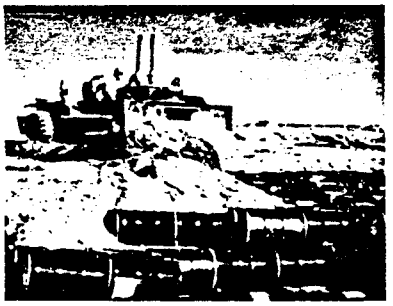
The drum is round, cylindrical. It's difficult to handle. And almost impossible to stack. And drums take up more warehouse space. That means more cost to you.

TUFF TANK, with its cube-like shape, is designed for easy handling. TUFF TANK has 4-way lift truck entry and safety fork pockets for secure in-plant transportation. And TUFF TANK's self-aligning stacking legs make it easy to stack. Up to 3 high.

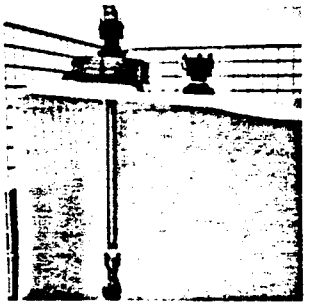


And since TUFF TANKS hold more liquid than drums, you won't need to move them as frequently. TUFF TANKS hold up to 330 gallons. Six times more than drums.

TUFF TANKS are reusable. No more disposal problems.

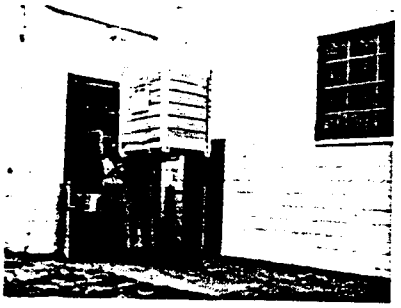


There's another problem using drums. How do you get rid of them? If drums are filled with a hazardous liquid, they too become a hazardous substance—with environmental and legal repercussions for those who try to dispose of them. Most drums are designed to be used once, then safely disposed of.



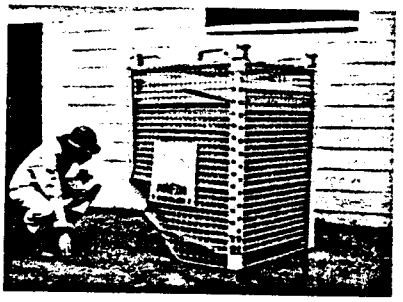
TUFF TANKS can be used over and over again. A specially designed cleaning head attaches securely to the top of TUFF TANK. The cutaway view above shows the rotating spray head which directs a steady stream of water over the entire inner surface of the container—making it ready for immediate reuse.

We tested TUFF TANK to DOT standards. Then we really tested it.



We subjected TUFF TANK to the tests required for authorization by the U.S. Department of Transportation and the U.S. Coast Guard. The stacking test. The pressure test. The vibration test. And the cold drop test.

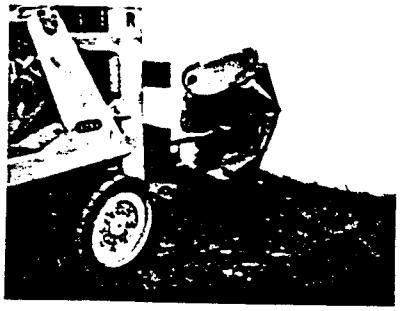
TUFF TANK passed with flying colors.



In fact, TUFF TANK proved capable of handling liquids as heavy as 15.3 pounds per gallon, the highest tested and authorized rating in the industry.

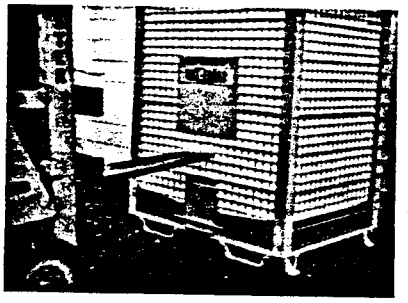
But we weren't satisfied. After we finished testing TUFF TANK to DOT standards, we really tested it.

The DOT drop test calls for the container to be dropped from the height of a flat bed trailer. About 4 feet.



We dropped TUFF TANK from 7 feet. And while the cage sustained some damage, the tank was unharmed. Absolutely no leakage.

Then we took the TUFF TANK, a 55-gallon drum, and four other competitive containers and we put them through the fork truck test.



The fork truck test recreates a real in-plant accident situation.

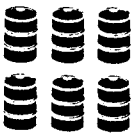
We rammed our lift truck into each container. From the same angle. At the same speed. Tank after tank was punctured, pierced, destroyed.

All except one. TUFF TANK.

Protected behind its heavy-duty wire mesh cage, TUFF TANK was the only container to survive the fork truck test.

TUFF TANKS cost less to handle. About half the cost of drums.

COST OF HANDLING

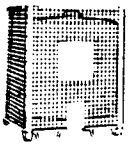


6 DRUMS = $240 to $300

A study made by a major Fortune 500 company determined that the cost of handling and disposing of a 55-gallon drum is between $40 and $50.

Since it takes six drums to equal one TUFF TANK 330; the cost of using six drums will range from $240 to $300.

COST OF HANDLING



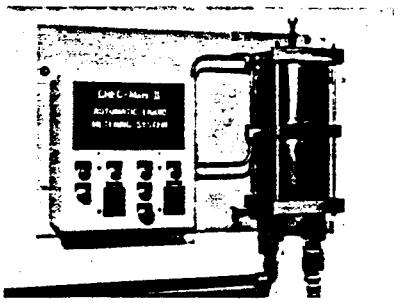
1 TUFF TANK = $130

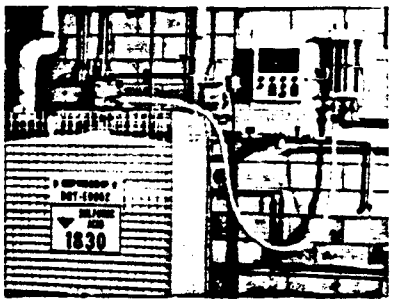
A large 330-gallon TUFF TANK costs no more than $130 to handle, including return freight. About half the cost of drums. And the average payback period for TUFF TANK users is less than six months.

The TUFF TANK System.

TUFF TANK is more than a container, it's part of an engineered handling system that combines features and benefits no other storage container can match.

CHEC MATE II. The automatic liquid metering system. For hazard-free dispensing.





When you want to empty TUFF TANK, you can do it easily through the top or bottom discharge outlets—by gravity or with any pump.

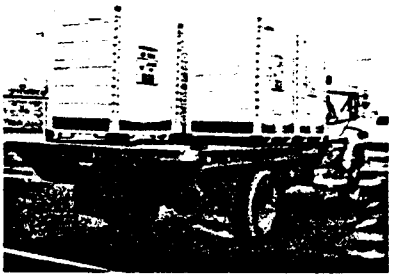
But the most efficient way to dispense liquids is through our own specially designed liquid metering system: CHEC MATE II.

CHEC MATE II connects quickly and safely to TUFF TANK for hazard-free dispensing. You simply insert the number of gallons, or liters, to be pumped into the digital counter. Push the start button and the system will pump the exact number of gallons you want. And turn itself off automatically.

CHEC MATE II will also record the number of gallons left in TUFF TANK—and stop the pumping action and give a visual sign when the tank is empty.

CHEC MATE II is completely air-operated and explosion-proof. It can be used with any container or storage tank for virtually all hazardous liquids.

We even have a way to transport TUFF TANKS.



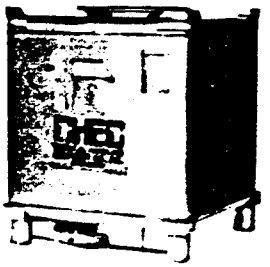
Our trucking system is designed to transport TUFF TANKS on a standard flat bed trailer. Specially designed containment brackets secure the tanks safely during transport. And allow for easy unloading wherever they're delivered.

TUFF TANK has an optional security top.

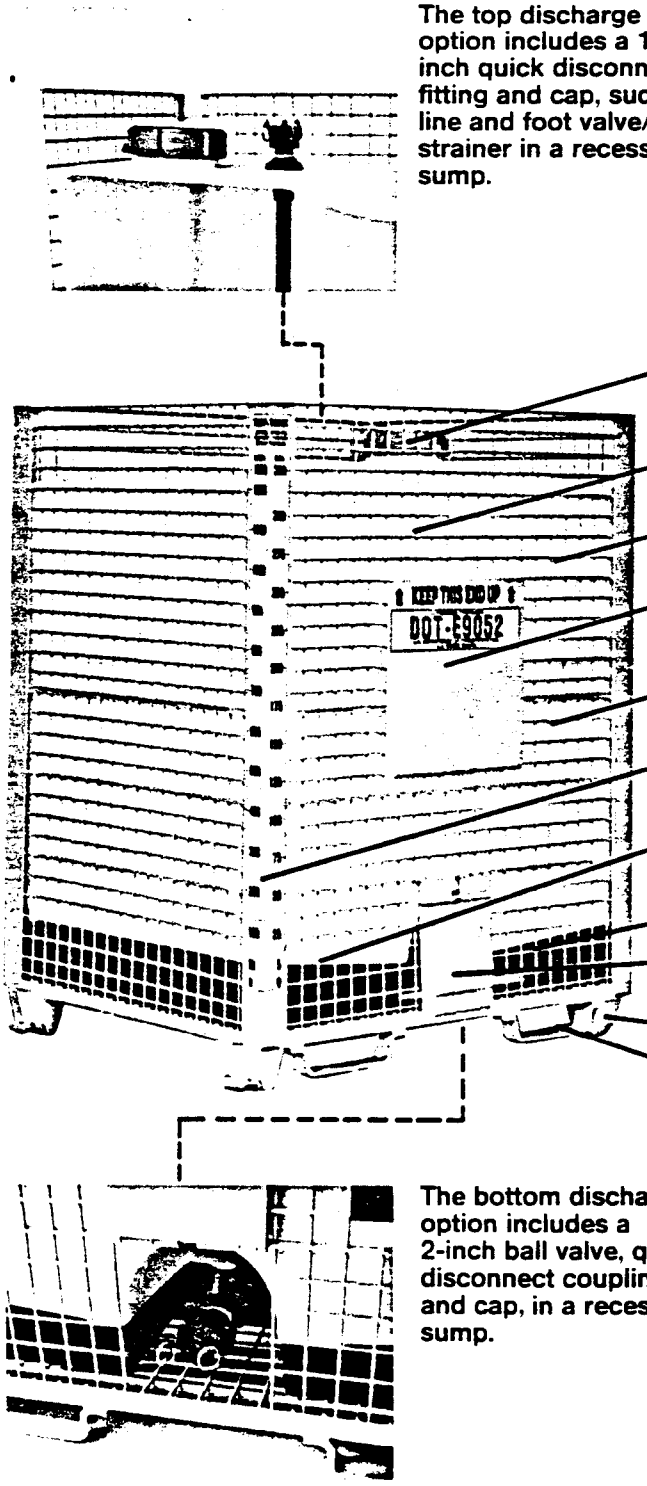
TUFF TANK's rigid, one-piece security top will support the weight of a man, but can still be easily removed for inspection or maintenance.

TUFF TANK comes in metal, too.

For liquids that are not compatible with polyethylene, we offer TUFF TANK in stainless steel, mild steel and aluminum.



Introducing TUFF TANK. The safest, easiest, most cost effective way to handle hazardous liquids.



The top discharge option includes a 1-inch quick disconnect fitting and cap, suction line and foot valve/ strainer in a recessed sump.

Large lockable fill cap with heavy-duty buttress-type threads.

Rugged translucent polyethylene inner tank.

Rigid heavy-duty wire mesh enclosure.

Large panel (2 sides) for DOT, EPA safety labels.

Liquid level constantly visible.

Volume gauge (Gallons & Liters).

Sloped bottom to recessed sump for complete emptying.

Tapered polyethylene cushion.

Rugged hinged door protects bottom valve assembly and is lockable.

Self-aligning stacking legs.

Four-way lift truck entry with safety fork pockets.

The bottom discharge option includes a 2-inch ball valve, quick disconnect coupling and cap, in a recessed sump.

U.S. Patent Pending

TUFF TANK SPECIFICATIONS

	220 Gal. (840 liter)	330 Gal. (1250 liter)
DOT Authorization:	DOT-E9052	DOT-E9052
Dimensions:	40" x 48" x 48" H	40" x 48" x 62" H
Tare Weight:	420 lbs.	550 lbs.
Authorized Gross Weight:	3790 lbs.	5600 lbs.
Maximum Liquid Density: (When filled)	15.3 lbs./gal.	15.3 lbs./gal.

Now you can see the remarkable TUFF TANK System in action. We'll send you a VHS copy of our video presentation demonstrating the unique features and benefits of TUFF TANK. Contact our master distributor:

GENERAL BOX COMPANY
5656 Opportunity
Toledo, OHIO 43612
(419) 476-6705

or your local distributor:

CHEC
CHEMICAL HANDLING EQUIPMENT CO., INC.
17700 Northland Park Ct.
Southfield, Michigan 48075
(313) 557-1151

CHEC TECHNICAL BULLETIN

CHEMICAL SUITABILITY DATA

CHEMICAL HANDLING EQUIPMENT CO., INC.
20505 WOODINGHAM DRIVE, DETROIT, MICHIGAN 48221 TELEPHONE (313) 861-7555

The following chemical suitability data is based upon rating information gathered from extensive laboratory and field testing, recommendations of our raw material suppliers and various technical publications. All ratings are based on a temperature of 73°F/23.3°C. This bulletin was prepared as a guide to be used only as a basis of recommendation. It is impossible to take into consideration the unlimited variations in physical properties that can affect a material's chemical resistance. Under no circumstances is the information contained herein to be construed as a guarantee. Materials should be tested under actual service to determine suitability for a particular application. Please consult factory for suitability ratings on any materials which do not appear in this bulletin.

RATING CODE

A .....Excellent = Recommended
B .....Good = Recommended
C .....Fair = Use under limited conditions
X .....Unsatisfactory = Not recommended
Blank.....Chemical Suitability Unknown

CHEMICAL NAME	CONC %	316 STAINLESS	PVC	POLYPROPYLENE	POLYETHYLENE	TEFLON	PVDF	BUNA N	VITON	ETHYLENE/PROPYLENE	HYPALON	KAL-REZ
Acetaldehyde		A	X	A	C	A	X	X	C	A	X	B
Acetaldehyde (Aqueous)	40		X	A		A	X	X	B	A		
Acetic Acid	10-40	A	A	A	A	A	A	X	B	B	B	A
Acetic Acid	40-80	B	A	A	A	A	A	X	B	X	B	A
Acetic Acid (Glacial)		B	X	A	A	B	A	X	B	X	B	
Acetic Anhydride	Pure	A	X	B	A	A	B	X	X	C	B	A
Acetone		A	X	A	B	A	X	X	X	B	X	A
Acetone (Aqueous)	Trace		A	A		A	A	B	A	A		
Acetonitrile				B		A	A	C		A		A
Acetophenone				A		A	A	X	C	A	X	A
Acetyl Acetone			X				X	X	X	A	X	
Acetyl Bromide						A	A					
Acetyl Chloride		A	A	A	A	A	A	X	B	X	X	A
Acetylene		A	X	A		A	A	A	A	C	B	A
Acrylic Acid Ethyl Ester			X			A	A					A
Acrylonitrile				B	A	A	A	X	X	A	C	
Adipic Acid Aqueous	Satu		A	A		A	A	A	A	A		A
Allyl Alcohol		A	X	A	B	A	A	A	A	B		A
Allyl Chloride			X			A	A	B	B	X		
Alum (Potassium Alum)	Satu	X	A	A	A	A	A	A	A	A	A	A
Aluminum Acetate	Satu		A	A		A	A	A	A	A	X	A
Aluminum Ammonium Sulfate	Satu			A		A	A	A	A	A		
Aluminum Bromide	Satu					A	A	A	A	A	A	
Aluminum Chloride	Satu	C	A	A	A	A	A	A	A	A	A	A
Aluminum Fluoride	Satu	C	A	A	A	A	A	A	A	A	A	A
Aluminum Hydroxide	Satu	A	A	A	A	A	A	A	A	A		A
Aluminum Nitrate	Satu		A	A	A	A	A	A	A	A	A	A
Aluminum Sulfate	Satu		A	A	A	A	A	A	A	A	A	A
Amber Acid (Succinic Acid)	Satu		A	A		A	A	A	A	A		
Ammonia Liquid	100	A	C	A	A	A	A	A	C	A	X	A
Ammonia Water	10		A	A		A	A	A	B	A		A
Ammonium Acetate	Satu		A	A	A	A		A	A	A		A
Ammonium Bifluoride	Satu	A	A	A	A	A	A	A	A	A		
Ammonium Carbonate	Satu	B	A	A	A	A	A	A	A	A	A	A
Ammonium Chloride	Satu	B	A	A	A	A	A	A	A	A	A	A
Ammonium Fluoride	20		A	A		A	A	A	A	A		A
Ammonium Hydroxide		A	A	A	A	A	A	B	B	A	A	A
Ammonium Metaphosphate			A	A		A	A	A	A	A		
Ammonium Nitrate		A	B	A	A	A	A	A	A	A	A	A
Ammonium Phosphate		C	A	A	A	A	A	A	A	A	A	A
Ammonium Sulfate	Satu	B	A	A	A	A	A	A	A	A	A	A
Ammonium Sulfide	Satu		A	A	A		A	A	X	A	A	A
Amyl Acetate	Pure	A	X	X	C	A	A	X	X	B	X	A
Amyl Alcohol	Pure	A	A	A	B	A	A	B	A	A	B	A
Amyl Borate	Pure					A	A	A	A	B		

CHEMICAL NAME	CONC %	316 STAINLESS	PVC	POLYPROPYLENE	POLYETHYLENE	TEFLON	PVDF	BUNA N	VITON	ETHYLENE/PROPYLENE	HYPALON	KAL-REZ
Amyl Chloride		B	X	X		A	A	B	B	X	X	A
Aniline	Pure	A	C	B	B	A	A	X	B	B	X	A
Aniline Hydrochloride	Pure		B	X	B	A	A	B	A	B	X	A
Antimony Trichloride	Satu	X	A	A	B	A	A		A	B		A
Aqua Regia			C	C	A	A	A	X	C	B	X	A
Arsenic Acid	Satu	B	A	A	A	A	A	A	A	A	A	A
Barium Carbonate	Satu	B	A	A	A	A	A	A	A	A	A	A
Barium Chloride	Satu	B	A	A	A	A	A	A	A	A	A	A
Barium Hydroxide	Satu	A	A	A	A	A	A	A	A	A	A	A
Barium Nitrate	Satu	A	A	A	A	A	A	A	A	A		A
Barium Sulfate	Satu	A	A	A	A	A	A	A	A	A	A	A
Barium Sulfide	Satu	A	A	A	A	A	A	B	A	A	B	A
Beer		A	A	A	A	A	A	B	A	A	A	
Benzaldehyde		A	A	A	A	A	A	X	C	C	X	A
Benzene	Pure	B	C	B	X	A	A	X	B	X	X	A
Benzene Sulfonic Acid	10		X	X		A	B	X	A			
Benzine	Pure		X	A	A	A	A	A	A	X		A
Benzoic Acid	Pure	B	A	A	A	A	A	B	A	A	X	A
Benzyl Alcohol	Pure			A		A	A	X	A	B		A
Benzyl Benzoate	Satu							X		B		A
Benzyl Chloride	Pure			A			A					A
Black Liquor	Satu		A	A	A	A	A	A	A	A	B	
Bleach	12.5	X	A		B	A	A	C	A	B	B	A
Borax	Satu	A	A	A	A	A	A	A	A	A	X	A
Boric Acid	Satu	A	A	A	A	A	A	A	A	A	B	
Borofluoric Acid			A	A		A	A		A	A		
Brine			A	A		A	A	A	A	A		A
Bromic Acid	Pure			X		A	A					
Bromine Water	Satu	X	B	C	X	A	A	X	A	X	X	
Butyl Acetate	Pure	C	C	C	C	A	A	X	X	B	X	A
Butyl Acrylate	Pure		X	X		A	A	X	X	A	X	
Butyl Alcohol	Pure		A	A	A	A	A	B	B	A	A	A
Butyl Amine	Satu		X	X			B	A	A	X	X	A
Butyl Bromide	Pure					A	A					
Butyl Cellosolve	Pure					A	A	X	X	B	X	
Butyl Chloride						A	A					
Butyl Diol			B			A	A	A	A	A		
Butyl Ether			X	X		A	A	B	X	X	X	
Butyl Mercaptan	Pure					A	A					A
Butyl Phenol						A	A					A
Butyl Phthalate				A		A	A	X	B	B		A
Butyl Stearate	Pure					A	A	B	A	C	X	A
Butylene						A	A		A			A
Butyric Acid	Pure	A	X	A	C	A	A	X	B	B	X	B
Caffeine Citrate						A	A					

CHEMICAL NAME	CONC %	316 STAINLESS	PVC	POLYPROPYLENE	POLYETHYLENE	TEFLON	PVDF	BUNA N	VITON	ETHYLENE/PROPYLENE	HYPALON	KAL-REZ
Calcium Acetate	Satu		A	A		A	A	A	A	A	B	A
Calcium Bisulfide	Satu		A	A	A	A	A	A	A	X		A
Calcium Bisulfite	Satu	B	A	A	A	A	A	A	A	B	A	A
Calcium Carbonate	Satu	A	A	A	A	A	A	A	A	A	A	A
Calcium Chlorate	Satu		A	A	A	A	A	C	A	A	A	A
Calcium Chloride	Satu	B	A	A	A	A	A	A	A	A	A	A
Calcium Hydroxide	Satu	A	A	A	A	A	A	A	A	A	A	A
Calcium Hypochlorite	Satu	X	A	A	A	A	A	C	A	B		A
Calcium Nitrate	Satu		A	A	B	A	A	A	A	A	A	A
Calcium Sulfate	Satu	B	A	A	A	A	A	A	A	A	A	A
Calcium Sulfide	Satu					A	A	A	A	A		A
Cane Sugar Liquors			A	A		A	A	A	A	A		
Caprylic Acid	Pure					A	A					
Carbitol	Pure		A			A		A	A	A		A
Carbon Disulfide	Pure	A	C	X	X	A	A	C	A	X	X	A
Carbon Tetrachloride	Pure	A	C	X	X	A	A	X	B	X	X	A
Carbonic Acid	Satu	A	A	A	A	A	A	A	A	A	A	
Casein						A	A		A	A		A
Caustic Potash	25		A	A		A	A	A	X	A		A
Cellosolve			B	A	A	A	A	C	C	B	X	A
Chloramine							X					A
Chloric Acid	20		A			A	A					
Chlorinated Solvents		A				A		X	B	X	X	A
Chlorine Dioxide	Pure		A	C		A	A		X			A
Chlorine Water	400	X	A	C	X	A	A	X	C	B	A	A
Chlorobenzene	Pure	A	X	B	X	A	A	X	A	X	X	A
Chloroform	Pure	A	X	B	C	A	A	X	B	X	X	A
Chlorosulfonic Acid	Pure	X	X	X	X	A	C	X	X	X	X	
Chromic Acid	10	A	A	X	A	A	A	X	A	B	X	A
Chromic Acid	50	X	C	X	B	A	A	X	X	X	X	A
Chromium Alum	Satu		A	A		A	A	A	A	A		
Citric Acid	10	A	A	A	A	A	A	A	A	A	A	
Copper Acetate	Satu		A	A		A	A	A	A	A	B	A
Copper Borofluoride			A	A		A	A	A	A	A		A
Copper Carbonate	Satu		A	A		A	A					A
Copper Chloride	Satu	B	A	A	A	A	A	A	A	A	B	A
Copper Cyanide	Satu	A	A	A	A	A	A	A	A	A	A	A
Copper Fluoride	Satu		A	A		A	A	A	A	A	A	A
Copper Nitrate		A	A	A	A	A	A	A	A	A	A	A
Copper Sulfate	Satu	A	A	A	A	A	A	A	A	A	A	A
Corn Oil		A	A	A		A	A	A	A	B		
Corn Syrup			A	A		A	A	A	A	A		
Cottenseed Oil		A	A	A	A	A	A	A	A	A	A	
Creosote			X			A		A	A	X		A
Cresol	Pure	A	C	C	B	A	A	X	A	X	X	A
Croton Aldehyde	Pure					A	A	C	A	B		A
Crude Oil		B	A		X	A	A	B	A	X	X	
Cryolite			B	A		A	A					
Cupric Fluoride	Satu		A	A		A	A	A	A	A		
Cupric Sulfate	Satu		A	A		A	A	A	A	A		
Cuprous Chloride	Satu		A	A		A	A	A	A	A		
Cyclohexane	Pure	A	X	C	B	A	A	B	A	X		A
Cyclohexanol	Pure		X	A		A	A	C	A	B	X	A
Cyclohexanone	Pure		X	B		A	B	X	X	C		A
Dextrin	Pure					A		X	A	X		
Dextrate	Pure					A	A	X		X		
Dextrin	Satu		A	A		A	A	A	A	A		A
Dextrose		A	A	A		A	A	A	A	A	A	A
Diacetone	Pure						X					A
Diacetone Alcohol	Pure			A		A	A	X	X	A	B	A
Dibenzyl Ether	Pure					A	A	X	X	C	X	A
Dibutly Amine	Pure					A	A					A
Dibutyl Ether	Pure						A	B	X	X	X	A
Dibutyl Phthalate	Pure					A	A	X	B	A	X	A
Dibutyl Sebacate						A	A	X	C	B	X	A
Dichlorobenzene	Pure					A	A	X	B	X		A
Dichloroethylene						A	A	X	A	X		A
Dichloroisopropylether	Pure						A					
Diesel Fuels						A	A					
Diethylamine	Pure	A	X	A		A	B	X	X	A	C	A
Diethylenetriamine							A					
Diethyl Ether	Pure		X	C		A	A	C	C	C	X	A
Diglycolic Acid	Satu		A	A		A	A	A	A	A		
Diisobutyl Ketone	Pure						A	B	X	X		A
Diisobutylene	Pure					A	A	A	A	X	X	A

CHEMICAL NAME	CONC %	316 STAINLESS	PVC	POLYPROPYLENE	POLYETHYLENE	TEFLON	PVDF	BUNA N	VITON	ETHYLENE/PROPYLENE	HYPALON	KAL-REZ
Diisopropyl Ketone	Pure					A	B	X	X	B		A
Dimethyl Amine	Pure		X	A		A	B	X	X	A		A
Dimethylaniline	Pure						B	X		X		
Dimethylformamide	Pure		X	A		A	X	X	X	B		A
Dimethyl Phthalate						A	B	X	B	B	X	A
Dioctyl Phthalate						A	A	B	A	A	X	A
Dioxane	Pure			B			C	X	X	X	X	A
Dioxolane							X	X	X	X	X	A
Diphenyl Oxide	Satu							X	A	X	X	A
Disodium Phosphate			A			A	A		A		A	A
Epichlorohydrin	Pure		X	A		A	C	X	X	X	X	A
Epsom Salt	Satu	A			A	A	A	A	A	A		
Esters						A	A					A
Ethanolamine	Pure	A	X			A	X	A		A		A
Ethers		A	X	C	X		A	X	X	X	X	A
Ethyl Acetate	Pure	A	X	B	X	A	A	X	X	B	X	A
Ethyl Acetoacetate	Pure					A	A	X	X	A		A
Ethyl Acrylate	Pure		X		X	A	A	X	X	B	X	A
Ethyl Alcohol	Pure		A	A	A	A	A	A	A	A		A
Ethyl Benzene						A	A	C	A	X		A
Ethyl Chloride		A	X	C	B	A	A	B	A	A	X	A
Ethyl Ether	Pure	B	X	X	X	A	A	B	C	C	X	A
Ethyl Formate	Pure							X	X	B		A
Ethyl Hexanol						A	A	X				A
Ethyl Mercaptan	Pure							X	A	A		A
Ethyl Oxalate								X	X	A		A
Ethylene Bromide	Pure		X	X	X	A	A	X	C	B	X	A
Ethylene Chloride		A		B	D	A	A	X	A	X		A
Ethylene Chlorohydrin	Pure		X	A		A	A	X	X	A	B	A
Ethylene Diamine	Pure					A	B	A		A		A
Ethylene Dichloride	Pure		X			A	A	X	A	X	X	A
Ethylene Glycol	Pure	A	A	A	A	A	A	A	A	A	A	A
Ethylene Oxide		A	X		X	A	A	X	X	X	X	A
Fatty Acids		A	A	A	B	A	A	A	A	X	X	
Ferric Hydroxide	Satu		A	A	A	A	A	A	A	A		A
Ferric Nitrate	Satu	A	A	A	A	A	A	A	A	A	A	A
Ferric Sulfide			A	A		A	A	A	A	A		
Ferric Chloride	Satu	X	A	A	A	A	A	A	A	A	B	A
Ferrous Chloride	Satu	X	A	A	A	A	A	A	A	A	A	A
Ferrous Hydroxide	Satu		A	A		A	A	A	A	A		
Ferrous Nitrate	Satu		A	A		A	A	A	A	A		
Ferrous Sulfate		C	A	A	B	A	A	A	A	A	A	
Fluoboric Acid	Pure	B	A	A	A	A	A	B	A	A	A	
Fluosilicic Acid	50	B	B	A	A	A	A	A	A	A	A	
Formaldehyde	35	A	A	A	A	A	A	B	A	A	X	B
Formaldehyde	37	A	A	A	A	A	A	B	A	A	X	B
Formaldehyde	50	A			A	A	A	X	B	A	X	B
Formic Acid	90	B	A	A	A	A	A	X	X	A	A	
Freon F-11		A	A			A	A	X	B	C	A	B
Freon F-12		A	A	B		A	A	C	B	B	A	B
Freon F-21		A	X			A	A	X	C	C	A	A
Freon F-22		A	X	B		A	A	X	X	B	A	A
Freon F-113		A	B			A	A	X	B	X	A	B
Freon F-114			B			A	A	B	A	C	A	B
Fructose			A	A	A	A	A	A	A	A		
Fruit Juice	Pure	A	A	A	A	A	A	A	A		A	
Furane							X	X	X	X		
Furfural	Pure	A	X	C	C	A	A	X	B	A	X	A
Furfuryl Alcohol	Pure					A	B	X	X	C		A
Gallic Acid		A	A			A	A	A	A	A	B	
Gasoline Leaded		A	A	X	X	A	A	B	B	X	X	
Gasoline Unleaded		A	A	X	X	A	A	B	B	X	X	
Gasoline Sour		A	A	X	X	A	A	B	A	X	X	
Glucose		A	A	A	A	A	A	A	A	A	B	A
Glycerol (Glycerine)	Pure	A	A	A	A	A	A	A	A	A	A	A
Glycolic Acid	Satu		A	A	A	A	A	A	A	A		
Glycols					A	A	A	A	A	A		
Grape Sugar		A	A	A	A	A	A	A	A	A		
Heptane		A	A	B	X	A	A	A	A	X	B	A
Hexane		A	A	B	A	A	A	A	A	X	B	A
Hexyl Alcohol	Pure		A			A		A	A	B		
Hydrazine	Pure	A	X		A	A		A	X	A	A	A
Hydrobromic Acid	20	X	A	A	A	A	A	C	A	A	A	A
Hydrobromic Acid	50	X	A	A	A	A	A	C	A	A	A	A
Hydrochloric Acid	25	X	A	A	A	A	A	C	A	A	X	

CHEMICAL NAME	CONC %	316 STAINLESS	PVC	POLYPROPYLENE	POLYETHYLENE	TEFLON	PVDF	BUNA N	VITON	ETHYLENE/PROPYLENE	HYPALON	KAL-REZ
Hydrochloric Acid	38	X	A	A	A	A	A	C	B	C	X	
Hydrocyanic Acid		A	A	A	A	A	A	B	B	B	A	
Hydrofluoric Acid	Dilute	C	A	A	A	A	A	X	A	A	A	
Hydrofluoric Acid	40	C	B	A	A	A	A	X	A	A	A	
Hydrogen Fluoride						A	A	X	X	B		A
Hydrogen Peroxide	5	A	A	A	A	A	A	X	A	A		A
Hydrogen Peroxide	50	A	B	C	A	A	A	X	A	C	X	A
Hydrogen Peroxide	90	A			A	A	A	X	A	X	X	A
Hydrogen Sulfide (Aqueous)		A	A	A	A	A	A	A	A	A	B	A
Hydroquinone	Satu		A			A	A	A	A	A		A
Hypochlorous Acid	10		A	A	A	A	A	C	A	A	X	
Iodine		X	B	A	B	A	A		B	X	B	A
Iodine Solution	10	X	A			A	A					
Isobutyl Alcohol	Pure					A	A	B	A	A		
Isooctane						A	A	A	A	X	A	A
Isophorone	Pure							X	X	X	X	A
Isopropyl Acetate	Pure	B				A		X	X	B	X	A
Isopropyl Alcohol	Pure		A	A	X	A	A	A	A	A	A	A
Isopropyl Chloride						A	A	B	A	X	X	A
Isopropyl Ether	Pure	A			C	A	A	A	C	C	C	A
Jet Fuel JP-4		A	A			A	A	B	A	X		A
Jet Fuel JP-5		A	A			A	A	A	A	X		A
Kerosene		A	A	A	X	A	A	A	A	X	X	A
Lacquer		A						X	X	X		A
Lactic Acid	25	A	A	A	A	A	A	A	A	A	B	
Lactic Acid	80	A	A	A	A	A	A	A	A	A	X	
Lauric Acid						A	A					
Lauroyl Chloride	Pure					A	A					
Lead Acetate	Satu	B	A	A	A	A	A	A	A	A	X	A
Lead Chloride			A	A	B	A	A	A	A	A		A
Lead Nitrate	Satu		A	A	B	A	A	A	A	A		A
Lead Sulfate			A	A		A	A	A	A	A		A
Linoleic Acid			B	B		A	A	B	A	X	X	
Linoleic Oil			B			A	A					
Linseed Oil		A	A	A		A	A	B	A	B	B	
Lithium Bromide	60		A			A	A		A			A
Lubricating Oil		A	A	B	X	A	A		A			
Machine Oil			A	A		A	A	A	A	X		
Magnesium Carbonate		A	A	A	A	A	A	A	A	A	A	A
Magnesium Chloride	Satu	A	A	A	A	A	A	A	A	A	A	A
Magnesium Citrate			A	A		A	A	A	A	A		A
Magnesium Hydroxide	Satu	A	A	A	A	A	A	A	A	A	A	A
Magnesium Nitrate		A	A	A	A	A	A	A	A	A	A	A
Magnesium Sulfate		A	A	A	A	A	A	A	A	A	A	A
Manganese Sulfate			A	A		A	A	A	A	A		A
Maleic Acid	Satu	A	A	A	A	A	A	A	A	A	X	A
Mercuric Chloride		X	A	A	A	A	A	A	A	A	A	
Mercuric Cyanide	Satu	A	A	A	A	A	A	A	A	A		A
Mercuric Sulfate	Satu		A	A		A	A	A	A	A		A
Mercurous Nitrate	Satu		A			A	A	A	A	A		A
Mercury		A	A	A	A	A	A	A	A	A	A	A
Methane Sulfonic Acid	50					A	A					
Methyl Acetate	Pure	A	X	B		A	A	X	X	B	X	A
Methyl Acrylate	Pure					A	A	X	X	B	X	A
Methyl Alcohol	Pure	A	A	A	A	A	A	B	B	A	A	A
Methyl Amine			X	X		A	C	C		A		A
Methyl Bromide					B	A	A	X	A	B	X	A
Methyl Cellosolve			A				A		X	B	B	A
Methyl Chloride		A	X	X	X	A	A	X	X	B	X	A
Methyl Chloroform						A	A	X	B	X	X	A
Methyl Ether								B	X	X	X	A
Methyl Ethyl Ketone		A	X	B	C	A	X	X	X	B	X	A
Methyl Formate								X	X	A	B	A
Methyl Isobutyl Carbinol				A		A		A	A	A		
Methyl Isobutyl Ketone		A	X	B	X	A	A	X	X	B	X	A
Methyl Isopropyl Ketone		A			X	A	A	X		X	X	A
Methyl Methacrylate			B			A	A	X	X	X	X	A
Methyl Sulfoxide						A	X					A
Methylene Bromide						A	A	X	A	X		A
Methylene Chloride		A	X	X	C	A	B	X	C	X		A
Methylene Dichloride						A		X	B	X		
Methylene Iodine			A			A	A		A			A
Milk		A	B	A	A	A	A					
Mineral Oil			B	A	A	A	A	A	A	X		A
Monobromo Benzene								X	A	X	X	

CHEMICAL NAME	CONC %	316 STAINLESS	PVC	POLYPROPYLENE	POLYETHYLENE	TEFLON	PVDF	BUNA N	VITON	ETHYLENE/PROPYLENE	HYPALON	KAL-REZ
Monochloracetic Acid	50		A	B		A	A	X	B	C		A
Monochlorobenzene				B		A	A	X	A	X	X	A
Monoethanolamine						A	X	A		A		A
Monomethylaniline								X	A	X		A
Motor Oil			A	A		A	A	A	A	X		
Naptha		A	A	A	C	A	A	C	A	X	X	A
Napthalene		B	X	B	C	A	A	X	A	X	X	A
Nickel Acetate			A			A		A	C	A	X	A
Nickel Chloride	Satu	C	A	A	A	A	A	A	A	A	A	A
Nickel Nitrate	Satu		A	A	A	A	A	A	A	A		A
Nickel Sulfate	Satu	B	A	A	A	A	A	A	A	A	A	A
Nicotine Acid			A	A	A	A	A			A		
Nitric Acid	10	A	A	A	A	A	A	X	A	A	X	A
Nitric Acid	30	A	A	A	A	A	A	X	A	B	X	A
Nitric Acid	50	A	A	A	B	A	A	X	A	X	X	B
Nitric Acid	70	A	A	C	B	A	A	X	C	X	X	B
Nitric Acid	98	A	X	X	X	A	A	X	C	X	X	B
Nitrobenzene		B	X	B	C	A	B	X	A	B	X	A
Nitroethane	Pure					A	A	X	X	A	B	A
Nitrogen Dioxide						A	A					
Nitromethane	Pure					A	A	X		B	B	A
Nitrous Acid	10			X				X	A	B		A
Nitrous Oxide			A	A		A	A		A	A		
Octane						A	A	A	A	X		
Octene	Pure					A	A	A	A	X		
Oleic Acid		A	A	A	A	A	A	X	A	X	X	
Oleum		A	X	X	X	A	X	X	X	X	A	A
Oxalic Acid	20-50	A	A	A	A	A	A	A	A	A	B	
Paint Solvents		A						X	X	X		A
Palmitic Acid	5			A		A	A	A	A	B	X	A
Palmitic Acid	10			A		A	A	A	A	B	X	A
Palmitic Acid	70			A		A	A	A	A	B	X	A
Paraffin		A	A	A	C	A	A	A	B	X		
Perchloroethylene	Pure	A			C	A	A					B
Perchloric Acid	10		A	A	A	A	A	X	A	B	B	A
Perchloric Acid	70				A	A	A				B	A
Perphosphate			A	A		A	A	A	A	A		
Petroleum Oils			A	B		A	A	A	A	X	B	A
Phenol		A	A	A	A	A	A	X	B	A	X	A
Phenyl Bisulfide	Pure					A		C	A	X		
Phenylhydrazine						A	A	X	X	B		A
Phosgene Liquid			A	A			A					A
Phosphoric Acid	10	A	A	A	A	A	A	A	A	A	C	A
Phosphoric Acid	50	B	A	A	A	A	A	A	A	A	X	A
Phosphoric Acid	80	C	A	A	A	A	A	A	A	A	X	A
Phosphorus Pentoxide			A	A	A	A	A					
Phosphorus Red			A	A		A	A					A
Phosphorus Trichloride	Pure	A				A	A	X	A	A	X	A
Phosphorus Yellow			A	A		A	A					A
Photographic Solutions		A	A	A	A	A	A					A
Phthalic Acid			X	X		A	A	A	A	A		A
Picking Solutions (Steel)			A	A		A	A	X	B	C	B	
Picric Acid	10	A	A	A	A	A	A	B	A	A	A	A
Plating Sol'n (Brass)		A	A	A	A	A	A	A	A	A	X	A
Plating Sol'n (Cadmium)			A	X	A	A	A	A	A	A	X	A
Plating Sol'n (Chrome)			A	X	B	A	A				X	A
Plating Sol'n (Copper)			A	A	A	A	A	A	A	A	X	A
Plating Sol'n (Gold)		A	A	X	A	A	A	A	A	A	X	A
Plating Sol'n (Lead)			A	A	A	A	A	A	A	A	X	A
Plating Sol'n (Nickel)			A	A	A	A	A	A	A	A	X	A
Plating Sol'n (Rhodium)			A	A	A	A	A		A	A	X	A
Plating Sol'n (Silver)		A	A	A	A	A	A	A	A	A	X	A
Plating Sol'n (Tin)			A	A	A	A	A	A	A	A	X	A
Plating Sol'n (Zinc)			A	A	A	A		A	A	A	X	A
Polyethylene Glycol			A	A		A	A		A	A		A
Polyvinyl Acetate						A	A	A	A	A	C	A
Polyvinyl Alcohol			A	A		A	A	A	A	A		
Potash		A	A	A	A	A	A	A	A	A		A
Potassium Acetate	Satu		A	A	A	A	A	A	A	A	A	A
Potassium Alum			A	A	A	A	A	A	A	A	A	A
Potassium Aluminum Sulfate			A	A	A	A	A	A	A	A	A	A
Potassium Bicarbonate	Satu	B	A	A	A	A	A	A	A	A	A	A
Potassium Bichromate	Satu		A	A	A	A	A	A	A	A	A	A
Potassium Bisulfate			A	A	A	A	A	A	A	A	A	A
Potassium Borate			A	A	A	A	A	A	A	A	A	A

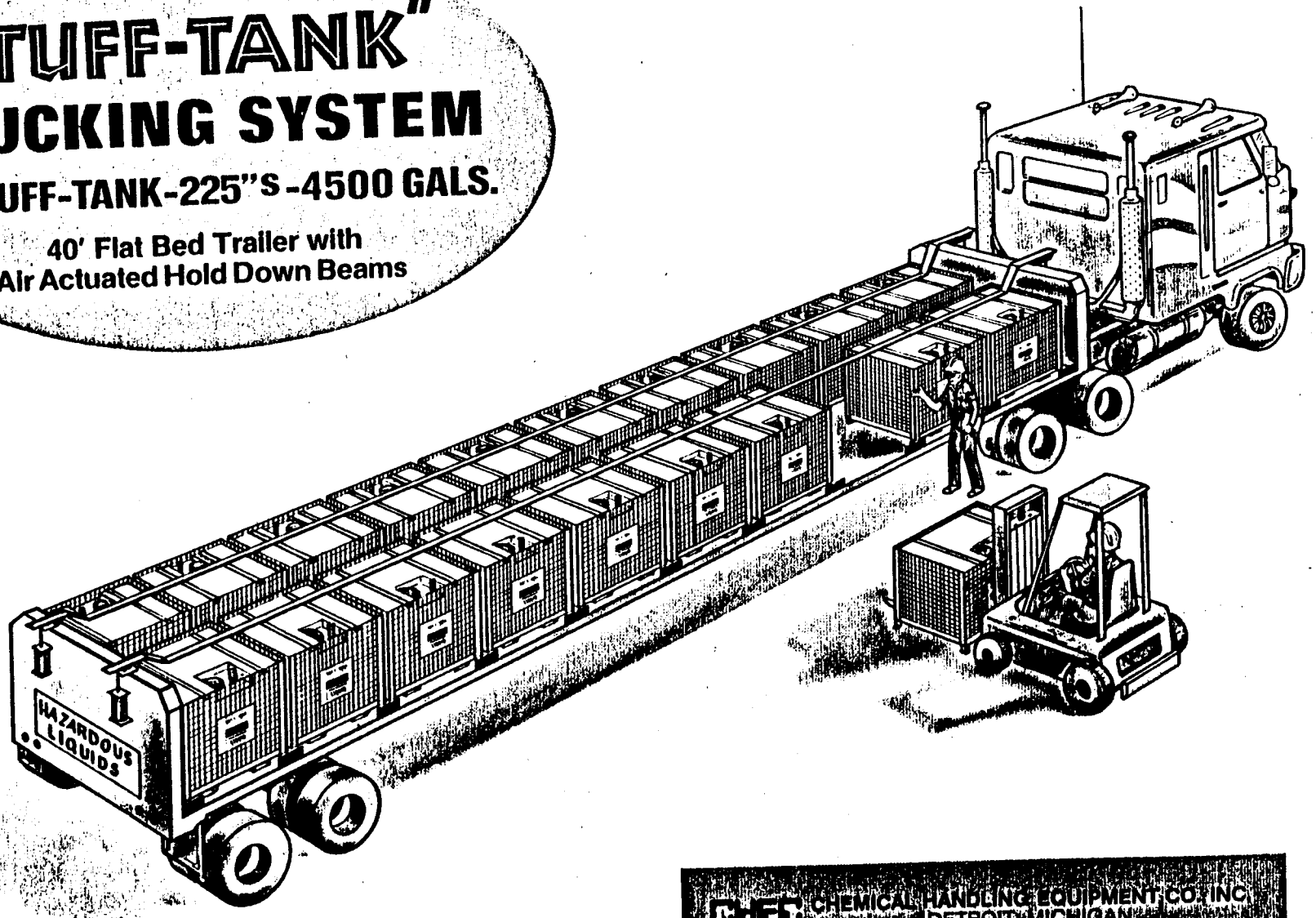
CHEMICAL NAME	CONC %	316 STAINLESS	PVC	POLYPROPYLENE	POLYETHYLENE	TEFLON	PVDF	BUNA N	VITON	ETHYLENE/PROPYLENE	HYPALON	KAL-REZ
Potassium Bromate			A	A	A	A	A					A
Potassium Bromide		B	A	A	A	A	A	A	A	A	A	A
Potassium Carbonate		A	A	A	A	A	A	A	A	A	A	A
Potassium Chlorate		A	A	A	A	A	A	C	A	A	A	A
Potassium Chloride		A	A	A	A	A	A	A	A	A	A	A
Potassium Chromate		B	A	A	A	A	A	A	A	A	A	A
Potassium Coppercyanide			A	A	A	A	A	A	A	A	A	A
Potassium Cyanide		A	A	A	A	A	A	A	A	A	A	A
Potassium Dichromate	Satu	A	A	A	A	A	A	A	A	A	A	A
Potassium Ferricyanide			A	A	A	A	A	A	A	A	A	A
Potassium Ferrocyanide			A	A		A	A	A	A	A	A	A
Potassium Fluoride			A	A	A	A	A	A	A	A	A	A
Potassium Hydroxide	25	B	A	A	A	A	A	B	X	A	A	A
Potassium Hypochlorite			A	A		A	A	B	A	A	A	A
Potassium Iodide			A	A		A	A	A	A	A	A	A
Potassium Nitrate		B	A	A	A	A	A	A	A	A	A	A
Potassium Perborate			A	A		A	A					
Potassium Perchlorate			A	A		A	A					A
Potassium Permanganate	10	B	A	A	A	A	A	C	A	A	A	A
Potassium Permanganate	25	B	A	A	A	A	A	X	A	A	A	A
Potassium Persulfate			A	A		A	A					
Potassium Sulfate	Pure	B	A	A	A	A	A	A	A	A	A	A
Propane		A	A	A	A	A	A	A	A	X		A
Propyl Acetate	Pure					A	A	X	X	B		A
Propyl Acetone	Pure						X					
Propyl Alcohol	Pure		A	A	A	A	A	B	A	A		A
Propylene Dichloride	Pure		A	A	A			X	B	X		A
Propylene Oxide			X				X	X	X	X		
Pyridine		B	X		A		C	X	X	B	X	A
Rhodan Salts			A	A		A	A	C	A	A		
Salicylaldehyde						A	A	A	A	A		
Salicylic Acid			A			A	A	A	A	A		A
Sewage			A	A	A	A	A	A	A	A	A	A
Silicic Acid			A	A	A	A	A	A	A	A		A
Silicone Oil			A	A		A	A	A	A	A	A	A
Silver Cyanide		A	A	A		A	A	A	A	A		A
Silver Nitrate		A	A	A	A	A	A	A	A	A	A	A
Silver Sulfate			A	A		A	A	A	A	A		A
Soaps		A	A	A	C	A	A	A	A	A	A	A
Sodium	Satu		A	A		A	A	A	A	A		X
Sodium Acetate	Satu	B	A	A	A	A	A	A	B	A	X	A
Sodium Alum	Satu	A	A	A	A	A	A	A	A	A		
Sodium Benzoate			A	A		A	A					A
Sodium Bicarbonate	Satu	A	A	A	A	A	A	A	A	A	A	A
Sodium Bichromate	Satu		A	A		A	A	A	A	A		
Sodium Bisulfate		A	A	A	A	A	A	A	A	A	A	A
Sodium Bisulfite		A	A	A	A	A	A	A	A	A	A	A
Sodium Borate	Satu			A	A	A	A	A	A	A	A	A
Sodium Bromide	Satu		A	A		A	A					
Sodium Carbonate		A	A	A	A	A	A	A	A	A	A	A
Sodium Chlorate	Satu	B	A	A	A	A	A	C	A	A	A	A
Sodium Chloride		B	A	A	A	A	A	A	A	A	A	A
Sodium Chlorite	25		X	X		B	B	X	X	X		A
Sodium Cyanide		A	A	A	A	A	A		A	A	A	A
Sodium Ferricyanide	Satu		A	A	A	A	A	A	A	A		A
Sodium Ferrocyanide	Satu		A	A	A	A	A	A	A	A	A	A
Sodium Fluoride			A	A	A	A	A	A	A	A	A	A
Sodium Hydroxide	15	A	A	A	A	A	A	A	C	A	A	A
Sodium Hydroxide	30	A	A	A	A	A	A	A	C	A	A	A
Sodium Hydroxide	50	B	A	A	A	A	A	A	X	A	A	A
Sodium Hydroxide	70			B	A	A	A	X	X	A		
Sodium Hypochlorite	13	C	A	B	A	A	A	X	X	X	A	A
Sodium Metasilicate		A	A	A		A	A	A	A	A		A
Sodium Nitrate	Satu	B	A	A	A	A	A	A	A	A	A	A
Sodium Nitrite	Satu		A	A		A	A	A	A	A		
Sodium Palmitate	5					A	A					
Sodium Perborate		C	A	A	A	A	A	B		A		A
Sodium Perchlorate			A	A		A	A					A
Sodium Peroxide		A	A	A	A	A	A	A	A	A	B	A
Sodium Phosphate Acid		B	A	A	A	A	A	A	A	A		A
Sodium Phosphate Alkaline		B	A	A	A	A	A	A	A	A		A
Sodium Phosphate Neutral		A	A	A		A	A	A	A	A	A	A
Sodium Sulfate	Satu	B	A	A	A	A	A	A	A	A	A	A
Sodium Sulfide		B	A	A	A	A	A	A	A	A	A	A
Sodium Sulfite		B	A	A	A	A	A	A	A	A	A	A

CHEMICAL NAME	CONC %	316 STAINLESS	PVC	POLYPROPYLENE	POLYETHYLENE	TEFLON	PVDF	BUNA N	VITON	ETHYLENE/PROPYLENE	HYPALON	KAL-REZ
Sodium Thiocyanate			A	A		A	A	A	A	A		A
Sodium Thiosulfate		A	A	A	A	A	A	A	A	A	A	A
Sour Crude Oil		B		A		A	A	B	A	X		
Stannic Chloride		A	A	A	A	A	A	A	A	A	X	A
Stannous Chloride		X	A	A	A	A	A	A	A	B	A	A
Starch		A	A	A	A	A	A	A	A	A		A
Stearic Acid		B	A	B	A	A	A	B	A	X	X	A
Styrene		A				A	A	C	C	X		A
Succinic Acid			A	A		A	A	A	A	A		A
Sulfamic Acid	20		X	X			X					A
Sulfate Liquors (Oil)		C						A	A	A		A
Sulfite Liquors	6	C	A	A		A	A	X	A	A		
Sulfur		B	A			A	A	X	A	C	B	A
Sulfur Chloride		X		C		A	A	C	A	X		A
Sulfur Dichloride				C		A	A	X	A	X		A
Sulfur Dioxide	Wet	C	A	A	A	A	A		A	A		
Sulfur Trioxide		C	X	X	A	B	X	X	C	C	X	A
Sulfuric Acid	10-50	X	A	A	A	A	A	A	A	A	A	A
Sulfuric Acid	70-80	X	A	A	A	A	A	B	A	A	A	A
Sulfuric Acid	90	X	A	A	B	A	A	C	A	A	X	A
Sulfuric Acid	93	X	A	A	B	A	A	C	A	B	X	A
Sulfuric Acid	94	X	A	B	B	A	A	X	A	C	X	A
Sulfuric Acid	95	X	A	C	B	A	A	X	A	X	X	A
Sulfuric Acid	96-98	A	B	X	X	B	A	X	X	X	X	A
Sulfuric Acid	100	A	X	X	X	B	X	X	X	X	X	A
Sulfurous Acid		B	A	A	A	A	A	C	A	A	A	A
Summition (Insecticide)			X	A		A	A	C	A	A		
Tannic Acid		C	A	A	A	A	A	B	A	B	B	A
Tanning Liquors		A	A	A		A	A	A		B		A
Tar			X	B		A	A	A	A	X		A
Tartaric Acid		B	A	A	A	A	A	A	A	A		
Tertiary Butyl Alcohol			A	A		A	A	X	A	B		
Tertiary Butyl Catechol								X		B		
Tetrachloroethane	Pure	A			X	A	A	X	A	X	X	A
Tetrachloroethylene	Pure	A				A	A	X	A	X	X	B
Tetraethyl Lead	Pure	A				A	A	X	B	X	X	A
Tetrahydrofuran	Pure	A	X	B	X	A	B	X	X	X	X	A
Tetralin	Pure							C	A	X		A
Tetramethyl Ammonium (OH)	50					A	A					
Titanic Sulfate			A	A		A	A					A
Titanous Sulfate			A	A		A	A					A
Titanium Tetrachloride									A			A
Toluene (Toluol)		A	X	B	X	A	A	X	B	X	X	A
Tomato Juice		A	A	A		A	A					
Triacetin	Pure							B	B	A		
Tributyl Phosphate				B		A	A	X	X	B		A
Trichloroacetic Acid				A		A	A	X	X	X		A
Trichloroethylene		A	X	B	X	A	A	X	A	X	X	A
Triethanolamine			B	X	B		X	C	X	A	C	A
Triethylamine			B	X			B					
Trimethylpropane		A	A	X		A	A					A
Turbine Oil (#140)			A	B		A	A	A	A	X	X	
Turpentine		A	A	B	B	A	A	B	A	B	X	A
Urea			A	A	A	A	A	A	A	A		
Urine		A	A	A	A	A	A	A	A	A		
Varnish						A	A	A	A	X		A
Vaseline			A	A		A	A	A	A	A		
Vegetable Oil		A	A	A	A	A	A	A	A	A		
Vinegar		A	A	A		A	A	C	A	A	A	
Vinyl Acetate			X			A	A	X	X	B		
Water		A	A	A	A	A	A	A	A	A	A	A
Water Distilled		A	A	A	A	A	A	A	A	A	A	A
Water (Potable)		A	A	A	A	A	A	A	A	A	A	A
Water (Salt)	Satu	A	A	A	A	A	A	A	A	A	A	A
Water (Sea Water)		A	A	A	A	A	A	A	A	A	A	A
Water (Sewage)		A	A	A	A	A	A	A	A	A	A	A
Whiskey		A	A	A	A	A	A	A	A	A		
White Acid					A	A	A					
White Liquor		A	A	A	C	A	A	A	A	A		A
Wines		A	A	A	A	A	A	A	A	A	A	
Xylene		A	X	X	X	A	A	C	B	X	X	
Zinc Acetate			A	A		A	A	A	A	A		A
Zinc Chloride		B	A	A	A	A	A	A	A	A	A	A
Zinc Nitrate			A	A		A	A	A	A	A		A
Zinc Sulfate		A	A	A	A	A	A	A	A	A	B	A

"TUFF-TANK" TRUCKING SYSTEM

20 "TUFF-TANK-225"s -4500 GALS.

40' Flat Bed Trailer with
Air Actuated Hold Down Beams



CHEC CHEMICAL HANDLING EQUIPMENT CO. INC.
DETROIT MICHIGAN

VAALER AWARDS

Material Handling

Portable, reusable container features 6-drum capacity

HONORS

"This is a safe, well engineered tank system that can eliminate the problem of moving and storing hazardous and non-hazardous liquids in hard-to-handle 55-gal drums," a chief judge comments about an *Honors* winning development in the 1984 CHEMICAL PROCESSING Vaaler Awards. Tanks are polyethylene containers placed in a rigid wire mesh enclosure for maximum protection and convenience. They are authorized by the U.S. Department of Transportation and the U.S. Coast Guard for the shipping and storing of hazardous liquids and wastes.

Containers are portable, reusable and built for extended, repeated filling. According to the developer, most hazardous and non-hazardous liquids have previously been shipped in 55-gal drums which often became a hazardous waste problem in themselves and were also unsafe and inconvenient to handle. The award-winning development is said to be novel because it replaces the smaller 55-gal drums with one container that can hold up to six times the capacity of the drum. It has the option of having top discharge with its built-in suction line in a depressed bottom sump, or can have a complete discharge bottom drain. The manufacturer describes the development as not just a container, but a complete liquid handling system with accessories for cleaning, locking, and convenient trucking.

Potential breadth of application of the container is wide. Every chemical processing operation is said to have an application for the unit for either receiving raw liquids or for shipping the liquid product.

Other features of the container are its system-engineered design, the ease of filling, a sloped bottom to depressed sump, complete emptying ability, a visual indication of liquid level, a puncture-resistant outer enclosure, stackability, and ease of transporting.

(Tuff-Tank Intermediate Bulk Container — Chemical Handling Equipment Co., Inc., 17700 Northland Park Court, Southfield, Michigan 48075)

APPENDIX J

RCRA TRIAL BURN PLAN

TABLE OF CONTENTS

		Page
D-5	INCINERATOR	1
D-5a	Justification for Exemption	1
D-5b	Trial Burn	1
D-5b(1)	New Incinerator Start-up Shakedown (not applicable)	1
D-5b(2)	Trial Burn Plan	1
D-5b(2)(a)	Incinerator Performance	1
D-5b(2)(b)	Detailed Engineering Description	1
	1. Manufacturer's Name and Model Number of Incinerator	1
	2. Type of Incinerator	2
	3. Linear Dimensions of the Incinerator Unit Including the Cross-Sectional Area of Combustion Chamber	2
	4. Description of the Auxiliary Fuel System	4
	5. Capacity of Prime Mover	6
	6. Description of Automatic Waste Feed Cut-Off Systems	6
	7. Stack Gas Monitoring and Pollution Control Equipment	10
	8. Liquid Burner Design	13
	9. Construction Materials	13
	10. Location of Temperature, Pressure, and Flow Indicating and Control Devices	14
D-5b(2)(c)	Sampling, Analysis, and Monitoring Procedures	16
	1. Sampling Locations and Procedures	16
	2. Sample Recovery Procedures	26
	3. Analytical Procedures	31
	4. Monitoring	31
D-5b(2)(d)	Detailed Trial Burn Protocol	31
	1. Waste Characterization	31
	2. POHC Selection Rationale	31
	3. Trial Burn Protocol and Operating Conditions	33
	4. Waste Constituents	33
	5. Combustion Temperature Ranges	38
	6. Waste Feed Rates	38
	7. Combustion Gas Velocity	38

TABLE OF CONTENTS

(Continued)

		Page
	8. Waste Feed Ash Content	38
	9. Auxiliary Fuel	38
	10. Scrubber Water	38
D-5b(2)(e)	Trial Burn Schedule	39
	1. Schedule	39
	2. Duration of Each Trial Burn Test	39
	3. Quantity of Waste to be Burned	39
D-5b(2)(f)	Trial Burn Permit Objectives	41
D-5b(2)(g)	Description and Planned Operating Conditions for the Emissions Control Equipment	47
D-5b(2)(h)	Shutdown Procedures	47
D-5b(2)(i)	Site Clean-Up	47
D-5b(2)(j)	Quality Assurance Plan	48
D-5c	Data in Lieu of Trial Burn (Not Applicable)	48
D-5d	Post Trial Burn Operation	48
D-5e	Incinerator Inspection	48
D-5f	Emergency Waste Feed Cutoff Testing	48
D-5g	Record Keeping	50
D-5h	Performance Test Determination	50

ATTACHMENTS

A. Quality Assurance Project Plan

B. Burner Information

C. Fan Curve

D. Liquid Waste Flow and Combustion Gas Velocity Indicator Meters

E. Analytical Methods

RCRA TRIAL BURN PLAN
FOR A MODULAR INCINERATOR
AT THE LOS ALAMOS NATIONAL LABORATORY
IN LOS ALAMOS, NEW MEXICO

Revision 1.0

OCTOBER 1985

SECTION D
PROCESS INFORMATION

D-5 INCINERATOR

Introduction

This trial burn plan is submitted as part of the RCRA Part B Permit Application requirements (40CFR 270.62) for the Controlled Air Incinerator (CAI) system at the Los Alamos National Laboratory in Los Alamos, New Mexico.

D-5a Justification for Exemption

Some Los Alamos waste forms, for which the incinerator operating permit is being sought, contain significant amounts of some hazardous constituents as listed in Appendix VIII of Part 261, and therefore, Los Alamos will not apply for an exemption as outlined in 264.340 (NMEID 206.D.8.a).

D-5b Trial Burn

D-5b(1) New Incinerator Startup/Shakedown

The Los Alamos incinerator is an operating incinerator. The provisions of 270.62(a) (NMEID 302.E.2.a) do not apply to this system.

D-5b(2) Trial Burn Plan

D-5b(2)(a) Incinerator Performance

Los Alamos seeks an operating permit by way of an additional trial burn of a principal organic hazardous constituent (POHC) with a high degree of difficulty of incineration, and will not submit results of earlier successful trial burns of hazardous wastes as justification for the permit.

D-5b(2)(b) Detailed Engineering Description of Incinerator

1. Manufacturer's Name and Model Number of Incinerator
   The Los Alamos CAI system was manufactured by Environmental Control Products (ECP) of Charlotte, North Carolina. The model number is ECP 500-T.

2. Type of Incinerator

The CAI system consists of a waste feed system and a controlled air incinerator. The Los Alamos CAI was developed through extensive modification and integration of commercially available and custom fabricated equipment. The small production-scale CAI system at Los Alamos was originally designed for the demonstration of volume reduction of combustible solid radioactive wastes. Components of the system include a dual chamber incinerator with a ram feeder for solids and a high intensity vortex liquid injection burner firing into the primary chamber, a secondary combustion chamber (SCC), an ash handling system, a water spray quench column, a high-energy venturi scrubber, a packed-column acid gas absorber followed by an offgas condenser, gas reheater, high efficiency particulate air (HEPA) filters, an activated carbon adsorber, and a final HEPA filter. One of the primary purposes of the CAI is incineration research. Research studies which have been completed in the CAI unit have included the incineration of various radioactively contaminated solid wastes, liquid PCBs, and pentachlorophenol contaminated wood.

A block flow diagram of the CAI incinerator is shown on Figure 1. The block flow diagram begins where the waste and auxiliary fuel is injected into the primary chamber and then traces the flow of the hot combustion gases to the secondary chamber, quench tower, and other pollution control devices with all discharge points noted.

3. Linear Dimensions of the Incinerator Unit Including the Cross-Sectional Area of the Combustion Chamber

The CAI system has two combustion chambers. The lower chamber (primary chamber) dimensions are 4 feet 10 inches inside diameter by 6 feet inside length. The upper chamber (secondary combustion chamber) dimensions are 3 feet 10 inches inside diameter by 6 feet inside length. The rectangular duct between the two chambers has internal dimensions of 1 foot by 3 feet and is 2 feet long. This duct contains the secondary air injectors and therefore functions as part of the secondary combustion chamber. The dimensions of the high-temperature duct between the secondary combustion chamber and the quench tower are 1 foot 8 inches inside diameter by 13

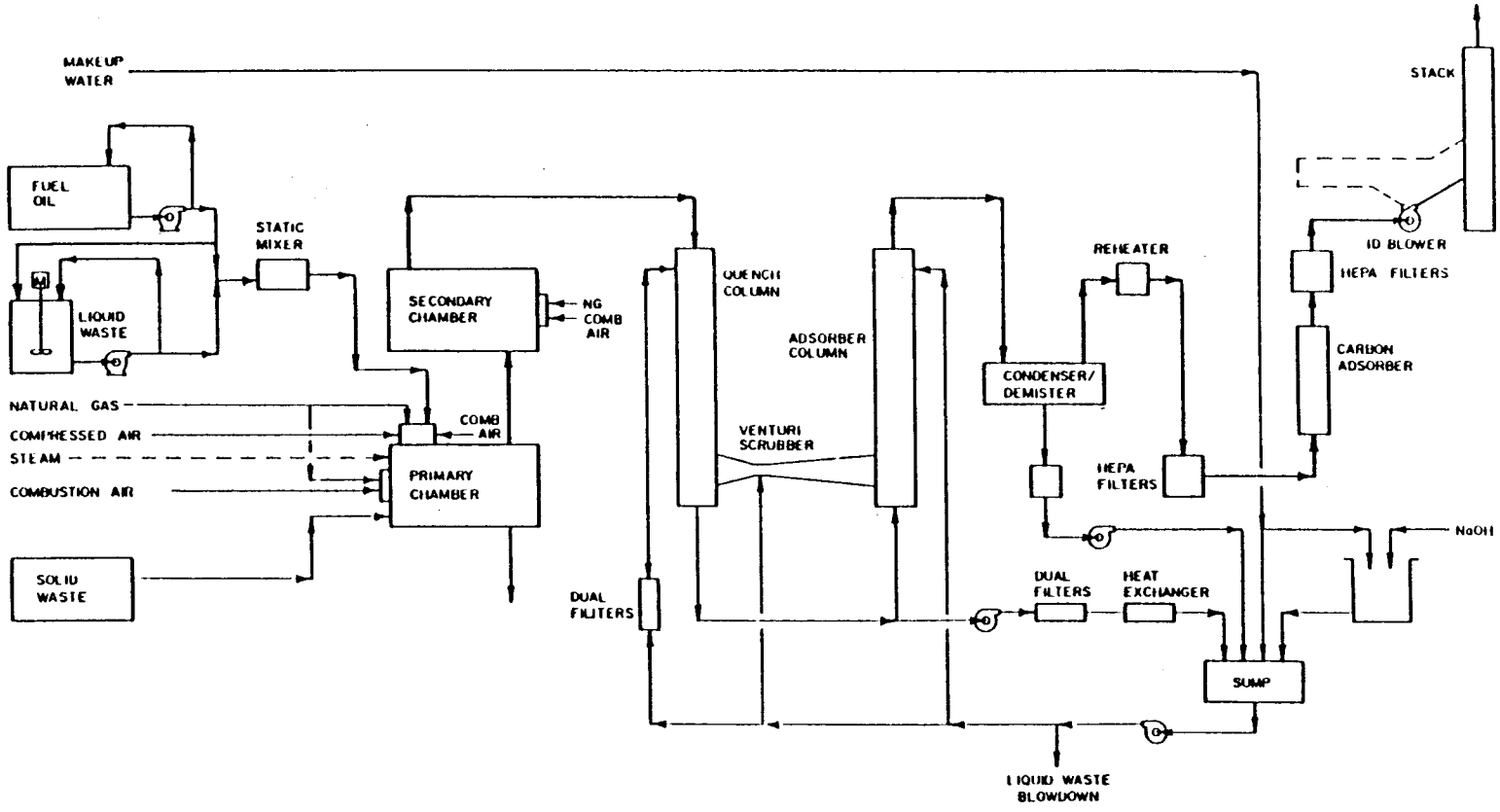


Fig. 1. Block Flow Diagram of CAI System

feet 7 inches long. The duct functions as an extension of the secondary combustion chamber. The volumes of the individual chambers are then approximately 110 ft^3 for the primary chamber, and 105 ft^3 for the secondary combustion chamber.

4. Description of the Auxiliary Fuel Burner System

The auxiliary fuel burner systems in the primary chamber and secondary chamber consist of gas burners. The primary and secondary chamber auxiliary fuel burners are identical. The primary chamber burner is located on the side of the primary chamber, and the SCC burner is located at the entrance to the SCC. Both of the auxiliary fuel burners are rated at 1,500,000 Btu per hour maximum output and are adjustable to suit operational requirements. The gas burners develop maximum rating with 3 inch W. G. gas pressure at the burners. All fittings, regulators, and control valves are Underwriters Laboratory, Chicago, Illinois, approved and assembled to meet the standards of Industrial Risk Insurers, Illinois, or other authority where applicable. Each of the auxiliary fuel burners is temperature controlled and is run with a preset combustion air to fuel ratio. The combustion air for both burners is supplied by a forced draft fan. Both burners are a pre-mix type manufactured by Pyronics, Inc., Cleveland, Ohio.

When fuel oil is used as an auxiliary fuel, it is either (1) injected through the liquid burner instead of waste liquid; or (2) batch-blended with the waste liquid and subsequently injected through the liquid burner as a mixture. An in-line static mixer has been installed to ensure dispersion of the fuel oil in the waste liquid as the mixture is being pumped to the liquid burner.

Method 1 is used to maintain heat in the lower chamber when operating the liquid burner and not feeding liquid waste. Method 1 is also used to flush the liquid feed lines following the completion of a liquid waste burn. Method 2 is used when the heating value of the liquid waste is too low to ensure proper operation of the liquid burner.

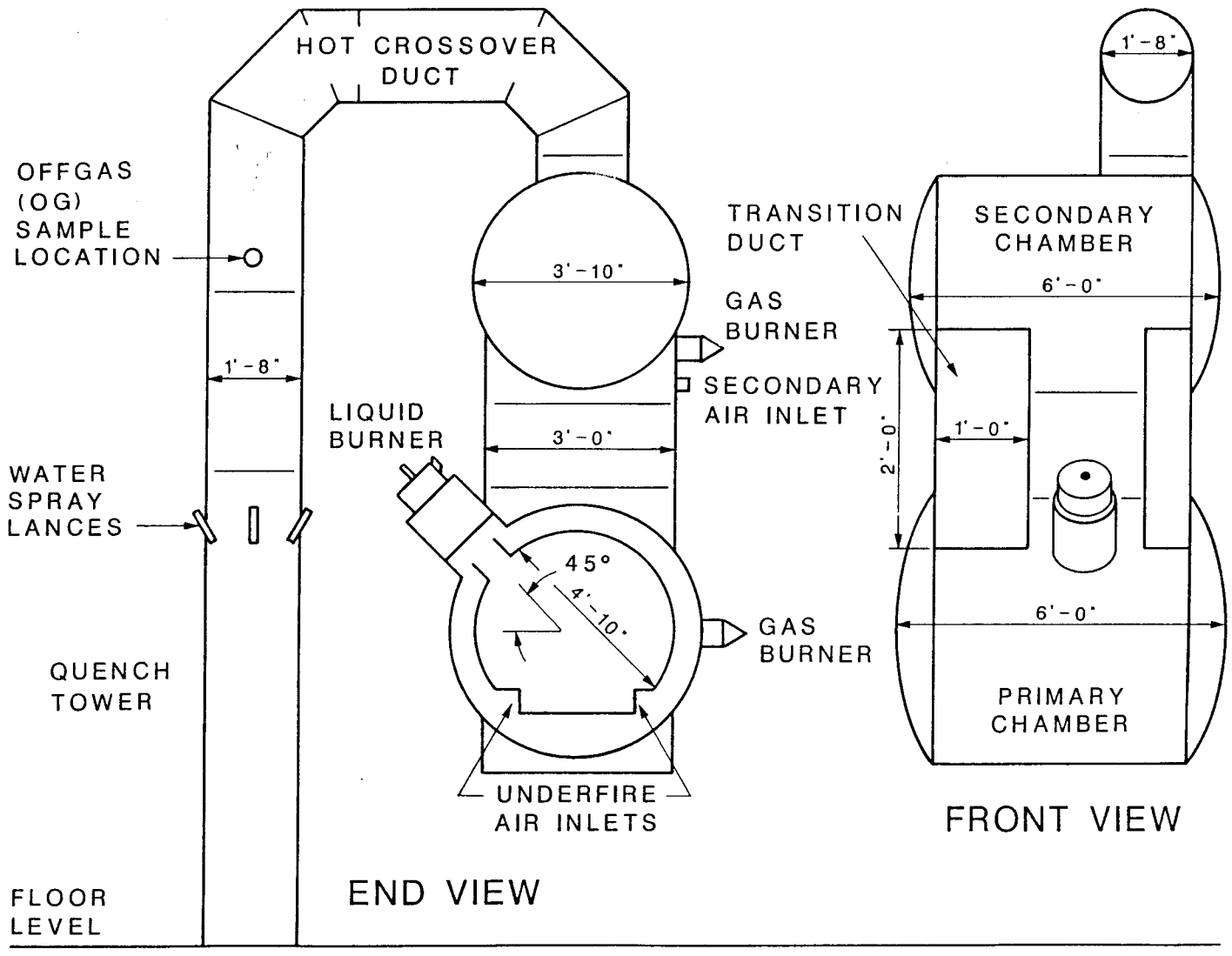


FIGURE 2. SCHEMATIC OF CAI

5. Capacity of Prime Mover

The CAI system prime mover is a Spencer Model G-3040-H-Spec turbine blower which operates as an induced draft (ID) fan. The ID fan is capable of producing an incineration negative pressure of 110 inch W.C. at a flow of 1900 cfm with a discharge pressure of 11.31 psia to accommodate the 7300 feet elevation at Los Alamos. The ID fan has a 40 hp, 3500 rpm motor.

6. Description of Automatic Waste Feed Cutoff

The primary function of the waste feed cut-off interlocks is to prevent the feeding of material at incineration conditions that are inadequate to assure destruction of the materials. During the startup and shutdown of the incinerator or during process upsets, the interlock system automatically stops all waste feed systems and prevents their restart until the incinerator is at proper operating conditions and the interlock is manually reset.

The process parameters identified in Table 1 are tied into an alarm panel and will also cut off the waste feed if the permit conditions for these parameters, as stated in 40 CFR 264.345(e), are exceeded. If any parameter is exceeded, a block valve in the waste liquid feed line to the liquid burner will automatically close, and the initiation signal to the solid waste feeding mechanism will automatically be deactivated. When permit conditions are within limits, neither the waste liquid block valve nor the solid waste feeding mechanism will be prevented from operating. The waste feed cut-off parameter permit condition values for permitted operation under 40 CFR Subpart O will be negotiated between EPA Region VI and Los Alamos based on the results of the RCRA trial burn. A discussion of the automatic waste feed cut-off parameters follows:

- Primary Chamber and SCC Temperatures -- The primary chamber and SCC temperatures are normally controlled to within 50`F below the temperature set-point. It is expected that the 50`F temperature variation will be encountered during normal operation and should not be cause for automatic waste feed cut-off.

- Carbon Monoxide -- Carbon monoxide (CO) concentrations are measured in the HEPA filter plenum and are discussed in Section D-5b(2)(b)7. Based on previous experience with the CAI, Los Alamos suggests that the

Table 1. Automatic Liquid and Solid Waste Feed Cut-Off Parameters

Parameter	
Minimum primary chamber temperature	1550°F
Minimum SCC temperature[a]	1550 or 1750°F
Maximum CO concentration	75 ppm by volume dry basis as measured by the continuous recording CO analyzer, except that for a period not to exceed 9 minutes, the system can continue to burn waste if the CO concentration does not exceed a maximum of 500 ppm.
Minimum scrub solution pH	4.0
Maximum combustion gas velocity[b]	To be determined during test run
Minimum HEPA filter pressure drop	0.1 inch W.C.
Maximum HEPA filter pressure drop	5.0 inch W.C.

[a]The trial burn is designed to determine the performance of the CAI while operating the SCC at two temperatures.

[b]Estimated to be less than 1500 SCFM.

CO automatic waste feed cut-off system be a two-tier system. The two-tier CO system is suggested as an approach to reducing waste feed cut-off situations which are caused by CO spikes. CO spikes are a common occurrence in incinerators during the feeding of liquid and solid wastes. The two-tier CO approach has previously been accepted by EPA Regions III and IV. The two-tier CO approach allows the use of a delay timer which starts if the CO level exceeds the first tier level, but not the second tier level. If at the end of a negotiated time the CO has not dropped below the first tier level, the waste feeds are automatically cut off. If, however, the CO drops below the first tier level before the time period has elapsed, the waste feeds are not cut off. If the second tier, however, is exceeded, the waste feeds are instantaneously cut off.

- Combustion Gas Velocity Indicator (CGVI) -- The CGVI will be measured during the trial burn and during permitted operation using a Fluidics HHR flow tube [see Section D-5b(2)(b)7 and Attachment D]. The CGVI permit condition for permitted operation will be based on the trial burn using the Fluidics flow tube.

- HEPA Filter Pressure Drop -- The pressure drop across each bank of the primary HEPA filters will be continuously monitored. If the filter pressure drop falls below the lower limit, the control system will automatically initiate a fast shutdown of the CAI. If the filter pressure drop exceeds the upper limit, the control system will automatically initiate a controlled shutdown of the CAI.

- Scrub Solution pH -- The acidity of the recycled scrub solution will be controlled by the addition of an alkali solution as required. The pH of the recycled solution will be continuously monitored. Operation of the CAI with a recycle scrub solution pH less than the limit will result in an automatic cutoff of the waste feed.

Three control logic sequences are provided to shut down the process in a safe and orderly manner.

- Controlled Shutdown -- initiated when there is potential for significant damage to minor process components. This is also the normal shutdown mode at the completion of a run. When controlled shutdown is initiated, feeding of waste to the incinerator is stopped, and a programmable set-point generator is activated that directs remote set-point inputs to the temperature controllers, causing a gradual decrease in

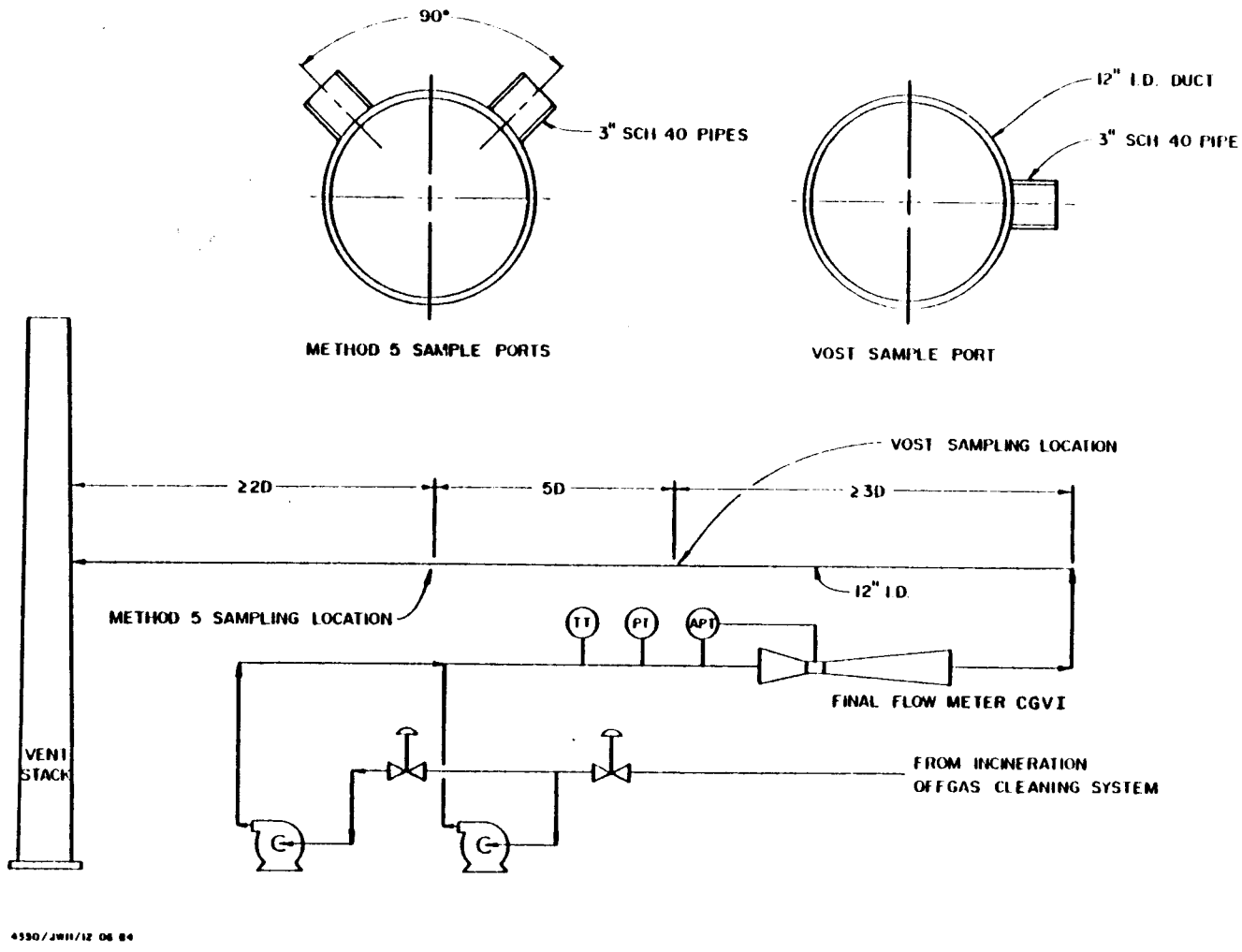


Fig. 3. Location of CGVI Flowmeter

chamber temperatures. Switches internal to the set-point generator cause an orderly timed shutdown of process components.

- Fast Shutdown -- initiated for conditions that could likely result in loss of containment or damage to major process components. Waste feeding is stopped. Following a two-minute timed interval following the last feeding of solid waste (immediately, if feeding liquid waste), the upper and lower chamber burners are shut down and the system valves and dampers are positioned so as to maintain a negative pressure in the system while minimizing flow through the system. Snuffing steam is introduced into the lower chamber. The two-minute delay when feeding solid waste allows for the ignition of pyrolytic gases formed immediately after feeding.

- Scram Shutdown -- initiated at the discretion of an operator. The chain of events are identical to the fast shutdown except that the sequence is not delayed when feeding solid waste. Scram buttons are located at the incinerator and in the control room.

The last two shutdown modes are potentially destructive to the incinerator refractory and are initiated only when the consequences of not shutting down are greater than the consequences to the incinerator during a scram or fast shutdown. It is the responsibility of the operating personnel and the process lead engineer to assess any situation and initiate the proper process shutdown sequence.

7. Stack Gas Monitoring and Pollution Control Equipment

Continuous monitoring of the off gas will be conducted for the combustion gas velocity indicator (CGVI) and CO. A single gas sample stream will be continuously withdrawn from the duct downstream of the reheater and just upstream of the HEPA filter inlet plenum for the CO analyses. Concentrations will be measured using a Foxboro-Wilks Miran II infrared (or equal) analyzer. Levels of CO will be recorded continuously on a strip chart in the control room.

The continuous CGVI monitoring will be recorded in the control room and measured by a Fluidic's HHR flow tube located in a straight run of duct between the ID fan outlet and the combustion gas stack. The CGVI

flowmeter information is supplied in Attachment D and the flowmeter location is shown in Figure 3.

The Los Alamos CAI Pollution Control Equipment (PCE) is shown in Figure 1. The PCE includes the following equipment.

- Quench column
- Venturi scrubber
- Packed absorber column
- Condenser/demister
- Reheater
- High efficiency particulate air (HEPA) filters
- Carbon bed adsorber
- Induced draft fan
- Recycle water system

In the quench column, combustion gases are cooled from the incinerator exit temperature to approximately 160°F by evaporation of scrub solution. Excess solution collects in the separator in the base of the column while the saturated gas phase is routed to the inlet of the venturi scrubber. The outlet temperature of the gas phase is monitored and a system limit of 250°F is imposed to protect the quench column from structural damage. Exceeding the temperature limit causes a waste feed shutoff and initiates an automatic controlled shutdown of the CAI.

The variable-throat venturi scrubber, located between the quench column and the absorber column, removes up to 99 weight percent of the offgas particulates. The intent and use of the venturi scrubber is to prolong the service life of the HEPA filters located further downstream in the PCE by reducing the particulate loading on the filters. The venturi assembly consists of converging and diverging cones with a clamp valve throat to allow the pressure drop to be varied. Venturi pressure drop normally is controlled in the 40 to 60 inch W.C. range. Recycled scrub solution is injected through a nozzle located upstream of the venturi throat.

Hydrochloric acid (HCl) is removed from the gas phase by counter-current contact with recycled scrub solution (or recycled condensate and fresh water) in the packed column absorber. The flow rate of the recycled solution is monitored and a low flow limit of 4.0 GPM is imposed to ensure

proper scrubbing of the HCl from the off gas. Operating below the flow rate limit causes a waste feed shutoff and initiates an automatic controlled shutdown of the CAI.

The condenser, mist eliminator, and reheater are included to condition the process exhaust gases before final HEPA filtration. The intent and use of the offgas conditioning system is to prolong the service life of the HEPA filters located further downstream in the PCE by minimizing blinding of the filters with condensate. The condenser lowers offgas temperature, removing water vapor from the scrubbed gas stream. The mist eliminator reduces the amount of water mist that is entrained in the offgas as the offgas leaves the downstream face of the condenser. The offgas is then reheated to a temperature above saturation temperature to avoid condensation and attendant plugging of the HEPA filters.

HEPA filtration is required for final removal of particulates. HEPA filters provide positive assurance that significant amounts of particulates are not vented in the stack gas. The filter module houses two frames (bank) in series, the first consisting of a prefilter and two HEPA filters in parallel, the second being similar but without the prefilter. Each bank of HEPA filters is tested in place for a minimum efficiency of 99.97 percent capture of particles with diameters >0.3 micrometer. The prefilter is rated at 85 percent efficiency. The pressure drop across each bank is monitored with a limit of >0.1 and <5.0 inch W.C. imposed. The lower limit ensures that a HEPA is properly in place (has not "sucked-through"), and the higher limit indicates a loaded filter bank. Operating below the lower limit causes a waste feed shutoff and initiates an automatic fast shutdown of the CAI. Exceeding the higher limit causes a waste feed shutoff and initiates an automatic controlled shutdown of the CAI.

The activated carbon bed adsorber serves as a final removal system for trace organic compounds. The housing for the activated carbon includes a third HEPA filter downstream of the carbon bed, which serves to remove any entrained carbon from the offgas stream. This third bank of HEPA filters is rated at the same capacity and is tested in place to the same efficiency as the primary HEPA filters located upstream of the carbon bed.

The induced draft fan is the prime mover which pulls the combustion gas through the air pollution control equipment.

The scrub solution recycle system is used to minimize liquid blowdown from the offgas cleaning system. Scrub solution usage ranges from 20-40 gal/min depending on the discharge pressure of the scrubber liquid pump and whether or not fresh water is being used in the absorber column. An alkaline solution is added at the process sump tank to maintain the scrub solution pH near the desired level. The addition rate is controlled by a pH sensor on the outlet of the process sump tank. The purge stream from the recycle water system goes to the Los Alamos liquid wastewater treatment system.

8. Liquid Burner Design

The details of the two auxiliary fuel burners are given in Section D-5b(2)(b)4 and Attachment B. A liquid waste burning nozzle and burner system is also located in the primary chamber. The burner is a commercial high intensity vortex liquid injection-type. The burner, a Trane Thermal model LV-2 vortex burner, is mounted on the side of the primary chamber firing downward at a 45° angle from horizontal directly into the chamber (Figure 2). The unit is equipped with its own natural gas pilot and natural gas supply for supplemental heat. Atomization of the liquid feed stream is accomplished with either air or steam through an internal mix nozzle. Details of the Trane burner are given in Attachment B.

9. Construction Materials

The construction materials for the CAI system components are as follows:

COMPONENT	CONSTRUCTION MATERIAL
Primary chamber, secondary chamber and high temperature duct	Carbon steel shell Internal mastic membrane Internal fiberboard insulation (refractory fiber) Internal high density refractory (40% Al_2O_3)

Quench tower, venturi scrubber, absorber tower, duct to condenser	FRP shell (ATLAC 382 resin, with with 5% antimony oxide fire retardant) Hastelloy C-276 Polypropylene
Condenser/demister, duct to HEPA filter plenum	304L stainless steel shell with phenolic resin internal coating and Plasite® paint coating
HEPA filter plenum, absorption tower	Carbon steel shell, Plasite® paint coating
Induced-draft blower, ductwork to blower and from blower to vent stack, vent stack	Carbon Steel

10. Location of Temperature, Pressure, and Flow Indicating and Control Devices

The discussion in this section is based on Figure 4. The numbers given at the end of each heading refer to the equipment location in Figure 4.

a. Primary Chamber and Secondary Combustion Chamber Combustion Temperatures (1,2) -- The combustion gas temperatures of the primary chambers and the secondary combustion chamber are each measured with a type S (platinum/10% rhodium) thermocouple. The primary chamber thermocouple is located in the hot duct between the primary and secondary combustion chambers. The SCC thermocouple is located downstream of the SCC at the entrance to the high temperature duct.

b. Waste Liquid Flow (3) -- Waste liquid flow is measured by a Micro-Motion®, Model C25, gyroscopic/coriolis mass flowmeter. The Micro-Motion flowmeter provides a measurement of instantaneous mass flowrate of the waste liquid being fed to the Trane burner. A detailed description of this flowmeter is given in Attachment D.

c. Solid Waste Flowrate (4) -- Solid waste is typically fed to the CAI in preweighed 1 foot X 1 foot X 2 foot cardboard boxes. These boxes are than transferred to the side ram feeder, which feeds the main ram feeder. The main ram feeder pushes boxes of solid waste into the primary chamber on a timed cycle which can be manually or automatically overriden when necessary. Each time a box of solid waste is fed to the primary chamber, the incinerator operator records the event on a log sheet.

The solid waste feed rate will be monitored, as is presently done, by the operator entering on a logsheet the weight and time each box of solid waste is fed to the primary chamber. Most of the solid wastes fed to the primary chamber are not RCRA hazardous wastes.

d. Combustion Gas Flowmeter (5) -- The combustion gas flowrate will be measured at a location between the ID fan and the stack by a Fluidic's HHR flow tube. This combustion gas flowrate will be the combustion gas velocity indicator (CGVI) (see Section D-5b(2)(b)7 and Attachment D).

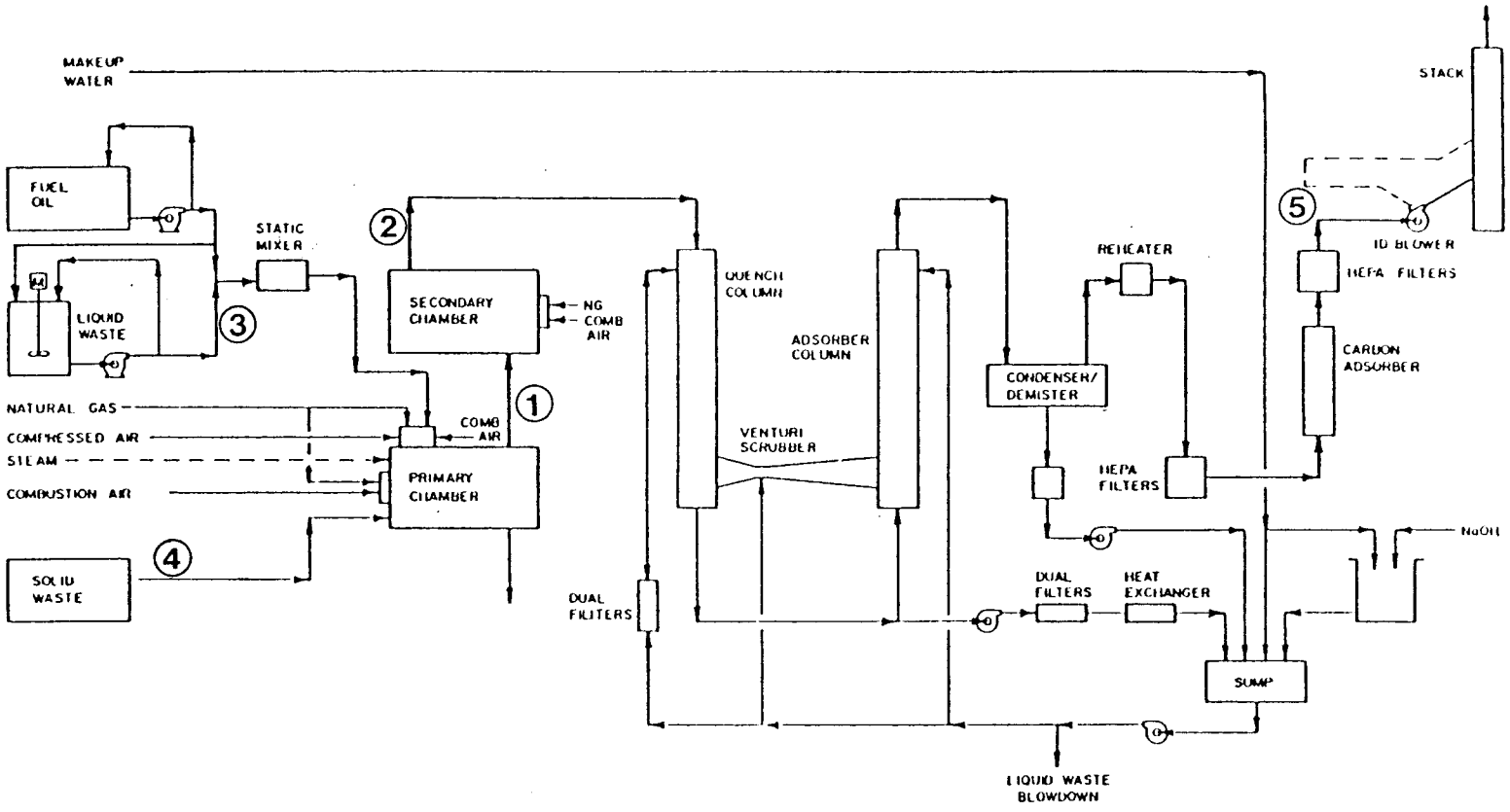


Fig. 4. Location of Temperature, Pressure, and Flow Indicating Control Devices

e. Research Parameter Measurement -- Because the CAI is used and will be used partly as an incineration research system, it is more highly instrumented than typical industrial hazardous waste incinerators. The CAI has many temperature, pressure, and flow indicating instruments not mentioned in this section. These instruments are necessary from the research point of view, but are not necessary to meet the requirements of the 40 CFR 264 Subpart O and 40 CFR 270.62 RCRA incineration and trial burn regulations.

D-5b(2)(c) Sampling, Analysis, and Monitoring Procedures

The objective of a trial burn test is to obtain process data that will:

- Permit calculation of Principal Organic Hazardous Constituent (POHC) destruction and removal efficiency, HCl removal efficiency, and particulate emission concentrations
- Confirm the fate of POHCs treated by the system; that is, destroyed by thermal oxidation, and removed by the air pollution control system, or emitted in the stack gases, ash residues or scrubber water purge stream
- Document the test process feed and operating conditions that will be used in establishing operating permit conditions

The sampling and analysis procedures included in this section are therefore selected to determine the physical-chemical characteristics of the incinerator feed materials (especially the POHC concentrations), material feed rates, the composition and flow rates of the stack gases, and the amounts of POHC discharged in the incinerator ash, the stack gases and the quench-scrubber purge water. The monitoring procedures are selected to measure concentrations of O_2 in the combustion gases and CO in stack gases.

The following sampling and analysis procedures are based on carbon tetrachloride (CCl_4) being used as the POHC. The rationale for selection of CCl_4 as the POHC is presented in Section D-5b(2)(d).

1. Sampling Locations and Procedures

The locations where solid, liquid, and gaseous samples are collected from the incineration system are shown in Figure 5. All of the materials supplied to the incineration and air pollution control processes including fuel oil, liquid and solid waste feeds, and makeup water are sampled at

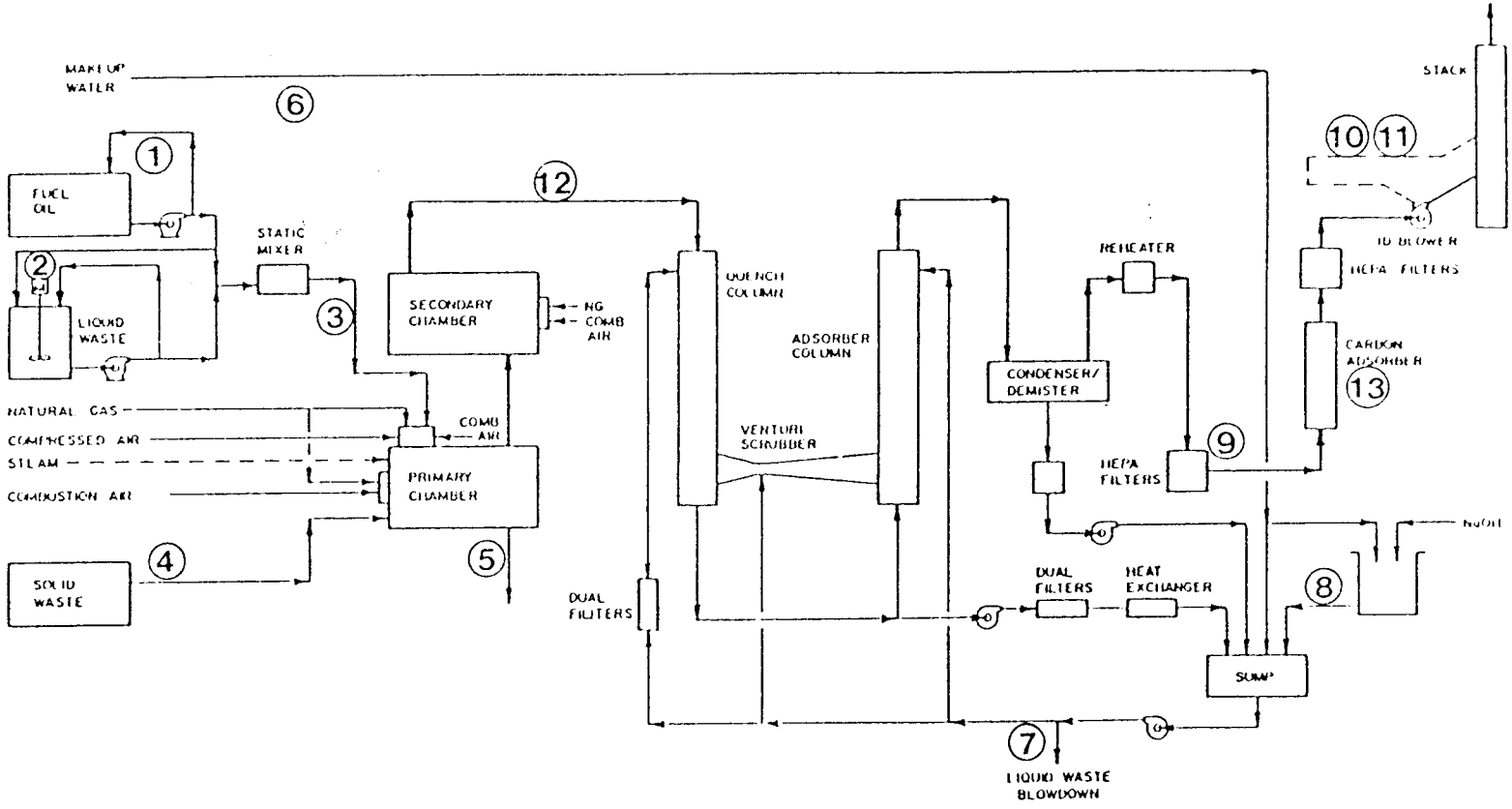


Fig. 5. Location of Sampling Points

locations 1, 2, 3, 4, 6, and 8. Samples of process solids (ash and carbon) and liquid (blowdown water) effluents are collected at locations 5, 13, and 7, respectively. POHC, HCl, and particulate emission samples are collected from the stack gases at locations 10 and 11. The O_2 concentration of the combustion gases is continuously monitored at location 12; CO_2 and CO concentrations are monitored at location 9.

The sampling equipment and the procedures for collecting samples at each location are summarized in Table 2. Sampling frequency and reference methods are included in that table. Additional details regarding each sampling location are discussed below.

a. Fuel Oil (1) -- A representative sample of fuel oil will be collected just before each test sampling run either by taking grab samples from a tap in the fuel oil recirculation line, or by using a coliwasa at an access port in the top of the tank. This sample will be retained for future analysis in case there are problems with analysis of the blended liquid sample taken at location 3.

b. Liquid Waste (2) -- A representative sample will be collected just before each test sampling run either by taking grab samples from the liquid waste recirculation line or by using a coliwasa at a access port in the top of the tank. This sample will also be retained for future analysis in case there are problems with analysis of the blended liquid sample taken at location 3.

c. Liquid Waste Blend (3) -- The organic liquid waste will be prepared in the liquid waste tank and either fed directly to the incinerator or blended with fuel oil in an inline static mixer before being fed to the incinerator. A flow diagram of the waste feed system is shown in Figure 6. Grab samples will be collected from a sample tap in the feed line to the incinerator at the beginning, middle, and end of each replicate sampling run and composited.

d. Solid Waste Blank (4) -- All solids materials will be prepared before the trial burn and stored in sealed containers. A scoop will be used to collect equal size samples from each bulk solids container before

the actual waste feed containers are prepared. The samples will be composited to provide a blank of solids matrix material and placed in a wide-mouth glass bottle with Teflon-lined lid.

e. Incinerator Ash (5) -- Small and possibly negligible amounts of ash are expected to be accumulated during each test sampling run. The ash drop doors will be operated at the end of each test period allowing any accumulated ash to fall into the drop-out hopper where it will be pneumatically conveyed to the ash collection hopper located above the glove box. The sample (if any) will be collected from the double valve drop chute inside the glove box. The ash drop doors and the pneumatic system will be operated before each test run to remove ash accumulated since the previous test.

f. Makeup Water (6) -- Grab samples will be collected from a supply line tap at the beginning and end of each replicate sampling run and composited.

g. Blowdown Water (7) -- Grab samples will be taken from a tap in the liquid waste discharge line to the industrial (radioactive) waste treatment plant. Before each sampling run, two grab samples will be collected 30 minutes apart and composited to provide a blank sample. Grab samples will be taken every 60 minutes during each replicate sampling run and composited for the run.

h. Aklaline Solution (8) -- Sample tank contents after preparing new batch.

i. HEPA Plenum Exhaust Gas (9) -- A gas sample is continuously extracted for carbon monoxide analysis. (CO_2 analysis will be used to confirm stack gas Orsat analyses).

j. Stack Gases (10, 11) -- Samples of the particulates, acid gases, and volatile organics in the offgas will be collected from the exhaust duct at locations 10 and 11 shown in Figure 7. The exhaust duct is designed for isokinetic sampling.

Table 2. Sample Collection Locations, Equipment, and Methods

Location	Description	Access	Equipment	General Procedures/Frequency	Reference Methods[a]
1.	Fuel oil recirculation line	Tap	Glass bottle	Grab sample at beginning and end of each run; composite for each replicate test run	S004,SW846
	Alternate: Fuel oil tank	Top port	Coliwassa; glass bottle	Grab sample prior to each replicate test run	S001,SW846
2.	Liquid waste recirculation line	Tap	Glass bottle	Mix tank contents, collect grab sample at beginning and end of each replicate run and composite	S004,SW846
	Alternate: Liquid waste tank		Coliwassa; glass bottle	Mix tank contents, collect sample prior to each test run	S001,SW846
3.	Liquid waste feed line	Tap	Glass bottle	Grab sample at beginning, middle, and end of each run; composite for each run	S004,SW846
4.	Solids storage containers	Open top	Scoop; glass bottle	Prior to loading waste feed boxes, collect sample from each bulk solids container; composite all samples to obtain blank of solids feed matrix	S007,SW846
5.	Ash drop chute	Valve	Glass bottle	Collect samples from valve at end of each run	S006,SW846
6.	Makeup water supply line	Tap	Glass bottle	Composite grab samples collected at beginning and end of run	S004,SW846
7.	Liquid waste blowdown	Tap	Glass bottle	Collect blank before run; composite hourly grab samples	S004,SW846
8.	Alkaline solution tank	Top port	Dipper, plastic bottle	Sample tank contents after preparing each batch	S002,SW846
9.	HEPA plenum exhaust	Port	Instrument vacuum pump	Continuously extracts and transports gas sample to instrument for CO/CO_2 analysis	
10.	Stack inlet duct	Port	VOST sampling train	Six pairs of sorbent cartridges collected over 3-hour period	S012
11.	Stack inlet duct	Port	EPA M5 sampling train	Collect integrated samples of particulates, moisture, and acid gases; measure stack gas velocity pressure and temperature over 3-hr sampling time; collect from the exhaust of the train integrated bag samples of stack gases for CO_2 and O_2 analysis every 30 min	S008, EPA Methods 1-5
12.	Secondary chamber	Port	Instrument aspirator pump	Continuously extracts and transports combustion gases to instrument for O_2 analysis.	
13.	Adsorber carbon	Port	Thief, glass bottle	Take core sample about 1/2 in. dia. X 6 in. long from inlet side of adsorber after each test	

[a]Prefix S refers to Sampling and Analysis Methods for Hazardous Waste Combustion, EPA-600/8-84-002. SW refers to Test Methods for Evaluating Solid Waste, SW 846, Sec. Ed., July 1982

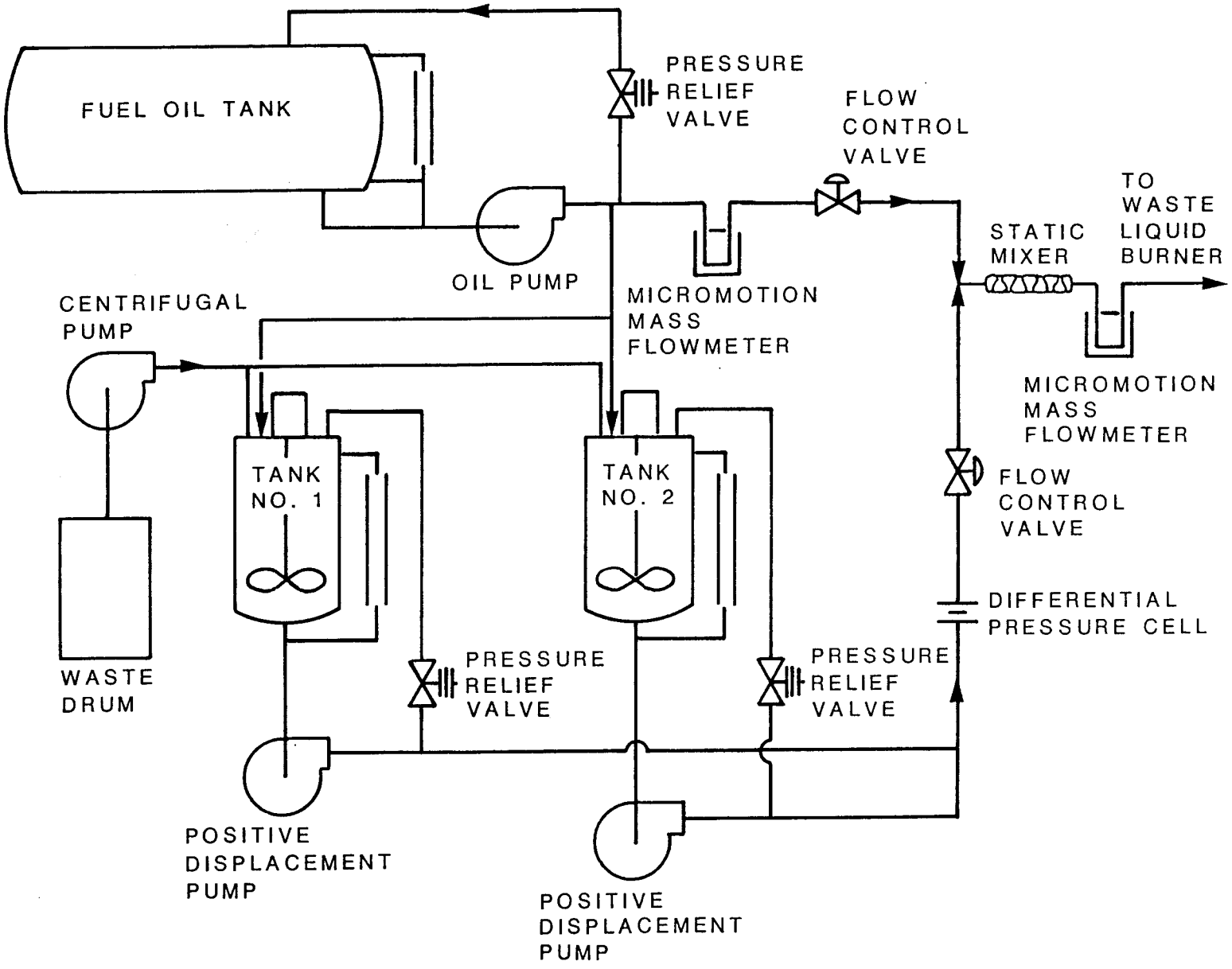


FIGURE 6. CAI LIQUID FEED SYSTEMS

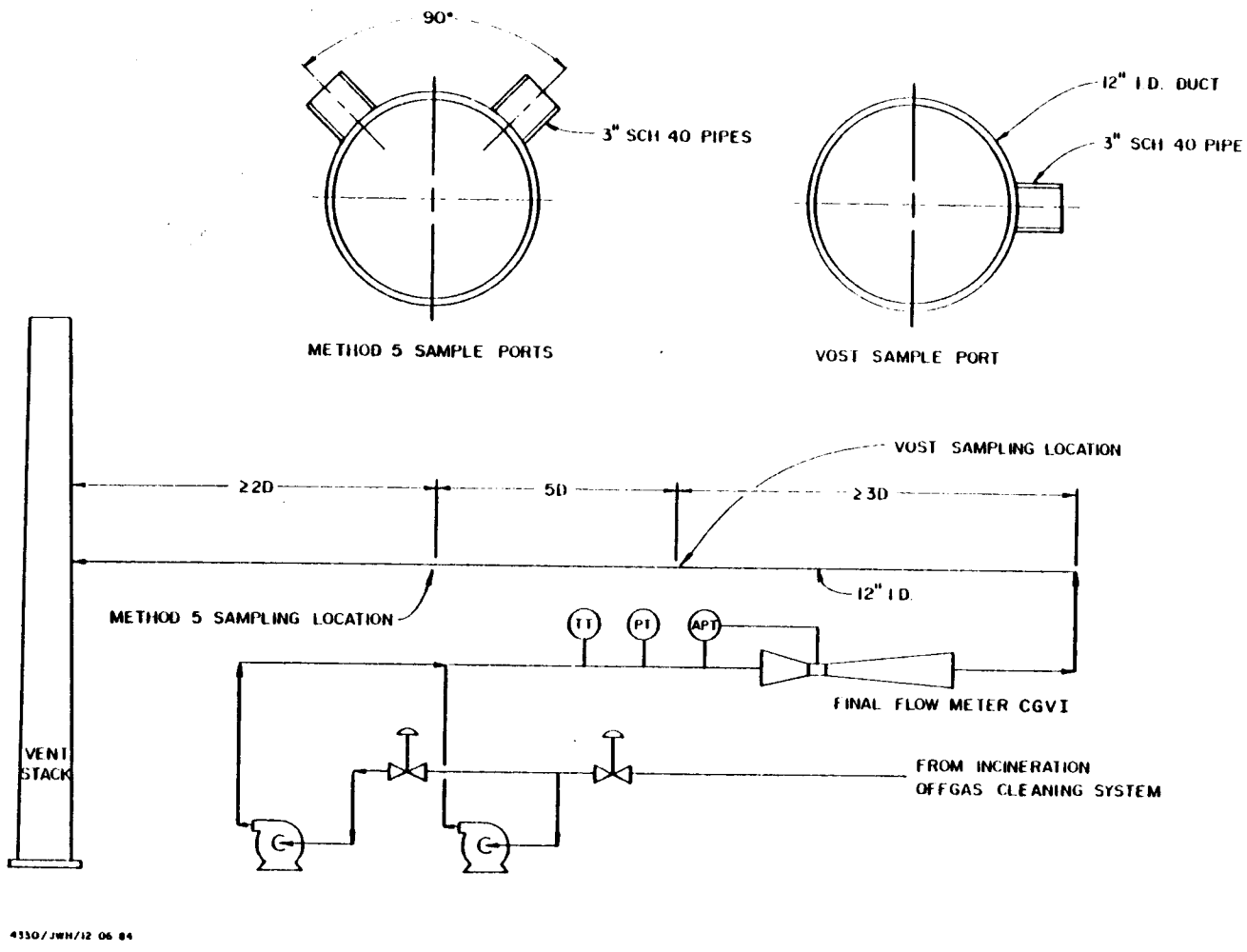
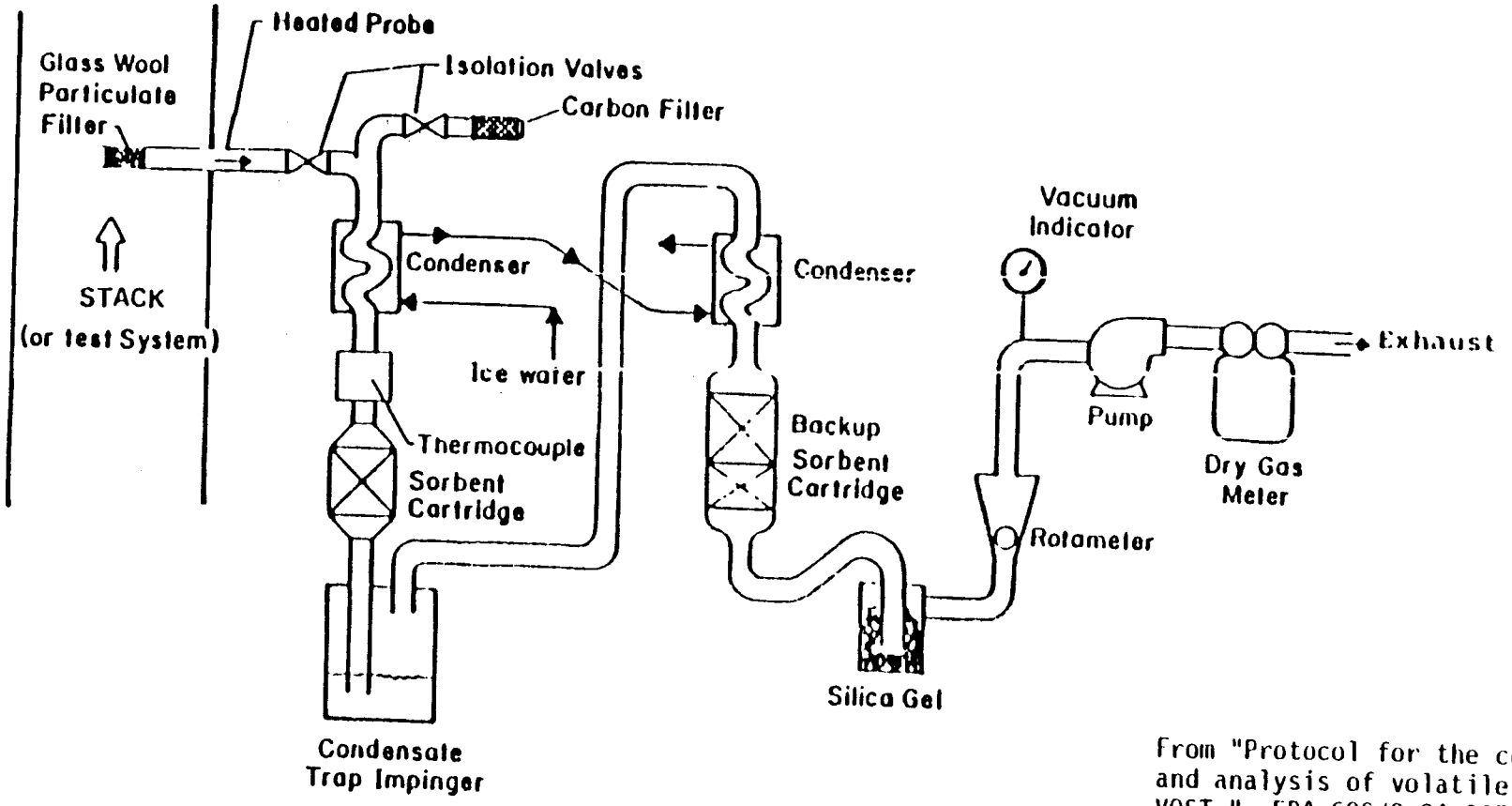


Fig. 7. Stack Gas Sampling Locations



From "Protocol for the collection and analysis of volatile POHC using VOST." EPA-600/8-84-007.

FIG. 8. Schematic of Volatile Organic Sampling Train (VOST)

A volatile organic sampling train (VOST, Figure 8) will be used at location 10 to collect CCl_4 and other volatile organics on sorbent resin according to procedures given in Attachment E. The VOST will be operated for approximately three hours during each test duplicate sampling run. The VOST cartridges will be capped immediately upon removal from the train, wrapped in aluminum foil, placed in glass tubes, and sealed.

An EPA Method 5 (M5, Fig. 9) sampling train will be used at location 11 for collection of particulate and HCl acid gas. The M5 procedures include measurement of the stack gas flow rate and temperature according to EPA Methods 1 and 2. Approximately every 30 minutes, integrated samples will be collected in gas bags from the M5 train exhaust for O_2 and CO_2 determinations by an Orsat analyzer according to EPA Method 3. The M5 train will be operated for approximately three hours to collect approximately 3.5 m^3 stack gas during each replicate sampling run.

k. Combustion Gas (12) -- A sample will be continuously extracted from the hot gas for O_2 concentration analysis.

l. Adsorber Carbon (13) -- A thief will be used to take a core sample (approximately 1/2-inch diameter X 6 inches long) from the inlet gas side of the absorber after each test. The sample will be placed in a glass container with a Teflon-lined lid.

There are three other process wastes that can potentially contain small amounts of CCl_4 in accumulated solids. These wastes are the offgas HEPA filters, the quench recycle liquid filters, and the absorber discharge liquid filters. These filters are not included in the sampling program for the following reasons:

- The amount of solids that will be accumulated in the filters during a 3-hour run is believed to be insignificant because the systems are designed for long term (weeks, months) of service before the filters are removed for disposal.

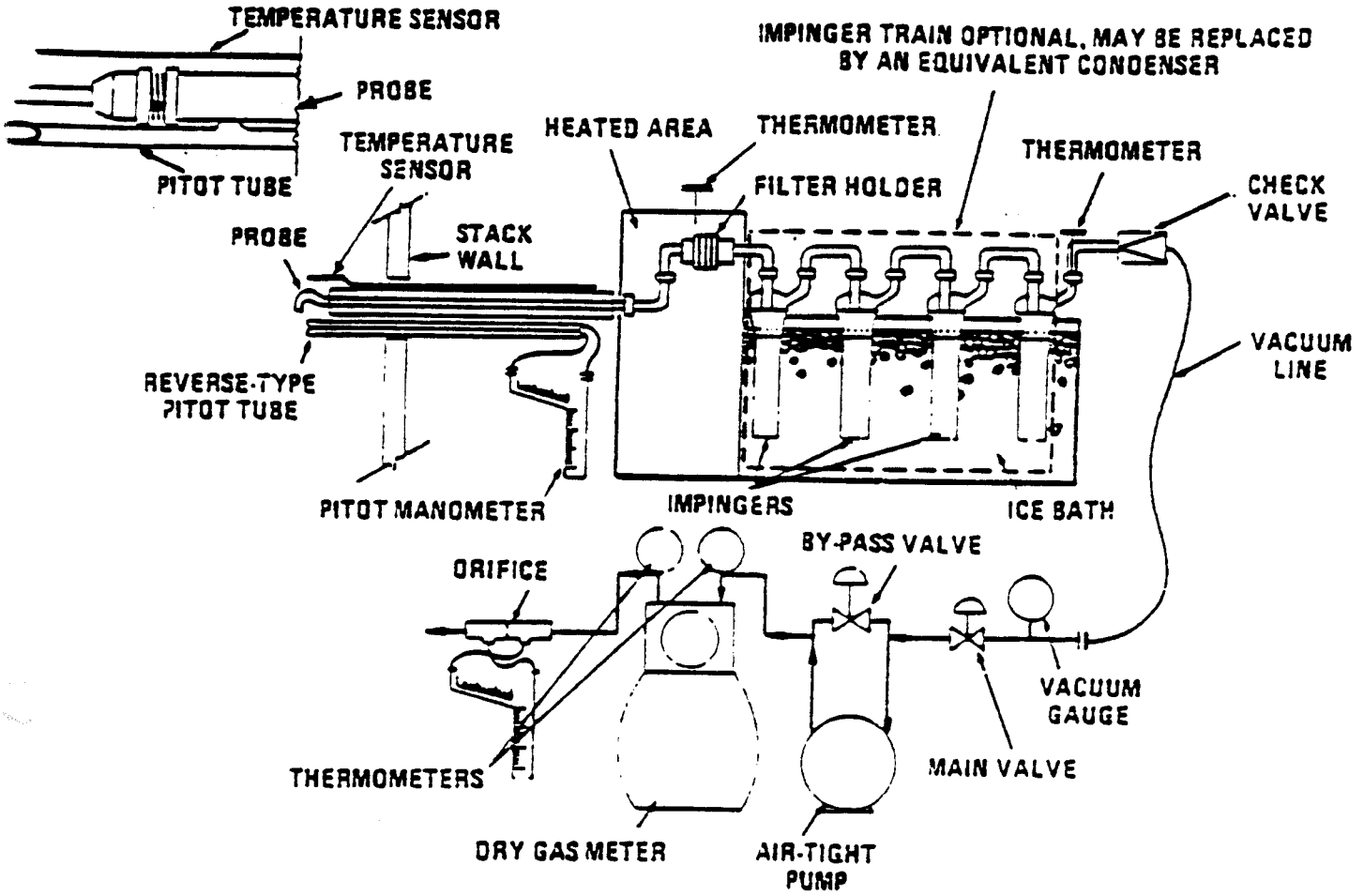


Fig. 9. EPA Method 5 Sampling Train

- The total amount of CCl_4 retained by the solids during a sampling run is believed to be negligible because the gas and liquid streams are at elevated temperatures and because CCl_4 has low solubility in water. At the proposed process conditions, residual CCl_4, if any, will tend to remain in the gas streams rather than be retained in the liquids or the small amount of accumulated solids.

- The filter media will probably contain radioactive particulates, complicating cartridge removal, recovery of accumulated solids, extraction and analysis of CCl_4. Removal of the air and liquid filter cartridges after each of the twelve sampling runs would cause extension of the test schedule and significantly increase trial burn costs.

All sample containers and organic sorbent traps for the above sampling program will be prepared by the laboratory having primary responsibility for analyzing all samples. At the test site a sample manager will be responsible for distributing sample containers and traps, monitoring sample collection, taking custody of samples from the sampling team, and preserving the samples. The sample manager will be responsible for shipping and for transferring sample custody to analysis coordinators in the primary and reference laboratories.

2. Sample Recovery Procedures

The laboratory analysis coordinators will inspect the samples as received and accept custody. Sample aliquots will be taken for the required analyses. Surrogate and/or reference compounds will be added to these samples before any preparation steps. The specific compounds and the amounts to be added will be as called for in the analytical procedures. Typically, the spike amounts will be near the analysis detection level. The laboratories will be responsible for implementing their own instrument calibration and QA/QC procedures.

The procedures for recovering compounds from the major sample groups are briefly summarized below.

Organic Liquids -- This group includes the fuel oil and the liquid waste blend samples. The fuel oil and liquid waste samples will be shaken to minimize stratification before removing aliquots for specific analyses.

For organic analyses, small aliquots will be diluted in hexane for direct analysis or processed through cleanup, as required by the analytical procedures identified in the next section.

Solids -- This group includes solid waste blanks, incinerator ash, and adsorber carbon. The samples will be dispersed in methanol or polyethylene glycol for analysis using purge and trap procedures (Attachment E).

Aqueous -- This sample group includes makeup water, blowdown water, alkaline solution and VOST condensate. Sample recovery procedures are not required for these samples because they will be direct injected according to procedures referenced in the next section for volatile organic analysis.

Sorbent Resins -- This sample group will include the VOST resin cartridges (Tenax® and Tenax-charcoal). Each pair of VOST resin cartridges will be thermally desorbed to an analytical trap according to the protocol detailed in EPA-600/8-84-007.

M5 Train Components -- The samples will be recovered from the M5 train as follows:

- Particulate filter -- Will be removed from holder, placed in a glass petri dish, wrapped in aluminum foil, placed in a plastic bag and sealed.

- Probe rinse -- The nozzle, probe, and front half of the filter holder and any connecting glassware will be brushed and rinsed with acetone followed by a rinse with hexane. The rinses will be placed in glass jars with Teflon-lined lids.

- Impinger water -- The contents of the impingers will be volumetrically measured and placed in a glass sample bottle with a Teflon-lined lid. The impingers will be rinsed with distilled water and the rinse added to the sample.

- Silica gel -- The cartridge will be returned to its original container and sealed.

Table 3. Analyses Planned for Trial Burn Samples

Sample Name	Analyses
	Tests 1 and 2 (Liquids)
Fuel oil	(Archive)[a]
Raw liquid waste	(Archive)[a]
Liquid waste blend	Density, heat content, ash content, elemental (C,H,N,O,S, organic Cl), matrix constituents, CCl_4
Incinerator ash	(Archive)[b]
Makeup water	CCl_4
Blowdown water	CCl_4, pH, total chlorides
Alkaline feed	CCl_4
Adsorber carbon	CCl_4
Stack gas VOST	CCl_4
Stack gas M5	Particulates, moisture, HCl, O_2, and CO_2
Combustion gas monitor	O_2
Absorber gas monitor	CO and CO_2
	Tests 3 and 4 (Solids)
Fuel oil	Density, heat contnt, ash content, elemental (C,H,N,O,S, organic Cl), CCl_4
Solids feed blank	Density, heat content, ash content, elemental (C,H,N,O,S, organic Cl), moisture, CCl_4
Incinerator ash	(Archive)[b]
Makeup water	CCl_4
Blowdown water	CCl_4, pH, total chlorides
Alkaline feed	CCl_4
Adsorber carbon	CCl_4
Stack gas VOST	CCl_4
	Tests 3 and 4 (solids) (Continued)
Stack gas M5	Particulate, moisture, HCl, O_2, and CO_2
Combustion gas monitor	O_2
Absorber gas monitor	CO and CO_2

[a]Retain for same analysis as liquid waste blend if needed.
[b]Retain for CCl_4 analysis if needed.

D229-LA-EX

Table 4 . Summary of Analytical Procedures and Methods

Analysis	Sample Name	Test No.	Sample Matrix	No. of Samples	Procedure Description	Reference Methods[a]
Density	Fuel oil	3,4	No. 2 fuel oil	6	Gravimetric/volumetric	
	Liquid waste blend	1,2	Fuel oil, CCl_4	6	Gravimetric/volumetric	
	Solids feed blank	3	Sawdust	1	Gravimetric/volumetric	
Heat Content	Fuel oil	3,4	No. 2 fuel oil	6	Bomb calorimeter	A006, ASTM D240
	Liquid waste blend	1,2	Fuel oil, CCl_4	6	Bomb calorimeter	A006, ASTM D240
	Solids feed blank	3	Sawdust	1	Bomb calorimeter	A006, ASTM D2015
Ash Content	Fuel oil	3,4	No. 2 fuel oil	6	Residue after combustion in muffle furnace	A001, ASTM D482
	Liquid waste blend	1,2	Fuel oil, CCl_4	6	Residue after combustion in muffle furnace	A001, ASTM D482
	Solids feed blank	3	Sawdust	1	Residue after combustion in muffle furnace	A001, ASTM D3174
Elemental Composition (C, H, N, O)	Fuel oil	1,2	No. 2 fuel oil	6	Analyze combustion products and residue	A003, ASTM 3176
	Liquid waste blend	1,2	Fuel oil, CCl_4	6	Analyze combustion products and residue	A003, ASTM 3176
	Solids feed blank	3	Sawdust	1	Analyze combustion products and residue	A003, ASTM 3176
Organic Chlorine	Fuel oil	1,2	No. 2 fuel oil	6	Halide titration of combustion residue	A004, ASTM D2361
	Liquid waste blend	1,2	Fuel oil, CCl_4	6	Halide titration of combustion residue	A004, ASTM D2361
	Solids feed blank	3,4	Sawdust	1	Halide titration of combustion residue	A004, ASTM D2361
Moisture	Solids feed blank	3	Sawdust	1	Heating under controlled conditions	A001, ASTM D3173
Total suspended solids	Blowdown water	1,2,3,4	Water	12	Filtration residue	EPA M160.1
Total dissolved solids	Blowdown water	1,2,3,4	Water	12	Filtrate residue	EPA M160.2
Total organic carbon	Blowdown water	1,2,3,4	Water	12	Oxidation/IR detection	EPA M415.1

Table 4. (Continued)

Analysis	Sample Name	Test No.	Sample Matrix	No. of Samples	Procedure Description	Reference Methods[a]
Organics						
CCl_4	Fuel oil	3,4	No. 2 fuel oil	6	Dilution, purge and trap, GC/MS	A101, SW 8240
	Liquid waste blend	1,2	Fuel oil	6	Dilution, purge and trap, GC/MS	A101, SW 8240
	Solids feed blank	3	Sawdust	1	Extraction, purge and trap, GC/MS	A101c, A101
	Incinerator ash	1,2,3,4	Combustion residue	0-12	Extraction, concentration, GC/MS	A101c, A101
	Makeup water	1,2,3,4	Water	4	Purge and trap, GC/MS	A101a, A101
	Blowdown water	1,2,3,4	Water	12	Purge and trap, GC/MS	A101a, A101
	Alkaline solution	1,2,3,4	20% NaOH	1-4	Purge and trap, GC/MS	A101a, A101
	Adsorber carbon	1,2,3,4	Carbon	12	Purge and trap, GC/MS	A101a, A101
	Stack gas VOST	1,2,3,4	Sorbent resins	36	Thermal desorption, trap, GC/MS	A101a
		1,2,3,4	Condensate	12	Purge and trap, GC/MS	A101a, A101
HCl	Stack gas M5	1,2,3,4	Condensate H_2O combined with impinger NaOH solution	12	Ion specific electrode	Orion Manual
Particulates	Stack gas M5	1,2,3,4	Probe rinse residue, filter	12	Gravimetric	EPA Method 5
O_2, CO_2	Stack gas M5	1,2,3,4	Stack gas	-	Integrated bag samples for ORSAT analysis every 30 min	EPA Method 3
O_2	Secondary Chamber	1,2,3,4	Combustion gas	b	Gas analysis by electrochemical cell (Thermox WDG-III)	
CO_2, CO	Adsorber exit gas	1,2,3,4	Combustion gas	b	Gas analysis by IR detector (Foxboro-Wilks Miran II)	

[a]"A" refers to Sampling and Analysis Methods for Hazardous Waste Combustion, EPA-600/8-84-002, February 1984.
"ASTM" refers to American Society for Testing Material Standards.
"SW" refers to Test Methods for Evaluating Solid Waste, SW 846, Second Edition, July 1982.
"EPA" refers to New Source Performance Standards, Test Methods and Procedures, Appendix A, 40 CFR 60.
"EPA M" refers to Chemical Analysis of Water and Wastes, EPA-600/4-79-020.
[b]Continuous monitoring.

D229-LA-T-4

3. Analytical Procedures

The analyses planned for each trial burn sample are listed in Table 3. The procedures and reference methods for these analyses are summarized in Table 4. The standard methods referenced for heat content, ash content, elemental composition, organic chlorine, and stack gas O_2, CO_2, and particulates are self-explanatory. Analysis of samples for CCl_4 will be by the methods referenced in EPA-600/8-84-002. These methods involve the use of standard purge-and-trap, gas chromatography (GC/MS) techniques for identification and quantification of volatile organics. Copies of referenced procedures are included as Attachment E.

4. Monitoring

Monitoring for CO will be done during the trial burn tests using a Foxboro-Wilks Miran II Infrared analyzer [See Section D-5b(2)(b)7].

D-5b(2)(d) Detailed Trial Burn Protocol

1. Waste Characterization

The CAI will be used to incinerate the Los Alamos laboratory waste. The laboratory wastes are a mixture of liquid and solid hazardous wastes composed of various organic solvents and liquids as well as chemically contaminated paper, wood, and plastics. The liquids are basically small quantity lab chemicals which will be transferred from lab size containers into larger containers and stored until ready to be incinerated. Laboratory liquids can contain either ignitable or U or P listed wastes containing Appendix VIII constituents.

Because the laboratory liquid wastes include numerous small bottles which are generated in a random fashion it is impossible to identify and quantify the Appendix VIII constituents by a sampling program. The POHC has therefore been selected based on an approach suggested by the EPA and discussed in the next section.

2. POHC Selection Rationale

In selecting the principal organic hazardous constituent (POHC) to be used in the CAI solids and liquids trial burn, several criteria were considered

important for various reasons. Trade-offs or constraints imposed by these criteria were carefully evaluated in selecting the compound.

Thermal stability of organic compounds must be considered in examining the behavior of organic compounds in a combustion unit. EPA's approach to trial burns is to specify POHCs of high thermal stability so that results can be extrapolated to compounds of similar or lower thermal stability. According to the EPA's Guidance Manual for Hazardous Waste Incinerator Permits, heat of combustion is the EPA's preferred indicator of thermal stability.[1] Accordingly, compounds with low heats of combustion (ΔHc) were given priority consideration in the POHC selection process. Since it is important to obtain as flexible a permit as possible, artificial wastes containing carbon tetrachloride (CCl_4) are proposed as the POHC during the trial burn. This option is suggested in the March 1983 draft of the EPA's Guidance Manual for Hazardous Waste Incinerator Permits. The Guidance Manual makes the following statement relative to the use of artificial wastes[2]:

> "Using an artificial waste feed has the advantage of simplifying the analytical procedures because interference by organics other than the POHCs is greatly reduced. This approach also allows the applicant to create waste feed that is very difficult to burn. A successful trial burn conducted with such a waste feed results in permit conditions allowing the operator to accept a wide variety of wastes for treatment, perhaps eliminating any future need for permit modifications and additional trial burns."

Carbon tetrachloride has a very high rank (fourth highest) on the EPA's ranking list of the incinerability of organic hazardous constituents on the basis of heats of combustion. Carbon tetrachloride has also been shown by the University of Dayton Research Institute to have a very high vapor phase thermal oxidation stability[3]. Therefore, CCl_4 is proposed for use as the POHC in both the solids and liquid trial burns.

Spiking the waste with CCl_4 will also provide a source of organic chlorine which will give maximum permit flexibility relative to the HCl performance standard. Los Alamos therefore recommends that CCl_4 be designated as the trial burn POHC.

The approximate composition and analytical parameters of the trial burn liquid and solid wastes are given in Tables 5 and 6. The values in Tables 5 and 6 are estimates.

3. Trial Burn Protocol and Operating Conditions

The trial burn will consist of four tests. Each trial burn will include triplicate sampling runs. A total of 12 sampling runs will be done. Table 7 presents the test protocol and schedule for each of these trial burn tests and 12 runs.

4. Waste Constituents

a. Liquid Wastes -- Trial burn tests 1 and 2 will involve the incineration of a liquid blend of fuel oil and carbon tetrachloride (CCl_4) as a suggested POHC in the primary chamber waste burner. The liquid blend will also be spiked with an ash surrogate which will generate particulate during incineration. The liquid waste will be spiked with an ash surrogate in order to obtain a more flexible RCRA liquid incineration permit relative to waste ash content. [See D-5b(2)(d) 8.] The viscosity of the liquid blend will be dependent on the characteristics of the blend of #2 fuel oil, CCL_4, and the ash surrogate. The ash surrogate may increase the viscosity of the blend substantially. Los Alamos will not burn material with a viscosity greater than 500 SSU at in injection temperature in order to ensure proper atomization. The approximate characteristics of the liquid waste blend are summarized in Table 5. The trial burn operating conditions are summarized in Table 8.

b. Solids Wastes -- Trial burn tests 3 and 4 will involve the incineration of sawdust and CCl_4. The CCl_4 was selected as a suggested POHC for the solids trial burn tests because of its commercial availability and high ranking on the EPA's heat of combustion hierachy. Because of CCl_4's high volatility, however, the CCl_4 will be fed to the incinerator in sealed containers. The sealed containers of CCl_4 and the sawdust will be placed in 1 foot X 1 foot X 2 foot cardboard boxes, weighed, and fed

Table 5. Approximate Estimated Composition of Trial Burn Waste Liquid[a]

	Wt%	
Composition		
Carbon tetrachloride	60-65	
Fuel oil	35-40	
Heat value		~7,000 Btu/lb
Organic chlorine content	55-60	
Ash content	2[b]	
Viscosity	< 500 SSU[c]	

[a]This is the CCl_4 spiked waste liquid which will be incinerated during the trial burn.

[b]An ash-producing material, aluminum stearate or other organometallic compound, will be added to the liquid waste blend as an ash surrogate.

[c]At injection temperature.

Table 6. Approximate Estimated Composition of Trial Burn Solid Waste

	Wt%
Composition	
Carbon tetrachloride	20-25
Sawdust	75-80
Organic chlorine content	20-25

Table 7. Test Protocol and Schedule

Trial Burn Test	Run No.	Sampling[a] Run Duration(hr)	Waste Feeds/POHCs Trial Burn Tests: Liquid[b] Waste	Solid[c] Waste	Natural[d] Gas	Stack Testing: DRE	Particulate	HCl
1	1 - 1	5 - 6	CCl_4		X	X	X	X
	1 - 2	5 - 6	CCl_4		X	X	X	X
	1 - 3	5 - 6	CCl_4		X	X	X	X
2	2 - 1	5 - 6	CCl_4		X	X	X	X
	2 - 2	5 - 6	CCl_4		X	X	X	X
	2 - 3	5 - 6	CCl_4		X	X	X	X
3	3 - 1	5 - 6		CCl_4	X	X	X	X
	3 - 2	5 - 6		CCl_4	X	X	X	X
	3 - 3	5 - 6		CCl_4	X	X	X	X
4	4 - 1	5 - 6		CCl_4	X	X	X	X
	4 - 2	5 - 6		CCl_4	X	X	X	X
	4 - 3	5 - 6		CCl_4	X	X	X	X

[a]Includes incinerator equilibration time and equipment change-over time between runs.

[b]Blend of fuel oil and CCl_4.

[c]Sawdust and CCl_4.

[d]As required to maintain primary and SCC temperatures.

Table 8. Trial Burn Operating Conditions[a]

Trial Burn Test	Physical Forms	Waste Feed Rates Solid (lb/hr)	Waste Feed Rates Liquid (lb/hr)	Heat Value (Btu/lb)	HCl (lb/hr)	Temperatures (°F) Primary	Temperatures (°F) SCC
1	Liquid		250-300	~ 7,000	150-185	1,600	1,800
2	Liquid		250-300	~ 7,000	150-185	1,600	2,000
3	Solid	250-300		-	60-75	1,600	1,800
4	Solid	250-300		-	60-75	1,600	2,000

[a]The values given in this table are estimates which may vary during actual operation.

to the incinerator by a ram feed or on a timed cycle. This is the present procedure for feeding most solid wastes to the CAI C [see Section D-5b(2)(b)10C]. The approximate composition of the solid waste in shown in Table 6. The trial burn operating conditions are shown in Table 8. The CCl_4 in plastic bottles simulates a lab solid waste which contains CCl_4 in a plastic bottle.

5. Combustion Temperature Ranges

The combustion temperatures for the tests will be 1600°F for the primary, and 1800 and 2000°F for the SCC as indicated in Table 8. Combustion temperatures are normally controlled to within 50°F. It is expected that this range will prevail for the trial burn.

6. Waste Feed Rates

The waste feed rates for trial burn test runs 1 through 4 are summarized in Table 8.

7. Combustion Gas Velocity

The measured indicator of combustion gas velocity during the trial burn will be the combustion gas flow through the Fluidics HHR flowmeter [See Section D-5b(2)(b)7C].

8. Waste Feed Ash Content

In order to obtain permit flexibility relative to the waste liquid ash content, an ash-producing material, aluminum stearate or other organo-metallic compound, will be added to the waste liquid before it is fed to the incinerator.

9. Auxiliary Fuel

Natural gas will be used as an auxiliary fuel as required to maintain temperatures, in both the primary and secondary combustion chambers.

10. Scrubber Water

Recycle water sumps will be sampled after each sampling test and will be flushed clean within practical limits before the next sampling test.

D-5b(2)(e) Trial Burn Schedule

1. Schedule

The trial burn is planned to begin within 6 months of the time that Los Alamos receives EPA approval for the Part B Permit application. The schedule for the test is shown in Table 9.

2. Duration of Each Trial Burn Test

Four trial burn tests are planned, each consisting of three replicate sampling runs. Each sampling run will last about 3 hours for a total of 9 hours per trial burn test. The incinerator will be fed test wastes for 2 to 3 hours before each sampling run for a total of 5 to 6 hours per test. This will establish steady operating at process test conditions. Sampling will be done 24 hours per day using two sampling shifts. Assuming minimal interruption of incinerator operation, the incinerator is therefore expected to operate on test waste feeds for 24 hours per day for about 3 days.

3. Quantity of Waste to Be Burned

Test waste liquids and test waste solids will each be fed to the incinerator for an estimated 30 to 36 hours. Allowing a 25 percent safety factor the consumption of test wastes is expected to be about 1,250 gallons of waste liquid and 13,500 pounds of waste solids. The CAI will be operating on normal wastes under interim status prior to and following the tests. It is expected that the unit will be equilibrated at test conditions with normal waste or auxiliary fuel and switched to the test waste two to three hours before the start of each sampling run. A surplus of test waste will be prepared in case operational problems require a longer testing period. Unused waste will be incinerated at the conclusion of the tests. The amount of POHC (CCl_4) present in the liquid and solid wastes is expected to be about 12,150 pounds.

Table 9. Test Schedule

Test	Sampling Run No.[a]	Day
1	1-1	1
	1-2	1
	1-3	1
2	2-1	1
	2-2	2
	2-3	2
3	3-1	2
	3-2	2
	3-3	3
4	4-1	3
	4-2	3
	4-3	3

[a]Each sampling run will be about 3 hrs long, preceded by a 2 to 3 hr equilibration period and equipment change-over period.

D-5b(2)(f) Trial Burn Permit Objectives

If the RCRA DRE, particulate, and HCl performance standards (40 CFR 264.343) are achieved during the trial burn as outlined in Table 8, the RCRA incineration operating permit should allow the Controlled Air Incineration System to be used to incinerate RCRA hazardous solid and liquid wastes at the rates and conditions discussed in this section [D-5b(2)(f)].

The expected RCRA incineration permit conditions discussed in this section are based on the March 1983 "Guidance Manual for Hazardous Waste Incinerator Permits," prepared by the U.S. EPA's Office of Solid Waste.

The expected RCRA permit conditions are discussed in the following pages and summarized in Table 10.

1. Anticipated RCRA Permit Conditions for Solid Wastes
   The following expected permit conditions will be based on waste characteristics:

   a. Appendix VIII Constituents -- Since the solids in trial burn tests 3 and 4 will contain CCl_4, the system permit should allow the incineration of wastes containing CCl_4 and any other Appendix VIII Constituent lower on the EPA's Ranking of Incinerability List. Only three Appendix VIII Constituents at levels above 1000 ppm would not be allowed: $CFCl_3$, $CHBr_3$, and CF_2Cl_2.

   b. Minimum Heat Value -- There should be no permit requirement that specifies a maximum or minimum solids, sludge or slurry heat value. The minimum heat value concept, while relevant to organic liquid, is not relevant to low heat value solids such as contaminated soils. To quote the March 1983 Guidance Manual:

      "However, in the case of solids fed to rotary kilns, hearths and other solids handling incineration equipment, a different approach to specifying a heating value for waste is needed. Many solid wastes, by their very nature, are subject to wide variations in heating value, and rotary kiln, hearth, and similar incinerator designs attempt to deal with this problem. Such designs provide

Table 10. Summary of Expected Permit Conditions

Content/Physical Form	Type of RCRA Permit: Solid	Type of RCRA Permit: Liquid	Comments
POHCs	CCl_4	CCl_4	
Trial burn tests	3-4	1-2	
Appendix VIII constituents	CCl_4	CCl_4	NPC = Not permit condition
Minimum Btu/lb	NPC	7000	
Max. organic chlorine (lb/hr)	180[a]	180	Total for liquid/solid and aqueous wastes
Maximum ash content (wt%)	NPC	2	Total ash for liquid and aqueous
Temperature			
Primary (°F)	1550-1600	1550-1600	
SCC (°F)	1750-1800	1750-1800	
Maximum primary chamber thermal duty (MM Btu/hr)	2	2	
Maximum primary chamber natural gas (MM Btu/hr)	NPC	NPC	
Water injection rate	NPC	NPC	
Liquid feed rate	NPC	NPC	
Solid waste feed rate	NPC	NPC	

[a]- All numerical values are estimates which will be finalized by the trial burn results.

> for the volatiles in the solids to be vaporized and subsequently destroyed in an afterburner or secondary combustion chamber. Thus in specifying heating values for solid waste feeds, a lower heating value limit may not be required if the incinerator is equipped and operated to maintain sufficient temperature by addition of liquid waste or auxiliary fuel."

Since the CAI has auxiliary fuel firing capability in both the primary and SCC chambers, the CAI should not have a heat value permit condition for solids incineration.

c. Maximum Organic Chlorine Content of Waste -- The maximum permitted pounds per hour of waste organic chlorine should be based on the trial burn results. If the CAI's air pollution control system for example removes 185 pounds of HCl per hour, then the permit condition should allow the CAI to incinerate up to 180 pounds of organic chlorine per hour in the combined liquid and solid waste feeds. Since the source of the HCl is irrelevant to the performance of the air pollution control equipment, the permit should allow 180 pounds of organic chlorine per hour to be incinerated either as all liquid or solid or any combination of liquid and solid.

d. Maximum Ash Content of Waste -- There should be no solids ash content permit condition for the CAI. Particulate emissions will be measured during both solids trial burn tests. If the particulate emissions are at or below RCRA regulations, this testing should be considered as an acceptable particulate test for all solid wastes and sludges. When considering particulate emissions, it should be realized that for the CAI, the ash content of the liquid wastes is more important to particulate generation and emissions than is the ash content of the solid wastes being incinerated.

e. Physical Form -- The physical form given in the RCRA solid hazardous waste permit should specify solids, sludges, and slurries.

f. Incinerator Operating Permit Conditions -- The following permit conditions are anticipated to be based on the incinerator operating conditions during the trial burn tests:

- Temperature - Table 8 summarizes the temperature conditions for the solids trial burn tests.

- Maximum Thermal Duty - A maximum primary chamber thermal duty permit condition based on the trial burn results is desirable so that the permit will allow the incineration of any combination of aqueous, liquid, and solid/sludge wastes with a total thermal duty equal to the maximum permitted duty. The March 1983 version of the Guidance Manual covers this situation in Section 5, Example 2. On page 5-10, the Guidance Manual discusses a case in which 1MM Btu/hr of solid wastes and 1.2 MM Btu/hr of liquid wastes are successfully incinerated. The Guidance Manual then goes on to state that hazardous wastes containing more readily incinerated Appendix VIII Constituents than those tested may be fed in greater amounts, provided that the total thermal input is less than 2.2 MM Btu/hr and the other permit restrictions on waste composition are satisfied. Since no waste will be fired in the secondary combustion chamber (SCC), the maximum thermal duty should only apply to the primary chamber.

- Natural Gas Feed Rate - During the incineration of solid wastes, the only permit limit on natural gas feed rate should be the maximum thermal duty. Natural gas feed rate can vary from near zero up to the maximum permitted thermal duty. When incinerating solids, the rate of liquid fuel or liquid waste fired in the primary chamber is not the important criterion. What is important is the outlet temperature of the primary chamber combustion gas, which is controlled by a permit condition at a minimum level. This situation is covered on page 4-6 of the March 1983 Guidance Manual. The Manual states that the net effect of specifying the total thermal input is to permit the substitution of easily incinerated waste (higher waste heat value) for auxiliary fuel when specified operating conditions, such as combustion zone temperature and air feed rate, are maintained.

- Liquid Waste Feed Rate - As previously stated for the natural gas feed rate, the Guidance Manual states on page 4-6 that more easily incinerated wastes (constituents lower than CCl_4 and waste heat values greater than 7000 Btu/lb) can be permitted at rates up to the maximum permitted thermal duty of the primary chamber.

- Solid Waste Feed Rate - The only permit conditions related to the solid waste feed rate should be the maximum allowable primary chamber thermal duty and the primary chamber and SCC temperatures. As long as these

permit conditions are met, organic solid wastes should be destroyed at the DRE levels specified in the RCRA regulations.

g. Other Permit Conditions -- Other expected permit conditions such as stack carbon monoxide concentration and combustion gas velocity indicator are not discussed in this section. These conditions will be established when the results of the trial burn tests are evaluated.

2. Anticipated RCRA Permit Conditions for Liquid Wastes
The following anticipated permit conditions will be based on waste characteristics:

a. Appendix VIII Constituents -- Since the liquid waste trial burn tests 1 and 2 will contain CCl_4, the incineration system should be permitted to incinerate CCl_4 and all other Appendix VIII Constituents lower on the EPA's Ranking of Incinerability List. Only three Appendix VIII Constituents at levels above 1000 ppm would not be allowed: $CFCl_3$, $CHBr_3$, and CF_2Cl_2.

b. Minimum Heat Value -- A minimum heat value of about 7000 Btu/lb (see Table 10) for the liquid waste mixture is an anticipated permit condition.

c. Maximum Organic Chlorine Content of Waste -- The maximum permitted pounds/hour of waste organic chlorine should be based on the trial burn results. If the CAI's air pollution control system removes 185 pounds of HCl per hour, then the permit condition should allow the CAI to incinerate up to 180 pounds of organic chlorine per hour in the combined liquid and solid waste feeds. Since the source of the HCl is irrelevant to the performance of the air pollution control equipment, the permit should allow 180 pounds of organic chlorine per hour to be incinerated in either all liquid wastes or all solid wastes or any combination of liquid and solid wastes.

d. Maximum Ash Content of Waste -- The maximum permitted liquid waste ash content should be based on the ash content of the liquid wastes incinerated during trial burn tests 1 and 2.

e. Physical Form -- The physical form specified in the RCRA liquid hazardous waste permit should be liquid organic and aqueous wastes.

f. Incinerator Operating Permit Conditions -- The following anticipated permit conditions are based on the proposed incinerator operating conditions during the liquid trial burn tests:

- Temperature - Table 8 summarizes the temperature conditions for each liquid trial burn test.

- Maximum Thermal Duty - Los Alamos expects to obtain a maximum thermal duty permit condition based on the trial burn results that allows the incineration of any combination of liquid, aqueous, and solid/sludge wastes with a total thermal duty equal to the maximum permitted duty (see previous discussion on maximum thermal duty).

- Water Feed Rate - There should be no special permit restriction on the feeding of contaminated or non-contaminated water into the primary chamber. The previously quoted statement from page 4-6 of the Guidance Manual covers water injection. The statement " . . . specified operating conditions, such as combustion zone temperature and air feed rate, are maintained." indicates that as long as the total thermal duty and CAI combustion zone temperature are maintained, the water feed rate is irrelevant. When too much water is injected, it will be impossible, for example, to maintain combustion temperature at a specified thermal duty.

  Relative to the destruction of hazardous constituents in contaminated water, volatilization of CCl_4 from the solid waste in the primary chamber and volatilization of CCl_4 from a contaminated water are essentially equivalent processes. The CCl_4 that is volatilized from solid wastes or injected water would be subjected to essentially the same combustion temperature, gas mixing, and residence time in the SCC. Since CCl_4 volatilized from both matrices will be subjected to the same SCC combustion conditions, both the RCRA solid and RCRA liquid permits should allow the incineration of contaminated water that is injected into the primary chamber. Permit justification will be the successful

demonstration of the flameless oxidation of CCl_4 in the solids trial burn tests 3 and 4. Contaminated water means a liquid containing no less than 90 weight percent of water in which the organic contaminant, if any, is CCl_4 or falls below CCl_4 on the RCRA Ranking of Incinerability List.

- Natural Gas Feed Rate - During the incineration of liquid wastes, the only limit on natural gas feed rate should be the maximum thermal duty. Natural gas feed rate can range from zero to the maximum permitted thermal duty.

- Liquid Waste Feed Rate - As previously stated for the natural gas feed rate, the Guidance Manual states on page 4-6 that more easily incinerated wastes (constituents lower than CCl_4 and waste heat values greater than 7000 Btu/lb) can be permitted at rates up to the maximum permitted thermal duty of the primary chamber.

g. Other Permit Conditions -- Other expected permit conditions such as stack carbon monoxide concentration and combustion gas velocity indicator are not discussed in this section. These will be established when the results of the trial burn tests are evaluated.

D-5b(2)(g) Description and Planned Operating Conditions for the Emissions Control Equipment

The emissions control equipment is described in Section D-5b(2)(b)7. The operating condition ranges for normal operation and the trial burn are summarized in Table 11. During operation the system water flow rates and pressure drops typically fluctuate over a normal range, and these fluctuations are also expected to occur during the trial burn.

D-5b(2)(h) Shutdown Procedures

Procedures for shutting down the waste feed are described in Section D-5b(2)(b)(6).

These procedures will be in effect during trial burn tests 1 through 4 while feeding the waste liquid and solids.

D-5b(2)(i) Site Clean-Up

After the trial burn program is completed, all residual wastes or POHC that remain will be destroyed. Assuming that incineration operations went smoothly

based on on-site observations, and that preliminary analytical results are positive (e.g., as indicated by low CO values), Los Alamos will destroy any trial burn residual wastes in the CAI system. The unit will be operated at a primary temperature of 1600°F and a SCC of 1800°F during the incineration of any residual wastes.

D-5b(2)(j) Quality Assurance Plan

The Quality Assurance Project Plan is given in Attachment A.

D-5c Data in Lieu of Trial Burn

Los Alamos seeks an operating permit by way of an additional trial burn of a principal organic hazardous constituent with a high degree of difficulty of incineration, and will not submit results of earlier successful trial burns of hazardous wastes as justification for the permit.

D-5d Post Trial Burn Operation

The interim period between completion of the trial burn and receipt of final approval from EPA for full operating authority could be several months. During this time, Los Alamos intends to continue operating the incineration system on a full-time basis, operating under all state and federal requirements as per 40 CFR 265. All appropriate operating records will be maintained for documentation of operating conditions during this interim period.

D-5e Incinerator Inspection

The incinerator will be visually inspected daily during operation for fugitive emissions, leaks, and associated equipment, spills, and signs of tampering, as per 40 CFR 264.347(b).

D-5f Emergency Waste Feed Cut-Off Testing

During permitted operation the emergency waste feed cut-off system and associated alarms as described in D-5b(2)(b)6 will be tested, as per 40 CFR 264.347(c) on a monthly basis during periods of operation in order not to unduly restrict or upset operations. If the CAI is not routinely operating, the emergency waste feed cut-off system will be tested before start-up of the CAI, but not necessarily on a monthly basis.

Table 11. Planned Operating Conditions for the Emissions Control System During the Trial Burn

Equipment	ΔP Range (in. w.c.)
Quench chamber	0-2
Venturi	40-70
Packed bed	1-8

D-5g Record Keeping

A written operating log will be kept at the CAI facility as per Appendix I of 40 CFR Part 264 and 40 CFR 264.73(b).

D-5h Performance Test Determination

Trial burn results and determinations will be provided after they become available and have been displayed in a report format.

REFERENCES

1. Guidance Manual for Hazardous Waste Incinerator Permits, U.S. EPA, Office of Solid Waste, Washington, D.C., March 1983 Draft, page 2-15.

2. Ibid, pages 2-37 and 2-38.

3. Dellinger, B., J. Torres, W. Rubey, D. Hall, J. Graham, and R. Carnes, "Determination of the Thermal Stability of Selected Hazardous Organic Compounds," paper presented at the Ft. Mitchell, Kentucky Hazardous Waste Conference, April 1984.

ATTACHMENT A
QUALITY ASSURANCE PROJECT PLAN

ATTACHMENT A

QUALITY ASSURANCE

The Los Alamos National Laboratory will conduct the trial burn for its Controlled Air Incinerator System and will subcontract to selected qualified firms the stack sampling and the sample analysis operations. The selected firms will be required to submit the Quality Control procedures they will use for their activities.

A. Stack Sampling

An EPA Method 5 train will be used for determining particulates and acid gas. A volatile organic sampling train (VOST) will be used to collect the samples for the POHC, carbon tetrachloride, analysis. All EPA quality assurance requirements specified for these methods (pitot tube and gas meter calibrations, glassware cleaning, sample bottle and trap preservations, and reagent source) will be in effect.

B. Monitoring Equipment

The incineration and offgas systems are equipped with extensive monitoring and control devices. The critical elements will be checked regularly and calibrated to assure operability and reliability.

Prior to the run, on-line monitors, including analyzers for O_2, CO_2, and CO, will be zeroed and calibrated using the appropriate techniques. CO-CO_2 monitors will be calibrated with a zero gas, full-span gas, and a mid-range gas and the calibration will be checked at least daily during the burning of test materials.

C. Analytical

Extraction efficiency for carbon tetrachloride from the VOST resin and water condensate will be established. The precision and accuracy for the instrumental analysis for carbon tetrachloride will be established.

A comprehensive program, about 10 percent of the analytical samples, will be developed for split samples and for field and laboratory blanks. Standard grade chemicals will be obtained and used to spike samples for procedure verification and instrument standardization.

D. Records

Sample records will be maintained in a bound pre-numbered notebook. The records consist of the unique sample identification number, the sample type (impinger solution, ash, etc.), sample location, date, time, and initials of the operator who collected the sample. Analytical results were entered in the notebook when received.

Sample chain of custody procedures will be followed. Figures 1, 2, and 3 are examples of the type of records that will be maintained.

D258-APPA

(NAME OF SAMPLING ORGANIZATION)

SAMPLE DESCRIPTION _____

PLANT: _____ LOCATION: _____

DATE: _____

TIME: _____

MEDIA: _____ STATION: _____

SAMPLE TYPE: _____ PRESERVATIVE: _____

SAMPLED BY: _____

SAMPLE ID NO.: _____ - _____ - _____ - _____

LAB NO. _____

REMARKS

Figure 1. Example of General Sample Label

W/O No. _____ Page____

FIELD TRACKING REPORT: _____-_____
(LOC-SN)

FIELD SAMPLE CODE (FSC)	BRIEF DESCRIPTION	DATE	TIME (s)	SAMPLER

Figure 2. Sample of Field Tracking Report Form

W/O No. _____ Page ____

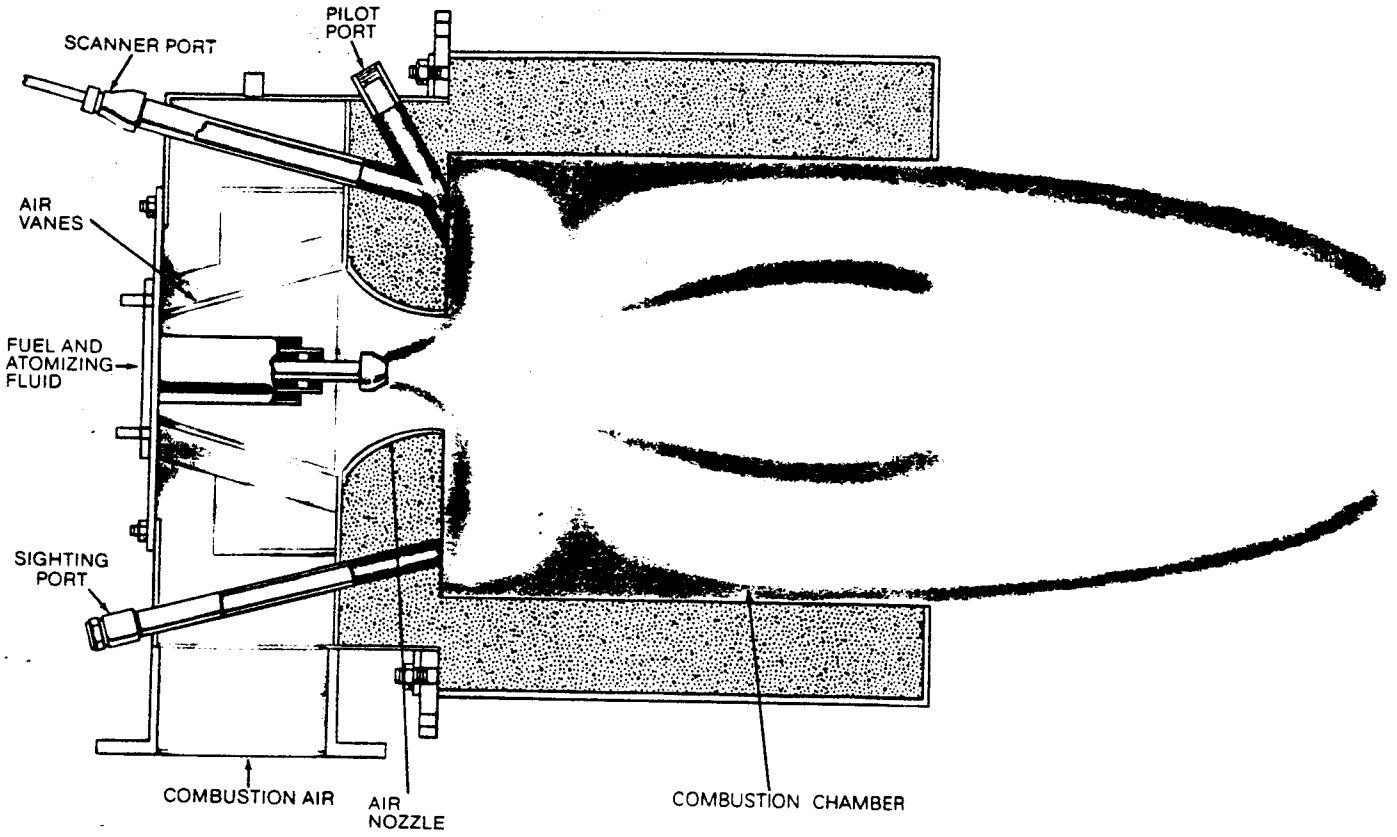
LAB TRACKING REPORT: _____ - _____ - _____
(LOC-SN-FSC)

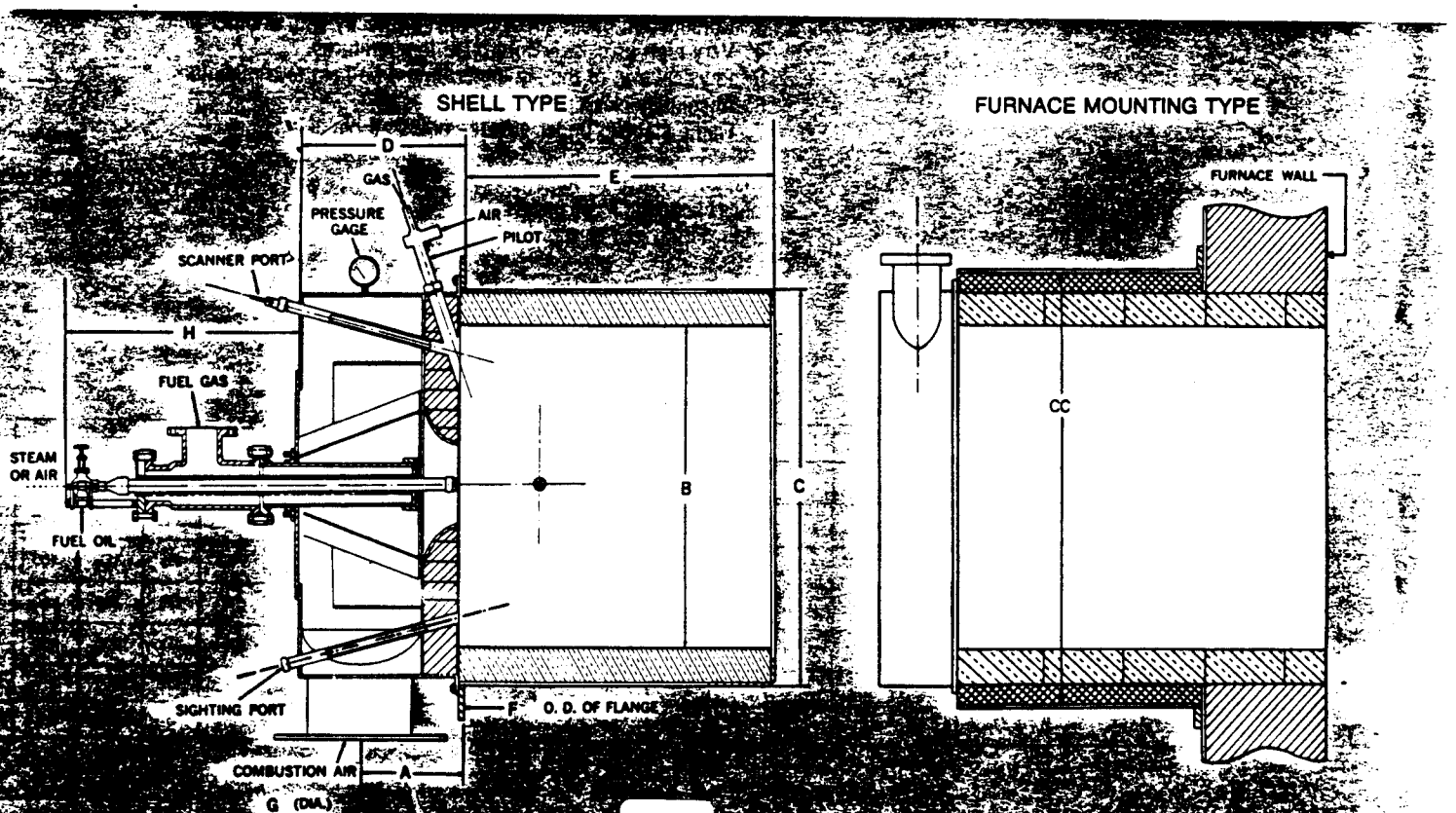
FRACTION CODE	X	PREP/ANAL REQUIRED	RESPONSIBLE INDIVIDUAL	DATE DELIVERED	DATE COMPLETED

Figure 3. Sample of Lab-Tracking Report Form

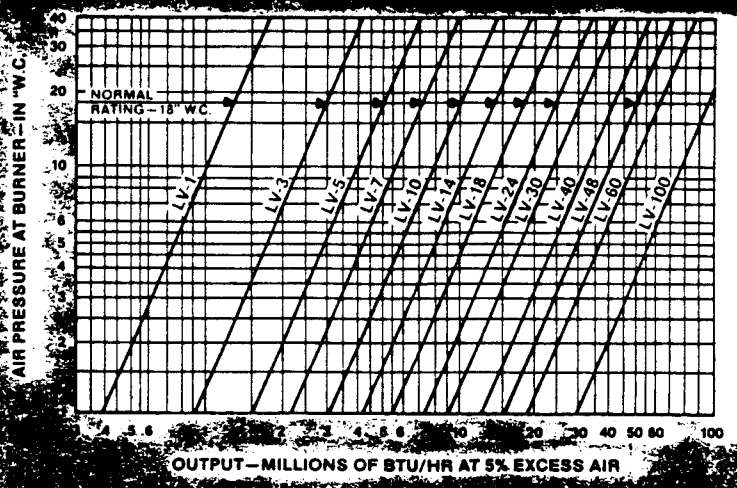
ATTACHMENT B
BURNER INFORMATION

LV VORTEX combination burner





Standing downstream looking into the flame produced the inspiration for the name Vortex burner. The whirling vortex of flame is awesome. Vortex action begins where combustion air is blown tangentially into the burner windbox. High rotational energy is imparted as the air accelerates through swirl vanes, whirls its way through the air nozzle and bursts like a cyclone into the combustion chamber. Fuel, either gas or finely atomized liquid, is injected through the burner gun centered in the air nozzle. Extreme turbulence in the nozzle area provides excellent mixing of fuel with air. Mixing is intensified as hot gases recycle into the low pressure zone which exists along the centerline of the vortex flame. This recycle mixing also brings heat to the liquid fuel injection area and helps to speed up vaporization. Thus liquid fuel is vaporized, mixed with combustion air and recycled gases, and heated to ignition temperature almost instantaneously.

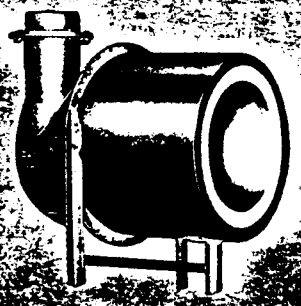


OUTPUT DATA — Trane Thermal Vortex burners are available in 13 standard models as shown. Turndown on liquid fuels is 3.5 to 1 from nominal high fire rating. Turndown on gaseous fuels is about 4 to 1. Burner curves shown are based upon furnace operation at standard atmospheric pressure with 5% excess air. Special designs may be supplied for unusual applications.

TRANE THERMAL VORTEX BURNER — High Outputs, Compact Design — Versatile Trane Thermal Vortex burners deliver outputs up to 100 MM Btu/hr. firing any liquid or gaseous fuel, separately or in combinations. Flame length is extremely short, about 1 to 1½ times the chamber diameter, with heat release rates upwards of one million Btu/hr. per cubic foot in the standard units. The Vortex can be fired horizontally or vertically. The high firing rates of single burners means that fewer burners are needed on some multiple burner applications simplifying and reducing the cost of controls. The compact design of the Vortex often permits space savings.

CHARACTERISTICS — Multi-Fuel — Vortex burners are capable of firing with fuel oils, all combustible gases (as low as 100 Btu/ft³.) and with combustible liquids (as low as 4500 Btu/lb.). These may be fired separately or in combination such as dual liquid, liquid-gas, or gas-gas. Special nozzle designs are available.

APPLICATIONS — Vortex burners are in service firing kilns, many types of dryers, process heaters and fired heat exchangers, incinerators and boilers. Where clean, really efficient combustion is mandatory, Vortex burners do the job.



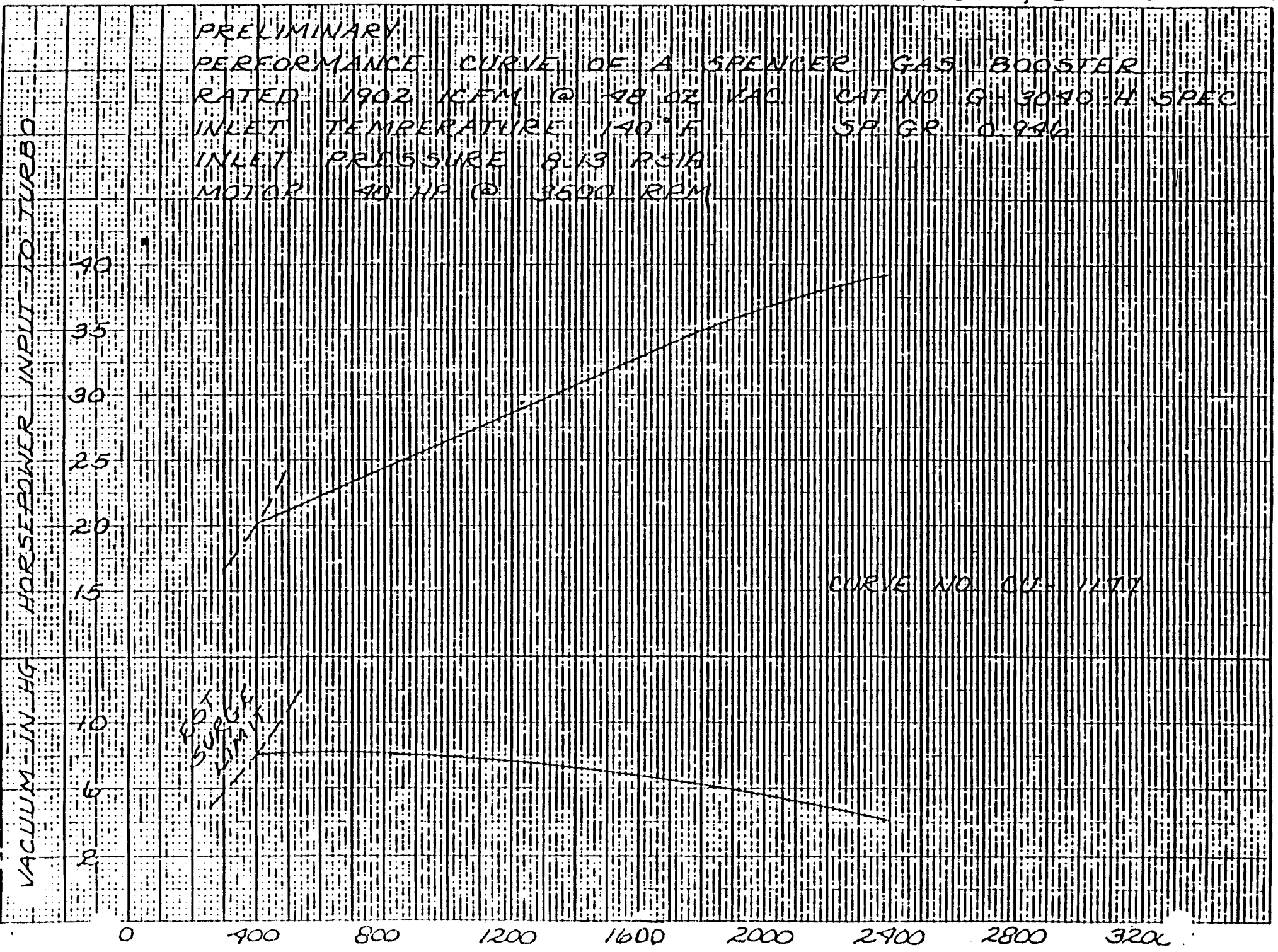
VORTEX BURNER

MODEL	MIL. of BTU/H	A	B	C	CC	D	E	F	G	H*	WT. LBS.
LV-1**	1.3	5¼	8½	12½	17	7 7/16	13⅛	16½	3	12½	161
LV-3	3	7⅛	15	24½	30¼	10¼	18 3/16	28	6	18⅛	900
LV-5	5	8 1/16	17¾	27	33	11 7/16	23 1/16	30½	6	20 3/16	1300
LV-7	7	8⅞	21	30¼	36¼	13¼	22 11/16	34	8	19⅛	1316
LV-10	10	9⅞	26	35¼	41⅜	15¼	27 3/16	39	10	19⅞	1826
LV-14	14	12¼	32	41¼	47⅜	19¼	30⅞	49⅜	12	20⅜	2621
LV-18	18	12¼	32	41¼	47⅜	19¼	30⅞	49⅜	12	28⅝	2822
LV-24	24	13	36	45¼	51⅜	20⅝	36	55	14	30⅝	3800
LV-30	30	13	42	51¼	57½	22 9/16	40	60½	16	30⅝	4250
LV-40	40	15¾	48	57¼	63⅝	25¾	48¾	66½	20	32	7130
LV-48	48	15¾	56	69½	75½	25¾	48¾	66½	20	32	8660
LV-60	60	21¾	63	82½	82½	34½	63	88½	24	38¾	18108
LV-100	100	30	84	102	108	48	84	108	36	42	24000

*Allow 24" for gun removal
**LV-1 air atomized only

ATTACHMENT C
FAN CURVE

THE SPENCER TURBINE CO.
WINDSOR, CONNECTICUT VLD

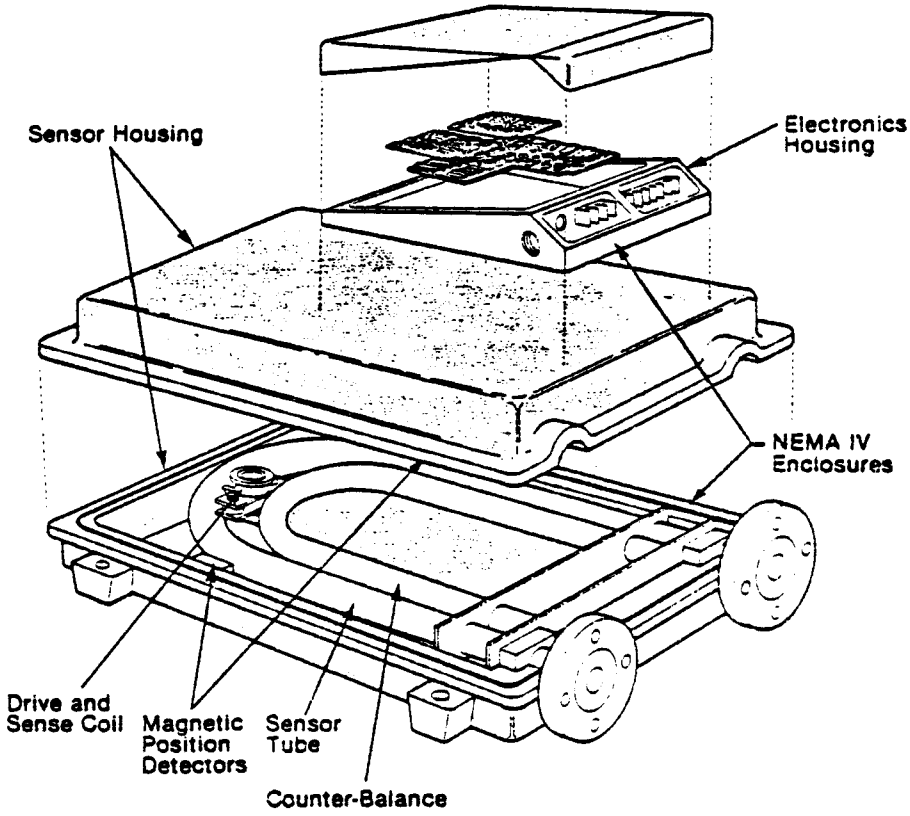


ATTACHMENT D
LIQUID WASTE AND CGVI FLOW METERS

Mass Flow Measurement by Micro Motion

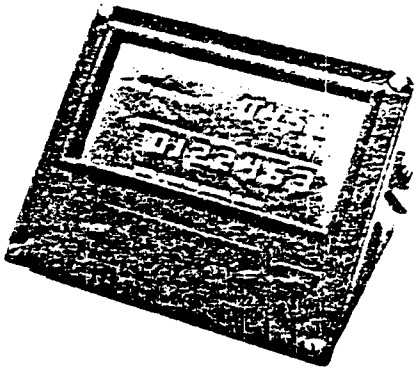
The flow sensor consists of a U-shaped tube which is vibrated at its natural frequency. The angular velocity of the vibrating tube in combination with the mass velocity of the flowing fluid causes the tube to twist. The amount of twist is measured with magnetic position detectors, producing a linear signal which is proportional to the mass flow rate of every particle passing through the U-shaped tube. The output of the meter is linearly proportional to mass flow rate and virtually unaffected by variations in fluid properties.

Physical Characteristics



Remote Flow Indicator D10-RT

The Micro Motion Model D10-RT is a digital flow indicator designed for use with Micro Motion Model C mass flow meters.



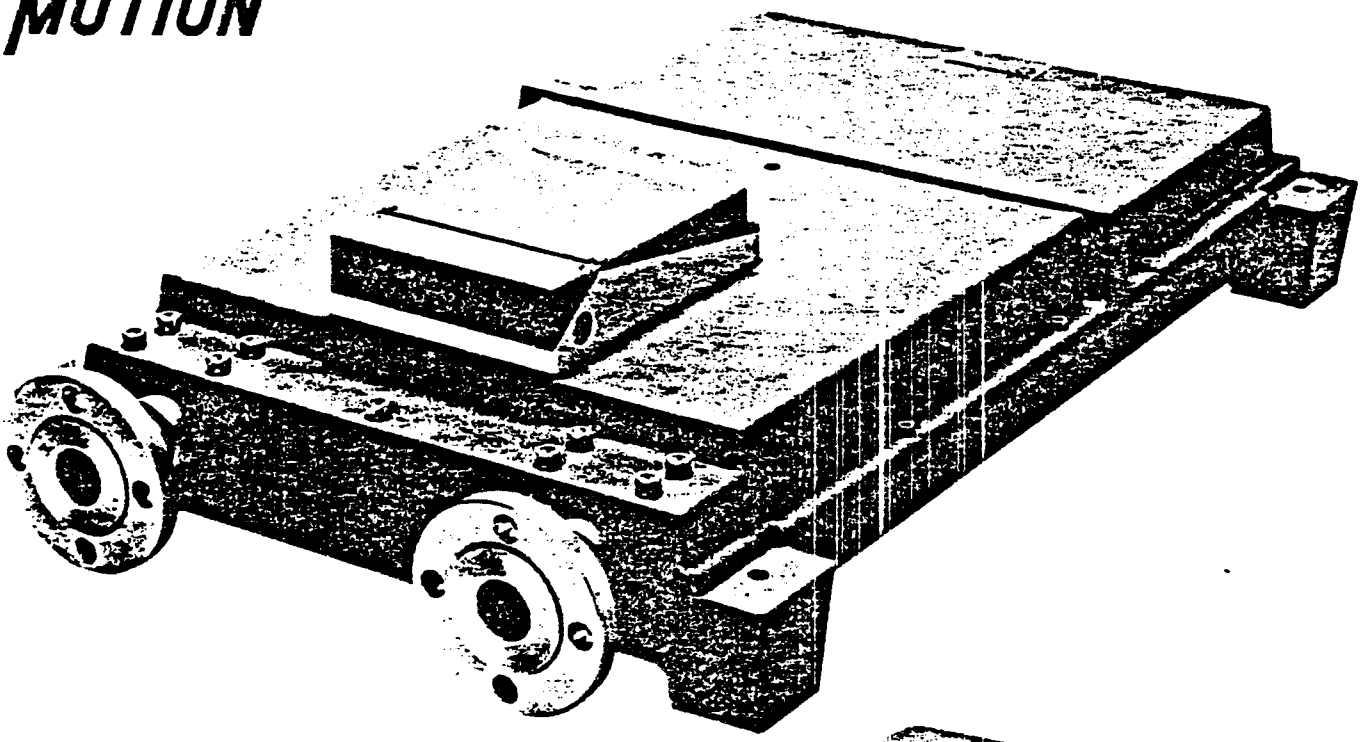
It converts the frequency of the meter output to a 4-digit flow rate indication, and a resettable, 7-digit totalizer displays the total flow. This compact and rugged instrument has a NEMA IV enclosure and can be operated on either AC or DC power.

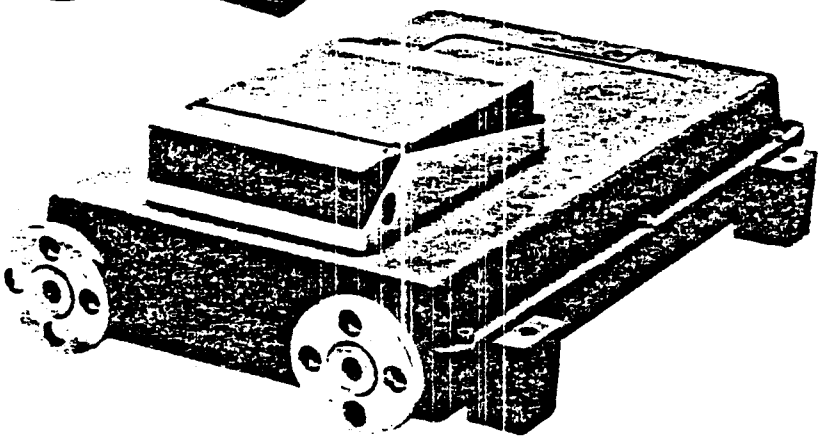
It may be set on a table top, mounted on a wall, or installed in a panel.

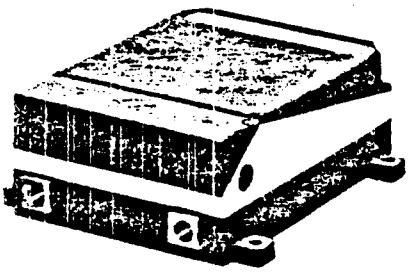
MICRO® MOTION

Model D Mass Flow Meters

MICRO® MOTION







Features

- Direct Mass Flow Measurement
- Non-Intrusive Sensor
- No Moving Parts
- Universal Calibration

Advantages

- Superior Accuracy
- Wide Range of Applications
- Reliable, Durable
- Simple Maintenance and Operation
- Factory Calibrated
- Easily Reranged in the Field

MICRO® MOTION

General Specifications

Accuracy	±0.4% of rate, ± zero stability*
Fluid Temperature Range	−67°F to 257°F (−55°C to 125°C)
Ambient Temperature Range	−40°F to 185°F (−40°C to 85°C)
Wetted Parts	316L stainless steel
Output Signal	
Analog:	0-20 mA or 4-20 mA, 500 Ω max load 0-5 VDC or 1-5 VDC, 100 kΩ min input
Frequency:	Max output adjustable 3-15,000 Hz Solid state switch, 30 VDC, 1 amp capability
Response Time	Adjustable 0.1 to 1.1 sec
Power	110 VAC, 220 VAC ± 10% or 24 VDC ± 20%, ≈8 watts

*Zero set at process temp. ±20°F

Detail Specifications

	Flow Range lb/min (kg/min)	*Zero Stability lb/min (kg/min)*	*Max Line Pressure Psi (bars)*	*Process Connections*	*Shipping Weight lb (kg)*	*Case Dimensions in (mm)*
Model C6	0-2.2 (0-1.0)	.0002 (.00009)	2000 (138)	¼" FNPT	11 (5)	*Models C6, C12 and C25* 8.63 (219) *L* 8.0 (203) *W* 3.48 (88) *H*
Model C12	0-13.5 (0-6.1)	.002 (.0009)	2000 (138)	¼" FNPT	11 (5)	
Model C25	0-90 (0-41)	.01 (.0045)	1000 (69)	¼" FNPT	11 (5)	
Model C50	0-440 (0-200)	.05 (.02)	2000 (138)	½" Flange*	53 (24)	*Models C50 and C100* 31.0 (787) *L* 15.0 (381) *W* 6.3 (100) *H*
Model C100	0-1600 (0-726)	.15 (.07)	1500 (103)	1" Flange*	53 (24)	
Model C150	0-2020 (0-916)	.2 (.09)	1500 (103)	1½" Flange*	175 (79)	*Models C150 and C200* 31.0 (787) *L* 21.5 (546) *W* 8.28 (210) *H*
Model C200	0-3200 (0-1450)	.3 (.14)	750 (52)	2" Flange*	185 (84)	

*Flanges are ASA 150 lb raised face slip ring

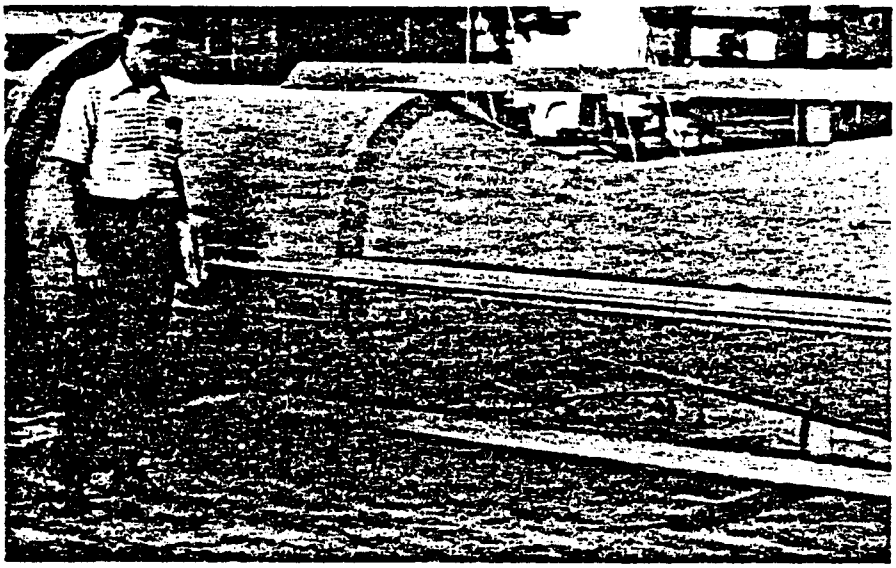
Options

Consult your local representative for information about the following options:

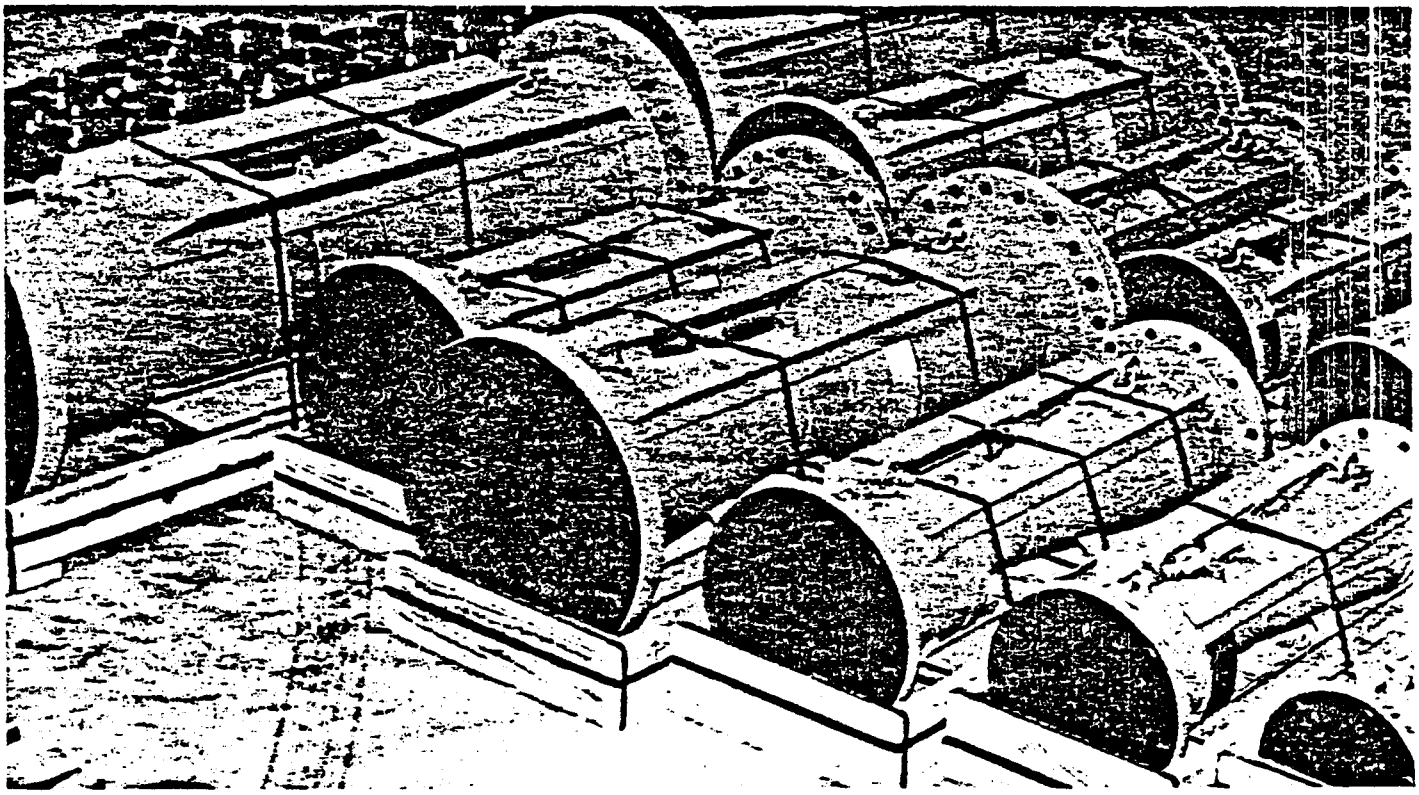
Expanded temperature range
Remote electronics
Corrosion resistant tubes
Abrasion resistant tubes
Expanded pressure ratings
Other process fittings
Intrinsically safe design, C6 - C200
(UL-Approved Models C12 - C200)

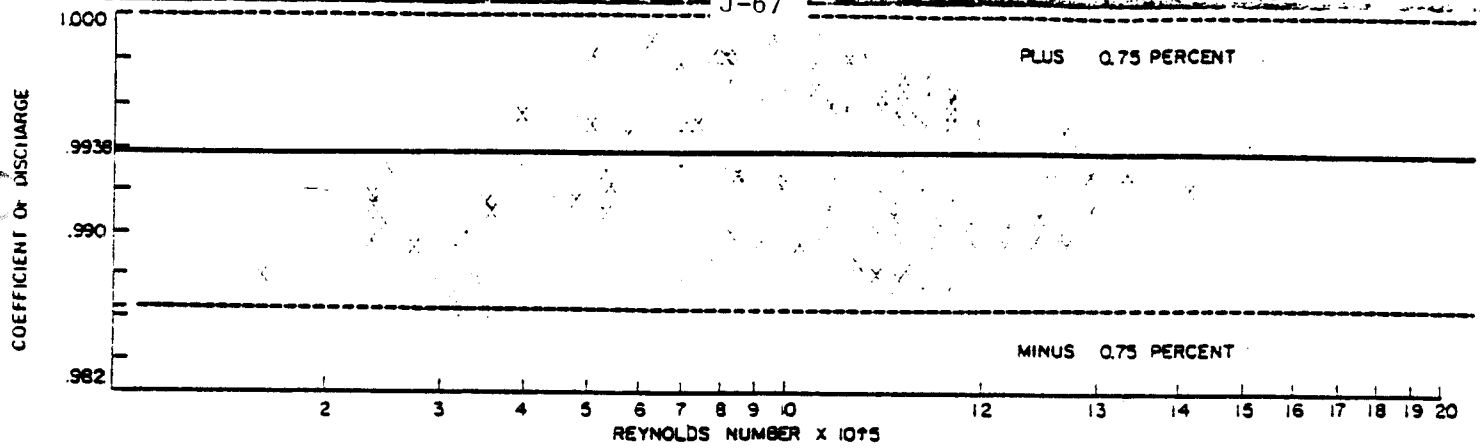
FLUIDIC'S HHR FLOW TUBE

- LOWEST OPERATING COST
- HIGHEST HEAD RECOVERY
- MORE EFFICIENT THAN AN ASME NOZZLE
- LOWEST UNCALIBRATED ERROR
- RUGGED FABRICATED CONSTRUCTION



The Fluidic Techniques, Inc. (FTI) High Head Recovery (HHR) Flow Tube is the most efficient differential producing flow measuring device available. The HHR Flow Tube provides significant savings in recurring operating costs over any other type primary flow element including the Venturi tubes. In addition to the low permanent loss, the HHR Flow Tube is probably the most efficient primary device available in terms of passing flow with an average coefficient of discharge of .9938. Calibration reports on the HHR Flow Tube consistently show less error than is present in the flow calibration of any other type of differential pressure producing primary flow element. These characteristics, combined with superior fabricated construction, make the HHR Flow Tube an ideal choice for flow measurement where accuracy, long life and low operating costs are important.





PLOT OF ACTUAL COEFFICIENT OF DISCHARGE VERSUS REYNOLDS NUMBER AS TAKEN FROM FLOW CALIBRATIONS OF THE ELLIPTICAL INLET FLOW TUBE AT BETA RATIOS VARYING FROM .4 TO .65 - THIS DATA REPRESENTS 127 FLOW CALIBRATION RUNS.

COEFFICIENT OF DISCHARGE

Shown above are the results of over 120 flow calibration runs of the FTI HHR Flow Tube. The chart shows that all points from 200,000 pipe reynolds number and up are within .75 of 1% of .9938. This coefficient of discharge is a measure of efficiency of a primary flow element and represents the actual flow rate versus the theoretical flow rate. A coefficient of discharge of 1.0 would be the most efficient possible. This high coefficient of discharge allows the HHR Flow Tube to be used with the lowest differential pressure ranges of any primary element device. The data shown above represents tests from 8" to 48" line size in beta ratios from .4 to .65.

OPERATING COSTS COMPARISONS

The following are two examples of actual operating situations comparing the Orifice Plate, the Venturi, and the HHR Flow Tube:

24 INCH STEAM LINE

Condition	Value	Device	Differential Pressure (in. wc)	Discharge Coefficient	Loss (%)	Power Loss at Normal Flow (HP)	Operating Cost at Normal Flow ($/year)
Line Size	24 in. (23.25 in. ID)						
Flowing Material	Steam						
Maximum Flow Rate	500,000 PPH	Orifice Plate	235.0	0.6625	58.5	670.0	219,000.
Normal Flow Rate	250,000 PPH	Venturi	75.0	0.985	12.5	44.0	14,406.
Flowing Pressure	164.73 psia	HHR Flow Tube	74.0	0.9938	3.6	13.0	4,273.
Flowing Temperature	550 deg F						
Density	0.2293 lb/cu ft						
Power Costs	$0.05/kWhr						
Beta Ratio	0.6566						

16 INCH AIR LINE

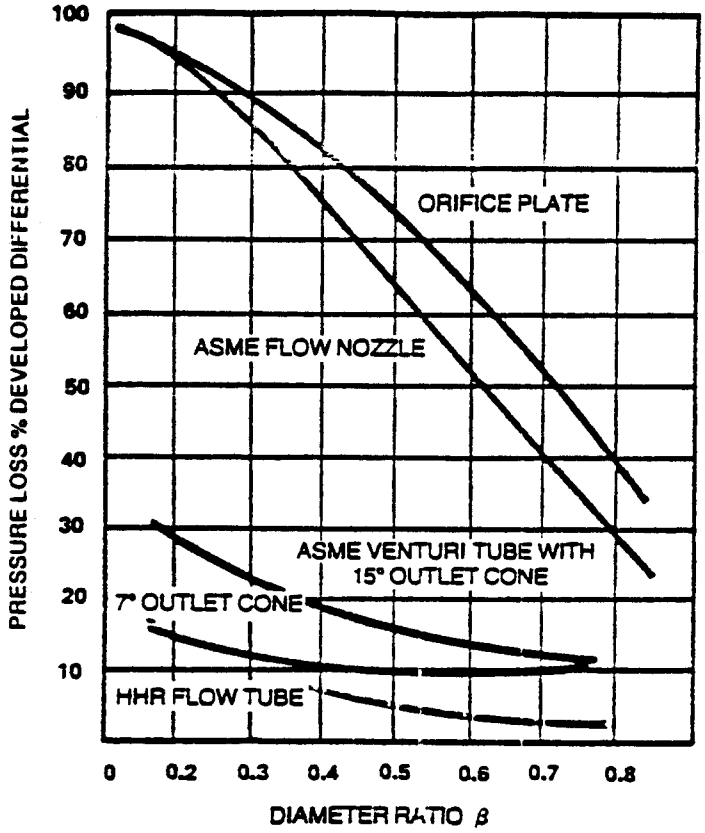
Condition	Value	Device	Differential Pressure (in. wc)	Discharge Coefficient	Loss (%)	Power Loss at Normal Flow (HP)	Operating Cost at Normal Flow ($/year)
Line Size	16 in. (15.250 in. ID)						
Flowing Material	Air						
Maximum Flow Rate	70,000 SCFM						
Normal Flow Rate	49,000 SCFM	Orifice Plate	275.02	0.6667	57.1	295.5	96,540.
Flowing Pressure	164.73 psia	Venturi	101.59	0.9850	12.1	23.13	7,558.
Flowing Temperature	60 deg F	HHR Flow Tube	99.74	0.9938	3.7	7.00	2,287.
Specific Gravity	0.8550						
Power Costs	$0.05/kWhr						
Beta Ratio	0.6446						

PERMANENT PRESSURE LOSS

The permanent pressure loss of the HHR Hi-Head Recovery Flow Tube is a well documented feature. The chart at right illustrates the permanent loss which can be expected versus Beta (bore/pipe I.D.) ratio.

For comparison, the permanent pressure loss of several other head type meter devices are given. In all cases, the percent loss shown is in percent of developed differential pressure.

As shown, the HHR Flow Tube has the lowest permanent loss of the primary elements shown, regardless of Beta ratio. This lowest loss combines with the HHR's high coefficient of discharge to achieve the lowest operating cost available.



DETAILS OF FTI HHR FLOW TUBE CONSTRUCTION

ENTRANCE SECTION

The HHR Tube inlet portion consists of a cylindrical section at least one diameter in length. This enables proper location of the high pressure meter tap at the proper distance from the beginning of the entrance nozzle.

ENTRANCE NOZZLE

An ASME eliptical nozzle is provided between the entrance section and the throat. This nozzle is machined from a one piece forging and is furnished with a smooth finish to assure efficiency.

ONE PIECE THROAT

Each HHR Tube is manufactured with a machined one piece stainless steel throat as standard. The transition from the throat bore to the cone angle is also machined to eliminate deformation of the bore due to welding and grinding of the throat-cone weld. Throats fabricated from rolled plate and throat liners are not recommended due to their effect on accuracy and repeatability. The machined HHR throat is furnished with better than 50 micro-inch finish to assure optimum performance.

EXIT CONE

The exit cone is attached to the discharge end of the HHR throat and is either fabricated or machined with all welds and protrusions ground smooth. HHR Flow Tubes are furnished with 15° exit cones.

EXIT SECTION

To facilitate field welding and installation, a cylindrical straight section matching the adjacent piping is furnished on all weld-in style HHR Tubes.

FLANGES

Flanged HHR Tubes are provided with raised face slip-on 150# flanges on each end of the tube as standard. Raised face weld neck flanges and flanges of other ratings are also available.

DIFFERENTIAL PRESSURE CONNECTIONS

All FTI HHR Tubes are furnished with one high pressure and one low pressure ½" NPT 3000# half coupling as standard. Full penetration weld adaptors, socket weld connections, higher ratings, and other sizes of threaded connections are available.

HHR Tubes are also available with multiple taps

MATERIALS OF CONSTRUCTION

Both fabricated and machined HHR Tubes are available in carbon steel, stainless steel, or other metals. When required, materials can be furnished as required by the ASME Boiler and Pressure Vessel Code or other piping codes.

METHOD OF CONSTRUCTION

In line sizes up to and including 5", all FTI HHR Tubes are machined from round bar material with flanges (if required) welded to each end. All HHR Tubes in line sizes from 6" and above are of fabricated construction.

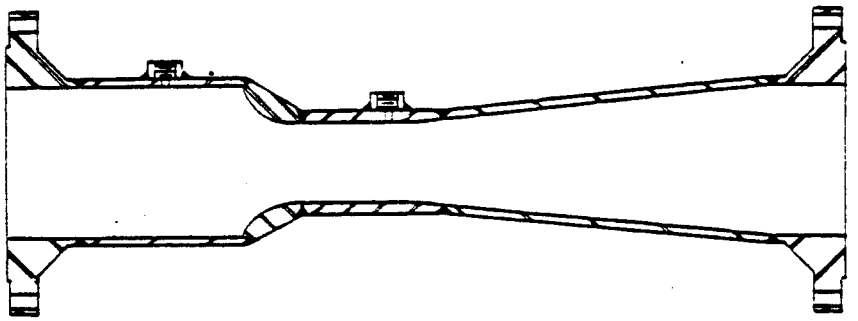
QUALITY CONTROL

HHR Flow Tubes are manufactured to exacting standards in a modern manufacturing facility under strict quality control. All welding is accomplished by code certified welders.

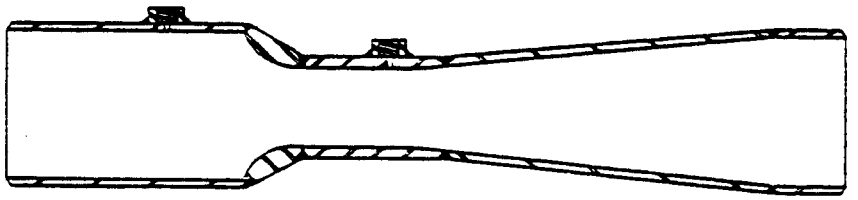
FTI's in-house testing capability includes radiography, hydrostatic, and other nondestructive tests. FTI holds both ASME Pressure Piping (PP) and ASME Pressure Vessel (U) Certificates of Authorization.

Special welding and quality procedures are available as required.

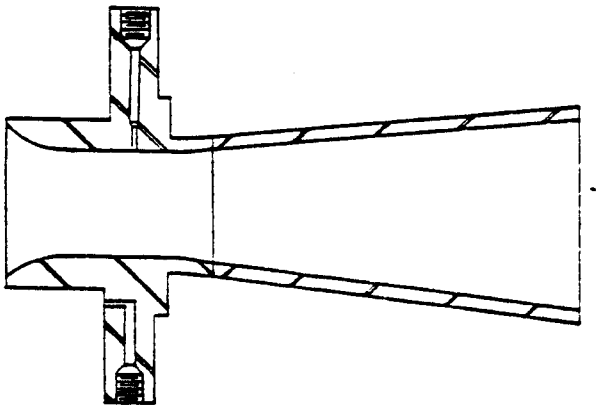
FTI Model HHR-F
Flanged Flow Tube

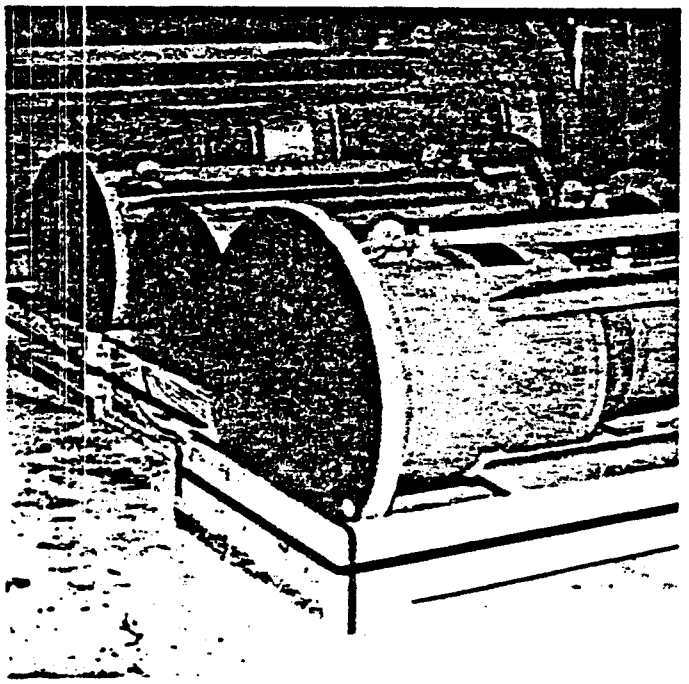


FTI Model HHR-W
Weld-In Flow Tube



FTI Model HHR-I
Insert Flow Tube





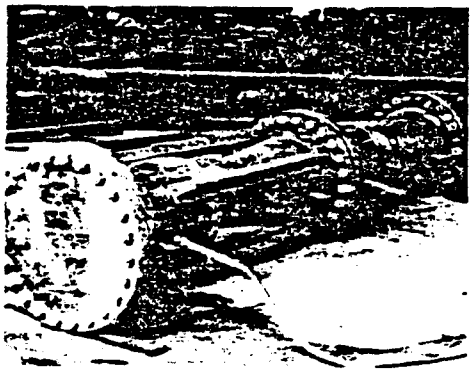
FLOW TUBE ACCURACY

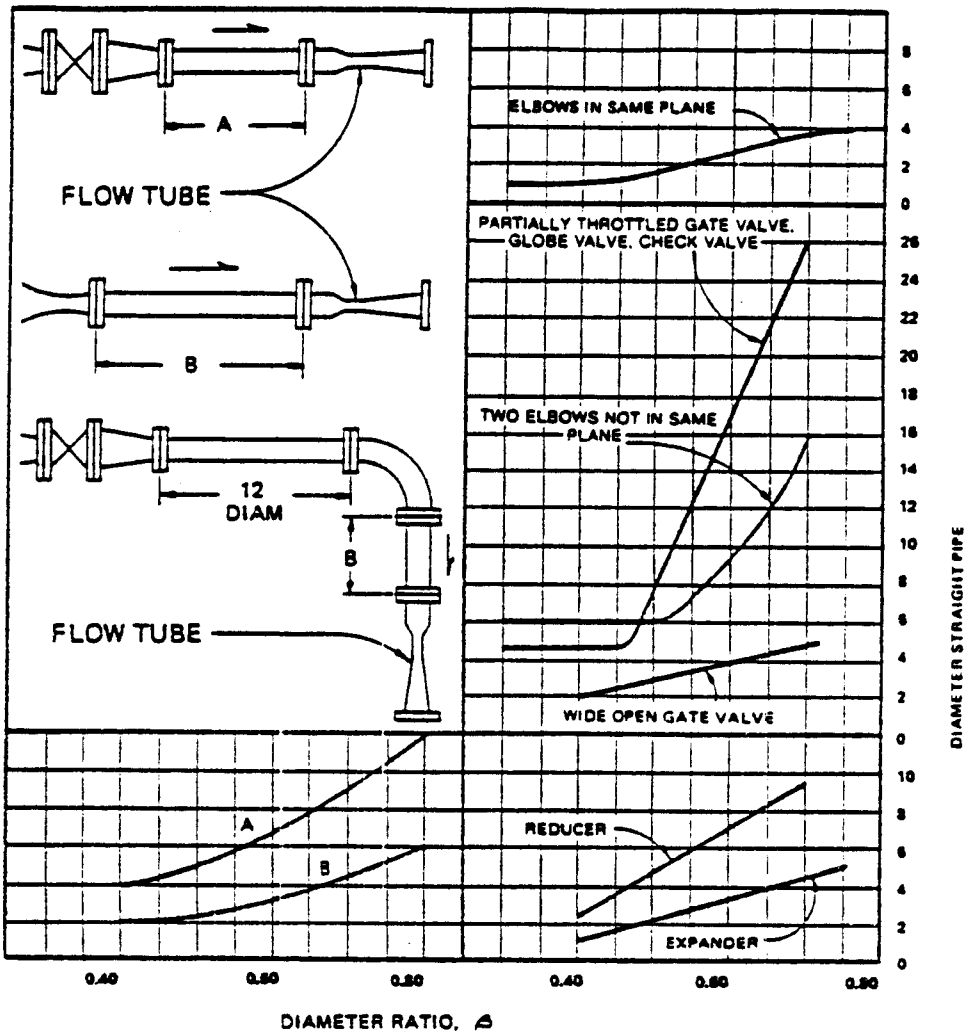
The uncalibrated HHR Flow Tube is accurate to within ± 0.75% of actual flow rate. This accuracy can only be maintained when FTI recommendations are used with regard to upstream piping requirements. Each FTI HHR Flow Tube throat section is machined to provide the smoothness and roundness necessary to assure that these accuracy limits are met. Throat forgings are lengthened to allow machining of the transition angle from the throat to the cone, eliminating the possibility of error due to the grinding of the cone throat weld.

When a higher degree of accuracy is desired, the Flow Tube can be flow calibrated after manufacture to establish an exact differential pressure range for the flow range desired. The accuracy of this data is dependent on the flow laboratory used. FTI recommends the use of laboratories traceable to the NBS who can certify their data to ± 0.25% .

UPSTREAM PIPING RECOMMENDATIONS

As with all head type metering devices, the accuracy of the HHR Flow Tube is in part, dependent on a well developed velocity profile of the flowing medium which contains a minimum of vortices and swirls. Such upstream piping effects can be reduced to an acceptable level by installing the metering device immediately after a length of straight pipe. The HHR Flow Tube offers a considerable savings in recommended upstream piping when compared to the orifice plate or the flow nozzle. The chart at right shows FTI's recommended minimum piping lengths for several typical piping configurations when used with a HHR Flow Tube.





SAMPLE SPECIFICATION

FLOW TUBES

The Flow Tube shall be a differential pressure producer sensing pure static pressure at the inlet and throat. Primary elements which amplify the differential by using velocity pressure shall not be considered.

The Flow Tube shall consist of an inlet straight section, a curved transition section, a straight throat section and a diffuser cone. The inlet straight section shall be of the same internal diameter as the mating piping and contain the high pressure tap. The curved transition section shall be machined to smoothly transition the flow from the internal pipe diameter to the throat diameter. The throat section shall be machined cylindrical in shape with a minimum length of two-thirds of the throat diameter and include the low pressure connection plus the start of the diffuser cone. The diffuser cone weld shall not be made at the back of the throat. The diffuser cone shall extend to the outlet flange or pipe section without truncation.

The Flow Tube shall be constructed of the following material (examples):

Flanged Ends - 150# RF - ANSI
Inlet Straight Section - A106 Gr. B pipe
Inlet Curved Section - A105 Carbon Steel
Throat Section - A182 F304SS
Diffuser Cone - A515-Gr. 70 Carbon Steel

APPROXIMATE DIMENSIONS FOR FTI HHR FLOW TUBES

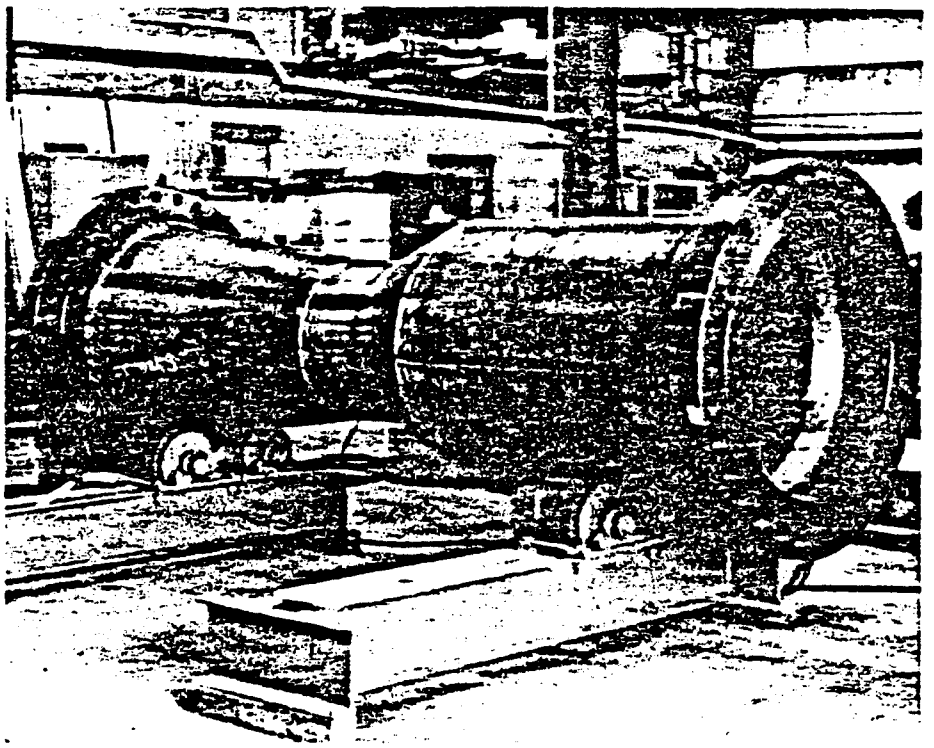
LINE SIZE	PIPE I.D. (INCH)	BETA RATIO	HHR-F LENGTH INCHES	HHR-W LENGTH INCHES	HHR-F WT. LBS.	HHR-W WT. LBS.	LINE SIZE	PIPE I.D. (INCH)	BETA RATIO	HHR-F LENGTH INCHES	HHR-W LENGTH INCHES	HHR-F WT. LBS.	HHR-W WT. LBS.
2	2.067	All	15	15	45	40	18	17.250	0.40	89	98	847	682
3	3.068	All	20	20	76	69	18	17.250	0.60	68	77	814	649
4	4.026	All	24	24	103	89	18	17.250	0.75	52	61	719	554
6	6.065	0.40	31	34	104	74	20	19.250	0.40	99	109	1099	869
6	6.065	0.60	24	27	96	66	20	19.250	0.60	76	86	1062	832
6	6.065	0.75	18	21	85	56	20	19.250	0.75	58	68	940	710
8	7.981	0.40	41	45	174	128	24	23.250	0.40	119	131	1645	1332
8	7.981	0.60	31	35	162	116	24	23.250	0.60	91	103	1604	1291
8	7.981	0.75	24	28	145	98	24	23.250	0.75	70	82	1414	1100
10	10.020	0.40	51	56	271	207	30	29.250	0.40	150	165	2737	2276
10	10.020	0.60	39	44	254	191	30	29.250	0.60	115	130	2703	2241
10	10.020	0.75	30	35	225	162	30	29.250	0.75	88	103	2371	1910
12	12.000	0.40	61	67	411	313	36	35.250	0.40	180	198	4249	3563
12	12.000	0.60	47	53	389	292	36	35.250	0.60	138	156	4241	3555
12	12.000	0.75	36	42	347	250	36	35.250	0.75	106	124	3715	3029
14	13.250	0.40	68	75	524	389	42	41.250	0.40	211	232	6251	5243
14	13.250	0.60	52	59	499	365	42	41.250	0.60	162	183	6296	5288
14	13.250	0.75	40	47	447	313	42	41.250	0.75	124	145	5515	4506
16	15.250	0.40	78	86	693	523	48	47.250	0.40	242	266	8581	7362
16	15.250	0.60	60	68	664	494	48	47.250	0.60	185	209	8714	7496
16	15.250	0.75	46	54	593	422	48	47.250	0.75	142	166	7607	6388

NOTES:

1. HHR-F WEIGHTS CALCULATED ON THE BASIS OF USING 150# RFSO FLANGED ENDS.
2. ABOVE FLOW TUBE WEIGHTS AND LENGTHS ARE BASED ON SCHEDULE STANDARD PIPE AND .375" THICK FLOW TUBE WALLS.
3. WEIGHTS AND LENGTHS ARE APPROXIMATE.
4. WEIGHTS AND LENGTHS OF HHR-I INSERT TYPE FLOW TUBES VARY WITH LINE I.D. - CONSULT FACTORY.

FTI FLOW TUBE ORDERING INFORMATION

(1) FTI Model Number
(2) Line Size
(3) Pipe Schedule or Actual I.D.
(4) Differential Pressure at Maximum Flow
(5) Material of Construction for Body and Throat
(6) Flange, Type and Rating (if applicable)
(7) Flowing Medium
(8) Maximum Flow (Specify Units)
(9) Operating Pressure and Temperature at Maximum Flow
(10) S.G. @ 60°F. Base Pressure and Temperature
(11) S.G. @ Flowing Conditions (liquid)
(12) Supercompressability Factor @ Operating Pressure (gas)
(13) Molecular Weight (gas)
(14) Viscosity



ATTACHMENT E
ANALYTICAL METHODS

Method Number: A101

Method Name: Volatiles

Basic Method: GC/MS - Purge and Trap

Matrices: Aqueous Liquids
Organic Liquids (neat or diluted)
Sludges
Solids

Constituents from Appendix VIII to which method may be applied:

Acetonitrile
Acrolein
Acrylamide
Acrylonitrile
Benzene
Bromoacetone
Bromomethane
Carbon disulfide
Carbon oxyfluoride
Chlorinated benzenes, N.O.S.
Chlorinated ethane, N.O.S.
Chlorinated fluorocarbons, N.O.S.
Chloroalkyl ethers, N.O.S.
Chlorobenzene
1-Chloro-2,3-epoxypropane
2-Chloroethyl vinyl ether
Chloroform
Chloromethane
Chloromethyl methyl ether
1,2-Dibromo-3-chloropropane
1,2-Dibromoethane
Dibromomethane
Dichlorobenzene (meta, ortho, and para isomers)
Dichlorobenzene, N.O.S.
1,4-Dichloro-2-butene
Dichlorodifluoromethane
1,1-Dichloroethane
1,2-Dichloroethane
trans-1,2-Dichloroethene
Dichloroethylene, N.O.S.
1,2-Dichloroethylene
Dichloromethane
Dichloropropane, N.O.S.
1,2-Dichloropropane
Dichloropropene, N.O.S.
1,3-Dichloropropene

From: Sampling and Analysis Methods for Hazardous Waste Combustion
EPA-600/8-84-002 February 1984

1,4-Dioxane
Formic acid
Halomethane, N.O.S.
Hexachloroethane
Hexachloropropene
Hydrazine
Iodomethane
Isocyanic acid, methyl ester
Methanethiol
Methyl ethyl ketone (MEK)
Methyl hydrazine
Tetrachloroethane, N.O.S.
1,1,1,2-Tetrachloroethane
1,1,2,2-Tetrachloroethane
Tetrachloroethene
Tetrachloromethane
Tetranitromethane
Toluene
Tribromomethane
1,1,1-Trichloroethane
1,1,2-Trichloroethane
Trichloroethene
Trichloromonofluoromethane
Trichloropropane, N.O.S.
1,2,3-Trichloropropane
Vinyl chloride

Apparatus: Finnigan 4000 GC/MS/DS or equivalent
Purge and Trap Device (Tekmar LSC-1 or equivalent)

Analysis Method Parameters:

Purge and Trap: A 25 cm trap will be prepared which contains 1/3 activated charcoal, 1/3 silica gel, and 1/3 Tenax. A 5 mL sample will be purged onto the trap (Methods A101a, A101b, or A101c) at 40 mL/min with helium or nitrogen for 12 min, and desorbed with backflushing at 180°C with 40 mL inert gas into GC for 4 min.

GC: Column - 6 ft 0.2% Carbowax 1500 on Carbopack C 60/80 mesh

Carrier Gas - He at 30 mL/min

Injector - 160°C

Temperature Program - 30°C for 7 min isothermal (beginning at start of purge); then, 30-160°C at 8°C/min; and 160°C for 15 min isothermal.

MS: Mass Range - 20-260 amu

Scan Rate - 2 s/scan

Ionization - EI, 70 eV

Detection Limit: 10-100 μg/L of each compound on-column.

References: U.S. Environmental Protection Agency, Federal Register, 44, 69464-69575 (December 3, 1979).

U.S. Environmental Protection Agency/Office of Solid Waste, Washington, D.C., "Test Methods for Evaluating Solid Waste - Physical/Chemical Methods," SW-846 (1980).

Method Number: A101a

Method Name: Volatiles

Basic Method: Purge and Trap

Matrix: Aqueous Liquids

Purging Method Parameters:

An aliquot (5 mL) of the aqueous sample will be transferred into the purging device; and purged with helium for 12 min at 40 mL/min.

Reference: U.S. Environmental Protection Agency, Federal Register, 44, 69464-69575 (December 3, 1979).

From: Sampling and Analysis Methods for Hazardous Waste Combustion
EPA-600/8-84-002 February 1984

Method Number: A101b

Method Name: Volatiles

Basic Method: Purge and Trap

Matrix: Sludges (including gels and slurries)

Purging Method Parameters:

An aliquot of a sludge sample will be diluted to 0.5% solids with reagent grade water. A 5-mL portion of this diluted mixture will then be transferred to the purging device and purged for 12 min with helium at 40 mL/min. If the sludge sample is not readily dispersible, polyethylene glycol (MW 400) will be used to dilute the sample.

Reference: Miller, H.C., R.H. James and W.R. Dickson, "Evaluated Methodology for the Analysis of Residual Wastes," Report prepared for U.S. Environmental Protection Agency/Effluent Guidelines Division, Washington, D.C., by Southern Research Institute, Birmingham, Alabama under Contract No. 68-02-2685 (December 1980).

From: Sampling and Analysis Methods for Hazardous Waste Combustion
EPA-600/8-84-002 February 1984

Method Number: A101c

Method Name: Volatiles

Basic Method: Purge and Trap

Matrix: Solids

Purging Method Parameters:

An aliquot of the solid sample will be diluted to 2% solids with reagent grade water. A 5-mL portion of this diluted mixture will be transferred to the purging device and purged for 12 min with helium at 40 mL/minute. If the solid sample is not readily dispersible in water, polyethylene glycol (MW 400) will be used to dilute the sample.

Reference: Miller, H.C., R.H. James and W.R. Dickson, "Evaluated Methodology for the Analysis of Residual Wastes," Report prepared for U.S. Environmental Protection Agency/Effluent Guidelines Division, Washington, D.C., by Southern Research Institute, Birmingham, Alabama under Contract No. 68-02-2685 (December 1980).

From: Sampling and Analysis Methods for Hazardous Waste Combustion
EPA-600/8-84-002 February 1984

METHOD 5030

PURGE-AND-TRAP METHOD

1.0 Scope and Application

1.1 Method 5030 is used to determine the concentration of volatile organic compounds in a variety of liquid and solid waste matrices.

1.2 This method is applicable to nearly all types of samples, regardless of water content, including aqueous sludges, caustic liquors, acid liquors, waste solvents, oily wastes, groundwater, mousses, tars, fibrous wastes, polymeric emulsions, filter cakes, spent carbons, spent catalysts, soils, and sediments.

1.3 For highly volatile matrices, direct injection preceded by dilution should be used to prevent gross contamination of the instrumentation. For pastes, dilution of the sample until it becomes free-flowing is used to ensure adequate interfacial area. The success of this method also depends on the level of interferences in the sample; results may vary due to the large variability and complicated matrices of solid waste samples.

1.4 Method 5030 is based upon a purge-and-trap, gas chromatographic procedure.

1.5 This method is recommended for use by, or under the supervision of, analysts experienced in the use of purge-and-trap systems and gas chromatographs and skilled in the interpretation of chromatograms.

2.0 Summary of Method

2.1 A portion of solid waste is dispersed in polyethylene glycol (PEG) or distilled-in-glass methanol to dissolve the volatile organic constituents. A portion of the PEG or methanol solution is combined with water in a specially designed purging chamber. For liquid and some semiliquid samples, PEG or methanolic extraction will not be necessary. An inert gas is then bubbled through the solution at ambient temperature and the volatile components are efficiently transferred from the aqueous phase to the vapor phase. The vapor is swept through a sorbent column where the volatile components are trapped. After purging is completed, the sorbent column is heated and backflushed with inert gas to desorb the components onto a gas chromatographic column. (SPECIAL NOTE: For Methods 8020 and 8030, drying of the trap for 4 min under helium flow is required. See Figure 5 for configuration.) The gas chromatographic column is heated to elute the components which are detected by the appropriate detector (Methods 8010, 8020, 8030).

2 / SAMPLE INTRODUCTION TECHNIQUES

3.0 Interferences

3.1 Low molecular weight impurities in PEG can be volatilized during the purging procedure. Thus, the PEG employed in this method must be purified before use as described in Section 5.3.

3.2 Impurities in the purge gas and organic compounds out-gasing from the plumbing ahead of the trap account for the majority of contamination problems. The analytical system must be demonstrated to be free from contamination under the conditions of the analysis by running laboratory reagent blanks. The use of non-TFE plastic tubing, non-TFE thread sealants, or flow controllers with rubber components in the purging device should be avoided.

3.3 Samples can be contaminated by diffusion of volatile organics (particularly fluorocarbons and methylene chloride) through the septum seal into the sample during shipment and storage. A field reagent blank prepared from reagent water and carried through the sampling and handling protocol can serve as a check on such contamination.

3.4 Contamination by carryover can occur whenever high-level and low-level samples are analyzed sequentially. Whenever an unusually concentrated sample is encountered, it should be followed by an analysis of reagent water (PEG or methanol solution) to check for cross contamination. After each use, the purging chamber is cleaned as described in Section 7.12. The trap and other parts of the system are also subject to contamination; therefore, frequent additional bakeout and purging or the entire system may be required.

4.0 Apparatus and Materials

4.1 Purge-and-trap device: The purge-and-trap device consists of three separate pieces of equipment: the purging chamber, trap, and the desorber. Several complete devices are commercially available.

4.1.1 The purging chamber must be designed to accept 5-ml or 25-ml samples with a water column at least 3 cm deep. The gaseous headspace between the water column and the trap must have a total volume of less than 15 ml. The purge gas must pass through the water column as finely divided bubbles with a diameter of less than 3 mm at the origin. The purge gas must be introduced no more than 5 mm from the base of the water column. The purging chamber, illustrated in Figure 1, meets these design criteria.

4.1.2 The sorbent trap consists of a 1/8-in. O.D. (0.105-in. I.D.) x 25-cm-long stainless steel tube packed with the appropriate absorbents as described in Table 1 (see Figures 2 and 3).

4.1.3 The desorber must be capable of rapidly heating the trap to 180° C within 30 sec.

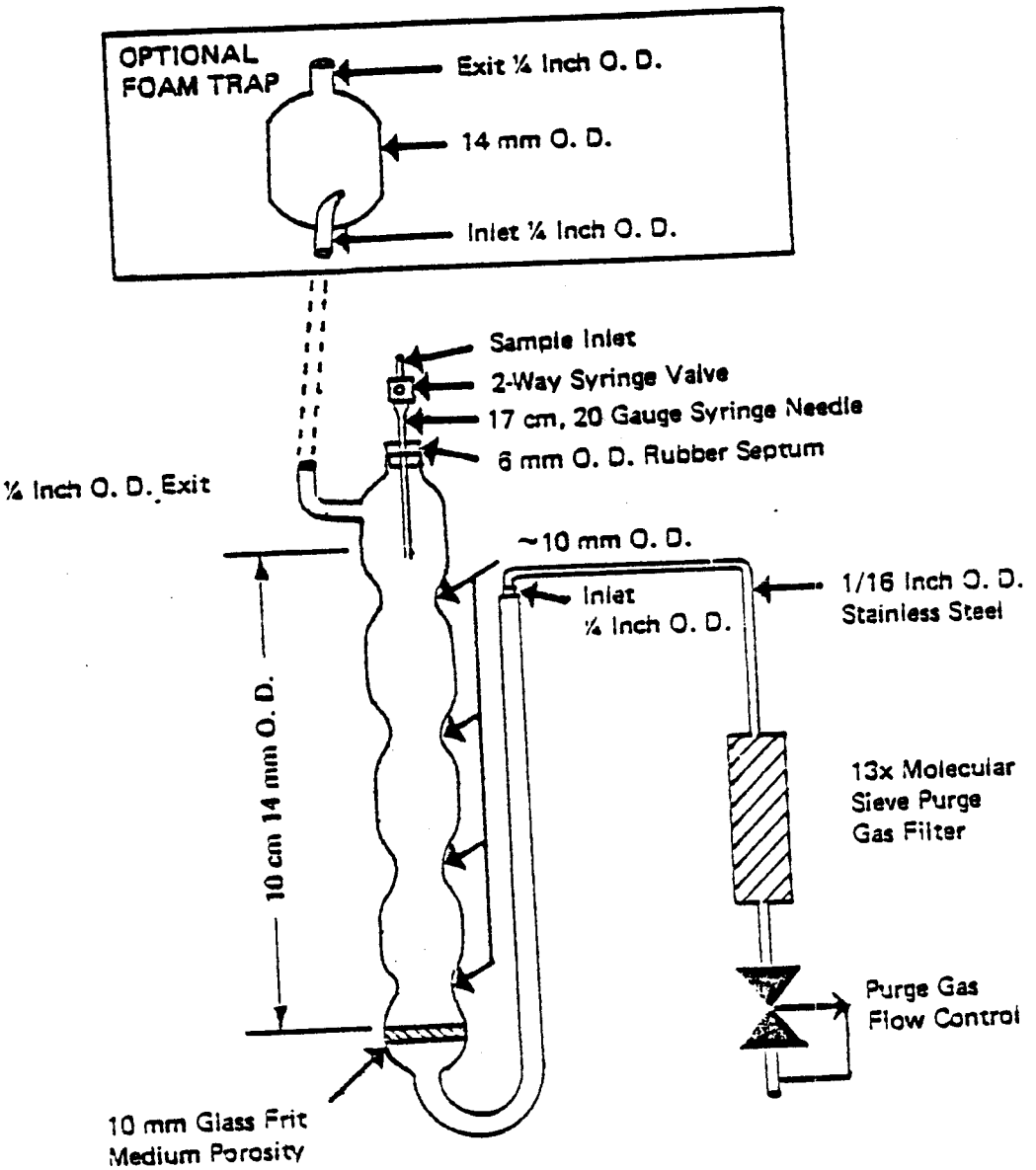


Figure 1. Purging chamber.

SAMPLE INTRODUCTION TECHNIQUES

TABLE 1. PURGE-AND-TRAP PARAMETERS

	Analysis method[a]		
	8010	8020	8030
Purge Gas	Nitrogen or Helium	Nitrogen or Helium	Helium
Purge Gas Flow Rate (ml/min)	40	40	20 ± 1
Purge Time (min)	11.0	12.0	30.0
Purge Temperature	Ambient	Ambient	85° C
Desorb Temperature (°C)	180°	180°	100°
Sorbents to be used in packing tube	A	B	B

[a]Measurement method to be employed for identification and quantification.

KEY: A = Porous polymer packing, 60/80 mesh, chromatographic grade Tenax GC (2,6-Diphenylene oxide).

Three percent OV-1 on Chromosorb-W 60/80 mesh (optional).

Silica gel, 35/60 mesh Davison grade-15 or equivalent.

Coconut charcoal, 6/10 mesh, Barnaby Chaney C.A. - 580-26 lot #M-2649 or equivalent.

Refer to Figure 2 for column packing.

B = Porous polymer packing, 60/80 mesh, chromatographic grade Tenax GC (2,6-Diphenylene oxide).

Three percent OV-1 on Chromosorb-W 60/80 mesh (optional).

Refer to Figure 3 for column packing.

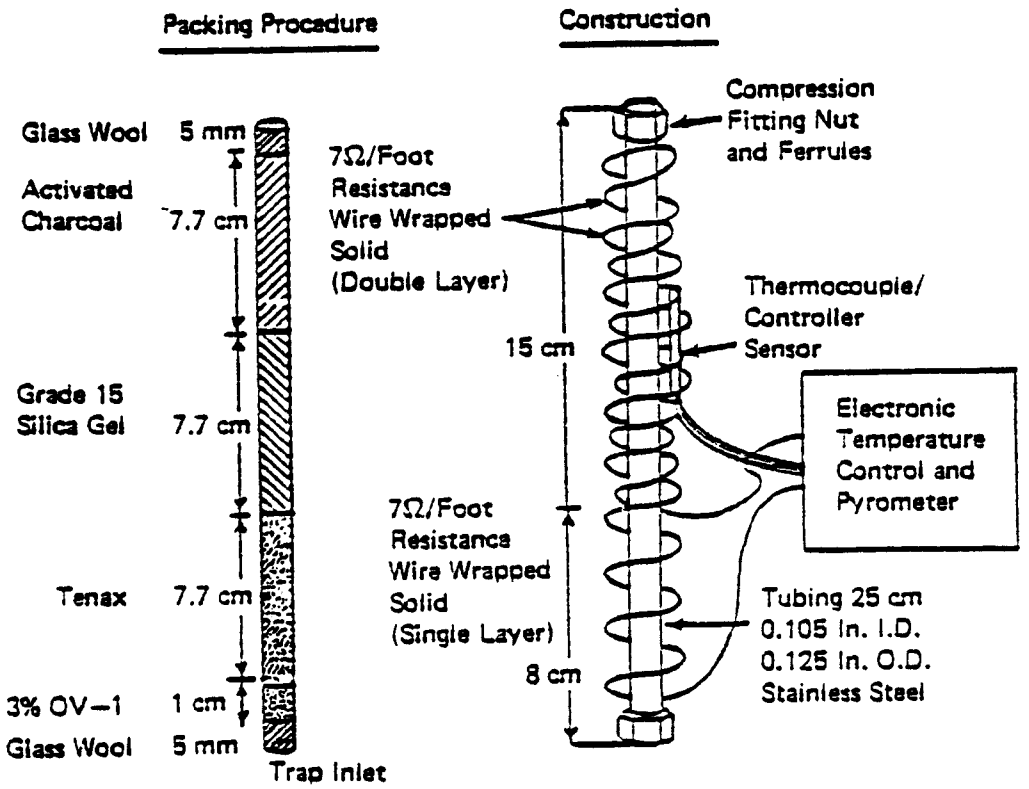


Figure 2. Trap packings and construction for Method 8010.

SAMPLE INTRODUCTION TECHNIQUES

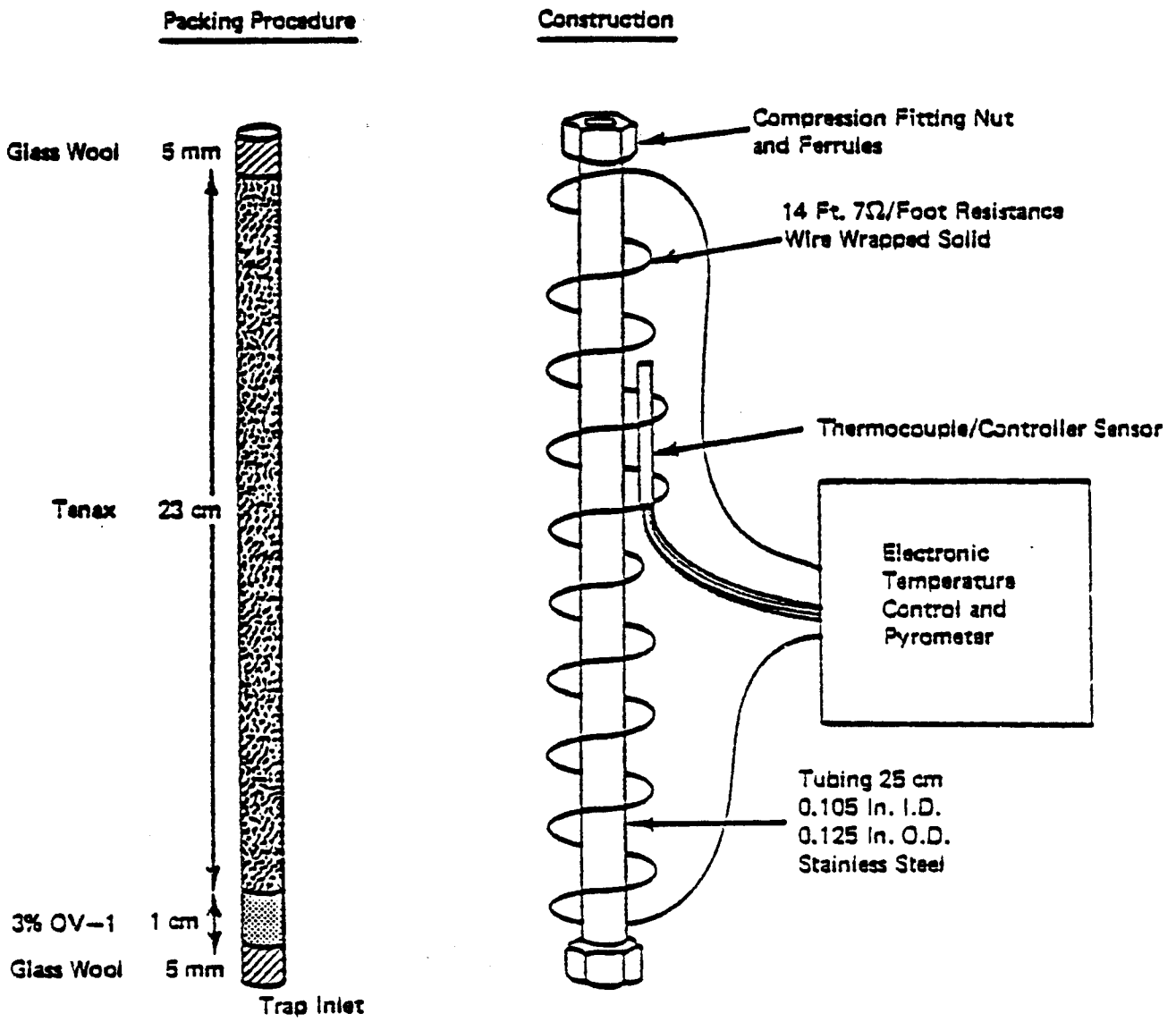


Figure 3. Trap packing and construction for Methods 8020 and 8030.

4.1.4 The purge-and-trap device may be assembled as a separate unit or be coupled to a gas chromatograph as illustrated in Figures 4 through 6.

4.2 Syringes: 5-ml and 25-ml glass hypodermic, equipped with 20-gauge needle, at least 15 cm in length.

4.3 Micro syringes: 10 µl, 25 µl, 100 µl, 250 µl, 500 µl, and 1,000 µl. These syringes should be equipped with 20-gauge needles having a length sufficient to extend from the sample inlet to within 1 cm of the glass frit in the purging device (see Figure 1). The needle length required will depend upon the dimensions of the purging device employed.

4.4 Centrifuge tubes: 50-ml round-bottom glass centrifuge tubes with Teflon-lined screw caps. The tubes must be marked before use to show an approximate 20-ml graduation (Kimble #45212 or equivalent).

4.5 Centrifuge: Capable of accommodating 50-ml glass tubes.

4.6 Syringe valve: 2-way, with Luer ends (2 each; Hamilton #86725 valve equipped with one Hamilton #35033 Luer fitting or equivalent).

4.7 Syringe: 5-ml, gas-tight with shutoff valve.

4.8 Bottle: 15-ml, screw-cap, Teflon cap liner.

4.9 Balance: Analytical, capable of accurately weighing 0.0001 g.

4.10 Rotary evaporator: Equipped with Teflon-coated seals (Buchi Rotavapor R-110 or equivalent).

4.11 Vacuum pump: Mechanical, two-stage.

5.0 Reagents

5.1 Trap materials (see Table 1 and Figures 2 and 3 for configuration).

5.1.1 2,6-Diphenylene oxide polymer: 60/80 mesh Tenax, chromatographic grade or equivalent.

5.1.2 Methyl silicone packing: 3% OV-1 on 60/80 mesh Chromosorb-W or equivalent.

5.1.3 Silica gel, Davison Chemical (35/60 mesh), grade 15 or equivalent.

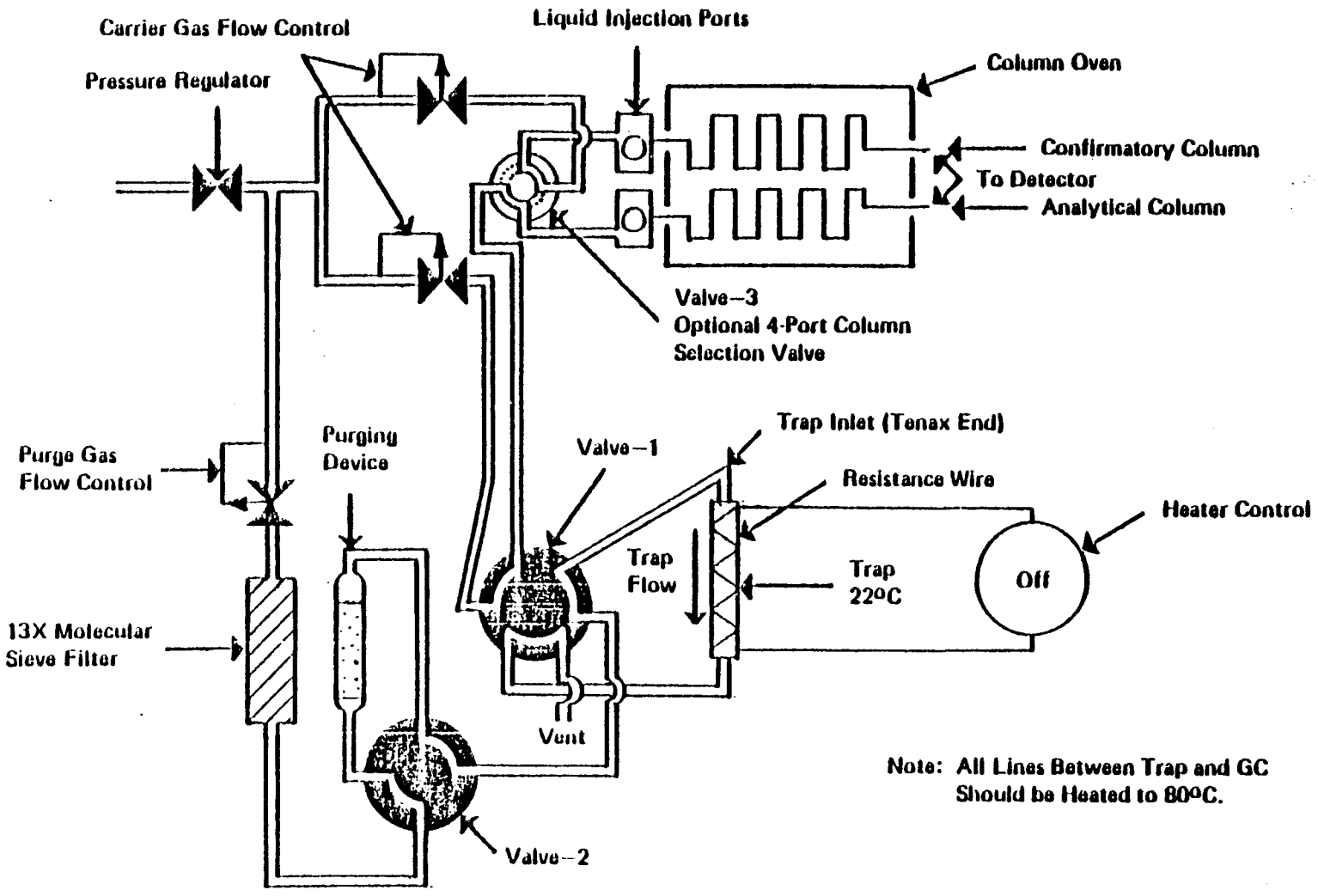


Figure 4. Purge-and-trap system, purge-sorb mode, for methods 8010, 8020 and 8030.

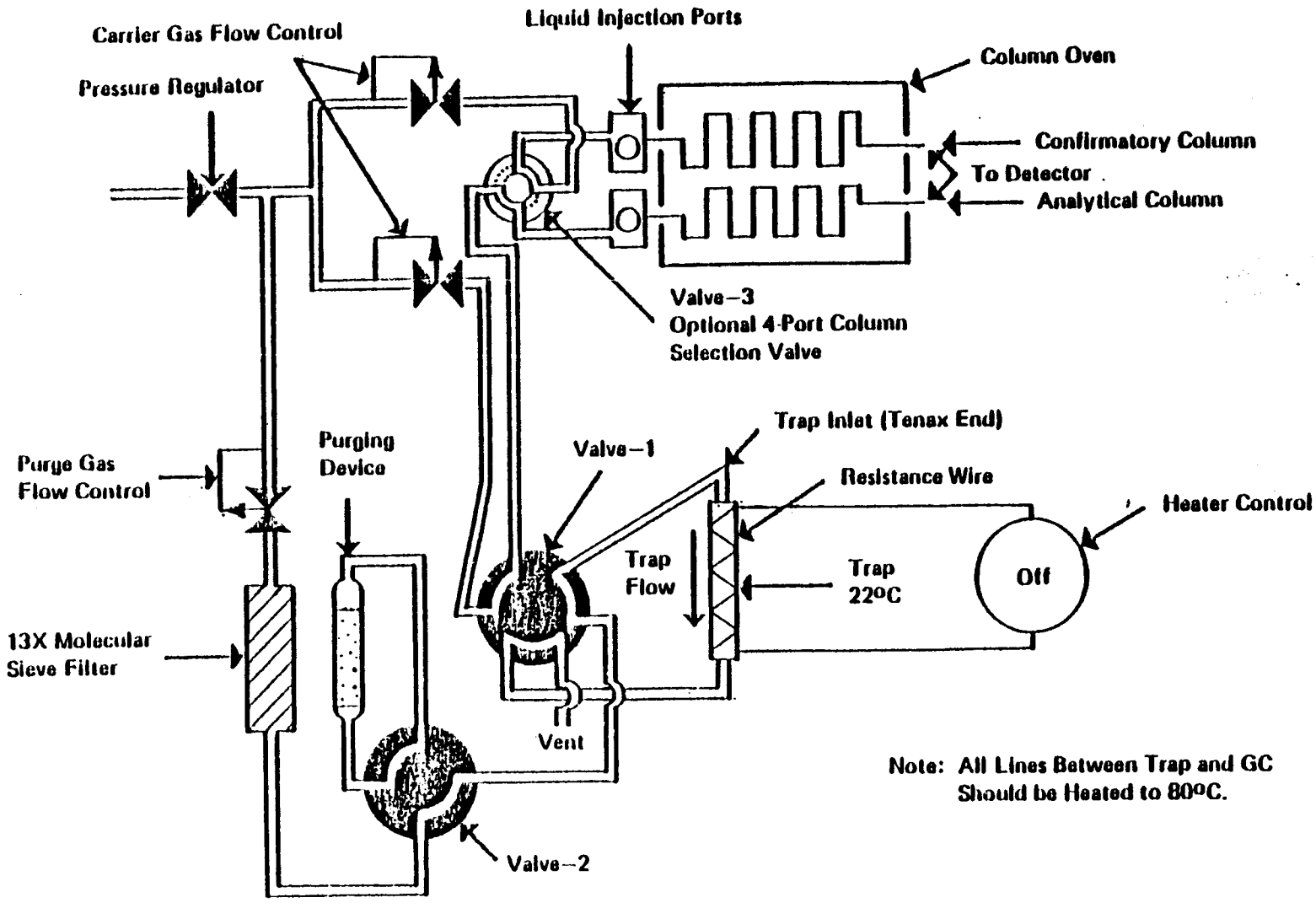


Figure 5. Purge-and-trap system, trap dry mode, for Methods 8020 and 8030.

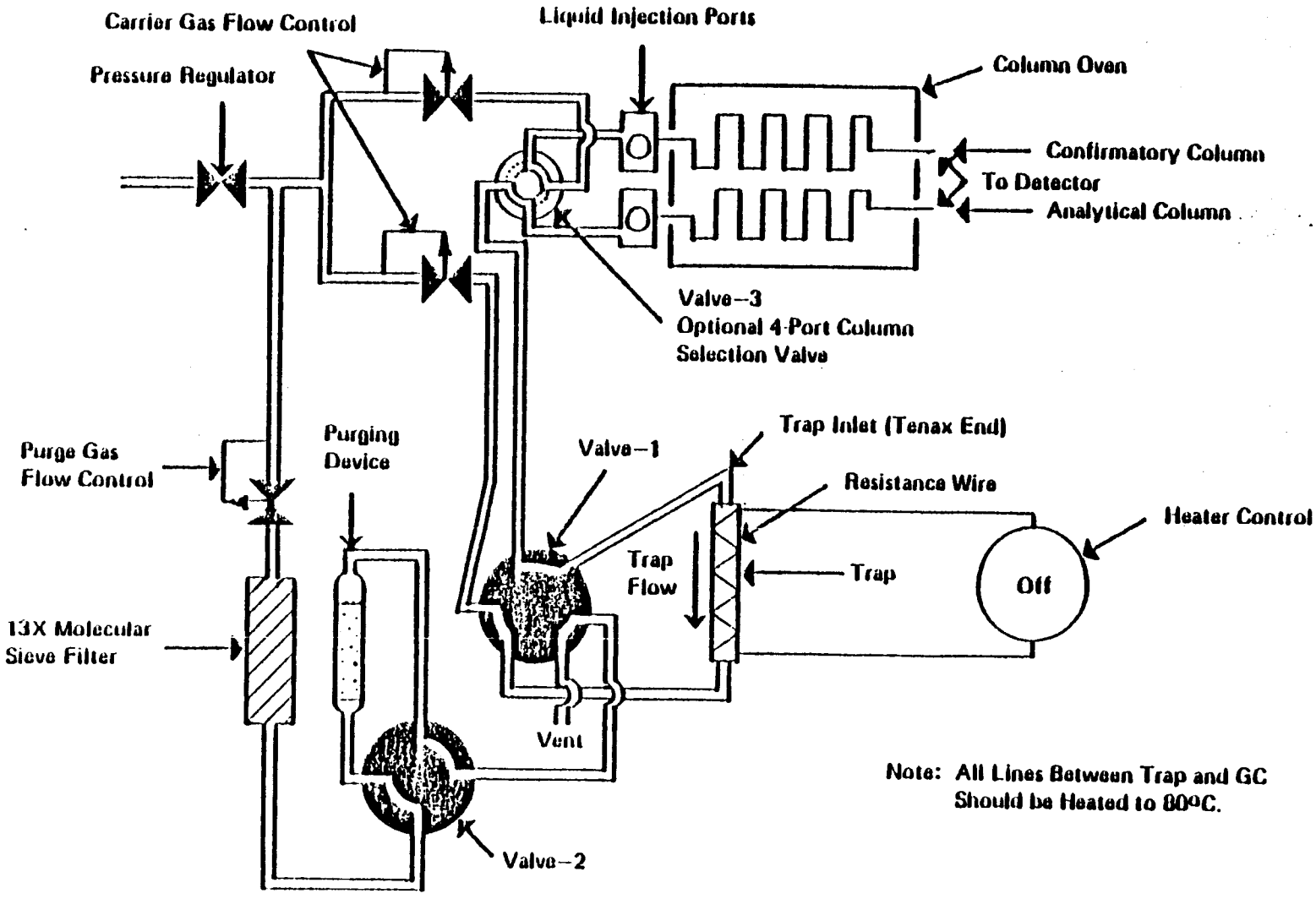


Figure 6. Purge-and-trap system, desorb mode, for Methods 8010, 8020 and 8030.

5.2 Reagent water: Reagent water is defined as a water in which an interferent is not observed at the method detection limit of the compounds of interest.

5.2.1 Reagent water may be generated by passing tap water through a carbon filter bed containing about 500 g of activated carbon (Calgon Corp., Filtrasorb-300 or equivalent).

5.2.2 A water purification system (Millipore Super-Q or equivalent) may be used to generate reagent water.

5.2.3 Reagent water may also be prepared by boiling water for 15 min. Subsequently, while maintaining the temperature at 90° C, bubble a contaminant-free inert gas through the water for 1 hr. While still hot, transfer the water to a narrow-mouth screw-cap bottle and seal with a Teflon-lined septum and cap.

5.3 Reagent PEG (polyethylene glycol; for solid samples): Reagent PEG is defined as PEG having a nominal average molecular weight of 400, and in which interferents are not observed at the method detection limit for compounds of interest. Methanol which has been distilled in glass can be used as a substitute for PEG.

5.3.1 Reagent PEG is prepared by purification of commercial PEG having a nominal average molecular weight of 400. The PEG is placed in a round-bottom flask equipped with a standard taper joint, and the flask is affixed to a rotary evaporator. The flask is immersed in a water bath at 90-100° C and vacuum is maintained at less than 10 mm Hg for at least 1 hr using a two-stage mechanical pump. The vacuum system is equipped with an all-glass trap, which is maintained in a dry ice/methanol bath.

5.3.2 In order to demonstrate that all interfering volatiles have been removed from the PEG, a reagent water/PEG blank must be analyzed.

6.0 Sample Collection, Preservation, and Handling

6.1 Refer to Method 8010, 8020, or 8030 for pertinent information.

7.0 Procedures

7.1 Assemble the purge-and-trap device (see Figures 4 through 6). Purge parameters to be used depend on the compounds being analyzed for; see Table 1. Pack the trap as shown in Figure 2 or 3 and condition overnight at a nominal 180° C by backflushing with an inert gas flow of at least 20 ml/min. Daily, prior to use, condition the trap for 10 min by backflushing at 180° C.

SAMPLE INTRODUCTION TECHNIQUES

7.2 Remove standards and samples from cold storage (approximately an hour prior to an analysis) and bring to room temperature by placing in a warm water bath at 20-25° C.

7.3 Adjust the purge gas (nitrogen or helium) flow rate according to Table 1.

7.4 Operate the gas chromatograph using the conditions described in the appropriate method, 8010, 8020, or 8030.

7.5 Attach the trap inlet to the purging device, and set the device to the purge mode. Open the syringe valve located on the purging device sample introduction needle.

7.6 Remove the plunger from a 5-ml syringe and attach a closed syringe valve. Open the sample bottle (or standard) and carefully pour the sample into the syringe barrel until it overflows. (NOTE: For pastes it may be necessary to dilute the sample by adding a nonvolatile solvent to the sample. In such cases diluting can be performed in the purging device.)

7.7 PEG extraction procedure for solids (methanol which has been distilled in glass can be used as a substitute for PEG). Sample aliquots for extraction should be transferred as quickly as possible to minimize loss of volatiles from the sample.

7.7.1 To a 50-ml glass centrifuge tube with Teflon-lined cap, add 40 ml of reagent PEG. Weigh the capped centrifuge tube and PEG on an analytical balance.

7.7.2 Using an appropriate implement, transfer approximately 2 g of sample to the PEG in the centrifuge tube in such a fashion that the sample is dissolved in or submerged in the PEG as quickly as possible. Take care not to touch the sample-transfer implement to the PEG. Recap the centrifuge tube immediately and weigh on an analytical balance to determine an accurate sample weight.

7.7.3 Disperse the sample by vigorous agitation for 1 min. The mixture may be agitated manually or with the aid of a vortex-mixer. If the sample does not disperse during this process, sonify the mixture in an ultrasonic bath for 30 min. Allow the mixture to stand until a clear supernatant is obtained as the sample extract. Centrifuge if necessary to facilitate phase separation.

7.7.4 The sample extract may be stored for future analytical needs. If this is desired, transfer the solution to a 10-ml screw cap vial with Teflon cap liner. Store at -10 to -20° C, and protect from light.

7.7.5 Add an aliquot of the sample extract to 5 ml reagent water.

7.8 Replace the syringe plunger and compress the sample. Open the syringe valve and vent any residual air while adjusting the sample volume to 5.0 ml. Since this process of taking an aliquot destroys the validity of the liquid samples for future analysis, the analyst should fill a second syringe at this time to protect against possible loss of data.

7.9 Attach the syringe-valve assembly to the syringe valve on the purging device. Open the syringe valve and inject the sample into the purging chamber. Close both valves and purge the sample for the time specified in Table 1. If Method 8020 will be used for analysis of the sample, dry the trap by maintaining a flow rate of 40 ml/min dry purge for 4 min.

7.10 Attach the trap to the chromatograph, and adjust the device to the desorb mode. Introduce the trapped materials to the GC column by rapidly heating the trap to the backflush temperature indicated in Table 1, while backflushing the trap with an inert carrier gas at 20 to 60 ml/min for 4 min. If rapid heating cannot be achieved, the gas chromatographic column must be used as a secondary trap by cooling it to 30° C (or subambient, if problems persist) instead of the initial program temperature of 45° or 50° C.

7.11 Return the purge trap device to the purge mode.

7.12 Allow the trap to cool for 8 min. Replace the purging chamber with a clean purging chamber. The purging chamber is cleaned after each use by sequential washing with acetone, methanol, detergent solution, and distilled water and drying at 105° C.

7.13 Close the syringe valve on the purging chamber after 15 sec to begin gas flow through the trap. Purge the trap at ambient temperature for 4 min. Recondition the trap by heating it to 180° C. Do not allow the trap temperature to exceed 180° C, since the sorption/desorption is adversely affected by heating the trap to higher temperatures. After heating the trap for approximately 7 min, turn off the trap heater. When cool, the trap is ready for the next sample.

7.14 The analysis of blanks is most important in the purge-and-trap technique since the purging device and the trap can become contaminated by residues from very concentrated samples or by vapors in the laboratory. Prepare blanks by filling a sample bottle with organic-free water. Blanks should be sealed, stored at 4° C, and analyzed with each group of samples.

SAMPLE INTRODUCTION TECHNIQUES

8.0 Quality Control

8.1 Before processing any samples, the analyst should demonstrate through the analysis of a distilled water method blank that all glassware and reagents are interference-free. Each time a set of samples is extracted or there is a change in reagents, a method blank should be processed as a safeguard against chronic laboratory contamination. The blank samples should be carried through all stages of the sample preparation and measurement.

8.2 Standard quality assurance practices should be used with this method. Field replicates should be collected to validate the precision of the sampling technique. Laboratory replicates should be analyzed to validate the precision of the analysis. Fortified samples should be carried through all stages of sample preparation and measurement; they should be analyzed to validate the sensitivity and accuracy of the analysis. If the fortified samples do not indicate sufficient sensitivity to detect less than or equal to 1 µg/g of sample, then the sensitivity of the instrument should be increased or the extract subjected to additional cleanup. Where doubt exists over the identification of a peak on the chromatograph, confirmatory techniques such as mass spectroscopy should be used.

9.0 References

1. Bellar, T.A., and J.J. Lichtenberg. 1974. J. Amer. Water Works Assoc. 66(12):739-744.

2. Bellar, T.A., and J.J. Lichtenberg. 1979. Semi-automated headspace analysis of drinking waters and industrial waters for purgeable volatile organic compounds. In: Van Hall (ed.), Measurement of organic pollutants in water and wastewater. ASTM STP 686, pp. 108-129.

3. Development and application of test procedures for specific organic toxic substances in wastewaters. Category 11 - Purgeables and Category 12 - Acrolein, Acrylonitrile, and Dichlorodifluoromethane. Report for EPA Contract 68-03-2635 (in preparation).

4. Ligon, W.V. and H. Grade. 1981. Poly(ethylene glycol) as a diluent for preparation of standards for volatile organics in water. Anal. Chem. 53:920-921.

METHOD 8240

GC/MS METHOD FOR VOLATILE ORGANICS

1.0 Scope and Application

1.1 Method 8240 is used to determine volatile organic compounds in a variety of solid waste matrices. This method is applicable to nearly all types of samples, regardless of water content, including groundwater, aqueous sludges, caustic liquors, acid liquors, waste solvents, oily wastes, mousses, tars, fibrous wastes, polymeric emulsions, filter cakes, spent carbons, spent catalysts, soils, and sediments.

1.2 The detection limit of Method 8240 for an individual compound is approximately 1 µg/g (wet weight) in waste samples. For samples containing more than 1 mg/g of total volatile material, the detection limit is proportionately higher.

1.3 Method 8240 is based upon a purge-and-trap, gas chromatographic/mass spectrometric (GC/MS) procedure. This method is restricted to use by or under the supervision of analysts experienced in the use of purge-and-trap systems and gas chromatograph/mass spectrometers and skilled in the interpretation of mass spectra and their use as a quantitative tool.

2.0 Summary of Method

2.1 The volatile compounds are introduced to the gas chromatograph by direct injection, the Headspace Method (Method 5020), or the Purge-and-Trap Method (Method 5030). Method 5030 should be used for groundwater analysis. The components are separated via the gas chromatograph and detected using a mass spectrometer which is used to provide both qualitative and quantitative information. The chromatographic conditions as well as typical mass spectrometer operating parameters are given.

2.2 If the above sample introduction techniques are not applicable, a portion of the sample can be dispersed in methanol or polyethylene glycol (PEG) to dissolve the volatile organic constituents. A portion of the methanolic or PEG solution is combined with water in a specially designed purging chamber. An inert gas is then bubbled through the solution at ambient temperature and the volatile comnponents are efficiently transferred from the aqueous phase to the vapor phase. The vapor is swept through a sorbent column where the volatile components are trapped. After purging is completed, the sorbent column is heated and backflushed with inert gas to desorb the components onto a gas chromatographic column. The gas chromatographic column is heated to elute the components, which are detected with a mass spectrometer.

2.3 An aliquot of each sample must be spiked with an appropriate standard to determine percent recovery and detection limits for that sample.

ORGANIC ANALYTICAL METHODS - GC/MS

2.4 Table 1 lists detection limits that can be obtained in wastewaters in the absence of interferences. Detection limits for a typical waste sample would be significantly higher.

TABLE 1. CHROMATOGRAPHIC CONDITIONS AND METHOD DETECTION LIMITS

Parameter	Retention time (min) Column 1[a]	Method detection limit (µg/l)
Chloromethane	2.3	ND
Bromomethane	3.1	ND
Vinyl chloride	3.8	ND
Chloroethane	4.6	ND
Methylene chloride	6.4	2.8
Trichlorofluoromethane	8.3	ND
1,1-Dichloroethene	9.0	2.8
1,1-Dichloroethane	10.1	4.7
trans-1,2-Dichloroethene	10.8	1.6
Chloroform	11.4	1.6
1,2-Dichloroethane	12.1	2.8
1,1,1-Trichloroethane	13.4	3.8
Carbon tetrachloride	13.7	2.8
Bromodichloromethane	14.3	2.2
1,2-Dichloropropane	15.7	6.0
trans-1,3-Dichloropropene	15.9	5.0
Trichloroethene	16.5	1.9
Benzene	17.0	4.4
Dibromochloromethane	17.1	3.1
1,1,2-Trichloroethane	17.2	5.0
cis-1,3-Dichloropropene	17.2	ND
2-Chloroethylvinyl ether	18.6	ND
Bromoform	19.8	4.7
1,1,2,2-Tetrachloroethane	22.1	6.9
Tetrachloroethene	22.2	4.1
Toluene	23.5	6.0
Chlorobenzene	24.6	6.0
Ethyl benzene	26.4	7.2
1,3-Dichlorobenzene	33.9	ND
1,2-Dichlorobenzene	35.0	ND
1,4-Dichlorobenzene	35.4	ND

ND = not determined.

[a]Column conditions: Carbopack B (60/80 mesh) coated with 1% SP-1000 packed in a 6-ft by 2-mm I.D. glass column with helium carrier gas at a flow rate of 30 ml/min. Column temperature is isothermal at 45° C for 3 min, then programmed at 8° C per minute to 220° and held for 15 min.

3.0 Interferences

3.1 Interferences coextracted from the samples will vary considerably from source to source, depending upon the particular waste or extract being tested. The analytical system, however, should be checked to ensure freedom from interferences under the conditions of the analysis by running method blanks. Method blanks are run by analyzing organic-free water in the normal manner. The use of non-TFE plastic tubing, non-TFE thread sealants, or flow controllers with rubber components in the purging device should be avoided.

3.2 Samples can be contaminated by diffusion of volatile organics (particularly methylene chloride) through the septum seal into the sample during shipment and storage. A field blank prepared from organic-free water and carried through the sampling and handling protocol can serve as a check on such contamination.

3.3 Cross contamination can occur whenever high-level and low-level samples are sequentially analyzed. To reduce cross contamination, the purging device and sample syringe should be rinsed out twice, between samples, with organic-free water. Whenever an unusually concentrated sample is encountered, it should be followed by an analysis of organic-free water to check for cross contamination. For samples containing large amounts of water-soluble materials, suspended solids, high boiling compounds, or high organohalide levels, it may be necessary to wash out the purging device with a soap solution, rinse with distilled water, and then dry in a 105° C oven between analyses.

3.4 Low molecular weight impurities in PEG can be volatilized during the purging procedure. Thus, the PEG employed in this method must be purified before use as described in Section 5.2.

4.0 Apparatus and Materials

4.1 Sampling equipment

4.1.1 Vial: 25-ml capacity or larger, equipped with a screw cap (Pierce #13075 or equivalent). Detergent wash, rinse with tap and distilled water, and dry for 1 hr at 105° C before use.

4.1.2 Septum: Teflon-faced silicone (Pierce #12722 or equivalent). Detergent wash, rinse with tap and distilled water and dry at 105° C for 1 hr before use.

4.2 Purge-and-trap device: The purge-and-trap device consists of three separate pieces of equipment: the purging chamber, trap, and the desorber. Several complete devices are now commercially available.

4.2.1 The purging chamber must be designed to accept 5-ml or 25-ml samples with a water column at least 3 cm deep. The gaseous head space between the water column and the trap must have a total volume of less than 15 ml. The purge gas must pass through the water column as finely divided bubbles with a diameter of less than 3 mm at the origin. The purge gas must be introduced no more than 5 mm from the base of the water column. The purging chamber, illustrated in Figure 1, meets these design criteria.

4.2.2 The trap must be at least 25 cm long and have an inside diameter of at least 2.5 mm. The trap must be packed to contain the following minimum lengths-of-adsorbents: 1.0 cm of methyl-silicone-coated packing (Section 5.3.2), 15 cm of 2,6-diphenylene oxide polymer (Section 5.3.1), and 8 cm of silica gel (Section 5.3.3). The minimum specifications for the trap are illustrated in Figure 2.

4.2.3 The desorber must be capable of rapidly heating the trap to 180° C within 30 sec. The polymer section of the trap should not be heated higher than 180° C and the remaining sections should not exceed 220° C. The desorber design, illustrated in Figure 2, meets these criteria.

4.2.4 The purge-and-trap device may be assembled as a separate unit or be coupled to a gas chromatograph as illustrated in Figures 3 and 4.

4.3 Gas chromatograph/mass spectrometer system

4.3.1 Gas chromatograph: An analytical system complete with a temperature-programmable gas chromatograph and all required accessories including syringes, analytical columns, and gases.

4.3.2 Column: 2-m x 2-mm I.D. stainless steel or glass, packed with 1% SP-1000 on 60/80 mesh Carbopack B or equivalent.

4.3.3 Mass spectrometer: Capable of scanning from 40 to 250 amu every 3 sec or less, utilizing 70 volts (nominal) electron energy in the electron impact ionization mode and producing a mass spectrum which meets all the criteria in Table 1 when 50 ng of 4-bromofluorobenzene (BFB) is injected through the GC inlet or introduced in the purge-and-trap mode.

4.3.4 GC/MS interface: Any GC-to-MS interface that gives acceptable calibration points at 50 ng per injection for each compound of interest and achieves acceptable tuning performance criteria (see Section 9) may be used. GC-to-MS interfaces constructed of all glass or glass-lined materials are recommended. Glass can be deactivated by silanizing with dichlorodimethylsilane. The interface must be capable of transporting at least 10 ng of the components of interest from the GC to the MS.

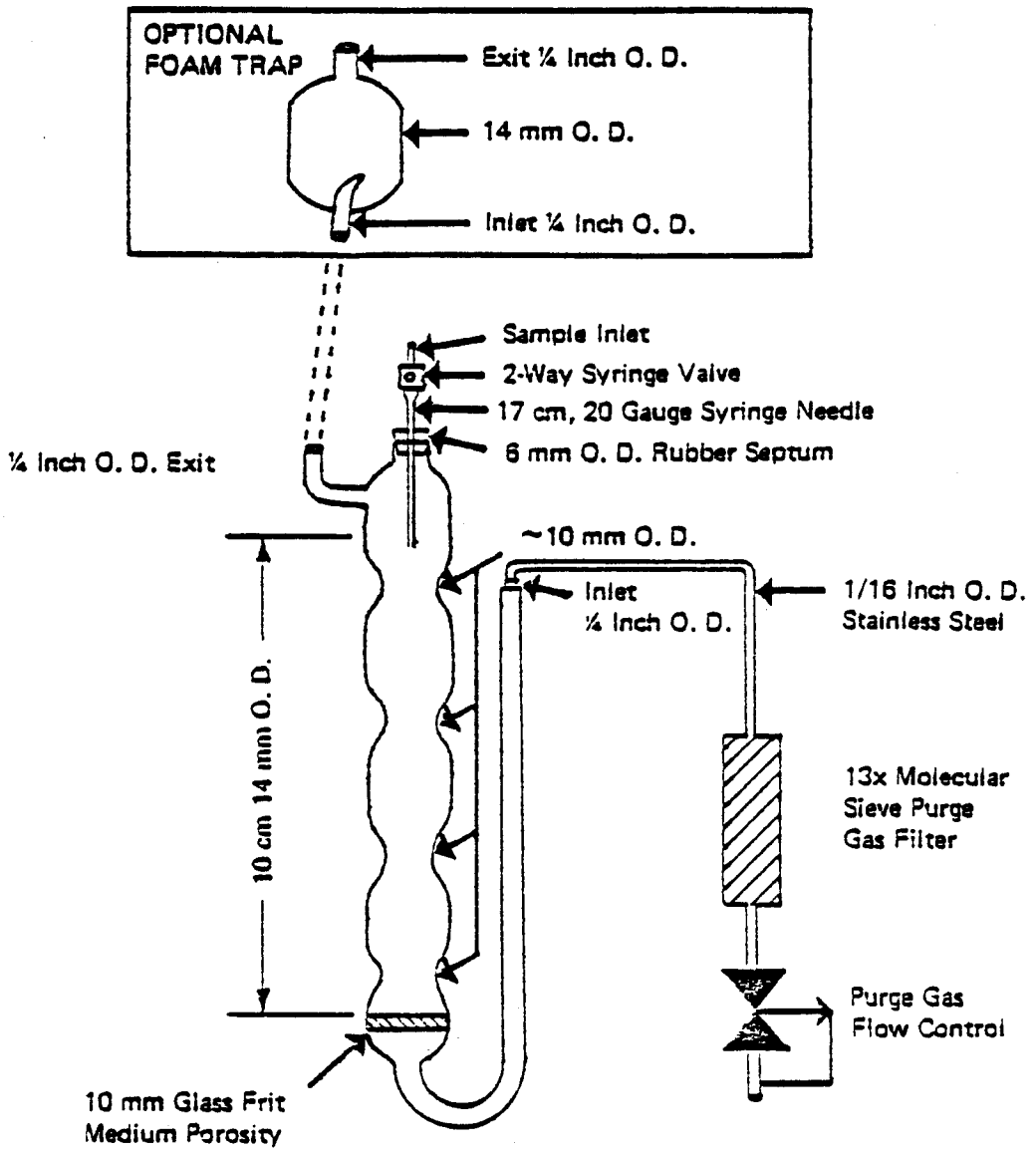


Figure 1. Purging chamber.

ORGANIC ANALYTICAL METHODS - GC/MS

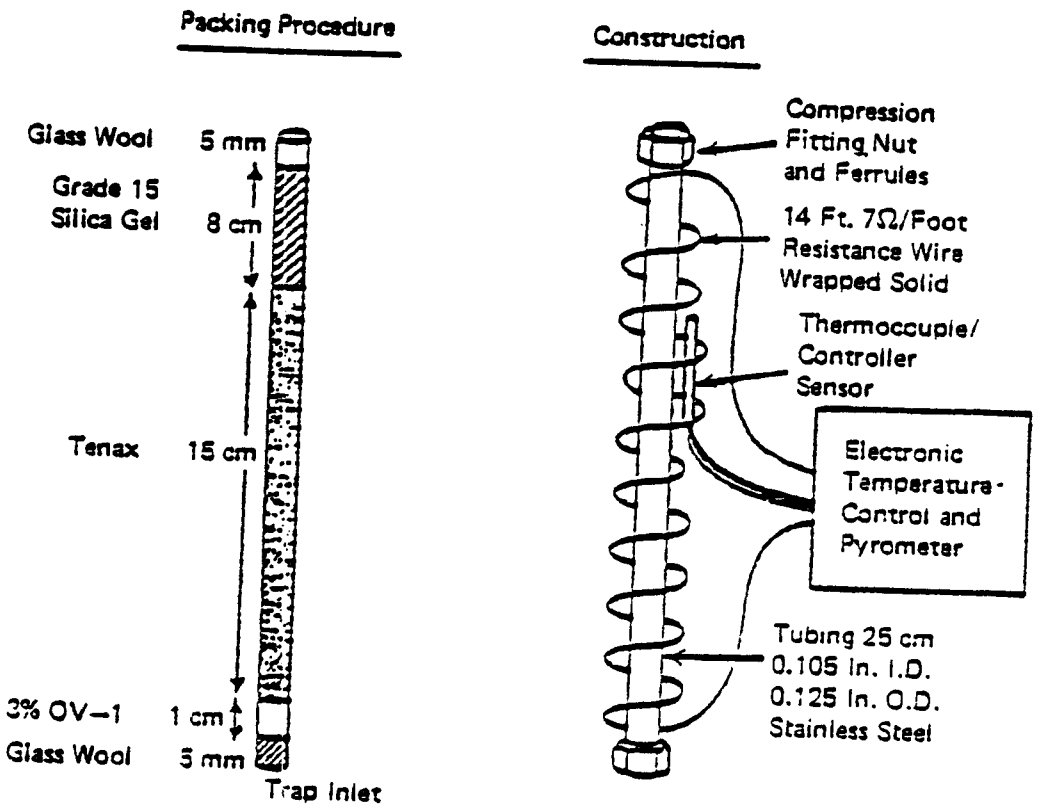


Figure 2. Trap packings and construction to include desorb capability.

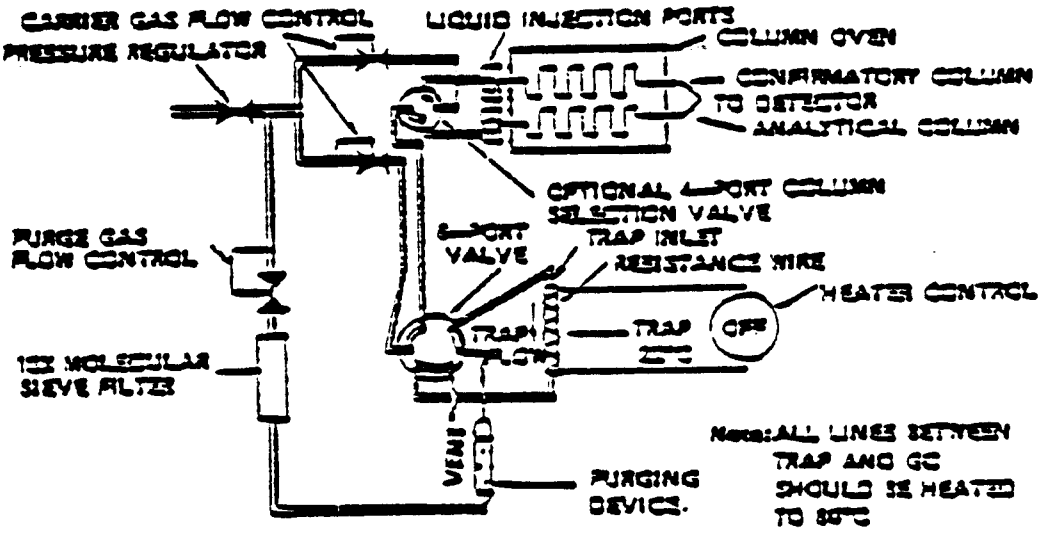


FIGURE 3. Schematic of purge and trap device — purge mode

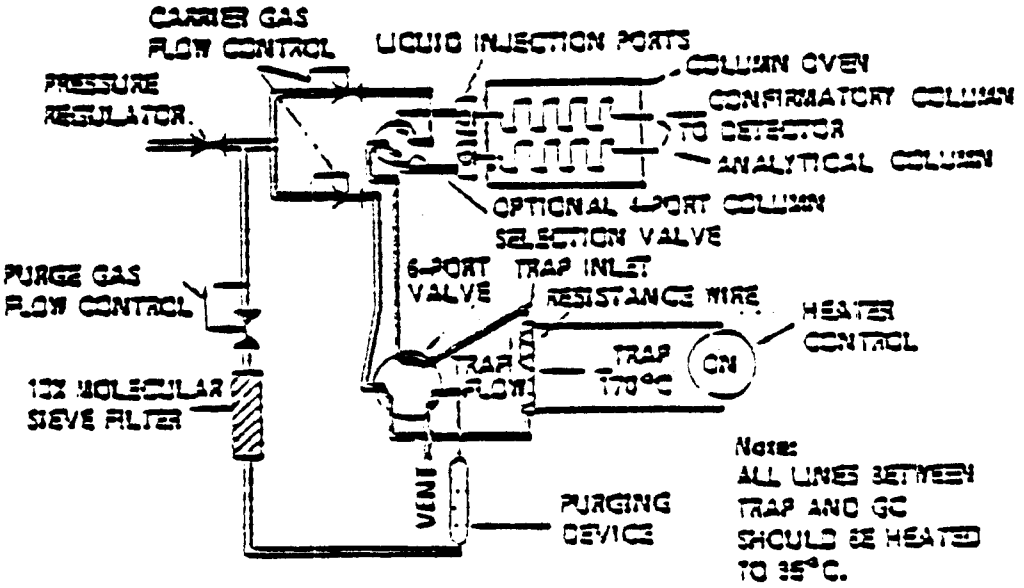


Figure 4. Schematic of purge and trap device - desorb mode

4.3.5 Data system: A computer system must be interfaced to the mass spectrometer that allows the continuous acquisition and storage on machine-readable media of all mass spectra obtained throughout the duration of the chromatographic program. The computer must have software that allows searching any GC/MS data file for ions of a specific mass and plotting such ion abundances versus time or scan number. This type of plot is defined as an Extracted Ion Current Profile (EICP). Software must also be available that allows integrating the abundance in any EICP between specified time or scan number limits. Hardware and software must be available to transform the data into a compatible format. These generally consist of a 9-inch, 800-bpi tape drive and the associated software.

4.4 Sample transfer implements: Implements are required to transfer portions of solid, semisolid, and liquid wastes from sample containers to laboratory glassware. The transfer must be accomplished rapidly to avoid loss of volatile components during the transfer step. Liquids may be transferred using a hypodermic syringe with a wide-bore needle or no needle attached. Samples should be introduced into the syringe by (1) removing the plunger from the syringe, (2) pouring the sample into the barrel, and (3) replacing the barrel and inverting the syringe to remove any air trapped in the syringe. Do not draw the sample up into the syringe. Solids may be transferred using a conventional laboratory spatula, spoon, or coring device. A coring device that is suitable for handling some samples can be made by using a glass tubing saw to cut away the closed end of the barrel of a glass hypodermic syringe.

TABLE 2. BFB KEY ION ABUNDANCE CRITERIA

Mass	Ion abundance criteria
50	15 to 40% of mass 95
75	30 to 60% of mass 95
95	Base Peak, 100% Relative Abundance
96	5 to 9% of mass 95
173	less than 2% of mass 174
174	greater than 50% of mass 95
175	5 to 9% of mass 174
176	greater than 95% but less than 100% of mass 174
177	5 to 9% of mass 176

4.5 Syringes: 5-ml and 25-ml glass hypodermic, equipped with 20-gauge needle, at least 15 cm in length.

4.6 Micro syringes: 10-µl, 25-µl, 100-µl, 250-µl, and 1000-µl. These syringes should be equipped with 20-gauge needles having a length sufficient to extend from the sample inlet to within 1 cm of the glass frit in the purging device (see Figure 1). The needle length required will depend upon the dimensions of the purging device employed.

4.7 Centrifuge tubes: 50-ml round-bottom glass centrifuge tubes with Teflon-lined screw caps. The tubes must be marked before use to show an approximate 20-ml graduation.

4.8 Centrifuge: Capable of accommodating 50-ml glass tubes.

4.9 Syringe valve: 2-way, with Luer ends (2 each) (Hamilton #86725 valve equipped with one Hamilton #35033 Luer fitting, or equivalent).

4.10 Syringe: 5-ml, gas-tight with shut-off valve.

4.11 Bottle: 15-ml, screw-cap, Teflon cap liner.

4.12 Balance: Analytical, capable of accurately weighing 0.0001 g.

4.13 Rotary evaporator: equipped with Teflon-coated seals (Buchi Rotavapor R-110, or equivalent).

4.14 Vacuum pump: mechanical, two-stage.

5.0 Reagents

5.1 Reagent water: Reagent water is defined as a water in which an interferent is not observed at the method detection limit of the compounds of interest.

5.1.1 Reagent water may be generated by passing tap water through a carbon filter bed containing about 500 g of activated carbon (Calgon Corp., Filtrasorb-300, or equivalent).

5.1.2 A water purification system (Millipore Super-Q or equivalent) may be used to generate reagent water.

5.1.3 Reagent water may also be prepared by boiling water for 15 min. Subsequently, while maintaining the temperature at 90° C, bubble a contaminant-free inert gas through the water for 1 hr. While still hot, transfer the water to a narrow-mouth screw-cap bottle and seal with a Teflon-lined septum and cap.

5.1.4 Reagent water may also be purchased under the name "HPLC water" from several manufacturers (Burdick and Jackson, Baker and Waters, Inc.).

5.2 Reagent PEG: Reagent PEG is defined as PEG having a nominal average molecular weight of 400, and in which interferents are not observed at the method detection limit for compounds of interest.

5.2.1 Reagent PEG is prepared by purification of commercial PEG having a nominal average molecular weight of 400. The PEG is placed in a round-bottom flask equipped with a standard taper joint, and the flask is affixed to a rotary evaporator. The flask is immersed in a water bath at 90-100° C and vacuum is maintained at less than 10 mm Hg for at least 1 hr using a two-stage mechanical pump. The vacuum system is equipped with an all-glass trap, which is maintained in a dry ice/methanol bath.

5.2.2 In order to demonstrate that all interfering volatiles have been removed from the PEG, a reagent water/PEG blank must be analyzed.

5.3 Trap materials

5.3.1 2,6-Diphenylene oxide polymer: 60/80-mesh Tenax, chromatographic grade or equivalent.

5.3.2 Methyl silicone packing: 3 percent OV-1 on 60/80 mesh Chromosorb-W or equivalent.

5.3.3 Silica gel, Davison Chemical (35/60 mesh), grade-15 or equivalent.

5.3.4 Prepared trapping columns may be purchased from several chromatography suppliers.

5.4 Methanol: Distilled-in-glass quality or equivalent.

5.5 Calibration standards; stock solutions (2 mg/ml): Stock solutions of calibration standards may be prepared from pure standard materials or purchased as certified solutions. Prepare stock standard solutions of individual compounds in methanol using assayed liquids or gases as appropriate. Because of the toxicity of some of the organohalides, primary dilutions of these materials should be prepared in a hood. A NIOSH/MESA-approved toxic gas respirator should be worn by analysts when handling high concentrations of these materials.

5.5.1 Place about 9.8 ml of methanol in a 10-ml ground-glass-stoppered volumetric flask. Allow the flask to stand, unstoppered, for about 10 min or until all alcohol-wetted surfaces have dried. Weigh the flask to the nearest 0.1 mg.

5.5.2 Add the assayed reference material as described below.

5.5.2.1 Liquids: Using a 100-µl syringe, immediately add 2 drops of assayed reference material to the flask, then reweigh. The liquid must fall directly into the alcohol without contacting the neck of the flask.

5.5.2.2 Gases: To prepare standards for any compounds that boil below 30° C (e.g., bromomethane, chloroethane, chloromethane, or vinyl chloride), fill a 5-ml valved gas-tight syringe with a reference standard to the 5.0-ml mark. Lower the needle to 5 mm above the methanol meniscus. Slowly introduce the reference standard above the surface of the liquid. The heavy gas rapidly dissolves in the methanol.

5.5.3 Reweigh, dilute to volume, stopper, then mix by gently inverting the flask several times. Calculate the concentration in µg/µl per microliter from the net gain in weight. When compound purity is assayed to be 96% or greater, the weight may be used without correction to calculate the concentration of the stock standard. Commercially prepared stock standards may be used at any concentration if they are certified by the manufacturer or by an independent source.

5.5.4 Transfer the stock standard solution into a Teflon-sealed screw-cap bottle. Store, with minimal headspace, at -10 to -20° C and protect from light.

5.5.5 Prepare fresh standards weekly for gases or for reactive compounds such as 2-chloroethylvinyl ether. All other standards must be replaced after one month, or sooner if comparison with check standards indicates a problem.

5.6 Calibration standards; secondary dilution solutions: Using stock solutions described in Section 5.5, prepare secondary dilution standards in methanol that contain the compounds of interest, either singly or mixed together. The secondary dilution standards should be prepared at concentrations such that the methanol or aqueous PEG calibration solutions prepared as described in Section 6.3.2 will bracket the working range of the analytical system. Secondary dilution standards should be stored with minimal headspace and should be checked frequently for signs of evaporation, especially just prior to preparing calibration standards from them.

5.7 Surrogate standards: Surrogate standards may be added to samples and calibration solutions to assess the effect of the sample matrix on recovery efficiency. The compounds employed for this purpose are 1,2-dibromotetrafluoroethane, bis(perfluoroisopropyl) ketone, fluorobenzene, and m-bromobenzotrifluoride. Prepare methanolic solutions of the surrogate standards using the procedures described in Sections 5.5 and 5.6. The

concentrations prepared and the amount of solution added to each sample should be those required to give an amount of each surrogate in the purging device that is equal to the amount of each internal standard added, assuming a 100% recovery of the surrogate standards.

5.8 Internal standards: In this method, internal standards are employed during analysis of all samples and during all calibration procedures. The analyst must select one or more internal standards that are similar in analytical behavior to the compounds of interest. The analyst must further demonstrate that the measurement of the internal standard is not affected by method or matrix interferences. Because of these limitations, no internal standard can be suggested that is applicable to all samples. However, for general use, D_4-1,2-dichloroethane, D_6-benzene, and D_5-ethylbenzene are recommended as internal standards covering a wide boiling point range.

5.9 4-Bromofluorobenzene (BFB): BFB is added to the internal standard solution or analyzed alone to permit the mass spectrometer tuning for each GC/MS run to be checked.

5.10 Internal standard solution: Using the procedures described in Sections 5.5 and 5.6, prepare a methanolic solution containing each internal standard at a concentration of 12.5 µg/ml.

5.11 Sodium monohydrogen phosphate: 2.0 µ in distilled water.

5.12 n-Nonane and n-dodecane, 98+% purity.

5.13 N-Hexadecane, distilled-in-glass (Burdick and Jackson, or equivalent).

6.0 Sample Collection, Handling, and Preservation

6.1 All samples must be collected using a sampling plan that addresses the considerations discussed in Section One of this manual.

6.2 All samples must be stored in Teflon-lined screw cap vials. Sample containers should be filled as completely as possible so as to minimize headspace or void space. Vials containing liquid sample should be stored in an inverted position.

6.3 All samples must be iced or refrigerated from the time of collection to the time of analysis, and should be protected from light.

7.0 Procedure

7.1 Calibration

7.1.1 Assemble a purge-and-trap device that meets the specifications in Section 4.2 and connect the device to a GC/MS system. Condition the trap overnight at 180° C by backflushing with an inert gas flow of at least 20 ml/min. Prior to use, condition the trap daily for 10 min while backflushing at 180° C.

7.1.2 Operate the gas chromatograph using the conditions described in Section 7.3.5 and operate the mass spectrometer using the conditions described in Section 7.3.2.

7.1.3 Calibration procedure

7.1.3.1 Conduct calibration procedures using a minimum of three concentration levels for each calibration standard. One of the concentration levels should be at a concentration near but above the method detection limit. The remaining two concentration levels should correspond to the expected range of concentrations found in real samples or should define the working range of the GC/MS system.

7.1.3.2 Prepare the final solutions containing the required concentrations of calibration standards, including surrogate standards, directly in the purging device. To the purging device, add 5.0 ml of reagent water or reagent water/PEG solution. This solution is prepared by taking 4.0 ml of reagent water or reagent PEG and diluting to 100 ml with reagent water. The reagent water/PEG solution is added to the purging device using a 5-ml glass syringe fitted with a 15-cm 20-gauge needle. The needle is inserted through the sample inlet shown in Figure 1. The internal diameter of the 14-gauge needle that forms the sample inlet will permit insertion of a 20-gauge needle. Next, using a 10-µl or 25-µl microsyringe equipped with a long needle (see Section 4.6), take a volume of the secondary dilution solution containing appropriate concentrations of the calibration standards (see Section 5.6). Add the aliquot of calibration solution directly to the reagent water or reagent water/PEG solution in the purging device by inserting the needle through the sample inlet. When discharging the contents of the micro-syringe be sure that the end of the syringe needle is well beneath the surface of the reagent water or water/PEG solution. Similarly, add 20 µl of the internal standard solution (see Section 5.10). Close the 2-way syringe valve at the sample inlet.

7.1.3.3 Carry out the purge and analysis procedure as described in Section 7.3.4. Tabulate the area response of the primary characteristic ion against concentration for each compound

including the internal standards. Calculate response factors (RF) for each compound as follows:

$$RF = (A_s C_{is})/A_{is} C_s)$$

where:

A_s = Area of the primary characteristic ion for the compound to be measured

A_{is} = Area of the primary characteristic ion of the internal standard

C_{is} = Concentration of the internal standard

C_s = Concentration of the compound to be measured.

The internal standard selected for the calculation of the RF of a compound and subsequent quantification of the compound is generally the internal standard that has a retention time closest to that of the compound. It is assumed that a linear calibration plot will be obtained over the range of concentrations used. If the RF value over the working range is a constant (less than 10% relative standard deviation), the RF can be assumed to be invariant, and the average RF can be used for calculations. Alternatively, the results can be used to plot a calibration curve of response ratios, A_s/A_{is}, versus RF.

7.1.3.4 The RF must be verified on each working day. The concentrations selected should be near the midpoint of the working range. The response factors obtained for the calibration standards analyzed immediately before and after a set of samples must be within ±20% of the response factor used for quantification of the sample concentrations.

7.2 Daily GC/MS performance tests

7.2.1 At the beginning of each day that analyses are to be performed, the GC/MS system must be checked to see that acceptable performance criteria are achieved for BFB (see Table 2).

7.2.2 The BFB performance test requires the following instrumental parameters:

Electron Energy:	70 volts (nominal)
Mass Range:	40 to 250 amu
Scan Time:	to give approximately 6 scans per peak but not to exceed 3 sec per scan.

7.2.3 Bleed BFB vapor into the mass spectrometer and tune the instrument to achieve all the key ion criteria for the mass spectrum of BFB given in Table 1. A solution containing 20 ng of BFB may be injected onto the gas chromatographic column in order to check the key ion criteria.

7.2.4 The peak intensity of D_6-benzene is used to monitor the mass spectrometer sensitivity. The peak intensity for D_6-benzene observed during each sample analysis must be between 0.7 and 1.4 times the D_6-benzene peak intensity observed during the applicable calibration runs. For example, if the peak intensity of D_6-benzene observed during calibration was 355,000 area counts, then each subsequent sample or blank must give a D_6-benzene peak intensity of between 250,000 and 500,000 area counts. If the D_6-benzene peak intensity is outside the specified range, the sample must be reanalyzed. If the peak intensity is again outside the specified range, the analyst must investigate the cause of the variability in sensitivity and correct the problem.

7.3 Sample extraction and analysis

7.3.1 The analytical procedure involves extracting the non-aqueous sample with methanol or polyethylene glycol (PEG) and analyzing a portion of the extract by a purge-and-trap GC/MS procedure. The amount of the extract to be taken for the GC/MS analysis is based on the estimated total volatile content (TVC) of the sample. The TVC is estimated by extracting the sample with n-hexadecane and analyzing the n-hexadecane extract by gas chromatography.

7.3.2 The estimated TVC is based on the total area response relative to that of n-nonane for all components eluting prior to the retention time of n-dodecane. The response factor for n-nonane and the retention time of n-dodecane are determined by analyzing a 2-µl aliquot of an n-hexadecane solution containing 0.20 mg/ml of n-nonane and n-dodecane.

7.3.2.1 The GC analyses are conducted using a flame ionization detector and a 3-m x 2-mm I.D. glass column packed with 10% OV-101 on 100-200 mesh Chromosorb W-HP. The column temperature is programmed from 80° C to 280° C at 8°/min and held at 280° for 10 min.

7.3.2.2 Determine the area response for n-nonane and divide by 0.2 to obtain the area response factor. Record the retention time of n-dodecane.

7.3.2.3 Add 1.0 g of sample to 20 ml of n-hexadecane and 2 ml of 2.0 M Na_2HPO_4 contained in a 50-ml glass centrifuge tube and cap securely with a Teflon-lined screw cap. Shake the mixture vigorously for one minute. If the sample does not disperse

during the shaking process, sonify the mixture in an ultrasonic bath for 30 min. Allow the mixture to stand until a clear supernatant is obtained. Centrifuge if necessary to facilitate phase separation.

7.3.2.4 Analyze a 2-µl aliquot of the n-hexadecane supernatant using the conditions described in Section 7.3.2.1. Determine the total area response of all components eluting prior to the retention time of n-dodecane and subtract the corresponding area of an n-hexadecane blank. Using the area response factor determined for n-nonane in Section 7.3.2.2, calculate the TVC as follows:

$$TVC = \frac{TAR_{sample} - TAR_{blank}}{\text{n-Nonane Area Response Factor}} \times 20$$

where:

TVC = total volatile content of the sample in mg/g

TAR_{sample} = total area response obtained for the sample

TAR_{blank} = total area response obtained for a blank.

7.3.3 The transfer of an aliquot of the sample for extraction with methanol or PEG should be made as quickly as possible to minimize loss of volatiles from the sample.

7.3.3.1 To a 50-ml glass centrifuge tube with Teflon-lined cap, add 40 ml of reagent methanol or PEG. Weigh the capped centrifuge tube and methanol or PEG on an analytical balance.

7.3.3.2 Using an appropriate implement (see Section 4.4), transfer approximately 2 g of sample to the methanol or PEG in the centrifuge tube in such a fashion that the sample is dissolved in or submerged in the methanol or PEG as quickly as possible. Take care not to touch the sample-transfer implement to the methanol or PEG. Recap the centrifuge tube immediately and weigh on an analytical balance to determine an accurate sample weight.

7.3.3.3 Disperse the sample by vigorous agitation for 1 min. The mixture may be agitated manually or with the aid of a vortex-mixer. If the sample does not disperse during this process, sonify the mixture in an ultrasonic bath for 30 min. Allow the mixture to stand until a clear supernatant is obtained as the sample extract. Centrifuge if necessary to facilitate phase separation.

7.3.3.4 The sample extract may be stored for future analytical needs. If this is desired, transfer the solution to a 10-ml screw cap vial with Teflon cap liner. Store at -10 to -20° C, and protect from light.

7.3.4 Reagent water, internal standard solution, and the sample extract are added to a purging chamber that is connected to the purge-and-trap device and that has been flushed with helium during a 7-min trap reconditioning step (see Section 7.3.4.4). The additions are made using an appropriately sized syringe equipped with a 15-cm 20-gauge needle. Open the syringe valve of the sample inlet (shown in Figure 1) and insert the needle through the valve.

7.3.4.1 Add 5.0 ml of reagent water or aqueous sample to which 20.0 µl of the internal standard solution has been added (see Section 5.10) to the purging chamber. Insert the needle of the syringe well below the surface of the water for the addition of the internal standard solution. If the sample is aqueous go to Section 7.3.5.

7.3.4.2 Add an aliquot of the sample extract from Section 7.3.3.4. The total quantity of volatile components injected should not exceed approximately 10 µg. If the total volatile content (TVC) of the sample as determined in Section 7.3.1.4 is 1.0 mg/g or less, use a 200-µl aliquot of the sample extract. If the TVC is greater than 1.0 mg/g, use an aliquot of the sample extract that contains approximately 10 µg of total volatile components; the volume (in µl) of the aliquot to be taken can be calculated by dividing 200 by the TVC. If the TVC is greater than 20 mg/g, take a 500-µl aliquot of the sample extract and dilute to 10 ml with PEG. In this case calculate the aliquot volume (in µl) of the undiluted extract to be taken by dividing 4,000 by the TVC. If the TVC is less than 1.0 mg/g and greater sensitivity is desired, use a large purging chamber containing 25 ml of reagent water and use a 1.0-ml aliquot of the sample extract.

7.3.4.3 Close the 2-way syringe valve at the sample inlet.

7.3.5 The sample in the purging chamber is purged with helium to transfer the volatile components to the trap. The trap is then heated to desorb the volatile components which are swept by the helium carrier gas onto the GC column for analysis.

7.3.5.1 Adjust the gas (helium) flow rate to 40 ± 3 ml/min. Set the purging device to purge, and purge the sample for 11.0 ± 0.1 min at ambient temperature.

7.3.5.2 At the conclusion of the purge time, adjust the device to the desorb mode, and begin the GC/MS analysis and data acquisition using the following GC operating conditions:

Column: 6-ft x 2-mm I.D. glass column of 1% SP-1000 on Carbo-pack B (60-80 mesh).

Temperature: Isothermal at 45° C for 3 min, then increased at 8° C/min to 220° C, and maintained at 220° C for 15 min.

Concurrently, introduce the trapped materials to the GC column by rapidly heating the trap to 180° C while backflushing the trap with helium at a flow rate of 30 ml/min for 4 min. If this rapid heating requirement cannot be met, the GC column must be used as a secondary trap by cooling it to 30° C or lower during the 4-min desorb step and starting the GC program after the desorb step.

7.3.5.3 Return the purge-and-trap device to the purge mode and continue acquiring GC/MS data.

7.3.5.4 Allow the trap to cool for 8 min. Replace the purging chamber with a clean purging chamber. The purging chamber is cleaned after each use by sequential washing with acetone, methanol, detergent solution and distilled water, and then dried at 105° C.

7.3.5.5 Close the syringe valve on the purging chamber after 15 sec to begin gas flow through the trap. Purge the trap at ambient temperature for 4 min. Recondition the trap by heating it to 180° C. Do not allow the trap temperature to exceed 180° C, since the sorption/desorption is adversely affected when the trap is heated to higher temperatures. After heating the trap for approximately 7 min, turn off the trap heater. When cool, the trap is ready for the next sample.

7.3.6 If the response for any ion exceeds the working range of the system, repeat the analysis using a correspondingly smaller aliquot of the sample extract described in Section 7.3.2.3.

7.4 Qualitative identification

7.4.1 Obtain an EICP for the primary characteristic ion and at least two other characteristic ions for each compound when practical. The following criteria must be met to make a qualitative identification.

7.4.1.1 The characteristic ions of each compound of interest must maximize in the same or within one scan of each other.

7.4.1.2 The retention time must fall within ±30 sec of the retention time of the authentic compound.

7.4.1.3 The relative peak heights of the characteristic ions in the EICP's must fall within ±20% of the relative intensities of these ions in a reference mass spectrum. Reference spectra may be generated from the standards analyzed by the analyst or from a reference library. All reference spectra generated from standards must be obtained from an appropriately tuned mass spectrometer.

7.5 Quantitative determination

7.5.1 When a compound has been identified, the quantification of that compound will be based on the integrated abundance from the EICP of the primary characteristic ion. In general, the primary characteristic ion selected should be a relatively intense ion, as interference-free as possible, and as close as possible in mass to the characteristic ion of the internal standard used. Generally, the base peak of the mass spectrum is used.

8.0 Quality Control

8.1 Each laboratory that uses this method is required to operate a formal quality control program. The minimum requirements of this program consist of an initial demonstration of laboratory capability and the analysis of spiked samples as a continuing check on performance. The laboratory is required to maintain performance records to define the quality of the data that are generated. Ongoing performance checks must be compared with established performance criteria to determine if the results of analyses are within the accuracy and precision limits expected of the method.

8.1.1 Before performing any analyses, the analyst must demonstrate the ability to generate acceptable accuracy and precision with this method. This ability is established as described in Section 8.2.

8.1.2 The laboratory must spike all samples including check samples with surrogate standards to monitor continuing laboratory performance. This procedure is described in Section 8.4.

8.1.3 Before processing any samples, the analyst should daily demonstrate, through the analysis of an organic-free water method blank, that the entire analytical system is interference-free. The blank samples should be carried through all stages of the sample preparation and measurement steps.

8.2 To establish the ability to generate acceptable accuracy and precision, the analyst must perform the following operations using a representative sample as a check sample.

8.2.1 Analyze four aliquots of the unspiked check sample according to the method in Section 7.3.

8.2.2 For each compound to be measured, select a spike concentration representative of twice the level found in the unspiked check sample or a level equal to 10 times the expected detection limit, whichever is greater. Prepare a spiking solution by dissolving the compounds in methanol at the appropriate levels.

8.2.3 Spike a minimum of four aliquots of the check sample with the spiking solution to achieve the selected spike concentrations. Spike the samples by adding the spiking solution to the PEG used for the extraction. Analyze the spiked aliquots according to the method in Section 7.3.

8.2.4 Calculate the average percent recovery, R, and the standard deviation of the percent recovery, s, for all compounds and surrogate standards. Background corrections must be made before R and s calculations are performed. The average percent recovery must be greater than 20 for all compounds to be measured and greater than 60 for all surrogate compounds. The percent relative standard deviation of the percent recovery, s/R x 100, must be less than 20 for all compounds to be measured and all surrogate compounds.

8.3 The analyst must calculate method performance criteria for each of the surrogate standards.

8.3.1 Calculate upper and lower control limits for method performance for each surrogate standard, using the values for R and s calculated in Section 8.2.4:

Upper Control Limit (UCL) = R + 3s
Lower Control Limit (LCL) = R - 3s

The UCL and LCL can be used to construct control charts that are useful in observing trends in performance.

8.3.2 For each surrogate standard, the laboratory must maintain a record of the R and s values obtained for each surrogate standard in each waste sample analyzed. An accuracy statement should be prepared from these data and updated regularly.

8.4 The laboratory is required to spike all samples with the surrogate standards to monitor spike recoveries. The spiking level used should be that which will give an amount in the purge apparatus that is equal to the amount of the internal standard assuming a 100% recovery of the surrogate standards. If the recovery for any surrogate standard does not fall within the control limits for method performance, the results reported for that sample must be

qualified as being outside of control limits. The laboratory must monitor the frequency of data so qualified to ensure that it remains at or below 5%. Four surrogate standards, namely 1,2-dibromodifluoroethane, bis(perfluoroisopropyl) ether, fluorobenzene, and m-bromobenzotrifluoride, are recommended for general use to monitor recovery of volatile compounds varying in volatility and polarity.

8.5 Each day, the analyst must demonstrate through the analysis of a process blank that all glassware and reagent interferences are under control.

8.6 It is recommended that the laboratory adopt additional quality assurance practices for use with this method. The specific practices that are most productive depend upon the needs of the laboratory and the nature of the samples. Field replicates may be analyzed to monitor the precision of the sampling technique. Whenever possible, the laboratory should perform analysis of standard reference materials and participate in relevant performance evaluation studies.

8.7 Standard quality assurance practices should be used with this method. Field replicates should be collected to validate the precision of the sampling technique. Laboratory replicates should be analyzed to validate the precision of the analysis. Fortified samples should be carried through all stages of sample preparation and measurement; they should be analyzed to validate the sensitivity and accuracy of the analysis. If the fortified waste samples do not indicate sufficient sensitivity to detect less than or equal to 1 µg/g of sample, then the sensitivity of the instrument should be increased or the extract subjected to additional cleanup. Detection limits to be used for groundwater samples are indicated in Table 1. Where doubt exists over the identification of a peak on the chromatograph, confirmatory techniques such as mass spectroscopy should be used.

8.8 The method detection limit (MDL) is defined as the minimum concentration of a substance that can be measured and reported with 99% confidence that the value is above zero. The MDL concentrations listed in Table 1 were obtained using reagent water. Similar results were achieved using representative wastewaters. The MDL actually achieved in a given analysis will vary depending on instrument sensitivity and matrix effects.

8.9 In a single laboratory, using reagent water and wastewaters spiked at or near background levels, the average recoveries presented in Table 3 were obtained. The standard deviation of the measurement in percent recovery is also included in Table 3.

APPENDIX K

LOS ALAMOS PROCEDURE FOR OPERATING DRUM PUMPS

OPERATING PROCEDURE FOR UTILIZING DRUM PUMPS

Introduction

This Operating Procedure summarizes the proper utilization of the Lutz drum pumps for the transfer of liquid hazardous wastes. The Lutz pumps have two main parts: the pump tubes and the motors. The pump tubes and motors are mutually interchangeable and care should be taken to utilize the correct combination of motor and pump tube for the particular waste being transferred.

Procedures

1. Identify the waste which will be transferred and know the hazards and incompatibilities associated with the waste.

2. If the waste is to be transferred to an empty drum, select a drum which will be compatible with the waste. Utilize polypropylene drums for all corrosive materials.

3. If the waste is to be transferred to a partially full drum, be certain that the material to be added is compatible with the material already in the drum.

4. Don personal protective equipment appropriate for the material being transferred.

5. Select a pump tube which is compatible with the waste by locating the waste in Pump Tube Selection Appendix. If the waste is not listed, then utilize the Drum Category Pump Tube Selection Chart below (see instructions for Identification and Segregation of Hazardous Wastes for further information on Drum Categories). Each pump tube has a tag attached to it which states the type of material it is constructed of. Carefully inspect the pump tube before using it to verify that it was properly cleaned of waste material after it was last used.

Waste Category	Pump Tube Type
Organics	Kynar
Corrosive acidic wastes	Kynar
Corrosive alkalic & caustic wastes	Polypropylene
Oxidizers	Kynar
Non-reactive metals	Polypropylene

6. Chemical compatibility of the waste with the motor is not a concern since the material does not come into contact with the motor. However, only explosion-proof motors should be used with wastes which are flammable or explosive. Air-driven motors should be used in areas where power is unavailable or in the event of a power failure. The air-driven motors are operated from compressed air cylinders.

7. After the waste has been transferred, the pump should be flushed with a solvent (including water) appropriate to the material transferred. The solvent should be collected and treated as a hazardous waste.

8. Record the material transfer on a Storage and Shipment Form for Hazardous Waste which should be attached to the receiving drum.

9. If the material transferred is not an Acutely Hazardous Waste, then the empty drum may be disposed of in the TA-54 Area G landfill.

10. If the material transferred is an Acutely Hazardous Waste, the empty drum must be rinsed three times with an appropriate solvent and then the empty drum may be disposed of in the landfill. The solvent must be collected and handled as a hazardous waste.

Maintenance and Repair

1. A back-up pump tube will be kept in storage for each type of pump tube available for transferring wastes. The Hazardous Waste Technician is responsible for promptly repairing unsuitable pump

tubes or ordering new pump tubes whenever a back-up pump tube is taken from storage and placed in use.

2. Once every three months, the Hazardous Waste Technician will operate all of the available motors and pump tubes to ascertain that they are properly working. Pumps which are not properly working will be disassembled and the parts inspected for damage or unacceptable wear. Any damaged or unacceptably worn parts will be promptly replaced or repaired or the pump tube or motor taken out of service until the parts are replaced or repaired.

3. Records of all pump maintenance and/or repair will be made on the Inspection Log Form.

PUMP TUBE SELECTION APPENDIX

Chemical Resistance Table and Material Selection Guide

The data in the following table gives the corrosion resistance of the five materials to various chemical media. This information may be considered only as a basis for recommendation, but not as a guarantee. Where compatibility is in question, material should be tested under actual field conditions to determine the proper choice. All test data listed is at room temperature (72°F) unless otherwise stated.

R = Recommended
F = Fair, should be tested under field conditions
D = Not Recommended
— = Unknown
B = Minor to moderate effect

	Aluminum	Hastelloy C®	Kynar®	Polypropylene	Stainless Steel 316
Acetaldehyde	B	R	—	R	R
Acetamide	R	—	—	—	R
Acetate Solvents	B	R	R	R	R
Acetic Acid, 10-80%	—	R	R	R	F
Acetic Acid, Glacial	B	R	R	R	F
Acetic, 80%	—	R	R	—	F
Acetic Anhydride	B	R	B	B	F
Acetone	R	R	D	F	F
Acetophenone	B	—	R	—	B
Acetyle Chloride	D	—	R	—	B
Acetylene	R	R	—	R	R
Acriflauine	—	—	—	R	—
Acrylic Emulsions	R	—	—	—	—
Alcohols					
Allyl	—	R	—	R	R
Amyl	B	R	R	R	R
Butyl	B	R	—	R	R
Ethyl	B	R	—	R	R
Methyl	B	R	—	R	R
Propyl	R	R	—	R	R
Aluminum Chloride	B	R	R	R	D
Aluminum Fluoride	—	R	R	R	D
Aluminum Hydroxide	R	—	R	R	R
Aluminum Nitrate	B	—	R	R	R
Aluminum Oxychloride	—	—	—	F	—
Aluminum Sulfate	R	R	R	R	R
Aluminum Sulfate Acid	—	F	—	—	—
Aluminum (All types)	—	—	—	R	—
Ammonia, Aqua, 10%	—	R	R	R	R
Ammonia, Aqueous	—	R	—	R	R
Ammonia (Concentrated)	—	—	—	R	R

	Aluminum	Hastelloy C®	Kynar®	Polypropylene	Stainless Steel 316
Ammonia Gas (Dry)	—	—	—	R	R
Ammonium Bifluoride	D	B	R	R	R
Ammonium Carbonate	D	B	R	R	R
Ammonium Chloride	—	R	R	R	F
Ammonium Fluoride, 10%	—	R	—	—	—
Ammonium Fluoride, 25%	—	R	—	R	—
Ammonium Hydroxide	D	R	R	R	R
Ammonium Nitrate	B	R	R	R	R
Ammonium Nitrite	—	—	—	—	—
Ammonium Oxalate	—	R	—	R	R
Ammonium Persulfate	D	R	—	R	R
Ammonium Phosphate, Dibasic	F	R	—	R	R
Ammonium Phosphate, Monobasic	F	R	—	R	R
Ammonium Phosphate, Tribasic	F	R	—	R	R
Ammonium Sulfate	F	F	R	R	R
Ammonium Sulfide	—	R	—	—	—
Ammonium Thio-Sulfate	—	—	—	—	R
Ammonium Thicyanate	—	—	—	—	—
Amyl Acetate Kynar, R, to 120°F)	F	F	R	D	R
Amyl Alcohol	F	R	R	R	R
Amyl Borate	—	—	—	—	—
Amyl Chloride	D	R	R	D	R
Amyl Chloronapthalene	—	—	—	—	—
Amyl Napthalene	—	—	—	—	—
Aniline (Kynar, R to 70°F)	F	F	R	F	R
Aniline Dyes	F	—	—	—	F
Aniline Hydrochloride	D	—	—	—	D
Animal Fats	R	—	—	—	R
Anisole	—	R	—	F	R

Chemical Resistance Table and Material Selection Guide (Continued).

	Aluminum	Hastelloy C®	Kynar®	Polypropylene	Stainless Steel 316
Antimony Chloride	—	R	—	R	—
Anti-Freeze	R	R	—	R	R
Antimony Trichloride	—	—	—	R	U
Aqua Regia (80%), (Kynar, R, 70°)	D	D	R	D	D
Arsenic Acid	D	R	R	R	F
Barium Carbonate	F	F	R	R	F
Barium Chloride	D	R	R	R	F
Barium Hydroxide	D	R	R	R	R
Barium Sulfate	D	—	—	—	R
Barium Sulfide	D	—	R	R	R
Beer	R	—	—	D	R
Beet Sugar Liquors	R	R	—	R	R
Bensaldehyde (Kynar, R, 70°F)	F	—	R	D	R
Benzene, Benzol (Kynar, R, 70°F)	F	F	R	D	R
Benzene Sulfonic Acid (Kynar, R, 70°F)	D	—	R	—	F
Benzoic Acid	F	R	R	D	R
Benzyl Alcohol	—	—	—	R	—
Benzyl Chloride	—	—	—	—	—
Bismuth Carbonate	—	R	—	R	—
Black Liquors	—	F	—	R	—
Bleach, 12.5% Active	—	R	—	R	R
Borax (Sodium)	F	R	R	R	R
Boric Acid	F	R	R	R	R
Brine Acid	—	R	—	—	—
Bromic Acid	—	R	—	R	D
Bromine Liquid	—	R	—	—	D
Bromine Water	D	—	R	—	F
Butane	R	—	—	D	R
Butyl Acetate (Kynar, R, 70°F)	R	F	R	D	F
Butyl Phthalate	—	—	—	R	—
Butylene	R	—	R	—	R
Butyl Phenol	—	R	—	—	—
Butyric Acid	F	R	R	R	R
Calcium Bisulfite	F	—	R	R	F
Calcium Carbonate	F	R	R	R	R
Calcium Chlorate	F	R	R	R	R
Calcium Chloride	F	R	R	R	R
Calcium Hydroxide	F	R	R	R	R

	Aluminum	Hastelloy C®	Kynar®	Polypropylene	Stainless Steel 316
Calcium Hyprochlorite	F	R	R	R	R
Calcium Nitrate	F	—	R	R	F
Calcium Sulfate	F	F	R	R	R
Calcium Sulfite	R	—	—	R	F
Cane Sugar Liquors	R	R	R	R	R
Carbon Dioxide	R	—	R	R	R
Carbon Disulfide (Kynar, R, 70°F)	F	—	R	D	R
Carbonic Acid	R	R	—	R	R
Carbon Tetrachloride	F	R	R	D	R
Castor Oil	—	R	—	R	R
Caustic Soda	—	—	—	R	—
Cellosolve	F	—	R	R	F
Cetyl Alcohol	—	—	—	R	R
Chlorine (Dry)	—	—	R	—	—
Chlorine (Wet)	D	R	R	—	D
Chlorine Liquid	D	R	R	D	D
Chloroacetic Acid	—	F	—	—	—
Chlorobenzene (Kynar, R, 150°F)	F	R	R	D	R
Chlorobenzyl Chloride	—	—	—	—	—
Chloroform	D	F	R	D	R
Chlorosulfonic Acid, 100%	D	F	D	D	D
Chromic Sulforic Acid	—	—	—	D	—
Chromic Acid, 10%	F	R	—	R	R
Chromic Acid, 50% (Kynar, R, 120°F)	F	R	R	F	F
Cider	F	R	R	F	R
Citric Acid	F	R	R	F	R
Copper Chloride	D	—	R	R	D
Copper Cyanide	D	R	R	R	R
Copper Nitrate	D	R	R	R	R
Copper Sulfate	D	R	R	R	R
Cottonseed Oil	—	R	—	R	R
Cresylic Acid (Kynar, R, 150°F)	F	F	R	—	R
Cyclohexane	R	—	R	D	R
Cyclohexanol (Kynar, R, 150°F)	F	—	R	—	F
Cyclohexanonene (Kynar, R, 70°F)	F	—	R	R	F
Decain	—	—	—	D	R
Detergents	R	—	—	R	R

	Aluminum	Hastelloy C®	Kynar®	Polypropylene	Stainless Steel 316
Developing Solutions	—	—	—	R	F
Dextrose	—	R	—	—	R
Diacetone Alcohol	R	—	—	—	R
Dichloroethylene	—	R	—	R	—
Diesel Fuels	R	R	R	D	R
Diethyl Ether (Kynar, R, 70°F)	F	—	R	R	B
Diisobutylene	F	—	R	—	F
Dimethyl Formamide	R	—	—	—	R
Dioctyl Phthalate	R	—	—	—	R
Distilled Water	—	R	—	R	R
Epichlorohydrine	R	—	D	—	R
Ethanolamine (Kynar, R, 70°F)	—	—	R	—	R
Ether (Kynar, R, 70°F)	R	F	R	—	R
Ethyl Acetate (Kynar, R, 70°F)	F	F	R	F	R
Ethyl Chloride	F	F	R	D	R
Ethyl Ether	F	—	—	—	R
Ethylene Chloride (Kynar, R, 70°F)	F	F	R	D	R
Ethylene Dichloride	D	F	—	R	R
Ethylene Glycol	R	—	R	D	R
Ethylene Oxide	R	—	R	—	—
Ethylene Trichloride	F	—	R	—	R
Fatty Acids	F	R	R	—	R
Ferric Chloride	D	F	R	R	F
Ferric Nitrate	D	R	R	R	R
Ferric Sulfate	D	R	R	R	R
Ferrous Chloride	D	F	R	R	D
Ferrous Sulfate	D	F	R	R	F
Fluboric Acid	—	R	—	—	F
Fluosilicic Acid	D	—	F	—	—
Formaldehyde (Kynar, R, 120°F)	R	F	R	R	R
Formic Acid	D	R	R	R	R
Freon (Seal-less Pump Tubes Only)	—	—	—	R	R
Fruit Juices	F	—	—	R	R
Fuel Oil	R	—	R	—	R
Furfural	R	F	F	D	R
Gallic Acid (Kynar, R, 70°F)	R	F	R	F	F
Gasoline	R	R	R	F	R

	Aluminum	Hastelloy C®	Kynar®	Polypropylene	Stainless Steel 316
Gelatine	R	R	—	R	R
Glucose	R	—	R	R	R
Glycerine	R	R	—	R	R
Glycolic Acid (Kynar, R, 70°F)	—	R	R	R	—
Glycols	F	—	R	—	F
Heptane	R	—	R	D	R
Hexane	R	R	R	F	R
Hydrobromic Acid	D	R	R	F	D
Hydrochloric Acid (20%)	D	R	R	R	D
Hydrochloric Acid (37%) (Hot)	D	D	R	—	D
Hydrochloric Acid (37%) (Cold)	D	R	R	R	D
Hydrofluoric Acid (20%)	D	F	R	R	F
Hydrofluoric Acid (50%)	D	F	R	D	D
Hydrofluoric Acid (75%)	D	—	R	D	D
Hydrofluoric Acid (Conc.) (Hot)	D	—	R	—	D
Hydrofluoric Acid (Conc.) (Cold)	—	—	R	—	—
Hydrofluosilicic Acid (20%)	D	—	R	R	D
Hydrogen Fluoride	—	R	—	R	R
Hydrogen Peroxide (Kynar, R, 70°F)	R	R	R	R	R
Hydrogen Sulfide (Wet) (Cold)	F	—	R	—	R
Hydrogen Sulfide (Wet) (Hot)	F	—	R	—	R
Hydrogen Sulfide Aqueous Solution	F	—	R	R	R
Hypochlorous Acid	D	—	R	—	D
Iodine (Kynar, R, 150°F)	D	F	R	D	D
Isopropyl Ether	R	—	R	D	R
Jet Fuel (JP3, JP4, JP5)	R	—	R	D	R
Kerosene	R	—	R	D	R
Lacquers	R	—	—	R	R
Lacquer Solvents	R	—	—	—	R
Lactic Acid (Kynar, R, 70°F)	F	—	R	R	R
Lard Oil	R	—	R	R	R
Latex	R	—	—	—	R
Lead Acetate	D	—	R	R	F
Lubricating Oils	R	—	R	—	R

Chemical Resistance Table and Material Selection Guide (Continued).

	Aluminum	Hastelloy C®	Kynar®	Polypropylene	Stainless Steel 316
Magnesium Carbonate	—	F	R	R	R
Magnesium Chloride	D	R	R	R	R
Magnesium Hydroxide	D	—	R	R	R
Magnesium Sulfate	F	F	R	R	R
Maleic Acid	F	—	R	F	R
Malic Acid	F	—	R	—	R
Mercuric Chloride (Dilute Solution)	D	F	R	R	D
Mercuric Cyanide	D	—	R	R	R
Methyl Acetone	R	—	R	—	R
Methyl Chloride	D	—	R	D	R
Methyl Ethyl Ketone	R	—	D	R	R
Methyl Isobutyl Ketone (Kynar, R, 70°F)	—	—	R	F	R
Methylene Chloride	F	R	F	D	R
Milk	R	—	R	R	R
Monoethanolamine	F	—	D	—	R
Naptha	R	F	R	R	R
Napthalene	F	—	R	—	F
Nickel Chloride	D	—	R	R	R
Nickel Sulfate	D	F	R	R	R
Nitric Acid (5-10%)	D	R	—	R	R
Nitric Acid (20%)	D	R	—	R	R
Nitric Acid (50%)	D	R	—	D	R
Nitric Acid, Concentrated (Kynar, R, 120°F)	D	F	R	—	R
Nitric Acid, Red Fuming	R	—	F	—	R
Nitrobenzene (Kynar, R, 70°F)	F	F	R	F	F
Oils, Vegetable	—	R	—	R	R
Oleio Acid	F	—	R	R	R
Oleum	F	—	D	D	R
Oxalic Acid, (Cold)	F	F	—	R	R
Palmitic Acid	F	—	R	—	R
Perchloric Acid Kynar, R, 125°F)	D	—	R	—	D
Petrolatum	F	—	—	—	R
Petroleum Oils, Refined	—	R	—	R	R
Phenol (Carbolic Acid) (Kynar, R, 150°F)	F	R	R	F	R
Phosphoric Acid, 20%	D	R	R	—	F
Phosphoric Acid, 20-40%	D	F	R	R	R

	Aluminum	Hastelloy C®	Kynar®	Polypropylene	Stainless Steel 316
Phosphoric Acid, 45%	D	—	—	—	F
Phosphorus, Yellow	—	R	—	—	R
Phosphorus, Red	—	R	—	—	R
Photographic Solutions	F	R	—	R	R
Plating Solutions:					
Chrome 40	F	—	R	R	R
Copper	F	—	R	R	R
Gold	F	—	—	R	R
Iron	F	—	—	R	R
Lead	F	—	—	R	—
Nickel	F	—	R	R	—
Silver	F	—	R	R	R
Tin	F	—	—	R	R
Zinc	F	—	R	R	R
Potassium Bicarbonate	F	R	—	—	F
Potassium Bromide	F	R	R	R	R
Potassium Carbonate	F	F	R	R	R
Potassium Chlorate	F	—	R	R	R
Potassium Chloride	F	R	R	R	F
Potassium Chromate	R	R	—	—	F
Potassium Dichromate	R	F	R	R	R
Potassium Hydroxide (Kynar, R, 150°F)	D	F	R	R	R
Potassium Nitrate	F	F	R	—	R
Potassium Permanganate	F	R	R	F	F
Potassium Sulfate	R	F	R	R	F
Pyridine	F	R	D	F	F
Rayon Coagulating Bath	—	R	—	—	—
Rust Inhibitors	—	—	—	R	R
Sea Water	F	R	R	R	R
Silicone Oil	F	—	—	R	R
Silver Nitrate	D	—	R	R	R
Soap Solutions	F	—	—	R	R
Sodium Acetate	B	R	R	R	R
Sodium Bicarbonate	R	F	R	R	R
Sodium Bisulfate	D	R	R	R	R
Sodium Bisulfite	R	R	R	R	R
Sodium Borate	B	—	—	—	F
Sodium Bromide	—	R	—	R	R
Sodium Carbonate	B	R	R	R	R
Sodium Chlorate, 50%	B	R	R	R	R

	Aluminum	Hastelloy C®	Kynar®	Polypropylene	Stainless Steel 316
Sodium Chloride	B	R	R	R	R
Sodium Cyanide	D	—	R	R	R
Sodium Hydroxide, 20% (Kynar, R, 212°F)	D	R	R	R	R
Sodium Hydroxide, 30% (Kynar, R, 212°F)	D	R	R	R	B
Sodium Hydroxide, 80%	D	F	U	R	D
Sodium Hyprochlorite to 20%	D	R	R	D	D
Sodium Metaphospate	R	—	—	D	R
Sodium Nitrate	R	—	R	R	R
Sodium Perborate	B	—	—	R	D
Sodium Phosphate	D	—	R	—	B
Sodium Silicate	D	—	R	R	R
Sodium Sulfphate	B	B	R	R	R
Sodium Sulfide	D	—	R	R	R
Sodium Thiosulphate	B	—	R	R	R
Stannic Chloride	D	—	R	—	D
Stearic Acid	B	R	R	D	R
Sulfate Liquors	B	R	—	R	D
Sulfur	R	—	—	R	R
Sulfur Chloride (Kynar, R, 70°F)	D	—	R	D	D
Sulfur Dioxide[2] (Kynar, R, 212°F)	R	B	R	D	R
Sulfuric Acid, 10% (Kynar, R, 230°F)	D	R	R	R	F
Sulfuric Acid, 10%-75% (Kynar, R, 175°F)	D	R	R	R	B
Sulfuric Acid, Concentrated	D	R	—	D	F
Sulfurous Acid (Kynar, R, 212°F)	D	F	R	R	B
Tannic Acid (Kynar, R, 230°F)	D	F	R	R	R
Tanning Liquors	D	R	—	—	R

	Aluminum	Hastelloy C®	Kynar®	Polypropylene	Stainless Steel 316
Tar Bituminous	—	—	—	—	B
Tartaric Acid (Kynar, R, 250°F)	D	R	R	R	R
Tetrahydrofuran	—	—	D	D	R
Tetralin	R	—	—	—	R
Titanium Tetrachloride	D	R	—	—	F
Toluene, Toluol (Kynar, R, 212°F)	R	R	R	R	R
Tomato Juice	R	R	—	R	R
Transformer Oil	R	R	—	R	R
Trichloroacetic Acid (Kynar, R, 70°F)	D	F	R	—	D
Trichloroethylene	B	R	R	D	R
Triethylamine (Kynar, R, 120°F)	—	—	R	—	—
Turpentine	R	R	R	B	R
Urine	B	R	—	R	R
Vegetable Oil	R	R	—	—	R
Vinegar	D	R	—	R	R
Vinyl Chloride	—	R	—	—	—
Water, Acid	D	R	—	R	R
Water, Distilled	B	R	—	R	R
Water, Fresh	R	R	R	R	R
Water, Salt	B	R	—	R	R
Whiskey and Wines	D	R	—	R	R
White Liquor	—	R	—	R	R
Xylene or Xylol	R	R	—	D	R
Zinc Chloride	D	F	R	R	R
Zinc Sulfate	D	R	R	R	R

APPENDIX K

MANUFACTURERS INFORMATION ON PORTABLE PUMPS

Got from Dave Mass & Dave Salazar on 5/1/85

Explosion Proof Motor w/S.L. Polypropylene Tubes

DRUM & BARREL PUMPS

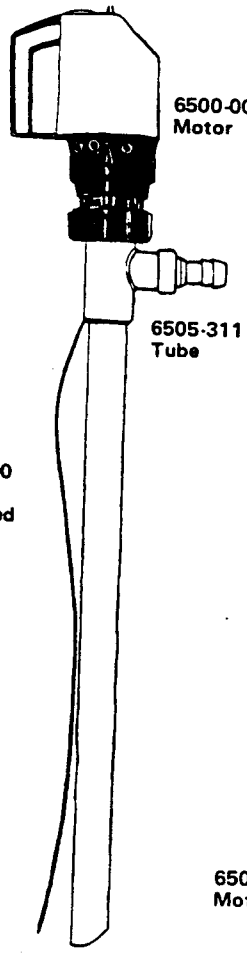
HOW TO ORDER: Motor and pump tube must be ordered separately. Any motor listed immediately below will assemble to any standard pump tube or to any S.L. (Seal-Less) pump tube.

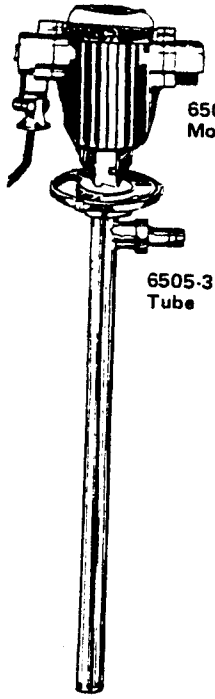
MOTOR PRICES:

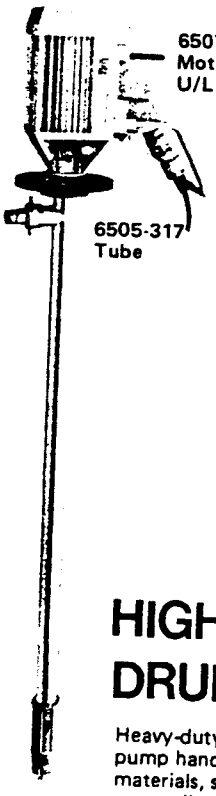
6500-000 PUMP MOTOR, portable electric motor, drip-proof . $220.00
6501-000 PUMP MOTOR, high-volume air motor 340.00
6502-000 PUMP MOTOR, heavy-duty electric motor, explosion-proof construction. 340.00
6503-000 PUMP MOTOR, extra-heavy duty electric motor, explosion-proof construction. 360.00
6504-000 PUMP MOTOR, low-volume air motor. 175.00
6506-000 PUMP MOTOR, heavy-duty electric motor, drip-proof 250.00
6507-000 PUMP MOTOR, extra-heavy-duty electric motor, explosion-proof construction, U/L-listed 525.00

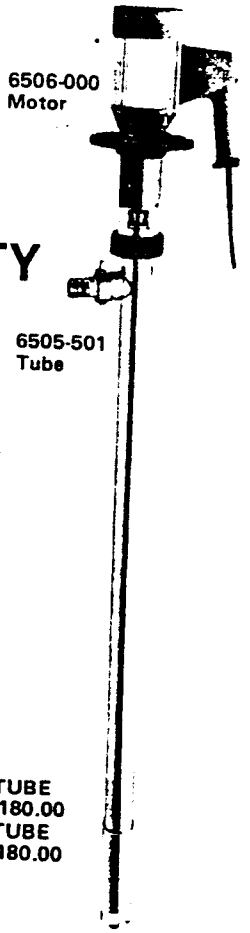
TUBE PRICES: ORDER 6505-(Size No.) PUMP TUBE

Size No.	Price Each	Length (in.)	Material
216	$235.00	27	S.L. Polypropylene
316	250.00	34	S.L. Polypropylene
416	260.00	47	S.L. Polypropylene
217	340.00	27	S.L. Stainless
317	370.00	34	S.L. Stainless
417	380.00	47	S.L. Stainless
218	460.00	27	S.L. Kynar
318	475.00	34	S.L. Kynar
418	500.00	47	S.L. Kynar
211	215.00	27	Polypropylene
311	240.00	34	Polypropylene
411	250.00	47	Polypropylene
[illegible]	305.00	27	316 Stainless
312	340.00	34	316 Stainless
412	370.00	47	316 Stainless
215	150.00	27	Aluminum
315	160.00	34	Aluminum
415	185.00	47	Aluminum









SEAL-LESS DRUM PUMP

HIGH PERFORMANCE
RUNS DRY WITHOUT DAMAGE

quality and simplicity in engineering that enable the drum pump to give high performance. It safely and ciently transfers corrosives and other chemicals from gallon drums, carboys or open tanks. This pump is erchangeable with all the motors listed above and is ilable in stainless steel and polypropylene. The new pump can run dry without damage to either pump motor. A patented Teflon sleeve prevents material m progressing up the pump shaft. A new design of the peller maximizes performance on high-viscosity material high specific-gravity solutions.

AMPLE: To order a pump combining a heavy-duty drip-of motor and a Seal-Less stainless steel tube 34" long, would specify: 6506-000 PUMP MOTOR
6505-317 PUMP TUBE, S.L. Stainless

HIGH-VISCOSITY DRUM PUMP

Heavy-duty, progressive-cavity pump handles high-viscosity materials, such as paint, polymers, oils, sucrose, etc. Efficiently pumps any material that will flow to the pump, from water to 100,000 SSU. Flows to 4.5 gpm at 100 psi. All 316 stainless steel pump tube is 2" dia. x 38" long. Stator is Teflon; rotor and all wetted parts 316 stainless. Available with a carbon/ceramic mechanical seal or stuffing box with Teflon packing. 6506-000 motor is recommended, but the tube is interchangeable with any Lutz motor.

ORDER:
6505-501 HIGH-VISCOSITY PUMP TUBE with mechanical seal $1180.00
6505-502 HIGH-VISCOSITY PUMP TUBE with stuffing box 1180.00
MOTORS — order separately from above table.

RYAN HERCO

Ryan Herco Products Corporation
P.O. Box 588, Burbank CA 91503

Address Correction Requested

Bulk Catalog Rate
U.S. Postage
PAID
Tempe AZ
Permit No. 209

458151 03 7391

LOS ALAMOS U C NATL LAB
MORT SANDERS BUYER
M/S 518

P O BOX 1663
LOS ALAMOS NM 87544

Your Western Service Centers for Industrial Plastics

Burbank CA 91504–2509 N. Naomi St., (818) 841-1141, (213) 849-1141, (714) 522-1141
San Diego CA 92126–9779 Candida St., (619) 693-1141
San Jose CA 95131–1819 Junction Av., (408) 286-1141, (415) 452-1140
Tempe AZ 85282–1245 W. Geneva Dr., (602) 968-1141
Seattle WA 98188–18200 Olympic Av. South, (206) 575-1141

*U. S. GOVERNMENT PRINTING OFFICE: 1981—779-297

Alamos National Laboratory

PURCHASE REQUEST

Requester: Retain pink; send all other copies to MAT-12, MS-274. Return ruined or unused copies to MAT-12. Do Not Destroy. DO NOT USE FOR STOCK WITHDRAWALS.

d by	Group	Mail Stop	Telephone	Realistic Date Reqd.	Date/Time Stamp
y Patterson	HSE-7	J592	7-6095	2/28/85	

e Code	Program Code/J.C.	Capital Equip. Code	Correspondence to	Mail Stop
	W57W		Rose Garcia	J592

o (name)	Area	Building	Room	Telephone	Mail Stop
atterson	TA-54	22	104	7-6095	J592

N AVAILABLE EXCESS LISTS HAVE BEEN REVIEWED

approved by (signature)

Typed Name: Harry Patterson

Title: Staff Member

Authority Level: $ 1K

ED AREAS FOR MATERIALS MANAGEMENT USE ONLY

s for Excess	Date	Buyer	Date Assigned	Telephone

Terms	Negotiated Shipping Date	Date of Order	Blanket Purchase Agreement

PURCHASE REQUEST NUMBER
4723

d By	Telephone	Date	Quote Num	SOCIO ECONOMIC SOURCE
				☐ Yes ☐ No

	Ship Via	Ship From

	TYPE COMPLETE DESCRIPTION OF REQUIREMENTS OR SPECIFICATIONS	QUAN.	UNIT	UNIT PRICE	EXTENSION
1.	Portable submersible pump Goulds Model SNW S0511B	2	ea.		
	1/2 HP, 115V, 1 phase, 1725 RPM				

Use a plain sheet of paper for continuation pages.

ESTED SOURCES (Sole source over $2.5K requires written justification)

LD PUMPS INC.

ECA FALLS, NY 13148

Total Estimated Cost: $600.00

Previous P.O. No.

State important handling or delivery information. QA handling?

ems	Total Cost	Account	Program	Loc.	Sec.	Exp.	Perm.	Job Order	Ord.	Proc.	Wk.	Surp.	Source	Accept

Bids Requested			Bids Received					Bids Requested			Seller's No.	Ex.	Due Date	Ship Date
S	D	W	B	S		W		Disadvantaged		Woman				

	Building	Room	For	Foreign Country	ACT-1 Use

PURCHASE REQUEST

ruined or unused copies to MAT-12. Do Not Destroy. DO NOT USE FOR STOCK ISSUE ITEMS IN LABORATORY WAREHOUSES.

te of Request 5/1/85					
uested by .Patterson	Group HSE7	Mail Stop J592	Telephone	Realistic Date Reqd. 5/17/85	Date/Time Stamp
nse Code 107	Program Code/J.O. W57W	Capital Equip. Code	Correspondence to	Mail Stop	
r to (name)	Area TA54	Building 22	Room 104	Telephone	Mail Stop
OWN AVAILABLE EXCESS LISTS HAVE BEEN REVIEWED			Typed Name		
nase approved by (signature)			Title	Authority Level $ K	

DED AREA FOR MATERIALS MANAGEMENT USE ONLY

ened for Exces	Date	Buyer	Telephone
oice Terms		Negotiated Shipping Date	Date of Blanket Purchase Agreement

PURCHASE REQUEST NUMBER M 4739

oted by	Telephone	Date	SOLE ECONOMIC SOURCE ☐ Yes ☐ No
O.B.			

ITEM	TYPE COMPLETE DESCRIPTION OF REQUIREMENTS OR SPECIFICATIONS	QUAN.	UNIT	UNIT PRICE
1	PUMP MOTOR (EXPLOSION PROOF)	1	EA	
	Cat no 6502-000			
2	PUMP TUBE - S.L. POLYPROPYLENE	1	EA	
	Cat. no → 6505-316			

(Use a plain sheet of paper for continuation pages.)

SUGGESTED SOURCES (Sole source over $2.5K requires written justification)

RYAN HERCO PRODUCTS CORP.
2509 N. NAOMI St.
Burbank, Calif. 91503
818-841-1141

Total Estimated Cost $590.00 XX

Previous P.O. No.

State important handling or delivery information. QA handling?

ns	Total Cost					Sol	Exp.	Paren.
Bids Requested				Bids Received				Bids Rejected
B	S	D	W	B	S	D	W	Small / Disadvantaged

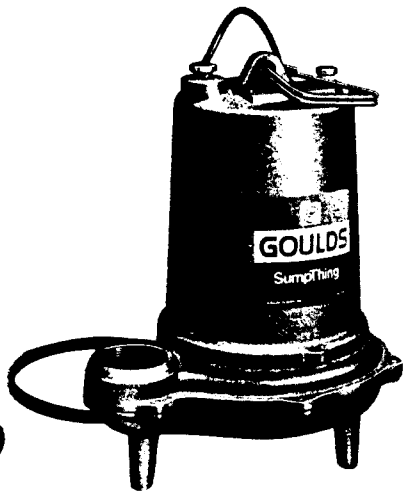
Group	Site	Building	Room	For

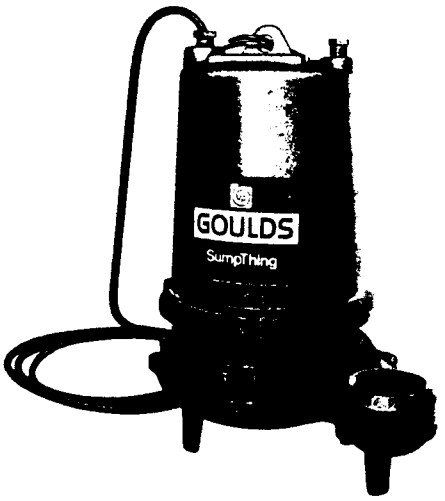
Form 838 (2/81)

BUYER FILE/ACT TO MAT-4

Installation Instructions for Submersible Effluent Pumps

Model 3870
WPO311E
WPO312E
WPH1012E
WPH1032E
WPH1034E



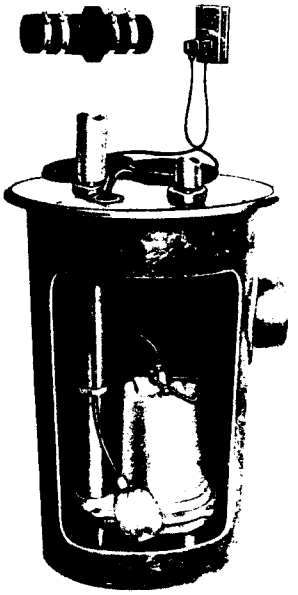


Pump Installation Consideration

The first steps in insuring the proper installation of your submersible effluent pump are to make certain: (1) a suitable receiver, sump, or sewage basin such as those offered in the Goulds Catalog is available; (2) supply voltage and phase matches pump nameplate power requirements; (3) wiring is adequate to carry maximum nameplate amperage, and (4) electrical installation conforms to applicable codes.

Mercury Level Control switch ALS2-5, 6, 7, if used, should be mounted to the discharge pipe.

Diaphragm Level Control Switch ALS2-1, 2, 4, if used, should be bracket mounted.



GOULDS PUMPS, INC.
SENECA FALLS, NEW YORK 13148

Pump & Piping Installation

Thread discharge pipe into discharge flange connection. If a check valve (ALS 9-2) is used in a system handling solids try to avoid installing it vertically, but instead position it horizontally or at a 45° angle with the valve pivot on top. This will guard against solids lodging on to the valve preventing it from opening. Drill a 3/16" hole in discharge pipe approximately 2" above the pump discharge connection to prevent air locking the pump. A gate valve should be installed in the system after the check valve, if used, to permit removal of pump and/or check valve for servicing. A union should be installed between the check valve and the pump so that the pump can be removed without disturbing too much of the piping.

Three-phase pumps must be checked for proper rotation after wiring is complete. Rotation must be counterclockwise looking into the suction of the pump. **Caution:** Do not attempt to feel for the rotation with fingers. Rotating impeller can cause severe body injury.

Single phase pumps have built-in thermal overload protection with automatic reset. Three-phase units must be protected by means of a starter having the appropriate overload protection. Consult your Goulds dealer for a recommendation.

Sewage Basin Installation

The basin should have a hard bottom to give the legs of the pump adequate support. The legs are of sufficient height to elevate the pump above the bottom of the basin to allow wastes to reach the suction opening without clogging around the base of the pump.

When using fiberglass sewage basins supplied by Goulds attach 4" cast iron inlet hubs to sewage and/or drain lines as required. In the case of the duplex basins with two (2) cast iron inlet hubs, seal second inlet hub if it is not used.

Basin Covers

Remove protective strip from gasket material and press onto the recessed portion of the basin rim. See diagram below. With a

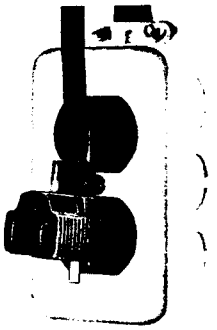
pointed tool, poke holes through the gasket into the tapped holes. Do not damage threads. Route all electrical cords through the appropriate opening in the basin cover.

Fit basin cover onto the protruding discharge pipe. Power cords are sealed with the split rubber stopper. The rubber "O" ring is placed over the discharge pipe and compressed between the pipe and cover by the smooth bore flange (chamfered side down) to form a seal. The vent pipe is threaded into the threaded flange provided with the basin cover.

Switch Operation

1. Diaphragm Level Control Switch (ALS2-1, or ALS2-4)

The diaphragm switch is a pressure activated switch which provides automatic operation with a 6" differential in liquid level. Switch will turn on when liquid level is 10" above bottom of switch unit, and turn off at 4" above bottom of switch.



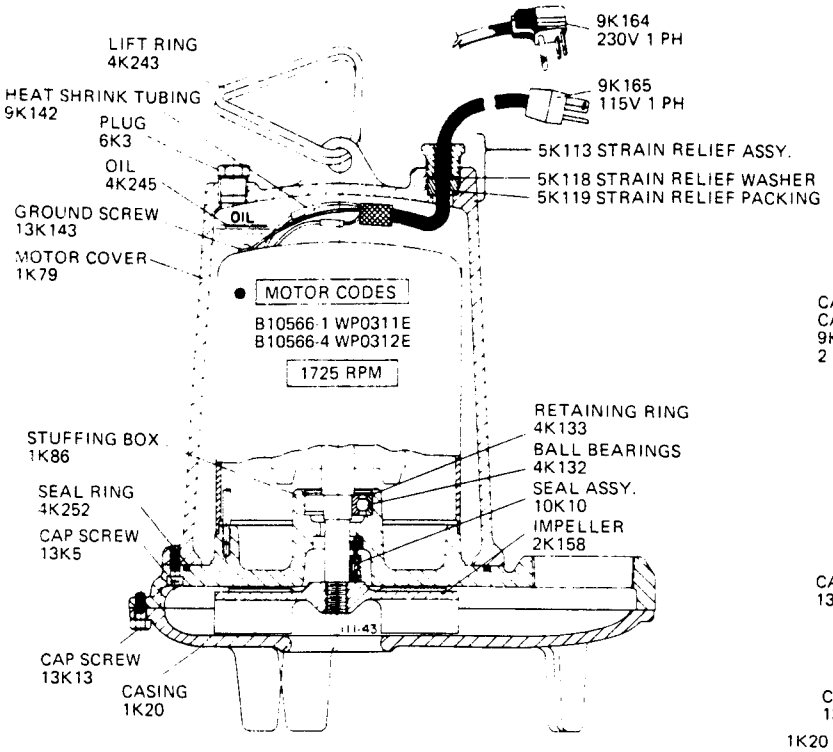
Caution: This type of control switch has a vent which must be left unobstructed and protected from moisture, dirt, or foreign material. Mount electrical cord so that the vent tube is pointed downwards. ⅓ H.P., 115V or 230V, 1 Ø pumps may be controlled directly by the switch. 1 H.P. units, 1 Ø require a contactor, such as ALS 3-1. 1 H.P. 3 Ø units require a starter, such as ALS3-3.

2. Mercury Level Control Switch (PIL)

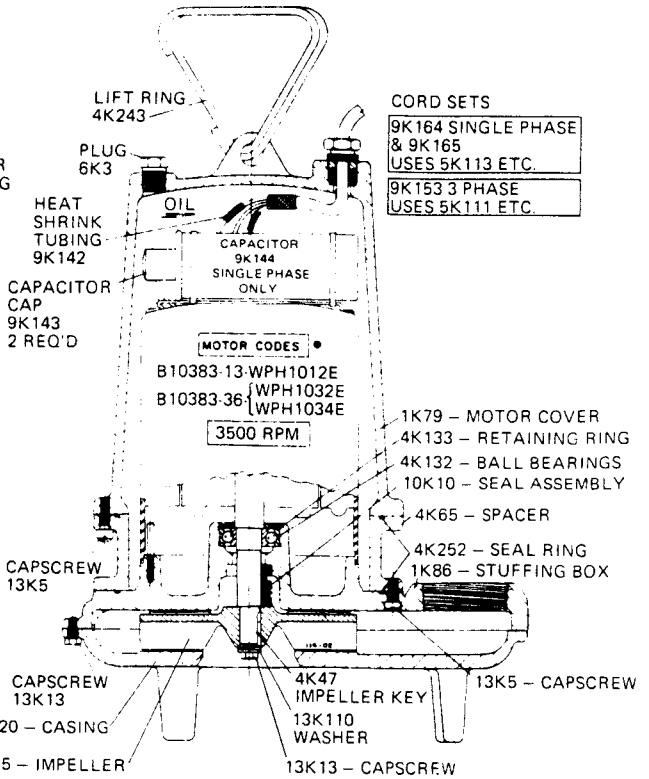
Mercury level control switch is a single float switch with adjustable differential level capability. Turn-on and turn-off levels are determined by how far the power cord is secured from the switch or the lead weight is located.

Caution: Electrical rating is ½ H.P. at 115 volts, 60 cycle, or 15 amps. Do not exceed rating.

Model 3870
WPO311E
WPO312E



Model 3870
WPH1012E
WPH1032E
WPH1034E



REPAIRS OR REPLACEMENTS

Before inspecting pump, **disconnect** all electrical power to pump(s) and accessories.

Caution: Motor section of this pump is oiled filled for lubrication and sealed against outside contamination. **Do Not** attempt to remove motor dome from the stuffing box. In the event motor or mechanical seal problems are diagnosed after all other possibilities have been eliminated, return the pump to your Goulds Pump dealer for servicing.

If motor, switch or other parts of this unit need replacement contact the supplier from whom this unit was purchased.

Warranty

1. The Company's standard warranty shall apply to submersible effluent pumps, except as hereinafter stated.

2. The period of one year from date of shipment of the Company's pumps, regarding any defective material or workmanship is enlarged as to submersible pumps to the first occurrence of a period of one year from date of installation or a period of eighteen (18) months from date of purchase.

3. This warranty shall not apply when damage is caused by improper installation, negligent or careless handling, lightning, or improper voltage supply.

Operating trouble chart

PROBLEM	PROBABLE CAUSES	CORRECTIVE ACTION
Pump Will Not Shut Off. **Note:** Before trouble shooting automatic control, check to see that pump operates on manual control. If it does, automatic controls are at fault. If not, fault is in pump or power supply.	Diaphragm Switch Weak rubber diaphragm Plugged vent tube Dirt or sediment lodged between retainer ring and rubber diaphragm causing contacts to remain closed.	Replace switch. Clear vent tube of any obstruction. Clean area around rubber diaphragm.
	Pump is air locked.	Shut power off for approximately 1 minute, then restart. Repeat several times to clear air from pump. If system includes a check valve, a 3/16″ hole should be drilled in discharge pipe approximately 2″ above discharge flange connection.
	Liquid inflow matches pump capacity.	Larger pump required.
Pump Runs But Does Not Discharge Liquid	Check valves installed backwards.	Check flow indicating arrow on check valve body to insure it is installed properly.
	Check valve stuck or plugged.	Remove check valve and inspect for proper operation.
	Lift too high for pump.	Check rating table.
	Inlet to impeller plugged.	Pull pump and clean.
	Pump is air locked.	(See corrective action above)
Pump Does Not Deliver Rated Capacity	Lift too high for pump.	Check rating table.
	Low voltage, speed too low.	Check for proper supply voltage to make certain it corresponds to nameplate voltage.
	Impeller or discharge pipe is clogged.	Pull pump and clean. Check pipe for scale or corrosion.
	Impeller may be rotating in the wrong direction.	**Single Phase Units**—Shut off power and allow impeller to stop rotating. Turn pump on again, and pump should self-correct rotation. Long discharge pipe without check valve allows liquid to drain back to sewage basin, rotating impeller backwards. If pump starts while impeller is rotating in the wrong direction, it will continue to operate in that direction. **Three Phase Units**—Interchange any two (2) power lead connections.
	Impeller wear due to abrasives or corrosion.	Replace worn impeller.
Pump Cycles Continually	No check valve in long discharge pipe allowing liquid to drain back into basin.	Install a check valve in discharge line.
	Check valve leaking.	Inspect check valve for correct operation.
	Sewage basin too small for inflow.	Install larger size sewage basin.

Note: Pump will not handle larger than ¾″ soft solid.

GOULDS PUMPS, INC.
SENECA FALLS, NEW YORK 13148

Form No. 9864A-WS

APPENDIX L

LOS ALAMOS PROCEDURE FOR IDENTIFICATION AND SEGREGATION OF HAZARDOUS WASTE

APPENDIX L

LOS ALAMOS PROCEDURE FOR IDENTIFICATION AND SEGREGATION OF HAZARDOUS WASTE

I. IDENTIFICATION

When chemical waste is ready for disposal, personnel at the generating laboratory fill out a Chemical Disposal Request Form and submit it to HSE-7. Since this form lists the chemicals to be disposed of, HSE-7 staff can assign a Reactivity Group Number (RGN) to each container or bottle. The RGN is found from Figure 1 (excerpted from EPA-600/2-80-076). The referenced EPA document, "A Method for Determining the Compatibility of Hazardous Waste," serves as the basis for the Los Alamos procedure. For additional information, the user is referred to the EPA document cited.

II. SEGREGATION

The basic segregation scheme is organics, corrosive acidic waste, corrosive basic waste, oxidizers, reactive materials, and nonreactive metals. Utilizing the RGN assigned to the container and Table 1, an area for storage/packaging of the waste is assigned. The organics and oxidizers have subcategories of segregation that will be followed by packaging/mixing of wastes to ensure that potential incompatibles are not combined together.

TABLE 1

Storage Category	Packaging Category	RGN
Organics (1)	A	4, 5, 9, 13, 14, 16, 17, 19, 26, 29, 31, 32, 101
	B	6, 7, 8, 27, 28
	C	12, 20
	D	34, 18
Oxidizers (2)	A	2
	B	104
	C	30
Acids (3)	N/A	1,3
Bases (4)	N/A	10, 11, 33, 105
Reactives (5)	N/A	21, 22, 25, 102, 107 - ALL STORED INDIVIDUALLY - NO COMBINING ALLOWED
Nonreactive Metals (6)	N/A	11, 15, 23, 24, 33 - 11 and 33 would only be allowed in labpack, solid quantities -
Others		The following must be evaluated on a case-by-case basis to determine which of the above categories is appropriate: 25, 102, 103.

REACTIVITY GROUP NO	REACTIVITY GROUP NAME	1	2	3	4	5	6	7	8	9	10	11	12	13
1	Acids, Mineral, Non-oxidizing	1												
2	Acids, Mineral, Oxidizing		2											
3	Acids, Organic		G H	3										
4	Alcohols and Glycols	H	H F	H P	4									
5	Aldehydes	H P	H F	H P		5								
6	Amides	H	H GT				6							
7	Amines, Aliphatic and Aromatic	H	H GT	H		H		7						
8	Azo Compounds, Diazo Compounds and Hydrazines	H G	H GT	H G	H G	H			8					
9	Carbamates	H G	H GT						G H	9				
10	Caustics	H	H	H		H				H G	10			
11	Cyanides	GT GF	GT GF	GT GF					G			11		
12	Dithiocarbamates	H GF F	H GF F	H GF GT		GF GT		U	H G				12	
13	Esters	H	H F						H G		H			13
14	Ethers	H	H F											
15	Fluorides, Inorganic	GT	GT	GT										
16	Hydrocarbons, Aromatic		H F											
17	Halogenated Organics	H GT	H F GT					H GT	H G		H GF	H		
18	Isocyanates	H G	H F GT	H G	H P			H P	H G		H P G	H G	U	
19	Ketones	H	H F						H G		H	H		
20	Mercaptans and Other Organic Sulfides	GT GF	H S GT						H G					
21	Metals, Alkali and Alkaline Earth, Elemental	GF H F	GF H F	GF H F	GF H F	GF H F	GF H	GF H	GF H	GF H	GF H	GF H	GF GT H	GF H
22	Metals, Other Elemental & Alloys as Powders, Vapors, or Sponges	GF H F	GF H F	GF					H F GT	U	GF H			
23	Metals, Other Elemental & Alloys as Sheets, Rods, Drops, Moldings, etc.	GF H F	GF H F						H F G					
24	Metals and Metal Compounds, Toxic	S	S	S			S	S			S			
25	Nitrides	GF HF	H F E	H GF	GF H E	GF H			U	H G	U	GF H	GF H	GF H
26	Nitriles	H GT GF	H F GT	H							U			
27	Nitro Compounds, Organic		H F GT			H					H E			
28	Hydrocarbons, Aliphatic, Unsaturated	H	H F			H								
29	Hydrocarbons, Aliphatic, Saturated		H F											
30	Peroxides and Hydroperoxides, Organic	H G	H E		H F	H G		H GT	H F E	H F GT		H E GT	H F GT	
31	Phenols and Cresols	H	H F						H G					
32	Organophosphates, Phosphothioates, Phosphodithioates	H GT	H GT						U		H E			
33	Sulfides, Inorganic	GT GF	HF GT	GT		H			E					
34	Epoxides	H P	H P	H P	H P	U		H P	H P		H P	H P	U	
101	Combustible and Flammable Materials, Miscellaneous	H G	H F GT											
102	Explosives	H E	H E	H E					H E		H E			H E
103	Polymerizable Compounds	P H	P H	P H					P H		P H	P H	U	
104	Oxidizing Agents, Strong	H GT		H GT	H F	H F	H F GT	H F GT	H E	H F GT		H E GT	H F GT	H F
105	Reducing Agents, Strong	H GF	H F GT	H GF	H GF F	GF H F	GF H	H GF	H G				H GT	H F
106	Water and Mixtures Containing Water	H	H						G					
107	Water Reactive Substances	← EXTREMELY REACTIVE!												

Figure 1. Hazardous waste compatibility chart.

Reactivity Code	Consequences
H	Heat generation
F	Fire
G	Innocuous and non-flammable gas generation
GT	Toxic gas generation
GF	Flammable gas generation
E	Explosion
P	Violent polymerization
S	Solubilization of toxic substances
U	May be hazardous but unknown

Example:

$H_{F_{GT}}$	Heat generation, fire, and toxic gas generation

	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	101	102	103	104	105	106	107
14																												
15																												
16																												
17																												
18																												
19																												
20				H	H	H																						
21				H_E	GF_H	GF_H	GF_H																					
22				H_E	GF_H		H_{GF_F}																					
23				H_F																								
24																												
25				GF_H	U	GF_H	GF_H	E																				
26								H_P			S	GF_H																
27								H_{GF_E}				H_{GF_E}																
28									H_E																			
29																												
30				H_E	H	E	$H_{F_{GT}}$	H_E	P_U		H_G	H_{GF_E}	$H_{P_{GT}}$		H_P													
31					H_P			GF_H				GF_H					H											
32								H									U											
33					H												H_{GT}											
34							H_P	H_P	H_P		H_P	H_P					H_P	H_P	U	H_P								
101								H_{G_F}				H_{GF_F}					$H_{F_{GT}}$											
102								H_E	H_E	H_E	E	E					H_E	H_E		H_E	H_E	H_E						
103								P_H	P_H	P_H	P_H	P_H					P_H	P_H		P_H			H_E					
104	H_F		H_F	H_{GT}	$H_{F_{GT}}$	H_F	$H_{F_{GT}}$	H_{F_E}	H_{F_E}	H_F		H_{F_E}	$H_{F_{GT}}$	H_E	H_F	H_F	H_G	H_F	$H_{F_{GT}}$	$H_{F_{GT}}$	H_{F_G}	H_{F_G}	H_E	$H_{P_{GT}}$					
105				H_E	GF_H	GF_H	GF_H						H_{GF}	H_E			H_E	GF_H	GT_{GF_H}		H	GF_H	H_E	$H_{P_{GF}}$	H_{F_E}			
106					H_G			GF_H	GF_H		S	GF_H								GT_{GF}						GF_{GT}		
107																												

DO NOT MIX WITH ANY CHEMICAL OR WASTE MATERIAL! EXTREMELY REACTIVE! →

Figure 1. Hazardous waste compatibility chart (continued).

APPENDIX M
BULGING DRUM PROCEDURE

LOS ALAMOS PROCEDURE FOR HANDLING BULGING OR LEAKING DRUMS

Bulging Drums

1. Identify the material inside the drum, based on drum log or inventory records.

2. Based upon the hazardous characteristics of the material in the drum, select appropriate personnel protective, emergency equipment and new receiving drum.

3. After donning personnel protective equipment and securing emergency equipment, carefully and slowly open a bung to relieve the internal pressure.

4. Use a portable hand-pump to transfer the material from the bulging drum to the new receiving drum. Properly mark new receiving drum.

5. Be certain that the contents of the bulging drum have been emptied into the new receiving drum.

6. If the material is an acutely hazardous waste, rinse the bulging drum three times with an appropriate solvent and handle rinsate as a hazardous waste.

7. Clean up any material that spilled during the transfer.

8. Remove or cover labels and send the empty bulging drum to the TA-54, Area L landfill.

9. Promptly complete an inspection log and record details of transfer on the log.

Leaking Drums

1. Identify the material inside the drum, based on drum log or inventory records.

2. Based on the hazardous characteristics of the material in the drum, select approriate personnel protective, emergency equipment and new receiving drum.

3. After donning personnel protective equipment and securing emergency equipment, spread absorbent material around the drum to absorb the leak.

4. Use a portable hand-pump to transfer the material from the leaking drum to the new receiving drum. Properly mark new receiving drum.

5. Be certain that the contents of the leaking drum have been emptied into the new receiving drum.

6. If the material is an acutely hazardous waste, rinse the leaking drum three times with an appropriate solvent and handle rinsate as a hazardous waste.

7. Remove or cover labels and send the empty leaking drum to the TA-54, Area L landfill.

8. Containerize the contaminated absorbent material and treat as a hazardous waste.

9. Promptly complete a weekly inspection log and record transfer and clean-up actions on the log.

APPENDIX M-1

SOP FOR THE TREATMENT TANKS AT AREA L, TA-54

SOP FOR THE TREATMENT TANKS AT AREA L, TA-54

I. INTRODUCTION

This SOP establishes the operational and general health and safety procedures for the use of the treatment tanks at Area L, TA-54. Individuals responsible for the overall operations under this SOP are the HSE-7 Section Leader and Associate Group Leader for Solid Waste Operations. They must approve any deviations from this SOP.

II. DESCRIPTION OF OPERATIONS

A. General

1. A minimum six-inch freeboard must be maintained in the tanks at all times.
2. If a snow or rainstorm is pending, the tanks shall be covered. The covers consist of four-inch rigid foam with removable plastic slip covers. They are held in place with elastic straps. Since the solutions in the tanks are agrieous and neutral, there is not a problem of incompatibility with the covers.
3. The tanks will be lined in the following manner except when reactives are treated.
   a. A cargo net is laid in the tank. This aids in the removal of the liner.
   b. Two plastic liners are placed in the tank, the excess brought to the outside of the tank and tied in-place with rope. This minimizes the wind causing the liner to billow.

B. Chemical Treatment of Ammonium Bifluoride

1. The waste shall be pumped into the lined tank by use of the submersible pump if delivered by tank truck or drum pump if delivered in drums.
2. While agitating the waste, lime and calcium chloride will be added. This binds the free fluoride as calcium fluoride.
3. Solution is left in tank to evaporate free liquid.
4. When solution has evaporated to a slurry, cement is added. The cement mix is placed in 55-gallon drums for disposal.
5. Liner is removed and disposed of at Area G since this is a non-RCRA waste.

C. Evaporation of Treated Salt Solutions

1. Treated cyanide, chromium or metal acid/base solutions can be transported from the TA-50 batch treatment system to Area L in drums.
2. The drums will be emptied with the drum pump into the lined tank.
3. Solution will remain in tank to evaporate.
4. When the solution has evaporated to a slurry, cement will be added. The cement mix will be placed in 55-gallon drums for disposal at Area L. Liner will be removed and disposed of in Area L as a RCRA-regulated waste.

D. Treatment of Radioactive Lithium Hydride

1. A liner will not be used during the treatment of reactives.
2. The tank will be filled to the halfway mark with water.
3. The chunks of lithium hydride will slowly be added to the tank. No more than five pounds of LiH should be in the tank reacting at any time.
4. When treatment is complete, the crustic solution will be pumped into drums and transported to TA-50 for treatment in the radioactive liquid waste treatment system.

III. HEALTH AND ENVIRONMENTAL CONCERNS

A. Chemical exposure of personnel.

B. Leak from a tank/release of tank contents.

C. Fire from lithium hydride treatment.

IV. PROCEDURES FOR SAFE OPERATIONS

A. Personal protective equipment/measures.

1. Safety glasses/face shields, gloves, and labcoats or coveralls are required to be worn.
2. Safety shoes shall be worn during all waste handling operations.
3. Respirators, either full-face or SCBA, will be used as necessary per instructions from HSE-5.
4. The emergency shower and eyewash must be checked to assure that it is operative prior to starting any treatment operations.
5. Two people must be present during treatment operations.

B. Spill control measures

Any release from a treatment tank will be contained within the concrete containment. A major release from a tank would initiate the procedures of the Hazardous Waste Contingency Plan. A minimum of the following materials will be maintained at Area L for emergency draining of a tank:

- Ten 55-gallon metal drums
- Ten drum liners
- Ten bags of vermiculite

The submersible pump would be used to draw down the liquid in the tanks. It would also be used for pumping any solution from within the containment area. The drums would be stored at Area L.

C. Fire protection measures

1. Smoking is prohibited inside the Area L enclosure at all times.
2. The quantity of lithium hydride to be treated at any one time is limited to five pounds because of hydrogen production. Only large pieces and incidental fines of lithium hydride will be treated by this method. TREATMENT OF LARGE QUANTITIES OF LiH FINES IS NOT PROVIDED FOR BY THIS SOP.

3. In case of a fire, the emergency procedures listed below and the Hazardous Waste Contingency Plan will be instituted.

V. RELATIONSHIPS BETWEEN OPERATIONS AND SUPPORT ACTIVITIES

HSE-7 uses the expertise and guidance of HSE-3 (Safety), HSE-5 (Environmental Surveillance) in the use of the treatment tanks. If the tanks were to be used for other waste streams, a Special Work Permit would be written and approved by these groups.

VI. TRAINING

The training requirements for personnel involved in this operation are covered in SOP CW-1. In addition, personnel shall read this SOP at least semi-annually. The Site Supervisor shall periodically review the tank performances of the technical personnel to insure understanding and compliance with these procedures.

VII. EMERGENCY PROCEDURES

A. Fire, explosion, or a major chemical release at Area L.

1. Evacuate immediate vicinity.
2. Call 9-911 and furnish information.
3. Notify HSE-7 Group Office (7-4301) and Site Supervisor.
4. Call the HSE-DO emergency number (7-7878).
5. Report to the muster area at Building 22.

B. Personnel injury

1. If toxic fumes are suspected, DO NOT ENTER AREA WITHOUT RESPIRATORY PROTECTION.
2. Render assistance to the injured party.
3. Remove any chemically contaminated clothing and keep party warm.
4. Call 9-911 for ambulance.
5. Notify HSE-7 Group Office and Site Supervisor.

VIII. RESPONSIBILITIES

The HSE-7 Section Leader for Solid Waste Disposal Operations has the overall responsibility for all operations at Area L. The Section Leader reports directly to the Associate Group Leader.

The Area L Supervisor is responsible for assuring that all personnel involved in the treatment of chemical wastes know and understand these procedures. All instances of non-compliance will be reported by the Site Supervisor to the

Section Leader, who is responsible for initiating appropriate corrective action.

CALL LIST

		Work	Home
Site Supervisor			
Section Leader	Karen Balo	7-6095	672-1369
Asso. Group Leader	John Warren	7-5397	662-9639
Deputy Group Leader	Lud Emelity	7-5839	753-7737
Group Leader	Ray Garde	7-4301	753-7737

APPENDIX M-2

MANUFACTURERS INFORMATION ON LORRAINE CRANE AND TRAINING MANUAL

22 Ton

22 Ton Capacity
(20 Metric Ton Capacity)

Lift Capacity PCSA 10-74
LRT 220 with 72′ (21.9 m) boom
— 5100 CWT

Note:
When lifting off main boom head and jib is erected, DEDUCT 800 lbs. for stow-away jib or 1300 lbs. for side-stow jib from main boom load chart capacities.

* up to 2.5 mph

*** ON TIRES 360°**

RADIUS	MAX. ANGLE°	MIN. ANGLE°	17.50 x 25 / 20.5 x 25	16.00 x24
10	70	59	15,900	18,800
12	70	57	13,700	15,200
15	70	52	9,500	11,500
20	70	38	5,500	6,900
25	70	0	3,400	4,200
30	63	0	2,200	2,600
35	59	0	1,400	1,600

*** ON TIRES STRAIGHT OVER FRONT**

RADIUS	MAX. ANGLE°	MIN. ANGLE°	17.50 x 25 / 20.5 x 25	16.00 x24
10	70	59	26,000	35,000
12	70	57	22,800	30,300
15	70	52	18,100	24,600
20	70	38	13,400	14,400
25	70	0	9,600	9,600
30	63	0	7,100	7,100
35	59	0	5,400	5,400
40	54	0	4,000	4,000
45	49	0	3,100	3,100
50	42	0	2,300	2,300
55	36	0	1,700	1,700

OUT AND DOWN OUTRIGGERS OVER FRONT

RADIUS	ANGLE°	BOOM LENGTH Retracted	ANGLE°	BOOM LENGTH 37′	ANGLE°	BOOM LENGTH 44′	ANGLE°	BOOM LENGTH 51′	ANGLE°	BOOM LENGTH 58′	ANGLE°	BOOM LENGTH 65′	ANGLE°	BOOM LENGTH Extended
10	59	44,000	68	44,000										
12	56	33,800	65	32,000	69	30,900								
15	50	29,200	60	27,700	65	26,600	69	25,700						
20	36	21,800	49	22,100	57	21,600	63	20,800	67	20,200				
25			38	16,800	49	16,900	56	17,000	62	16,600	65	16,000	68	15,500
30			23	13,200	40	13,400	49	13,500	55	13,600	60	13,200	64	12,800
35					28	10,800	41	10,900	49	11,000	54	11,100	59	10,800
40							31	8,000	42	9,000	49	9,150	54	9,000
45							16	7,100	33	7,200	42	7,300	48	7,400
50									22	5,900	35	5,900	43	6,000
55											26	4,900	36	4,900
60											0	4,000	29	4,000
65													18	3,350

OUT AND DOWN OUTRIGGERS 360°

RADIUS	ANGLE°	BOOM LENGTH Retracted	ANGLE°	BOOM LENGTH 37′	ANGLE°	BOOM LENGTH 44′	ANGLE°	BOOM LENGTH 51′	ANGLE°	BOOM LENGTH 58′	ANGLE°	BOOM LENGTH 65′	ANGLE°	BOOM LENGTH Extended
10	59	44,000	68	44,000										
12	56	33,800	65	32,000	69	30,900								
15	50	29,200	60	27,700	65	26,600	69	25,700						
20	36	21,800	49	22,100	57	21,600	63	20,800	67	20,200				
25			38	16,800	49	16,900	56	17,000	62	16,600	65	16,000	68	15,500
30			23	12,400	40	12,600	49	12,700	55	12,800	60	12,900	64	12,800
35					28	9,400	41	9,500	49	9,600	54	9,700	59	9,800
40							31	7,400	42	7,500	49	7,500	54	7,600
45							16	5,800	33	5,900	42	6,000	48	6,000
50									22	5,500	35	5,600	43	5,600
55											26	4,600	36	4,600
60											0	3,700	29	3,800
65													18	2,500
70														2,700
75														2,200
80														1,800
85														1,600

MODEL 150 series A SAFE LOAD CHART – 4 SEC. PWR. BOOM

15 Ton

BASED ON 85% OF TIPPING – CRANE ON LEVEL

WORKING RADIUS IN FEET	LOAD IN POUNDS			
	360° ROTATION		OFF FRONT OF CRANE	
	WITHOUT OUTRIGGERS	WITH OUTRIGGERS	WITHOUT OUTRIGGERS	WITH OUTRIGGERS
8	30,000	30,000	30,000	30,000
10	23,200	30,000	30,000	30,000
12	17,000	25,000	23,700	25,000
14	13,000	21,400	18,350	21,400
15	11,600	20,000	16,350	20,000
16	10,500	18,800	14,600	18,800
18	8,900	16,750	11,950	16,750
20	7,300	15,000	9,800	15,000
22	6,150	13,350	8,150	13,700
24	5,100	11,400	7,000	12,500
25	4,750	10,700	6,500	12,000
30	3,200	7,800	4,750	9,800
35	2,150	6,000	3,500	7,800
40	1,400	4,600	2,650	6,000
45	800	3,750	1,850	4,800
50	300	2,800	1,250	3,800
55		2,350	950	3,250
60		1,800	600	2,700

The maximum allowable load on the 15 foot jib is 4000 lbs.

Deduct 400 lbs. plus the weight of any load handling device from the above ratings, due to dead weight, to determine the safe working load at any given radius.

The jib can be adjusted to operate at three different angles. Under no circumstances should the jib be operated below a horizontal position regardless of the boom angle.

All booms should be operated as short as conditions permit.

GALION

H-93022

GALION

18 Ton

CRANE LOAD RATINGS-POUNDS

Boom Radius Feet	Boom Angle Degrees	Boom Peak Height Feet	With Outriggers 360°
	25 Ft. Boom		
10	58.1	30.9	36000★
11	55.2	30.1	33000★
12	50.5	28.9	30000★
13	47.4	28.0	27700★
14	44.0	26.9	25700★
15	40.5	25.7	24000★
20	11.9	14.4	17200★
	30 Ft. Boom		
12	58.2	35.2	30000★
13	55.8	34.5	27700★
14	53.4	33.8	25700★
15	51.0	32.9	24000★
20	36.6	27.3	17200★
25	10.6	14.8	13200★
	36 Ft. Boom		
12	64.0	42.2	30000★
13	62.2	41.6	27700★
14	60.4	41.0	25700★
15	58.5	40.4	24000★
20	46.4	36.5	17200★
25	36.1	30.7	13200★
30	17.3	20.0	10500★
	42 Ft. Boom		
13	66.5	48.4	27400★
14	65.0	47.9	25700★
15	63.4	47.4	24000★
[illegible]	55.4	44.3	17200★
[illegible]	46.4	40.0	13200★
30	35.8	34.0	10500★
35	20.6	24.1	8250★
	48 Ft. Boom		
15	67.0	[illegible]	23000★
20	63.3	51.4	17200★
25	59.0	48.0	13200★
30	45.0	43.5	10500★
35	35.5	37.3	8250★
40	22.7	27.8	6750★

Boom Radius Feet	Boom Angle Degrees	Boom Peak Height Feet	With Outriggers 360°
	54 Ft. Boom		
20	63.9	58.3	17200★
25	57.7	55.4	13200★
30	51.1	51.7	10500★
35	43.8	46.9	8250★
40	35.3	40.6	6750★
45	24.2	31.5	5700
	60 Ft. Boom		
20	66.7	65.0	17000★
25	61.3	62.4	13200★
30	55.7	59.2	10500★
35	49.6	55.3	8250★
40	42.8	50.3	6750★
45	35.1	43.9	5700
50	25.3	35.0	4650
55	7.0	16.6	3850
	15 Ft. Jib Main Boom Extended to 60 Ft.		
25	67.5	79.1	6000★
30	63.2	76.8	6000★
35	58.8	73.9	5200★
40	54.2	70.5	4800
45	49.3	66.5	4100
50	44.0	61.6	3500
55	38.1	55.7	3100
60	31.2	48.2	2700
65	22.5	38.0	2400
70	6.2	17.3	2150
	20 Ft. Jib Main Boom Extended to 60 Ft.		
25	68.9	84.6	4500★
30	65.0	82.4	3800★
35	61.0	79.7	3400★
40	56.8	76.6	3000★
45	52.3	73.0	3000★
50	47.6	68.7	3000★
55	42.5	63.5	3000★
60	36.8	57.4	2700
65	30.2	49.6	2400
70	21.8	39.0	2150
75	6.0	17.6	1900

Without Outriggers

Boom Radius Feet	Max. Boom Extension Feet	14.00 x 24 (16 P.R.) Tires		16.00 x 24 (16 P.R.) Tires		17.5 x 25 (14 P.R.) Tires	
		Over Front	Over Side	Over Front	Over Side	Over Front	Over Side
12	36	21800★	15800	24600★	16000	17450★	16000★
15	42	17850★	11300	18600★	11450	13500★	11450
20	48	11600	7400	11600	7500	9700★	7500
25	60	8000	5200	8000	5300	8000	5300
30	60	5800	3600	5800	3600	5800	3600
35	60	4350	2500	4350	2500	4350	2500
40	60	3250	1700	3250	1700	3250	1700
45	60	2450		2450		2450	
50	60	1850		1850		1850	
55	60	1350		1350		1350	

NOTES

1. Crane load ratings in pounds as determined by boom length, radius or boom angle apply to the LRT-18L rough terrain crane only as originally manufactured and equipped. THEY ARE MAXIMUM LOAD RATINGS.
2. Operating radius is the horizontal distance from the axis of rotation before loading to the center of the vertical hoist line or tackle with load applied. Crane load ratings are for machines with 5,000 lbs. of counterweight and do not exceed 85% of tipping loads. Ratings identified with (★) are based on the machine's structural competence and not on the machine stability. Weight of hooks, hook blocks, slings and all other load handling devices, except hoist rope shall be considered a part of the load. Crane load ratings with outriggers are based on Powrspan outriggers fully extended and set to a distance of 8'0" from the longitudinal axis of the carrier to the outrigger float pivot connection and wheels within the boundary of the outriggers. Crane load ratings without outriggers depend on tire capacity and condition of tires inflated to 90 P.S.I. with 14.00 X 24 tires (75 P.S.I. with 16.00 X 24 and 65 P.S.I. with 17.5 X 25 tires.)
3. Crane load ratings are based on freely suspended loads with the machine leveled and standing on a firm, uniform supporting surface. Practical working loads depend on supporting surface, wind and other factors affecting stability, hazardous surroundings, experience of personnel and proper handling, all of which must be taken into account by the operator. Positioning or operation at radii and boom or jib lengths beyond the maximum and minimum shown, is not intended or approved. FOR BOOM RATINGS NOT SHOWN, USE THE RATINGS OF NEXT LONGER BOOM.
4. The operator and other personnel should fully read and acquaint themselves with Operator's Manual furnished by the manufacturer BEFORE operating this machine, and rules for safe operation of equipment should be adhered to at all times.
5. This crane and its load ratings are in accordance with Power Crane & Shovel Association Standard No. 2, SAE Crane Load Stability Test Code J-765a, and Safety Code for Cranes, Derricks and Hoists, ANSI B30.15.
6. When telescoping out with a load, do not exceed load ratings at longest boom length required.
7. Maximum length of main telescoping boom ..... 60 ft.
8. With outriggers set maximum boom and jib can be raised over the front or rear.
9. The ability to telescope the load is limited by boom angle, hydraulic pressure and boom lubrication.
10. Load ratings for the 25 ft. boom require the boom to be fully retracted.

JIB NOTES

1. Jibs may be used straight or offset. The 15 ft. telescoping jib may be extended to 20 ft. The following data applies:

Boom Angle Degrees	15 Ft. Jib Load Ratings		20 Ft. Jib Load Ratings	
	No Offset (Lbs.)	27° Offset (Lbs.)	No Offset (Lbs.)	27° Offset (Lbs.)
65	6000	5750	5000	3000
60	6000	5500	4400	2800
50	6000	4900	3700	2700
40	6000	4500	3100	2500
30	6000	4300	2700	2400
20	5200	3900	2400	2000
10	5000		2400	
0	4800		2400	

2. Load ratings for jibs are the same as for the boom length which is equal to the length of main boom plus jib, BUT IN NO CASE MAY THEY EXCEED THE RATINGS SHOWN ABOVE.
3. With jib installed, load ratings over main boom head must be reduced 840 lbs.

Hoist Cable Reeving

Number of Parts of Hoist Lines	1	2	3	4	5	6
Main Hoist Max. Loads (Lbs.)	6,500	13,000	19,500	26,000	32,500	36,000

Use ½" diameter hoist cable (6 x 25, IWRC, IPS) of 11.5 tons breaking strength.

Note: These loads are based on safe load capacity. See chart for crane load ratings.

We reserve the right to amend these specifications at any time without notice. The only warranty applicable is our standard written warranty. We Make No Other Warranty, Expressed Or Implied.

Koehring
Lorain Division
Chattanooga, Tennessee 37405

Made in USA

L-3047A

This is the drum hook used at Area GPL. We have tried different types over ten years & this has been the safest and most reliable to date. [illegible] 9/21/85

To Place An Order Call: TOLL FREE 1-800-828-7540
In New York State Reverse The Charges Call: 716-885-0155

DRUM HANDLING

TRUCKS
DRUMS

	Wght. Lbs.	PRICE
1 STYLE		
	135	$265.00
	143	225.00
STYLE		
	165	$300.00
	225	310.00

...s on Single Models ..... Add $25.00

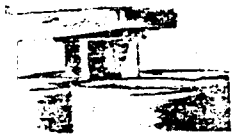
F.O.B. TN

YOUR

...ELS DH-218 and DH-220

F.O.B. IL

3-4-5-6-7-8



...ODEL DH-222
...ling 4 fiber drums

...ODEL DH-239
...ed in ship loading

...ipping ...en Ins.	Wght. Lbs.	PRICE
...x3...	440	$2300.00
...x38x32	440	2300.00
...x37x38	455	2800.00
...x39x32	455	2800.00
...x28x37	400	2300.00
...x38x35	994	5900.00

(716) 885-0155

SINGLE DRUM LIFTER

CAPACITY 1000 LBS.

Bright Yellow Finish

MODEL DH-161
$52.00

Weight Approx. 6 Lbs.

See page 100 for tine hooks.

F.O.B. NY

DRUM UPENDER

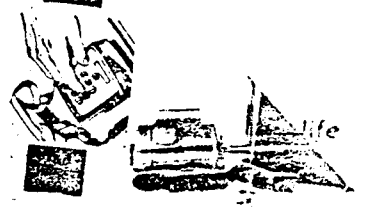
This heavy-duty steel 40" offset Upender takes the strain and effort out of positioning drums from horizontal to vertical position. A wide 2½" toe plate prevents denting of drums, and the 1½" hook has adequate clearance for the largest chime.

MODEL DH-194 **$18.70** Weight 8 Lbs.

TIL...ERS

This Drum... Makes tip... double ba... engaged... stock. Fi... 6½".

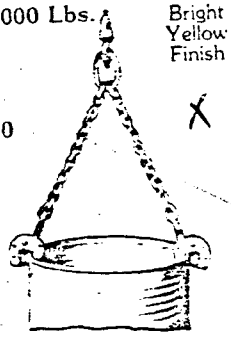
MOD... DH-1...



CHAIN SLING LIFTER

Capacity 2000 Lbs.

Bright Yellow Finish



FOR LIFTING ALL SIZES OF DRUMS

MODEL DH-160
$147.85

Weight, Approx. 15 Lbs.

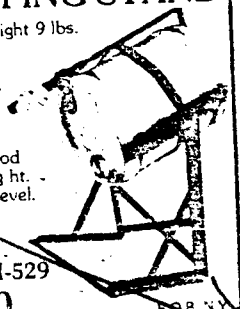
Complete with two grabs and alloy chain.

See page 100 for tine hooks.

F.O.B. NY

CAN TIPPING STAND

Weight 9 lbs.

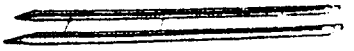


Will handle 5 gal. round cans and accommodate square cans by bending center rod to fit. Dispensing ht. 10" above floor level. Folds flat for storage.

MODEL DH-529
$22.30

F.O.B. NY

WOOD DRUM SKIDS



13½" Between Rails

Hook one end on truck and other end rests on the ground. Barrel will slide down skid by force of gravity.

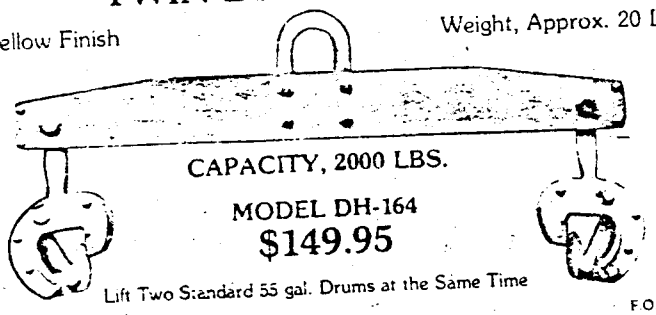
MODEL	Lgth.	1½" Rail	No. Bars	Wgt. Lbs.	PRICE
DH-196	6'	x 3...	2	4...	$ 60.00
DH-197	7'	x 3...	2	4...	63.00
DH-198	8'	x 3½"	2	55	71.00
DH-199	10'	x 4"	3	65	87.00
DH-200	12'	x 5...	3	70	104.00

F.O.B. NY

TWIN DRUM LIFTER

Bright Yellow Finish

Weight, Approx. 20 Lbs.



CAPACITY, 2000 LBS.

MODEL DH-164
$149.95

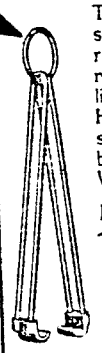
Lift Two Standard 55 gal. Drums at the Same Time

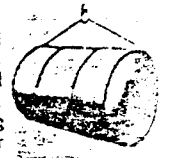
F.O.B. NY

See page 100 for tine hooks.

DRUM LIFTING HOOKS

STEEL DRUM LIFTING HOOK





This Drum Lifting Hook consists of 7/16" double steel rods which are attached to malleable iron hooks. Welded lifting ring is 3" in diameter. Hook is designed for lifting steel drums. Can be used for barrels. Capacity, 1000 lbs. Weight, 5 lbs.

MODEL DH-165 (Steel) **$16.50**

BRONZE DRUM LIFTING HOOK

This non-sparking hook has the same construction features as above except entire unit is made of brass or bronze and has a 750 lbs capacity. Weight 3 lbs.

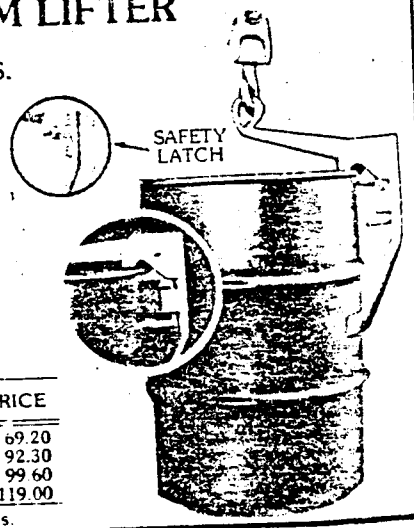
MODEL DH-166 (Bronze) **$40.70**

F.O.B. NY

SINGLE TINE DRUM LIFTER

CAPACITIES 2000 and 3000 LBS.

The single tine drum lifter provides positive grip and automatically locks as lifting force is applied. Models to handle 2000 and 3000 lbs. with and without positive safety lock. One man can handle full drums. No tilt lifting. Drums will lift straight up. Works with tight head or removeable head 30 and 55 gallon steel drums. Use existing overhead lifting equipment or fork truck equipped with the tine hook attachment (see page 96). Painted orange.



MODEL	Description	Cap. Lbs.	Wgt. Lbs.	PRICE
DH-167	Standard	2000	22	$ 69.20
DH-168	With Lock	2000	22	92.30
DH-527	Standard	3000	24	99.60
DH-528	With Lock	3000	24	119.00

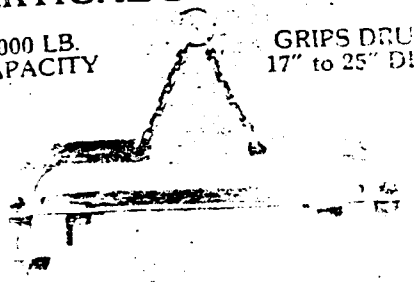
F.O.B. IL

See page 100 for tine hooks.

VERTICAL DRUM LIFTER

1000 LB. CAPACITY

GRIPS DRUMS 17" to 25" DIAM.



Just hook to your crane. Positive grip holds drums that are open or closed. Heavy-duty — forged chain. Bright red enamel finish.

MODEL DH-169 **$116.35** Weight, 21 lbs.

F.O.B. ...

PN#

			Zia Rate x G & A 13%
30157	Manitowoc Crane	140 ton	54.30
30346	P & H Crane	90 ton	33.50
30058	~~Koehring Crane~~	55 ton	28.20
30342	Lorain Crane	22 ton	14.00
30260	Lorain Crane	18 ton	14.85
30248	Lorain Crane	15 ton	14.00
30329	Fork Lift	20 ton	17.80
30388	Fork Lift	10 ton	14.10
30298	Fork Lift	7½ ton	14.40
30145	Fork Lift	6 ton	12.35
30331	Fork Lift	2 ton	5.25
30384	IHC Loader	2½ yd.	17.45
30334	Fiat Loader	3 yd.	15.95
30315	Yale Loader	3 yd.	14.85
30149	Michigan Loader	3½ yd.	24.85
30220	Michigan Loader	3 yd.	22.75
30360	Liebherr Backhoe 7/8 yd. 36" wide x 27' deep		33.40
30386	John Deere Backhoe or Crawler Dozer		7.65
30279	Case Backhoe		4.40
30247	IHC Backhoe		9.50
30349	IHC Track Dozer 25 w/ripper		30.35
30299	IHC Track Dozer 25 w/ripper		25.00
30223	Cat Track Dozer 46A w/ripper		30.10
30261	Michigan Dozer 280 Rubber Tired		30.10
30301	Terex Scraper	14 yd.	35.00
30332	Fiat Scraper	15 yd.	46.75
30324	John Deere Blade		15.05
30288	Champion Blade		14.10
30098	Buck Eye Ditcher 24" wide 5'9" deep		1.55
30316	Ditch Witch Ditcher 8" or 12" 6' deep		9.70
30202	Davis Ditcher 4" to 12" 4' deep		11.05
32449	Air Auger 1',2' or 3' diameter		2.45
30076	Chip Spreader		21.15
30308	✓ Barber Green Lay down machine		17.10
30301	Ray Go- Vibratory Roller		18.25
30309	Ray Go- Vibratory Sheep foot		12.45
30153	Ingram- Pneumatic		6.60
30087	Bros- Pneumatic		4.65
30017	Pull type Sheep foot roller		1.45
30094	Ingram Steel wheel		4.20
30317	Bob Cats ¼ yd.		4.85
30318	Bob Cats ¼ yd.		4.85
30320	Bombadier rubber track dozer		9.35
30339	Bombadier rubber track dozer		9.35
30344	Vac All	Broom	33.45
30341	Bros	Broom	6.40

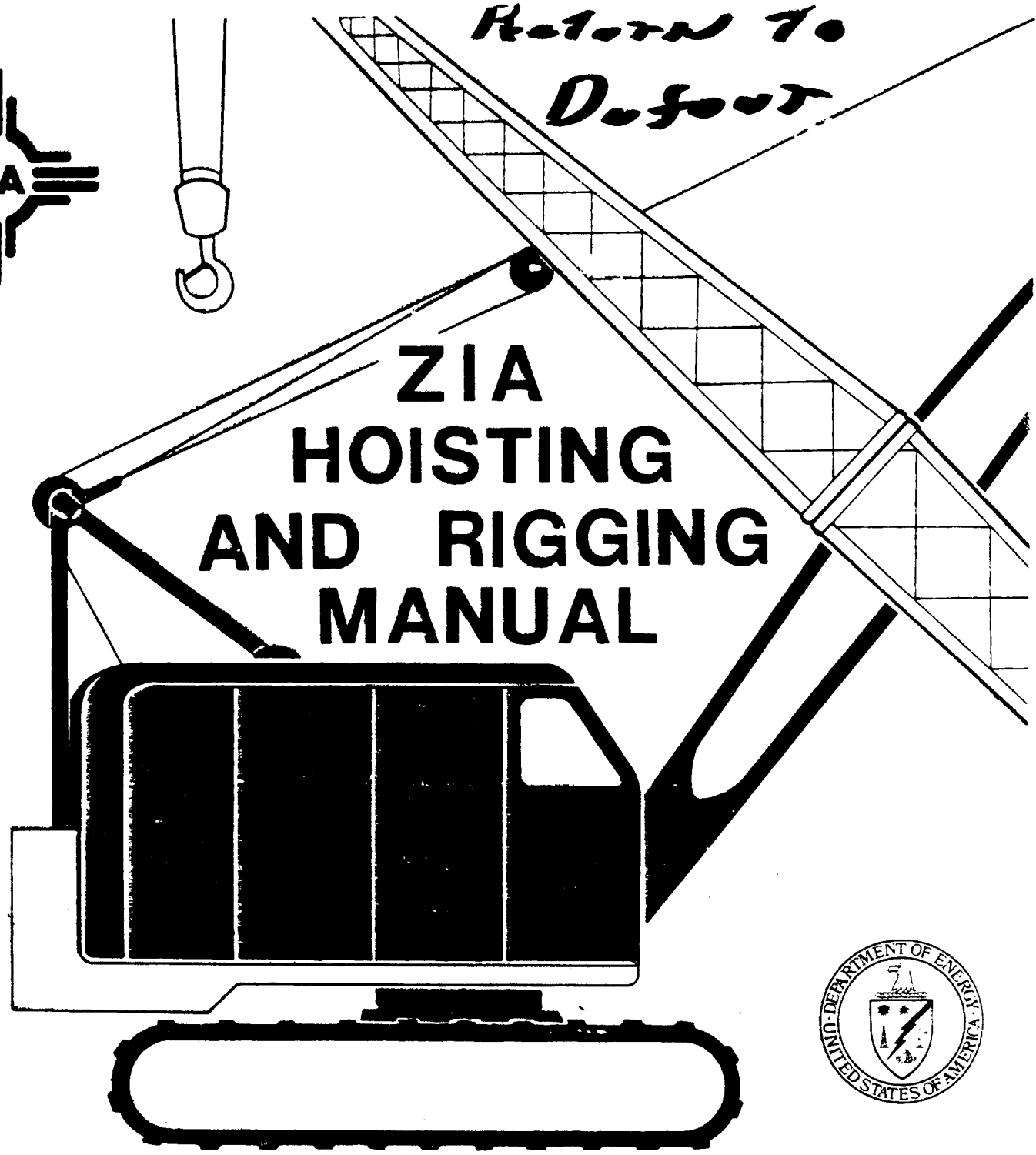
Used by Zia R. figure to lower into the shaft, drum

All Zia Riggers & Operators who dispose off Waste at Area G & L (drum lowering into the shafts, etc) are certified by the Crane Inspection Certification Bureau.

M Salzer HSE-7 9/26/85

CRANE INSPECTION
CICB
Ph. 800-321-1380
CERTIFICATION BUREAU

Return to Dufour



ZIA HOISTING AND RIGGING MANUAL

ZIA HOISTING AND RIGGING MANUAL

The Zia Company
Los Alamos, New Mexico

1985

This manual is a Zia revised edition of DOE Hoisting and Rigging Manual with the following acknowledgments:

ACKNOWLEDGMENTS

1. Permission to reprint specific portions of the following documents has been granted by the American Society of Mechanical Engineers.
   ANSI B30.2.0-1976, Overhead and Gantry Cranes (Top Running Bridge, Multiple Girder)

   ANSI B30.5-1978, Crawler, Locomotive, and Truck Cranes

   ANSI B30.9-1971, Slings

   ANSI B30.10-1975, Hooks

   ANSI B30.16-1973, Overhead Hoists (Underhung)

   ANSI B56.1-1975, Low Lift and High Lift Trucks

   ANSI MH11.4-1973, Forks and Fork Carriers for Powered Industrial Fork Lift Trucks

   ANSI/ASME NQA-1-1979, Quality Assurance Program Requirements for Nuclear Power Plants

2. Permission to reprint specific illustrations from the Rigging Manual has been granted by the Construction Safety Association of Ontario.

3. Permission to reprint specific figures from SAE J1028, Mobile Crane Working Area Definitions, has been granted by the Society of Automotive Engineers, Inc., SAE.

How to Use This Manual

This Manual is intended to be used as a reference by line managers, supervisors, and personnel responsible for the safety of hoisting, rigging, and other material-handling activities in which mechanical assistance is required. Compliance with this Manual will be considered to be in compliance with applicable codes, standards, and regulations.

Revisions will be issued as the occasion warrants. The Manual is issued on a controlled distribution and all revisions will be distributed to Manual holders.

Section 1.0 contains definitions and terminology arranged alphabetically for easy reference. The subject of personnel qualifications is covered in Section 2.0. Sections 3.0 and 4.0 give the general requirements for lifting equipment and common below-the-hook devices.

The required operating practices may be followed for each specific type of lifting equipment and each type of below-the-hook device by reading the appropriate subsections of Section 5.0. For example, if the lifting equipment to be used is an overhead crane, Subsection 5.2 will delineate the general requirements for use of the crane and the specific requirements for Ordinary Lifts, High-Consequence Lifts, or Special High-Consequence Lifts (see Section 1.0 for definitions). Then, if the below-the-hook devices are wire-rope slings, Subsection 5.6 is to be used to determine the sling requirements, in the appropriate lift category.

Section 6.0 contains load tables, loading charts, weights of materials, and other information intended to help assure that the load is properly rigged and handled.

The inspection, test, maintenance, and storage requirements for each item in each lift category are contained in Secton 7.0.

Section 8.0 contains other safety considerations. Section 9.0 lists the references upon which this Manual is based.

CONTENTS

	Page
Acknowledgments	ii
How to Use This Manual	iii
Contents	v
1.0 Terminology and Definitions	1-1
2.0 Operator Training and Qualification	2-1
2.1 Operator Training	2-1
2.2 Person-In-Charge	2-7
2.3 Rigger Training	2-8
2.4 Physical Requirements	2-11
2.5 Qualification Examinations	2-13
3.0 Lifting Equipment	3-1
3.1 General	3-1
3.2 Overhead and Gantry Cranes	3-2
3.3 Mobile Cranes	3-7
3.4 Forklift Trucks	3-9
3.5 Hoists	3-12
3.6 Hooks	3-13
4.0 Rigging and Tackle	4-1
4.1 General	4-1
4.2 Wire-Rope Slings	4-1

Page

4.3 Steel-Chain Slings 4-3
4.4 Metal- and Synthetic-Mesh Slings 4-4
4.5 Shackles, Links, Rings, and Turnbuckles. 4-8
4.6 Eyebolts 4-11
4.7 Metal-Plate Clamps 4-12
4.8 Special Devices. 4-13

5.0 Operating Practices 5-1

5.1 All Equipment Categories 5-1
5.2 Overhead and Gantry Cranes 5-7
5.3 Mobile Cranes. 5-16
5.4 Forklift Trucks. 5-34
5.5 Hoists 5-41
5.6 Wire-Rope Slings 5-50
5.7 Steel-Chain Slings 5-58
5.8 Metal-Mesh Slings. 5-63
5.9 Synthetic-Mesh Slings. 5-66
5.10 Hooks. 5-68
5.11 Standard Signals and Signaler Identifications. . . . 5-69

6.0 General Rigging Information and Load Tables 6-1

6.1 Load Tables. 6-1
6.2 General Sling Information. 6-5
6.3 Wire Rope. 6-11
6.4 Wire-Rope (Cable) Slings 6-17
6.5 Eight-Part Round Body Braided Slings 6-19
6.6 Safe-Working Loads for Pressed-Sleeve Slings 6-20
6.7 Efficiency of Wire-Rope Connections. 6-21
6.8 Grommet Slings 6-22
6.9 Steel-Mesh Slings. 6-24
6.10 Steel-Chain Sling Safe-Loading Guidelines. 6-25

Page

6.11 Shackles 6-27
6.12 Eyebolts 6-30

7.0 Inspection, Testing, Maintenance, and Storage 7-1

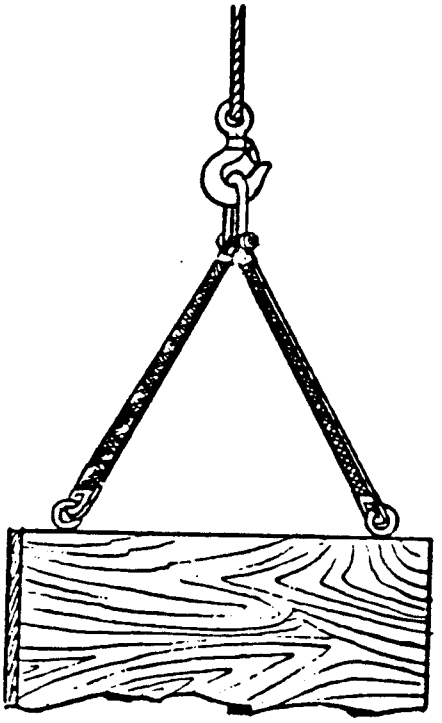
7.1 Inspection 7-1
7.2 Testing. 7-38
7.3 Maintenance. 7-52
7.4 Storage of Slings. 7-54

8.0 Other Safe Work Practices 8-1

8.1 Housekeeping 8-1
8.2 Fire Protection. 8-2
8.3 Emergency Access and Egress. 8-2
8.4 Rereeving. 8-3

9.0 References. 9-1

ZIA RIGGERS



TRAINING MANUAL

JANUARY 1985

ZIA RIGGERS TRAINING MANUAL

by Jules Dufour, Tito Trujillo and Dale Zarecor

ZIA TRAINING AND DEVELOPMENT CENTER

The Zia Company
PO Box 1539
Los Alamos NM 87544

Portions of this manual have been reprinted from non-copyright sources that include publications of the U. S. Department of Energy.

INTRODUCTION

Handling materials with any kind of overhead crane is an important job. Your life and those of many people, Zia employees and others, may depend on how well you work, and how carefully you follow safety and good crane-operating practice. Efficiency, cost-effectiveness and on-time achievement all depend on how well you handle your crane. Each kind of job has its special problems. You have to understand the basic principles behind the equipment you use. Each lift is, in effect, an engineering problem you must solve.

This manual, the larger Zia Hoisting and Rigging Manual, the CICB Student Manual, and many other safety manuals used in the industry, are designed to help you use basic rigging equipment correctly to do the job right. Any manual of this kind, though, only works if you read it, learn the ideas it contains, and practice using them in your work. Many tables in this manual, and tables like your crane's load chart, are designed for you to look up the information you need. Don't try to memorize the chart; instead, learn how to use it, so you can get the information you need about safe limits. Learn how to attach slings and hitches, then check back with the book when you do one. Make the principle that your always inspect ropes a part of your life, then refer to illustrations in the text to be sure you know how the rope should look.

Above all, don't expect this or any other manual to do your job for you. The information here will help you do a better and safer job, but only if you use it correctly and consistently.

TABLE OF CONTENTS

Know Your Wire Rope.....1
Inspect Your Rope First.....2
Hooks and How to Use Them.....4
A Look at Eye Bolts.....7
Be Sure About Shackles.....9
Cable Guards or Protectors.....11
Versatile Crosby Clips.....14
Turnbuckles Level the Load.....15
Chain Hoists and Ways to Use Them.....17
Pull-Lifts Can Do Many Jobs.....19

Chart No. 1: Work Load in Pounds (Eye Bolt).....8
Chart No. 2: Capacity and Hook Size of Pull-Lifts.....21
Chart No. 3: Wire Rope Loading.....24
Chart No. 4: Wire Rope Sling Loading.....25
Chart No. 5: Hitches.....26
Chart No. 6: Hitch Loading.....27
Chart No. 7: Crane or Swinging Boom Hand Signals.....28

Figure 0: Composition of a Wire Rope.....1
Figure 00: Four Types of Rope Lay.....3
Figure 1: Slip Hook.....4
Figure 2: Grab Hook.....4
Figure 3: Sling to Hook Loading.....5
Figure 4: Calculating Safe Load Capacity (SLC).....6
Figure 5: Hook Opening.....6
Figure 6: Plain Pattern Eye Bolt.....8
Figure 7: Decreased Eye Pattern Eye Bolt.....8
Figure 8: Shackle and Calculating Safe Weight Limit (SWL).10
Figure 9: Design of Cable Guard or Protector.....11
Figure 10: Right and Wrong Way to Use a Protector.....12
Figure 10-A: Special Loading for Soft or Finished Surfaces
.....13
Figure 11: Crosby Clip (with chart).....14
Figure 12: Use of Turnbuckles.....15
Figure 13: Placing Turnbuckles.....16
Figure 14: Chain Hoist.....17
Figure 15: Normal, Worn and Stretched Chain.....18
Figure 16 (deleted)
Figure 17: Link Chain Pull-Lift.....20
Figure 18: Pull-Lift Hook Dimensions.....21
Figure 19: Pull-Lift Parts.....22
Figure 20: Handle Is Not Designed to Stand Extra Pressure
.....23
Figure 21: Hitching Through Eye-Bolts.....29
Figure 22: Single Cable Hitch.....30
Figure 23: Basket Hitches.....31
Figure 24: Double Wrap Hitch.....32
Figure 25: Single Choker Hitch.....33
Figure 26: Double Choker Hitch.....34
Figure 27: Two & Four Ends Down.....35
Figure 28: Shortening and Lengthening Cables.....36

CONTENTS

Foreword iii
Standards Committee Roster v
Introduction 1
General 1
Section I Scope 1
Section II Purpose 2
Section III Exceptions and Interpretations 2
Section IV New and Old Installations 2
Section V Mandatory and Advisory Rules 2

Chapter 10–0 Scope, Definitions, and References 3
Section 10–0.1 Scope of 330.10 3
Section 10–0.2 Definitions 3

Chapter 10–1 Hooks – Hoisting 8
Section 10–1.1 Hook Characteristics 8
Section 10–1.2 Hook Identification 8
Section 10–1.3 Attachments 8
Section 10–1.4 Inspection, Performance Testing, and Maintenance 9
10–1.4.1 Inspection Classification 9
10–1.4.2 Frequent Inspection 9
10–1.4.3 Periodic Inspection 9
10–1.4.4 Hooks Not in Regular Use 9
10–1.4.5 Performance Testing 9
10–1.4.6 Maintenance 9
Section 10–1.5 Operating Practices 10

Chapter 10–2 Hooks – Miscellaneous 11
Section 10–2.1 Hook Properties 11
Section 10–2.2 Hook Identification 11
Section 10–2.3 Inspection, Performance Testing, and Maintenance 11
10–2.3.1 Inspection Classification 11
10–2.3.2 Frequent Inspection 11
10–2.3.3 Periodic Inspection 12
10–2.3.4 Hooks Not in Regular Use 12
10–2.3.5 Performance Testing 12
10–2.3.6 Maintenance 12
Section 10–2.4 Operating Practices 12

Figures
1 Sorting Hook 5
2 Clevis Hook 5
3 Eye Hook 5
4 Shank Hook 5
5 Duplex Hook (Sister) 6

(6) If hooks are painted, visual inspection should take this coating into consideration. Surface variations can disclose evidence of heavy or severe service to require more detailed analysis of 10-1.4.1-(b)(2)(b) or 10-1.4.1(b)(2)(c). The surface condition may then call for stripping the paint in such instances.

(b) Repair of cracks, nicks, and gouges shall be carried out by a designated person by grinding longitudinally, following the contour of the hook, provided that no dimension is reduced more than 10% (or as recommended by the manufacturer) of its original value. (A qualified person may authorize continued use if the reduced area is not critical.)

(c) All other repairs shall be performed by the manufacturer or other qualified person.

Section 10-1.5 Operating Practices

Personnel using hooks shall be aware of the following:

(a) It shall be determined that the weight of the load to be lifted does not exceed the lesser of the load rating of the hook or the load rating of the equipment of which the hook is a part.

(b) Shock loading should be avoided.

(c) Load shall be centered in the base (bowl-saddle) of the hook to prevent point loading of the hook.

(d) Hooks shall not be used in such a manner as to place a side load or back load on the hook.

(e) When using a device to close the throat opening of the hook, care shall be taken that the load is not carried by the closing device.

(f) Hands, fingers, and body shall be kept from between hook and load.

(g) Duplex (sister) hooks shall be loaded equally on both sides unless the hook is specifically designed for single loading. When using an articulated duplex hook (sister) (see Fig. 6), care should be taken because articulation of the hook may cause instability in the slung load.

(h) If the duplex (sister) hook is loaded at the pinhole instead of at the two saddles, the load applied shall not exceed the rated load that would normally be shared by the two saddles, or the rated load of the supporting equipment.

AMERICAN NATIONAL STANDARD

SAFETY STANDARDS FOR CRANES, DERRICKS, HOISTS, HOOKS, JACKS, AND SLINGS

SLINGS

ANSI B30.9 - 1971

OCT 30 1972
LOP
PROPERTY

SECRETARIAT

NAVAL FACILITIES ENGINEERING COMMAND,
U.S. DEPARTMENT OF THE NAVY
THE AMERICAN SOCIETY OF MECHANICAL ENGINEERS

PUBLISHED BY

THE AMERICAN SOCIETY OF MECHANICAL ENGINEERS

United Engineering Center 345 East 47th Street New York, N. Y. 10017

CONTENTS

		Page
Foreword		iii
INTRODUCTION		
General		1
Section I	Scope	1
Section II	Purpose	2
Section III	Exceptions and Interpretations	2
Section IV	Mandatory and Advisory Rules	2
CHAPTER 9-0 SCOPE, DEFINITIONS, REFERENCES		
Section 9-0.1	Scope of B30.9	3
Section 9-0.2	Definitions	3
Section 9-0.3	References to Other Standards	5
CHAPTER 9-1 ALLOY STEEL CHAIN		
Section 9-1.1	Chain Properties	6
Section 9-1.2	Properties of Alloy Steel Chain Slings	6
Section 9-1.3	Sling Identification	6
Section 9-1.4	Effects of Temperature	7
Section 9-1.5	Attachments	7
Section 9-1.6	Repair and Reconditioning Alloy Steel Chain Slings	7
Section 9-1.7	Storage of Chain Assemblies	7
Section 9-1.8	Sling Chain Inspection	7
Section 9-1.9	Safe Operating Practices	8
CHAPTER 9-2 WIRE ROPE		
Section 9-2.1	Wire Rope Properties	10
Section 9-2.2	Wire Rope Sling Properties	10
Section 9-2.3	Proof Load	17
Section 9-2.4	Effects of Temperature	17
Section 9-2.5	Minimum Sling Lengths	17
Section 9-2.6	End Attachments	17
Section 9-2.7	Storage	17
Section 9-2.8	Sling Inspection & Replacement	17
Section 9-2.9	Safe Operating Practices	18
CHAPTER 9-3 METAL MESH		
Section 9-3.0	General	19
Section 9-3.1	Metal Mesh Sling Construction	19
Section 9-3.2	Safety Factor	21
Section 9-3.3	Sling Testing	21
Section 9-3.4	Sling Marking	21
Section 9-3.5	Proper Use of Metal Mesh Slings	21
Section 9-3.6	Safe Operating Practices	21
Section 9-3.7	Inspection and Repair	21

CHAPTER 9-4 ROPE: NATURAL AND SYNTHETIC FIBER

		Page
Section 9-4.1	Type of Fiber & Safety Factor	23
Section 9-4.2	Rope: Grade, Size, Construction	23
Section 9-4.3	Rated Load Capacities	23
Section 9-4.4	Sling Configurations	23
Section 9-4.5	Safe Operating Practices	26
Section 9-4.6	Inspection of Fiber Slings in Service	26

CHAPTER 9-5 SYNTHETIC WEBBING (NYLON, POLYESTER, POLYPROPYLENE)

Section 9-5.1	Construction	31
Section 9-5.2	Safety Factor	31
Section 9-5.3	Marking	31
Section 9-5.4	Rated Capacity	31
Section 9-5.5	Safe Operating Practices	31
Section 9-5.6	Inspection	32
Section 9-5.7	Repairs	32

ILLUSTRATIONS

Figure 1.	Major Components of a Quadruple Sling	9
2.		22
3.		22
4.	Basic Sling Configurations with Vertical Legs	24
5.	Sling Configurations with Angled Legs	25

TABLES

1.	Rated Capacity (Working Load Limit) for Alloy Steel Chain Slings	6
2.	Maximum Allowable Wear of any Point of Link	7
3.	Rated Capacity for Single Leg Slings; 6x19 and 6x37 Classification Improved Plow Steel Grade Rope with Fiber Core (FC)	10
4.	Rated Capacities for Single Leg Slings; 6x19 and 6x37 Classification Improved Plow Steel Grade Rope with Independent Wire Rope Core (IWRC)	11
5.	Rated Capacities for Single Leg Slings Cable Laid Rope – Mechanical Splice only; 7x7x7 and 7x7x19 Constructions Galvanized Aircraft Grade Rope; 7x6x19 IWRC Construction Improved Plow Steel Grade Rope	11
6.	Rated Capacities for Single Leg Slings 8-Part and 6-Part Braided Rope; 6x7 and 6x19 Construction Improved Plow Steel Grade Rope; 7x7 Construction Galvanized Aircraft Grade Rope	12
7.	Rated Capacities for 2-Leg & 3-Leg Bridle Slings; 6x19 and 6x37 Classification Improved Plow Steel Grade Rope with Fiber Core (FC)	12
8.	Rated Capacities for 2-Leg & 3-Leg Bridle Slings; 6x19 and 6x37 Classification Improved Plow Steel Grade Rope with Independent Wire Rope Core (IWRC)	13
9.	Rated Capacities for 2-Leg & 3-Leg Bridle Slings Cable Laid Rope – Mechanical Splice only; 7x7x7 and 7x7x19 Constructions Galvanized Aircraft Grade Rope; 7x6x19 IWRC Construction Improved Plow Steel Grade Rope	13

10. Rated Capacities for 2-Leg and 3-Leg Bridle Slings 8-Part and 6-Part Braided Rope, 6x7 and 6x19 Construction Improved Plow Steel Grade Rope, 7x7 Construction Galvanized Aircraft Grade Rope 14

11. Rated Capacities for Strand Laid Grommet – Hand Tucked Improved Plow Steel Grade Rope 14

12. Rated Capacities for Cable Laid Grommet – Hand Tucked; 7x6x7 and 7x6x19 Constructions Improved Plow Steel Grade Rope; 7x7x7 Construction Galvanized Aircraft Grade Rope 15

13. Rated Capacities for Strand Laid Endless Slings – Mechanical Joint; Improved Plow Steel Grade Rope 15

14. Rated Capacities for Cable Laid Endless Slings – Mechanical Joint; 7x7x7 and 7x7x19 Constructions Galvanized Aircraft Grade Rope; 7x6x19 IWRC Construction Improved Plow Steel Grade Rope 16

15. Metal Mesh Sling Classification 19

16. Fabric Construction 19

17. Rated Capacities – Metal Mesh 20

18. Manila Rope Slings 27

19. Nylon Rope Slings 28

20. Polyester Rope Slings 29

21. Polypropylene Rope Slings 30

APPENDIX M-3

HAZARDOUS WASTES DISPOSED AT TA-54, AREA L, IN DISPOSAL SHAFTS

LOS ALAMOS NATIONAL LABORATORY
HAZARDOUS CHEMICAL WASTES DISPOSED
AT TA-54, AREA L, IN DISPOSAL SHAFTS

SHAFT NUMBER: 19

H 830063L	TRANSFORMER OIL ON ZORBAL & VERMICULITE	H-CODE:	06	VOL=	.113562	M3	WGT=	68.0389	KG	D-DATE:	830325

GROSS-VOL THIS SHAFT= .113562 M3 GROSS-WGT THIS SHAFT= 68.0389 KG

SHAFT NUMBER: 20

H 830016N	CHROMIC ACID BURIED IN 15 GAL DRUM	H-CODE:	00	VOL=	.567812E-01	M3	WGT=	36.2874	KG	D-DATE:	830223
H 830020L	ALUMINUM CHLORIDE IN DRUM #17 PLUS BE	H-CODE:	00	VOL=	.113562	M3	WGT=	79.3788	KG	D-DATE:	830223
H 830021L	INORGANICS IN DRUM #18	H-CODE:	00	VOL=	.113562	M3	WGT=	79.3788	KG	D-DATE:	830223
H 830022L	INORGANICS IN DRUM #19	H-CODE:	00	VOL=	.113562	M3	WGT=	86.1827	KG	D-DATE:	830223
H 830027L	PERCHLORIC ACID	H-CODE:	03	VOL=	.378541E-02	M3	WGT=	.907186	KG	D-DATE:	830203
H 830059N	INORGANICS DISPOSED OF IN OWN DRUM	H-CODE:	00	VOL=	.454250	M3	WGT=	453.597	KG	D-DATE:	830324
H 830066N	10 GAL OF FUME LITHARGE (PBO)	H-CODE:	00	VOL=	.378541E-01	M3	WGT=	37.8297	KG	D-DATE:	830324
H 830195L	OIL ON VERMICULITE	H-CODE:	06	VOL=	.416375	M3	WGT=	226.776	KG	D-DATE:	830929
H 830196L	CUTTING OIL ON VERMICULITE	H-CODE:	06	VOL=	.454250	M3	WGT=	249.476	KG	D-DATE:	830929
H 830211L	OIL ABSORBED ON VERMICULITE	H-CODE:	06	VOL=	.624593	M3	WGT=	226.776	KG	D-DATE:	830929

GROSS-VOL THIS SHAFT= 2.38860 M3 GROSS-WGT THIS SHAFT= 1476.63 KG

SHAFT NUMBER: 21

H 830091N	CORRODED CL2 AND HF CYLINDERS-VENTED	H-CODE:	08	VOL=	.757083E-01	M3	WGT=	90.7186	KG	D-DATE:	830525
H 830205N	F2 CYCLINDER VENTED PUT IN SHAFT	H-CODE:	08	VOL=	.141584E-01	M3	WGT=	9.07186	KG	D-DATE:	830929
H 830281N	8 CYLINDERS FROM C AREA TO CYL. SHAFT	H-CODE:	08	VOL=	.200000	M3	WGT=	136.078	KG	D-DATE:	831215
H 840127N	EMPTY CYLINDERS TO SHAFT	H-CODE:	08	VOL=	.141584E-01	M3	WGT=	18.1437	KG	D-DATE:	840424
H 840306N	EMPTY GAS MIXING CYLINDER	H-CODE:	08	VOL=	.100000E-01	M3	WGT=	9.07186	KG	D-DATE:	840703
H 840353N	EMPTY GAS CYLINDERS	H-CODE:	08	VOL=	.566336E-01	M3	WGT=	18.1437	KG	D-DATE:	840806
H 840409N	EMPTY CYLINDERS	H-CODE:	08	VOL=	.141584	M3	WGT=	45.3593	KG	D-DATE:	840924
H 840411N	EMPTY CYLINDERS	H-CODE:	08	VOL=	.481386E-01	M3	WGT=	11.3398	KG	D-DATE:	840926
H 840454N	EMPTY GAS CYLINDERS	H-CODE:	08	VOL=	.849505E-01	M3	WGT=	22.6796	KG	D-DATE:	841120
H 840455N	EMPTY GAS CYLINDERS	H-CODE:	08	VOL=	.206138	M3	WGT=	90.7186	KG	D-DATE:	841120

LOS ALAMOS NATIONAL LABORATORY
HAZARDOUS CHEMICAL WASTES DISPOSED
AT TA-54 AREA L, IN DISPOSAL SHAFTS

H 850051N	GAS CYLINDERS THAT HAVE BEEN VENTED	H-CODE:	08	VOL=	.113267 M3	WGT=	45.3593 KG	D-DATE:	850319
H 850163N	EMPTY HELIUM CYLINDERS	H-CODE:	08	VOL=	.500000E-02 M3	WGT=	13.6078 KG	D-DATE:	850715
H 850165N	EMPTY KRYPTON CYLINDERS	H-CODE:	08	VOL=	.198218E-01 M3	WGT=	4.53593 KG	D-DATE:	850725
H 850214L	EMPTY FLOURINE CYCLINDERS	H-CODE:	08	VOL=	.842505E-01 M3	WGT=	102.058 KG	D-DATE:	850813
H 850215N	BATTERIES	H-CODE:	00	VOL=	.416395 M3	WGT=	181.437 KG	D-DATE:	850805

GROSS-VOL THIS SHAFT= 2.12021 M3 GROSS-WGT THIS SHAFT= 298.324 KG

SHAFT NUMBER: 22

H 830009L	ORGANICS IN DRUM #40	H-CODE:	01	VOL=	.113562 M3	WGT=	104.326 KG	D-DATE:	830223
H 830010L	ORGANIC SOLVENT WITH KEROSENE BASE	H-CODE:	01	VOL=	.113562 M3	WGT=	20.7186 KG	D-DATE:	830223
H 830011L	ORGANIC CHEMICALS	H-CODE:	01	VOL=	.113562 M3	WGT=	83.9147 KG	D-DATE:	830223
H 830012L	ORGANICS	H-CODE:	01	VOL=	.113562 M3	WGT=	27.1108 KG	D-DATE:	830223
H 830013L	ORGANICS DRUM #44	H-CODE:	01	VOL=	.113562 M3	WGT=	61.6086 KG	D-DATE:	830223
H 830014L	ORGANICS IN DRUM #45	H-CODE:	01	VOL=	.113562 M3	WGT=	21.1722 KG	D-DATE:	830223
H 830017L	ORGANICS IN DRUM #46	H-CODE:	01	VOL=	.113562 M3	WGT=	47.6273 KG	D-DATE:	830223
H 830018L	ORGANICS IN DRUM #47	H-CODE:	01	VOL=	.113562 M3	WGT=	81.6467 KG	D-DATE:	830223
H 830019L	ORGANICS IN DRUM #39	H-CODE:	01	VOL=	.113562 M3	WGT=	99.7905 KG	D-DATE:	830223
H 830023N	CUTTING OIL ON VERMICULITE	H-CODE:	06	VOL=	.340687 M3	WGT=	229.371 KG	D-DATE:	830223
H 830024N	PAINT THINNER IN VERMICULITE	H-CODE:	01	VOL=	.624593 M3	WGT=	635.036 KG	D-DATE:	830223
H 830038L	ORGANICS DRUM #48	H-CODE:	01	VOL=	.208198 M3	WGT=	122.224 KG	D-DATE:	830325
H 830039L	ORGANICS DRUM #49	H-CODE:	01	VOL=	.208198 M3	WGT=	103.419 KG	D-DATE:	830325
H 830060N	CHEMICALS DISPOSED OF IN OWN CONTAINER	H-CODE:	01	VOL=	.227125 M3	WGT=	83.9147 KG	D-DATE:	830315
H 830061N	UNREACT ORGANICS BURIED IN OWN CONTAINER	H-CODE:	01	VOL=	3.10000 M3	WGT=	1905.11 KG	D-DATE:	830324

GROSS-VOL THIS SHAFT= 5.23086 M3 GROSS-WGT THIS SHAFT= 3887.27 KG

SHAFT NUMBER: 23

H 830086L	OIL ON VERMICULITE	H-CODE:	06	VOL=	.832791 M3	WGT=	725.755 KG	D-DATE:	830525
H 830087L	OIL ON VERMICULITE	H-CODE:	06	VOL=	.832791 M3	WGT=	362.874 KG	D-DATE:	830525
H 830088L	VACUUM PUMP OIL ON VERMICULITE	H-CODE:	06	VOL=	.208198 M3	WGT=	136.078 KG	D-DATE:	830525
H 830089L	OIL ABSORBED ON VERMICULITE	H-CODE:	06	VOL=	.113562 M3	WGT=	72.3788 KG	D-DATE:	830525

LOS ALAMOS NATIONAL LABORATORY
HAZARDOUS CHEMICAL WASTES DISPOSED
AT TA-54, AREA L, IN DISPOSAL SHAFTS

H 830020L	REGAL OIL GR AND O	H-CODE:	06	VOL=	.378541E-01 M3	WGT=	40.8234 KG	D-DATE:	830525
H 830141L	CUTTING OIL ON VERMICULITE	H-CODE:	06	VOL=	.454250 M3	WGT=	453.597 KG	D-DATE:	830526
H 830268L	LOW PCB OIL FOR AREA L	H-CODE:	06	VOL=	2.21477 M3	WGT=	1360.79 KG	D-DATE:	831216
H 830269L	CUTTING OIL ON VERMICULITE	H-CODE:	06	VOL=	.454250 M3	WGT=	272.156 KG	D-DATE:	831216
H 830273L	LOW PCB OIL ON VERMICULITE	H-CODE:	06	VOL=	1.87378 M3	WGT=	1088.63 KG	D-DATE:	831216
H 830274L	OIL AND H2O ABSORBED ON VERMICULITE	H-CODE:	06	VOL=	.624593 M3	WGT=	362.878 KG	D-DATE:	831216
H 830275N	DIRTY OIL TO OIL SHAFT	H-CODE:	06	VOL=	.189271E-01 M3	WGT=	22.6796 KG	D-DATE:	831216
H 830276L	DIESEL FUEL OIL ON VERMICULITE	H-CODE:	06	VOL=	5.60000 M3	WGT=	1814.39 KG	D-DATE:	831216
H 830286N	LIGHT WEIGHT OIL TO OIL SHAFT	H-CODE:	06	VOL=	.1000005-03 M3	WGT=	2.26796 KG	D-DATE:	831216
H 840030L	OIL ON VERMICULITE	H-CODE:	06	VOL=	.208198 M3	WGT=	136.078 KG	D-DATE:	840223
H 840031N	PCB FREE OIL ON VERMICULITE	H-CODE:	06	VOL=	.832791 M3	WGT=	453.597 KG	D-DATE:	840223
H 840032L	USED CUTTING OIL ON VERMICULITE	H-CODE:	06	VOL=	.454250 M3	WGT=	272.156 KG	D-DATE:	840223

GROSS VOL THIS SHAFT= 15.4611 M3 GROSS WGT THIS SHAFT= 7504.13 KG

SHAFT NUMBER: 24

H 830259L	ORGANICS IN DRUM 91	H-CODE:	01	VOL=	.208198 M3	WGT=	192.777 KG	D-DATE:	831216
H 830260L	OIL AND KEROSENE ON VERMICULITE	H-CODE:	06	VOL=	.832791 M3	WGT=	544.317 KG	D-DATE:	831216
H 830261L	TRICHLOROETHANE ON VERMICULITE	H-CODE:	01	VOL=	.208198 M3	WGT=	90.7186 KG	D-DATE:	831216
H 830262L	RESIN	H-CODE:	01	VOL=	.624593 M3	WGT=	453.597 KG	D-DATE:	831216
H 830263L	ETHYLENE GLYCOL ON VERMICULITE	H-CODE:	01	VOL=	.208198 M3	WGT=	90.7186 KG	D-DATE:	831216
H 830264L	STODDARD SOLVENT ON VERMICULITE	H-CODE:	01	VOL=	.832791 M3	WGT=	544.317 KG	D-DATE:	831216
H 830265L	ORGANICS IN DRUM 88	H-CODE:	01	VOL=	.208198 M3	WGT=	217.725 KG	D-DATE:	831216
H 830266L	ORGANICS IN DRUM #89	H-CODE:	01	VOL=	.200000 M3	WGT=	204.117 KG	D-DATE:	831216
H 830267L	ORGANICS IN DRUM 90	H-CODE:	01	VOL=	.208198 M3	WGT=	222.261 KG	D-DATE:	831216
H 830288N	2-ETHYL-1-HEXANOL	H-CODE:	00	VOL=	.302833 M3	WGT=	302.547 KG	D-DATE:	830929
H 840033L	PAINT THINNER ABSORBED ON VERMICULITE	H-CODE:	01	VOL=	.416395 M3	WGT=	181.437 KG	D-DATE:	840223
H 840034L	2-PROPANOL ABSORBED ON VERMICULITE	H-CODE:	01	VOL=	.416395 M3	WGT=	181.437 KG	D-DATE:	840223
H 840035L	ORGANICS IN DRUM 92	H-CODE:	01	VOL=	.208198 M3	WGT=	181.437 KG	D-DATE:	840223
H 840036N	SURFACTANT OVERPACKED IN VERMICULITE	H-CODE:	01	VOL=	.321760 M3	WGT=	158.758 KG	D-DATE:	840223
H 840037L	ORGANICS IN DRUM 93	H-CODE:	01	VOL=	.208198 M3	WGT=	204.117 KG	D-DATE:	840223
H 840038L	ORGANICS IN DRUM 94	H-CODE:	01	VOL=	.208198 M3	WGT=	226.796 KG	D-DATE:	840223
H 840039L	PAINT THINNER ON VERMICULITE	H-CODE:	01	VOL=	.416395 M3	WGT=	272.156 KG	D-DATE:	840223
H 840040L	GLYCOL ETHER EB ON VERMICULITE	H-CODE:	01	VOL=	.132482 M3	WGT=	68.0389 KG	D-DATE:	840223

LOS ALAMOS NATIONAL LABORATORY
HAZARDOUS CHEMICAL WASTES DISPOSED
AT TA-54, AREA L, IN DISPOSAL SHAFTS

H 840041L	OILS WITH SOLVENT ON VERMICULITE	H-CODE:	06	VOL=	2.22017 M3	WGT=	2267.92 KG	D-DATE:	840223
H 840042L	1,1,1 TRICHLOROETHANE ON VERMICULITE	H-CODE:	01	VOL=	1.04099 M3	WGT=	907.194 KG	D-DATE:	840223
H 840043L	ORGANICS IN DRUM 95	H-CODE:	01	VOL=	.208198 M3	WGT=	204.117 KG	D-DATE:	840223
H 840044L	ORGANICS IN DRUM 96	H-CODE:	01	VOL=	.208198 M3	WGT=	204.117 KG	D-DATE:	840223
H 840045L	ORGANICS IN DRUM 97	H-CODE:	01	VOL=	.208198 M3	WGT=	190.509 KG	D-DATE:	840223
H 840046L	ORGANICS IN DRUM 98	H-CODE:	01	VOL=	.208198 M3	WGT=	204.117 KG	D-DATE:	840223
H 840047L	ORGANICS IN DRUM 99	H-CODE:	01	VOL=	.208198 M3	WGT=	226.796 KG	D-DATE:	840223
H 840095L	ORGANICS IN DRUM 111	H-CODE:	01	VOL=	.208198 M3	WGT=	170.097 KG	D-DATE:	840405
H 840096L	ORGANICS IN DRUM 110	H-CODE:	01	VOL=	.113562 M3	WGT=	90.7186 KG	D-DATE:	840405
H 840097L	ORGANICS IN DRUM 109 (BENZENE)	H-CODE:	01	VOL=	.113562 M3	WGT=	90.7186 KG	D-DATE:	840405
H 840098L	ORGANICS IN DRUM 108	H-CODE:	01	VOL=	.208198 M3	WGT=	181.437 KG	D-DATE:	840405
H 840099L	ORGANICS IN DRUM 107	H-CODE:	01	VOL=	.208198 M3	WGT=	181.437 KG	D-DATE:	840405
H 840100L	ORGANICS IN DRUM 106	H-CODE:	01	VOL=	.208198 M3	WGT=	181.437 KG	D-DATE:	840405
H 840101L	ORGANICS IN DRUM 105	H-CODE:	01	VOL=	.208198 M3	WGT=	181.437 KG	D-DATE:	840405
H 840102L	ORGANICS IN DRUM 104	H-CODE:	01	VOL=	.208198 M3	WGT=	181.437 KG	D-DATE:	840405
H 840103L	ORGANICS IN DRUM 103	H-CODE:	01	VOL=	.208198 M3	WGT=	158.758 KG	D-DATE:	840405
H 840104L	ORGANICS IN DRUM 102	H-CODE:	01	VOL=	.208198 M3	WGT=	170.097 KG	D-DATE:	840405
H 840105L	ORGANICS IN DRUM 101	H-CODE:	01	VOL=	.208198 M3	WGT=	181.437 KG	D-DATE:	840405
H 840106L	ORGANICS IN DRUM 100	H-CODE:	01	VOL=	.113562 M3	WGT=	113.398 KG	D-DATE:	840405
H 840115L	LOW LEVEL PCB OIL ON VERMICULITE	H-CODE:	06	VOL=	2.91477 M3	WGT=	1814.39 KG	D-DATE:	840405
H 840116L	VACUUM PUMP OIL ON VERMICULITE	H-CODE:	06	VOL=	.340687 M3	WGT=	272.156 KG	D-DATE:	840405
H 840117L	TEXACO REGAL OIL ON VERMICULITE	H-CODE:	06	VOL=	1.04099 M3	WGT=	725.755 KG	D-DATE:	840405
H 840118L	ORGANIC AND OIL ON VERMICULITE	H-CODE:	06	VOL=	3.42195 M3	WGT=	2267.92 KG	D-DATE:	840405

GROSS-VOL THIS SHAFT= 20.7169 M3 GROSS-WGT THIS SHAFT= 15504.8 KG

SHAFT NUMBER: 25

H 830034L	INORGANIC IN DRUM #20	H-CODE:	00	VOL=	.208198 M3	WGT=	80.4506 KG	D-DATE:	830325
H 830035L	INORGANICS IN DRUM #21	H-CODE:	00	VOL=	.113562 M3	WGT=	117.934 KG	D-DATE:	830325
H 830036L	INORGANICS IN DRUM #22	H-CODE:	00	VOL=	.113562 M3	WGT=	74.8428 KG	D-DATE:	830325
H 830037N	GaAs ABSORBED ON PAPER TOWELS DRUM #23	H-CODE:	00	VOL=	.113562 M3	WGT=	181.437 KG	D-DATE:	830325
H 830079L	PERCHLORIC ACID	H-CODE:	04	VOL=	.109271E-01 M3	WGT=	4.53593 KG	D-DATE:	830405
H 830104L	PHOTOCHEMICAL WASTES IN DRUM 23	H-CODE:	00	VOL=	.208198 M3	WGT=	181.437 KG	D-DATE:	830525
H 830105L	INORGANICS IN DRUM #24	H-CODE:	01	VOL=	.208198 M3	WGT=	190.509 KG	D-DATE:	830525

LOS ALAMOS NATIONAL LABORATORY
HAZARDOUS CHEMICAL WASTES DISPOSED
AT TA-54, AREA L, IN DISPOSAL SHAFTS

H 830106L	PHOTOCHEMICALS INORGANIC DRUM #25	H-CODE:	02	VOL=	.113562 M3	WGT=	90.7186 KG	D-DATE:	830525
H 830107L	PHOTOCHEMICALS IN DRUM INORGANIC 26	H-CODE:	02	VOL=	.113562 M3	WGT=	99.7905 KG	D-DATE:	830525
H 830108L	UNKNOWN WHITE POWDER IN INORG. DRUM #27	H-CODE:	00	VOL=	.208198 M3	WGT=	204.117 KG	D-DATE:	830525
H 830164L	INORGANICS IN DRUM #29	H-CODE:	00	VOL=	.208198 M3	WGT=	36.2874 KG	D-DATE:	830725
H 830168L	INORGANICS IN DRUM #28	H-CODE:	00	VOL=	.208198 M3	WGT=	158.758 KG	D-DATE:	830725
H 830169L	INORGANICS IN DRUM #29	H-CODE:	00	VOL=	.113562 M3	WGT=	99.9866 KG	D-DATE:	830725
H 830170L	INORGANICS IN DRUM #30	H-CODE:	00	VOL=	.208198 M3	WGT=	158.758 KG	D-DATE:	830725
H 830171L	INORGANICS IN DRUM #31	H-CODE:	00	VOL=	.208198 M3	WGT=	113.398 KG	D-DATE:	830725
H 830209N	INORGANICS IN OWN CARTONS	H-CODE:	00	VOL=	1.36275 M3	WGT=	1360.79 KG	D-DATE:	830929
H 830277L	INORGANICS IN DRUM #34	H-CODE:	00	VOL=	.208198 M3	WGT=	120.509 KG	D-DATE:	831216
H 830278N	SODA LIME IN OWN DRUM	H-CODE:	02	VOL=	.113562 M3	WGT=	68.0389 KG	D-DATE:	831216
H 830279L	INORGANICS IN DRUM #33	H-CODE:	00	VOL=	.208198 M3	WGT=	272.156 KG	D-DATE:	831216
H 840003N	INORGANICS BURIED IN OWN CONTAINERS	H-CODE:	00	VOL=	.226535 M3	WGT=	204.117 KG	D-DATE:	840127
H 840027L	INORGANICS IN DRUM 35	H-CODE:	00	VOL=	.208198 M3	WGT=	204.117 KG	D-DATE:	840223
H 840028N	OAKITE - STRONG DETERGENT	H-CODE:	01	VOL=	.567812E-01 M3	WGT=	45.3593 KG	D-DATE:	840223
H 840029N	CHEESECLOTH WITH OIL, ACIDS IN PLASTIC	H-CODE:	02	VOL=	.113562 M3	WGT=	22.6796 KG	D-DATE:	840223
H 840107L	INORGANICS IN DRUM 41	H-CODE:	00	VOL=	.208198 M3	WGT=	181.437 KG	D-DATE:	840405
H 840108L	INORGANICS IN DRUM 40	H-CODE:	00	VOL=	.113562 M3	WGT=	90.7186 KG	D-DATE:	840405
H 840109L	INORGANICS IN DRUM 39	H-CODE:	00	VOL=	.208198 M3	WGT=	181.437 KG	D-DATE:	840405
H 840110L	INORGANICS IN DRUM 38	H-CODE:	00	VOL=	.208198 M3	WGT=	181.437 KG	D-DATE:	840405
H 840111L	INORGANICS IN DRUM 37(HG)	H-CODE:	00	VOL=	.208198 M3	WGT=	181.437 KG	D-DATE:	840405
H 840112L	INORGANICS IN DRUM 36	H-CODE:	00	VOL=	.208198 M3	WGT=	181.437 KG	D-DATE:	840405
H 840121N	GLASSWARE-HG CONTAMINATED	H-CODE:	09	VOL=	.208198 M3	WGT=	113.398 KG	D-DATE:	840405
H 840123N	VARIOUS ARTICLES CONTAM. WITH AS	H-CODE:	02	VOL=	.113562 M3	WGT=	68.0389 KG	D-DATE:	840405
H 840129L	INORGANICS IN DRUM #46	H-CODE:	00	VOL=	.208198 M3	WGT=	204.117 KG	D-DATE:	840426
H 840130L	INORGANICS IN DRUM #45	H-CODE:	00	VOL=	.208198 M3	WGT=	204.117 KG	D-DATE:	840426
H 840131L	INORGANICS IN DRUM #44	H-CODE:	00	VOL=	.208198 M3	WGT=	226.796 KG	D-DATE:	840426
H 840132L	INORGANICS IN DRUM 42	H-CODE:	00	VOL=	.208198 M3	WGT=	158.758 KG	D-DATE:	840426
H 840196L	INORGANICS IN DRUM #51	H-CODE:	00	VOL=	.208198 M3	WGT=	181.437 KG	D-DATE:	840618
H 840197L	GALLIUM ARSENIDE IN DRUM #50	H-CODE:	00	VOL=	.113562 M3	WGT=	34.0193 KG	D-DATE:	840618
H 840198L	INORGANICS IN DRUM #49	H-CODE:	00	VOL=	.208198 M3	WGT=	204.117 KG	D-DATE:	840618
H 840199L	INORGANICS IN DRUM #48	H-CODE:	00	VOL=	.208198 M3	WGT=	192.777 KG	D-DATE:	840618
H 840208N	SIGMA CHEMICALS DISPOSED OF IN OWN DRUMS	H-CODE:	02	VOL=	.208198 M3	WGT=	204.117 KG	D-DATE:	840618
H 840209L	BROKEN BATTERY PLUS CLEANUP ON VEB.	H-CODE:	02	VOL=	.208198 M3	WGT=	113.398 KG	D-DATE:	840618
H 840210L	ENBOND Z-72	H-CODE:	02	VOL=	.208198 M3	WGT=	90.7186 KG	D-DATE:	840618
H 840305N	LEAD CHIPS	H-CODE:	00	VOL=	.113562 M3	WGT=	113.398 KG	D-DATE:	840723

LOS ALAMOS NATIONAL LABORATORY
HAZARDOUS CHEMICAL WASTES DISPOSED
AT TA-54, AREA L, IN DISPOSAL SHAFTS

H 840317L	INORGANICS IN DRUM 57 COPIER FLUID	H-CODE: 02	VOL=	.208198 M3	WGT=	217.725 KG	D-DATE:	840724
H 840318L	INORGANICS IN DRUM 56 COPIER FLUID	H-CODE: 02	VOL=	.208198 M3	WGT=	204.117 KG	D-DATE:	840724
H 840319L	INORGANICS IN DRUM 55 COPIER FLUID	H-CODE: 02	VOL=	.208198 M3	WGT=	204.117 KG	D-DATE:	840724
H 840320L	INORGANICS IN DRUM 54	H-CODE: 00	VOL=	.208198 M3	WGT=	217.725 KG	D-DATE:	840724
H 840321L	INORGANICS IN DRUM 53	H-CODE: 00	VOL=	.208198 M3	WGT=	204.117 KG	D-DATE:	840724
H 840390L	INORGANICS IN DRUM 60	H-CODE: 00	VOL=	.208198 M3	WGT=	204.117 KG	D-DATE:	841029
H 840391L	INORGANIC DRUM 59	H-CODE: 00	VOL=	.208198 M3	WGT=	190.509 KG	D-DATE:	840924
H 840392L	INORGANIC DRUM 58	H-CODE: 00	VOL=	.208198 M3	WGT=	192.777 KG	D-DATE:	840924
H 840398N	SODIUM SILICATE	H-CODE: 00	VOL=	.208198 M3	WGT=	204.117 KG	D-DATE:	840924
H 840435L	RE WASTES PACKED IN VERMICULITE	H-CODE: 00	VOL=	.113562 M3	WGT=	36.2874 KG	D-DATE:	841029
H 840468L	INORGANICS IN DRUM#64 (SALTS)	H-CODE: 00	VOL=	.208198 M3	WGT=	215.457 KG	D-DATE:	841219
H 840473N	EBONAL-C	H-CODE: 02	VOL=	.302833 M3	WGT=	302.547 KG	D-DATE:	841219
H 840474N	PHOTO RESIST STRIPPER	H-CODE: 02	VOL=	.416395 M3	WGT=	453.597 KG	D-DATE:	841219
H 840476N	AMMONIA ETCHANT	H-CODE: 00	VOL=	.624593 M3	WGT=	635.036 KG	D-DATE:	841219
H 840479L	INORGANICS IN DRUM #62	H-CODE: 00	VOL=	.208198 M3	WGT=	208.653 KG	D-DATE:	841219
H 840480L	INORGANICS IN DRUM #61	H-CODE: 00	VOL=	.208198 M3	WGT=	204.117 KG	D-DATE:	841219
H 840482L	INORGANICS IN DRUM #63	H-CODE: 00	VOL=	.208198 M3	WGT=	.453593 KG	D-DATE:	841219
H 840487L	INORGANICS IN DRUM 365	H-CODE: 00	VOL=	.208198 M3	WGT=	249.476 KG	D-DATE:	841219
H 840491L	HYDROGEN CHLORIDE ON SODIUM CARBONATE	H-CODE: 00	VOL=	.113562 M3	WGT=	22.6796 KG	D-DATE:	841219
H 850022L	INORGANICS IN DRUM #66	H-CODE: 00	VOL=	.208198 M3	WGT=	238.136 KG	D-DATE:	850221
H 850030L	INORGANICS IN DRUM #67	H-CODE: 00	VOL=	.208198 M3	WGT=	113.398 KG	D-DATE:	850221
H 850034L	INORGANICS IN DRUM #68	H-CODE: 00	VOL=	.208198 M3	WGT=	158.758 KG	D-DATE:	850221
H 850061L	INORGANICS IN DRUM #69	H-CODE: 00	VOL=	.208198 M3	WGT=	204.117 KG	D-DATE:	850426

GROSS-VOL THIS SHAFT= 13.2676 M3 GROSS-WGT THIS SHAFT= 12150.9 KG

SHAFT NUMBER: 26

H 830040L	ORGANICS IN DRUM #50	H-CODE: 01	VOL=	.208198 M3	WGT=	104.326 KG	D-DATE:	830325
H 830041L	ORGANICS IN DRUM #51	H-CODE: 01	VOL=	.208198 M3	WGT=	131.542 KG	D-DATE:	830325
H 830042L	ORGANICS IN DRUM #52	H-CODE: 01	VOL=	.208198 M3	WGT=	122.016 KG	D-DATE:	830325
H 830043L	ORGANICS DRUM #56	H-CODE: 01	VOL=	.208198 M3	WGT=	77.1108 KG	D-DATE:	830325
H 830044L	ORGANICS IN DRUM #57	H-CODE: 01	VOL=	.208198 M3	WGT=	131.542 KG	D-DATE:	830325
H 830045L	FLAMMABLE ORGANICS IN DRUM #58	H-CODE: 01	VOL=	.208198 M3	WGT=	147.418 KG	D-DATE:	830325
H 830046L	ORGANICS IN DRUM #59	H-CODE: 01	VOL=	.208198 M3	WGT=	167.829 KG	D-DATE:	830325

LOS ALAMOS NATIONAL LABORATORY
HAZARDOUS CHEMICAL WASTES DISPOSED
AT TA-54 AREA L, IN DISPOSAL SHAFTS

H 830047L	ORGANICS IN DRUM #60	H-CODE: 01	VOL=	.208198 M3	WGT=	156.490 KG	D-DATE:	830325
H 830062L	ORGANICS IN DRUM #60	H-CODE: 01	VOL=	.208198 M3	WGT=	61.2350 KG	D-DATE:	830325
H 830064N	DIOCTYL PHTHOLATE CONTAMINATED EQUIPMENT	H-CODE: 01	VOL=	.416395 M3	WGT=	272.156 KG	D-DATE:	830325
H 830067L	1 PT. TRIFLUOROMETHANE & SULFAMIC ACID	H-CODE: 01	VOL=	.113562 M3	WGT=	31.7515 KG	D-DATE:	830325
H 830092L	ETHANOL AND TREOP ON VERMICULITE	H-CODE: 01	VOL=	.208198 M3	WGT=	136.078 KG	D-DATE:	830525
H 830101L	SOLVENT PACKED ON VERMICULITE	H-CODE: 01	VOL=	.624593 M3	WGT=	454.597 KG	D-DATE:	830525
H 830103L	CHLOROTHENE ON VERMICULITE	H-CODE: 01	VOL=	.416395 M3	WGT=	226.796 KG	D-DATE:	830525
H 830109L	PHOTOCHEMICAL WASTES IN DRUM #61	H-CODE: 01	VOL=	.208198 M3	WGT=	170.097 KG	D-DATE:	830525
H 830110L	ORGANICS IN DRUM #62	H-CODE: 01	VOL=	.208198 M3	WGT=	190.509 KG	D-DATE:	830525
H 830111L	ORGANICS IN DRUM #63	H-CODE: 01	VOL=	.208198 M3	WGT=	204.117 KG	D-DATE:	830525
H 830112L	ORGANICS IN DRUM #64	H-CODE: 01	VOL=	.208198 M3	WGT=	204.117 KG	D-DATE:	830525
H 830113L	ORGANICS IN DRUM #65	H-CODE: 01	VOL=	.208198 M3	WGT=	190.509 KG	D-DATE:	830525
H 830114L	ORGANICS IN DRUM #66	H-CODE: 01	VOL=	.208198 M3	WGT=	158.758 KG	D-DATE:	830525
H 830115L	ORGANICS IN DRUM #67	H-CODE: 01	VOL=	.208198 M3	WGT=	190.509 KG	D-DATE:	830525
H 830116L	ORGANICS IN DRUM #68	H-CODE: 01	VOL=	.208198 M3	WGT=	181.437 KG	D-DATE:	830525
H 830117L	ORGANICS IN DRUM #69	H-CODE: 01	VOL=	.113562 M3	WGT=	63.5030 KG	D-DATE:	830525
H 830118L	CUSO4 AND OIL ON VERMICULITE IN DRUM #70	H-CODE: 01	VOL=	.113562 M3	WGT=	49.8932 KG	D-DATE:	830525
H 830119L	ORGANICS IN DRUM #71	H-CODE: 01	VOL=	.113562 M3	WGT=	122.470 KG	D-DATE:	830525
H 830120L	ETHYLENE DIAMINE LEAKING DRUM #72	H-CODE: 01	VOL=	.113562 M3	WGT=	68.0389 KG	D-DATE:	830525
H 830142N	4-5 GAL. CANS OF OIL	H-CODE: 06	VOL=	.757083L-01 M3	WGT=	68.0389 KG	D-DATE:	830620
H 830163L	ORGANICS IN DRUM #77	H-CODE: 01	VOL=	.208198 M3	WGT=	61.2350 KG	D-DATE:	830725
H 830166L	CLEANING SOL. CONTAIN Be ON VERMICULITE	H-CODE: 00	VOL=	.832791 M3	WGT=	1360.79 KG	D-DATE:	830725
H 830173L	ORGANICS IN DRUM #73	H-CODE: 01	VOL=	.208198 M3	WGT=	136.078 KG	D-DATE:	830725
H 830174L	ORGANICS IN DRUM #74	H-CODE: 01	VOL=	.208198 M3	WGT=	113.398 KG	D-DATE:	830725
H 830175L	ORGANICS IN DRUM #75	H-CODE: 01	VOL=	.208198 M3	WGT=	158.758 KG	D-DATE:	830725
H 830176L	ORGANICS IN DRUM #76	H-CODE: 01	VOL=	.208198 M3	WGT=	147.418 KG	D-DATE:	830725
H 830177L	ORGANICS IN DRUM #77	H-CODE: 01	VOL=	.208198 M3	WGT=	181.437 KG	D-DATE:	830725
H 830178L	ORGANICS IN DRUM #78	H-CODE: 01	VOL=	.208198 M3	WGT=	204.117 KG	D-DATE:	830725
H 830179L	ORGANICS IN DRUM #79	H-CODE: 01	VOL=	.208198 M3	WGT=	181.437 KG	D-DATE:	830725
H 830194L	ORGANIC CHEMICALS FROM S-SITE CLEANUP	H-CODE: 01	VOL=	2.66872 M3	WGT=	2267.99 KG	D-DATE:	830929
H 830207L	SOLVENT WASTE ON VERMICULITE	H-CODE: 01	VOL=	.624593 M3	WGT=	635.036 KG	D-DATE:	830929
H 830208L	ORGANICS ABSORBED ON VERMICULITE	H-CODE: 01	VOL=	.416395 M3	WGT=	226.796 KG	D-DATE:	830929
H 830218L	ORGANICS IN DRUM 80	H-CODE: 01	VOL=	.208198 M3	WGT=	172.365 KG	D-DATE:	830929
H 830219L	ORGANICS IN DRUM 81	H-CODE: 01	VOL=	.113562 M3	WGT=	68.0389 KG	D-DATE:	830929
H 830220L	DYE ON VERMICULITE DRUM 82	H-CODE: 01	VOL=	.208198 M3	WGT=	181.437 KG	D-DATE:	830929
H 830221L	ORGANICS IN DRUM 83	H-CODE: 01	VOL=	.208198 M3	WGT=	181.437 KG	D-DATE:	830929

LOS ALAMOS NATIONAL LABORATORY
HAZARDOUS CHEMICAL WASTES DISPOSED
AT TA-54, AREA L, IN DISPOSAL SHAFTS

H 830222L	ORGANICS IN DRUM 84 ON VERMICULITE	H-CODE: 01	VOL=	.113562 M3	WGT=	34.0125 KG	D-DATE:	830929
H 830223L	DRUM 85 DYE ON VERMICULITE	H-CODE: 01	VOL=	.113562 M3	WGT=	68.0389 KG	D-DATE:	830929
H 830224L	ORGANICS IN DRUM 86	H-CODE: 01	VOL=	.208198 M3	WGT=	204.117 KG	D-DATE:	830929
H 830225L	ORGANICS IN DRUM 87	H-CODE: 01	VOL=	.208198 M3	WGT=	136.078 KG	D-DATE:	830929
H 850103L	BERYLLIUM WASTE	H-CODE: 00	VOL=	.454250 M3	WGT=	102.058 KG	D-DATE:	850307

GROSS-VOL THIS SHAFT= 13.8925 M3 GROSS-WGT THIS SHAFT= 10904.0 KG

SHAFT NUMBER: 27

H 830078L	SULFAMIC ACID ABSORBED ON VERMICULITE	H-CODE: 01	VOL=	.567812E-01 M3	WGT=	45.3593 KG	D-DATE:	830405
H 830098N	MERCURY WITH HIGH EXPLOSIVE TO SHAFT #27	H-CODE: 00	VOL=	.900000E-03 M3	WGT=	15.8758 KG	D-DATE:	830512
H 830102N	LIH ON MISC. ARTICLES 1-55 GAL, 1-30GAL	H-CODE: 05	VOL=	.321760 M3	WGT=	136.078 KG	D-DATE:	830525
H 830165L	LIH CONTAMINATED ARTICLES	H-CODE: 03	VOL=	.208198 M3	WGT=	136.078 KG	D-DATE:	830727
H 830172L	Na-K CONTAMINATED MATERIAL IN DRUM #32	H-CODE: 03	VOL=	.113562 M3	WGT=	49.8952 KG	D-DATE:	830725
H 830204N	MERCURY VAPOR LIGHT IN SHAFT 27	H-CODE: 02	VOL=	.500000E-03 M3	WGT=	.907186 KG	D-DATE:	830928
H 830210L	Be WASTE IN SPECIAL SHAFT	H-CODE: 00	VOL=	.757083E-01 M3	WGT=	45.3593 KG	D-DATE:	830909
H 840019N	BERYLLIUM OXIDE	H-CODE: 00	VOL=	.302833E-02 M3	WGT=	4.53593 KG	D-DATE:	840227
H 840024L	CLEANUP FROM HYDROXYL AMMINE NO3 SPILL	H-CODE: 02	VOL=	1.04099 M3	WGT=	453.597 KG	D-DATE:	840223
H 840025N	MG TURNINGS	H-CODE: 00	VOL=	.832791 M3	WGT=	272.156 KG	D-DATE:	840223
H 840026N	LASER CELL WITH OSMIUM TETROXIDE	H-CODE: 00	VOL=	.283168E-02 M3	WGT=	6.80389 KG	D-DATE:	840201
H 840064L	CLOTHING,GLOVES ETC.CONTAMINATED WITH AS	H-CODE: 00	VOL=	.113562 M3	WGT=	36.2874 KG	D-DATE:	840223
H 840074N	ROLL OF ASBESTOS	H-CODE: 11	VOL=	.283168E-01 M3	WGT=	13.6078 KG	D-DATE:	840309
H 840076N	MATERIALS CONTAMINATED WITH NA K	H-CODE: 03	VOL=	.378541E-01 M3	WGT=	2.26796 KG	D-DATE:	840323
H 840124L	LOW LEVEL PCB CONTAM. ARTICLES IN VERM.	H-CODE: 01	VOL=	.113562 M3	WGT=	45.3593 KG	D-DATE:	840405
H 840150L	BE SCRAPS	H-CODE: 00	VOL=	.189271E-01 M3	WGT=	6.80389 KG	D-DATE:	840426
H 840161L	CELLULOSE NITRATE FILM	H-CODE: 01	VOL=	.567812E-01 M3	WGT=	13.6078 KG	D-DATE:	840514
H 840166N	HG VAPOR TUBE FROM OZALID MACHINE	H-CODE: 00	VOL=	.283168E-02 M3	WGT=	.907186 KG	D-DATE:	840510
H 840438N	BARIUM NITRATE	H-CODE: 04	VOL=	.908499 M3	WGT=	1179.35 KG	D-DATE:	841029
H 840454N	4-EMPTY KRYPTON CYLINDERS	H-CODE: 08	VOL=	.566336E-01 M3	WGT=	4.53593 KG	D-DATE:	841114
H 840457L	PICRIC ACID	H-CODE: 03	VOL=	.500000E-03 M3	WGT=	.453593 KG	D-DATE:	841128
H 840488N	HEPA FILTERS WITH CARCINOGENS	H-CODE: 02	VOL=	.141584 M3	WGT=	31.7515 KG	D-DATE:	841218
H 850014L	BERYLLIUM WASTE	H-CODE: 00	VOL=	.681374 M3	WGT=	204.117 KG	D-DATE:	850221

GROSS-VOL THIS SHAFT= 4.81748 M3 GROSS-WGT THIS SHAFT= 2705.20 KG

SHAFT NUMBER: 28

H 840352N	BERYLLIUM OXIDE FROM MACHINING	H-CODE: 00	VOL=	.141584E-01 M3	WGT=	4.53593 KG	D-DATE:	840806
H 850062L	ORGANICS IN DRUM #154	H-CODE: 01	VOL=	.208198 M3	WGT=	106.594 KG	D-DATE:	850426
H 850063L	PHOTO CHEMICALS IN DRUM #155	H-CODE: 01	VOL=	.208198 M3	WGT=	204.117 KG	D-DATE:	850426
H 850064L	EPOXY IN DRUMS #156 & 157	H-CODE: 01	VOL=	.227125 M3	WGT=	102.058 KG	D-DATE:	850426
H 850065L	ORGANICS IN DRUM #158	H-CODE: 01	VOL=	.208198 M3	WGT=	117.027 KG	D-DATE:	850426
H 850068L	ORGANICS IN DRUMS # 162,163 & 164	H-CODE: 01	VOL=	.624593 M3	WGT=	635.036 KG	D-DATE:	850426
H 850070N	PAINT ON VERMICULITE	H-CODE: 01	VOL=	1.87378 M3	WGT=	1905.11 KG	D-DATE:	850426
H 850071N	EPON RESIN	H-CODE: 01	VOL=	.208198 M3	WGT=	147.418 KG	D-DATE:	850426
H 850072N	OIL ON VERMICULITE	H-CODE: 06	VOL=	.624593 M3	WGT=	840.000 KG	D-DATE:	850426
H 850079N	WEED KILLER & COMPOUND SPRAY ON VERMIC.	H-CODE: 01	VOL=	.416395 M3	WGT=	249.476 KG	D-DATE:	850426
H 850080N	DISEL FUEL ON VERMICULITE	H-CODE: 06	VOL=	.208198 M3	WGT=	207.746 KG	D-DATE:	850426
H 850082N	USED CUTTING OIL ON VERMICULITE	H-CODE: 06	VOL=	.227125 M3	WGT=	226.796 KG	D-DATE:	850426
H 850083N	TRANSFORMER OIL ON VERMICULITE (50 PPM	H-CODE: 06	VOL=	.416395 M3	WGT=	415.945 KG	D-DATE:	850426

GROSS VOL THIS SHAFT= 5.46515 M3 GROSS WGT THIS SHAFT= 5161.86 KG

SHAFT NUMBER: 29

H 840093L	ORGANICS IN DRUM 113-OIL	H-CODE: 06	VOL=	.208198 M3	WGT=	136.078 KG	D-DATE:	840405
H 840094L	ORGANICS IN DRUM 112	H-CODE: 01	VOL=	.208198 M3	WGT=	204.117 KG	D-DATE:	840405
H 840114L	OIL ON VERMICULITE	H-CODE: 06	VOL=	3.53936 M3	WGT=	2721.58 KG	D-DATE:	840405
H 840126N	HYDRAULIC OIL (REGAL 8) ON VERMICULITE	H-CODE: 06	VOL=	.208198 M3	WGT=	136.078 KG	D-DATE:	840405
H 840132L	ORGANICS IN DRUM #116	H-CODE: 01	VOL=	.208198 M3	WGT=	215.457 KG	D-DATE:	840426
H 840133L	ORGANICS IN DRUM #115 (METHANOL)	H-CODE: 01	VOL=	.208198 M3	WGT=	204.117 KG	D-DATE:	840426
H 840135L	VACUUM PUMP OIL ON VERMICULITE	H-CODE: 06	VOL=	.454250 M3	WGT=	226.796 KG	D-DATE:	840426
H 840137L	OIL ON VERMICULITE	H-CODE: 06	VOL=	4.00000 M3	WGT=	3628.78 KG	D-DATE:	840426
H 840138L	INORGANICS IN DRUM 43 (CD)	H-CODE: 00	VOL=	.208198 M3	WGT=	294.835 KG	D-DATE:	840426
H 840140L	ORGANICS IN DRUM 114	H-CODE: 01	VOL=	.208198 M3	WGT=	204.117 KG	D-DATE:	840426
H 840141L	MECHANICAL PUMP OIL	H-CODE: 06	VOL=	.208198 M3	WGT=	113.398 KG	D-DATE:	840426
H 840142L	CHLOROETHANE,ETOH AND ACETONE(ACETONE)	H-CODE: 01	VOL=	.208198 M3	WGT=	113.398 KG	D-DATE:	840426
H 840143L	DYE,METHANOL AND ETOH ON VERMICULITE	H-CODE: 01	VOL=	.208198 M3	WGT=	136.078 KG	D-DATE:	840426
H 840186L	ORGANICS IN DRUM #122	H-CODE: 01	VOL=	.208198 M3	WGT=	204.117 KG	D-DATE:	840618

LOS ALAMOS NATIONAL LABORATORY
HAZARDOUS CHEMICAL WASTES DISPOSED
AT TA-54, AREA L, IN DISPOSAL SHAFTS

H 840187L	ORGANICS IN DRUM #126	H-CODE: 01	VOL=	.208198 M3	WGT=	213.102 KG	D-DATE:	840618
H 840188L	ORGANICS IN DRUM #125	H-CODE: 01	VOL=	.208198 M3	WGT=	204.117 KG	D-DATE:	840618
H 840189L	ORGANICS IN DRUM #123	H-CODE: 01	VOL=	.208198 M3	WGT=	181.437 KG	D-DATE:	840618
H 840190L	ORGANICS IN DRUM #122	H-CODE: 01	VOL=	.208198 M3	WGT=	204.117 KG	D-DATE:	840618
H 840191L	ORGANICS IN DRUM #121	H-CODE: 01	VOL=	.208198 M3	WGT=	204.117 KG	D-DATE:	840618
H 840192L	ORGANICS IN DRUM #120	H-CODE: 01	VOL=	.208198 M3	WGT=	204.117 KG	D-DATE:	840618
H 840193L	ORGANICS IN DRUM #119	H-CODE: 01	VOL=	.208198 M3	WGT=	192.777 KG	D-DATE:	840618
H 840194L	ORGANICS IN DRUM #118	H-CODE: 01	VOL=	.208198 M3	WGT=	181.437 KG	D-DATE:	840618
H 840195L	ORGANICS IN DRUM #117	H-CODE: 01	VOL=	.208198 M3	WGT=	181.437 KG	D-DATE:	840618
H 840200L	INORGANICS IN DRUM #47	H-CODE: 00	VOL=	.208198 M3	WGT=	204.117 KG	D-DATE:	840618
H 840201L	SLUDGE WITH PCB <10PPM	H-CODE: 01	VOL=	.832791 M3	WGT=	635.036 KG	D-DATE:	840618
H 840202L	DIELECTRIC FLUID WITH TRACE OF AS	H-CODE: 06	VOL=	.208198 M3	WGT=	136.078 KG	D-DATE:	840618
H 840203L	MISC. ORGANIC FLUIDS ON VERMICULITE	H-CODE: 01	VOL=	.416395 M3	WGT=	272.156 KG	D-DATE:	840618
H 840204L	OIL WITH ACETONE ON VERMICULITE	H-CODE: 06	VOL=	.208198 M3	WGT=	136.078 KG	D-DATE:	840618
H 840205L	METHYL ETHYL KETONE ON VERMICULITE	H-CODE: 01	VOL=	.208198 M3	WGT=	136.078 KG	D-DATE:	840618
H 840206L	OIL ON VERMICULITE	H-CODE: 06	VOL=	.208198 M3	WGT=	136.078 KG	D-DATE:	840618
H 840207L	SLIMICIDE FUNGICIDE F-16	H-CODE: 01	VOL=	1.66558 M3	WGT=	1088.63 KG	D-DATE:	840618
H 840213L	ORGANICS IN DRUM 128	H-CODE: 01	VOL=	.208198 M3	WGT=	192.777 KG	D-DATE:	840618
H 840214L	OIL ABSORBED ON VERMICULITE	H-CODE: 06	VOL=	.208198 M3	WGT=	136.078 KG	D-DATE:	840618
H 840216L	DMSO ON VERMICULITE	H-CODE: 01	VOL=	.208198 M3	WGT=	136.078 KG	D-DATE:	840618

GROSS-VOL THIS SHAFT= 17.5372 M3 GROSS WGT THIS SHAFT= 13514.9 KG

SHAFT NUMBER: 30

H 840218L	OIL ON VERMICULITE	H-CODE: 06	VOL=	6.20000 M3	WGT=	4082.37 KG	D-DATE:	840618
H 840283L	MIXED ORGANIC WASTES ON VERMICULITE	H-CODE: 01	VOL=	.624593 M3	WGT=	408.234 KG	D-DATE:	840723
H 840284L	SOLVENTS AND OILS ON VERMICULITE	H-CODE: 01	VOL=	.624593 M3	WGT=	408.234 KG	D-DATE:	840723
H 840286N	SOLIDIFIED PAINT	H-CODE: 01	VOL=	.378541 M3	WGT=	226.796 KG	D-DATE:	840723
H 840287L	DIBUTYL PHTHALATE ON VERMICULITE	H-CODE: 01	VOL=	.416395 M3	WGT=	226.796 KG	D-DATE:	840723
H 840289L	OIL ON VERMICULITE	H-CODE: 06	VOL=	3.53936 M3	WGT=	1925.83 KG	D-DATE:	840723
H 840290L	CHLOROETHANE,ETOH,ACETONE,OIL ON VERMIC.	H-CODE: 01	VOL=	.208198 M3	WGT=	136.078 KG	D-DATE:	840723
H 840291L	DIBUTYL CARBITOL ON VERMICULITE	H-CODE: 01	VOL=	.416395 M3	WGT=	226.796 KG	D-DATE:	840723
H 840292L	STODDARD SOLVENT ON VERMICULITE	H-CODE: 01	VOL=	.416395 M3	WGT=	226.796 KG	D-DATE:	840723
H 840293L	TRICHLOROETHYLENE ON VERMICULITE	H-CODE: 01	VOL=	.416395 M3	WGT=	226.796 KG	D-DATE:	840723

LOS ALAMOS NATIONAL LABORATORY
HAZARDOUS CHEMICAL WASTES DISPOSED
AT TA-54, AREA L, IN DISPOSAL SHAFTS

H 840294L	ISOBUTYL ACETATE ON VERMICULITE	H-CODE: 01	VOL=	.416395 M3	WGT=	226.796 KG	D-DATE:	840723
H 840295L	METHYL ISOBUTYLKETONE ON VERMICULITE	H-CODE: 01	VOL=	.416395 M3	WGT=	226.796 KG	D-DATE:	840723
H 840296L	DOWCLENE ON VERMICULITE	H-CODE: 00	VOL=	.416395 M3	WGT=	226.796 KG	D-DATE:	840723
H 840297L	CIMCOOL CONCENTRATE ON VERMICULITE	H-CODE: 01	VOL=	.416395 M3	WGT=	226.796 KG	D-DATE:	840723
H 840299L	TRIBUTYL PHOSPHATE ON VERMICULITE	H-CODE: 01	VOL=	.416395 M3	WGT=	226.796 KG	D-DATE:	840723
H 840300L	DIESEL OIL ON VERMICULITE	H-CODE: 06	VOL=	.208198 M3	WGT=	113.398 KG	D-DATE:	840723
H 840301L	ACETONE ON VERMICULITE	H-CODE: 01	VOL=	.416395 M3	WGT=	226.796 KG	D-DATE:	840723
H 840302L	METHYLENE CHLORIDE ON VERMICULITE	H-CODE: 01	VOL=	.416395 M3	WGT=	226.796 KG	D-DATE:	840723
H 840303L	FREON ON VERMICULITE	H-CODE: 01	VOL=	.624593 M3	WGT=	340.195 KG	D-DATE:	840723
H 840304L	WASTE OIL ON VERMICULITE	H-CODE: 06	VOL=	.208198 M3	WGT=	113.398 KG	D-DATE:	840723
H 840322L	ORGANICS IN DRUM 132	H-CODE: 01	VOL=	.208198 M3	WGT=	192.777 KG	D-DATE:	840723
H 840323L	ORGANICS IN DRUM 131	H-CODE: 01	VOL=	.208198 M3	WGT=	204.117 KG	D-DATE:	840723
H 840324L	ORGANICS IN DRUM 130	H-CODE: 01	VOL=	.208198 M3	WGT=	204.117 KG	D-DATE:	840723
H 840325L	ORGANICS IN DRUM 129	H-CODE: 01	VOL=	.208198 M3	WGT=	217.725 KG	D-DATE:	840723

GROSS VOL THIS SHAFT= 18.4294 M3 GROSS WGT THIS SHAFT= 11138.0 KG

SHAFT NUMBER: 31

H 840312L	ORGANIC DYE ON VERMICULITE	H-CODE: 01	VOL=	.208198 M3	WGT=	136.078 KG	D-DATE:	840724
H 840313L	PAINT THINNER ON VERMICULITE	H-CODE: 01	VOL=	.624593 M3	WGT=	340.195 KG	D-DATE:	840724
H 840314L	VACUUM PUMP OIL ON VERMICULITE	H-CODE: 06	VOL=	.208198 M3	WGT=	90.7186 KG	D-DATE:	840724
H 840315N	DIRT WITH ORGANICS	H-CODE: 02	VOL=	.832791 M3	WGT=	725.755 KG	D-DATE:	840724
H 840383L	ORGANICS IN DRUM 139	H-CODE: 01	VOL=	.208198 M3	WGT=	204.117 KG	D-DATE:	840924
H 840385L	ORGANICS IN DRUM 137	H-CODE: 01	VOL=	.208198 M3	WGT=	204.117 KG	D-DATE:	840924
H 840386L	ORGANICS IN DRUM 136	H-CODE: 01	VOL=	.208198 M3	WGT=	192.777 KG	D-DATE:	840924
H 840387L	ORGANICS IN DRUM 135	H-CODE: 01	VOL=	.208198 M3	WGT=	204.117 KG	D-DATE:	840924
H 840395L	OILON VERMICULITE	H-CODE: 06	VOL=	.340687 M3	WGT=	340.195 KG	D-DATE:	840924
H 840397L	TRICHLOROETHYLENE ON VERMICULITE	H-CODE: 01	VOL=	.416395 M3	WGT=	226.796 KG	D-DATE:	840924
H 840403L	ORGANICS IN DRUM 143	H-CODE: 01	VOL=	.208198 M3	WGT=	204.117 KG	D-DATE:	841029
H 840404L	ORGANICS IN DRUM 144	H-CODE: 01	VOL=	.208198 M3	WGT=	204.117 KG	D-DATE:	841029
H 840406L	OIL ON VERMICULITE	H-CODE: 06	VOL=	3.74756 M3	WGT=	2086.55 KG	D-DATE:	840924

GROSS VOL THIS SHAFT= 7.62761 M3 GROSS WGT THIS SHAFT= 5159.65 KG

LOS ALAMOS NATIONAL LABORATORY
HAZARDOUS CHEMICAL WASTES DISPOSED
AT TA-54, AREA L, IN DISPOSAL SHAFTS

SHAFT NUMBER: 32

H 840394L	OIL ON VERMICULITE	H-CODE: 06	VOL=	.624593 M3	WGT=	408.234 KG	D-DATE:	840924
H 840396L	SUBATHOSTUDDARD SOLVENTS ON VERMICULITE	H-CODE: 01	VOL=	1.04029 M3	WGT=	1542.23 KG	D-DATE:	840924

GROSS-VOL THIS SHAFT= 1.66558 M3 GROSS-WGT THIS SHAFT= 1950.46 KG

SHAFT NUMBER: 33

H 840380L	ORGANICS IN DRUM 142	H-CODE: 01	VOL=	.208198 M3	WGT=	204.117 KG	D-DATE:	841029
H 840381L	ORGANICS IN DRUM 141	H-CODE: 01	VOL=	.208198 M3	WGT=	215.457 KG	D-DATE:	841029
H 840382L	ORGANICS IN DRUM 140	H-CODE: 01	VOL=	.208198 M3	WGT=	204.117 KG	D-DATE:	841029
H 840384L	ORGANICS IN DRUM 138	H-CODE: 01	VOL=	.208198 M3	WGT=	204.117 KG	D-DATE:	841029
H 840388L	ORGANICS IN DRUM 134	H-CODE: 01	VOL=	.208198 M3	WGT=	204.117 KG	D-DATE:	841029
H 840389L	ORGANICS IN DRUM 133	H-CODE: 01	VOL=	.208198 M3	WGT=	198.862 KG	D-DATE:	841029
H 840393L	ORGANICS SOLVENTS ON VERMICULITE	H-CODE: 01	VOL=	.208198 M3	WGT=	136.078 KG	D-DATE:	841029
H 840399L	LOW LEVEL PCB OIL ON VERMICULITE	H-CODE: 06	VOL=	2.70657 M3	WGT=	1814.39 KG	D-DATE:	841029
H 840436L	NON PCB TRANS. OIL AND H2O ON VERMIC.	H-CODE: 06	VOL=	.208198 M3	WGT=	136.078 KG	D-DATE:	841029
H 840466L	ORGANICS IN DRUM #148	H-CODE: 01	VOL=	.208198 M3	WGT=	231.342 KG	D-DATE:	841219
H 840467L	ORGANICS IN DRUM #149	H-CODE: 01	VOL=	.208198 M3	WGT=	235.868 KG	D-DATE:	841219
H 840469P	OIL ON VERMICULITE	H-CODE: 06	VOL=	1.66558 M3	WGT=	907.194 KG	D-DATE:	841219
H 840470L	ORGANICS IN DRUM #146	H-CODE: 01	VOL=	.208198 M3	WGT=	226.796 KG	D-DATE:	841219
H 840471L	ORGANICS IN DRUM #145	H-CODE: 01	VOL=	.208198 M3	WGT=	213.189 KG	D-DATE:	841219
H 840475L	ORGANICS IN DRUM #147	H-CODE: 01	VOL=	.208198 M3	WGT=	222.261 KG	D-DATE:	841219
H 840477L	MACHINE OIL ON VERMICULITE	H-CODE: 06	VOL=	.208198 M3	WGT=	68.0389 KG	D-DATE:	841219
H 840478N	TRICHLOROETHANE 1-1-1 ON VERMICULITE	H-CODE: 01	VOL=	1.66558 M3	WGT=	1632.95 KG	D-DATE:	841219
H 840484L	ORGANICS ON VERMICULITE	H-CODE: 01	VOL=	.208198 M3	WGT=	215.457 KG	D-DATE:	841219
H 840486N	USED PUMP OIL ON VERMICULITE	H-CODE: 06	VOL=	.643520E-01 M3	WGT=	29.4835 KG	D-DATE:	841219
H 840494L	USED VACUUM PUMP OIL ON VERMICULITE	H-CODE: 06	VOL=	.227125 M3	WGT=	60.0389 KG	D-DATE:	841219
H 850015L	CHLOROETHANE ON VERMICULITE	H-CODE: 01	VOL=	.208198 M3	WGT=	181.437 KG	D-DATE:	850221
H 850016L	ORGANICS	H-CODE: 01	VOL=	.340687 M3	WGT=	158.758 KG	D-DATE:	850221
H 850017L	ORGANICS IN DRUM #152	H-CODE: 01	VOL=	.208198 M3	WGT=	235.868 KG	D-DATE:	850221
H 850018L	METHANOL & LASER DYE ON VERMICULITE	H-CODE: 01	VOL=	.113562 M3	WGT=	45.3523 KG	D-DATE:	850221
H 850019L	MOTOR OIL ABSORBED ON VERMICULITE	H-CODE: 06	VOL=	.113562 M3	WGT=	43.0913 KG	D-DATE:	850221

LOS ALAMOS NATIONAL LABORATORY
HAZARDOUS CHEMICAL WASTES DISPOSED
AT TA-54, AREA L, IN DISPOSAL SHAFTS

H 850020L	ORGANICS IN DRUM #150	H-CODE:	01	VOL=	.208198 M3	WGT=	96.6153 KG	D-DATE:	850221
H 850021L	ORGANICS IN DRUM #151	H-CODE:	01	VOL=	.208198 M3	WGT=	249.476 KG	D-DATE:	850221
H 850022L	ORGANICS IN DRUM #153	H-CODE:	01	VOL=	.208198 M3	WGT=	217.725 KG	D-DATE:	850221
H 850024L	USED TRASH FLUIDS IN VERMICULITE	H-CODE:	01	VOL=	1.04099 M3	WGT=	1360.79 KG	D-DATE:	850221
H 850025L	CHLOROETHANE,ETHANOL 190, ACETONE, OIL	H-CODE:	01	VOL=	.416395 M3	WGT=	385.554 KG	D-DATE:	850221
H 850026L	ACETONE ON VERMICULITE	H-CODE:	01	VOL=	.832791 M3	WGT=	1451.51 KG	D-DATE:	850221
H 850027L	VACUUM PUMP OIL ON VERMICULITE	H-CODE:	06	VOL=	.113562 M3	WGT=	38.5534 KG	D-DATE:	850221
H 850028L	VACUUM PUMP OIL ON VERMICULITE	H-CODE:	06	VOL=	.416395 M3	WGT=	367.410 KG	D-DATE:	850221

GROSS-VOL THIS SHAFT= 13.8811 M3 GROSS-WGT THIS SHAFT= 12110.1 KG

SHAFT NUMBER: 34

H 850066L	ORGANICS IN DRUM #159	H-CODE:	01	VOL=	.208198 M3	WGT=	147.410 KG	D-DATE:	850426
H 850067L	ORGANICS IN DRUM #160	H-CODE:	01	VOL=	.416395 M3	WGT=	415.945 KG	D-DATE:	850426
H 850069N	PSEUDO (TRI-METHYL-BENZENE)	H-CODE:	01	VOL=	1.87378 M3	WGT=	1905.11 KG	D-DATE:	850426
H 850073N	LOW PCB OIL ON VERMICULITE	H-CODE:	06	VOL=	3.75586 M3	WGT=	5352.45 KG	D-DATE:	850426
H 850077N	NEUTRALIZED ACIDS HYDRIDES & SULFATES	H-CODE:	00	VOL=	.321760 M3	WGT=	204.117 KG	D-DATE:	850426
H 850097L	ORGANICS IN DRUM #161	H-CODE:	01	VOL=	.208198 M3	WGT=	113.398 KG	D-DATE:	850507
H 850098L	ORGANICS IN DRUM #165	H-CODE:	01	VOL=	.208198 M3	WGT=	136.070 KG	D-DATE:	850507
H 850099L	TRICHLOROETHANE ON VERMICULITE	H-CODE:	01	VOL=	1.04099 M3	WGT=	725.795 KG	D-DATE:	850507
H 850100N	PHOTO STRIPPER ON VERMICULITE	H-CODE:	01	VOL=	.738155 M3	WGT=	456.597 KG	D-DATE:	850507
H 850101L	WASTE FLUID MIXED WITH VERMICULITE	H-CODE:	06	VOL=	.624593 M3	WGT=	635.036 KG	D-DATE:	850507
H 850106N	ORGANICS OF VARIOUS TYPES	H-CODE:	01	VOL=	.208198 M3	WGT=	3004.46 KG	D-DATE:	850507

GROSS-VOL THIS SHAFT= 7.80433 M3 GROSS-WGT THIS SHAFT= 13173.4 KG

LOS ALAMOS NATIONAL LABORATORY

HAZARDOUS CHEMICAL WASTES DISPOSED
AT TA-54, AREA L, SURFACE IMPOUNDMENT 'B'

HSE-7 WASTE TYPE CODE: 00

H 830092N	DEVELOPER TO INORGANIC PIT	GROSS-VOL=	.151417E-01 M3	GROSS-WT=	18.1437 KG	D-DATE:	830525
H 830231N	CORRSIVE LIQUID TO PIT B	GROSS-VOL=	.378541E-02 M3	GROSS-WT=	3.62874 KG	D-DATE:	831024
H 830239N	AQUEOUS SOLUTION TO INORGANIC PIT	GROSS-VOL=	.100000E-01 M3	GROSS-WT=	68.0389 KG	D-DATE:	831101
H 840007N	BORIC ACID SOL TO PIT	GROSS-VOL=	.624593 M3	GROSS-WT=	635.036 KG	D-DATE:	840126
H 840309N	AMMONIUM BIFLUORIDE	GROSS-VOL=	2.27125 M3	GROSS-WT=	2177.27 KG	D-DATE:	840713
H 840310N	P.T.ACTIVATOR-DEVELOPER	GROSS-VOL=	.283906E-01 M3	GROSS-WT=	27.2156 KG	D-DATE:	840716
H 840326N	AMMONIUM BIFLUORIDE	GROSS-VOL=	1.89271 M3	GROSS-WT=	1814.39 KG	D-DATE:	840725
H 840351N	AMMONIUM BIFLUORIDE	GROSS-VOL=	2.27125 M3	GROSS-WT=	2267.99 KG	D-DATE:	840801

HSE-7 WASTE TYPE CODE: 01

H 840354N	ZN,NI,AS MELPHALAN	GROSS-VOL=	.800000E-02 M3	GROSS-WT=	8.16467 KG	D-DATE:	840807

HSE-7 WASTE TYPE CODE: 02

H 830203N	AMMONIA FROM OZALID MACHINE TO PIT	GROSS-VOL=	.757083E-02 M3	GROSS-WT=	6.80389 KG	D-DATE:	830902
H 830243N	AMMONIA FROM OZALID MACHINE TO PIT	GROSS-VOL=	.378541E-02 M3	GROSS-WT=	3.62874 KG	D-DATE:	831114
H 830244N	AMMONIA FROM OZALID MACHINE TO PIT	GROSS-VOL=	.189271E-02 M3	GROSS-WT=	2.26796 KG	D-DATE:	831129
H 830280N	PHOTOCHEMICALS TO PIT	GROSS-VOL=	.454250E-02 M3	GROSS-WT=	4.53593 KG	D-DATE:	831220
H 840005N	BASIC PHOTO CHEMICALS IN INORGANIC PIT	GROSS-VOL=	.681374 M3	GROSS-WT=	635.036 KG	D-DATE:	840119

HSE-7 WASTE TYPE CODE: 03

H 830240N	LIH REACTED IN PIT	GROSS-VOL=	.189271E-02 M3	GROSS-WT=	2.26796 KG	D-DATE:	831117

LOS ALAMOS NATIONAL LABORATORY

HAZARDOUS CHEMICAL WASTES DISPOSED
AT TA-54, AREA L, SURFACE IMPOUNDMENT 'B'

TOTAL GROSS VOLUME= 7.82617 M3 TOTAL GROSS WEIGHT= 7674.41 KG

M-4

GUIDELINES FOR CONSTRUCTION AND USE OF SOLID WASTE DISPOSAL FACILITIES AT AREA G, TA-54

Note: Guidelines are also applicable to Area L facilities.

LOS ALAMOS SCIENTIFIC LABORATORY
UNIVERSITY OF CALIFORNIA
LOS ALAMOS, NEW MEXICO 87545
Telephone Ext: 4301

OFFICE MEMORANDUM

TO : Distribution

DATE: 10 December 1980

THRU: Harry Jordan, H-DO

FROM : W. D. Purtymun, H-8
M. Wheeler, LS-6
J. L. Warren, H-7

SUBJECT : GUIDELINES FOR CONSTRUCTION AND USE OF SOLID WASTE DISPOSAL FACILITIES AT AREA G, TA-54

SYMBOL : H7-80-660

MAIL STOP : 518

The final version of the guidelines, revised after review by the Operational Waste Management Committee, is being submitted for your information. Groups H-7 and H-8 plan to implement the guidelines immediately.

WDP,MLW,JLW/HSJ/rmb

Enc. a/s

Distribution:
- J. W. Healy, H-DO, MS-400
- W. J. Maraman, CMB-DO, MS-756
- R. J. Bard, CMB-8, MS-734
- M. M. Thorpe, NM-DO, MS 324
- D. R. Smith, Q-14, MS 560
- E. M. Sitzberger, ENG-DO, MS 624
- T. K. Keenan, H-7, MS 518
- J. Steger, LS-6, MS 495
- M. A. Rogers, LS-6 MS 495
- W. R. Hansen, H-8, MS 490

LASL GUIDELINES FOR CONSTRUCTION AND USE OF SOLID WASTE DISPOSAL FACILITIES AT AREA G, TA-54

I. INTRODUCTION

These recommended practices for the location, construction, and operation of the LASL TA-54, Area G waste disposal/storage site have been prepared to document procedures that will minimize and control releases from the site, and to provide a continuing documentation of site control. The overall responsibility for ensuring compliance with these guidelines rests with the H-7 Solid Waste Disposal Section Leader. Other LASL groups, as required, will be called on to provide special assistance in providing necessary information.

Deviations from these criteria in specific instances will be necessary, and will be allowed when justified and properly documented. Approval for such deviations will be obtained from the Waste Management (H-7) and Environmental Surveillance (H-8) Group Leaders. Additional approval from the LASL Waste Management Operations Advisory Committee may also be required if requested by either Group Leader.

In all instances the LASL criteria and operations will be consistent with established DOE Burial Site Criteria (Appendix A).

II. RESPONSIBILITY AND DOCUMENTATION

A. Documentation of site suitability studies, current maps and engineering drawings, copies of site and individual pit/shaft inspections, and other related information will be maintained in the files by Group H-7.

B. The Area G Site Engineer is responsible for notifying the H-8 office, in writing, of each activity requiring their attention.

C. Following the completion of all required facility inspections, site studies, and site evaluations, written notification including approvals, results, and recommendations shall be provided to the Area G Site Engineer by the Environmental Surveillance Group Office (H-8).

C. The Site Engineer will call upon the Engineering Department to provide the required topographic maps, engineering drawings, pit surveys, etc., as described in Sections IV, V, and VI.

III. SITE EXPANSION

TA-54, the location of Area G, includes all of Mesita del Buey. This site is of sufficient size that all LASL radioactive solid waste can be buried/stored at this location through the foreseeable future. Consequently, these criteria do not address new site selection. It is assumed that all appropriate DOE and other Federal Agency criteria, as well as the NEPA process, would be followed should any new site ever be required.

Presently, approximately 63 acres of the TA-54 site are fenced, and future expansion of this fenced area will eventually be required. During any such site expansion the following criteria will apply:

A. Prior to the expansion of the useable portion of Area G, notification will be provided to the Environmental Surveillance Group (H-8). The Group will perform the required environmental and archaeological studies, and will provide the necessary documentation.

B. The ecology of the expanded area will be considered in relation to plants and animal communities that are classified as rare or endangered. Any such entities observed will be preserved and protected as specified in the "Endangered Species Act of 1973" (50 CFR-Part 17).

C. Prior to the use of an expanded portion of the disposal site, a thorough site evaluation will be performed by H-8 to determine the suitability of the area for its intended use.

D. Appropriate review and evaluation of the expansion area for archaeological ruins must be conducted as prescribed in Federal Regulations (36 CFR Part 800, as amended March 1, 1979).

IV. GENERAL SITE CRITERIA

A. The use of the TA-54 site is restricted to the top of Mesita del Buey and must be consistent with these Guidelines.

B. A topographic contour map of the fenced portion of Area G will be developed and kept current. Topography will be shown at contour intervals of 5' or less. Filled and proposed burial/storage facilities will be designated. The map will also indicate the final grade contours of the filled portion of Area G.

C. Engineering drawings will be developed, and maintained, which locate the position of site facilities (buildings, retrievable storage areas, disposal pits and shafts, permanent and significant monitoring installations, fence lines, bench marks, etc.).

V. BURIAL PIT/SHAFT CONSTRUCTION

Several weeks prior to clearing and excavation of a pit or shaft, notification will be provided to H-8. At the discretion of H-8, samples may be collected during the construction of a pit or shaft. Following completion of the construction, and before a facility is placed into use, H-8 will be responsible for preparing a geologic/hydrologic description of the pit (and shaft to the extent possible). Upon completion of this inspection, written notification will be provided to the Site Engineer by the H-8 Group Office. This notification will identify any features in the pit or shaft requiring the attention of the Site Engineer. If any additional documentation is necessary the ESG will provide it to the Site Engineer at a later time.

A. Location (see Fig. 1)

1. The "spill point" (the lowest elevation of the undisturbed rock surrounding the pit or shaft) determines the maximum utilization volume of the pit or shaft (Section VI-D). Thus, the layout of the pit will be with the long dimension more or less parallel to the topographic contours.
2. As protection against lateral erosion of the mesa, leading to possible eventual exposure of waste material, the nominal design distance between the edge of a pit or shaft and the canyon rim will be 50 feet. The "rim" is interpreted to be the significant break in slope between the surface and the side of the mesa. The position of this rim will be physically identified by suitable markers

as established by the Engineering Department, and identified on a designated topographic map of the site (Section IV-B). Some variation in this 50-foot separation can be expected over the length of a pit due to localized topographic or pit edge variabilities. These variations should not reduce the separation distance to less than about 45 feet.

3. The nominal design surface distance between the edges of adjacent pits will be 15 feet but in no case less than 10 feet.

B. Burial Pit/Shaft Excavation

1. To the extent possible, natural vegetation and topsoil in the area will remain undisturbed (see Fig. 2).
2. Topsoil from an area to be excavated will be removed either for immediate use elsewhere in revegetation or for stockpiling for future use. Any stockpiling will be done in a manner as to minimize erosion.
3. Tuff removed during construction of the pits will be separately stockpiled in the same manner as the topsoil. No stockpiling will be done on top of rehabilitated or undisturbed areas.
4. In order to protect against water movement from saturated alluvium into the waste, the deepest point in a pit or shaft shall be no deeper than 65', which has been determined as being at least 10' above the adjacent canyon floors.

5. The floors of the pits do not need to be level.
6. Horizontal dimensions (length, width) and shape of pits or shafts are not restricted.
7. The walls and access ramps of the pit will be constructed at a slope deemed to be safe by the Site Engineer and Group H-3.
8. Crushed tuff 0.5 to 1 ft deep will be compacted on the floor of each pit before emplacement of wastes.
9. Upon completion of a pit, excavation engineering drawings will be prepared showing lengthwise profiles at walls and centerline, and crosswise profiles at significant breaks in bottom slope and every 100 ft length. At the time of this survey, the location of the first and last reference posts (for waste disposal location) will be established and recorded on the drawings.

VI. BURIAL PIT/SHAFT USE

A goal of the LASL Waste Disposal Facility is to conduct waste management operations in accordance with DOE and LASL criteria and in a manner that will restrict the release of radioactive materials to the environment to levels below existing standards, and further, to levels that are as low as reasonably achievable. The primary release mechanisms of concern are transport by moving soil moisture (either towards the surface or towards ground water aquifers); erosion of the cover material overlying buried waste; or intrusion into the waste by plants, animals, or man.

A. Only wastes in solid or solidified form will be accepted for burial.

B. As much as possible, wastes will be layered in pits with each layer covered with a minimum of at least 0.5 ft of compacted crushed tuff.

C. Loose combustible wastes subject to wind dispersal will be covered by the end of the day of disposal.

D. Pits and shafts will be filled with wastes to a level no higher than 3 ft below the "spill point" (lowest point on pit rim, Fig. 2.)

E. As a pit is filled, care will be taken to ensure that sufficient room is allowed between waste and large open fractures in the walls and access ramps to allow crushed tuff to fill these fractures.

F. Open joints or fractures are difficult or impossible to identify, inspect, or fill in vertical shafts. Special measures may be required to insure containment of some wastes within disposal shafts. These measures may include the use of shaft liners and/or special waste containers.

G. Surface drainage will be constructed and maintained so that surface runoff does not enter the waste storage or disposal facilities.

VII. FINAL PIT/SHAFT COVER

A. The final cover of a pit will be crushed tuff (minimum of 3') overlain by topsoil (approximately 4").

B. The final cover of a pit will be at or above the original land-surface, as required for contouring to provide the desired drainage within the area.

C. The final cover of a shaft will be noncontaminated cement, a minimum of 3 ft thick, slightly rounded, and extending about 0.5 ft above land surface.

D. Provisions will be made to control runoff in the disposal area to minimize infiltration and erosion of the final cover of pits or shafts.

E. Turf-forming grasses and bunch grasses will be planted in the final cover to prevent wind and sheet wash erosion.

F. Identifying engineering type markers will be placed at two diagonal corners (surveyed) of each pit, and in the final pour of seal cement in the shafts. For pits the markers, at least 12 in. in diameter, will be set approximately 2-3 ft deep in undisturbed tuff and will extend about 0.5 to 1 ft above the ground surface. This marker will be a single brass cap set in concrete as illustrated in Fig. 3. Information on the cap shall include the wording "Buried Radioactive Waste" along with the pit number, corner, radionuclides buried, and dates of use.

Shaft markers will contain information (along with the above wording) including shaft number, radionuclides buried, total curies, and dates of use.

G. Prior to site closure, criteria will be developed for construction and placement of permanent site identifying markers. Site decommissioning will include placement of these markers.

H. Access roads to pits or shafts will be laid out so that vehicles do not transverse rehabilitated areas.

VII. ENVIRONMENTAL MONITORING

The disposal site is a potential source of radionuclides in the environment. There should be no routine release of effluents containing radionuclides from either site operations or site facilities. Further, all releases, whether from operations or through migration of disposed radionuclides, should be as low as reasonably achievable.

A. A routine environmental surveillance program will be conducted by Group H-8, to identify and monitor for any contaminant releases from the site.

B. The monitoring data should be sufficient to allow identification of the processes responsible for contaminant release, and to assess the significance of any releases.

C. The operations of the site will be conducted in a manner consistent with these monitoring programs.

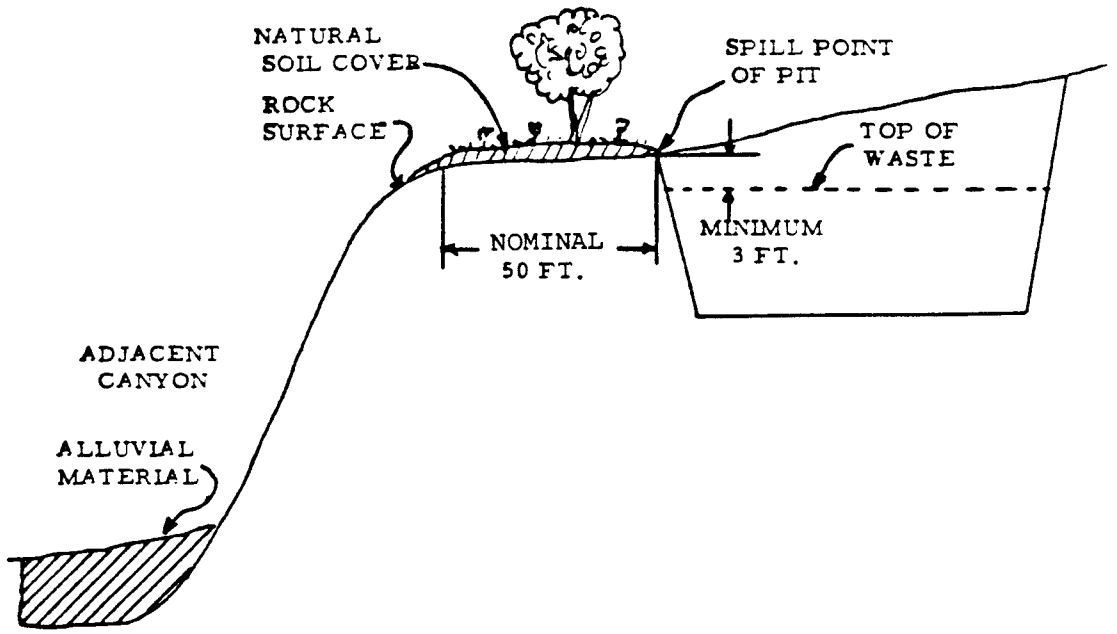


Fig. 1. Cross-section showing details of pit location and placement of wastes.

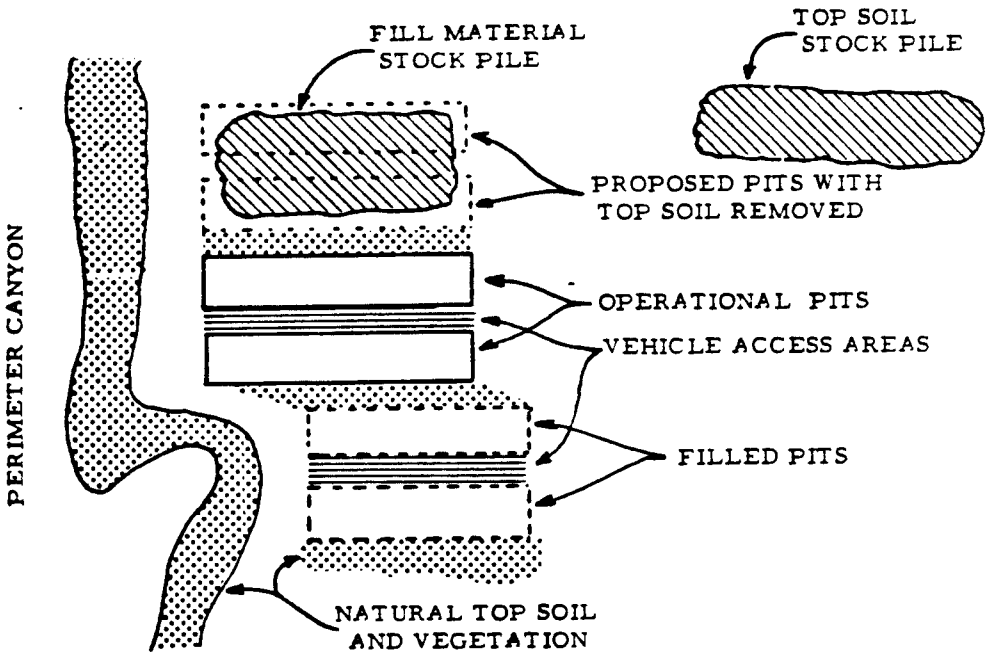


Fig. 2. Example layout of disposal pit, stockpile areas, and biotic sanctuaries.

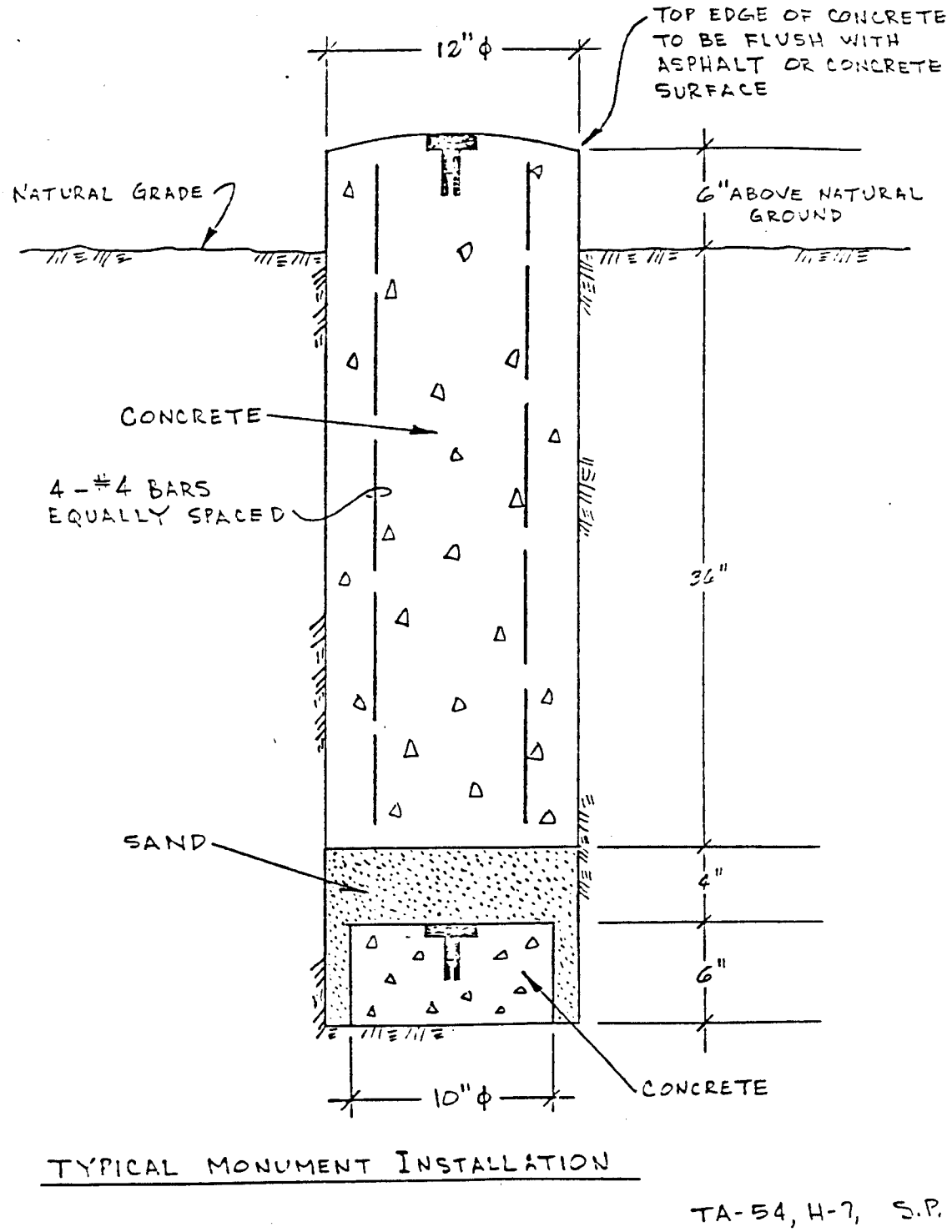


Fig. 3. Typical Monument to Identify Pit or Shaft

Initial Disposal Criteria for DOE Solid Low-Level Waste

Purpose

The purpose of these criteria is to provide that DOE solid low-level waste (LLW) is disposed of (1) in a safe and economical manner, (2) with an acceptable environmental impact, (3) with minimum reliance on long-term surveillance and/or maintenance activities, (4) with acceptable risk to future generations, and (5) with minimum land usage. It is recognized that the general and preliminary nature of these initial criteria will lead to substantive changes in order to provide system-wide, quantified final criteria in FY 1980.

Goals

Disposal site operations should:

1. Encourage minimum waste generation and minimum land usage by applying good housekeeping practices, volume-reduction techniques, better landfill designs and improved disposal methods consistent with operational, health and safety requirements.

2. Use disposal methods and waste conditioning techniques which minimize long-term environmental impact, dependence upon long-term surveillance and/or maintenance, and potential risks to future generations.

3. Generate a properly recorded operating experience data base reflecting environmental and health and safety results of the disposal method(s) in use.

4. Operate, and interpret results of existing and improved site performance surveillance system(s) to assist in the evaluation of the performance of the disposal site and practices.

Criteria

1. General

   a. Good housekeeping and industrial operating practices shall be employed.

   b. Occupational health and safety, environmental and security standards shall be met in all operations.

   c. Land usage for disposal shall be minimized without compromising health and safety.

   d. Emergency response systems should be tested routinely.

e. Technology should be assessed periodically to upgrade practices (volume reduction, containment, surveillance).

f. Plans shall be made for the long-term control and ultimate disposition of the site using the latest technical and land use information.

g. A quality assurance program shall be maintained.

II. Administrative

a. An individual responsible for all disposal site operations shall be specified. The responsibilities and authorities shall be documented and shall include (but not be limited to):

(1) Documenting compliance with appropriate directives, standards and procedures.

(2) Developing and implementing standard operating procedures.

(3) Establishing waste acceptance criteria and, where appropriate, determining the acceptability of input waste.

(4) Providing estimates of resources necessary to assure that site and operations meet standards.

(5) Providing waste volume projections.

b. Generators shall be encouraged to minimize waste generation. Consideration should be given to charging a portion of disposal costs to the generator, such as a sliding charge scale that discourages generation.

c. An independent review system shall be established.

d. Anomalous occurrences at the waste disposal area shall be reviewed and analyzed, and corrective measures implemented and documented as required.

III. Site Selection

a. The site shall have suitable geological, hydrological and climatological properties which are tested, documented, reviewed and accepted by competent authorities to avoid excessive dose to man from radioactive and nonradioactive contaminants.

b. Impact on ecological and archaeological conditions shall be minimized.

c. Transportation of waste, population distribution, and availability of utilities and other site support factors should be considered.

d. Recognized potential uses should be considered for an area prior to its being dedicated for waste disposal so as to minimize the impact of land withdrawal.

V. Site Operation

a. Approved standard operating procedures shall be centrally documented, implemented, reviewed annually and revised as necessary. Procedures shall include:

(1) Waste acceptance requirements including contents and labeling

(2) Disposal method and location

(3) Criticality, radiation and occupational safety

(4) Method of handling unacceptable waste or packaging

(5) Proper handling equipment and techniques to be used

(6) Decontamination of personnel, vehicles, equipment and facilities

(7) Fire prevention methods

(8) Segregation of TRU waste for retrievable storage

(9) Emergency response plans

(10) Consideration of potential future discovery of artifacts

(11) Quality assurance program

(12) Site surveillance program

b. Methods should be established to control:

(1) Wind dispersion of waste or contamination

(2) Water intrusion

(3) Dust

(4) Chemical hazards

(5) Vehicle and personnel traffic

(6) Materials with the potential of mobilizing waste (solvents, organics, etc.)

(7) Intrusion by vegetation or animals

c. Specifications for containment designs and construction shall be developed and implemented for all packaging and disposal techniques.

d. Measurement methods will be implemented, documented and updated as appropriate for.

(1) Radiological conditions in and around the disposal area

(2) Migration of contaminants (radioactive and nonradioactive) in surface and ground water

(3) Uptake of radionuclides by vegetation and animals

(4) Release of airborne contaminants

e. Exposures to site operating personnel and off-site population shall be kept as low as practicable.

V. Site Maintenance

a. Adequate site drainage systems shall be maintained.

b. Final cover shall be maintained to control surface accumulation of water.

c. Adequate erosion control measures shall be employed.

d. Corrective action shall be taken when maximum authorized levels of radiation are approached or predicted to occur.

e. A method to identify the location of disposed waste shall be maintained.

f. Conceptual hydrological model shall be developed utilizing local geohydrological and radiological data, and surveillance systems shall be maintained to aid in detecting and evaluating subsurface migration.

VI. Support

a. Adequate fire suppression shall be available.

b. Security shall be adequate to prevent unauthorized access to waste.

c. Operators shall be qualified for their duties, and an adequate training program should be implemented.

d. Permanent records shall be maintained on:

(1) Waste volume, content, properties and location

(2) Interpreted results of surveillance and monitoring programs

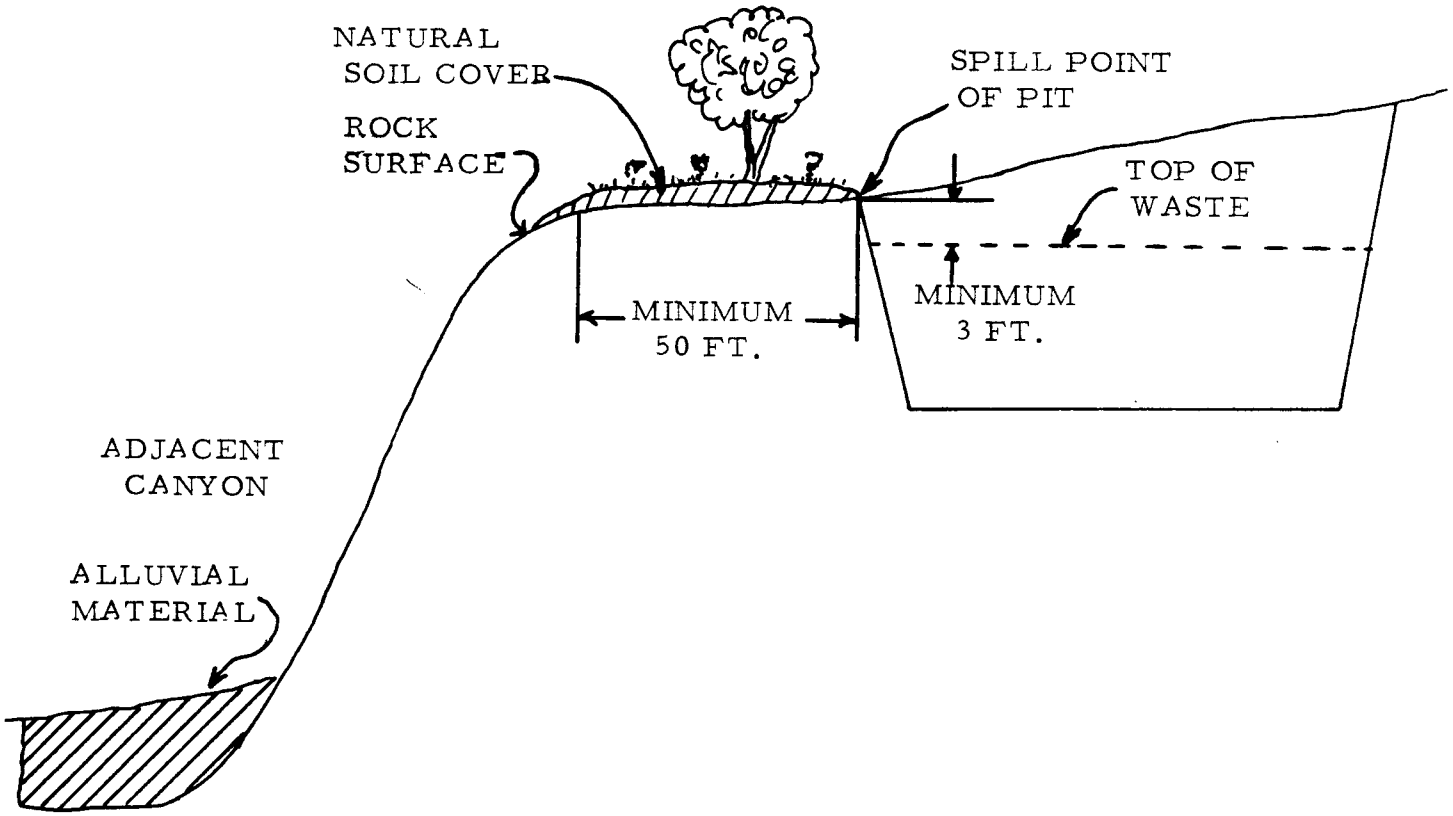
(3) Routine and significant nonroutine events

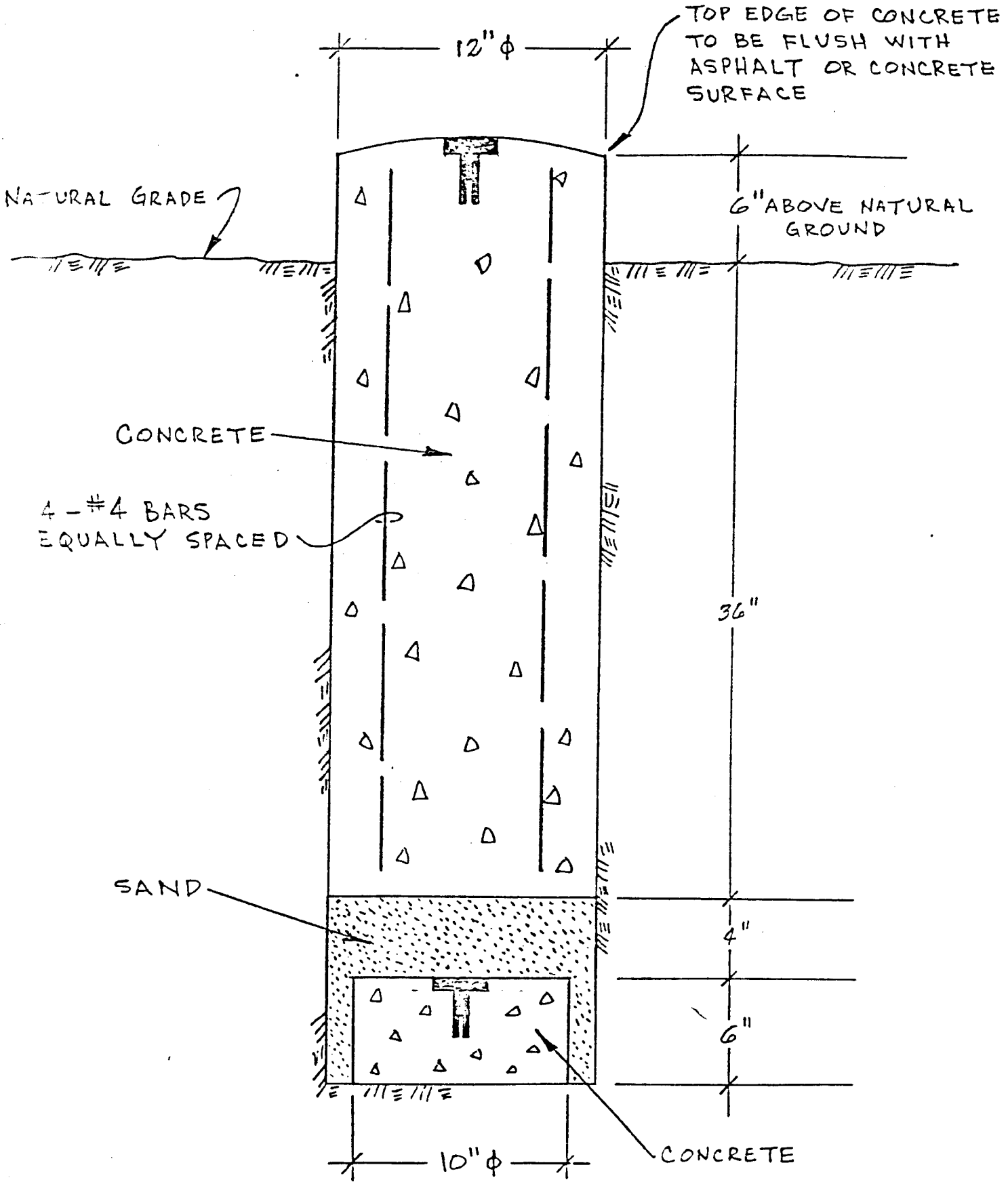
(4) Results of periodic independent evaluation of operations

(5) Results of emergency response tests

(6) Site geological, hydrological and climatological properties

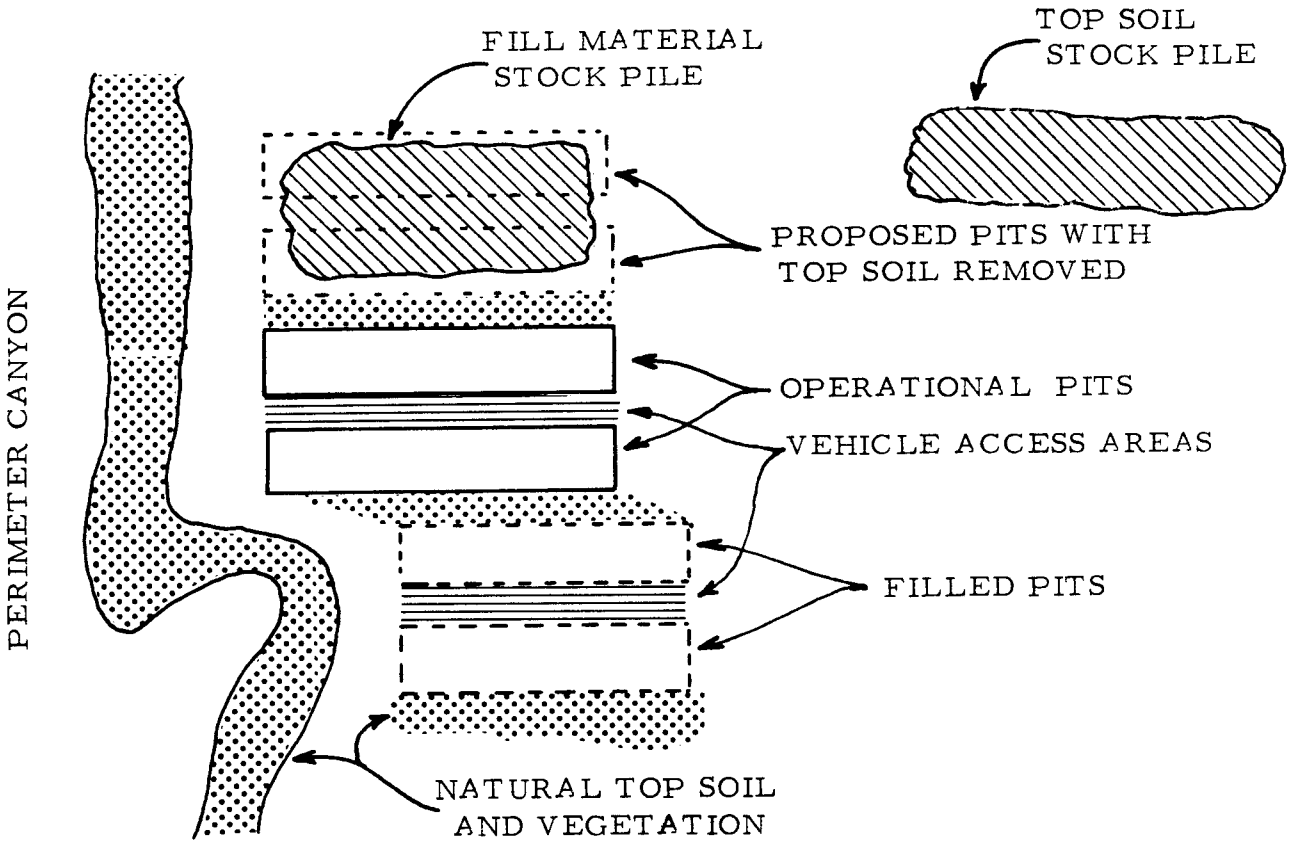
(7) Operating personnel and dose accumulation


NATURAL
SOIL COVER
ROCK
SURFACE
SPILL POINT
OF PIT
TOP OF
WASTE
MINIMUM
50 FT.
MINIMUM
3 FT.
ADJACENT
CANYON
ALLUVIAL
MATERIAL



TYPICAL MONUMENT INSTALLATION

TA-54, H-7, S.P.


FILL MATERIAL
STOCK PILE
TOP SOIL
STOCK PILE
PROPOSED PITS WITH
TOP SOIL REMOVED
PERIMETER CANYON
OPERATIONAL PITS
VEHICLE ACCESS AREAS
FILLED PITS
NATURAL TOP SOIL
AND VEGETATION

APPENDIX M-5

SOP FOR HSE-7 CHEMICAL BATCH TREATMENT SYSTEM

STANDARD OPERATING PROCEDURES
FOR HSE-7 CHEMICAL BATCH TREATMENT SYSTEM

I. INTRODUCTION

This Standard Operating Procedure (SOP) establishes operational and general health and safety procedures for the chemical treatment of wastes at TA-50-1, Room 24. Most of these wastes will require storage at Area L, TA-54 until treatment can be performed. Individuals responsible for the overall operations are the HSE-7 Section Leader and Associate Group Leader for Solid Waste Operations. Any deviation from this SOP must receive their approval.

II. DESCRIPTION OF OPERATIONS

Liquid waste requiring chemical treatment prior to disposal is transported to TA-50 in 55-gallon drums or one of the container tanks. This SOP will describe the treatment processes in general terms. Specific operating instructions for each process will be written after treatment parameters have been developed.

A. Cyanide Waste

Cyanide wastes are treated by alkaline chlorination. The wastes are rendered harmless by conversion to CO_2, N_2, and H_2O.

1. The pH of waste is verified and adjusted, if necessary, to at least 10, prior to transfer to the reaction tank.
2. Wash all pipelines and tanks that will be used in treatment/transfer of waste with water.
3. Waste is pumped to the reaction vessel.
4. Waste is diluted and pH adjusted to 12.
5. Gaseous chlorine is added with agitation to convert cyanide to cyanate.
6. When complete, adjust the pH to 8.
7. Continue adding chlorine until cyanate is destroyed.
8. Discontinue chlorine addition.
9. Adjust pH by adding sodium hydroxide to precipitate metal ions present.

10. Analyze for cyanide presence. If any remains, continue treatment.

11. When total CN is approximately 10 ppm, filter sludge in basket filter and solidify with cement in 55-gallon drum for disposal at Area L.

12. Liquid effluent is discharged to TA-50-1 effluent tank.

13. Wash all pipelines and tanks used in process with water.

B. Chromium Waste

Chrome wastes are reduced by a two-stage process of reduction by sulfur dioxide and precipitation with sodium hydroxide.

1. Wash all pipelines and tanks that will be used in treatment/transfer of wastes with water.

2. Add 100 gallons of water to reaction tank.

3. Pump waste into tank and adjust pH to 2 with sulfuric acie.

4. Add sulfur dioxide to reduce Cr^{+6} to Cr^{+3}.

5. Discontinue sulfur dioxide flow and analyze a sample to demonstrate conversion.

6. Adjust the pH to 8 to precipitate chrome ion.

7. Filter sludge in basket filter and solidify with cement in a 55-gallon drum for disposal at Area L.

8. Effluent is discharged to TA-50.

9. Wash all pipelines and tanks used in process with water.

C. Heavy Metal Separation

Waste containing heavy metals will be treated by pH adjustment to precipitate the metal ion.

1. Wash all pipelines and tanks that will be used in treatment/transfer of wastes with water.

2. Pump waste into reaction vessel.

3. Adjust the pH to the predetermined point by addition of either sodium hydroxide or acid. (Usually the pH will need to be increased by caustic addition).

4. Filter sludge in basket filter and solidify with cement in 55-gallon drum for disposal at Area L.

5. Effluent is discharged to TA-50-1 effluent tank.

6. Wash all pipelines and tanks used in process with water.

D. Acid Waste

These waste streams contain no heavy metals and require only neutralizaiton. The 10,000-gallon neutralization tank at TA-50-1 is used in place of the 500-gallon reaction vessel.

1. Wash all transfer lines that will be used in process with water.

2. Add necessary dilution water and caustic to neutralization tank.

3. Monitoring temperature and pH, slowly add acid to tank.

4. Stop acid addition and adjust pH with sodium hydroxide as necessary.

5. Wash all transfer lines that were used with water.

6. Treated solution will be pumped to either the wiped film evaporator system or to the TA-50-1 effluent tank.

III. Health, Safety, and Environmental Concerns

A. Exposure to toxic and corrosive chemicals

B. Reactions out-of-control

C. Spills of wastes during transfer or treatment

IV. PROCEDURES FOR SAFE OPERATIONS

A. Personal Protective Equipment/Measures

1. Safety glasses/face shields, gloves, and lab coats or coveralls are the minimum protection that must be worn. During transfer of >50% acid wastes, acid wear suits must also be worn.

2. Safety shoes shall be worn during all waste handling operations.

3. Respirators, either full-face or SCBA, will be used as necessary per instructions from HSE-5.

4. The emergency shower and eyewash must be checked to assure that it is operative prior to starting any treatment operations.

5. Two people must be present during treatment operations.

B. Treatment Process

1. All instrumentation will be recalibrated at least yearly.

2. Pressure gauges will be monitored for pressure increases during treatment processes. If sudden pressure increases are detected, treatment will cease immediately. Agitation and cooling water in the jacket will continue to control the reaction.

3. The operating instructions are written to prevent a run-away reaction. Strict adherence to these procedures is required.

C. Spill Control Measures

1. The treatment process takes place inside a concrete bermed area designed to contain all spills and releases.

2. If the reaction overpressurizes the system, any blowdown will be contained in the overflow tank.

3. A major release would initiate the procedures of the Hazardous Waste Contingency Plan.

V. RELATIONSHIPS BETWEEN OPERATIONS AND SUPPORT ACTIVITIES

HSE-7 uses the expertise and guidance of HSE-3 (Safety), HSE-5 (Industrial Hygiene), and HSE-8 (Environmental Surveillance) in the use of the treatment system. If the system were to be used for other waste streams than those described above, a Special Work Permit would be written and approved by these groups.

VI. TRAINING

The training requirements for personnel involved in this operation are covered in SOP CW-1. In addition, personnel shall read this SOP at least semi-annually. The treatment supervisor shall periodically review the task performances of the technical personnel to ensure understanding and compliance with these procedures.

VII. EMERGENCY PROCEDURES

The TA-50-1 Emergency Procedures shall be followed for all emergencies.

VIII. RESPONSIBILITIES

The HSE-7 Section Leader for Solid Waste Operations has the overall responsibility for the treatment system. The Section Leader reports directly to the Associate Group Leader.

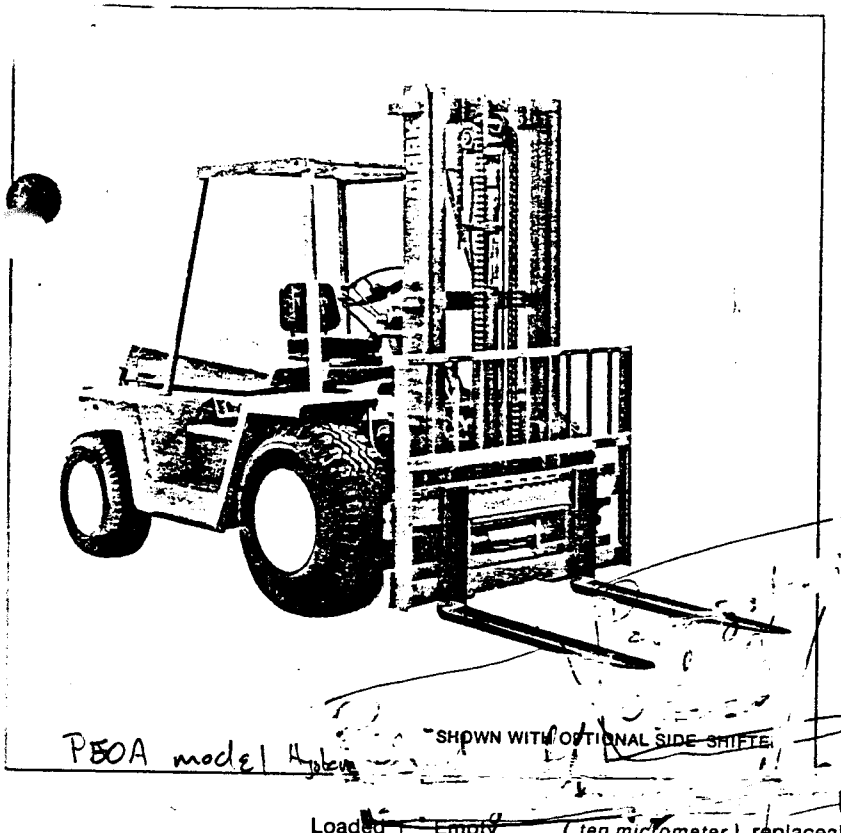
The treatment supervisor is responsible for assuring that all personnel involved in the treatment of chemical wastes know and understand these procedures. All instances of non-compliance will be reported by the supervisor to the Section Leader who is responsible for initiating appropriate corrective action.

CALL LIST

		Work	Home
Treatment Supervisor			
Section Leader	Karen Balo	7-6095	672-1369
Assoc. Group Leader	John Warren	7-5397	662-9639
Deputy Group Leader	Lud Emelity	7-5389	662-7993
Group Leader	Ray Garde	7-4301	753-7737

APPENDIX M-6

MANUFACTURERS SPECIFICATIONS ON DRUM HANDLING EQUIPMENT USED AT TA-54



SHOWN WITH OPTIONAL SIDE SHIFTER

P80A model Hyster

Clark
Rough Terrain Truck

IT 60

Internal Combustion
2 Wheel Drive Towable Truck

6000 lbs. Rated Capacity at 24-in. (600 mm) Load Center

2720 kg Rated Capacity at 500 mm (20-in.) Load Center

Gasoline

SPEED ON GRADE:	Loaded mi/h	Loaded km/h	Empty mi/h	Empty km/h
0%	35.7	*57.4*	36.5	*58.7*
5%	12.2	*19.6*	20.6	*33.1*
10%	7.7	*12.4*	11.3	*18.2*
15%	5.5	*8.9*	8.9	*14.3*
41.2% @	1.0	*1.6*	—	—

MAX. GRADEABILITY %:	Loaded	Empty
(.9 cf)	49.6	33.4

MAX. DRAWBAR PULL:	lbs.	*N*
Rated Load	8168	*36 331*
Empty 0.9 cf	6082	*27 053*

LIFTING SPEEDS:	Standard ft/min	Standard m/s	Triple Stage ft/min	Triple Stage m/s
Loaded	63	*0.32*	75	*0.38*
Empty	65	*0.33*	80	*0.41*
LOWERING SPEEDS:				
Loaded	84	*0.43*	80	*0.41*
Empty	39	*0.20*	75	*0.38*

ENGINE: Ford 300, in-line, 6 cylinder overhead valve industrial engine. The engine incorporates cast iron cylinder block and head with 7 main bearing crankshaft, chrome plated piston rings, hard faced exhaust valves and valve seat inserts, positive exhaust valve rotators, full pressure lubricating system, and a sealed maximum velocity governor. 7 PSI *(48 kPa)* cooling system has 15 quart *(14 L)* capacity.

Model 300
Bore ..... 4.00 in *(102 mm)*
Stroke ..... 3.98 in *(101 mm)*
Displacement ..... 300 cu in *(4.9 L)*
Max. No Load Governed Speed ..... 2600 RPM
Crankcase Capacity ..... 7 quarts *(6.6 L)*
Fuel Tank Capacity ..... 20 gallons *(76 L)*

FILTERS: Spin-on engine oil filter with pleated paper element. Filtered crankcase breather. Donaldson Cyclopac, two stage, air cleaner with replaceable cartridge. Gasoline filter in a metallic bowl on inlet side of pump. Gas filler equipped with strainer. Spin-on transmission oil filter with a built-in bypass valve. Hydraulic system has ten micron *(ten micrometer)* replaceable filter at inlet side of pump, 30 mesh screen in filler neck, and replaceable fiber disc type filler cap breather.

ELECTRICAL SYSTEM: 60 amp hour battery and 37 amp Delco alternator with built-in electronic regulator. Enclosed electric starter with positive pinion engagement. Gauges for reading engine hours, engine oil pressure, engine temperature, battery charging rate and fuel level.

HYDRAULIC SYSTEM: Lift, lower, tilt and auxiliary control levers are mounted on steering column pylon for right hand operation. Full feathering spool type valves. Main hydraulic pump is direct driven. System fluid capacity is 17 gallons *(64 L)*. Sump tank of 25 gallon *(95 L)* capacity is integral with truck frame.

DRIVE TRAIN: Clark full floating drive axle driven by a double universal joint propeller shaft. Axle reduction ratio 6.3:1.

TRANSMISSION: Powershift forward and reverse transmission coupled to a four speed, fully synchronized gear case to provide 4 speeds in forward and reverse. A torque converter multiplies engine torque 2:1. Transmission fluid oil cooler located in the engine radiator. Equipped with neutral start switch. Left foot transmission release pedal, and right foot auxiliary throttle mounted on brake pedal that enables simultaneous operation of engine speed, brakes and transmission engagement. Left hand directional control lever and right hand floor mounted speed selector lever with latch to hold lever in neutral while towing.

STANDARD UPRIGHT: Interlocking "I" beam and channel rails that are reinforced with heavy tie bars. Four canted, variable retainment upright rollers and six canted load rollers on the carriage. Four lateral thrust carriage rollers that bear on the inner rails to resist deflection due to off-center loading. Upright rollers are shim adjustable without major upright disassembly. Non-rigid lift cylinder and tilt cylinder mounts minimize size loading on cylinder rods, seals and packings. Lift and tilt cylinders are serviceable without cylinder removal. Tilt cylinders are key locked to yokes for positive adjustment. Cylinder rods are chrome plated. The upright is mounted to a heavy tubular cross member with greaseable steel backed bushings. Urethane rod wipers and double 'U' cup packings on tilt cylinders. Anti-cavitation valve in tilt circuit. Hook mounted forks are upset forged for full section strength at fork heel. Pivot type forks are optional.

FRAME: Heavy, precision aligned, one-piece structure with integral fuel and hydraulic tanks of .25 in. *(6.3 mm)* plate. First step to operators compartment is open grating to reduce dirt and snow accumulation.

BRAKES: Hydraulic brakes with two stage master cylinder and dual wheel cylinders. Brake shoes are 4.0 in. *(102 mm)* wide and operate in 16.25 in. *(413 mm)* diameter drums. Equipped with Orscheln adjustable lever and cable that actuates drum and band type parking brake at rear of transmission.

POWER STEERING SYSTEM: Fully fluid linked hydrostatic steering for positive hand wheel control. Dual steering cylinders provide constant steering rate. Cast steer axle is mounted on center pivot pin and two semi-elliptical leaf springs that allow up to 10 in. *(254 mm)* variation in tire height. Inclined king pins and axle caster promote improved tracking and towing characteristics. Pressure lubricant fittings on king pins and other steering components.

OVERHEAD GUARD: Meets ANSI B56.1 safety standards and has been subjected to an impact test of 16 000 ft-lbs *(21 693 N·m)*.

ADDED ADVANTAGES: 48 in. *(1220 mm)* high load backrest extension; protectoseal fuel tank cap; couple provision for towing auxiliary equipment; and multipass muffler. Standard bolts are SAE Grade 5, and are zinc phosphate coated or cadmium plated to resist corrosion.

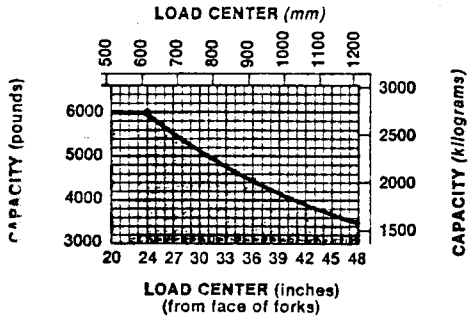
OPTIONAL ACCESSORIES: Towing equipment, pivoting forks, block handling forks, lights, and tires for varied operating surfaces.

PAINT: Exposed surfaces have been shot blasted, primed, and painted with weather-resistant paint. Standard color is Clark green.

IT 60

6000 lbs. Rated Capacity at 24 in. (600 mm) Load Center
2720 kg Rated Capacity at 500 mm (24 in.) Load Center

GENERAL DATA
CAPACITY CHART



NOTE: Capacities shown above are computed with upright in vertical position. Capacity up to 6,000 lbs. applies to uprights with maximum fork height up to 184 inches. Capacity up to *2720 kg* at *500 mm* load center applies to uprights with maximum fork heights to *3300 mm*. For trucks equipped with uprights above these maximum fork heights, contact a Clark representative. Specific capacities will be shown on truck nameplates.

UPRIGHT DIMENSION TABLE

TYPE	MAXIMUM FORK HEIGHT		OVERALL HEIGHT LOWERED		FREE LIFT	
	in	mm	in	mm	in	mm
STANDARD	*136	*3454*	104	*2642*	5.5	*140*
	148	*3760*	110	*2794*	5.5	*140*
	160	*4064*	116	*2946*	5.5	*140*
	184	*4674*	128	*3251*	5.5	*140*
TRIPLE STAGE	*288	*7315*	145	*3683*	112	*2845*
	360	*9144*	162	*4115*	129	*3277*

*Preferred standard heights.
Other upright heights available, contact Clark representative.

SERVICE WEIGHTS:	136 in. (3454 mm) Std.		288 in. (7315 mm) TSU	
	lb	kg	lb	kg
IT 60	12 400	*5625*	13 400	*6078*

UNDERCLEARANCES:
With Rated Load
- Upright ..... 9.2 in *(234 mm)*
- Drive Axle ..... 9.1 in *(231 mm)*

With No Load
- Steer Axle ..... 10.0 in *(254 mm)*
- Frame ..... 12.0 in *(305 mm)*
- Counterweight ..... 11.3 in *(287 mm)*

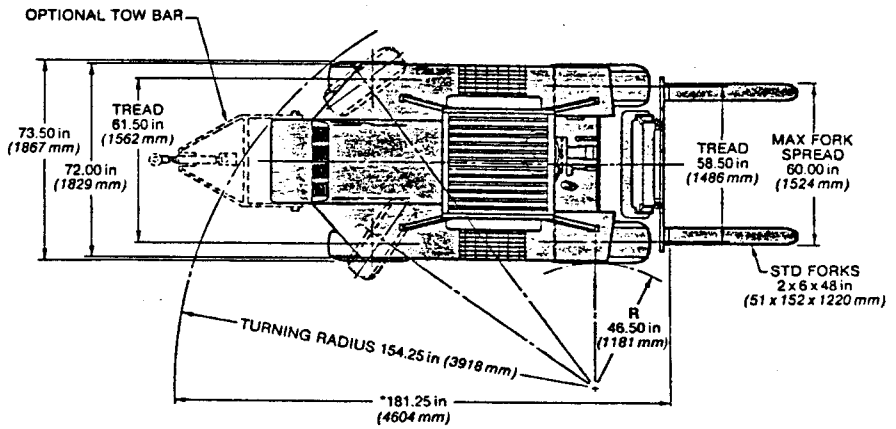
INSURANCE CLASSIFICATIONS: Classified by Underwriters' Laboratories, Inc. as to fire hazard only; type G industrial trucks. See UL Index of Classified Products.

PERFORMANCE CRITERIA . . .
Performance values based on full power engine operating conditions in accordance with SAE Standard J816 [85°F and 500 ft. altitude *(29°C and 152 m)*].

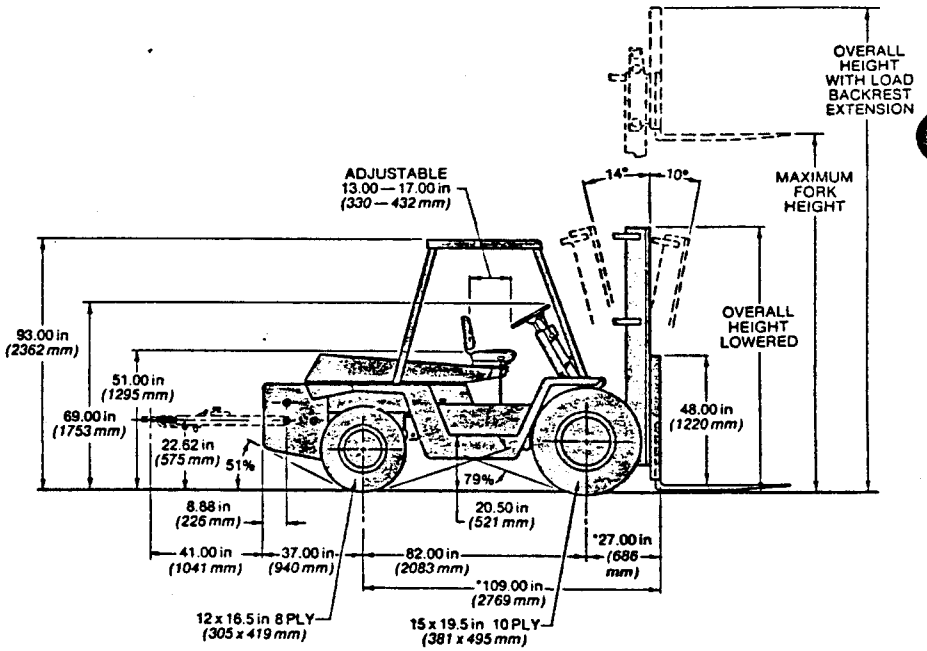
NOTE: Production engine driveline components may vary in output and/or efficiency by ± 5%. The performance shown represents nominal values which may be obtained under typical operating conditions of a standard machine. Slight variations may be expected due to local temperature and altitude and/or individual machine accessory and loaded weight conditions.

Metric specifications shown are equivalents of U.S. dimensions.

Clark products and specifications are subject to improvements and changes without notice.



FOR BASIC RIGHT ANGLE STACKING AISLE ADD LOAD LENGTH



*ADD 1.50 in *(38 mm)* FOR FULL FREE LIFT TRIPLE STAGE UPRIGHT

CLARK Industrial Truck Division

Internal Combustion Trucks
Battle Creek, Mi 49016

electric and internal combustion lift trucks / narrow aisle trucks / walk and walk-ride electric trucks / tow tractors / complete line of attachments

SERIAL NUMBER IT581-32-4915	BC	MODEL IT60	
CUSTOMER Los Alamos Scientific Labs, Los Alamos, NM		DEALER/ORDER 0308	S.R. NO. 263155
		JOB/ITEM 1219-11	SHIPPING DATE 28jan82
		DEALER Albuquerque	
		COUNTY Los Alamos	

20.376	187885	DRIVE AXLE SERIAL: 5045583	34.000	249M0798	UPRIGHT
20.287	124444	DIFFERENTIAL GEAR & CASE			PAGE 34-176,536,874
20.248	122574	RING & PINION SET	34.013a	1654614	ROLLER
23.016a	1317603	DRIVE TIRES 15x19.5x14"Ply	34.400	2358012	CYLINDER 34.400VP 358
00.000	2350186	ENGINE - MAKE FORD			PAGE 34-470
		SPEC. 300CID SERIAL: 17789		IN-18735	WIRING DIAGRAM
34.359a	1810170	FORK STOP PIN KIT	53.099	2377223-40	Side Shifter w/Flow
34.999a	2362721	LOAD BACK REST EXTENSION			Control Valve 33-038,
26.100	190996	STEERING AXLE SERIAL:626979			53-102, 53-206, 53-678
26.142a	840867	KNUCKLE PIN KIT	33.000	2346216	Flow Control Valve
23.006a	1315821	STEER TIRES 12x16.5x8"Ply	33.002	999603	Valve Sub-Assy.
32.000/001	1763793	TILT CYLINDER	33.009	999601	Seal Kit
06.200	995856	TRANSMISSION, FWD & REV MAKE	53.020	2329090	Cylinder Assy.
		MODEL SERIAL: 3157	54.222	1811244	Packing Kit
08.440	1772754	TRANSMISSION (SPEED CHANGE)		2343579	Aux Valve Inst.
34.300	2356049	CARRIAGE PAGE 34-924	30.200	2343270	Aux Valve 30-190,
34.340a	2356048	WELDED ASSEMBLY			75(30)234
34.316a	1654614	ROLLER		2321584	Hose Adapt 50-237,
34.350a	1772403	FORKS 60"			50-191, 50-543

a No Serviceable Parts mb — Fold — MRC 65 — Rev 9

P.I.C.	PARTS MANUAL #	MAINT. MANUAL #	P.M.A. MANUAL # 587.2	OP. MANUAL # 61.387
DATE 1 FEB 1982	DATE 1-100-19	DATE	DATE FEB 1 - 1982	DATE FEB 1 - 1982

DIVERSIONS	Los Alamos Scientific Labs,Los Alamos	PER NM 2z 22 Feb 82 342734
		PER
		PER
		PER
MODIFICATIONS AND CHANGES		PER
		PER
		PER
		PER

Dealer Use Only

MANUALS DELIVERED TO NAMES _____ TITLE _____

COMPANY _____

REMARKS

John Fokker

254574

02.225	1615458	AIR CLEANER
02.242a	886525	ELEMENT
12.200	2365377	ALTERNATOR
12.234a	999307	BRUSH W/HOLDER
12.316a	994381	VOLTAGE REGULATOR
12.372a	2345324	ALTERNATOR BELT
13.043a	949286	AMMETER
12.010a	1310125	BATTERY - DRY
14.026a	784751	BATTERY GROUND CABLE
14.025a	1314543	BATTERY STARTER CABLE
23.245	119089	BRAKE - L.H.
23.214	894305	WHEEL CYLINDER
23.216a	863668	CYLINDER REPAIR KIT
23.244	119088	BRAKE - R.H.
23.215	894305	WHEEL CYLINDER
23.217a	863668	CYLINDER REPAIR KIT
23.247a	120450	SHOE & LINING - AXLE SET
23.150	2348867	BRAKE MASTER CYLINDER
23.159a	857949	REPAIR KIT
02.100		CARBURETOR GAS: 997411 LPG:
02.102a	992780	GASKET KIT
02.101a	992781	REPAIR KIT
11.201a	881097	COIL
11.300	1810871	DISTRIBUTOR
11.319a	899850	CAP
11.388a	996396	POINTS/ROTOR/CONDENSER
23.020	2372560	DRIVE WHEEL
21.001	1772755	DRIVE AXLE PROP SHAFT
21.002a	861452	CENTER CROSS REPAIR KIT
01.307a	899839	ENGINE OIL FILTER
13.052a	2353857	ENGINE OIL PRESSURE GAUGE
13.013a	6000171	ENGINE OIL PRESSURE GAUGE SENDER
13.057a	2353859	ENGINE TEMPERATURE GAUGE
13.011a	2338565	ENGINE TEMPERATURE GAUGE SENDER
01.406a	997412	FAN BELT
01.381a	997413	FAN BLADE
13.028a	947257	FUEL GAUGE
13.070a	1723625	FUEL GAUGE SENDER
02.755	890384	FUEL PUMP
02.760a	890729	REPAIR KIT
02.752a	890385	ELEMENT
02.060a	2344433	FUEL TANK CAP
13.003a	1830006	HORN
25.002a	1810444	HORN BUTTON SET
13.001a	733623	HORN RELAY
13.023a	1743826	HOUR METER
13.015a	740342	HOUR METER PRESSURE SWITCH

29.100	2364603	HYDRAULIC PUMP - MAIN
29.147a	991166	CARTRIDGE KIT
29.146a	888543	SEAL KIT
29.144a	991685	VANE KIT
21.200	2339903	HYDRAULIC PUMP PROP SHAFT
21.205a	992624	CENTER CROSS REPAIR KIT
13.047a	1790936	KEY SWITCH
02.582a	1756435	MUFFLER
13.022a	2345322	NEUTRAL STARTING SWITCH
39.932a	2340572	OVERHEAD GUARD
23.268	888025	PARKING BRAKE SHOE & LINING
23.697	2350027	PARKING BRAKE LEVER
01.550a	2344749	RADIATOR
01.570a	525318	CAP
01.577a	2351286	RADIATOR UPPER HOSE
01.600a	2340777	RADIATOR LOWER HOSE
39.719	995186	SEAT ASSEMBLY
39.721a	995188	BACK REST
39.720a	995187	CUSHION
11.020	992710	STARTER
11.043a	1810864	BRUSH SET
11.033a	991161	DRIVE ASSEMBLY
11.027a	884581	SOLENOID SWITCH
11.001a	215276	STARTER RELAY
26.000	1754228	STEERING CYLINDER
26.003a	885119	ROD SEAL KIT
25.001	2358453	STEERING GEAR
25.004a	1752863	STEERING HANDWHEEL
25.025	1751522	STEER WHEEL
29.738	2344074	SUMP FILTER
29.740a	1810889	ELEMENT
29.728a	2308783	SUMP FILLER CAP
01.596a	890380	THERMOSTAT
32.072a	1811179	TILT CYLINDER PACKING KIT
31.500	233471	TILT LOCK VALVE
10.105a	990937	TRANSMISSION OIL FILTER
05.000a	2342062	TORQUE CONVERTER
29.300a	896467	TORQUE CONVERTER PUMP
30.000	1625336	VALVE - LIFT & TILT
30.032a	892871	SEAL KIT - INLET SECTION
30.116a	892871	SEAL KIT - OUTLET SECTION
01.430	899845	WATER PUMP
14.114a	2340785	WIRING HARNESS

aNO SERVICEABLE PARTS

PU. HASE REQUEST/ORDER

REQUESTER: Retain Pink, Send Original, and Three (3) Copies (with interleaf carbon paper) To SP-D

RQT **017067**

For Group **H-8** Account Code _____ Program Code _____

equested by **John Warren** Phone **5862** Date **1/14/74**

SHADED AREAS for Supply & Property use ONLY

INCLUDE WRITTEN EXPLANATION IF DELIVERY TIME IS CRITICAL AND/OR SOLE SOURCE IS REQUESTED.

PLEASE ANSWER THE FOLLOWING QUESTIONS:

HAVE YOU CHECKED LASL STOCK FOR THIS ITEM OR SUITABLE SUBSTITUTE? YES ____ NO ____

SHOULD SP CONSIDER STOCKING THE ITEM(S)? YES ____ NO ____

ESTIMATED ANNUAL USAGE? ____

WILL INSTALLATION COSTS BE INCURRED? YES ____ NO ____

ENG DEPT. EST. $ ____

E-DIV EST. $ ____

Realistic Date Required **3/10/74**

Deliver to

Area **TA-54** Bldg. **Area G** Room ____ Person **John Warren**

KNOWN AVAILABLE EXCESS LISTS HAVE BEEN REVIEWED.	FOR SP DEPT. USE ONLY
Purchase Approved By _____ Group Leader or Authorized Alternate (Date)	(Buyer) _____ (Date) _____ Phone Ext.

INVOICE TERMS From Receipt of Goods or Invoice — whichever is later.	REQUIRED SHIPPING DATE	DATE OF ORDER	PURCHASE ORDER NO.
TO			BLANKET PURCHASE AGREEMENT
QUOTED BY	PHONE	DATE	QUOTE NO.
F.O.B.	SHIP VIA		SHIP FROM

ITEM	DESCRIPTION OF REQUIREMENTS (SPECS)	QUANTITY	UNIT	UNIT PRICE	EXTENSION
1.	Forklift, gasoline driven, rough-terrain model, 5000 lb. capacity at 24" lead center, new current model, constant mesh transmission, 3 speed forward & reverse, oil clutch, must climb a 25% grade wet, with rated load, 12 volt electrical system, pressure cooling system, full time - full flow hydraulic filter, power steering, hour meter, auxiliary throttle to be operated from brake pedal, telescoping upright, 113" overall lowered height, 168" maximum fork, height (to top of forks), minimum tilt either direction 10%, load carriage not to exceed (CONTINUED ON PAGE 2)	1	ea.		
	SUGGESTED SOURCES:				
	Escon 4019 Broadway, S.E. Albuquerque, N.M. 87102				
	Empire Clarklift, Inc. 3411 Gerard N.E., Albuquerque, N.M. 87107				
	TOTAL EST. COST				

ITEMS	TOTAL COST	ACCOUNT	PROGRAM	LOC.	SOR.	EXP.	PAREN.	JOB ORDER	ORDER	PROC.	WORK	B BIDS REQ. M/S
BIDS RECD. M/S	M/S	BIDS REJ.	SURPLUS	SOURCE	ACCEPT	SELLERS NO.	EXPEDITE	DUE DATE	SHIP DATE			
GROUP	SITE	BUILDING	ROOM	FOR	AO 1 USE ONLY							

FORM 838 REV. 7/73

width of truck, side shift with 8" travel and to allow load arm to extend to outer edge of truck, to be furnished with load back-rest and overhead guard, 48" full taper load arms, flowtation tires, drive wheels 12.00 x 16.5, 10 ply, Off road tread, 11.00 x 15 6 ply steering tires. Drive wheels must have enough clearance for tire chains, turning radius must not exceed 10 ft. from center of drive axle to rear of truck, to be furnished with 5 lb. dry chemical fire extinguisher and protecto seal fuel cap.

ESTIMATED COST: $11,000.00

APPENDIX N

GROUNDWATER MONITORING WAIVER REQUEST

GROUND WATER MONITORING EXEMPTION REQUEST

Pursuant to: 40 CFR 264.90 (b) (4) and

40 CFR 265.90 (c)

November 1, 1984

I. PURPOSE

The purpose of this document is to provide information necessary to obtain a variance from 40 CFR 264, Subpart F in accordance with 40 CFR 264.90 (b)(4). Subpart F requires groundwater monitoring unless it can be demonstrated there is no potential for migration of liquids from the regulated unit to the uppermost aquifer. Data presented here demonstrates that the annual evapotranspiration equals or exceeds the annual precipitation resulting in a negative percolation rate. Current disposal practices prohibit the disposal of free liquids. Past disposal of volumes of free liquids are insufficient to contaminate ground water. Depth to the first aquifer is 950 ft. (Area L) to 850 ft. (Area G). There is no potential for waste leachate to migrate to the top of the first aquifer.

II. LOCATION

A. General

The waste disposal area within the bounderies of Los Alamos National Laboratory is located in north central New Mexico about 60 miles north of Albuquerque (Los Alamos Scientific Laboratory, 1979). The Laboratory is located on the Pajarito Plateau, a series of ashflow and ashfall tuffs that form an apron around the eastern flanks of the Sierra de Los Valles. The eastern edge of the Plateau terminates above the Rio Grande.

The Plateau has been dissected by southeast trending canyons into a number of finger-like mesas. The waste disposal area, TA-54, is located on Mesita del Buey, beginning at the junction of Rex Drive and Pajarito Road and extending approximately 2 mi. It is located at S 1/2, Section 31, T. 19 N., R7E., N.M.P.M. A general location map of Los Alamos is shown on figure 1. The layout of Los Alamos National Laboratory facilities relative to adjacent communities is shown on figure 2.

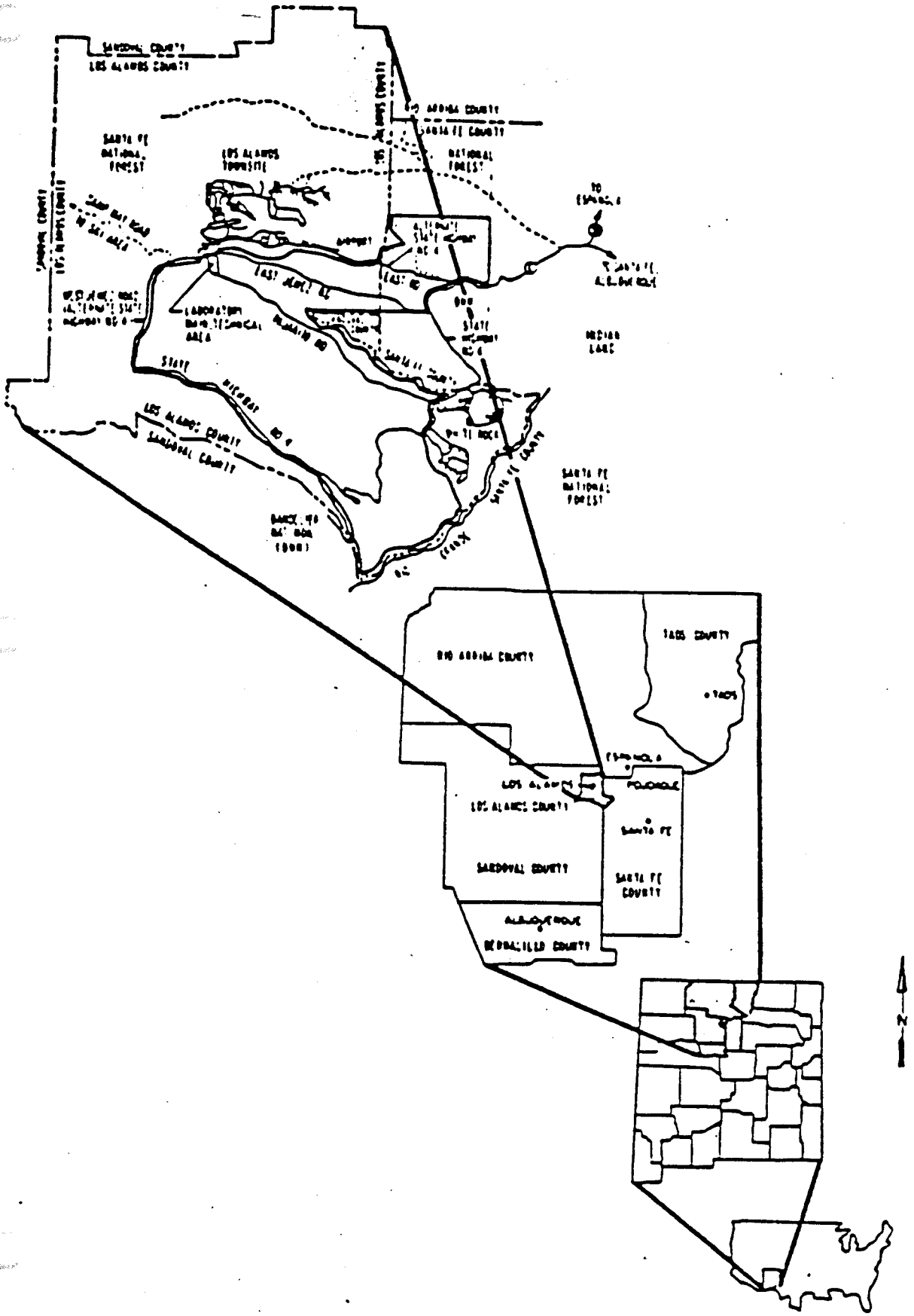


Figure 1. Regional Location Of Los Alamos, New Mexico

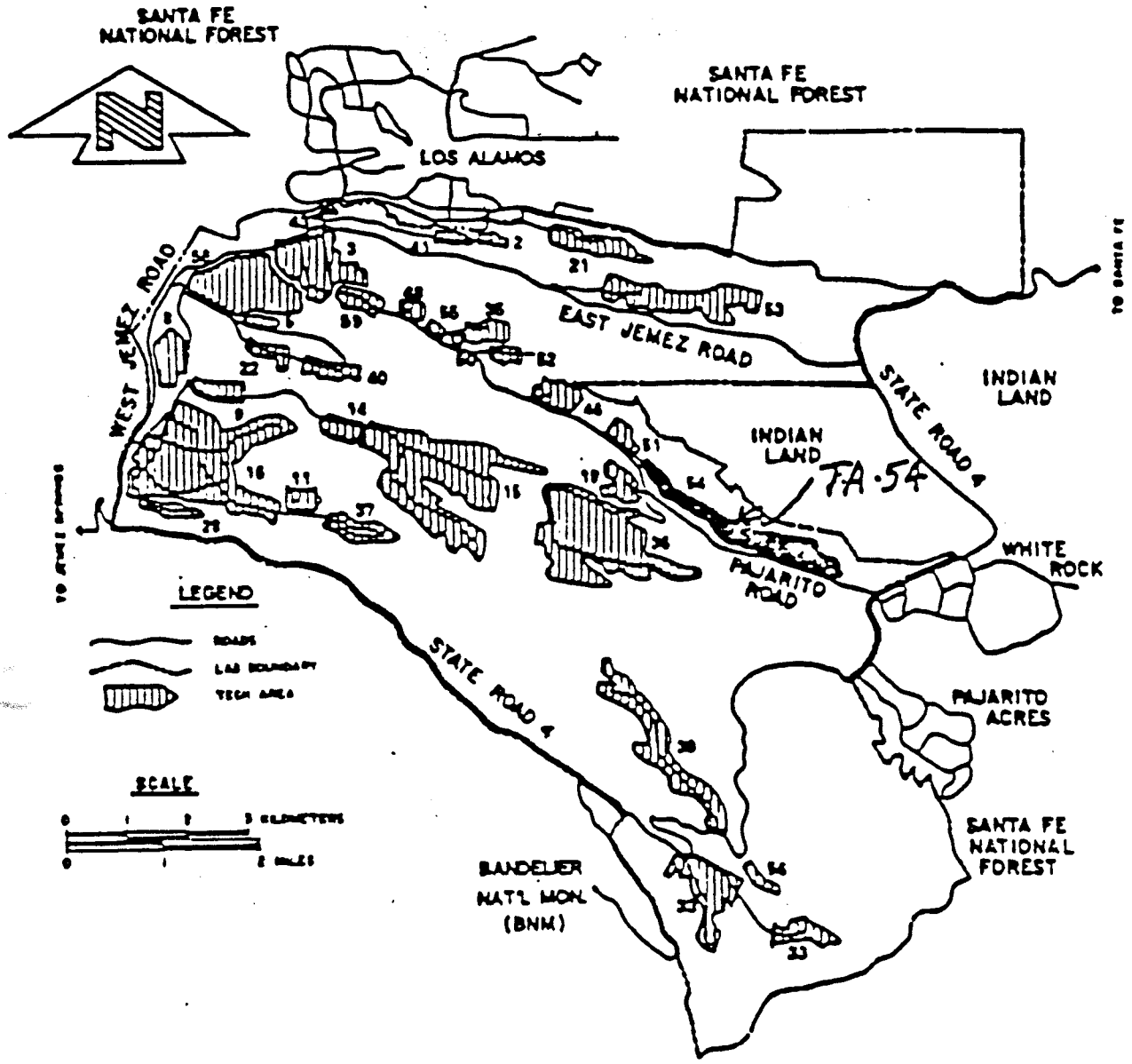


Figure 2.-Los Alamos National Laboratory Technical Areas
And Adjacent Communities

B. Proximity to Residential Areas

The nearest residential community is White Rock, New Mexico, located approximately 1.15 mi. to the SE of TA-54. A second residential community is Los Alamos, New Mexico, located approximately 4.4 mi. to the NW of TA-54. The total population of Los Alamos County, New Mexico is 19,000 to 20,000.

C. Proximity to Surface Waters

The nearest perennial navigable stream, as defined by the Clean Water Act, is the Rio Grande, located 4.5 mi. to the SE of TA-54. Surface water drainage areas are shown on figure 3. The disposal area is bordered on the north by Canada del Buey and on the south by Pajarito Canyon. Both canyons have intermittent streams. Canada del Buey has a small drainage area and flows only during high intensity, localized summer thunderstorms. The channel alluvium in Canada del Buey is 3 to 4 feet thick. Pajarito Canyon has a larger drainage area and thicker alluvium, 20 to 30 feet thick (Purtymun, 1971). Approximately one-half mile southeast of the disposal area, the Pajarito Canyon alluvium fans out to the top of a basalt deposit. Stream flow in both canyons is insufficient to recharge an alluvial aquifer which would be capable of yielding sufficient amounts of groundwater to supply wells and springs.

D. Flooding Potential in the Vicinity of the Landfill

The disposal Areas L and G are located on a mesa top. The disposal areas are not subject to flooding as drainage is into deep canyons adjacent to the mesas. The mesa at Area L is at an elevation of 6800 ft., and the adjacent canyon floor is at an elevation of 6650 ft. At Area G, the elevation is 6700 ft., while the canyon floor is at 6600 ft.

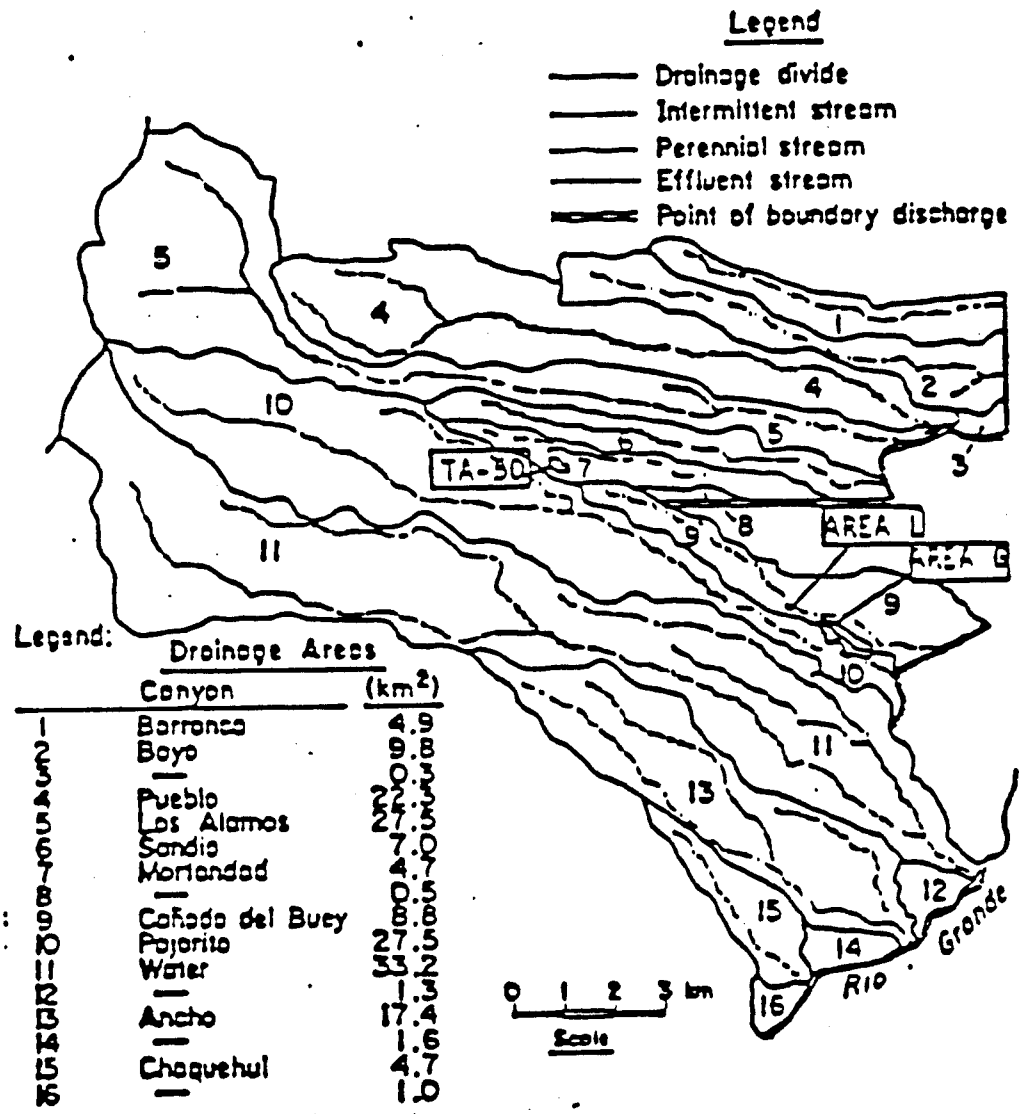


Figure 3.-Surface Water Drainage Areas

III. DESCRIPTION

A. Size of Facility

1. Site. Currently the main hazardous waste disposal facility Area L, is located in TA-54 and has an area of 0.88 acres (figure 4). Area G, a low level radioactive waste disposal area, is also located in TA-54, comprising an area of 63 acres (figure 5). Area G receives a relatively small amount of nonradioactive hazardous waste, such as asbestos insulation and PCBs (regulated under the Toxic Substances Control Act). This area has received an exemption from ground water monitoring and leachate collection systems under TSCA by virtue of a letter (June 5, 1980) from Adlene Harrison to Kenneth R. Braziel. (Appendix I). An additional 36 acres of Mesita del Buey is dedicated to future expansion of Areas L & G.

2. Area L. From 1964 through May 1975, all chemical wastes were disposed of in one pit at the site. Beginning in June 1975, with the transfer of responsibility for disposal operations to the Waste Management Group, this pit was covered and shafts were used for waste chemical disposal.

Chemical disposal shafts measure 2 ft to 8 ft in diameter by up to 65 ft deep. Different shafts are used for different categories of waste chemical (e.g., organics, inorganics, oils, etc.), to assure that incompatible chemicals will not mix and react. In addition, two small pits, approximately 10 ft. wide, 20 ft. long and 10 ft. deep, are used intermittantly for disposal of small bulk quantities of treated non-hazardous aqueous waste. The water quickly evaporates from these wastes leaving a "salt cake" in the pit bottom. Pit disposal volumes and frequencies are not adequate to form a permanent pool. When the salt cake is within 3 ft of the top, the pit is backfilled and covered.

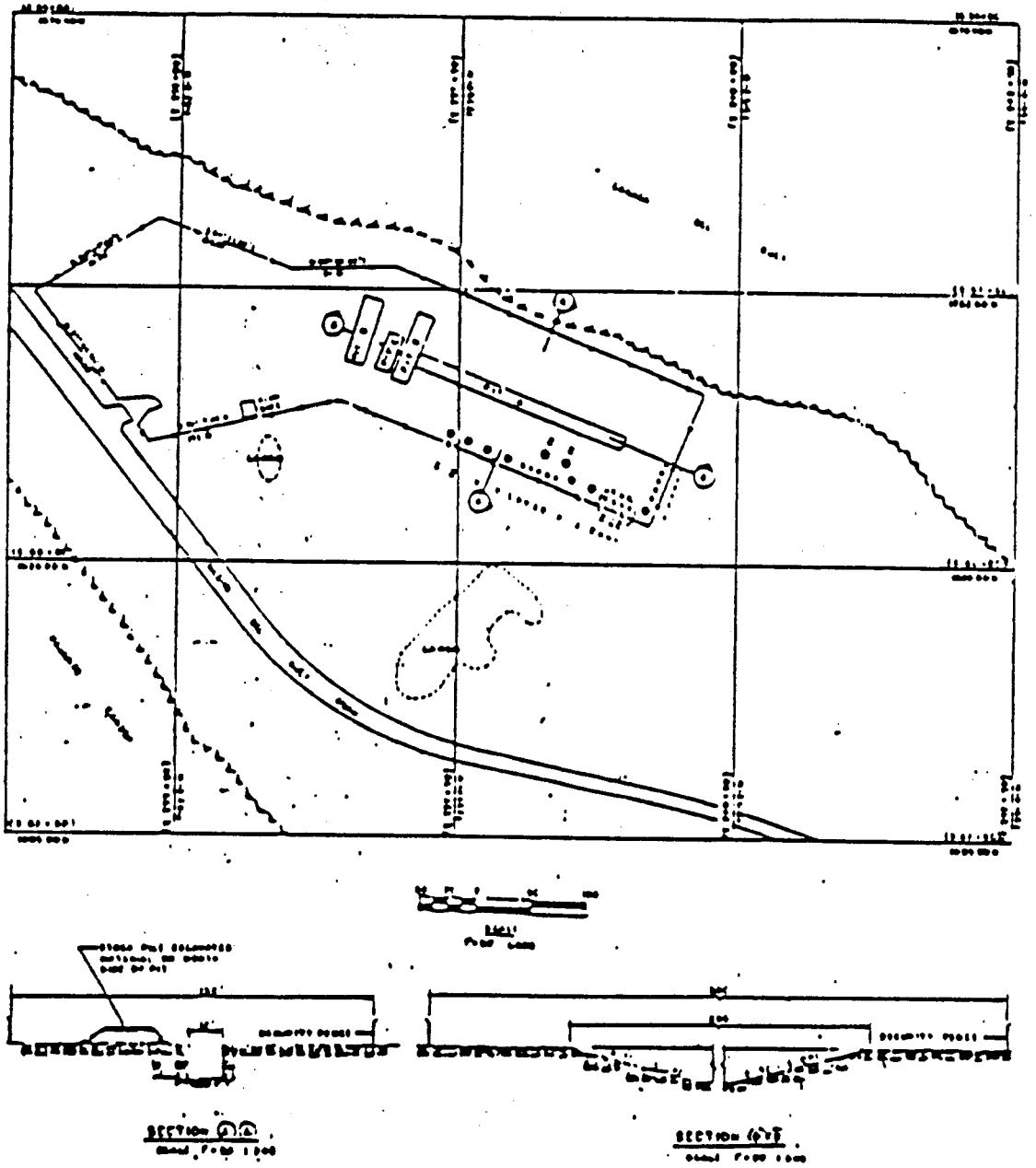


Figure 4.-Disposal Area For Chemical Wastes, Area L, TA-54
(Pit A and C Closed)

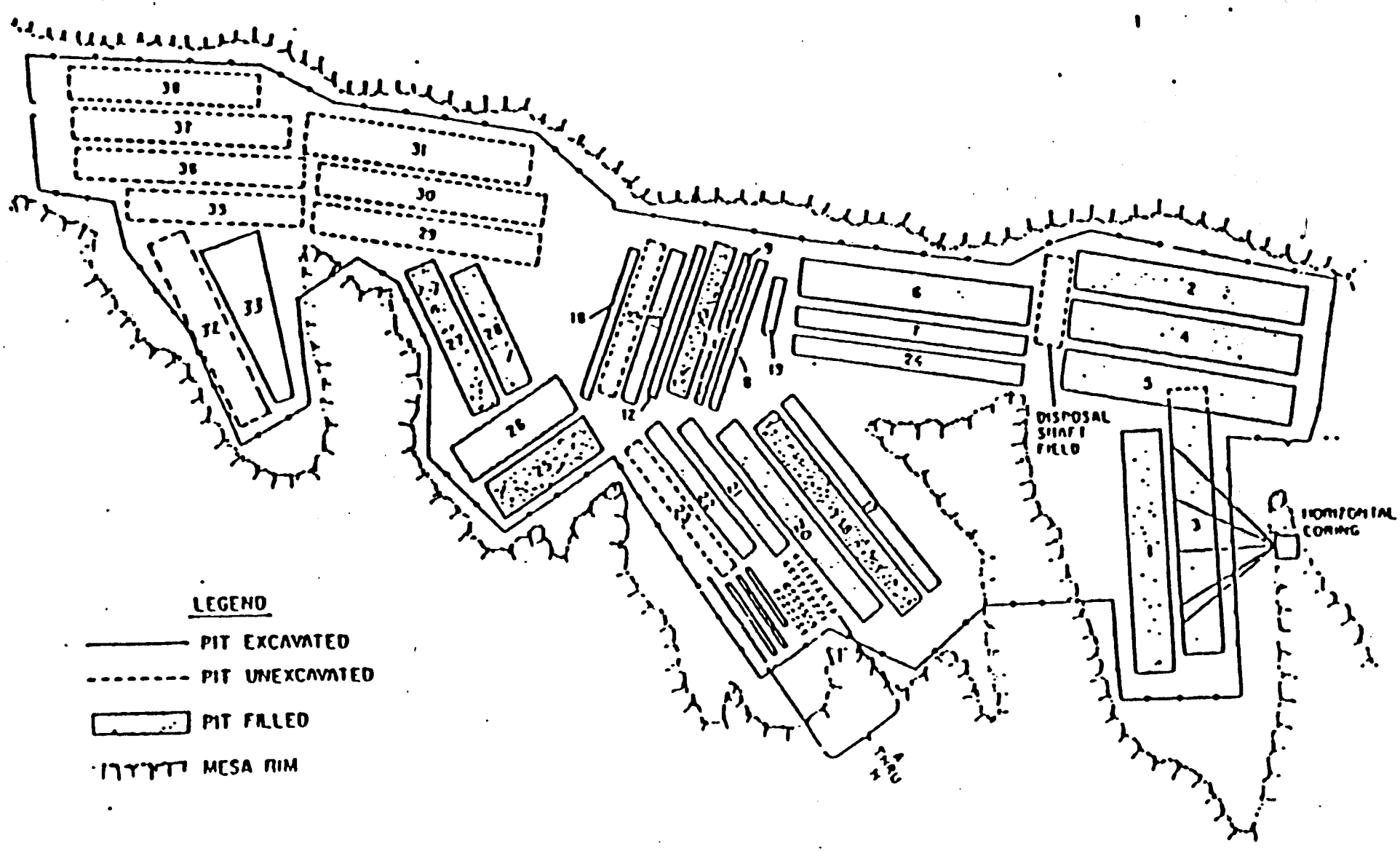


Figure 5.-Disposal Area for Radioactive Wastes (Solids) Area G, TA-54

Current disposal practices are phasing out the use of pit disposal. Liquid hazardous wastes are packed in vermiculite and containerized prior to shaft disposal in accordance with 40 CFR 264.314 and 40 CFR 264.316 to prevent the fromation of free liquids. Past practice, however, allowed the disposal of quantities of free liquid in several shafts. The impact of these liquids is discussed later in this document. Shafts are filled to within three feet from the top then covered with a cement cap to prevent direct infiltration.

3. Area G. Area G is the current low level radioactive solid waste burial/storage site at the Laboratory. The area has been in use since 1957, and is expected to remain active through the foreseeable future. In FY 1977, the active portion of the site was expanded to a total area of 63 acres; future expansions of this area are planned. Burial/storage facilities within the area include pits, shafts, trenches, and pads, all of varying dimensions. Figure 5 shows the present layout of Area G, including past and future planned use of disposal and support facilities within the fenced portion of the site.

Certain "nonradioactive" hazardous solid chemical wastes have been buried in pits and shafts along with radioactive wastes at Area G. Such wastes include asbestos, beryllium residues, empty pesticides containers, PCB-contaminated solids (transformers, capacitors, solids (before 1978)), and solid trash-type wastes contaminated with known or suspected carcinogens. Between 1976 and 1979 much of this waste was buried in a separate pit (Pit 19) at the site, although there were exceptions due to very large volumes (e.g., drained PCB-contaminated transformers). In 1980, approval was granted by the EPA for disposal of PCB-solid waste in special facilities at Area G.

Shafts and pits are filled to within 3 feet of the rim of the shaft or pit, then covered. Pits are covered with tuff, then topsoil followed

by revegetation. The upper 3 ft. of the shafts are capped with cement to prevent infiltration.

B. Hazardous Waste Migration

1. Potential Migration Due to Precipitation.

Calculations were performed to determine the degree of infiltration from precipitation using a worst case scenario in a water balance, Appendix II. Precipitation data from TA-59, which is 133% greater than TA-54, was used and then only the largest recorded in the 33 years of available records. Potential evapotranspiration was calculated using the Blaney-Criddle Method.

When runoff alone was considered in the calculation, infiltration amounts of less than 1 inch were shown to occur during 4 months, less than 2 inches during 1 month, and about 3.3 inches during 1 month. When runoff, interception, and depression storage were considered as part of the calculation, which is a more accurate hydrologic description of the water balance, an infiltration was seen to occur of about 1.3 inches during only 1 month, and a trace (0.04 inch) amount during two other months. Assumptions were conservative in nature.

2. Potential Migration Due to Past Disposal Practices

Currently, non hazardous aqueous wastes are evaporated in a 10 ft wide, 20 ft long, 10 ft deep pit. This method of disposal is periodic and being phased out as a disposal method. Dumping rates are not adequate to maintain a standing pool. In FY 84 an estimated 1500 gallons will be disposed of in this manner. Assuming the wastes to be entirely aqueous, spread over the pit floor, and no direct evaporation, the pit disposal locally adds 12 inches equivalent precipitation to the pit floor. This produces a positive infiltration rate only when the more

conservative evapotranspiration rates are assumed. Further the above analysis is conservative in that it assumes no pan evaporation, the wastes is entirely water, and there is no lateral movement of water which significantly increases the evapotranspiration area. This conservative analysis indicates that the pit disposal is not a significant moisture head source.

Prior to 1982, shaft disposal of liquid chemicals was conducted without the addition of absorbents. It is possible that leakage could create liquid head causing migration of waste. There are ten shafts containing drummed organic liquids and waste oil. Accounting for the arrangement of drums in the shafts and assuming all drums are filled with only liquid, the maximum total possible organic liquid volume is 3750 ft^3 There are four shafts containing inorganic chemicals with a maximum possible inorganic liquid volume of 1125 ft^3 (calculations shown in Appendix III).

Assuming complete, instantanious failure of the containers of organics and waste oil, the maximum depth of penetration can be estimated from the formula (Baradat, 1979).

$$D = \frac{V}{A \times R \times K}$$

where

D = Maximum depth of penetration, ft.
V = Volume of infiltrated oil, ft^3
A = Area of infiltration at surface, ft^2
R = Retention capacity of soil in cubic feet per cubic foot (ft^3/ft^3)
K = Approximate correction factor for various oil viscosities

The retention capacity of soils vary from 0.005 ft^3/ft^3 for stone and coarse gravel to 0.04 ft^3/ft^3 for fine sand and silt.[8] While the formation is discribed as fine silt, a value of 0.025 ft^3/ft^3 for medium to fine sand is assumed to be conservative. The viscosity correction factors vary from 0.5 for light hydrocarbons to 2.0 for viscous oils.[8] Even though the bulk of organics stored are lubricating oils, a value of 0.5 is assumed. The area of infiltration, 3594 ft^2, is the surface area associated with the L shaped configuration of the disposal shafts. The calculation takes no credit for lateral migration thus predicting a worst case. For the stored volume of oil, 3750 ft^3, the maximum hydrocarbon penetration, assuming complete and instantaneous container failure, is 83 ft below the shaft floor. Actual penetration will of course be less due to lateral plume migration. Container failure will not be instantaneous and offset by biodegradation. Ultimately the organics will be decomposed by either aerobic or anaerobic biofilm degradation, the rate of degradation limited by nutrient supply (American Petroleum Institute, 1972; McCarty, 1981). These organic wastes are therefore no potential threat to the main aquifer.

Failure of the aqueous containers, likewise, is no potential threat. For the moderately welded Bandalier Tuff, moisture contents below 4 per cent by volume result in no migration; from 4 to 8 per cent moisture is redistributed by diffusion; from 8 to 23 per cent distribution is by capillary action, and above 23 per cent the movement is by capillary and gravity drainage (Purtymun, 1979).

Moisture contents of the site tuff below 10 feet vary from 0.2 to 2 per cent by weight (Purtymun, 1971) (0.3 to 3.2 percent by volume). Complete and instantaneous failure of the aqueous storage containers releasing 1125 ft^3 of liquid over the 3594 ft^2 storage area would increase the moisture content of the tuff to 8 per cent to a maximum depth of 6.5 ft. Further moisture migration would be by diffusion. Diffusion of the moisture in of the waste would trap the metal and salt content of the waste in the tuff.

Gases evolving from wastes placed in shafts are diffused through the tuff in open joints or along contacts between ashflows. The soil on the mesa top and weathering characteristics of the tuff outcrops along the canyon wall restrict the movement of air into and out of the tuff; however, the tuff responds to atmospheric pressure changes around shafts that penetrate the soil zone. The movement of gases or volatiles in the vapor phase would be localized around the shaft disposal area, as has occurred with tritium in the vapor phase at Area G (Purtymun, 1973).

C. Security Measures

Both Areas L and G are completely fenced with a 8 ft high chain-link security fence, topped by standard three-strand barbed wire 45° standoffs to discourage unauthorized entry.

D. Proximity to Drinking Water Sources

Stream flow in Canada del Buey, north of Area L and G and in Pajarito Canyon south of Area L and G, is intermittent. The intermittent streams in the canyon recharge water in the alluvium, which is perched on the underlying tuff. The alluvium in Canada del Buey is thin and contains no perennial water due to the small drainage area and small amount of runoff (Purtymun, 1971).

The intermittent stream in Pajarito Canyon recharges a body of water in the alluvium. As is typical of stream-connected aquifers, the water table is highest during the spring from snowmelt and in late summer from showers. In the fall and early summer the water table declines. The decline in the water table is due to high evapotranspiration, especially in areas of old gravel pits, which are near the top of the stream-connected aquifer in Pajarito Canyon (Purtymun,1971). Water in the alluvium in Canada del Buey and in Pajarito Canyon is not in sufficient quantity to be a source of water supply.

There are no perched aquifers in the vicinity of Areas L and G between the mesa top and the upper surface of the main aquifer. This is based on data collected during construction of two supply wells drilled into the main aquifer (located 1 mile to the west, and the other two miles to the northwest) (Purtymun, 1984; Cooper, 1965). Three test holes (two in Pajarito Canyon and one in Area G) were completed dry into the basalts (Table I) (Griggs, 1964; Purtymun, 1978). Lithologic logs of supply wells PM-2, PM-3 and PM-4 are furnished in Appendix V.

The only aquifer at Los Alamos capable of Water Supply is the main aquifer. The main aquifer lies at a depth of about 950 feet at Area L and 850 feet at Area G. Overlying the main aquifer at Area L are about 340 feet of dry rhyolite tuff and 610 feet of volcanic flow rocks and sediments (Fig. 6).

The major recharge area for the main aquifer is the intermountain basin formed by the Valles Caldera and deep canyon cut into the flanks of the mountains west of Pajarito Plateau (Area L and G are located on the eastern third of the Plateau). The depth to the aquifer ranges from about 1200 feet along the western edge of the plateau, decreasing to 600 feet along the eastern edge. Movement of water in the aquifer is to the southeast toward the Rio Grande where there is discharge into the river through seeps and springs (Fig. 7) (Cushman, 1965; Purtymun, 1980A, 1980B). Movement in the upper 1740 feet of the aquifer in the area is about 95 feet/year (Purtymun, 1984).

E. Geological Discription

The disposal area is located on Mesita del Buey, a narrow southeastern trending mesa about two miles long and a quarter of a mile wide. The mesa surface slopes gently from an elevation of 6900 feet near its western margin to about 6,600 feet near its eastern end. The mesa is bounded on the north by Canada del Buey and on the south by Pajarito Canyon. Both canyons have cut 50 to 100 feet below the mesa surface.

TABLE I - DISPOSAL SITE STRATIGRAPHY

		Approximate Thickness Feet	Description
BANDLIER TUFF			
Tshirege Member	Unit 2b	60	Rhyolite tuff, light gray to brown, moderately welded, forms upper surface of Mesita del Buey.
	Unit 2a	30-85	Rhyolite tuff, light gray pumiceous, moderately welded, outcrops on walls of Mesita del Buey, thin from west to east.
	Unit 1b	25	Rhyolite tuff, grayish brown, moderately welded, outcrop on wall of Mesita del Buey.
	Unit 1a	10-30	Rhyolite tuff, light orange to light brown pumiceous tuff, nonwelded to moderately welded, outcrops in lower slopes of Mesita del Buey, thin west to east.
Otowi Member		120	Rhyolite Tuff, light gray, nonwelded, pumiceous, does not outcrop at Mesita del Buey but is found in subsurface.
Guaje Member		10-30	Rhyolite pumice, light gray, nonwelded, an ashfall pumice.
ANTA FE GROUP			
Chino Mesa Basalt		250-300	Composed of basalt flow rocks and interbedded sediments.
Puye Conglomerate		700-750	Upper 600-650 feet is volcanic debris, lower 70 feet is poorly consolidated channel-fill.
Tesuque Formation		+1200	Silty sandstones, sandstones with lenses of clay & pebbly conglomerate, many contain interbedded basalts.

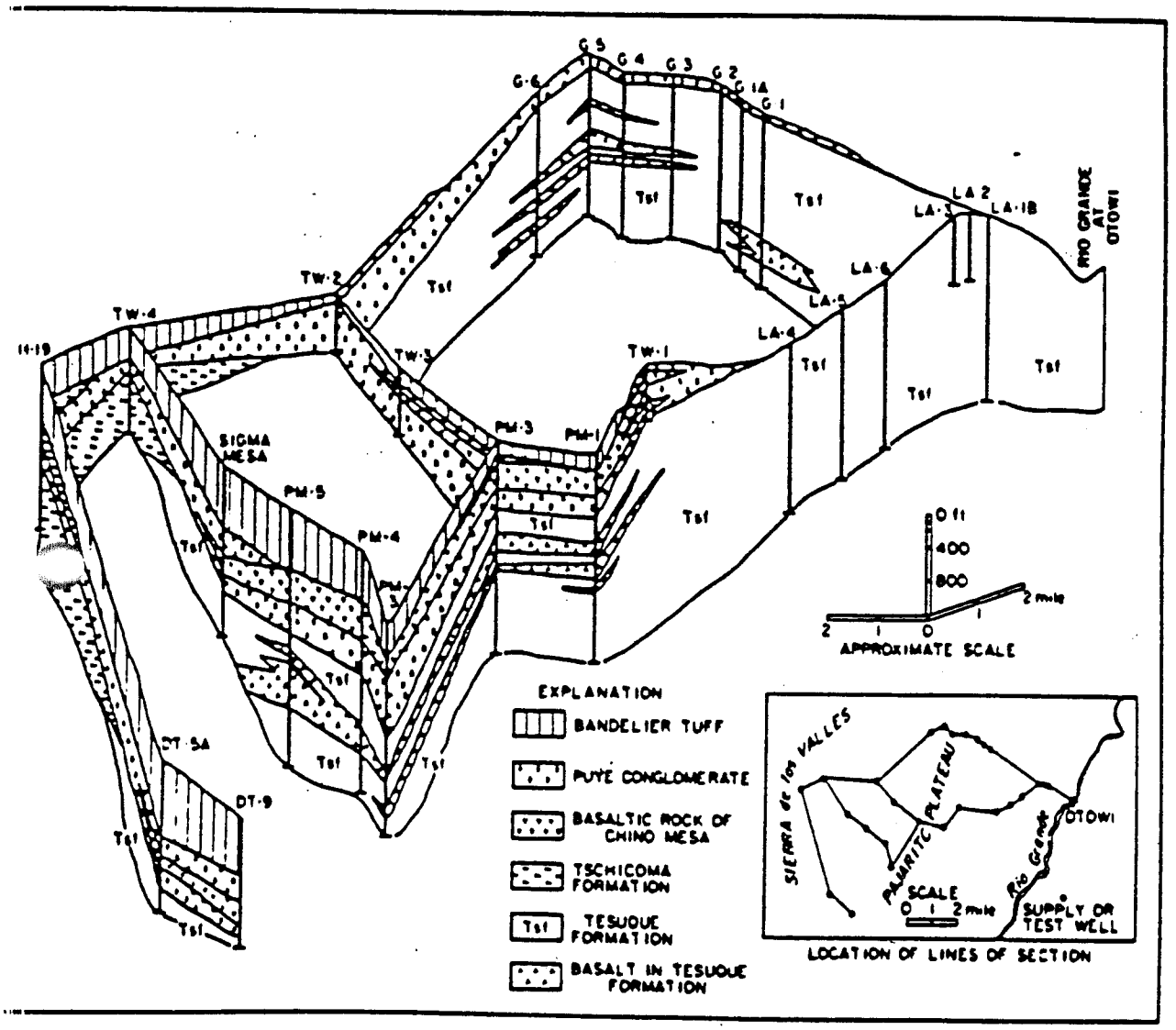


Fig. 6A. Detailed geologic section based on test holes and supply wells completed into the main aquifer.

Mesita del Buey is part of the Pajarito Plateau which forms a topographic high area along the western part of the Rio Grande depression in North Central New Mexico. The Pajarito Plateau is formed by a series of Pleistocene/Ashfalls and ashflows of Bandelier Tuff. In the subsurface are the sediments and basalts of the Santa Fe Group of Middle Miocene to Pleistocene Age (Griggs 1964). The formation in the Santa Fe Group from oldest to youngest are the Tesuque and Puye with interbedded Chino Mesa basalts. The stratigraphy of the Mesita del Buey is summarized on Table I and shown on Fig. 6. A detailed geologic section based on data from supply and test wells is shown in Fig. 6A. Detailed geologic mapping of the units on Mesita del Buey failed to find any evidence of faulting (Purtymun, 1971). Inspection of pits and shacks have also failed to find any evidence of faulting on the mesa.

1. Disposal Area Formation Thickness. The top of the main aquifer is 950 ft at Area L and 850 ft. at Area G. At area L there are 340 ft. of tuff underlain by 610 ft. of volcanic rock and sediments above the main aquifer. At Area G, there is 220 ft. of tuff underlain by 630 ft. of volcanic rocks and sediments above the main aquifer

2. Permeability. Laboratory measurements of saturated permeabilities range from 0.8 gpd/ft^2 for a welded tuff to 22 gpd/ft^2 for a nonwelded tuff. Permeabilities are not applicable as the tuff is not saturated. The porosity ranges from 15% by volume for a welded tuff to 60% by volume for a nonwelded tuff. Generally the effective porosity is 15 to 25% less than the porosity indicated. The pores in the tuff are generally of capillary size so that any movement of fluid that occurs is mainly capillary movement. These capillary-size pores also tend to restrict movement of fluids as well as retain fluids.

3. Main Aquifer and Surface Water Monitoring. The quality of water (chemical and radiochemical) of the main aquifer is monitored at the two nearby supply wells and springs in White Rock Canyon of the Rio Grande. Also monitored is the quality of surface flow, if it occurs, in canyons

adjacent to Area L. Monitoring of these sources has shown no chemical contamination from disposal of chemical wastes (Environmental Surveillance Group, 1984). Surface water sampling stations in the vicinity of the disposal area are shown in figure 8. The non radioactive chemical analyses performed on surface and main aquifer waters are shown on Table II. Results of water sampling are published annually in the Laboratory's environmental surveillance report. Copies are routinely supplied to the New Mexico Environmental Improvement Division (NMEID). An example of a special study of vadose zone monitoring was made in 1976. Radiochemical analyses of cores taken from beneath a solid waste pit at Area G indicated no migration or movement of radionuclides from wastes in the pit (Purtymun, 1980).

4. Additional Monitoring. Current operating practice includes air, soil, and biota sampling programs directly related to disposal site activity. The objective of the monitoring program is to reveal loss of confinement of hazardous material from waste disposal sites, and to characterize emissions of hazardous materials from waste treatment processess. Key contaminants relative to environmental surveillance of Laboratory waste management activities are listed in Table III. Existing air, soil (including sediment) and biota sampling sites related to the disposal site are shown on figures 9 thru 14. Results are published in the Laboratory's annual environmental surveillance report. Additional investigations and constructions to establish a system to monitor shallow ground water in the alluvium adjacent to Area L and vadose zone monitoring at Area L are found in Appendix IV.

F. EPA Based Assumptions

The Federal Register (47 FR 32293) of July 26, 1982, lists eight criteria/assumptions that are to be used by owners of disposal facilities in making travel time predictions of contaminants. These assumptions are intended to maximize the estimated rate of leachate migration. Two of the assumptions (i.e., assuming unit is full of liquid and assuming the

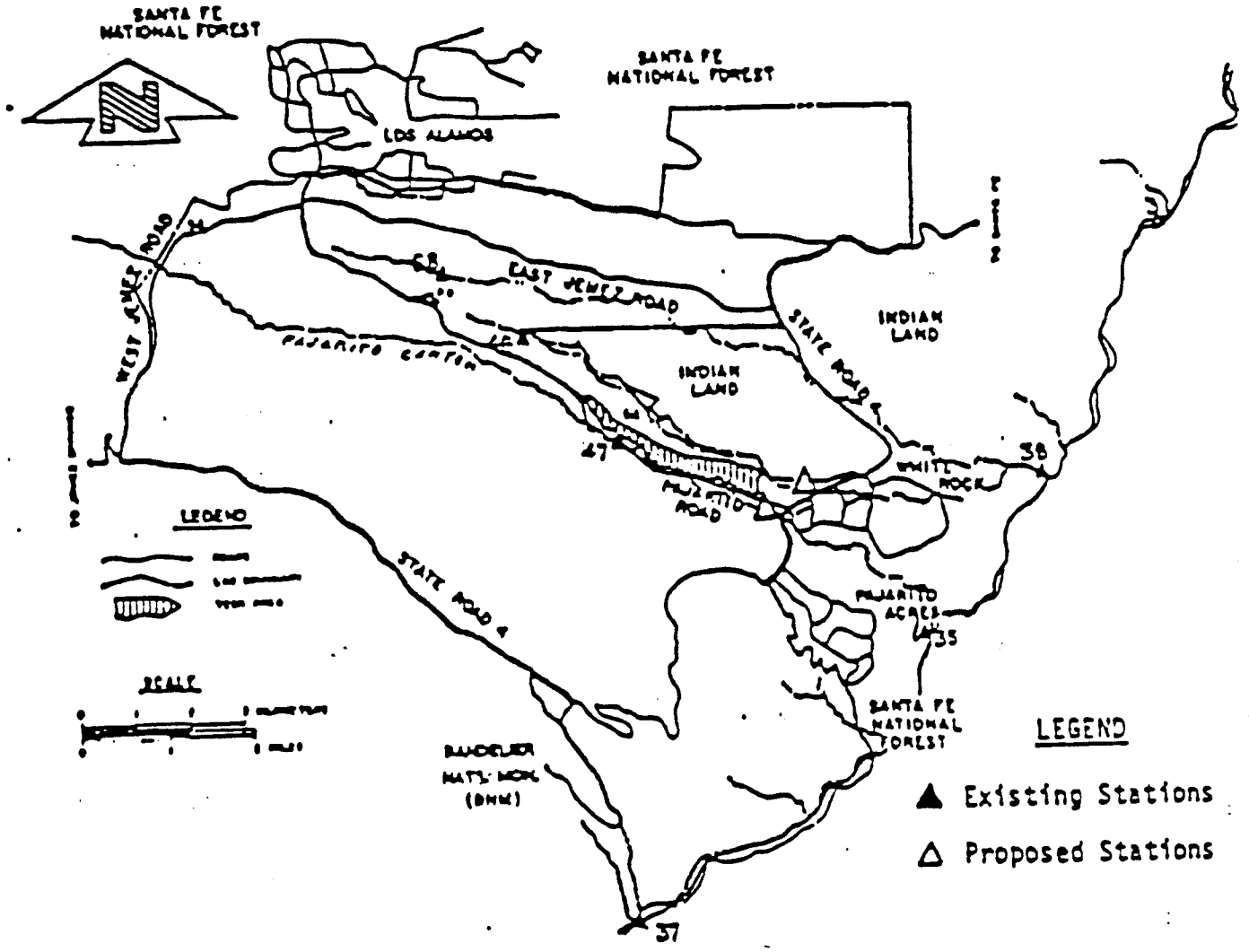


Fig. 8 Surface Water Sampling Stations in the Vicinity of TA-50 and TA-54

		Zinc Zn	Sulfate SO_4	Sodium Na	Silver Ag	Silica SiO_2	Selenium Se	Potassium K	Phosphate PO_4	Nitrogen N	Nitrate NO_3	Mercury Hg	Manganese Mn	Magnesium Mg	Lithium Li	Lead Pb	Iron Fe	Fluorine F	Cyanide CN	Copper Cu	Chromium Cr	Chlorine Cl	Carbonate CO_3	Carbondioxide CO_2	Calcium Carbonate $CaCO_3$	Calcium Ca	Cadmium Cd	Boron B	Bicarbonate HCO_3	Barium Ba	Arsenic As	Ammonium NH_3	Suspended Solids SS	Total Dissolved Solids TDS	Conductivity/Conductance	Chemical Oxygen Demand COD	Acidity/Alkalinity pH	Hardness
Regional	: Surface Water										x							x				x												x			x	
Perimeter	: Surface Water		x	x	x			x			x			x				x				x			x				x					x	x		x	x
	Main Aquifer		x	x	x			x			x			x				x				x			x				x					x	x		x	x
White Rock Canyon (Perimeter)	: Surface Water		x	x		x		x	x		x			x				x				x		x		x			x					x	x		x	x
	Main Aquifer		x	x		x		x	x		x			x				x				x		x		x			x					x	x		x	x
Onsite	: Surface Water		x	x	x			x			x			x				x				x			x				x					x		x	x	x
	Main Aquifer		x	x	x			x			x			x				x				x			x				x					x		x	x	x
Effluent Release Areas (onsite & perimeter)	: Surface Water	x	x	x		x		x	x	x	x	x		x	x	x		x		x	x	x	x			x	x	x	x			x	x	x	x	x	x	x
	Perched Water	x	x	x		x		x	x	x	x	x		x	x	x		x		x	x	x	x			x	x	x	x			x	x	x	x	x	x	x
Waste Treatment Plants (onsite)	:	x		x					x		x	x		x		x		x	x	x	x	x			x		x							x		x	x	
Municipal Supply Onsite & Perimeter (Main Aqf)	: Main Aquifer and Distribution System	b	b		a	a	a				a	a	b			a	b	a		b	a	b					a			a	a			b			b	

a. Primary Chemical Quality for Municipal Use.

b. Secondary Chemical Quality for Municipal Use.

TABLE II Water Monitoring Status-1983

TABLE III

CURRENT KEY CONTAMINANT ANALYSIS[2]

Soil/Sediment/Tuff	Air	Bees	Honey
Radiochemical			
^{241}Am	^{241}Am	^{7}Be	^{7}Be
^{238}Pu	^{238}Pu	^{134}Cs	^{134}Cs
^{239}Pu	$^{239+240}Pu$	^{137}Cs	^{137}Cs
Total U	Total U	^{57}Co	^{57}Co
^{90}Sr	^{3}H	^{54}Mn	^{54}Mn
^{137}Cs	Gross α		
	Gross B	^{83}Rb	
Gross α			^{22}Na
Gross B		^{22}Na	
		Total U	Total U
		^{3}H	
Chemical			
	TSP	As	Cd
		B	F
		Cr	Hg
		F	
		Hg	

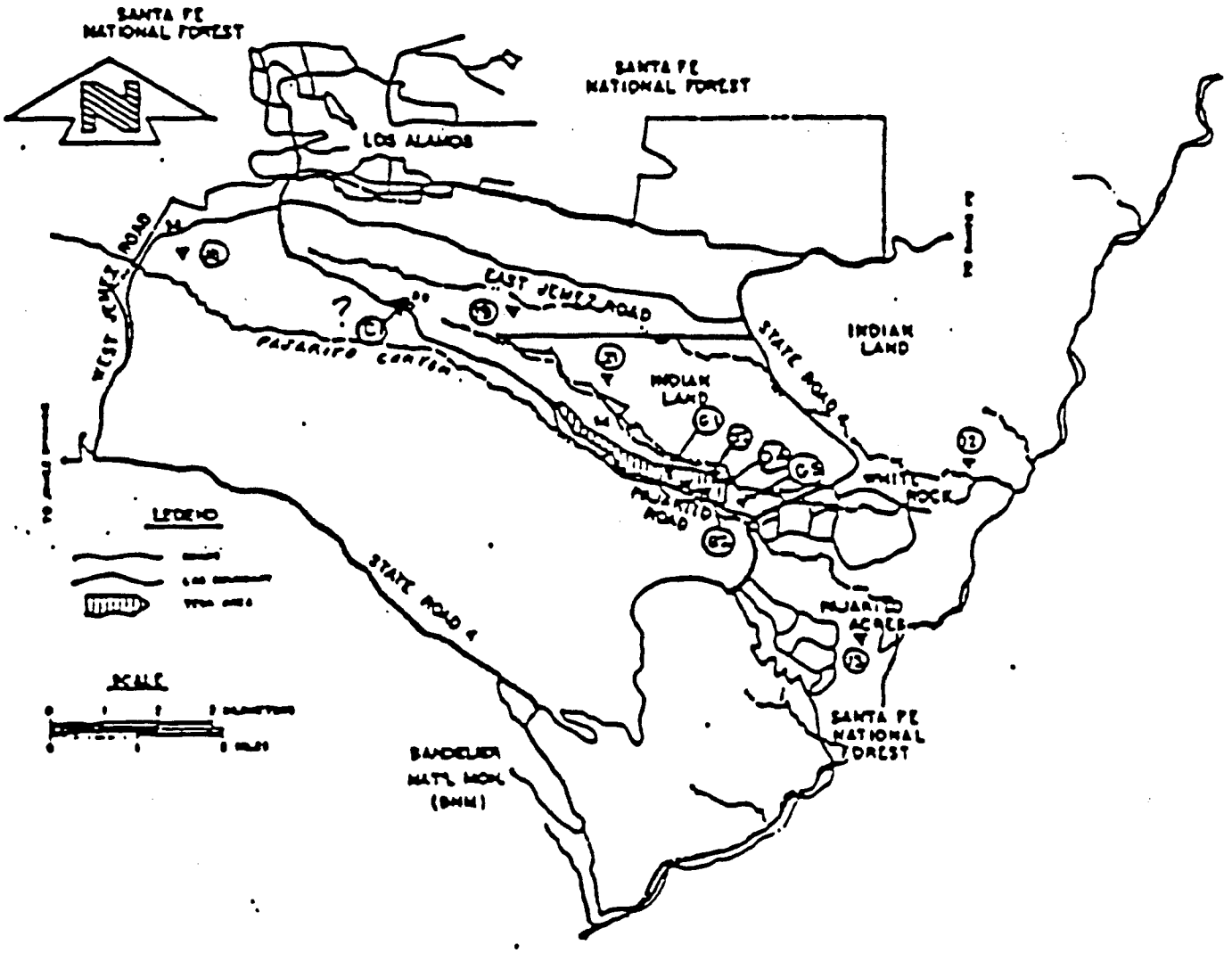


Fig. 9 Existing Air Sampling Locations Pertinent to TA-50 and TA-54

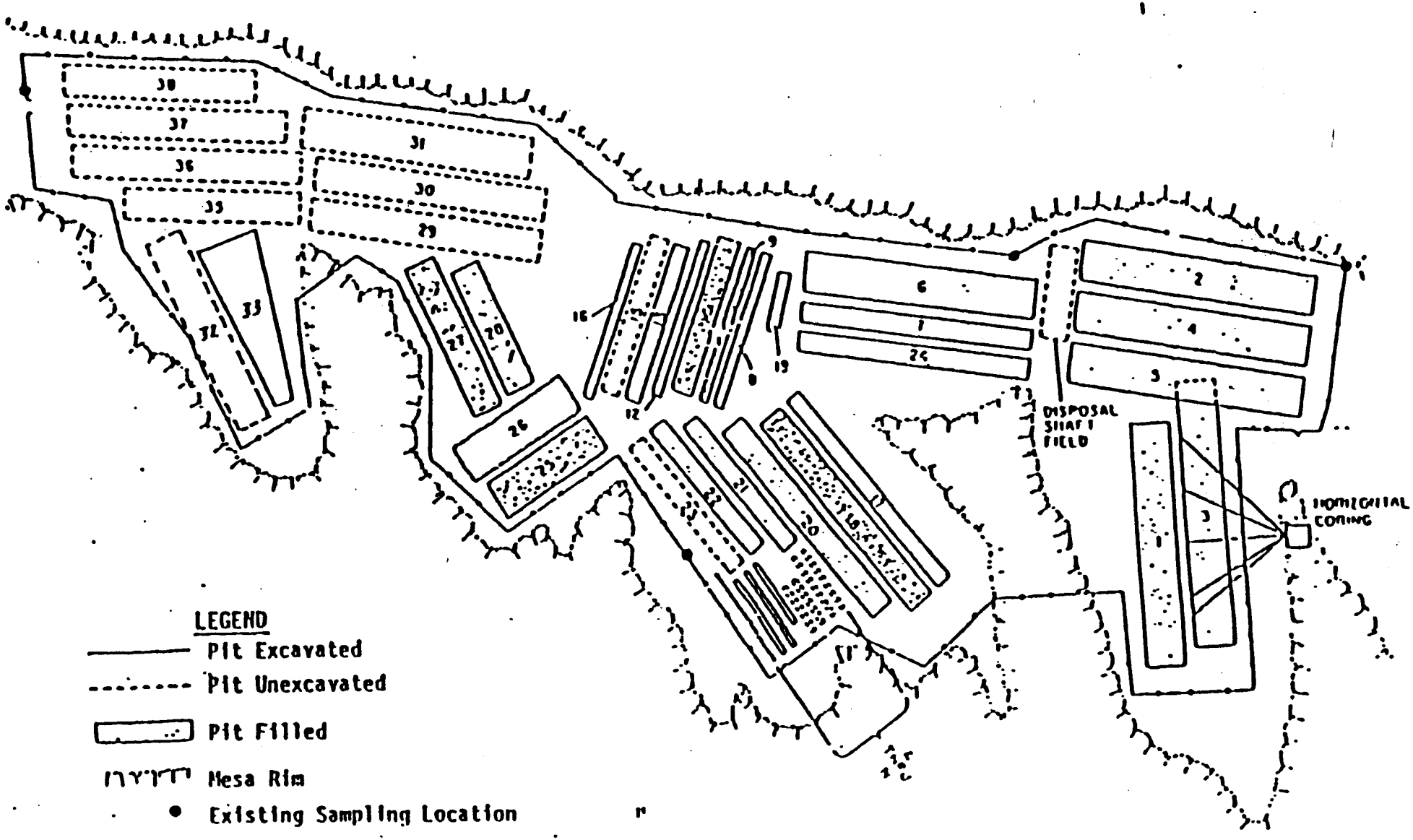


Fig. 10 Air Sampling Locations at Area G

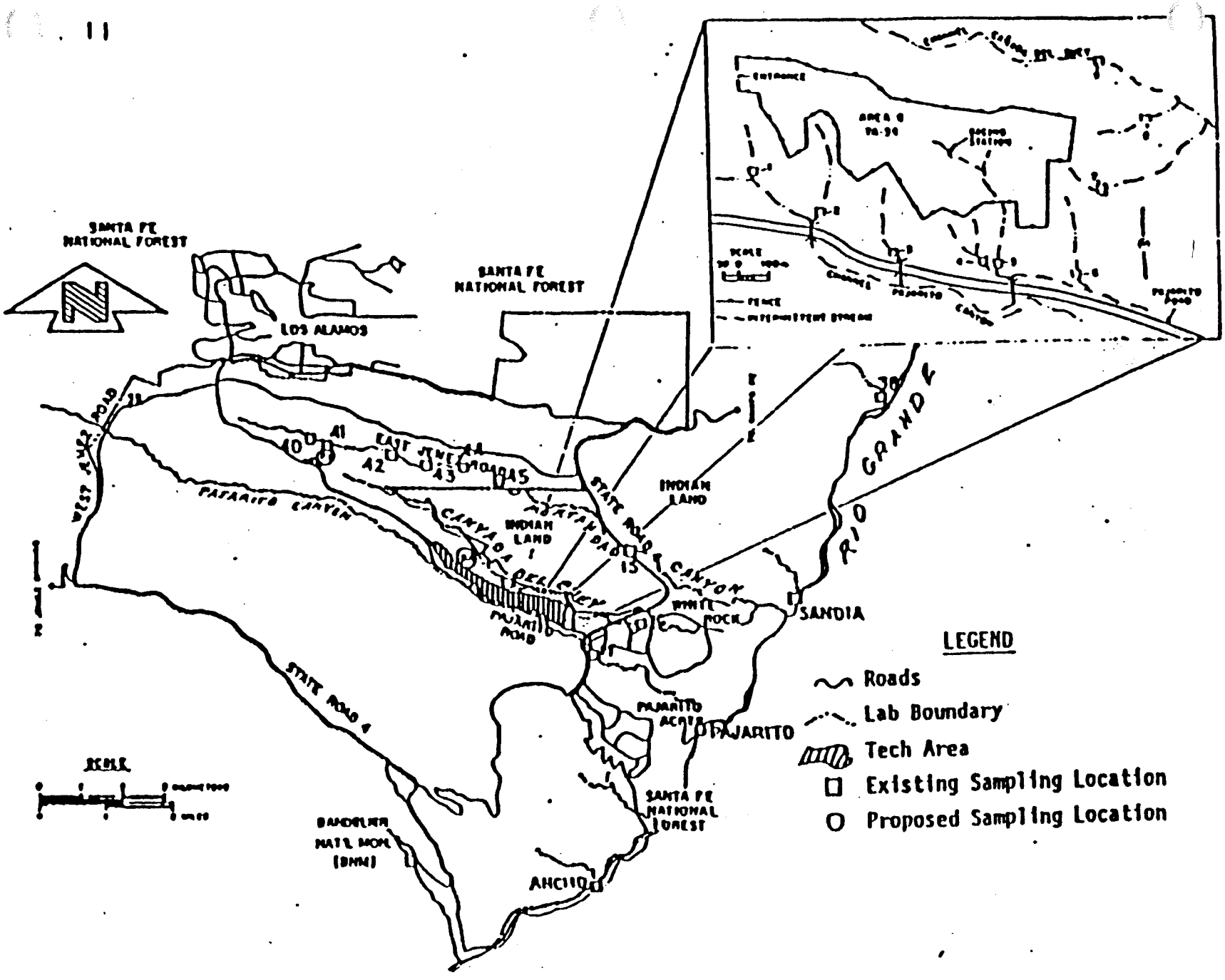


Fig. 11 Sediment Sampling Locations for TA-50 and TA-54

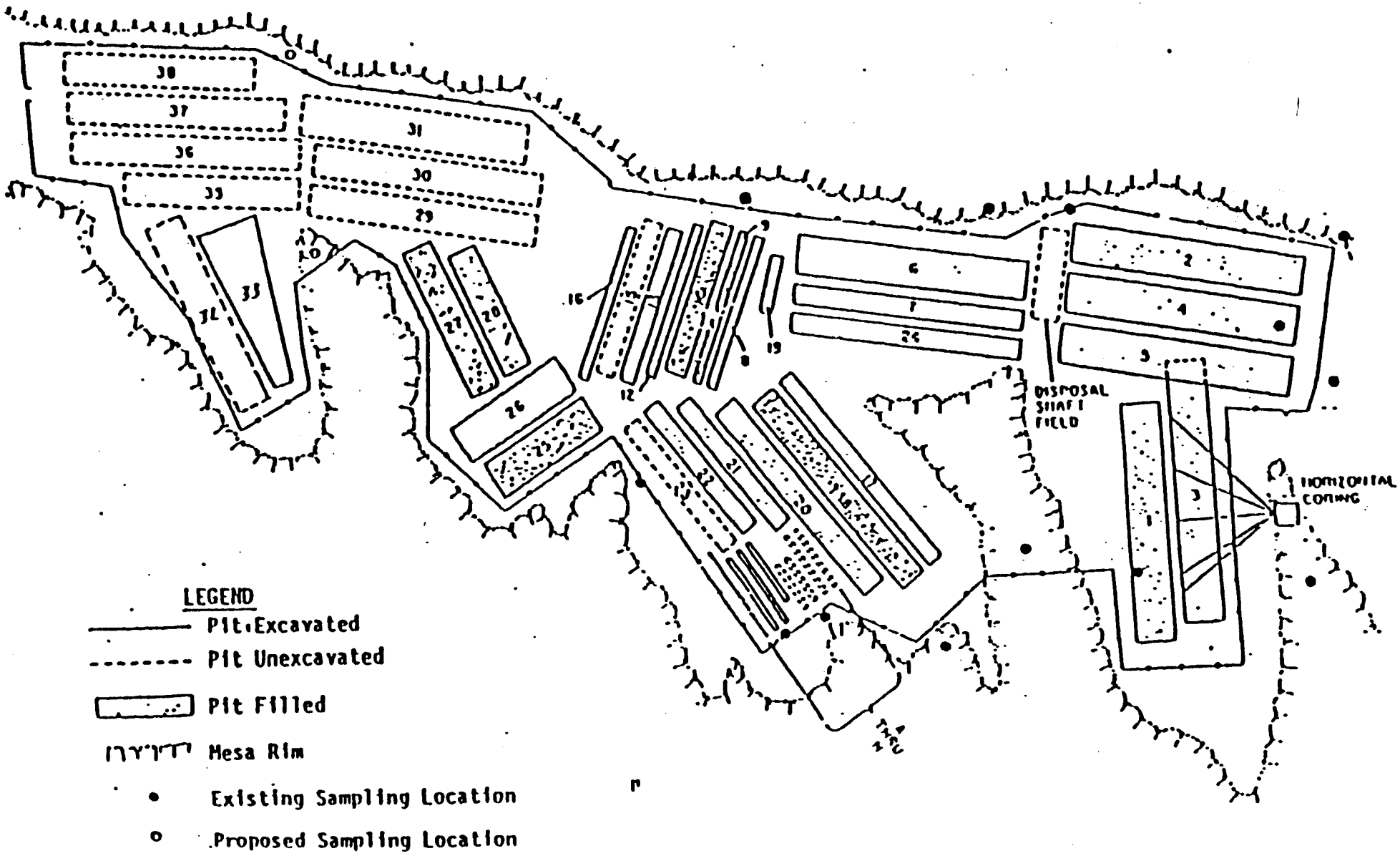


Fig. 12 Surface Soil and Vegetation Sampling Locations at Area G

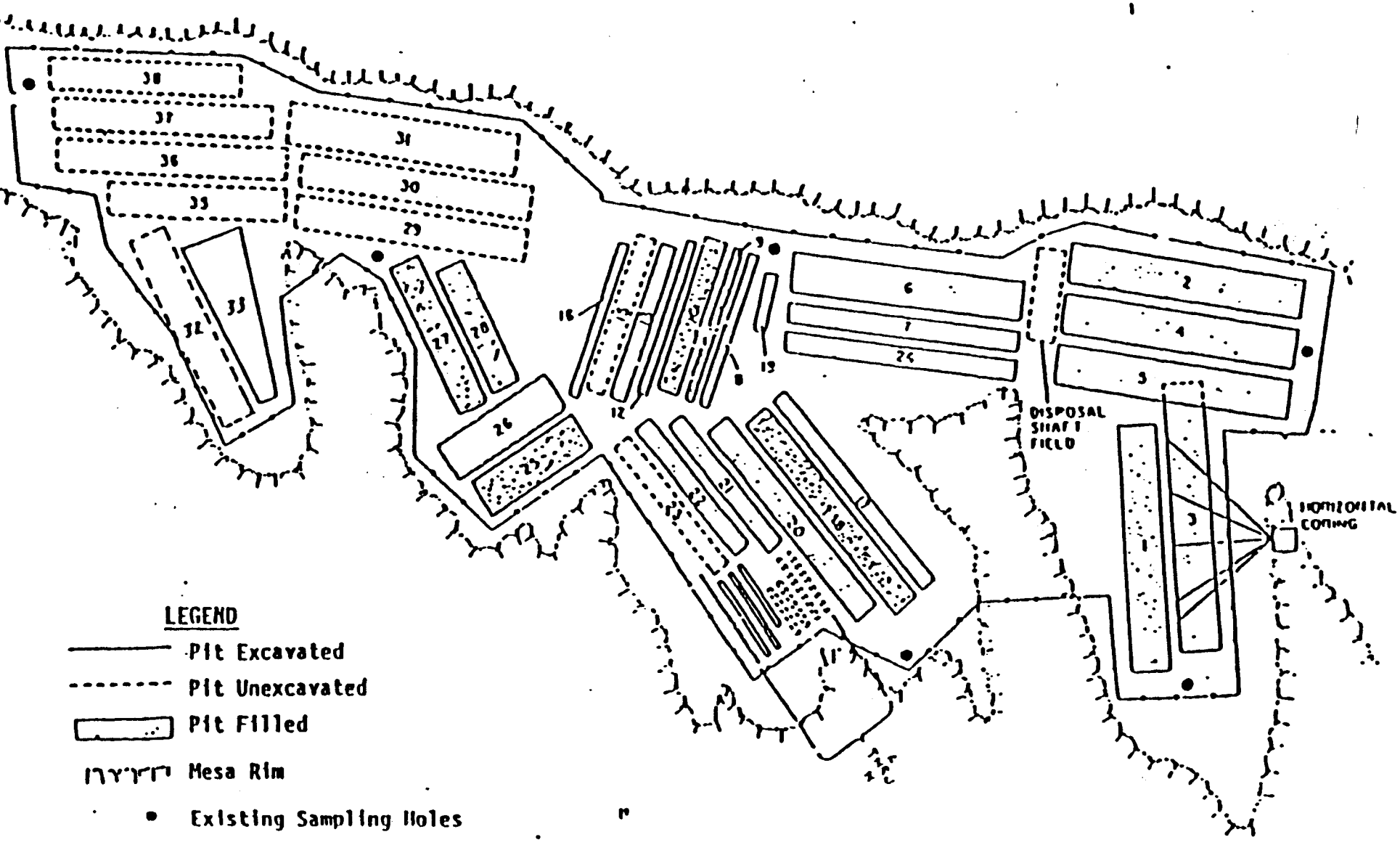


Fig. 13 Subsurface Soil Monitoring and Sampling Holes at Area G

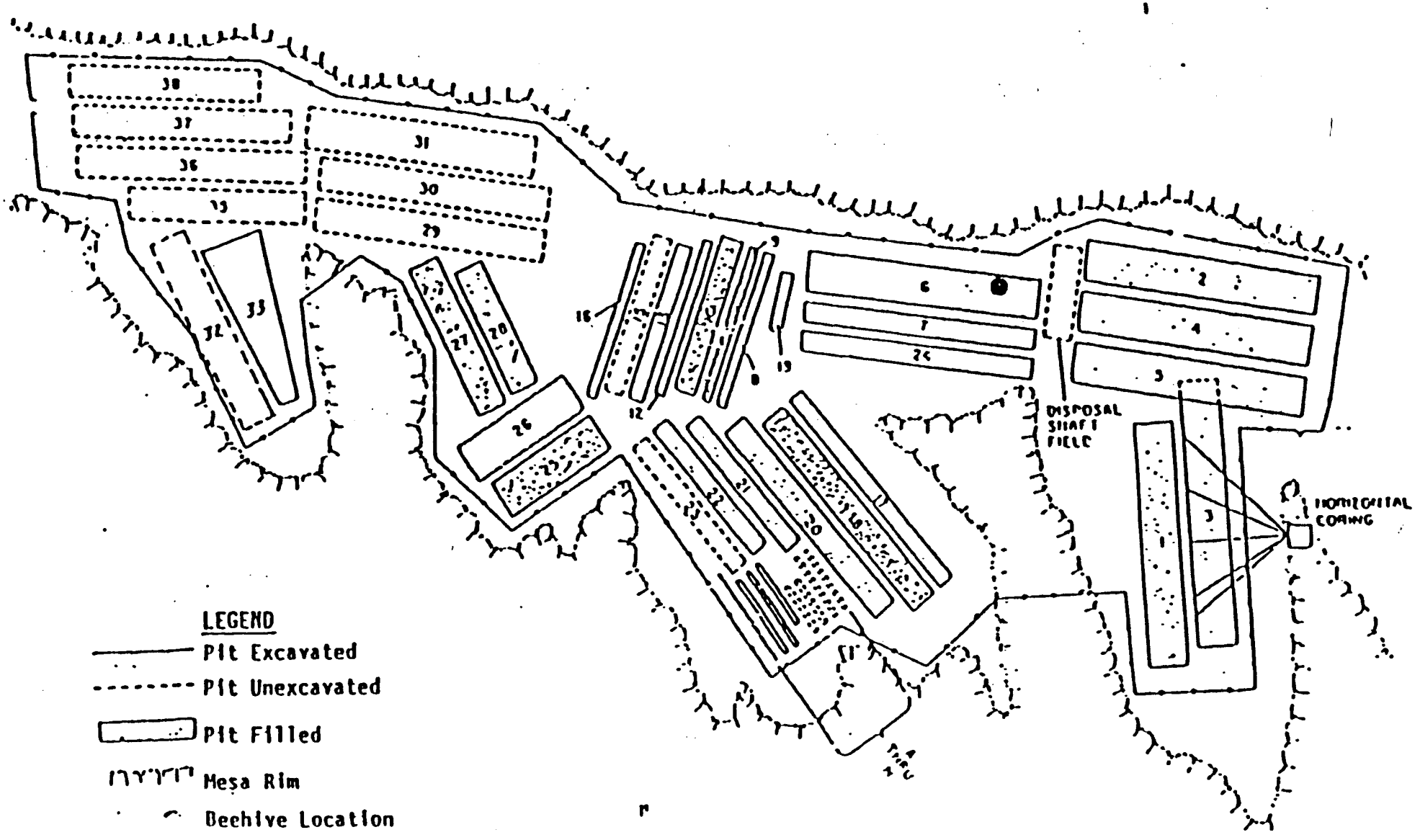


Fig. 14 Beehive Location at Area G

soil is saturated) are completely inappropriate in regard to the TA-54 landfill area. First, the landfill will never be full of liquid since no free liquid is deposited into the shafts and all liquids in the pits are evaporated. Second, the tuff has not been saturated since it was deposited about 1.1 million years ago. There is no recharge to the main aquifer through the mesa tops (Cushman, 1963). To saturate the section of tuff, volcanics, and sediments above the main aquifer would require the mesas to be covered by about 285 ft of water. Taking these factors into account, there is no driving force to carry waste constituents to the aquifers. The required assumptions are discussed here as compared to conditions at the site.

1. Criteria/Assumptions (47FR32293).

a. Thickness or depth of geologic units underlying the regulated unit - See Cestion III(E)(1). Area L is 885 ft. and Area G is 785 ft.

b. Calculation of travel time based on:

(1) Natural Soil Properties. Saturated permeabilities range from 0.8 to 22 gpd/ft^2 with an average of 11 gpd/ft^2 (Purtymun, 1979). The volcanics and sediments underlying the disposal area are not saturated; natural moisture content is less than 5% by volume (Purtymun, 1971).

(2) Least Viscous Fluid in the Regulated Unit. The least viscous fluid in the regulated unit is probably freon 113, which makes up less than 5% of wastes received; however, due to the high vapor pressure of freon 113 which will cause the fluid to evaporate at normal temperature and pressure, little if any of this fluid remains in the waste. Calculations for rate of

movement were made using viscosity of water (permeability) as freon 113 can not be contained as liquid in the wastewater, if present, would be the main driving force at these areas.

(3) Assumption That Unit is Full of Fluids. The unit is not full of fluids. Current practice dictates that liquids are absorbed into vermiculite in 30 or 55 gal drums to immobilize the fluids. The impact of past free liquids in the storage shafts has been previously discussed, and shown to have very little movement within the unsaturated zone.

(4) Assumption That Soil is Saturated. The volcanics and sediments underlying the disposal areas are not saturated. About 950 ft of unsaturated material overlies the main aquifer in the area at Area G. The area (on a mesa) is not in the recharge area to the aquifer. The area is well drained by adjacent canyons, thus there is no ponding of any water. There is little, or no infiltration of water from precipitation into the waste due to the high level of evapotranspiration. Based upon the effective porosity (30%) and thickness of unsaturated volcanics and sediments, it would take 285 ft of precipitation with no runoff or evapotranspiration to saturate the material between the mesa surface and top of the aquifer.

(5) Effective Porosity of 10%. Effective porosity is estimated at 30% by volume.

(6) Soil Attenuation Mechanisms. Soil Attenuation Mechanisms are not considered.

(7) Assumption that Migration of Fluids Through the Soil Began When the Unit Commenced Operation. This assumption is not necessary because prior calculations are based on the maximum volume of free liquids previously stored. There is no on-going storage of free liquid to contribute additional hydraulic head.

G. Field Conditions

Field conditions at the site indicate the tuff, volcanics, and sediments are not saturated above the main aquifer. There is no driving force (water) to facilitate infiltration or leaching of chemical from the disposal shaft. The chemical wastes are now packaged so that there is no liquid available to set up even a minor driving force for infiltration or movements of chemicals from the shafts or pits. Based on the above discussion, there is no hydraulic gradient, thus the hydraulic gradient is zero (0).

$$\text{Velocity} = \frac{\text{Permeability x gradient}}{\text{porosity}}$$

$$= \frac{11\ \text{gpd/ft}^2 \times 0}{7.48\ \text{g/ft}^3 \times 0.10}$$

$$= 0\ \text{ft/day}$$

For all practicable purposes the time to reach the water table cannot be calculated, but is infinitely long.

H. Geologist Qualifications/Certification Statement

W. D. Purtymun

BA Major Geology - Minor Engineering 1958
University of New Mexico
Registered Geologist - State of California
Certificate No. 796 (April 8, 1970).

US Geological Survey 1955-1969
Los Alamos National Laboratory - 1969 to Present

Major Projects: Waste disposal studies (liquids and solid) related to monitoring movement of waste contaminates in the environment. Water Supply Studies related to location and development of water for municipal and industrial use.

REFERENCES

American Petroleum Institute, 1972: American Petroleum Institute, "The Migration of Petroleum Products in Soil and Ground Water," API Publication 4149, Washington, D. C. (1972).

Baradat 1979: Y. Baradat, R. Barthel, A. Chiarelli, D. R. Fussell, T. L. de Pastrovich, "Protection of Groundwater from Oil Pollution," CONCAWE, Special Task Force No. 11, Report No. 3/79 (April 1979).

Cooper 1965: J. B. Cooper, W. D. Purtymun, and E. C. John, "Records of Water Supply Wells Guaje Canyon 6, Pajarito Mesa 1, and Pajarito Mesa 2, Los Alamos, New Mexico Basic Data Report," U.S. Geol. Survey Open-File Report (July 1965).

Cushman 1965: R. L. Cushman, "An Evaluation of the Aquifer and Well Characteristics of the Municipal Well Fields in Los Alamos and Guaje Canyons near Los Alamos, New Mexico," U.S. Geological Survey Water Supply Paper 1809-D (1965).

Environmental Surveillance Group 1984: Environmental Surveillance Group, "Environmental Surveillance at Los Alamos During 1983," Los Alamos Scientific Laboratory Report LA-10100-ENV (April 1984).

Griggs 1964: R. L. Griggs, "Geology and Ground Water Resources of the Los Alamos Area, NM," U.S. Geological Survey Water Supply Paper 1753 (1964).

Los Alamos Scientific Laboratory 1979: "Los Alamos Scientific Laboratory Final Environmental Impact Statement" (December 1979).

McCarty 1981: P. L. McCarty, B. E. Rittmann, "Trace Organics in Ground Water," Environmental Science and Technology, Vol. 15, No. 1, pages 40-49 (January 1981).

Purtymun 1971: W. D. Purtymun and W. R. Kennedy, "Geology and Hydrology of Mesita del Buey," Los Alamos Scientific Laboratory Report LA-4660 (1971).

Purtymun 1973: W. D. Purtymun, "Underground Movement of Tritium from Solid Waste Storage Shafts," Los Alamos Scientific Laboratory LA-5286-MS (May 1973).

Purtymun 1978: W. D. Purtymun, M. L. Wheeler, and M. A. Rogers, "Geologic Description of Cores from Holes P-3 MH-1 through P-3 MH-5, Area G, Technical Area 54," Los Alamos Scientific Laboratory report LA-7308-MS (May 1978).

Purtymun 1979: W. D. Purtymun, "Geohydrology of the Pajarito Plateau with Reference to Quality of Water: 1949-1972," Los Alamos National Laboratory Informal Report (December 1979).

Purtymun 1980: W. D. Purtymun, M. A. Rogers, M. L. Wheeler, "Radiochemical Analyses of Samples from Beneath a Solid Radioactive Waste Disposal Pits at Los Alamos, New Mexico," Los Alamos Scientific Report LA-8422-MS (June 1980).

Purtymun 1980A: W. D. Purtymun and H. Adams, "Geohydrology of Bandelier National Monument, New Mexico," Los Alamos Scientific Laboratory Report LA-8461-MS (July 1980).

Purtymun 1980B: W. D. Purtymun, R. J. Peters, and J. W. Owens, "Geohydrology of White Rock Canyon of the Rio Grande from Otowi to Frijoles Canyon," Los Alamos Scientific Laboratory report LA-8635-MS (December 1980).

Purtymun 1984: W. D. Purtymun, "Hydrology of the Main Aquifer with Reference to Location of Additional Water Supply Wells," Los Alamos National Laboratory report LA-9957-MS (January 1984).

APPENDIX I

TSCA GROUND WATER MONITORING EXEMPTION

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION VI
1201 ELM STREET
DALLAS, TEXAS 75270

5 June 1980

Mr. Kenneth R. Braziel, Area Manager
Department of Energy
Albuquerque Operations
Los Alamos Area Office
Los Alamos, New Mexico 87544

Dear Mr. Braziel:

On May 31, 1979, the United States Environmental Protection Agency published final regulations in the Federal Register (43 FR 7150 - 7164) on Polychlorinated Biphenyls (PCBs), Disposal and Marking. These regulations prohibit the disposal of PCBs at any site not approved by EPA after July 2, 1979. The regulations also require that the owner and/or operator of a chemical waste landfill used for the disposal of PCBs submit information in accordance with Section 761.41, "Chemical Waste Landfills," to the Regional Administrator for review.

On January 25, 1979, we received your formal application for a PCB landfill at the Los Alamos Scientific Laboratory (LASL). The application was for disposal of DOE/LASL generated PCB solid waste and would not be a commercial operation. The application was distributed to Regional, Headquarters, and State personnel for comment. A March 26, 1979, news release concerning EPA's receipt of the application generated several local news stories and three written responses to the Regional Office. One letter was in favor of the site, one opposed, and one brought attention to the nearness of the LASL site to Indian lands and requested the careful review of the facility plan. The New Mexico Environmental Improvement Division and the U. S. Fish and Wildlife Service reviewed the application and indicated to EPA in writing that they had no objection to the application.

After a review of all the information, I made a tentative decision to approve your facility as an Annex II chemical landfill for PCB articles. This tentative decision was sent to you in my letter of April 14, 1980, and we solicited public comment by placing an announcement in the April 19, 1980, issue of the Albuquerque Journal. No letters were received commenting on the tentative approval.

The proposed PCB disposal site is located on top of the Misita del Buey, which is on LASL property and is the present location of the ongoing, low-level radioactive disposal site. The proposed site meets all the technical requirements for a chemical waste landfill as required in Section 761.41 (b), except "Groundwater Monitor Wells" and "Leachate

Collection Systems." These systems are not considered feasible due to arid climate conditions, and soil characteristics and conditions. The Groundwater Monitor Wells and Leachate Collection System requirements are hereby waived as provided in Section 761.41, and the attached conditions are required as substitutes. These waivers will not present an unreasonable risk of injury to health or environment from PCBs.

The DOE/LASL chemical waste landfill for disposal of PCB articles is hereby approved. Conditions for the operation of your PCB chemical waste landfill are listed in Enclosure 1 of this letter.

Approval for the DOE/LASL landfill may be revoked, modified, or otherwise altered at any time evidence indicates a violation of the conditions of this approval letter, 40 CFR Part 761, or other applicable rules and regulations. Also this approval is for disposal of PCBs in a chemical waste landfill and is not to be construed to be approval for PCB incineration or for PCB liquids. The approval applies only to the Department of Energy, Los Alamos Scientific Laboratory Landfill, Los Alamos, New Mexico. This designation is non-transferrable.

Sincerely,

Francis E. Phillips, for
Adlene Harrison
Regional Administrator

Enclosures

cc: Thomas E. Baca, M.P.H. Director
Environmental Improvement Division
New Mexico Health Environment
Department

Conditions for Disposal of PCBs at the Department of Energy/Los Alamos Scientific Laboratory Chemical Waste Landfill, Los Alamos, New Mexico

1. Maintain records as specified in 40 CFR 761.45 (b), "Records and Monitoring."

2. Advise EPA immediately of any changes, alternations, or divergencies in the operational managerial policies and procedures as outlined in the documents submitted in support of the application.

3. Report immediately to the Regional Administrator, EPA Region 6, any detection of PCBs in stormwater runoff or in groundwater samples.

4. Monitor the two springs currently monitored for the Safe Drinking Water Act at least once each year (during and after site operation) for PCBs, pH, specific conductance, and chlorinated organics.

5. Install onsite cumulative samplers for rainfall runoff collection. Water samples collected in the cumulative samplers after rainfall of sufficient volume for analysis must be analyzed for PCBs, pH, specific conductance, and chlorinated organics.

6. Report to the EPA Regional Administrator, attention Chief, Solid Waste Branch, every six months the following information:

    a. Types and quantities of PCB articles disposed.

    b. A summary of analytical data which must be developed under 40 CFR 761.41 (b) (6) (iii) "Water Analysis," and for conditions 4 and 5 listed above.

    c. A summary of shaft or trench construction activities for PCB articles disposal and corrective maintenance work required for PCB shaft or trench stormwater diversion structures.

APPENDIX II

POTENTIAL FOR MIGRATION FROM INFILTRATION AND PRECIPITATION - CALCULATIONS

APPENDIX II

POTENTIAL FOR MIGRATION FROM INFILTRATION OF PRECIPITATION - CALCULATIONS

I. INTRODUCTION

Calculations were made to investigate the possibility of infiltration of precipitation into waste disposal pits and shafts and provide a means for waste to migrate outward. It was specified that a worst-case scenario be considered.

A. Precipitation

Although a weather station exists at Area G, it has been collecting data for less than 5 full years. Because the length of record is so short, it cannot provide a statistically meaningful data base. Tree-ring data cannot be used because methods do not exist to remove CO_2 effects (Bower, 1984).

Weather data has been collected at either TA-3 or TA-59 for the last 33 years. The TA-3 and TA-59 collection locations are close together, so that stationarity is not significant. Previous to 1952, weather data has been collected at other locations within Los Alamos County, and stationarity does become an issue. For this reason, only data collected between 1952 and the present is considered a stationary data set.

The Area G weather station is located about 5.2 miles southeast of TA-59. In general, precipitation diminishes to the southeast, and specifically, Area G receives annually only about 75% of the precipitation amount measured at TA-59 (Bowen 1984). Due to the paucity of data at Area G, it was decided to use unadjusted TA-59 data, which represents data, on the average, 133% greater. The largest monthly precipitation recorded in the 33-year record was used to represent a worst-case scenario for Area G. Monthly rainfall statistics are presented in Table II-1.

TABLE II-1

LOS ALAMOS RAINFALL 1952-1984
(inches)

	January	February	March	April	May	June	July	August	September	October	November	December
Minimum	0.05	0.00	0.02	0.00	0.05	0.00	0.35	1.07	0.00	0.00	0.00	0.01
Maximum	2.81	1.87	4.11	3.23	3.50	3.40	6.60	11.18	4.55	6.77	6.60	2.85
Average	0.82	0.67	1.14	0.82	1.16	1.10	3.20	3.86	1.73	1.47	0.99	0.97

B. Evapotranspiration

There are many methods available to calculate potential evapotranspiration. The method employed was the Blaney-Criddle Method, as recommended in Cruff (1967), which was shown to be practical in arid and subhumid environments. Calculations are shown on Calculation Sheet No. 1.

The calculation calls for the use of the mean monthly temperature. The relationship between monthly average temperature and monthly total rainfall was investigated for the month of January to determine if a case could be made to use the minimum temperature, Fig. II-1. It is evident that no obvious relationship exists, and so that low temperature does not correlate with high rainfall. Therefore, the mean temperature was used, as the method dictates.

C. Soil Moisture

Soil moisture was determined from the available water capacity, Calculation Sheet No. 2. The available water capacity was calculated for both a native soil cover, using the characteristics of the Hackroy sandy loam that covers the top of Mesita del Buey, and for crushed volcanic tuff, which is used as a cap and fill in waste disposal pits and shafts. The available water capacity for these two covers does not differ greatly, 138 mm for the Hackroy sandy loam compared to 126 mm for crushed volcanic tuff.

D. Water Balance

A water balance was constructed to determine the amount of water available for infiltration. The method used was the Thornthwaite Method, as described in Dunne (1978). Water balances were calculated using (1) largest monthly rainfall data recorded at TA-59, (2) potential

CALCULATION SHEET #1

CALCULATION OF EVAPOTRANSPIRATION USING THE BLANEY-CRIDDLE METHOD

$$u = k \sum_{i=1}^{m} p_i t_i$$

after Chow (1964)

where u = evapotranspiration in inches
m = months
p = per cent of daytime hours of the year occurring during the period divided by 100
t = mean monthly temperature °F
k = monthly consumptive use coefficient

It is recommended that for a subhumid environment, where mean precipitation ranges from 5-20 inches, that k = 0.90 during the growing season and k = 0.75 during the entire year. (Cruff and Thompson, 1967).
Growing season will be assumed to extend from May through September.

Latitude of Los Alamos = 35° 52.5 min = 35.88° N.
p will be adjusted for this latitude.

Month	k	Daytime Hour p	p/100	Avg. Temp °F	Monthly (in.)	Evapotranspiration (mm)
January	0.75	7.00	0.070	29.1	1.53	38.80
February	0.75	6.85	0.0685	32.3	1.66	42.15
March	0.75	8.35	0.0835	37.6	2.35	59.81
April	0.75	8.85	0.0885	45.6	3.03	76.88
May	0.90	9.81	0.0981	54.8	4.84	122.89
June	0.90	9.82	0.0982	65.0	5.74	145.92
July	0.90	9.98	0.0998	68.2	6.13	155.59
August	0.90	9.40	0.0940	65.9	5.58	141.61
September	0.90	8.37	0.0837	60.2	4.53	115.19
October	0.75	7.85	0.0785	50.2	2.96	75.07
November	0.75	6.93	0.0693	37.9	1.97	50.03
December	0.75	6.80	0.0680	30.8	1.57	39.90
				Total	41.89	

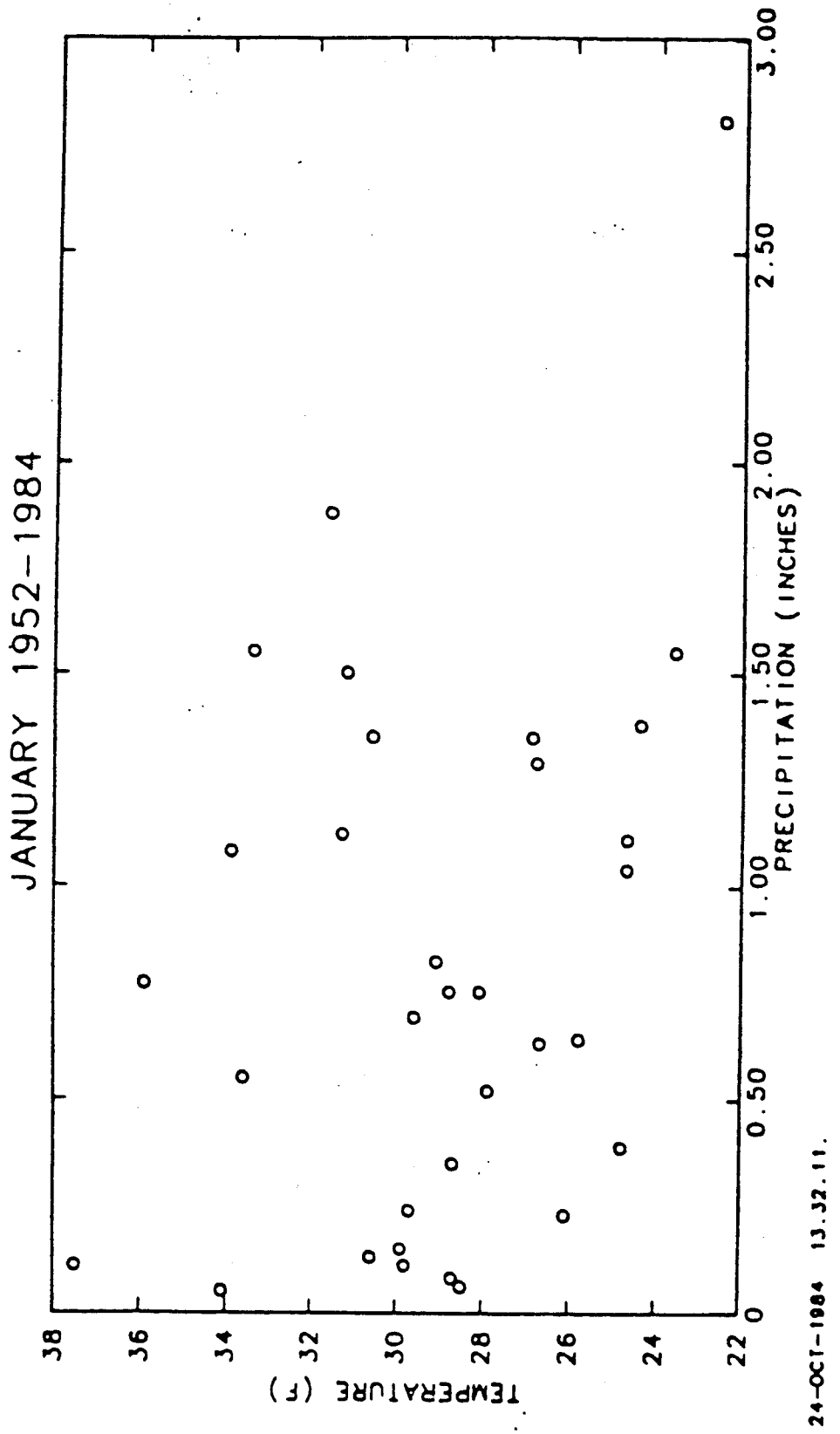

JANUARY 1952-1984
TEMPERATURE (F)
38
36
34
32
30
28
26
24
22
0
0.50
1.00
1.50
2.00
2.50
3.00
PRECIPITATION (INCHES)
24-OCT-1984 13.32.11.

Fig. II-1

CALCULATION SHEET #2

Soil Moisture Calculations

Available water capacity (AWC) AWC = (field capacity - wilting point)* (rooting depth)

Rooting Depth: The four most common species as determined by importance value, a measure of relative abundance, relative dominance, and relative frequency, found on revegetated low-level radioactive waste disposal areas are:

1) sand dropseed - Sporobolus cryptandrus
2) sweet clover - melilotus spp.
3) fescue - festuca spp.
4) Bigelow aster - aster bigelovii

(Foxx, Tierney and Williams, in press)

Rooting depths as summarized from the literature are summarized below:

Species	Average Rooting Depth (cm)
Sand dropseed	99
Sweet clover	130
Fescue	78
Bigelow aster	154

(From Tierney & Foxx, 1982)

Assuming that each of these is equally represented, one may obtain an average rooting depth by averaging. This result is reasonable when examining their respective importance values (19, 19, 18, 16) (Foxx, Tierney and Williams, in press).

$$\text{Average rooting depth} = \frac{(99 + 130 + 78 + 154)\ \text{cm}}{4}$$

$$= 115\ \text{cm}$$

Available water capacity:

	Field Capacity	Wilting Point	Rooting Depth(cm)	Available Water Capacity(%)	Available WC (mm)
Native soil cover*			115	12	138
Crushed tuff**	0.19	0.08	115		126

*Soil is a Hackroy sandy loam, data in Nyhan, et al. (1978).
**Data from Lane (1984).

evapotranspiration according to the Blancy-Criddle Method, and (3) available water capacities for both native soil and crushed volcanic tuff. The results are shown in Tables II-2 and II-3.

The water balance method, as described, accounts for runoff only after soil moisture needs have been satisfied. This assumption on the timing of runoff is probably not valid for the local hydrogeologic conditions in Los Alamos. Rainfall events in Los Alamos are usually of short duration and relatively high intensity. This, combined with the relative impermeability of the soils (Hydrologic Soils Groups C and D) develops a rapid runoff. Therefore, it is appropriate to subtract off the runoff from the precipitation before soil moisture deficits are considered, Table II-4. This technique is also described as being appropriate (Dunne 1978).

Using the SCS Curve Number Method (SCS 1972), a rainfall-runoff relationship was developed for a curve number of 82, which corresponds to a 40% cover of herbaceous plants, brush and grasses (Lane 1984), which would develop over a revegetated waste area, Table II-5. Because most individual rainfall events do not produce over 1-1/2 inches, a value of 20% was chosen to represent the amount of rainfall that becomes runoff. Note that this is conservative compared to the 50% figure recommended in the Thornthwaite Method. Then, this 20% is subtracted from the precipitation before continiung the water balance, Table II-4.

E. Discussion

Comparing the values for monthly detection (last line) on Tables II-2 and II-3 shows that there is not much difference in the soil moisture characteristics of the crushed volcanic tuff or Hackroy sandy loam native soil covers. However, Tables II-2 and II-3 do not accurately portray hydrologic and hydrogeologic conditions at Los Alamos because runoff is not considered rapid in these instances. Table II-4 does consider a

TABLE II-2

WATER BALANCE - NATIVE SOIL COVER
(units are millimeters)

	January	February	March	April	May	June	July	August	September	October	November	December
Precipitation P	71	48	104	82	89	86	168	284	116	172	168	72
Potential E-T (PET)	39	42	60	77	123	146	156	142	115	75	50	40
P-PET	32	6	44	5	-34	-60	12	142	1	97	118	32
Accum. Potential Waterless	-	-	-	-	-34	-94	-	-	-	-	-	-
Soil Moisture	138	138	138	138	120	75	87	138	138	138	138	138
Δ in Soil Moisture	0	0	0	0	-18	-45	+12	+51	0	0	0	0
Actual E-T	39	42	60	77	107	131	156	142	115	75	50	40
Soil Moisture Deficit	0	0	0	0	16	15	0	0	0	0	0	0
Soil Moisture Surplus	32	6	44	5	0	0	0	91	1	97	118	32
Total Available for Runoff	92	52	70	40	20	10	5	91	46	120	178	121
Runoff	46	26	35	20	10	5	3	46	23	60	89	61
Detention	46	26	35	20	10	5	2	45	23	60	89	60

TABLE II-3

WATER BALANCE - CRUSHED TUFF COVER
(units are millimeters)

	January	February	March	April	May	June	July	August	September	October	November	December
Precipitation P	71	48	104	82	89	86	168	284	116	172	168	72
Potential E-T (PET)	39	42	60	77	123	146	156	142	115	75	50	40
P-PET	32	6	44	5	-34	-60	12	142	1	97	118	32
Accum. Potential Water Loss	-	-	-	-	-34	-94	-	-	-	-	-	-
Soil Moisture	126	126	126	126	105	72	84	126	126	126	126	126
Change in Soil Moisture	0	0	0	0	-21	-33	12	42	0	0	0	0
Actual E-T	39	42	60	77	110	119	156	142	115	75	50	40
Soil Moisture Deficit	0	0	0	0	13	27	0	0	0	0	0	0
Soil Moisture Surplus	32	6	44	5	0	0	0	100	1	97	118	32
Total Available for Runoff	92	52	70	40	20	10	5	100	51	122	179	121
Runoff	46	26	35	20	10	5	3	50	26	61	90	61
Detention	46	26	35	20	10	5	2	50	25	61	89	60

TABLE II-4

Water Balance - Native Vegetation Cover With Runoff

(Units Are Millimeters)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec
Precipitation P	71	48	104	82	89	86	168	284	116	172	168	72
20% P	14	10	21	16	18	17	34	57	23	34	34	14
P-20% P=P*	57	38	83	66	71	69	134	227	93	138	134	58
Potential E-T (PET)	39	42	60	77	123	146	156	142	115	75	50	40
P*-PET	18	-4	23	-11	-52	-77	-22	85	-22	63	84	18
Accumulated Potential Water Loss		-4		-11	-63	-140	-162	-77	-99			
Soil Moisture	138	135	138	128	100	55	50	85	80	138	138	138
Change In Soil Moisture	0	-3	3	-10	-28	-45	-5	35	-5	58	0	0
Actual E-T	39	42	60	77	117	131	156	142	115	75	50	40
Soil Moisture Deficit	0	0	0	0	6	15	0	0	0	0	0	0
Soil Moisture Surplus	18	0	20	0	0	0	0	50	0	5	84	18

TABLE II-5

VARIATION OF RAINFALL/RUNOFF FOR CN=82, USING THE SCS CURVE NUMBER METERED
CN=82 CORRESPONDS TO - 40% COVER OF HERBACEOUS PLANTS, BRUSH and
GRASS (LANE, 1984)

Rainfall (in)	Direct Runoff (in)	% Rainfall Which Becomes Runoff
0.5	0.	0
1.0	0.15	15
1.5	0.35	23
2.0	0.65	33
2.5	1.05	42
3.0	1.45	48
3.5	1.8	51
4.0	2.25	56
4.5	2.7	60
5.0	3.15	63

rapid runoff, which is in most instances what is physically observed in field conditions and studies, and should be considered an appropriate representation for field conditions.

The last row on Table II-4, Soil Moisture Surplus, represents that water that is available for infiltration. There is no surplus water available during the months of February, April, May, June, July, and September. The amount of surplus water available during the months of January, March, October, and December is less than 1 inch per month. August has a surplus of just under 2 inches and November has a surplus of 3.3 inches.

This method of water balance calculation is deficient in the respect that there is no accounting for that amount of rainfall that is taken up by interception and depression storage. Interception is that portion of the total precipitation that wets and adheres to above ground objects until it is returned to the atmosphere. Interception storage may account for anywhere from 5 to 40% of the rainfall (Viessman 1977). Depression storage is that portion of the total precipitation detained in and evaporated from surface depressions and does not contribute to either runoff or infiltration. Measurements of depression storage for intense storms vary with cover composition, and is less than 1/2 inch (Viessman 1977). If these constituents of the hydrologic cycle are considered, calculations would show inconsequential soil moisture surpluses for the months of January, March, and December, and about 1.3 inches for August, Table II-6.

It should be stressed that all assumptions used in these calculations are very conservative and present an extreme worst case.

TABLE II-6

Water Balance - Native Vegetation With Runoff, Interception, And Depression Storage

(Units Are Millimeters)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec
Precipitation P	71	48	104	82	89	86	168	284	116	172	168	72
Runoff (20% P) R	14	10	21	16	18	17	34	57	23	34	34	14
Interception (15% P) I	11	7	16	12	13	13	25	43	17	26	25	11
Depression Storage D	6	6	6	6	6	6	6	6	6	6	6	6
Potential E-T (PET)	39	42	60	77	123	146	156	142	115	75	50	40
P-R-I-D-PET	1	-17	1	-29	-71	-96	-53	36	-45	31	53	1
Accumulated Potential Water Loss		-17	-16	-45	-116	-212	-265	-229	-274			
Soil Moisture	104	130	130	105	55	30	23	25	18	49	102	103
Change In Soil Moisture	1	26	0	-25	-50	-25	-7	2	-7	31	53	1
Actual E-T	39	42	60	77	123	111	156	142	115	75	50	40
Soil Moisture Deficit	0	0	0	0	0	35	0	0	0	0	0	0
Soil Moisture Surplus	1	0	1	0	0	0	0	34	0	0	0	0

REFERENCES

Bower 1984: B. Bower, "CO_2 Rises Stretch Tree-Ring Sizes," Science News, V. 126, No. 10, p.156. September 8, 1984.

Bowen 1984: B. Bowen, "TA-54 (Area G) Precipitation," Los Alamos National Laboratory Memorandum to Naomi M. Becker dated October 25, 1984, HSE-8-951.

Chow 1964: V. T. Chow, Handbook of Applied Hydrology McGraw-Hill Book Company, New York (1964).

Cruff 1967: R. W. Cruff and T. H. Thompson, "A Comparison of Methods of Estimating Potential Evapotranspiration from Climatological Data in Arid and Subhumid Environments," US Geological Survey Water-Supply Paper 1839-M (1967).

Dunne 1978: T. Dunne and L. B. Leopold, Water in Environmental Planning, W. H. Freeman and Company, San Francisco (1978).

Foxx 1984: T. S. Foxx, G. D. Tierney, and J. M. Williams, "Rooting Depths of Plants on Low-Level Waste Disposal Sites," Los Alamos National Laboratory report LA-10253-MS.

Lane (to be published): L. J. Lane, "Surface Water Management: A User's Guide to Calculate a Water Balance Using the CREAMS Model," A Technology Transfer Document prepared for the US Department of Energy, National Low-Level Waste Management Program, Shallow Land Burial Technology, Arid, Los Alamos National Laboratory LA-10177 (to be published).

Nyhan 1978: J. W. Nyhan, L. W. Hacker, T. E. Calhoun, and D. L. Young, "Soil Survey of Los Alamos County, New Mexico," Los Alamos National Laboratory report LA-6779-MS (June 1978).

Tierney 1982: G. D. Tierney and T. S. Foxx, "Floristic Composition and Plant Succession on Near-Surface Radioactive Waste Disposal Facilities in the Los Alamos National Laboratory," Los Alamos National Laboratory report LA-9219-MS (March 1982).

US Department of Agriculture 1972: US Department of Agriculture Soil Conservation Service, NEH-4 Hydrology, US Government Printing Office (August 1972).

Viessman 1977: W. Viessman, J. W. Knapp, G. L. Lewis, and T. E. Harbaugh, Introduction to Hydrology (Harper and Row, New York, 1977).

APPENDIX III

POTENTIAL MIGRATION DUE TO PAST PRACTICES (CALCULATIONS)

PROBLEM: ESTIMATE VOLUME OF FREE LIQUID WASTE POSSIBLE IN WASTE SHAFTS FILLED PRIOR TO 1982.

Break Down of Shafts:

SHAFT NO.	DATE OPEN	DATE CLOSED	DIA. FT.
Organic-Waste Oil			
1 Organic	1980	Sept. 1983	3
4 Organic	Feb. 1975	May 1980	3
5 Waste Oil	Feb. 1975	June 1977	3
10 Waste Oil	June 1977	June 1979	3
11 WO-Solvent	Jan. 1978	July 1979	8
12 WO-Solvent	Jan. 1978	July 1979	8
17 Organic	June 1979	May 1982	3
18 Waste Oil	June 1979	June 1980	8
19 Waste Oil	April 1980	Sept. 1980	8
22 Organic			3
Acids & Bases			
2*	Feb. 1975	July 1979	3
Inorganic			
3	Feb. 1975	Nov. 1978	3
13	June 1979	May 1982	8
20	April 1980	Sept. 1983	3

Shafts filled after 1983 include vermiculite so 100 free liquid occurs.

* Chemicals not containerized.

Source of Data: Area L Waste Log Book and DWG ENG-4-4468 "Materials Disposal Areas, Area L".

MAXIMUM LIQUID VOLUMES

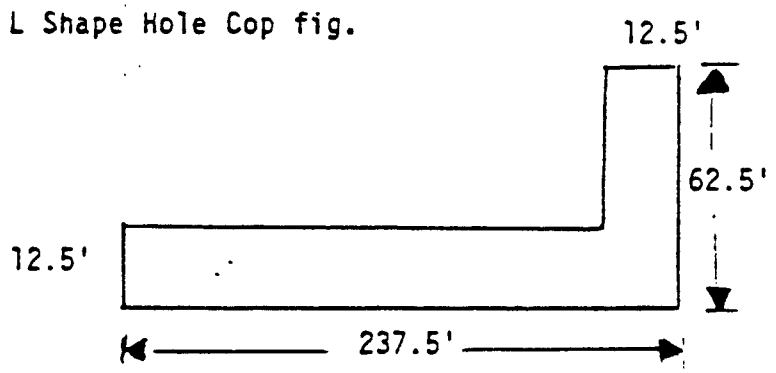
Organic & Waste Oil

6 (3') shafts x 125 cu. ft./shaft	=	750 cu. ft.
4 (8') shafts x 125 cu. ft./shaft	=	3000 cu. ft.
		3750 cu. ft.

Acid & Base 1 (3') Shaft x 125 cu. ft./shaft	=	125 cu. ft.
10 Organic 2 (3') shaft x 125 cu. ft./shaft	=	250 cu. ft.
1 (8') shaft x 750 cu. ft./shaft	=	750 cu. ft.
		1125 cu. ft.

APPROXIMATE STORAGE AREA

L Shape Hole Cop fig.



Area = 62.5' x 12.5' x (237.5225 - 12.5') x 12.5' = 3593.75 ft.^{2}

Calc. max. depth of oil penetration assumed total failure of organic storage.

Source: T.L. de Pastrovich, "Protection of Groundwater from Water from Oil Pollution", Concowe Report Nr.3/79.

FORMULA Page 13

$$D = \frac{1000\ V}{A \times R \times K}$$

Where D = Maximum Depth of Penertration, m

V = Volume of infiltrated oil M^3

A = Area of infiltration

R = Retention Capacity of Soil

k = Approx. viscosity correction factor

K = 0.5 for Low Vis, Eg. Gasoline
1.0 for Kerosene, Gas, Oil, etc.
2.0 for Fuel Oil, No. 1 & Heavier

VALUES FOR R

Soil	R L/M³ Oil Retention Capacity
Stone/Coarse Gravel	5
Gravel, Coarse Sand	8
Coarse Sand	15
Medium - Fine Sand	25
Fine Sand, Silt	40

V M^3 Oil $= \frac{3750 \text{ cu.ft.} \quad M^3}{35.31 \text{ cu.ft.}} = 106.2 \text{ m}^3$

A Area In M^2 $= \frac{3593.75 \text{ ft}^2 \quad M^2}{10.76 \text{ ft}^2} = 333.99 \text{ m}^2$

$= 334 \quad M^2$

Log indicates that waste is mainly waste oil; to be conservative, assume low vis.: k = 0.5

Subsurface soil closest to fine sand R = 25

$$D = \frac{1000 \ (106.2 \ M^3)}{334 \ M^2 \times 25 \ L/M^3 \times 0.5} = 25.4 \text{ m } (83.3 \text{ ft})$$

Sensitivity

Assume R = 5 Coarse Gravel

$$D = \frac{1000 \ (106.2 \ m^3)}{334 \ m^2 \times 5 \ L/M^3 \times 0.5} = 127.2 \text{ m } (417.3 \text{ ft.})$$

CALCULATE SHAFT VOLUMES

3'Ø H 60'

$Vol = \pi R^2 (H)$

$= 3.141 (3/2')^2 (60')$

$= 424 \ Ft^3$

8'Ø H 60'

$Vol = \pi R^2 (H)$

$= 3.141 (8/2)^2 (60')$

$= 3015 \ Ft^3$

Gross Shaft Volumes

Organic and Waste Oil

6 (3') Shafts x 424 ft^3/Shaft	=	2544 ft^3
4 (8') Shafts x 3015 ft^3/Shaft	=	12060 ft^3
SUBTOTAL	=	14604 ft^3

Acid and Base

1 (3') Shaft x 424 ft^3/Shaft	=	424 ft^3

Inorganic

2 (3') Shafts x 424 ft^3/Shaft	=	848 ft^3
1 (8') Shaft x 3015 ft^3/Shaft	=	3015 ft^3
SUBTOTAL	=	4287 ft^3

TOTAL = 18891 ft^3

PACKING PROCEDURE: In an 8 ft. Ø shaft 5-6 55 gal. drums are placed in a layer with 6 inches of crushed tuff between layers.

In a three ft. Ø shaft 1-55 gal. drums forms a layer with 6 inches of crushed tuff.

To maximize volume prediction, assume 6 drums per layer.

Drum Dimension: 22 1/4" Ø x 33 1/4" Ht. Vol. 55 Gal.
(By Measurement)

A Layer = 33 1/4" + 6" Dirt = 39 1/4"

Assume 60 ft. shaft less 3 ft. topfill.

$$\text{Possible Layers} = \frac{60\text{ ft.} - 3\text{ ft.}}{39\ 1/4\ \ 11/12\ \ 11/1} = 17.4 \approx 17$$

Vol. per 8'Ø Shaft

$$\text{Cubic ft.} = \frac{6\text{ Drums}}{\text{Layer}} \quad \frac{55\text{ Gal.}}{\text{Drum}} \quad \frac{\text{Cu. Ft.}}{7.481\text{ Gal.}} \quad \frac{17\text{ Layers}}{\text{Shaft}}$$

= 749.9 Cu. Ft.

= 750 Cu. Ft.

Vol. per 3'Ø Shaft

$$\text{Cubic Ft.} = \frac{1\text{ Drum}}{\text{Layer}} \quad \frac{55\text{ Gal.}}{\text{Drum}} \quad \frac{\text{Cu. Ft.}}{7.481\text{ Gal.}} \quad \frac{17\text{ Layers}}{\text{Shaft}}$$

= 124.9 Cu. Ft.

= 125 Cu. Ft.

Ref. J.H. Abrahams, Jr., "Physical Properties of and Movement of Water in Bandelier Tuff"

USGS, Open File Report 1963, Albuquerque, NM.

From 0-8% Vol. H_2O is Redistributed by Diffusion
8-22% By Capillary and Gravity
22-41% Gravity by Drainage

Below 10 ft. moisture content is 0.2 - 3.2% Vol.

Calculate depth of rock associated with 4.8% increase in moisture to 8%.

∴ 1125 cu. ft. = 8-3.2% of Total Volume.

$$\text{Depth} = \frac{1125 \text{ cu. ft.} \quad 1.0 \text{ Total}}{0.048\ H_2O \quad 3593.75\ ft^2} = 6.5 \text{ ft.}$$

Calculated 1% Change.

$$\text{Depth} = \frac{1125 \text{ cu. ft.} \quad 1.0 \text{ Total}}{0.01\ H_2O \quad 3593.75\ ft^2} = 31.3 \text{ ft.}$$

Calculated 100 ft. = % Moisture Change.

$$\% = \frac{1125 \text{ cu. ft.}}{3593.7\ ft^2 \times 100 \text{ ft.}} \times 100\% = 0.3\%$$

Calculated @ 950 ft. % Moisture Change.

$$\% = \frac{1125 \text{ cu. ft.}}{3593.7\ ft.^2 \times 950} \times 100\% = 0.325\%$$

Ultimate Fate of Oil

Ref. 1. American Petroleum Institute, 1972, "The Migration of Petroleum Products in Soil and Ground Water": API Publication 4149, Washington, D.C.,

Ref. 2. P.L. McCarty, M. Reinhard, B.E. Rittman, "Trace Organics in Ground Water".

Ref. 3 Biodegradation producers Microbial Cells, H_2O, CO_2 & H_2O.

Aerobic Bacteria - Need Oxygen, have been found in pourous (permiable) formations several thousand feet down.

Anaerobic Bacteria - Found in subsurface but results in slower decomposition rates.

Ref. 4. Mechanism Biofilm degradation or biofilm kenetics - nutrients rate limiting.

Consider Aqueous Liquids

Volume 1125 cu. ft.

$$LB\ H_2O = \frac{1125\ \text{cu. ft.}\quad 62.4\ \text{lb}}{\text{cu. ft.}} = 70{,}200\ \text{lbs}$$

Consider Rock Density 72 - 115#/cu. ft.
Moderately Welded (Source: Purtymun)

Surface Area 3593.75 ft.

APPENDIX O

VADOSE ZONE MONITORING PROGRAM

INVESTIGATION AND CONSTRUCTION TO ESTABLISH A MONITORING SYSTEM

I. INTRODUCTION

The proposed investigation and construction is to be performed to establish a monitoring system at Area L (Chemical Waste Disposal Area). Area L is located on Mesita del Buey, a narrow southeast trending mesa bounded on the north by Canada del Buey and on the south by Pajarito Canyon (Fig IV-1). The surface of the mesa is underlain by about 250 ft of ashflow and ashfall of rhyolite tuff (depth to top of aquifer 950 ft).

The study will (1) establish observation wells in adjacent canyon; (2) establish a system to monitor possible infiltration of water from precipitation (possible transport mechanism for contaminants) and (3) establish through test drilling, sample collection, and analyses of samples of transport of oils or chemicals has occurred from existing pits or shafts.

A. Observation Wells

Six observation wells are scheduled for construction, three in Canada del Buey and three in Pajarito Canyon. In each canyon, there will be one well upgradient from Area L, one opposite Area L, and one below Area G (Fig IV-1). Effort will be made to locate the wells in the thickest section of alluvium. Thickness of alluvium in Canada del Buey ranges from 3 to 4 feet, while in Pajarito Canyon the thickness is less than 25 ft. Water in the alluvium is seasonal and occurs only after prolonged runoff from snowmelt. The wells will be drilled with an rig using a 7-inch auger. The wells are to be completed at the alluvium-bedrock contact, and will be cased with 4-inch PVC casing. The lower 8 ft of the

casing is perforated with 1/2-inch diameter (drilled) holes and wrapped with stainless steel screen. The annular space between the casing and the hole wall is to be filled with 1/4 to 1/2 inch gravel to within 3 ft of land-surface. The upper 3 ft of the annular space will be filled with cement. The well head will be completed with a locking cap.

B. Moisture Access Holes

Five moisture access holes will be constructed (four within Area L and one on the mesa outside of the area) to measure the distribution and possible movement of moisture in the tuff (Fig IV-2). The holes will be constructed using a 3-inch auger and cased to a depth of about 23 ft (depth of hole) with aluminum tubing. The holes are to be monitored using moisture/density equipment (Campbell Pacific Nuclear Corp., 501 Depthprobe Moisture/density gauge). The use of moisture/density equipment has been used in the past at Los Alamos to determine distribution and movement of moisture and density in the tuff.

C. Test Drilling

Four core holes are to be drilled as part of the investigation to determine possible movement of contaminants from pits or shafts. One core hole (~20 ft deep) will be drilled to obtain cores for background data out side Area L. The remaining three holes are to be drilled in Area L (Fig IV-2). Locations are : (1) adjacent to seepage pit B (liquid lithium hydroxide release), (2) adjacent to shaft 12 (oil in drums), and (3) adjacent to shaft 24 (vermiculite-oil mixture in drums). Holes are to be drilled using a hollow stem auger to a depth of about 100 ft. Drive split spoon or auger cores will be collected at about a 10 ft. interval.

Cores are to be analyzed to determine if migration of chemicals or oils has occurred. Initial core analyses will be determined as described

below; however, unused portions of the cores will be retained if further analyses are necessary.

1. Moisture content shall be determined of all cores.

2. Cores taken from near the seepage pit will be analyzed for Li, Cr, Cu, NH_4F_2, F, and TDS (Total Dissolved Solids).

3. Cores taken near shafts will be analyzed for total organic carbon.

4. The set of cores collected outside of Area L and analyzed for the above constituents or compounds to provide background for comparison of analyses from within Area L.

Upon completion of drilling and sampling, the holes will be used to determine if vapor migration (vapor from organic compounds) of organics from the shafts or pits exists in the tuff. Samples will collected by pumping air from the holes or through the use of packers to pump air from selected depths within the holes. The methods employed will depend on results of analyses of cores.

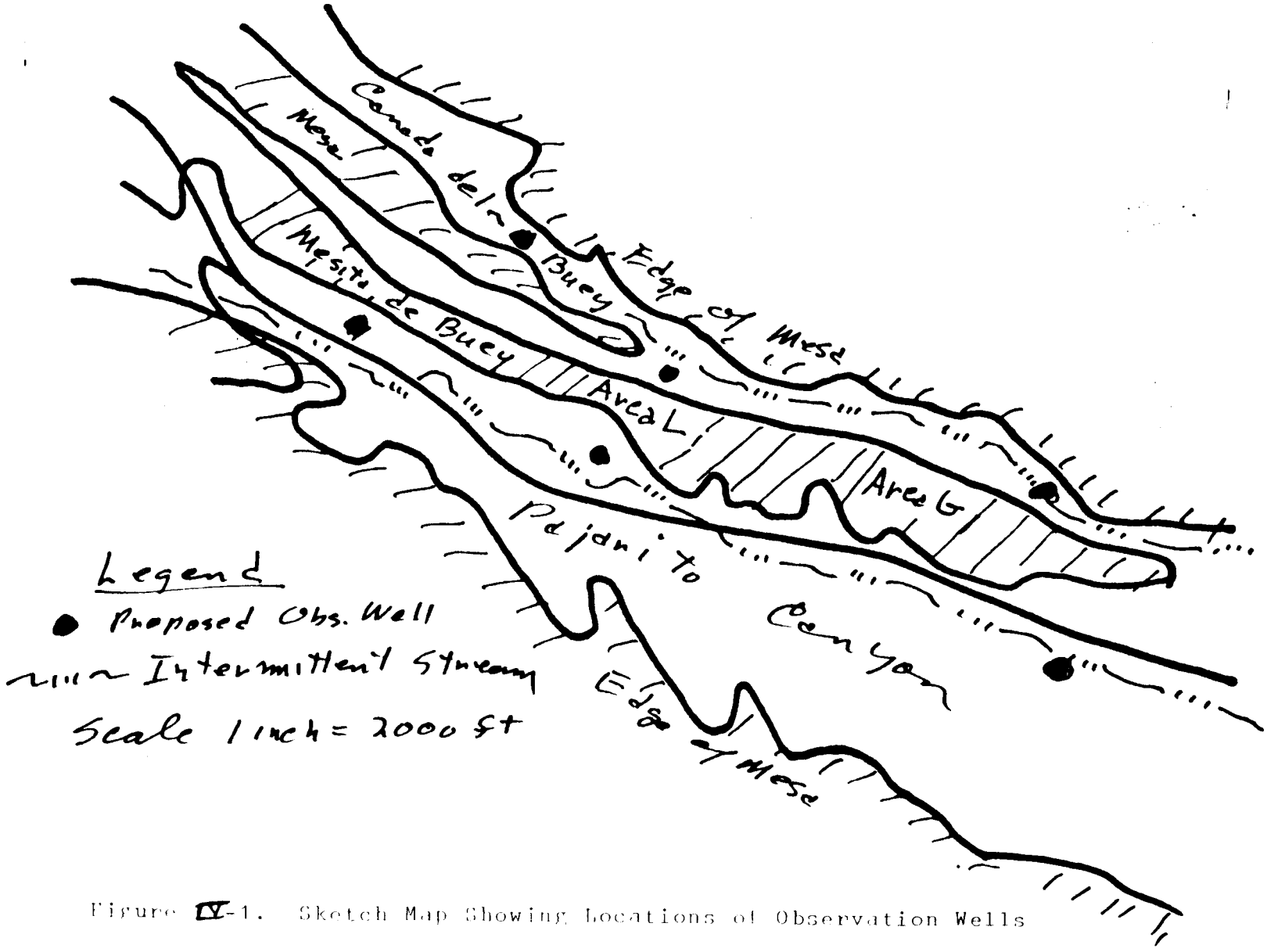
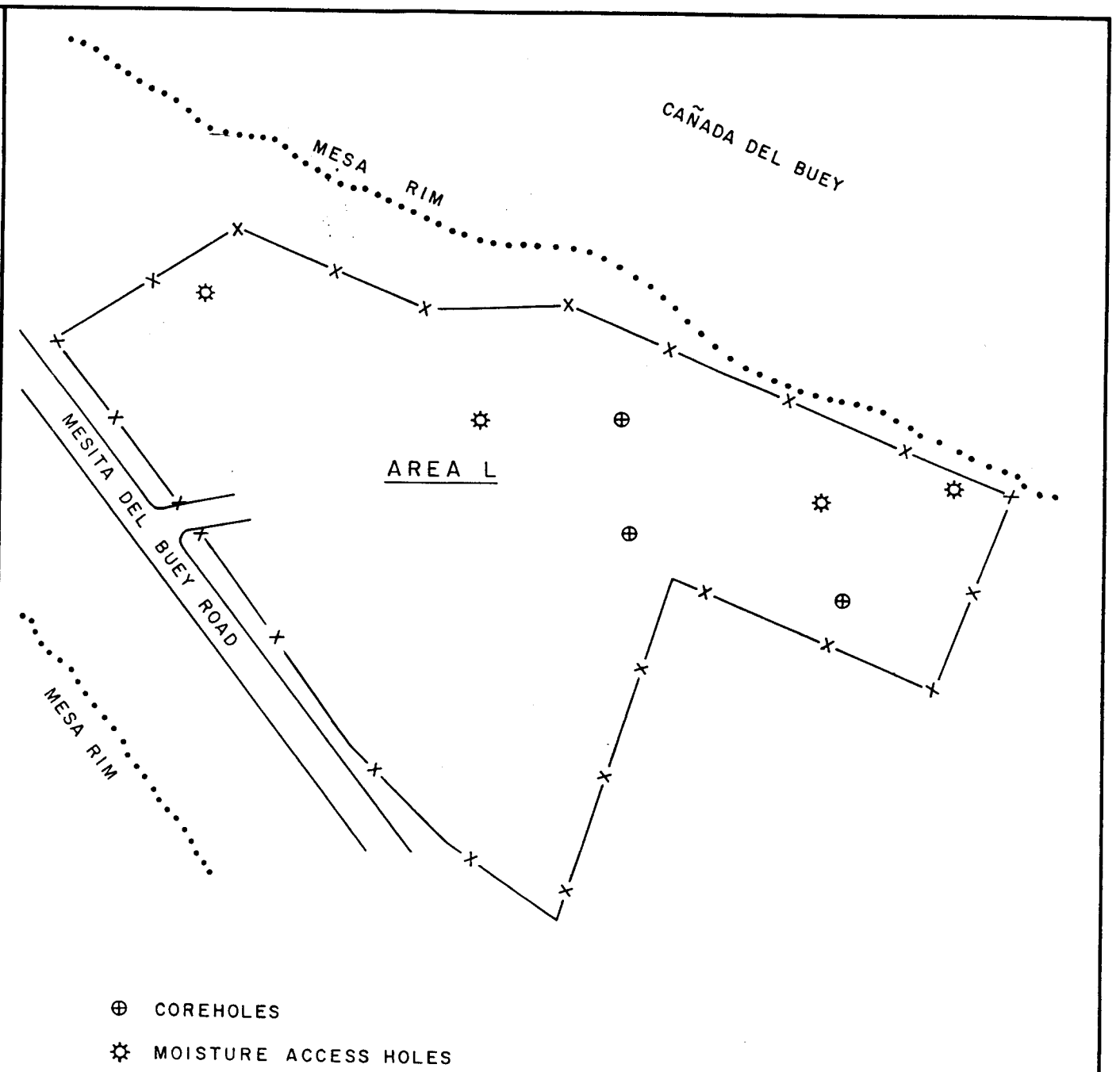


Figure IV-1. Sketch Map Showing Locations of Observation Wells



50 0 100 FEET
SCALE

FIGURE IV-2

LOCATION OF
VADOSE ZONE MONITORING
AND CORE HOLES AT AREA L

PREPARED FOR

LOS ALAMOS NATIONAL LABORATORY
LOS ALAMOS, NEW MEXICO

DRAWING NUMBER
CHECKED BY
APPROVED BY
MJG 2/27/83
WN BY

© 1984 IT CORPORATION
ALL COPYRIGHTS RESERVED

65360

"Do Not Scale This Drawing"

IT ... Creating a Safer Tomorrow

APPENDIX P

PORTIONS OF THE LOS ALAMOS HEALTH AND SAFETY MANUAL PERTAINING TO WASTE MANAGEMENT ACTIVITIES

Hazardous Materials

Introduction

Research and development activities often require the use of material(s) that may endanger the health of employees who use such materials or who work nearby. To maintain employee exposures as low as reasonably achievable, it is essential that the use of any hazardous material be evaluated by the Health, Safety, and Environment Division; effective controls be established; and each affected employee be provided with the appropriate training and technical information to safely use the material.

Definitions

Hazardous Materials - potentially harmful materials that are or may generate or release toxic, infectious, carcinogenic, asphyxiating, irritating, corrosive, or flammable/combustible dusts, fumes, mists, vapors, gases, or fibers, which could endanger Laboratory employees, the public, the environment, or facilities. Such generation or release may occur during manufacture, handling, machining, transport, storage, use, or disposal.

Material Safety Data Sheet (MSDS) - an organized, authoritative source of health, safety, and environmental information on hazardous materials that details trade name and product identification; ingredients and hazards; physical data; fire and explosive data; reactivity data and health hazard information; spill, leak, and disposal procedures; special protection information; and other special precautions.

Controls - methods, procedures, and equipment used to minimize exposures to Laboratory employees, the public, the environment, and facilities. The four types of controls are substitution with less hazardous materials, engineering controls, administrative controls, and personal protective equipment.

Evaluation of the Operation

Group leaders must evaluate their operations and establish and maintain measures to ensure that personnel exposures to hazardous materials are kept as low as reasonably achievable. It is imperative that the Health, Safety, and Environment (HSE) Division be contacted for an evaluation of proposed processes involving hazardous materials *before* the process is initiated, preferably during the planning stages. The HSE Division determines the risks associated with hazardous materials, helps the group leaders determine the appropriate control measures for a particular operation, and conducts periodic surveys to help ensure that appropriate control measures are in effect.

Building Modifications/ Major Operational Changes

Building modifications and major changes to operations, materials, equipment, or facilities must be reviewed by the HSE Division and Facilities Engineering (ENG) Division to ensure that those activities will not expose employees to hazardous materials.

Training and Use

Working with HSE Division personnel, group leaders must ensure that their employees (1) are aware of the risks associated with the use of hazardous materials, (2) are trained in and follow the health and safety procedures necessary to prevent or mitigate exposures to those materials, and (3) receive the appropriate Material Safety Data Sheet (MSDS), or other toxicological information. Only trained employees shall be allowed to work with hazardous materials to help ensure safe use.

NOTE: Material Safety Data Sheets are secured from the manufacturer and disseminated by Industrial Hygiene to the operating groups.

Inventories and Audits

The Materials Management Division (MAT) and its chemical contractor, VWR Scientific Inc. (VWR), ensure compliance with regulations for labeling and storing stock items, and participate in the audit of toxic chemical use by maintaining inventory and issue data on toxic materials in Stock. The Industrial Hygiene Group (HSE-5) works with MAT/VWR to audit toxic chemical use at the Laboratory and to help ensure compliance with applicable regulations.

Procurement

Industrial Hygiene provides MAT/VWR with a list of potentially hazardous materials. Using this list, MAT/VWR screens purchase requests and forwards those identified as involving potentially hazardous materials to Industrial Hygiene for a determination of the potential hazard to the user. If Industrial Hygiene determines that adequate procedures and equipment will not be in effect before planned use of a particular material, MAT/VWR will delay issuance of that material. MAT/VWR assists Industrial Hygiene by obtaining the appropriate toxicological information from hazardous material suppliers. In addition, MAT/VWR ensures that outgoing shipments of hazardous materials are packaged and shipped according to applicable regulations.

Receipt of Hazardous Materials

Group leaders whose operations involve the use of hazardous materials must identify at least one employee and alternate(s) as authorized receivers of hazardous materials at each receiving location, and provide MAT/VWR with a current list of those employees. The requesting group must ensure that their facilities are adequate and their authorized personnel are properly trained for receipt of hazardous materials. MAT/VWR will deliver hazardous materials *only* to designated or identified authorized receivers.

NOTE: MAT will not deliver potential chemical carcinogens. Such materials must be picked up by an authorized user. (See Administrative Requirement 6-3, "Use of Potential Chemical Carcinogens.")

Disposal

Group leaders must ensure that disposal of hazardous materials follows approved health and safety procedures. The Waste Management Group (HSE-7) ensures that disposal of hazardous materials conforms with applicable regulations.

Reporting Exposure Incidents

Exposures to hazardous materials must be reported to the Health, Safety, and Environment Division acccording to the procedures specified in Administrative Requirement 1-1, "Accident/Incident Reporting."

References

"Accident/Incident Reporting," Administrative Requirement 1-1, in *Health and Safety*, Los Alamos National Laboratory Manual, Chapter 1 (August 1984).

"Environmental Protection, Safety, and Health Protection Program for DOE Operations," Department of Energy Order 5480.1A (August 13, 1981).

"Explosives," Administrative Requirement 6-6, in *Health and Safety*, Los Alamos National Laboratory Manual, Chapter 1 (August 1984).

"Occupational Safety and Health Program for Government-Owned Contractor-Operated Facilities," Department of Energy Order 5483.1 (April 13, 1979).

"Use of Potential Chemical Carcinogens," Administrative Requirement 6-3, in *Health and Safety*, Los Alamos National Laboratory Manual, Chapter 1 (August 1984).

Referrals

Industrial Hygiene Group (HSE-5), 7-5231

Waste Management Group (HSE-7), 7-4301

Facilities Engineering (ENG) Division, 7-6131

Biological Monitoring for Hazardous Materials

Introduction

Biological samples are collected from Laboratory employees who routinely work with, or may be exposed to, certain hazardous materials. These samples are analyzed and used to monitor employee exposure and evaluate engineering controls designed to reduce such exposure. The frequency and type of sampling depend on the nature and intensity of potential exposure to the hazardous material.

Definitions

Biological Monitoring - the systematic collection and analysis of a sample (such as blood, urine, hair, or breath) from employees potentially exposed to hazardous materials. Such monitoring helps determine the amount of a given material, metabolite, or antibody present in a biological system.

Biological Sample - specimen of blood, urine, hair, feces, breath, or other human material collected for analysis.

Hazardous Materials - potentially harmful materials that are or may generate or release toxic, infectious, asphyxiating, carcinogenic, irritating, corrosive, or flammable/combustible dusts, fumes, mists, vapors, gases, or fibers, which could endanger Laboratory employees, the public, the environment, or facilities. Such generation or release may occur during manufacture, handling, machining, transport, storage, use, or disposal.

Determining the Need for Monitoring

The Industrial Hygiene Group (HSE-5) determines if biological monitoring is needed and notifies the employees and appropriate management if their participation in the program is required or just advisable. Sampling may be as follows:

- urine sampling to monitor exposure to some metals, anions, and organic compounds,
- blood sampling to monitor exposure to some metals, solvents, and gases,
- breath sampling to monitor exposure to some organic vapors and various gases.

Employee Participation

Laboratory employees working with hazardous materials in amounts that may be harmful to their health must participate in the biological monitoring program, as determined appropriate by the Health, Safety, and Environment (HSE) Division.

Collecting and Analyzing Samples

The Occupational Medicine Group (HSE-2) collects and analyzes biological samples during routine physical examinations and as needed after real and suspected exposures to evaluate the health status of employees.

The HSE Division provides instructions, sampling containers, and delivery and pickup of samples that do not require medical assistance (for example, urine, feces, and breath samples).

The Health and Environmental Chemistry Group (HSE-9) performs chemical analyses of the materials or their metabolites, maintains records, interprets the data, and reports the results, as appropriate.

Records

Results of monitoring activities and the interpretations of those results are recorded in the employee's medical or exposure records. These records are available to the employee upon written request to Occupational Medicine.

References

"Biological Sample Monitoring," Technical Bulletin 606, in *Health and Safety*, Los Alamos National Laboratory Manual, Chapter 1 (August 1984).

"Hazardous Materials," Administrative Requirement 6-1, in *Health and Safety*, Los Alamos National Laboratory Manual, Chapter 1 (August 1984).

Referrals

Occupational Medicine Group (HSE-2), 7-7251

Industrial Hygiene Group (HSE-5), 7-5231

Field Services Section of HSE-5, 7-1206

Health and Environmental Chemistry Group (HSE-9), 7-3269

Flammable and Combustible Liquids

Introduction

The Laboratory uses flammable and combustible liquids as fuels, reagents, cleaning agents, solvents, etc. To minimize the risks of fire and explosion and to ensure workplace safety, this administrative requirement specifies the procedures for using and storing such liquids at the Laboratory.

Definitions

Combustible Liquid - a liquid with a flash point at or above 100°F (37.8°C). Combustible liquids are subclassified as follows:

- **Class II and IIIA Liquids** have flash points above 100°F (37.8°C) but below 200°F (93.4°C). Examples: turpentine and kerosene.
- **Class IIIB Liquids** have flash points at or above 200°F (93.4°C). Examples: mineral oil and transformer oils.

Flammable Liquid - a liquid with a flash point below 100°F (37.8°C) and a vapor pressure not exceeding 40 pounds per square inch (absolute) at 100°F. Flammable liquids are known as Class I liquids, with the following three subclasses:

- **Class IA Liquids** have flash points below 73°F (22.8°C) and boiling points below 100°F (37.8°C), Examples: gasoline and ethyl ether.
- **Class IB Liquids** have flash points below 73°F (22.8°C) and boiling points at or above 100°F (37.8°C). Examples: acetone and benzene.
- **Class IC Liquids** have flash points at or above 73°F (22.8°C) but below 100°F (37.8°C). Examples: amyl alcohol, xylene, and some diesel fuels.

Flash Point - the minimum temperature at which a liquid gives off vapor in sufficient concentration to form an ignitable mixture with air near the surface of the liquid.

Use

Safe Means of Exit. Group leaders must ensure that flammable or combustible liquids are never used in a place or situation (for example, limited egress/confined spaces) unless the user and fellow employees could escape safely in the event of a spill or fire.

Fume Hoods/Ventilation and Ignition Sources. Flammable liquids must be used in a fume hood or under local exhaust ventilation. Before dispensing or using flammable liquids, supervisors and employees must ensure that ventilation is adequate and ignition sources (for example, spark-producing devices or pilot lights) are eliminated.

Procurement

Procurement of flammable or combustible liquids must be limited to quantities that can be used in a reasonable amount of time (usually within 1 month).

Disposal

Flammable or combustible liquids that are no longer needed or are not in active use must be disposed of promptly and safely. For specific disposal instructions, see Administrative Requirement 10-3, "Nonradioactive Chemical Waste."

Storage

The following types of containers are used by the Laboratory to ensure the safe storage of flammable or combustible liquids.

Safety Cans. Only safety cans that have been listed and labeled by the Underwriters Laboratories Inc. (UL) or approved and labeled by Factory Mutual Research Corporation (FM) shall be used at the Laboratory. Class I flammable liquids must be stored in approved safety cans when quantities exceed 1 quart or 1 liter unless the liquid would be rendered unfit for its intended use by contact with metal and the users' process would require either (1) more than 1 quart of a Class I liquid of a single assay lot to be used at one time, or (2) the maintenance of an analytical standard liquid of an ultra-pure quality.

Drums. Containers used to ship flammable or combustible liquids must be approved Department of Transportation (DOT) shipping containers (drums, DOT 17E) and the liquids within them must be dispensed only into approved safety cans that are electrically bonded to the drums.

Cabinets. Any cabinet used to store flammable liquids must be UL-listed or FM-approved, closed, yellow metal, and clearly marked with the words "DANGER: FLAMMABLE LIQUIDS" and with the Laboratory precautionary sticker. Contact the Loss Prevention Section of ENG-4 to obtain these stickers.

Although not a requirement, combustible liquids also should be stored in these cabinets.

When several *small bottles* are used to store more than 1 gal. of flammable liquid (for example, chemically pure or reagent-grade liquids), the small bottles also must be kept in an approved safety cabinet, storage room, or shed.

NOTE: Nonflammable solvents must not be stored in these cabinets.

Storage Rooms. Large quantities (for example, 50 gal. or more) that are not immediately needed for an operation/activity must be stored in approved flammable liquid storage rooms or in outside sheds that are noncombustible.

NOTE: Multiple cabinets are not a substitute for a storage room or outside shed. Only limited quantities of flammable or combustible liquids are allowed outside the flammable liquid storage rooms (contact the Loss Prevention Section).

Storage of more than 60 gal. of flammable or combustible liquids must be approved by the Loss Prevention Section.

Labeling

Safety Cans. When storing flammable liquids, the safety cans must

- be painted red,
- be clearly marked with the words "DANGER: FLAMMABLE LIQUIDS,"
- be labeled with the name of the flammable liquid, and
- have a yellow stripe around the safety can.

Exceptions must be covered in an approved standard operating procedure.

NOTE: Do not store nonflammable solvents in these red-painted cans.

Other Containers. Pint bottles and other containers of flammable liquids must have the contents properly labeled and, when the flash point is less than or equal to 100°F, have the words "DANGER: FLAMMABLE" marked on the container.

References

"Flammable and Combustible Liquids" 29 CFR 1910.106, Occupational Safety and Health Administration (January 1, 1976).

"Flammable and Combustible Liquids Code," National Fire Protection Association (NFPA) Standard No. 30 (1981 or latest edition).

"Flammable and Combustible Liquids Code Handbook," National Fire Protection Association (NFPA) (1982).

"Nonradioactive Chemical Waste," Administrative Requirement 10-3, in *Health and Safety*, Los Alamos National Laboratory Manual, Chapter 1 (August 1984).

"Standard on Fire Protection for Laboratories Using Chemicals," National Fire Protection Association (NFPA) Standard No. 45 (1982 or latest edition).

Referrals

Safety Group (HSE-3), 7-4644

Loss Prevention Section of ENG-4, 7-9045

Nonradioactive Chemical Waste

Introduction

This administrative requirement specifies the rules and general procedures for disposal of nonradioactive liquid and solid chemical wastes at the Laboratory, thus ensuring the protection of Laboratory personnel, the public, and the environment, as well as compliance with Federal and state regulations.

Chemical wastes commonly generated at the Laboratory include all types of laboratory research chemicals, oils, solvents, beryllium, asbestos, carcinogens, compressed gases, and other nonradioactive solid or liquid wastes contaminated with hazardous chemicals. *NOTE: High explosive wastes are a special case and are not included in this document.*

Definitions

Hazardous Chemical Waste - any chemical or mixture of chemicals that is intended for disposal and is corrosive to living tissue; is toxic, flammable, carcinogenic, teratogenic, mutagenic, or infectious; or in any way poses a present or potential hazard to human health or the environment.

Identification of Hazardous Wastes

Group leaders must ensure that the potentially hazardous waste materials in their work areas are identified and that the Industrial Hygiene Group (HSE-5) is contacted if workers could be exposed while handling, treating, or disposing of such materials.

Guidance in identifying hazardous chemicals is provided by the health physics staff (HSE-1, -10, and -11), Industrial Hygiene, and the Waste Management Group (HSE-7), as well as by the following sources:

- 40 CFR 712 (as proposed), which defines toxic substances under the terms of the Toxic Substances Control Act,
- 40 CFR 261, which defines the characteristics and provides a listing of hazardous wastes under the terms of the Resource Conservation and Recovery Act,
- 40 CFR 116, which defines hazardous substances under the terms of the Clean Water Act, and
- 40 CFR 117, which defines reportable quantities for hazardous substances under the Clean Water Act.

Determination of Appropriate Disposal Methods

Before initiating an operation that will either generate a new hazardous waste or increase the volume of existing wastes, the originating group should discuss available treatment/disposal options with Waste Management staff. In most cases, the existing waste-management facilities, technology, and manpower at the Laboratory will be able to

handle the wastes. If not, Waste Management staff will help identify disposal options, including the use of offsite treatment facilities. The originating group however, may need to allocate the appropriate personnel, funding, and facilities.

Training

Group leaders must ensure that their operating personnel are trained in and follow Waste Management policies and procedures appropriate to their work.

Chemical Waste Coordinator

A Chemical Waste Coordinator must be identified for each waste-generating group or site, as applicable, to serve as the primary contact with Waste Management staff. The Chemical Waste Coordinator must ensure the safe use of chemical waste collection areas or cabinets and the pre-disposal treatment of the wastes, as determined appropriate by Waste Management. *NOTE: The Chemical Waste Coordinator may be the same person as the Spill Coordinator identified in Administrative Requirement 9-4, "Oil, Chemical, and Airborne Releases."*

Waste Reduction

Generation of chemical waste must be kept as low as reasonably achievable. The groups generating the wastes can reduce the volume by obtaining only the minimum amount needed to perform a specific task. Whenever possible, unopened containers of chemicals should be returned to Chemical Stock (VWR) rather than disposed of. Waste Management staff are available to help the originating groups determine waste-reduction procedures.

Standard Operating Procedures

Operations involving the handling and disposal of beryllium, carcinogens, and suspected carcinogens require a standard operating procedure (SOP). (See Administrative Requirement 1-3, "Standard Operating Procedures and Special Work Permits.") In addition, an SOP may be required for operations involving significant quantities of other particularly toxic or hazardous materials, as determined by Waste Management. If an SOP is required, Waste Management review of the SOP must precede initial implementation and occur annually thereafter.

The SOPs must include procedures for segregating, treating, packaging, and shipping the wastes, as well as special problems involved. Waste Management staff are available to help the originating office prepare these SOPs.

Initiating the Disposal Operations

When chemical wastes are ready for disposal, the originating group shall complete a Chemical Waste Disposal Request (HS Form 10-3A) and send the form to Waste Management. Upon receipt of the form, Waste Management determines the packaging, handling, treatment, transportation, and disposal requirements, based on the type and quantity of the waste involved. The originating group may be required to complete some pre-disposal treatment/chemical analysis of the wastes before Waste Management will take over the disposal operations.

Packaging

Hazardous waste must be packaged in Waste Management-approved, leakproof containers to ensure its safe handling, transportation, and disposal.

Liquids Exceeding 1 Gallon. Containerized liquid exceeding 1 gallon must not be disposed of until it has been solidified; absorption on vermiculite is an acceptable pre-disposal treatment method in this case.

Small Quantities of Liquids/Solids. Liquids less than 1 gallon or solids generally will be packaged by Waste Management for disposal.

Leaks and Spills

See Administrative Requirement 9-4, "Accidental Oil, Chemical, and Airborne Releases."

Special Disposal Considerations

Drains. Never pour chemical waste down a drain without prior approval from Waste Management.

Gases. Never vent gases without prior approval from Waste Management.

Cyanides, Chromates, and Corrosive Substances. Before cyanides, chromates, and corrosive substances are disposed of, they must be treated by Waste Management to remove the hazardous properties.

Reactive Chemicals. Reactive chemicals (for example, pyrophoric or water-reactive substances) must be rendered nonreactive before disposal. This treatment must be performed with the prior approval of Waste Management. If it is determined that neither the originating group nor Waste Management can safely perform this pre-disposal treatment, Waste Management will help the operating group determine alternate disposal methods.

Oils. Waste Management must be notified before draining oil from any electrical or hydraulic system because polychlorinated biphenyls (PCBs) may be present. (See Administrative Requirement 10-4, "Polychlorinated Biphenyls.") The operating group must determine whether such oils have been contaminated with PCBs or radioactive substances. Contact Waste Management if PCB contamination is possible; contact the health physics staff if radioactive contamination is suspected. Unless the oils will be recycled, they must be packaged as described above.

Recyclable Materials

Where feasible, chemical wastes should be recycled or salvaged according to the appropriate Laboratory procedures. Those materials listed below are prime recycling candidates.

Elemental Mercury. Generally, elemental mercury must be recovered rather than disposed of. Contact the Decontamination Section (7-5420) of the Radiation Protection Group (HSE-1) for collection.

Gas Cylinders. All gas cylinders must be returned to the Liquid and Compressed Gas Processing Center (MAT-1) for retesting and refilling. To facilitate recycling operations, cylinders must remain labeled at all

times. If a cylinder cannot be reused, notify Waste Management for assistance in disposing of it.

Batteries. Paper or other nonconducting material must be used to package batteries individually before the batteries are sent to Laboratory Salvage (MAT-14).

Oil or Solvents. Bulk quantities of oil or solvents should be recycled rather than disposed of. Contact Waste Management for specific guidance.

References

"Accidental Oil, Chemical, and Airborne Releases," Administrative Requirement 9-4 in *Health and Safety*, Los Alamos National Laboratory Manual, Chapter 1 (August 1984).

"Chemical Information Rules," 40 CFR 712 (most recent).

"Designation of Hazardous Substances," 40 CFR 116 (most recent).

"Determination of Reportable Quantities for Hazardous Substances," 40 CFR 117 (most recent).

"Hazardous and Radioactive Mixed Waste Management," Department of Energy Order 5480.2 (most recent).

"Hazardous Waste Act," New Mexico Laws 1977, Chapter 313 (most recent).

"Identification and Listing of Hazardous Waste," 40 CFR 261 (most recent).

"Identification, Classification, and Proposed Regulation of Toxic Substances Posing a Potential Occupational Carcinogenic Risk," 29 CFR 1980 (most recent).

"Occupational Safety and Health Standards," (OSHA Regulations), 29 CFR 1910 (most recent).

"Polychlorinated Biphenyls," Administrative Requirement 10-4, in *Health and Safety*, Los Alamos National Laboratory Manual, Chapter 1 (August 1984).

"Radioactive Solid Waste," Administrative Requirement 10-2, in *Health and Safety*, Los Alamos National Laboratory Manual, Chapter 1 (August 1984).

"Resource Conservation and Recovery Act, Subtitle C," 90 US Statutes at Large, p. 2795 (1976).

"Standard Operating Procedures and Special Work Permits," Administrative Requirement 1-3, in *Health and Safety*, Los Alamos National Laboratory Manual, Chapter 1 (August 1984).

Referrals

Radiation Protection Group (HSE-1), 7-5296

Decontamination Section of HSE-1, 7-5420

Industrial Hygiene Group (HSE-5), 7-5231

Waste Management Group (HSE-7), 7-4301
Liquid Waste Section of HSE-7, 7-5834
Solid Waste Section of HSE-7, 7-5397
Regulatory Affairs Section of HSE-7, 7-7957
Chemistry Health Protection Group (HSE-10), 7-7218
Accelerator Health Protection Group (HSE-11), 7-5890

Forms HS Form 10-3A, Chemical Waste Disposal Request

Polychlorinated Biphenyls

Introduction

Although the manufacture of polychlorinated biphenyls (PCBs) was banned in 1977 because of environmental and health hazards, many PCB-containing materials and equipment are still used at the Laboratory. Thus, special care must be taken in their use and disposal. This administrative requirement describes the proper handling and disposal of PCBs at the Laboratory, including identification of PCBs and procedures to be followed in the event of leaks and spills.

Definitions

Polychlorinated Biphenyl (PCB) - any chemical that is limited to the biphenyl molecule and has been chlorinated to varying degrees.

PCB Article - an article contaminated with PCBs, for example, capacitors, rags, debris, soil, and drained or rinsed transformers.

PCB Liquid - liquid containing more than 50 ppm by weight polychlorinated biphenyls.

Verification of PCB Presence

Assume Contamination. Any container, article, debris, or liquid that might be contaminated with polychlorinated biphenyls (PCBs) must be treated as contaminated until the absence of PCBs is verified by analysis. Oil in capacitors or transformers, notably mineral oil transformers, must be considered PCB-contaminated unless labeled otherwise.

Testing. If the operating group is uncertain about the presence of PCBs, the Waste Management Group (HSE-7) will collect a sample and submit it to the appropriate laboratory for analysis. The originating group will be backcharged for analytical costs. Test results will be sent to the originating group.

Labeling

Items Containing PCBs. Operating groups shall ensure that items containing PCBs are conspicuously labeled (Chemical Stock, LG 4133 1/C-8 and 4134 1/C-9). Exemptions from this labeling requirement are

- electrical ballasts for fluorescent lamps,
- capacitors on small electric motors, and
- small capacitors (less than 3 lb dielectric fluid) that contain only PCB-soaked insulation.

Procurement

PCB items are only available within the Laboratory or from other government installations. If PCB-contaminated items need to be procured for a particular operation at the Laboratory, Waste Management must be

contacted for prior review and approval. In some cases, disposal costs may preclude use of the PCB item.

Inventory

Group leaders must identify all PCB articles, oil, and debris under their control, record the status of these items, and send the information to Waste Management. This record must be kept current and include such information as acquisition, disposition, storage and use location, and quantities of oil involved. Waste Management maintains (1) an inventory of in-service items and (2) an inventory of articles stored for offsite disposal.

Enclosed Use Only

PCBs must be used in a totally enclosed manner to ensure that any PCB exposure to humans or release to the environment is insignificant. Federal regulations do not allow PCB use in an open tank (or container) or in a closed container that needs to be opened frequently for adjustment or repair. However, capacitors and transformers containing PCB oil can be used even though the equipment could possibly rupture and leak oil. (See "Leaks and Spills.")

Workplace Safety

The Industrial Hygiene Group (HSE-5) determines the levels of airborne PCBs in the workplace, specifies precautions to protect personnel, advises groups about worker-exposure problems, and recommends precautionary signs.

Precautions. Groups that manage PCB materials must take the following precautions:

- conspicuously post signs that state the procedure for entering the area where PCBs are being used;
- permit only trained and authorized personnel to enter the regulated area;
- provide supplied-air breathing apparatus (contact Industrial Hygiene) to a worker whenever engineering controls cannot maintain the levels of airborne PCBs below acceptable limits;
- provide instructions for handling liquid PCBs to prevent skin contact or inhalation;
- provide PCB-resistant gloves and/or clothing;
- instruct personnel to remove all contaminated protective clothing and to wash hands, forearms, and face as soon as possible after use; and
- in emergencies, evacuate nonessential personnel until the situation is controlled.

Storage, Salvage, and Disposal

General Procedures. PCBs and PCB-contaminated materials must be packaged, stored, and disposed of according to approved Waste Management procedures. Because PCB disposal is complex, groups should notify Waste Management as soon as a disposal problem is

apparent by submitting a Chemical Waste Disposal Request (HS Form 10-3A) and a copy of the results from PCB analyses. (See "Verification of PCB Presence.") Waste Management must be contacted before any PCB item is transferred.

Capacitors. PCB capacitors scheduled for disposal must be shorted out and packaged in metal drums that meet or exceed Department of Transportation (DOT) Specification 17C (or as Waste Management specifies). Void spaces in the drums must be filled with an absorbent material such as vermiculite. Contact Waste Management to arrange for storage of large capacitors (3 lb or more of dielectric fluid) until transfer to an Environmental Protection Agency (EPA)-approved incineration site can be arranged. *NOTE: Reusable PCB capacitors may be listed with the Salvage and Excess Section of MAT-14 for reissue. Contact Waste Management before transferring the item to the user.*

Transformers. Before Waste Management disposes of transformers at an EPA-approved Laboratory site, the operating group or Zia crew must drain and rinse the transformers containing PCBs according to approved Waste Management procedures.

Other Articles. Other PCB-contaminated articles such as soil, rags, and clothing require disposal by Waste Management at an EPA-approved Laboratory site. These waste articles must be packaged as specified above for capacitors, and PCB containers must be rinsed as specified for transformers.

PCB Liquids. Liquid PCBs must be stored only in tightly closed containers in a well-ventilated area that is isolated from drainage systems. Containers of liquid PCBs must be moved carefully to avoid punctures, spills, or contamination of the outside of the container. (See "Leaks and Spills.")

Waste Liquids. Contact Waste Management to arrange for storage of waste liquids that contain more than 500 ppm PCB. These liquids must be packaged for storage and ultimate offsite disposal in leak-free DOT 17E metal drums with nonremovable heads. Waste PCB liquids that contain less than 500 ppm must be absorbed with vermiculite so that no free liquid is present, packaged in leak-free DOT 17C metal drums, and sent to Waste Management for disposal. All packaging is to be conducted by the originating group or its designee.

Oils. Salvage or recycle of oil or oil-bearing items must be approved by Waste Management before such action is initiated.

Cost

Offsite Disposal. Packaging, transportation, and disposal costs at *offsite* locations will be backcharged to the originating group.

Onsite Disposal. Packaging, draining, and rinsing costs for *onsite* disposal will be backcharged to the originating group. Contact the Regulatory Compliance Section of HSE-7 for additional guidance.

Leaks and Spills

PCB-filled transformers or capacitors must be inspected quarterly by the users and leaks reported immediately to Industrial Hygiene and Waste Management. The responsible group or Zia crew (appropriately clad with protective clothing/gloves) must promptly clean up leaks and spills by using sawdust, vermiculite, or other sorbents. Use solvent-soaked rags to wipe any residual PCB oil from contaminated surfaces and dispose of the rags, sorbents, or soil as specified by Waste Management. The Environmental Surveillance Group (HSE-8) determines the environmental impact of oil spills/discharges.

References

"Disposal and Marking PCBs," 40 CFR 761 (latest edition).

"Nonradioactive Chemical Waste," Administrative Requirement 10-3, in *Health and Safety*, Los Alamos National Laboratory Manual, Chapter 1 (August 1984).

"Polychlorinated Biphenyls: Criteria for a Recommended Standard," NIOSH Publication No. 77-225 (latest edition).

"Threshold Limit Values for Chemical Substances and Physical Agents in the Workroom Environment," American Conference of Government Industrial Hygienists, Cincinnati, Ohio (latest edition).

Referrals

Industrial Hygiene Group (HSE-5), 7-5231

Waste Management Group (HSE-7), 7-4301

Polychlorinated Biphenyls Control Section of HSE-7, 7-7954

Regulatory Compliance Section of HSE-7, 7-7957

Solid Waste Section of HSE-7, 7-5397

Environmental Surveillance Group (HSE-8), 7-5021

Salvage and Excess Section of MAT-14, 7-4501

Forms

HS Form 10-3A, Chemical Waste Disposal Request

Personal Protective Equipment

Introduction

The use of personal protective equipment may be required in Laboratory work areas where hazards may not be effectively controlled by other means (for example, by engineering or administrative controls). Various types of personal protective equipment provide specialized protection of the respiratory system, eyes, face, feet, and head as well as the entire body. This document specifies the requirements and procedures necessary for the safe and effective use of personal protective equipment at the Laboratory.

Definitions

Anti-C Apparel - clothing, hoods, and boots worn in radiation areas to prevent contamination of a person's body or clothing.

Equipment for Eye and Face Protection - any device designed to be worn to protect the eyes or the face from injury. Included are safety glasses, safety goggles, face shields, and welding helmets.

Protective Clothing - clothing such as laboratory coats, Anti-C apparel, coveralls, impervious clothing, and gloves that are used to provide a barrier to potential hazards such as toxic chemicals, explosives, biological agents, welding hazards, excessive heat or cold, and radioactive materials.

Protective Footwear - varying types of shoes or protective shields that are worn on the feet to reduce the risk of certain hazards such as foot injury, electrical shock, the spread of contamination, and static discharges in explosive areas.

Protective Headgear - any device designed to be worn to protect the head from injury. Included are hardhats and "bump caps."

Respiratory Protective Equipment - any device designed to be worn to protect the wearer from inhaling toxic or harmful atmospheres. This may include half-face and fullface air-purifying respirators, self-contained breathing apparatus, supplied-air facepieces, and supplied-air suits and hoods.

Approved Respirators

Only respirators approved by the National Institute for Occupational Safety and Health (NIOSH) and the Mine Safety and Health Administration (MSHA) shall be used at the Laboratory unless special exception is granted by the Department of Energy.

Identification of Hazardous Operations/ Procedures

With assistance from the Health, Safety, and Environment (HSE) Division, the operating group shall identify the possibly hazardous operations or procedures for which personal protective equipment may be needed. Job evaluations shall be made by the operating group to justify

the use of personal protective equipment usually in conjunction with engineering or administrative controls. Group leaders are urged to contact the appropriate HSE Division group

- for help in selecting the appropriate type(s) of protective equipment for a particular operation,
- if they believe specific hazards are not adequately addressed, or
- if they are in doubt about the level of protection required for specific operations and locations.

If the use of respiratory protective equipment is required, adequate time must be allowed for processing the medical questionnaire, fitting and training employees, and preparing/approving the necessary standard operating procedures (SOP) or special work permits (SWP).

Standard Operating Procedures and Special Work Permits

A special work permit may be required by the HSE Division for the use of personal protective equipment in a particular operation/activity.

Standard operating procedures are required for the use of respiratory protective equipment and certain protective clothing. (Contact the Industrial Hygiene Group, HSE-5, for further clarification.) Requirements for such personal protective equipment must be covered in an existing SOP for a particular operation/activity or in a separate SOP, and shall be reviewed annually by the operating group and the HSE Division. If the application is short-term, special work permits may be required in lieu of the SOP.

(Refer to Administrative Requirement 1-3, "Standard Operating Procedures and Special Work Permits.")

Waivers. The SOP requirement for the use of *respiratory protective equipment* may be waived for specific tasks in *low-toxicity* environments with the approval of the appropriate HSE Division group (Radiation Protection, HSE-1; Chemistry Health Protection, HSE-10; Accelerator Health Protection, HSE-11; or Industrial Hygiene). The SOP requirement for the use of *protective clothing* may be waived for specific tasks in *low-hazard* environments with the approval of the appropriate HSE-Division group (that is, the health physics staff; Safety, HSE-3; or Industrial Hygiene). In most instances, an SWP is required when the SOP requirement is waived.

Medical Approval

Before using respiratory protective equipment, employees must complete a medical questionnaire (HS Form 12-1A, available from Industrial Hygiene) and be medically approved for the use of such equipment. The medical approvals and reviews are required annually. (Also see "Use of Equipment" in this administrative requirement.)

Fitting and Training

The responsibilities and requirements for fitting personnel with protective equipment and training them in its proper use are identified below according to the specific part of the body protected.

Respiratory Protection. Group leaders shall identify those employees and contract personnel who need respiratory protection in their work. Upon notification from the operating group, Industrial Hygiene initially fits and trains personnel. Respirator fitting cards, which must be updated at least annually, are then issued to certified users. Requirements for refitting and retraining by Industrial Hygiene vary according to the type of respiratory equipment, as shown in the following.

- **Air-purifying and supplied-air respirators**: users must be refitted and retrained annually.
- **Self-contained breathing apparatus (SCBA), User Category A (Life Saving)**: users must be retrained once per quarter for the first year; once every 6 months for the second year; then once per year thereafter.
- **Self-contained breathing apparatus (SCBA), User Category B (Facility Emergency)**: users must be retrained once every 6 months for the first year; then once per year thereafter.

Hearing Protection. See Administrative Requirement 8-2, "Hearing Conservation," for a discussion of appropriate equipment for hearing protection. Also see Technical Bulletin 802, "Hearing Conservation," for further information.

Other Protective Equipment. Group leaders shall train their employees in the proper use, intent, and limitations of all other personal protective equipment. Upon request, the HSE Division assists operating groups in providing such training.

Use of Equipment

Group leaders shall ensure that their employees secure the necessary medical approvals and properly use the personal protective equipment appropriate to their work tasks. Use of the equipment shall be in accordance with the training received. Employees shall notify the Occupational Medicine Group (HSE-2) regarding any change in health that may affect their ability to use such equipment.

Respiratory Protection. Only persons trained and fitted by Industrial Hygiene may use respiratory protective equipment at the Laboratory. The respirator fitting cards must be kept current and must be available for inspection by user group supervisors and area health physics and Industrial Hygiene personnel.

To ensure the user's safety, conditions preventing a proper face seal of respirators must not be allowed. *Facial hair, eyeglass temple bars, surgeons' caps, etc.*, must not interfere with the peripheral seal of the respirator. Neither *contact lenses* nor *partial dentures* shall be worn with fullface respirators. *Full dentures* may be worn only if the respirator was originally fit with the full dentures in place.

NOTE: A minimum leadtime of 6 weeks should be allowed if prescription lenses are required for use in conjunction with fullface respirators.

Eye and Face Protection. Employees must wear the proper equipment for eye and face protection in areas where an operation could result in serious injury to the face or eyes. Plano (nonprescription) safety glasses are available from Safety Stock. Prescription safety glasses require group leader approval on Form 952, Authorization and Invoice for Prescription Safety Glasses. (Prescription safety glasses are obtained from an outside contractor.) In certain cases, photochromic (photogray) glasses may be obtained; this requires approval from the Safety Group. See Technical Bulletin 1201, "Eye and Face Protection," for additional information.

Protective Footwear. As appropriate, *steel-toe safety shoes* shall be worn in shop and warehouse areas. Shoes with *conductive soles* may be required in designated explosives areas. Personnel who routinely work under electrically hazardous conditions shall wear shoes with *nonconductive soles*. Those personnel who work in areas that are or may become contaminated with radioactive or explosive material shall wear safety shoes that remain in the controlled area or use protective shoe covers (booties) that are removed when leaving the controlled area.

Group leader approval on Form 956, Authorization for Safety Shoes, is required to obtain safety shoes. A safety shoemobile visits the Laboratory frequently; instructions for obtaining safety shoes and other foot protection are given in Technical Bulletin 1202, "Protective Clothing."

Protective Headgear. *Hardhats* must be worn in areas where overhead work is in progress. Work in confined spaces usually requires the use of a *hardhat* or "*bump cap*," as determined appropriate by the group leader. Bump caps are marked to differentiate them from hardhats. A Stock Order Request signed by the group leader is required for protective headgear.

Protective Clothing. Specific types of protective clothing are required for personnel involved in certain operations, as specified below.

- Anti-C apparel must be worn in radiation areas where a potential exists for contaminating a person's body or clothing.
- Employees working with chemical carcinogens shall wear a clean change of appropriate disposable outer Laboratory clothing.
- Appropriate protective gloves must be worn by personnel engaged in procedures where skin contact with chemical carcinogens is likely to occur, or when handling sharp, rough objects or corrosive materials.
- Personnel working with high explosives where static electricity may be a problem shall wear cotton coveralls and cotton underapparel or other antistatic apparel.
- Flame-retardant clothing shall be worn by employees at the S-Site TA-16 burn area. This type of protective clothing may be specified for other operations according to the SOP.
- Beryllium Shop employees shall wear blue coveralls and cotton underapparel laundered by the S-Site laundry.

Most protective clothing (for example, Anti-C coveralls, booties, underwear, winter jackets, overshoes, and an assortment of gloves made from various materials) is available from Safety Stock. A Stock Order Request signed by the group leader is required to obtain such protective clothing. If specialized protective clothing (for example, acid suits or tritium suits) is needed, a purchase request must be submitted to the Materials Management Division.

Maintenance

Used respiratory protective equipment must be returned to the health physics staff on a monthly basis for cleaning and disinfection. *SCBA units* must be inspected monthly by the user group and Industrial Hygiene must be notified *immediately* after any unit has been used.

Anti-C clothing is collected by the Materials Management Division, laundered by a licensed facility offsite, and monitored by the health physics staff before reuse. Operating groups must avoid mixing used Anti-C clothing with other types of protective clothing or personal items.

Clothing required for certain operations must be laundered by the S-Site laundry, for example:

- the blue coveralls and cotton underapparel worn by Beryllium Shop employees, and
- clothing contaminated with high explosives.

References

"Eye and Face Protection," Technical Bulletin 1201, in *Health and Safety*, Los Alamos National Laboratory Manual, Chapter 1 (August 1984).

"Hearing Conservation," Administrative Requirement 8-2, in *Health and Safety*, Los Alamos National Laboratory Manual, Chapter 1 (August 1984).

"Hearing Conservation," Technical Bulletin 802, in *Health and Safety*, Los Alamos National Laboratory Manual, Chapter 1 (August 1984).

"Laser Safety," Technical Bulletin 501, in *Health and Safety*, Los Alamos National Laboratory Manual, Chapter 1 (August 1984).

"Occupational and Educational Eye and Face Protection," American National Standards Institute (ANSI) Z87.1 (1979).

"Practices for Respiratory Protection," American National Standards Institute (ANSI) Z88.2 (1980).

"Protective Clothing," Technical Bulletin 1202, in *Health and Safety*, Los Alamos National Laboratory Manual, Chapter 1 (August 1984).

"Respiratory Protective Equipment," Technical Bulletin 1203, in *Health and Safety*, Los Alamos National Laboratory Manual, Chapter 1 (August 1984).

"Standard for Men's Safety Toe Footwear," American National Standards Institute (ANSI) Z41 (1976).

"Use of Potential Chemical Carcinogens," Administrative Requirement 6-3, in *Health and Safety*, Los Alamos National Laboratory Manual, Chapter 1 (August 1984).

Referrals

Radiation Protection Group (HSE-1), 7-5296

Occupational Medicine Group (HSE-2), 7-7251

Safety Group (HSE-3), 7-4644

Industrial Hygiene Group (HSE-5), 7-5231

Respirator Fitting and Training Office (HSE-5), 7-6270

Chemistry Health Protection Group (HSE-10), 7-7218

Accelerator Health Protection Group (HSE-11), 7-5890

Forms

HS Form 12-1A,	Medical Questionnaire for Respiratory Protective Equipment
Form 952,	Authorization and Invoice for Prescription Safety Glasses
Form 956,	Authorization for Safety Shoes

Flammable Liquids

Introduction

The fire and explosion hazards of flammable liquids are generally recognized when such liquids are used as fuels. However, thousands of gallons of flammable liquids are used each year at the Laboratory for other purposes. In such cases, the user is often inattentive to the fire hazards. This bulletin reviews the hazards associated with flammable liquids and recommends safety precautions.

Fire and Explosion Hazards

Although many flammable and combustible liquids pose *health* hazards, the hazards of interest in this bulletin are *fire and explosion* hazards. Technically, these liquids do not burn; however, they generate sufficient quantities of vapors to form ignitable vapor-air mixtures. As a general rule, the lower the flash point of a liquid, the greater the hazard.

Liquids with flash points below room temperature (Class IA and IB liquids) continually emit ignitable vapors, except when the liquids are chilled to temperatures below their flash point. Even then, if they are spilled on a floor or work surface, the liquids will heat rapidly and present severe fire and explosion hazards.

Liquids with flash points above room temperature (Class II and III combustible liquids) can be heated easily to the temperatures where they will create flammable vapor-air mixtures. The heating can be caused by sunshine, an electrical contact, a nearby heat-producing appliance such as an oven, hot plate, or light bulb, or by any other hot surface. Once ignited, the flames will probably generate enough heat to keep the fire burning.

Flammable liquid vapors are heavier than air; they can travel for great distances and can accumulate in low places. Because the vapor of flammable liquid burns, the fire and explosion hazard may not be confined to the immediate working area. Vapors can be ignited several hundred feet from the point where vapor is being generated. Flammable liquid vapors usually require less ignition energy and often can be ignited by small sparks from electrical motors, switches, relay contacts, etc.

Extreme care must be exercised when using flammable liquids in closed spaces with minimal ventilation, such as in glove boxes and tanks. Even milliliter quantities of flammable liquids can cause the build-up of explosive mixtures in the confined space.

Precautions

Properties of the Liquid and Intended Use. Recommended precautions are based on the properties of the liquid to be used and the intended application. The user cannot decide on necessary precautions unless the

properties of the liquid are known and the intended use is reviewed for safety.

Ventilation. To prevent flammable vapor accumulations, ventilation must be adequate. Flammable liquids must be used in a fume hood or under local exhaust ventilation. When exhaust ventilation is unavailable, normal room ventilation may permit small-scale use of flammable liquids (a few milliliters); however, if large quantities of liquid must be used in such facilities, it is often necessary to provide additional ventilation by opening doors and windows or by providing some form of temporary exhaust ventilation. Generally, flammable vapor concentrations should be kept below 25% of the lower flammable limit and even lower for health considerations. (See Administrative Requirement 6-5, "Flammable and Combustible Liquids.")

Ignition Sources. It is important to verify that no ignition sources are in the vicinity where flammable liquids are used and where flammable vapors could conceivably flow. For example, avoid using flammable liquids near spark-producing devices or open flames; however, in certain cases (for example, chemical or industrial), it may be acceptable to use such liquids under a fume hood or near an approved exhaust system.

Safety Cans

Container Safety. The safest containers for flammable liquids are safety cans that have been listed and labeled by Underwriters Laboratories Inc. (UL) or approved and labeled by Factory Mutual Research Corporation (FM). Several models and sizes are available from Laboratory Stock. These cans are designed to safely contain the liquid contents under most circumstances, including the situation when fire heats the can. In such cases, safety cans will vent pressurized gases that burn off, but they will prevent the prompt release of contents. Glass, plastic, or ordinary metal containers will fail rapidly and contribute fuel to the fire. One gallon of a flammable liquid can result in an enormous fire (for example, 150 sq. ft or larger), which usually cannot be handled with a fire extinguisher. The protection afforded by safety cans is significant for the safety of the users and their facilities.

Size and Construction of Safety Cans. Approved safety cans are available in a wide range of sizes and materials that can meet virtually all user needs, including the need for product purity. Construction materials are reinforced plastic, steel, and stainless steel, including passivated and Teflon-coated stainless steels.

Some flammable liquids are available from suppliers in containers that are larger than one quart or one liter; and in such cases, the Laboratory requires that the liquids be transferred to safety cans before use. Exemptions are permissible under the Occupational Safety and Health Administration (OSHA) and may be obtained by the Safety Group (HSE-3).

Labeling

All containers with chemicals, including research samples and mixtures, must be labeled properly as to their contents. If a container holds flammable materials, the chemical name and the words "DANGER: FLAMMABLE" must be marked on the container.

For chemicals available from Stock in bulk quantities, appropriate labels with the chemical names and appropriate warning messages are also stocked and used. In addition to these, OSHA and the National Fire Protection Association (NFPA) (DOE-prescribed standards) require that containers with Class I liquids be marked with a yellow marking. This requirement can be met by attaching the appropriate yellow contents label from Stock, or by painting a yellow band around the exterior of the container. Flammable liquids used directly from the manufacturer's containers generally meet all labeling requirements.

Storage

Storing flammable liquids is inherently dangerous (even in sealed containers) because of their large energy content and rapid heat release during a fire. Laboratory policy is to minimize the quantities of flammable liquids stored in buildings. Users can best implement this policy by ordering flammables in the smallest practicable quantities and by disposing of flammables that are no longer needed. When storing flammables, the following considerations apply.

Safety Cans. Approved safety cans are painted red and are to be used *only* for flammable liquids. Solvents that cannot be ignited under normal conditions, such as methylchloroform, should not be stored in red safety cans. Instead, they should be stored in special blue containers to distinguish them from the red safety cans for flammable or combustible liquids. These blue noncombustible liquid storage containers are available from Laboratory Stock.

Storage Rooms and Sheds. Approved flammable liquids storage rooms or sheds must be used for all flammable and combustible liquids that are not needed immediately. All flammable liquids should be stored in approved closed metal cabinets, away from heat sources such as glassware-drying equipment and sunshine. Use the yellow cabinets that are clearly marked "DANGER: FLAMMABLE LIQUIDS" in red letters.

More than one gallon or several small bottles of flammable liquids must be stored in approved flammable liquids cabinets, storage rooms, or sheds. Cabinets are specially constructed to prevent their contents from becoming immediately involved in a Laboratory fire. This will enable Laboratory and Fire Department personnel to fight a small fire without being endangered further by exploding bottles. Contact the Loss Prevention Section of ENG-4 if you need assistance in selecting storage facilities. Total quantities of flammable liquids are specifically limited within laboratories or buildings. The limits are based on laboratory construction, fire barriers, fire protection features, and the nature of the occupancy. The Laboratory's Loss Prevention personnel determine the limits for users of flammable liquids.

Recommendations

It is important that users of flammable and combustible liquids observe the following precautions.

- Limit procurement of flammable liquids to quantities that can be used in a reasonable period of time.
- Promptly dispose of flammable liquids that are no longer needed.
- Keep all flammable liquids in safety cans, and store them in approved cabinets, storage rooms, or sheds.
- Label all containers and storage facilities.
- Never use flammable liquids in a place or situation where you cannot escape if a fire starts.
- Verify adequate ventilation and eliminate ignition sources before using flammable liquids.
- Never attempt to extinguish a flammable liquid fire unless you are recently trained in extinguisher use and the Fire Department has already been called.

References

"Flammable and Combustible Liquids," Administrative Requirement 6-5, in *Health and Safety*, Los Alamos National Laboratory Manual, Chapter 1 (August 1984).

"Flammable and Combustible Liquids," Occupational Safety and Health Administration, 29 CFR 1910.106 (January 1, 1976).

"Flammable and Combustible Liquids Code," National Fire Protection Association (NFPA) Standard No. 30 (1981 or latest edition).

"Flammable and Combustible Liquids Handbook," National Fire Protection Association (NFPA) (1981 or latest edition)

"Nonradioactive Chemical Waste," Administrative Requirement 10-3, in *Health and Safety*, Los Alamos National Laboratory Manual, Chapter 1 (August 1984).

"Standard on Fire Protection for Laboratories Using Chemicals," National Fire Protection Association (NFPA) Standard No. 45 (1982 or latest edition).

Referrals

Safety Group (HSE-3), 7-4644

Loss Prevention Section of ENG-4, 7-9045

Flammable Gases

Introduction

The most widely used flammable gases at the Laboratory are acetylene, hydrogen, propane, methane, carbon monoxide, and natural gas (see Table I). This technical bulletin describes hazardous properties, precautions, and recommendations for handling and use.

TABLE I

PROPERTIES OF COMMONLY USED FLAMMABLE GASES

	Flammable Limits (%)	Ignition Temperature (°F)	Minimum Spark Ignition Energy (mJ)[a]	Density
Acetylene	2.5-100[b]	500	—	0.9
Hydrogen	4-75	750	0.02	0.07
Methane	5-15	1,000	0.3	0.5
Propane	2-9.5	840	0.3	1.6
Carbon monoxide	12-75	1,100	—	1.0
Natural gas	4-17	1,000	0.5	0.5

[a]Human body static charge can easily exceed 3 millijoules.
[b]Can violently decompose under pressure, even in absence of air.

Discussion

Flammable gases will burn in air within volumetric flammable limits expressed in the volume per cent of gas in air. Within a narrower, nearly stoichiometric range, where the theoretically correct fuel-to-oxygen proportion exists, detonations are possible if there is also good mixing, an energetic ignition source, and confinement. In a true detonation, the shock wave proceeds at supersonic speed and the pressure rises high and rapidly. A deflagration, at subsonic speeds, can occur in both the rich and the lean portions of the flammable limits. These phenomena are loosely called explosions; the effects are milder as the rich or lean limit is approached. In deflagration, typical pressure rises are two- to sixfold, but in detonation, much higher pressure increases are superimposed on the deflagration pressures.

The "Chemical Safety Data Sheets" and the *Matheson Gas Data Book* deal chiefly with properties, uses, and components; pamphlets from the Compressed Gas Association concern standards and requirements of the US Department of Transportation. The NFPA "National Fuel Gas Code" describes appropriate containers and components, and the NFPA "Fire Protection Guide on Hazardous Materials" is a complete treatise.

Storage and Use

Store and use flammable gases so that there is no reasonable probability that the lower limit of flammability will be approached. Store flammable gases at least 20 ft away from oxidizing gases or separate them with a 1/2-hour fire-resistant barrier. Those in service should connect to a standard manifold or tube trailer station installed by the Facilities Engineering Division's Maintenance and Operations Group (ENG-4). Electrical grounding and bonding (electrically interconnecting metal components) should be provided unless these conditions are met intrinsically. For large supplies, flow-limiting orifices should be considered. Indoor supplies should be minimized where practical. In the case of hydrogen, special storage will help avoid embrittling metals; and in the case of acetylene, special storage should help avoid formation of shock-sensitive acetylides. Check valves, flash arrestors, and pressure regulators are also needed on acetylene systems. *Do not share other service with supply and purge lines.*

Fires

Using a fire extinguisher to put out a gas fire will probably result in its re-ignition, sometimes with catastrophic results. Therefore, turn off the gas supply at the source and cool hot surfaces with water spray; then fight any peripheral or secondary fires conventionally.

Shipping and Receiving

A designated person and a designated place should be available to receive cylinders from the Gas Plant (SM-170). Cylinders should never be completely emptied. Only open trucks should be used for intersite transportation. Contact the traffic manager or specialist in the Distribution Group (MAT-14) about offsite shipments to avoid violating US Department of Transportation rules.

References

William Braker and Allen L. Mossman, *Matheson Gas Data Book*, 6th ed. (Matheson Gas Products, Lynhurst, New Jersey, 1980).

"Chemical Safety Data Sheets," Chemical Manufacturers' Association (formerly known as Manufacturing Chemists Association) (a continuing series).

Compressed Gas Association, Inc. pamphlets.

"Fire Protection Guide on Hazardous Materials," National Fire Protection Association (NFPA) No. 491M, (1983 or latest).

Bernard Lewis and Guenther Von Elbe, *Combustion, Flames and Explosions of Gases*, 2nd ed. (Academic Press, Inc., New York, 1961).

"National Fuel Gas Code," National Fire Protection Association (NFPA) Standard No. 54 (1983 or latest).

Referrals

Safety Group (HSE-3), 7-4644

Maintenance and Operations Group (ENG-4), 7-4657

Loss Prevention Section of ENG-4, 7-9045

Supply and Distribution Group (MAT-14), 7-4171

Solvents

Introduction

Most solvents vary in toxicity and, unless properly controlled, may impair a worker's health. Major health concerns are related to inhalation, skin contact, splashing in the eye, and flammability. It is important that personnel be informed about the potential hazards and the properties of each solvent used and that proper control procedures be in effect to prevent toxic exposure.

This document describes the potential health hazards and properties of solvents, with a specific reference to benzene, and the proper controls for their use. Appendix A provides information on solvents most commonly used at this Laboratory.

Potential Health Hazards

Potential health hazards from the use of solvents depend on several factors, including

- how the solvent is used,
- how workers are exposed,
- the duration and frequency of exposure,
- the concentration of vapors in the work area, and
- the toxicity of the solvent.

Harmful effects from solvent exposure come from skin contact and vapor inhalation. The most common result of skin contact with solvents is dermatitis. A brief summary of the effects of inhalation and skin contact with various solvents is given in Appendix A.

Physiological Effects. In general, inhalation or absorption of solvents may cause *narcosis*. Some solvents can injure the *liver and kidneys* as a result of excessive vapor inhalation or skin contact. Some solvents can cause *dermatitis*, which can lead to a *bacterial or fungal infection*. Others can cause a *dermatitis by allergic reaction* to the solvent; a few of the highly volatile materials can cause *frostbite* when contacted (for example, methylene chloride from compressed gas containers).

People do not respond the same to skin contact with solvents. For example, women and fair-skinned individuals are more susceptible to dermatitis resulting from solvent contact because they have fewer oils and fats in the skin. Individual susceptibility should be recognized and suitable protective measures applied to account for these differences.

For analogous materials, vapor inhalation toxicity of solvents generally increases according to the following order:

1. fluorinated,
2. nonhalogenated, and
3. chlorinated.

Fluorides tend to bind whole molecules together more tightly than do other substituents, reducing a molecule's chemical and physiological reactivity. However, no general rule can be made for all compounds. For this reason, all potential exposures need to be evaluated by the Industrial Hygiene Group (HSE-5).

Decomposition Products. Halogenated solvents may decompose when exposed to open flames, hot metal surfaces, or high ultraviolet sources and form small amounts of highly irritating and toxic gases. When thermal or photochemical decomposition occurs, halogenated solvent vapors in air can produce the corresponding acid (hydrogen chloride, hydogen fluoride, etc.) along with varying amounts of the free halogen and of the carbonyl halide (phosgene is an example of carbonyl chloride). Usually, the acid is in high enough concentrations to provide reliable warning by irritating the nose and eyes. However, under some conditions, degradation of halogenated solvents will produce hazardous concentrations of carbonyl halide (for example, carbonyl chloride) without causing the nose and eye irritation. Welding, because of the exposed hot metal surfaces and ultraviolet radiation, tends to decompose halogenated solvent vapors. Other conditions, such as vapor contact with space heaters or open flames, can be equally dangerous.

Flammable Liquids. At the Laboratory, flammable liquids are used as reagents, cleaning agents, and solvents. The fire and explosion hazards of flammable liquids are discussed in Technical Bulletin 601, "Flammable Liquids." Also see Administrative Requirement 6-5, "Flammable and Combustible Liquids."

Selection

When selecting a solvent, choose the least toxic and least flammable ones available to accomplish the desired result. Also consider the

- rate and type of ventilation in the work area (preferably use a local exhaust); solvents should not be used in a confined work space unless that activity/operation is covered by an approved standard operating procedure (SOP);
- vapor pressure and evaporation rate of the solvent; and
- technique in which a solvent is to be used, including work temperature, quantity, surface area, worker position relative to the solvent, skin contact, and protective measures.

Exposure Control

Substitution. The best control method is substitution of less hazardous solvents for the more hazardous ones. For example, less toxic and less

flammable solvents such as trifluorotrichloroethane (Freon TF) or methyl chloroform should be substituted for more toxic solvents like carbon tetrachloride and chloroform. The use of nonflammable solvents whenever possible is encouraged.

Ventilation. Solvents should be handled in ventilated hoods or well-ventilated areas. If such an area is not available, and such work is absolutely necessary, contact Industrial Hygiene for the selection and issuance of proper respiratory protective equipment.

Training. As specified in Administrative Requirement 6-1, "Hazardous Materials," supervisors must inform employees about the toxicity and other hazards of materials with which they work so that employees can help protect themselves and use controls effectively.

Benzene Control

Benzene is a human carcinogen and is only authorized for use at the Laboratory when no suitable substitute is available. Confinement and local exhaust ventilation are the preferred control methods for airborne benzene vapors. *Avoid all skin contact and vapor inhalation.* Where engineering controls are unavailable and the operation cannot be performed elsewhere, contact Industrial Hygiene for the appropriate respiratory protective equipment.

Industrial Hygiene evaluates all operations involving benzene before it is used. An approved SOP may be required. Any questions regarding purchase, use, or toxicity of benzene, as well as requests for copies of regulations limiting its use should be directed to your Industrial Hygiene representative. (Also see Administrative Requirement 6-3, "Use of Potential Chemical Carcinogens.")

Personal Protective Equipment

Respiratory Protection. Respiratory protective devices issued by Industrial Hygiene include half-face and fullface air-purifying respirators, self-contained breathing apparatus, supplied-air facepieces, and supplied-air suits and hoods. The Industrial Hygiene staff fits and trains employees to use this equipment (see Administrative Requirement 12-1, "Personal Protective Equipment").

Protective Clothing. Because exposure to solvents can cause dermatitis and systemic poisoning, rubber or synthetic aprons and gloves and other protective clothing may need to be used to prevent skin contact. Some solvents dissolve glove material fairly rapidly, thus, gloves should be replaced as soon as they appear to be reacting with or degraded by the solvent. Additional information is available in Technical Bulletin 1202, "Protective Clothing."

Eye Protection. Most solvents produce painful injury if splashed into the eyes. Although face shields protect against limited and direct splashes, splash-proof goggles or safety glasses should be worn under a face shield. Where protection is needed against solvent vapor as well as splashes, ventilation is required and hood shields should be used. (See Administrative Requirement 6-1, "Hazardous Materials.") Know the

location of the eye wash fountain and the safety shower in your work area. *NOTE: Persons accidentally contaminating their eyes should wash them immediately with plenty of water and then contact the Occupational Medicine Group (HSE-2).*

Labels

Labels for solvents issued in bulk quantities are available from Stock. Every container must have a label identifying the chemicals or solvents in the container and warning the user of potential harm and protective measures. (See Administrative Requirement 6-1.)

Solvent Disposal

Small amounts of solvents may be discarded into open containers of vermiculite. The container then should be placed in a hood and the solvent allowed to evaporate. Large amounts (liters) of solvent may be discarded by contacting the Waste Management Group (HSE-7). Organic solvents should not be poured down the sink or floor drain. All solvent-soaked rags or solvent-absorbing materials should be placed in self-closing waste cans and disposed of within a reasonable period of time.

References

"Flammable and Combustible Liquids," Administrative Requirement 6-5, in *Health and Safety*, Los Alamos National Laboratory Manual, Chapter 1 (August 1984).

Handbook of Organic Industrial Solvents, Technical Guide No. 6, 5th ed. (Alliance of American Insurers, Chicago, Illinois, 1980), p. 55.

"Hazardous Materials," Administrative Requirement 6-1, in *Health and Safety*, Los Alamos National Laboratory Manual, Chapter 1 (August 1984).

"NIOSH/OSHA Occupational Health Guidelines for Chemical Hazards," US Department of Health and Social Services and US Department of Labor (1981).

"Occupational Safety and Health Standards," 29 CFR 1910, Occupational Safety and Health Administration (June 1981).

"Personal Protective Equipment," Administrative Requirement 12-1, in *Health and Safety*, Los Alamos National Laboratory Manual, Chapter 1 (August 1984).

N. H. Proctor and J. P. Hughes, *Chemical Hazards of the Workplace* (J. B. Lippincott Company, Philadelphia, Pennsylvania, 1978).

"Protective Clothing," Technical Bulletin 1202, in *Health and Safety*, Los Alamos National Laboratory Manual, Chapter 1 (August 1984).

"Respiratory Protective Equipment," Technical Bulletin 1203, in *Health and Safety*, Los Alamos National Laboratory Manual, Chapter 1 (August 1984).

"Threshold Limit Values for Chemical Substances and Physical Agents in the Workroom Environment," American Conference of Governmental Industrial Hygienists, Cincinnati, Ohio (1980 or current edition).

"Use of Potential Chemical Carcinogens," Administrative Requirement 6-3, in *Health and Safety*, Los Alamos National Laboratory Manual, Chapter 1 (August 1984).

Referrals

Industrial Hygiene Group (HSE-5), 7-5231

Occupational Medicine Group (HSE-2), 7-7251

Waste Management Group (HSE-7), 7-4301

Appendix

Appendix A. Industrial Hygiene and Fire Safety Data on Flammable Solvents

Appendix A.

Industrial Hygiene and Fire Safety Data on Flammable Solvents

Solvent	Occupational Exposure Level, OEL[a] (ppm)	Flash Point °F (°C)	Boiling Point at 760 mm Hg °F (°C)	Evaporation Rate where ether = 1	Fire Hazard Class[b]	Eye Irritation by Vapor (ppm)	Approximate Odor Threshold (ppm)	Inhalation or Skin Effects
Acetone	750	0	133 (56)	1.9	3	1000 Eye irritant	40	No permanent effects reported. Narcotic above 10%. 2500-3000 causes minor irritation. Severe exposure may defat skin.
Benzene[c] (HSE-5 approval required)	10	12(−11)	175 (80)	2.8	3	3000	1.5-4.7	Potential chemical carcinogen. Irritates throat at 3000 ppm. Toxic effects (blood changes) at 210 ppm, repeated exposure. Fatalities reported at 2% in air for 5-10 minutes.
Carbon tetrachloride[c] (HSE-5 approval required)	5	Nonflammable	(77)	2.6	0	>10	50	Potential chemical carcinogen. Has caused liver tumors in animals by ingestion only. Central nervous system depression, headache, nausea. Chronic effects include injury to liver and kidney. Irritation to skin upon repeated contact. The liquid can be absorbed through the intact skin. Thermal decomposition products are toxic.
Chloroform[c] (HSE-5 approval required)	10	Nonflammable	(61)	2.2	0	>25	50	Potential chemical carcinogen. Vapors are anesthetic. When ingested, has caused liver carcinoma in rodents. Action principally on the liver. Skin defatting occurs, with possible burns upon prolonged contact. Skin absorption is minimal.
Dichloromethane (see methylene chloride)								
Ethanol (Ethyl alcohol)	1000	55	173 (78)	7	3	5500	2	Exposure may cause central nervous system depression above 1500 ppm. Vapor nearly free of systemic effect except irritation of upper respiratory tract and eyes. No permanent effects.
Ethylene dichloride[c]	10	13	(84)	3.3	3	>50	6-10	Potential chemical carcinogen. Has caused a variety of neoplasms in rats and mice by ingestion only. Excessive exposure may cause nausea, irritation of upper respiratory tract, depression of central nervous system, and injury to liver and kidneys. Chronic effects principally to the liver. Also absorbed through skin.

Freon PCA, Freon TF, or Freon 113	1000	Nonflammable	(48)	1.95	0	>1000	>1000	Central nervous system depressant. Causes irritation to respiratory tract at high concentrations (4500 ppm). Potential thermal decomposition products are toxic. No permanent effects reported.
Freon TMC, an azeotrope of Freon TF and methylene chloride	600	Nonflammable	(36)	---	0	>1000	>600	Central nervous system depressant. Causes irritation to respiratory tract at high concentrations. Potential thermal decomposition products are toxic.
n-Hexane (solvent in rubber cements)	50	−7	156 (69)	1.9	3	1500	---	Irritates throat at 1500 ppm. Headache and nausea. Reports of poly neuritis, numbness, difficulty in walking between 500 and 1300 ppm. No effect below 500 ppm.
Isopropanol	400	53	180 (82)	7.7	3	400	<400	Irritation of mucous membranes may occur at OEL. No permanent health effects.
Kerosene 5th fraction of petroleum (10-16 carbon atoms/ molecule)	14 ppm or 100 mg/m^3	150-185 (65-85) Combustible only	100-150 (38-66)	4.4	2	Not an eye irritant	0.09	Headache, dizziness, ataxia, bronchitis, nausea. Defats skin, may cause dermatitis. No permanent health effects.
Methanol	200	52	147 (64)	5.2	3	---	>2000	Absorbed through skin. Repeated exposure exceeding 200 ppm may injure optic nerve. Above 300 ppm, euphoria, loss of muscle coordination, headache, dizziness, vomiting, narcosis, eczematoid dermatitis, blindness.
Methyl chloroform (see 1,1,1-trichloroethane)								
Methylene chloride	100	Nonflammable	(40)	1.8	0	>2000	~200	A central nervous system depressant. Metabolized in humans to carbon monoxide. Causes carboxyhemoglobin above 500 ppm. Chronic exposure at extremely high concentrations in animals results in liver and kidney damage.
Methyl ethyl ketone	200	21	176	2.7	3	200	2	Slight throat irritation at 100 ppm. Nausea at 400 ppm. High exposure affects central nervous system. Small amounts are absorbed through skin. May cause dermatitis.

[a] "Threshold Limit Values for Chemical Substances and Physical Agents in the Workroom Environment." American Conference of Governmental Industrial Hygienists, Cincinnati, Ohio (1980 or current edition).

[b] Fire Hazard Class 0 = nonflammable or unburnable for 5 minutes at 1500°F.
1 = materials that will burn in air when exposed to a temperature of 1500°F for 5 minutes.
2 = flash point above 73°F and boiling point below 100°F (Class IC flammable liquid)
3 = flash point below 73°F and boiling point above 100°F (Class IB flammable liquid)
4 = flash point below 73°F and boiling point below 100°F (Class IA flammable liquid)
This information was taken from *Hazardous Chemicals Data* (National Fire Protection Association, Quincy, Massachusetts, 1975 or current edition), NFPA 49.

[c] Industrial substances suspect of carcinogenic potential for man

[d] The National Institute for Occupational Safety and Health has issued alerts.

Industrial Hygiene and Fire Safety Data on Flammable Solvents (cont)

Solvent	Occupational Exposure Level, OEL[a] (ppm)	Flash Point °F (°C)	Boiling Point at 760 mm Hg °F (°C)	Evaporation Rate where ether = 1	Fire Hazard Class[b]	Eye Irritation by Vapor (ppm)	Approximate Odor Threshold (ppm)	Inhalation or Skin Effects
Methyl isobutyl ketone	50	73 (23)	246 (119)	5.6	3	200	0.10	Odor objectionable at 200 ppm. May be irritating to respiratory tract at 300 ppm.
Perchloroethylene (Tetrachloroethylene)	50	Nonflammable	(121)	6.6	0	>100	50	Central nervous system depression and liver damage, with reports of permanent injury to the nervous system, including impaired memory, impaired vision, numbness of extremities above 850 ppm. Thermal decomposition products are toxic.
Tetrachloromethane (see carbon tetrachloride)								
1,1,1-Trichloroethane	350	Nonflammable	(74)	2.7	1	>350	100	Central nervous system depression. Dermatitis may result from repeated skin contact. Thermal decomposition products are toxic.
1,1,2-Trichloroethane	10	Nonflammable	(114)	12.6	1	(no data)	--	Has caused liver cancer in mice only on forced ingestion.[d] Narcosis and liver damage at prolonged high concentrations. Thermal decomposition products are toxic.
Trichloroethylene	50	Nonflammable	(83)	3.1	1	(slight)	100	Has caused liver tumors in mice only on forced ingestion.[d] Central nervous system depressant and mild irritant to respiratory tract. Liquid can penetrate skin. Dermatitis may result from repeated skin contact. Injury to cardiovascular system, gastrointestinal tract, liver, and kidneys also has been observed. Thermal decomposition products are toxic.
1,1,2-Trichloro-1,2,2-trifluoroethane (see Freon TF)								

[a] "Threshold Limit Values for Chemical Substances and Physical Agents in the Workroom Environment," American Conference of Governmental Industrial Hygienists, Cincinnati, Ohio (1980 or current edition).

[b] Fire Hazard Class 0 = nonflammable or unburnable for 5 minutes at 1500°F.
1 = materials that will burn in air when exposed to a temperature of 1500°F for 5 minutes.
2 = flash point above 73°F and boiling point below 100°F (Class IC flammable liquid).
3 = flash point below 73°F and boiling point above 100°F (Class IB flammable liquid).
4 = flash point below 73°F and boiling point below 100°F (Class IA flammable liquid).
This information was taken from *Hazardous Chemicals Data* (National Fire Protection Association, Quincy, Massachusetts, 1975 or current edition), NFPA 49.

[c] Industrial substances suspect of carcinogenic potential for man.

[d] The National Institute for Occupational Safety and Health has issued alerts.

Epoxies

Introduction

The use of epoxy resin systems presents certain general health hazards because a variety of toxic potentials are involved. This variety makes the hazards difficult to characterize for any particular resin system. When such health hazards are evaluated, the curing agents, cured and uncured resins, and any filler or solvents need to be considered. Determination of the toxicity of a specific resin system should be made by the Industrial Hygiene Group (HSE-5).

Curing Agents

Amines. The major health hazards posed by epoxy resin systems are due to amine curing agents (for example, aliphatic and aromatic amines). Although most amine curing agents are liquid, some are solid. The use of the *solid* agents increases the toxic potential because they must be heated before being incorporated into the resin system.

All amines are *caustic* and can cause dermatitis, severe burns, and sometimes sensitization. Amines directly contacting the eyes will produce severe damage. Sensitization may occur at any time, thus, protection is needed. Once an individual is sensitized, even minute quantities of the offending agent, can produce an adverse response.

Triamine curing agents are generally more irritating than *diamine* curing agents. Modified aliphatic amines with minimum potential for irritation are available and should be substituted for the more hazardous curing agents.

Organic Anhydrides. Acid anhydrides are solids that react readily with water to produce an organic acid of varying strength. Some of these compounds are known skin irritants that cause burns upon prolonged contact. In dust or vapor, these agents may irritate the eyes, nose, or throat. To improve their properties as curing agents, small percentages of amine curing agents often are incorporated in anhydrides; in such cases, these materials act as hot-curing agents. Using heat for curing or mixing solid systems increases the exposure hazard. Therefore, handle these curing agents carefully.

Polyamides. In addition to their role as curing agents, polyamides are used primarily to modify the epoxy system. As a class, these agents are probably the safest and are not known as irritants. Their ability to cold-cure with minimal heat production excludes the hazards resulting from elevated temperatures in other epoxy systems. Unfortunately, modifiers composed of amines or amine adducts are often added to the polyamides, thus negating the comparative safety of the polyamides.

Uncured Resins

Although uncured epoxy resins and glycidal compounds are a health hazard, they are much less so than the irritants in curing agents. Uncured resins commonly are composed of polymers of epichlorohydrin and bisphenol A. A resin's toxicity generally decreases with the increase in molecular weight and the epoxy number. The uncured resins are primary skin irritants and/or sensitizers. Contact dermatitis is a common response, with the possibility of sensitization after initial contact.

Fillers and Solvents

Epoxy resins may be modified with *fillers* such as chalk, mica flour, asbestos, or silicates. Asbestos and silicate fillers may be a potential inhalation hazard during resin production. Care should be exercised while the resin is mixing with such fillers and while cured products containing these fillers are being machined. Cured products containing such fillers should be properly labeled if they are to be machined or similarly handled. Use local exhaust ventilation, respiratory protection, and wet machining or cleaning procedures to reduce aerosol exposure hazards.

Solvents are used occasionally in some epoxy resin formulations. Their ability to dehydrate and remove natural oils from the skin makes them primary skin irritants. Although sensitization is not directly associated with solvents, the skin is more vulnerable to the other sensitizing agents in the epoxy resin system after solvent exposure. Some epoxy paints, which are epoxy resin systems in volatile organic solvents, present an inhalation hazard, especially when sprayed. Acceptable water-based epoxy paints are available and should be substituted.

Cured Resins

Most fully cured resins have little or no toxic effect. Curing may be incomplete, however, leaving small amounts of the toxic curing agents and unreacted resin compounds on or in the finished product. When handled by previously sensitized individuals, these unreacted compounds can result in recurrence of adverse health effects.

Control

The health hazards associated with the use of epoxy resin systems can be substantially reduced by proper system selection (substitution with less toxic systems), personal hygiene, personal protective devices, and handling procedures.

Selection. When selecting an epoxy formulation for a specific job, consider its potential toxicity. When possible, a formulation with the lowest potential toxicity should be substituted for systems of greater toxicity.

Personal Hygiene. Worker contact with curing agents, resins, solvents, and their vapors should be minimized. In addition to instructing and educating epoxy workers in the hazards associated with epoxies, supervisors need to emphasize certain personal hygiene factors:

- clean disposable towels, mild soaps, or waterless handcleaners should be used, and
- no smoking, eating, or drinking should be allowed in the work area.

Protective Devices. Protective devices that should be used while working with epoxy resin systems include

- clean rubber gloves;
- protective clothing, such as clean coveralls for workers having repeated or prolonged contact;
- impervious aprons for additional protection where there is a potential of splashing or spilling epoxy solutions; and
- fullface shields to protect the eyes from contamination.

Handling Procedures. The procedures described below should be followed when handling epoxies.

When *mixing resins and hardeners*, workers should use a ventilated hood. If such an area is unavailable for an operation that must be performed, an individually fitted respirator (available from Industrial Hygiene) should be used.

Laying-up and curing operations should be confined to areas with exhaust ventilation facilities.

Hot process systems should be totally enclosed and the enclosure exhausted through a fan or vacuum pump, with the exhaust air discharged outside of the building. Contact Industrial Hygiene to ensure that the exhaust and discharge location is acceptable before installation.

Cold process systems (air curing) should be covered with wrapping paper or other disposable material and placed in a local exhaust hood until curing is complete. Ingredients should be mixed in cardboard or other disposable containers. These measures limit the need for general cleanup with solvents.

Waste (including cardboard and disposable mixing materials, unused epoxy resin, paper towels, etc.) should be wrapped so that other workers are not exposed to the materials. For disposal of epoxy resin materials, contact the Waste Management Group (HSE-7).

References

L. B. Bourne, "Health Problems of Epoxy Resins and Amine-Curing Agents," British Journal of Industrial Medicine **16**, 81 (1959).

C. Hine, V. K. Rowe, E. R. White, K. I. Darmer, and G. T. Youngblood, "Toxicology," Chapter 32, in *Patty's Industrial Hygiene and Toxicology*, Vol. IIA (John Wiley & Sons, New York, 1981).

"NIOSH Criteria for a Recommended Standard . . . . Occupational Exposure to Glycidyl Ethers," US Department of Health, Education and Welfare, Publication No. 78-166 (1978).

N. H. Proctor and J. P. Hughes, *Chemical Hazards of the Workplace* (J. B. Lippincott Co., Philadelphia, Pennsylvania, 1978).

C. Weil, N. Condra, C. Hann, and J. Striegel, "Experimental Carcinogenicity and Acute Toxicity of Representative Epoxides," American Industrial Hygiene Association Journal **24**, 305 (1963).

Referrals

Industrial Hygiene Group (HSE-5), 7-5231

Waste Management Group (HSE-7), 7-5398

APPENDIX Q

MANUAL OF FIRE PROTECTION POLICIES AND PROCEDURES

FIRE PROTECTION SYSTEMS AND PROCEDURES

No.	:	3120.1
Issued	:	5-1-72
Revised	:	2-11-80
Page	:	1

Subject: Fire Detection Devices and Circuits *(14)

A. Purpose

1. This procedure establishes inspection and maintenance procedures for fire detection devices and circuits.

B. Inspections

1. Initial and Continuous:

a. Inspection, testing, and maintenance shall be the responsibility of the Fire Protection Section of the Craft Operations Division.

b. Maintain a current master listing of all fire detection circuits.

c. Initially check all fire detection circuits and devices to assure that they are properly installed to provide protection for premises.

d. Notify the Fire Alarm Control Center that the master box controlling the area will be out of service for testing alarm initiating devices.

e. Check device for presence of paint or corrosion and include condition on report.

f. All fire detector devices shall be tested for proper operation by utilizing proper testing method and equipment, i.e., heat lamp, sensitivity meter, and ohm meter.

*(14) NFPA 72A - Local Protective Signalig Systems
72B - Auxiliary Protective Signaling Systems
72C - Remote Station Signaling Systems
72D - Proprietary Protective Signaling Systems

FIRE PROTECTION SYSTEMS AND PROCEDURES

g. Assure that proper coded alarm is received at the Fire Alarm Control Center.

h. Test all detectors and circuits in the entire building before proceeding to the next building.

i. Testing will be continuous until all DOE facilities are tested within two calendar years.

C. Control and Records

1. Monthly, continuous inspections shall be recorded on form ENG-4-87, and forwarded to the Fire Protection Program Engineering Coordinator for filing and retention for 2 years.

STANDARD FOR PORTABLE EXTINGUISHERS

SCOPE:

This standard provides general and technical guidance for procurement, placement, and maintenance of portable fire extinguishers in Los Alamos facilities and vehicles.

REFERENCES:

1. DOE Order 5480.1A, "Environmental Protection Safety, And Health Program For DOE," Chapter VII, "Fire Protection."
2. DOE Order 6430, "General Design Criteria."
3. NFPA Std. #10, "Portable Fire Extinguishers."
4. NFPA Std. #58, "Liquified Petroleum Gasses."
5. NFPA Std. #385, "Tank Vehicles for Flammable and Combustible Liquids."
6. NFPA Std. #495, "Explosive Materials."
7. NFPA Std. #512, "Truck Fire Protection."
8. "DOE Explosive Safety Manual"
9. Los Alamos National Laboratory, "Health, Safety, and Environment Manual."

GENERAL GUIDELINES:

1. Portable fire extinguishers shall be provided in all new facilities, including buildings acquired by lease or purchase, in accordance with DOE Order 6430, Chapter X, Paragraph 8b(7).

2. Fire extinguishers shall be provided as directed by ~~a~~ Fire Protection Specialists. Extinguishers shall be the appropriate type for the facility. Following is a general guideline:

   a. Office occupancies - One 2½ gallon water for every 3,000 sq. ft. (3K ORDINARY HAZARD)

   b. Computer, electronic, and laser occupancies - Halon 1211 extinguisher~~s~~ of at least ~~13~~ 9 pounds capacity and a rating of at least ~~1-A~~ and 20-B:C (See NFPA 10 for ratings explanation). for every sq. ft.

   c. Wet chemical laboratory occupancies - BC extinguisher~~s~~ of approximately 9 to 15 pounds capacity and a rating of at least 10-B:C for each sq. ft.

d. Machine shop occupancies (no hazardous materials such as explosives, pyrofronics metals) one BC extinguisher with a rating of at least 10-B:C for each sq. ft.

e. Special hazard applications will be provided with a dedicated extinguisher of size, type, and rating as determined by the fire protection specialists.

3. For all new construction, extinguishers shall be G.F.E. and shall be procured from appropriate project funds. The fire protection specialist shall determine the type, size, quantity, and location required after analyzing the proposed facility and occupancy. These extinguishers shall be procured by the Los Alamos Fire Department (LAFD) for placement in accordance with General Guidelines 1 and 2. Supplemental and replacement extinguishers may be purchased by the LAFD, the Laboratory, and the Zia Company. Zia craftsmen will hang all extinguishers that require wall mounting. Extinguisher units will be kept to a minimum and each shall be marked with the NFPA pictographs. Extinguishers that are not readily visible shall be identified with auxiliary signs.

4. It is the long-range goal to reduce the number of fire extinguishers to the minimum required by NFPA 10.

5. Extinguishers will not ordinarily be provided for fork-lift trucks or passenger vehicles (except those which operate regularly away from Los Alamos County), except as required below:

   a. Vehicles over 10,000 lbs. carrying cargo shall be provided with fire extinguishers in accordance with the requirements of DOT #393.95, Subpart H (Federal Motor Carrier Safety Regulations, DOT).

   b. Motor vehicles transporting explosive materials will be provided with fire extinguishers in accordance with Chapter 5, NFPA #495, and Chapters 22 and 24, DOE Explosive Safety Manual.

   c. Tank vehicles transporting flammable and combustible liquids will be provided with fire extinguishers in accordance with Paragraph 6-3, NFPA Standard #385.

   d. Vehicles, including trailers, transporting flammable gasses will be provided with extinguishers in accordance with Chapter 6, NFPA Standard #58.

6. Regular inspections by the LAFD and operating personnel will verify the need for recharging, testing, and other maintenance. Hydrostatic tests will be arranged for by the LAFD, and conducted in accordance with NFPA #10.

7. Wall-mounted cabinets, appropriately marked, should be provided for required fire extinguishers in new and renovated buildings. These should be recessed, where possible. Cabinet locations for new facilities will be designated in Title II documents in accordance with NFPA Standard #10. Cabinets shall be installed so the hanging bracket of the extinguisher is 42 inches off the floor when the extinguisher is placed within the cabinet.

8. Contract documents for leased buildings shall allow for the placement of wall-mounted fire extinguishers by the Government or Government-Contractor for the term of use. Wall-mounted extinguishers should be hung as shown in the Facilities Engineering Division "Loss Prevention Standards Manual" (Volume 7).

TECHNICAL SPECIFICATIONS:

Portable fire extinguisher cabinets shall be installed as shown on the contract drawings and shall be at least 10"W x 28"H x 8"D for single units or 22"W x 28"H x 8"D for double units. Cabinets shall be of all metal construction and shall be recessed where wall construction permits; required egress clearance specified by NFPA Standard 101 shall be measured from the face of the extinguisher or extinguisher cabinet to the opposite wall and shall not be diminished by the cabinet installation. Portable fire extinguishers shall be G.F.E. and installed by others at the completion of the construction project.

Approved
Fire Protection
Program Director E. M. Sitzberger 7/30/82 DATE

No. 3000.1
Issued: 7-15-73
Revised: 7-20-82
Page: 1 of 3

FIRE PROTECTION SYSTEMS AND PROCEDURES

3000.1 SUBJECT: MASTER, SUPERVISORY, AND MANUAL PULL STATIONS

A. Scope

This procedure describes the method for conducting inspection, testing and maintenance required for master alarm boxes, supervisory boxes, and manual pull stations.

B. References

1. NFPA-71 - "Central Station Signaling Systems"
2. NFPA-72A - "Local Protective Signaling Systems"
3. NFPA-72B - "Auxiliary Protective Signaling Systems"
4. NFPA-72C - "Remote Station Signaling Systems"
5. NFPA-72D - "Proprietary Protective Signaling Systems"

C. Initial System Acceptance

1. Upon completion of a new system by a contractor, an installation inspection and test of the entire system shall be made. The contractor shall perform a functional test of all circuits and devices associated with the system. The Fire Protection Section of the Zia Craft Operations Division shall assist, as required, and the Laboratory, Zia, and DOE personnel shall witness the test. Zia personnel shall record all information on Form ALL-27F, pages 2, 3, and 4, and submit to the Technical Programs Branch, DOE/LAAO.

2. The Central Alarm Station shall verify that all signals are received properly.

3. Furnish Central Alarm Station with necessary infomation of new code numbers, locations, and circuit numbers.

4. Furnish Fire Department with necessary information of new code number, location, zone or area coverage, fire protection and/or detection tied to alarm system and resetting instruction.

D. Outage Control

1. Initial acceptance: The Central Alarm Station must be notified prior to testing the new system(s).

2. Bi-Monthly Testing (60 days): The Central Alarm Station must be notified prior to testing the alarm boxes.

3. Bi-Annual Testing (2 years): The Central Alarm Station shall be nofified that the master fire alarm box for the facility is to be shunted out and the manual and/or automatic alarm systems will be out of service.

4. Five-Year Maintenance: The Central Alarm Station shall be notified that the master fire alarm box is to be removed from service.

5. Restoration to Service: The Central Alarm Station shall be notified that the system has been restored to normal service and the alarm center shall verify that the alarm circuit was restored to the normal condition.

E. Inspection

1. Responsibility: The Laboratory ENG-4 Fire Protection Section is assigned the responsibility to supervise and maintain records of inspection, testing and maintenance, which shall be conducted by the Fire Protection Section of the Craft Operations Division.

2. Frequency:

a. Bi-Monthly (two (2) months)

1. Examine and test master fire and supervisory alarm boxes every 60 days. Boxes shall be tested by operation under conditions simulating actual use, and tests shall be transmitted to and recorded at Central Alarm Station. Each master box shall be tested by the actuation of one detection device with signal transmitted from the device, through the master box to Fire Alarm Control Center. The Fire Alarm Control Center shall verify the signal was received properly.

2. In buildings having alarm and/or evacuation signals, these signals shall be tested only one time after proper notification of facility personnel.

3. After completion of the tests in each building, the master fire alarm box, the supervisory boxes and building fire alarm control panel shall be returned to their normal operation condition.

4. Following each box test, the interior of the box (not the movements) shall be cleaned, if necessary.

b. Bi-Annual (two (2) years)

1. Test all manual pull station.

2. After completion of the tests in each building, the master fire alarm box, the supervisory boxes and building fire alarm control panel shall be returned to their normal operation condition.

c. Five-Year Maintenance:

1. General cleaning, oiling, and inspection of the movements in the fire alarm boxes shall be performed in accordance with the manufacturer's recommendations.

2. Proceed with testing required by paragraph (a) to insure proper operation of the components.

F. Reporting and Records

1. New installation acceptance tests shall be recorded on Form A11-27-F, and pages 2, 3, and 4 submitted to DOE/LAAO Technical Programs Branch.

2. Bi-monthly and Bi-annual tests shall be recorded on Form ENG-4-87 and forwarded to the Fire Protection Program Engineering Co-ordinator for filing and retention for two years.

3. Five-year cleaning and oiling shall be recorded on a sticker inside the fire alarm box.

(NEW FORMAT)

ALL-27F
Page 1

EXHIBIT 8

SIGNALING SYSTEMS INSTALLATION INSPECTION FORM

TO: Contracting Officer
U.S. Department of Energy

SIGNALING SYSTEMS INSPECTED: _____

TYPE: _____ CONTRACT NUMBER _____

LOCATION: _____ TA _____ BLDG _____

AN INSTALLATION INSPECTION OF THE SIGNALING SYSTEMS WAS CONDUCTED TO IDENTIFY CODE AND DESIGN COMPLIANCE.

DEFICIENCIES IDENTIFIED:

PLEASE ASSURE THAT ALL DEFICIENCIES IDENTIFIED ARE CORRECTED PRIOR TO MAKING ARRANGEMENTS FOR A REINSPECTION AND APPROVAL OF THE SYSTEM.

LAAO DOE TECHNICAL PROGRAMS BRANCH
SAFETY MANAGER

ALL-27F
Page 2

APPROVAL OF SIGNALING SYSTEM

PRIME CONTRACTOR: _____
ADDRESS: _____
LOCATION OF WORK: _____ TA _____ BUILDING _____

SUBCONTRACTOR: _____
ADDRESS: _____
SUBCONTRACTOR REP'S NAME _____
ADDRESS: _____

MANUFACTURER: _____
LOCAL REPRESENTATIVE: _____
ADDRESS: _____

EQUIPMENT

NAME	MANUFACTURER	MODEL NO.	TO
Control Panel:			
Manual Pull Station:			
Thermal Detectors:			
Ionization Detectors:			
Photo. Elec. Detectors:			
Flow Switches:			
Pressure Switches:			
Evacuation Horns:			
Post Indicator Switches:			
Fire Alarm Transmitter:			
Supervisory Transmitter:			
Battery Charger:			
Batteries:			
Other:			

ALL-27F
Page 3

Exhibit 8

EMERGENCY POWER SUPPLY

AUTOMATIC SWITCH OVER: YES _____ NO _____
TROUBLE SIGNAL UPON SWITCH OVER: YES _____ NO _____
BATTERY DISCHARGE TEST: YES _____ NO _____
BATTERY RECHARGED: YES _____ NO _____
BATTERY TYPE: LEAD ACID _____ NICAD _____ OTHER _____

VOLTAGE SPECIFICATIONS

LINE VOLTAGE: _____ AC
OPERATING VOLTAGE: _____ DC

ELECTRICAL ZONES

ALARM ZONES _____ TOTAL
SUPERVISORY ZONES _____ TOTAL
SPARE ALARM ZONES _____ TOTAL
SPARE SUPERVISORY ZONES _____ TOTAL
SPACE FOR FUTURE ZONES _____ TOTAL

ZONE CHECK

Control Panel Alarm Zone Number*	Alarm Received		Trouble Alarm Received		Alarm Override Received	
	Yes	No	Yes	No	Yes	No
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						

*Identify Zones: A or S = A - Alarm; S - Supervisory

ZONE IDENTIFICATION

Acceptable _____ Not Acceptable _____

ALL-27F
Page 4

Exhibit 8

TESTS

EVACUATION HORNS: YES _____ NO _____
SUPERVISORY TRANSMITTER: YES _____ NO _____
FIRE ALARM TRANSMITTER: YES _____ NO _____

OTHER MATERIALS PROVIDED

MANUFACTURER DESIGN DRAWINGS: YES _____ NO _____
MANUFACTURER INSTRUCTION MANUALS: YES _____ NO _____
AS BUILT DRAWINGS: YES _____ NO _____
SPECIAL TEST EQUIPMENT: YES _____ NO _____

THIS SYSTEM HAS BEEN INSTALLED IN COMPLIANCE WITH NFPA 71 AND 72.

PRIME CONTRACTOR: _____ TIME _____ DATE _____
DOE OR DESIGNATED CONT. REP.: _____ TIME _____ DATE _____
A-E INSPECTOR: _____ TIME _____ DATE _____
ZIA ALARM ELECTRICAL: _____ TIME _____ DATE _____

COMMENTS:

FIRE ALARM INSPECTION SURVEY

NO. ________ BLDG. NO. ____________ ____________________ WING. NO. ____________

ROOM NO.	DATE INSP.	ROOM NO.	DATE INSP	ROOM NO.	DATE INSP.

FIRE PROTECTION SYSTEMS AND PROCEDURES

No.	:	5000.1
Issued	:	4-1-71
Revised	:	2-11-80
Page	:	1

Subject: Housekeeping Inspections *(19)

A. Purpose

1. A high standard of housekeeping is an important factor in the prevention of fire.

B. Scope

1. This policy shall cover inspection procedures for all DOE/LASL/Zia facilities at Los Alamos, to include storage facilites, warehouses, equipment rooms, utility areas, grounds, penthouse and roof areas, among others. Inspections shall be accomplished as a part of normally assigned functions.

2. All LASL engineering and maintenance spaces shall fall under LASL Engineering Department responsibility, other LASL spaces are the responsibility of the using groups, DOE and County spaces under DOE, and Zia spaces under The Zia Company.

C. Inspections

1. Monthly

a. All equipment rooms and areaways shall be inspected for cleanliness and fire hazards. An immediate cleanup shall be initiated where hazards are found. The below special hazard items require removal:

1) Collection of combustible materials, waste, rags, paper, oil or grease.

2) Excessively heavy oil/grease in or about operating machinery/equipment.

3) Excessive quantities of combustible material in non-sprinklered areas.

4) Excessively flammable and combustible liquids in area.

*(19) NFPA 101, Life Safety Code

FIRE PROTECTION SYSTEMS AND PROCEDURES

b. All equipment rooms and areaways shall be inspected for storage or group material of supplies, the presence of which could create a fire or safety hazard and/or prevent access to operating facility equipment.

c. Penthouses, roof areas, basements and outside spaces adjacent to buildings shall be inspected for fire/safety hazards.

d. Fire sprinkler riser/alarm valve compartments, hose cabinets, fire alarm/pull boxes, etc., shall be inspected for obstructions to access.

3. Every Six Months

a. Determine that at least 18" clearance shall exist between sprinkler head and obstructions stacked below to prevent blocking of water flow pattern. This clearance must be increased to 36" minimum for high-piled combustible stack.

D. Reporting Procedure

1. All discrepancies, abnormal conditions, obstructions to fire system or facility equipment and fire/safety hazards shall be reported; first, by verbal order and if not corrected within a reasonable period, then by memo to the authority responsible for maintenance of area for action.

2. Form A11-59 shall be used to report any discrepancies, abnormal conditions, or obstructions to the Fire Protection Program Engineering Coordinator for appropriate action and record.

BUILDING FIRE INSPECTION	DATE	STRUCTURE NOMENCLATURE	LOCATION TA-_____ BLDG._____

.RKS

CONTACT PERSONS

ADMITTANCE PROCEDURE:/KEY AVAILABILITY

SPECIAL HAZARDS: ☐ HIGH EXPLOSIVES ☐ TOXIC GASES ☐ CRITICALITY ☐ RADIATION ☐ FLAMMABLE LIQUIDS ☐ LASERS ☐ HIGH VOLTAGE

CHECKLIST - COMMON AND/OR SPECIAL FIRE HAZARDS

BUILDING EXTERIOR:

1 ROADWAY ACCESS BLOCKED
2 PARKING CLOSE TO BUILDING
3 HYDRANT ACCESSIBILITY/UNPROTECTED
4 PIV(A) BLOCKED/UNPROTECTED
5 FIRE DEPT. CONNECTIONS BLOCKED
6 GAS REGULATOR UNPROTECTED
7 ELECTRICAL SERVICE ENDANGERED
8 FOLIAGE (WEEDS/TREES) TOO CLOSE
COMBUSTIBLE TRASH/STORAGE EXPOSURE
BLDG. ELECTRICAL GROUND NOT CONNECTED
11 TRAILERS/TRANSPORTABLE TOO CLOSE

BUILDING INTERIOR:

ELECTRICAL:

12 MULTIPLE OUTLET USE
13 FRAYED/DETERIORATED CORDS
14 COMBUSTIBLE STORAGE NEAR LIGHTS/PANELS
15 IMPROPER WIRING (SPLICES, PIGTAILS, ETC.)
16 OPEN/EXPOSED SWITCH BOXES/PANELS
17 UNAUTHORIZED TYPE APPLIANCES

PAINTS/FLAMMABLE LIQUIDS:

18 SOLVENTS IN GLASS OVER 1 QUART
19 INADEQUATE SAFETY CANS
20 STORAGE NOT IN UL FLAMMABLE LIQUID CABINETS
21 LEAKING AND SPILLS
22 FLAMMABLES NOT LABELED
23 DRUMS NOT SECURED/GROUNDED

F.P. SYSTEMS:

24 (AS) IN SERVICE
25 HOSE/EXT. CABINET BLOCKED
ALARM VALVE BLOCKED
27 ALARM PANEL BLOCKED
28 FIRE ALARM SYSTEM IMPAIRED
29 (AS) VALVE NOT LOCKED/SEALED/SUPERVISED

HOUSEKEEPING:

30 COMBUSTIBLES IN EQUIPMENT ROOM
31 COMBUSTIBLES STORED NEAR HEATER
32 EXCESSIVE COMBUSTIBLE LOADING

FIRE DOORS:

33 BLOCKED/JAMMED
34 INOPERATIVE (CLOSE/OPEN)
35 MARKING NEEDED

EXITS/EXITWAYS:

36 BLOCKED
37 LIGHTS MISSING/OUT
38 SIGNS MISSING/OUT
39 PANIC HARDWARE INOPERATIVE

FIRE EXTINGUISHERS:

40 MISSING
41 DAMAGED
42 NEEDS SERVICE
43 IMPROPERLY MARKED
44 NOT HUNG
45 IMPROPERLY LOCATED
46 IMPROPER TYPE/SIZE
47 _____
48 _____
49 _____
50 _____

GROUP_____

NAME(S) OF INSPECTORS

RECORD OF INSPECTIONS			
Deficiency Number or Condition	Location of Deficiency	Describe Condition	Corrective Action Taken

Design Guidelines

702 - DESIGN GUIDELINES

1. INTRODUCTION

These design guidelines serve primarily as a standard approach for identifying the governing codes, standards, and recommended practices, basic engineering and design practices, appropriate material, and approaches for interdiscipline coordination to ensure that fire protection systems implemented at the Laboratory perform as intended and that quality of design is not compromised.

2. DESIGN CRITERIA

The loss prevention design criteria should provide the basis for design as related to a specific project. The design criteria should be developed by the ENG-4 Loss Prevention Section and reviewed and commented on by the other disciplines before being finalized. The Loss Prevention Design Guidelines should be used internally as a coordination document. The design criteria prepared for a project should identify hazards; methods to protect against the hazards; unusual conditions related to the hazards identified; preliminary calculations; alternative methods and procedures; and appropriate codes and recommended practices.

3. COORDINATION

A consistent approach is needed in loss prevention design to reduce fire and other property losses and minimize the cost of protection. The best approach is to identify activities and tasks, assign areas of responsibility, and identify interfacing disciplines. A procedural method has been developed (Los Prevention Design Analysis) and should be used to identify the loss prevention requirements, e.g., automatic sprinklers, fire-resistant construction, compartmentation, process review, lightning protection, programmatic impact, and fire alarm signaling. The primary discipline should meet with supporting disciplines to resolve all comments.

4. REGULATORY REQUIREMENTS

4.1 DEPARTMENT OF ENERGY

a. DOE Order 5480.1A, Environmental Protection, Safety, and Health Protection Program for DOE Operations.

Design Guidelines

b. DOE/AL Order 5480.1A, Environmental Protection, Safety, and Health Protection Program for AL Operations.

c. DOE Order 6430.1, General Design Criteria Manual.

d. DOE/EV-0043, Standard on Fire Protection for Portable Structures.

e. DOE/EV/06194.1, UC-45, DOE Explosives Safety Manual.

f. DOE/NV/00410-21, Cross Index to DOE Prescribed Occupational Safety Codes and Standards.

g. DOE Interim Guide, Installation of Smoke Detectors.

h. DOE/Lab/Zia Red Book, "Manual of Fire Protection Systems, Policies, and Procedures".

i. Factory Mutual (FM) Approval Guide.

j. Factory Mutual (FM) Loss Prevention Data Sheets (Improved Risk Guide).

k. GSA Accessibility Standard (See Federal Register, 10/14/80, Volume 45, No. 200).

l. GSA Federal Property Management Regulations, Part 101-20, Management of Buildings and Grounds.

m. GSA, "Protecting Federal Records Centers and Archives from Fires". (4/77).

n. NFPA, "Fire Protection Handbook" (Improved Risk Guide).

o. NFPA "National Fire Codes".

p. OSHA (29 CFR, Part 1910).

q. Underwriter's Laboratories, Inc., Product Directories.

r. Uniform Building Code.

s. WASH-1245-1, "Standard for Fire Protection of AEC Electronic Computer/Data Processing Systems".

Design Guidelines

5. RECOMMENDED PRACTICES AND GUIDELINES

5.1 UNDERGROUND PIPE FLUSHING

Thorough flushing of underground mains and sprinkler lead-in connections is performed to remove foreign materials which may have entered the pipe during installation. This must be done prior to the final tie-in to any existing system, and it must be continued for a sufficient time to ensure thorough cleaning. Consideration must also be given to dispersion and disposal of test water to avoid flooding and damage to landscaping.

a. Minimum flow rates for flushing are set forth in NFPA Standard No. 24; however, the hydraulically calculated water demand rate of the system must be used, if greater. The pressure of the water supply source should not be reduced below 20 psi to avoid disruption to process water circulation. Valve operation should be slow enough to avoid causing water hammer.

5.2 NITROGEN REQUIREMENT

Calculate system piping capacity in gallons using the method as indicated for air.

Determine pressure requirement and select cylinders based on the following:

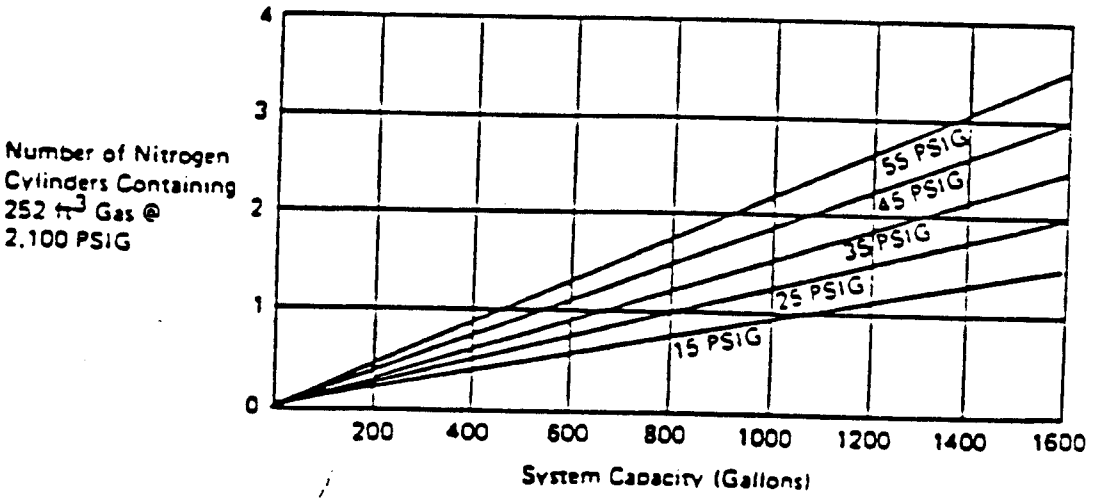


FIGURE 1
NITROGEN CYLINDER CAPACITY

Design Guidelines

5.3 PIPE LAYING

Requirements and typical details for laying underground piping will be found in Volume 3, Los Alamos Facilities Engineering Division, Civil Standards.

5.4 OCCUPANCY CHANGES

Normally any Laboratory facility with an area of 5,000 square feet or more should be carefully reviewed by ENG-4 Loss Prevention section for the fire protection adequacy of proposed changes prior to construction, even though the current valuation of building and contents does not exceed the $1 million limit. Light hazard sprinkler design shall not be used, per DOE Regulation 6430.1. It is more cost-effective to install an Ordinary Hazard Group II density system than to revise a Group I density system due to a change in facility occupancy.

5.5 RADIATION HAZARDS

Automatic sprinklers should be used in areas presenting high radiation radioactive contamination or a risk of criticality, but require special precautions and close coordination with the HSE-6 Group.

5.6 HOSE CABINETS, RACKS AND REELS

Hose cabinets and hose racks are not required in sprinklered buildings, and shall not be installed except in very special occupancies, e.g., TA-55-4. Standpipe outlets will be capped for fire department use. Hoses shall be removed from existing hose cabinets and, where possible, the cabinets used for hand fire extinguishers.

5.7 WATER SUPPLY

Water supply and design data (volume and pressure) for sprinkler systems shall be based on flow tests conducted near the proposed system location as provided by the ENG-4 Loss Prevention Section. The data shall be taken from the area in question downstream from all pressure-reducing valves and meters. The Fire Protection Engineering Coordinator shall approve water flow procedures and data before the data is used in the calculation of a fire protection system.

Design Guidelines

5.8 FREEZE PROTECTION

a. Use of antifreeze AS systems is preferred over the use of dry pendant AS heads, where more than six heads are needed. Extensive use of dry pendant heads shall be approved by the Fire Protection Program Engineering Coordinator. All antifreeze automatic sprinkler systems shall use CP grade glycerine and shall have a check valve as shown in NFPA Standard 13, Paragraph 5-5.4. The check valve shall be installed as shown, NFPA noted exceptions notwithstanding. Backflow preventors and/or pressure reducing valves are not allowed in dedicated fire protection system piping.

5.9 SPRINKLER SYSTEM MODIFICATIONS

a. Sprinkler system modifications of a minor nature, which are to be completed by work order and are not in formal design at ENG-2 or Zia, will be accomplished, or approved by, the Loss Prevention Section of ENG-4. Required sketches or drawings and test criteria shall be prepared or approved by this Section.

b. Hydrostatic testing above 200 psi, or a higher normal static pressure, whichever is greater, will not normally be required, unless high value equipment or other factors predicate a more stringent test. ENG-4 Loss Prevention Section will specify testing requirements in special cases.

c. The Zia Company shall install or modify systems only with sketches or drawings which have been designed or approved by the ENG-4 Loss Prevention Section.

5.10 SPECIAL FIRE SUPPRESSION SYSTEMS APPLICATIONS

Special application fire suppression systems (halon, dry chemical, water spray, etc.) should be installed when automatic sprinkler systems are not economically justified; to supplement automatic sprinkler systems which protect high value equipment; or to protect special hazard operations or occupancies. The design guidance for the selection of detection and suppression required for the specific application shall be provided by the ENG-4 Loss Prevention Section.

Design Guidelines

5.10.1 Criteria. Generally, these special fire suppression systems are required only where the following conditions warrant:

a. Areas containing concentrated high dollar value equipment, e.g., computer rooms diagnostic equipment, electronic parts, (including screen rooms and clean rooms), concentrated high valve shall be defined as more than $500 per square feet in an area with a value of $500,000 or more.

b. Continuously occupied areas critical to the operation of the facility.

c. Where deemed necessary by the Fire Protection Program Director for special situations (e.g., diagnostic skids in remote locations, mobile electronic trailers, special purpose vehicles, areas without standard protection, etc.).

5.10.2 Installation Responsibility. For systems to be installed by contract, it is desirable to have the responsibility for the entire suppression system (design, installation, and test) delegated to one contractor. The technical specifications presented in this manual have been prepared to achieve this end.

5.10.3 Design Basis. The purpose of a special suppression system is to provide rapid fire suppression which will protect personnel and property, and to reduce down time. To achieve this goal, cross-zoned early warning detection should be used to activate the suppression system. A pre-discharge alarm (the first zone) should be used to alert occupants and the fire department that a discharge may be pending. The following shall also be considered in the design basis:

a. The system should normally be designed to provide total flooding of the entire hazard.

b. Agent storage containers should be located within a protected area.

c. Design concentrations for Halon 1301 should be 7% in trailers, 6% in permanent building rooms, 5% in very large spaces (over 100,000 cubic feet). A tolerance of ± .5% will be allowed.

Design Guidelines

5.10.4 System Design Consistency. The majority of Halon system hardware now in service at the Laboratory is of the "Fenwal" brand name. To facilitate maintenance and recharging, and to minimize quantity of spare parts storage, only Fenwal Halon 1301 system hardware should be provided. ENG-4-81-006, sole-source justification for Halon 1301 systems approved 10/27/80, provides justification for this limitation.

5.11 FIRE ALARM SYSTEM ZONING

a. Each building level shall be a separate physical fire zone.

b. Each fire area/division of each floor shall be a separate physical zone.

c. Smaller areas that require early warning or special suppression systems, e.g., computer rooms, vaults, RFI screen rooms, shall be separate electrical zones.

d. Each small detached or semi-detached space/building, e.g., equipment room with only an outside entrance, may be a separate electrical zone.

e. Manual Pull Stations (MPS) shall be installed only at the main building entrance and the most used exits. These devices should be represented on the fire alarm panel with one electrical zone per floor.

f. Final authority for designating or approving zone requirements shall be the responsibility of the Fire Protection Program Engineering Coordinator.

6. ADDITIONAL CONCEPTS

6.1 AUTOMATIC FLOW SWITCHES

Automatic sprinkler system flow switches should be kept to a minimum.

6.2 CONTROL VALVES

The number of control valves should be kept to a minimum. Post indicator valves (PIVs) will be the main control for AS system shut-off. Only Technical Area 55 shall require Post Indicator Valve Assemblies (PIVAs). All valves two inches or larger which control water to automatic sprinkler heads shall be equipped with supervisory switches having one normally open contact and one normally closed contact. All valves less than two inches in size shall be locked.

Design Guidelines

6.3 AUTOMATIC SPRINKLER SYSTEM

The basic fire suppression system in virtually all protected buildings shall be an automatic sprinkler system. Where a fire detection system is already installed it may be retained on a case-by-case analysis after new AS systems are installed.

6.4 EXISTING SYSTEMS

Fire alarm system components such as manual pull stations, control panels, supervisory boxes, and detectors will be retained if compatible with the in-going site-wide LORAX/BRASS alarm system.

6.5 HAND EXTINGUISHER INSTALLATION

Where fire extinguishers are hung outside of the cabinets, they will be installed at the height shown in Figure 2 below. All new buildings shall have fire extinguisher cabinets.

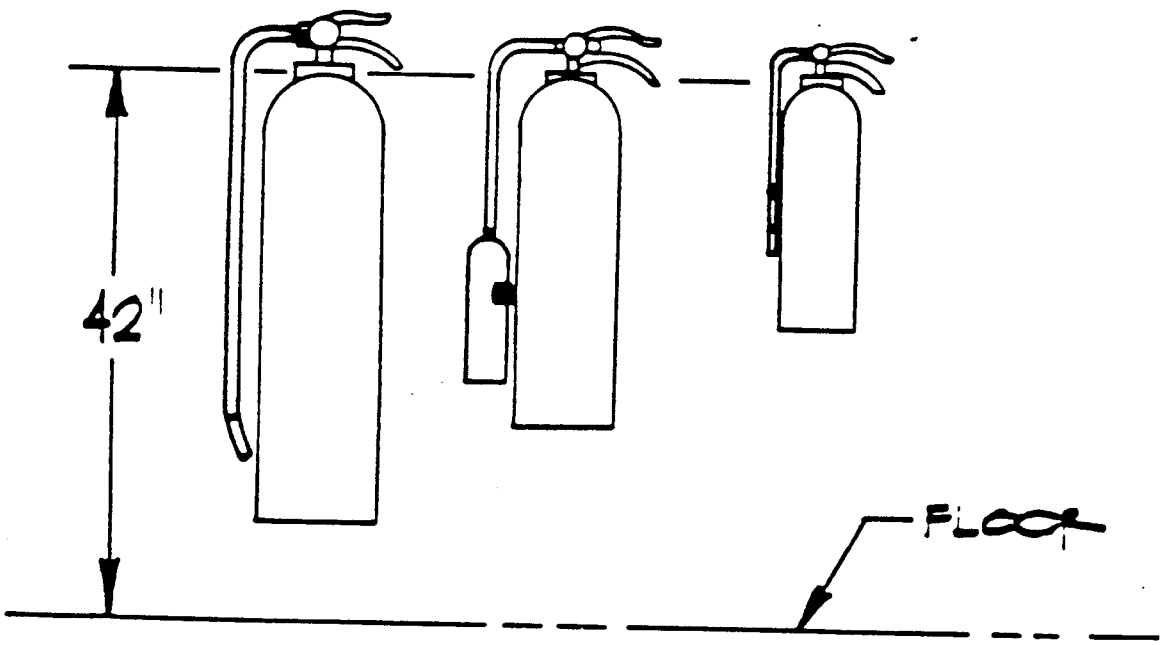


FIGURE 2
FIRE EXTINGUISHER INSTALLATION

Design Guidelines

6.6 FIRE EXTINGUISHER CABINETS

Fire extinguisher cabinets shall be not less than 22-inch by 28-inch by 8-inch dimension, of all-metal construction, and planned for two standard extinguishers, which shall be furnished by the Government.

6.7 ENVIRONMENTAL FACTORS

The altitude of the Los Alamos National Laboratory ranges from 6,800 feet to 10,000 feet above sea level. This results in a wide variation in temperatures, snow fall, rain fall, and other environmental factors. The parameters concerning elevations, temperatures, and other environmental considerations must be defined for each design.

a. The maximum depth of ground freeze is 3 feet. All fire protection piping shall be buried at least 48" (per NFPA 24).

APPENDIX R

OPERATIONAL SAFETY REQUIREMENTS FOR THE CONTROLLED-AIR INCINERATION PROCESS

OPERATIONAL SAFETY REQUIREMENTS FOR THE CONTROLLED AIR INCINERATION PROCESS

I. LIMITING CONDITIONS FOR PROCESS OPERATION

In order to assure safe operation, the Controlled Air Incineration Process will be operated within the following limits:

A. Process Feed Preparation Line

1. Equipment

   The following equipment must be operating or available.

   a. Plant Utilities

      (1) Electrical Services (normal and auxiliary generator in 10 second standby mode).

      (2) Compressed Air (designated and standby compressors).

      (3) Building Fire Protection Systems.

      (4) Special Glovebox Fire Protection System.

      (5) Special Exhaust Duct Cool-Down System.

   b. Radiation Protection and Plant Instrumentation

      (1) Continuous Air Monitors (alpha and beta-gamma).

      (2) Facility Stack Sampling System.

      (3) Building Exhaust and Process Line Glovebox HEPA Filter Systems. Differential pressure across each filter bank not less than 0.1 inch nor more than 8 inches water column.

2. Personnel

A minimum of two persons are required to be present during any operations in the Feed Preparation Line. A health physicist or health physics surveyor must also be available.

B. **Liquid/Resin Feed Preparation Area**

1. Equipment

The following equipment must be operating or available.

a. Plant Utilities

(1) Electrical Services (normal and auxiliary generator in 10 second standby mode).

(2) Compressed Air (designated and standby compressors).

(3) Building Fire Protection Systems.

(4) Feed Preparation Area Halon Fire System

(5) Feed Prepartion Area Exhaust System.

(6) Activated Carbon Bed Filter (differential pressure not less than 0.1 inches nor greater than 8 inches water column).

2. Personnel

A minimum of two persons are required to be present during any operations in the Liquid Feed Preparation Area.

C. **Controlled Air Incinerator**

1. Checkout Operations Below 500°F

a. Equipment

In addition to the above minimum requirements, the following must be operational for low temperature instrumentation and equipment checkout and calibration.

(1) Utilities

(a) Fuel (Natural Gas) Supply System

(b) Auxiliary Cooling Water System

(c) Uninterruptible Power Supply (UPS)

(d) Instrument and Control Air Supply (designated and standby compressors)

(2) Equipment

(a) Quench Tower Pumps and Sprays

(b) Incinerator Induced Draft (blower or automatic crossover to building exhaust HEPA filter plenum)

(c) Process Offgas HEPA Filters (differential pressure across each filter bank not less than 0.1 inches nor more than 8 inches water column)

(d) Activated Carbon Bed Filter (differential pressure across the bed not less than 0.1 inches nor more than 8 inches water column).

(3) Instrumentation

All instrument and control panels must be on and operating. Prior approval of the Lead Engineer must be obtained to disable any interlock. If any interlocks are disabled, the instrument chasis front must be tagged and the disabled interlock identified. An appropriate entry must be made in the Operating Log when any interlock is disabled or restored to operational condition.

(4) Personnel

Not less than two persons must be present during operation of the incinerator. These are a shift supervisor and an additional process engineer. A Health Physicist or Health Physics Surveyor must be available.

2. High Temperature Operation

a. Equipment

During incinerator startup for operation at temperatures above 500°F (high temperature), the following must be fully functional in addition to the items listed above:

(1) Utilities

(a) Auxiliary Generator and Automatic Switchgear (running and ready)

(b) Primary, Secondary, and Cooling Tower Loops and Pumps

(c) Process Steam Generator (pre-start interlock satisfied)

(2) Equipment

(a) Venturi Scrubber System

(b) Packed Column Scrubber System

(c) Process Liquid Filter and Recirculation System

(d) Offgas Condenser System

(e) Offgas Superheater

(f) Induced Draft Blower (designated and standby)

(3) Instrumentation

All of the process controls and interlocks listed in the Final Safety Analysis Report, Chapter 6.4.2.2 through 6.4.2.5 must be operable and no interlocks shall be disabled.

b. Personnel

Personnel requirements are the same as for low temperature operation as in 1 above.

3. Waste Feed Operations

a. Equipment

The following conditions must be within the limits noted before beginning and during waste feed charging operations:

(1) Utilities

(a) Argon Gas System Supply Adequate (10% of tube trailer supply is tagged reserve)

(2) Process Equipment

(a) Lower Incinerator Chamber Temperature not less than 1000°F nor greater than 2500°F

(b) Upper Incinerator Chamber Temperature not less than 1500°F nor greater than 2500°F

(c) Quench Column Gas Stream Exit Temperature not greater than 250°F

(d) Condenser Gas Stream Exit Temperature not greater than 180°F

(e) Process HEPA Filter Gas Stream Inlet Temperature not greater than 300°F

(f) Scrubber Solution Temperature not greater than 180°F

(3) Personnel

In addition to the shift supervisor and process engineer, operations personnel shall be assigned to each shift as required to meet objectives of the

experimental run plan. A health physicist or health physics surveyor shall be present during waste feed operations.

III. LIMITING CONDITIONS FOR OPERATIONS INVOLVING FISSION-ACTIVATION PRODUCTS (F-AP)

A. **F-AP Isotopes**

Current program studies require the use of the isotopes iodine-131, ruthenium-106, cobalt-60, cesium-137, and iron-59.

B. **Facility Inventory**

In accordance with Section 6.1.1, FSAR Addendum dated April 1981, the amount of beta-gamma (β-γ) emitting radioisotopes of the above species is limited to a total of 100 curies.

IV. LIMITING CONDITIONS FOR CONTINUING PROCESS OPERATION OR PROCESS RE-START

The Controlled Air Incineration process shall be shutdown and not restarted without approval of OSD/ALO upon the occurrence of any accident, fire, or explosion that causes:

A. Death or serious injury to one or more personnel due to process equipment failure.

B. Loss or damage to the process or facility exceeding $50,000.

C. Release to the environment of radioactive material or pollutants or radiation exposure to personnel equal to or in excess of DOEM Appendix 0502 guidelines.

D. Over-pressure resulting in major breaching of the Zone I containment

E. An off-site emergency.

The occurrence of any natural phenomenon that subjects the process equipment or facility to structural stresses in excess of design basis criteria, such as

A. Earthquake

B. Windload

C. Snowload

APPENDIX S

CONTROLLED-AIR INCINERATOR PROCESS OPERATING MANUAL

IX. PROCESS UTILITIES SOPs

A. 3-Phase Electrical Supply
B. 120 VAC Uninterrupted Power Supply
C. Auxiliary Diesel Generator
D. Plant Air Supply
E. Instrument Air Supply
F. Plant Water Supply
G. Emergency Water Supply
H. TDF Building Liquid Blowdown
I. Caustic Solution System
J. Natural (Fuel) Gas Supply
K. Liquid Fuel (Oil) Supply

892

HEALTH·SAFETY·ENVIRONMENT FORM

SOP SUBMITTAL

DATE 1/20/82

TO H-DIVISION SOP OFFICE MAIL STOP [redacted] 229

SOP TITLE THE 3-PHASE ELECTRICAL SUPPLY TO THE CONTROLLED-AIR INCINERATION PROCESS

ORIGINATING ORGANIZATION H-7 LOCATION TA-50, BLDG 37 (AS SPECIFIED IN THE SOP)

SOP STATUS: ☐ NEW ☒ REVISED ☐ RENEWAL ☐ OTHER _____ (SPECIFY)

DISCIPLINES INVOLVED:

- ☐ HEALTH PHYSICS (H–1)
- ☐ OCCUPATIONAL MEDICINE (H–2)
- ☐ FIRE PROTECTION (H–3)
- ☒ SAFETY (H–3)
- ☐ INDUSTRIAL HYGIENE (H–5)
- ☐ WASTE MANAGEMENT (H–7)
- ☐ ENVIRONMENTAL SURVEILLANCE (H–8)
- ☒ OTHER H-DC (SPECIFY)

EXPLANATION/COMMENTS:

This SOP is a revision and update to the existing Controlled Air Incineration Process Operating Manual. If there are any technical questions regarding the system or this SOP, please call C. L. Warner at 7-7391.

SUBMITTED BY C. L. Warner ORGANIZATION H-7

APPROVED BY:

(NAME)	(TITLE)	(ORGANIZATION)	(DATE)
[illegible]	Dep Grp Ldr	H-7	1/28/82

NOTE: THIS SOP MUST BE APPROVED IN ACCORDANCE WITH ESTABLISHED DIVISION PROCEDURES BEFORE IT IS SUBMITTED TO H-DIVISION.

LOS ALAMOS SCIENTIFIC LABORATORY

THE 3-PHASE ELECTRICAL SUPPLY TO THE CONTROLLED-AIR INCINERATION PROCESS

I. SCOPE

This SOP covers the control and distribution of electrical power from the building supply of 480 VAC and 280 VAC power from motor control centers (MCC) 1 and 2 to elements of the CAI process requiring 3-phase power.

II. HEALTH AND SAFETY PRECAUTIONS

The 3-phase electrical power supply system presents a personnel hazard if not properly isolated. In addition, an unscheduled interruption in electrical power to the CAI process could result in an unnecessary shutdown and in some cases could result in equipment damage. Do not repair or make any adjustments to components of the electric power system without approval of the shift supervisor or floor manager.

III. OPERATIONS

A. Startup

1. Before operating all or part of the CAI process, verify that MCC1 breakers and control switches are positioned as follows:

Breakers		Control Switch
Junction Box Feed (Breaker 5B)	ON	--
Bus Duct, Room 113 (4C)	ON	--
Auxiliary Instrument Air Compressor (5C)	ON	AUTO
Main Plant Air Compressor (2C)	ON	--
LP-2 Feed (1D)	ON	--
Bus Duct, Room 112 (2D)	ON	--
Power Panel Transformer Feed (4D)	ON	--
EP-1 Feed (6D)	ON	--

2. Verify that MCC2 breakers and control switches are positioned as follows:

Breakers		Control Switch
Process Boiler (Breaker 1E)	ON	--
Auxiliary Plant Air Compressor (2E)	ON	AUTO
Building Sump Pump (3E)	ON	AUTO*
Process Sump Pump (4E)	ON	OFF*
Cooling Tower #1 Fan (1F)	ON	OFF*
Cooling Tower #2 Fan (2F)	ON	OFF*
Process Exhaust Fan #1 (4F)	ON	OFF*
Cooling Tower Pump (1G)	ON	OFF*
LP-1 Feed (3G)	ON	--
Process Exhaust Fan #2 (1H)	ON	OFF*
Main Instrument Air Compressor (2H)	ON	--
Offgas Superheater Supply (3H)	ON	--

*Located in Room 112.

3. Verify that the following PP-1 breakers are positioned as follows:

Breaker	
Bus Duct Room 112 (breaker 4)	ON
Emergency Generator (10)	ON
Cooling Tower (15)	ON
Emergency Switchgear (16)	ON
Bus Duct Room 113 (38)	ON

B. Shutdown

1. The status of the breakers should remain the same following shutdown of the CAI process. They should

be changed only if isolation of a component for maintenance or modification is required.

IV. AUTHORITY

Modification or changes to any component part of the 3-phase electrical power supply must be approved by an H-7 R&D Section Leader. The shift supervisor or floor manager must be contacted for permission to actuate any CAI process breaker or control switch. Maintenance and service for component parts of the 3-phase electrical power supply system is to be coordinated through ENG-4.

V. REFERENCES

1. LASL Health and Safety Manual, Chapter X, Section A, p.x.2, "General Safety Rules," and Section D, paragraph 6, p.x.5, "When Operating Circuit Breakers."

HEALTH·SAFETY·ENVIRONMENT FORM

SOP SUBMITTAL

DATE 1/21/82

TO H-DIVISION SOP OFFICE MAIL STOP [redacted] 229

SOP TITLE THE 120 VAC UNINTERRUPTIBLE POWER SUPPLY

ORIGINATING ORGANIZATION H-7 LOCATION TA-50, BLDG 37 (AS SPECIFIED IN THE SOP)

SOP STATUS: ☐ NEW ☒ REVISED ☐ RENEWAL ☐ OTHER _____ (SPECIFY)

DISCIPLINES INVOLVED:

- ☐ HEALTH PHYSICS (H–1)
- ☐ OCCUPATIONAL MEDICINE (H–2)
- ☐ FIRE PROTECTION (H–3)
- ☒ SAFETY (H–3)
- ☐ INDUSTRIAL HYGIENE (H–5)
- ☐ WASTE MANAGEMENT (H–7)
- ☐ ENVIRONMENTAL SURVEILLANCE (H–8)
- ☒ OTHER H-DO (SPECIFY)

EXPLANATION/COMMENTS:

This SOP is a revision and update to the existing Controlled Air Incineration process Operating Manual. If there are any technical questions regarding the system or this SOP please call R. A. Koenig at 7-7391.

SUBMITTED BY R. A. Koenig ORGANIZATION H-7

APPROVED BY:

(NAME)	(TITLE)	(ORGANIZATION)	(DATE)
[illegible]	Div. Group Ldr	H-7	1-28-82
[illegible]		H-DO	1/8/82

NOTE: THIS SOP MUST BE APPROVED IN ACCORDANCE WITH ESTABLISHED DIVISION PROCEDURES BEFORE IT IS SUBMITTED TO H-DIVISION.

LOS ALAMOS SCIENTIFIC LABORATORY

THE 120 VAC UNINTERRUPTIBLE POWER SUPPLY

I. SCOPE

This SOP covers the operation of a DELTEC uninterruptible power supply (UPS) located in the mechanical equipment room (Room 111) which provides a source of continuous 120 VAC power to all controls associated with the CAI process with the exception of the MEGAS and the micro-dose x-ray system. The primary feed to the UPS is Motor Control Center #2 (MCC2), the auxiliary feed is the MCC1, and the emergency feed is from a battery rack, also located in Room 111.

II. HEALTH AND SAFETY PRECAUTIONS

Lead-calcium batteries use an acid electrolyte, therefore, two persons are required to service the batteries. The operator must always use hand and eye protection, and a portable eye-wash station must be positioned near the work area. This battery system has very high amperage capacity and high voltage at all terminals. Extreme caution must be taken to prevent any conductor from touching battery terminals or connectors. The cover over the battery rack should be removed only for brief periods during battery service, and must be replaced whenever the rack is unattended. Hydrogen generation is not a hazard with this type of battery. Any repairs or adjustments to the UPS must be approved by the shift supervisor or floor manager.

III. OPERATIONS

A. Startup

1. Begin with all UPS front panel circuit breakers OFF.
2. Apply battery power. Front panel indicators should be as follows:

   AC Line (primary supply)---------ALARM

Auxiliary----------ALARM
Battery Charger----------NORMAL
Battery Condition----------NORMAL
Inverter----------INPUT and
OUTPUT ALARMS
Output Mode----------INVERTER

3. Apply auxiliary power. Verify that the output mode indicator shows a transfer to **LINE** after about 50 seconds.
4. Turn on the AC input circuit breaker and the battery charger output circuit breaker. The **RECHARGE** indicator should light in 10 to 20 seconds.
5. Turn on the inverter input circuit breaker. The inverter will start in 1 to 2 seconds. The inverter input and output alarms will turn off and the inverter **NORMAL** indicator will light. In several seconds, the **SYNC** indicator will light, and about 3 seconds later, the output mode indicator will show a transfer to **INVERTER**.
6. Push the **MANUAL TRANSFER** switch to verify that it will transfer the load to the auxiliary line.
7. Push the **MANUAL TRANSFER** switch again to return the load to the inverter.
8. The output circuit breaker may now be turned on.

B. <u>Shutdown</u>

1. Turn off the output circuit breaker.
2. Turn off the inverter input circuit breaker.
3. Turn off the battery charger output circuit breaker.
4. Turn off the AC input circuit breaker.

IV. AUTHORITY

Modification or changes to the equipment must be approved by an H-7 R&D Section Leader. The Section Leaders will designate persons responsible for servicing and maintaining the UPS. Any shutdown, startup, or maintenance of the UPS must be approved by the shift supervisor or floor manager.

V. REFERENCES

1. Manufacturer's manual, DELTEC model 5248A-2054 Uninterruptible Power System, Part No. 5126639, September 1977.
2. LASL Health and Safety Manual, Chapter X, Section A, p. X.2, "General Safety Rules, Electrical Safety," and Chapter VI, Section K, p. VI. 21, Electrical Safety.

HEALTH·SAFETY·ENVIRONMENT FORM

SOP SUBMITTAL

DATE 1/21/82

TO H-DIVISION SOP OFFICE MAIL STOP [redacted] 229

SOP TITLE THE AUXILIARY GENERATOR

ORIGINATING ORGANIZATION H-7 LOCATION TA-50, BLDG 37 (AS SPECIFIED IN THE SOP)

SOP STATUS: ☐ NEW ☒ REVISED ☐ RENEWAL ☐ OTHER _____ (SPECIFY)

DISCIPLINES INVOLVED:

- ☐ HEALTH PHYSICS (H–1)
- ☐ OCCUPATIONAL MEDICINE (H–2)
- ☐ FIRE PROTECTION (H–3)
- ☒ SAFETY (H–3)
- ☐ INDUSTRIAL HYGIENE (H–5)
- ☐ WASTE MANAGEMENT (H–7)
- ☐ ENVIRONMENTAL SURVEILLANCE (H–8)
- ☐ OTHER H-DO (SPECIFY)

EXPLANATION/COMMENTS:

This SOP is a revision and update to the existing Controlled Air Incineration process Operating Manual. If there are any technical questions regarding the system or this SOP please call C. L. Warner at 7-7391.

SUBMITTED BY C. L. Warner ORGANIZATION H-7

APPROVED BY:

(NAME)	(TITLE)	(ORGANIZATION)	(DATE)
[illegible]	Dep Grp Ldr	H-7	1/28/82
[illegible]		H-DO	4/7/82

NOTE: THIS SOP MUST BE APPROVED IN ACCORDANCE WITH ESTABLISHED DIVISION PROCEDURES BEFORE IT IS SUBMITTED TO H-DIVISION.

LOS ALAMOS SCIENTIFIC LABORATORY

THE AUXILIARY GENERATOR

I. SCOPE

The purpose of the auxiliary generator is to provide a back-up power source for the CAI process in the event of a power failure. The unit is a skid mounted diesel-engine generator located outside near the northwest corner of the TDF. The generator is a synchronous type, developing 500 kW at 1800 rpm with a regulated output voltage of 480 Vac 3-phase, 60 Hz. If there is a commercial power failure, the generator will connect to the TDF emergency power panel through an automatic transfer switch. The switch disconnects the generator when commercial power is restored.

II. HEALTH AND SAFETY PRECAUTIONS

1. Wear ear protection when servicing the unit if it is operating.
2. Do not open control panels or covers when the unit is operating.

III. OPERATIONS

A. Startup

1. Check coolant level according to the Cummings Generator Set Service Manual.
2. Check engine oil level.
3. Check governor oil sump level.
4. Close fuel transfer pump breaker and check fuel tank level. Record underground fuel storage tank level in CAI log.
5. Place the switch on the engine instrument panel to "OFF" (This control is overridden by the auto start panel.).

6. Check the oil sump and water jacket heaters for proper operation.
7. On the auto start panel, switch the auto-off-manual switch to manual. The generator will start and come-up to speed in 10 s.

Note: It should not be necessary to adjust the engine speed or the generator voltage. If frequency adjust is necessary, change the engine speed until the frequency indicates 61.8 Hz (this accounts for a 3% hydraulic governor droop). If voltage does not indicate 480 V, adjust with the voltage control rheostat.

B. Shutdown

1. Turn the auto-off-mannual switch to the off position.

Note: If the unit has been running for an extended period under load, allow the unit to run about 10 min. under no-load condition before switching to off.

2. After the engine has stopped, place the auto-off-manual switch to auto. With loss of commercial power, the generator will automatically start and supply power to the emergency buss.

VI. AUTHORITY

Maintenance, modifications, or changes to this generator must be approved by the shift supervisor or floor manager.

V. REFERENCES

Cummings Generator Set Service Manual.

AUXILIARY DIESEL GENERATOR UNDERGROUND FUEL TANK CALIBRATION
(48" x 132" Horizontal Storage Tank)
GALLONS PER INCH OF DIAMETER

INCHES	GALLONS	INCHES	GALLONS
1	5	25	545
2	15	26	572
3	27	27	600
4	41	28	626
5	57	29	653
6	75	30	680
7	93	31	706
8	113	32	733
9	134	33	758
10	156	34	783
11	178	35	807
12	202	36	832
13	227	37	856
14	251	38	878
15	276	39	900
16	301	40	921
17	328	41	941
18	354	42	959
19	381	43	977
20	408	44	993
21	435	45	1008
22	462	46	1020
23	490	47	1029
24	517	48	1034

HEALTH•SAFETY•ENVIRONMENT FORM

SOP SUBMITTAL

DATE 1/20/82

TO H-DIVISION SOP OFFICE MAIL STOP [redacted] 229

SOP TITLE THE PLANT AIR SUPPLY

ORIGINATING ORGANIZATION H-7 LOCATION TA-50, BLDG 37 (AS SPECIFIED IN THE SOP)

SOP STATUS: ☐ NEW ☒ REVISED ☐ RENEWAL ☐ OTHER _____ (SPECIFY)

DISCIPLINES INVOLVED:

- ☐ HEALTH PHYSICS (H–1)
- ☐ OCCUPATIONAL MEDICINE (H–2)
- ☐ FIRE PROTECTION (H–3)
- ☒ SAFETY (H–3)
- ☐ INDUSTRIAL HYGIENE (H–5)
- ☐ WASTE MANAGEMENT (H–7)
- ☐ ENVIRONMENTAL SURVEILLANCE (H–8)
- ☐ OTHER H-DI (SPECIFY)

EXPLANATION/COMMENTS:

This SOP is a revision and update of the existing Controlled Air Incineration Process Operating Manual. If there are any questions regarding the system or this SOP, please call C. L. Warner at 7-7391.

SUBMITTED BY C. L. Warner ORGANIZATION H-7

APPROVED BY:

(NAME)	(TITLE)	(ORGANIZATION)	(DATE)
[signature]		H-7	1-28-82
[signature]		H-DO	4/8/82

NOTE: THIS SOP MUST BE APPROVED IN ACCORDANCE WITH ESTABLISHED DIVISION PROCEDURES BEFORE IT IS SUBMITTED TO H-DIVISION.

LOS ALAMOS SCIENTIFIC LABORATORY

THE PLANT AIR SUPPLY

I. SCOPE

High pressure plant air (>90 psig) is supplied by a Joy compressor with a Worthington compressor as a backup. Both compressors feed a 130 gal receiver tank. This system supplies air for shop use, and for high pressure pneumatic motors and drives in the process area. This SOP covers the operation and isolation of the system which is located in the mechanical equipment room (Room 111).

II. HEALTH AND SAFETY PRECAUTIONS

Caution is required when working with or on any compressed air system due to the energy stored in compressed gas. Ordinary objects can become missiles and be potentially hazardous.

The electrically driven motors shall be isolated by lock and tag procedures before any maintenance or modifications are performed.

To prevent any problems with the CAI process or on-going work, any maintenance or work on the system must be approved by the shift supervisor or floor manager.

III. OPERATIONS

A. Startup

1. Open all of the isolation valves for each compressor.

2. Turn the power supply breaker for the Main Plant Air. Compressor to ON (Breaker 2 C on the back of the motor control center). Monitor the tank pressure gage. It should rise to 90 psig.

3. Turn on the power supply for the Auxiliary Plant Air. Compressor (Breaker 2 E on the front or south side of the motor control center).

B. Normal Operation

The compressor systems are fully automatic and operates on demand.

C. Shutdown

1. Turn breakers 2 C and 2 E to OFF.
2. To bleed air from the system, open the shop air supply and monitor the pressure at the receiving tank.

D. Isolation

1. Either compressor can be isolated from the system by closing the appropriate valve immediately downsteam of the pump outlet and turning off the appropriate breaker (2 C or 2 E).
2. The tank can be isolated by closing the inlet and outlet valves; however, both compressors should be turned off at the breakers and tagged.

IV. AUTHORITY

Modifications or changes to this equipment must be approved by an H-7 R&D Section Leader. Maintenance of the equipment will be supplied by ENG-4. Any shutdown or isolation of the system or components must be approved by the shift supervisor or floor manager.

HEALTH·SAFETY·ENVIRONMENT FORM

SOP SUBMITTAL

DATE 1/20/82

LOS ALAMOS SCIENTIFIC LABORATORY

TO H-DIVISION SOP OFFICE MAIL STOP [redacted] 229

SOP TITLE INSTRUMENT AIR SUPPLY

ORIGINATING ORGANIZATION H-7 LOCATION TA-50, BLDG 37 (AS SPECIFIED IN THE SOP)

SOP STATUS: ☐ NEW ☒ REVISED ☐ RENEWAL ☐ OTHER _____ (SPECIFY)

DISCIPLINES INVOLVED:

- ☐ HEALTH PHYSICS (H–1)
- ☐ OCCUPATIONAL MEDICINE (H–2)
- ☐ FIRE PROTECTION (H–3)
- ☒ SAFETY (H–3)
- ☐ INDUSTRIAL HYGIENE (H–5)
- ☐ WASTE MANAGEMENT (H–7)
- ☐ ENVIRONMENTAL SURVEILLANCE (H–8)
- ☒ OTHER H-DC (SPECIFY)

EXPLANATION/COMMENTS:

This SOP is a revision and update to the existing Controlled Incineration Process Operating Manual. If there are any technical questions regarding the system or this SOP, please call C. L. Warner at 7-7391.

SUBMITTED BY C. L. Warner ORGANIZATION H-7

APPROVED BY:

(NAME)	(TITLE)	(ORGANIZATION)	(DATE)
L. A. Emodity	Dep Grp Ldr	H-7	1/28/82
Gary A. Gordan		H-DO	4/7/82

NOTE: THIS SOP MUST BE APPROVED IN ACCORDANCE WITH ESTABLISHED DIVISION PROCEDURES BEFORE IT IS SUBMITTED TO H-DIVISION.

INSTRUMENT AIR SUPPLY

I. SCOPE

This SOP covers the oepration of the TDF instrument air supply. The system provides clean, dry air for opration of pneumatic controls and consists of the following components:

1. A Ingersall-Rand Model V17 M-7 1/2 compressor (AC-2) as the main supply.
2. A Speedair Model 3Z199 (AC-3) as the backup supply.
3. An auxiliary compressed nitrogen bottle supply.
4. A Hankison refrigerant air dryer.
5. A fourth backup to the instrument air supply is provided by the plant air supply system, which is connected to the instrument air supply system at the inlet of the refrigerated air dryer (Item 4, above) via a manual valve and a pressure regulator valve set below the compressed nitrogen service pressure.

All components are located in the southeast corner of the mechanical equipment room.

II. HEALTH AND SAFETY PRECAUTIONS

Caution is required when working with or on any compressed air system due to the energy stored in compressed gas. Ordinary objects can become missiles and be potentially hazardous.

The electrically driven motors shall be isolated by lock and tag procedures before any maintenance or modifications are performed.

To prevent any problems with the CAI process or on-going work, any maintenance or work on the system must be approved by the shift supervisor or floor manager.

III. OPERATIONS

A. Startup

1. Open all of the isolation valves for each compressor.
2. Turn the power supply breaker for the Main Instrument Air. Compressor to **ON** (Breaker 2-H on the front side of the motor control center). Monitor the tank pressure gage. It should rise to 90 psig.

3. Turn on the main power supply for the backup Auxiliary Instrument Air. Compressor (Breaker 5-C on the back side of the motor control center).
4. Plug in the air dryer (DRA-1) and turn the local circuit breaker to ON.
5. Open the compressed nitrogen bottle valves and set the regulator to 70 psig.

B. Normal Operation

The system is fully automatic. The backup compressor will turn on if the main compressor fails. The nitrogen system will supply gas if the line pressure drops below 70 psig.

C. Shutdown

1. Turn breakers 5-C and 2-H to OFF.
2. Turn the refrigerated air dryer local circuit breaker to OFF.
3. Turn the valve from the plant air supply to OFF.
4. Close the compressed nitrogen bottle valves.
5. Bleed the system.

D. Isolation

1. Either compressor can be isolated from the system by closing the appropriate valve downstream of the receiver tank outlet and turning off the appropriate breaker (5-C or 2-H).
2. The bottle system is isolated by a check valve. The bottles may be changed if the remaining bottles are shut off.
3. The dryers cannot be isolated.

IV. AUTHORITY

Modifications or changes to this equipment must be approved by an H-7 R&D Section Leader. Maintenance of the equipment will be supplied by ENG-4. Any shutdown or isolation of the system or components must be approved by the shift supervisor or floor manager.

HEALTH•SAFETY•ENVIRONMENT FORM

SOP SUBMITTAL

DATE 1/20/82

TO H-DIVISION SOP OFFICE MAIL STOP [redacted] 229

SOP TITLE THE PLANT WATER SUPPLY TO THE CONTROLLED-AIR INCINERATOR

ORIGINATING ORGANIZATION H-7 LOCATION TA-50, BLDG 37 (AS SPECIFIED IN THE SOP)

SOP STATUS: ☐ NEW ☒ REVISED ☐ RENEWAL ☐ OTHER _____ (SPECIFY)

DISCIPLINES INVOLVED:

- ☒ HEALTH PHYSICS (H-1)
- ☐ OCCUPATIONAL MEDICINE (H-2)
- ☐ FIRE PROTECTION (H-3)
- ☒ SAFETY (H-3)
- ☐ INDUSTRIAL HYGIENE (H-5)
- ☒ WASTE MANAGEMENT (H-7)
- ☐ ENVIRONMENTAL SURVEILLANCE (H-8)
- ☒ OTHER H-DO (SPECIFY)

EXPLANATION/COMMENTS:

This SOP is a revision and update to the existing Controlled Air Incineration Process Operating Manual. If there are any technical questions regarding the system or this SOP, please call C. L. Warner at 7-7391.

SUBMITTED BY C. L. Warner ORGANIZATION H-7

APPROVED BY:

(NAME)	(TITLE)	(ORGANIZATION)	(DATE)
[illegible]	Deg Grp Ldr	H-7	1/28/82
[illegible]	H-DO		4/4/82

NOTE: THIS SOP MUST BE APPROVED IN ACCORDANCE WITH ESTABLISHED DIVISION PROCEDURES BEFORE IT IS SUBMITTED TO H-DIVISION.

LOS ALAMOS SCIENTIFIC LABORATORY

THE PLANT WATER SUPPLY TO THE CONTROLLED-AIR INCINERATOR

I. SCOPE

This SOP covers the control of plant water from the TDF non-potable water supply to the supply locations for process makeup and pump seals, auxiliary water tank, auxiliary water tank by-pass, and caustic makeup tank. The CAI system consumes plant water only through these four interfaces.

II. HEALTH AND SAFETY PRECAUTIONS

A blocked supply for either the auxiliary water tank or the tank bypass would present a danger to the process equipment and operators in the event that primary water supplies fail. For these reason, tag procedures will be followed for valves located in these two supply lines.

III. OPERATIONS

A. Startup

1. Prior to startup of the CAI process, verify that the valves for process makeup, seal water, and caustic makeup are open.
2. Verify that the following valves are open and tagged with yellow tags, obtainable from ENG-4:
    a. Main building pressure regulator block valves (two-located in Equipment Room)
    b. Nonpotable water backflow preventer block valves (two-located in Equipment Room)
    c. Emergency water tank supply block valve (on west wall of high bay)
    d. Emergency water tank bypass block valve (high on south wall of high bay)
3. Verify that the supply pressure for the emergency water tank is between 35 and 50 psig.

B. Shutdown

None of the above valves should be closed following shutdown of the CAI process. Approval of the shift supervisor or floor manager must be obtained before closing or repairing any tagged valve.

IV. AUTHORITY

Modification or changes to any component part of the plant water supply system must be approved by an H-7 R&D Section Leader. The shift supervisor or floor manager must be contacted for permission to close any tagged valve. Maintenance and service for component parts of the plant water supply system is to be coordinated through ENG-4.

V. REFERENCES

1. LASL Health and Safety Manual, Chapter VI, Section J, p. VI. 17, "Lock and Tag Procedures."

HEALTH•SAFETY•ENVIRONMENT FORM

SOP SUBMITTAL

DATE 1/20/82

TO H-DIVISION SOP OFFICE MAIL STOP [redacted] 229

SOP TITLE THE AUXILIARY WATER SUPPLY TO THE CONTROLLED-AIR INCINERATOR

ORIGINATING ORGANIZATION H-7 LOCATION TA-50, BLDG 37 (AS SPECIFIED IN THE SOP)

SOP STATUS: ☐ NEW ☒ REVISED ☐ RENEWAL ☐ OTHER _____ (SPECIFY)

DISCIPLINES INVOLVED:

- ☐ HEALTH PHYSICS (H–1)
- ☐ OCCUPATIONAL MEDICINE (H–2)
- ☐ FIRE PROTECTION (H–3)
- ☒ SAFETY (H–3)
- ☐ INDUSTRIAL HYGIENE (H–5)
- ☐ WASTE MANAGEMENT (H–7)
- ☐ ENVIRONMENTAL SURVEILLANCE (H–8)
- ☒ OTHER H DC (SPECIFY)

EXPLANATION/COMMENTS:

This SOP is a revision and update to the existing Controlled Air Incineration Process Operating Manual. If there are any technical questions regarding the system or this SOP, please call R. A. Koenig at 7-7391.

SUBMITTED BY R. A. Koenig ORGANIZATION H-7

APPROVED BY:

(NAME)	(TITLE)	(ORGANIZATION)	(DATE)
[illegible]	Sr. Smelting Dep Grp Ldr	H-7	1/28/82
[illegible]	[illegible]	H-DO	4/8/82

NOTE: THIS SOP MUST BE APPROVED IN ACCORDANCE WITH ESTABLISHED DIVISION PROCEDURES BEFORE IT IS SUBMITTED TO H-DIVISION.

LOS ALAMOS SCIENTIFIC LABORATORY

THE AUXILIARY WATER SUPPLY TO THE CONTROLLED-AIR INCINERATOR

I. SCOPE

This SOP covers the control of a pressurized auxiliary water supply to a spray lance in the off-gas quench tower. This water provides backup to supply evaporative cooling of the incinerator offgas if the normal supply should fail.

II. HEALTH AND SAFETY PRECAUTIONS

A reliable source of high pressure water is vital to safe operation of the CAI process. Without it, cooling of incinerator offgas can not be achieved during a shutdown following a failure of the primary supply. Overheating can result in equipment damage and/or failure. Do not repair or make any adjustments to components of the emergency water supply system without approval of the shift supervisor or floor manager.

III. OPERATIONS

A. System Design

1. Turning the Scrubber Control Panel off following process shutdown will result in injection of the total volume of emergency water into the process. This feature is mandated to allow the system to activate following a total loss of power, including backup.
2. When the controls are energized following a shutdown, the first action is an automatic venting of pressurized air from the water tank. This will allow the lower-pressure plant water to enter the tank to build the necessary reserve. When the volume builds to about 200 gal, a level switch opens a solenoid valve which allows plant air to fill the remaining volume in the tank. The higher air pressure forces the plant water supply back against a check valve and the filling of the tank with water than stops.

B. Startup

1. Verify that the above actions take place automatically when the control panel is turned on.
2. Verify that the final liquid level is within the range indicated on the sight gauge, the plant water pressure is greater than 40 psig, plant air pressure is greater than 80 psig, and tank pressure is greater than 80 psig.

C. Normal Operation

No operator action is necesary to actuate the auxiliary supply. It will automatically route high pressure water to the quench tower following a failure of the primary water supply (pump). This action will take place in case of a failure of plant water, plant air, or electrical power, singly or in combination.

D. Abnormal Events

Should the auxiliary water supply fail, scrubber water can be routed to the spray lance manifold by opening a valve located directly above the scrubber sump pump.

Should the scrubber water supply fail, low pressure plant water can be routed to the injector normally supplied by the AWS by opening a valve on the south wall of the high bay by activating a pull-chain provided for this purpose.

Should the primary spray lance not pass sufficient volume, a low-flow alarm will sound. Water can then be routed to a secondary lance by opening a valve on the south wall of the high bay by a pull-chain provided for this purpose.

IV. AUTHORITY

Modification or changes to any component part of the auxiliary water system must be approved by an H-7 R&D Section Leader. Any maintenance or adjustments to the system must be approved by the shift supervisor or floor manager.

HEALTH•SAFETY•ENVIRONMENT FORM

SOP SUBMITTAL

DATE 1/22/82

TO H-DIVISION SOP OFFICE MAIL STOP 401 229

SOP TITLE THE BUILDING LIQUID BLOWDOWN

ORIGINATING ORGANIZATION H-7 LOCATION TA-50, BLDG 37 (AS SPECIFIED IN THE SOP)

SOP STATUS: ☐ NEW ☒ REVISED ☐ RENEWAL ☐ OTHER _____ (SPECIFY)

DISCIPLINES INVOLVED:

- ☒ HEALTH PHYSICS (H–1)
- ☐ OCCUPATIONAL MEDICINE (H–2)
- ☐ FIRE PROTECTION (H–3)
- ☒ SAFETY (H–3)
- ☐ INDUSTRIAL HYGIENE (H–5)
- ☒ WASTE MANAGEMENT (H–7)
- ☐ ENVIRONMENTAL SURVEILLANCE (H–8)
- ☐ OTHER _____ (SPECIFY)

EXPLANATION/COMMENTS:

This SOP is a revision and update to the existing Controlled Incineration process Operating Manual. If there are any technical questions regarding the system or this SOP, please call Ralph Koenig at 7-7391.

SUBMITTED BY R. A. Koenig ORGANIZATION H-7

APPROVED BY:

(NAME)	(TITLE)	(ORGANIZATION)	(DATE)
[illegible]	Dep. Grp Ldr	H-7	1/28/82
[illegible]		H-DO	4/8/82

NOTE: THIS SOP MUST BE APPROVED IN ACCORDANCE WITH ESTABLISHED DIVISION PROCEDURES BEFORE IT IS SUBMITTED TO H-DIVISION.

LOS ALAMOS SCIENTIFIC LABORATORY

THE BUILDING LIQUID BLOWDOWN

I. SCOPE

This SOP covers operation of the TDF building liquid collection tank and pump station, and the transfer of liquied to TA-50-1 (Liquid Waste Treatment Facility).

The collection tank accepts process blowdown and discharges from building lab sinks and floordrains.

II. HEALTH AND SAFETY PRECAUTIONS

The liquid handled in this collection and pumping system presents those hazards associated with acidic, caustic, radioactive, and thermally hot liquids and chemical hazards which might result from hazardous waste incineration. This system automatically clears the building sump tank of these liquids. Any obstruction in the system may cause unwanted shutdown of the CAI process or contamination due to spillage. Do not repair or make any adjustments to components of the liquid blowdown system without approval of the shift supervisor or floor manager.

III. OPERATIONS

A. Startup

1. Energize Filter Control Panels #1 and #2.
2. Verify that the annunciator on FCP #1 does not indicate a building sump tank level--Low.
3. Verify that the building sump pump motor starter control switch, located on the north wall of Room 112, is positioned to **OFF**.
4. Start the sump tank mixer by actuating Breaker #3 in Panel PP3 and closing the field breaker located on the north wall of Room 112.
5. Close the field breaker for the building sump pump located on the north wall of Room 112.
6. Start pump by moving the motor starter control switch to **HAND**.

7. Adjust the pump seal water flow to 20 gal/hr.
8. Verify that pump discharge pressure is 20 ± 5 psig.
9. Move the starter control switch to AUTO. Pump will stop.
10. Verify that a blowdown was indicate on the blowdown recorder and totalizer mounted on Filter Control Panel #2.

B. Automatic Operation

When the level in the tank reaches about 600 gal, the pump will automatically start, pump the tank down to about 200 gal, and then stop.

Filter Control Panels #1 and #2 do not have to be energized for the Building Blowdown System to function automatically, but must be energized if a record of the blowdown time and volume is desired.

C. Shutdown

The Building Blowdown System should normally remain activated in automatic mode. Automatic operation of the system is required to periodically clear the tank of liquids that slowly accumulate from building lab activities. If there is cause for shuting the system down for any significant length of time, notify building personnel that discharges into building floordrains and lab sinks are to be minimized.

Shut the pump station down in the following sequence:

1. Turn the motor control switch to OFF.
2. Open the field breaker.
3. Open the field breaker for the mixer.
4. Open Breaker #3 in PP3 to isolate mixer power.

When isolation of the TDF blowdown system from the LASL collection system is desired, **and approved by the shift supervisor or floor manager**, close the ball valve in the outside pit and notify TA-50-1 that the valve is closed.

IV. AUTHORITY

Modifications or changes to any component part of the TDF building liquid blowdown must be approved by an H-7 R&D Section Leader. The Section Leader will designate qualified persons to service and maintain the system. Any maintenance to the system must be approved by the shift supervisor or floor manager.

HEALTH•SAFETY•ENVIRONMENT FORM

SOP SUBMITTAL

DATE 1/20/82

TO H-DIVISION SOP OFFICE MAIL STOP [redacted] 229

SOP TITLE THE CAUSTIC MAKEUP AND PUMP STATION

ORIGINATING ORGANIZATION H-7 LOCATION TA-50, BLDG 37 (AS SPECIFIED IN THE SOP)

SOP STATUS: ☐ NEW ☒ REVISED ☐ RENEWAL ☐ OTHER _____ (SPECIFY)

DISCIPLINES INVOLVED:

- ☐ HEALTH PHYSICS (H–1)
- ☐ OCCUPATIONAL MEDICINE (H–2)
- ☐ FIRE PROTECTION (H–3)
- ☒ SAFETY (H–3)
- ☒ INDUSTRIAL HYGIENE (H–5)
- ☐ WASTE MANAGEMENT (H–7)
- ☐ ENVIRONMENTAL SURVEILLANCE (H–8)
- ☒ OTHER H-DC (SPECIFY)

EXPLANATION/COMMENTS:

This SOP is a revision and update to the existing Controlled Air Incineration Process Operating Manual. If there are any technical questions regarding the system or this SOP, please call R. A. Koenig at 7-7391.

SUBMITTED BY R. A. Koenig ORGANIZATION H-7

APPROVED BY

(NAME)	(TITLE)	(ORGANIZATION)	(DATE)
[illegible]	Div. Exp. Safety Dep Grp Ldr	H-7	1/28/82
[illegible]	(TITLE)	H-DO	4/7/82

NOTE: THIS SOP MUST BE APPROVED IN ACCORDANCE WITH ESTABLISHED DIVISION PROCEDURES BEFORE IT IS SUBMITTED TO H-DIVISION.

LOS ALAMOS SCIENTIFIC LABORATORY

THE CAUSTIC MAKEUP AND PUMP STATION

I. SCOPE

This SOP covers the operation of a caustic solution makeup tank and pump station that supplies sodium hydroxide solution on demand to the process liquid train for neutralization of combustion-generated acids.

II. HEALTH AND SAFETY PRECAUTIONS

Sodium hydroxide and sodium hydroxide solutions can cause deep local skin and eye burns. If inhaled, sodium hydroxide can cause irritation of the respiratory tract and inflamation of the lungs. If swallowed, sodium hydroxide and sodium hydroxide solutions can cause burning in the mouth and throat; nausea and vomiting; abdominal pain and diarrhea, occasionally with blood; swelling of the throat and subsequent suffocation; perforation of the gastrointestinal tract; heart failure; and coma. It follows, therefore, that it is absolutely imperative to wear a full face shield, a 3 M #8710 single use dust respirator, arm-length rubber gloves, and rubber apron when handling open containers of sodium hydroxide or when preparing sodium hydroxide solutions. The protective clothing is located in a cabinet near the caustic tank.

It is equally important that the correct mixing sequence be followed when preparing sodium hydroxide solutions. If the wrong mixing procedure is followed, solution temperatures high enough to produce steam can be generated that will result in the spattering of hot solution out of the mixing tank. Go slow. Follow the mixing instructions carefully.

Do not repair or adjust any components of the caustic makeup and pumping station without approval of the floor manager or shift supervisor.

III. EMERGENCY TREATMENT

A. First Aid-Immediate Action

- o If caustic gets in eyes, irigate eyes with water.
- o If caustic gets on skin, wash effected areas of body with soap and water. Treat skin burns as usual.
- o If caustic is swallowed, ingest 5% acetic acid followed by olive oil (found clearly marked in cabinet).

B. Further Treatment

- o For emergency help, call 7-7878. Call 7-4437 after hours.
- o After an accident requiring first aid, contact H-2 for a followup examination by a Laboratory physician.

C. Spills and Leakage

1. For solids

- o Collect and remove with a broom in a large bucket
- o Dilute with water and drain into a sewer with sufficient water.

2. For solution

- o Wipe with mop.
- o Drain into a sewer with sufficient water.

IV. OPERATIONS

A. Caustic Makeup

The caustic solution used for process liquid neutralization is water and up to 20% sodium hydroxide by weight. Always remember that when mixing caustic solutions the water fraction is added to the mixing tank **FIRST** and the sodium hydroxide fraction is **ONLY THEN** added to the tank. It is safe to add water to any residual caustic solution in the tank.

When mixing a caustic solution, use a CAUSTIC MIXING CALCULATION form and the following procedure:

1. Note the residual caustic level. Enter the value on the calculation form.
2. Stop the caustic pump.

3. Open the city water valve and fill the tank to a level of 32 in. on the rule (38 in. from the floor).
4. Close the tank cover and activate the solution mixer for a minute or two and blend the water with any residual caustic solution.
5. Set aside the appropriate amount of sodium hydroxide indicated by the calculation form.
6. Add one scoop at a time to the solution in the tank with the mixer going.
7. When the correct total amount of sodium hydroxide has been added, continue to mix the solution for about five minutes to dissolve any remaining solid.
8. Stop the mixer.
9. Once the surface of the solution is still, float a hydrometer in the solution to check the concentration. A 20% sodium hydroxide solution will indicate a specific gravity of 1.22 on the hydrometer. However, if the hydrometer reads between 1.20 (18%) and 1.24 (22%), no correction to the solution concentration needs to be made. If the specific gravity is out of this range, add more water to lower the reading or more sodium hydroxide to raise the reading to the acceptable range.
10. Start the caustic pump.

B. <u>Caustic Pump Station Startup</u>

1. Verify that the block valve in the caustic return line to the tank is open.
2. Verify that the air pressure on the pinch valve in the caustic return line is relieved.
3. Verify that an annunciator on the Scrubber Control Panel does not indicate **CAUSTIC LEVEL--LOW.**
4. Start pump by actuating the line switch on the pump extension cord. This pump is a positive displacement type and pulsating flow is normal. Do not start the pump against a closed valve as the pump is magnetically

coupled to it's motor and will de-coule against a high head. To recouple, interrupt the power and allow the motor to stop. Then restart the pump.

5. Increase air pressure on the pinch valve until the pump discharge reads approximately 50 psig.

C. Caustic Pump Station Shutdown

1. Open the field breaker on the south wall.

V. AUTHORITY

Modification or changes to any component part of the caustic makeup and pump station or its operation as defined in this SOP must be approved by an H-7 R&D Section Leader. The Section Leader will designate qualified persons to be responsible for servicing and maintaining the station. Repairs to the station must be approved by the floor manager or shift supervisor.

HEALTH•SAFETY•ENVIRONMENT FORM

SOP SUBMITTAL

DATE 1/20/82

TO H-DIVISION SOP OFFICE MAIL STOP [redacted] 229

SOP TITLE THE NATURAL GAS SUPPLY TO THE CONTROLLED AIR INCINERATOR

ORIGINATING ORGANIZATION H-7 LOCATION TA-50, BLDG 37 (AS SPECIFIED IN THE SOP)

SOP STATUS: ☐ NEW ☒ REVISED ☐ RENEWAL ☐ OTHER _____ (SPECIFY)

DISCIPLINES INVOLVED:

- ☐ HEALTH PHYSICS (H–1)
- ☐ OCCUPATIONAL MEDICINE (H–2)
- ☒ FIRE PROTECTION (H–3)
- ☒ SAFETY (H–3)
- ☐ INDUSTRIAL HYGIENE (H–5)
- ☐ WASTE MANAGEMENT (H–7)
- ☐ ENVIRONMENTAL SURVEILLANCE (H–8)
- ☐ OTHER H DC (SPECIFY)

EXPLANATION/COMMENTS:

This SOP is a revision and update to the existing Controlled Air Incineration Process Operating Manual. If there are any technical questions regarding the system or this SOP, please call R. A. Koenig at 7-7391.

SUBMITTED BY R. A. Koenig ORGANIZATION H-7

APPROVED BY:

(NAME)	(TITLE)	(ORGANIZATION)	(DATE)
[illegible]	Dep. Grp Ldr	H-7	1/28/82

NOTE: THIS SOP MUST BE APPROVED IN ACCORDANCE WITH ESTABLISHED DIVISION PROCEDURES BEFORE IT IS SUBMITTED TO H-DIVISION.

LOS ALAMOS SCIENTIFIC LABORATORY

THE NATURAL GAS SUPPLY TO THE CONTROLLED AIR INCINERATOR

I. SCOPE

This SOP covers the control and regulation of the natural gas supply from the TDF building supply to the fuel gas trains for each of three incinerator burners. The CAI process consumes natural gas only through these two burners.

II. HEALTH AND SAFETY PRECAUTIONS

Natural gas presents a hazard if allowed to accumulate in a confined space from dilution of breathing air and danger of explosion. Do not repair or make any adjustments to components of the natural gas supply line without approval from the shift supervisor or floor manager. If a gas leak outside the incinerator ignites and continued burning - would not excalate the problem, do not extinguish. Ref. TDF Emergency Plan

III. OPERATIONS

A. Startup

1. Verify that the following valves are closed:
   a. Gas train block valves (six valves under combustion air glovebox and three valves on south wall above venturi)
   b. Process block valve (south wall)
   c. Meter block valves (two valves outside building on north)
   d. Meter bypass valve (outside, north side of building)
2. Verify that the gas flow calibration ball valves are in the correct position.
3. Verify that the six vent valves are open (vents between motorized valves on upper burner supply and pilot, lower burner supply and pilot).
4. Open upstream meter block valve.

5. Verify that the TDF supply pressure is adjusted to 10 + 1 psig.
6. Open downstream meter block valve.
7. Open process block valve.
8. Open two block valves for each gas train.
9. Open block valve for each pilot train.
10. Verify that the supply pressure for each gas train is regulated to 28 $\pm$ 1 in. W.C.

B. Shutdown

1. Close the natural gas block valves in the following order:
   a. Pilot block valves (three)
   b. Gas train block valves (six)
   c. Process block valve
   d. Meter block valves (two)
2. Verify that the meter bypass valve is closed.

IV. AUTHORITY

Modification or changes to any component part of the natural gas supply system must be approved by an H-7 R&D Section Leader. Any maintenance or adjustment to the system must be approved by the shift supervisor or floor manager.

HEALTH•SAFETY•ENVIRONMENT FORM

SOP SUBMITTAL

DATE Nov. 30, 1981

TO H-DIVISION SOP OFFICE MAIL STOP [redacted] 229

SOP TITLE FUEL OIL SUPPLY SYSTEM

ORIGINATING ORGANIZATION H-7 LOCATION TA-50-37 (AS SPECIFIED IN THE SOP)

SOP STATUS: ☒ NEW ☐ REVISED ☐ RENEWAL ☐ OTHER _____ (SPECIFY)

DISCIPLINES INVOLVED:

- ☐ HEALTH PHYSICS (H–1)
- ☐ OCCUPATIONAL MEDICINE (H–2)
- ☒ FIRE PROTECTION (H–3)
- ☒ SAFETY (H–3)
- ☐ INDUSTRIAL HYGIENE (H–5)
- ☐ WASTE MANAGEMENT (H–7)
- ☐ ENVIRONMENTAL SURVEILLANCE (H–8)
- ☒ OTHER H DC (SPECIFY)

EXPLANATION/COMMENTS:

This SOP is an addition to the existing Controlled Air Incineration Process Operating Manual. The fuel oil supply system described is part of a process modification to allow incineration of hazardous chemicals and resin slurries. An FSAR Addendum has been approved covering the general safety aspects of the modification. If there are any technical questions regarding the system or this SOP, please call John Vavruska at 7-7391.

SUBMITTED BY J. S. Vavruska ORGANIZATION H-7

APPROVED BY

(NAME)	(TITLE)	(ORGANIZATION)	(DATE)
[illegible]	Dep. Group Ldr	H-7	12/1/81

NOTE: THIS SOP MUST BE APPROVED IN ACCORDANCE WITH ESTABLISHED DIVISION PROCEDURES BEFORE IT IS SUBMITTED TO H-DIVISION.

LOS ALAMOS SCIENTIFIC LABORATORY

FUEL OIL SUPPLY SYSTEM

I. SCOPE

This SOP covers startup, operation, and shutdown of the CAI fuel oil supply system. Reference is made to two other detailed SOPs dealing with the liquid waste blending/metering system and the liquid burner. A flow diagram of the fuel oil supply system is shown as Fig. 1.

II. HEALTH AND SAFETY PRECAUTIONS

Although No. 2 fuel oil is a flammable liquid, in the absence of an ignition source at room temperature, it does not present a significant fire hazard. All operations involving fuel oil at the TDF are carried out in totally enclosed systems of tanks and piping. Repair or adjustments to components of the fuel oil supply system require approval from the shift supervisor.

III. OPERATIONS

The fuel oil supply system is designed to operate in either of two modes. It can be used to transfer fuel oil to a waste liquid feed tank for blending with waste or it can be used to meter fuel oil directly to the liquid burner.

A. Calibration of Flowmeter

Calibration of the d/p cell flowmeter is only necessary prior to the metering mode of operation. This procedure requires two persons, preferably each having a head set for remote communications. The following steps are involved in calibration.

1. Verify that the oil level in the supply tank is at least 10 inches above the bottom of the sight glass.
2. Verify that oil is routed through gear pump, d/p cell, flow control valve, and back to supply tank

only. Valve Nos. F12, F17 closed; Nos. F10, F11, F13, F14, F15, F16, open.

3. Energize Liquid Burner Control Panel.
4. Adjust fuel oil feed flow controller dial to a setting of 10% on 0-100% scale while in manual mode.
5. Turn on fuel oil gear pump.
6. Switch flow controller to auto mode.
7. When flow has stabilized, take volumetric flowrate measurement using sight glass on feed tank. Shut ball valve at base of tank and bottom leg of sight glass simultaneously.
8. Record change in liquid level on gauge and time (in seconds) for liquid level to drop. A minimum of a 15 cm level change is required for accurate measurement. Sight glass volume = 7.92 cm^3/cm.
9. Reopen both ball valves immediately.
10. For next reading increase dial setting on fuel oil flow controller to 25%. Allow flow to stabilize.
11. Repeat Steps 7 through 10 for a total of five evenly spaced points on calibration curve.
12. After completion of the calibration, switch controller to manual mode.
13. Turn off fuel oil gear pump.

B. Startup

1. **Fuel Oil Transfer Mode.**

   For this mode of operation, the Liquid Burner Control Panel need not be activated as the fuel oil flow controller is not used.

   a. Verify that fuel oil flow is routed from supply tank through the gear pump located at the northwest corner of Bay 2. Valve Nos. 10, 11, 12, 17 open.

b. Verify that ball valves are set to bypass the d/p cell and flow control valve. Valve Nos. 13, 14, 15, 16 closed.

c. Verify that ball valves within the feed enclosure are set to direct oil to the desired feed tank only.

d. Turn on fuel oil gear pump.

e. When desired liquid level is reached, turn off gear pump.

2. **Fuel Oil Metering Mode.**

Follow the procedure described in Secion III-C-2 in the SOP on the Liquid Waste Blending/Metering System. This procedure covers the continuous blending mode of operation.

C. **Shutdown**

To shut down the fuel oil supply system, the following steps are involved.

1. If operating in metering mode, switch fuel oil flow controller to manual mode.
2. Turn off fuel oil gear pump.

IV. AUTHORITY

Modifications or changes to any component of the CAI fuel oil supply system equipment or operation must be approved by the H-7 Hazardous Waste R&D Section Leader. Any maintenance or adjustment to the system must be approved by the shift supervisor.

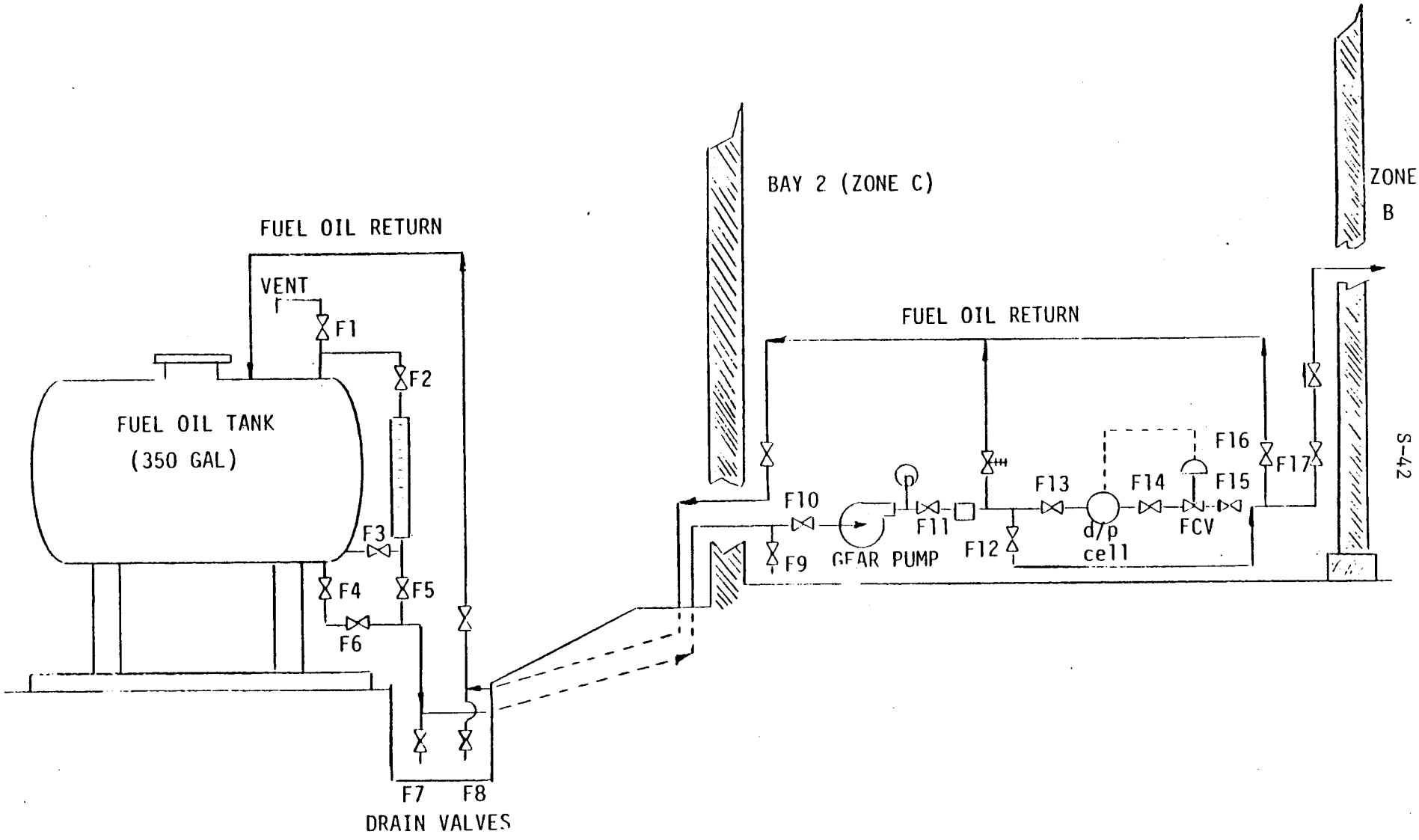


Fig. 1. CAI FUEL OIL SUPPLY SYSTEM

APPENDIX T

HAZARDOUS WASTE FACILITIES CONTINGENCY PLAN FOR THE LOS ALAMOS NATIONAL LABORATORY

HAZARDOUS WASTE FACILITIES CONTINGENCY PLAN FOR THE LOS ALAMOS NATIONAL LABORATORY

ISSUED 10/9/85

Amendment Number	Date	Authorization Signature

CONTINGENCY PLAN AUTHORIZATION

This document presents the essentials of the Los Alamos National Laboratory's Hazardous Waste Facilities (HWF) Contingency Plan and associated emergency procedures as required by 40 CFR 264, Subpart D. The plan is designed to minimize hazards to human health or to the environment from fires, explosions, or any unplanned sudden or nonsudden release of hazardous wastes. The provisions of the plan will be carried out immediately whenever there is a fire, explosion, spill or release of hazardous waste constituents that could threaten human health or the environment.

In the event of a contingency not specifically addressed in this plan, the Hazardous Wastes Emergency Coordinator will take whatever actions, based on his/her best judgment, are necessary. He will use whatever HSE-Division or support resources available to first protect human life and secondly, protect the environment.

A copy of the HWF Contingency Plan and all current revisions to the plan shall be maintained at the HSE-Division Office, the HSE-7 Group Office, the HSE-8 Group Office, and at each operating hazardous waste facility. A copy of the Contingency Plan and current revisions shall also be submitted to any group required to respond to emergency situations in accordance with this plan.

To assure proper implementation in the event of any emergency, the HWF Contingency Plan must be studied and understood by all personnel involved in the handling, storage, or treatment of hazardous waste and by all personnel required to respond to emergency situations involving hazardous wastes.

Authorization Signature

_____ _____

(Name) (Title) (Date)

HAZARDOUS WASTE FACILITIES CONTINGENCY PLAN

The Los Alamos National Laboratory's Hazardous Waste Facilities (HWF) Contingency Plan (also referred to as the Contingency Plan) has been prepared in compliance with 40 CFR §270.14(b)(7) (NMHWMR 302.A.4.b[1]) and specific requirements as stated in 40 CFR §264.51 through §264.56 (NMHWMR 206.B.10) as applicable.

1.0 INTRODUCTION

The Los Alamos National Laboratory and the resident communities of Los Alamos and White Rock are located in north central New Mexico on the Pajarito Plateau, situated west of the Rio Grande on the eastern slopes of the Jemez Mountains. The Laboratory site covers about 111 km (27,500 acres) in and adjacent to Los Alamos County and includes 32 active Technical Areas (TAs) (Figure 1).

The principal mission of the Laboratory is the design and development of weapons for the nation's nuclear arsenal; however, considerable research and development (R&D) is directed toward the development of advanced technology. In executing its research mission, the Laboratory produces hazardous wastes in small quantities, the nature of which varies with changes in the research projects conducted. The potential exists for hazardous waste generation to occur at virtually all of the technical areas.

Overall responsibility for Hazardous Waste Management is with the HSE-7 Waste Management Group in the Health, Safety and Environment (HSE) Division (Figure 2). Generators of hazardous wastes are responsible for proper identification, segregation, and documentation of their wastes. Except for HE wastes, packaging, transportation, and final disposition of hazardous wastes are the responsibility of HSE-7 Solid Wastes Operations.

HE wastes are handled by Dynamic Testing (M) and Design Engineering (WX) Division groups whose central purpose is the design and testing of explosives.

Activities within HSE-7 include liquid waste treatment, hazardous chemical waste packaging, transport, treatment, and disposal.

The Laboratory maintains its own response forces to handle emergencies. Emergency resources available to the Laboratory include the DOE Fire Department, the contracted services of the Mason-Hanger Protective Force (security), Zia Co. (maintenance), Los Alamos Medical Center, internal laboratory services including medical facilities, and minor external assistance from the Los Alamos County Police.

1.1 HAZARDOUS WASTES

The hazardous wastes generated by the Laboratory activities can be considered as three general types:

- Wastes from research and development,
- Wastes from process operations, and
- High explosive wastes (HE).

In addition to the wastes noted above, various laboratory items that contain chemical residues or are otherwise chemically contaminated are considered hazardous waste.

Table 1 lists the hazardous wastes currently generated at the Laboratory, the approximate annual generation rate, and the basis for hazardous waste designation. These wastes are further discussed in the following text.

1.1.1 Wastes from Basic and Applied Chemistry R&D Programs

Primary Laboratory sites for basic and applied chemistry R&D include the Chemistry and Metallurgy Research Building (TA-3-29), Radiochemistry Laboratory (TA-48), Sigma Building (TA-3-66) and the Health Research Laboratory (TA-43). Typical hazardous chemical wastes consist of partly empty small containers of laboratory reagents, solvents, test samples and other laboratory wastes. Up to several hundred relatively small quantities of different acids, bases, organics, inorganics, reactive metals and other chemicals require disposal. The variability of research work prohibits limitation on the variety that can occur in this grouping. Conversely, quantities of individual chemical constituents are small.

1.1.2 Wastes from Processing Operations

Processing wastes typically are significant volumes of material that contain a very limited number of contaminants. The wastes are recurring resulting from ongoing experiments or materials production. The composition and concentration of contaminants in a given process waste are generally uniform unless modifications to the process are made.

- Electrochemistry Processing Wastes
  The Electrochemistry Section of the MST-6 Materials Technology Group, located at TA-3-66, generates plating solutions containing chromates and cyanides. These are reactive and toxic wastes. The Print Circuit Board Shop of the E-2 Electronic Manufacturing and Technician Resources Group, located at TA-3-40, generates acid/base wastes heavily contaminated with copper. These are considered as hazardous wastes due to their corrosivity.

- Isotope Separation Wastes
  The Isotope and Structural Chemistry Group, INC-4, generates highly concentrated nitric and sulfuric acid wastes. Both nitric and sulfuric acid wastes are hazardous due to their highly corrosive characteristics. Nitric acid is also considered hazardous because it can be an oxidizer depending on its concentration.

- Shops Department Wastes
  The Main Shops Department, Building TA-3-39, houses most of the highly versatile machine shop capabilities at the Laboratory. Parts can be machined from almost any metal, alloy or other materials. The machining operations generate hazardous wastes including lithium metal and lithium hydride, both of which are reactive.

1.1.3 Explosives Wastes

High explosives (HE) waste is generated by the Dynamics Testing (M) and Design Engineering (WX) Division groups in the course of processing and testing various HE materials. Processing includes pressing, machining and casting HE. Waste occurs as discrete pieces of HE, as well as chips, machine cuttings and powder. The chips, cuttings and powder are usually in the form of water-borne suspensions, collected in specially designed accumulating/settling sump tanks. Wastes also consist of materials contaminated with HE; these may include paper, oil, solvents, wood, etc. Chemically, the wastes consist of HMX, RDX (cyclonite), TNT (2,4,6 trinitrotoluene), PETN (pentaerythritol

tetranitrate), ammonium nitrate, barium nitrate, TATB (triaminotrinitrobenzene), nitrocellulose, tetryl, nitroguanidine and various plastic binders. Nearly all the HE waste substances are ignitable or reactive and barium nitrate is EP toxic. Residues from HE waste are generated by flashing, burning, or detonating HE waste at TA-14, 15, 16, 36, and 39. These residues are typically present in the uppermost layer of sand that covers the burn pad. The sand from two burn pads is considered hazardous due to its high barium content when barium nitrate is burned on these pads.

1.1.4 Chemically Contaminated Equipment

Empty drums, tanks and gas cylinders are typical contaminated items. Generation of this type of hazardous waste occurs throughout the Laboratory facilities and produces a wide variety of waste types. The hazards are the same as those associated with contaminating constituents.

1.2 HAZARDOUS WASTE FACILITIES

The safe handling, treatment, and/or storage of hazardous wastes is the responsibility of HSE-7. Daily operations involving hazardous wastes are performed by Solid Waste Operations. HE wastes are an exception, their treatment being the responsibility of M and WX Divisions. HSE-7 is only responsible for residuals from HE treatment when these residuals are determined to be hazardous wastes.

Hazardous Waste Facilities (HWF) currently in operation are summarized in Table 2. The locations of the HWF are shown as the shaded areas on Figure 1. The flow plan for hazardous wastes within the Laboratory is shown in Figure 3.

1.2.1 Technical Area 16 (TA-16) Thermal Treatment Facilities

The thermal treatment facilities located at TA-16 include three general types. One type consists of a sand pad which is surrounded on at least two sides by a berm or a natural hillside. Waste explosives are placed on these pads and remotely burned using an "electric match" firing device. There are two facilities of this type at TA-16. A similar pad is used to flash contaminated equipment.

A second type of thermal treatment facility present at TA-16 consists of a large metal pan on a sand pad in which there are five secondary metal pans lined with fire brick. Waste HE fluids are poured into the secondary pans and the HE is remotely ignited, with an "electric match." There is one facility of this type at the Laboratory. About 55 gallons of waste are burned once a month. The third type of facility present at TA-16 is used to burn sludges containing waste HE. These facilities consist of steel cone-shaped vessels having a diameter of about five feet, buried with only the upper three to four feet of the vessel above ground. The steel vessels are filled with sand and gravel and an open fluids drain is located at the bottom of the cone. Sludge HE is pumped into the top of the cone, onto the sand and gravel bed. A heavy steel cap is then placed over the top of the cone and hot air is forced into the cone through air ducts. The hot air dries the waste sludge and liquids from the sludge migrate downward through the sand and gravel bed and through the fluids drain. Effluent from these drains is regulated by NPDES permit (NM 0028355). When the remaining explosive material is relatively free of moisture, the steel cap is removed from the cone and the explosive is ignited remotely with an "electric match." There are two facilities of this type at Los Alamos; both of these are located in Technical Area 16. Explosives are burned at these two facilities at a rate of about one burn per week. Each burn consists of about 750 pounds of waste explosive sludge.

In some cases the burn pad sand or surface is contaminated by barium, which is a constituent of HE, prior to burning. Since the upper layer of the burn pad sand contains EP Toxic barium, it is drummed, stored and disposed of as a hazardous waste.

1.2.2 TA-14, 15, 36, and 39 Thermal Treatment Facilities

Waste HE detonation sites are located at Los Alamos in Technical Areas 14, 15, 36, and 39. These sites are used routinely to detonate scrap HE, failed experimental detonations, unneeded classified explosives shapes, other HE determined to be excess, and reactive wastes. These sites consist of firing pads often located within a small canyon. Associated facilities at these sites include bunkers which are occupied by technical personnel during detonations. Prior to all firings, nearby roads are checked and kept clear.

1.2.3 TA-50-01 Batch Treatment System and Container Storage Area

The Batch Treatment System is located in Building 1 at Technical Area 50 (Figure 4). The system consists of a totally enclosed, vented, 500-gallon pressure vessel equipped with a filtering system, condenser, and vacuum transfer lines (Figure 5). Wastes treated in the Batch Treatment System include cyanide, chromate plating solutions, and solutions of acids, bases and heavy metals.

A chemical waste storage area is located in the same room housing the Batch Treatment System. Storage space consists of a bermed area encompassing 16 square feet. The area is designed to accommodate four 55-gallon waste drums. Wastes are stored in this area prior to treatment in the Batch Treatment System. Only compatible wastes are stored in this area at one time. A ventilated hood is provided for transferring wastes between drums.

1.2.4 TA-50-37 Chemical Waste Incinerator

The waste incinerator is located in Building 37 at Technical Area 50 (Figure 6). The highly modified, controlled air incinerator is rated at a nominal 45 kilograms per hour waste feed throughput. The incinerator was developed as part of a continuing incinerator study and demonstration program being conducted by Los Alamos and is currently permitted by the EPA to burn PCB-contaminated materials. Modifications to the incinerator include additions of liquid and solid waste feed preparation lines, a continuous ash removal system, a high-efficiency off-gas cleanup system, and backup utility systems (Figure 7). Standard combustion equipment has been modified to permit effective incineration of waste in solid, liquid, slurry, or gaseous form. Particular attention has been given to engineering for proper waste containment, resulting in a system that is safe for evaluating the incineration of hazardous chemicals and certain radioactive waste forms. The liquid waste blowdown goes to the radioactive waste treatment facility. Samples will be collected as specified in the Incinerator Trial Burn Plan.

1.2.5 Technical Area 54 (TA-54), Area L Facilities

Waste Transfer, Packaging and Storage Facilities

A single-story metal building encompassing 196 square feet and a roofed concrete storage pad encompassing 1595 square feet are located in Area L of Technical Area 54. These facilities are used for the accumulation, packaging

and storage of waste containers generated from throughout the Laboratory (Figure 8). Area L of TA-54 is an area of about three acres surrounded by an eight-foot-high chain-link and barbed-wire fence (Figure 8). Currently active waste management facilities located within this area include four waste treatment tanks and one waste disposal shaft as well as the transfer, packaging and storage facilities. The metal building has a concrete floor having a design standard load-bearing capacity of 250 pounds per square foot. Three shallow sumps covered by fiberglass grates are located within the floor of the building. The storage pad has a concrete floor having a design standard load-bearing capacity of 700 pounds per square foot.

Hazardous waste containers generated at the various Los Alamos laboratories are delivered to these facilities on a routine basis. Wastes are segregated into compatible types and placed upon the three fiberglass grates located in the metal building, or within one of the six storage cells on the roofed concrete pad. Wastes, packaged in small containers, are placed into lab packs. Also, vermiculite is added to 55-gallon drums containing liquids in these facilities. Wastes suitable for recycling are consolidated into drums and any damaged or leaking drums are repackaged into larger drums in these facilities. Los Alamos wishes to obtain a permit to operate the waste transfer, packaging and storage facilities.

Treatment Tanks

Four 1665-gallon ten-gauge steel tanks are located at Area L of TA-54. The tanks are lined with plastic. These tanks are used to neutralize, oxidize and evaporate wastes. The waste most commonly oxidized in these tanks is lithium hydride. Ammonium bifluoride (a "non-RCRA" waste) is the waste most commonly evaporated in the tanks.

Land Disposal Facilities

Land disposal facilities located in Area L include 34 shafts which range in diameter from three to eight feet. Thirty-three of the shafts have been capped. All of these shafts are about 60 feet deep. When in use, the shafts are covered with a heavy steel cap. When filled, the shafts are capped with a three-feet-thick concrete plug. Each shaft is used for the disposal of a single category of chemical wastes to assure that incompatible chemicals will not mix and react.

2.0 HAZARDOUS WASTE EMERGENCY RESPONSE RESOURCES

The Laboratory maintains its own response resources to handle emergencies. Interaction with outside agencies is limited for security reasons and because it is impractical to train these agencies to cope with the technical diversity of the Laboratory's operations such that they could safely contribute in an emergency. Response resources include personnel, emergency equipment, and communication systems.

2.1 Response Groups

The emergency response groups available to the Laboratory include the DOE Fire Department, the contracted services of the Mason Hanger Protective Force (security), Zia Co. (maintenance), Los Alamos Medical Center internal laboratory services including medical facilities, and minor external assistance from the Los Alamos County Police. The services offered by these response groups are itemized on Table 3 and discussed briefly in the following. Each of the emergency response groups retains a current copy of the HWF Contingency Plan.

2.1.1 Medical Facilities

The Laboratory maintains its own medical facility, HSE-2 Occupational Medicine, to handle job-related injuries and to monitor employee health. Medical facilities include a staff of six physicians, two physician assistants, ten nurses, six x-ray technicians, and two laboratory technicians.

HSE-2 is supported by HSE-5, Industrial Hygiene. HSE-5 can provide exposure and treatment information via telephone access to Chemtrec and the National Library of Medicine, and via computer access to TOXLINE, CHEMLINE, and the Toxicity Data Bank.

Those cases which cannot be handled at HSE-2 would be forwarded to the Los Alamos County Hospital, where the Laboratory maintains a fully equipped decontamination room. The HSE-2 staff meets with the hospital's emergency staff monthly to go over procedures. In the event that a case is sent to the hospital, staff from HSE-2 provide assistance at the hospital.

2.1.2 HSE-3 Safety

HSE-3 reviews and approves fire protection procedures. They may assist in process shutdown and evacuation.

2.1.3 HSE-5 Industrial Hygiene

In addition to medical support, HSE-5 provides site field testing to determine the nature (nonradiological) and extent of contamination, provide information on correct handling of chemicals, and specify protective clothing and equipment.

2.1.4 HSE-7 Waste Management

Provides cleanup operations and proper disposal of hazardous materials and supervises emergency response operations. Since HSE-7 normally handles hazardous waste, the group is highly trained and equipped. This group represents the nucleus of the hazardous waste emergency response.

2.1.5 HSE-8 Environmental Surveillance

Provides field surveys of soils, water, air and biota to determine environmental effects of exposure. The group includes expertise in geohydrology.

2.1.6 DOE Fire Department

The DOE Fire Department provides fire protection for the Laboratory as well as the communities of Los Alamos and White Rock. The department includes 98 personnel.

The Fire Department is under direct control of the DOE and fire fighting personnel are DOE employees. In the case of an emergency within the Laboratory, the DOE Fire Department puts itself under the direction of the Laboratory response team.

The Fire Department personnel make regular tours of the Laboratory facilities to detect and discuss hazards associated with individual facilities and are instructed in hazardous material handling and emergency procedures. They are aware of the hazardous waste practices at the Laboratory, and are well equipped to handle any credible emergency situation.

2.1.7 Mason & Hanger Protective Force (Pro-Force)

The Pro-Force consists of more than 200 personnel who are responsible for Laboratory security. The security force is provided by Mason & Hanger, Silas Mason, under contract to the Laboratory.

During an emergency, the Pro-Force activities include maintenance of security, direction of traffic within the Laboratory, and control of access to the emergency site. The Pro-Force maintains the necessary equipment to perform these functions such as crowd control equipment, patrol cars, etc.

2.1.8 Zia Company

The Zia Company provides a maintenance support force on contract to the Laboratory. This support force is under the Laboratory's direction in an emergency. Also included are 14 eight-man firefighting teams. The Zia Company conducts inspections of Laboratory equipment, maintains equipment, and participates in emergency cleanup.

2.1.9 Los Alamos County Police

In keeping with the principle of handling emergencies internally, the Los Alamos County Police have only a minimal interaction with the Laboratory in an emergency. That interaction is limited to traffic control on DOE roads with public access. The limits of interaction are included in a signed agreement, a copy of which is included as an attachment to this document. There are no agreements with other agencies.

2.2 Emergency Equipment

A list of emergency equipment for use at the Laboratory and the location of this equipment can be found in Table 4. The equipment immediately available for use is located at TA-54, Area L, the TA-50 batch treatment system and container storage area, and the TA-50 waste incinerator.

In addition, Zia Company, the DOE Fire Department, and HSE-2 maintain emergency equipment. Major emergency facilities are shown in Figure 9.

2.3 Communications

Effective emergency response at Los Alamos National Laboratory requires an

efficient communication system which will integrate all personnel into the emergency response procedure.

There are two central alarm systems (CAS) at the Laboratory; an emergency CAS and a mechanical CAS. The emergency CAS is activated by:

- Telephone communication (9-911)
- Automatic fire alarms
- Manual pull alarms
- Computer interface (to warn of critical events or loss of confinement at selected facilities)
- Break-in security
- Radio communications

The emergency CAS is located in the central control room in Building 4409 at TA-3. The control room is manned 24 hours a day and is equipped with telephones, medium and short range radios, direct line telephones, a National Warning System (NAWAS) station, and an emergency power system. The fire alarm board at the control room gives the location of automatic and pull fire alarms.

The maintenance CAS board, located in Building 223 at TA-3, is manned by Zia personnel 24 hours a day. The maintenance CAS board interfaces with computers which monitor critical equipment throughout the Laboratory. Activation of an alarm triggers a call-out procedure to provide maintenance personnel and management supervision to correct the malfunction. The maintenance CAS does not directly trigger an emergency response.

Internal communication systems at the Laboratory include:

- Centrex telephone system
- Medium range radio nets (30-60 miles)
- Limited range radio nets (3-10 miles)
- Telephone/radio paging
- Two-way hand held radios

Off-site communications with Federal, state, county and other agencies are maintained by the following:

- Centrex telephone system
- Private telephone lines (if Centrex fails)
- Medium range radio nets (30-60 miles)
- Limited range radio nets (3-10 miles)
- Two National Warning System Stations (NAWAS)
- Direct line to KRSN (local radio station)

All alarm systems and internal and external communication systems are available for use by all employees.

Activation of the emergency CAS automatically alerts the DOE Fire Department, the Mason Hanger Pro-Force, and the CAS dispatcher. For hazardous waste emergencies, the CAS dispatcher notifies the HSE-7 Hazardous Waste Emergency Coordinator (HWEC) and notifies upper management of the problem.

HSE-7 has access to all communications systems including a short wave radio base station located at TA-50-1. During normal working hours, communications to support response groups can be handled by HSE-7. During off hours, the HWEC uses the CAS Dispatcher to contact support groups.

3.0 NONSUDDEN RELEASES

Nonsudden releases include those incidences which, if uncontrolled, impact the environment over a long period of time. Such incidences include minor leaks of containers, loss of integrity of secondary containment, incomplete treatment, and leachate migration from disposal areas.

3.1 Responsibility

Correction of nonsudden release shall be the responsibility of the HSE-7 Solid Wastes Operations Associate Group Leader and can be handled with normal maintenance and management procedures. Correction methods for nonsudden releases that have resulted in environmental contamination shall be coordinated with the New Mexico Environmental Improvement Division (NMEID).

3.2 Credible Nonsudden Releases

Credible nonsudden releases, their detection and correction are given in Table 5. Not all failures can be predicted. In general, the response to nonsudden release will (1) contain the release, (2) correct the cause of the release, and (3) clean up any release to a level that protects health and the environment.

3.3 Nonsudden Release Surveillance

In addition to routine inspection and site-specific sampling and testing, the Laboratory maintains an area-wide environmental monitoring network maintained by HSE-8. Routine monitoring for radiation, radioactive materials, and chemical substances on the Laboratory site helps to fulfill the Laboratory's policy to protect the general public, employees, and the environment.

Monitoring and sampling locations for various types of measurements are organized into three main groups. Regional monitoring stations are located within the five counties surrounding Los Alamos County. They are placed up to 80 kilometers (50 miles) from the Laboratory, and serve to determine background conditions. Perimeter stations are located within approximately four kilometers (2.5 miles) of the Laboratory boundary, and document conditions in residential areas surrounding the Laboratory. On-site stations are within the Laboratory boundary, and most are accessible only to employees during work hours.

The types of routine surveillance conducted at these stations includes radiation measurements and collection of air particulates, waters, soils, sediments, and foodstuffs for subsequent analysis.

Additional samples are collected to gain information about particular events such as major runoff events and nonroutine releases. Data are used for comparison with standards, background radiation levels, and dose calculations.

4.0 SUDDEN RELEASES

This section deals with incidents involving sudden release such as spills, fires, or explosions which pose a significant threat to human health or the

environment and includes the release of hazardous materials and hazardous wastes. Hazardous materials are chemical substances that become a regulated waste as the result of the incident and can include hazardous raw materials that are spilled, products of combustion, and products of uncontrolled reactions.

4.1 Hazardous Waste Emergency Coordinator (HWEC)

The HWEC is responsible for coordinating all emergency response measures involving sudden releases of hazardous wastes with the exception of the thermal treatment facilities at TA-14, 15, 16, 36, and 39. HE waste handling is the responsibility of M and WX divisions, who have developed Standard Operating Procedures (SOPs) based on safe handling practices designed to eliminate the risk of fire and explosions. Unplanned detonation or combustion of HE renders the HE waste nontoxic. In some cases, residuals contain barium. Cleanup of barium contaminated areas due to unplanned detonations shall be coordinated with the HWEC.

The HSE-7 Group Leader or his designee is the primary HWEC. The list of the primary and secondary HWECs and their telephone numbers is on Table 6. Either the primary HWEC or a secondary HWEC is on call to provide coverage 24 hours a day, 365 days per year.

The HWEC can be reached during working hours by contacting the HSE-7 office (7-4301) or the CAS Dispatcher during off hours.

The HWEC shall respond to all incidents involving the release of hazardous wastes including spills, fires, or explosions; assess the possible hazards to human health or the environment; and use whatever response group or emergency equipment needed to control and contain the wastes.

4.2 HWF Emergency Contingency Plan

This section defines the guideline used to initiate the HWF Emergency Contingency Plan and the resulting actions taken.

4.2.1 Guidelines for Implementation

The decision to implement the HWF Emergency Contingency Plan depends upon whether or not an imminent or actual incident could threaten human health or

the environment. The following guidelines shall be used by the HWEC in making the decision whether or not to institute the HWF Emergency Contingency Plan.

The HWF Emergency Contingency Plan could be implemented in the following situations involving hazardous wastes or hazardous materials:

Spills

- A hazardous waste or hazardous material spill cannot be contained with secondary containment or application of absorbents,
- Precipitation threatens to move spilled material off site,
- A hazardous waste or hazardous material spill causes the release of flammable material, creating a fire or explosion hazard,
- A hazardous waste or hazardous material spill results in toxic fumes which threaten human health, or
- An earthquake or other natural disaster threatens containment integrity.

Explosions

- An unplanned explosion involving hazardous wastes occurred (except at TA-14, 15, 16, 36, and 39), or
- An imminent danger exists that an explosion involving hazardous wastes or hazardous material could occur.

Fires

- Any fire involving hazardous wastes or hazardous material (except planned burning of HE waste), or
- Any building, grass, forest, nonhazardous waste fire that threatens to ignite hazardous wastes.

4.2.2 Emergency Notification

Immediately upon discovery of an imminent or actual incident involving hazardous wastes or hazardous materials, the HWEC will be notified first. In the case of fire involving hazardous wastes or hazardous materials, this is superceded by the Laboratory fire alarm system. A fire is reported by dialing 9-911, activation of automatic alarms, or activation of a fire pull box. All fire alarms simultaneously alert the CAS Dispatcher, the DOE Fire Department, and the Mason and Hanger Pro-Force. For fire involving hazardous wastes,

hazardous materials, or hazardous waste facilities, the CAS Dispatcher shall contact the HWEC (Figure 10).

During off hours, all incidents involving hazardous wastes or hazardous materials shall be reported to the CAS Dispatcher, who will contact the on-call HWEC.

The HWEC shall proceed to the incident and assess the nature of the problem. On an as-needed basis, the HWEC shall contact response groups directly or instruct the CAS Dispatcher to contact them. Table 3 shows the assistance available from each emergency response group. The HWEC will use this list as criteria to determine which groups to contact in an emergency.

Each response group maintains an on-call person and/or a call-down procedure to answer emergencies.

Because the initial observer may not be able to recognize the involvement of hazardous materials, the HWEC shall be notified of any incident as described in Section 4.1. The HWEC shall use whatever means available including the assistance of other response groups, computer data searches, and sampling to determine if a hazardous waste is generated. HSE-5 and HSE-8 have the expertise to determine the nature and extent of contamination, the chemicals involved in the incident, and the characteristics of the hazardous waste.

4.2.3 HWEC Actions

Upon notification of an incident, the HWEC shall:

1. Proceed directly to the site;
2. Assess the nature of the incident, and quantities and types of hazardous wastes or hazardous materials involved; and
3. Based on the guidelines in Section 4.2.1 of the Contingency Plan, determine if implementation of the HWF Emergency Contingency Plan is warranted.

Upon the decision to implement the HWF Emergency Contingency Plan, the HWEC shall perform, in this order, the following actions:

1. Assess the hazards to human health and the environment including both direct and indirect effects such as generation of toxic, irritating, or asphyxiating gases, hazards of runoff of fire water or treatment chemicals. The HWEC will use the guidelines in Section 4.2.1 to assess the hazards to human health and the environment. If any of the criteria under Section 4.2.1 are met, evacuation of the immediate area will be initiated.

2. Determine if evacuation of the local area is advisable, and if so, immediately notify appropriate response groups and/or the Los Alamos County Police.

3. Notify required response personnel by phone, radio, or through the CAS Dispatcher in the case of a spill or incident other than fire. In the case of fire, since the fire fighters have already responded, he shall confirm that the Fire Department Officer-in-Charge is aware of the hazardous waste or hazardous materials involvement and the special hazards associated with the wastes.

4. Warn the remaining personnel of imminent or actual hazards using the radio and/or the PA system.

5. Notify the New Mexico Environmental Improvement Division (505) 827-9329, and the National Response Center (800) 424-8802, reporting:

   - Name and telephone number of the reporter

   - Name and address of the facility

   - Time and type of incident

   - Name and quantity of materials involved, to the extent known

   - The extent of injuries, if any

   - The possible hazards to human health or the environment outside the facility

6. Advise the response groups as needed to minimize personnel exposure and expedite control; and

7. For the Batch Treatment Plant and Controlled Air Incinerator, where the emergency stops operations, the HWEC must monitor for leaks, pressure buildup, gas generation or equipment ruptures. The instruments that are monitored during shutdown and what they are monitored for are shown on Table 7 for the Batch Treatment Plant and Table 8 for the Incinerator.

Once control of the emergency is established, the HWEC shall:

1. Arrange for site cleanup
2. Provide for treating, storing, or disposing of recovered wastes, contaminated soil or contaminated surface waters
3. Provide for decontamination of equipment as needed
4. Replace and/or repair equipment as needed
5. Conduct testing as needed to verify successful cleanup
6. Within 15 days of the incident, submit to the Regional Administrator and Environmental Improvement Division the report described in Section 10.

5.0 SPECIFIC EMERGENCY RESPONSE PROCEDURES FOR HAZARDOUS WASTE FACILITIES

The following section summarizes the guidelines for handling emergencies.

5.1 Chemical Spills

Hazardous wastes are handled and stored in small containers, lab packs, 55-gal. drums, and dumpster tanks. The individual volumes handled are small. Handling of hazardous materials may involve truckload quantities of material such as solvents, fuels, acids, and bases.

The general steps in handling hazardous wastes are:

- Containment including spreading of absorbents or forming of temporary dikes,
- Waste pickup and packaging in sound containers, and
- Decontamination followed by testing to assure adequate clean-up.

The emergency preparedness procedures related to flammable organic solvent spills call for stabilization of the spilled material with the organic solvent spill kit. Other chemical spills are to be stabilized using the acid and caustic spill kits or by the addition of absorbents such as vermiculite. Personnel protective equipment will be worn during spill control and

cleanup. The stabilized material will be treated as hazardous waste. Runoff which might occur from spills outside containment areas during precipitation must be contained and handled as a hazardous waste unless analyzed and found to be nonhazardous. Temporary dikes can be constructed to contain runoff.

5.1.1 Spill Control Procedures

Vermiculite will be used to control all chemical spills except hydrofluoric acid spills. Vermiculite is compatible with all chemicals except fluorine and hydrofluoric acid. Hydrofluoric acid is only handled in very small volumes, in small containers, so that a spill would be limited to a very small volume (less than 1 gallon). A hydrofluoric acid spill will be neutralized by carefully adding calcium hydroxide to the spill. After an excess of calcium hydroxide has been added and the reaction has ceased, the resulting solution will be cleaned up using vermiculite. Vermiculite and calcium hydroxide are stored at all the TSD facilities at the Laboratory.

Type 17H 55-gallon drums will be used to collect all spilled material and contaminated absorbent. There are many drums of this type, located at all TSD facilities at the laboratory. For corrosives, the drums will be lined with polyethylene drum liners. The list of emergency equipment (Table 4) shows the equipment available at each area to be used to control a spill. The ultimate disposition of any contaminated absorbent or waste material will be decided by HSE-7 according to permit conditions and RCRA standards. The material will be temporarily stored at TA-54, Area L.

Decontamination will be accomplished at the spill site. After the spilled material has been absorbed by vermiculite, the material will be drummed. If the spill occurs on a cemented area, water or an appropriate solvent will be used to clean the area and this liquid will be adsorbed onto vermiculite and drummed.

A composite sample will be taken of the vermiculite used to adsorb the final waste water. No contamination should be present in this sample. If contamination is present, the procedure will be repeated (i.e., clean the area and collect and analyze a composite sample). The composite sample will be taken from a drum using a thief or trier as specified in SW-846.

If the spill occurrs on soil, any free liquid present will be adsorbed onto vermiculite and the resulting material will be drummed. The contaminated soil will be dug up and drummed. For a spill of less than one gallon, the visibly contaminated dirt plus a sufficient amount of dirt around the spill site will be dug up. For a spill of more than one gallon, the contaminated dirt plus the perimeter dirt will be drummed and a sample taken of the perimeter dirt using the same method as discussed for the vermiculite sample.

There will be no sampling for a spill in a sealed storage area. Once all visible signs of contamination have been removed, it will be simple to verify any remaining contamination because the floors are sealed with epoxy. In addition, sealed storage areas have secondary containment structures that will control potential spills. At closure, if there is any residual contamination, it will be removed.

If a spill is from a known source, the waste will be analyzed for materials present in that container. Analytical procedures specified in Table 9 will be used. If the spill is from an unknown source, the chemical composition will be determined by using the parameters and test methods specified in Table 9.

5.2 Fire

Depending on the size of the fire and fuel source, portable ABC fire extinguishers may be used to put out fires. However, the Laboratory is discouraging the use of portable fire extinguishers by employees and encouraging the immediate evacuation and notification of the DOE Fire Department. The person fighting the fire must wear appropriate protective equipment. If the fire spreads or increases in intensity, all personnel should evacuate to an upwind point at least 100 yards away from the fire. For any fire involving hazardous waste, the HWEC must be contacted immediately, and he will alert all necessary emergency preparedness personnel. The DOE Fire Department is automatically alerted when the CAS is activated. The HWEC should remain near the site, but at a safe distance, so he can advise the personnel responding to the fire of the known hazards. The HWEC is familiar with RCRA provisions, spill response, and emergency actions and therefore, is qualified to advise firefighting personnel of the potential hazards involved. Upon arrival at a

fire, the Fire Department Officer-in-Charge will be in command of fire fighting. He will accept and evaluate the advice of Los Alamos personnel and emergency preparedness organization members, but he will retain the responsibility to select the fire fighting methods and tactics. The HWEC will be in overall control of the Laboratory's emergency response efforts until the emergency is terminated.

5.3 Explosion

In the case of explosions, all personnel will immediately evacuate the area. Any injured personnel will be immediately transported to the Medical Department for treatment. The HWEC must be contacted immediately upon activation of the CAS, and then he must alert all necessary emergency response personnel. The DOE Fire Department is notified automatically upon CAS activation. The HWEC will remain near the disposal site, but at a safe distance, so he can advise the personnel responding to the explosion of the known hazards.

Upon arrival at the disposal site, the Fire Department Officer-in-Charge will be in command of fire fighting. He will accept and evaluate the advice of Los Alamos personnel and emergency preparedness organization members, but he retains the responsibility to select the fire fighting methods and tactics. The HWEC will be in overall control of the Laboratory's emergency response efforts until the emergency is terminated.

5.4 Exposure

Chemical material in the eye or on the skin will be washed either with the entire contents of the portable eye wash station or for at least 15 minutes. The eyelids will be held open during washing. The injured person will then be quickly transported to the Medical Department for evaluation. If possible, the chemical material involved in the injury will be ascertained and the information given to the Medical Department.

Other potential chemical exposures will necessitate evacuation if anyone notices any of the following conditions:

- Irritation of the eyes, breathing passages or skin,
- Difficulty in breathing, or
- Nausea, light-headedness, vertigo, or blurred vision.

The affected person will be transferred to the Medical Department and the HSE-5 Group representative will attempt to ascertain what, if any, chemical exposure occurred and what corrective measure is appropriate.

5.5 Flood

The U.S. Army Corps of Engineers has documented that Los Alamos National Laboratory's waste management facilities are not located within the 100-year floodplain. This documentation has been included as an attachment to this document.

6.0 EVACUATION

A facility will be evacuated upon the voice command of "evacuate the area," or upon the sounding of the evacuation alarm, or upon the fire alarm.

6.1 Evacuation Plan

Emergency situations may warrant the shutdown and evacuation of an area(s) or building(s) in order to protect personnel and property, to anticipate the emergency condition, or to enhance the appropriate response. Table 10 shows the criteria for evacuation, persons responsible for initiating evacuations, and reentry conditions. The TA-54, Area L evacuation route is shown in Figure 11. Building evacuation routes for the TA-50 batch treatment system and TA-50 incinerator building are shown in Figures 12 and 13. The evacuation route for TA-50 is shown in Figure 14.

To initiate building evacuation, the evacuation alarm is sounded and/or the public address system is used. The evacuation alarm, which is more suitable for evacuation of the whole facility, is a steady, continuous, audible signal. This alarm cannot be silenced and reset by site personnel. The Fire Alarm Maintenance Section at 667-4027 and the Fire Department Platoon Chief at 667-7026 can silence and reset the alarm.

To evacuate a portion of the building, the public address system is more appropriate. The PA system will notify the occupants of the area to be evacuated, and additionally, will advise personnel in the rest of the facility of the existence of a problem in that specific area.

Upon initiation of an evacuation, either via the PA or evacuation alarm, all personnel are to leave the specified area and go to the muster area, turning off all equipment that could contribute to the hazard if left unattended.

In the event of an evacuation of only a portion of the building, one of the out buildings, or outlying work areas, the Group Leader will designate a control point at the closest and/or the most convenient location. This area will be outside the affected area and will serve as a muster point and provide control of the affected area to prevent further spread of the hazard.

Sweep Team personnel will remain in the area for a visual inspection of all the affected work areas, laboratories, and offices. At least two persons will do the sweep to insure that if an injured person is found or if a single person is fighting a small fire, turning off equipment or activating fire suppression systems, one sweep team member can give assistance while the other reports to the muster area or control point to obtain additional aid.

If the building is evacuated during normal working hours, the secretary will remove the personnel attendance roster that is posted near the secretary's desk, take it to the muster area, call roll, and report the personnel accounting to the Group Leader. During second or third shift operations, the lead engineer will be responsible for evacuation and roll call. The evacuation procedure follows:

- Group Leader determines cause and probable extent of hazard.
- Group Leader will sound the evacuation alarm or make an announcement on the PA system.
- Group Leader will designate an assembly area if other than muster area.
- Group Leader will notify the on-call HWEC.
- Personnel will shut down equipment that might contribute to the hazard.
- Personnel will activate fire suppression systems.
- Personnel will not remain in affected area except to assist injured personnel.

- Personnel will report to the muster area or designated control point.
- Roll call (general evacuation) or personnel accounting (partial evacuation).
- Building or Area sweep by assigned personnel.

For a small scale evacuation, the Group Leader takes control. For a large-scale evacuation, the CAS will be activated, the HWEC will be notified and will be responsible for the evacuation.

6.2 Process Shutdown

Personnel are instructed to shut down equipment prior to evacuating a building unless an immediate building evacuation is announced. To ensure efficient shutdown, training and exercises in process shutdown are required. In the case of an immediate evacuation, a selected team may shutdown designated equipment in an evacuated area. The team will be equipped with the proper equipment, clothing and breathing apparatus. If present, HSE-1, HSE-3, and HSE-5 will provide advice and assistance. Process shutdown procedures only apply to the TA-50 batch treatment system and waste incinerator. Process shutdown procedures are as follows.

6.2.1 TA-50 Batch Treatment System

The Batch Treatment System will be operated in accordance with current Standard Operating Procedures (Attachment 3). If a fire or evacuation alarm sounds during the operation of the Batch Treatment System, the operating crew will initiate a process shutdown. Because the process is a batch treatment, cessation of treatment is adequate to bring the process to a safe condition. In general, the process shutdown should include the following:

- Shutdown of the waste pump discontinuing waste transfer or circulation,
- Shutdown of treatment chemical feeds,
- Shutdown of steam to the reactor jacket, if any,
- Shutdown cooling water only if there is a risk of contamination of the water with waste (continued cooling removes residual heat from the system), and

- Allow the reactor mixer to operate unless its operation poses a unique hazard (operation helps remove heat and prevents stratification).

6.2.2 TA-50 Waste Incinerator

If a fire or evacuation alarm sounds during the operation of the controlled air incineration process, the operating crew will initiate a process shutdown in accordance with the current Standard Operating Procedures which are included as Attachment 4 to this document. Three logic sequences are provided to shut down the process in a safe and orderly manner.

- Controlled Shutdown - initiated when there is potential for significant damage to minor process components. This is also the normal shutdown mode at the completion of a run. When controlled shutdown is initiated, feeding of waste to the incinerator is stopped and a programmable set-point generator is activated that directs remote set-point inputs to the temperature controllers, causing a gradual decrease in chamber temperatures. Switches internal to the set-point generator cause an orderly-timed shutdown of process components.

- Fast Shutdown - initiated for conditions that could likely result in loss of containment or damage to major process components. Waste feeding is stopped. Following a two-minute timed interval following the last feeding of solid waste (immediate, if feeding liquid waste), the upper and lower chamber burners are shut down and the system valves and dampers are positioned so as to maintain a negative pressure in the system while minimizing flow through the system. Snuffing steam is introduced into the lower chamber. The two-minute delay when feeding solid waste allows for the ignition of pyrolitic gases formed immediately after feeding.

- Scram Shutdown - initiated at the discretion of an operator. The chain of events are identical to the fast shutdown except that the sequence is not delayed when feeding solid waste. Scram buttons are located at the incinerator and in the control room.

  The last two shutdown modes are potentially destructive to the incinerator refractory and are initiated only when the consequences of not shutting down are greater than the consequences to the incinerator during a scram or fast shutdown. It is the responsibility of the operating personnel and the process lead engineer to

assess any situation and initiate the proper process shutdown sequence.

7.0 SALVAGE AND CLEANUP

The affected area will be surveyed by appropriate representatives from HSE Groups before salvage, cleanup and return to normal operations. Visual inspections of the affected area will be supplemented by sampling to determine whether cleanup is complete. After determination of any existing hazards from toxic or hazardous gases or fumes, electrical hazards, or other unsafe conditions, personnel or selected teams, equipped with proper breathing apparatus and protective clothing, will reenter the area to perform designated tasks to affect decontamination, repairs, and salvage to allow the return to normal operations. After an emergency, the HWEC will:

- Provide for treating, storing, or disposing of recovered waste, contaminated soil or surface water, or any other material that results from a release, fire, or explosion. Contaminated material will be treated as a hazardous waste and temporarily stored at Area L. HSE-7 will be responsible for determining the final disposition of the waste. This determination will be made in compliance with the permit and RCRA standards.

- Remain at the site to ensure that no waste that may be incompatible with the released material is treated, stored, or disposed of until cleanup procedures are completed.

- Ensure that emergency equipment is cleaned and fit for its intended use before operations are resumed. Equipment will be visually inspected and sampled to determine the type and degree of contamination and appropriate cleanup measures will be used.

Prior to resuming operations, appropriate local authorities will be notified that cleanup procedures are completed and emergency equipment is cleaned and fit for its intended use.

Damage assessment and recovery shall be performed within the reporting and investigative requirements of DOE Order 5484.1 included as Attachment 5 to this document. The HWEC has general responsibility for coordinating post-emergency actions, particularly during the time period immediately after the

emergency. Such actions include cleanup operations, repair of vital equipment, or interim hazard-removing operations (such as demolition of unstable walls). The services of the affected operational organizations, HSE Division, the Zia Company, and other on-site talent will also be utilized to estimate cleanup costs and operational impact. The HWEC declares the end of the emergency; an Incident Report is filled out, and the HSE-7 Group Leader and his staff review emergency actions.

8.0 POST-EMERGENCY ASSESSMENT

When the emergency is over, the causes of the emergency and the effectiveness of the response are investigated, in order that future emergencies may either be prevented, or that the response to them may be more effective. Following each event requiring the implementation of the HWF Contingency Plan, the HWEC shall meet with representatives of all response functions to determine the adequacy of the response.

9.0 EMERGENCY RECORDS

The details of any incident that requires implementation of the HWF Emergency Contingency Plan must be noted in that facility's log book. This record must include the time, date, and full description of the incident.

10.0 EMERGENCY REPORTS

Any emergency that requires implementation of the HWF Emergency Contingency Plan will be reported in writing within 15 days to the EPA Regional Administrator and to the New Mexico Environmental Improvement Division (EID).

The report shall include the following data:

- Name, address, and phone number of owner or operator
- Name, address and phone number of the facility
- Date, time, and type of incident (e.g. fire, explosion, spill)
- Name of material involved

- Quantity of material involved
- Extent of injuries (if any)
- Assessment of actual or potential hazards to human health or the environment
- Estimated quantity and disposition of material recovered from the incident

11.0 CONTINGENCY PLAN AMENDMENT

The Contingency Plan shall be reviewed by the HSE-7 Group Leader and immediately amended if determined to be inadequate to handle nonsudden and sudden releases, and whenever:

- The HWF permit is revised
- There is significant change in the design or operation of the HWF (i.e., waste quantities handled, handling techniques, or final disposition)
- The list of emergency coordinators changes
- The list of emergency equipment significantly changes
- Operating experience, drills, or technical review demonstrates the plan is inappropriate
- Actual implementation of the plan demonstrates inadequacies

The Contingency Plan shall have a cover sheet noting the date of the last amendment. Each amendment date shall be initiated by the HSE-7 Group Leader authorizing the changes. Amendments shall be issued to all HWF Contingency Plan holders and shall include a cover letter that describes the plan changes and rationale for those changes.

TABLE 1
WASTE HANDLED, TREATED, STORED AND DISPOSED AT LOS ALAMOS

Process or Operation Generating Hazardous Waste and Waste Generated	Approx. Annual Volume (lbs)	Hazard	Basis for Hazard Designation
Basic and Applied Chemistry R&D Programs			
Chemistry and Metallurgy Research Building			
Radiochemistry Laboratory			
Health Research Laboratory			
- Numerous chemical wastes	Organic 50,000 Inorganic 40,000	Varies	R&D wastes are comprised of numerous listed wastes
Electrochemistry Processing			
Materials Technology Group			
- Chromate and cyanide plating solutions	2,000	Toxic, Reactive	Listed waste - F007, F009 - toxic and reactive, could contain 10,000-20,000 ppm cyanide
Print Circuit Board Shop			
- Acid/base copper etching/ plating solutions	40,000	Corrosive	D002 - pH can vary from less than 2 to about 11
Isotope Separation			
Isotope and Structural Chemistry Group			
- Concentrated nitric and sulfuric acid	80,000	Corrosive	D002 - pH is generally less than 2, concentrated nitric acid is also ignitable (D001) per 261.21(a)(4) (NMHWMR 201.B.2.a[4]) as an oxidizer
Shops Department			
Main Shops Department			
- Lithium hydride, lithium metal	3,500	Reactive	D003 - per 261.23(a)(2),(3), (NMHWMR 201.B.4.a[2],[3]) gas and heat upon rapid reaction with water
- Halogenated solvents	<1,000	Toxic	Listed waste - F001, F002 - toxic
- Non-halogenated solvents	<1,000	Ignitable	Listed waste - F003 - ignitable
Explosives			
Dynamics Testing and Design Engineering			
- High Explosives	50,000	Ignitable, Reactive	Listed waste - K044 - also D001, D003, may also contain D005 waste
- Contaminated burn pad sand	10,000	Toxic	D005 - sand contaminated and tests EP Toxic for barium per 261.24(a) (NMHWMR 201.B.5.a)
Chemically Contaminated Equipment			
Many LANL Facilities	12,000		Same characteristics as hazardous material contaminants

TABLE 2

SUMMARY OF HAZARDOUS WASTE FACILITIES
LOS ALAMOS NATIONAL LABORATORIES

Technical Area and Building or Area Designation	Wastes Handled	Activity Description
TA-14, 15, 16, 36, and 39	HE	Thermal treatment facilities used to burn waste high explosives and high explosives contaminated material
TA-50-01	Electrochemistry wastes Isotope separation wastes	Chemical batch treatment by neutralization, metal precipitation, and cyanide destruction. Includes associated waste container storage area
TA-50-37	Combustible liquids and solids, including chlorinated and fluorinated hydrocarbons, and carcinogenic materials	Waste incineration with flue gas treatment
TA-54 Area L	Shops department wastes Wastes from Basic and Applied Chemistry R&D programs	Wastes are segregated and stored prior to treatment, incineration, recycle, shipment offsite, or disposed at Area L

TABLE 3

HAZARDOUS WASTE EMERGENCY RESPONSE GROUPS

Laboratory Controlled Response Group	Emergency Telephone	Assistance Available
HSE-2 Occupational Medicine	667-7878 (8 am - 5 pm) 988-0539 off-duty hours	Emergency medical treatment
HSE-3 Safety		Reviews and approves fire protection procedures. May assist in process shutdown and evacuation
HSE-5 Industrial Hygiene		Site evaluation - field testing to determine the nature and extent of contamination (nonradiological)
		Specify protective clothing and equipment
		Information services regarding hazards of wastes and treatment for exposure
HSE-7 Waste Management		Hazardous waste cleanup, handling, treatment, and disposal
HSE-8 Environmental Surveillance		Field surveys to determine spread of contamination and adequacy of clean up
		Meterological information
		Geohydrologic support
HSE-9 Health and Environmental Chemistry		Chemical analytical services
DOE Fire Department	9-911	Firefighting personnel and equipment
		Ambulance and parametic service
Mason & Hanger Protective Force (Pro Force)	667-4437	Traffic Control
		Security

TABLE 3
(Continued)

Laboratory Controlled Response Group	Emergency Telephone	Assistance Available
Zia Company	667-6196	Maintenance personnel and equipment
Non-Laboratory Controlled		
Los Alamos County Police	662-4176	Traffic control on DOE roads with public access
Los Alamos Medical Center*	662-4201	Medical Services

*Medical services related to hazardous wastes injuries provided under the direction of HSE-2.

TABLE 4

EMERGENCY EQUIPMENT

EMERGENCY EQUIPMENT AT THE TA-50 BATCH WASTE TREATMENT FACILITY (BWTR)

Fire Control Equipment:

2 fire extinguishers (B,C)

Description of General Capabilities:
These are portable units of approximately 9 to 15 pounds capacity used in wet chemical laboratory applications. May be used by any employee in the event of fire.

East wall of Batch Waste Treatment Room (BWTR)
West wall of adjoining room (Rm. 24) to west of BWTR

Fire alarm pull box

Description of General Capabilities:
Manually operated fire alarm which may be activated by any employee in the event of fire to notify Central Alarm Station.

Located on east wall immediately outside BWTR
1 automatic thermal alarm

Sprinkler system

Description of General Capabilities:
The sprinkler system is an automatic system which delivers a maximum of 200 psi of water spray through shower heads placed at locations which maximize fire suppression range capability. In the event of fire, this system should function automatically, requiring no manual assistance.

2 sprinkler heads in ceiling of BWTR, set off at 212°F

Communication Equipment:

Telephones

Description of General Capabilities:
Telephones for internal communication at the Laboratory and off-site communication with Federal, State, County and other agencies are available. A Centrex telephone system and a private telephone line (if Centrex fails) are available for use by all employees.

Located in Room 24 and at the BWTR
Telephones equipped with building-wide paging system

Evacuation alarm, single tone horn

Description of General Capabilities:
The evacuation alarm activates the central alarm system, which automatically activates the emergency response procedures.

TABLE 4
(Continued)

Spill Control Equipment:

Eight-inch curb around reactor, receiving tanks, and storage area
Absorbent kept onsite

Description of General Capabilities:
The curbing and enclosed containment volume has been designed to satisfy containment requirements specified in 40 CFR 261.

Decontamination Equipment

Safety shower located next to reactor tank outside curbed area
Eye wash
Located on south wall next to hood

Description of General Capabilities:
Safety showers and eye washes are used by personnel who receive a chemical splash to skin or eyes. Specific material safety data sheets for the chemical should be obtained prior to working with the chemical to determine if the application of water is indicated for decontamination.

TABLE 4
(Continued)

EMERGENCY EQUIPMENT AT THE TA-50 WASTE INCINERATOR

Fire Control Equipment:

13 fire extinguishers (9C-CO; 4 A-water)

Description of General Capabilities:
These are portable units of approximately 9 to 15 pounds capacity used in wet chemical laboratory applications. May be used by any employee in the event of fire.

Manually operated fire alarm may be activated by any employee in the event of fire to notify Central Alarm Station.

The sprinkler system is an automatic system which delivers a maximum of 200 psi of water spray through shower heads placed at locations which maximize fire suppression range capability. In the event of fire, this system should function automatically, requiring no manual assistance.

Halon Extinguishing Systems are indicated to supplement automatic sprinkler systems which protect high value equipment, or suppress special hazardous operations or occupancies.

Location:
1 Mechanical Equipment Room 111
2 High Bay Room 112
2 High Bay Room 114
1 South of Library and Conference Room
1 Chemistry Laboratory Room 107
1 Process Engineering Laboratory Room 209
1 Office Area Room 202
1 Room 21

11 Fire Alarm Pull Boxes connected to the CAS
Location:
1 Mechanical Equipment Room 111
1 High Bay Room 112
2 South of Library and Conference Room
2 High Bay Room 114
1 East of women's changing room
1 Process Engineering Laboratory
1 Office Area Room 202
2 Room 21

Automatic thermal alarm on inlet and exhaust of ventilation system
Automatic thermal sprinkler system throughout offices

4 Fire Hydrants
Location:
1 Northwest corner of Building 84
1 West of Building 69
1 Northeast of Building 37

Halon Extinguishing System, manual and ultraviolet in Room 115

TABLE 4
(Continued)

Communication Equipment:

Telephones throughout building with building-wide paging system

Description of General Capabilities:
Telephones for internal communication at the Laboratory and off-site communication with Federal, State, County and other agencies are available. A Centrex telephone system and a private telephone line (if Centrex fails) are available for use by all employees.

Radio located in Room 202

Spill Control Equipment:

Absorbent kept onsite
PCB room is bermed to handle all liquids stored
Have Spill Prevention and Containment Plan

Description of General Capabilities:
Containment is designed to handle all liquids stored. Absorbent is used in the event of a small spill.

Decontamination Equipment:

Showers
Emergency eyewash

Description of General Capabilities:
Safety showers and eye washes are used by personnel who receive a chemical splash to skin or eyes. Specific material safety data sheets for the chemical should be obtained prior to working with the chemical to determine if the application of water is indicated for decontamination.

TABLE 4

(Continued)

EMERGENCY EQUIPMENT - HSE-7 CONTROLLED

Spill Control Equipment: Located at TA-54--Area G

Heavy equipment available for emergencies may include
- 2 scrapers
- 1 bulldozer
- 1 tractor (front end loader)

Shovels
Absorbents (vermiculite) in combustibles storage shed

Description of General Capabilities:
The following pieces of heavy equipment will be used in the event of large spills. Small spills will be absorbed with absorbent.

Decontamination Equipment:

Small decontamination pit for heavy equipment
Showers (MD-11)

Other:

Change room with protective clothing (MD-11)
2-3 dozen respirators (particulates) (MD-11)
2 self-contained, portable air masks (MD-11)
2 emergency generators, portable
3 vehicles are available for evacuation of personnel:
- 2 sanfu
- 1 Jeep (with emergency equipment, e.g., coveralls, booties, tape, rope)

TABLE 4
(Continued)

EMERGENCY EQUIPMENT AT TA-54, AREA L

Fire Control Equipment:

1 fire hydrant located 30 feet south of site entrance to site
1 CO fire extinguisher located inside trailer at west end of site (B,C)
1 CO fire extinguisher located inside storage shed (B,C)
1 freeze-proof faucet located immediately east of shed

Description of General Capabilities:
These are portable units of approximately 9 to 15 pounds capacity used in wet chemical laboratory applications. May be used by any employee in the event of fire.

Spill Control Equipment:

Shovels
Oversized drums
Absorbent inside storage shed
Heavy equipment from Area G available for any emergencies at Area L
Bermed storage area

Description of General Capabilities:
The following pieces of heavy equipment will be used in the event of large spills. Small spills will be absorbed with absorbent.

Communications Equipment:

2-way radios are available to all personnel when in area
2-way radios are in all vehicles used for moving hazardous waste
Telephone located inside trailer

Description of General Capabilities:
External and internal Laboratory communications which may be used in emergency situations are listed.

Decontamination Equipment:

1 emergency shower and eye wash located immediately east of shed

Description of General Capabilities:
Safety showers and eye washes are used by personnel who receive a chemical splash to skin or eyes. Specific material safety data sheets for the chemical should be obtained prior to working with the chemical to determine if the application of water is indicated for decontamination.

Other:

2 self-contained, portable air masks located inside trailer

TABLE 4
(Continued)

SUPPLEMENTARY EMERGENCY EQUIPMENT

ZIA COMPANY (667-6196)

Equipment	Number
A. Transportation	
1. Pickups, 1/2 through 3/4 ton	183
2. Trucks 1 through 3 ton	25
3. Powerwagon (E-20781 with welder (PN-30256) mounted on vehicle, CC-135	1
4. Buses (11-passenger)	2
5. Stationwagens	11
6. Vans, panels, and carryalls	24
B. Special Equipment	
1. Road grader, Champion, self-propelled blade, with radio	1
2. Grader, John Deere, self-propelled, with radio	1
3. Loaders, bucket, Melroe, Bobcat, 1/3 cubic yards	3
4. Loader, bucket, Michigan, 2-3/4 cubic yards	1
5. Loader, Fiat-Ellis, 3 cubic yards	1
6. Loader, bucket, Michigan, 2-1/2 cubic yards	1
7. Loader, bucket, Michigan, 3-1/4 cubic yards	1
8. Loader, bucket, Yale, 3 cubic yards, with radio	1
9. Loader, bucket, backhoe, International, 1-1/2 cubic yards	1
10. Loaders, bucket, backhoe, Case, 7/8 cubic yards	2
11. Loader, backhoe, Ford, 1 cubic yard	1
12. Snowplows, Bombardier, with blade	2
13. Bulldozer, D-8, Crawler	1
14. Bulldozers, TD-25, International	2
15. Scraper, Terex, self-propelled	1
16. Scraper, Fiat-Ellis, self-propelled	1
17. Bulldozer, 280, rubber-tired, with radio	1
18. Semitrailers	5
19. Lights, camp (electrical, plant, portable, 1000 to 5000 watts)	4
20. Power saws	14 (approx)
21. Flusher, street, 3000-gallon Truck, tanker, 500-gallon, International	1
22. Mobile transceivers (2-way, KOB-753)	64

TABLE 4
(Continued)

ZIA COMPANY (667-6196)

Equipment	Number
B. Special Equipment (cont)	
23. Mobile transceivers (2-way, fire network)	7
24. Handsets (2-way)	8
25. Pageboys (1-way)	235
26. Welders, mounted on trailers and trucks	32
27. Fire tools (hand)	150 (approx)
C. Supplies	
1. Food	
Box lunches	150
D. Other Supplies	
1. Bedding	
Blankets	60
Bedrolls (disposable)	50
(from U.S. Forest Service in Santa Fe)	
2. Butane gas (25-gallon tanks)	4
3. Fuel and lubricants	
4. Miscellaneous supplies	
Manpower	
A. Fire Bosses	
1. Crew bosses	3
2. Straw bosses	12
B. Service Bosses	
1. Transportation boss	1
C. Specialists	
1. Cat bosses	2
2. Bulldozer operators	14
3. Clerks	10
4. Dispatchers	3
5. Mechanics	17
6. Power saw operators	8
7. Radio and telephone operators	10
8. Truck drivers	13
9. Tool sharpener	4

TABLE 4
(Continued)

ZIA COMPANY (667-6196)

Manpower (cont)	Number
7. Radio and telephone operators	10
8. Truck drivers	13
9. Tool sharpener	4
D. Firefighters	
1. Organized crews (approximately 8 men per crew)	14 crews

TABLE 4
(Continued)

EMERGENCY EQUIPMENT AT THE DOE FIRE DEPARTMENT
(9-911)

8 1000-gallons-per-minute pumper trucks
5 Minipumper trucks
5 1500-gallon tank trucks
4 Modular ambulances
1 Rescue vehicle
69 Self-contained breathing apparati
Various firefighting equipment
Emergency Medical Technician (EMT) medical equipment
98 Personnel with 81 hours MTA training
1 75-foot elevated platform

TABLE 4
(Continued)

EMERGENCY RESOURCES AT THE MEDICAL FACILITY (HSE-2)
(667-7878) 8 am - 5 pm
(988-0539) off-duty hours

Manpower

6 (2 casual) physicians
2 physician's assistants
10 (1 part-time) nurses
3 (2 casuals) x-ray technicians
2 laboratory technicians

Special Equipment - Portable

1 Radio base station (HSE-Div. net, being installed)
3 Walkie talkies (HSE-Div. net)
1 Portable cardiac monitor and defibrillator
1 Crash cart - emergency equipment
1 Portable physicians bag - drugs
1 Portable suction unit
5 Portable stretchers
1 Ambulance stretcher with straps
6 Wheel chairs
1 Manual resuscitator
6 Portable oxygen units
Several intravenous holders and solutions
6 Otoscope/opthalmoscope sets
1 Portable sphygmomanometer
10 Stethoscopes
Many contamination apparel
1 Eye irrigation system
Many inflatable limb traction splints
3 Industrial first aid kits
Many extrication and cervical collars
Many crutches and canes
Many suture sets

Supplies

Bedding and pillows
Rescue blankets
Burn blankets
Thermal/icing pouches
Multitrauma dressing and bandages

TABLE 4
(Continued)

EMERGENCY RESOURCES AT THE MEDICAL FACILITY (HSE-2)
(667-7878) 8 am - 5 pm
(988-0539) off-duty hours

Special Facilities - Nonportable

Completely equipped medical clinic with emergency lighting system, x-ray machine, and ambulance entrance. Contamination showers, protective clothing, and wound counters. Suction unit, electrocardiograph (12 lead), pulse rate monitor/recorder, primary response trauma kits are included.

Transportation

1970 Plymouth Sedan

TABLE 5

CREDIBLE NONSUDDEN RELEASES

Location	Credible Releases	Detection	Correction
TA-14, 15, 16, 36, 39	Toxic material leaching	Sand and soil samples	Removal and proper treatment or disposal of contaminated sand and soil
	Wind dispersion (prevented by procedures)	Visual	Operating procedures prohibit treatment under adverse weather conditions
TA-50-1	Incomplete treatment	Analysis	Continue or modify treatment (notify EID of modification and revise permit as required)
	Failure of containment	Inspection for leaking containers and tanks, inspect secondary containment for integrity	Maintenance or replacement of containment
Transport	Leaking containers	Inspection prior to transfer	Repackage in sound container
TA-50-37	Incomplete treatment	Analysis and stack monitoring	Modify treatment procedure prior to continuing (notify EID of modification and revise permit as required)
	Failure of containment	Inspection for leaking containers and tanks, inspect secondary containment for integrity	Maintenance or replacement of containment
TA-54 Area L	Failure of containment	Inspection for leaks, inspect secondary containment for integrity	Maintenance or replacement of containment
	Toxic material migration from disposal shafts	Vadose zone monitoring	Develop in agreement with the NM EID a detection monitoring program and corrective action program in compliance with 40 CFR 264.99 and 264.100

TABLE 6
HAZARDOUS WASTE EMERGENCY COORDINATORS

(To be notified in succession)

Primary Coordinator	Laboratory Telephone	Telephone	Home Address
Ray Garde, HSE-7 Group Leader	7-7920/4301	753-7737	2560 Aeby Lane, Espanola, NM
Secondary Coordinators			
1. Lud Emelity, HSE-7 Deputy Group Leader	7-5839/4301	662-7993	388 El Conejo, Los Alamos, NM
2. J. L. Warren, HSE-7 Associate Group Leader	7-5398	662-9639	1082 Big Rock Loop, Los Alamos, NM
3. Jerry Buchholz Associate Group Leader	7-4301	672-3647	316 Potrillo Drive, White Rock, NM
4. Lee Borduin Associate Group Leader	7-7391	455-2882	Rt. 1, Box 92G, Santa Fe, NM
5. Karen Balo Section Leader	7-6095	672-1369	400 Kolleen Court, White Rock, NM
6. W. M. Sanders Section Leader	7-4301	672-1931	214 Rover, White Rock, NM
7. R. A. Koenig Staff Member	7-7391	662-2458	971 Alamo Road, Los Alamos, NM
8. B. R. Myers Staff Member	7-6095	672-9509	83 Mimbres, White Rock, NM

TABLE 6
(Continued)

Secondary Coordinators	Laboratory Telephone	Telephone	Home Address
9. D. G. Vance Staff Member	7-4301	None at present	Rt. 14, Box 750, Santa Fe, NM
10. M. D. Salazar Staff Member	7-6095	753-4423	Rt. 2, Box 124, Espanola, NM
11. N. W. Weeks Tech. Supervisor	7-6094	662-5366	2176 37th, Los Alamos, NM
12. W. D. Moss Fac. Equip. Oper.	7-6094	662-5124	2932 Woodland, Los Alamos, NM
13. D. L. Volz Fac. Equip. Oper.	7-6094	662-3287	2146-C 43rd St., Los Alamos, NM
14. D. F. Salazar Fac. Equip. Oper.	7-6904	852-2456	P.O. Box 922, San Juan Pueblo, NM
15. L. D. Williams Fac. Equip. Oper.	7-6904	753-5782	P.O. Box 3754, Fairview, NM
16. L. L. Hupke PCB Disposal Coord.	7-7316	753-6984	P.O. Box 905, Los Alamos, NM
17. C. L. Gilley Matr. Tech.	7-7391	662-4051	2173 B. 36th St., Los Alamos, NM
18. R. J. Payne Fac. Oper.	7-4301	672-9744	128 Aragon, Los Alamos, NM

TABLE 7

ITEMS MONITORED AT THE BATCH TREATMENT PLANT DURING EMERGENCY SHUTDOWN

Item	Monitored For
Piping/Valves	Leaks, damage, poor seals
Gauges	Acceptable range

TABLE 8

ITEMS MONITORED AT THE WASTE INCINERATOR DURING EMERGENCY SHUTDOWN

Item	Monitored For
Incinerator/Equipment	Functioning
Pumps, valves, pipes	Leaks
Tank by-pass	Leaks
Emergency waste feed cutoff system	Functioning
Tank hi-level alarm	Functioning

TABLE 9

WASTE ANALYSIS PARAMETERS AND TEST METHODS

Parameter	Test Method	Reference[1]
Ignitability	Pensky-Martens Closed-Cup Method	(L) SW1010 (L) ASTM D93-80
Reactivity	Numerous methods and tests	(L,S) SW Section 2.1.3
pH	Electrometric	(L) SW9040
EP Toxicity	EP Toxicity Extraction[2] and Graphite Furnace Atomic Absorption Spectrophotometry	(L,S) SW1310
Arsenic		(L) SW7060
Barium		(L) SW7081
Beryllium		(L) SW7091
Cadmium		(L) SW7131
Chromium		(L) SW7191
Lead		(L) SW7421
Selenium		(L) SW7740
Silver		(L) SW7761
	EP Toxicity Extraction[2] and Manual Cold Vapor Technique	(L,S) SW1310
Mercury		(L) SW7470

(1) "A" refers to Sampling and Analysis Methods for Hazardous Waste Combustion, EPA-600/8-84-002, February 1984.

"ASTM" refers to American Society for Testing Material Standards.

"SW" refers to Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, SW-846, 2nd Edition, EPA, July 1982.

"L" refers to liquid waste.

"S" refers to solid waste.

(2) If EP Toxicity (and other analyses) do not permit identification of an unknown chemical waste, digested metal samples (per SW3020) will be analyzed for the metals noted.

TABLE 9

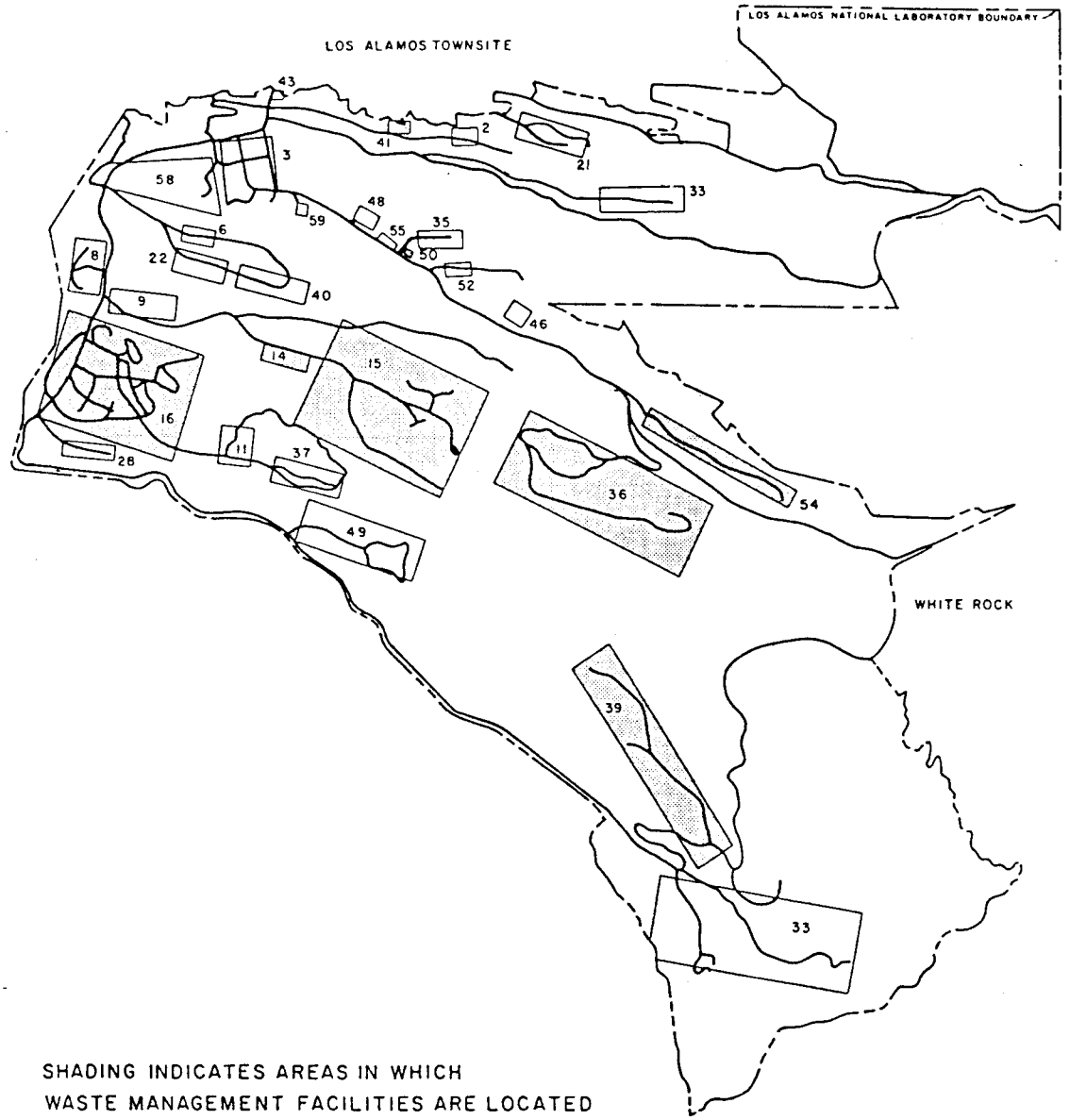
WASTE ANALYSIS PARAMETERS AND TEST METHODS
(continued)

Parameter	Test Method	Reference[1]
EP Toxicity	EP Toxicity Extraction and Gas Chromatography	(L,S) SW1310
Organochlorine Pesticides		(L) SW8080
Chlorinated Herbicides		(L) SW8150
Chemical Composition	Any of those methods in this Table plus the following:	
	Chemical analysis for volatile organic compounds using gas chromatography/mass spectrometry	(L) SW8240
	Chemical analysis for semi-volatile organic compounds using gas chromatography/mass spectrometry	
	- with packed column	(L) SW8250
	- with capillary column	(L) SW8270
Heat Value	Bomb calorimeter	(L) A006, ASTM D240
Organic Chlorine	Halide titration of combustion residue	(L,S) A004, ASTM D2361
Trichlorofluoromethane, Bromoform, Dichlorodifluoromethane	Chemical analysis for volatile organic compounds using gas chromotography/mass spectrometry	(L) SW8240
Ash Content	Residue after combustion in muffle furnace	(L) A001, ASTM D482
Cyanide	Distillation and titration	(L) SW9010
Chrome	Colorimetric method for hexavalent chromium	(L) SW7196

TABLE 10

EVACUATION DETERMINATION AND REENTRY

Reason for Evacuation	Determination Made By	Reentry Conditions
Fire	Fire or Evacuation Alarm; Group Leader; Alternate; Lead Engineer, Senior Staff Member present, or HWEC	Following survey by the Chief Fire Officer, HSE-1 and/or HSE-5, and R&D Supervision
Explosion	Same as above	Same as above plus HSE-3
Loss of Ventilation	Group Leader, Alternate, Senior Staff Member, Lead Engineer, or Senior Technician	Following survey by HSE-1 and/or HSE-5, and R&D Supervision
Loss of Electric Power	Same as above	Same as above
Extensive Contamination	Same as above or HSE-1 Representative	Same as above
Airborne Contamination	Same as above or Rad Monitor	Same as above
Escape or Release of Toxic or Hazardous Gas or Fumes	Group Leader, Alternate, Senior Staff Member, Lead Engineer, Senior Technician, or HWEC	Same as above plus HSE-5
Bomb Threat	HSE-3 or Protective Force Representative, R&D Section Leader, Alternative, Senior Staff Member or Lead Engineer	Following determination by HSE-3 or Protective Force Representative and R&D Supervision



SHADING INDICATES AREAS IN WHICH WASTE MANAGEMENT FACILITIES ARE LOCATED

4000 0 4000

SCALE

FIGURE 1

LOS ALAMOS
TECHNICAL AREAS

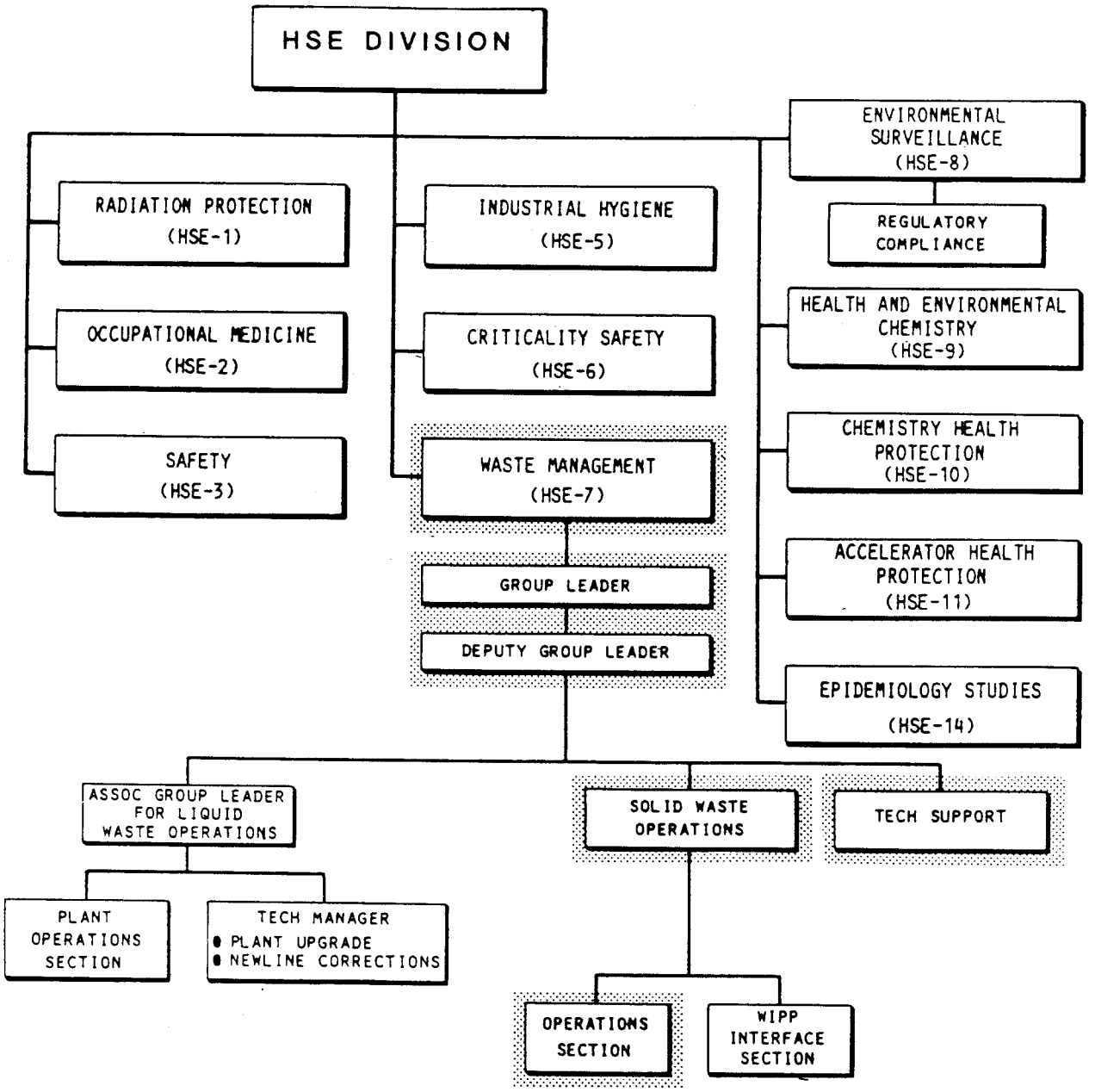
PREPARED FOR
LOS ALAMOS NATIONAL LABORATORY
LOS ALAMOS, NEW MEXICO

IT CORPORATION

32803

DRAWING NUMBER 8000.02-A-14

BY	DATE	APPROVED BY	CHECKED BY
NN	MJG 11/26/84		



NOTE: SCREENED BOXES INDICATE PRIMARY RESPONSIBILITY FOR CHEMICAL WASTE MANAGEMENT

FIGURE 2

HEALTH, SAFETY AND ENVIRONMENT DIVISION MANAGEMENT CHART

PREPARED FOR

LOS ALAMOS NATIONAL LABORATORY
LOS ALAMOS, NEW MEXICO

DRAWING NUMBER 8465/0.A24

CHECKED BY

APPROVED BY

DRAWN BY

© 1984 IT CORPORATION
ALL COPYRIGHTS RESERVED

"Do Not Scale This Drawing"

IT ... Creating a Safer Tomorrow

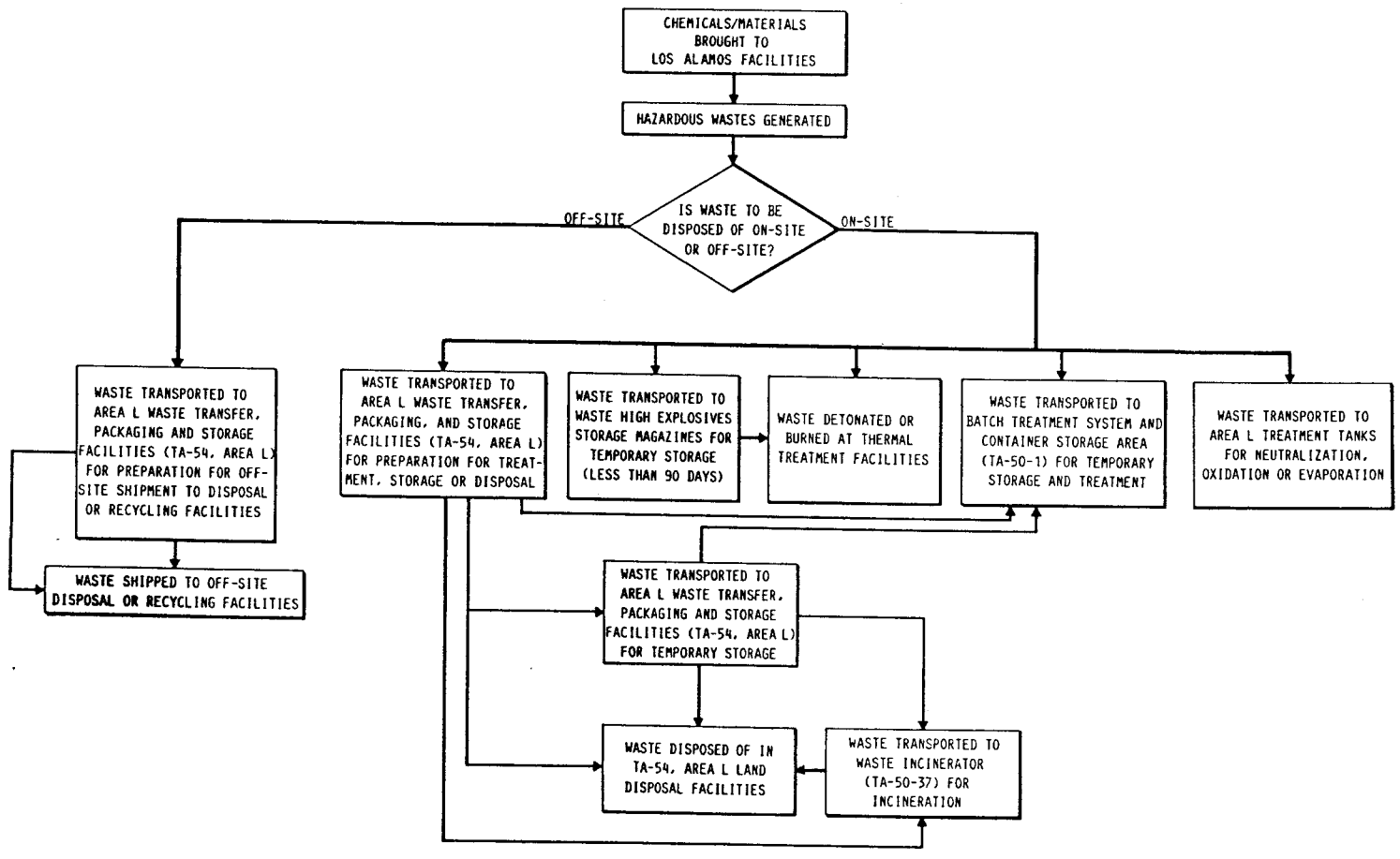


FIGURE 3

SCHEMATIC DIAGRAM OF LOS ALAMOS HAZARDOUS WASTE MANAGEMENT ACTIVITIES

PREPARED FOR

LOS ALAMOS NATIONAL LABORATORY

LOS ALAMOS, NEW MEXICO

IT ... Creating a Safer Tomorrow

DRAWING NUMBER 84 6510-A15

CHECKED BY

APPROVED BY

DRAWN BY

© 1984 IT CORPORATION
ALL COPYRIGHTS RESERVED
"Do Not Scale This Drawing"

65390

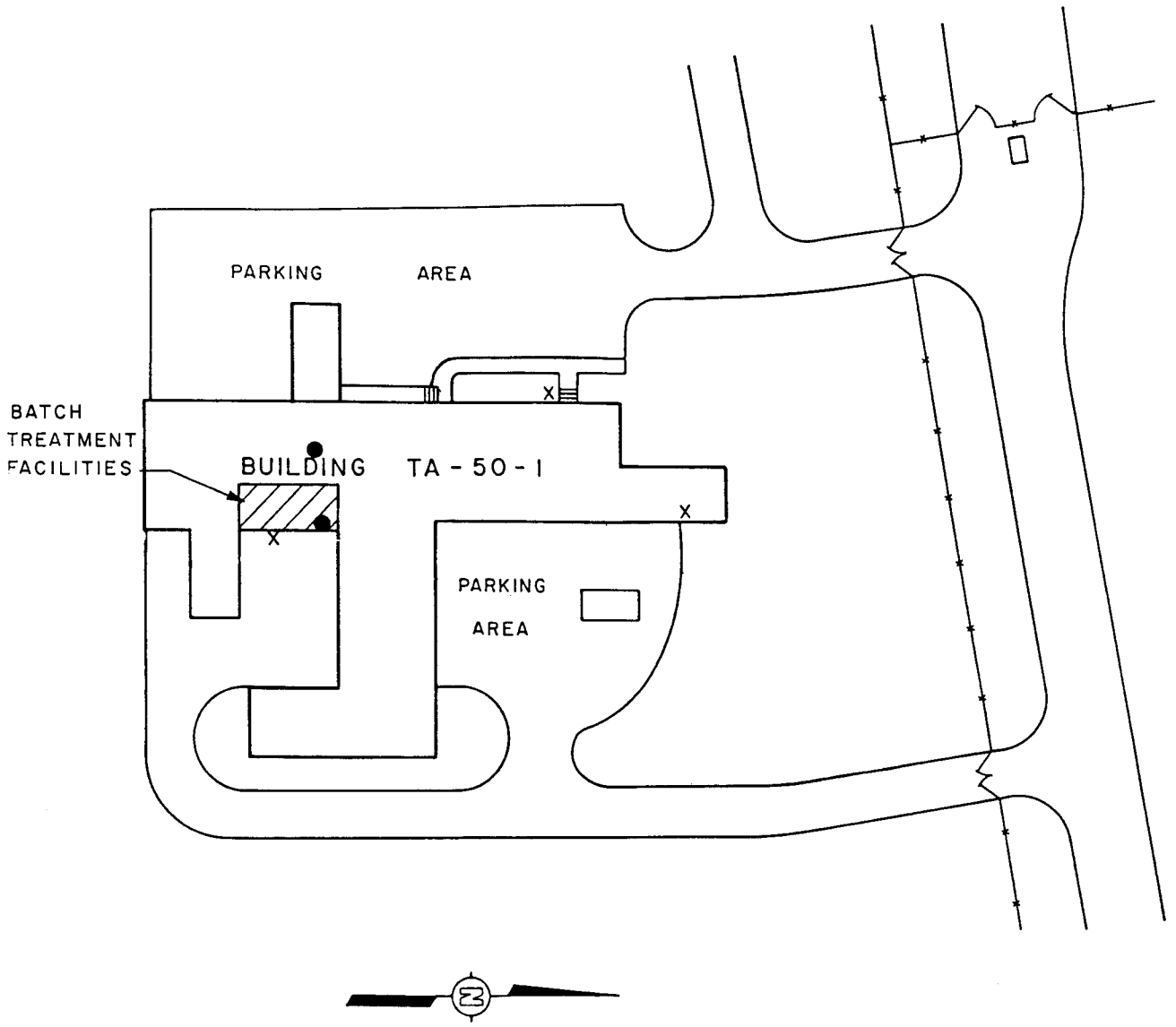


FIGURE 4

LOCATION OF
BATCH TREATMENT FACILITIES
IN BUILDING I IN TA-50

PREPARED FOR

LOS ALAMOS NATIONAL LABORATORY
LOS ALAMOS, NEW MEXICO

X ALARM PULL BOXES
● FIRE EXTINGUISHERS

IT CORPORATION

DRAWING NUMBER 87-510-A16
CHECKED BY
APPROVED BY
10/10/84
BY

32803

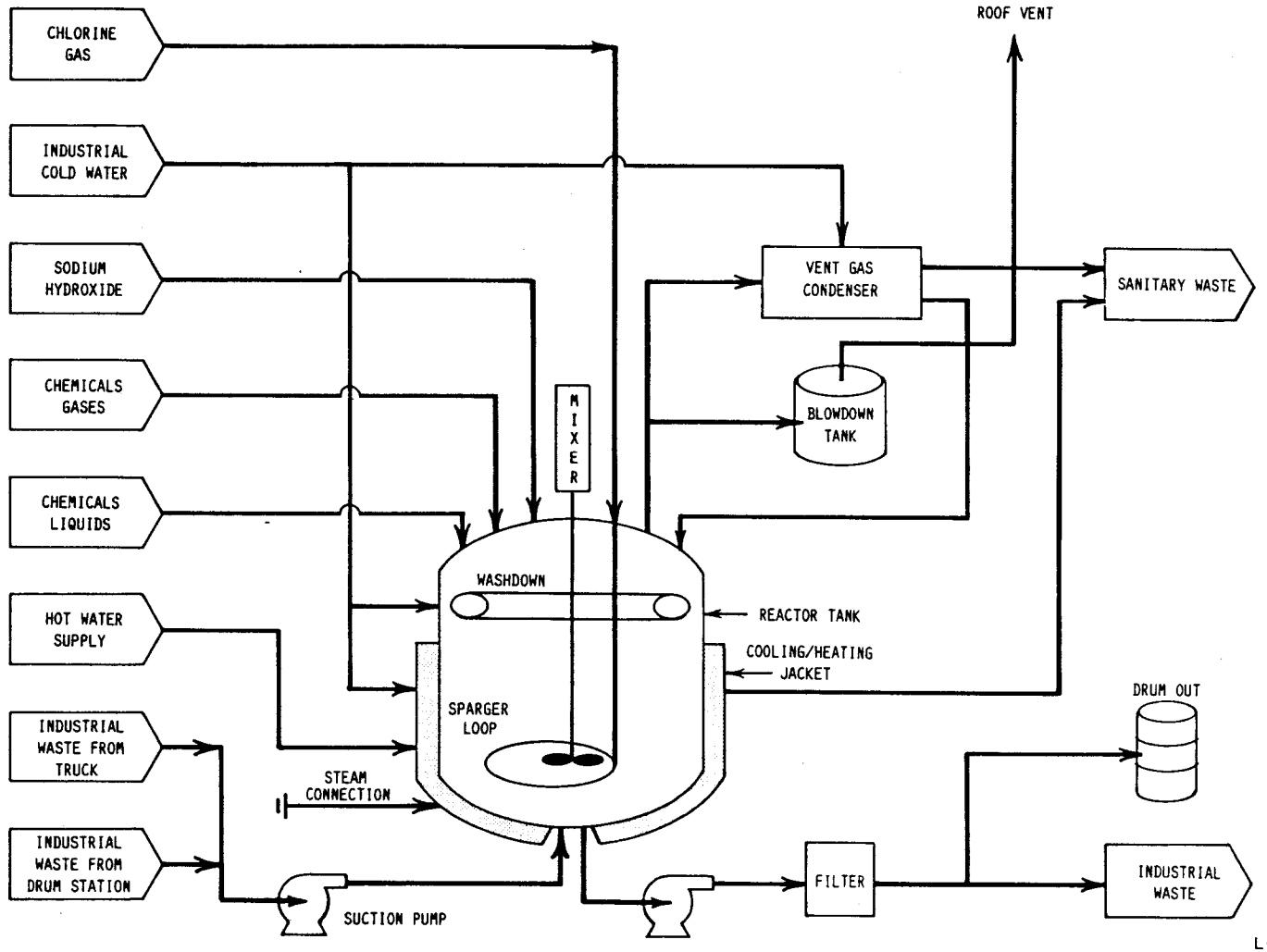


FIGURE 5

FLOW DIAGRAM OF BATCH TREATMENT SYSTEM

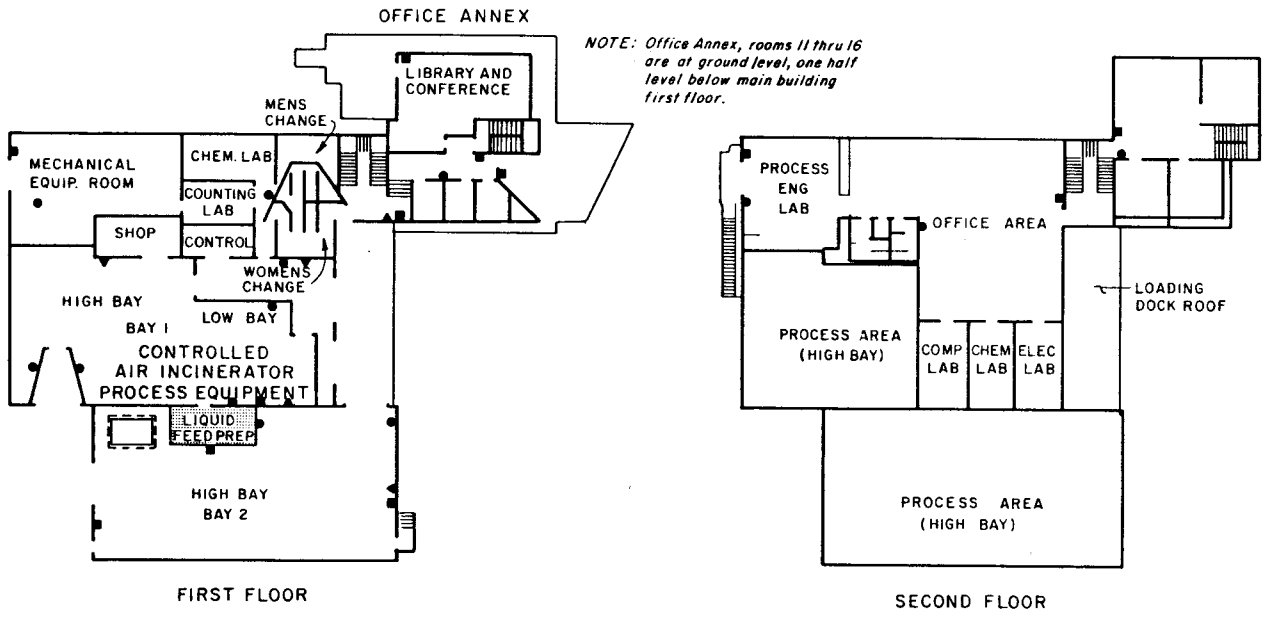
PREPARED FOR

LOS ALAMOS NATIONAL LABORATORY
LOS ALAMOS, NEW MEXICO

IT CORPORATION

DRAWN BY
CHECKED BY
APPROVED BY
DRAWING NUMBER 846510-A17

19 1253 HERCULENE. A&B SMITH CO., PGH., PA



NOTE: Office Annex, rooms 11 thru 16 are at ground level, one half level below main building first floor.

TREATMENT DEVELOPMENT FACILITY
TA-50, BUILDING 37

NOTE: All rooms are covered by automatic sprinkler heads. Fire water flow activates automatic alarm pull.

▲ EVACUATION ALARM
■ ALARM PULL (FIRE)
● FIRE EXTINGUISHER
HALON SYSTEM

FIGURE 6

TREATMENT DEVELOPMENT FACILITY
SHOWING LOCATIONS OF
CHEMICAL WASTE INCINERATOR
AND SUPPORT FACILITIES

PREPARED FOR

LOS ALAMOS NATIONAL LABORATORY
LOS ALAMOS, NEW MEXICO

IT CORPORATION

DRAWN BY	MJG	CHECKED BY	KFC	DRAWING NUMBER	846510-918
	11/20/84	APPROVED BY	TDP		

19 1253 HERCULENE, A&B SMITH CO., PGH., PA

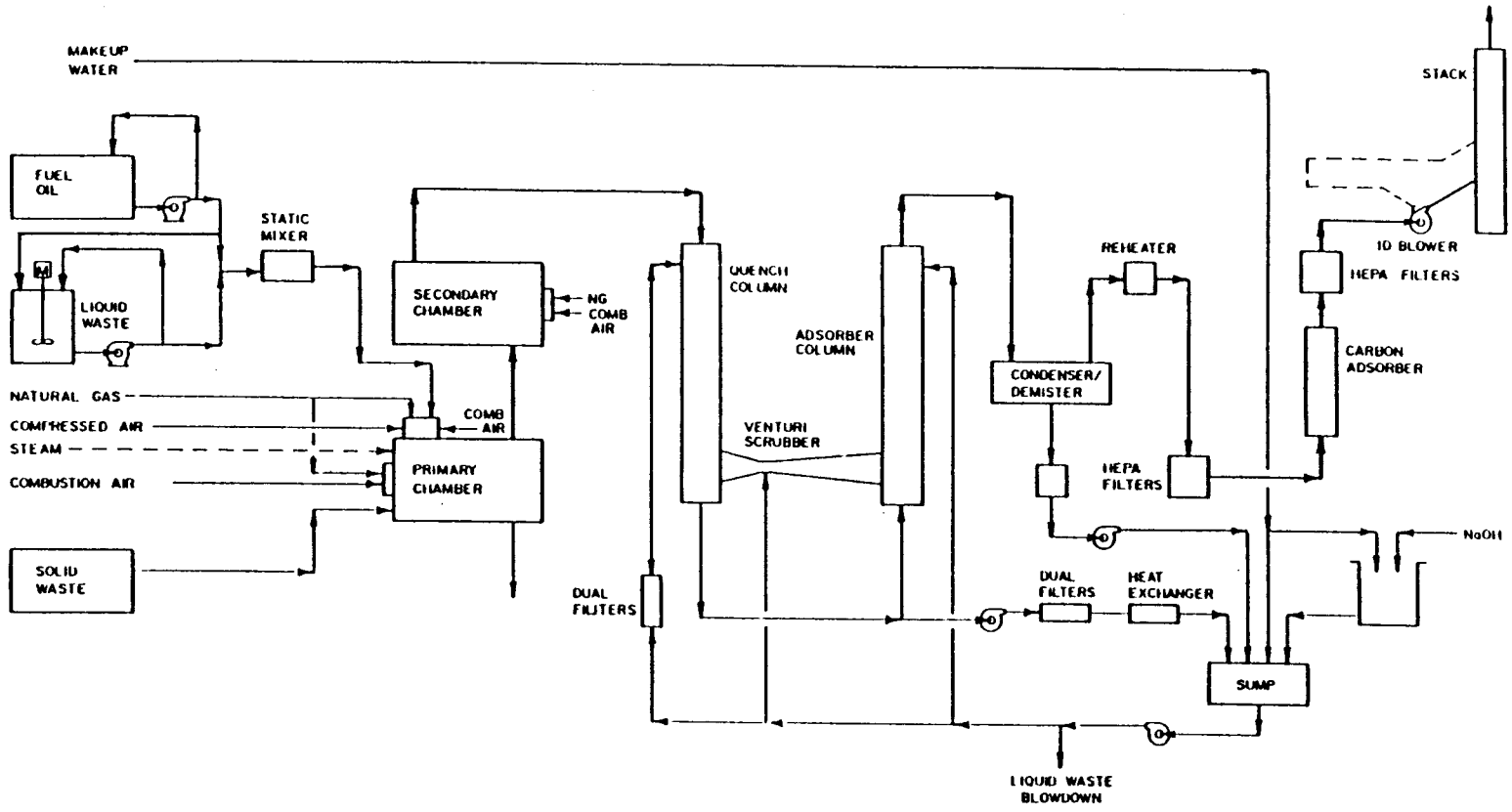


FIGURE 7

INCINERATOR
PROCESS DIAGRAM

PREPARED FOR

LOS ALAMOS NATIONAL LABORATORY

LOS ALAMOS, NEW MEXICO

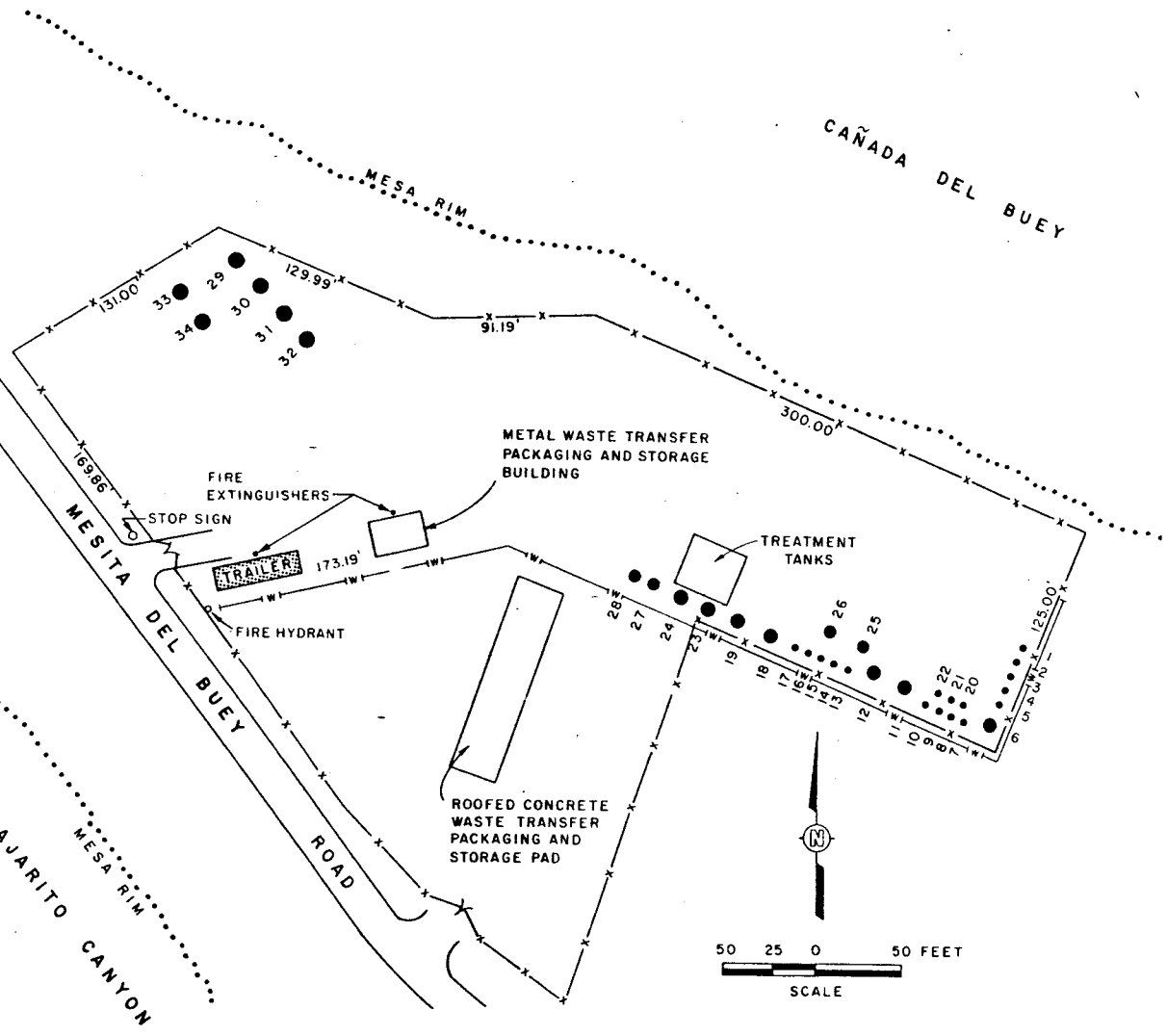
... Creating a Safer Tomorrow

DRAWING NUMBER 8465/0-A11

CHECKED BY / APPROVED BY

DRAWN BY

© 1984 IT CORPORATION
ALL COPYRIGHTS RESERVED
"Do Not Scale This Drawing"



AREA L SHAFTS[1]
(INFORMATION CURRENT MARCH 1985)

SHAFT NO.	SHAFT DIAMETER (FEET)	DATE DRILLED	DATE CAPPED	CONTENTS
1	3	4/80	9/83	ORGANICS[2]
2	3	2/75	7/79	ACIDS & BASES
3	3	2/75	11/78	INORGANIC
4	3	2/75	5/80	ORGANIC
5	3	2/75	6/77	WASTE OIL
6	4	6/75	6/79	REACTIVE
7	3	6/75	6/79	REACTIVE
8	3	6/75	6/79	REACTIVE
9	3	6/75	6/79	GAS CYLINDERS
10	3	6/77	6/79	WASTE OIL
11	8	1/78	7/79	WASTE OIL/SOLVENT
12	4	1/78	7/79	WASTE OIL/SOLVENT
13	3	6/79	5/82	INORGANIC
14	3	6/79	5/82	REACTIVE
15	3	6/79	5/82	REACTIVE
16	3	6/79	5/82	GAS CYLINDERS
17	3	6/79	5/82	ORGANIC
18	8	6/79	6/80	WASTE OIL
19	8	4/80	5/82	WASTE OIL
20	3	4/80	9/83	INORGANIC
21	3	4/80	OPEN	GAS CYLINDERS
22	3	4/80	9/83	ORGANIC
23[3]	8	4/82	3/84	WASTE OIL
24[4]	8	4/82	4/84	ORGANIC & WASTE OIL
25	6	9/82	5/85	INORGANIC
26	6	9/82	3/84	ORGANIC
27	4	1/83	2/85	SPECIAL[5]
28	4	1/82	5/85	SPECIAL
29	6	12/83	8/84	ORGANIC
30	6	12/83	8/84	ORGANIC
31	6	12/83	9/84	ORGANIC
32	4	9/84	9/84	ORGANIC
33	6	9/84	2/85	ORGANIC
34	6	2/85	5/85	ORGANIC

NOTES:
(1) ALL SHAFTS ARE APPROXIMATELY 60 FEET DEEP.
(2) SHAFT ONE CONTAINS WASTES NOT IN DRUMS.
(3) PRIOR TO SHAFT 23, LIQUIDS WERE DISPOSED OF IN DRUMS WITHOUT ADDING ABSORBENTS.
(4) MIDDLE SECTION OF THIS SHAFT NOT USED.
(5) USED FOR MISCELLANEOUS WASTE REQUIRING GREATER ISOLATION.

FIGURE 8

TA-54 AREA L
WASTE MANAGEMENT FACILITIES

PREPARED FOR

LOS ALAMOS NATIONAL LABORATORY
LOS ALAMOS, NEW MEXICO

IT CORPORATION

DRAWN BY	L L F	CHECKED BY		DRAWING NUMBER 846510-B2
	9/20/84	APPROVED BY		

19 1253 HERCULENE, ABB SMITH CO., PGH., PA

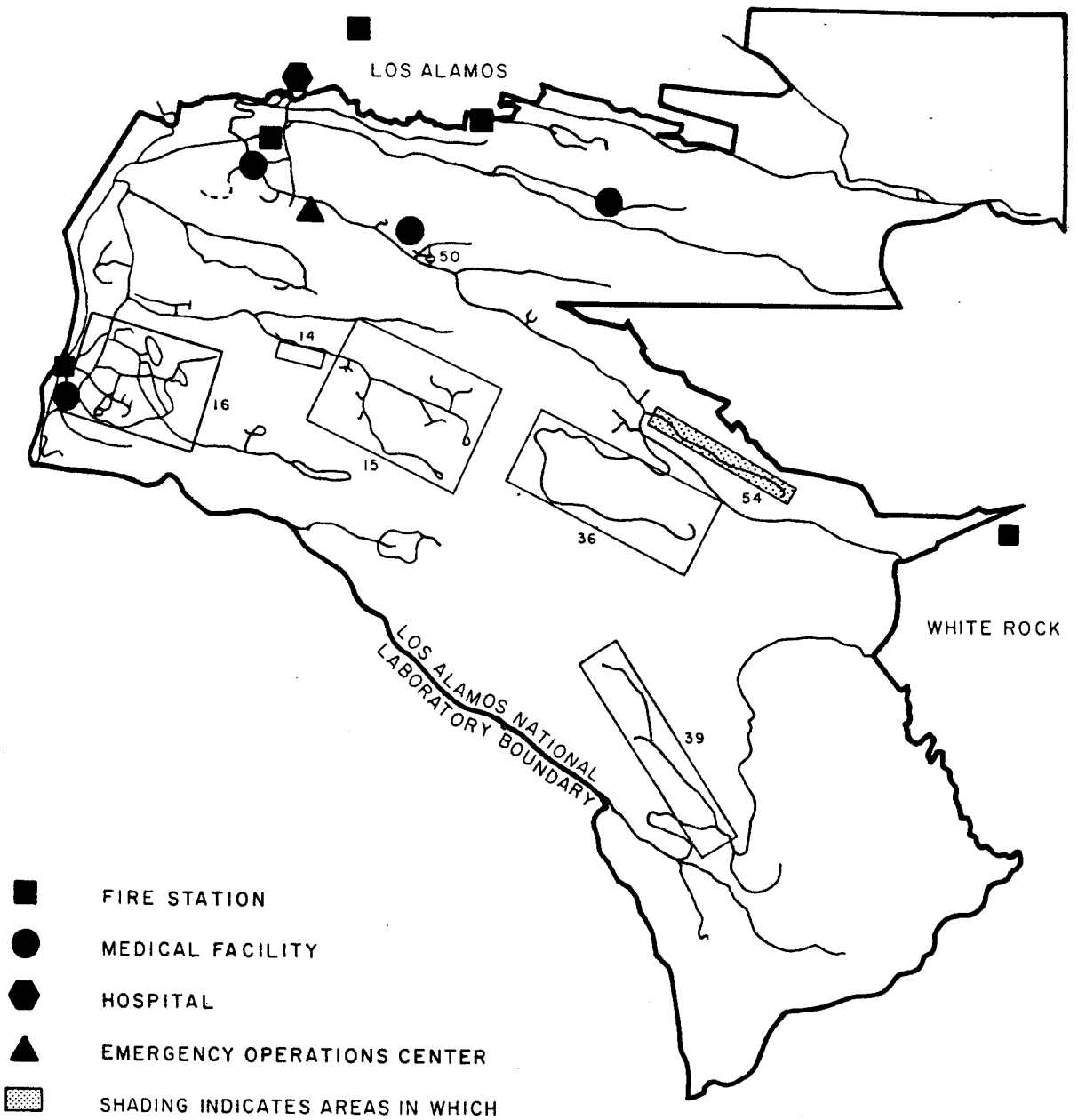


FIGURE 9

EMERGENCY FACILITIES

PREPARED FOR

LOS ALAMOS NATIONAL LABORATORY
LOS ALAMOS, NEW MEXICO

IT CORPORATION

DRAWN BY L.L.F 9/26/

CHECKED BY

APPROVED BY

DRAWING NUMBER 846510-A21

19 1253 HERCULENE. A&B SMITH CO., PGH., PA LT1530-1079

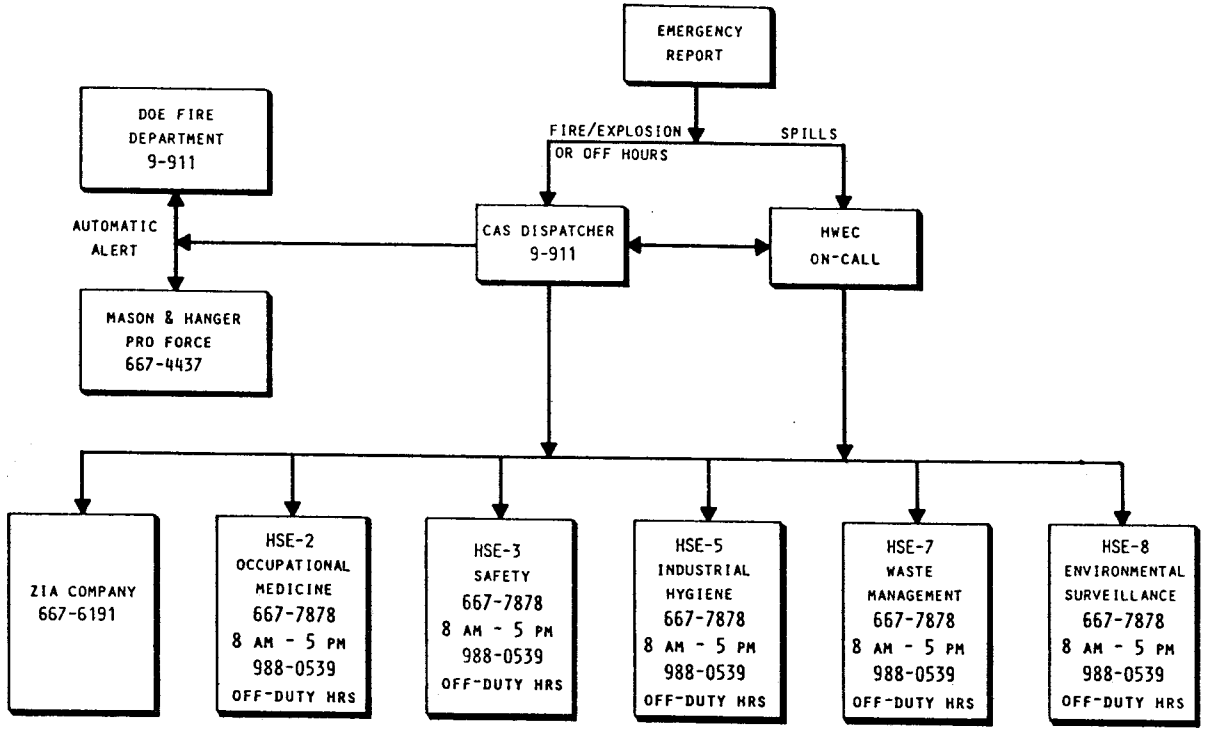


FIGURE 10

HAZARDOUS WASTE
EMERGENCY
NOTIFICATION STRUCTURE

PREPARED FOR

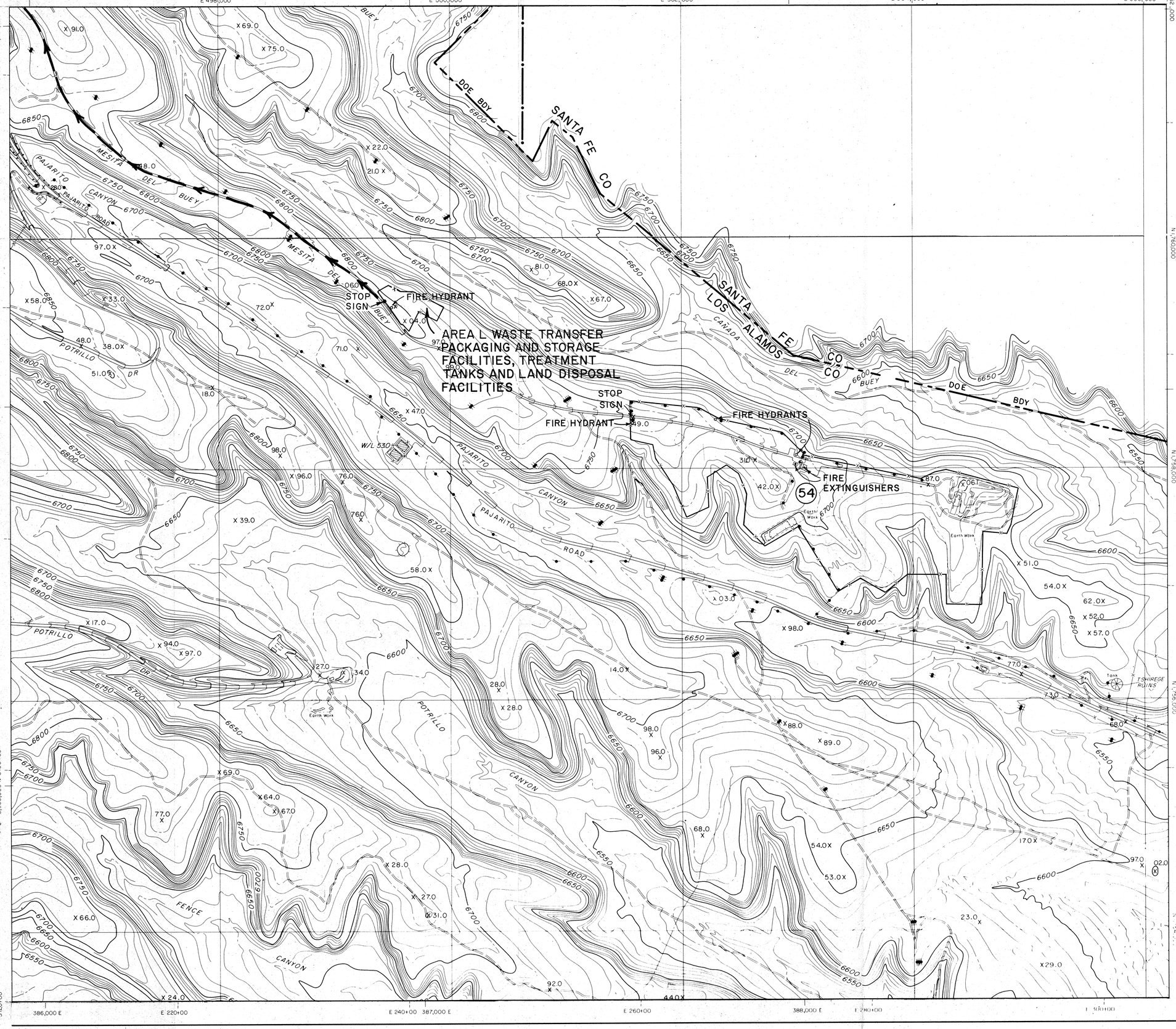
LOS ALAMOS NATIONAL LABORATORY
LOS ALAMOS, NEW MEXICO

... Creating a Safer Tomorrow

DRAWN BY	LLF 3/14/85	CHECKED BY		DRAWING NUMBER 8465/10-810
		APPROVED BY		

© 1984 IT CORPORATION
ALL COPYRIGHTS RESERVED
"Do Not Scale This Drawing"

85380

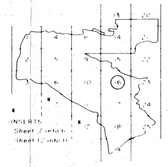


LEGEND

x 93.0	SPOT ELEVATION	N 1,768,000	NMSP GRID
—6900—	INDEX CONTOUR	3,989,000 N	UTM GRID
	INTERMEDIATE CONTOUR 10ft.	N 240-00	LASL GRID
	SUPPLEMENTARY CONTOUR 5ft.		
	CONTOURS THROUGH HEAVY VEGETATION		
	COUNTY LINES – TRANSFERRED FROM USGS 1:24,000 QUADRANGLES		
	DOE BOUNDARY – X & Y COORDINATE DATA PROVIDED BY LASL		
	DOE BOUNDARY – SURVEY DESCRIPTIONS OR RECORD PLATS PROVIDED BY LASL		
	DOE BOUNDARY – TRANSFERRED FROM USGS 1:24,000 QUADRANGLES BASED ON PROJECTED COUNTY LINES		

35	TECHNICAL AREA NO.		TOWER
	BUILDING		PIPE LINE
	FENCE		CUT LINE OR POWER LINE CLEARANCE SCAR
	PAVED ROAD		WATER TOWER
	DIRT ROAD	Tank	TANK
	JEEP TRAIL		POND
	CULVERT	Rw	RETAINING WALL
	GUARD RAIL		EARTH DIKES OR BLASTING SHIELDS
	TUNNEL	Earth Work	EARTH WORK OR GRADED AREAS
	EARTHEN BUNKERS		GATE
	POWER POLE		EVACUATION ROUTE

SHEET LAYOUT



NORTH

GRID NMSP NORTH

MAPPING COMPLETED BY PHOTOGRAMMETRIC METHODS, UTILIZING 1:30,000, 1:12,000 & 1:13,200 PHOTOGRAPHY, OBTAINED IN NOV. 1976 & JUNE 1980 WITH ZEISS RMK A 15/23 CAMERAS OF 153.42 & 152.43mm C.F.L. RESPECTIVELY. MAPPING BASED ON CONTROL SURVEYS TIED TO THE NEW MEXICO STATE PLANE COORDINATE SYSTEM (CENTRAL ZONE). MAPPING COMPLETED IN ACCORDANCE WITH NATIONAL MAP ACCURACY SPECIFICATIONS.

GRAPHIC SCALE 1 in =400 ft

CONTOUR INTERVAL 10 ft

TECHNICAL AREAS

MD–SITE

LOS ALAMOS SCIENTIFIC LABORATORY

FIGURE 11

CONTOUR MAP SHOWING THE LOCATION OF AREA L WASTE MANAGEMENT FACILITIES

LAB JOB NO 5682
1"=400' SCALE
PLAN / TOPO
SHEET 16 OF 25

14866-K

DRAWN BY	LLF	CHECKED BY		DRAWING NUMBER 846510-A22
	10/10/84	APPROVED BY		

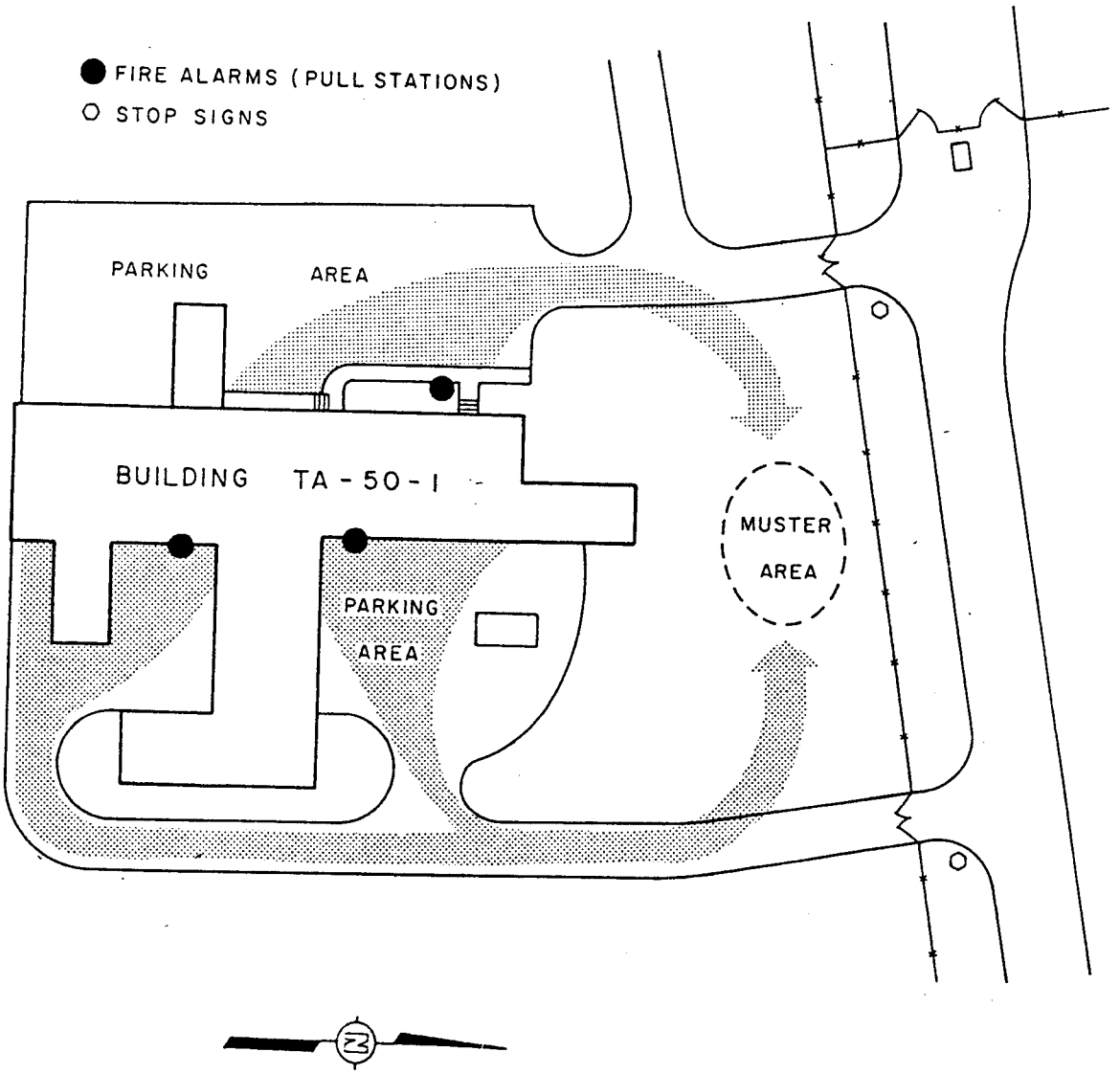


FIGURE 12

TA-50,
BATCH TREATMENT PLANT
EVACUATION ROUTE

PREPARED FOR

LOS ALAMOS NATIONAL LABORATORY
LOS ALAMOS, NEW MEXICO

IT CORPORATION

32803

DRAWN BY	CHECKED BY		DRAWING NUMBER
LLF 10/12/84	APPROVED BY		846510-A23

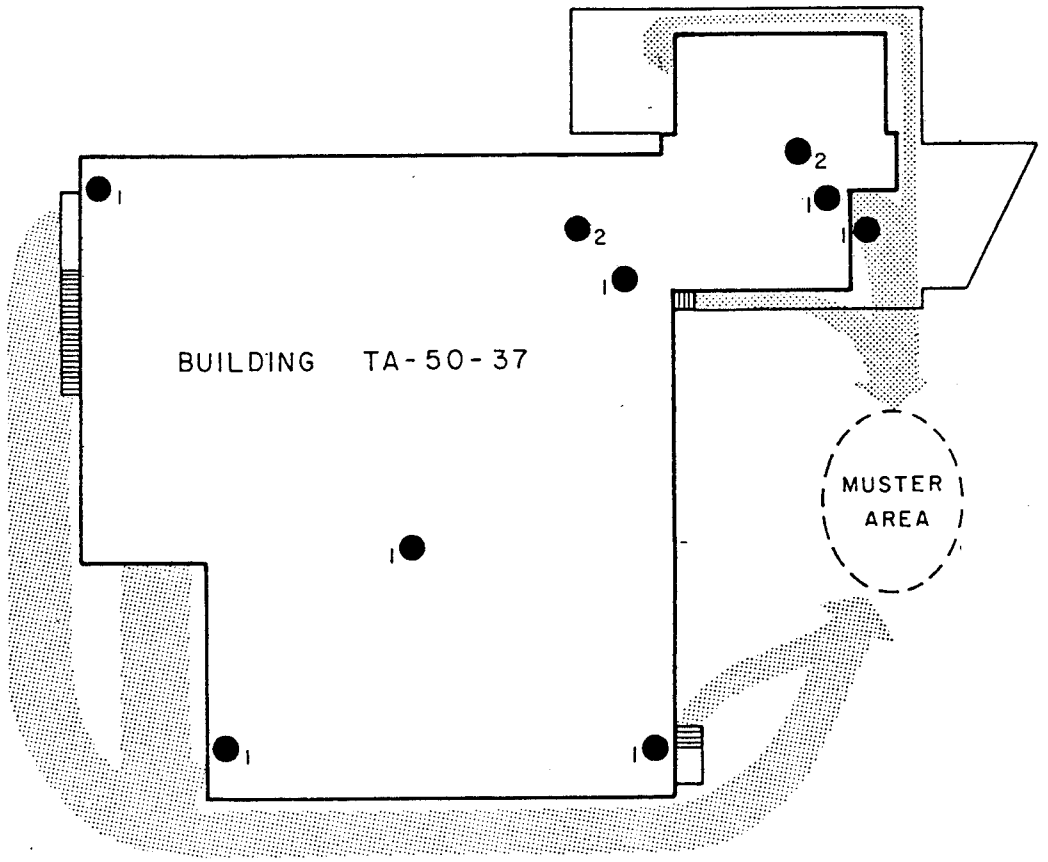


FIGURE 13

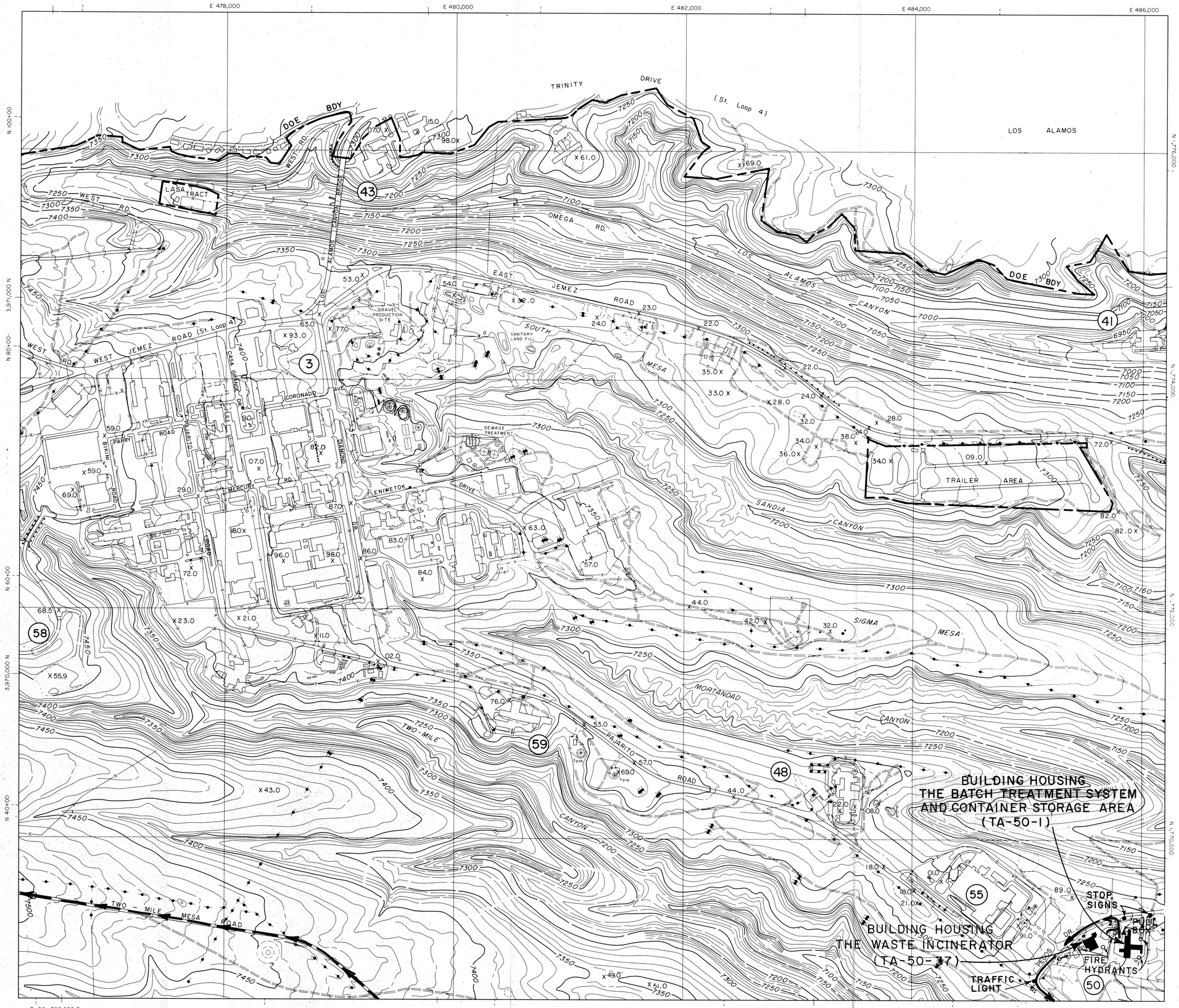
TA-50
WASTE INCINERATOR BUILDING
EVACUATION ROUTE

PREPARED FOR

LOS ALAMOS NATIONAL LABORATORY
LOS ALAMOS, NEW MEXICO

IT CORPORATION

32803

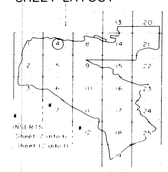


LEGEND

x 93.0	SPOT ELEVATION	N 1,768,000	NMSP GRID
—6900—	INDEX CONTOUR	3,989,000 N	UTM GRID
	INTERMEDIATE CONTOUR 10ft.	N 240-00	LASL GRID
	SUPPLEMENTARY CONTOUR 5ft.		
	CONTOURS THROUGH HEAVY VEGETATION		
	COUNTY LINES – TRANSFERRED FROM USGS 1:24,000 QUADRANGLES.		
	DOE BOUNDARY – X & Y COORDINATE DATA PROVIDED BY LASL.		
	DOE BOUNDARY – SURVEY DESCRIPTIONS OR RECORD PLATS PROVIDED BY LASL.		
	DOE BOUNDARY – TRANSFERRED FROM USGS 1:24,000 QUADRANGLES BASED ON PROJECTED COUNTY LINES.		

35	TECHNICAL AREA NO.		TOWER
	BUILDING		PIPE LINE
	FENCE		CUT LINE OR POWER LINE CLEARANCE SCAR
	PAVED ROAD		WATER TOWER
	DIRT ROAD	Tank	TANK
	JEEP TRAIL		POND
	CULVERT	RW	RETAINING WALL
	GUARD RAIL		EARTH DIKES OR BLASTING SHIELDS
	TUNNEL	Earth Work	EARTH WORK OR GRADED AREAS
	EARTHEN BUNKERS		GATE
	POWER POLE		EVACUATION ROUTE

SHEET LAYOUT



NORTH

TRUE NORTH
GRID NORTH
GRID NMSP NORTH

MAPPING COMPLETED BY PHOTOGRAMMETRIC METHODS, UTILIZING 1:30,000, 1:12,000 & 1:13,200 PHOTOGRAPHY, OBTAINED IN NOV. 1976 & JUNE 1980 WITH ZEISS RMK A 15/23 CAMERAS OF 153.42 & 152.43mm C.F.L. RESPECTIVELY. MAPPING BASED ON CONTROL SURVEYS TIED TO THE NEW MEXICO STATE PLANE COORDINATE SYSTEM (CENTRAL ZONE). MAPPING COMPLETED IN ACCORDANCE WITH NATIONAL MAP ACCURACY SPECIFICATIONS.

400 200 0 400 800 1200 FEET
100 50 0 100 200 300 400 500 METER

GRAPHIC SCALE: 1 in.=400 ft. CONTOUR INTERVAL 10 ft.

TECHNICAL AREAS

- 3 SM–SITE
- 41 W–SITE
- 50 WM–SITE
- 43 HRL–SITE
- 48 RC–SITE
- 58 TWO MILE NORTH–SITE
- 55 PLUTONIUM FACILITY SITE
- 59 OH–SITE

LOS ALAMOS SCIENTIFIC LABORATORY

BOVAY ENGINEERS, INC.
LABORATORY AERIAL MAPPING DIVISION

FIGURE 14

CONTOUR MAP SHOWING THE LOCATIONS OF THE BATCH TREATMENT SYSTEM AND CONTAINER STORAGE AREA AND THE WASTE INCINERATOR

LAB JOB NO. 5682
1"=400' SCALE
PLAN / TOPO
SHEET 4 OF 25

14866-L

ATTACHMENT 1

POLICY AGREEMENT BETWEEN
LOS ALAMOS NATIONAL LABORATORY AND
LOS ALAMOS POLICE DEPARTMENT

STATEMENT OF POLICY AND AGREEMENT BETWEEN THE LOS ALAMOS AREA OFFICE OF THE ATOMIC ENERGY COMMISSION AND LOS ALAMOS COUNTY RELATIVE TO TRAFFIC CONTROL AND RESPONSE BY THE LOS ALAMOS POLICE DEPARTMENT

I. Traffic Regulation on AEC Roads and Streets

a. Only the following roads and streets, but no parking areas, on AEC land in Los Alamos County are considered by the AEC to be open to the public for purposes of enforcement of State laws and County ordinances with respect to traffic. The Los Alamos County Police Department will enforce those laws and ordinances on the following specified roads and streets.

1. Diamond Drive from the north end of the bridge to the intersection of Diamond Drive and Pajarito Road.

2. Pajarito Road from Diamond Drive to State Road No. 4.

3. East Jemez Road from Diamond Drive east to the Los Alamos County line.

4. West Jemez Road from Diamond Drive west to State Road No. 4.

5. West Road from Diamond Drive to intersection with West Jemez Road.

b. Traffic control on all other AEC roads and streets, and in all AEC parking areas, is the responsibility of the AEC/LAAO Protective Force.

II. Traffic Control During Emergencies

a. For the control of traffic on the above specified roads and streets the Los Alamos Police Department will provide initial action. For sustained or large area control, support may be provided by auxiliary police or other personnel subject to Los Alamos Police Department direction, or by the AEC/LAAO Protective Force in cooperation with the LAPD.

b. On all other AEC roads and in all AEC parking areas traffic control will be under the direction of the AEC/LAAO Protective Force. Some support may be available from the LAPD in cooperation with the Protective Force.

III. Notification of Los Alamos County Police Concerning Accidents and Other Matters

In the event of possible or suspected criminal violation of applicable state law or county ordinance not primarily of security interest (for example, a traffic accident involving hit-and-run, driving under the influence of intoxicating liquor or drugs or reckless driving, a serious industrial accident, unattended death, etc.) the Los Alamos Police Department is to be notified by the AEC/LAAO Protective Force Duty Officer. The Police Department will respond to and investigate only such incidents as required by state law or county ordinance.

IV. Use of Telephone Number 911

Nothing in this agreement is intended to preclude the use of telephone number 911 by any person to obtain immediate response by the police, fire department, ambulance etc. to appropriate emergencies.

Los Alamos County

12-17-74
Date

Atomic Energy Commission
Los Alamos Area Office

11/20/74
Date

ATTACHMENT 2

DOCUMENTATION OF THE 100-YEAR FLOODPLAIN

DEPARTMENT OF THE ARMY
ALBUQUERQUE DISTRICT, CORPS OF ENGINEERS
P. O. BOX 1580
ALBUQUERQUE, NEW MEXICO 87103-1580

November 20, 1984

REPLY TO
ATTENTION OF:

Engineering and Planning Division
Planning Branch

Mr. M. L. McCorkle
Mail Stop: E518
Los Alamos National Laboratory
Los Alamos, New Mexico 87545

Dear Mr. McCorkle:

In response to your letter of October 15, 1984 (HSE8-84-913) to Mr. Boyd Lare. I am providing the following four flood plain evaluations:

a. TA-54, area L is not in a 100-year flood plain.

b. TA-54, area G is not in a 100-year flood plain except for the "burial pits." The burial pits will collect rain that falls into the pits. Rainwater will drain, collect, and be confined to the lowest depressions in the pits.

c. TA-16, "S" site burn pits are not in a 100-year flood plain except for the northern portion of pad 388. More detailed site data are needed to accurately evaluate the flood plain at pad 388. There is a two-foot diameter culvert under the access road and adjacent to the northern edge of the pad. This culvert is subject to clogging by debris during intense thunderstorms such as the storm which would produce the 100-year flood plain.

d. TA-40, HE scrap burn pits are not in a 100-year flood plain.

The above flood plain information is based upon a September 5, 1984 site visit made by Mr. Boyd Lare and Mr. Thomas Ryan of my staff and on topographic information provided by Los Alamos National Laboratory from Lab. Job No. 5682 Plan/Topo Sheet No.s 2, 5, and 16.

If you should need further evaluation of TA-16, please call Mr. Boyd Lare at 766-3225 to discuss additional data needs.

Sincerely,

John J. Cunico, P.E.
Chief, Planning Branch
Engineering and Planning Division

ATTACHMENT 3

STANDARD OPERATING PROCEDURES FOR HSE-7

CHEMICAL BATCH TREATMENT SYSTEM

STANDARD OPERATING PROCEDURES
FOR HSE-7 CHEMICAL BATCH TREATMENT SYSTEM

I. INTRODUCTION

This Standard Operating Procedure (SOP) establishes operational and general health and safety procedures for the chemical treatment of wastes at TA-50-1, Room 24. Most of these wastes will require storage at Area L, TA-54 until treatment can be performed. Individuals responsible for the overall operations are the HSE-7 Section Leader and Associate Group Leader for Solid Waste Operations. Any deviation from this SOP must receive their approval.

II. DESCRIPTION OF OPERATIONS

Liquid waste requiring chemical treatment prior to disposal is transported to TA-50 in 55-gallon drums or one of the container tanks. This SOP will describe the treatment processes in general terms. Specific operating instructions for each process will be written after treatment parameters have been developed.

A. Cyanide Waste

Cyanide wastes are treated by alkaline chlorination. The wastes are rendered harmless by conversion to CO_2, N_2, and H_2O.

1. The pH of waste is verified and adjusted, if necessary, to at least 10, prior to transfer to the reaction tank.
2. Wash all pipelines and tanks that will be used in treatment/transfer of waste with water.
3. Waste is pumped to the reaction vessel.
4. Waste is diluted and pH adjusted to 12.
5. Gaseous chlorine is added with agitation to convert cyanide to cyanate.
6. When complete, adjust the pH to 8.
7. Continue adding chlorine until cyanate is destroyed.
8. Discontinue chlorine addition.
9. Adjust pH by adding sodium hydroxide to precipitate metal ions present.

10. Analyze for cyanide presence. If any remains, continue treatment.

11. When total CN is approximately 10 ppm, filter sludge in basket filter and solidify with cement in 55-gallon drum for disposal at Area L.

12. Liquid effluent is discharge to TA-50-1 effluent tank.

13. Wash all pipelines and tanks used in process with water.

B. Chromium Waste

Chrome wastes are reduced by a two-stage process of reduction by sulfur dioxide and precipitation with sodium hydroxide.

1. Wash all pipelines and tanks that will be used in treatment/transfer of wastes with water.

2. Add 100 gallons of water to reaction tank.

3. Pump waste into tank and adjust pH to 2 with sulfuric acie.

4. Add sulfur dioxide to reduce Cr^{+6} to Cr^{+3}.

5. Discontinue sulfur dioxide flow and analyze a sample to demonstrate conversion.

6. Adjust the pH to 8 to precipitate chrome ion.

7. Filter sludge in basket filter and solidify with cement in a 55-gallon drum for disposal at Area L.

8. Effluent is discharged to TA-50.

9. Wash all pipelines and tanks used in process with water.

C. Heavy Metal Separation

Waste containing heavy metals will be treated by pH adjustment to precipitate the metal ion.

1. Wash all pipelines and tanks that will be used in treatment/transfer of wastes with water.

2. Pump waste into reaction vessel.

3. Adjust the pH to the predetermined point by addition of either sodium hydroxide or acid. (Usually the pH will need to be increased by caustic addition).

4. Filter sludge in basket filter and solidify with cement in 55-gallon drum for disposal at Area L.

5. Effluent is discharged to TA-50-1 effluent tank.

6. Wash all pipelines and tanks used in process with water.

D. Acid Waste

These waste streams contain no heavy metals and require only neutralizaiton. The 10,000-gallon neutralization tank at TA-50-1 is used in place of the 500-gallon reaction vessel.

1. Wash all transfer lines that will be used in process with water.

2. Add necessary dilution water and caustic to neutralization tank.

3. Monitoring temperature and pH, slowly add acid to tank.

4. Stop acid addition and adjust pH with sodium hydroxide as necessary.

5. Wash all transfer lines that were used with water.

6. Treated solution will be pumped to either the wiped film evaporator system or to the TA-50-1 effluent tank.

III. Health, Safety, and Environmental Concerns

A. Exposure to toxic and corrosive chemicals

B. Reactions out-of-control

C. Spills of wastes during transfer or treatment

IV. PROCEDURES FOR SAFE OPERATIONS

A. Personal Protective Equipment/Measures

1. Safety glasses/face shields, gloves, and lab coats or coveralls are the minimum protection that must be worn. During transfer of >50% acid wastes, acid wear suits must also be worn.

2. Safety shoes shall be worn during all waste handling operations.

3. Respirators, either full-face or SCBA, will be used as necessary per instructions from HSE-5.

4. The emergency shower and eyewash must be checked to assure that it is operative prior to starting any treatment operations.

5. Two people must be present during treatment operations.

B. Treatment Process

1. All instrumentation will be recalibrated at least yearly.

2. Pressure gauges will be monitored for pressure increases during treatment processes. If sudden pressure increases are detected, treatment will cease immediately. Agitation and cooling water in the jacket will continue to control the reaction.

3. The operating instructions are written to prevent a run-away reaction. Strict adherence to these procedures is required.

C. Spill Control Measures

1. The treatment process takes place inside a concrete bermed area designed to contain all spills and releases.

2. If the reaction overpressurizes the system, any blowdown will be contained in the overflow tank.

3. A major release would initiate the procedures of the Hazardous Waste Contingency Plan.

V. RELATIONSHIPS BETWEEN OPERATIONS AND SUPPORT ACTIVITIES

HSE-7 uses the expertise and guidance of HSE-3 (Safety), HSE-5 (Industrial Hygiene), and HSE-8 (Environmental Surveillance) in the use of the treatment system. If the system were to be used for other waste streams than those described above, a Special Work Permit would be written and approved by these groups.

VI. TRAINING

The training requirements for personnel involved in this operation are covered in SOP CW-1. In addition, personnel shall read this SOP at least semi-annually. The treatment supervisor shall periodically review the task performances of the technical personnel to ensure understanding and compliance with these procedures.

VII. EMERGENCY PROCEDURES

The TA-50-1 Emergency Procedures shall be followed for all emergencies.

VIII. RESPONSIBILITIES

The HSE-7 Section Leader for Solid Waste Operations has the overall responsibility for the treatment system. The Section Leader reports directly to the Associate Group Leader.

The treatment supervisor is responsible for assuring that all personnel involved in the treatment of chemical wastes know and understand these procedures. All instances of non-compliance will be reported by the supervisor to the Section Leader who is responsible for initiating appropriate corrective action.

CALL LIST

		Work	Home
Treatment Supervisor			
Section Leader	Karen Balo	7-6095	672-1369
Assoc. Group Leader	John Warren	7-5397	662-9639
Deputy Group Leader	Lud Emelity	7-5389	662-7993
Group Leader	Ray Garde	7-4301	753-7737

ATTACHMENT 4

STANDARD OPERATING PROCEDURES FOR THE WASTE INCINERATOR

IX. PROCESS UTILITIES SOPs

A. 3-Phase Electrical Supply
B. 120 VAC Uninterrupted Power Supply
C. Auxiliary Diesel Generator
D. Plant Air Supply
E. Instrument Air Supply
F. Plant Water Supply
G. Emergency Water Supply
H. TDF Building Liquid Blowdown
I. Caustic Solution System
J. Natural (Fuel) Gas Supply
K. Liquid Fuel (Oil) Supply

S-72

HEALTH·SAFETY·ENVIRONMENT FORM

SOP SUBMITTAL

DATE 1/20/82

TO H-DIVISION SOP OFFICE MAIL STOP [redacted] 229

SOP TITLE THE 3-PHASE ELECTRICAL SUPPLY TO THE CONTROLLED-AIR INCINERATION PROCESS

ORIGINATING ORGANIZATION H-7 LOCATION TA-50, BLDG 37 (AS SPECIFIED IN THE SOP)

SOP STATUS: ☐ NEW ☒ REVISED ☐ RENEWAL ☐ OTHER _____ (SPECIFY)

DISCIPLINES INVOLVED:

- ☐ HEALTH PHYSICS (H-1)
- ☐ OCCUPATIONAL MEDICINE (H-2)
- ☐ FIRE PROTECTION (H-3)
- ☒ SAFETY (H-3)
- ☐ INDUSTRIAL HYGIENE (H-5)
- ☐ WASTE MANAGEMENT (H-7)
- ☐ ENVIRONMENTAL SURVEILLANCE (H-8)
- ☒ OTHER H-DC (SPECIFY)

EXPLANATION/COMMENTS:

This SOP is a revision and update to the existing Controlled Air Incineration Process Operating Manual. If there are any technical questions regarding the system or this SOP, please call C. L. Warner at 7-7391.

SUBMITTED BY C. L. Warner ORGANIZATION H-7

APPROVED BY:

(NAME)	(TITLE)	(ORGANIZATION)	(DATE)
[illegible]	Quality Dep Grp Ldr	H-7	1/28/82

NOTE: THIS SOP MUST BE APPROVED IN ACCORDANCE WITH ESTABLISHED DIVISION PROCEDURES BEFORE IT IS SUBMITTED TO H-DIVISION.

LOS ALAMOS SCIENTIFIC LABORATORY

THE 3-PHASE ELECTRICAL SUPPLY TO THE CONTROLLED-AIR INCINERATION PROCESS

I. SCOPE

This SOP covers the control and distribution of electrical power from the building supply of 480 VAC and 280 VAC power from motor control centers (MCC) 1 and 2 to elements of the CAI process requiring 3-phase power.

II. HEALTH AND SAFETY PRECAUTIONS

The 3-phase electrical power supply system presents a personnel hazard if not properly isolated. In addition, an unscheduled interruption in electrical power to the CAI process could result in an unnecessary shutdown and in some cases could result in equipment damage. Do not repair or make any adjustments to components of the electric power system without approval of the shift supervisor or floor manager.

III. OPERATIONS

A. Startup

1. Before operating all or part of the CAI process, verify that MCC1 breakers and control switches are positioned as follows:

Breakers		Control Switch
Junction Box Feed (Breaker 5B)	ON	--
Bus Duct, Room 113 (4C)	ON	--
Auxiliary Instrument Air Compressor (5C)	ON	AUTO
Main Plant Air Compressor (2C)	ON	--
LP-2 Feed (1D)	ON	--
Bus Duct, Room 112 (2D)	ON	--
Power Panel Transformer Feed (4D)	ON	--
EP-1 Feed (6D)	ON	--

2. Verify that MCC2 breakers and control switches are positioned as follows:

Breakers		Control Switch
Process Boiler (Breaker 1E)	ON	--
Auxiliary Plant Air Compressor (2E)	ON	AUTO
Building Sump Pump (3E)	ON	AUTO*
Process Sump Pump (4E)	ON	OFF*
Cooling Tower #1 Fan (1F)	ON	OFF*
Cooling Tower #2 Fan (2F)	ON	OFF*
Process Exhaust Fan #1 (4F)	ON	OFF*
Cooling Tower Pump (1G)	ON	OFF*
LP-1 Feed (3G)	ON	--
Process Exhaust Fan #2 (1H)	ON	OFF*
Main Instrument Air Compressor (2H)	ON	--
Offgas Superheater Supply (3H)	ON	--

*Located in Room 112.

3. Verify that the following PP-1 breakers are positioned as follows:

Breaker	
Bus Duct Room 112 (breaker 4)	ON
Emergency Generator (10)	ON
Cooling Tower (15)	ON
Emergency Switchgear (16)	ON
Bus Duct Room 113 (38)	ON

B. Shutdown

1. The status of the breakers should remain the same following shutdown of the CAI process. They should

be changed only if isolation of a component for maintenance or modification is required.

IV. AUTHORITY

Modification or changes to any component part of the 3-phase electrical power supply must be approved by an H-7 R&D Section Leader. The shift supervisor or floor manager must be contacted for permission to actuate any CAI process breaker or control switch. Maintenance and service for component parts of the 3-phase electrical power supply system is to be coordinated through ENG-4.

V. REFERENCES

1. LASL Health and Safety Manual, Chapter X, Section A, p.x.2, "General Safety Rules," and Section D, paragraph 6, p.x.5, "When Operating Circuit Breakers."

HEALTH·SAFETY·ENVIRONMENT FORM

SOP SUBMITTAL

DATE 1/21/82

TO H-DIVISION SOP OFFICE MAIL STOP [redacted] 229

SOP TITLE THE 120 VAC UNINTERRUPTIBLE POWER SUPPLY

ORIGINATING ORGANIZATION H-7 LOCATION TA-50, BLDG 37 (AS SPECIFIED IN THE SOP)

SOP STATUS: ☐ NEW ☒ REVISED ☐ RENEWAL ☐ OTHER _____ (SPECIFY)

DISCIPLINES INVOLVED:

- ☐ HEALTH PHYSICS (H–1)
- ☐ OCCUPATIONAL MEDICINE (H–2)
- ☐ FIRE PROTECTION (H–3)
- ☒ SAFETY (H–3)
- ☐ INDUSTRIAL HYGIENE (H–5)
- ☐ WASTE MANAGEMENT (H–7)
- ☐ ENVIRONMENTAL SURVEILLANCE (H–8)
- ☒ OTHER H-DO (SPECIFY)

EXPLANATION/COMMENTS:

This SOP is a revision and update to the existing Controlled Air Incineration process Operating Manual. If there are any technical questions regarding the system or this SOP please call R. A. Koenig at 7-7391.

SUBMITTED BY R. A. Koenig ORGANIZATION H-7

APPROVED BY:

(NAME)	(TITLE)	(ORGANIZATION)	(DATE)
[illegible]	Deep. Grp. Ldr	H-7	1-28-82
[illegible]		H-DO	1/8/82

NOTE: THIS SOP MUST BE APPROVED IN ACCORDANCE WITH ESTABLISHED DIVISION PROCEDURES BEFORE IT IS SUBMITTED TO H-DIVISION.

LOS ALAMOS SCIENTIFIC LABORATORY

THE 120 VAC UNINTERRUPTIBLE POWER SUPPLY

I. SCOPE

This SOP covers the operation of a DELTEC uninterruptible power supply (UPS) located in the mechanical equipment room (Room 111) which provides a source of continuous 120 VAC power to all controls associated with the CAI process with the exception of the MEGAS and the micro-dose x-ray system. The primary feed to the UPS is Motor Control Center #2 (MCC2), the auxiliary feed is the MCC1, and the emergency feed is from a battery rack, also located in Room 111.

II. HEALTH AND SAFETY PRECAUTIONS

Lead-calcium batteries use an acid electrolyte, therefore, two persons are required to service the batteries. The operator must always use hand and eye protection, and a portable eye-wash station must be positioned near the work area. This battery system has very high amperage capacity and high voltage at all terminals. Extreme caution must be taken to prevent any conductor from touching battery terminals or connectors. The cover over the battery rack should be removed only for brief periods during battery service, and must be replaced whenever the rack is unattended. Hydrogen generation is not a hazard with this type of battery. Any repairs or adjustments to the UPS must be approved by the shift supervisor or floor manager.

III. OPERATIONS

A. Startup

1. Begin with all UPS front panel circuit breakers OFF.
2. Apply battery power. Front panel indicators should be as follows:

   AC Line (primary supply)---------ALARM

Auxiliary----------ALARM
Battery Charger----------NORMAL
Battery Condition----------NORMAL
Inverter----------INPUT and OUTPUT ALARMS
Output Mode----------INVERTER

3. Apply auxiliary power. Verify that the output mode indicator shows a transfer to **LINE** after about 50 seconds.
4. Turn on the AC input circuit breaker and the battery charger output circuit breaker. The **RECHARGE** indicator should light in 10 to 20 seconds.
5. Turn on the inverter input circuit breaker. The inverter will start in 1 to 2 seconds. The inverter input and output alarms will turn off and the inverter **NORMAL** indicator will light. In several seconds, the **SYNC** indicator will light, and about 3 seconds later, the output mode indicator will show a transfer to **INVERTER**.
6. Push the **MANUAL TRANSFER** switch to verify that it will transfer the load to the auxiliary line.
7. Push the **MANUAL TRANSFER** switch again to return the load to the inverter.
8. The output circuit breaker may now be turned on.

B. <u>Shutdown</u>

1. Turn off the output circuit breaker.
2. Turn off the inverter input circuit breaker.
3. Turn off the battery charger output circuit breaker.
4. Turn off the AC input circuit breaker.

IV. AUTHORITY

Modification or changes to the equipment must be approved by an H-7 R&D Section Leader. The Section Leaders will designate persons responsible for servicing and maintaining the UPS. Any shutdown, startup, or maintenance of the UPS must be approved by the shift supervisor or floor manager.

V. REFERENCES

1. Manufacturer's manual, DELTEC model 5248A-2054 Uninterruptible Power System, Part No. 5126639, September 1977.
2. LASL Health and Safety Manual, Chapter X, Section A, p. X.2, "General Safety Rules, Electrical Safety," and Chapter VI, Section K, p. VI. 21, Electrical Safety.

HEALTH·SAFETY·ENVIRONMENT FORM

SOP SUBMITTAL

DATE 1/21/82

TO H-DIVISION SOP OFFICE MAIL STOP [redacted] 229

SOP TITLE THE AUXILIARY GENERATOR

ORIGINATING ORGANIZATION H-7 LOCATION TA-50, BLDG 37 (AS SPECIFIED IN THE SOP)

SOP STATUS: ☐ NEW ☒ REVISED ☐ RENEWAL ☐ OTHER _____ (SPECIFY)

DISCIPLINES INVOLVED:

- ☐ HEALTH PHYSICS (H–1)
- ☐ OCCUPATIONAL MEDICINE (H–2)
- ☐ FIRE PROTECTION (H–3)
- ☒ SAFETY (H–3)
- ☐ INDUSTRIAL HYGIENE (H–5)
- ☐ WASTE MANAGEMENT (H–7)
- ☐ ENVIRONMENTAL SURVEILLANCE (H–8)
- ☐ OTHER H-DO (SPECIFY)

EXPLANATION/COMMENTS:

This SOP is a revision and update to the existing Controlled Air Incineration process Operating Manual. If there are any technical questions regarding the system or this SOP please call C. L. Warner at 7-7391.

SUBMITTED BY C. L. Warner ORGANIZATION H-7

APPROVED BY:

(NAME)	(TITLE)	(ORGANIZATION)	(DATE)
[illegible]	Dep Grp Ldr	H-7	1/28/82
[illegible]		H-DO	4/7/82

NOTE: THIS SOP MUST BE APPROVED IN ACCORDANCE WITH ESTABLISHED DIVISION PROCEDURES BEFORE IT IS SUBMITTED TO H-DIVISION.

LOS ALAMOS SCIENTIFIC LABORATORY

9/79

THE AUXILIARY GENERATOR

I. SCOPE

The purpose of the auxiliary generator is to provide a back-up power source for the CAI process in the event of a power failure. The unit is a skid mounted diesel-engine generator located outside near the northwest corner of the TDF. The generator is a synchronous type, developing 500 kW at 1800 rpm with a regulated output voltage of 480 Vac 3-phase, 60 Hz. If there is a commercial power failure, the generator will connect to the TDF emergency power panel through an automatic transfer switch. The switch disconnects the generator when commercial power is restored.

II. HEALTH AND SAFETY PRECAUTIONS

1. Wear ear protection when servicing the unit if it is operating.
2. Do not open control panels or covers when the unit is operating.

III. OPERATIONS

A. Startup

1. Check coolant level according to the Cummings Generator Set Service Manual.
2. Check engine oil level.
3. Check governor oil sump level.
4. Close fuel transfer pump breaker and check fuel tank level. Record underground fuel storage tank level in CAI log.
5. Place the switch on the engine instrument panel to "OFF" (This control is overridden by the auto start panel.).

6. Check the oil sump and water jacket heaters for proper operation.
7. On the auto start panel, switch the auto-off-manual switch to manual. The generator will start and come-up to speed in 10 s.

Note: It should not be necessary to adjust the engine speed or the generator voltage. If frequency adjust is necessary, change the engine speed until the frequency indicates 61.8 Hz (this accounts for a 3% hydraulic governor droop). If voltage does not indicate 480 V, adjust with the voltage control rheostat.

B. Shutdown

1. Turn the auto-off-mannual switch to the off position.

Note: If the unit has been running for an extended period under load, allow the unit to run about 10 min. under no-load condition before switching to off.

2. After the engine has stopped, place the auto-off-manual switch to auto. With loss of commercial power, the generator will automatically start and supply power to the emergency buss.

VI. AUTHORITY

Maintenance, modifications, or changes to this generator must be approved by the shift supervisor or floor manager.

V. REFERENCES

Cummings Generator Set Service Manual.

AUXILIARY DIESEL GENERATOR UNDERGROUND FUEL TANK CALIBRATION

(48" x 132" Horizontal Storage Tank)

GALLONS PER INCH OF DIAMETER

INCHES	GALLONS	INCHES	GALLONS
1	5	25	545
2	15	26	572
3	27	27	600
4	41	28	626
5	57	29	653
6	75	30	680
7	93	31	706
8	113	32	733
9	134	33	758
10	156	34	783
11	178	35	807
12	202	36	832
13	227	37	856
14	251	38	878
15	276	39	900
16	301	40	921
17	328	41	941
18	354	42	959
19	381	43	977
20	408	44	993
21	435	45	1008
22	462	46	1020
23	490	47	1029
24	517	48	1034

HEALTH•SAFETY•ENVIRONMENT FORM

LOS ALAMOS SCIENTIFIC LABORATORY

SOP SUBMITTAL

DATE 1/20/82

TO H-DIVISION SOP OFFICE MAIL STOP [redacted] 229

SOP TITLE THE PLANT AIR SUPPLY

ORIGINATING ORGANIZATION H-7 LOCATION TA-50, BLDG 37 (AS SPECIFIED IN THE SOP)

SOP STATUS: ☐ NEW ☒ REVISED ☐ RENEWAL ☐ OTHER _____ (SPECIFY)

DISCIPLINES INVOLVED:

- ☐ HEALTH PHYSICS (H–1)
- ☐ OCCUPATIONAL MEDICINE (H–2)
- ☐ FIRE PROTECTION (H–3)
- ☒ SAFETY (H–3)
- ☐ INDUSTRIAL HYGIENE (H–5)
- ☐ WASTE MANAGEMENT (H–7)
- ☐ ENVIRONMENTAL SURVEILLANCE (H–8)
- ☐ OTHER H-D (SPECIFY)

EXPLANATION/COMMENTS:

This SOP is a revision and update of the existing Controlled Air Incineration Process Operating Manual. If there are any questions regarding the system or this SOP, please call C. L. Warner at 7-7391.

SUBMITTED BY C. L. Warner ORGANIZATION H-7

APPROVED BY:

(NAME)	(TITLE)	(ORGANIZATION)	(DATE)
[signature]		H-7	1-28-82
[signature]		H-00	4/8/82

NOTE: THIS SOP MUST BE APPROVED IN ACCORDANCE WITH ESTABLISHED DIVISION PROCEDURES BEFORE IT IS SUBMITTED TO H-DIVISION.

THE PLANT AIR SUPPLY

I. SCOPE

High pressure plant air (>90 psig) is supplied by a Joy compressor with a Worthington compressor as a backup. Both compressors feed a 130 gal receiver tank. This system supplies air for shop use, and for high pressure pneumatic motors and drives in the process area. This SOP covers the operation and isolation of the system which is located in the mechanical equipment room (Room 111).

II. HEALTH AND SAFETY PRECAUTIONS

Caution is required when working with or on any compressed air system due to the energy stored in compressed gas. Ordinary objects can become missiles and be potentially hazardous.

The electrically driven motors shall be isolated by lock and tag procedures before any maintenance or modifications are performed.

To prevent any problems with the CAI process or on-going work, any maintenance or work on the system must be approved by the shift supervisor or floor manager.

III. OPERATIONS

A. Startup

1. Open all of the isolation valves for each compressor.

2. Turn the power supply breaker for the Main Plant Air. Compressor to ON (Breaker 2 C on the back of the motor control center). Monitor the tank pressure gage. It should rise to 90 psig.

3. Turn on the power supply for the Auxiliary Plant Air. Compressor (Breaker 2 E on the front or south side of the motor control center).

B. Normal Operation

The compressor systems are fully automatic and operates on demand.

C. Shutdown

1. Turn breakers 2 C and 2 E to OFF.
2. To bleed air from the system, open the shop air supply and monitor the pressure at the receiving tank.

D. Isolation

1. Either compressor can be isolated from the system by closing the appropriate valve immediately downsteam of the pump outlet and turning off the appropriate breaker (2 C or 2 E).
2. The tank can be isolated by closing the inlet and outlet valves; however, both compressors should be turned off at the breakers and tagged.

IV. AUTHORITY

Modifications or changes to this equipment must be approved by an H-7 R&D Section Leader. Maintenance of the equipment will be supplied by ENG-4. Any shutdown or isolation of the system or components must be approved by the shift supervisor or floor manager.

HEALTH·SAFETY·ENVIRONMENT FORM

SOP SUBMITTAL

DATE 1/20/82

TO H-DIVISION SOP OFFICE MAIL STOP [redacted] 229

SOP TITLE INSTRUMENT AIR SUPPLY

ORIGINATING ORGANIZATION H-7 LOCATION TA-50, BLDG 37 (AS SPECIFIED IN THE SOP)

SOP STATUS: ☐ NEW ☒ REVISED ☐ RENEWAL ☐ OTHER _____ (SPECIFY)

DISCIPLINES INVOLVED:

- ☐ HEALTH PHYSICS (H–1)
- ☐ OCCUPATIONAL MEDICINE (H–2)
- ☐ FIRE PROTECTION (H–3)
- ☒ SAFETY (H–3)
- ☐ INDUSTRIAL HYGIENE (H–5)
- ☐ WASTE MANAGEMENT (H–7)
- ☐ ENVIRONMENTAL SURVEILLANCE (H–8)
- ☒ OTHER H-DC (SPECIFY)

EXPLANATION/COMMENTS:

This SOP is a revision and update to the existing Controlled Incineration Process Operating Manual. If there are any technical questions regarding the system or this SOP, please call C. L. Warner at 7-7391.

SUBMITTED BY C. L. Warner ORGANIZATION H-7

APPROVED BY:

(NAME)	(TITLE)	(ORGANIZATION)	(DATE)
[illegible]	Dep Grp Ldr	H-7	1/28/82
[illegible]	[illegible]	H-DO	4/7/82

NOTE: THIS SOP MUST BE APPROVED IN ACCORDANCE WITH ESTABLISHED DIVISION PROCEDURES BEFORE IT IS SUBMITTED TO H-DIVISION.

LOS ALAMOS SCIENTIFIC LABORATORY

INSTRUMENT AIR SUPPLY

I. SCOPE

This SOP covers the oepration of the TDF instrument air supply. The system provides clean, dry air for opration of pneumatic controls and consists of the following components:

1. A Ingersall-Rand Model V17 M-7 1/2 compressor (AC-2) as the main supply.
2. A Speedair Model 3Z199 (AC-3) as the backup supply.
3. An auxiliary compressed nitrogen bottle supply.
4. A Hankison refrigerant air dryer.
5. A fourth backup to the instrument air supply is provided by the plant air supply system, which is connected to the instrument air supply system at the inlet of the refrigerated air dryer (Item 4, above) via a manual valve and a pressure regulator valve set below the compressed nitrogen service pressure.

All components are located in the southeast corner of the mechanical equipment room.

II. HEALTH AND SAFETY PRECAUTIONS

Caution is required when working with or on any compressed air system due to the energy stored in compressed gas. Ordinary objects can become missiles and be potentially hazardous.

The electrically driven motors shall be isolated by lock and tag procedures before any maintenance or modifications are performed.

To prevent any problems with the CAI process or on-going work, any maintenance or work on the system must be approved by the shift supervisor or floor manager.

III. OPERATIONS

A. Startup

1. Open all of the isolation valves for each compressor.
2. Turn the power supply breaker for the Main Instrument Air. Compressor to ON (Breaker 2-H on the front side of the motor control center). Monitor the tank pressure gage. It should rise to 90 psig.

3. Turn on the main power supply for the backup Auxiliary Instrument Air. Compressor (Breaker 5-C on the back side of the motor control center).
4. Plug in the air dryer (DRA-1) and turn the local circuit breaker to ON.
5. Open the compressed nitrogen bottle valves and set the regulator to 70 psig.

B. Normal Operation

The system is fully automatic. The backup compressor will turn on if the main compressor fails. The nitrogen system will supply gas if the line pressure drops below 70 psig.

C. Shutdown

1. Turn breakers 5-C and 2-H to OFF.
2. Turn the refrigerated air dryer local circuit breaker to OFF.
3. Turn the valve from the plant air supply to OFF.
4. Close the compressed nitrogen bottle valves.
5. Bleed the system.

D. Isolation

1. Either compressor can be isolated from the system by closing the appropriate valve downstream of the receiver tank outlet and turning off the appropriate breaker (5-C or 2-H).
2. The bottle system is isolated by a check valve. The bottles may be changed if the remaining bottles are shut off.
3. The dryers cannot be isolated.

IV. AUTHORITY

Modifications or changes to this equipment must be approved by an H-7 R&D Section Leader. Maintenance of the equipment will be supplied by ENG-4. Any shutdown or isolation of the system or components must be approved by the shift supervisor or floor manager.

HEALTH·SAFETY·ENVIRONMENT FORM

SOP SUBMITTAL

DATE 1/20/82

TO H-DIVISION SOP OFFICE MAIL STOP [redacted] 229

SOP TITLE THE PLANT WATER SUPPLY TO THE CONTROLLED-AIR INCINERATOR

ORIGINATING ORGANIZATION H-7 LOCATION TA-50, BLDG 37 (AS SPECIFIED IN THE SOP)

SOP STATUS: ☐ NEW ☒ REVISED ☐ RENEWAL ☐ OTHER _____ (SPECIFY)

DISCIPLINES INVOLVED:

- ☒ HEALTH PHYSICS (H-1)
- ☐ OCCUPATIONAL MEDICINE (H-2)
- ☐ FIRE PROTECTION (H-3)
- ☒ SAFETY (H-3)
- ☐ INDUSTRIAL HYGIENE (H-5)
- ☒ WASTE MANAGEMENT (H-7)
- ☐ ENVIRONMENTAL SURVEILLANCE (H-8)
- ☒ OTHER H-DC (SPECIFY)

EXPLANATION/COMMENTS:

This SOP is a revision and update to the existing Controlled Air Incineration Process Operating Manual. If there are any technical questions regarding the system or this SOP, please call C. L. Warner at 7-7391.

SUBMITTED BY C. L. Warner ORGANIZATION H-7

APPROVED BY:

(NAME)	(TITLE)	(ORGANIZATION)	(DATE)
[illegible]	Quality Dep Grp Ldr	H-7	1/28/82
[illegible]	H-DO		4/4/82

NOTE: THIS SOP MUST BE APPROVED IN ACCORDANCE WITH ESTABLISHED DIVISION PROCEDURES BEFORE IT IS SUBMITTED TO H-DIVISION.

LOS ALAMOS SCIENTIFIC LABORATORY

THE PLANT WATER SUPPLY TO THE CONTROLLED-AIR INCINERATOR

I. SCOPE

This SOP covers the control of plant water from the TDF non-potable water supply to the supply locations for process makeup and pump seals, auxiliary water tank, auxiliary water tank by-pass, and caustic makeup tank. The CAI system consumes plant water only through these four interfaces.

II. HEALTH AND SAFETY PRECAUTIONS

A blocked supply for either the auxiliary water tank or the tank bypass would present a danger to the process equipment and operators in the event that primary water supplies fail. For these reason, tag procedures will be followed for valves located in these two supply lines.

III. OPERATIONS

A. Startup

1. Prior to startup of the CAI process, verify that the valves for process makeup, seal water, and caustic makeup are open.
2. Verify that the following valves are open and tagged with yellow tags, obtainable from ENG-4:
    a. Main building pressure regulator block valves (two-located in Equipment Room)
    b. Nonpotable water backflow preventer block valves (two-located in Equipment Room)
    c. Emergency water tank supply block valve (on west wall of high bay)
    d. Emergency water tank bypass block valve (high on south wall of high bay)
3. Verify that the supply pressure for the emergency water tank is between 35 and 50 psig.

B. Shutdown

None of the above valves should be closed following shutdown of the CAI process. Approval of the shift supervisor or floor manager must be obtained before closing or repairing any tagged valve.

IV. AUTHORITY

Modification or changes to any component part of the plant water supply system must be approved by an H-7 R&D Section Leader. The shift supervisor or floor manager must be contacted for permission to close any tagged valve. Maintenance and service for component parts of the plant water supply system is to be coordinated through ENG-4.

V. REFERENCES

1. LASL Health and Safety Manual, Chapter VI, Section J, p. VI. 17, "Lock and Tag Procedures."

HEALTH·SAFETY·ENVIRONMENT FORM

LOS ALAMOS SCIENTIFIC LABORATORY

SOP SUBMITTAL

DATE 1/20/82

TO H-DIVISION SOP OFFICE MAIL STOP [redacted] 229

SOP TITLE THE AUXILIARY WATER SUPPLY TO THE CONTROLLED-AIR INCINERATOR

ORIGINATING ORGANIZATION H-7 LOCATION TA-50, BLDG 37 (AS SPECIFIED IN THE SOP)

SOP STATUS: ☐ NEW ☒ REVISED ☐ RENEWAL ☐ OTHER _____ (SPECIFY)

DISCIPLINES INVOLVED:

- ☐ HEALTH PHYSICS (H-1)
- ☐ OCCUPATIONAL MEDICINE (H-2)
- ☐ FIRE PROTECTION (H-3)
- ☒ SAFETY (H-3)
- ☐ INDUSTRIAL HYGIENE (H-5)
- ☐ WASTE MANAGEMENT (H-7)
- ☐ ENVIRONMENTAL SURVEILLANCE (H-8)
- ☒ OTHER H DC (SPECIFY)

EXPLANATION/COMMENTS:

This SOP is a revision and update to the existing Controlled Air Incineration Process Operating Manual. If there are any technical questions regarding the system or this SOP, please call R. A. Koenig at 7-7391.

SUBMITTED BY R. A. Koenig ORGANIZATION H-7

APPROVED BY:

(NAME)	(TITLE)	(ORGANIZATION)	(DATE)
[illegible]	Quality Assy Grp Ldr	H-7	1/28/82
[illegible]		H-DO	4/8/82

NOTE: THIS SOP MUST BE APPROVED IN ACCORDANCE WITH ESTABLISHED DIVISION PROCEDURES BEFORE IT IS SUBMITTED TO H-DIVISION.

THE AUXILIARY WATER SUPPLY TO THE CONTROLLED-AIR INCINERATOR

I. SCOPE

This SOP covers the control of a pressurized auxiliary water supply to a spray lance in the off-gas quench tower. This water provides backup to supply evaporative cooling of the incinerator offgas if the normal supply should fail.

II. HEALTH AND SAFETY PRECAUTIONS

A reliable source of high pressure water is vital to safe operation of the CAI process. Without it, cooling of incinerator offgas can not be achieved during a shutdown following a failure of the primary supply. Overheating can result in equipment damage and/or failure. Do not repair or make any adjustments to components of the emergency water supply system without approval of the shift supervisor or floor manager.

III. OPERATIONS

A. System Design

1. Turning the Scrubber Control Panel off following process shutdown will result in injection of the total volume of emergency water into the process. This feature is mandated to allow the system to activate following a total loss of power, including backup.
2. When the controls are energized following a shutdown, the first action is an automatic venting of pressurized air from the water tank. This will allow the lower-pressure plant water to enter the tank to build the necessary reserve. When the volume builds to about 200 gal, a level switch opens a solenoid valve which allows plant air to fill the remaining volume in the tank. The higher air pressure forces the plant water supply back against a check valve and the filling of the tank with water than stops.

B. Startup

1. Verify that the above actions take place automatically when the control panel is turned on.
2. Verify that the final liquid level is within the range indicated on the sight gauge, the plant water pressure is greater than 40 psig, plant air pressure is greater than 80 psig, and tank pressure is greater than 80 psig.

C. Normal Operation

No operator action is necesary to actuate the auxiliary supply. It will automatically route high pressure water to the quench tower following a failure of the primary water supply (pump). This action will take place in case of a failure of plant water, plant air, or electrical power, singly or in combination.

D. Abnormal Events

Should the auxiliary water supply fail, scrubber water can be routed to the spray lance manifold by opening a valve located directly above the scrubber sump pump.

Should the scrubber water supply fail, low pressure plant water can be routed to the injector normally supplied by the AWS by opening a valve on the south wall of the high bay by activating a pull-chain provided for this purpose.

Should the primary spray lance not pass sufficient volume, a low-flow alarm will sound. Water can then be routed to a secondary lance by opening a valve on the south wall of the high bay by a pull-chain provided for this purpose.

IV. AUTHORITY

Modification or changes to any component part of the auxiliary water system must be approved by an H-7 R&D Section Leader. Any maintenance or adjustments to the system must be approved by the shift supervisor or floor manager.

HEALTH·SAFETY·ENVIRONMENT FORM

LOS ALAMOS SCIENTIFIC LABORATORY

SOP SUBMITTAL

DATE 1/22/82

TO H-DIVISION SOP OFFICE MAIL STOP 401 229

SOP TITLE THE BUILDING LIQUID BLOWDOWN

ORIGINATING ORGANIZATION H-7 LOCATION TA-50, BLDG 37 (AS SPECIFIED IN THE SOP)

SOP STATUS: ☐ NEW ☒ REVISED ☐ RENEWAL ☐ OTHER _____ (SPECIFY)

DISCIPLINES INVOLVED:

- ☒ HEALTH PHYSICS (H-1)
- ☐ OCCUPATIONAL MEDICINE (H-2)
- ☐ FIRE PROTECTION (H-3)
- ☒ SAFETY (H-3)
- ☐ INDUSTRIAL HYGIENE (H-5)
- ☒ WASTE MANAGEMENT (H-7)
- ☐ ENVIRONMENTAL SURVEILLANCE (H-8)
- ☐ OTHER _____ (SPECIFY)

EXPLANATION/COMMENTS:

This SOP is a revision and update to the existing Controlled Incineration process Operating Manual. If there are any technical questions regarding the system or this SOP, please call Ralph Koenig at 7-7391.

SUBMITTED BY R. A. Koenig ORGANIZATION H-7

APPROVED BY:

(NAME)	(TITLE)	(ORGANIZATION)	(DATE)
[illegible]	Dep. Grp Ldr	H-7	1/28/82
[illegible]		H-DO	4/8/82

NOTE: THIS SOP MUST BE APPROVED IN ACCORDANCE WITH ESTABLISHED DIVISION PROCEDURES BEFORE IT IS SUBMITTED TO H-DIVISION.

THE BUILDING LIQUID BLOWDOWN

I. SCOPE

This SOP covers operation of the TDF building liquid collection tank and pump station, and the transfer of liquied to TA-50-1 (Liquid Waste Treatment Facility).

The collection tank accepts process blowdown and discharges from building lab sinks and floordrains.

II. HEALTH AND SAFETY PRECAUTIONS

The liquid handled in this collection and pumping system presents those hazards associated with acidic, caustic, radioactive, and thermally hot liquids and chemical hazards which might result from hazardous waste incineration. This system automatically clears the building sump tank of these liquids. Any obstruction in the system may cause unwanted shutdown of the CAI process or contamination due to spillage. Do not repair or make any adjustments to components of the liquid blowdown system without approval of the shift supervisor or floor manager.

III. OPERATIONS

A. Startup

1. Energize Filter Control Panels #1 and #2.
2. Verify that the annunciator on FCP #1 does not indicate a building sump tank level--Low.
3. Verify that the building sump pump motor starter control switch, located on the north wall of Room 112, is positioned to **OFF**.
4. Start the sump tank mixer by actuating Breaker #3 in Panel PP3 and closing the field breaker located on the north wall of Room 112.
5. Close the field breaker for the building sump pump located on the north wall of Room 112.
6. Start pump by moving the motor starter control switch to **HAND**.

7. Adjust the pump seal water flow to 20 gal/hr.
8. Verify that pump discharge pressure is 20 ± 5 psig.
9. Move the starter control switch to AUTO. Pump will stop.
10. Verify that a blowdown was indicate on the blowdown recorder and totalizer mounted on Filter Control Panel #2.

B. Automatic Operation

When the level in the tank reaches about 600 gal, the pump will automatically start, pump the tank down to about 200 gal, and then stop.

Filter Control Panels #1 and #2 do not have to be energized for the Building Blowdown System to function automatically, but must be energized if a record of the blowdown time and volume is desired.

C. Shutdown

The Building Blowdown System should normally remain activated in automatic mode. Automatic operation of the system is required to periodically clear the tank of liquids that slowly accumulate from building lab activities. If there is cause for shuting the system down for any significant length of time, notify building personnel that discharges into building floordrains and lab sinks are to be minimized.

Shut the pump station down in the following sequence:

1. Turn the motor control switch to OFF.
2. Open the field breaker.
3. Open the field breaker for the mixer.
4. Open Breaker #3 in PP3 to isolate mixer power.

When isolation of the TDF blowdown system from the LASL collection system is desired, **and approved by the shift supervisor or floor manager**, close the ball valve in the outside pit and notify TA-50-1 that the valve is closed.

IV. AUTHORITY

Modifications or changes to any component part of the TDF building liquid blowdown must be approved by an H-7 R&D Section Leader. The Section Leader will designate qualified persons to service and maintain the system. Any maintenance to the system must be approved by the shift supervisor or floor manager.

HEALTH·SAFETY·ENVIRONMENT FORM

DATE 1/20/82

SOP SUBMITTAL

TO H-DIVISION SOP OFFICE MAIL STOP [redacted] 229

SOP TITLE THE CAUSTIC MAKEUP AND PUMP STATION

ORIGINATING ORGANIZATION H-7 LOCATION TA-50, BLDG 37 (AS SPECIFIED IN THE SOP)

SOP STATUS: ☐ NEW ☒ REVISED ☐ RENEWAL ☐ OTHER _____ (SPECIFY)

DISCIPLINES INVOLVED:

- ☐ HEALTH PHYSICS (H-1)
- ☐ OCCUPATIONAL MEDICINE (H-2)
- ☐ FIRE PROTECTION (H-3)
- ☒ SAFETY (H-3)
- ☒ INDUSTRIAL HYGIENE (H-5)
- ☐ WASTE MANAGEMENT (H-7)
- ☐ ENVIRONMENTAL SURVEILLANCE (H-8)
- ☐ OTHER H-DC (SPECIFY)

EXPLANATION/COMMENTS:

This SOP is a revision and update to the existing Controlled Air Incineration Process Operating Manual. If there are any technical questions regarding the system or this SOP, please call R. A. Koenig at 7-7391.

SUBMITTED BY R. A. Koenig ORGANIZATION H-7

APPROVED BY

(NAME)	(TITLE)	(ORGANIZATION)	(DATE)
[illegible]	Sr. Engineer Des Grp Ldr	H-7	1/28/82
[illegible]	[illegible]	H-DO	4/5/82

NOTE: THIS SOP MUST BE APPROVED IN ACCORDANCE WITH ESTABLISHED DIVISION PROCEDURES BEFORE IT IS SUBMITTED TO H-DIVISION.

LOS ALAMOS SCIENTIFIC LABORATORY

THE CAUSTIC MAKEUP AND PUMP STATION

I. SCOPE

This SOP covers the operation of a caustic solution makeup tank and pump station that supplies sodium hydroxide solution on demand to the process liquid train for neutralization of combustion-generated acids.

II. HEALTH AND SAFETY PRECAUTIONS

Sodium hydroxide and sodium hydroxide solutions can cause deep local skin and eye burns. If inhaled, sodium hydroxide can cause irritation of the respiratory tract and inflamation of the lungs. If swallowed, sodium hydroxide and sodium hydroxide solutions can cause burning in the mouth and throat; nausea and vomiting; abdominal pain and diarrhea, occasionally with blood; swelling of the throat and subsequent suffocation; perforation of the gastrointestinal tract; heart failure; and coma. It follows, therefore, that it is absolutely imperative to wear a full face shield, a 3 M #8710 single use dust respirator, arm-length rubber gloves, and rubber apron when handling open containers of sodium hydroxide or when preparing sodium hydroxide solutions. The protective clothing is located in a cabinet near the caustic tank.

It is equally important that the correct mixing sequence be followed when preparing sodium hydroxide solutions. If the wrong mixing procedure is followed, solution temperatures high enough to produce steam can be generated that will result in the spattering of hot solution out of the mixing tank. Go slow. Follow the mixing instructions carefully.

Do not repair or adjust any components of the caustic makeup and pumping station without approval of the floor manager or shift supervisor.

III. EMERGENCY TREATMENT

A. First Aid-Immediate Action

- o If caustic gets in eyes, irigate eyes with water.
- o If caustic gets on skin, wash effected areas of body with soap and water. Treat skin burns as usual.
- o If caustic is swallowed, ingest 5% acetic acid followed by olive oil (found clearly marked in cabinet).

B. Further Treatment

- o For emergency help, call 7-7878. Call 7-4437 after hours.
- o After an accident requiring first aid, contact H-2 for a followup examination by a Laboratory physician.

C. Spills and Leakage

1. For solids

- o Collect and remove with a broom in a large bucket
- o Dilute with water and drain into a sewer with sufficient water.

2. For solution

- o Wipe with mop.
- o Drain into a sewer with sufficient water.

IV. OPERATIONS

A. Caustic Makeup

The caustic solution used for process liquid neutralization is water and up to 20% sodium hydroxide by weight. Always remember that when mixing caustic solutions the water fraction is added to the mixing tank **FIRST** and the sodium hydroxide fraction is **ONLY THEN** added to the tank. It is safe to add water to any residual caustic solution in the tank.

When mixing a caustic solution, use a CAUSTIC MIXING CALCULATION form and the following procedure:

1. Note the residual caustic level. Enter the value on the calculation form.
2. Stop the caustic pump.

3. Open the city water valve and fill the tank to a level of 32 in. on the rule (38 in. from the floor).
4. Close the tank cover and activate the solution mixer for a minute or two and blend the water with any residual caustic solution.
5. Set aside the appropriate amount of sodium hydroxide indicated by the calculation form.
6. Add one scoop at a time to the solution in the tank with the mixer going.
7. When the correct total amount of sodium hydroxide has been added, continue to mix the solution for about five minutes to dissolve any remaining solid.
8. Stop the mixer.
9. Once the surface of the solution is still, float a hydrometer in the solution to check the concentration. A 20% sodium hydroxide solution will indicate a specific gravity of 1.22 on the hydrometer. However, if the hydrometer reads between 1.20 (18%) and 1.24 (22%), no correction to the solution concentration needs to be made. If the specific gravity is out of this range, add more water to lower the reading or more sodium hydroxide to raise the reading to the acceptable range.
10. Start the caustic pump.

B. <u>Caustic Pump Station Startup</u>

1. Verify that the block valve in the caustic return line to the tank is open.
2. Verify that the air pressure on the pinch valve in the caustic return line is relieved.
3. Verify that an annunciator on the Scrubber Control Panel does not indicate **CAUSTIC LEVEL--LOW.**
4. Start pump by actuating the line switch on the pump extension cord. This pump is a positive displacement type and pulsating flow is normal. Do not start the pump against a closed valve as the pump is magnetically

coupled to it's motor and will de-coule against a high head. To recouple, interrupt the power and allow the motor to stop. Then restart the pump.

5. Increase air pressure on the pinch valve until the pump discharge reads approximately 50 psig.

C. Caustic Pump Station Shutdown

1. Open the field breaker on the south wall.

V. AUTHORITY

Modification or changes to any component part of the caustic makeup and pump station or its operation as defined in this SOP must be approved by an H-7 R&D Section Leader. The Section Leader will designate qualified persons to be responsible for servicing and maintaining the station. Repairs to the station must be approved by the floor manager or shift supervisor.

HEALTH·SAFETY·ENVIRONMENT FORM

SOP SUBMITTAL

DATE 1/20/82

TO H-DIVISION SOP OFFICE MAIL STOP [redacted] 229

SOP TITLE THE NATURAL GAS SUPPLY TO THE CONTROLLED AIR INCINERATOR

ORIGINATING ORGANIZATION H-7 LOCATION TA-50, BLDG 37 (AS SPECIFIED IN THE SOP)

SOP STATUS: ☐ NEW ☒ REVISED ☐ RENEWAL ☐ OTHER _____ (SPECIFY)

DISCIPLINES INVOLVED:

- ☐ HEALTH PHYSICS (H–1)
- ☐ OCCUPATIONAL MEDICINE (H–2)
- ☒ FIRE PROTECTION (H–3)
- ☒ SAFETY (H–3)
- ☐ INDUSTRIAL HYGIENE (H–5)
- ☐ WASTE MANAGEMENT (H–7)
- ☐ ENVIRONMENTAL SURVEILLANCE (H–8)
- ☐ OTHER H Div (SPECIFY)

EXPLANATION/COMMENTS:

This SOP is a revision and update to the existing Controlled Air Incineration Process Operating Manual. If there are any technical questions regarding the system or this SOP, please call R. A. Koenig at 7-7391.

SUBMITTED BY R. A. Koenig ORGANIZATION H-7

APPROVED BY:

(NAME)	(TITLE)	(ORGANIZATION)	(DATE)
[illegible]	Deputy Group Ldr	H-7	1/28/82

NOTE: THIS SOP MUST BE APPROVED IN ACCORDANCE WITH ESTABLISHED DIVISION PROCEDURES BEFORE IT IS SUBMITTED TO H-DIVISION.

LOS ALAMOS SCIENTIFIC LABORATORY

9/79

THE NATURAL GAS SUPPLY TO THE CONTROLLED AIR INCINERATOR

I. SCOPE

This SOP covers the control and regulation of the natural gas supply from the TDF building supply to the fuel gas trains for each of three incinerator burners. The CAI process consumes natural gas only through these two burners.

II. HEALTH AND SAFETY PRECAUTIONS

Natural gas presents a hazard if allowed to accumulate in a confined space from dilution of breathing air and danger of explosion. Do not repair or make any adjustments to components of the natural gas supply line without approval from the shift supervisor or floor manager. If a gas leak outside the incinerator ignites and continued burning - would not excalate the problem, do not extinguish. Ref. TDF Emergency Plan

III. OPERATIONS

A. Startup

1. Verify that the following valves are closed:
   a. Gas train block valves (six valves under combustion air glovebox and three valves on south wall above venturi)
   b. Process block valve (south wall)
   c. Meter block valves (two valves outside building on north)
   d. Meter bypass valve (outside, north side of building)
2. Verify that the gas flow calibration ball valves are in the correct position.
3. Verify that the six vent valves are open (vents between motorized valves on upper burner supply and pilot, lower burner supply and pilot).
4. Open upstream meter block valve.

5. Verify that the TDF supply pressure is adjusted to 10 + 1 psig.
6. Open downstream meter block valve.
7. Open process block valve.
8. Open two block valves for each gas train.
9. pen block valve for each pilot train.
10. Verify that the supply pressure for each gas train is regulated to 28 ± 1 in. W.C.

B. Shutdown

1. Close the natural gas block valves in the following order:
   a. Pilot block valves (three)
   b. Gas train block valves (six)
   c. Process block valve
   d. Meter block valves (two)
2. Verify that the meter bypass valve is closed.

IV. AUTHORITY

Modification or changes to any component part of the natural s supply system must be approved by an H-7 R&D Section Leader. Any maintenance or adjustment to the system must be approved by the shift supervisor or floor manager.

HEALTH·SAFETY·ENVIRONMENT FORM

SOP SUBMITTAL

DATE Nov. 30, 1981

TO H-DIVISION SOP OFFICE MAIL STOP [redacted] 229

SOP TITLE FUEL OIL SUPPLY SYSTEM

ORIGINATING ORGANIZATION H-7 LOCATION TA-50-37 (AS SPECIFIED IN THE SOP)

SOP STATUS: ☒ NEW ☐ REVISED ☐ RENEWAL ☐ OTHER _____ (SPECIFY)

DISCIPLINES INVOLVED:

- ☐ HEALTH PHYSICS (H-1)
- ☐ OCCUPATIONAL MEDICINE (H-2)
- ☒ FIRE PROTECTION (H-3)
- ☒ SAFETY (H-3)
- ☐ INDUSTRIAL HYGIENE (H-5)
- ☐ WASTE MANAGEMENT (H-7)
- ☐ ENVIRONMENTAL SURVEILLANCE (H-8)
- ☒ OTHER H DC (SPECIFY)

EXPLANATION/COMMENTS:

This SOP is an addition to the existing Controlled Air Incineration Process Operating Manual. The fuel oil supply system described is part of a process modification to allow incineration of hazardous chemicals and resin slurries. An FSAR Addendum has been approved covering the general safety aspects of the modification. If there are any technical questions regarding the system or this SOP, please call John Vavruska at 7-7391.

SUBMITTED BY J. S. Vavruska ORGANIZATION H-7

APPROVED BY

(NAME)	(TITLE)	(ORGANIZATION)	(DATE)
[illegible]	Dep. Grp Ldr	H-7	12/1/81

NOTE: THIS SOP MUST BE APPROVED IN ACCORDANCE WITH ESTABLISHED DIVISION PROCEDURES BEFORE IT IS SUBMITTED TO H-DIVISION.

LOS ALAMOS SCIENTIFIC LABORATORY

FUEL OIL SUPPLY SYSTEM

I. SCOPE

This SOP covers startup, operation, and shutdown of the CAI fuel oil supply system. Reference is made to two other detailed SOPs dealing with the liquid waste blending/metering system and the liquid burner. A flow diagram of the fuel oil supply system is shown as Fig. 1.

II. HEALTH AND SAFETY PRECAUTIONS

Although No. 2 fuel oil is a flammable liquid, in the absence of an ignition source at room temperature, it does not present a significant fire hazard. All operations involving fuel oil at the TDF are carried out in totally enclosed systems of tanks and piping. Repair or adjustments to components of the fuel oil supply system require approval from the shift supervisor.

III. OPERATIONS

The fuel oil supply system is designed to operate in either of two modes. It can be used to transfer fuel oil to a waste liquid feed tank for blending with waste or it can be used to meter fuel oil directly to the liquid burner.

A. Calibration of Flowmeter

Calibration of the d/p cell flowmeter is only necessary prior to the metering mode of operation. This procedure requires two persons, preferably each having a head set for remote communications. The following steps are involved in calibration.

1. Verify that the oil level in the supply tank is at least 10 inches above the bottom of the sight glass.
2. Verify that oil is routed through gear pump, d/p cell, flow control valve, and back to supply tank

only. Valve Nos. F12, F17 closed; Nos. F10, F11, F13, F14, F15, F16, open.

3. Energize Liquid Burner Control Panel.
4. Adjust fuel oil feed flow controller dial to a setting of 10% on 0-100% scale while in manual mode.
5. Turn on fuel oil gear pump.
6. Switch flow controller to auto mode.
7. When flow has stabilized, take volumetric flowrate measurement using sight glass on feed tank. Shut ball valve at base of tank and bottom leg of sight glass simultaneously.
8. Record change in liquid level on gauge and time (in seconds) for liquid level to drop. A minimum of a 15 cm level change is required for accurate measurement. Sight glass volume = 7.92 cm^3/cm.
9. Reopen both ball valves immediately.
10. For next reading increase dial setting on fuel oil flow controller to 25%. Allow flow to stabilize.
11. Repeat Steps 7 through 10 for a total of five evenly spaced points on calibration curve.
12. After completion of the calibration, switch controller to manual mode.
13. Turn off fuel oil gear pump.

B. **Startup**

1. **Fuel Oil Transfer Mode.**

   For this mode of operation, the Liquid Burner Control Panel need not be activated as the fuel oil flow controller is not used.

   a. Verify that fuel oil flow is routed from supply tank through the gear pump located at the northwest corner of Bay 2. Valve Nos. 10, 11, 12, 17 open.

b. Verify that ball valves are set to bypass the d/p cell and flow control valve. Valve Nos. 13, 14, 15, 16 closed.

c. Verify that ball valves within the feed enclosure are set to direct oil to the desired feed tank only.

d. Turn on fuel oil gear pump.

e. When desired liquid level is reached, turn off gear pump.

2. **Fuel Oil Metering Mode.**

Follow the procedure described in Secion III-C-2 in the SOP on the Liquid Waste Blending/Metering System. This procedure covers the continuous blending mode of operation.

C. **Shutdown**

To shut down the fuel oil supply system, the following steps are involved.

1. If operating in metering mode, switch fuel oil flow controller to manual mode.
2. Turn off fuel oil gear pump.

IV. AUTHORITY

Modifications or changes to any component of the CAI fuel oil supply system equipment or operation must be approved by the H-7 Hazardous Waste R&D Section Leader. Any maintenance or adjustment to the system must be approved by the shift supervisor.

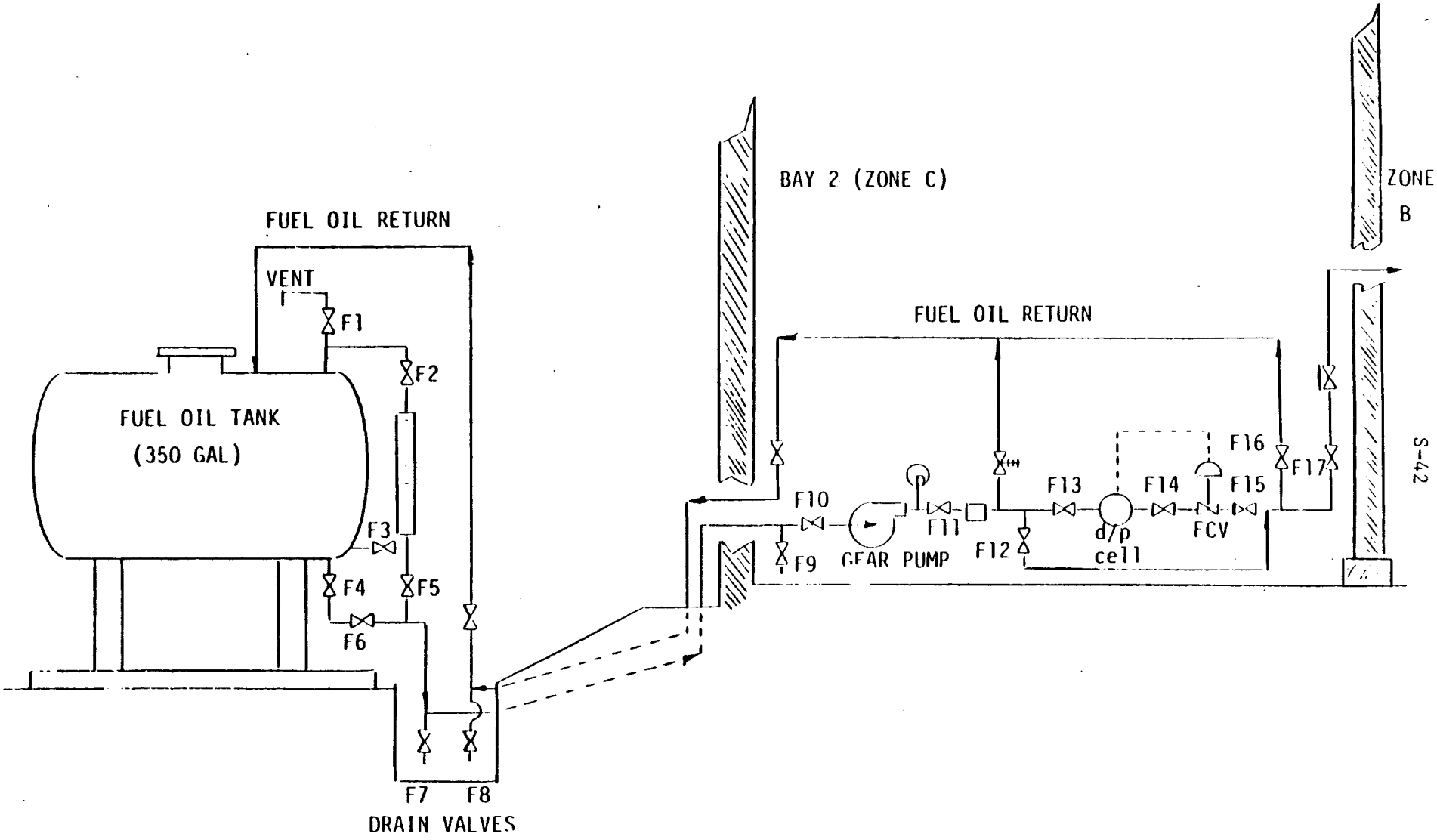


Fig. 1. CAI FUEL OIL SUPPLY SYSTEM

ATTACHMENT 5

DOE ORDER 5484.1, REPORTING REQUIREMENTS

U.S. Department of Energy
Washington, D.C.

ORDER

DOE 5484.1

2-24-81

SUBJECT: ENVIRONMENTAL PROTECTION, SAFETY, AND HEALTH PROTECTION INFORMATION REPORTING REQUIREMENTS

1. PURPOSE. This Order establishes the requirements and procedures for the reporting of information having environmental protection, safety, or health protection significance for Department of Energy operations.

2. SCOPE. This Order applies to all Department of Energy contractor operations where, under the contractual arrangements for the work to be performed, the Department of Energy has established control over environmental protection, safety, and health protection program content. The provisions of this Order also apply to Federal operations but not to the Federal employee occupational safety and health program (as defined in DOE 3790.1). This Order will serve as guidance for the Federal employees occupational safety and health program until it is specifically amended to apply directly to that program.

3. REFERENCES.

   a. DOE Procurement Regulation 9-50.704-2, which provides environmental protection, safety, and health protection contract clauses.

   b. Accident/Incident Investigation Manual, ERDA 76-20, which provides guidance for conducting Department of Energy accident investigations.

   c. ERDA Guide to the Classification of Occupational Injuries and Illnesses, ERDA-76/45-7, which provides guidance for recording and reporting occupational injuries and illnesses.

   d. 29 CFR 1904, Recording and Reporting Occupational Injuries and Illnesses, which provides the Occupational Safety and Health Administration (OSHA) standards for recording and reporting of occupational injuries and illnesses.

   e. 29 CFR 1960, 10-21-80, Basic Program Elements for Federal Employee Occupational Safety and Health Programs and Related Matters, Subpart I, Recordkeeping and Reporting Requirements, which provides Occupational Safety and Health Standards for recording and reporting Federal employee occupational injuries and illnesses.

   f. DOE 5480.1, ENVIRONMENTAL PROTECTION, SAFETY, AND HEALTH PROTECTION PROGRAM, of 5-5-80 which establishes the environmental protection, safety, and health protection program for the Department.

   g. 49 CFR 173, General Requirements for Shipments and Packagings.

DISTRIBUTION:
All Departmental Elements
Federal Energy Regulatory Commission

INITIATED BY:
Operational and Environmental Safety Division

4 Establish a complete and substantive basis for the analysis and conclusions sections of the report. This assures both accuracy and completeness. It also eliminates the tendency to introduce new facts in the analysis and conclusions sections.

5 Stress the areas which form the basis for corrective measures.

6 Inform the reader, where appropriate, that additional information on a subject is contained elsewhere in the report. Use a footnote or note of reference naming the section or appendix where such material can be found.

7 Do not omit any relevant fact for any reason whatever, i.e., that it might conflict with some preconceived notion of the investigator or interfere with the dissemination of information (bulletins, news releases, etc.). Investigators must, at all times, be critical of their own reasoning to assure a completely objective and independent account of the occurrence. Examples of information to include are:

a Pertinent background information, where available, i.e., brief description of facilities, climate, history, etc.

b Description of injury, exposure, or loss due to occurrences, as well as the property damage or decontamination costs.

c Physical evidence.

d Chronological account of events.

e Physical hazards and review of safety controls.

f Technical data accumulated.

g Related events not in the causal sequence, but revealing deficiencies (to be placed at the end of the section).

b. Trained Investigator. An individual who has completed the Department of Energy Accident Investigation Workshop.

c. Substantial. Clearly outside normally accepted or experienced bounds.

d. Department of Energy Contractor. Any Department of Energy prime contractor or subcontractor subject to the provisions of the Department of Energy Procurement Regulation 9-50.704-2 or other contractual provisions (e.g., cost-shared) where the Department of Energy has elected to enforce environmental protection, safety, and health protection regulations by specific negotiated contract requirements.

e. Notification. The actions taken to notify cognizant Department of Energy officials of an occurrence, and the subsequent actions taken at successive levels within the Department of Energy to notify the Secretary of an occurrence.

f. Investigation. A detailed, systematic search to uncover the "who, what, when, where, why and how" of occurrences and to determine what corrective actions are needed in order to prevent a recurrence.

g. Investigation Report. A clear and concise written account of the results of the investigation.

h. Contracting Officer. An official designated to enter into or administer contracts and make related determination and findings.

i. Terminated Employee. An individual employed by the Department of Energy or a Department of Energy contractor who terminates his employment; an individual assigned to work in the Department of Energy or Department of Energy contractor facility, but not employed by the Department of Energy or a Department of Energy contractor, who completes his work assignment in the facility; an individual who transfers to another Department of Energy or contractor facility or office; an individual who begins a leave of absence of greater than 12 months' duration; all monitored employees of contractors whose contracts with the Department of Energy are terminated.

j. Visitor. Any individual visiting a Department of Energy or Department of Energy contractor facility under circumstances requiring that he be monitored for radiation exposure.

k. Recorded Exposure. That number, zero and above, which is recorded as representing a specific individual's exposure to ionizing radiation determined in accordance with established health physics principles and Order DOE 5480.1, Chapter XI, requirements.

l. Positive Exposure. Any recorded exposure greater than the established minimum sensitivity of the monitoring device or the measuring technique employed.

3 Judgments of needs. This section consists of the investigators' conclusions as to the kinds of managerial controls and safety measures believed necessary and sufficient to prevent, or to minimize the probability or severity of, a recurrence. These judgments provide the basis for the subsequent recommendations for corrective action. These statements should be clear, concise, direct, and should be based on the weight of the substantive evidence.

(h) Signatures. The chairman and members of the board shall sign the report. Any board member has the right to set forth a dissenting position to the report. A dissenting position shall be stated in a letter to the board chairman and shall be transmitted to the appointing official with the investigation report.

(i) Minority report. If there is a minority report, it should be limited to the analytical highlights and conclusions which are at variance. The minority report should be signed.

(j) Board authority. This is the letter (board appointment) which established the investigation board. It shall include the names, employer, job titles, positions of board members, and the authority for the investigation. It should also detail the scope of the investigation including the limitations, if any.

(k) Appendix. (Exhibits). Material that is pertinent but need not be made a part of the written report in order to understand or use the report shall be included as exhibits to the report, and shall follow the body of the report. These may include written statements, witnesses' statements, letters, laboratory analyses, memoranda, pictures, death certificates, etc. Medical records and legal opinions shall not be included in the report. Only material that a reader may want to evaluate or material that is in controversy should be included in the appendix. All such material should be identified the same; e.g., "Exhibit ___," or "Appendix ___." Where more than one such item is used, they shall be numbered in sequence as introduced in the report, i.e., "Exhibit A," "Exhibit B," etc. Every exhibit shall be introduced in the report in appropriate sequence and, at the time introduced, there shall be a brief recitation of its contents. Long, detailed, complex exhibits shall be avoided.

(2) A Department of Energy-controlled site is one which is leased or otherwise made available to the Government under terms which afford to the Department of Energy rights of access and control substantially equal to those which the Department of Energy would possess if it were the holder of the fee (or pertinent interest therein) as agent of and on behalf of the Government.

5. POLICY AND OBJECTIVES.

a. It is the policy of the Department of Energy that timely notification of occurrences involving Department of Energy and Department of Energy contractor operations be made to responsible authority; that all occurrences be investigated; that reports be submitted to responsible Department of Energy officials; that management take responsive action; and that there be consistency in the treatment of such occurrences.

b. The objectives of the information reporting system are:

(1) To investigate and evaluate occurrences to determine their causes and the appropriate measures to prevent recurrences and improve the safety of the Department of Energy and Department of Energy contractor operations.

(2) To obtain early, complete, and factual information on occurrences as a basis for: (a) reports to the Secretary, Congress, and other Federal agencies; and (b) where appropriate, informing the public.

(3) To assure the gathering of adequate information on which to base management action.

(4) To provide a basis for the improvement of codes, guides, and standards used in the Department of Energy and Department of Energy contractor operations.

(5) To establish a procedure for the development and reporting of occupational radiation exposure information to the Radiation Records Repository that will be of assistance to the Department of Energy in determining that radiation doses to individuals are maintained at the lowest levels technically and economically practicable.

(6) To monitor, evaluate, and report onsite discharges, liquid and airborne effluents, and environmental conditions in the vicinity of Department of Energy sites to assess the levels of radioactive and nonradioactive pollutants and their impact on the public and the environment.

e. Closing the Case. When all proposed actions are complete, the appointing official shall inform the Director, Operational and Environmental Safety Division, with copies to the Inspector General and the appropriate programmatic division director(s), that the case is closed. Only those occurrences investigated by Type A and Type B boards must be closed officially.

(7) Assures that the corrective actions that are directed by the Assistant Secretary for Environment are satisfactorily completed.

(8) Accepts field investigation reports and, if appropriate, recommends to heads of field organizations additional corrective actions.

(9) Informs the Secretary and the Assistant Secretary for Environment, the appropriate Congressional Committees, other Federal agencies, the Inspector General and other appropriate Headquarters offices and divisions of significant occurrences in the Department of Energy and Deparment of Energy contractor operations.

(10) Maintains, consolidates, and summarizes information regarding occurrences in the Department of Energy and Department of Energy contractor operations in order to:

(a) Provide basic safety statistics used in evaluating safety program performance.

(b) Provide safety information to the Secretary, the Congress, Department of Energy offices, Department of Energy contractors, other Federal agencies, and the public.

(c) Provide a basis for identifying needed improvements in safety codes, standards, and regulations.

(d) Identify areas where research or development work is needed for safety evaluation or control purposes.

(11) Develops and maintains a cadre of Department of Energy trained accident investigators who are available to participate as members of Headquarters and field investigation boards.

(12) Circulates investigation reports for review by appropriate Headquarters divisions and offices when the recommendations for corrective actions involve or may affect activities under their jurisdiction.

(13) Conducts and coordinates all activities associated with operation and maintenance of the Department of Energy Radiation Records Repository, including:

(a) Submission of radiation exposure data to the Repository.

(b) Processing of requests for exposure information from the Repository.

(14) Establishes and interprets Department of Energy environmental and effluent monitoring and reporting requirements.

4. SCOPE AND CONTENT OF ENVIRONMENTAL MONITORING PROGRAM, REPORTS, AND SUMMARIES.

a. Environmental Monitoring. Programs for monitoring the environment shall be conducted at Department of Energy sites to determine:

(1) Compliance with the requirements of Order DOE 5480.1, Chapters I, XI, and XII.

(2) The background levels and site contribution of radioactivity; and, as appropriate, other pollutants, in the site environs.

(3) Compliance with applicable environmental quality and public exposure limits and other environmental commitments (e.g., those published in environmental impact statements or other official documents).

b. Environmental Monitoring Report.

(1) An environmental monitoring report shall be prepared annually to summarize and interpret the levels of radioactivity and, as appropriate, nonradioactive pollutants in the environs of Department of Energy sites attributable to site operations. Levels of pollutants should be placed in perspective by comparing them to applicable standards and to relevant parameters, such as background and natural radioactivity. Copies of this report shall be distributed as indicated in Chapter IV, paragraph 4c(2), of this Order.

(2) The environmental monitoring report shall summarize the results of monitoring to determine compliance with applicable effluent standards and permit conditions and should incorporate any other effluent and environmental data and information derived from routine sampling or special studies or measurements that would indicate adherence to or deviations from public safety and property protection commitments published by the Department of Energy in environmental impact statements or other official Department of Energy documents. Any results of offsite radiation surveys made with the Aerial Measurement System should be summarized and included in the report as they become available. The results of pertinent environmental surveys conducted by other Federal, state, or local environmental protection agencies (as available) should be characterized in the report and referenced.

(3) In general, onsite monitoring data need not be included in the environmental monitoring report unless the data are necessary to demonstrate compliance with applicable standards or may be helpful in interpreting offsite data. Effluent monitoring data for pollutants shall be included in the report (a) if needed to demonstrate

(2) Notify within 24 hours after receipt of exposure information, any Department of Energy employee in their organization of any radiation exposure received which exceeds the dose equivalent standards specified in Order DOE 5480.1, Chapter XI.

(3) Assure that employees in their organization obtain a personnel monitoring device prior to visiting facilities not operated by the Department of Energy or Department of Energy contractors where exposure to radiation is possible, and instruct Department of Energy employees who might unexpectedly visit a contractor or licensed facility without a monitoring device to use the personnel monitoring device provided by the facility and to request that any resultant exposure information along with the individual's name, social security number, and date of birth be sent to the Department of Energy Headquarters, Attention: Director, Operational and Environmental Safety Division.

(4) Assign a staff member to act as liaison for the purpose of notifying the Office of Health and Environmental Research of their anticipated needs for personnel dosimeters and to facilitate the movement of dosimeters to and from the Office of Health and Environmental Research.

f. Heads of Field Organizations and Other Contracting Officers:

(1) Establish procedures to assure proper notification (internally and to Federal, state, regional, and local agencies), investigation, and reporting of occurrences as required in this Order.

(2) Identify occurrences which are to be investigated by field organization boards. Appoint field investigation boards and establish the scope of their investigations including limitations, if any. Heads of field organizations may desire to use Department of Energy personnel from other offices. Arrangements for use of such personnel may be made by contacting the Director, Operational and Environmental Safety Division, or communicating directly with another field organization. If arrangements are made with another field organization, the Operational and Environmental Safety Division should be advised.

(3) Review reports of field investigation boards and order additional investigation, if necessary.

(4) Transmit reports of field investigation boards to the Operational and Environmental Safety Division with copies to the Inspector General and other appropriate Headquarters officials. Transmit with each report a field organization evaluation of the report including a statement of the corrective actions which have been taken or are planned by the field organization.

(5) Assure that corrective actions are satisfactorily completed and so advise the Operational and Environmental Safety Division with copies to the appropriate Headquarters program organization.

d. Reporting Units and Format.

(1) Units.

(a) Radiological.

1 Air. μCi/ml (for uranium and thorium also include $\mu g/m^3$).

2 Water. μCi/ml (for uranium and thorium also include mg/l).

3 Soil.

a $\mu Ci/m^2$ or pCi/m^2. (Specify depth or profile depth. For tritium the concentration may be expressed in μCi/ml of soil moisture.)

b μCi/g or pCi/g dry weight. (Specify depth and method of obtaining dry weight.)

4 Sediment. μCi/g or pCi/g dry weight. (Specify depth and method of obtaining dry weight. For uranium and thorium also include μg/g dry or wet weight, where feasible. For tritium the concentration may be expressed in mCi/ml of moisture content in unit volume of wet samples.)

5 Food and Vegetation. μCi/g or pCi/g dry weight. (Specify percent moisture and method of obtaining dry weight. For tritium the concentration may be expressed in mCi/ml of moisture content in unit volume of wet samples.)

6 Milk. μCi/ml.

7 Penetrating. mrem/year.

(b) Nonradioactive Pollutants. The reporting units should be the same as those prescribed by the applicable effluent and environmental quality standards. In reporting other measurements the commonly used and accepted units for the pollutant in question should be used. When the metric equivalent is specified in the standard, it will be the unit of preference.

(c) Metric Units. Metric units may be used throughout the report with English equivalents included parenthetically, except as in (b) above.

(13) Recommend to the Director, Operational and Environmental Safety Division, with the concurrence of the Director(s) of the responsible program office(s), when routine environmental monitoring and reporting is not required (programs to be waived) or is to be terminated at Department of Energy sites. Requests for approval to terminate any environmental monitoring and reporting activities should include an explanation, with supporting data, as to why the site is not expected to have significant releases or a significant effect on the environment. For any site holding an exemption from environmental reporting requirements, the respective field organization head or contract administrator shall assure that an annual environmental summary is prepared as required by Chapter III, paragraph 4c of this Order, and copies forwarded to the Director, Operational and Environmental Safety Division.

(14) May grant an exemption from monitoring and reporting for those effluents which meet all of the following criteria:

(a) Do not routinely contain and are not a potential source of accidental releases of significant quantities or concentrations of radioactivity or nonradioactive pollutants in relation to applicable standards.

(b) Are of no health and safety or environmental significance.

(c) Are not required to be maintained by other Federal, state, or local pollution control agencies or regulations. (The Operational and Environmental Safety Division will assist in the interpretation of "significant" as used above, and elsewhere in this Order, on a case-by-case basis as requested.)

g. Members of Headquarters and Field Organization Boards of Investigation:

(1) Report directly to the Department of Energy appointing official during the investigation.

(2) Understand the scope of the investigation including the limitations, if any, prior to initiating the investigation. If necessary, the board should discuss the scope of the investigation with the appointing official or his designee.

(3) Conduct an investigation and prepare an investigation report which satisfies the requirements in this Order.

(4) Transmit the report with a cover memorandum which includes the board's recommendations to the appointing official within a specified period of time.

than in liquid effluents or surface water. Under certain circumstances, such as the discharge of noble gases and tritium in stack effluents, calculations of potential dose using average annual effluent and meteorological data, and applicable dispersion equations may provide an acceptable estimate. In the latter case, the related environmental monitoring data that are available should be evaluated and interpreted to verify, or qualify, the calculated dose estimate. Simple modeling and calculational methods are acceptable, e.g., use of the ratio of the observed average concentration to the applicable Radioactivity Concentration Guide (RCG), as the basis for estimating the dose to the critical organ. Specific isotope data are preferred for dose calculations. However, gross activity measurements may be used if supporting data relating gross activity to specific radionuclide values can be referenced. All significant potential pathways of exposure should be evaluated, including, particularly, those wherein reconcentration is likely to occur.

2 Dose Reference Points. Generally, the assessment should provide realistic estimates of:

a The "fence-post" dose rate at the location on the site boundary where the maximum exposure rates exist.

b Maximum organ (whole body included) doses to any individual exposed in an offsite location.

c Average dose to the critical organs (whole body included) of a suitable sample of the exposed population.

d The man-rem (whole body) dose to the population within 80 km (50 miles). The 80-kilometer distance shall be measured from a point located centrally with respect to major facilities or Department of Energy program activities.

3 Reporting of Dose Assessments. All assessments developed pursuant to this section shall be summarized and incorporated in the annual environmental monitoring report. The modeling and calculational methodology should be included or referenced. A comparison of results with applicable standards and relevant parameters, e.g., natural and artificial sources of exposure shall also be included.

TABLE OF CONTENTS

CHAPTER I - NOTIFICATION OF OCCURRENCES — Page

1. Immediate Notification I-1
2. Notification Within 72 Hours I-3
3. Information Required in Notifications Made Immediately or Within 72 Hours I-4

CHAPTER II - INVESTIGATION REQUIREMENTS

1. Types of Investigations II-1
   a. Type A Investigations II-1
   b. Type B Investigations II-2
   c. Type C Investigations II-2
   d. Submission of Type A and Type B Investigation Reports II-2
   e. Submission of Type C Investigation Reports II-3
2. Standards for Investigation II-3
   a. Appointing the Board II-3
   b. The Investigation Report II-4
3. Corrective Actions II-9
   a. Immediate Corrective Actions II-9
   b. Recommendations of the Board II-9
   c. Corrective Actions from Appointing Official II-9
   d. Corrective Actions from Headquarters II-9
   e. Closing the Case II-10

CHAPTER III - EFFLUENT AND ENVIRONMENTAL MONITORING PROGRAM REQUIREMENTS

1. Monitoring New Sites, Processes, and Facilities III-1
2. Monitoring Existing Sites III-1
3. Quality Assurance III-1
4. Scope and Content of Environmental Monitoring Program, Reports, and Summaries III-2
   a. Environmental Monitoring III-2
   b. Environmental Monitoring Report III-2
   c. Environmental Summary III-3
   d. Reporting Units and Format III-4
5. Effluent Monitoring III-7
   a. Effluent Monitoring III-7
   b. Onsite Discharge Monitoring III-7
   c. Monitoring Guidelines III-7
   d. Monitoring Data Recordkeeping III-9

(b) Technical specifications on sample collection and analysis are not included here since they do not lend themselves to development of broad guidance but must be tailored to the monitoring requirements in each specific situation. However, standard sampling and analytical techniques should be used to the extent practical (see references).

(2) Monitoring Locations. Measurements of volume, rate of discharge, content, etc., should be made, insofar as is practical, at the point at which the data most closely represent what is being released. This implies that measurements should be made at the point of discharge, though there are exceptions. Effluents should be monitored at the point at which the applicable standards apply. In the case of onsite discharges, the monitoring location may be the waste treatment or disposal system; and in case of effluents, the monitoring location may be the point of release to the offsite environment after all treatment and control, including retention and decay, have been effected. In many instances, the monitoring location is specified in a discharge or operating permit.

(3) Type and Frequency of Sampling.

(a) Sampling frequency and type should be determined by considering the purpose for which the data are being obtained, e.g., evaluation of the effectiveness of waste treatment and control, compliance with operating limits of applicable effluent or performance standards, compilation of release data, etc. Continuous sampling is desirable and may be necessary where there is wide variation in the concentration or mixture of potential pollutants in the effluent stream. However, periodic sampling may suffice when the concentrations and mixtures are reasonably constant and there is little likelihood of unusual variations. Similarly, proportional sampling may be necessary when effluent flow rates fluctuate, whereas a representative grab-sample may suffice for batch discharges. The method of sampling may be specified in the applicable regulation or permit.

(b) For purposes of reporting radiological data, gross radioactivity measurements are generally inadequate. They are appropriate only:

1 When gross radioactivity releases are a small fraction of the offsite Radioactivity Concentration Guides (RCG's) for "unidentified mixtures" and are of no health or environmental significance;

CHAPTER I

NOTIFICATION OF OCCURRENCES

1. IMMEDIATE NOTIFICATION. Notification to Headquarters Emergency Operations Center of the following occurrences shall be made as soon as sufficient information is obtained to indicate the general nature and extent of the occurrence:

   a. Any fatal or imminently fatal injury or illness involving a Department of Energy or Department of Energy contractor employee or a member of the public due to an occurrence associated with a Department of Energy or Department of Energy contractor operation. (Type A investigation.)

   b. Any one occurrence (involving either occupational injuries or illness) in a Department of Energy or Department of Energy contractor operation which results in five or more lost workday cases. (Type A investigation.)

   c. Estimated loss or damage to Department of Energy or other property amounting to $100,000 or more, or estimated costs of $100,000 or more required for cleaning (including decontamination), renovating, replacing, or rehabilitating structures, equipment, or property. (Type A investigation, if the costs exceed $250,000. See Chapter V of this Order "Criteria for Determining DOE Property Valuation and DOE losses.")

   d. Any occurrence involving a nuclear explosive under Department of Energy jurisdiction which results in an explosion, fire, the spread of radioactive material, personal injury or death, or damage to private property. (Type A investigation.)

   e. Any accidental releases of pollutants which result or could result in significant effect on the public or on the offsite environment, e.g., need to relocate people, substantial fish kill, requirements for corrective action in the environment, requests that downstream water supply intakes be shut down, etc. (Type A investigation.)

   f. Any accidental releases of pollutants designated by the Environmental Protection Agency as "hazardous" and requiring activation by the Environmental Protection Agency or the U.S. Coast Guard of the National Oil and Hazardous Substances Pollution Contingency Plan to effect removal or corrective measures. (Type A investigation.)

   g. Any apparent loss or theft of radioactive or nonradioactive material in such quantities and under such circumstances that it could constitute a hazard to the health and safety of individuals. Where this involves the possible theft of Government property, the Federal Bureau of Investigation shall be notified by the Office of Safeguards and Security for a decision as to acceptance of investigation jurisdiction. For apparent losses of source material, special nuclear material, and such other material included in the category "Special Nuclear Materials," see Order DOE 5632.2. (Type A investigation.)

r. Any aviation related occurrence involving: a fatality or fatalities; lost workday injuries to crew members, ground crew, or other personnel assigned to aviation operations; injuries to passengers or members of the general public, downtime for aircraft; an explosion or fire involving an aircraft; substantial damage to property, and classified, radioactive, high explosive or other hazardous cargo. (Level of investigation for these occurrences not already requiring Type A or B investigation shall be determined by the head of the field organization.) Investigations shall comply with all applicable Federal Aviation Administration, Department of Transportation, and National Transportation Safety Board regulations, and with state accident reporting requirements.

2. NOTIFICATION WITHIN 72 HOURS. Notification to Headquarters of the following occurrences shall be made within 72 hours of the occurrence.

a. Estimated loss or damage to Department of Energy or other property amounting to between $50,000 and $100,000 or estimated costs within these limits required for cleaning (including decontamination), renovating, replacing, or rehabilitating structures, equipment, or property. (Type B investigation is required for loss or damage between $50,000 and $250,000. See Chapter V of this Order, "Criteria for Determining DOE Property Valuation and DOE losses.")

b. Any occupational illness which results in inpatient hospitalization. (Type B investigation.)

c. Any series of occupational illnesses with the same or similar causes involving five or more persons of which at least one is a lost workday case. (Type B investigation.) If the occurrence results in five or more lost workday cases then a Type A investigation must be performed. See paragraph 1b of this Chapter.

d. Any occupational illness which is a lost workday case involving more than 5 days away from work. (Type B investigation.)

e. Any radiation exposure to an individual which in 1 calendar quarter exceeds the following (Type B investigation):

(1) 3 rem to the whole body.

(2) 15 rem to skin of whole body or thyroid.

(3) 30 rem to the forearms.

(4) 75 rem to the hands or feet.

f. Any internal uptake of radioactive material which on the basis of a small number of early assay data could result in a dose or dose commitment in excess of the pertinent annual standard set forth in the order DOE 5480.1, Chapter XI, "Standards for Radiation Protection." For whole-body dose, 5 rem is the pertinent annual standard. (Type B investigation.)

(3) Radiation exposure information:

(a) Approximate dates for period during which the exposure was accumulated.

(b) Types of radiation involved.

(c) Total estimated radiation dose in rem.

b. Form 5484.3, Supplementary Record of Occupational Injuries and Illnesses, Attachment 1, shall be prepared by each Department of Energy office and Department of Energy contractor organizational unit, for all "recordable occupational injuries and illnesses," as defined on the Form OSHA No. 200, Log of Occupational Injuries and Illnesses, Attachment 7. The Office of Workers' Compensation Programs Forms CA 1 and 2, which shall include additional information (items 1 through 5 on page 3 of "Recordkeeping and Reporting Guidelines for Federal Agencies"), may be completed in lieu of Form 5484.3 for Federal Employees. One copy of each of these forms shall be submitted to the System Safety Development Center (SSDC), EG&G Idaho, Inc., on or before the 25th of April, July, October, and January.

c. Form 5484.5, Report of Property Damage or Loss, Attachment 4, shall be prepared for each accident or loss in the categories listed on the form. This form is to be prepared by the Department of Energy or Department of Energy contractor employee designated to investigate such an accident at the time of the accident. One copy shall be submitted to the System Safety Development Center (SSDC), EG&G Idaho, Inc., with Form 5484.4. Form 5484.5 is to be used in reporting Department of Energy property damage or loss from all accidental causes, exclusive of that resulting from use and occupancy considerations, from motor vehicle accidents, or from aircraft accidents. In general, loss estimates should be predicated on the net cost for replacing or restoring damaged facilities to the condition existing prior to the accident. Due allowance should be made for salvage values but no allowance made for prior depreciation. The appropriate method for filling in Form 5484.5 is self evident, with the exception of Sections 4 and 5.

(1) Section 4.

(a) All damage to, or loss of Department of Energy-owned cargo, or damage caused by such cargo, which occurs during transportation should be classed as Type 4e irrespective of the cause.

c. The following information shall be obtained and filed on occurrences which take place during the transportation of radioactive materials:

(1) Identification of the shipper and receiver.

(2) Identification of service used for shipment, i.e., public vehicle or common carrier and mode of shipment (truck, rail, air, or waterway). Include the name of the carrier and the specific vehicle or car number.

(3) Location of occurrence.

(4) Driver's account or report of the occurrence.

(5) Identification of the packaging by model, special permit, specification, or certificate number.

(6) Type and quantity of material in each package, and total quantity in the shipment(s).

(7) Nature of package and vehicle contamination, if any.

(8) Radiation levels detected (direct) and amount of removable contaminants (microcuries per 100 square centimeters).

(9) Personnel exposure and contamination, how determined, and action taken.

(10) Extent of contamination and estimated cost of cleanup.

(11) Nature of packaging failure, if any.

(12) Source of contamination if the package is undamaged.

(13) Nature of any defects or deterioration of the packaging.

(14) Evidence of improper package handling.

3. QUARTERLY SUMMARIES AND OTHER REPORTS.

a. Form EV-102A. Form EV-102A, Summary of Department of Energy and Department of Energy Contractor Occupational Injuries and Illnesses, Attachment 8, shall be prepared by each Department of Energy office and Department of Energy contractor organizational unit. Form EV-102A data may be obtained from the Forms OSHA-200 and/or OSHA-100F, or their equivalents, maintained at the individual establishments. One copy from each field organization, area office, and contractor organizational unit shall be submitted to the System Safety Development Center (SSDC), EG&G Idaho, Inc., on or before the 25th of April, July, October, and January. Revisions of reports for each of the two preceding calendar years are due February 28. The revisions should reflect the new (corrected) totals rather than the additions or deletions which should be applied to the previous report.

b. DOE F 5484.4. DOE F 5484.4, "Tabulation of Property Damage Experience," Attachment 2, shall be prepared by each Department of Energy office and Department of Energy contractor organization unit. One copy from each field organization, area office, and contractor organizational unit shall be submitted to the System Safety Development Center (SSDC), EG&G Idaho, Inc., on or before the 25th of April, July, October, and January. Revisions of reports for each of the two preceding calendar years are due February 28.

c. Forms OSHA-200 and OSHA-100F. Form OSHA-200, "Log of Occupational Injuries and Illnesses," Attachment 7, shall be completed for Department of Energy contractor employees, and Form OSHA-100F, "Log of Federal Occupational Injuries and Illnesses," Attachment 9, shall be completed for Federal employees and maintained on file for a period of at least 5 years.

d. Reports of Occupational Exposure to Radiation for Department of Energy and Department of Energy Contractor Personnel Upon Termination of Employment. Upon termination of employment, report on Form 5484.8, Termination Occupational Exposure Report, Attachment 10, all external and internal radiation exposures recorded for the terminated individual during his period of employment or work assignment at a Department of Energy or Department of Energy contractor facility. These reports are to be submitted to the System Safety Development Center (SSDC), EG&G Idaho, Inc., within 30 days from the individual's date of termination or within 30 days after his exposure has been determined, whichever is later. Upon written and signed request, a copy of the report shall be provided to the individual terminating employment or work assignment.

Vertical line denotes change.

CHAPTER II

INVESTIGATION REQUIREMENTS

1. TYPES OF INVESTIGATIONS.

a. Type A Investigations - shall be conducted by a Department of Energy Headquarters or field organization board. Standards for the appointment of the Board, for conducting the investigation, and for preparing the investigation report are in paragraph 2 below. In addition, any other occurrence that Headquarters or the head of the field organization determines to be of sufficient severity or to have significant impact on the Department of Energy program may be investigated by a Department of Energy Headquarters or a field organization board. Under certain circumstances the head of the field organization involved, with the concurrence of the Director of the Operational and Environmental Safety Division, may decide that a field organization board of investigation is not necessary even though it is required by this Chapter, for example, the facts regarding the occurrence are known or another Federal agency is conducting an acceptable investigation.

(1) Investigation of occurrences by Headquarters.

(a) Investigation of occurrences required by the Assistant Secretary for Environment to be conducted by Headquarters will be made by the Inspector General or by a Department of Energy board of investigation, appointed by the Assistant Secretary for Environment.

(b) For investigations to be conducted by the Inspector General, the Inspector General shall direct the Assistant Inspector General for Investigations, and where appropriate, one or more technical experts to investigate the occurrence and to prepare an investigation report. Investigation procedures and preparation of the report shall be in accordance with paragraph 2 below.

(c) The Assistant Secretary for Environment shall appoint the members of a Headquarters board with advice from the Director, Operational and Environmental Safety Division. Appointment of the board, investigation procedures, and preparation of the report shall be in accordance with paragraph 2 below. The Assistant Secretary for Environment shall accept the Headquarters investigation board's report.

4. ANNUAL REPORTS.

a. Annual Radiation Exposure Reports. Field organization managers shall submit the following reports (Forms 5484.6, 5484.7 only) to the System Safety Development Center (SSDC), EG&G Idaho, Inc., by March 31 for the preceding calendar year for monitored Department of Energy and Department of Energy contractor employees and for visitors to Department of Energy or Department of Energy contractor facilities.

(1) Whole Body Exposures. Form 5484.6, Annual Summary of Whole Body Exposures to Ionizing Radiation, Attachment 13.

(2) Internal Exposures.

(a) Form 5484.7, Summary of Exposures Resulting in the Internal Body Depositions of Radioactive Materials for CY ____, Attachment 14. The report shall include:

1 Any uptake of radioactive material occurring during the reporting year that independently, or when added to a current burden, is estimated to result in a dose commitment to the critical organ in excess of 50 percent of the pertinent annual dose equivalent standards set forth in Order DOE 5480.1, Chapter XI.

2 Any previously unreported uptake of radioactive material that is determined to have been reportable according to the above criteria by reason of more recent dose estimates.

(b) Any dose commitment to a critical organ resulting from an uptake of radioactive material should be added to the dose received by that organ from external sources when determining uptakes that are reportable according to the above criteria. In those cases where the whole body is considered to be the critical organ and the dose commitment from each internal uptake is combined with the dose contributed by external sources for the purpose of reporting cumulative whole body exposures on Form 5484.6, it is not necessary to report those internal exposures on Form 5484.7.

b. Annual Industrial Summary of Fire and Other Property Damage Experience (Suggested Format). The report summarizes the 19 CY experience and activities of this office relative to the control of Department of Energy property damage and loss from fire and other accident causes. An aggregate loss of $_____ was suffered during 19 CY as a consequence of property damage accidents on Department of Energy-owned property for which this office has responsibility. About ____ percent of this loss resulted from the accidents listed below. A description of each accident involving a loss of $5,000 or more is attached.

e. Submission of Type C Investigation Reports.

(1) All occupational injuries and illnesses shall be investigated to determine corrective action appropriate to minimize or preclude similar injuries and illnesses. A report shall be made on Form 5484.3, Supplementary Record of Occupational Injuries and Illnesses, Attachment 1, for occupational illnesses as defined by the Occupational Safety and Health Administration, and for lost work day cases and nonfatal cases without lost work days as defined in 29 CFR 1904.

(2) All accidents involving Government-owned, -rented, or -leased vehicles (including Interagency Motor Pool vehicles) or privately owned vehicles while operated on official business shall be investigated and the number of such occurrences reported on Form 5484.4, Tabulation of Property Damage Experience, Attachment 2. The investigation for each accident causing $250 or more damage and/or injury shall be recorded on SF-91A, Investigation Report of Motor Vehicle Accident, Attachment 3, and copies submitted to the System Safety Development Center (SSDC), EG&G Idaho, Inc., on or before the 25th of the month following the end of the quarter in which the accident occurred.

(3) All accidents resulting in Department of Energy or other property damage or loss shall be investigated. The investigation for each loss exceeding $1000 shall be recorded on Form 5484.5, Report of Property Damage or Loss, Attachment 4, and copies submitted to the System Safety Development Center (SSDC), EG&G Idaho, Inc., on or before the 25th of the month following the end of the quarter in which the accident occurred.

(4) All radiation exposures of individuals which in one calendar quarter exceed the following shall be reported by memo to the Operational and Environmental Safety Division:

(a) 3 rem to whole body.

(b) 5 rem to skin of whole body or thyroid.

(c) 10 rem to forearms.

(d) 25 rem to hands or feet.

2. STANDARDS FOR INVESTIGATION.

a. Appointing the Board.

(1) A board of investigation shall consist of three to five members, one of whom is appointed as chairman.

Vertical line denotes change

(3) Property Damage Vulnerability of Department of Energy Projects. While property damage risks have been reduced to proportions warranting little concern by management at most locations, it should be noted that, under existing conditions, high property damage loss and/or serious interruption of Department of Energy operations are considered as being reasonably possible at the locations given below:

(a) Locations. Limit to locations where losses of $1,000,000 or serious interruption of important operations may reasonably be anticipated. If lengthy, summarize in this section and furnish details in an exhibit.

(b) Remarks. (Be brief.)

(4) Department of Energy Fire Engineering Risk Appraisal. The responsibilities of this office for Department of Energy appraisals of fire risks detailed in this Chapter were discharged by conduct of the Department of Energy fire protection engineering appraisals of the installations detailed in Exhibit ____. This exhibit also includes for each facility brief comments as to the overall status of fire protection, the estimated replacement value of Department of Energy property, the number of inspections made during 19 CY, and notations as to their relative importance to the Department of Energy program.

(5) Major Fire Protection Accomplishments During 19 CY. Summarize the categories of fire protection in which major improvements have been made. For example, mention should be made of automatic protection systems installed, increased inspection activities, organizational improvement, cost reductions, and promotional activities (e.g., National Fire Prevention Week, etc.).

(6) Major Fire Protection Objectives for Next Year. Briefly summarize in this section areas in which major expenditures of effort or funds are anticipated.

(7) Observations, Conclusions, and Recommendations. While no suggested format is given for the content of this section, in individual cases it may be appropriate to suggest basic changes in Department of Energy regulations or to point out especially important risks (e.g., arson, sabotage, explosion, risk to the public, radiation hazards from fires, etc.). In general, any items of interest to other field organizations should be included. The material in this section should very briefly summarize conclusions resulting from 19 CY experience.

(b) The investigation report shall fully cover and explain the technical elements of the causal sequences of the occurrence and shall also describe the management systems which should have, or could have, prevented the occurrence, e.g., the hazard review system and the quality assurance program for safety, including the monitoring of actual operations.

(c) The investigators' recommendations for corrective actions to prevent a similar occurrence shall not be contained in the report but shall be included in the cover memorandum that transmits the investigation report to the appointing official.

(2) Outline of the Report.

(a) Cover. The cover and title page shall state the subject and date of occurrence, the date of the report, and the security classification. The cover and title page shall not include distribution lists, internal organization nomenclature, name of organization participating or preparing the report, or other such information.

(b) Table of Contents. The table of contents shall identify the sections and subsections of the report, illustrations, charts, and appendixes with their report page number designated.

(c) Scope of Investigation. This statement shall set forth the issues or objectives to be investigated and any special limitations or instructions to the board.

(d) Summary. This section shall be written in such a manner that the reader, who may be relatively unfamiliar with the subject matter, can obtain the essential facts, the findings, and the probable causes and contributing factors with a minimum of effort and time. The summary shall not contain information that is not discussed elsewhere in the report.

(e) Facts. This section of the report shall cover the major areas of investigation in a uniform manner and in a reasonable, logical sequence. Another good investigation board should be able to reproduce this section.

1 Make this section factual. Do not include any conclusion in this section.

2 Give the reader a good understanding of the accident.

3 Stress the areas of the accident investigation bearing on the causal consideration.

(d) Field organizations should assure that any data errors on the Radioactive Effluent/Onsite Discharge Data Form are reported promptly to the Information Systems Branch, EG&G Idaho, Inc., using amended forms.

(2) Environmental Monitoring Reports covering the previous calendar year shall be prepared annually and distributed by May 1 to the Operational and Environmental Safety Division (10 copies), appropriate program offices, the Department of Energy Technical Information Center, and to other agencies and organizations, as appropriate. Attachment 5 of this Order provides the suggested format for this report.

(3) Environmental Summaries for the previous calendar year shall be submitted annually to the Operational and Environmental Safety Division (10 copies) by May 1 for all sites which are exempted from (2) above, in accordance with the provisions of Chapter III of this Order. Attachment 6 of this Order provides the suggested format for this report.

(4) Environmental Reports to Regulatory Agencies shall be submitted in accordance with schedules established by the applicable permits or regulations.

Vertical line denotes change.

(f) The Analysis.

1 This section of the report is intended to present an analysis of the factual material contained in the investigation. Its purpose is to show the reader the interpretation of the facts, conditions, circumstances and inferences which support the findings, probable causes, and judgments of needs. This section should include a discussion of the causal sequences, and due consideration should be given to charting the relationship of events and causal factors. Speculated events, facts in controversy, denial of allegations, and what could not be determined should also be discussed in the analysis section.

2 Do not put additional facts in this section. This section is for analysis of the facts.

3 . Make the analysis lead up to the findings, probable causes, and judgments of needs. The qualified reader should be able to anticipate the causal factors from the analysis.

4 Make the analysis "accident prevention-worthy" not blameworthy.

(g) Conclusion.

1 Findings. This subsection consists of the significant facts and the analytical conclusions of the investigators.

a Organize findings sequentially, preferably in chronological order, or in logical sets of sequences, e.g., hardware, procedures, people, organization.

b Make analytical conclusions which can be understood on the basis of the facts and the subsequent analysis.

c Keep findings to a minimum number. They are a recap of the significant facts and the analytical highlights, not the entire sequence of events.

d Keep findings as short as possible and, to the extent possible, put only one highlight in each finding.

2 Probable causes. The statement of probable causes shall consist of a series of relatively simple statements which summarize the causes and contributing factors, including any systemic factors.

(4) All post-occurrence cleanup expenses, e.g., cleanup of radioactive contamination resulting from accidents, explosions, fires, or other occurrences.

b. Exclude.

(1) Expenses directly resulting solely from loss of the use or occupancy of facilities affected by the occurrence.

(2) All post-occurrence expenses paid for by non-Department of Energy sources, e.g., expenses covered by private insurance.

c. Miscellaneous Guidelines.

(1) Credit should be allowed for the estimated salvaged value of items recovered.

(2) The damage and loss of privately-owned property is not reportable, under the requirements of this appendix, except to the extent that the Department of Energy is liable for damage and loss consequences resulting from the occurrence.

(3) Burnout of electric motors and other electrical equipment through overheating from electrical causes will be considered a "fire loss" only if self-sustained combustion exists after power is shut off.

(4) Expenses due to normal wear are not considered as reportable loss providing that all of the loss is reasonably foreseeable and preaccepted. However, unanticipated loss accompanying such occurrences is reportable. For example, the cost for repairing or replacing a tank, which developed a leak due to corrosion, may not be an accidental loss; but the cost for recovery and/or replacement of released material, including accompanying costs for product recovery, or replacement and costs for cleanup and decontamination, should be considered as an accidental loss.

(3) Recommendations. The natural followup to the judgments of needs is the recommendations. Each board shall arrive at recommendations intended to prevent similar occurrences. The utmost care should be exerted in forming the recommendations so that all are clear-cut, feasible, logical, and applicable in the field for which they are intended. These recommendations shall be transmitted to the appointing official in the cover memorandum for the investigation report. The purpose in separating the recommendations from the body of the report is to reflect the actual implementation process. The head of the field organization, the Operational and Environmental Safety Division, the Secretary, and finally Congress may add to or modify recommendations. In practice, higher authorities have often added or strengthened recommendations. They have seldom, if ever, deleted recommendations. Recommendations concerning major policies or large funding requirements are properly reserved for the Secretary or the Congress.

3. CORRECTIVE ACTIONS.

a. Immediate Corrective Actions. These are the immediate measures taken by the Department of Energy or Department of Energy contractors that are necessary to prevent a second occurrence. They are needed since the long range corrective actions resulting from the investigation are usually not transmitted for implementation until 6-8 weeks after the date of the occurrence.

b. Recommendations of the Board. Headquarters and field investigation boards shall formulate appropriate recommendations for corrective actions to prevent the recurrence of a similar type of event and to correct any systemic problems that contributed to the occurrence. These recommendations shall be transmitted to the appointing official in the cover memorandum.

c. Corrective Actions from the Appointing Official. The recommendations of the board are reviewed by the appointing official. Any additional corrective actions that the official considers appropriate for the operation involved and for other Department of Energy operations with a similar accident potential shall be included in the memorandum transmitting the investigation report to the Director, Operational and Environmental Safety Division.

d. Corrective Actions from Headquarters. The recommendations of the board and the corrective actions of the appointing official are reviewed by Headquarters. If necessary, major policy issues will be discussed with the Secretary. Any additional corrective actions suggested by Headquarters shall be included in the memorandum to the appointing official which accepts the investigation report. Copies of the investigation report and a memorandum with appropriate corrective actions shall also be transmitted for consideration to all Department of Energy field organizations whose contractors conduct operations with a similar potential.

The following additional information (items 20-25) must be provided for lost workday cases:

LOST WORKDAY CASES

20. Days away from work: 0 Enter the number of workdays (consecutive or not) on which the employee would have worked but could not because of occupational injury or illness. The number of lost workdays should not include the day of injury or onset of illness or any days on which the employee would not have worked even if he had been able to work. NOTE: For employees not having a regularly scheduled shift, i.e., certain truck drivers, construction workers, farm labor, casual labor, part-time employees, etc., it may be necessary to estimate the number of lost workdays. Estimates of days away from work shall be based on prior work history of the employee AND days worked by employees, not ill or injured, working in the department and/or occupation of the ill or injured employee.

21. Days of restricted work activity: _____ Enter the number of workdays (consecutive or not) on which because of injury or illness: 1) the employee was assigned to another job on a temporary basis, or 2) the employee worked at a permanent job less than full time, or 3) the employee worked at a permanently assigned job but could not perform *all* duties normally connected with it. The number of days of restricted work activity should not include the day of injury or onset of illness or any days on which the employee would not have worked even if he had been able to work.

CORRECTIVE ACTION

22. What actually has been done to correct conditions causing the injury or illness? _____

23. What remains to be done to correct such conditions and why? _____

24. Comments on adequacy or corrective action taken, or planned, including progress on pending actions: _____

25. Signature of reviewing official: Y. McCamy Date: 7/6/79
Title: Safety Auditor

EXAMPLE

GUIDELINES CONCERNING THE
SUPPLEMENTARY RECORD OF
OCCUPATIONAL INJURIES
AND ILLNESSES

To supplement the Log of Occupational Injuries and Illnesses (OSHA No. 100), each establishment must retain a record of each recordable occupational injury or illness. Workmen's compensation, insurance, or other reports are acceptable as records if they contain all facts listed below or are supplemented to do so. If no suitable report is made for other purposes, this form may be used or the necessary facts can be listed on a separate plain sheet of paper. These records must also be available in the establishment without delay and at reasonable times for examination by representatives of the Department of Labor and the Department of Health, Education and Welfare. The records must be maintained for a period of not less than five years following the end of the calendar year to which they relate.

Such records must contain at least the following facts:

1) About the employer–name, mail address, and location if different from mail address.

2) About the injured or ill employee–name, social security number, home address, age, sex, occupation, and department.

3) About the accident or exposure to occupational illness–place of accident or exposure, whether it was on employer's premises, what the employee was doing when injured, and how the accident occurred.

4) About the occupational injury or illness–description of the injury or illness, including part of body affected, name of the object or substance which directly injured the employee; and date of injury or diagnosis of illness.

5) Other–name and address of physician; if hospitalized, name and address of hospital; date of report; name and position of person preparing the report; and case number corresponding to the log.

For lost workday cases:

6) About lost workdays–the number of days away from work and/or the number of days of restricted work activity.

7) About causative factors–a statement of what has been done and what remains to be done to correct conditions causing the accident; signed comments by a reviewing official on the adequacy of the corrective actions.

Note: If an occurrence results in recordable injury or illness as well as property damage of $1,000 or more, DOE F 5484.5 must be completed also and submitted as required. If property damage results without injury, then only the DOE F 5484.5 should be submitted. If a motor vehicle accident results in recordable injury, DOE F 5484.3 must be completed in addition to any required motor vehicle accident report forms

CHAPTER III

EFFLUENT AND ENVIRONMENTAL MONITORING PROGRAM REQUIREMENTS

1. MONITORING NEW SITES, PROCESSES, AND FACILITIES. An environmental survey shall be conducted prior to actual start up of a new site, facility, or process which has the potential for adverse environmental impact, or which will process, release, or dispose of pollutants. The preoperational survey should begin about 2 years, but not less than 1 year before start up to cover seasonal changes adequately. The survey shall establish background levels of radioactive and toxic pollutants; characterize pertinent environmental and ecological parameters; and identify potential pathways for human exposure or environmental impact as a basis for determining the nature and extent of the subsequent routine operational effluent and environmental monitoring program.

2. MONITORING EXISTING SITES. An environmental radioactivity monitoring program shall be maintained at existing sites and, as determined on a case-by-case basis by the Director, Operational and Environmental Safety Division, at certain former sites to determine:

   a. Whether containment and control of releases of radioactivity from site operations are functioning as planned.

   b. Whether and to what extent environmental levels of radioactivity and other pollutants, as appropriate, released from Department of Energy sites comply with applicable standards.

   c. The overall impact of Department of Energy operations on the environment.

3. QUALITY ASSURANCE. Quality assurance with respect to sampling and analytical procedures, data processing, and reporting shall be an integral part of the program. Judgment regarding the extent of environmental monitoring must be exercised by the Department of Energy field organizations and contractor management based on hazard potential, quantities and concentrations of materials released, specific local public interest or concern, and extent and type of utilization of affected offsite air, land, and water. Environmental monitoring for nonradioactive pollutants is necessary if it is not possible to determine compliance with Federal, state, or local environmental quality standards on the basis of effluent monitoring data. Before a new facility becomes operational at an existing site, the environmental monitoring program should be modified to establish background information with respect to those radionuclides or other pollutants likely to be released and those environmental parameters likely to be affected by operation of that facility.

INSTRUCTIONS FOR COMPLETION OF DOE F 5484.4

APPLICATION—This form is to be completed as required for all DOE offices and contractor organizational units. The data provided shall be for the same reporting unit(s) as designated on side "A" of the form. All data is cumulative except column 1 (current reporting period only).

DEFINITIONS

Motor Vehicle—any car, truck, bus, or motorcycle licensed for over-the-road use.

Occurrence—any deviation from the planned or expected behavior or course of events in connection with any DOE or DOE contractor operation if the deviation has safety, health, or environmental significance.

SECTION I

General—List all occurrences in which one of the conveyances or pieces of equipment listed in categories a through g is being operated on official DOE Federal Government business, and which results in death, recordable injury, or property damage of two hundred fifty dollars ($250) or more, regardless of who was injured (if anyone) or what property was damaged. Occurrences which are of a transportation or mobile equipment nature but do not fit one of the categories listed in this section should be listed under the miscellaneous category of Section II.

Categories

a. Contractor-operated motor vehicles—include all Federal Government-owned, leased, or rented vehicles, or privately-owned vehicles which are operated by a DOE contractor employee.

b. Aircraft—means any air-borne craft, whether powered, towed, or free-flying, which is being operated by a DOE or DOE contractor employee. This includes privately-owned as well as Federal Government-owned, leased, or rented aircraft.

c. Marine—means any water-borne craft, motorized, non-motorized, steam, sail, towed, etc., which is operated by a DOE or DOE contractor employee. This includes privately-owned as well as Federal Government-owned, leased, or rented marine craft.

d. Railroad—means any unit of equipment (or combinations) listed below, which is operated by a DOE or DOE contractor employee:

(1) Locomotive: self-propelled unit of equipment designed solely for moving other equipment.

(2) Light locomotive: self-propelled unit of equipment uncoupled to any other equipment.

(3) Motor car: self-propelled unit of equipment designed to carry freight or passengers (not a locomotive).

(4) Car: examples include freight, passenger, dining equipment, caboose, chemical, gondola, mining, ATMX, courier.

For categories e, f, and g, below, list only those occurrences in which the motor vehicle or piece of equipment was being operated by a DOE Federal Government employee.

e. Government Motor Vehicle—includes any Federal Government-owned, leased, or rented motor vehicle.

f. Private Motor Vehicle—includes any privately-owned motor vehicle.

g. Materials Handling Equipment—means operations of lifting and handling during construction, warehousing, storage, dock loading, and dock unloading using cranes, powered industrial trucks, and yard vehicles.

Columns

(1) Number of Conveyances—Includes all conveyances owned, leased, or rented by DOE during the reporing period and all privately-owned conveyances used for official DOE Federal Government business during the current reporting period. For railroads, count each separate unit or car as a single conveyance.

(2) Number of Occurrences with Injury—Include all occurrences which result in death or recordable injury.

(3) Total Number of Occurrences—Include all occurrences which result in death, recordable injury, or property damage of two hundred fifty ($250) or more. (Column 3 includes column 2 plus the property damage occurrences which did not involve death or recordable injury.)

(4) Miles of Travel—Record the number of miles travelled on official DOE Federal Government business. For railroads, count only the miles travelled by the power unit.

(5) Hours Operated—Record the number of hours operated on official DOE Federal Government business. If aircraft or marine units are towed or otherwise moved by a power unit, count only the hours of operation of the power unit.

(6) Rate—The rate for motor vehicles and railroads equals the total number of occurrences (column 3) multiplied by 1,000,000 and divided by miles of travel (column 4). The rate for aircraft and marine equals the total number of occurrences (column 3) multiplied by 1,000 and divided by hours operated (column 5).

(7) Government Estimated Loss—If DOE bears all or part of the cost of the occurrence as of the end of the reporting period, regardless of who may be responsible, record in dollars the estimated Federal Government loss borne by DOE in column 7.

(8) Reimbursed and Other Estimated Loss—If by the end of the reporting period another party reimburses DOE or bears an amount of the loss for an occurrence, record in dollars the amount reimbursed or borne by such parties in column 8.

(9) Total Estimated Loss—The sum of columns 7 and 8 is recorded in column 9.

(10) Total Cost per 1,000 Miles—Multiply the appropriate motor vehicle total estimated loss (column 9) by 1,000 and divide by miles of travel (column 4). Record the result in column 10.

SECTION II

General—Record all property damage occurrences of $1000 or more not recorded in Section I above. Include occurrences which result in damage to DOE Federal Government property or involve DOE Federal Government or DOE contractor operations.

Categories

h. Electrical—Property damage resulting from electrical fault or failure.

i. Fire—Property damage resulting from fire. Except that for motor vehicle accidents which result in fire, the loss should be listed in Section I rather than Section II. However, if a fire damages a motor vehicle and it is not the result of that vehicle being involved in an accident, then the loss should be listed in Section II.

j. Mechanical—Property damage resulting from mechanical failure or breakdown, not including normal wear unless the failure of a worn component incurs damage of $1000 or more on other components. However, if wear resulting from lack of maintenance or improper maintenance causes a loss of $1000 or more, then this occurrence should be recorded as a mechanical failure of the worn component.

k. Radiation/Nuclear—Include losses from contamination (leaks, spills, releases), unplanned criticality, nuclear reactor (meltdown, excursion, material spill or leak, fire), and other related occurrences.

l. Explosion—Property damage suffered as a consequence of explosion (including any losses from contamination spread by the explosion).

m. Natural Causes—Property damage suffered as a consequence of wind, rain, flood, waves, lightning, earthquake, etc.

n. Miscellaneous—Include all property damage occurrences which are recordable but did not fit one of the categories a–m in Sections I or II.

Columns

(11) Number of Occurrences—Record the number of occurrences for each of the categories h–n.

(12) Government Estimated Loss—If DOE bears all or part of the cost of the occurrence as of the end of the reporting period, regardless of who may be responsible, record in dollars the estimated Federal Government loss borne by DOE in column 12.

(13) Reimbursed and Other Estimated Loss—If by the end of the reporting period another party reimburses DOE or bears an amount of the loss for an occurrence, record in dollars the amount reimbursed or borne by such parties in column 13.

(14) Total Estimated Loss—The sum of columns 12 and 13 is recorded in column 14.

ITEM 15—Include only tort claims against DOE resulting from an occupational occurrence other than a breach of contract for which the Federal Tort Claims Act allows recovery. Record in item 15 the total dollar amount paid by DOE from the start of the calendar year through the end of this reporting period.

ITEM 16—The total amount of Government property damage is the sum of all entries in columns 7 and 12.

ITEM 17—The most recent estimate of DOE Federal Government property valuation (based on DOE 5484.1) should be recorded in item 17.

Vertical line denotes change.

whether or not such effluents are in compliance with applicable effluent, emission, or environmental standards; or (b) if used to calculate offsite impacts. With regard to effluent monitoring data for radioactivity, the total number of curies in airborne and liquid effluents released to the offsite environment, and the nuclides of particular local interest, shall be included in the portions of the report dealing with air and water monitoring, respectively. In instances where liquid effluents released to different receiving streams results in separate routes of potential environmental exposure, the radioactivity discharged to each receiving stream should be identified.

(4) Detailed effluent data, such as that submitted annually on Form DOE F 5821.1, should not be included in the Environmental Monitoring Report. Onsite discharge data should also be excluded from this report.

c. Environmental Summary. An environmental summary shall be prepared annually for all sites exempted from preparing an Environmental Monitoring Report.

(1) To summarize and interpret the levels of radioactive and non-radioactive pollutants in the environs of Department of Energy sites resulting from facility operations in relation to applicable standards.

(2) To be less detailed and of lesser magnitude than the environmental monitoring report. It should be inclusive enough to determine the environmental impact of facility operations. The summary shall include the following topics:

(a) Facility Description.

1 Location.

2 Work performed.

3 Environmental setting.

(b) Pollutants Released in Effluents.

1 Air.

2 Liquid (including those released to sanitary sewers).

(c) Comparison of Effluents with Respect to Applicable Standards.

9 KILLED OR INJURED

A

a NAME: None | SEX | AGE | b ADDRESS

c Mark X in two appropriate boxes: ☐ KILLED ☐ INJURED | ☐ DRIVER ☐ HELPER | ☐ PASSENGER ☐ PEDESTRIAN

d IN WHICH VEHICLE: ☐ FED ☐ OTHER (2)

e LOCATION IN VEHICLE

f FIRST AID GIVEN BY

g TAKEN BY

h TAKEN TO

i REGISTRATION NUMBER

B

a NAME | SEX | AGE | b ADDRESS

c Mark X in the two appropriate boxes: ☐ KILLED ☐ INJURED | ☐ DRIVER ☐ HELPER | ☐ PASSENGER ☐ PEDESTRIAN

d IN WHICH VEHICLE: ☐ FED ☐ OTHER (2)

e LOCATION IN VEHICLE

f FIRST AID GIVEN BY

g TAKEN BY

h TAKEN TO

i REGISTRATION NUMBER

10 PEDESTRIAN

a DIRECTION PEDESTRIAN WAS GOING

b ☐ ON ☐ ACROSS Street name or highway

c WHERE WAS PEDESTRIAN GOING SW corner to NE corner E side to W side etc.) FROM | TO

d DESCRIBE WHAT PEDESTRIAN WAS DOING AT THE TIME OF THE ACCIDENT (Crossing intersection with signal against signal diagonally in roadway working playing walking hitching on vehicle etc.)

11 DAMAGE TO PROPERTY OTHER THAN MOTOR VEHICLES OR CARGO (Name objects show ownership state nature of damage)

None

EXAMPLE

12 KIND OF LOCALITY (Mark one)

- a Manufacturing industrial
- b Shopping business
- c Residential
- d School playground
- X e Open country
- f Industrial premises
- g Home domestic premises
- h Other (specify)

13 LIGHT (Mark one)

- X a Daylight
- b Dusk
- c Dawn
- d Darkness with
  - (1) Artificial light
  - (2) No artificial light

14 WEATHER (Mark one)

- X a Clear
- b Raining
- c Showering
- d Fog
- e Other (specify)

15 CONDITION OF DRIVERS AND PEDESTRIAN

FED	2	PED	Mark one for each person
X	X		a Had not been drinking
			b Had been drinking (Mark (1) (2) or (3) below)
			(1) Ability impaired
			(2) Ability not impaired
			(3) Not known whether impaired
			Mark one or more for each person
			c Physical defect
			d Other handicaps carrying bundles umbrella etc
			e Sleepy fatigued etc
			f Apparently asleep
X	X		g Apparently normal

16 CONDITION OF VEHICLES

FED	2	Mark one or more for each vehicle
		a Defective brakes
		b Headlights out ☐ One ☐ Both
		c Taillight out or obscured
		d Dim cowl or fender lights only
	X	e Signal lights defective Brake
		f Other lights reflectors defective
		g Tire blew out
		h Defective steering mechanism
X		i No apparent defects
		j Other defects (Specify)

17 VISION OBSCURED BY

FED	2	Mark where applicable
		a Rain snow etc on windshield
		b Cracked windshield
		c Dirty windshield windows
		d Windows windshield not glass
		e Trees crops etc
		f Building
		g Embankment
		h Signboards
		i Parked vehicle
		j Moving vehicle
		k Other (Specify)

18 ROAD CONDITIONS (Mark one)

- X a Dry
- b Wet
- c Muddy
- d Snowy
- e Icy

Continued next column

ROAD CONDITIONS Contd – Mark one or more

- f Loose material on surface
- g Holes deep ruts
- h Defective shoulders
- X i No defects
- j Other defects (Specify)
- k Road under construction or repair ☐ YES ☒ NO

19 TRAFFIC CONTROLS

FUNCTIONING	NOT FUNCTIONING	Mark appropriate column for each control present
		a Railroad crossing gates
X		b Railroad automatic signal
		c Officer or watchman
		d Stop and go light
		e Stop sign
		f Warning sign or signal
		g Flags or flares

If none mark here ☐ h No controls present

20 ROAD DESCRIPTION

a WIDTH OF ROAD OR PAVEMENT: 25

b NUMBER OF LANES: 2

c LANES MARKED: ☒ YES ☐ NO

d LANES SEPARATED: ☒ NO ☐ YES If Yes describe separation

(2) Format.

(a) The Environmental Monitoring Report shall include for each sampling station the number of samples taken with an indication of the central tendency and spread of the data. Where appropriate, this should include concentration (C) maximum and C minimum, the mean concentration per report period (C mean) and two standard deviations, and the percent of the relevant effluent or environmental quality standard for each parameter. The relevant standard also should be shown and the source referenced. The minimum detection levels should be indicated. Data below the minimum detection level may be expressed as being less than (<) the minimum detection value. Background levels should be subtracted from the sampling results included in the report.

(b) In computing averages, the preferred method is the method outlined in ERDA-77-24, "A Guide for Environmental Radiological Surveillance at ERDA Installations." However, as an alternate method, it is acceptable that sample results below the detection level be assigned the detection level value, and the average expressed as less than (<) the computed value. In either case, the methods used to calculate these numbers should be outlined in the report.

(c) The prescribed format for a typical Environmental Monitoring Report is indicated in Attachment 5 of this Order. The prescribed format for a typical Environmental Summary is indicated in Attachment 6 of this Order.

(d) Assessment and Reporting of Potential Dose to the Public. The environmental monitoring report shall contain an assessment of the potential radiation exposure to the public which could have resulted from site operations during the calendar year. The assessment should be as accurate and realistic as is practical and shall incorporate the dose reference points in 2 below. As the potential exposure to an individual or population group increases with respect to the relevant Order DOE 5480.1, Chapter XI, dose standards, the dose assessment should be increasingly more detailed.

1 Basic approach and methodology. Average or typical effluent and environmental data and exposure conditions (after subtracting background contributions) shall be used in making the assessment rather than atypical data and assumptions which exaggerate the estimates. Generally the most accurate dose estimates can be calculated using actual measurements of radioactivity in the pathways of exposure as close to man as possible, e.g., measurements in drinking water after treatment rather

5. EFFLUENT MONITORING. Monitoring shall be conducted for pollutants as follows:

a. Effluent Monitoring. Effluents shall be monitored:

(1) To determine compliance with the requirements of Order DOE 5480.1, Chapters I, XI, and XII.

(2) To evaluate the effectiveness of effluent treatment and control.

(3) For radioactivity inventory purposes.

(4) To determine compliance with all Department of Energy, Environmental Protection Agency, state agencies, etc., imposed effluent limits and other environmental commitments, e.g., those published in environmental impact statements, or other official documents.

b. Onsite Discharge Monitoring. Radioactivity released to onsite waste treatment or disposal systems shall be monitored to assess the efficacy of treatment and control, and to provide a quantitative and qualitative annual summary of the radioactivity released onsite.

c. Monitoring Guidelines.

(1) General.

(a) As a general rule, monitoring should be conducted in a manner that provides accurate measurements of the quantity and concentration of liquid and airborne pollutants in effluents as a basis for:

1 Determining compliance with applicable discharge and effluent control limits, including self-imposed administrative limits designed to assure compliance with in-plant operating limits, effluent standards or guides, and with environmental standards or guides.

2 Evaluating the adequacy and effectiveness of containment and waste treatment and control as well as of efforts toward achieving levels of radioactivity which are as low as reasonably achievable considering technical and economical constraints.

3 Compiling an annual inventory of the radioactivity released in effluents and onsite discharges.

DOE F 5484.5 Continued

8. CAUSE AND CONTROL

a. CAUSE

Metal being melted and liner materials were incompatible, and at elevated temperature the liner quickly deteriorated.

b. FACTORS CONTRIBUTING TO EXTENT OF LOSS

1. Lack of liner deterioration monitoring.
2. Contamination of material being processed.

c. PREVENTIVE ACTION TAKEN OR CONTEMPLATED TO MINIMIZE RISK OF SIMILAR LOSSES

See Accident Investigation Report KY-4-F.

EXAMPLE

9. STORY AND RECOMMENDATIONS

The "C" shift emergency squad responded to fire alarm box 347 at 1911 hours. There were many small fires inside the building and a grass fire to the east of the building. Six 15-pound CO_2 and one 150-pound CO_2 extinguishers were used to extinguish the fires. All support systems for the furnace were tagged out and the furnace was left to cool by itself. The all clear was given at 1952 hours and the extinguishers were replaced.

10. WHAT NEW WORK PRACTICE, GUIDE, CODE OR STANDARD, ETC., IS SUGGESTED TO HELP OTHERS AVOID SIMILAR LOSSES?

Reported by	Title:	Date:
L. S. Dauer	Fire Protection Engineer	7/25/80

2 When the relative concentrations of specific radionuclides are so well known by other means that gross radioactivity measurements are truly indicative of the activity being released; or

3 When the activity of waste streams is so low as to preclude specific nuclide measurements.

d. Monitoring Data Recordkeeping. Radioactive effluents and onsite discharge monitoring and reporting shall be adequate to provide an annual average concentration and an annual summary of the quantities of radioactivity released. The summary should be complete to the extent that all significant releases are reported. It is necessary, therefore, that the annual average flow and the specific concentration in each waste stream be known. For the purpose of determining compliance with standards, the data should be collected and recorded in the units in which relevant standards are expressed. The onsite discharge and effluent data reports will be used to compile a Department of Energy-wide summary of radioactivity which has been released onsite and to the offsite environment from its facilities.

5. Monitoring Data Collection, Analysis, and Evaluation.

   a. Include a brief description of the type and frequency of sampling, methods of analysis, and accompanying tables and graphs which clearly and accurately present the monitoring results. Quality assurance programs should also be discussed for sampling and analysis. A map showing the location of monitoring stations and sampling points also shall be included.

   b. As a general rule, data should only be presented for radioactivity and pollutants in media for which there are applicable standards or other meaningful bases for interpreting the results (e.g., background levels, upstream versus downstream concentration). Interpretations shall be made, as appropriate, of how the environmental levels resulting from site operations compare to relevant parameters such as background, natural radioactivity, and applicable effluent and/or environmental quality standards.

6. References. List and explain, as appropriate, the effluent, air and water quality, and other standards or documents cited in the body of the report.

7. Distribution. A standard distribution list which includes all persons and/or organizations to whom the environmental monitoring report is regularly distributed should be included as an integral part of the report.

CHAPTER IV

ENVIRONMENTAL PROTECTION, SAFETY, AND HEALTH PROTECTION REPORTS

1. GENERAL.

   a. Requirements for reports resulting from Type A and B investigations are provided in Chapter II to this Order.

   b. Approval of the Operational and Environmental Safety Division is necessary prior to substitution of contractor forms for those required in this Chapter.

   c. Department of Labor, Occupational Safety and Health Administration (OSHA) rules and definitions shall govern the recording and measuring of work injury experience. Chapter V of this Order shall govern the determination of Department of Energy property valuation for property damage experience. "American National Standards Institute Method of Recording and Measuring Motor Vehicle Fleet Accident Experience," D15.1 (latest edition) shall govern the recording and measuring of motor vehicle accident experience. Revision of annual reports for each of the 2 calendar years immediately preceding shall be transmitted to the System Safety Development Center (SSDC), EG&G Idaho, Inc., before February 28 of each year. Doubtful cases of occupational injury or illness classification shall be forwarded to the Operational and Environmental Safety Division for final determination.

2. TYPE C INVESTIGATION REPORTS.

   a. A quarterly report of Radiation Exposures defined in paragraph e(4) of Chapter II of this Order, which occurred during the calendar quarter shall be prepared by field organizations and submitted to the System Safety Development Center (SSDC), EG&G Idaho, Inc., on or before the 25th of the month following the end of the quarter in which the exposure occurred; negative reports are not required. The report shall include the following information:

      (1) A brief description of how the exposure occurred.

      (2) Personal information:

         (a) Name.

         (b) Date of birth.

         (c) Place of birth.

         (d) Sex.

         (e) Social security number.

h. Privacy Act, PL 93-579.

i. Freedom of Information Act, PL 90-23.

j. A Guide for Environmental Radiological Surveillance at Energy Research and Development Administration Installations, ERDA-77-24, March 1977.

k. Effluent Information System (EIS) and Onsite Discharge Information System (ODIS) User's Manual, October 1977.

l. Quality Criteria for Water, 1976, Environmental Protection Agency.

m. Guidance for Air Quality Monitoring Network Design and Instrument Siting, January 1974, Environmental Protection Agency.

n. Ambient Monitoring Guidelines for Prevention of Significant Deterioration (PSD), May 1978, Environmental Protection Agency.

o. Guide to Sampling Airborne Radiactive Materials in Nuclear Facilities, American National Standards Institute, N13.1.

p. Standard Methods for the Examination of Water and Wastewaters, 14th Edition, 1976, American Public Health Association.

q. American Society of Testing Materials (ASTM) Standards, Parts 23 and 31, Water and Atomspheric Analysis, 1970.

r. Manual of Methods for Chemical Analysis of Water and Wastes, 1974, Office of Technology Transfer, Environmental Protection Agency.

s. 40 CFR 136, Guidelines Establishing Test Procedures for the Analysis of Pollutants.

t. 40 CFR 141, Interim Primary Drinking Water Regulations: Radioactivity, June 28, 1976.

u. DOE 5632.2, PHYSICAL PROTECTION OF SPECIAL NUCLEAR MATERIALS, of 2-16-79 which establishes minimum protection standards for special nuclear materials.

v. 40 CFR 125, Policies and Procedures for the National Pollutant Discharge Elimination System.

w. DOE 3790.1, OCCUPATIONAL SAFETY AND HEALTH PROGRAM FOR FEDERAL EMPLOYEES of 12-11-80.

4. DEFINITIONS.

a. Occurrence. Any deviation from the planned or expected behavior or course of events in connection with any Department of Energy or Department of Energy-controlled operation if the deviation has environmental protection, safety, or health protection significance.

(b) All damage to, or loss of, or damage caused by, nuclear reactors or vital appendages thereto (e.g., cooling system components, control equipment), should be classed as Type 4g3. "Vital appendages" include all equipment and materials directly associated with or necessary to the sustaining of reactor operation.

(c) All damage or loss sustained as a consequence of (and following the outbreak of) fire should be classed as Type 4a except fire losses involving cargo during transportation (see (a), above). Contamination damage caused by fire should be included in the loss reportable under Type 4a accidents.

(d) Except for cases covered by (a), (b), or (c), above, all losses suffered as a consequence of explosion (including any losses from contamination spread during the explosion) are classed as Type 4b.

(e) All contamination-caused losses, exclusive of those cases covered by (a), (b), (c), or (d), above, or those which result from nonreactor criticality accidents, should be classed as Type 4g1.

(f) Section 4d (Electrical Fault or Failure with Loss over $1000) should not be used for reporting losses resulting from other than accidental (i.e., reasonably unforeseeable) causes.

(2) Section 5. If a given loss involves more than one accident type (see Section 4 of Form 5484.5), list each such accident type contributing to the loss in the "Accident Type No." olumn and opposite each enter appropriate data.

d. SF-91A, Investigation Report of Motor Vehicle Accident, Attachment 3, shall be prepared for each incident resulting in injury or property damage of $250 or more. One copy shall be submitted to the System Safety Development Center (SSDC), EG&G Idaho, Inc., with Form 5484.4. The description of the occurrence, item number 26, shall include the following information:

(1) Whether or not the vehicle was equipped with seat belts.

(2) Whether or not the seat belts were in use at the time of the accident.

(3) The dollar loss incurred.

m. Dose Commitment. Dose commitment is the dose equivalent (rems) received by specified organs during a period of one calendar year which was the result of an uptake of a radionuclide by a person occupationally exposed.

n. Radiation Records Repository. The Department of Energy centralized data base which maintains occupational radiation exposure information for individuals monitored while engaged in activities associated with the Department of Energy or Department of Energy contractor operations. The Repository includes similar data for the Atomic Energy Commisson and the Energy Research and Development Administration activities.

o. Effluent. Airborne and liquid wastes discharged from a Department of Energy site or facility following such engineered waste treatment and all effluent controls, including onsite retention and decay, as may be provided. This term does not include solid wastes, wastes for shipment offsite, wastes which are contained (e.g., underground nuclear test debris) or stored (e.g., in tanks) or wastes which are to remain onsite through treatment or disposal.

p. Effluent Monitoring. Collection and analysis of samples and other measurements for the purpose of establishing the type and concentration of radioactive and nonradioactive pollutants in liquids and airborne discharges from Department of Energy facilities.

q. Environmental Monitoring. Sample collection and analysis of environmental media, i.e., air, water, soil, foodstuff, biota, etc., from the environs of Department of Energy sites for the purpose of assessing effects of Department of Energy operations at that site on the local environment. Generally, environmental monitoring is required to determine compliance with applicable environmental radiation standards.

r. Onsite Discharge. Airborne and liquid wastes discharged to onsite treatment or disposal systems, e.g., sewage lagoons, retention ponds, and cribs, for retention, settling, decay, or storage onsite.

s. Department of Energy Site.

(1) A Department of Energy-owned or -controlled tract used for Department of Energy operations:

(a) Containing one or more facilities (excluding tracts used primarily for substations and transmission towers, and similar utility facilities), or

(b) At which one or more major Department of Energy operations or program activities are being carried out.

e. Report of Radiation Exposures to Headquarters Employees. Report all recorded external and internal radiation exposures that occur during a visit by Department of Energy Headquarters employees to a Department of Energy field organization or contractor facility. Complete the appropriate portions of Form 5484.8 and submit it to the System Safety Development Center (SSDC), EG&G Idaho, Inc., within 30 days after the individual's date of visit or within 30 days after his exposure has been determined, whichever is later.

f. Report of Radiation Exposures to Visitors.

(1) Report all positive external and internal radiation exposures recorded for visitors during the period of their visit to a Department of Energy or Department of Energy contractor facility. Complete the appropriate portions of Form 5484.8 and submit copies of these reports to the visitor's employer (or to the visitor if he has no employer) and to the System Safety Development Center (SSDC), EG&G Idaho, Inc., within a period of 30 days after the date of the visit or within 30 days after the visitor's exposure has been determined, whichever is later. For visitors who are employees of the Department of Energy or Department of Energy contractors, a report should be submitted only to the visitor's employer.

(2) Any radiation exposure in excess of the radiation dose equivalent standards established by Order DOE 5480.1, Chapter XI, shall be reported within 24 hours after the exposure or within 24 hours after the exposure has been determined, whichever is later, to the visitor and his employer by telephone or teletype message. If the initial report is made by telephone, a written report shall follow within 30 days.

g. Preoperational Environmental Survey Reports shall be prepared as specified in Chapter III, paragraph 1, which summarize preoperational survey data and information. Five copies shall be submitted to the Operational and Environmental Safety Division and one copy to appropriate program offices before the new site becomes operational.

h. Aircraft Accident/Incident Reports. Form 5484.1, Aircraft Accident/Incident Preliminary Report, Attachment 11, and Form 5484.2, Aircraft Accident/Incident Record, Attachment 12, shall be prepared for all aircraft accidents and incidents. One copy of each form as soon as completed shall be forwarded to the Operational and Environmental Safety Division, Safety Analysis Branch, EV-134, and one copy to the appropriate Headquarters program office. Copies of both completed forms will also be included in the regular report of an Aircraft Accident/Incident Investigation Board.

6. RESPONSIBILITIES AND AUTHORITIES.

a. Assistant Secretary for Environment:

(1) Appoints Headquarters investigation boards and establishes the scope of Headquarters investigations.

(2) Accepts Headquarters investigation boards' reports.

(3) Directs corrective actions based on Headquarters investigation boards' recommendations.

b. The Director, Operational and Environmental Safety Division:

(1) Develops policies, procedures, standards, and guidelines for notification, investigation, and reporting of occurrences in the Department of Energy and Department of Energy contractor operations.

(2) Establishes requirements and prescribes procedures for the collection and compilation of data and reports related to occurrences and other information of environmental protection, safety, and health protection significance.

(3) Recommends Headquarters or field investigations (when not otherwise required by this Order) for occurrences which have an overall impact on Department of Energy programs.

(4) Recommends members for Headquarters investigation boards to the Assistance Secretary for Environment.

(5) Reviews the reports of Headquarters and field investigation boards to:

(a) Determine whether the investigations and the reports meet Department of Energy standards for thoroughness, objectivity, and independence.

(b) Assure prompt identification and correction of injury and property damage causes.

(c) Assure appropriate distribution of the reports in those instances where the lessons learned are potentially applicable to other Department of Energy and Department of Energy contractor sites.

(6) Recommends to the Assistant Secretary for Environment the acceptance of the reports of Headquarters investigation boards and the necessary corrective actions based on the boards' reports and other appropriate considerations.

Major 19 CY Department of Energy Property Damage Accidents

Loss	Date	Location	Type of Accident
$15,000	7/24	Power Plant, Fernald	Spontaneous ignition of coal in boiler feed bin.

(1) Loss Experience Analysis. The monetary damage or loss suffered from the following categories of accidents should be presented:

(a) Fire.

(b) Explosion.

(c) Nature.

(d) Mechanical.

(e) Electrical.

(f) Radiation/Contamination.

(g) Other.

(2) Recurring Loss Prevention Costs. The major available recurring costs of control or property damage or loss from the subject causes are primarily incurred as a consequence of paid fire department, volunteer brigade, and fire protection engineering expenses. A comparison of such costs with that of previous years should be set forth in charts (or tables). Data should be given for 19 CY and at least 2 previous years. If too voluminous, data should be given in an attached exhibit or reduced to chart form. Minimum data should include:

(a) Dollar cost in 19 CY and 1 previous year for contractor and field organization fire department, fire brigade, and fire protection engineering expenses.

(b) As above, but expressed in terms of dollar cost per $1,000,000 of Department of Energy-owned property.

(c) Department of Energy field organization fire protection engineering expense during 19 CY expressed in $/$1,000,000 of Department of Energy-owned property. The (higher) (lower) recurring costs of 19 CY as compared with the previous 19 CY, are attributed to: (Give reasons.)

(15) Reviews and approves field organization recommendations as to which sites need not perform routine effluent or environmental monitoring and reporting. This approval authority does not extend to monitoring and reporting required by Federal, state, and local laws, regulations, and permits.

(16) May waive specific Department of Energy effluent and environmental monitoring and reporting requirements for existing sites if not otherwise required by law or permit conditions.

c. The Director, Office of Health and Environmental Research:

(1) Provides, upon request, personnel monitoring devices for Department of Energy Headquarters employees who are planning to visit facilities not operated by the Department of Energy or Department of Energy contractors where they might encounter radiation exposure.

(2) Furnishes copies of the results of monitoring to the Director, Operational and Environmental Safety Division, and to the head of the appropriate office or division, Headquarters.

d. Inspector General:

(1) Reviews and recommends policies and standards for notification, investigation, and reporting of occurrences, in the Department of Energy and Department of Energy contractor operations.

(2) Reviews Department of Energy notification, investigation, and reporting of occurrences for adequacy and consistency with the requirements of this chapter and, as appropriate, reports results of such reviews to the Secretary.

(3) Conducts investigations as required by the Secretary.

(4) Concurs in the membership of all Headquarters investigation boards recommended by the Director, Operational and Environmental Safety Division.

e. Heads of Offices and Divisions, Headquarters:

(1) Review reports of occurrences for operations for which they are cognizant in order to determine if any instructions or procedures for which they are responsible need revision. Those responsible Headquarters officials having contractor organizations directly under their jurisdiction will assume the same responsibilities as heads of field organizations in paragraph 6f below. The Deputy Assistant Secretary for Naval Reactors shall assume, for Naval Reactor's activities, the same responsibilities as heads of field organizations.

(8) Cover Memorandum. The covering memorandum should call particular attention to any section of the report considered to be of outstanding importance or interest. Brief comments on the highlights of the report are also appropriate.

c. Effluent and Environmental Monitoring Reports.

(1) Reports of Effluent Monitoring Data.

(a) Effluent monitoring data for nonradioactive pollutants should be reported in the site environmental monitoring report or summary as described in Chapter III of this Order.

(b) Radioactive Effluent and Onsite Discharge Data Reports covering the previous calendar year shall be submitted to the Information Systems Branch, EG&G Idaho, Inc., by April 1, with a copy of the cover letter (enclose maps only) to the Operational and Environmental Safety Division. The reports, including the data forms, cover sheet, maps, and, if necessary, explanatory information shall be submitted in accordance with instructions provided in Section II of the Effluent Information System and Onsite Discharge Information System User's Manuals. Maps should be included only when they reflect modifications (terminations or startups, etc.) from previous years. The Monitoring Data Report shall consist of:

1 A cover sheet listing the site, facility, report period, contractor(s), and address.

2 A summary providing pertinent descriptive and interpretative information which would serve to explain any facets of the data which are not adequately described on the forms. (Classified effluent data should be submitted on separate forms.)

3 Maps, 8-1/2 x 11 inch, showing the locations of effluent streams and onsite discharge points.

4 Completed Radioactive Effluents/Onsite Discharges/Unplanned Releases Form, Form DOE F 5821.1, Attachment 15, unless submitted via the Secure Automatic Communications Network (SACNET) or directly to the computer operations.

(c) Unplanned releases of radioactivity in effluents, or that go offsite by spills, leaks, etc., which are reported according to Chapter I of this Order, and unplanned releases of radioactivity in onsite spills, leaks, etc., shall be reported to the Information System Branch, EG&G Idaho, Inc., on a separate Form DOE F 5821.1.

(6) Assure that, except for necessary emergency actions, the scene of any occurrence requiring or possibly requiring a Headquarters or field organization board investigation is not disturbed until the investigation board concurs that recovery or normal operations may be resumed.

(7) Assure that Headquarters and field investigation boards receive the necessary logistic and administrative support.

(8) Direct the preparation and release of public statements on occurrences, where deemed appropriate.

(9) Assure that all individuals under their jurisdiction are:

(a) Notified within 24 hours after receipt of exposure information of any radiation exposures that exceed the dose equivalent standards specified in Order DOE 5480.1, Chapter XI.

(b) Provided, upon written and signed request, with a summary of their reported occupational radiation exposures. Such report shall be furnished within 30 days from the time the request is made, or within 30 days after the exposure has been determined, whichever is later.

(10) Prepare an Annual Summary of Fire and Other Property Damage Experience Report and submit it to the Director, Operational and Environmental Safety Division on or before March 15 of each year.

(11) Determine when preoperational and environmental surveys are required to obtain background and baseline data in advance of start up of any new site or a new facility or process at an existing site; review and approve the preoperational survey program prior to its implementation; and review and approve the report of the survey results prior to start up of the new facility or site operation.

(12) Assure that the Department of Energy facilities and sites under their purview conduct the effluent and environmental monitoring and reporting programs in accordance with the requirements of this Order and as necessary to determine compliance with all applicable Federal, state, and local effluent standards and permit conditions and report to the local, state, and regional environmental protection agencies, the public and Department of Energy Headquarters on the status of such compliance.

CHAPTER V

CRITERIA FOR DETERMINING DEPARTMENT OF ENERGY PROPERTY VALUATION AND DEPARTMENT OF ENERGY LOSSES

1. DEPARTMENT OF ENERGY PROPERTY VALUATION.

   a. Include (for fire, property damage, and contamination accidents).

      (1) Approximate replacement value of all Department of Energy-owned buildings and equipment. The replacement value shall be calculated by applying to the original cost (or most recent appraised value) an appropriate cost index ratio (cost index data published by "Engineering News Record" shall be used.)

      (2) Cost of all Depatment of Energy-owned supplies.

      (3) Average inventory of all source and special nuclear materials.

   b. Exclude (for fire, property damage, and contamination accidents).

      (1) Land and land improvements, such as sidewalks, roads, etc.

      (2) Below-ground facilities not susceptible to damage by fire or explosion, such as major water mains, water ponds, etc., which are carried as separate capital accounts.

2. GUIDELINES GOVERNING LOSS ESTIMATION.

   a. Include.

      (1) All estimated or actual costs to restore Department of Energy property to preoccurrence conditions irrespective of whether this is done in fact. Where the occurrence involves property that has been lost, completely destroyed, or contaminated to a degree precluding economically justifiable recovery, estimates should be based on cost for actual replacement and installation of identical building equipment, devices, or materials (including nuclear materials). In the case of unused, obsolete, or excess buildings, equipment, or materials, the estimated market value at time of occurrence should be used.

      (2) Estimated cost for restoring to preoccurrence condition, without improvement, all partially lost or damaged Department of Energy property. Include cost for decontamination where required.

      (3) Estimated costs for reprocessing and reclaiming partially destroyed and damaged materials. Include damage resulting from firefighting, such as that caused by water and smoke.

h. Requestors of Radiation Exposure Information:

All requests for exposure information for individuals from the Department of Energy Records Repository should be directed to the Director, Operational and Environmental Safety Divison. Exposure information which identifies the individual will be disclosed only upon written authorization of the individual or his duly authorized representative pursuant to the Privacy Act of 1974 and the Freedom of Information Act. The release of summary statistical information reported in accordance with this Order is governed by Chapter 3101, "Public Information Program."

William S. Heffelfinger
Director of Administration

DOE F 5484.3
8-80
DOE 5484.1

U.S. DEPARTMENT OF ENERGY

Case or File No. 2601

Supplementary Record of Occupational Injuries and Illnesses

EMPLOYER

1. Name Columbia Construction
2. Mail address P. O. Box 3652 (No. and street) Hudson, (City or town) New York (State)
3. Location, if different from mail address _____

INJURED OR ILL EMPLOYEE

4. Name Ralph (First name) C. (Middle name) Lewis (Last name) Social Security No. 039-61-4179
5. Home address 16 Remsem Road (No. and street) Bingham, (City or town) New York (State)
6. Age 29 7. Sex: Male X Female _____ (Check one)
8. Occupation Machine Repair (Enter regular job title, *not* the specific activity he was performing at time of injury)
9. Department Crafts Services (Enter name of department or division in which the injured person is regularly employed, even though he may have been temporarily working in another department at the time of injury.)

THE ACCIDENT OR EXPOSURE TO OCCUPATIONAL ILLNESS

10. Place of accident or exposure Same as (2) (No. and street) (City or town) (State)

EXAMPLE

If accident or exposure occ[illegible] ad[illegible] of plant or establishment in which it occurred. Do not indica[illegible] [illegible]nt or establishment. If accident occurred outside employer's premises at an identifiable address, give that address. If it occurred on a public highway or at any other place which cannot be identified by number and street, please provide place references locating the place of injury as accurately as possible.

11. Was place of accident or exposure on employer's premises? Yes (Yes or No)
12. What was the employee doing when injured? Dismantling a Power Saw (Be specific. If he was using tools or equipment or handling material Using a socket wrench to remove a bolt name them and tell what he was doing with them.)
13. How did the accident occur? The wrench slipped and right thumb struck sharp (Describe fully the events which resulted in the injury or occupational illness. Tell what edge of saw. happened and how it happened. Name any object or substances involved and tell how they were involved. Give full details on all factors which led or contributed to the accident. Use separate sheet for additional space.)

OCCUPATIONAL INJURY OR OCCUPATIONAL ILLNESS

14. Describe the injury or illness in detail and indicate the part of body affected. Laceration of right (e.g.: amputation of right index finger thumb - 6 sutures required at second joint; fracture of ribs; lead poisoning; dermatitis of left hand, etc.)
15. Name the object or substance which directly injured the employee. (For example, the machine or thing he struck against or which struck him; the vapor or poison he inhaled or swallowed; the chemical or radiation which irritated his skin; or in cases of strains, hernias, etc., the thing he was lifting, pulling, etc.) Edge of saw
16. Date of injury or initial diagnosis of occupational illness 6/1/79 (Date)
17. Did employee die? No (Yes or No)

OTHER

18. Name and address of physician Dr. Rooney, Site Physician
19. If hospitalized, name and address of hospital Outpatient, Bingham Hospital Emergency Room

Date of report 7/6/79 Prepared by Y. McCamy
Official position Safety Auditor

(Complete reverse for lost workday cases.)

CHAPTER IV - ENVIRONMENTAL PROTECTION, SAFETY, AND HEALTH PROTECTION REPORTS

Page

1. General IV-1
2. Type C Investigation Reports IV-1
3. Quarterly Summaries and Other Reports IV-4
   a. Form EV-102A, Summary of Department of Energy and Department of Energy Contractor Occupational Injuries and Illnesses IV-4
   b. Form 5484.4, Tabulation of Property Damage Experience IV-4
   c. Form OSHA-200, Log of Occupational Injuries and Illnesses, and Form OSHA-100F, Log of Federal Occupational Injuries and Illnesses IV-4
   d. Reports of Occupational Exposure to Radiation for Department of Energy and Department of Energy Contractor Personnel Upon Termination of Employment IV-4
   e. Report of Radiation Exposures to Headquarters Employees IV-5
   f. Report of Radiation Exposures to Visitors IV-5
   g. Preoperational Environmental Survey Reports IV-5
   h. Aircraft Accident/Incident Reports IV-5
4. Annual Reports IV-6
   a. Annual Radiation Exposure Reports IV-6
   b. Annual Industrial Summary of Fire and Other Property Damage Experience (Suggested Format) IV-6
   c. Effluent and Environmental Monitoring Reports IV-9
5. Unusual Occurrence Reporting IV-10
   a. General IV-10
   b. Guidelines and Examples IV-10

CHAPTER V - CRITERIA FOR DETERMINING DEPARTMENT OF ENERGY PROPERTY VALUATION AND DEPARTMENT OF ENERGY LOSSES

1. Department of Energy Property Valuation V-1
   a. Include V-1
   b. Exclude V-1
2. Guidelines Governing Loss Estimation V-1
   a. Include V-1
   b. Exclude V-2
   c. Miscellaneous Guidelines V-2

DOE 5484.1
2-24-81

DOE 5484.1

U.S. DEPARTMENT OF ENERGY

TABULATION OF PROPERTY DAMAGE EXPERIENCE

REPORTING PERIOD From January 1, 1980 To March 31, 1980 NAME OF REPORTING UNIT Simpson Engineering

SECTION I TRANSPORTATION AND MOBILE EQUIPMENT OCCURRENCES

CATEGORY	NUMBER OF CONVEYANCES (this reporting period only) (1)	NUMBER OF OCCURRENCES		USAGE		RATE (6)	ESTIMATED LOSS (in dollars)			TOTAL COST PER 1,000 MILES (10)
		With Injury (2)	Total (3)	Miles of Travel (4)	Hours Operated (5)		Government (7)	Reimbursed and other (8)	Total (9)	
a. Contractor Operated Motor Vehicle	896	0	10	857,388		11.66	3070	150	3220	$3.76
b. Aircraft	1	0	0		223	0	0	0	0	
c. Marine	3	0	0		90	0	0	0	0	
d. Railroad	0	0	0	0		0	0	0	0	
OPERATED BY FEDERAL EMPLOYEES										
e. Government Motor Vehicle										
f. Private Motor Vehicle										
g. Materials Handling Equipment										

SECTION II – OTHER PROPERTY DAMAGE OCCURRENCES

CATEGORY	NUMBER OF OCCURRENCES (11)	ESTIMATED LOSS (in dollars)		
		Government (12)	Reimbursed and Other (13)	Total (14)
h. Electrical	0	0	0	0
i. Fire	1	750	0	750
j. Mechanical	0	0	0	0
k. Radiation/Nuclear	0	0	0	0
l. Explosion	0	0	0	0
m. Natural Causes	0	0	0	0
n. Miscellaneous	1	3,016	0	3,016

(15) Total amount of tort claims (under Federal Tort Claims Act)	$0.00
(16) Total amount of Government property damage (columns 7 and 12)	$6,836
(17) Government Property Evaluation (most recent estimate based on DOE 5484.1)	$397,900,000

SUBMITTED BY

Eugene B. Dunn

DATE

4/4/80

Attachment 2
Page 1

h. A single or annual accumulated whole-body exposure of an individual to 25 rem or more of radiation, a single exposure of the skin of the whole body of an individual to 75 rem or more of radiation, a single exposure of the forearms of an individual to 150 rem or more of radiation, or a single exposure of the hands or feet of any individual to 375 rem or more of radiation. (Type A investigation.)

i. Any internal uptake of radioactive material which on the basis of a small number of early assay data could result in a dose or dose commitment in excess of 5 times the pertinent annual standard set forth in the Chapter. For whole body dose, 5 rem is the pertinent annual standard. (Type A investigation.)

j. Any nuclear criticality achieved in a system not intended to reach criticality. (Type A investigation.)

k. Any release of radioactive material to controlled or uncontrolled areas in concentrations which, if averaged over a period of 24 hours, would exceed 5,000 times the respective concentration guides specified for such materials in the Order DOE 5480.1, Chapter XI "Standards for Radiation Protection." (Type B investigation.)

l. Any release of radioactive material offsite that could reasonably be expected to result in an annual dose or dose commitment to any member of the general population greater than the annual standards set forth in Order DOE 5480.1, Chapter XI, "Standards for Radiation Protection." (Type B investigation.)

m. Any occurrence which is likely to give rise to an inquiry by members of the public or press, if the field organization head involved considers the inquiry to be of sufficient importance to notify headquarters. (Level of investigation shall be determined by the head of the field organization.)

n. Any occurrence where a press release is made or where information is provided to the news media, other Federal agencies, or state or local authority, either by the field organization or a Department of Energy contractor. (Level of investigation shall be determined by the head of the field organization.)

o. Any radiological assistance occurrence. (Level of investigation shall be determined by the head of the field organization.)

p. Any request to an offsite authority for emergency assistance involving a nuclear operation. (Level of investigation shall be determined by the head of the field organization.)

q. Any discovery of significant radioactive or nonradioactive contamination in the onsite or offsite environment attributable to current or past Department of Energy operations.

INVESTIGATION REPORT OF MOTOR VEHICLE ACCIDENT

Please read the Privacy Act Statement at the bottom

1 DEPARTMENT OR AGENCY: Department of Energy

2 REPORTING UNIT (Name and location): Ledderly Services, Seconic River Plant

3 GENERAL LOCATION OF ACCIDENT (If accident was in the city, complete item 3a; if outside city limits, complete a, b, c and d):

4 EXACT TIME OF ACCIDENT

a CITY OR TOWN, COUNTY AND STATE: Seconic River Plant, Miles County, North Carolina

b MILES:

c DIRECTION:

d FROM CITY/TOWN (shown in a): ☐ LIMITS ☐ CENTER

e DATE (Day, Mo., Yr.): 8/19/80

b DAY OF THE WEEK: Wednesday

c HOUR: 4:00 a.m. / p.m.

5 EXACT LOCATION OF ACCIDENT

a ACCIDENT OCCURRED ON (Street name) (Highway): Road 5

b AT INTERSECTION (Street name, alley or highway identification) (Highway): Road 5 and Burlington RR Crossing

c NOT AT INTERSECTION: EXACT DISTANCE | DIRECTION | OF (Street or other identity) | AND EXACT DISTANCE | DIRECTION | OF (Street or other identity)

Mark 5b or c and complete appropriate information. Other identity could be nearest intersecting street, house number, power or telephone pole (give number), highway curve, bridge, railroad crossing, filling station, alley, driveway, culvert, guardrail, milepost, underpass, or other identifying landmark.

6 FEDERAL VEHICLE (Fed.) (Includes privately owned, Federally operated)

a YEAR: 1974

b MAKE: Ford

c BODY TYPE: Pick-up

d NO. OF PASSENGERS: 1

e KIND OF CARGO: None

f EXTENT OF CARGO DAMAGE (If none, so state): None

g REGISTRATION NUMBER: NME2-118

h PARTS OF VEHICLE DAMAGED AND NATURE OF DAMAGE: Hood, right fender, grill, windshield, bumper, radiator, and supports on front end. Damage $2065

i OPERATOR'S PERMIT (State and Number): N.C. 5142BD6

(Federal No.): 85019

j LIMITATION OF PERMIT: None

k TRAVELING DIRECTION: North

l STREET HIGHWAY ON WHICH VEHICLE WAS TRAVELING: Road 5

m TYPE PERMIT: ☒ OPERATOR ☐ TRUCK DRIVER ☐ CHAUFFEUR

n YEARS DRIVING EXPERIENCE: TOTAL 19; TYPE VEHICLE IN WHICH ACCIDENT OCCURRED 19

o NUMBER OF HOURS ON DUTY BEFORE ACCIDENT OCCURRED: 3

p DISTANCE DANGER WAS NOTICED: 20 ft

q ESTIMATED SPEED THEN: 40 mph

r ESTIMATED SPEED AT IMPACT: 40 mph

s LAWFUL SPEED: ft

t LAWFUL SPEED: 45 mph

u MAXIMUM SAFE SPEED: 45 mph

v DRIVER (Name): Donald Weaver

SEX: M

AGE: 42

w DRIVER'S ADDRESS: State Road 31, P. O. Box 39-F, Marshalltown, N. C.

EXAMPLE

7 OTHER VEHICLE (2)

a YEAR: 1978

b MAKE: Dodge

c BODY TYPE: 2 1/2 ton Pickup

d NO. OF PASSENGERS: 1

e KIND OF CARGO: None

f EXTENT OF CARGO DAMAGE (If none, so state): None

g REGISTRATION NUMBER: NME 39-25

h PARTS OF VEHICLE DAMAGED AND NATURE OF DAMAGE: None

i OPERATOR'S PERMIT (State and number): N.C. 4287CZ4

(Federal No.): 34658

j LIMITATION OF PERMIT: None

k TRAVELING DIRECTION: North

l STREET HIGHWAY ON WHICH VEHICLE WAS TRAVELING: Road 5

m TYPE PERMIT: ☒ OPERATOR ☐ TRUCK DRIVER ☐ CHAUFFEUR

n YEARS DRIVING EXPERIENCE: TOTAL 11; TYPE VEHICLE IN WHICH ACCIDENT OCCURRED 11

o NUMBER OF HOURS ON DUTY BEFORE ACCIDENT OCCURRED: 7 1/2

p DISTANCE DANGER WAS NOTICED: 0 ft

q ESTIMATED SPEED THEN: 30 mph

r ESTIMATED SPEED AT IMPACT: 30 mph

s LAWFUL SPEED: ft

t LAWFUL SPEED: 45 mph

u MAXIMUM SAFE SPEED: 45 mph

v DRIVER (Name): Lawrence Chambers

SEX: M

AGE: 31

w DRIVER'S ADDRESS: General Delivery, Scholesville, N. C.

8 WITNESSES (Name)

	Name	Address	Telephone No.	Location at time of accident
A	None			
B				

In compliance with the Privacy Act of 1974, the following information is provided:
Solicitation of the information requested on this form is authorized by Title 40 U.S.C. Section 491. Disclosure of the information by a Federal employee is mandatory as it is the first step in the Government's investigation of a motor vehicle accident. The principal purposes for which the information is intended to be used are to provide necessary data for use by legal counsel in legal actions resulting from the accident and to provide accident information/statistics for use in analyzing accident causes and developing methods of reducing accidents. Routine use of the information may be by Federal, State or local governments, or agencies, when relevant to civil, criminal, or regulatory investigations or prosecutions. An employee of a Federal agency who fails to report accurately a motor vehicle accident involving a Federal vehicle or who refuses to cooperate in the investigation of an accident may be subject to administrative sanctions.

g. Any unplanned nuclear excursion in a reactor, whether or not terminated by protective actions, which is clearly outside the routinely accepted and experienced bounds for that reactor. (Type B investigation.)

h. Any vehicle transporting radioactive material that is known by the shipper or the receiver to have been found on arrival at a Department of Energy or Department of Energy contractor facility to be contaminated in either the interior or exterior above the limits specified in Section 173.397, "Contamination Control," Department of Transportation Regulations, 49 CFR 173. (Level of investigation shall be determined by the head of the field organization.)

i. Any shipment of radioactive material that arrives at a Department of Energy contractor facility damaged to the extent that there is substantial reduction in the effectiveness of the package; from which radioactive contents are leaking or may have leaked; or contaminated above the limits specified in Section 173.397, "Contamination Control," Department of Transportation Regulations, 49 CFR 173. (Level of investigation shall be determined by the head of the field organization.

3. INFORMATION REQUIRED IN NOTIFICATIONS MADE IMMEDIATELY OR WITHIN 72 HOURS.

a. For immediate notifications, as soon as sufficient information is obtained to indicate the general nature and extent of the occurrence, the reporting official shall notify the Emergency Operations Center by telephone (301-353-5555 or FTS 233-5555). All calls on this emergency number are tape recorded. A confirming teletype shall be sent as soon as possible.

b. For the immediate notification confirmation and the 72 hour notification, a teletype shall be directed to the Director, Operational and Environmental Safety Division, with copies to the appropriate programmatic division director and to the Inspector General and the Director, Office of Public Affairs. If possible, the teletype shall state:

(1) Time, date, location, contractor, general nature of the occurrence, and its major consequences.

(2) Whether a press release has been issued or is contemplated.

(3) Whether known facts eliminate need for investigation by a Department of Energy board.

(4) Known significant details of the occurrence, the consequences, programmatic and public effects, injuries, property damage, action taken for emergency control and amelioration, status of actions to initiate investigation, and comments on possible causes of occurrence.

(5) If appropriate, the names and titles of proposed investigation board, advisors, and consultants.

21 DRIVER ACTIONS		
FED	2	Mark one for each driver
		a Making right turn
		b Making left turn
		c Making U turn
X	X	d Going straight ahead
	X	e Slowing down stopping
		f Overtaking passing
		g Forward from parking space
		h Backward from parking space
		i Other backing
		j Stopped in traffic lane
		k Other (Specify)

DRIVER'S ACTIONS Continued		
FED	2	Mark if applicable
		l Skidding
		m Avoiding vehicle object or pedestrian
		n Emerging from alley or driveway
		o Disabled vehicle parked
		p Gave warning (horn signal indicator)

22 VIOLATIONS		
FED	2	Mark one or more
		a Exceeding lawful speed
X		b Following too closely
		c Disregarded stop sign
		d Disregarded stop-go signal
		e Disregarded police officer

f OTHER IMPROPER ACTION Specify	
FED	
2	

23 POLICE ACTION (if any)

a CHARGE Federal vehicle. warning for following to close

b NAME OF PERSON CHARGED Don Weaver

c POLICE OFFICER'S NAME S. Noone

d BADGE NO 6217

e POLICE OFFICER'S DEPARTMENT SHP-Patrol

24 INDICATE ON THIS DIAGRAM HOW THE ACCIDENT HAPPENED

Use one of these outlines to sketch the scene. Write in street or highway names or numbers.

a Number Federal vehicle as 1, other vehicle as 2, additional vehicle as 3 and show direction of travel with arrow. Example

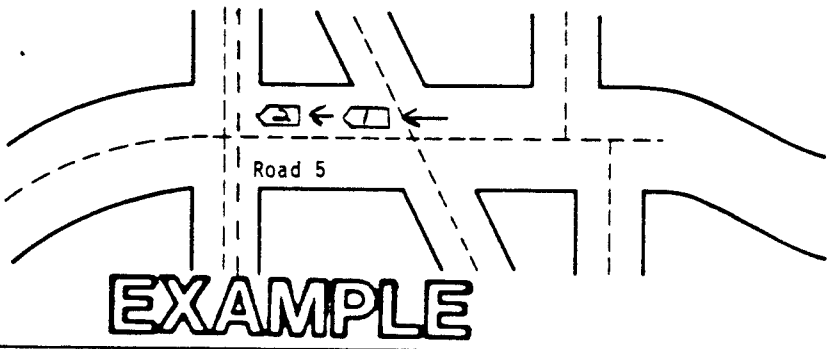
b Use solid line to show path before accident and broken line the accident

c Show pedestrian by

d Show railroad by

e Place arrow in this circle to indicate NORTH

Burlington RR Crossing



25 POINT OF IMPACT		
FED	2	Mark one for each vehicle
X		a Front
		b Right front
		c Left front
	X	d Rear
		e Right rear
		f Left rear
		g Right side
		h Left side

26 DESCRIBE WHAT HAPPENED Refer to vehicles as Fed and 2

As vehicle #2 slowed down for railroad crossing, Federal vehicle ran into rear of vehicle #2.

27 REVIEWING OFFICIAL'S STATEMENT The back of this form may be used for additional space to continue any item

a SHOW CONSEQUENCES OF ACCIDENT AFFECTING AGENCY PERSONNEL SHOWN IN ITEM 9 BY COMPLETING ITEMS BELOW

A	TYPE OF PERSONNEL ☐ MILITARY ☐ CIVILIAN	PROBABLE DISABILITY
	DATE STOPPED WORK	NATURE OF INJURY AND PART OF BODY
	DATE RESUMED WORK	
B	TYPE OF PERSONNEL	PROBABLE DISABILITY
	DATE STOPPED WORK	NATURE OF INJURY AND PART OF BODY
	DATE RESUMED WORK	

b REMARKS (If any)

REVIEWING OFFICIAL	SIGNATURE	TITLE (Military or civilian)	DATE
	Warren T. Scully	Safety Superintendent	8/21/80

DOE F 5484.5
8-80
DOE 5484.1

U.S. DEPARTMENT OF ENERGY

REPORT OF PROPERTY DAMAGE OR LOSS

Use form to report any accident causing loss (use and occupancy excepted) or damage to DOE-owned property in excess of amounts shown in section 4 below

1. GENERAL

a. FIELD ORGANIZATION
Department of Energy
Ashville, Kentucky

b. CONTRACTOR ACCOUNTABLE FOR PROPERTY (If subcontractor, also state contractor)
Martin Brothers

c. LOCATION OF ACCIDENT
L-463B South Warehouse

d. DATE OF ACCIDENT
7-23-80

e. TIME OF ACCIDENT
1908

2. TYPE OF ACTIVITY

- ☐ GOVERNMENT
- ☒ PRODUCTION
- ☐ RESEARCH
- ☐ SERVICES
- ☐ COST PLUS CONSTRUCTION
- ☐ LUMP SUM CONSTRUCTION
- ☐ ARCHITECT/ENGINEER

3. PERSONNEL EFFECTS

	DOE	OTHER
a. FATALITY	0	0
b. OCCUPATIONAL INJURY	0	0
c. OCCUPATIONAL ILLNESS	0	0

4. ACCIDENT TYPE

a. FIRE (Reactors excluded) INVOLVING LOSS OVER $1,000.
- 1. Building and Contents ☐
- 2. Brush and Forest ☐
- 3. Other (Specify) ☐

b. EXPLOSION (Reactors excluded) INVOLVING LOSS OVER $1,000
- 1. Air-flammable vapor (or gas) ☐
- 2. Chemical reaction ☐
- 3. Compressed fluids ☐
- 4. High explosives ☐
- 5. Dust ☐

c. NATURAL CAUSES INVOLVING LOSS OVER $1,000.
- 1. Wind, rain, flood or waves ☐
- 2. Lightning ☐
- 3. Earthquake ☐

d. ELECTRICAL FAULT OR FAILURE LOSS OVER $1,000 ☐

e. TRANSPORTATION LOSS OVER $1,000 (Cargo only, all causes) ☐

f. MECHANICALLY CAUSED DAMAGE LOSS OVER $1,000 ☐

g. RADIATION AND NUCLEAR ACCIDENTS LOSS OVER $1,000
- 1. Contamination (Spills, leaks, releases, etc.) ☐
- [illegible] (Reactors excluded) ☐
- [illegible] reactor
- [illegible] from inadequate cooling ☐
- b. Excursion (Damage from uncontrolled fission) ☐
- c. Radioactive material spill or leak ☐
- d. Nonradioactive material spill or leak ☐
- e. Fire ☐
- f. Other (Specify) ☐

h. OTHER (Specify)
Furnace liner melted

EXAMPLE

5. MONETARY DAMAGE OR LOSS BY ACCIDENT TYPE

ACCIDENT TYPE	TO DOE OWNED PROPERTY: From Contamination: In Building	From Contamination: Outside	From Fire	From Explosion	From Other	DOE Total	TO OTHER PUBLIC OR PRIVATE PROPERTY TOTAL
liner burnout					$34,642	$34,642	
TOTALS							

6. DESCRIPTION OF DAMAGE OR LOSS

1. Molten metal burned through refractory liner and electrical coils of induction furnace.

2. Damage to some instrumentation and power cables.

7. EFFECT ON PRODUCTION OR OPERATION CAPABILITY

None

(2) Investigation of Occurrences by a Field Organization. Investigations of occurrences required by the field organization shall be conducted by a Department of Energy board of investigation appointed by the head of the field organization, to consist entirely of Department of Energy personnel unless it is determined by the head of the field organization and the Director, Operational and Environmental Safety Division, that the facts concerning the occurrence are known and no Department of Energy board of investigation is necessary.

b. Type B Investigations - shall be conducted by a Department of Energy board appointed by the head of the field organization to consist of Department of Energy or contractor personnel or both, at the discretion of the field organization head. Standards for the appointment of the board, for conducting the investigation and for preparing the investigation report are in paragraph 2 below.

c. Type C Investigations - shall be conducted by Department of Energy contractor personnel when their operations are involved and by Department of Energy personnel when Federal operations are involved. Standards for these investigations beyond those in this part shall be established by the individual management.

d. Submission of Type A and Type B Investigation Reports.

(1) The investigation board shall submit the investigation report to the appointing official within the amount of time prescribed by that official. The investigation report shall be transmitted by a memorandum which contains, but is not limited to, the board's recommendations.

(2) The appointing official shall submit 4 copies of the investigation report to the Operational and Environmental Safety Division within 45 days, with one copy to the appropriate program division director. In addition, one copy of the Type A investigation report shall be submitted to the Assistant Secretary for Environment, and one copy to the Inspector General.

(3) If the investigation report cannot be submitted within 45 days, the Operational and Environmental Safety Division shall be notified as to the reason for the delay and the anticipated date of submission.

(4) Investigation reports shall be accompanied by a memorandum signed by the head of the reporting office which contains, but is not limited to, the actions taken, or to be taken, as a result of the findings.

QUALITY AND FORMAT FOR A TYPICAL ENVIRONMENTAL MONITORING REPORT

1. Quality of Report. The report shall be of the high quality typical of DOE and contractor technical and public reports (e.g., appropriate cover, printed text, quality 8-1/2 x 11" figures and maps, and professional editing).
2. Title Page. Include the name of site, facility, report period, address, and operating contractor.
3. Introduction. Provide a brief description of the site, the nature of its primary operations or activities, and a general discussion of environmental features and land and water use, including pertinent demographic information, that could be affected by site operations.
4. Summary. Provide a concise evaluation and interpretation of the monitoring data contained in the report in relation to applicable standards and requirements with explanation, as appropriate, of unusual incidents or releases. This section should include discussion of any abnormal occurrences, such as flooding, forest fires, fish kills, altered land use, etc., which could have resulted from or have some impact upon either the program activity or the site, and should be written in a manner understandable by the informed layman. Summarization of population dose estimates should be included.

(2) All members of Type A investigation boards shall be Department of Energy employees. Type B investigation boards may consist of Department of Energy employees, Department of Energy contractor employees, or both, at the discretion of the head of the field organization. Department of Energy employees appointed to a Type A investigation board, and Department of Energy and Department of Energy contractor employees appointed to a Type B investigation board shall work for, and report to, the appointing official during the investigation.

(3) At least one of the members of the board shall be a trained accident investigator.

(4) All competencies should be considered in appointing each board, including managerial, scientific, professional, and investigative.

(5) The use of necessary consultants or advisors who are experts in certain areas or who are familiar with the operations or management of the program involved in the occurrence is encouraged. These persons may be contractor personnel.

(6) A superior and his subordinate shall not serve on the same board.

(7) Employees directly related to the operation or activity involved in the occurrence shall not serve on a board.

b. The Investigation Report. The purpose of the investigation report is to convey in clear and concise language the results of the investigation (the facts surrounding the occurrence, the analysis of these facts, and the conclusions). The investigation report constitutes a record of the occurrence by which the investigation is measured as to thoroughness, accuracy, and objectivity, and to which reference may be made at a later date. In addition, any corrective actions directed by the appointing or the reviewing official will be based largely on the contents of the report.

(1) General. The investigation report shall consist of, but is not limited to, four sections: summary, facts, analysis, and conclusions.

(a) The summary is a brief account of the essential facts of the occurrence and the investigators' conclusions. The facts section consists of a recitation of the factual information determined in the course of the investigation. It should relate the "who, what, when, where, why, and how," of the occurrence. The analysis section of the report is based on the factual information developed and consists of the reasoning of the investigators which support the conclusions. The conclusions section consists of the findings, the probable causes of and contributing factors to the occurrence, and the judgments of needs.

QUALITY AND FORMAT OF A TYPICAL ENVIRONMENTAL SUMMARY

1. Quality of Report. The report shall be of high quality typical of DOE and contractor technical and public reports, and be suitable for publication by the Operational and Environmental Safety Division.
2. Title Page. Include the name of the site, facility, report period, address, and operating contractor.
3. Summary. Provide a concise evaluation and interpretation of the data included in the body of the Summary in relation to applicable standards and requirements.
4. Body of the Summary. Include a discussion of those topics listed in Chapter III of this Order as well as any other topics of relevant interest.
5. References. List and explain as appropriate the applicable standards cited in the body of the report.
6. Distribution. Include a listing of those persons or organizations receiving copies of the environmental summary.

I. **Log and Summary of Occupational Injuries and Illnesses**

Each employer who is subject to the recordkeeping requirements of the Occupational Safety and Health Act of 1970 must maintain for each establishment a log of all recordable occupational injuries and illnesses. This form (OSHA No. 200) may be used for that purpose. A substitute for the OSHA No. 200 is acceptable if it is as detailed, easily readable, and understandable as the OSHA No. 200.

Enter each recordable case on the log within six (6) workdays after learning of its occurrence. Although other records must be maintained at the establishment to which they refer, it is possible to prepare and maintain the log at another location, using data processing equipment if desired. If the log is prepared elsewhere, a copy updated to within 45 calendar days must be present at all times in the establishment.

Logs must be maintained and retained for five (5) years following the end of the calendar year to which they relate. Logs must be available (normally at the establishment) for inspection and copying by representatives of the Department of Labor, or the Department of Health, Education and Welfare, or States accorded jurisdiction under the Act.

II. **Changes in Extent of or Outcome of Injury or Illness**

If, during the 5-year period the log must be retained, there is a change in an extent and outcome of an injury or illness which affects entries in columns 1, 2, 6, 8, 9, or 13, the first entry should be lined out and a new entry made. For example, if an injured employee at first required only medical treatment but later lost workdays away from work, the check in column 6 should be lined out, and checks entered in columns 2 and 3 and the number of lost workdays entered in column 4.

In another example, if an employee with an occupational illness lost workdays, returned to work, and then died of the illness, the entries in columns 9 and 10 should be lined out and the date of death entered in column 8.

The entire entry for an injury or illness should be lined out if later found to be nonrecordable. For example, an injury or illness which is later determined not to be work related, or which was initially thought to involve medical treatment but later was determined to have involved only first aid.

III. **Posting Requirements**

A copy of the totals and information following the fold line of the last page for the year must be posted at each establishment in the place or places where notices to employees are customarily posted. This copy must be posted no later than *February 1 and must remain in place until March 1.*

Even though there were no injuries or illnesses during the year, zeros must be entered on the totals line, and the form posted.

The person responsible for the *annual summary totals* shall certify that the totals are true and complete by signing at the bottom of the form.

IV. **Instructions for Completing Log and Summary of Occupational Injuries and Illnesses**

Column A - **CASE OR FILE NUMBER.** Self-explanatory.

Column B - **DATE OF INJURY OR ONSET OF ILLNESS.**
For occupational injuries, enter the date of the work accident which resulted in injury. For occupational illnesses, enter the date of initial diagnosis of illness, or, if absence from work occurred before diagnosis, enter the first day of the absence attributable to the illness which was later diagnosed or recognized.

Columns C through F - Self explanatory.

Columns 1 and 8 - **INJURY OR ILLNESS RELATED DEATHS.** Self-explanatory.

Columns 2 and 9 - **INJURIES OR ILLNESSES WITH LOST WORKDAYS.** Self-explanatory.

Any injury which involves days away from work, or days of restricted work activity, or both must be recorded since it always involves one or more of the criteria for recordability.

Columns 3 and 10 - **INJURIES OR ILLNESSES INVOLVING DAYS AWAY FROM WORK.** Self-explanatory.

Columns 4 and 11 - **LOST WORKDAYS--DAYS AWAY FROM WORK.**
Enter the number of workdays (consecutive or not) on which the employee would have worked but could not because of occupational injury or illness. The number of lost workdays should not include the day of injury or onset of illness or any days on which the employee would not have worked even though able to work.
NOTE: For employees not having a regularly scheduled shift, such as certain truck drivers, construction workers, farm labor, casual labor, part time employees, etc., it may be necessary to estimate the number of lost workdays. Estimates of lost workdays shall be based on prior work history of the employee AND days worked by employees, not ill or injured, working in the department and/or occupation of the ill or injured employee.

Columns 5 and 12 - **LOST WORKDAYS--DAYS OF RESTRICTED WORK ACTIVITY.**
Enter the number of workdays (consecutive or not) on which because of injury or illness:
(1) the employee was assigned to another job on a temporary basis, or
(2) the employee worked at a permanent job less than full time, or
(3) the employee worked at a permanently assigned job but could not perform all duties normally connected with it.

The number of lost workdays should not include the day of injury or onset of illness or any days on which the employee would not have worked even though able to work.

Columns 6 and 13 - **INJURIES OR ILLNESSES WITHOUT LOST WORKDAYS.** Self-explanatory.

Columns 7a through 7g - **TYPE OF ILLNESS.**
Enter a check in only *one* column for each illness.

TERMINATION OR PERMANENT TRANSFER.—Place an asterisk to the right of the entry in columns 7a through 7g (type of illness) which represented a termination of employment or permanent transfer.

V. **Totals**

Add number of entries in columns 1 and 8.
Add number of checks in columns 2, 3, 6, 7, 9, 10 and 13.
Add number of days in columns 4, 5, 11, and 12.
Totals are to be generated for each column at the end of each page and at the end of each year. *Only* the yearly totals are required for posting.

If an employee's loss of workdays is continuing at the time the totals are summarized, estimate the number of future workdays the employee will lose and add that estimate to the workdays already lost and include this figure in the annual totals. No further entries are to be made with respect to such cases in the next year's log.

VI. **Definitions**

OCCUPATIONAL INJURY is any injury such as a cut, fracture, sprain, amputation, etc., which results from a work accident or from an exposure involving a single incident in the work environment.
NOTE: Conditions resulting from animal bites, such as insect or snake bites or from one time exposure to chemicals, are considered to be injuries.

OCCUPATIONAL ILLNESS of an employee is any abnormal condition or disorder, other than one resulting from an occupational injury, caused by exposure to environmental factors associated with employment. It includes acute and chronic illnesses or diseases which may be caused by inhalation, absorption, ingestion, or direct contact.

The following listing gives the categories of occupational illnesses and disorders that will be utilized for the purpose of classifying recordable illnesses. For purposes of information, examples of each category are given. These are typical examples, however, and are not to be considered the complete listing of the types of illnesses and disorders that are to be counted under each category.

7a **Occupational Skin Diseases or Disorders**
Examples: Contact dermatitis, eczema, or rash caused by primary irritants and sensitizers or poisonous plants, oil acne, chrome ulcers, chemical burns or inflammations, etc.

7b **Dust Diseases of the Lungs (Pneumoconiosis)**
Examples: Silicosis, asbestosis, coal worker's pneumoconiosis, byssinosis, siderosis, and other pneumoconioses.

7c **Respiratory Conditions Due to Toxic Agents**
Examples: Pneumonitis, pharyngitis, rhinitis or acute congestion due to chemicals, dusts, gases, or fumes; farmer's lung, etc.

7d **Poisoning (Systemic Effect of Toxic Materials)**
Examples: Poisoning by lead, mercury, cadmium, arsenic, or other metals; poisoning by carbon monoxide, hydrogen sulfide, or other gases; poisoning by benzol, carbon tetrachloride, or other organic solvents; poisoning by insecticide sprays such as parathion, lead arsenate; poisoning by other chemicals such as formaldehyde, plastics, and resins, etc.

7e **Disorders Due to Physical Agents (Other than Toxic Materials)**
Examples: Heatstroke, sunstroke, heat exhaustion, and other effects of environmental heat; freezing, frostbite, and effects of exposure to low temperatures; caisson disease; effects of ionizing radiation (isotopes, X-rays, radium); effects of nonionizing radiation (welding flash, ultraviolet rays, microwaves, sunburn); etc.

7f **Disorders Associated With Repeated Trauma**
Examples: Noise-induced hearing loss; synovitis, tenosynovitis and bursitis; Raynaud's phenomena; and other conditions due to repeated motion, vibration, or pressure.

7g **All Other Occupational Illnesses**
Examples: Anthrax, brucellosis, infectious hepatitis, malignant and benign tumors; food poisoning; histoplasmosis; coccidioidomycosis; etc.

MEDICAL TREATMENT includes treatment (other than first aid) administered by a physician or by registered professional personnel under the standing orders of a physician. Medical treatment does NOT include first aid treatment (one-time treatment and subsequent observation of minor scratches, cuts, burns, splinters, and so forth, which do not ordinarily require medical care) even though provided by a physician or registered professional personnel.

ESTABLISHMENT: A single physical location where business is conducted or where services or industrial operations are performed (for example: a factory, mill, store, hotel, restaurant, movie theater, farm, ranch, bank, sales office, warehouse, or central administrative office). Where distinctly separate activities are performed at a single physical location—such as construction activities operated from the same physical location as a lumber yard—each activity shall be treated as a separate establishment.

For firms engaged in activities which may be physically dispersed—such as agriculture, construction, transportation, communications, and electric, gas, and sanitary services—records may be maintained at a place to which employees report each day.

Records for personnel who do not primarily report or work at a single establishment, such as traveling salesmen, technicians, engineers, etc., shall be maintained at the location from which they are paid or the base from which personnel operate to carry out their activities.

WORK ENVIRONMENT is composed of the physical location, equipment, materials processed or used, and the kinds of operations performed in the course of an employee's work, whether on or off the employer's premises.

Bureau of Labor Statistics
Log and Summary of Occupational
Injuries and Illnesses

U.S. Department of Labor

For Calendar Year 19 80 — Page 1 of 1

NOTE: This form is required by Public Law 91-596 and must be kept in the establishment for 5 years. Failure to maintain and post can result in the assessment of citations and assessment of penalties. *(See posting requirements on the other side of form.)*

RECORDABLE CASES: You are required to record information about every recordable fatal death, every nonfatal occupational illness, and those nonfatal occupational injuries which involve one or more of the following: loss of consciousness, restriction of work or motion, transfer to another job, or medical treatment (other than first aid). *(See definitions on the other side of form.)*

Company Name: Simpson Engineering Company
Establishment Name: Medical Research Institute
Establishment Address: 1732 Research Drive, Livermore, California 94550

Form Approved O.M.B. No. 44R-1057

Case or File Number (A)	Date of Injury or Onset of Illness (B)	Employee's Name (C)	Occupation (D)	Department (E)	Description of Injury or Illness (F)	Extent of and Outcome of INJURY: Fatalities — Enter DATE of death (1)	Nonfatal Injuries: Injuries With Lost Workdays — Enter a CHECK if injury involves days away from work or days of restricted work activity or both (2)	Enter a CHECK if injury involves only days away from work (3)	Enter number of DAYS away from work (4)	Enter number of DAYS of restricted work activity (5)	Injuries Without Lost Workdays — Enter a CHECK if no entry was made in col. 2 but the injury is recordable as defined above (6)
					PREVIOUS PAGE TOTALS →						
CF-1	1/10/80	E. L. Bagley	Bus Driver	Transportation	Right lumbo sacral strain	-	✓	✓	9	0	-
CF-2	1/12/80	A. S. LaGrange	Nurse	Medical	Abrasion left knee, swollen right ankle, tender with movement	-	✓	✓	1		-
CF-3	1/14/80	C. W. Fowler	Laborer	Maintenance	Pain lumbo sacral neck	-	✓	✓			-
CF-4	1/17/80	B. R. Collier	Bus Driver	Transportation	Bruised right shin and knee, knee swollen, pain in back	-	-		-		✓
CF-5	1/21/80	J. W. Thomas	Cook	Service	1st - 2nd degree burns, right forearm	-	-		-		✓
CF-6	2/1/80	C. B. Tilden	Service Station Attendant	Transportation	Pain in right shoulder	-			0	2	-
CF-7	2/3/80	F. W. Palmateer	Cook	Service	Deep laceration, left arm			-	-	-	✓
CF-8	2/22/80	T. L. Carson	Painter,	Maintenance	Lower lumbar pain		✓	✓	3	2	-
CF-9	3/10/80	B. A. Turner	Equipment Operator	Production	Muscle spasm, right shoulder	-	✓	-	0	1	-
CF-10	3/17/80	R. S. Story	Bus Driver	Transportation	Sprained right ankle	-	✓	✓	4	0	-
CF-11	4/26/80	C. C. Knowles	Mechanic	Maintenance	1 1/4" laceration, third finger left hand	-	-	-	-	-	✓
CF-12	6/23/80	S. L. Conway	Bus Driver	Transportation	Pain in lumbo sacral arm, extending down left leg	-	✓	✓	13	36	-
					TOTALS (Instructions on other side of form.) →	0	8	6	33	44	4

Type, Extent of and Outcome of ILLNESS — CHECK Only One Column for Each Illness (See other side of form for examples or permanent cases.)

Case or File Number (A)	Occupational skin diseases or disorders (a)	Dust diseases of the lungs (b)	Respiratory conditions due to toxic agents (c)	Poisoning, systemic effects of toxic materials (d)	Disorders due to physical agents (e)	Disorders associated with repeated trauma (f)	All other occupational illnesses (g)	Fatalities — Illness Filed — Enter DATE of death (8)	Nonfatal Illnesses: Illnesses With Lost Workdays — Enter a CHECK if illness involves days away from work or days of restricted work activity or both (9)	Enter a CHECK if illness involves only days away from work (10)	Enter number of DAYS away from work (11)	Enter number of DAYS of restricted work activity (12)	Illnesses Without Lost Workdays — Enter a CHECK if no entry was made in col. 9 or 9 (13)
CF-1													
CF-2													
CF-3													
CF-4													
CF-5													
CF-6													
CF-7													
CF-8													
CF-9													
CF-10													
CF-11													
CF-12													

EXAMPLE

Certification of Annual Summary Totals By: Ben Curtin — Title: Safety Engineer — Date: 6/30/80

OSHA No. 200

POST ONLY THIS PORTION OF THE LAST PAGE NO LATER THAN FEBRUARY 1

SUMMARY OF OCCUPATIONAL INJURIES AND ILLNESSES
DOE Form EV-102 A

APPLICATION. This form is to be completed as required by all organizational units (DOE Federal Government facilities) and by all DOE contractors. For contractors with 25 or fewer employees, the organizational unit may designate whether to submit separate forms for each, or a single combined form for all such contractors. If a combined form is submitted, all of the combined contractors must have the same type of operation and the number of contractors involved should be stated in the space where the contractor's name is usually placed. The contract number is not filled in for a combined report.

ATTACHMENTS. Copies of all DOE EV-101 forms for the current reporting period must be attached to the DOE Form EV-102 A when it is submitted.

CORRECTIONS. Explanations of corrections to previous submittals of this form should be made on a separate sheet of plain paper and included with the DOE form which reflects those changes in the year-to-date totals line (code 32).

REPORTING PERIOD. Fill in the dates of the reporting period for which all data on the form applies (except the code 32 line and the cumulative man-hours, which are assumed to start from January 1).

TYPE OF OPERATION: Check the appropriate box if the submission is for a single reporting unit. This section may be left blank for a combined report of Government and Contractor Units.

TYPE OF REPORT. Check the box for a single reporting unit only if the form is for a single contractor or a single DOE Federal Government facility. The combined box for all government and contractor units should be checked if the form is for an organizational unit(s) and its contractors. The last box may be used if the form is for a combined report of all contractors with 25 or fewer employees.

DEFINITIONS. For definitions of terms used in this form's injury/illness section, see the back of form OSHA No. 100.

POSTING REQUIREMENTS. A copy or copies of the calendar year summary must be posted at each establishment (organizational unit or contractor) in the place or places where notices to employees are customarily posted. This summary must be posted no later than February 1 and must remain in place until March 1.

INSTRUCTIONS for completing this form. All entries must be summarized from the log (OSHA No. 100) or its equivalent. Before preparing this summary, review the log to be sure that entries are correct and each case is included in only one of the following classes: deaths (date in column 8), lost workday cases (check in column 9), or nonfatal cases without lost workdays (check in column 10). If an employee's loss of workdays is continuing at the time the summary is being made, estimate the number of future workdays he will lose and add that estimate to the workdays he has already lost and include this total in the summary. No further entries are to be made with respect to such cases in the next year's summary.

Occupational injuries and the seven categories of occupational illnesses are to be summarized separately. Identify each case by the code in column 7 of the log of occupational injuries and illnesses.

The summary from the log is made as follows:

BE SURE TO COUNT ONLY THOSE CASES FROM THE LOG WHICH ARE FOR THE CURRENT REPORTING PERIOD.

A. For occupational injuries (identified by a code 10 in column 7 of the log form) make entries on the line for code 10 of this form:

Column 1—Total Cases. Count the number of entries which have a code 10 in column 7 of the log. Enter this total in column 1 of this form. This is the total of occupational injuries for the year.
Column 2—Deaths. Count the number of entries (date of death) for occupational injuries in column 8 of the log.
Column 3—Total Lost Workday Cases. Count the number of checks for occupational injuries in column 9 of the log.
Column 4—Cases Involving Days Away From Work. Count the number of entries for occupational injuries in column 9A of the log.
Column 5—Days Away From Work. Add the entries (total days away) for occupational injuries in column 9A of the log.
Column 6—Days of Restricted Work Activity. Add the entries (total of such days) for occupational injuries in column 9B of the log.
Column 7—Nonfatal Cases Without Lost Workdays. Count the number of checks for occupational injuries in column 10 of the log.
Column 8—Terminations or Permanent Transfers. Count the number of checks for occupational injuries in column 11 of the log.

CHECK: If the totals for code 10 have been entered correctly, the sum of columns 2,3, and 7 of this form will equal the number entered in column 1 of this form.

B. Follow the same procedure for each illness code, entering the totals on the appropriate line of this form.

C. Add the entries of codes 21 through 29 in each column for occupational illnesses and enter totals on the line for code 30.

D. Add the entries for codes 10 and 30 in each column and enter totals on the line for code 31.

E. Add together code 31 line entries from this summary and the previous reporting period summary (unless this is the first summary for the year) and enter the totals on the line for code 32.

CHECK: If the summary has been made correctly, the entry in column 1 of the year-to-date total line (code 32) of this form will equal the total number of cases on the log for all reporting periods this year.

F. For combined reports of more than one unit, add together the individual DOE EV-102 A forms submitted by each unit to obtain the figures for the combined form.

ON THE LINES PROVIDED, enter the average number of employees and the total man-hours worked for this reporting period as well as the cumulative man-hours worked for the year.

The person responsible for the preparation of the summary shall certify that it is true and complete by signing the statement on the form.

DOE Form EV-102A
(11-77)

U.S. DEPARTMENT OF ENERGY

SUMMARY OF DOE AND DOE CONTRACTOR OCCUPATIONAL INJURIES AND ILLNESSES

REPORT PERIOD: FROM January 1, 1980 TO March 31, 1980

1. ORGANIZATIONAL UNIT:
Department of Energy
Northern California Operations Office

2. ADDRESS OF REPORTING UNIT:
Simpson Engineering Company
P. O. Box 919
Livermore, CA 94550

3. CONTRACTOR: Simpson Engineering Company

4. CONTRACT NO.: 56477 ENG 60

5. TYPE OF OPERATION:
- [ ] Government
- [ ] Production
- [X] Research
- [ ] Services
- [ ] Cost-Plus Construction
- [ ] Lump-Sum Construction
- [X] Architect-Engineering

6. TYPE OF REPORT:
- [X] Single Reporting Unit
- [ ] Combined, all Government and Contractor Units
- [ ] Combined, all Contractor Units (same type of operation) With 25 or Fewer Employees

INJURY AND ILLNESS CATEGORY		TOTAL CASES	DEATHS	LOST WORKDAY CASES				NONFATAL CASES WITHOUT LOST WORKDAYS	TERMINATIONS OR PERMANENT TRANSFERS
				Total Lost Workday Cases	Cases Involving Days Away From Work	Days Away From Work	Days of Restricted Work Activity		
CATEGORY	CODE	Number of entries in col. 7 of the log (1)	Number of entries in col. 8 of the log (2)	Number of checks in col. 9 of the log (3)	Number of entries in col. 9A of the log (4)	Sum of entries in col. 9A of the log (5)	Sum of entries in col. 9B of the log (6)	Number of checks in col. 10 of the log (7)	Number of checks in col. 11 of the log (8)
OCCUPATIONAL INJURIES	10	53	0	27	20	73	154	26	0
OCCUPATIONAL ILLNESSES: Occupational Skin Diseases or Disorders	21	2	0	0	0	0	0	2	0
Dust Diseases of the Lungs	22								
Respiratory Conditions Due to Toxic Agents	23								
Poisoning (Systemic Effects of Toxic Materials)	24								
Disorders Due To Physical Agents	25								
Disorders Associated with Repeated Trauma	26								
All Other Occupational Illnesses	29								
TOTAL – OCCUPATIONAL ILLNESSES (*Sum of codes 21 through 29*)	30	2	0	0	0	0	0	2	0
TOTAL (Sum of code 10 & code 30) OCCUPATIONAL INJURIES AND ILLNESSES – REPORTING PERIOD	31	55	0	27	20	73	154	28	0
TOTAL (Sum of code 10 & code 30) OCCUPATIONAL INJURIES AND ILLNESSES – YEAR-TO-DATE	32	55	0	27	20	73	154	28	0

EXAMPLE

(For this reporting period only)

AVERAGE NUMBER OF EMPLOYEES FOR THIS REPORTING PERIOD	6,810
TOTAL MAN-HOURS WORKED FOR THIS REPORTING PERIOD	2,890,362
CUMULATIVE MAN-HOURS WORKED (*Year-to-date*)	2,890,362

I certify that the Summary of DOE and DOE Contractor Occupational Injuries and Illnesses is true and complete to the best of my knowledge.

(Signature) Eugene B. Dunn

(Title & Date) Safety Engineer 4/4/80

DEFINITIONS OF TERMS FOR USE IN RECORDING FEDERAL OCCUPATIONAL INJURIES AND ILLNESSES

OCCUPATIONAL INJURY is any injury such as a cut, fracture, sprain, amputation, etc., which results from a work accident or from exposure in the work environment.

OCCUPATIONAL ILLNESS of an employee is any abnormal condition or disorder, other than one resulting from an occupational injury, caused by exposure to environmental factors associated with his employment. It includes acute and chronic illnesses or diseases which may be caused by inhalation, absorption, ingestion, or direct contact, and which can be included in the categories listed below.

The following listing gives the categories of occupational illnesses and disorders that will be utilized for the purpose of classifying recordable illnesses. The identifying codes are those to be used in Column 7 of the log. For purposes of information, examples of each category are given. These are typical examples, however, and are not to be considered to be the complete listing of the types of illnesses and disorders that are to be counted under each category.

(21) Occupational Skin Diseases or Disorders
Examples: Contact dermatitis, eczema, or rash caused by primary irritants and sensitizers or poisonous plants; oil acne, chrome ulcers; chemical burns or inflammations; etc.

(22) Dust Diseases of the Lungs (Pneumoconioses)
Examples: Silicosis, asbestosis, coal worker's pneumoconiosis, byssinosis, and other pneumoconioses.

(23) Respiratory Conditions Due to Toxic Agents
Examples: Pneumonitis, pharyngitis, rhinitis or acute congestion due to chemicals, dusts, gases, or fumes; farmer's lung, etc.

(24) Poisoning (Systemic Effects of Toxic Materials)
Examples: Poisoning by lead, mercury, cadmium, arsenic, or other metals, poisoning by carbon monoxide, hydrogen sulfide or other gases, poisoning by benzol, carbon tetrachloride, or other organic solvents; poisoning by insecticide sprays such as parathion, lead arsenate, poisoning by other chemicals such as formaldehyde, plastics and resins, etc.

(25) Disorders Due to Physical Agents (Other Than Toxic Materials)
Examples: Heatstroke, sunstroke, heat exhaustion and other effects of environmental heat; freezing, frostbite and effects of exposure to low temperatures; caisson disease; effects of ionizing radiation (isotopes, X rays, radium); effects of nonionizing radiation (welding flash, ultraviolet rays, microwaves, sunburn), etc.

(26) Disorders Due to Repeated Trauma
Examples: Noise-induced hearing loss; synovitis, tenosynovitis, and bursitis, Raynaud's phenomena; and other conditions due to repeated motion, vibration or pressure.

(29) All Other Occupational Illnesses
Examples: Anthrax, brucellosis, infectious hepatitis, malignant and benign tumors, food poisoning, histoplasmosis, coccidioidomycosis, etc.

RECORDABLE OCCUPATIONAL INJURIES AND ILLNESSES are any occupational injuries or illnesses which result in:

1) FATALITIES, regardless of the time between the injury and death, or the length of the illness; or
2) LOST WORKDAYS CASES, other than fatalities that result in lost workdays; or
3) NONFATAL CASES WITHOUT LOST WORKDAYS, which result in transfer to another job or termination of employment, or require medical treatment (as defined below), or involve loss of consciousness or restriction of work or motion. This category also includes any diagnosed occupational illnesses which are reported to the Agency but are not classified as fatalities or lost workday cases.

MEDICAL TREATMENT includes treatment administered by a physician or by registered professional personnel under the standing orders of a physician. Medical treatment does NOT include first aid treatment (one-time treatment and subsequent observation of minor scratches, cuts, burns, splinters, and so forth, which do not ordinarily require medical care) even though provided by a physician or registered professional personnel.

ESTABLISHMENT: A single physical location where business is conducted or where services or industrial operations are performed. (For example: warehouse, or central administrative office.) Where distinctly separate activities are performed at a single physical location (such as contract construction activities operated from the same physical location as a lumber yard), each activity shall be treated as a separate establishment.

Agencies engaged in activities such as agriculture, construction, transportation, communications, and electric, gas and sanitary services, which may be physically dispersed, records may be maintained at a place to which employees report each day.

Records for personnel who do not primarily report to work at a single establishment, such as traveling technicians, engineers, etc., shall be maintained at the location from which they are paid or the base from which personnel operate to carry out their activities.

WORK ENVIRONMENT is comprised of the physical location, equipment, materials processed or used, and the kinds of operations performed by an employee in the performance of his work, whether on or off the Agency's premises.

INSTRUCTIONS FOR COMPLETING LOG OF FEDERAL OCCUPATIONAL INJURIES AND ILLNESSES (OSHA FORM NO. 100F)

Column 1 – CASE OR FILE NUMBER
Any number may be entered which will facilitate comparison with supplementary records.

Column 2 – DATE OF INJURY OR ILLNESS
For occupational injuries enter the date of the work accident which resulted in injury. For occupational illnesses enter the date of initial diagnosis of illness, or, if absence occurred before diagnosis, the first day of the absence in connection with which the case was diagnosed.

Column 3 – EMPLOYEE'S NAME

Column 4 – OCCUPATION

Enter the occupational title of the job to which the employee was assigned at the time of injury or illness. In the absence of a formal occupational title, enter a brief description of the duties of the employee.

Column 5 – DEPARTMENT
Enter the name of the department to which employee was assigned at the time of injury or illness, whether or not employee was actually working in that department at the time. In the absence of formal department titles, enter a brief description of normal workplace to which employee is assigned.

Column 6 – NATURE OF INJURY OR ILLNESS AND PART(S) OF BODY AFFECTED
Enter a brief description of the injury or illness and indicate the part or parts of body affected. Where entire body is affected, the entry "body" can be used.

Column 7 – INJURY OR ILLNESS CODE
Enter the one code which most accurately describes the nature of injury or illness. A list of codes appears at the bottom of the log. A more complete description of occupational injuries and illnesses appears below in "definitions."

Column 8 – FATALITIES
If the occupational injury or illness resulted in death, enter date of death.

Column 9 – LOST WORKDAY CASES
Enter a check for each case which involves days away from work, or days of restricted work activity, or both. Each lost workday case also requires an entry in column 9A or column 9B, or both.

Column 9A – LOST WORKDAYS – DAYS AWAY FROM WORK
Enter the number of workdays (consecutive or not) on which the employee would have worked but could not because of occupational injury or illness. The number of lost workdays should not include the day of injury or onset of illness or any days on which the employee would not have worked even though able to work.

NOTE: For employees not having a regularly scheduled shift, i.e., certain truck drivers, construction workers, part time employees, etc., it may be necessary to estimate the number of lost workdays. Estimates of lost workdays shall be based on prior work history of the employee and days worked by employees, not ill or injured, working in the department and or occupation of the ill or injured employee.

Column 9B – LOST WORKDAYS – DAYS OF RESTRICTED WORK ACTIVITY
Enter the number of workdays (consecutive or not) on which because of injury or illness:
1) the employee was assigned to another job on a temporary basis,
2) the employee worked at a permanent job less than full time, or
3) the employee worked at a permanently assigned job but could not perform all duties normally connected with it.

The number of lost workdays should not include the day of injury or onset of illness or any days on which the employee would not have worked even though able to work.

Column 10 – NONFATAL CASES WITHOUT LOST WORKDAYS
Enter a check in Column 10 for all cases of occupational injury or illness, which did not involve fatalities or lost workdays but did result in:
- Transfer to another job or termination of employment, or
- Medical treatment, other than first aid, or
- Diagnosis of occupational illness, or
- Loss of consciousness, or
- Restriction of work or motion.

Column 11 – TRANSFER TO ANOTHER JOB OR TERMINATION OF EMPLOYMENT WITHOUT LOST WORKDAYS
If the check in Column 10 represented a transfer to another job or termination of employment with no lost workdays, enter another check in Column 11.

INITIALING REQUIREMENT
Each line entry regarding an occupational injury or illness must be initialed in the right hand margin by the person responsible for the accuracy of the entry. Changes in an entry also must be initialed in the affected column.

CHANGES IN EXTENT OF OR OUTCOME OF INJURY OR ILLNESS
If there is a change in an occupational injury or illness case which affects entries in Columns 9, 10, or 11, the first entry should be lined out and a new entry made. For example, if an injured employee at first required only medical treatment but later lost workdays, the check in Column 10 should be lined out and the number of lost workdays entered in Column 9.

In another example, if an employee with an occupational illness lost workdays, returned to work, and then died of the illness, the workdays noted in Column 9 should be lined out and the date of death entered in Column 8.

An entry may be lined out if later found to be a nonoccupational injury or illness.

OSHA NO. 100F
JAN. 1, 1976

LOG OF FEDERAL OCCUPATIONAL INJURIES AND ILLNESSES

This is the separate log for Civilian Personnel [X], Military (Non combat) Personnel [ ]

RECORDABLE CASES: You are required to record information about: every occupational death, every nonfatal occupational illness, and those nonfatal occupational injuries which involve one or more of the following: loss of workdays, loss of consciousness, restriction of work or motion, transfer to another job, or medical treatment (other than first aid).
More complete definitions appear on the other side of this form.

CASE OR FILE NUMBER (1)	DATE OF INJURY OR ONSET OF ILLNESS Mo./day/yr. (2)	EMPLOYEE'S NAME (First name or initial, middle initial, last name) (3)	OCCUPATION (Enter regular job title, not activity employee was performing when injured or at onset of illness.) (4)	DEPARTMENT (Enter department in which the employee is regularly employed.) (5)	DESCRIPTION OF INJURY OR ILLNESS: Nature of Injury or Illness and Part(s) of Body Affected (Typical entries for this column might be: Amputation of 1st joint right forefinger; Strain of lower back; Contact dermatitis on both hands; Electrocution - body) (6)	Injury or Illness Code (See codes at bottom of page) (7)	EXTENT OF AND OUTCOME OF CASES: DEATHS (Enter date of death.) Mo./day/yr. (8)	LOST WORKDAY CASES: Enter a check if case involved lost workdays. (9)	LOST WORKDAYS: Enter number of days AWAY FROM WORK due to injury or illness. (9A)	LOST WORKDAYS: Enter number of days of RESTRICTED WORK ACTIVITY due to injury or illness. (9B)	NONFATAL CASES WITHOUT LOST WORKDAYS (Enter a check if no entry was made in columns 9 or 9 but the case is recordable, as defined above.) (10)	TERMINATIONS OR PERMANENT TRANSFERS (Enter a check if the entry in columns 9 or 10 represented a termination or permanent transfer.) (11)
F-1	1/10/80	E. L. Bagley	Bus Driver	Transportation	Right lumbo, sacral stain	10	-	✔	9	0	-	-
F-2	1/12/80	A. S. LaGrange	Nurse	Medical	Abrasion left knee, swollen right knee, tender with movement	10	-	✔	1	0	-	-
F-3	1/14/80	C. W. Fowler	Laborer	Maintenance	Pain lumbo, sprain neck	10	-	✔	3	5	-	-
F-4	1/17/80	B. R. Collier	Bus Driver	Transportation	Bruised right shin and knee, Pain in back and hip	10	-	-	-	-	✔	-
F-5	1/21/80	J. W. Thomas	Cook	Service	1st - 2nd degree burns	10	-	-	-	-	✔	-
F-6	2/1/80	C. B. Tilden	Attendant Service Station	Transportation	Pain in right shoulder	10	-	✔	0	2	-	-
F-7	2/3/80	F. W. Palmateer	Cook	Service	Deep laceration, left arm	10	-	-	-	-	✔	-
F-8	2/22/80	T. L. Carson	Painter	Maintenance	Lower lumbar pain	10	-	✔	3	2	-	-
F-9	3/10/80	B. A. Turner	Equipment Operator	Production	Muscle spasm, right shoulder	10	-	✔	0	1	-	-
F-10	3/17/80	R. S. Story	Bus Driver	Transportation	Sprained right ankle	10	-	✔	4	0	-	-
F-11	4/26/80	C. L. Knowles	Mechanic	Maintenance	1 1/4" laceration, third finger, left hand	10	-	-	-	-	✔	-
F-12	6/23/80	S. L. Conway	Bus Driver	Transportation	Pain in lumbo sacral, extending down left leg	10	-	✔	13	14	-	-

EXAMPLE

Department of Energy
(Parent Agency and Federal Establishment Code)

(Sub-Agency & Federal Establishment Code)

(Address of Sub-Agency)

Injury Code
10 All occupational injuries

Illness Codes
21 Occupational skin diseases or disorders
22 Dust diseases of the lungs (pneumoconiosis)
23 Respiratory conditions due to toxic agents
24 Poisoning (Systemic effects of toxic materials)
25 Disorders due to physical agents (other than toxic materials)
26 Disorders due to repeated trauma
29 All other occupational illnesses

INSTRUCTIONS FOR COMPLETING DOE F 5484.8

Termination Occupational Exposure Report

1. GENERAL INSTRUCTIONS

a. Pursuant to DOE 5484.1, a Termination Exposure Report summarizing whole body exposures recorded during the period of employment by DOE and DOE contractor shall be prepared upon termination.

b. Please print all information. The letter 'O' should be printed 'Ø' to differentiate it from the number zero. Similarly, the letter 'Z' should be printed 'Ƶ' to differentiate it from the number '2'. Several of the data items require data to be right justified (R.J.), written from the right hand side of the field, while others require data to be left justified (L.J.), written from the left hand side of the field. All months and days should be represented by two-digit numbers (e.g., September 3, 1941, should be written, 09-03-41).

c. Only one character per indicated space is allowed. Do not use more than the allotted spaces on the form.

d. PREPARED BY, DATE, ORGANIZATION, AND ADDRESS—This information is for reference, should future verification be required from the individual who originally encoded the summary information. If cards or tapes are submitted, this portion of DOE F 5484.8 should be completed and submitted with them.

e. For each individual reported, there must be identification data ('1' in column 80) and either external exposure data ('2' in column 80) or internal exposure data ('3' in column 80). The '2' or '3' cards, as many as necessary, should be grouped and follow the '1' card when transmitted to assure that all exposure data for an individual is reported.

2. SPECIFIC INSTRUCTIONS

a. *SOCIAL SECURITY NUMBER*: Enter social security number of individual being reported. Use the word "none" for individuals without a social security number and "unknown" for those who refuse to reveal it. In either case, the entry should be left justified.

b. *HIRE*: Enter date the individual was hired. For visitors, hire dates are not required.

c. *NAME*: Enter the first name of the individual starting in column 22, the middle initial in column 37, and the last name starting in column 38. If there is no middle initial, leave that box blank.

d. *BIRTH*: Enter birthdate of individual.

e. *TERMINATION*: Enter the date the individual was terminated. For visitors, the end exposure date will be the same as the termination date.

f. *CONTRACT CODE*: A unique identifier assigned to each contractor and DOE office reporting to the Radiation Exposure System. The code should be left justified in the field with hyphens included and spaces trailing. This section and item 7, Type, must always be completed and consistent for all cards (1 through 3).

g. *TYPE*: Enter alphabetic character to indicate type of organization:

(1) 'C' = DOE Contractor
(2) 'G' = DOE Office

h. *BEGIN*: Enter beginning monitoring date of exposure for external exposure reports.

i. *END*: Enter ending monitoring date of exposure for external exposure reports.

j. *AREA EXP*: Enter 2-character code to indicate the area of exposure:

(1) 'WB' = Whole Body	(5) 'EX' = Extermity
(2) 'SK' = Skin	(6) 'EY' = Eye
(3) 'HN' = Hands	(7) 'HD' = Head
(4) 'FA' = Forearms	(8) 'GN' = Gonads

k. *EXTERNAL EXPOSURE*: Indicate the total dose in REMS that was recorded for the specified part of body during the indicated period of exposure; use seven digits, three decimal positions. If the total dose was recorded as being minimal (i.e., less than measurable by the monitoring system employed), place an 'M'. Right justify data and omit the decimal point, e.g., code 1.252 as 1252.

l. *TYPREC*: Always equal 'T' for terminated employees.
Always equal 'V' for report of visitor exposure.

m. *TYPEXP*: Always equal 'E' for external.

n. *BEGIN*: Enter beginning date of exposure for internal exposure reports.

o. *END*: Enter ending date of exposure for internal exposure reports.

p. *ORGAN CODE*: Enter 2-digit code to indicate organ affected:

(1) Lung	28	(8) Liver	56
(2) Bone	11	(9) Testes	78
(3) Digestive System	50	(10) Prostate	77
(4) Whole Body	00	(11) Thyroid	96
(5) Kidney	71	(12) Ovary	87
(6) Spleen	07	(13) Muscle	13
(7) Pancreas	59	(14) Adrenal Gland	93

q. *INTERNAL EXPOSURE*: Enter estimate of internal desposition, seven digits, three decimal positions (right justify, numbers omit the decimal point, e.g., code 45.252 as 45252). If the total dose was recorded as being minimal (i.e., less than measurable by the monitoring system employed), place an 'M.'

r. *METH. DOSE*: Method of determing dose:

(1) B – Bioassay
(2) IV – In-vivo count

s. *ORGAN CODE*: Second organ code (see number 16, if required)

t. *UNITS*: Unit of measure codes:

(1) Microcuries	'C'	(4) % of Lung Burden	'G'
(2) Micrograms	'D'	(5) % of Thyroid Burden	'H'
(3) % of Body Burden	'E'	(6) % of Kidney Burden	'L'

u. *NUCLIDE*: Enter the deposited nuclide(S), left justified. Use the proper isotope notation as listed in the Table, order DOE 5480.1 Chapter XI, omitting hyphens and spacing. If the dose resulted from a mixture of nuclides, list the major contributors consecutively (i.e., Cesium 137 and Cobalt 60 would be coded CS137CO60).

v. *TYPREC*: Always equal 'T' terminated employees.
Always equal 'V' for report to visitor exposure.

w. *TYPEXP*: Always equal 'I' for internal.

DOE F 5484.6
(8-80)
DOE 5484.1

U.S. DEPARTMENT OF ENERGY
TERMINATION OCCUPATIONAL EXPOSURE REPORT

REPORTING ORGANIZATION	PREPARED BY
Fusion Research Laboratory	R. Carrington
ADDRESS: P. O. Box 1605	DATE: 2/4/80 AREA CODE PHONE: 319-265-3131
Cupertino, California 94553	

KEYPUNCH COLS 1-9 & 66-70 IN ALL CARDS

1 SOCIAL SECURITY NO: 162103477

6 CONTRACTOR CODE: 01-00-4372-10C

EXAMPLE

2 HIRE (MMDDYY)	3 NAME FIRST	MI	LAST	4 BIRTH (MMDDYY)	5 TERM (MMDDYY)	CARD
090774	CLARENCE	F	WILLIAMS	042533	120979	1

8 BEGIN (MMDDYY)	9 END (MMDDYY)	10 AREA EXP	11 EXTERNAL EXPOSURE	12 TYPE	13 TYPE EXP	CARD
091574	120979	WB	1252	T	E	2
					E	2
					E	2
					E	2
					E	2

14 BEGIN (MMDDYY)	15 END (MMDDYY)	16 ORGAN CODE	17 INTERNAL EXPOSURE	18 METH DOSE	19 ORGAN CODE	20 UNIT	21 NUCLIDE(S) (L.J.)	22 TYPE	23 TYPE EXP	CARD
091574	120979	11	8000	IV		E	AM241	T		3
										3
										3
										3
										3

REGISTRATION OR IDENTIFICATION NUMBER	MAKE AND MODEL	DATE OF ACCIDENT/INCIDENT
N-3624	Conair C 1000	20 April, 1980

C. PRIORITY PROCEDURES

1. ☐ Human Safety
2. ☒ Contractor and DOE Notified
3. ☒ NTSB/FAA Notified
4. ☐ Passengers *(arrange for accommodations or continued transportation as necessary)*
5. ☒ Wreckage *(arrange for protection and for removal after NTSB clearance)*
6. ☐ Secure Hazardous or Classified Cargo

D. CONTRACTOR AND DOE, NTSB/FAA INITIAL NOTIFICATION

1. AIRCRAFT TYPE	2. N NUMBER	3. AIRCRAFT NATIONALITY	4. AIRCRAFT OPERATOR
Conair C 1000	3624	USA	Atlas Aviation

5. AIRCRAFT OWNER	6. PILOT IN COMMAND	7. ACCIDENT/INCIDENT TIME	8. LAST DEPARTURE POINT	9. NEXT EXTENDED LANDING POINT
Department of Energy	Colin Ferguson	Unknown	Markel Airport New Mexico	Buford Airport Colorado

10. AIRCRAFT/WRECKAGE POSITION	11. NUMBER PERSONS ABOARD Crew	Passengers	12. NUMBER OF Injuries	Fatalities	13. WEATHER VFR	IFR	Vis.	Wind	Ceil.
Mt. Moran, Colorado	1	1	0	2	X				

14. EXTENT OF DAMAGE	15. DANGEROUS ARTICLES ABOARD	16. TYPE OF FLIGHT *(check one)*
Demolished	None	☐ Cargo ☐ Trng. ☒ Pass.

EXAMPLE

17.a. NAME OF NTSB, FAA AGENT, CONTRACTOR/DOE OFFICIAL NOTIFIED	17.b. DATE AND TIME OF NOTIFICATION
T. C. Charles	1340 20 April, 1980

E. CONTRACTOR NOTIFICATION CHECKLIST *(Business and home telephone numbers)*

1. ☒ Chief Pilot
   (Business) 216-343-6817
   (Home) 216-410-5115
2. ☐ Chairman of Board
   (Business) _____
   (Home) _____
3. ☐ President
   (Business) _____
   (Home) _____
4. ☐ Chief of Maintenance
   (Business) _____
   (Home) _____
5. ☐ P. R. Department
   (Business) _____
   (Home) _____
6. ☐ Contractor Attorney
   (Business) _____
   (Home) _____
7. ☐ Contractor Insurance
   (Business) _____
   (Home) _____
8. ☐ Contractor Answering Service Briefed
9. ☐ Other Key Personnel
   (Title) E. F. Moses, Manager (Business) 216-410-6744 (Home) 216-342-1035
   (Title) _____ (Business) _____ (Home) _____

1. RECEIVED AT	2. DELIVERED TO	3. DATE	4. TIME
Emergency Information Center	Aviation Safety Division	20 April 1980	1510

5. RECEIVED BY *(Signature and Title)*	6. DATE	7. TIME	8. RECEIVED VIA
L. T. Farley Emergency Information Coordination	20 April 1980	1635	☐ In Person ☐ Radio ☒ Telephone

DOE F 5484.1
(8-80)

U.S. DEPARTMENT OF ENERGY

AIRCRAFT ACCIDENT/INCIDENT PRELIMINARY REPORT

INSTRUCTIONS: (1) To be completed as soon as possible by the assigned DOE or DOE contractor accident investigator. (2) Forward one copy to the head of the field organization safety division or office and one copy to the Director, Office of Operational and Environmental Safety, DOE Headquarters.

A. ACCIDENT/INCIDENT DATA

1. FROM (office of origin)	2. TO	3. DATE	4. TIME (local)
Rocky Mountain Operations Office	DOE Headquarters EV-134	April 20,1980	Unknown

5. INFORMATION FROM

6. REGISTRATION NUMBER	7. MAKE AND MODEL	8. OPERATOR OF AIRCRAFT
N 3524	Conair C 1000	Atlas Aviation

9. TYPE OF ACTIVITY (air taxi, instruction, pleasure, business, executive, cargo) IF KNOWN
Business

10. BRIEF DESCRIPTION OF CIRCUMSTANCES SURROUNDING THE OCCURRENCE

Aircraft departed Markel Airport at 0916 20 April, 1980; did not arrive at destination, declared overdue and missing 1141 20 April. Subsequent search discovered wreckage and bodies approximately 100 feet below peak of Mt. Mason.

EXAMPLE

11. WEATHER DATA
Scattered clouds 10,000 feet

12. AIRCRAFT DAMAGE: ☒ Demolished ☐ Substantial ☐ Minor ☐ Fire ☐ None

13. NUMBER OF INJURIES OF OCCUPANTS AND NON-OCCUPANTS ▶	NONE	MINOR	SERIOUS	FATAL
				2

14. NAME AND ADDRESS OF PILOT	15. NAMES OF CREW	16. NUMBER OF PASSENGERS
Colin Ferguson	None	1

17. LOCATION OF OCCURRENCE (Nearest city, town and state) (Give route if overdue or missing)
Copinsburg, Colorado

18. DATE AND TIME OF OCCURRENCE
20 April, 1980 Time unknown

19. INFORMATION ON COVERAGE OF OCCURRENCE BY FAA, NTSB, OTHERS

B. FAA AIR TRAFFIC SERVICES SUMMARY OF FLIGHT HANDLING

1. LAST DEPARTURE POINT	2. DATE AND TIME	3. INTENDED DESTINATION
Markel Airport	20 April 1980	Buford Airport, Colorado

4. LAST RADIO CONTACT/POSITION AND/OR RADAR POSITION
1037

5. LAST ATC CONTROL CLEARANCE
1030

6. FLIGHT PLAN ☐ IFR ☒ VFR ☐ None ☐ Unknown

7. PILOT BRIEFING ☐ Yes ☒ No ☐ Unknown

8. OTHER

I – CREW HISTORY (Who)

1. Pilot in Control ☒ PIC ☐ SIC		2. Seat Occupied ☒ Left ☐ Right	3. Name of VIP or Newsworthy Aboard: None		
4.A. Name of Pilot in Command: Colin Ferguson	B. Date of Birth: 6/17/36		5.A. Name of Second in Command: None	B. Date of Birth	
C. Domicile (city and state): Hyattstown, Colorado			C. Domicile (city and state)		
D. Certificate - Grade, Number and Rating: Airline, Multi-engine land 6033498			D. Certificate - Grade, Number and Rating		
E. Total Time: 3277 hrs.	F. Time in Equip.: 241 hrs.	G. Medical - Class, Date: 1st 12/31/79	E. Total Time	F. Time in Equip.	G. Medical - Class, Date
H. Profic. Check - Date: 6/24/79	I. Line Check - Date: 9/3/79	J. Duty Time - 24 Hrs.: None	H. Profic. Check - Date	I. Line Check - Date	J. Duty Time - 24 hrs.

J – FACTORS INVOLVED

(Check applicable box)	YES	NO	(Check applicable box)	YES	NO	(Check applicable box)	YES	NO
TAKEOFF/LANDING			**COLLISION**			**CONTROL AFFECTED**		
1. Unscheduled landing			18. Near midair			32. Inflight (incl. takeoff & landing)		
2. Forced emergency landing			19. Midair between aircraft			33. Ground		
3. Landed short of runway - 500 feet or LESS			20. Midair with obstruction			34. Off taxiway/ramp while taxing		
4. Landed short of runway - 500 feet or MORE			21. Ground - Aircraft, other object, person	X		35. Unable/unsafe to taxi (install pins, tow, etc.)		
5. Landed on wrong airport			22. Bird(s)			**MISCELLANEOUS**		
6. Landed on wrong runway			**PRESSURE VESSEL**			36. Structural failure		
7. Overran departure end of runway			23. Explosive decompression			37. Loss/separation of part(s)		
8. Off side of runway			24. Rapid decompression pressure - temperature			38. Cargo containment/restraint		
9. Rejected takeoff			26. Passenger oxygen masks extended			39. Lightning strike		
10. Mercy landing (sick passeng. crew)			27. Ruptured/pierced (prop. turbine, etc.)			40. Turbulence		
EMERGENCIES			**FIRE**			41. Powerplant shutdown		
11. Declared			28. Inflight			42. Non-routine pax. off loading		
12. Descent			29. Ground (refueling, APU, etc.)			43. Crew member incapacitation		
13. Collision avoidance maneuver			30. Smoke/fumes in cockpit or cabin			44. Runway blocked		
14. Evacuation			31. Fire warning			45. Air security (hijack, bomb threat, sabotage, etc.)		
15. Fire and rescue-alert						46. Public protection		
16. Fire and rescue-action						47. Passenger disturbance (unruly passenger, etc.)		
17. Other emergency alternate/ Abnormal action (specify)						48. Public complaint (noise, low flying, etc.)		
						49. Parachute incident		

EXAMPLE

K – MALFUNCTIONS/FAILURES

(Check applicable box)	YES	NO	(Check applicable box)	YES	NO
1. Flight controls			8. Communication		
2. Lift/drag devices			9. Propulsion (engine, props, fuel, reversers, etc.)		
3. Flight instruments (alt., air speed, gyro, etc.)			10. Hydraulic system		
4. Other instruments/gages (press., temp., qty., etc.)			11. Landing gear (wheels, brakes, tires, doors, etc.)		
5. Other indicators (gear, doors, horns, lights, etc.)			12. Electrical system		
6. Emergency equip. (exits, slides, oxygen, extng., etc.)			13. Pressurization system		
7. Navigation systems			14. Other (specify)		

15. Components involved (engine make and model, part name and numbers): UNKNOWN

L – INVESTIGATION

1. NTSB/FAA NOTIFIED ☒ YES ☐ NO	2. RECORDER REVIEW: A. FLIGHT ☐ YES ☒ NO; B. VOICE ☐ YES ☒ NO	3. EXTENT OF INVESTIGATION ☐ OFFICE ☒ SCENE	4. SOURCE OF INFORMATION ☒ ATC ☐ OPERATOR ☐ SURVEILLANCE ☐ OTHER (specify)
5. RELATED REPORTS ☐ MRR ☐ M or D ☐ OTHER (specify) ☒ NONE		6. NTSB/FAA INVESTIGATOR: R. Wessching	7. DOE COORD./INVESTIGATOR: L. T. Farley

M – DISPOSITION

1. REPORT SUBMITTED BY (Signature)	2. OFFICE	3. DATE	4. RECEIVED		DIST. OF REPORT
L. T. Farley	ASD	4/20	Field Safety Div. Date: 4/20 Init. 4/20	OESD, HQ Date 4/20 Init. 4/20	List

DOE F 5484.2
(8-80)
DOE F 5484.1

U.S. DEPARTMENT OF ENERGY

AIRCRAFT ACCIDENT/INCIDENT RECORD

A – GENERAL IDENTIFICATION (WHAT, WHERE, WHEN)

1. CATEGORY	2. AGENCY AIRCRAFT	3. TYPE OCCURRENCE
☒ 135 Aircraft ☐ Large Aircraft	☒ Owned ☐ Rented	☒ Accident ☐ Incident
4. AIRCRAFT MAKE AND MODEL	**5. REGISTRATION MARK**	**6. LOCATION OF ACCIDENT** *(City, County, State)*
Conair C 1000	N-3624	Copinsburg, Colorado
7. NAME OF OPERATOR	**8. ADDRESS OF OPERATOR**	**9. DATE** / **10. TIME** *(local)*
Atlas Aviation	Three Mile Road Brunswick, New Mexico	April 20,1980 / Unknown

B – NARRATIVE (Explanations · Remarks)

Aircraft departed Markel Airport at 0916 20 April, 1980. Did not arrive at destination, declared overdue and missing 1141 20 April. Subsequent search discovered wreckage and bodies approximately 100 feet below peak of Mt. Moran.

EXAMPLE

(Continue on additional sheet when necessary)

C – PERSONS INVOLVED

	1. Passenger	2. Flt. Crew	3. Cabin Crew	4. Grnd. Crew	5. Public	6. Total
ABOARD	1	1				2
INJURED (MINOR / SERIOUS)						
DECEASED	1	1				2

D – DAMAGE

	YES	NO
1. Minor		
2. Substantial		
3. Demolished	✓	
4. Fire after impact		
5. Property damage		
6.		

F – AIRCRAFT OPERATION

1. TYPE OF OPERATION	2. FLT. NO.	3. OPERATION CONDUCTED UNDER FAR PART:	4. PHASE OF FLIGHT					
				GROUND	TAKEOFF	X LEVEL FLT.	APPROACH
				TAXI	CLIMB	DESCENT	LANDING

F – AIRPORT

1. NAME OF AIRPORT	2. RUNWAY NUMBER	3. RUNWAY LENGTH	4. ELEVATION	5. RUNWAY TEMP.

6. REMARKS *(Condition of runway · ice, snow, lighting, etc.)*

Not Used

G – WEATHER

1. STATION	2. TIME	3. SKY CONDITION	4. VIS.	5. RESTRICTIONS TO VIS.	6. TEMP.	7. D. P.	8. WIND
Markel Airport	1000	10,000 Scattered	6 mi.	None	46	210	4 kts

9. REMARKS *(Sigmets, advisorys, pireps, turbulence, trends, etc.)*

H – AIR TRAFFIC CONTROL

1. CONTROL/COMMUNICATION FACILITY					2. CLEAR./FLT. PLAN			3. TYPE OF APPROACH					
TOWER		CENTER		FSS		IFR		NONE	ILS FRONT		VOR	VOR/DME	PAR
OTHER *(explain)*		UNICOM		NONE	X	VFR			ILS BACK		ADF	ASR	VISUAL

4. RADAR	YES	NO
IN AREA OF COVERAGE		
UNDER CONTROL		

5. DEPARTED Markel Airport 0916 DESTINATION FOR Buford Airport AT Z

6. LAST COMMUNICATION *(Position, time, altitude)* Markel Airport Time 0916 Altitude 000 feet

ANNUAL SUMMARY OF WHOLE BODY EXPOSURES TO IONIZING RADIATION

1. GENERAL INSTRUCTIONS

a. Pursuant to DOE 5484.1, an annual report summarizing internal body exposures recorded during the previous calendar year for DOE and DOE contractor employees in the course of DOE activities and for visitors to DOE or DOE operations shall be prepared each year.

b. Please print all information. The letter 'O' should be printed 'Ø' to differentiate it from the number zero. Similarly, the letter 'Z' should be printed 'Ƶ' to differentiate it from the number '2'. Several of the data items require data to be right justified (R. J.), written from the right hand side of the field, while others require data to be left justified (L. J.), written from the left hand side of the field.

c. Only one character per indicated space is allowed. Do not use more than the alloted spaces on the form.

d. Prepared By, Date, Organization, and Address—This information is for reference, should future verification be required from the individual who originally encoded the summary information. If cards or tapes are submitted, this portion of DOE F 5484.6 should be completed and submitted with them.

e. A separate DOE F 5484.6 must be completed for each facility type where monitored personnel are employed. For example, if a contractor operates several facilities and also monitors visitors, a separate DOE F 5484.6 should be prepared for each facility and for the total number of visitors.

2. SPECIFIC INSTRUCTIONS

a. *EMPLOYER:* This section must always be completed and consistent for all cards (A through C). It is composed of codes in three parts as follows:

(1) *Type*—A one-character alpha code to indicate the type of organization. 'C' = DOE contractor. 'G' = DOE office.

(2) *Contractor Code*—A unique identifier assigned to each contractor and DOE office reporting to the Radiation Exposure Information Reporting System. The code should be left justified in the field with hyphens included and spaces trailing.

(3) *Facility Code*—A two-character numeric code identifying the facility type for which the summary is being reported. If the facility type does not correspond to one of those listed on the front of DOE F 5484.6, indicate code '40' here and specify the facility type in item number 6 of card C.

b. *YR:* Indicate the calendar year for which the summary is being submitted.

c. *TOTAL:* The total number of individuals in all of the dose ranges. (The number should be right justified with leading blanks.)

d. *NUMBER OF INDIVIDUALS WITH DOSES IN EACH RANGE (REM):* A series of 18, 5-digit fields which represent the number of individuals who received doses during the calendar year for the 18 ranges specified. (The numbers must be right justified with leading blanks.)

e. *ACTUAL VALUES:* All exposures over 12,000 rems must be reported individually by actual value. (The value is right justified in the field with leading spaces. Omit the decimal point, e.g., code 13.426 as 13426. Three decimal places are assumed for these values.)

f. *'OTHER' FACILITY TYPE:* If the facility type for which a contractor wishes to submit a report is not listed on the front of DOE F 5484.6, indicate code '40' in item 1-c and enter the name of the new facility type here, left justified, abbreviating when necessary.

DOE 5484.6
(8-80)
DOE 5484.1

U.S. DEPARTMENT OF ENERGY

ANNUAL SUMMARY OF WHOLE BODY EXPOSURES TO IONIZING RADIATION

PUNCH COLS. 1-16 IN ALL THREE CARDS (A, B, AND C)

1	EMPLOYER (L J)	
TYPE	CONTRACTOR CODE	FACIL. CODE
C	01-00-4372-1	02

ORGANIZATION	PREPARED BY
Fusion Research Laboratory	R. Carrington
ADDRESS	DATE / AREA CODE PHONE
P. O. Box 1605	2/4/80 319-265-3131
Cupertino, California 94553	

EXAMPLE

CARD	2 YR CY	3 TOTAL NUMBER	4. NUMBER OF INDIVIDUALS WITH DOSE IN EACH RANGE REM (R J)											
			NONE	<.100	.100 - .249	.250 - .499	.500 - .749	.750 - .999	1.000 - 1.999	2.000 - 2.999	3.000 - 3.999	4.000 - 4.999	5.000 - 5.999	
A	79	491	450	26	10	3	1	1						

CARD	4 (CONTINUED) (R J)								5 ACTUAL VALUES OF EXPOSURES > 12.00			
	6.000 - 6.999	7.000 - 7.999	8.000 - 8.999	9.000 - 9.999	10.000 - 10.999	11.000 - 11.999	>12.000		VALUE 1	VALUE 2	VALUE 3	VALUE 4
B												

6 OTHER FACILITY TYPE (L J)

FACILITY TYPES
02 REACTOR
04 FUEL FABRICATION
08 URANIUM ENRICH.
10 WEAPONS FAB & TEST
14 GENERAL RESEARCH
16 ACCELERATOR
40 OTHER*
88 VISITORS
90 DOE OFFICES

ANNUAL SUMMARY OF EXPOSURES RESULTING IN INTERNAL BODY DEPOSITIONS OF RADIOACTIVE MATERIALS

1. GENERAL INSTRUCTIONS

a. Pursuant to DOE 5484.1, an annual report summarizing internal body exposures recorded during the previous calendar year for DOE and DOE contractor employees in the course of DOE activities and for visitors to DOE or DOE operations shall be prepared each year.

b. Please print all information. The letter 'O' should be printed 'Ø' to differentiate it from the number zero. Similarly, the letter 'Z' should be printed 'Ƶ' to differentiate it from the number '2'. Several of the data items require data to be right justified (R. J.), written from the right hand side of the field, while others require data to be left justified (L. J.), written from the left hand side of the field.

c. Only one character per indicated space is allowed. Do not use more than the alloted spaces on the form.

d. Prepared By, Date, Organization, and Address – This information is for reference, should future verification be required from the individual who originally encoded the summary information. If cards or tapes are submitted, this portion of DOE F 5484.7 should be completed and submitted with them.

2. SPECIFIC INSTRUCTIONS

a. *EMPLOYER (required item on all cards)*: This section must always be completed and consistent for all cards.

(1) *Contractor Code*–A unique identifier assigned to each contractor and DOE office reporting to the Radiation Exposure Information Reporting System. The code should be left justified in the field with hyphens included and spaces trailing.

(2) *Type*–A one-character alpha code to indicate the type of organization. 'C' = DOE contractor. 'G' = DOE office.

b. *SOCIAL SECURITY NUMBER*: Enter social security number(s) of individual(s) being reported.

c. *EXPOSURE DATE*: Enter beginning date of exposure.

d. *BIRTH*: Enter birthdate of individual(s) being reported.

e. *NAME*: Enter the first initial of the individual in column 36, the middle initial in column 37, and the last name starting in column 38.

f. *NUCLIDES*: Enter the deposited nuclide(s), left justified. Use the proper Isotope notation as listed in the Table, Order DOE 5480.1, Chapter 11, A–Standards for Radiation Protection, omitting hyphens and spacing. If the dose resulted from a mixture of nuclides, list the major contributors consecutively (i.e., Cesium 137 and Cobalt 60 would be coded CS137CØ60).

g. *ORGAN CODE 1*: Enter 2-digit code to indicate each organ for which a dose is specified. Select from the codes listed:

(1)	Lung	28	(8)	Liver	56
(2)	Bone	11	(9)	Testes	78
(3)	Digestive System	50	(10)	Prostate	77
(4)	Whole Body	00	(11)	Thyroid	96
(5)	Kidney	71	(12)	Ovary	87
(6)	Spleen	07	(13)	Muscle	13
(7)	Pancreas	59	(14)	Adrenal Gland	93

h. *ORGAN CODE 2*: Second organ code (if required).

i. *ORGAN CODE 3*: Third organ code (if required).

j. *DOSE EQUIVALENT*: Enter the dose commitment (rems) received by the specified organ(s) during the calendar year; seven digits including three decimal positions. (Right justify numbers, omit the decimal point, e.g., code 45.252 as 45252.)

k. *METH. DOSE*: Enter method of determining dose. Select 2-digit code from following list:

(1) – Bioassay (2) – In-vivo count

GPO 873 351

DOE F 5484.7
(8-80)
DOE 5484.1

SUMMARY OF EXPOSURES RESULTING IN INTERNAL BODY DEPOSITIONS OF RADIOACTIVE MATERIALS FOR CY 19__

(GREATER THAN 50% ANNUAL DOSE COMMITMENT)

KEYPUNCH
COLS. 1-14
IN EACH CARD

1. EMPLOYER (L.J.)	
CONTRACTOR CODE	TYPE
01-00-4372-10	0

REPORTING ORGANIZATION: Fusion Research Laboratory
PREPARED BY: R. Carrington
ADDRESS: P. O. Box 1605
DATE: 2/4/80
AREA CODE PHONE: 319-265-3131
Cupertino, California 94553

2. SOCIAL SECURITY NO.	3. EXP. DATE (M M D D Y Y)	4. BIRTH (M M D D Y Y)	5. NAME F.I.	M.I.	LAST	6. NUCLIDES (L.J.) ISOTOPE NOTATION	7. ORGAN CODE 1	8. ORGAN CODE 2	9. ORGAN CODE 3	10. DOSE (REMS)	11. METH. DOSE
162103477	070680	110439	C	F	WILLIAMS	PU238	11			22100	1V

EXAMPLE

U.S. DEPARTMENT OF ENERGY

DOE F 5821.1 (Rev. 11-80)
Replaces DOE Form EV 7597 (3-79)

RADIOACTIVE EFFLUENT/ONSITE DISCHARGES/UNPLANNED RELEASES

Typewriter compatible

Section 0

A = Air Effl. B = Air Discharg. W = Liq. Discharg. L = Liq. Effl.

Report Control Symbol					Reference Location Ident.	
Top Tbl.	Area/Off.	Contr.	Plant	Facility	Map No.	Effl. Discharg. Point Ident.
C	U	V	K	B	L36	392

Incident Report Date (YY MM DD): 14 19 — Navy Time Zone (HH MM Z): 20 25

Keypunch Instr. cc 2-19 (All Cards) cc 20-26 (For Section 2 ONLY)

Report Period From (YY MM DD): 790101 — To (YY MM DD): 791231

Security Class. Amended / Data Designation: 26 / 20

Prepared By: I. G. Martarity
Date: 5/6/80 Area Code: FTS Phone: 739-1165

Approved By: N. K. Meyers
Date: 5/7/80 Area Code: FTS Phone: 739-1337

SECTION 1 NARRATIVE SUMMARY (For New Release Points and Amended Data Only)

01	Plant Title: Pacific Refractory
02	Facility Title: CMC-1 High Temperature Unit
01	Effluent Release Point or Onsite Waste Discharge Point: Liquid Waste Evaporator Exhaust Stack
02	Operations Generating Pollutants: Evaporation of Liquid Waste Materials
03	Waste Treatment System: Condensation
04	Monitoring System: Continuous Air Sampler 15 Foot Sample Line
05	Monitoring System Continued
06	No. of Samples (Approximately): 52 — Sample Information: Continuous
07	Name of Receiving Media or Storage/Disposal Facility Receiving Discharge: Atmosphere — Storage/Disposal Facility Class Code — Storage/Disposal Facility Name Code

Include Other Information Detailed comments on the following lines of Section 1

DO NOT WRITE IN THIS SPACE

EXAMPLE

SECTION 2 NUCLIDE DATA

Storage Disposal Facility Operational Status: Startup Date — Termination Date

Units: F Cubic Feet, M Cubic Meters, G Gallons, P Pounds, C Curies

Discharge/Effl. Point Gross Volume: 1.46 E 410

Section "01" Report Control Codes — Section "10" Report Control Codes

DO NOT WRITE IN THIS SPACE

Nuclide Description	Amount or Concentration	Units	Brief Comments
UN-10 BETA	+ 7.45 E -12	M U	Total Stack Concentration
UN-10 ALPHA	+ 5.94 E -13	M U	Total Stack Concentration
TH-208	+ 2.17 E -17	M U	Total Stack Concentration
BI-214	+ 4.09 E -15	M U	Total Stack Concentration
CO-60	+ 3.43 E -15	M U	Total Stack Concentration
	+ . E		
	+ . E		
	+ . E	

INSTRUCTIONS

GENERAL INSTRUCTIONS. All [illegible] releasing liquid and airborne radioactive wastes are required to complete this form [illegible] effluent release points, onsite radioactive waste discharge points and unplanned releases.

SPECIFIC INSTRUCTIONS

a. A separate form must be completed for each effluent release point and for each onsite radioactive waste discharge point.
b. Limit the number of characters in each block as indicated.
c. Data entered on the form must be legible and must be printed. The letter "O" shall be printed Ø to differentiate it from the number zero.
d. Do not use more than the allotted spaces indicated on the form.
e. The forms shall be submitted to Waste Programs Division, EG&G Idaho, P.O. Box 1625, Idaho Falls, Idaho 83415, no later than three months following the annual period for which it is prepared.

AMENDED DATA INSTRUCTIONS

a. To amend Section 1 data only, the identification codes in columns 2-13 of Section 0 must be equal to the codes in the corresponding columns of the record to be amended.
b. To amend Section 1 and 2 data or to amend Section 2 data only, the identification codes in columns 2-25 of Section 0 must be equal to the codes in the corresponding columns of the record to be amended.
c. Select the proper amended data code. See Section 0, item 26, and enter in column 26.
d. Section 1 Narrative Summary and/or Section 2 Nuclide Data may be amended.

SECTION 0

GENERAL INSTRUCTIONS. This section must always be completed. The alphabetical designation for the contractor, plant and facility required in Columns 4, 5 and 6 shall be established by the operations offices. Each office shall ensure that there are no duplications of designations within its jurisdiction.

COLUMN

2 Alphabetical designation for the Operations Office. Use office designations as shown below.

Albuquerque Operations Office	A
San Francisco Operations Office	B
Chicago Operations Office	C
Headquarters-Germantown	G
Idaho Operations Office	I
Grand Junction Office	J
Nevada Operations Office	L
Oak Ridge Operations Office	O
Pittsburgh Naval Reactors Office	P
Richland Operations Office	R
Savannah River Operations Office	S
Energy Research Center	E
Schenectady Naval Reactors Office	Y

3 Alphabetical designation for the Area Office. Use office designation as shown below.

Amarillo	A	Batavia	J	Shippingport	S
Burlington	B	Kansas City	K	Pittsburgh	T
Cincinnati	C	Los Alamos	L	Pacific Area	
Dayton	D	Portsmouth	M	Support	U
West Milton	E	Nevada	N	Cleveland	V
Rocky Flats	F	Palo Alto	O	Windsor	W
Canoga Park	G	Pinellas	P	Sandia	X
Brookhaven	H	Puerto Rico	Q	Paducah	Y
Idaho	I	Sacramento	R	New Brunswick	Z

Leave blank if not applicable.

4 The alphabetical designation of the contractors, laboratories, universities and other Government organizations which have liquid and/or airborne radioactive effluents. This designation shall be compatible with the standard Operations Office/Area Office Contractor (OAC) name file provided to field offices.

5 The alphabetical designation of the main plant, such as Chemical Processing Plant, 200 Area, etc.

6 The alphanumeric designation of the facilities within the main plant, e.g., Calcination Facility, Fast Flux Test Facility which discharge or release liquid and airborne radioactive wastes or effluents.

7-9 Identifying number which relates to a map showing the site and facility and the point of discharge or release. Provide a number for each column. For example the number 8 would be 008, 99 would be 099.

10-12 Identifying number of each significant liquid and airborne radioactive release point or onsite waste discharge point. Follow the instructions for numbering as noted for columns 7-9.

13 Identify if the onsite radioactive waste discharge point or effluent release point is an air or liquid stream.

A-Airborne Effluent
L-Liquid Effluent
B-Airborne Onsite Waste Discharge
M-Liquid Onsite Waste Discharge

14-25 Report Period. The lower part of this section should be used for the normal annual reporting of effluents and onsite waste discharges. For example, the annual effluent report for the period January 1972 through December 1972 would be 720101721231.

The upper portion should be used for reporting unplanned releases. Time is to be reported in 24 Hour Navy Time. The designation for the various time zones in Column 25 are:

E-Eastern	P-Pacific
C-Central	A-Atlantic
M-Mountain	Z-Others use GMT

For example, for an accidental radioactive release occurring at 8:30 PM on February 14, 1973, in the Eastern States, the report period would be 730214 2030E. NOTE: An entry must always be made in Columns 14 through 25.

26 Alphabetical designation for new or amended data and/or security classification.

Blank-UNCL Data	A-Amended UNCL
C-Confidential	M-Amended Confidential
S-Secret	Y-Amended Secret

SECTION 1

GENERAL INSTRUCTIONS. This section must be filled out only when (a) a new effluent release point or an onsite waste discharge point is being reported or (b) when section 1 is being amended. When amending section 1 data, section 2 may be left blank, if desired. Unless otherwise noted, entries in this section must begin in column 23.

CARD LINE COLUMN

1, 1 23-80 Plant Title. A brief descriptive title of the main plant.

1, 2 23-80 Facility Title. A brief descriptive title of the facility within the main plant, e.g., Calcination Facility, Fast Flux Test Facility, which releases or discharges radioactive liquid and airborne wastes.

2, 1 23-80 Effluent Release Point or Onsite Waste Discharge Point. A descriptive title identifying the onsite waste discharge point or effluent release point, e.g., Bldg. 280, Room 4, 280 B discharge to CRIB 11, etc.

2, 2 23-80 Operation Generating Pollutants. A description of the operation which generates the pollutants, e.g., hot cells, plutonium radiochemistry lab, uranium salvage incinerator, P reactor core cooling basin, etc.

2, 3 23-80 Waste Treatment System. A descriptive title, e.g., 300 ft pressure sand filter, Bldg. 11 high efficiency cyclone, etc., used for treatment of the onsite waste discharge or effluent prior to release or disposal.

2, 4-5 23-80 Monitoring System. A brief description of the type of monitoring equipment including the manufacturer and model number of the equipment, the type of probe and chamber, length of sampling line, efficiency, etc., as appropriate to provide a concise abstract of the monitoring system.

2, 6 23-28 Number of Samples. Approximate number of samples taken during the reporting period. Entry must be an integer and right adjusted. Minor year-to-year variations do not necessitate an amended section 1 form.

2, 6 29-80 Sample Information. Entry must begin in column 29. Describe as proportional, continuous, etc.

2, 7 23-76 Receiving Media Or Controlled Storage/Disposal/Discharge Facility Receiving Discharge. A descriptive title of the media receiving the effluents, e.g., Miami River, atmosphere, ground water, etc., or of the storage/disposal facility receiving the onsite waste discharge noted in 2-23-80 above.

2, 7 77-79 Storage/Disposal Facility Name Code. A field office designated three digit code to identify all storage or disposal facilities receiving onsite waste discharges as defined in ERDAM 0513.

2, 7 80 Storage/Disposal Facility Classification Code. A one digit code.

T-Tile Field	E-Seepage Basin
D-Disposal Well	C-Crib
R-Retention Basin	L-Pond or Lagoon
S-Settling Basin	W-Weapon Test Point
G-Spills to Ground	A-Tankage

2, 8-16 23-80 Other Information. Any pertinent information not submitted with other data. This part provides the opportunity to elaborate on points or problems which are pertinent to the narrative and nuclide data provided on this form. NOTE: If an amended section 1 is submitted, one must repeat previous comments in order to preserve them in the record.

SECTION 2

GENERAL INSTRUCTIONS. This section must always be filled out except when the 5821 form is being used to submit amended Section 1 data. When amending Section 2 data, Section 1 may be left blank, if desired. Only 21 nuclides may be input for any reporting period.

3 CARD
COLUMN

28-33 If this form is reporting an "Onsite Waste Discharge," specify the startup date. If the form is reporting an "Effluent Release Point," leave columns blank.

35-40 If the "Onsite Waste Discharge" Facility is active, print "Active" in these columns. If Facility is retired, specify the termination date as prescribed. No entry is required if reporting on "Effluent Release Point."

41-49 Gross volume flow of liquid or air for the effluent stream reported as follows:

Column 41 Sign plus is preprinted
Column 42 Units
Column 43 Tenths
Column 44 Hundredths
Column 45 Thousandths
Column 46 "E" preprinted to denote exponential
Column 47 Plus or minus sign of exponent
Column 48-49 Value of exponent

Examples of this method of notation follow: 30515 is reported 3.150E 03; 3.15 reported 3.150E + 00; 3150 is reported 3.150E + 03.

NOTE: If volume is unknown, print "UNKN" in columns 42-45. Otherwise an entry must always be made in Columns 42 through 49.

50 Units used to report the gross volume in Columns 42-49 according to the notations on the form.

51-78 List the section 0 report control code(s) for any "Effluent Release Points" or "Onsite Discharge Points" which discharge radioactivity FROM the storage/disposal facility listed in section 1. If no storage/disposal facilities are reported in section 1, e.g., columns 77-80 of Card 07 are blank in section 1, these columns should be left blank. The intention here is to sum all of the separate discharges into a given disposal facility and to correct for all radioactivity discharges FROM the Facility in order to arrive at a correct total inventory of nuclides remaining in the disposal facility.

4 CARD
COLUMN

27-40 Identify the individual pollutants discharged for each onsite waste discharge or effluent stream. Use normal accepted notations. Cobalt-60 is reported CO-60. Uranium-235 is U-235. Self-explanatory abbreviations are acceptable, such as MAP (Mixed Activation Products), MFP (Mixed Fission Products), UN (O-8 + G). The designations must be compatible with the Standard Nuclide Identification list provided to Field Offices.

42-49 Indicate either the annual amount or the annual average concentration (not both) of the nuclide reported in columns 27-40 using the same notations as in Section 2, Card 3, Columns 42-49. The value in columns 42-46 may be equal to 0000, which allows columns 47-49 to be left blank.

50 Indicate according to the notations on the form the Units used to report the amount or concentration in columns 42-49. Column 50 may be blank if the Amount or Concentration value in columns 42-46 is equal to 0000.

51 Indicate according to notations for solubility on the Form.

52 Any pertinent information related to nuclide Amount or Concentration.

5 CARD
COLUMN

27-46 DISPER FACTOR preprinted. Note: This factor is applicable only to EIS airborne releases.

41-48 Enter value of dispersion factor to be reported for release point described in Section 0. Entry cannot equal 0.000E + 00. Unless a value is entered, this factor will always default to 1.000E + 00.

APPENDIX U

JOB DESCRIPTIONS

RCRA JOB DESCRIPTION

TITLE: Chemical Technician II, III (HSE-7)

J. A. Mascarenas

T. S. Montoya

A. Required Skills:

- o Familiarity with State and Federal Regulations regarding hazardous materials and waste.
- o Good technical knowledge of problems associated with hazardous materials handling and use.
- o Oral communication skills for interfacing with waste generators.

B. Required Education/Training:

- o Formal chemistry classes or experience in chemical handling operations
- o RCRA Provisions
- o Personnel Safety
- o Respirator/SCBA
- o Spill Response
- o Contingency Plan
- o Recordkeeping/Inspections
- o On-Site Transportation
- o Hazardous Waste Handling and Operations
  - a. Batch Treatment
  - b. Incineration
  - c. Detonation/Burning HE
  - d. Acids/Bases
  - e. Organics - General
  - f. Inorganics - General

C. Duties:

- o Collect chemical waste from technical areas in Laboratory (Hazardous Waste Handling and Operations courses)
- o Segregate and/or package waste for storage/treatment/disposal (Hazardous Waste Handling and Operations courses)

- Transport waste to the storage/treatment/disposal area (On-Site Transportation course)
- Chemically treat any waste requiring treatment (Hazardous Waste Handling and Operations courses)
- Oversee the disposal of chemicals into the proper shafts (Hazardous Waste Handling and Operations courses)
- Perform required hazardous waste facility inspections (Recordkeeping/Inspections course)
- Assist in the recordkeeping of all chemical waste activities (Recordkeeping/Inspections course)
- Assist in spill response treatment, cleanup, and disposal operations as required (Spill Response and RCRA Contingency Plan courses)
- Provide input to updating of operational procedures (Recordkeeping/Inspections course)

RCRA JOB DESCRIPTION

TITLE: Staff Member, Chemical Waste Operations (HSE-7)

Position Vacant

K. A. Balo, Section Leader

Process Engineer, Position Vacant

A. Required Skill:

- o Knowledge of State and Federal Regulations regarding hazardous materials and waste.
- o Technical knowledge of problems associated with hazardous materials handling and use.
- o Ability to communicate with a wide variety of personnel, both internal and external to the Laboratory.
- o Ability to supervise personnel in proper chemical waste management.

B. Required Education/Training:

- o Minimum of a bachelor's degree in chemistry/chemical engineering or an equivalent combination of experience and education
- o RCRA Provisions
- o Personal Safety
- o Respirator/SCBA
- o Hazardous Waste Handling and Operations
  - a. Batch Plant
  - b. Incineration
  - c. Detonation/Burning HE
  - d. Explosives/Reactives
  - e. Acids/Bases
  - f. Organics - General
  - g. Inorganics - General
- o Spill Response
- o RCRA Contingency Plan
- o Recordkeeping/Inspections
- o On-Site/Off-Site Transportation

C. Duties:

- Oversee the daily collection, packaging, and transport activities of the chemical waste technicians (RCRA Provisions course)

- Plan and direct treatment/disposal activities (Hazardous Waste Handling and Operations courses)

- Review incoming Chemical Waste Disposal Request forms and identify hazards associated with the requests (Hazardous Waste Handling and Operations courses and Recordkeeping/Inspections course)

- Interact with waste generators on waste problem solutions (such as identification of unknown waste) (Hazardous Waste Handling and Operations courses)

- Write and update all chemical waste procedures (RCRA Provisions and Hazardous Waste Handling of Operations courses)

- Maintain operational records for Area L and batch waste treatment system (Recordkeeping/Inspections course)

- Assist in on-the-job training for chemical waste handlers (RCRA Provisions and RCRA Contingency Plan courses)

- Provide input to spill responses for hazardous materials/waste as necessary (Spil Response course)

- Evaluate overall performance of technicians and staff annually (Section Leader) (General knowledge)

- Maintain awareness of changes in RCRA regulations and identify necessary improvements (RCRA Provisions course)

- Review and approve hazardous waste generator's SOPs and relevant parameters in facility designs (Hazardous Waste Handling and Operations courses)

- Review training records and inspection records for completeness and identify any needs (Section Leader) (Recordkeeping/Inspections course)

RCRA JOB DESCRIPTION

TITLE: Associate Group Leader, Solid Waste Operations (HSE-7)

J. L. Warren

A. Required Skill:

- o Familiarity with State and Federal Regulations regarding hazardous materials and waste.
- o Good technical knowledge of problems associated with hazardous chemical handling and use.
- o Ability to supervise personnel in proper chemical waste management.
- o Ability to communicate with a wide variety of personnel, both internal and external to the Laboratory.

B. Required Education/Training:

- o Minimum of a bachelor's degree in chemistry/chemical engineering or an equivalent combination of experience and education
- o RCRA provisions
- o Personal Safety
- o Hazardous Waste Handling and Operations
  - Batch Treatment
  - Incineration
  - Detonation/Burning HE
  - Acids/Bases
  - Organics - General
  - Inorganics - General
- o Spill Response
- o RCRA Contingency Plan
- o Recordkeeping/Inspections
- o On-Site Transportation

C. Duties:

- o Direct overall chemical waste storage, treatment, and disposal activities (Hazardous Waste Handling and Operations and RCRA Provisions courses)
- o Provide input to procedural changes for operations (Hazardous Waste Handling and Operations courses)

- Maintain security of waste management facilities (RCRA Provisions course)
- Act as substitute HWEC as provided in Contingency Plan (RCRA Contingency Plan and Spill Response courses)
- Oversee evaluations of technicians and staff (General knowledge)
- Evaluate performance of Section Leader (General knowledge)

RCRA JOB DESCRIPTION

TITLE: Deputy Group Leader, Waste Management (HSE-7)

Associate Group Leader, Liquid Waste Operations (HSE-7)

L. A. Emelity

J. R. Buchholz

A. Required Skills:

- o Familiarity with State and Federal Regulations regarding hazardous materials and waste.
- o Good technical knowledge of problems associated with hazardous chemical handling and use.
- o Ability to supervise personnel in proper chemical waste management.
- o Ability to communicate with a wide variety of personnel, both internal and external to the Laboratory.

B. Required Education/Training:

- o Minimum of a bachelor's degree in chemistry/chemical engineering or an equivalent combination of experience and education
- o RCRA Provisions
- o Spill Response
- o Contingency Plan
- o Emergency Procedures

C. Duties:

- o Act as substitute HWEC as provided in the Contingency Plan (Spill Response and Contingency Plan courses)

RCRA JOB DESCRIPTION

TITLE: Group Leader, Waste Management (HSE-7)

R. Garde

A. Required Skills:

- o Familiarity with State and Federal Regulations regarding hazardous materials and waste.
- o Good technical knowledge of problems associated with hazardous chemical handling and use.
- o Ability to supervise personnel in proper chemical waste management.
- o Ability to communicate with a wide variety of personnel, both internal and external to the Laboratory.

B. Required Education/Training:

- o Minimum of a bachelor's degree in chemistry/chemical engineering or an equivalent combination of experience and education
- o RCRA Provisions
- o Spill Response
- o Contingency Plan
- o Hazardous Waste Handling and Operations

C. Duties:

- o Oversee all chemical waste activities (RCRA Provisions and Hazardous Waste Handling and Operations courses)
- o Maintain security of waste management facilities (RCRA Provisions course)
- o Serve as HWEC as provided in Contingency Plan (Spill Response and Contingency Plan courses)
- o Evaluate performance of Associate Group Leader (General knowledge)

RCRA JOB DESCRIPTION

TITLE: Associate Group Leader, Technical Support Section (HSE-7)
Leon C. Borduin

A. Required Skills:

- o Familiarity with State and Federal regulations regarding RCRA-listed hazardous materials.
- o Ability to supervise Section personnel in requirements of proper handling and incineration of hazardous wastes.
- o Good understanding of waste incinerator design and operation.

B. Required Education/Training:

- o RCRA Provisions
- o Personal Safety
- o Spill Response
- o RCRA Contingency Plan
- o On-Site Transportation

C. Duties:

- o Coordinate Section capabilities to properly receive, accumulate, and incinerate RCRA-listed hazardous wastes (RCRA Provisions course)

RCRA JOB DESCRIPTION

TITLE: Lead Engineer, Technical Support Section (HSE-7)
Ralph A. Koenig

A. Required Skills:

- o Familiarity with State and Federal regulations regarding RCRA-listed hazardous materials.
- o Thorough understanding of waste incinerator design and operation.
- o Ability to train and supervise operators of waste incinerator.
- o Ability to ensure proper collection and archiving of operating data required by incinerator operating permit.

B. Required Education/Training:

- o RCRA Provisions
- o Personal Safety
- o Hazardous Waste Handling and Operations
  - Incineration
  - Acids/Bases
  - Organics-General
  - Inorganics-General
- o Spill Response
- o RCRA Contingency Plan
- o Recordkeeping/Inspections
- o On-Site Transportation

C. Duties:

- o Lead engineer for design, construction, and maintenance of hazardous waste incinerator (Hazardous Waste Handling and Operations courses)
- o Train Section staff and technicians on handling of hazardous wastes, incinerator operation, and data collection (RCRA Provisions and Hazardous Waste Handling and Operations courses)
- o Serve as shift supervisor during incinerator operations (Hazardous Waste Handling and Operations, Spill Response and RCRA Contingency Plan courses)
- o Maintain records of required run data in an auditable form (Recordkeeping/Inspections course)

RCRA JOB DESCRIPTION

TITLE: Staff Member, Technical Support Section (HSE-7)

Charles L. Warner

A. Required Skills:

- o Familiarity with State and Federal regulations regarding RCRA-listed hazardous materials
- o Good understanding of waste incinerator design and operation
- o Ability to train and supervise other Section members as required by operations

B. Required Education/Training:

- o RCRA Provisions
- o Personal Safety
- o Respirator/SCBA
- o Hazardous Waste Handling and Operations
  - Incineration
  - Acids/Bases
  - Organics-General
  - Inorganics-General
- o Spill Response
- o RCRA Contingency Plan
- o Recordkeeping/Inspections

C. Duties:

- o Assist in training of Section staff and technicians in handling of hazardous wastes, incinerator operation, and data collection (RCRA Provisions and Hazardous Waste Handling and Operations courses)
- o Supervise handling of hazardous wastes as required by operations (Hazardous Waste Handling and Operations and Personal Safety courses)
- o Serve as shift supervisor during incinerator operations (Hazardous Waste Handling and Operations, Spill Response, and RCRA Contingency Plan courses)
- o Collect records of required run data (Recordkeeping/Inspections course)

RCRA JOB DESCRIPTION

TITLE: Staff Member, Technical Support Section (HSE-7)
John S. Vavruska

A. Required Skills:

- o Familiarity with State and Federal regulations regarding RCRA-listed hazardous materials
- o Good understanding of waste incinerator design and operation
- o Ability to train and supervise other Section members as required by operations

B. Required Education/Training:

- o RCRA Provisions
- o Personal Safety
- o Respirator/SCBA
- o Handling and/or incineration of acids/bases, and general organic and inorganic compounds
- o Hazardous Waste Handling and Operations
  - Incineration
  - Acids/Bases
  - Organics-General
  - Inorganics-General
- o Spill Response
- o RCRA Contingency Plan
- o Recordkeeping/Inspections

C. Duties:

- o Provide engineering support for design, construction, and maintenance of hazardous waste incinerator (Hazardous Waste Handling and Operations courses)
- o Supervise handling of hazardous wastes (Hazardous Waste Handling and Operations courses)
- o Serve as shift supervisor during incinerator operations (Hazardous Waste Handling and Operations, Spill Response and RCRA Contingency Plan courses)
- o Collect records of required run data (Recordkeeping/Inspections course)

RCRA JOB DESCRIPTION

TITLE: Staff Member, Technical Support Section (HSE-7)
David A. Hutchins

A. Required Skills:

- o Familiarity with State and Federal regulations regarding RCRA-listed hazardous materials
- o Good understanding of proper handling of hazardous waste forms
- o Good understanding of waste incinerator design and operation

B. Required Education/Training:

- o RCRA Provisions
- o Personal Safety
- o Respirator/SCBA
- o Hazardous Waste Handling and Operations
  - Incineration
  - Acids/Bases
  - Organics-General
  - Inorganics-General
- o Spill Response
- o RCRA Contingency Plan
- o Recordkeeping/Inspections

C. Duties:

- o Provide engineering support for design, construction, and maintenance of hazardous waste incinerator (Hazardous Waste Handling and Operations courses)
- o Assist in handling of hazardous wastes (Hazardous Waste Handling and Operations and Personal Safety courses)
- o Assist in collection of required run data (Recordkeeping/Inspection course)

RCRA JOB DESCRIPTION

TITLE: Materials Technician III, Technical Support Section (HSE-7)
Corbin L. Gilley

A. Required Skills:

- o Familiarity with State and Federal regulations regarding RCRA-listed hazardous materials
- o Technical competence in area of proper handling of hazardous materials
- o Good understanding of waste incinerator operation

B. Required Education/Training:

- o RCRA Provisions
- o Personal Safety
- o Respirator/SCBA
- o Hazardous Waste Handling and Operations
  - Incineration
  - Acids/Bases
  - Organics-General
  - Inorganics-General
- o Spill Response
- o RCRA Contingency Plan
- o Recordkeeping/Inspections

C. Duties:

- o Provide specialized technical support for proper handling of hazardous wastes (Hazardous Waste Handling and Operations, and Personal Safety courses)
- o Assist in operation of incinerator (Hazardous Waste Handling and Operations courses)
- o Assist in collection of required run data (Recordkeeping/Inspections course)

RCRA JOB DESCRIPTION

TITLE: Electronic Technician III, Technical Support Section (HSE-7)
Position Vacant

A. Required Skills:

- o Familiarity with State and Federal regulations regarding RCRA-listed hazardous materials
- o Technical competence in area of process control and data collection systems
- o Good understanding of proper handling of hazardous waste forms
- o Good understanding of waste incinerator design and operation

B. Required Education/Training:

- o RCRA Provisions
- o Personal Safety
- o Respirator/SCBA
- o Hazardous Waste Handling and Operations
  - Incineration
  - Acids/Bases
  - Organics-General
  - Inorganics-General
- o Spill Response
- o RCRA Contingency Plan
- o Recordkeeping/Inspections

C. Duties:

- o Provide specialized technical support for design, construction, and maintenance of hazardous waste incinerator (Hazardous Waste Handling and Operations courses)
- o Assist in handling of hazardous wastes (Hazardous Waste Handling and Operations, and Personal Safety courses)
- o Assist in operation of incinerator (Hazardous Waste Handling and Operations courses)
- o Assist in collection of required run data (Recordkeeping/Inspections course)

RCRA JOB DESCRIPTION

TITLE: Mechanical Technician IV, Technical Support Section (HSE-7)
Johan F. Rutten

A. Required Skills:

- o Familiarity with State and Federal regulations regarding RCRA-listed hazardous materials
- o Technical competence in area of mechanical equipment design and fabrication
- o Good understanding of proper handling of hazardous waste forms
- o Good understanding of waste incinerator design and operation

B. Required Education/Training:

- o RCRA Provisions
- o Personal Safety
- o Respirator/SCBA
- o Hazardous Waste Handling and Operations
  - Incineration
  - Acids/Bases
  - Organics-General
  - Inorganics-General
- o Spill Response
- o RCRA Contingency Plan
- o Recordkeeping/Inspections

C. Duties:

- o Provide specialized technical support for design, construction, and maintenance of hazardous waste incinerator (Hazardous Waste Handling and Operations courses)
- o Assist in handling of hazardous wastes (Hazardous Waste Handling and Operations, and Personal Safety courses)
- o Assist in operation of incinerator (Hazardous Waste Handling and Operations courses)
- o Assist in collection of required run data (Recordkeeping/Inspections course)

RCRA JOB DESCRIPTION

TITLE: Mechanical Technician III, Technical Support Section (HSE-7)
Dave Melton

A. Required Skills:

- o Familiarity with State and Federal regulations regarding RCRA-listed hazardous materials
- o Technical competence in area of mechanical equipment fabrication
- o Good understanding of proper handling of hazardous waste forms
- o Good understanding of waste incinerator operation

B. Required Education/Training:

- o RCRA Provisions
- o Personal Safety
- o Respirator/SCBA
- o Hazardous Waste Handling and Operations
  - Incinerator
  - Acids/Bases
  - Organics-General
  - Inorganics-General
- o Spill Response
- o RCRA Contingency Plan
- o Recordkeeping/Inspections

C. Duties:

- o Provide specialized technical support for construction and maintenance of hazardous waste incinerator (Hazardous Waste Handling and Operations courses)
- o Assist in handling of hazardous wastes (Hazardous Waste Handling and Operations and Personal Safety courses)
- o Assist in operation of incinerator (Hazardous Waste Handling and Operations courses)
- o Assist in collection of required run data (Recordkeeping/Inspections course)

RCRA JOB DESCRIPTION

TITLE: Associate Group Leader of Explosives Development and Testing (M-1)
M. J. Urizar

A. Required Skills:

- Familiarity with State and Federal Regulations regarding hazardous materials and waste
- Good technical knowledge of problems associated with high explosives handling and use
- Ability to supervise personnel in proper HE waste management
- Ability to communicate with a wide variety of personnel, both internal and external to the Laboratory

B. Required Education/Training:

- RCRA Provisions
- Personal Safety
- Hazardous Waste Handling and Operations
  - Detonation/Burning HE
- RCRA Contingency Plan
- Recordkeeping/Inspections
- On-site Transportation

C. Duties:

- Directs and coordinates destruction of HE waste at Q-Site firing site (Detonation and Burning of HE Waste and Personal Safety courses)
- Removes waste from storage area for disposal at firing site (Detonation/Burning HE course)
- Presents on-the-job training for Q-Site waste handlers (RCRA Provisions course)
- Responsible for maintenance of operational records (Recordkeeping/ Inspections course)

RCRA JOB DESCRIPTION

TITLE: Technical Administrative Specialist (M-1)

C. C. Maxwell

A. Required Skills:

- Familiarity with State and Federal Regulations regarding hazardous materials and waste
- Good technical knowledge of problems associated with high explosives handling and use

B. Required Education/Training:

- RCRA Provisions
- Personal Safety
- Hazardous Waste Handling and Operations
  - Detonation/Burning HE
- RCRA Contingency Plan
- Recordkeeping/Inspections
- On-site Transportation

C. Duties:

- Responsible for site maintenance at TA-9 and TA-14 (Recordkeeping/ Inspections course)
- Supervise TA-9 explosives area (Personal Safety and RCRA Contingency Plan courses)
- Develop processing on new materials (Detonation/Burning HE course)
- Coordinate production, assembly and delivery (Detonation/Burning HE course)
- Supervise new equipment installation (Detonation/Burning HE course)
- Supervise HE shop scheduling (Detonation/Burning HE course)

RCRA JOB DESCRIPTION

TITLE: Testing Technician III (M-1)

M. L. Clancy

A. Required Skills:

- o Familiarity with State and Federal Regulations regarding hazardous materials and waste
- o Good technical knowledge of problems associated with high explosives handling and use

B. Required Education/Training:

- o RCRA Provisions
- o Personal safety
- o Hazardous Waste Handling and Operations
  - Detonation/Burning HE
- o RCRA Contingency Plan
- o Recordkeeping/Inspections
- o On-site Transportation

C. Duties:

- o Removes waste from storage for disposal at Q-Site firing area (Detonation/Burning HE course)
- o Responsible for small-scale sensitivity evaluation of explosives (Detonation/Burning HE course)
- o Responsible for small-scale performance tests (Detonation/Burning HE course)
- o Directs conventional firing at Q-Site (Detonation/Burning HE course)

RCRA JOB DESCRIPTION

TITLE: Disposal Operations Materials Technician (WX-3)

Silas Martinez

A. Responsibilities:

Participation as a member of the Disposal Crew in the pickup, transportation, and disposal of a wide variety of explosives, propellants, high explosive (HE) contaminated oils and solvents, and other HE contaminated flammable waste from all areas involving Group WX-3 operations and other Groups. Responsible for adhering to the safety practices for the disposal activities. Knowledgeable of Group SOPs and the specific procedures for the Disposal operations. The incumbent must understand that all operations are to be conducted according to the intent as well as the letter of the SOPs.

B. Training:

Personnel assigned to the Disposal Crew are trained on the job. Most come to the job from other technical positions in WX-3, so they are well grounded in explosives safety. They take part in an initial orientation program, presented by Group management. Included is the study of relevant SOPs. They are trained to do the simple tasks and later the more complex or hazardous tasks by a senior member of the crew or the Disposal Supervisor. Their competence in the Disposal operations are recorded by the Supervisor in the annual personnel evaluation.

As part of the WX-Division safety program, all personnel attend monthly safety meetings and participate in safety training, presentation and in discussions related to their jobs.

C. Required Courses:

- o RCRA Provisions
- o Personal Safety
- o Hazardous Waste Handling and Operations
  - Detonation/Burning HE
- o RCRA Contingency Plan
- o Recordkeeping/inspections
- o On-site transportation

D. Duties:

1. Participates in the operations of a truck-mounted vacuum tank for the removal of sump waste by a vacuum method. Also operates a radio-equipped ½-ton pickup, a 3½-ton HE van, and one special boom-equipped 2½-ton flat bed truck (Detonation/Burning HE course).

2. Prepares HE for burning. Uses squibs, firing circuitry to start the burning operations (Detonation/Burning HE course).

3. Makes recommendations to his supervisor concerning problems associated with the efficiency, safety, and maintenance of the operation (RCRA Provisions and Personal Safety courses).

4. The job requires outdoor exposure throughout all seasons, and is characterized by the unpleasant working conditions during the cleaning of sumps and pickup of explosives waste. The job also requires the incumbent to assist in lifting large quantities of materials that can be moderately heavy, sloppy, and unpleasant (No course applicable).

5. Charged with practicing good housekeeping for the proper level of cleanliness of the facilities and equipment (Recordkeeping/ Inspections course).

RCRA JOB DESCRIPTION

TITLE: Disposal Operations Supervisor (WX-3)

Pete Velarde

A. Responsibilities:

Directs the activities of one or two technicians in the pickup, transportation, and disposal of a wide variety of explosives, propellants, high explosive (HE) contaminated oils and solvents, and other HE-contaminated flammable waste from all areas involving Group WX-3 operations and other Groups. Responsible for the safety of all personnel engaged in the disposal activities. Responsible for the training of personnel in the handling, transportation, and destroying of wastes, with special emphasis on the precautions necessary for individual and crew protection. Schedules the activities of the crew to have all explosive or contaminated waste (except sumps) removed from facilities for disposal at the Burning Ground on a frequent basis. Schedules the removal of explosive waste from 70 drainage sumps within TA-16 and other sites. Oversees sump cleaning activities to assure a safe, effective operation and inspects all sumps regularly. Understand and enforce security regulations concerning classified scrap handled by the disposal crew. Responsible for the cleanliness and maintenance requirements of all facilities and equipment involved in disposal activities.

B. Training:

The procedures for the explosives operations within TA-16 are procedures developed by WX-Division. The Standing Operating Procedures are the documents used to guide our personnel in the explosives handling activities. These SOPs are based on the procedures developed over the decades of our experience in handling, transporting, and using explosives at TA-16, and the regulations stated in both the U.S. Army's Material Development and Readiness Command Manual 385-100 and the DOE Safety Manual.

The Disposal Supervisor must have a thorough understanding of the SOPs and safety manuals. This is a necessary capability for the Supervisor in order to meet his responsibility to maintain current SOPs for his activities. The Supervisor obtains this capability by both on-the-job training from his supervision and participation in the WX-Division safety program.

The supervisory training for the Supervisor is primarily on-the-job training. The Supervisor is an individual promoted to this position based on his demonstrated experience and knowledge of the disposal activities, explosives in general, and safety practices in explosives operations.

C. Required Courses:

- RCRA Provisions
- Personal Safety

- Hazardous Waste Handling and Operations
  - Detonation/Burning HE
- RCRA Contingency Plan
- Recordkeeping/Inspections
- On-site Transportation

D. Duties:

1. Responsible for the operations of a truck-mounted vacuum truck for the removal of sump waste by a vacuum method (Detonation/Burning HE course).

2. Works with the crew in preparing HE for burning. Uses squibs, firing circuitry to start the burning operations. Charged with the custody of the firing apparatus (Detonation/Burning HE course).

3. Makes recommendations to his supervision concerning problems associated with the efficiency and safety of the operation (RCRA Provisions and Personal Safety courses).

4. Maintains his facilities and equipment by requesting maintenance support and conducts safety checks of the Burning Ground (Recordkeeping/ Inspections course).

5. Administrative duties include personnel evaluations and compliance with the security regulations involved in the work (RCRA Provisions course, General knowledge).

RCRA JOB DESCRIPTION

TITLE: Certifying Agent (WX-12)

Verdie Raper

Bill McCormick

A. Responsibilities:

Responsible for the verification by visual inspection and/or application of appropriate tests that equipment or other materials leaving the TA-16 explosive area are free of explosives. Certifies that the item in question is for general use with no qualifications.

B. Training:

The Certifier is trained on the job by senior personnel. Qualified Certifiers are senior technicians knowledgeable in explosives safety and familiar with the explosives used in the area and specific facilities. Training from the Group M-1 Analytical Chemistry section is provided on an as-needed basis for the training of approved methods to chemically detect explosive contamination in the field.

C. Required Courses:

- o RCRA Provisions
- o Personal Safety
- o Hazardous Waste Handling and Operations
  - Detonation/Burning HE
- o RCRA Contingency Plan
- o Recordkeeping/Inspections
- o On-site Transportation

D. General Standards for Decontamination Certification:

In general it is possible, through employment of one of the decontamination methods described elsewhere, to so completely remove high explosives from contaminated equipment that it can be certified for general use with no qualifications. There are occasions, however, when it is not practicable nor necessary to completely decontaminate equipment. Items for decontamination may be categorized in the following manner:

1. Transfer of Equipment Within an Explosive Area - Equipment to be transferred within an explosive area should basically be decontaminated at least to the point of being safe for prudent handling and transportation. The item shall be clean on all surfaces inside and out to the extent dictated by normal good housekeeping practices. It shall be free of explosives on all of its surfaces that might be touched,

scraped, hit, or turned in the course of transferral (Detonation/ Burning HE course).

2. Layaway of Equipment Within an Explosives Area - Equipment which is temporarily not needed may be laid away within a storage area in the explosive area. Equipment so consigned should be decontaminated as completely as practicable; however, the nature of equipment such as molds is such as to make it nearly impossible to insure complete removal of all explosives without destroying their usefulness. The Certifying Agent should make sure that all equipment being temporarily laid away at least meets the standards listed in Paragraph 1 (Detonation/Burning HE course).

3. Storage of Equipment Outside of an Explosives Area - Equipment that is being dismantled or removed for storage outside an explosives area shall be completely decontaminated. The Certifying Agent shall ensure himself both by visual inspection as well as by applying the appropriate tests as described in WX-3 SOPs 27.5.1 and 27.5.2 that no HE remains (Detonation/Burning HE and RCRA Contingency Plan courses).

4. Removal of Equipment from an Explosives Area for Salvage or Destruction - Equipment which is no longer needed may be salvaged or destroyed depending on its value and whether it can be decontaminated without destroying its usefulness. Irrespective of whether an item is to be disposed of by salvage or destruction (or discarding), it must be completely decontaminated. The Certifying Agent shall ensure himself that decontamination is complete as in Item 3, above (Detonation/ Burning HE course).

5. Preparation of Equipment for Repair - Contaminated equipment which is in need of repair or modification may fall into two broad categories:

   a. Those items upon which operations must be performed that involve the application or generation of heat. Such operations include welding, grinding, hole-drilling, sawing, and glue curing.

   b. Those items upon which operations can be performed without the application or generation of heat. This includes such things as the replacement of gaskets.

   Items in 5.a above shall be completely decontaminated. In instances where it is impossible to completely decontaminate the whole item, but the area of repair is localized, then the repair area must be completely decontaminated.

   Items in category (b) shall be decontaminated to the greatest degree practicable; however, in cases where complete decontamination is impossible, the Certifying Agent may exercise his judgment and allow those repairs which are not hazardous. The Certifying Agent must acquaint himself with the specific repair operation and procedure, and satisfy himself that no hazard exists before permitting any operation on a contaminated or partially contaminated item.

All items which have been contaminated, or are suspected of being contaminated, shall be inspected and tagged after decontamination by a Qualified Certifying Agent before any disposition on the item can be made. The Certification tag will display the following information:

a. Serial number of the decontamination tag

b. What the item is certified for (repair, transfer, storage, etc.)

c. Method of decontamination

d. Name of decontaminating operator

e. Signature of Certifying Agent

f. If partially decontaminated, any appropriate remarks by the Certifying Agent about the qualification on the item

g. Date of Certification

(Detonation/Burning HE, Recordkeeping/Inspections courses)

APPENDIX V

PERSONNEL TRAINING INFORMATION

OUTLINE OF LOS ALAMOS NATIONAL LABORATORY'S TRAINING PROGRAM

IC - internal classroom instruction

EC - external classroom instruction

OJT - on-the-job training

I. RCRA PROVISIONS

A. Legislation (Federal/State) - (IC, EC) introductory with annual update.

Brief overview of legislative mandates.

B. Regulations (Federal/State) - introductory with annual update.
1. Overview of 40 CFR 260-265 (N.M. Hazardous Waste Regs. Parts I & II)
2. Overview of DOT shipping regulations
3. Familiarization with Los Alamos National Laboratory emergency response, record keeping.

II. PERSONNEL HEALTH AND SAFETY

A. Familiarization with Standard Operating Safety Guidelines (IC)

B. Safe Handling of Chemicals (EC)
1. Explosive/fire hazards, chemical burns, chemical compatibility
2. Eye/skin hazards and protection
3. Respiratory hazards and protection

C. First Aid (IC) introductory, annual recertification

D. CPR (IC) introductory, annual recertification

E. Use of H&S equipment
1. Safety showers, eyewashers
2. Fire extinguishers
3. Alarm system
4. Communication system

III. RESPIRATOR

A. Air-Purifying Devices (IC) introductory, annual
1. Use
   a) Operation of device
   b) Changing filters
   c) Donning and taking off equipment
   d) Safety features
2. Care and cleaning

3. Inspection
4. Fitting

B. Self-Contained Breathing Apparatus (IC) introductory, annual
1. Use:
   a) Operation of device
   b) Changing compressed air bottles
   c) Donning and taking off equipment
   d) Safety features
2. Care and cleaning
3. Inspection
4. Fitting

IV. HAZARDOUS WASTE HANDLING AND OPERATIONS

A. Batch Waste Treatment (OJT) introductory with annual update
1. Familiarization of SOP
2. Familiarizaton of Operating Manual
3. Supervised Operation of Facility
4. Emergency Shutdown Procedures
5. Evacuation Procedures
6. Accidental Release Procedure
7. Familiarization with Emergency Equipment Use, Inspection, Repair, etc.
8. Use of Communication/Alarm System

B. Controlled Air Incineration (OJT) introductory with annual update
1. Familiarization of SOP
2. Familiarization of Operating Manual
3. Supervised Operation of Facility
4. Emergency Shutdown Procedures
5. Evacuation Procedures
6. Accidental Release Procedure
7. Familiarization with Emergency Equipment Use, Inspection, Repair, etc.
8. Use of Communication/Alarm System

C. Detonation/Burning HE (OJT) introductory with annual update
1. Familiarization of SOP
2. Supervised Operation of Facility
3. Emergency/Evacuation Procedures
4. Accidental Release Procedures
5. Familiarization with Emergency Equipment Use, Inspection, Repair, etc.
6. Use of Communication/Alarm System

D. Landfill Disposal (OJT) introductory with annual update
1. Familiarization of SOP
2. Familiarization of Operating Manual
3. Supervised Operation of Facility

4. Emergency Shutdown Procedures
5. Evacuation Procedures
6. Accidental Release Procedure
7. Familiarizaton with Emergency Equipment Use, Inspection, Repair, etc.
8. Use of Communication/Alarm System

E. Non-HE Reactives, Corrosives, Ignitables, Toxics
1. Chemical Hazards and Reactions (EC)
2. Emergency Procedures (OJT)
3. Accidental Release Procedures (OJT)
4. Emergency Equipment
5. Communication/Alarm System

V. RECORD KEEPING/INSPECTIONS (IC,EC,OJT) introductory

A. Use of Manifest System (on-site)

B. Operating Records

C. Reporting

D. Inspections
1. Facility
2. Operating Equipment
3. Safety/Emergency Equipment
4. Security System

VI. TRANSPORTATION (OJT) introductory

A. On-Site
1. Packaging
2. Placarding/labeling
3. Manifesting/recordkeeping
4. Internal Procedures
5. Waste Segregation

B. Off-Site
1. Packaging
2. Placarding/labeling
3. Manifesting/recordkeeping
4. Internal Procedures
5. Waste Segregation

Supervisors and staff receive training appropriate to their degree of handling hazardous waste (e.g., reporting and other procedures required for compliance). Material handlers are trained in the hands-on aspects such as maintenance of operating records, plant operation, and response to spills or other emergencies.

RESUME

Name: Hansen, Wayne Richard

Birth: Township Oakgrove, Wisconsin
August 6, 1939

Status: Married 1960 - Two children

Address: Los Alamos National Laboratory
P. O. Box 1663, MS K490
Los Alamos, NM 87545

SPECIALIZATIONS: Environmental Science, Health Physics

EDUCATION: University of Wisconsin, EC, BS, 1961 (Chem)
University of Kansas, MS, 1963 (Radiation Biophysics)
Colorado State University., Ph.D., 1970 (Radiation Biology)

American Board of Health Physics Diplomat 1972

Fellow, American Association for the Advancement of Science

PROFESSIONAL EXPERIENCE:

10/84 to Present	Associate Division Leader for Environment Health, Safety, and Environment Division Los Alamos National Laboratory Los Alamos, NM 87545 Supervise waste management, environment, and chemistry programs. Includes training direction for programs.
3/78 to 10/84	Group Leader, Environmental Surveillance Group Health, Safety, and Environment Division Los Alamos National Laboratory Los Alamos, NM 87545 Supervise research, monitoring, meteorology, and chemistry of environmental impacts of nuclear facilities.
2/77 to 3/78	Staff Member and Section Leader, H-8, Environmental Studies.
1975 - 1977	Senior Radiobiologist, US Nuclear Regulatory Commission Office of Nuclear Regulatory Research, Washington, D.C. Supervise research in health, ecology, radioecology, and environmental transport for nuclear facilities.
1971 - 1975	Health Physicist, US Environmental protection Agency Office of Radiation Programs, Washington, D.C. Agency Specialist in pathways of actinides and transuranics. Assist in preparation of environmental standards for radiation
1970 - 1971	Health Physicist, US HEW, FDA Bureau of Radiological Health, Rockville, MD Teach radiation protection short courses.

1967 - 1970 Research Assistant, Dept. of Radiology and Radiobiology, Colorado State University, Ft. Collins, CO

Research.

1963 - 1967 Health Physicist, University of Colorado, Boulder, CO

Campus Radiation Safety Officer.

MEMBERSHIPS: AAAS, Health Physics Society, Sigma Xi, Phi Kappa Phi.

RESEARCH: Environmental behavior of transuranic elements in nuclear waste sites, environmental behavior of polonium.

OTHER PROFESSIONAL ACTIVITIES:

Consultant: FREIR Committee, National Academy of Sciences

Chairman: DOE Health Effects Panel for Remedial Action Programs, 1982-83

Chief Umpire for Site Restoration - NUWAX 81 and 83, Nuclear Weapons Accident Exercise. Joint DOE, DOD, FEMA Exercises.

Co-Chairperson for Publicity and Public Relations for the 16th Midyear Meeting of the Health Physics Society, January, 1983.

Environmental Surveillance Specialist for DOE, Accident Response Group/Nuclear Emergency Search Team (ARG/NEST)

Governor's Special Health and Safety Subcommittee on WIPP 1983.

Governor's Radiation Technical Advisory Council, 12/83-12/88.

PUBLICATIONS AND PRESENTATIONS:

T.E. Buhl and W.R. Hansen, (1984). "Estimating the Risks of Cancer Mortality and Genetic Defects Resulting from Exposures to Low Levels of Ionizing Radiation, Los Alamos National Laboratory report LA-9893-MS.

W.R. Hansen and J.C. Rodgers, (1983). "Risk Analyses for Shallow Land Burial and Greater Confinement of Alpha Contaminated Wastes." Nuclear and Chemical Waste Management. Vol. 4, pp 81-94.

W.D. Purtymun, W.R. Hansen, R.J. Peters, (1983). "Radiochemical Quality of Water in the Shallow Aquifer in Mortandad Canyon, 1967-1978." Los Alamos National Laboratory report LA-9675-MS.

D. Mayfield and W.R. Hansen, (1983). "Surface Reconnaissance Through 1980 for Radioactivity at Radioactive Waste Disposal Area G at Los Alamos National Laboratory." Los Alamos National Laboratory report LA-9656-MS.

B.M. Bowen, T.E. Buhl, J.M. Dewart, W.R. Hansen, D.Talley, A.I. Chen, W.A. Olsen, D.M. Van Etten, (1983). "Measurements and Modeling of Gamma Absorbed Doses Due to Releases from a Linear Proton Accelerator: Experimental Design and Preliminary Results." Proceedings of the Fourth DOE Environmental Protection Information Meeting, December 7-9; 1982, Denver, Colorado. CONF-821215.

D.M. Van Etten, D. Talley, T.E. Buhl, W.R. Hansen, (1983). "Capabilities of the Los Alamos National Laboratory's Environmental Emergency Response Vehicle," Proceedings of the Fourth DOE Environmental Protection Information Meeting, December 7-9, 1982, Denver, Colorado, CONF-821215.

R.W. Ferenbaugh, T.E. Buhl, A.K. Stoker, W.R. Hansen, (1982). "Environmental Analysis of Acid/Middle Pueblo Canyon, Los Alamos, New Mexico," Los Alamos National Laboratory report LA-9409-MS.

W.R. Hansen, (1982). "Health Effects and Radiation Dose Predictions," Remedial Action Programs Annual Meeting, Grand Junction, Colorado. October 26-27, 1982

W.R. Hansen, (1982). "Assessment of TRU Levels for Los Alamos, NM," Defense TRU Waste Program Meeting, September 29-30, 1982, Denver, Colorado.

W.R. Hansen, (1982). "Risk and Safety Analysis for Disposal of Alpha-Contaminated Waste at Los Alamos National Laboratory." In: Proceedings of the Alpha Contaminated Waste Management Workshop. Gaithersburg, Maryland, August 10-13, 1982. CONF-820845.

R.W. Ferenbaugh, T.E. Buhl, A.K. Stoker, W.R. Hansen, (1982). "Environmental Analysis of the Bayo Canyon (TA-10) Site, Los Alamos, New Mexico, Los Alamos National Laboratory report LA-9252-MS.

J.C. Rodgers and W.R. Hansen, (1982). "On the Feasibility of Various Disposal Techniques for Selected Los Alamos Stored and Buried TRU Wastes," Los Alamos National Laboratory report LA-UR-82-3071.

L.J. Walker, W.R. Hansen, F.A. Guevara, D.C. Nelson, J.L. Warren, G. Maestas, J.C. Rodgers, W.J. Wenzel, J.M. Graf, (1981). "Alternative Transuranic Waste Management Strategies at Los Alamos National Laboratory," Los Alamos National Laboratory report LA-8982-MS.

W.R. Hansen, (1980). "Pathways to Man," Eighth Life Sciences Symposium, Los Alamos National Laboratory, "Radiation and Its Effects, October 8-10, 1980, Los Alamos, New mexico.

W.R. Hansen, D.L. Mayfield, L.J. Walker, (1980). "Interim Environmental Surveillance Plan for LASL Radioactive Waste Areas," LA-UR-80-3110.

W.R. Hansen and D.R. Elle, (1980). "Radiological Assessments, Environmental Monitoring, and Study Design, " In: Transuranic Elements in the Environment, (ed) W.C. Hanson. U.S. Department of Energy, Technical Information Center, DOE/TIC 22800 (1980).

J.C. Rodgers and W.R. Hansen, (1979). "Transuranic Waste Burial Site Evaluation," In: Nuclear Waste Management Technology Development Activities, January-December, 1978. L.J. Johnson and B.H. Desilets, eds., Los Alamos National Laboratory report LA-7921-PR.

W.R. Hansen, (1978). "Comparison and Discussion of Risk Analysis Methods for TRU Waste Management," presented to the DOE TRU Waste Management Working Group, Salt Lake City, Utah, October 1978.

L.J. Johnson, D.E. Daniel, W.V. Abeele, J.O. Ledbetter, W.R. Hansen, (1978). "Effects from Past Solid Waste Disposal Practices," Environmental Health Perspectives, Vol. 27, pp. 215-22).

W.R. Hansen and R.L. Watters, (1971). "Unsupported $^{210}PoO_2$ in Soil: Soil Adsorption and Characterization of Soil Solution Species," Soil Science 112:145-155.

W.R. Hansen, R.L. Watters and N.D. Yancy, (1971). "$^{210}PoO_2$ Movement in a Mountain Watershed Soil," Health Physics 20:425-429.

W.R. Hansen and R.L. Watters, (1970). "Plant Uptake of ^{210}Po from Soil," Radiation Botany 10:371-375.

R.L. Watters and W.R. Hansen, (1970). "The Hazards Implication of the Transfer of Unsupported ^{210}Po from Alkaline Soil to Plants," Health Physics 18:409-413.

W.R. Hansen, (1970). "Polonium-210 in Soils and Plants," Special Report. COO-1733-11.

R.L. Watters, J.E. Johnson and W.R. Hansen, (1970). A Study of Unsupported Polonium-210 for Ion Exchange in Soils and Uptake in Vegetation. Summary Report for the Three Year Period 1967-1970. COO-1733-10.

R.L. Watters, J.E. Johnson and W.R. Hansen, (1970). A Study of Unsupported Polonium-210 for Ion Exchange in Soils and Uptake in Vegetation. 3rd Technical Progress Report. COO-1733-9.

R.L. Watters, J.E. Johnson and W. R. Hansen, (1969). A Study of Unsupported Polonium-210 for Ion Exchange in Soils and Uptake in Vegetation. 2nd Technical Progress Report. COO-1733-3.

W.R. Hansen and R.L. Watters, (1969). "Translocation of Polonium Oxide from Soils to Plants." Fourteenth Annual Meeting of the Health Physics Society, Pittsburg, Pennsylvania.

R.L. Watters and W.R. Hansen, (1968). "Polonium-210 Absorption by Soils and Translocation to Plants." Thirteenth Annual Meeting, Health Physics Society, Denver, Colorado.

R.L. Watters, J.E. Johnson and W.R. Hansen, (1968). A Study of Unsupported Polonium-210 for Ion Exchange in Soils and Uptake in Vegetation. 1st Technical Progress Report. COO-1733-1.

W.R. Hansen and L.B. Yoder, (1968). "Surveying for Tritium Released from Labeled Compounds in Refrigerated Storage," Health Physics 14:170.

UNITED STATES OF AMERICA
DEPARTMENT OF ENERGY
LOS ALAMOS AREA OFFICE
528 35TH STREET
LOS ALAMOS, NEW MEXICO 87544

SURVEY FOR WASTE DISPOSAL SITE TA-54

Los Alamos County, New Mexico

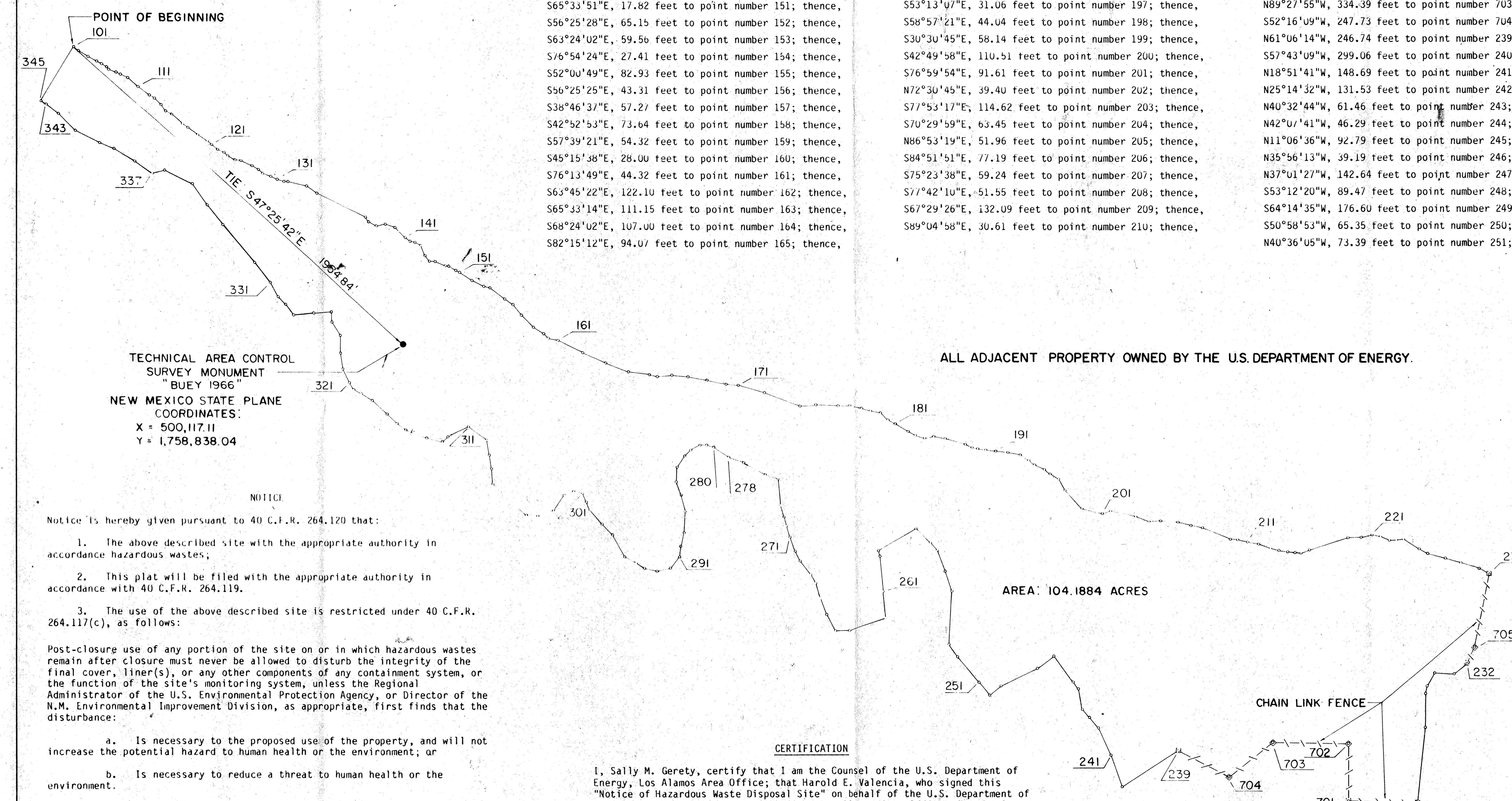
NOTICE OF HAZARDOUS
WASTE DISPOSAL SITE

SITE DESCRIPTION

A tract of land situate within the Ramon Vigil Grant, Los Alamos County, New Mexico, said tract bering more particularly described as follows:

Beginning at the northwest corner of the tract of land herein described, (herein designated as point number 101), from whence Technical Areas Control Survey Monument "BUEY-1966" (having New Mexico State Plane Coordinates X=500, 117.11, Y=1, 758,838.04, Central Zone) bears S47°25'42"E, 1954.84 feet; thence,

S49°20'31"E, 26.25 feet to point number 102; thence,
S58°38'27"E, 48.21 feet to point number 103; thence,
S60°26'45"E, 41.34 feet to point number 104; thence,
S63°20'48"E, 26.10 feet to point number 105; thence,
S55°22'30"E, 26.35 feet to point number 106; thence,
S40°58'15"E, 12.28 feet to point number 107; thence,
S67°49'53"E, 34.77 feet to point number 108; thence,
S62°39'42"E, 21.54 feet to point number 109; thence,
S66°20'26"E, 34.76 feet to point number 110; thence,
S47°31'53"E, 59.08 feet to point number 111; thence,
S51°29'50"E, 58.74 feet to point number 112; thence,
S53°25'52"E, 25.90 feet to point number 113; thence,
S44°56'21"E, 40.05 feet to point number 114; thence,
S38°09'39"E, 34.44 feet to point number 115; thence,
S59°54'51"E, 28.77 feet to point number 116; thence,
S47°56'32"E, 64.61 feet to point number 117; thence,
S53°12'38"E, 28.52 feet to point number 118; thence,
S53°05'04"E, 52.74 feet to point number 119; thence,
S54°34'34"E, 49.22 feet to point number 120; thence,
S51°01'54"E, 25.23 feet to point number 121; thence,
S49°08'30"E, 35.05 feet to point number 122; thence,
S68°24'53"E, 31.02 feet to point number 123; thence,
S45°54'49"E, 23.95 feet to point number 124; thence,
S59°31'11"E, 33.53 feet to point number 125; thence,
S82°13'08"E, 29.03 feet to point number 126; thence,
S65°30'01"E, 51.75 feet to point number 127; thence,
S58°41'14"E, 34.63 feet to point number 128; thence,
S46°20'33"E, 23.54 feet to point number 129; thence,
S69°10'16"E, 38.08 feet to point number 130; thence,
S64°23'53"E, 31.13 feet to point number 131; thence,
S75°38'19"E, 32.05 feet to point number 132; thence,
S89°15'34"E, 17.02 feet to point number 133; thence,
S75°53'25"E, 85.20 feet to point number 134; thence,
S55°30'25"E, 55.80 feet to point number 135; thence,
S64°45'07"E, 244.57 feet to point number 136; thence,
S30°27'27"E, 25.03 feet to point number 137; thence,
S61°16'44"E, 39.23 feet to point number 138; thence,
N79°13'46"E, 40.62 feet to point number 139; thence,
S70°22'13"E, 44.59 feet to point number 140; thence,
S45°49'31"E, 62.35 feet to point number 141; thence,
S51°15'50"E, 26.96 feet to point number 142; thence,
S78°21'43"E, 22.60 feet to point number 143; thence,
S57°06'18"E, 30.58 feet to point number 144; thence,
S23°32'21"E, 48.38 feet to point number 145; thence,
S37°00'51"E, 31.76 feet to point number 146; thence,
S87°22'45"E, 24.28 feet to point number 147; thence,
S67°42'33"E, 48.48 feet to point number 148; thence,
S84°03'04"E, 17.46 feet to point number 149; thence,
S57°53'23"E, 36.52 feet to point number 150; thence,
S65°33'51"E, 17.82 feet to point number 151; thence,
S56°25'28"E, 65.15 feet to point number 152; thence,
S63°24'02"E, 59.56 feet to point number 153; thence,
S76°54'24"E, 27.41 feet to point number 154; thence,
S52°00'49"E, 82.93 feet to point number 155; thence,
S56°25'25"E, 43.31 feet to point number 156; thence,
S38°46'37"E, 57.27 feet to point number 157; thence,
S42°52'53"E, 73.64 feet to point number 158; thence,
S57°39'21"E, 54.32 feet to point number 159; thence,
S45°15'38"E, 28.00 feet to point number 160; thence,
S76°13'49"E, 44.32 feet to point number 161; thence,
S63°45'22"E, 122.10 feet to point number 162; thence,
S65°33'14"E, 111.15 feet to point number 163; thence,
S68°24'02"E, 107.00 feet to point number 164; thence,
S82°15'12"E, 94.07 feet to point number 165; thence,
S77°28'03"E, 34.47 feet to point number 166; thence,
N85°02'45"E, 64.15 feet to point number 167; thence,
S84°52'11"E, 71.24 feet to point number 168; thence,
S79°52'35"E, 84.88 feet to point number 169; thence,
S77°54'01"E, 87.64 feet to point number 170; thence,
S83°43'52"E, 53.30 feet to point number 171; thence,
S74°13'53"E, 120.26 feet to point number 172; thence,
S69°17'18"E, 168.35 feet to point number 173; thence,
N86°23'13"E, 69.98 feet to point number 174; thence,
S87°13'41"E, 97.80 feet to point number 175; thence,
N88°26'06"E, 54.92 feet to point number 176; thence,
S77°32'32"E, 56.00 feet to point number 177; thence,
S75°25'07"E, 40.28 feet to point number 178; thence,
S76°10'02"E, 43.71 feet to point number 179; thence,
S48°25'37"E, 45.54 feet to point number 180; thence,
S59°45'44"E, 37.63 feet to point number 181; thence,
S57°52'24"E, 63.13 feet to point number 182; thence,
S63°48'08"E, 38.37 feet to point number 183; thence,
S72°20'49"E, 42.18 feet to point number 184; thence,
N80°29'39"E, 39.00 feet to point number 185; thence,
S79°41'54"E, 49.60 feet to point number 186; thence,
S73°09'46"E, 93.01 feet to point number 187; thence,
S66°38'00"E, 34.47 feet to point number 188; thence,
S77°01'04"E, 23.99 feet to point number 189; thence,
S78°47'33"E, 37.30 feet to point number 190; thence,
S82°52'53"E, 45.27 feet to point number 191; thence,
S83°07'19"E, 51.52 feet to point number 192; thence,
S80°34'35"E, 55.82 feet to point number 193; thence,
S56°31'12"E, 44.61 feet to point number 194; thence,
S51°47'39"E, 31.74 feet to point number 195; thence,
S62°08'37"E, 47.43 feet to point number 196; thence,
S53°13'07"E, 31.06 feet to point number 197; thence,
S58°57'21"E, 44.04 feet to point number 198; thence,
S30°30'45"E, 58.14 feet to point number 199; thence,
S42°49'58"E, 110.51 feet to point number 200; thence,
S76°59'54"E, 91.61 feet to point number 201; thence,
N72°30'45"E, 39.40 feet to point number 202; thence,
S77°53'17"E, 114.62 feet to point number 203; thence,
S70°29'59"E, 63.45 feet to point number 204; thence,
N86°53'19"E, 51.96 feet to point number 205; thence,
S84°51'51"E, 77.19 feet to point number 206; thence,
S75°23'38"E, 59.24 feet to point number 207; thence,
S77°42'10"E, 51.55 feet to point number 208; thence,
S67°29'26"E, 132.09 feet to point number 209; thence,
S89°04'58"E, 30.61 feet to point number 210; thence,
S75°54'15"E, 46.60 feet to point number 211; thence,
S78°51'59"E, 47.18 feet to point number 212; thence,
S69°10'02"E, 56.24 feet to point number 213; thence,
S76°02'45"E, 37.20 feet to point number 214; thence,
S82°11'05"E, 39.64 feet to point number 215; thence,
S83°41'57"E, 32.07 feet to point number 216; thence,
S84°31'26"E, 25.04 feet to point number 217; thence,
N72°10'37"E, 42.64 feet to point number 218; thence,
N71°59'39"E, 178.22 feet to point number 219; thence,
N89°50'46"E, 59.52 feet to point number 220; thence,
N77°19'34"E, 48.36 feet to point number 221; thence,
S80°05'24"E, 41.02 feet to point number 222; thence,
S66°39'11"E, 41.11 feet to point number 223; thence,
N85°38'58"E, 31.90 feet to point number 224; thence,
N81°46'52"E, 31.90 feet to point number 225; thence,
S56°34'27"E, 81.76 feet to point number 226; thence,
S62°26'46"E, 43.28 feet to point number 227; thence,
S75°43'28"E, 81.31 feet to point number 228; thence,
S73°50'08"E, 71.84 feet to point number 229; thence,
S72°02'45"E, 85.16 feet to point number 230; thence,
S61°12'32"E, 50.89 feet to point number 231; thence,
S11°18'30"W, 329.04 feet to point number 705; thence,
S25°46'21"W, 79.21 feet to point number 232; thence,
S51°22'19"W, 73.53 feet to point number 233; thence,
N87°24'36"W, 88.96 feet to point number 234; thence,
S29°44'34"W, 65.91 feet to point number 235; thence,
S10°11'29"W, 35.27 feet to point number 236; thence,
S00°46'25"W, 149.59 feet to point number 237; thence,
S05°47'04"W, 334.76 feet to point number 238; thence,
N88°57'02"W, 307.41 feet to point number 701; thence,
N00°00'32"E, 255.13 feet to point number 702; thence,
N89°27'55"W, 334.39 feet to point number 703; thence,
S52°16'09"W, 247.73 feet to point number 704; thence,
N61°06'14"W, 246.74 feet to point number 239; thence,
S57°43'09"W, 299.06 feet to point number 240; thence,
N18°51'41"W, 148.69 feet to point number 241; thence,
N25°14'32"W, 131.53 feet to point number 242; thence,
N40°32'44"W, 61.46 feet to point number 243; thence,
N42°07'41"W, 46.29 feet to point number 244; thence,
N11°06'36"W, 92.79 feet to point number 245; thence,
N35°56'13"W, 39.19 feet to point number 246; thence,
N37°01'27"W, 142.64 feet to point number 247; thence,
S53°12'20"W, 89.47 feet to point number 248; thence,
S64°14'35"W, 176.60 feet to point number 249; thence,
S50°58'53"W, 65.35 feet to point number 250; thence,
N40°36'05"W, 73.39 feet to point number 251; thence,
N39°30'51"W, 147.56 feet to point number 252; thence,
N33°46'28"W, 67.85 feet to point number 253; thence,
N03°20'14"E, 232.94 feet to point number 254; thence,
N19°23'35"W, 93.81 feet to point number 255; thence,
N19°39'05"W, 96.52 feet to point number 256; thence,
N38°54'44"W, 44.67 feet to point number 257; thence,
N46°21'40"W, 90.20 feet to point number 258; thence,
S59°48'51"W, 190.21 feet to point number 259; thence,
S15°31'52"E, 26.22 feet to point number 260; thence,
S04°55'06"E, 154.78 feet to point number 261; thence,
S05°04'45"E, 118.72 feet to point number 262; thence,
S71°32'50"W, 171.74 feet to point number 263; thence,
S88°33'38"W, 62.50 feet to point number 264; thence,
N27°27'10"W, 80.82 feet to point number 265; thence,
N21°37'22"W, 77.45 feet to point number 266; thence,
N17°48'04"W, 70.33 feet to point number 267; thence,
N28°40'40"W, 44.76 feet to point number 268; thence,
N37°05'02"W, 72.85 feet to point number 269; thence,
N27°59'11"W, 49.40 feet to point number 270; thence,
N20°22'01"W, 65.94 feet to point number 271; thence,
N18°16'48"W, 52.64 feet to point number 272; thence,
N15°20'54"W, 43.11 feet to point number 273; thence,
N17°01'56"W, 52.58 feet to point number 274; thence,
N04°43'52"W, 116.88 feet to point number 275; thence,
N70°00'09"W, 61.11 feet to point number 276; thence,
N60°24'19"W, 109.40 feet to point number 277; thence,
N70°06'54"W, 69.36 feet to point number 278; thence,
N56°38'20"W, 79.70 feet to point number 280; thence,
N73°06'51"W, 33.81 feet to point number 281; thence,
S85°02'35"W, 28.82 feet to point number 282; thence,
S64°06'30"W, 44.52 feet to point number 283; thence,
S45°09'28"W, 38.49 feet to point number 284; thence,
S33°04'49"W, 60.19 feet to point number 285; thence,
S04°02'32"W, 63.13 feet to point number 286; thence,
S19°20'10"E, 64.15 feet to point number 287; thence,
S13°15'54"E, 76.40 feet to point number 288; thence,
S03°06'30"W, 93.87 feet to point number 289; thence,
S14°42'39"W, 61.39 feet to point number 290; thence,
S05°50'11"W, 46.71 feet to point number 291; thence,
S38°41'10"W, 64.49 feet to point number 292; thence,
S77°11'55"W, 59.53 feet to point number 293; thence,
N77°01'37"W, 57.64 feet to point number 294; thence,
N56°23'29"W, 42.93 feet to point number 295; thence,
N63°37'21"W, 56.02 feet to point number 296; thence,
N28°17'01"W, 113.48 feet to point number 297; thence,
N44°32'28"W, 63.59 feet to point number 298; thence,
N41°01'31"W, 84.26 feet to point number 299; thence
N20°52'08"W, 39.02 feet to point number 300; thence,
N25°12'25"W, 41.33 feet to point number 301; thence,
N75°48'21"W, 41.35 feet to point number 302; thence,
S70°49'16"W, 46.27 feet to point number 303; thence,
S34°01'39"W, 82.92 feet to point number 304; thence,
S69°33'18"W, 71.94 feet to point number 305; thence,
N82°45'56"W, 50.03 feet to point number 306; thence,
N46°48'18"W, 198.24 feet to point number 307; thence,
N04°09'49"W, 68.59 feet to point number 308; thence,
N10°09'49"W, 60.58 feet to point number 309; thence,
N10°24'27"W, 70.36 feet to point number 310; thence,
N53°53'33"W, 99.49 feet to point number 311; thence,
S64°12'36"W, 100.17 feet to point number 312; thence,
S49°31'00"W, 32.69 feet to point number 313; thence,
N76°22'27'W, 72.12 feet to point number 314; thence,
N69°23'28"W, 97.87 feet to point number 315; thence,
N52°35'02"W, 49.51 feet to point number 316; thence,
N44°44'52"W, 59.43 feet to point number 317; thence,
N49°00'54"W, 89.27 feet to point number 318; thence,
N57°35'25"W, 55.86 feet to point number 319; thence,
N61°16'53"W, 38.92 feet to point number 320; thence,
N28°51'01"W, 36.79 feet to point number 321; thence,
N26°30'45"W, 68.19 feet to point number 322; thence,
N09°30'57"W, 70.29 feet to point number 323; thence,
N01°14'09"W, 78.82 feet to point number 324; thence,
N32°22'44"W, 68.48 feet to point number 325; thence,
N02°41'17"W, 45.63 feet to point number 326; thence,
S86°26'04"W, 80.24 feet to point number 327; thence,
S85°01'19"W, 90.58 feet to point number 328; thence,
N38°03'23"W, 56.79 feet to point number 329; thence,
N43°34'01"W, 48.35 feet to point number 330; thence,
N28°11'16"W, 71.07 feet to point number 331; thence,
N38°22'42"W, 110.93 feet to point number 332; thence,
N39°57'03"W, 215.80 feet to point number 333; thence,
N38°32'55"W, 111.89 feet to point number 334; thence,
N33°53'30"W, 115.10 feet to point number 335; thence,
N63°10'41"W, 133.66 feet to point number 336; thence,
S77°07'05"W, 55.26 feet to point number 337; thence,
N53°45'44"W, 89.91 feet to point number 338; thence,
N57°08'57"W, 106.24 feet to point number 339; thence,
N67°29'00"W, 65.75 feet to point number 340; thence,
N62°20'15"W, 120.02 feet to point number 341; thence,
N43°41'47"W, 103.80 feet to point number 342; thence,
N51°03'08"W, 66.19 feet to point number 343; thence,
N60°37'27"W, 27.72 feet to point number 345; thence,
N30°49'45"E, 275.95 feet to the Point of Beginning of the tract of land herein described, containing 104.1884 acres more or less.



N

SCALE: 1" = 300'

The above described land was a part of the territory to which title was vested in the United States by virtue of the "Treaty of Peace, Friendship, Limits and Settlement between the United States of America and the Mexican Republic," duly executed at the City of Guadalupe Hidalgo on February 2, 1848. Ratification was exchanged at Queretaro on May 30, 1848, and proclamation was made July 4, 1848. (See Statutes at Large, Vol. 9, pp. 922-943).

Title has remained in the United States since that date. Pursuant to the Department of Energy Organization Act (Public Law 95-91, 91 Stat. 565) the administrative jurisdiction and control of said land is held by the United States Department of Energy.

Surveyor's Notes

1. Basis of Bearings: New Mexico State Plane Grid Bearings, Central Zone Delta Alpha = +0°00'00.8".
2. All Distances shown are ground distances.
3. No Monuments were set as a result of this Survey.
4. Coordinates shown are New Mexico State Plan Coordinates Central Zone.

SURVEYOR'S CERTIFICATE

I, Kim C. Stelzer, N.M.L.S. #7482, do hereby certify that the information contained hereon was prepared under my direction and is true and correct to the best of my knowledge.

K. C. Stelzer — Kim C. Stelzer N.M.L.S. #7482
June 7, 1985 — Date

NOTICE

Notice is hereby given pursuant to 40 C.F.R. 264.120 that:

1. The above described site with the appropriate authority in accordance hazardous wastes;

2. This plat will be filed with the appropriate authority in accordance with 40 C.F.R. 264.119.

3. The use of the above described site is restricted under 40 C.F.R. 264.117(c), as follows:

Post-closure use of any portion of the site on or in which hazardous wastes remain after closure must never be allowed to disturb the integrity of the final cover, liner(s), or any other components of any containment system, or the function of the site's monitoring system, unless the Regional Administrator of the U.S. Environmental Protection Agency, or Director of the N.M. Environmental Improvement Division, as appropriate, first finds that the disturbance:

a. Is necessary to the proposed use of the property, and will not increase the potential hazard to human health or the environment; or

b. Is necessary to reduce a threat to human health or the environment.

4. This Notice supersedes the Notice recorded with the Clerk of Los Alamos County, New Mexico, on April 29th, 1985, Doc. No. 66548, Misc. Plat Book 5, Page 14.

Date this 12th day of June, 1985.

Harold E. Valencia
Area Manager
Los Alamos Area Office
U.S. Department of Energy

CERTIFICATION

I, Sally M. Gerety, certify that I am the Counsel of the U.S. Department of Energy, Los Alamos Area Office; that Harold E. Valencia, who signed this "Notice of Hazardous Waste Disposal Site" on behalf of the U.S. Department of Energy was then the Area Manager of the Los Alamos Area Office of the U.S. Department of Energy; and, that this "Notice of Hazardous Waste Disposal Site" was thereby duly signed for and on behalf of the U.S. Department of Energy.

June 12, 1985 — Date

Sally M. Gerety
Counsel

OFFICIAL SEAL

ACKNOLWEDGEMENT

State of New Mexico
County of Los Alamos

The foregoing instrument was acknowledged before me this ______ day of ______, 1985, by Sally M. Gerety, Counsel for the Los Alamos Area Office, U.S. Department of Energy.

My commission expires: ______

Notary Public

NO.	DATE	REVISIONS	BY	CK.	PROJ. ENGR.	DOE
1	5/17	EXPANDED SURVEY	K.			

UNITED STATES
DEPARTMENT OF ENERGY
LOS ALAMOS AREA OFFICE—LOS ALAMOS, NEW MEXICO

WASTE DISPOSAL SITE TA-54

CONTRACT NO. AE | DRAWN | CHECKED | A.E. APPROVED | DESIGN | PROJ. ENGR. | CHIEF ENGR. | SCALE | DATE

CLASSIFICATION U   REVIEWER J. D. Rhodes   DATE 6-13-85

SUBMITTED Wen Cooper P.E. ARCHITECT ENGINEER | RECOMMENDED ZIA | APPROVED LAB

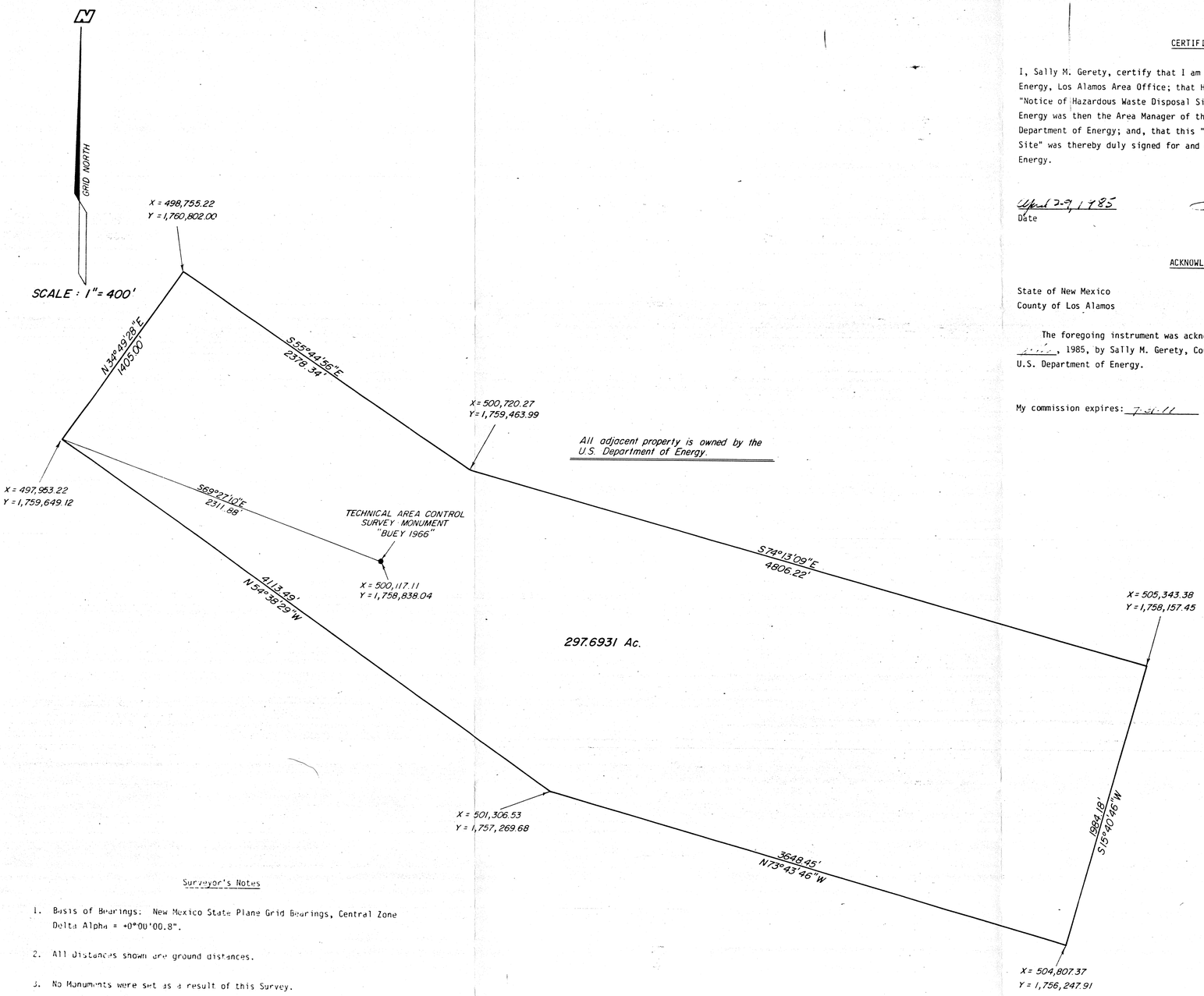
GORDON HERKENHOFF & ASSOCIATES INC.
ARCHITECT—ENGINEER
ALBUQUERQUE NEW MEXICO

DRAWING NO. ENG-54-44 | SHEET 1 | OF 1

14866-M

SURVEY FOR WASTE DISPOSAL SITE

TA-54 , Los Alamos County, New Mexico



Surveyor's Notes

1. Basis of Bearings: New Mexico State Plane Grid Bearings, Central Zone Delta Alpha = +0°00'00.8".
2. All Distances shown are ground distances.
3. No Monuments were set as a result of this Survey.
4. Coordinates shown are New Mexico State Plan Coordinates Central Zone.

SURVEYOR'S CERTIFICATE

I, Kim C. Stelzer, N.M.L.S. #7482, do hereby certify that the information contained hereon was prepared under my direction and is true and correct to the best of my knowledge.

K. C. Stelzer
Kim C. Stelzer N.M.L.S. #7482

4-26-85
Date

LEEDSHILL - HERKENHOFF, INC. ARCHITECTS ENGINEERS
COPPER SQUARE, ALBUQUERQUE, N.M.

14866-M

CERTIFICATION

I, Sally M. Gerety, certify that I am the Counsel of the U.S. Department of Energy, Los Alamos Area Office; that Harold E. Valencia, who signed this "Notice of Hazardous Waste Disposal Site" on behalf of the U.S. Department of Energy was then the Area Manager of the Los Alamos Area Office of the U.S. Department of Energy; and, that this "Notice of Hazardous Waste Disposal Site" was thereby duly signed for and on behalf of the U.S. Department of Energy.

April 29, 1985
Date

Sally M. Gerety
Sally M. Gerety
Counsel

ACKNOWLEDGMENT

State of New Mexico
County of Los Alamos

The foregoing instrument was acknowledged before me this 29 day of April, 1985, by Sally M. Gerety, Counsel for the Los Alamos Area Office, U.S. Department of Energy.

My commission expires: 7-31-88

Betty F. Cummings
Notary Public

UNITED STATES OF AMERICA
DEPARTMENT OF ENERGY
LOS ALAMOS AREA OFFICE
528 35TH STREET
LOS ALAMOS, NEW MEXICO 87544

NOTICE OF HAZARDOUS
WASTE DISPOSAL SITE

SITE DESCRIPTION

A tract of land situate within the Ramon Vigil Grant, Los Alamos County, New Mexico, said tract being more particularly described as follows:

Beginning at the southwest corner of the tract of land herein described, from whence Technical Areas Control Survey Monument "BUEY-1966" (having New Mexico State Plane Coordinates X=500,117.11, Y=1,758,838.04, Central Zone) bears
S69°27'10"E, 2311.88 feet; thence,
N34°49'28"E, 1405.00 feet; thence,
S55°44'56"E, 2378.34 feet; thence,
S74°13'09"E, 4806.22 feet; thence,
S15°40'46"W, 1984.18 feet; thence,
N73°43'46"W, 3648.45 feet; thence,
N54°38'29"W, 4113.49 feet to the Point of Beginning of the tract of land herein described, containing 297.6931 acres more or less.

Basis of Bearings: Grid Bearings, New Mexico State Plane Coordinate System, Central Zone.

The above described land was a part of the territory to which title was vested in the United States by virtue of the "Treaty of Peace, Friendship, Limits and Settlement between the United States of America and the Mexican Republic," duly executed at the City of Guadalupe Hidalgo on February 2, 1848. Ratification was exchanged at Queretaro on May 30, 1848, and proclamation was made July 4, 1848. (See Statutes at Large, Vol. 9, pp. 922-943).

Title has remained in the United States since that date. Pursuant to the Department of Energy Organization Act (Public Law 95-91, 91 Stat. 565) the administrative jurisdiction and control of said land is held by the United States Department of Energy.

NOTICE

Notice is hereby given pursuant to 40 C.F.R. 264.120 that:

1) The above described site has been used to manage and dispose of hazardous wastes;
2) This plat will be filed with the appropriate authority in accordance with 40 C.F.R. 264.119.
3) The use of the above described site is restricted under 40 C.F.R. 264.117(c), as follows:

Post-closure use of any portion of the site on or in which hazardous wastes remain after closure must never be allowed to disturb the integrity of the final cover, liner(s), or any other components of any containment system, or the function of the site's monitoring system, unless the Regional Administrator of the U.S. Environmental Protection Agency, or Director of the N.M. Environmental Improvement Division, as appropriate, first finds that the disturbance:

(a) Is necessary to the proposed use of the property, and will not increase the potential hazard to human health or the environment; or
(b) Is necessary to reduce a threat to human health or the environment:

Dated this 29th day of April, 1985.

H E Valencia
Harold E. Valencia
Area Manager
Los Alamos Area Office
U.S. Department of Energy

66548
April 29 85
8:44 A.
This Plats 14
Maggie Cantelle

COUNTY CLERK SEAL LOS ALAMOS COUNTY, N.M.

ENG-54-44