008060

START

MAR 1990
RECEIVED
EDMC

RCRA Part B Permit Application
Nonradioactive Dangerous Waste Landfill and Storage Facility

BEST AVAILABLE COPY

BEST AVAILABLE COPY

TABLE OF CONTENTS

	PAGE
LIST OF TABLES	ix
LIST OF FIGURES	xi
FOREWORD	xiii
A PART A APPLICATION	A-1
A-1 INTRODUCTION	A-1
A-2 PART A APPLICATION	A-1
B FACILITY DESCRIPTION	B-1
B-1 GENERAL DESCRIPTION	B-1
B-2 TOPOGRAPHIC MAP	B-2
B-2a General Requirements	B-2
B-2b Additional Topographic Requirements	B-4
B-3 LOCATION INFORMATION	B-4
B-3a Seismic Consideration	B-4
B-3b Floodplain Standard	B-4
B-3b(1) Demonstration of Compliance	B-4
B-4 TRAFFIC INFORMATION	B-5
APPENDIX B-1 - HANFORD SITE MAP	
APPENDIX B-2 - AREA MAP 200 WEST	
C WASTE CHARACTERISTICS	C-1
C-1 CHEMICAL AND PHYSICAL ANALYSES	C-1
C-2 WASTE ANALYSIS PLAN	C-3
C-2a Parameters and Rationale	C-4
C-2b Test Methods	C-4
C-2c Sampling Methods	C-5
C-2d Frequency of Analysis	C-6
C-2e Additional Requirements for Wastes Generated Off-Site	C-6
C-2f Additional Requirements for Ignitable, Reactive, or Incompatible Wastes	C-8
REFERENCES	C-11
D PROCESS INFORMATION	D-1
D-1 CONTAINERS	D-1
D-1a(1) Description of Containers	D-1
D-1a(2) Container Management Practices	D-1

TABLE OF CONTENTS

(Continued)

		PAGE
	D-1a(3) Secondary Containment System Design and Operation	D-2
	D-1a(3)(a) Requirement for the Base or Liner to Contain Liquid	D-3
	D-1a(3)(b) Containment System Drainage	D-3
	D-1a(3)(c) Containment System Capacity	D-3
	D-1a(3)(d) Control of Run-on	D-3
	D-1a(4) Removal of Liquids from Containment Systems	D-3
	D-1b Test for Free Liquids	D-4
D-2	TANKS	D-4
D-3	WASTE PILES	D-4
D-4	SURFACE IMPOUNDMENTS	D-4
D-5	INCINERATORS	D-4
D-6	PROCESS INFORMATION	D-4
	D-6a List of Waste	D-4
	D-6b Exemption Request	D-4
	D-6c Liner Engineering Report	D-5
	D-6d Liner System Foundation	D-5
	D-6e Leachate Collection and Removal System	D-5
	D-6f Run-on Control System	D-5
	D-6f(1) Calculation of Peak Flows	D-6
	D-6f(2) Design and Performance	D-6
	D-6f(3) Construction	D-6
	D-6f(4) Maintenance	D-6
	D-6g Run-off Control System	D-6
	D-6g(1) Calculation of Peak Flow	D-6
	D-6g(2) Design and Performance	D-6
	D-6g(3) Construction	D-7
	D-6g(4) Maintenance	D-7
	D-6h Management of Collection and Holding Units	D-7
	D-6i Control of Wind Dispersal	D-7
	D-6j Double Liner Exemption	D-7
	D-6k Bulk or Noncontainerized Free Liquids	D-7
	D-6l Containers Holding Liquids	D-7

TABLE OF CONTENTS

(Continued)

	PAGE
D-61(1) Removal of Free-Standing Liquid	D-8
D-61(2) Restriction to Small Containers	D-8
D-61(3) Overpack Containers (Lab-Packs)	D-8
D-61(3)(a) Inside Containers	D-8
D-61(3)(b) Overpack (Outside Container)	D-8
D-61(3)(c) Absorbent Materials	D-9
D-61(3)(d) Incompatible Wastes	D-9
D-61(3)(e) Reactive Wastes	D-9
D-6m Containerized Wastes	D-9
D-6m(1) Void Space	D-10
D-6m(2) Volume Reduction	D-10
D-7 LAND TREATMENT	D-10
APPENDIX D-1 - REGULATED WASTE PLACED IN THE NONRADIOACTIVE DANGEROUS WASTE LANDFILL	
APPENDIX D-2 - LINER EXEMPTION REQUEST	
E GROUNDWATER MONITORING	E-1
E-1 EXEMPTION FROM GROUNDWATER PROTECTION REQUIREMENTS	E-1
E-1a Surface Impoundment	E-1
E-1b Waste Piles	E-1
E-1c Landfills	E-1
E-1d No Migration	E-1
E-2 INTERIM STATUS PERIOD GROUNDWATER MONITORING DATA	E-1
E-3 AQUIFER IDENTIFICATION	E-2
E-4 CONTAMINANT PLUME DESCRIPTION	E-2
E-5 GROUNDWATER MONITORING PROGRAM	E-2
E-6 DETECTION MONITORING PROGRAM	E-2
E-7 COMPLIANCE MONITORING PROGRAM	E-2
E-8 CORRECTIVE ACTION PROGRAM	E-2
APPENDIX E-1 - REQUEST FOR WAIVER FROM WAC REQUIREMENT FOR GROUNDWATER MONITORING AT THE NONRADIOACTIVE DANGEROUS WASTE LANDFILL, HANFORD SITE, WASHINGTON STATE	

TABLE OF CONTENTS

(Continued)

	PAGE
F PROCEDURES TO PREVENT HAZARDS	F-1
F-1 SECURITY	F-1
F-1a Security Procedures and Equipment	F-1
F-1a(1) 24-Hour Surveillance System	F-1
F-1a(2)(a) Barrier	F-2
F-1a(2)(b) Means to Control Entry	F-2
F-1a(3) Warning Signs	F-2
F-1b Waiver	F-2
F-2 INSPECTION SCHEDULE	F-2
F-2a General Inspection Requirements	F-2
F-2a(1) Type of Problems	F-3
F-2a(2) Frequency of Inspections	F-3
F-2b(1) Container Inspection	F-3
F-2b(2) Tank Inspection	F-4
F-2b(3) Waste Pile Liner Exemption from Groundwater Protection Requirement	F-4
F-2b(4) Waste Pile Inspection	F-4
F-2b(5) Surface Impoundment Inspection	F-4
F-2b(6) Incinerator Inspection	F-4
F-2b(7) Landfill Inspection	F-4
F-2b(7)(a) Run-on and Run-off Control Systems	F-5
F-2b(7)(b) Leak Detection System	F-5
F-2b(7)(c) Wind Dispersal Control System	F-5
F-2b(7)(d) Leachate Collection and Removal System	F-5
F-2b(8) Land Treatment Facility Inspection	F-5
F-3 WAIVER OR DOCUMENTATION OF PREPAREDNESS AND PREVENTION REQUIREMENTS	F-6
F-3a Equipment Requirements	F-6
F-3a(1) Internal Communications	F-6
F-3a(2) External Communications	F-6
F-3a(3) Emergency Equipment	F-6
F-3a(4) Water for Fire Control	F-7
F-3b Aisle Space Requirement	F-7

TABLE OF CONTENTS

(Continued)

		PAGE
F-4	PREVENTIVE PROCEDURES, STRUCTURES, AND EQUIPMENT	F-7
F-4a	Unloading Operations	F-7
F-4b	Run-Off	F-8
F-4c	Water Supplies	F-8
F-4d	Equipment and Power Failure	F-8
F-4e	Personnel Protection Equipment	F-8
F-5	PREVENTION OF IGNITION OR REACTION OF IGNITABLE, REACTIVE, OR INCOMPATIBLE WASTES	F-9
F-5a	Precautions to Prevent Ignition of Ignitable Reactive Waste	F-9
F-5b	General Precautions for Handling Ignitable or Reactive Waste and Mixing of Incompatible Waste	F-9
F-5c	Management of Ignitable or Reactive Waste in Containers	F-10
F-5d	Management of Incompatible Wastes in Containers	F-10
F-5e	Management of Ignitable or Reactive Waste in Tanks	F-10
F-5f	Management of Incompatible Wastes in Tanks	F-10
F-5g	Management of Ignitable or Reactive Wastes Placed in Waste Piles	F-10
F-5h	Management of Incompatible Wastes Placed in Waste Piles	F-10
F-5i	Management of Ignitable or Reactive Wastes Placed in Surface Impoundments	F-10
F-5j	Management of Incompatible Wastes Placed in Surface Impoundments	F-11
F-5k	Management of Ignitable or Reactive Wastes Placed in Landfills	F-11
F-5l	Management of Incompatible Wastes Placed in Landfills	F-11
F-5m	Management of Ignitable or Reactive Wastes Placed in Land Treatment Units	F-11
F-5n	Management of Incompatible Wastes in Land Treatment Units	F-11
G	**CONTINGENCY PLAN**	G-1
G-1	GENERAL INFORMATION	G-1
G-2	EMERGENCY COORDINATORS	G-3
G-3	IMPLEMENTATION OF THE CONTINGENCY PLAN	G-3

TABLE OF CONTENTS

(Continued)

	PAGE
G-4 EMERGENCY RESPONSE PROCEDURES	G-6
G-4a Notification	G-6
G-4b Identification of Dangerous Materials	G-7
G-4c Assessment	G-8
G-4d Control Procedures	G-9
G-4d(1) Spill or Material Release	G-9
G-4d(2) Fire or Explosion	G-10
G-4e Prevention of Recurrence	G-13
G-4f Storage and Treatment of Released Material	G-14
G-4g Incompatible Waste	G-15
G-4h Post-Emergency Equipment Maintenance	G-15
G-4i Container Spills and Leakage	G-16
G-4j Tank Spills and Leakage	G-16
G-4k Waste Pile Spills and Leakage	G-16
G-4l Surface Impoundments Spills and Leakage	G-16
G-4m Incineration Spills and Leakage	G-16
G-4n Landfill Leakage	G-17
G-4n(1) Notification	G-17
G-4n(2) Remedial Action	G-17
G-4n(3) Detection Monitoring Program	G-17
G-5 EMERGENCY EQUIPMENT	G-17
G-5a Hanford Fire Department	G-17
G-5b Cleanup Support Equipment	G-18
G-5c Emergency Director (ED) Vehicle	G-19
G-5d Emergency Medical Equipment, Facilities and Personnel	G-21
G-5e Emergency Communication Systems	G-22
G-6 COORDINATION AGREEMENTS	G-25
G-7 EVACUATION PLAN	G-30
G-8 REQUIRED REPORTS	G-32
APPENDIX G-1 - CONTINGENCY PLAN	
APPENDIX G-2 - MEMORANDA OF UNDERSTANDING	
H PERSONNEL TRAINING	H-1
H-1 OUTLINE OF TRAINING PROGRAM	H-1

TABLE OF CONTENTS

(Continued)

	PAGE
H-1a Introductory Training by Job Title and Duties	H-2
H-1b Training Content, Frequency, and Techniques	H-2
H-1c Training Director	H-11
H-1d Relevance of Training to Job Position	H-11
H-1e Training for Emergency Response	H-12
H-2 IMPLEMENTATION OF TRAINING PROGRAM	H-13
APPENDIX H-1 - NONRADIOACTIVE HAZARDOUS WASTE SAFETY TRAINING	
APPENDIX H-2 - JOB TITLES & DESCRIPTIONS FOR HAZARDOUS WASTE PROGRAM PERSONNEL	
I CLOSURE AND POST-CLOSURE REQUIREMENTS	I-1
I-1 CLOSURE PLANS	I-2
I-1a Closure Performance Standard	I-2
I-1b Partial and Final Closure Activities	I-3
I-1c Maximum Waste Inventory	I-8
I-1d Inventory Removal, Disposal or Decontamination of Equipment	I-10
I-1d(1) Closure of Containers	I-11
I-1d(2) Closure of Tanks	I-13
I-1d(3) Closure of Waste Piles	I-13
I-1d(4) Closure of Surface Impoundment	I-13
I-1d(5) Closure of Incinerators	I-13
I-1d(6) Closure of Land Treatment Facilities	I-13
I-1e Closure of Disposal Units	I-13
I-1e(1) Disposal Impoundments	I-13
I-1e(2) Cover Design	I-13
I-1e(3) Minimization of Liquid Migration	I-17
I-1e(4) Maintenance Needs	I-19
I-1e(5) Drainage and Erosion	I-20
I-1e(6) Settlement and Subsidence	I-21
I-1e(7) Cover Permeability	I-21
I-1e(8) Freeze/Thaw Effects	I-22
I-1f Continuance of Operations	I-22
I-1g Schedule for Closure	I-22

TABLE OF CONTENTS

(Continued)

	PAGE
I-1h Extensions for Closure Time	I-24
I-2 POST-CLOSURE PLAN	I-24
I-2a Inspection Plan	I-24
I-2b Monitoring Plan	I-25
I-2c Maintenance Plan	I-26
I-2d Land Treatment	I-27
I-3 NOTICE IN DEED	I-27
I-4 CLOSURE COST ESTIMATE	I-28
I-5 FINANCIAL ASSURANCE MECHANISM FOR CLOSURE	I-29
I-6 POST-CLOSURE COST ESTIMATE	I-29
I-7 FINANCIAL ASSURANCE MECHANISM FOR POST-CLOSURE CARE	I-29
I-8 LIABILITY REQUIREMENTS	I-29
APPENDIX I-1 - LOCATION OF NRDWL CLOSURE/POST-CLOSURE PLAN	
APPENDIX I-2 - RESPONSIBLE PERSON FOR STORAGE AND UPDATING OF COPIES OF CLOSURE/POST-CLOSURE PLAN	
APPENDIX I-3 - CERTIFICATIONS OF CLOSURE	
J OTHER FEDERAL LAWS	J-1
K CERTIFICATION	K-1

LIST OF TABLES

TABLE NO.	TITLE
C-1	Major Nonradioactive Dangerous Wastes Generated in the 100 Area of the Hanford Site
C-2	Major Nonradioactive Dangerous Wastes Generated in the 200 East Area of the Hanford Site
C-3	Major Nonradioactive Dangerous Wastes Generated in the 200 West Area of the Hanford Site
C-4	Major Nonradioactive Dangerous Wastes Generated in the 300 Area of the Hanford Site
C-5	Major Nonradioactive Dangerous Wastes Generated in the 400 Area of the Hanford Site
C-6	Major Nonradioactive Dangerous Wastes Generated in the 700 Area of the Hanford Site
C-7	Major Nonradioactive Dangerous Wastes Generated in the 1100 and 3000 Areas of the Hanford Site
C-8	Mandatory Waste Characterization Information
C-9	Analytical Methodology Specified by TSD Technical Staff for Generator Waste
C-10	Verification Testing Methods
C-11	Sampling Methods and Equipment
C-12	Verification Testing Parameters Based in Identifying Hazard Characteristics
F-1	Inspection Procedures for the Nonradioactive Dangerous Waste Landfill
F-2	Inspection Procedures for the Nonradioactive Dangerous Waste Storage Facility, 2727-S Building
I-1	NRDWL Trench Status
I-2	Waste Inventory (Existing NRDWS)
I-3	Waste Inventory (Proposed NRDWS)
I-4	Properties of Mirafi Geotextile

LIST OF TABLES
(Continued)

TABLE NO.	TITLE
I-5	Water Retention in Layered Soils
I-6	Closure Schedule (NRDWL)
I-7	Closure Schedule (Existing and Proposed NRDWS)
I-8	Closure Schedule (Demolition Sites)

LIST OF FIGURES

FIGURE NO.	TITLE
B-1	Surrounding Land Use
B-2	Wind Rose for the Hanford Telemetry Network
B-3	Central Landfill With Shaded Areas Denoting NRDWL
B-4	Location of Proposed Nonradioactive Dangerous Waste Storage Facility
B-5	Nonradioactive Dangerous Waste Storage Facility (616)
B-6	Shock Sensitive or Potentially Explosive Chemical Demolition Sites
B-7	Flooded Area for the Probable Maximum Flood
B-8	Hanford Site 600 Area Roads
C-1	Major Nonradioactive Dangerous Waste Generating Facilities in the 100 Areas of the Hanford Site
C-2	Major Nonradioactive Dangerous Waste Generating Facilities in the 200 East Area of the Hanford Site
C-3	Major Nonradioactive Dangerous Waste Generating Facilities in the 200 West Area of the Hanford Site
C-4	Major Nonradioactive Dangerous Waste Generating Facilities in the 300 Area of the Hanford Site
C-5	Major Nonradioactive Dangerous Waste Generating Facilities in the 400 Area of the Hanford Site
C-6	Major Nonradioactive Dangerous Waste Generating Facilities in the 700 Area of the Hanford Site
C-7	Major Nonradioactive Dangerous Waste Generating Facilities in the 1100 and 3000 Areas of the Hanford Site
C-8	Generator Waste Disposition Logic Diagram
C-9	NRDWL and NRDWS Technical Staff Worksheet for Waste Decision Review
C-10	Decision Flow Chart for Determining Waste Designation and Disposition at the Nonradioactive Dangerous Waste Landfill and Storage Facilities
C-11	Chemical Waste Disposal Request Form
C-12	Disposal Analysis Form

LIST OF FIGURES
(Continued)

FIGURE NO.	TITLE
C-13	Generator Waste Verification Testing Documentation
C-14	Compatibility Chart - J. T. Baker, Source
C-15	Compatibility Chart - U.S. EPA, Source
D-1	Proposed Nonradioactive Dangerous Waste Storage Facility Floor Plan
D-2	Proposed Nonradioactive Dangerous Waste Storage Facility Secondary Containment Features
F-1	Inspection Log Nonradioactive Dangerous Waste Landfill Central Landfill/600 Area
F-2	Inspection Log Nonradioactive Dangerous Waste Storage Facility 2727-S Building/200 West Area
G-1	Hanford Area map
G-2	Shock Sensitive or Potentially Explosive Chemical Demolition Sites
G-3	Emergency Notification Sequence - Hazardous Material/Waste
G-4	Overview of the Emergency Plan of Action
G-5	The Location of Emergency Services at Hanford
H-1	Level of Training for Hazardous Waste Personnel
I-1	Hanford Disposal Facility
I-2	Central Landfill 600 Area Hanford Site
I-3	Location of Proposed Nonradioactive Dangerous Waste Storage Facility
I-4	Proposed Nonradioactive Dangerous Waste Storage Facility
I-5	Existing Hanford Storage Facility
I-6	Layout of Existing Nonradioactive Dangerous Waste Storage Facility
I-7	Multilayer Cover System
I-8	Nonradioactive Dangerous Waste Landfill
I-9	Total Annual Precipitation Probability Diagram

FOREWORD

The U. S. Department of Energy, Richland Operations Office (DOE-RL) Part B Permit Application for the Hanford Site consists of separate permit applications for the following hazardous waste treatment, storage, and disposal units:

1. The Nonradioactive Dangerous Waste Landfill and Storage Facilities
2. Alkali Metal Treatment and Storage Facilities
3. Low-Level Burial Grounds and Retrievable Storage

In addition, the following hazardous waste treatment, storage, and disposal units will be closed under interim status and have been described in a Closure/Post-Closure Plan:

1. The 300 Area Process Trenches
2. Solar Evaporation Basins
3. Solvent Evaporator (Closure Plan only)

Each separate permit application provides a complete description of hazardous waste management activities as is required in the Washington Administrative Code (WAC) 173-303-806 and Title 40 Code of Federal Regulations (CFR) Part 270 Subpart B. Site-wide services and descriptions have been incorporated into each volume. It is anticipated that each separate application will be reviewed individually and will undergo subsequent revisions prior to acceptance by the State of Washington Depaartment of Ecology (WDOE) and the United States Environmental Protection Agency, Region X (EPA).

The following submittal contains the DOE-RL Part B Permit Application for the Nonradioactive Dangerous Waste Landfill, the existing Nonradioactive Dangerous Waste Storage Facility (which will be closed under interim status), the proposed Nonradioactive Dangerous Waste Storage Facility which is scheduled for operation in Calendar Year 1986, and nonradioactive waste detonation activities.

SECTION A
PART A APPLICATION

A-1 INTRODUCTION

This U. S. Department of Energy (DOE-RL) Part B Permit Application was prepared for submittal to the State of Washington Department of Ecology (WDOE) and the U. S. Environmental Protection Agency, Region X (EPA) on November 8, 1985. Proposed permit conditions for the DOE-RL Nonradioactive Dangerous Waste Landfill (NRDWL), the existing Nonradioactive Dangerous Waste Storage Facility (NRDWS) and the proposed NRDWS are contained in the following permit application. The existing NRDWS will be closed under interim status. The proposed NRDWS is scheduled to begin operation in calendar year 1986. This Part B Permit Application also includes proposed permit conditions for the treatment of shock-sensitive and peroxide-forming chemicals by detonation.

An initial Part A permit application was submitted to EPA in November of 1980. This Part A contained only descriptions of the NRDWL. Subsequent Part A revisions describing the NRDWL and the existing and proposed NRDWS were submitted to WDOE in November of 1984, March of 1985, June of 1985 and September of 1985.

Both the NRDWL and the existing NRDWS are operating under interim status. The proposed NRDWS will operate under interim status until the Part B Permit Application for these facilities is accepted.

A-2 PART A APPLICATION

The following Part A Permit Application contains waste process and waste designation codes for the NRDWL and the existing and proposed NRDWS, and for detonation activities.

PART A

DANGEROUS WASTE PERMIT FORMS

(FORMS 1 and 3)

WASHINGTON STATE
DANGEROUS WASTE PERMIT
GENERAL INFORMATION

Permit Application Process

There are two parts to a Dangerous Waste Permit Application—Part A and Part B. Part A consists of Form 1 and Form 3. Part B requires detailed site—specific information such as geologic, hydrologic, and engineering data. WAC 173-303-800 specifies the information that will be required from dangerous waste management facilities in Part B.

Operation During Interim Status

Part A of the permit application defines the processes to be used for treatment, storage, and disposal of dangerous wastes; the design capacity of such processes; and the specific dangerous wastes to be handled at a facility during the interim status period. Once Part A is submitted to the Department of Ecology, changes in the dangerous wastes handled, changes in design capacities, changes in processes, and changes in ownership or operational control at a facility during the interim status period may only be made in accordance with the procedures in WAC 173-303-820. Changes in quantity of waste handled at a facility during interim status can be made without submitting a revised Part A provided the quantity does not exceed the design capacities of the processes specified in Part A of the permit application. Failure to furnish all information required to process a permit application is grounds for termination of an interim status permit.

Confidential Information

All information submitted in this form will be subject to public disclosure, to the extent provided by RCRA and the Freedom of Information Act, 5 U.S.C. Section 552, and EPA's Business Confidentiality Regulations, 40 CFR Part 2 *(see especially 40 CFR 2.305)*, and will be subject to the State of Washington Public Records Act chapter 42.17 RCW and chapter 43.21A-160 RCW. Persons filing this form may make claims of confidentiality. Such claims must be clearly indicated by marking "confidential" on the specific information on the form for which confidential treatment is requested or on any attachments, and must be accompanied, at the time of filing, by a written substantiation of the claim, by answering the following questions:

Confidential Information (continued)

A. Which portions of the information do you claim are entitled to confidential treatment?

B. For how long is confidential treatment desired for this information?

C. What measures have you taken to guard against undesired disclosure of the information to others?

D. To what extent has the information been disclosed to others, and what precautions have been taken in connection with that disclosure?

E. Has the Department of Ecology, EPA or any other Federal or State agency made a pertinent confidentiality determination? If so, what would those harmful effects be and why should they be viewed as substantial? Explain the causal relationship between disclosure and the harmful effects.

If no claim of confidentiality or no substantiation accompanies the information when it is submitted, EPA or the department may make the information available to the public without further notice to the submitter.

Definitions

Terms used in these instructions and in this form are defined in the Definitions section of the Dangerous Waste Regulation, chapter 173-303 WAC.

FORM 1—INSTRUCTIONS

This form must be completed by all applicants.

Completing This Form

Please type or print. If you print, place each character between the marks. Abbreviate if necessary to stay within the number of characters allowed for each item. Use one space for breaks between words, but not for punctuation marks unless they are needed to clarify your response.

Section I

Space is provided at the upper right hand corner of Form 1 for insertion of your EPA/State identification number. If you have an existing facility, enter your identification number. If you don't have an EPA/State identification number, please contact the Department of Ecology (206) 459-6303 and one will be provided for you. If your facility is new (not yet constructed), leave this item blank.

Section II

Enter the facility's official or legal name. Do not use a colloquial name.

Section III

Give the name, title, and work telephone number of a person who is thoroughly familiar with the operation of the facility and with the facts reported in this application and who can be contacted if necessary.

Section IV

Give the complete mailing address of the office where correspondence should be sent. This often is not the address used to designate the location of the facility or activity.

Section V

Give the address or location of the facility identified in Section III of this form. If the facility lacks a street name or route number, give the most accurate alternative geographic information (e.g., section number or quarter section number from county records or at intersection of Rts. 425 and 22).

Section VI

List, in descending order of significance, the four 4-digit standard industrial classification (SIC) codes which best describe your facility in terms of the principal products or services you produce or provide. Also, specify each classification in words. These classifications may differ from the SIC codes describing the operation generating the dangerous wastes.

SIC code numbers are descriptions which may be found in the "Standard Industrial Classification Manual" prepared by the Executive Office of the President, Office of Management and Budget, which is available from the Government Printing Office, Washington, D.C. Use the current edition of the manual. If you have any questions concerning the appropriate SIC code for your facility, contact your Department of Ecology Regional office (see Table 1).

Table 1. Department of Ecology Regional Offices

Northwest Regional Office 4350 - 150th NE Redmond, Washington 98052 Tel: 206-885-1900	Southwest Regional Office 7272 Cleanwater Lane Olympia, Washington 98504 Tel: 206-753-2353
Eastern Regional Office East 103 Indiana Spokane, Washington 99207 Tel: 509-456-2926	Central Regional Office 3601 West Washington Yakima, Washington 98903 Tel: 509-575-2490

Section VII-A

Give the name, as it is legally referred to, of the person, firm, public organization, or any other entity which operates the facility described in this application. This may or may not be the same name as the facility. The operator of the facility is the legal entity which controls the facility's operation rather than the plant or site manager. Do not use a colloquial name.

Section VII-B

Indicate whether the entity which operates the facility also owns it by marking the appropriate box

Section VII-C

Enter the appropriate letter to indicate the legal status of the operator of the facility. Indicate "public" for a facility solely owned by local government(s) such as a city, town, county, parish, etc.

Sections VII-D—H

Enter the telephone number and address of the operator identified in Item VII-A

Section VIII

Indicate whether the facility is located on Indian lands.

Section IX

Provide a topographic map or maps of the area extending at least to one mile beyond the property boundaries of the facility which clearly show the following:

The legal boundaries of the facility;

The location and serial number of each of your existing and proposed intake and discharge structures;

All hazardous waste management facilities;

Each well where you inject fluids underground; and

All springs and surface water bodies in the area, plus all drinking water wells within ¼ mile of the facility which are identified in the public record or otherwise known to you.

If an intake or discharge structure, hazardous waste disposal site, or injection well associated with the facility is located more than one mile from the plant, include it on the map, if possible. If not, attach additional sheets describing the location of the structure, disposal site, or well, and identify the U.S. Geological Survey (or other) map corresponding to the location.

On each map, include the map scale, a meridian arrow showing north, and latitude and longitude at the nearest whole second. On all maps of rivers, show the direction of the current, and in tidal waters, show the directions of the ebb and flow tides. Use a 7-½ minute series map published by the U.S. Geological Survey, which may be obtained through the U.S. Geological Survey Offices listed below. If a 7-½ minute series map has not been published for your facility site, then you may use a 15 minute series map from the U.S. Geological Survey. If neither a 7-½ nor 15 minute series map has been published for your facility site, use a plat map or other appropriate map, including all the requested information; in this case, briefly describe land uses in the map area (e.g., residential, commercial).

You may trace your map from a geological survey chart, or other map meeting the above specifications. If you do, your map should bear a note showing the number or title of the map or chart it was traced from. Include the names of nearby towns, water bodies, and prominent points.

U.S.G.S. OFFICES	AREA SERVED
Western Mapping Center National Cartographic Information Center U.S.G.S. 346 Middlefield Road Menlo Park, Ca. 94025 Phone No. (415) 323-8111	Ariz., Calif., Hawaii, Idaho, Nev., Oreg., Wash., American Samoa, Guam, and trust Territories

Section X

Briefly describe the nature of your business (e.g., products produced or services provided).

Section XI

For a corporation, by a principal executive officer of at least the level of vice president.

For partnership or sole proprietorship, by a general partner or the proprietor, respectively; or

For a municipality, State, Federal, or other public facility, by either a principal executive officer or ranking elected official.

FORM 1

State of Washington Department of Ecology

WASHINGTON STATE

DANGEROUS WASTE PERMIT GENERAL INFORMATION

(Read "Form 1 Instructions" before starting)

I. EPA/STATE I.D. NUMBER: WA 7 8 9 0 0 0 8 9 6 7

II. NAME OF FACILITY

US DEPT OF ENERGY RICHLAND OPERATIONS OFFICE

III. FACILITY CONTACT

A. NAME & TITLE (last, first, & title)	B. PHONE (area code & no.)
FITZSIMMONS, T. R. ASSISTANT MGR SAFETY*	509 376 7387

IV. FACILITY MAILING ADDRESS

A. STREET OR P.O. BOX	B. CITY OR TOWN	C. STATE	D. ZIP CODE
P.O. BOX 550	RICHLAND	WA	99352

V. FACILITY LOCATION

A. STREET, ROUTE NO. OR OTHER SPECIFIC IDENTIFIER	B. COUNTY NAME
HANFORD SITE	BENTON

C. CITY OR TOWN	D. STATE	E. ZIP CODE	F. COUNTY CODE (if known)
RICHLAND	WA	99352	005

IV. SIC CODES *(4-digit, in order of priority)*

A. FIRST	B. SECOND
9711 (specify) NATIONAL SECURITY	8922 (specify) NUCLEAR NONCOMMERCIAL RESEARCH DEVELOPMENT AND EDUCATION
C. THIRD	**D. FOURTH**
9611 (specify) ADMINISTRATION AND GENERAL ECONOMICS PROGRAM	4911 (specify) STEAM - ELECTRIC GENERATOR

VII. OPERATOR INFORMATION

A. NAME	B. Is the name listed in Item VII-A also the owner?
US DEPT OF ENERGY RICHLAND OPERATIONS	☒ YES ☐ NO

C. STATUS OF OPERATOR (Enter the appropriate letter into the answer box; if "Other", specify.)		D. PHONE (area code & no.)
F = FEDERAL, S = STATE, P = PRIVATE, M = PUBLIC (other than federal or state), O = OTHER (specify)	F (specify)	509 376 7387

E. STREET OR P.O. BOX	F. CITY OR TOWN	G. STATE	H. ZIP CODE
PO BOX 550	RICHLAND	WA	99352

VIII. INDIAN LAND

Is the facility located on Indian lands? ☐ YES ☒ NO

COMPLETE BACK PAGE

*Office of Assistant Manager for Safety, Safeguards and Quality Assurance

ECY 030-31

SCL4 -270-

WA7890008967

IX. MAP

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

X. NATURE OF BUSINESS *(provide a brief description)*

O NATIONAL DEFENSE NUCLEAR MATERIAL PRODUCTION

O ENERGY RESEARCH AND TECHNOLOGY DEVELOPMENT

O DEFENSE NUCLEAR WASTE MANAGEMENT

O BYPRODUCT STEAM, SOLD FOR ELECTRIC POWER GENERATION

O AND SIC 15: BUILDING CONSTRUCTION - GENERAL CONTRACTORS AND OPERATIVE BUILDERS

XI. 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
T.R. FITZSIMMONS, ASST. MANAGER		

ECY 030-31 Reverse

ECL 5 278-

FORM 3—INSTRUCTIONS

Completing This Form

Please type or print. If you print place each character between the marks. Abbreviate if necessary to stay within the number of characters allowed for each item. Use one space for breaks between words, but not for punctuation marks unless they are needed to clarify your response.

Section I

Existing dangerous waste management facilities should enter their EPA/STATE Identification Number *(if known)*. New facilities should leave this item blank.

Section II

A. FIRST APPLICATION. If this is the first application that is being filed for the facility place an "X" in either the Existing Facility box or the New Facility box.

1. EXISTING FACILITY. Existing facilities are:

a. Those facilities which received hazardous waste for treatment, storage, and/or disposal on or before November 19, 1980; or

b. Those facilities for which construction had commenced on or before November 15, 1980. Construction had "commenced" only if:

(1) The owner or operator had obtained all necessary Federal, State, and local preconstruction approvals or permits; and

(2-a) A continuous physical, on—site construction program had begun *(facility design or other preliminary non—physical and non—site specific preparatory activities do not constitute an on—site construction program)*, or

(2-b) The owner or operator had entered into contractual obligations *(options to purchase or contracts for feasibility, engineering, and design studies do not constitute contractual obligations)* which could not be cancelled or modified without substantial loss. Generally, a loss is deemed substantial if the amount an owner or operator must pay to cancel construction agreements or stop construction exceeds 10% of the total project cost.

EXISTING FACILITY DATE. If the Existing Facility box is marked, enter the date dangerous waste operations began *(i.e., the date the facility began treating, storing, or disposing of hazardous waste)* or the date construction commenced.

2. NEW FACILITY. New facilities are all facilities for which construction commenced, or will commence, after November 19, 1980.

NEW FACILITY DATE. If the New Facility box is marked, enter the date that operation began or is expected to begin.

B. REVISED APPLICATION. If this is a subsequent application that is being filed to amend data filed in a previous application, place an "X" in the appropriate box to indicate whether the facility has interim status or a permit.

1. FACILITY HAS AN INTERIM STATUS PERMIT. Place an "X" in this box if this is a revised application to make changes at a facility during the interim status period.

2. FACILITY HAS A FINAL PERMIT. Place an "X" in this box if this is a revised application to make changes at a facility for which a permit has been issued.

(NOTE. When submitting a revised application, applicants must resubmit in their entirety each item on the application for which changes are requested. In addition, Items I and IX [and Item X if applicable] must be completed. It is not necessary to resubmit information for other items that will not change).

Section III

The information in Section III describes all the processes that will be used to treat, store, or dispose of dangerous waste at the facility. The design capacity of each process must be provided as part of the description. The design capacity of injection wells and landfills at existing facilities should be measured as the remaining, unused capacity. See the form for the detailed instructions to Section III.

Section IV

The information in Section IV describes all the dangerous wastes that will be treated, stored, or disposed at the facility. In addition, the processes that will be used to treat, store, or dispose of each waste and the estimated annual quantity of each waste must be provided. See the form for the detailed instructions to Section IV.

Section V

All existing facilities must include a drawing showing the general layout of the facility. This drawing should be approximately to scale and fit in the space provided on the form. This drawing should snow the following:

The property boundaries of the facility;

The areas occupied by all storage, treatment, or disposal operations that will be used during interim status;

The name of each operation. *(Example—multiple hearth incinerator, drum storage area, etc.)*;

Areas of past storage, treatment, or disposal operations;

Areas of future storage, treatment, or disposal operations; and

The approximate dimensions of the property boundaries and all storage, treatment, and disposal areas.

Section VI

All existing facilities must include photographs that clearly delineate all existing structures; all existing areas for storing, treating, or disposing of hazardous waste; and all known sites of future storage, treatment, or disposal operations. Photographs may be color or black and white, ground-level or aerial. Indicate the date the photograph was taken on the back of each photograph.

Section VII

Enter the latitude and longitude of the facility in degrees, minutes, and seconds. For larger facilities, enter the latitude and longitude at the approximate mid-point of the facility. You may use the map you provided for Section IX of Form 1 to determine latitude and longitude. Latitude and longitude information is also available from Regional Offices of the U.S. Department of Interior, Geological Survey and from State agencies such as the Department of Natural Resources.

Section VIII

See the form for the instructions to Section VIII.

Section IX and Section X

All facility owners must sign Section IX. If the facility will be operated by someone other than the owner, then the operator must sign Section X. Federal regulations require the certification to be signed as follows:

A. For a corporation, by a principal executive officer at least the level of vice president;

B. For a partnership or sole proprietorship, by a general partner or the proprietor, respectively; or

C. For a municipality, State, Federal, or other public facility, by either a principal executive officer or ranking elected official.

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

FORM 3

DANGEROUS WASTE PERMIT APPLICATION

I. EPA/STATE I.D. NUMBER: W A 7 8 9 0 0 0 8 9 6 7

FOR OFFICIAL USE ONLY

APPLICATION APPROVED	DATE RECEIVED (mo., day, & yr.)	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/STATE I.D. Number, or if this is a revised application, enter your facility's EPA/STATE I.D. Number in Section I above.

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

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

MO.	DAY	YR.
0 3		4 3

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

☐ 2. NEW FACILITY (*Complete item below.*)

MO.	DAY	YR.

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

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

☒ 1. FACILITY HAS AN INTERIM STATUS PERMIT

☐ 2. FACILITY HAS A FINAL 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 (*Section 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	D80	GALLONS OR LITERS
LANDFILL	D81	ACRE-FEET (*the volume that would cover one acre to a depth of one foot*) OR HECTARE-METER
LAND APPLICATION	D82	*ACRES OR HECTARES*
OCEAN DISPOSAL	D83	GALLONS PER DAY OR LITERS PER DAY
SURFACE IMPOUNDMENT	D84	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, Section III-C.)	T04	GALLONS PER DAY OR LITERS PER DAY

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

EXAMPLE FOR COMPLETING SECTION 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.

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 (*specify*)	B. 2. UNIT OF MEASURE (*enter code*)	FOR OFFICIAL USE ONLY
X-1	S 0 2	600	G		5				
X-2	T 0 3	20	E		6				
1	S 0 1	47,000	G		7				
2	D 8 1	6,000	C		8				
3	T 0 4	500	G		9				
4					10				

Continued from the front

III. PROCESSES (continued)

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

T04: Thermal treatment of shock sensitive or potentially explosive chemical wastes.

IV. DESCRIPTION OF DANGEROUS WASTES

A. **DANGEROUS WASTE NUMBER** — Enter the four digit number from Chapter 173-303 WAC for each listed dangerous waste you will handle. If you handle dangerous wastes which are not listed in Chapter 173-303 WAC, enter the four digit number(s) that describes the characteristics and/or the toxic contaminants of those dangerous 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 dangerous waste: For each listed dangerous waste entered in column A select the code(s) from the list of process codes contained in Section III to indicate how the waste will be stored, treated, and/or disposed of at the facility.

For non—listed dangerous wastes: For each characteristic or toxic contaminant entered in Column A, select the code(s) from the list of process codes contained in Section III to indicate all the processes that will be used to store, treat, and/or dispose of all the non—listed dangerous 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: DANGEROUS WASTES DESCRIBED BY MORE THAN ONE DANGEROUS WASTE NUMBER — Dangerous wastes that can be described by more than one Waste Number shall be described on the form as follows:

1. Select one of the Dangerous 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 Dangerous 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 Dangerous Waste Number that can be used to describe the dangerous waste.

EXAMPLE FOR COMPLETING SECTION 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. DANGEROUS 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	K054	900	P	T03 D80	
X-2	D002	400	P	T03 D80	
X-3	D001	100	P	T03 D80	
X-4	D002			T03 D80	included with above

Continued from page 2

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

I.D. NUMBER (enter from page 1)
WA 7 8 9 0 0 0 8 9 6 7

IV. DESCRIPTION OF DANGEROUS WASTES (continued)

LINE NO.	A. DANGEROUS WASTE NO. (enter codes)	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	20,000	K	S01 D81	
2	D002	10,000	K	S01 D81	
3	D004	10	K	S01 D81	
4	D005	10	K	S01 D81	
5	D006	10	K	S01 D81	
6	D007	10	K	S01 D81	
7	D008	10	K	S01 D81	
8	D009	500	K	S01 D81	
9	D010	10	K	S01 D81	
10	D011	20	K	S01 D81	
11	WT01	10,000	K	S01	
12	WT02	10,000	K	S01	
13	WT02	10,000	K	S01 D81	
14	WP01	10	K	S01	
15	WP02	10	K	S01	
16	WC01	100	K	S01	
17	WC02	100	K	S01	
18	F001	2500	K	S01	
19	F002	2500	K	S01	
20	F003	1000	K	S01	
21	F004	500	K	S01	
22	F005	5000	K	S01	
23	D003	500	K	S01	
24					
25					
26					

Continued from page 2

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

ID NUMBER (enter from page 1)
WA789000396 7

IV. DESCRIPTION OF DANGEROUS WASTES (continued)

LINE NO.	A. DANGEROUS 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	U001	500	K	S01	
2	U003	1000			
3	U006	500			
4	U007				
5	U008				
6	U009				
7	U010				
8	U012				
9	U015				
10	U017				
11	U018				
12	U019				
13	U020				
14	U021				
15	U022				
16	U023				
17	U024				
18	U025				
19	U026				
20	U027				
21	U029				
22	U030				
23	U032	1000			
24	U033	500			
25	U034				
26	U035				

Continued from page 2

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

ID NUMBER (enter from page 1)
W A 7 8 9 0 0 0 8 9 6 7

IV. DESCRIPTION OF DANGEROUS WASTES (continued)

LINE NO.	A. DANGEROUS 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 D1)
1	U 0 3 6	500	K	S 0 1	
2	U 0 3 7				
3	U 0 3 8				
4	U 0 3 9				
5	U 0 4 1				
6	U 0 4 2				
7	U 0 4 3				
8	U 0 4 4	1000			
9	U 0 4 5	500			
10	U 0 4 6				
11	U 0 4 7				
12	U 0 4 8				
13	U 0 4 9				
14	U 0 5 0				
15	U 0 5 1				
16	U 0 5 2				
17	U 0 5 3				
18	U 0 5 5				
19	U 0 5 6				
20	U 0 5 7				
21	U 0 5 8				
22	U 0 6 0				
23	U 0 6 1				
24	U 0 6 2				
25	U 0 6 3				
26	U 0 6 4				

CONTINUE ON REVERSE

Continued from page 2

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

I.D. NUMBER (enter from page 1)
WA789000896 7

IV. DESCRIPTION OF DANGEROUS WASTES (continued)

LINE NO.	A. DANGEROUS 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	U066	500	K	S01	
2	U067				
3	U068				
4	U070				
5	U071				
6	U072				
7	U073				
8	U074				
9	U075				
10	U076				
11	U077				
12	U078				
13	U079				
14	U080				
15	U081				
16	U082				
17	U083				
18	U084				
19	U085				
20	U087				
21	U092				
22	U093				
23	U094				
24	U095				
25	U096				
26	U097				

Continued from page 2

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

I.D. NUMBER (enter from page 1)
W A 7 8 9 0 0 0 8 9 6 7

IV. DESCRIPTION OF DANGEROUS WASTES (continued)

LINE NO.	A. DANGEROUS 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, describe)
1	U 0 9 9	500	K	S 0 1	
2	U 1 0 3				
3	U 1 0 5				
4	U 1 0 6				
5	U 1 0 9				
6	U 1 1 0				
7	U 1 1 1				
8	U 1 1 4				
9	U 1 1 5				
10	U 1 2 1				
11	U 1 2 2				
12	U 1 2 5				
13	U 1 2 6				
14	U 1 2 7				
15	U 1 2 8				
16	U 1 2 9				
17	U 1 3 0				
18	U 1 3 1				
19	U 1 3 2				
20	U 1 3 3	5000			
21	U 1 3 5	500			
22	U 1 3 8				
23	U 1 4 2				
24	U 1 4 3				
25	U 1 4 4				
26	U 1 4 7				

Continued from page 2

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

I.D. NUMBER (enter from page 1)
WA789000896 7

IV. DESCRIPTION OF DANGEROUS WASTES (continued)

LINE NO	A. DANGEROUS 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	U149	500	K	S01	
2	U151	140,000			
3	U152	500			
4	U153				
5	U156				
6	U157				
7	U158				
8	U160				
9	U163				
10	U165				
11	U166				
12	U167				
13	U168				
14	U169				
15	U170				
16	U171				
17	U174				
18	U176				
19	U177				
20	U178				
21	U179				
22	U183				
23	U184				
24	U185				
25	U188				
26	U189				

Continued from page 2

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

I.D. NUMBER (enter from page 1)

IV. DESCRIPTION OF DANGEROUS WASTES (continued)

LINE NO.	A. DANGEROUS 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	U190	500	K	S01	
2	U191				
3	U194				
4	U196				
5	U197				
6	U201				
7	U207				
8	U208				
9	U209				
10	U210				
11	U211	5000			
12	U212	500			
13	U219				
14	U220				
15	U223				
16	U225				
17	U226	5000			
18	U227	500			
19	U228				
20	U230				
21	U231				
22	U232				
23	U233				
24	U235				
25	U236				
26	U237				

Continued from page 2

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

I.D. NUMBER (enter from page 1)
W A 7 8 9 0 0 0 8 9 6 7

IV. DESCRIPTION OF DANGEROUS WASTES (continued)

LINE NO.	A. DANGEROUS 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	U 2 3 9	500	K	S O L	
2	U 2 4 0				
3	U 2 4 2				
4	U 2 4 3				
5	U 2 4 5				
6	U 2 4 6				
7	U 2 4 7				
8					
9					
10					
11					
12					
13					
14					
15					
16					
17					
18					
19					
20					
21					
22					
23					
24					
25					
26					

Continued from page 2

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

I.D. NUMBER (enter from page 1)
WA789000896 7

IV. DESCRIPTION OF DANGEROUS WASTES (continued)

LINE NO.	A. DANGEROUS 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	P001	500	K	S01	
2	P002				
3	P003				
4	P004				
5	P005				
6	P007				
7	P008				
8	P009				
9	P010				
10	P011				
11	P012				
12	P013				
13	P014				
14	P015				
15	P016				
16	P017				
17	P018				
18	P020				
19	P021				
20	P022				
21	P023				
22	P024				
23	P025				
24	P026				
25	P027				
26	P028				

Continued from page 2

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

I.D. NUMBER (enter from page 1)
WA789000896 7

IV. DESCRIPTION OF DANGEROUS WASTES (continued)

LINE NO.	A. DANGEROUS 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	500	K	S01	
2	P030				
3	P031				
4	P033				
5	P034				
6	P035				
7	P036				
8	P037				
9	P038				
10	P039				
11	P040				
12	P041				
13	P042				
14	P043				
15	P044				
16	P045				
17	P046				
18	P047				
19	P048				
20	P049				
21	P050				
22	P051				
23	P054				
24	P056				
25	P057				
26	P058				

Continued from page 2

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

I.D. NUMBER (enter from page 1)
WA789000896

IV. DESCRIPTION OF DANGEROUS WASTES (continued)

LINE NO.	A. DANGEROUS 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	P059	500	K	S01	
2	P060				
3	P062				
4	P063				
5	P064				
6	P065				
7	P066				
8	P067				
9	P068				
10	P069				
11	P070				
12	P071				
13	P072				
14	P073				
15	P074				
16	P075				
17	P076				
18	P077				
19	P078				
20	P079				
21	P081				
22	P082				
23	P084				
24	P985				
25	P087				
26	P088				

Continued from page 2

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

I.D. NUMBER (enter from page 1)
WA789000896 7

IV. DESCRIPTION OF DANGEROUS WASTES (continued)

LINE NO.	A. DANGEROUS 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	P089	500	K	S01	
2	P092				
3	P093				
4	P094				
5	P095				
6	P096				
7	P097				
8	P098				
9	P099				
10	P101				
11	P102				
12	P103				
13	P104				
14	P105				
15	P106				
16	P107				
17	P108				
18	P109				
19	P110				
20	P111				
21	P112				
22	P113				
23	P114				
24	P115				
25	P116				
26	P118				

Continued from page 2

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

I.D. NUMBER (enter from page 1)
WA789000896 7

IV. DESCRIPTION OF DANGEROUS WASTES (continued)

LINE NO.	A. DANGEROUS 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	P119	500	K	S01	
2	P120				
3	P121				
4	P122				
5	P123				
6					
7					
8					
9					
10					
11					
12					
13					
14					
15					
16					
17					
18					
19					
20					
21					
22					
23					
24					
25					
26					

Continued from page 2

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

I.D. NUMBER (enter from page 1)
WA789000896 7

IV. DESCRIPTION OF DANGEROUS WASTES (continued)

LINE NO.	A. DANGEROUS 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	U002	1000	K	S01D81	
2	U004	500			
3	U005				
4	U011				
5	U014				
6	U016				
7	U028				
8	U031				
9	U059				
10	U069				
11	U086				
12	U087				
13	U088				
14	U089				
15	U090				
16	U091				
17	U098				
18	U101				
19	U102				
20	U107				
21	U108				
22	U112				
23	U113				
24	U116				
25	U117				
26	U118				

Continued from page 2

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

D NUMBER (enter from page 1)
WA789000896 7

IV. DESCRIPTION OF DANGEROUS WASTES (continued)

LINE NO.	A. DANGEROUS 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	U119	500	K	S01D81	
2	U120				
3	U123				
4	U124				
5	U134	1000			
6	U136	500			
7	U137				
8	U139				
9	U140				
10	U141				
11	U145	1000			
12	U146	500			
13	U148				
14	U150				
15	U154	1000			
16	U155	500			
17	U159				
18	U161				
19	U162				
20	U164				
21	U172				
22	U173				
23	U180				
24	U181				
25	U182				
26	U186				

Continued from page 2

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

I.D. NUMBER (enter from page 1)
WA789000 8967

IV. DESCRIPTION OF DANGEROUS WASTES (continued)

LINE NO.	A. DANGEROUS 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 C(1))
1	U187	500	K	S01D81	
2	U192				
3	U193				
4	U200				
5	U202				
6	U203				
7	U204				
8	U205				
9	U206				
10	U213				
11	U214				
12	U215				
13	U216				
14	U217				
15	U218				
16	U221				
17	U222				
18	U234				
19	U238				
20	U239	1000			
21	U244				
22					
23					
24					
25					
26					

Continued from page 2

NOTE: Photocopy this page before completing if you have more than 25 wastes to list.

ID NUMBER (enter from page 1)

WA789000896 7

IV. DESCRIPTION OF DANGEROUS WASTES (continued)

LINE NO.	A. DANGEROUS 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	D003	2000	K	T04	
2	D001				Any of the following may be in
3	D002				combination with D003. Estimated
4	D007				annual quantity is included with
5	D008				above.
6	D010				
7	D011				
8	WT01				
9	WT02				
10	U117	100	K	T04	
11	P006	50	K	T04	
12	P009				
13	U223				
14	U020				
16	U160				
17	P022				
18	U133				
19	U096				
20	P048				
21	P065				
22	P112				
23	U163				
24	P081				
25	U189				
26					

Continued from page 2

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

I.D. NUMBER (enter from page 1)
WA7890008967

IV. DESCRIPTION OF DANGEROUS WASTES (continued)

LINE NO.	A. DANGEROUS 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	P062	50	K	T04	
2	P122				
3	U234				
4	U205				
5	U213				
6	U006				
7					
8					
9					
10					
11					
12					
13					
14					
15					
16					
17					
18					
19					
20					
21					
22					
23					
24					
25					
26					

Continued from the front

IV. DESCRIPTION OF DANGEROUS WASTES *(continued)*

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

V. FACILITY DRAWING See Section V in the following pages

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 See Section VI in the following pages

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)*

VII. FACILITY GEOGRAPHIC LOCATION See Section VII in the following pages

LATITUDE *(degrees, minutes, & seconds)*	LONGITUDE *(degrees, minutes, & seconds)*

VIII. FACILITY OWNER

[X] A. If the facility owner is also the facility operator as listed in Section VII 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 VII on Form 1, complete the following items:

1. NAME OF FACILITY'S LEGAL OWNER	2. PHONE NO. *(area code & no.)*

3. STREET OR P.O. BOX	4. CITY OR TOWN	5. ST.	6. ZIP CODE

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.

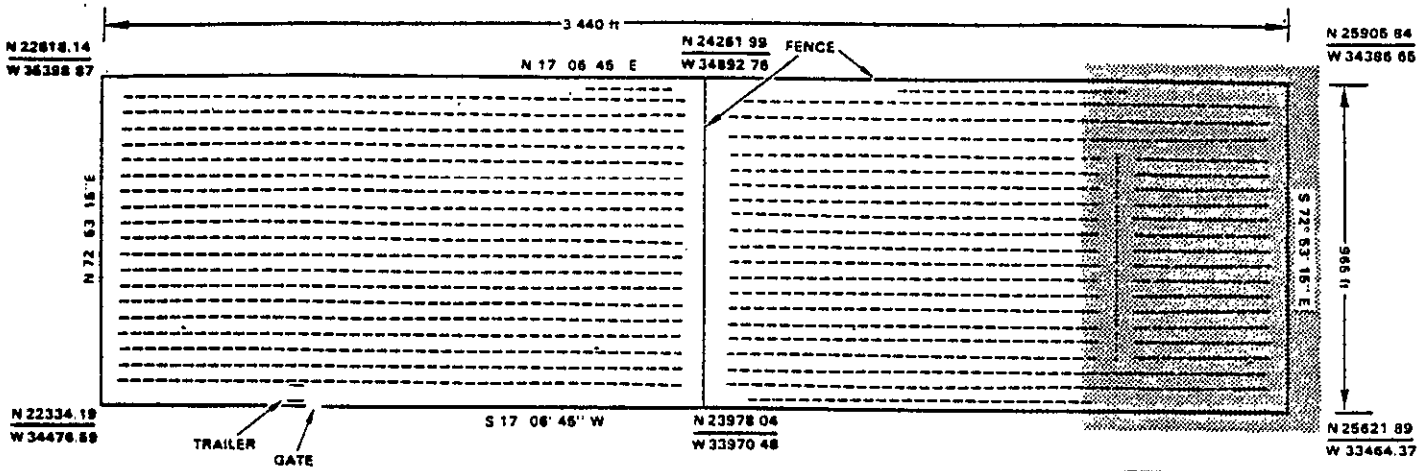
NAME *(print or type)*	SIGNATURE	DATE SIGNED
T.R. FITZSIMMONS, ASST. MANAGER		

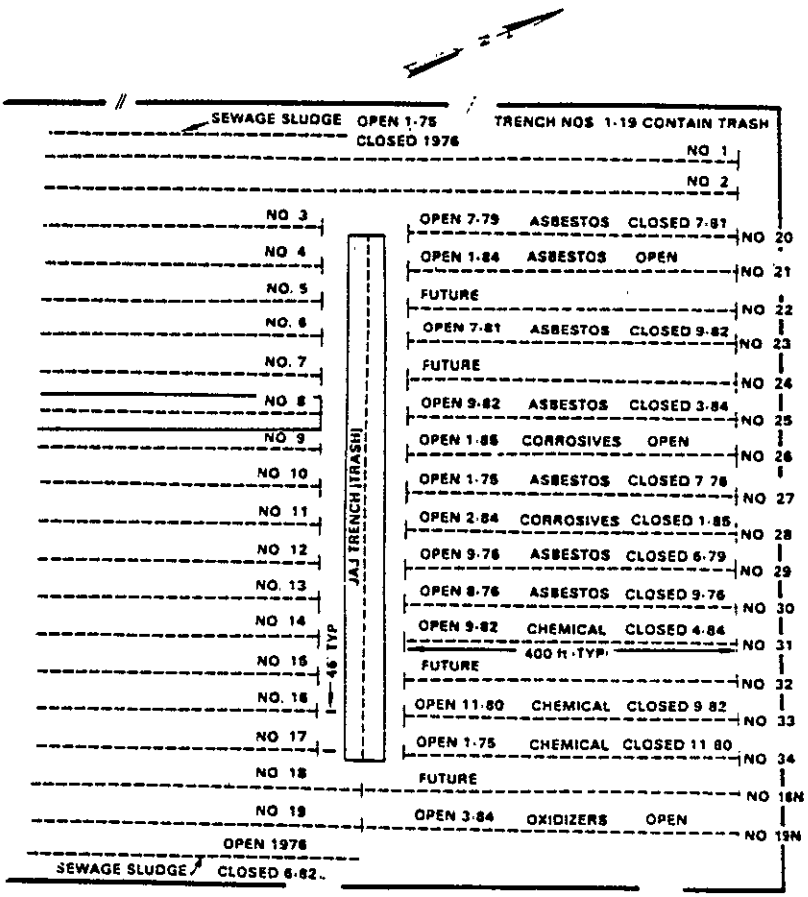
X. OPERATOR CERTIFICATION

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.

NAME *(print or type)*	SIGNATURE	DATE SIGNED
T.R. FITZSIMMONS, ASST. MANAGER		

SECTION V - FACILITY DRAWINGS

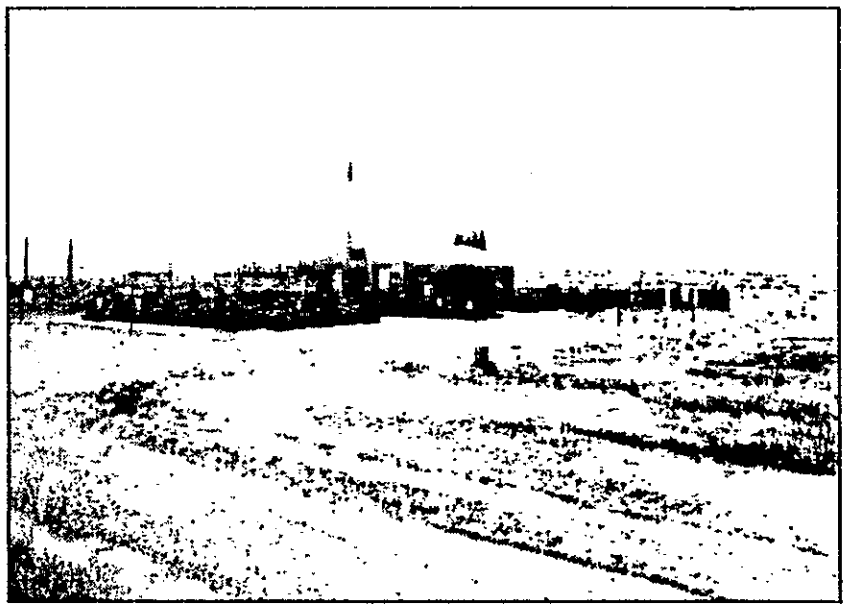




NON-RADIOACTIVE
DANGEROUS WASTE
DISPOSAL SITE

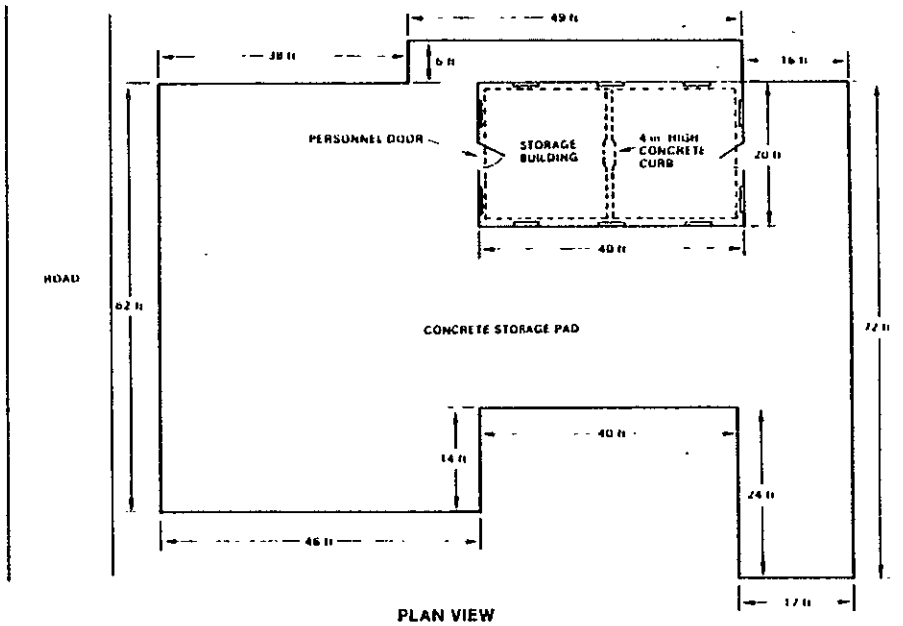
2K8510-9.4

2727-S/200 WEST AREA NONRADIOACTIVE DANGEROUS WASTE STORAGE FACILITY



46° 33′ 14.601″ N
119° 32′ 48.167″ W

PHOTO TAKEN 1985

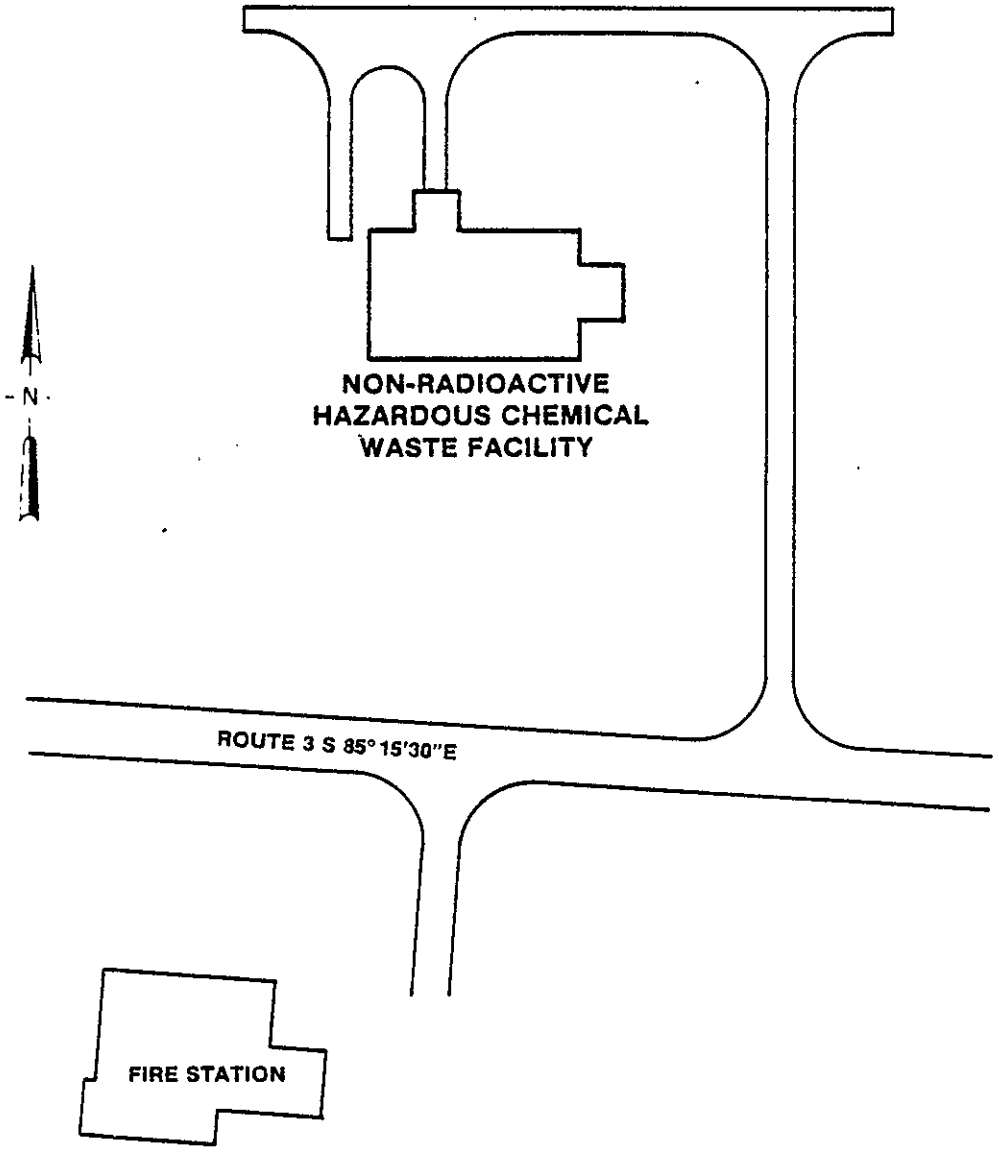


PLAN VIEW

2K8509-3.9

WA7890008967

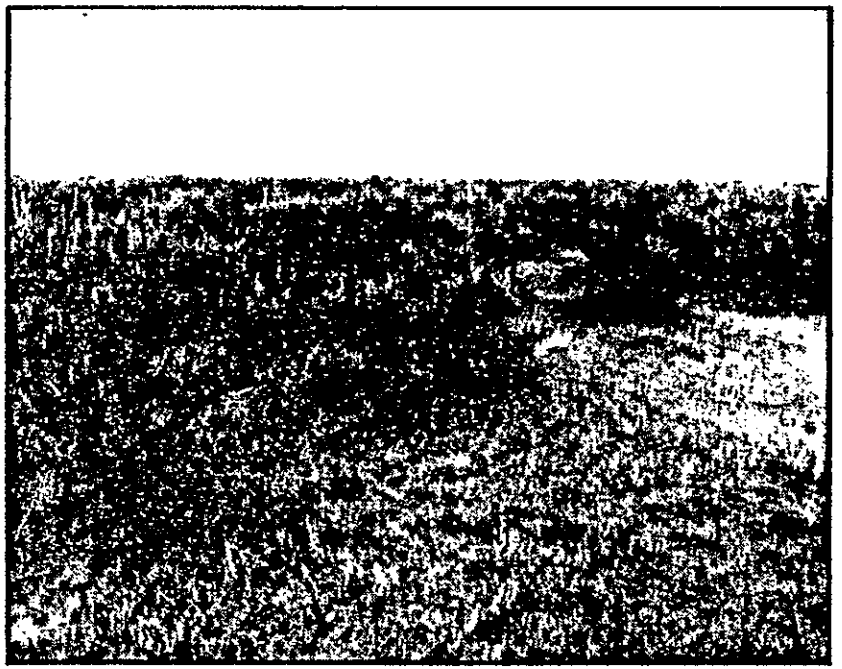
PROPOSED LOCATION NONRADIOACTIVE DANGEROUS WASTE STORAGE FACILITY (BLDG 616)



SITE PLAN

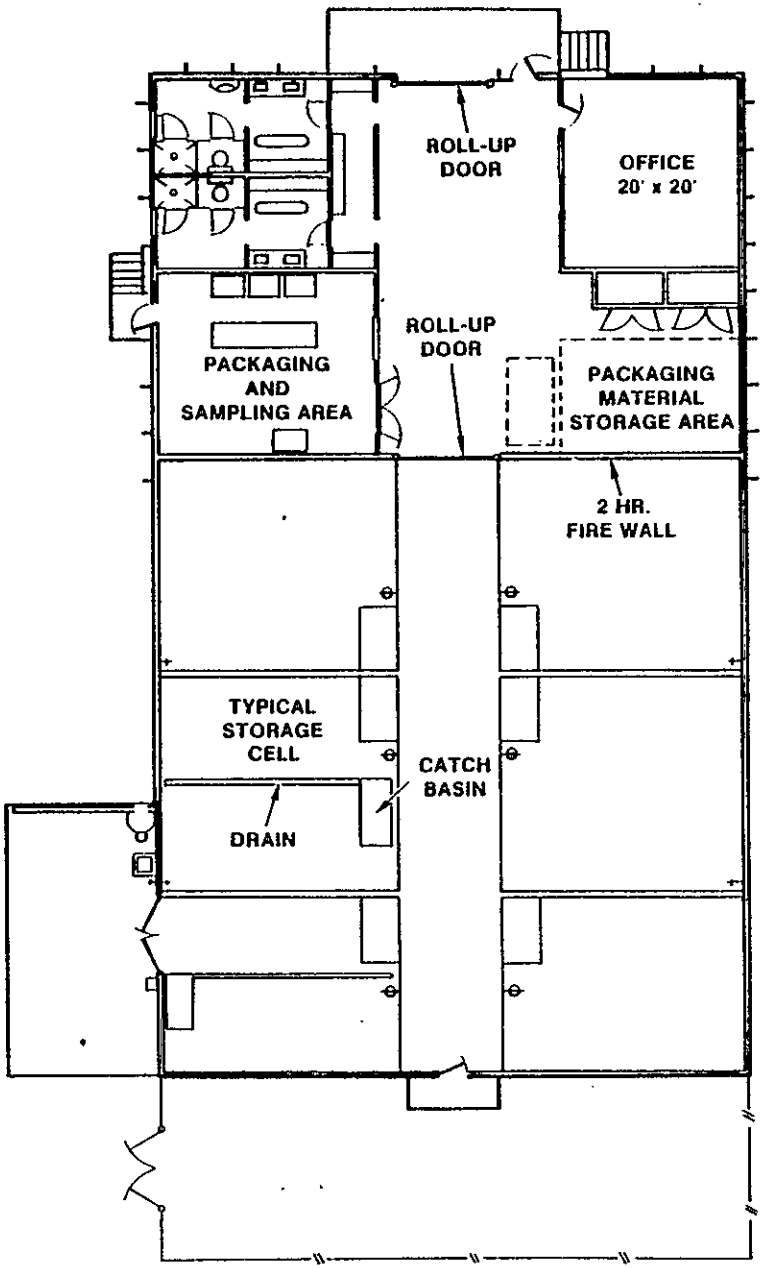
2K8509-3.5

PROPOSED NONRADIOACTIVE DANGEROUS WASTE STORAGE FACILITY (BLDG 616) LOCATED BETWEEN 200 W/200 E



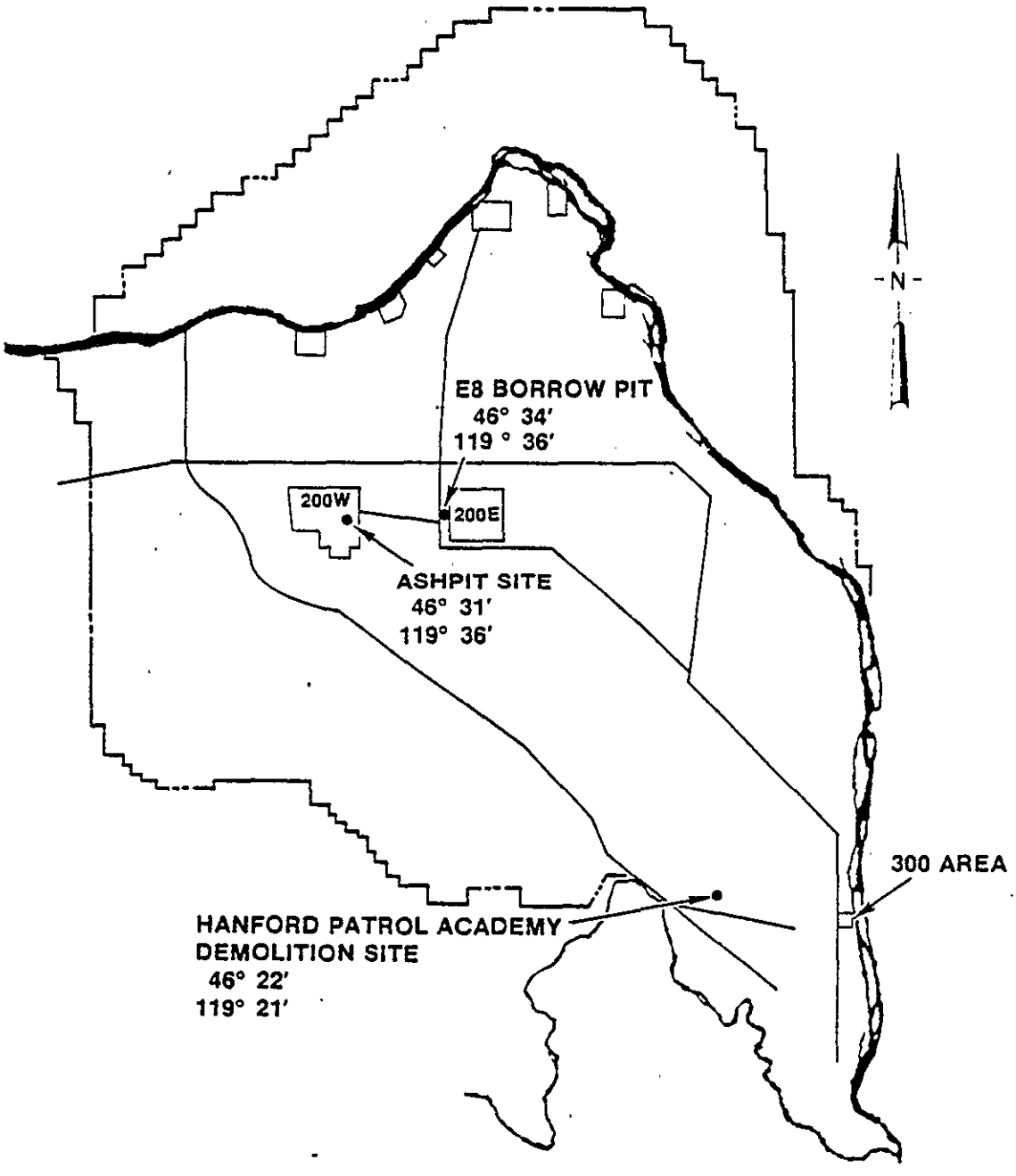
46° 33′ 14.601″ N
119° 32′ 48.167″ W

PHOTO TAKEN 1984



2K8509-3.13

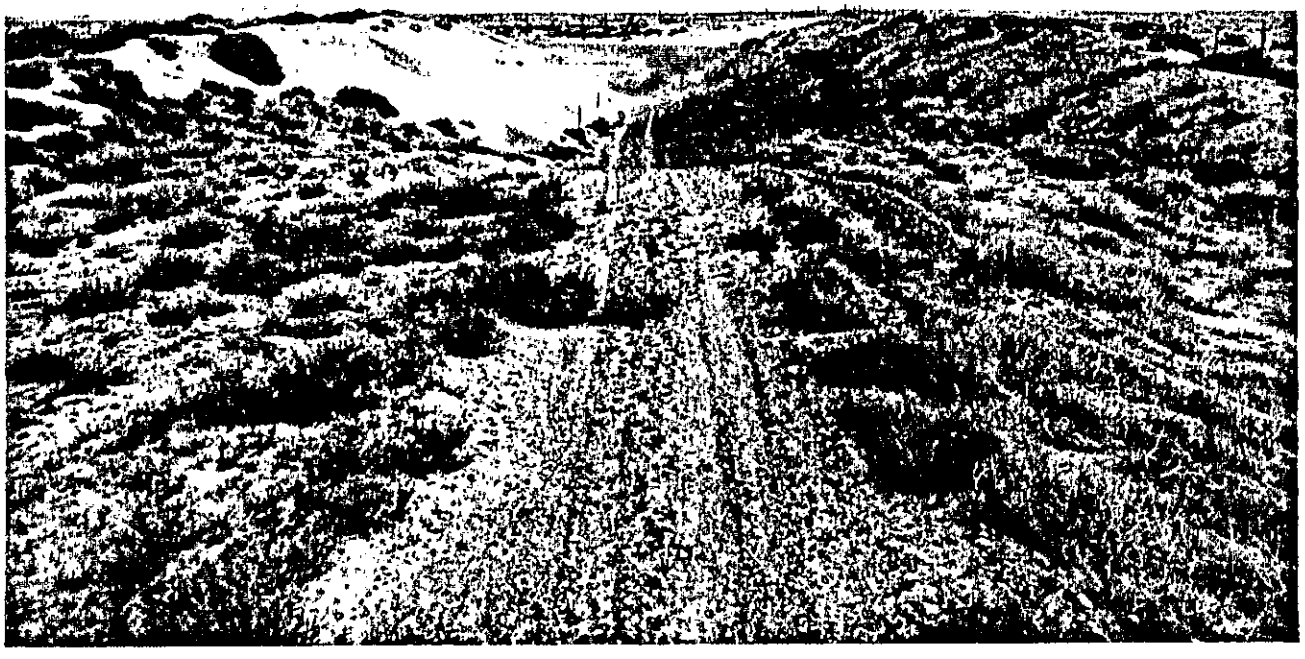
SHOCK SENSITIVE OR POTENTIALLY EXPLOSIVE CHEMICAL DEMOLITION SITES



2K8509-3.7

SECTION VI - PHOTOGRAPHS

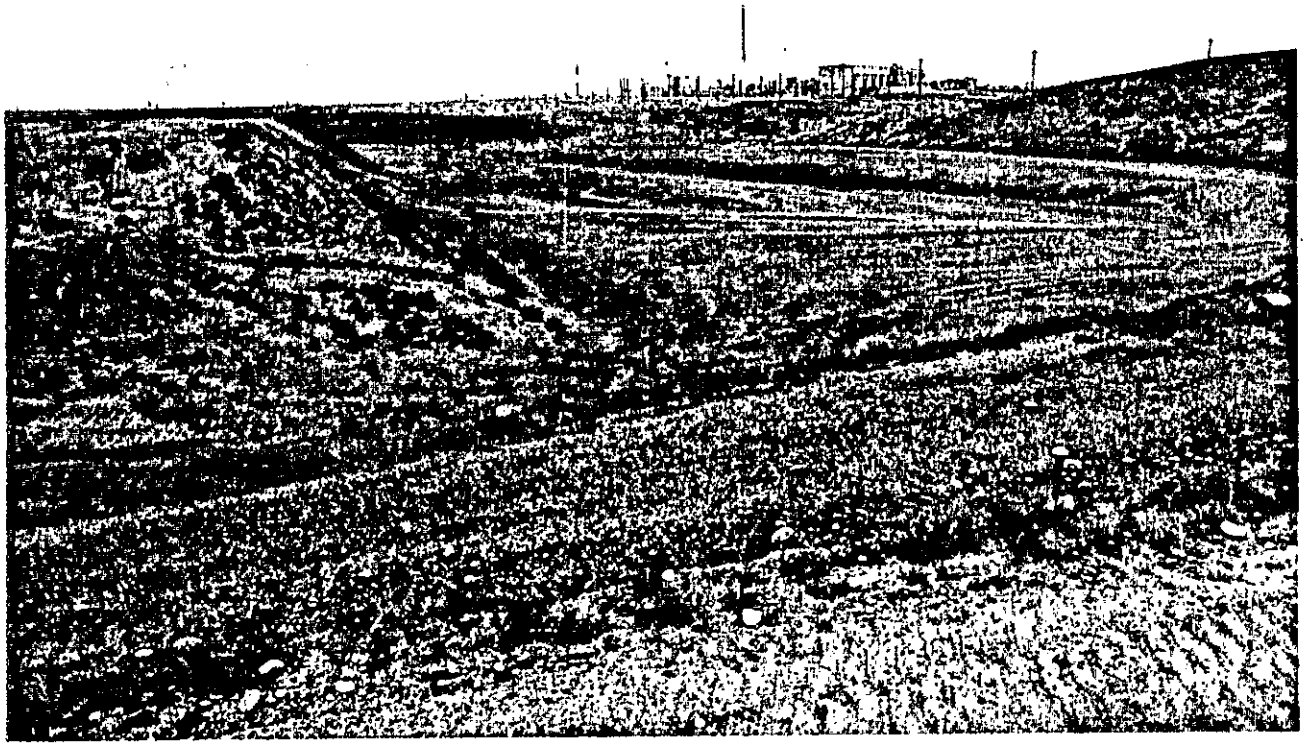
NONRADIOACTIVE DANGEROUS WASTE LANDFILL 600 AREA



46° 30' 40"
119° 27' 50"

PHOTO TAKEN 1985

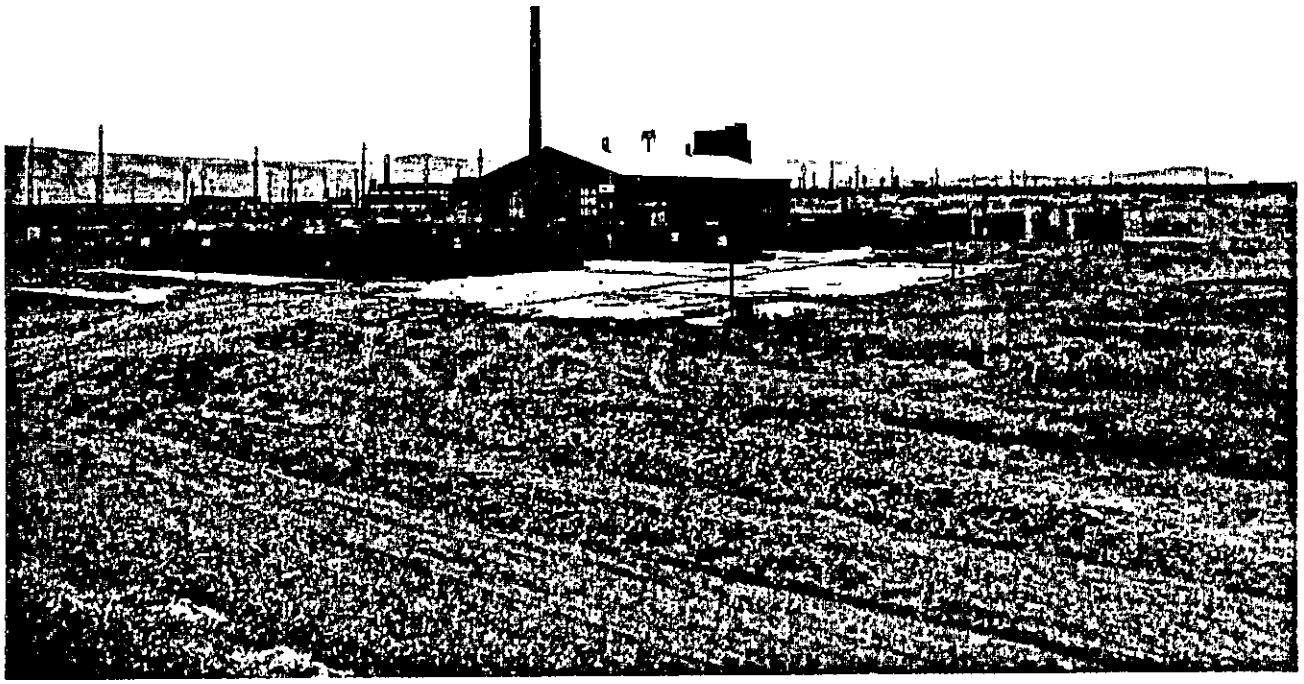
TYPICAL SHOCK SENSITIVE OR POTENTIALLY EXPLOSIVE CHEMICAL DEMOLITION SITE COAL ASH PIT/200-W AREA



46° 33' 10.37"
119° 36' 44.58"

PHOTO TAKEN 1985

NONRADIOACTIVE DANGEROUS WASTE STORAGE FACILITY 2727-S/200-W AREA



46° 33' 14.601"
119° 32' 48.167"

PHOTO TAKEN 1985

SECTION VII - FACILITY GEOGRAPHIC LOCATION

VII. FACILITY GEOGRAPHIC LOCATION

S01:

Proposed Nonradioactive Dangerous Waste Facility (Midway between 200 East and 200 West Areas)	46°33'09.962"N	119°34'35.625"W
Existing Nonradioactive Dangerous Waste Storage Facility	46°32'14.560"N	119°36'57.413"W

D81:

Nonradioactive Dangerous Waste Landfill, 600 Area	46°30'40"N	119°27'50"W

T04:

Detonation Areas

Ash Disposal Pit	46°31'10.37"	119°36'44.58"
E-8 Burning Grounds	46°34'	119°31'
Hanford Patrol Academy Chemical Detonation Site - 1100 Area	46°22'	119°21'

Ephemeral Streams

Cold Creek	46°34'02.112"N	119°44'00.423"W
	46°32'20.394"N	119°41'32.355"W
	46°30'40.276"N	119°38'21.519"W
	46°29'07.696"N	119°34'37.162"W
	46°32'53.171"N	119°29'31.418"W
	46°22'41.114"N	119°26'00.905"W
Dry Creek	46°29'51.643"N	119°44'43.974"W
	46°30'06.842"N	119°43'15.126"W

Seepage Ponds

B-Pond/200 East Area	46°33'23.420"N	119°29'32.703"W
Gable Mountain Pond/200 West Area	46°34'56.324"N	119°30'41.512"W

Not all areas listed here are required in Part A, but are included to assist in finding facility locations/areas on the topographic map.

SECTION B
FACILITY DESCRIPTION

This section provides a general description of the hazardous waste management facility as required by 40 CFR 270.14(b) and WAC 173-303-806(4)(a)i. This description is intended to acquaint the permit application reviewer/permit writer with an overview of the facility. More complete details can be found in other parts of this permit application and in the other permit application volumes.

B-1 GENERAL DESCRIPTION

The Hanford site is a 570 square mile tract of semiarid land which is owned and operated by the U.S. Department of Energy. The site is located primarily west and south of the section of the Columbia River immediately north of the city of Richland, Washington. Richland lies approximately three miles from the southern-most portion of the Hanford Site boundary and is the nearest population center (Figure B-1). In early 1943, the United States Army Corps of Engineers selected the Hanford Site as the location for reactor and chemical separation facilities for the production and purification of plutonium for possible use in nuclear weapons (Manhattan Project). A total of eight graphite-moderated reactors using Columbia River water for once-through cooling, and a new type of dual purpose reactor (N Reactor) using a recirculating water coolant and producing both plutonium and steam for electricity, were eventually built along the Columbia River. Today, only the N Reactor remains in operation.

Activities are centralized in numerically designated areas on the Hanford Site. The reactor facilities (active and decommissioned) are located along the Columbia River in what are known as the 100 Areas. The reactor fuel processing and waste management facilities are in the 200 Areas which are on a plateau about seven miles from the river. The 300 Area, just north of Richland, contains the reactor fuel manufacturing facilities and the research and development laboratories. The 400 Area, five miles northwest of the 300 Area, contains the Fast Flux Test Facility. The 1100 Area, north of Richland, contains facilities associated with maintenance and transportation functions for the Hanford Site. Administrative buildings and other research and

development laboratories are found in the 300 Area, north of Richland. The Dangerous Waste Landfill is located two miles southeast of the 200 East Area.

This Part B volume addresses the Nonradioactive Dangerous Waste Landfill (NRDWL), the 2727-S Nonradioactive Dangerous Waste Storage Facility (NRDWS), the proposed 616 NRDWS and the Shock Sensitive or Potentially Explosive chemical Demolition Sites. A brief description of these facilities is as follows:

- NRDWL -- The NRDWL is located approximately two miles southeast of the 200-East Area and receives nonradioactive dangerous wastes for disposal from process operations, research and development laboratories, and maintenance and transportation functions throughout the Hanford Site.

- 2727-S NRDWS -- The 2727-S NRDWS is located in the southeast portion of the 200 West Area and provides container storage for nonradioactive dangerous wastes generated in the research and development laboratories, process operations, and maintenance and transportation function throughout the Hanford Site. This storage area will be closed after completion of the 616 NRDWS.

- 616 NRDWS -- The proposed 616 NRDWS will be located directly between the 200-East and the 200-West Areas. The 616 NRDWS will replace the 2727-S NRDWS after completion.

- Demolition Sites -- The demolition sites include the E8 Borrow Pit located adjacent to the 200-East Area, the Ashpit Site located in the 200-West Area, and the Hanford Patrol Academy Demolition Site located to the west of the 300 Area. These demolition sites are used to detonate explosive wastes that are generated throughout the Hanford Site.

B-2 TOPOGRAPHIC MAP

B-2a General Requirements

The drawing in Appendix B-1 is a general overview map of the entire Hanford site property and the surrounding countryside. This figure is intended as a location map and illustrates the following:

- The facility boundary

- Surrounding land use including the Saddle Mountain National Wildlife Refuge and the State Game Reserve to

the north and the Rattlesnake Mountain Ecological Reserve located to the west. Land east of the Site across the Columbia River is primarily farmland or a part of the Game Reserve. The surrounding land area is also shown on Figure B-1

- Contours sufficient to show surface water flow. Because of the large facility size, contours are shown at intervals of 20 feet
- Locations of the various areas described in Section B-1 of this document
- Fire control facilities located on the Hanford Site
- Locations of access roads, internal roads, railroads, and perimeter gates and barricades
- Longitudes and Latitudes

Figure B-2 illustrates wind roses for various locations on the Hanford Site. Winds are predominately from the west.

The location of the NRDWL is shown on drawing No. H-6-951 located in Appendix B-1. Figure B-3 shows the layout of the NRDWL. Hazardous wastes are only disposed in the shaded portion of the landfill indicated on Figure B-3. The NRDWL is surrounded by a perimeter fence and access is through various gates around the landfill. The only structure at the landfill is the office trailer.

The location of the 2727-S NRDWS is shown on the 200 West Area layout (drawing No. H-2-34762) located in Appendix B-2. This drawing shows all buildings, structures, roads, fences and hazardous wastes units of the 200 West Area.

The proposed 616 NRDWS will be located between the 200 East and 200 West Areas on Route 3S across from the 609-A Fire Station. The 616 NRDWS location is shown on Figure B-4, and the 609-A Fire Station location is shown on drawing No. H-6-951 in Appendix B-1. A layout drawing of the storage area is shown in Figure B-5.

The demolition site locations are shown on Figure B-6. All of the sites are located in isolated areas of the Hanford Site, no buildings, structures, or hazardous waste units are located in immediate areas of demolition activities.

Although these demolition 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.

B-2b Additional Topographic Requirements for Land Disposal Facilities

A water table contour map of the uppermost aquifer showing the groundwater flow directions for the Hanford Site Facilities is located in Appendix D-2 (Table 9). The individual units are shown on the maps in Appendix B-1. Further hydrology and geology information is discussed in Section E of this and other Part B volumes.

B-3 LOCATION INFORMATION

B-3a Seismic Consideration

The DOE Hanford Site is not located within any of the political jurisdictions identified in Appendix VI of 40 CFR 264 and WAC 173-303-420(3)(C). Thus, further demonstration of compliance with the seismic standard of 40 CFR 264.18 and WAC 173-303-806(xi)(B) is not required.

B-3b Floodplain Standard

The Army Corp of Engineers has calculated the probable maximum flood based on the upper limit of precipitation falling on a drainage area and other hydrologic factors such as antecedent moisure conditions, snowmelt, and tributary conditions that could lead to maximum runoff. The probable maximum flood for the Columbia River below Priest Rapids Dam has been calculated to be 1.4 million cubic feet per second (COE, 1951, 1969). The floodplain associated with the probable maximum flood is shown in Figure B-7. The inundated area shown in Figure B-7 is greater than that which would be inundated during a 100-year flood. The waste management area covered by this volume is located well above the floodplain.

B-3b(1) Demonstration of Compliance -- The hazardous waste management units under consideration in this permit application volume are not located within the 100-year floodplain and there are no plans for establishing units in the

floodplain. A further demonstration of compliance is therefore not applicable for this Part B permit volume. Information for other hazardous waste units is given in other Part B volumes.

B-4 TRAFFIC INFORMATION

Roadways inside the facility are restricted to authorized personnel and cannot be accessed by the general public. The nearest public highway, State Highway 240, is approximately four miles from the patrolled site areas. The majority of traffic inside the facility consists of light duty vehicles and buses used to transport the employees to the various operations sites within the facility.

Figure B-8 shows the major roads throughout the Hanford Site. These roads are classified as either primary or secondary routes. The primary routes include Routes 4S, 10, 4N and the portion of 11A east of route 4N. All other roads are secondary routes. The primary routes are constructed of bituminous asphalt (usually two inches thick, but the thickness of the asphalt layer will vary with each road) with an underlying aggregate base. The secondary routes are constructed of layers of an oil and rock mixture with an underlying aggregate base. The aggregate base consists of various types and sizes of rock found on site. Currently, no load-bearing capacities of these roads are available; however, past knowledge indicates that the roads will sufficiently support all vehicles that will transport hazardous waste.

The NRDWL and the existing and proposed NRDWS are located within the Hanford Controlled Access Area whose roadways cannot be accessed by the general public. These facilities are isolated from the nearest public highway, State Highway 240, by at least four miles.

The NRDWL is located approximately one mile southwest of the Hanford Site highway which is used by site personnel traveling between outer cities and the 100 and 200 Areas. The road leading to the NRDWL is asphalted. This road is also traveled by Hanford Site personnel for the purposes of transporting solid waste to the sanitary landfill (Central Landfill). Approximately ten heavy duty vehicles (e.g. dump trucks) utilize this roadway daily. Hazardous waste transport vehicles arrive on an average of once per week. These vehicles are

routed to the asphalt roadway via a dirt road to a separate locked entry gate near the hazardous waste disposal areas.

The existing NRDWS is located off of an asphalt roadway within the 200 West Controlled Access Area. This roadway receives light traffic from site personnel traveling between separations area facilities. The proposed NRDWS will be located between the 200 East and 200 West Areas and across from the 200 Area Fire Station off of an asphalt highway. This highway receives light to medium traffic throughout the day with the exception of shift changes when traffic is heavy. Hazardous waste transport will not occur during shift change hours.

Detonation activities will only be performed during off-hours for site personnel. Detonation sites are remote from any traffic route (Figure B-6).

SURROUNDING LAND USE

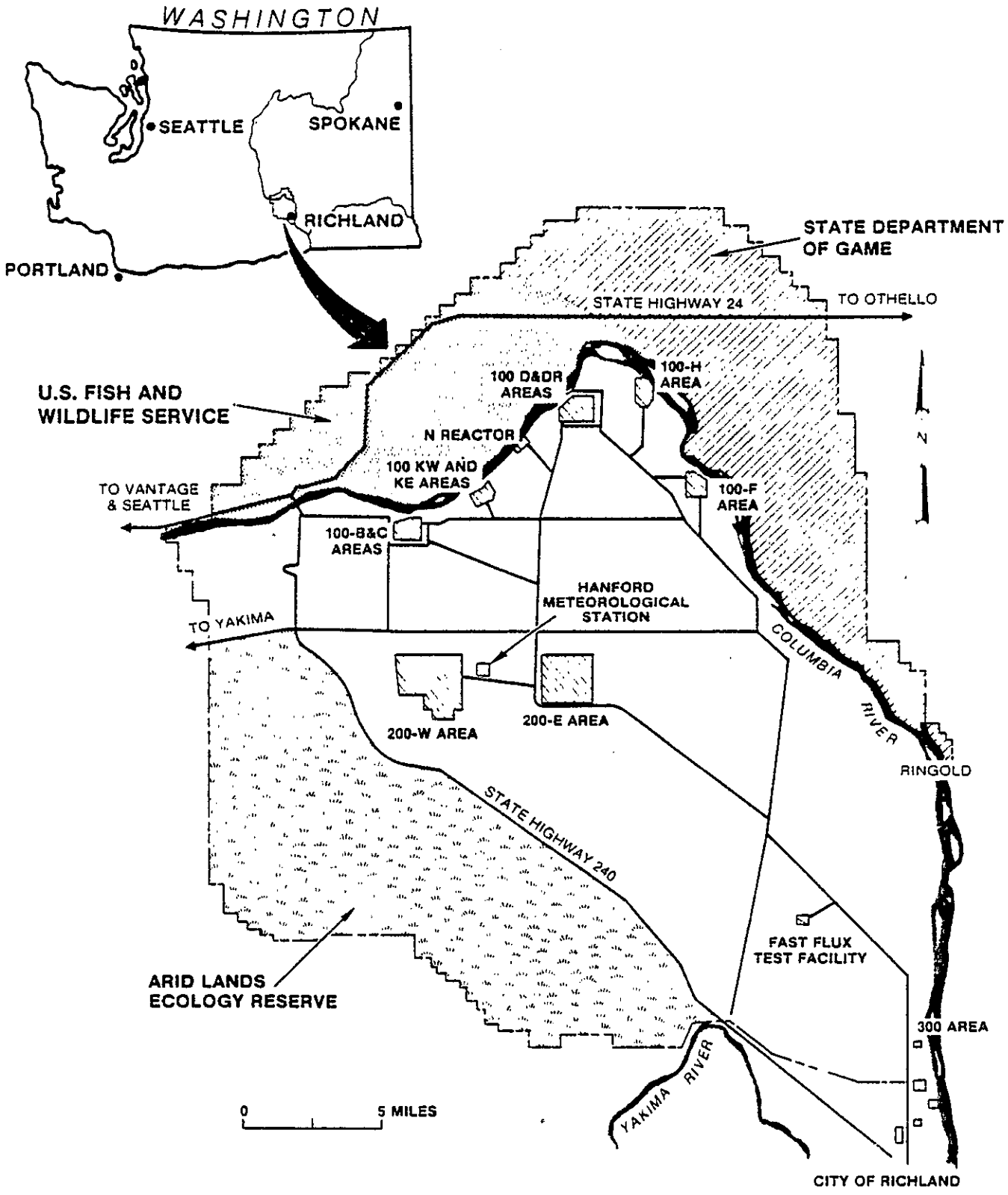


FIGURE B-1. SURROUNDING LAND USE

2K8509-3.23

WIND ROSE FOR THE HANFORD TELEMETRY NETWORK

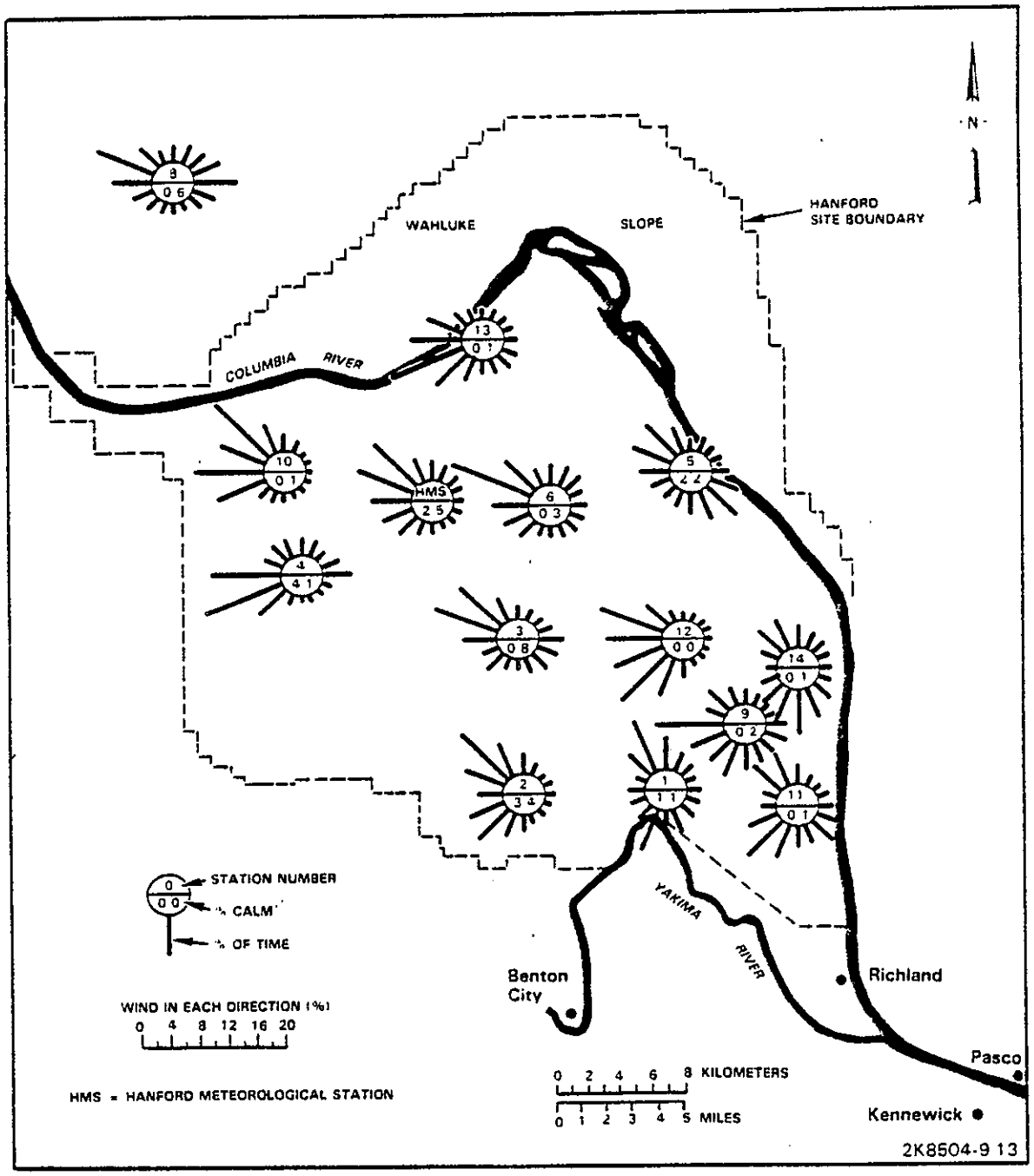


FIGURE B-2. WIND ROSE FOR THE HANFORD TELEMETRY NETWORK

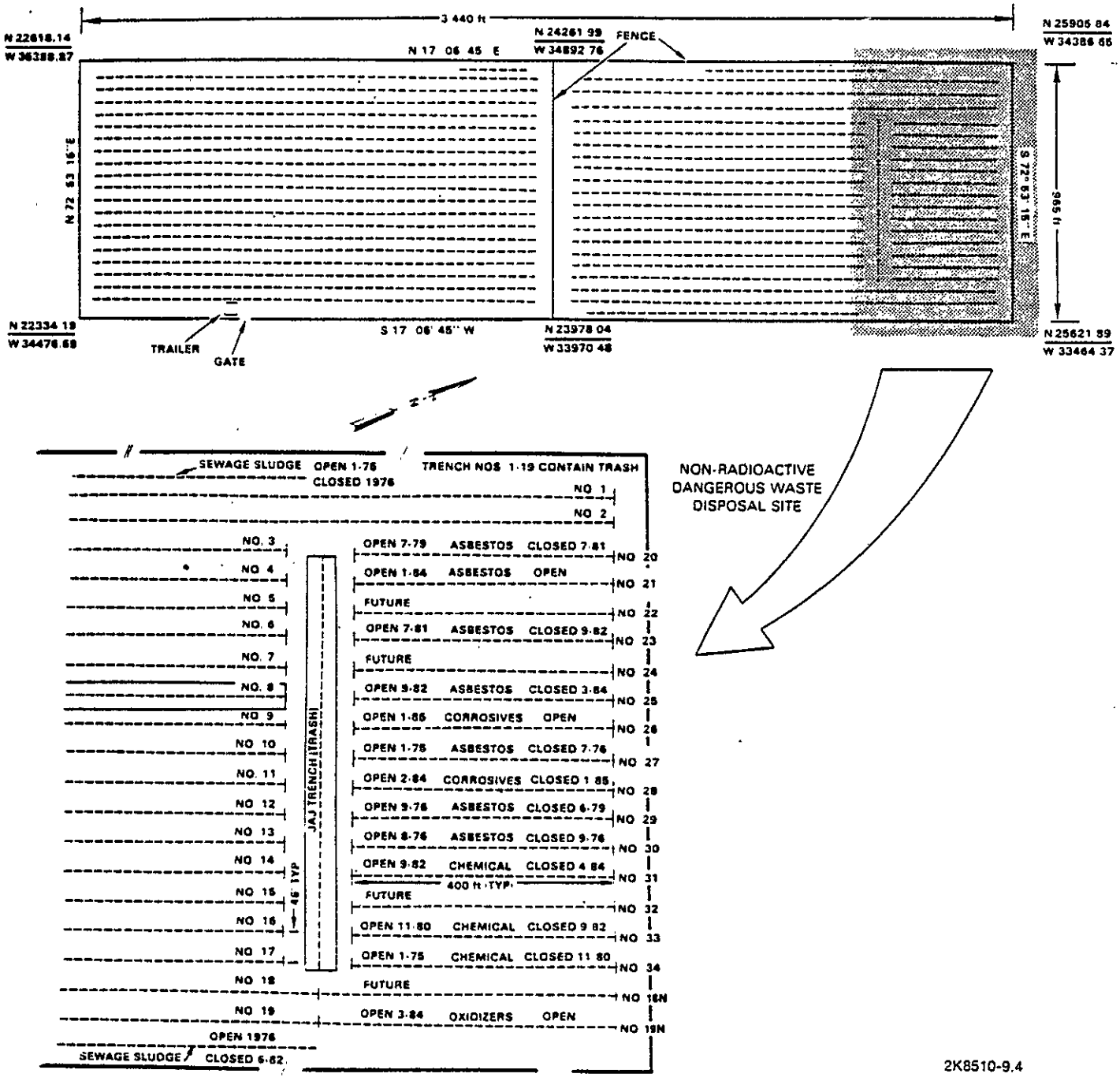
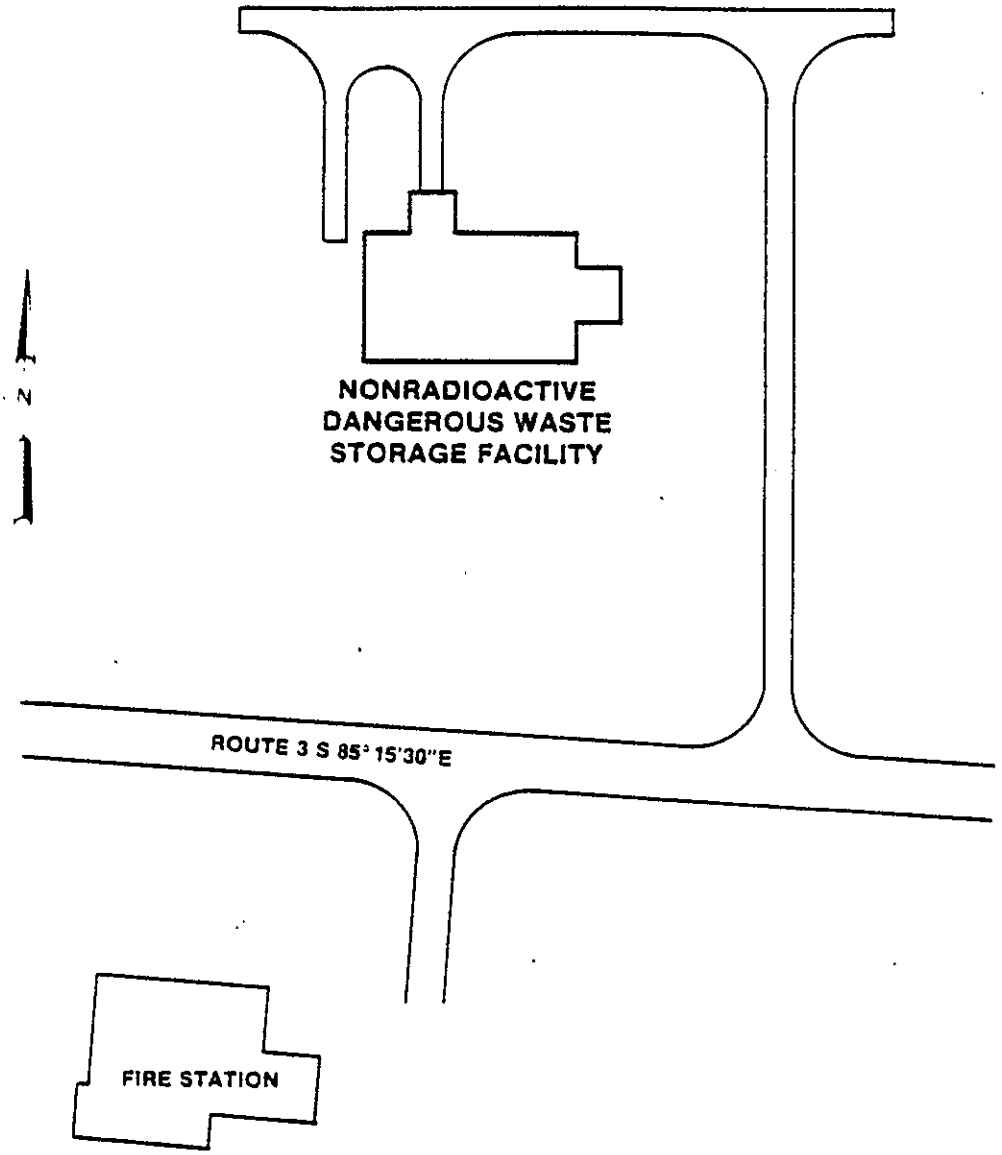


FIGURE B-3. CENTRAL LANDFILL WITH SHADED AREAS DENOTING NRDWL

LOCATION OF PROPOSED NONRADIOACTIVE DANGEROUS WASTE STORAGE FACILITY
(616)

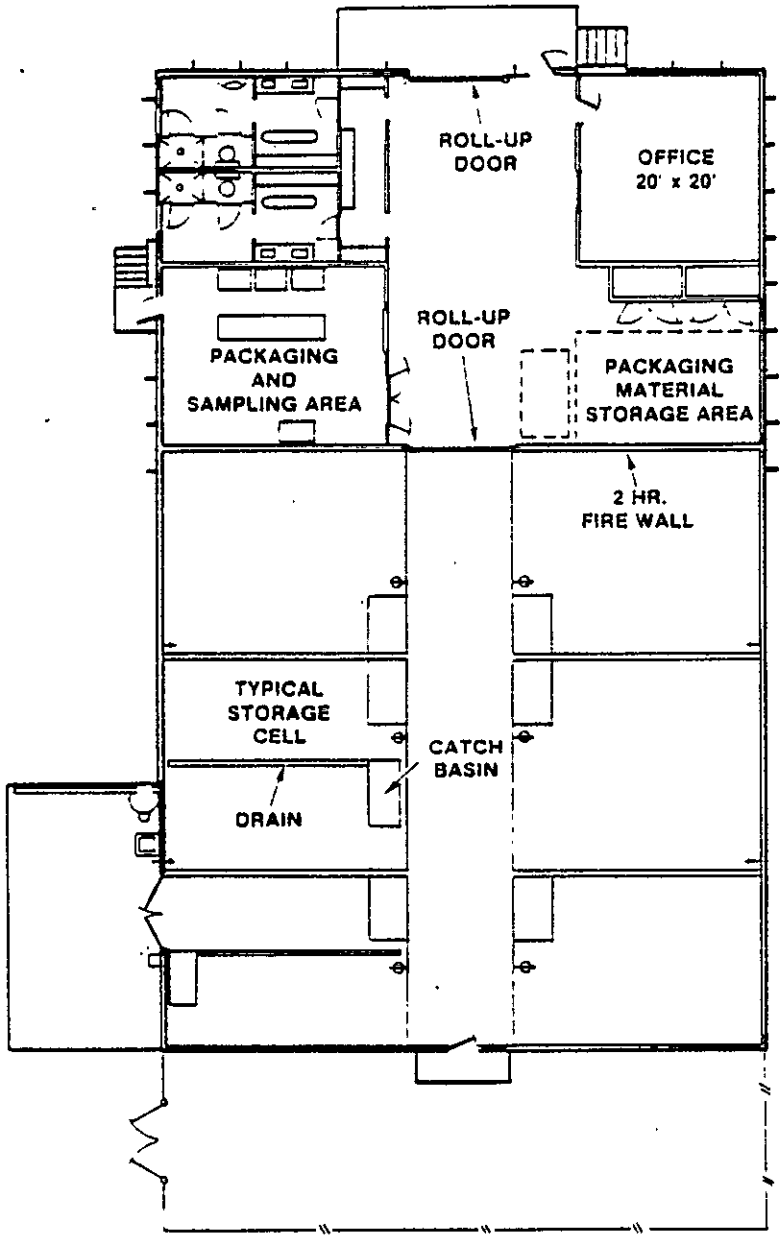


SITE PLAN

2K8509-3.22

FIGURE B-4. LOCATION OF PROPOSED NONRADIOACTIVE DANGEROUS WASTE STORAGE FACILITY

NONRADIOACTIVE DANGEROUS WASTE STORAGE FACILITY (616)



2K8509-3.21

FIGURE B-5. NONRADIOACTIVE DANGEROUS WASTE STORAGE FACILITY (616)

SHOCK SENSITIVE OR POTENTIALLY EXPLOSIVE CHEMICAL DEMOLITION SITES

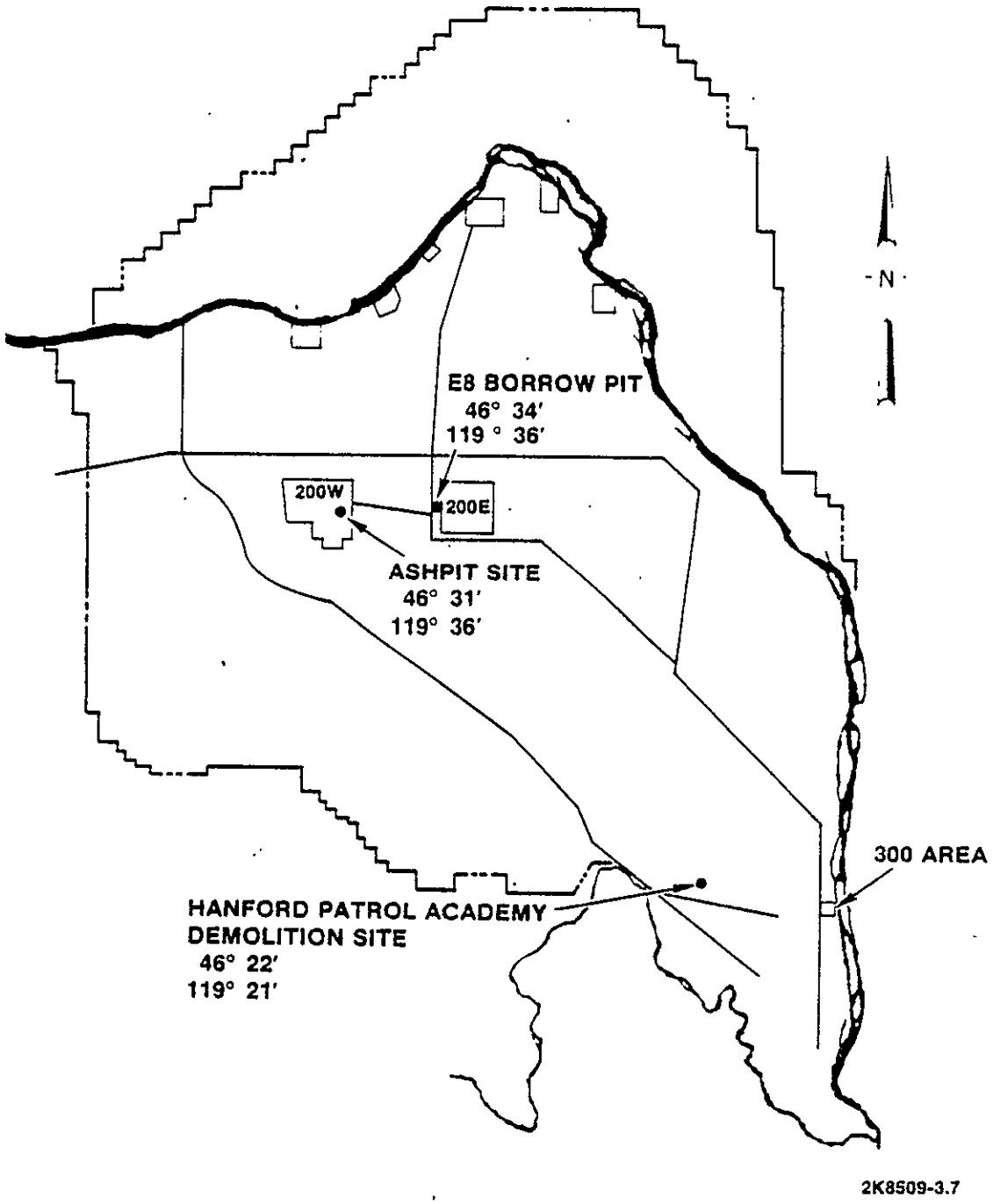


FIGURE B-6. SHOCK SENSITIVE OR POTENTIALLY EXPLOSIVE CHEMICAL DEMOLITION SITES

FLOODED AREA FOR THE PROBABLE MAXIMUM FLOOD

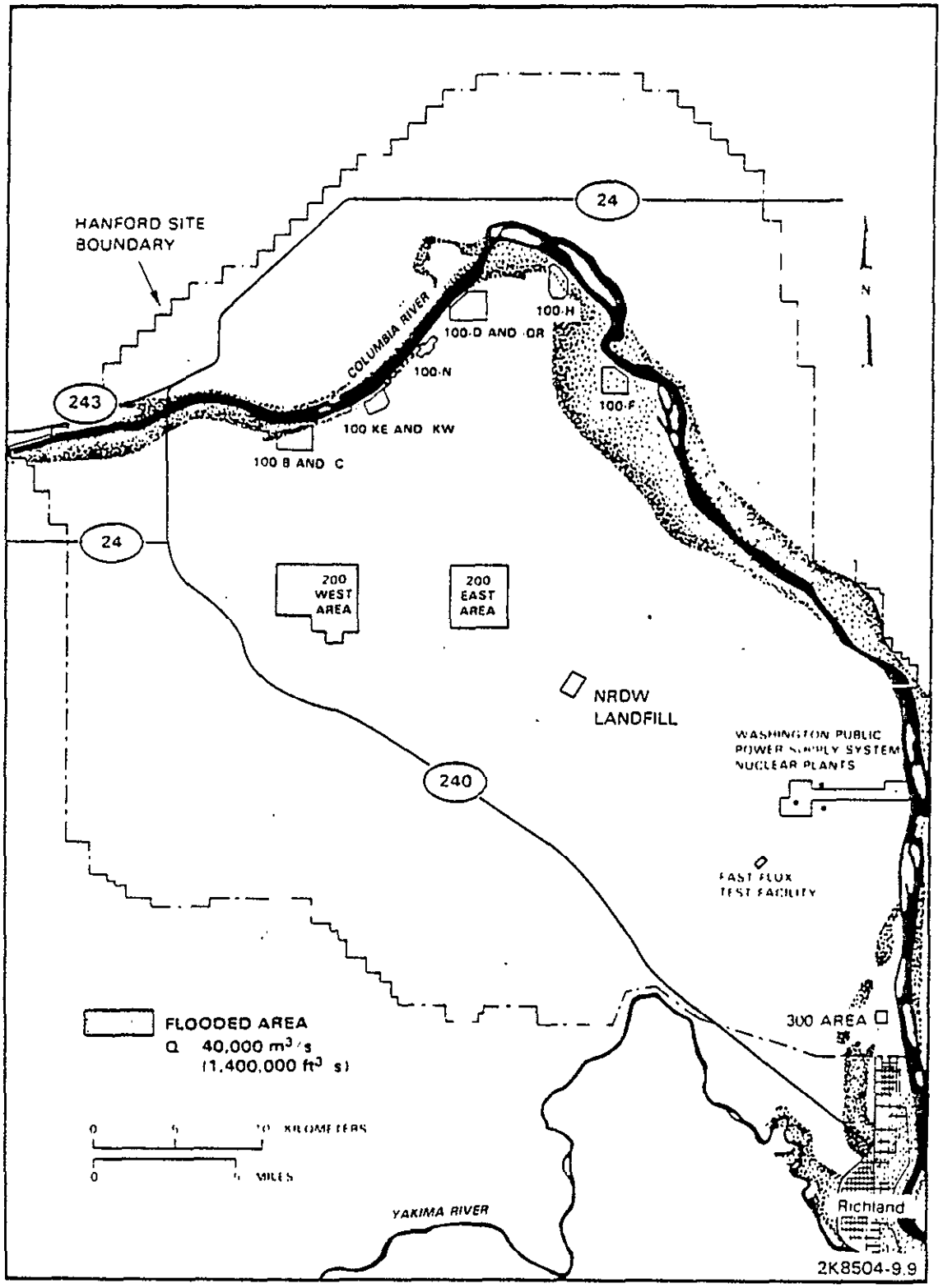


FIGURE B-7. FLOODED AREA FOR THE PROBABLE MAXIMUM FLOOD

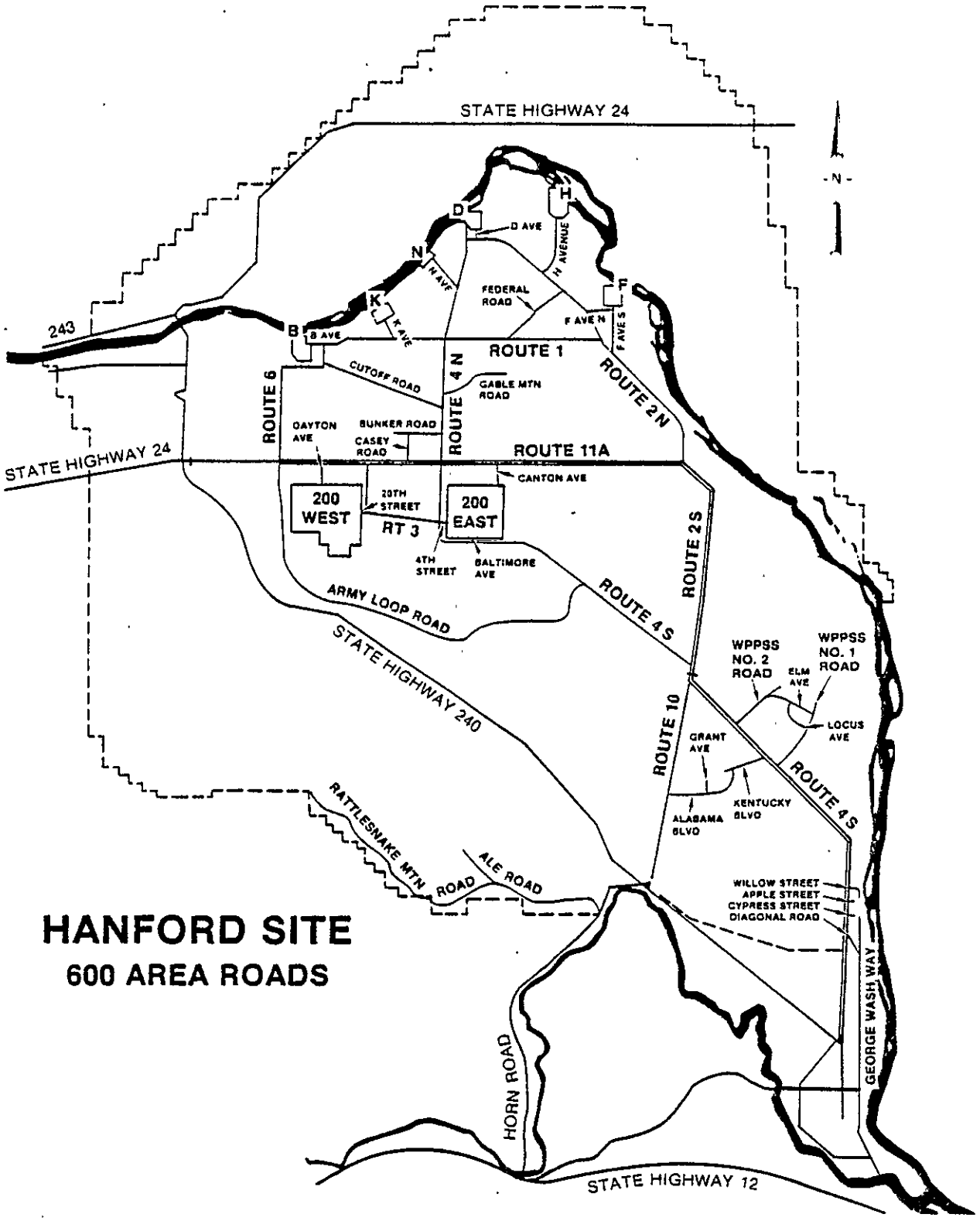
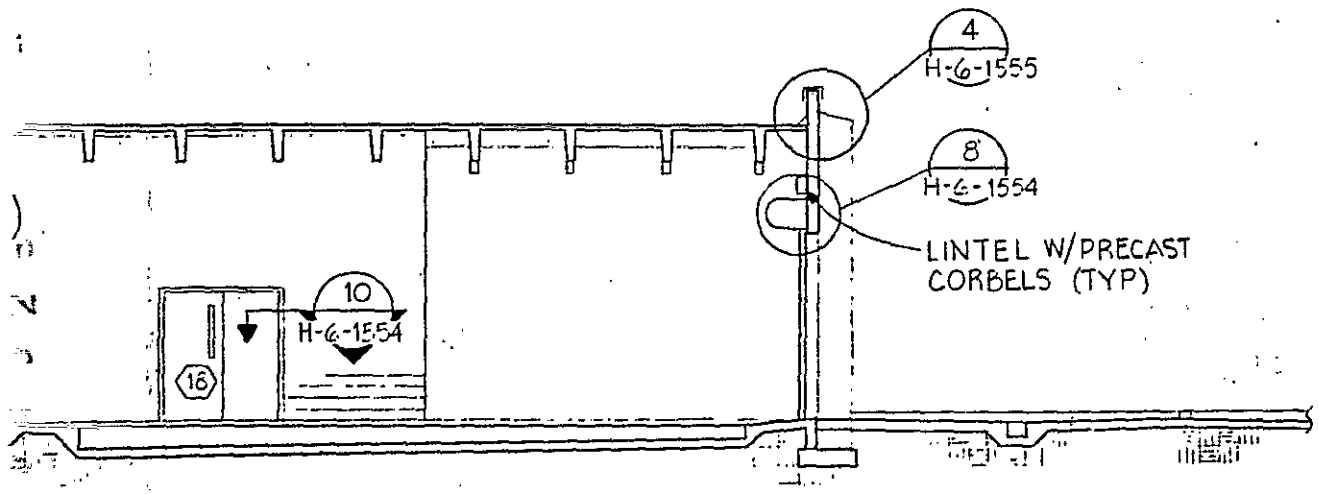


FIGURE B-8. HANFORD SITE 600 AREA ROADS

SCALE: 1/8" = 1'-0"



RHO APPROVAL BY		DATE 7/24/85	U. S. DEPARTMENT OF ENERGY Richland Operations Office KAISER ENGINEERS HANFORD COMPANY
PROJ ENGR		11-4-85	ARCHITECTURAL PLAN, ELEVATIONS & SECTIONS
QA			
APPROVED BY		6/14/85	
SAFETY		4/21/85	
APPROVED BY		11/14/85	PROJECT TITLE NON-RADIOACTIVE HAZARDOUS CHEMICAL WASTE FACILITY
CHECKED BY	R.C. SPILMAN	6/18/85	PROJ B-526 / WO X52602 / JOB R688A2
DRAWN BY	A.L. EDWARDS	2/26/85	SCALE SHOWN / BLDG 214D / INDEX 0800, 0801
DESIGNED BY	S.Y. INES	2/21/85	
CLASSIFICATION: NONE	BY: NOT REQD		DRAWING NUMBER H-6-1553 / SHEET 1 / OF 1 / REV 0

DRIPTION REV

B

A

2 1

(SIMILAR)

GENERAL NOTES:

1. ALL BOLTS FOR STRUCTURAL STEEL CONNECTIONS ARE 5/8" DIAMETER (ASTM A 325).

2. THE EXPANSION BOLTS HAVE THE FOLLOWING MINIMUM EMBEDMENT LENGTHS UNLESS NOTED OTHERWISE:

   2-1/2" LONG FOR 3/8" DIAMETER BOLTS

   3-1/2" LONG FOR 1/2" DIAMETER BOLTS

3. MINIMUM CONCRETE COVER FOR REINFORCEMENT SHALL BE AS FOLLOWS:

   CONCRETE CAST AGAINST EARTH = 3"

   CONCRETE EXPOSED TO EARTH OR WEATHER = 1-1/2"

4. THE CONSTRUCTION OF SEPTIC TANK AND PERFORATED PIPES IN DRAIN FIELD SHALL BE IN ACCORDANCE WITH SPECIFICATION AND REQUIREMENTS CONFORMING TO EPA MANUAL NO. EPA 625/1-80-012.

5. ALL CONCRETE SLABS WITH EXTERIOR VERTICAL SURFACES SHALL HAVE EXPANSION JOINTS. (SEE DRAWING H-6-1556, DETAIL 1 FOR EXPANSION JOINT DETAIL.)

6. SEE SPECIFICATION B-526-C1 FOR MATERIAL DESCRIPTION AND INSTALLATION INSTRUCTIONS.

B

A

		DATE
RHO APPROVAL BY		7/24/85
PROJ ENGR		7/24/85
QA		6/24/85
APPROVED BY		6/14/85
SAFETY		6/21/85
APPROVED BY		6/14
CHECKED BY	R. KING	6/18/85
DRAWN BY	C. MCGOUGH	3-22-85
DESIGNED BY	M. HAQ	3-20-85
CLASSIFICATION	BY	
NONE	NOT REQD	

U. S. DEPARTMENT OF ENERGY
Richland Operations Office
KAISER ENGINEERS HANFORD COMPANY

STRUCTURAL PLAN & SECTIONS

PROJECT TITLE: NON-RADIOACTIVE HAZARDOUS CHEMICAL WASTE FACILITY

PROJ	WO	JOB
B-526	X52602	R688A2
SCALE: SHOWN	BLDG: 214 D	INDEX: 0900, 1000

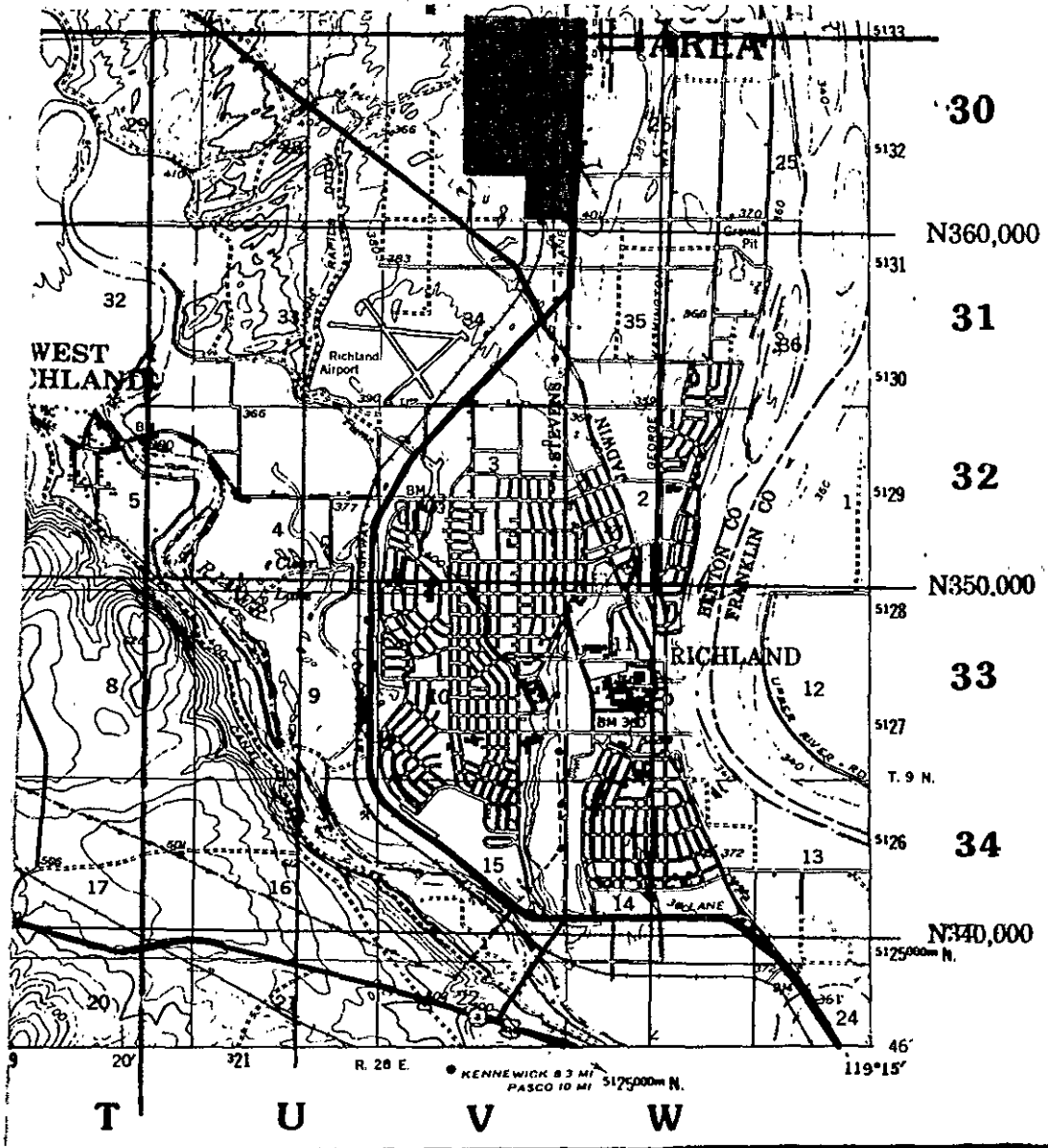
DRAWING NUMBER	SHEET	OF	REV
H-6-1556	1	1	0

SCRIPTION | REV

2 1

APPENDIX B-1

HANFORD SITE MAP



DRAWING APPROVALS	DATE
APPD FOR QUALITY ASSURANCE	
APPD	
APPD R. L. Martell	1/18/85
APPD	
RESPONSIBLE ENGINEER R. MARTELL	1/18/85
DRAFTING APPD R. L. Martell	2/8/85
CHECKED E. Cameron	1/18/85
DRAWN J. Card	1/18/85

U. S. Department of Energy
Richland Operations Office

Rockwell Hanford Operations
Richland, Washington 99352

M

HANFORD SITE MAP

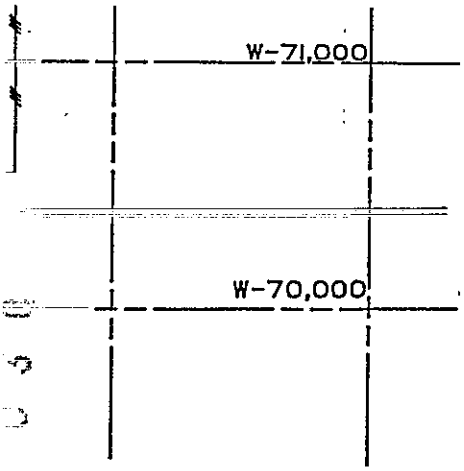
H

SCALE	BLDG NO	INDEX NO.
AS SHOWN	600 GEN	0100

CLASSIFICATION	BY	DRAWING NO	SHEET NO.	SHEETS
NONE	NOT REQ'D	H-6-951	1	1

APPENDIX B-2

DRAWING EXTRACTED FROM H-2-34762



B

200 WEST AREA
SITE PLAN

A

EXTRACTED FROM
H-2-34762 SH 1

3 | 2 KEHCAD | 1

SECTION C
WASTE CHARACTERISTICS

C-1 CHEMICAL AND PHYSICAL ANALYSES

Nonradioactive dangerous wastes generated on the Hanford Site may be transported to either the U. S. Department of Energy, Richland Operations Office (DOE-RL) Nonradioactive Dangerous Waste Landfill (NRDWL) for burial or to the Nonradioactive Dangerous Waste Storage Facility (NRDWS) where they are stored prior to transport to an off-site treatment, storage, or disposal (TSD) unit. Wastes are normally received in 55-, 30-, and 5-gallon containers, but may also be received in bags, plastic carboys, or fiberboard boxes. No wastes are transported to these facilities in bulk loads.

The NRDWL and NRDWS receive dangerous wastes from DOE-RL processing and testing units. Individual Hanford management contractors contribute waste to these units under the common DOE-RL identification number. Therefore, the NRDWL and NRDWS are, in actuality, receiving "on-site" (not "off-site") generated wastes. Nonetheless, DOE-RL management contractors have implemented control procedures similar to those required for "off-site" TSD facilities to ensure that proper waste identification and WDOE designation is attained at the generating site.

Hanford contractors who manage generating units within the Hanford Site include Rockwell Hanford Operations (Rockwell), Pacific Northwest Laboratory (PNL), Westinghouse Hanford Company (WHC), United Nuclear Industries (UNC), Hanford Environmental Health Foundation (HEHF), Kaiser Engineers Hanford (KEH), J. A. Jones Construction Services (JAJ), and Boeing Computer Services, Richland (BCS). These management contractors will be referred to as "generators" throughout the waste analysis plan. Figures C-1 through C-7 identify the location of generating units on the Hanford Site and Tables C-1 through C-7 identify wastes generated at these locations.

Most of the nonradioactive dangerous wastes received at the NRDWL or NRDWS consist of empty EHW drums, unused pure chemical products and product mixtures in small laboratory quantities. Any waste listed in WAC 173-303-9903, or any

dangerous waste mixture (WAC-173-303-084) or characteristic waste (WAC-173-303-090) may potentially be generated on the Hanford Site. Wastes can normally be characterized into "U", "P", "F", "D", "WP", "WC" or "WT" WDOE waste code designation by the use of product manufacturers information, Material Safety Data Sheets and such references as Dangerous Properties of Industrial Materials (Sax, 1979) and The Condensed Chemical Dictionary (Hawley, 1981). They are also characterized per requirements of 40 CFR 261.

Depending on a waste's designation, nonradioactive dangerous wastes are either managed on-site or shipped off-site to an appropriate treatment, storage, or disposal (TSD) facility. Wastes are designated according to the Washington Department of Ecology (WDOE) waste designation regulations which are summarized in Washington Administrative Codes (WAC) 173-303-9901 and -9902. The NRDWL can only accept solid wastes designated Dangerous Waste (DW) under WDOE regulations. Wastes within these criteria are shipped directly to the NRDWL from the generating site. Chemical wastes generated at the Hanford Site which are designated as Extremely Hazardous Waste (EHW) or regulated liquids are sent from the generating site to the existing NRDWS in the 2727-S Building located in the 200 West Area. Wastes received are segregated according to compatibility group prior to being shipped to an off-site TSD facility. A future storage facility (Project B-526) is planned which will increase current storage capacity and improve sampling and testing capability.

Figure C-8 illustrates the decision process for dangerous wastes generated on the Hanford Site.

Occasionally, the TSD technical staff are alerted to the existence of shock-sensitive or peroxide-forming chemicals which could present a serious explosion hazard. Common examples are laboratory quantities of outdated, unstable picric acid and ethyl ether. All chemicals of this nature are designated D003 or are "U" or "P" designated pure chemical products. These chemicals are not allowed at the NRDWL or NRDWS unless they can be safely stored and transported off-site. Their location is noted and the imminency of the hazard they present is assessed. The city of Richland Police Department Bomb Disposal Squad is ultimately utilized to detonate these chemicals.

C-2 WASTE ANALYSIS PLAN

The purpose of this waste analysis plan is to provide a detailed description of how wastes destined for the NRDWL and NRDWS will be identified to ensure their proper handling and disposition. The waste analysis plan describes waste identification procedures and sampling and analytical methodologies for complete characterization of hazardous constituents in Hanford Site waste streams.

Waste characterization procedures have been developed for three separate stages of waste determination:

- GENERATOR SUPPLIED INFORMATION - Generators of nonradioactive dangerous wastes on the Hanford Site are solely responsible for correctly and completely identifying the hazardous constituents of their waste and disclosing this information to the TSD technical staff to ensure proper waste disposition. A detailed manual describing waste identification procedures has been developed for site-wide use by the TSD technical staff.

  Personnel from each management contractor have been instructed to report waste generation to a designated staff member. These staff members are responsible for designating all wastes and are thoroughly trained to comply with WDOE requirements for the proper identification of wastes. This training includes an awareness of proper sampling and testing procedures required to identify their wastes. Should the generator have questions regarding the identification of a waste, the NRDWL and NRDWS TSD technical staff will be consulted.

- WASTE DISPOSITION ANALYSIS - From information supplied by the generator, the TSD technical staff will perform a review of the wastes. If the information provided is correct and adequate and a proper designation has been made, the TSD technical staff will choose the appropriate TSD facility for the waste and provide packaging instructons per U.S. Department of Transportation (DOT) regulations. Should the data be inadequate, the TSD technical staff will request more information on the waste in question. This may involve specific analytical testing. The waste is thus subjected to a second review cycle prior to ultimate disposition. Figure C-9 presents a copy of the worksheet used by the TSD technical staff to perform this review.

- WASTE SHIPMENT INSPECTION AND VERIFICATION - Upon receiving proper packaging instructions, generators are

instructed to inform NRDWL and NRDWS TSD technical staff when wastes are ready for shipment. The wastes are then inspected to ensure that packaging, marking, and labeling are proper and consistent with the information provided on the identification documentation and the accompanying manifest. Actual verification testing procedures are proposed for implementation at a future date.

C-2a Parameters and Rationale

The minimum parameters to be provided and the rationale for their selection are presented in Table C-8. The goal of obtaining this information is to assure that a proper and complete waste designation per WAC 173-303-080 through 103 and 40 CFR 264.13 is made. This information will also assure that all hazards of the waste have been identified for the purposes of safe handling and proper waste disposition. Because most of the wastes generated on the Hanford Site are discarded chemical products, the hazard characteristics identified by these parameters are easily obtained from the information known about the product. If this is not the case, analytical testing will be performed. Dangerous waste toxic mixtures (WT01 and WT02) of known chemical content will be designated according to toxicity calculations defined in WAC 173-303-084(5) which utilize the National Institute for Occupational Safety and Health registry.

C-2b Test Methods

Analytical testing may be required by the TSD technical staff under two circumstances: 1) testing performed by the generator as requested by the TSD technical staff for the purposes of complete characterization of the waste prior to transport to the TSD facility; and 2) testing performed by the TSD technical staff for the purposes of verifying correct generator identification of the waste upon arrival at the TSD facility.

Table C-9 provides a list of analytical methodologies used by the generator and specified by the TSD technical staff. The specific test method is referenced by the procedure number found in the appropriate testing method document.

Verification testing methods are designed to provide the TSD technical staff with rapid screening methods with which to verify generator waste identification information. Verification testing methods are provided in Table C-10. Verification testing is not currently implemented to its full extent due to the lack of safe and adequate sampling and testing facilities.

C-2c Sampling Methods

Representative sampling may be required under the same circumstances identified in Section C-2b: generator characterization and verification testing. Representative sampling to assure proper waste identification may be requested by the TSD technical staff and performed under the direction of the waste generator. Verification sampling at the NRDWL and NRDWS is not currently performed, although sampling capabilities for waste verification are in the process of being implemented.

The majority of verification samples will be taken from waste containers. Solid and liquid sampling methodologies for tank and bulk waste may be implemented, but the need for these methods is not anticipated at this time. Sampling methods in all instances will conform to those referenced in Chemical Testing Methods for Complying with the State of Washington Dangerous Waste Regulations (WDOE 83-13), the American Society for Testing Materials (ASTM), and Test Methods for the Evaluation of Solid Waste, Physical/Chemical Methods (SW-846). The specific sampling methods and equipment will vary with the chemical and physical nature of the waste material and the sampling circumstances.

Sampling methods and equipment utilized for sampling different materials are presented in Table C-11. For liquid waste in tanks or containers, a Coliwasa device or tubing is used to obtain a vertical core section of sample. The length of the Coliwasa device will be adequate to reach the bottom of the vessel, thus allowing representative sampling of all phase layers in the waste. For solid waste, either tubing or a scoop may be used, depending on the nature of the waste. For bulk solids, such as contaminated soils, representative samples will be obtained with a trier or auger. Composite sampling will be performed by obtaining samples in random locations. Should a maximum chemical contamination level be required, the location of the highest likely chemical contamination will be chosen for sampling purposes.

All sampling equipment and sample containers will be handled so that analytical interference with the waste's chemical composition will be precluded. For example, plastic materials (other than Teflon) will not be used for organic waste sampling. Appropriate preservation techniques and chain-of-custody requirements specified in SW-846 will be used.

C-2d Frequency of Analysis

Currently, the Hanford Site does not have facilities which generate a continuous nonradioactive dangerous waste stream for which the chemical constituents and their concentrations are not readily known from knowledge of the raw materials. Each request for waste disposition is considered unique and is normally a one-time-only situation. The need for sampling and analysis of a particular waste will be identified at the time the waste is generated or at the time a disposal request is received by the TSD technical staff. Should a continuous nonradioactive dangerous waste stream be identified which will require periodic analysis, that analysis will be repeated annually, at a minimum, or whenever the process or raw materials used changes.

C-2e Additional Requirements for Wastes Generated Off-Site

As was previously discussed, both generating units and TSD units are owned and operated by DOE-RL and maintain a common WDOE identification number. All activities are considered "on-site" activities. "Off-site" TSD requirements are therefore, not strictly applicable to the Hanford Site. It is recognized that with the size of the Hanford Site and with the numbers of diverse activities being performed here, waste management control procedures similar to those required at "off-site" commercial TSD facilities must be maintained. This section describes those control procedures instituted by the TSD technical staff which assure that proper waste identification has been made by the "generator" of the waste.

Control procedures established by the TSD technical staff for assuring that waste is properly designated are presented in Figure C-10. Generators on the Hanford Site are required to initiate waste disposition by supplying information to the TSD technical staff on a "Chemical Waste Disposal Request" form as shown in Figure C-11. Waste designations of pure chemical products and

product mixtures can normally be attained from known raw material data. If proper waste designation cannot be assured by prior knowledge, additional information must be obtained before further processing. More detailed information regarding the waste may be provided by documentation such as Material Safety Data Sheets or by analytical testing procedures specified by the TSD technical staff.

The TSD technical staff will make a final evaluation of waste disposition only after waste characterization is complete and the proper WDOE designation has been made. Figure C-12 presents the form used by the TSD technical staff to identify the disposition of each waste upon evaluation of the generator-supplied information.

Tracking of the physical location of wastes shipped from the generator site is performed by maintaining copies of all on-site and off-site manifests in a central filing system in the 2750E Building, 200 East Area.

Preshipment inspections presently take place at the generating unit. These inspections serve the purpose of confirming proper waste packaging, marking, labeling and manifesting in accordance with WDOE preshipment requirements and DOT requirements. Presently, waste shipments are not analytically verified by the TSD technical staff to confirm generator waste identification because inspections are made in areas with inadequate analytical and safety equipment. Verification procedures are not considered crucial for most waste streams on the Hanford Site since wastes consist mainly of empty product drums or discarded chemical products. However, the need for establishing verification procedures has been identified to ensure that improper waste designation can be identified prior to waste shipment and disposition. Verification testing is proposed to be performed at the generator site but will consist only of those parameters that do not require testing in a controlled environment, such as an exhaust hood. These proposed testing parameters are physical description, pH, and specific gravity measurements. These parameters will adequately screen the majority of waste types. At least ten percent of a generator shipment will be randomly selected and tested to verify content.

The proposed DOE-RL NRDWS will allow more extensive inspection and verification testing. Additional verification parameter capabilities in the new facility will include flash point, cyanide and sulfide screens and water reactivity tests.

Lab packs are now randomly inspected by the TSD technical staff during the generator packaging process to assure that incompatible wastes are segregated properly, and that adequate quantities of nonbiodegradable absorbent are used. At least ten percent of each generator's lab pack requests are randomly selected for inspection.

Figure C-13 presents preshipment verification documentation to be used by the TSD technical staff. From generator-supplied information, parameters which are reliable indicators of waste composition are selected. Waste characteristics, applicable WDOE waste codes, and testing parameters to be implemented in the proposed verification testing procedure are presented in Table C-12. Should waste verification testing identify a significant variance from generator-reported information, the waste will not be approved for placement in the NRDWL or NRDWS until the re-evaluation of the waste by the TSD technical staff and the generator resolves the discrepancy. Waste acceptance approval is given by the TSD technical staff by initialing the appropriate manifest.

C-2f <u>Additional Requirements for Ignitable, Reactive or Incompatible Wastes</u>
Based upon the hazard characteristics identified by the generator, specific packaging instructions are provided by the TSD technical staff. Instructions take into consideration the ignitability, reactivity and potential incompatibilities of the waste stream. Consideration for compatibility of the waste with the container is determined at this time as well.

Instructions are in compliance with DOT regulations at all times. If multiple waste types are to be placed in a single container (e.g., lab packs), compatibility analyses are performed and potentially incompatible wastes are packaged in separate containers. In no case are wastes of differing hazard classes packaged together. Wastes designated as EHW are packaged into a compatible

lab pack and stored at the NRDWS prior to transport to an off-site TSD. Lab-packed wastes designated as DW are placed in the on-site landfill. A mixture of EHW and DW wastes will always be designated as EHW and shipped offsite.

Various references are used to determine potential incompatibilities. Figures C-14 and C-15 present two compatibility charts used, in conjunction with their associated texts, for this purpose.

Ignitable wastes must be stored and placed in a landfill in closed, nonleaking containers. Liquid ignitable wastes will not be put in a landfill except in the form of lab packs which are packaged with at least a four-to-one ratio of nonbiodegradable absorbent to liquid waste. Dangerous wastes are never placed in an unwashed container that previously held an incompatible waste or material. Reactive wastes are never put in a landfill. Shock sensitive and peroxide-forming chemicals are detonated with the services of the City of Richland Police Department Bomb Disposal Squad.

The DOE-RL currently stores waste in a unit (Building 2727-S) which consists of a covered building with two main curbed cells for segregating oxidizing materials from corrosive, organic, ignitable, and other waste types. Should wastes be encountered which are not compatible with either cell (as determined in the initial generator waste analysis), containers are isolated outside the building.

Any leaks or spills in curbed cells or outside the existing NRDWS will be characterized by identifying the source. If unknown, the material will be completely analyzed using methodology presented in Section C-2b. In either case the contamination will be containerized and properly dispositioned along with the debris generated during cleanup operations. Soil testing will be performed to confirm complete chemical decontamination of the area to Initial, Standard/Background, or Protection Cleanup Levels, depending on the imminence of the hazard, as prescribed by the WDOE in "Final Cleanup Policy-Technical", effective date July 10, 1984.

Due to inadequate storage capacity and utility services, a new storage facility is being designed through Project B-526. Future storage facility

capabilities will include laboratory functions. Cells will be expanded for segregation of wastes based on the following National Fire Protection Association waste categories: Class IA Flammable Liquids, Class IB Flammable Liquids, Combustibles, Corrosives, and Oxidizers. This expansion will further preclude the possibility of waste incompatibilities.

When the new storage facility is completed, the TSD technical staff will consolidate generator wastes into common containers for more efficient disposition to the NRDWL and off-site facilities. Only wastes of the same chemical composition, WDOE waste designation, or hazard class will be consolidated (e.g., ignitable solvents (D001)). Wastes to be consolidated will be adequately tested to verify compatibility.

Wastes destined for the NRDWL will be WDOE designated Dangerous Waste (DW) or unregulated wastes for which safety considerations dictate their placement in the NRDWL. All wastes to be put in the landfill must have a solids content greater than 70 percent and contain no free liquids. Presently, these parameters are obtained by physical inspection. Storage facility capabilities will include the performance of free liquids testing using the paint filter method described in Section C-2b. Wastes are placed in one of two trenches according to compatibility as identified by generator-supplied information and TSD technical staff compatibility analyses. One trench receives strictly solid oxidizing material and the other trench receives all other solid dangerous wastes.

Ignitable solid dangerous wastes will be put in the landfill only if their flash point is greater than 100 degrees F. These wastes will be disposed of at the NRDWL in nonleaking containers, which are handled and placed in such a manner as to avoid heat, sparks, rupture, or other conditions which could cause ignition. Reactive waste, D003, will not be placed in the NRDWL unless the waste has been rendered nonreactive, as specified in the WDOE definition for reactive waste, WAC 173-303-090 (7)(a)-(b).

REFERENCES - SECTION C-2

1. State of Washington Department of Ecology, June 27, 1984, Washington Administrative Code Chapter 173-303, Olympia, WA.

2. Sax, N. Irving, 1979, Dangerous Properties of Industrial Materials, Von Nostrand Reinhold Company, New York, NY.

3. Hawley, Gessner G., 1981, The Condensed Chemical Dictionary, Von Nostrand Reinhold Company, New York, NY.

4. United States Environmental Protection Agency, 1980, Test Methods for Evaluating Solid Waste, SW-846, Office of Water and Waste Management, Washington D.C.

5. American Society for Testing Materials, 1982, Annual book of ASTM Standards, Parts 15, 19, and 31, Philadelphia, PA.

6. State of Washington Department of Ecology, July 1983, Chemical Testing Methods for Complying with the State of Washington Dangerous Waste Regulation, WDOE 83-13, Olympia, WA.

7. State of Washington Department of Ecology, July 1981, Biological Testing Methods, OE 80-12, Olympia, WA.

8. U. S. Department of Health and Human Services, June 1983, Registry of Toxic Effects of Chemical Substances, 1981-82 Edition, Volumes 1, 2, and 3, Cincinnati, OH.

9. J. T. Baker Chemical Company, 1979, The Management and Disposal of Hazardous Chemical Wastes, Advanced Environmental Technology Corporation, Morris Plains, NJ.

10. United States Environmental Protection Agency, 1982, A Method for Determining the Compatibility of Hazardous Wastes, Office of Research and Development Municipal Environmental Research Laboratory, Cincinnati, OH.

TABLE C-1. MAJOR NONRADIOACTIVE DANGEROUS WASTES GENERATED IN THE 100 AREAS OF THE HANFORD SITE

100-B AND 100-C AREA

UNC

105B AND 105C REACTOR BUILDING

- DEMOLITION AND DISPOSAL WASTE-
  MERCURY (D009)

100-K AREA

UNC

105-K REACTOR BUILDING

- DEMOLITION AND DISPOSAL WASTE-
  MERCURY (D009)

100-N AREA

JAJ

100-N MAINTENANCE WASTE COLLECTION FACILITY

- MAINTENANCE WASTE-
  PAINT, SOLVENTS (D001, F001-F005, WT01, WT02)

KEH

1134-N OFFICE BUILDING

- MAINTENANCE WASTE-
  BLUEPRINT MACHINE WASTE (D002, WT02)

UNC

105-N REACTOR BUILDING

- MAINTENANCE WASTE ELECTRICAL AND TRANSPORTATION-
  MERCURY, SOLVENTS (D001, D009, F001-F005, WT01, WT02)

1133-N OFFICE BUILDING

- MAINTENANCE WASTE-
  BLUEPRINT MACHINE WASTE (D002, WT02)

100-D AREA

UNC

105-D AND 105-DR REACTOR BUILDINGS

- DEMOLITION AND DISPOSAL WASTE-
  MERCURY (D009)

1703-D AND 1713-D OFFICE BUILDINGS

- MAINTENANCE WASTE-
  BLUEPRINT MACHINE WASTE (D002, WT02)

WHC

105-DR REACTOR BUILDING

- MAINTENANCE WASTE-
  ALKALI METALS (D003)**

100-H AREA

UNC

105-H REACTOR BUILDING

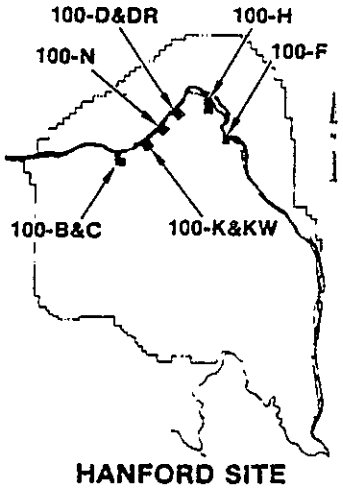
- DEMOLITION AND DISPOSAL WASTE-
  MERCURY (D009)

100-F AREA

UNC

105-F REACTOR BUILDING

- DEMOLITION AND DISPOSAL WASTE-
  MERCURY (D009)



HANFORD SITE

**THESE WASTES ARE DISPOSITIONED TO THE DOE-RL ALKALI METAL TREATMENT FACILITIES, NOT TO THE NROWL AND NROWS.

TABLE C-2. MAJOR NONRADIOACTIVE DANGEROUS WASTES GENERATED IN THE 200 EAST AREA OF THE HANFORD SITE.

JAJ

200-E AREA MAINTENANCE WASTE ASSEMBLY FACILITY

- MAINTENANCE WASTE-
  PAINT, WASTE SOLVENT (D001, F001-F005, WT01, WT02)

KEH

2911-E ENGINEERING AND GRAPHICS BUILDING

- MAINTENANCE WASTE-
  BLUEPRINT MACHINE WASTE, PHOTO PROCESSING WASTES (D002, WT02)

RHO

221-B AND 272-B, B PLANT

- MAINTENANCE WASTE AND EXCESS CHEMICALS-
  1,1,1-TRICHOLOETHANE, LANTHANUM NITRATE, PHOSPHORIC ACID, ISOPROPANOL, TRIBUTYL PHOSPHATE, REGULATED CONTAINERS (D002, U226, WT01, WT02)

2703-E CHEMICAL ENGINEERING LABORATORY

- MAINTENANCE AND LABORATORY WASTE-
  NONRADIOACTIVE PROCESS REAGENTS, WASTE REAGENTS*

2101-M BASALT MATERIALS RESEARCH LABORATORY

- LABORATORY WASTE-
  WASTE REAGENTS*

202-A PUREX PLANT

- MAINTENANCE WASTE AND EXCESS CHEMICALS-
  POTASSIUM PERMANGANATE, SODIUM NITRATE, REGULATED CONTAINERS (D002, WT01, WT02)

272-E AND 272-BC FABRICATION SHOPS

- MAINTENANCE WASTE-
  WASTE SOLVENT (D001, F001-F005, WT02)

275-EA STORAGE BUILDING

- MAINTENANCE WASTE AND OUTDATED CHEMICAL SUPPLIES-
  CHEMICALS, REGULATED PESTICIDE WASTE AND CONTAINERS (U332, U240, WP01, WP02, WP03, WT01, WT02)*

284-E POWERHOUSE

- MAINTENANCE WASTE-
  EXCESS CAUSTIC MATERIALS (D002, WT01, WT02)

2750-E OFFICE BUILDING

- MAINTENANCE WASTE-
  BLUEPRINT MACHINE WASTE (D002, WT02)

MO-405 OFFICE BUILDING

- MAINTENANCE WASTE-
  BLUEPRINT MACHINE WASTE (D002, WT02)

MO-047 OFFICE BUILDING

- MAINTENANCE WASTE-
  BLUEPRINT MACHINE WASTE (D002, WT02)

2704-E OFFICE BUILDING

- MAINTENANCE WASTE-
  BLUEPRINT MACHINE WASTE (D002, WT02)

2715-EC AND 2715-ED

- MAINTENANCE WASTE FROM PAINT SHOP AND PAINT STORAGE BUILDING-
  PAINT, WASTE SOLVENT (D001, F001-F005, WT01, WT02)

*HANFORD SITE RESEARCH AND DEVELOPMENT LABORATORIES GENERATE SMALL QUANTITIES OF A BROAD RANGE OF REGULATED WASTES WHICH MAY INCLUDE:

- ANY OF THE CHEMICALS LISTED ON THE DISCARDED CHEMICAL PRODUCTS LIST ("U" OR "P" DESIGNATION)
- DANGEROUS WASTE MIXTURES ("WT", "WP", OR "WC" DESIGNATION)
- WASTE EXHIBITING DANGEROUS WASTE CHARACTERISTICS ("D" DESIGNATION)

TABLE C-3. MAJOR NONRADIOACTIVE DANGEROUS WASTES GENERATED IN THE 200 WEST AREA OF THE HANFORD SITE

JAJ

200-W AREA MAINTENANCE WASTE ASSEMBLY FACILITY

- MAINTENANCE WASTE (D001, F001-F005, WT01, WT02)

RHO

272-W MACHINE SHOP

- MAINTENANCE WASTE-
  WASTE SOLVENT (D001, F001-F005, WT02)

284-W POWERHOUSE

- MAINTENANCE WASTE-
  EXCESS CAUSTIC MATERIAL (D002, WT01, WT02)

224-UA UO3 PLANT

- MAINTENANCE WASTE AND EXCESS CHEMICAL-
  SULFURIC ACID (D002, WT01, WT02)

222-SA GOLD STANDARDS LABORATORY ENGINEERING AND DEVELOPMENT LABORATORY

- MAINTENANCE AND LABORATORY WASTE-
  ACIDS, BASES AND LABORATORY CHEMICAL SOLUTIONS*

234-5Z PLUTONIUM FINISHING PLANT

- MAINTENANCE WASTE AND EXCESS CHEMICALS-
  ALUMINUM NITRATE NONOHYDRATE, HYDROXYLAMINE NITRATE, 1,1,1-TRICHLOROETHANE AND REGULATED CONTAINERS (D002, U226, WT01, WT02)

281-SX TANK FARM WASTE ASSEMBLY BUILDING

- MAINTENANCE WASTE AND EXCESS CLEANERS-
  CAUSTIC SOLUTIONS (D002, WT01, WT02)

271-T OFFICE BUILDING

- MAINTENANCE WASTE-
  BLUEPRINT MACHINE WASTE (D002, WT02)

2704-W OFFICE BUILDING

- MAINTENANCE WASTE-
  BLUEPRINT MACHINE WASTE (D002, WT02)

BWIP DRILLING SITE

- MAINTENANCE WASTE-
  WASTE SOLVENT (D001, F001-F005, WT01, WT02)

WHC

221-T LARGE SODIUM FIRE FACILITY

- MAINTENANCE WASTE-
  ALKALI METALS (D003)**

*HANFORD SITE RESEARCH AND DEVELOPMENT LABORATORIES GENERATE SMALL QUANTITIES OF A BROAD RANGE OF REGULATED WASTES WHICH MAY INCLUDE:

- ANY OF THE CHEMICALS LISTED ON THE DISCARDED CHEMICAL PRODUCTS LIST ("U" OR "P" DESIGNATION)
- DANGEROUS WASTE MIXTURES ("WT", "WP" OR "WC" DESIGNATION)
- WASTE EXHIBITING DANGEROUS WASTE CHARACTERISTICS ("D" DESIGNATION)

**THESE WASTES ARE DISPOSITIONED TO THE DOE-RL ALKALI METAL TREATMENT FACILITIES, NOT TO THE NRDWL AND NRDWS.

TABLE C-4. MAJOR NONRADIOACTIVE DANGEROUS WASTES GENERATED IN THE 300 AREA OF THE HANFORD SITE.

JAJ

300 AREA MAINTENANCE WASTE ASSEMBLY FACILITY

- MAINTENANCE WASTE- PAINT, WASTE SOLVENTS (D001, F001-F005, WT01, WT02)

PNL

305 DEVELOPMENT LABORATORY

- MAINTENANCE WASTE- BLUEPRINT MACHINE WASTE, LABORATORY WASTE*

306 W MATERIALS DEVELOPMENT LABORATORY

- MAINTENANCE AND LABORATORY WASTE- BLUEPRINT MACHINE WASTE, WASTE REAGENTS (D002, WT02)

314 ENGINEERING DEVELOPMENT LABORATORY

- LABORATORY WASTE- WASTE REAGENTS*

318 RADIOLOGICAL CALIBRATION FACILITY

- LABORATORY WASTE- WASTE REAGENTS*

320 ANALYSIS AND NUCLEAR RESEARCH

- LABORATORY WASTE- WASTE REAGENTS*

324 CHEMICAL MATERIALS ENGINEERING LABORATORY

- MAINTENANCE AND LABORATORY WASTE- BLUEPRINT MACHINE WASTE, WASTE REAGENTS*

325 RADIOCHEMISTRY BUILDING

- LABORATORY WASTE- WAST REAGENTS*

329 PHYSICS SCIENCE LABORATORY

- LABORATORY WASTE- WASTE REAGENTS*

331 LIFE SCIENCES LABORATORY COMPLEX

- LABORATORY WASTE- WASTE REAGENTS*

350 PLANT OERATIONS AND MAINTENANCE FACILITY

- MAINTENANCE WASTE- PAINT, JANITORIAL WASTES, (D001, WT02)

3705 PHOTOGRAPHY

- PHOTOCHEMICAL WASTE- PHOTO SOLUTION CONTAINING SILVER (D011, WT02)

3708 LABORATORY

- LABORATORY WASTE- WASTE REAGENTS*

3714 ORGANIC CHEMISTRY LABORATORY

- LABORATORY WASTE- WASTE REAGENTS*

3720 MATERIALS SCIENCE LABORATORY

- LABORATORY WASTE- WASTE REAGENTS*

UNC

333 N FUELS FABRICATION BUILDING

- X-RAY FILM DEVELOPER WASTE- PHOTOCHEMICAL WASTE (D002, WT02)

3707 D OFFICE BUILDING

- MAINTENANCE WASTE- BLUEPRINT MACHINE WASTE (D002, WT02)

3713 SHOP BUILDING

- MAINTENANCE WASTE- WASTE SOLVENTS, PAINT, BLUEPRINT MACHINE WASTE (D001, D002, F001-F005, WT01, WT02)

WHC

306 E FABRICATION AND TESTING LABORATORY

- LABORATORY AND MAINTENANCE WASTE- WASTE REAGENTS*

308 FUELS DEVELOPMENT LABORATORY

- MAINTENANCE WASTE- PHOTOGRAPHIC WASTE (D011, WT02)

309 MAINTENANCE FACILITY

- MAINTENANCE WASTE- WASTE SOLVENT, COOLANT (D001, F001-F005, WT02)

321 OFFICE BUILDING

- MAINTENANCE WASTE- BLUEPRINT MACHINE WASTE (D002, WT02)

324 CHEMICAL ENGINEERING LABORATORY

- LABORATORY WASTE- ALKALI MTEALS**, COOLANT (D003, WT02)

325 CHEMISTRY LABORATORY

- MAINTENANCE AND LABORATORY WASTE- WASTE REAGENTS, COOLANT*

326 MATERIALS TECHNOLOGY LABORATORY

- LABORATORY WASTE- PHOTOGRAPHIC WASTE (D011, WT02)

327 RADIOMETALLURGY BUILDING

- MAINTENANCE WASTE- WASTE SOLVENTS, LABORATORY WASTE*

328 MACHINE SHOP

- MAINTENANCE WASTE- WASTE SOLVENTS (D001, F001-F005, WT01, WT02)

337 HIGH TEMPERATURE SODIUM FACILITY

- MAINTENANCE AND LABORATORY WASTE- ALKALI METALS, BLUEPRINT MACHINE WASTE, COOLANT (D003, WT02)

338 EQUIPMENT DEVELOPMENT

- MAINTENANCE WASTE- COOLANT (D002)

384 POWERHOUSE

- MAINTENANCE WASTE- CAUSTIC SOLUTIONS (D002, WT02)

3702 OFFICE BUILDING

- MAINTENANCE WASTE- BLUEPRINT MACHINE WASTE (D002, WT02)

3706 INFORMATION SERVICES

- MAINTENANCE WASTE- PHOTOGRAPHIC WASTE (D011, WT02)

3707 D OFFICE BUILDING

- MAINTENANCE WASTE- BLUEPRINT MACHINE WASTE (D002, WT02)

3709 PAINT SHOP

- MAINTENANCE WASTE- PAINT, WASTE SOLVENT (D001, F001-F005 WT01, WT02)

3713 PAINT SHOP

- MAINTENANCE WASTE- PAINT, WASTE SOLVENT (D001, F001-F005, WT01, WT02)

3717 B SHEET METAL SHOP

- MAINTENANCE WASTE- WASTE SOLVENTS (D001, F001-F005 WT01)

3718 F SODIUM BURN FACILITY

- FACILITY WASTE- 2 BUTOXY ETHANOL, METHANOL** (D001, WT02)

3765 OFFICE BUILDING

- MAINTENANCE WASTE- BLUEPRINT MACHINE WASTE (D002, WT02)

*HANFORD SITE RESEARCH AND DEVELOPMENT LABORATORIES GENERATE SMALL QUANTITIES OF A BROAD RANGE OF REGULATED WASTES WHICH MAY INCLUDE:

- ANY OF THE CHEMICALS LISTED ON THE DISCARDED CHEMICAL PRODUCTS LIST ("U", "P" DESIGNATION)
- DANGEROUS WASTE MIXTURES ("WT "WP" OR "WC" DESIGNATION)
- WASTE EXHIBITING DANGEROUS WASTE CHARACTERISTICS ("D" DESIGNATION)

**THESE WASTES ARE DISPOSITIONED TO THE DOE-RL ALKALI METAL TREATMENT FACILITIES, NOT TO THE NRDWL AND NRDWS.

TABLE C-5. MAJOR NONRADIOACTIVE DANGEROUS WASTES GENERATED IN THE 400 AREA OF THE HANFORD SITE.

WHC

427 FUEL MATERIAL EXAMINATION FACILITY (FMEF)

- MAINTENANCE WASTES-
  BLUEPRINT MACHINE WASTE, COOLANT (D002, WT02)

437 MAINTENANCE AND STORAGE FACILITY (MASF)

- MAINTENANCE WASTES-
  COOLANT (WT02)

483 COOLING TOWER FACILITY

- MAINTENANCE WASTE-
  COOLANT (WT02)

4704 OFFICE BUILDING

- MAINTENANCE WASTE-
  BLUEPRINT MACHINE WASTE (D002, WT02)

4710 OFFICE BUILDING

- MAINTENANCE WASTE-
  BLUEPRINT MACHINE WASTE (D002, WT02)

FAST FLUX TEST FACILITY (FFTF) COMPLEX

- MAINTENANCE WASTE-
  ALKALI METALS (D003)**

*HANFORD SITE RESEARCH AND DEVELOPMENT LABORATORIES GENERATE SMALL QUANTITIES OF A BROAD RANGE OF REGULATED WASTES WHICH MAY INCLUDE:

- ANY OF THE CHEMICALS LISTED ON THE DISCARDED CHEMICAL PRODUCTS LIST ("U" OR "P" DESIGNATION)
- DANGEROUS WASTE MIXTURES ("WT", "WP", OR "WC" DESIGNATION)
- WASTE EXHIBITING DANGEROUS WASTE CHARACTERISTICS ("D" DESIGNATION)

**THESE WASTES ARE DISPOSITIONED TO THE DOE-RL ALKALI METAL TREATMENT FACILITIES, NOT TO THE NRDWL AND NRDWS.

TABLE C-6. MAJOR NONRADIOACTIVE DANGEROUS WASTES GENERATED IN THE 700 AREA OF THE HANFORD SITE.

HEHF
747 LABORATORY FACILITIES

- LABORATORY WASTE-
  ORGANIC SOLVENTS, MISC. CHEMICAL WASTES*

PNL
FEDERAL BUILDING PHOTOGRAPHY REPAIR

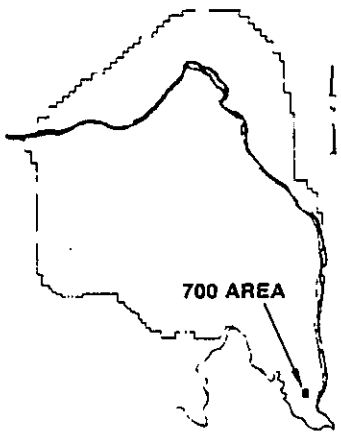
- MAINTENANCE WASTE-
  SOLVENTS (D001, F001-F005, WT01, WT02)

RHO
712 PRINTING AND DUPLICATING OFFICE

- PRINTING AND MAINTENANCE WASTE-
  SOLVENTS, PRINTING MACHINE WASTE (D001, F001-F005, WT01, WT02)

*HANFORD SITE RESEARCH AND DEVELOPMENT LABORATORIES GENERATE SMALL QUANTITIES OF A BROAD RANGE OF REGULATED WASTES WHICH MAY INCLUDE:

- ANY OF THE CHEMICALS LISTED ON THE DISCARDED CHEMICAL PRODUCTS LIST ("U" OR "P" DESIGNATION)
- DANGEROUS WASTE MIXTURES ("WT", "WP", OR "WC" DESIGNATION)
- WASTE EXHIBITING DANGEROUS WASTE CHARACTERISTICS ("D" DESIGNATION)



HANFORD SITE

TABLE C-7. MAJOR NONRADIOACTIVE DANGEROUS WASTES GENERATED IN THE 1100 AND 3000 AREAS OF THE HANFORD SITE.

JAJ

1208 PAINT SHOP

- MAINTENANCE WASTE-
  WASTE SOLVENT (D001, F001-F005, WT01, WT02)

1209 X-RAY FACILITY

- MAINTENANCE WASTE-
  ACIDS (D002, WT02)

1226 AUTOMOTIVE SHOP

- MAINTENANCE WASTE-
  WASTE SOLVENT, ANTIFREEZE (D001, WT02)

1240 FABRICATION SHOP

- MAINTENANCE WASTE
  WASTE SOLVENT (D001, F001-F005, WT01, WT02)

1254 SHEET METAL SHOP

- MAINTENANCE WASTE-
  GALVANIZING ACIDS, CLEANERS (D002, WT02)

3000 AREA MAINTENANCE WASTE ASSEMBLY FACILITY

- MAINTENANCE WASTE
  PAINT, WASTE SOLVENT (D001, F001-F005, WT01, WT02)

KEH

1212 OFFICE BUILDING

- MAINTENANCE WASTE-
  BLUEPRINT MACHINE WASTE (D002, WT02)

TCPC TRI-CITIES PROFESSIONAL CENTER

- MAINTENANCE WASTE-
  BLUEPRINT MACHINE WASTE (D002, WT02)

PNL

2400 OFFICE AND LABORATORY

- MAINTENANCE AND LABORATORY WASTE-
  BLUEPRINT MACHINE WASTE, NUMEROUS LABORATORY WASTES*

CEL CHEMICAL ENGINEERING LABORATORY

- LABORATORY WASTE-
  WASTE REAGENTS*

EDL ENGINEERING DEVELOPMENT LABORATORY

- LABORATORY WASTE-
  WASTE REAGENTS*

LSL-II LIFE SCIENCE LABORATORY

- LABORATORY WASTE-
  WASTE REAGENTS*

MDL MECHANICAL DEVELOPMENT LABORATORY

- LABORATORY WASTE-
  WASTE REAGENTS*

MRC MATERIALS RELABILITY CENTER

- LABORATORY WASTE-
  WASTE REAGENTS*

PSL PHYSICAL SCIENCE LABORATORY

- LABORATORY WASTE-
  WASTE REAGENTS*

RBO RESEARCH OPERATIONS BUILDING

- PHOTOCHEMICAL WASTE-
  WASTE REAGENTS*

RTL RESEARCH TECHNICAL LABORATORY

- LABORATORY WASTE-
  WASTE REAGENTS*

SIGMA I

- MAINTENANCE WASTE-
  BLUEPRINT MACHINE WASTE (D002, WT02)

SIGMA V

- LABORATORY WASTE-
  WASTE REAGENTS*

RHO

1154-A RADIO MAINTENANCE

- MAINTENANCE WASTE-
  WASTE SOLVENTS, REGULATED CONTAINERS
  (D001, F001-F005, WT01, WT02)

1166 GENERAL STORES BUILDING AND 1169 ACID AND FLAMMABLE STORAGE

- OUTDATED CHEMICAL SUPPLIES-
  ETHER, PEROXIDES AND NUMEROUS CHEMICAL REAGENTS*

1167 EXCESS FACILITY

- OUTDATED CHEMICAL SUPPLIES-
  PAINT AND CHEMICAL PRODUCTS*

1171 MAIN SHOP BUILDING

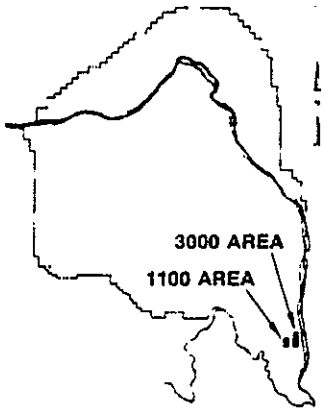
- MAINTENANCE WASTE FROM AUTO, PAINT AND HERBICIDE SHOPS-
  SOLVENTS, PAINT, ANTIFREEZE, PESTICIDE SOLUTIONS AND MAINTENANCE WASTES (D001, D002, F001-F005, WP01, WP02, WP03, WT01, WT02)

PBB PEOPLES BANK BUILDING

- MAINTENANCE WASTE-
  BLUEPRINT MACHINE WASTE (D002, WT02)

*HANFORD SITE RESEARCH AND DEVELOPMENT LABORATORIES GENERATE SMALL QUANTITIES OF A BROAD RANGE OF REGULATED WASTES WHICH MAY INCLUDE:

- ANY OF THE CHEMICALS LISTED ON THE DISCARDED CHEMICAL PRODUCTS LIST ("U" OR "P" DESIGNATION)
- DANGEROUS WASTE MIXTURES ("WT", "WP", OR "WC" DESIGNATION)
- WASTE EXHIBITING DANGEROUS WASTE CHARACTERISTICS ("D" DESIGNATION)



HANFORD SITE

TABLE C-8. MANDATORY WASTE CHARACTERIZATION INFORMATION TO BE SUPPLIED BY GENERATOR

ANALYTICAL PARAMETER	RATIONALE FOR SELECTION
1 Radioactive Screen	All wastes suspected of being radioactively contaminated or located within a radioactive zone are screened for radioactivity prior to being released to nonradioactive areas for the purposes of safe handling and proper management of this hazard characteristic.
2 pH	To indicate the degree of corrosivity of the waste for safe handling and to establish a relatively simple indicator parameter for the purposes of verification testing.
3 Flash Point	To determine conditions for ignitability of waste content for safe handling. Organic wastes which are determined to be ignitable will be directed to incineration or to reuse or recycle options, if possible. This test will also determine if waste is WDOE and/or DOT regulated ignitable, flammable or combustible substance.
4 Water Reactivity	To determine whether the waste has a potential to violently react with water to form gases or generate heat for the purposes of safe handling and proper disposition. The need for waste treatment may be determined should waste be considered water reactive.
5 Reactive Cyanide/ Reactive Sulfide Content	To determine if wastes produce hydrogen cyanide or hydrogen sulfide upon acidification below pH 2. A positive cyanide or sulfide screen would direct the waste to a treatment or incineration facility. These wastes would not be landfilled. This information would not be required for wastes with pH less than 6.
6 Chemical Compatibility	An analysis of hazardous reaction potential with other waste types will be performed for the puropses of segregating waste types in both the NRDWL and in the storage facilities.
7 Physical Description	To determine the general physical characteristics of the waste (e.g., viscosity, color, texture, odor free liquids) for comparison between generator supplied information and verification by Rockwell.
8 Specific Gravity	To establish a measurement for a parameter which will effectively compare liquid waste characteristics against generator supplied information.
9 PCB Screen	To determine PCB content in oil-bearing wastes for the purposes of managing these wastes in accordance with regulations prescribed in the Toxic Substances Control Act.
10 EP Toxicity	To determine whether a waste is a regulated toxic waste due to its heavy metal or pesticide content.
11 Toxicity	To determine whether a waste is WDOE regulated DW or EHW due to its toxic constituents as determined by the NIOSH Registry of Toxic Effects or the CERCLA spill table.
12 Halogenated Hydrocarbons	To determine whether a waste is WDOE regulated DW or EHW due to its halogenated hydrocarbon content.
13 Polycyclic Aromatic Hydrocarbons	To determine whether a waste is WDOE regulated DW or EHW to its polycyclic aromatic hydrocarbon content.
14 Carcinogenicity	To determine whether a waste is WDOE regulated DW or EHW due to its carcinogenic chemical constituents as determined by the International Agency for Research on Cancer.

2K8506-12.1

TABLE C-9. ANALYTICAL METHODOLOGY SPECIFIED BY TSD TECHNICAL STAFF FOR GENERATOR WASTE

PARAMETER AND METHOD	REFERENCE
Characteristics:	
Flash point Pensky-Martens closed-cup method	1010*
Flash point Setaflash closed-cup method	1020*
Corrosivity pH meter or pH paper	9040*, 9041*
Heavy metals Extraction procedure toxicity or ICP	6010**
Inorganic Techniques	
Acid digestion procedure for flame atomic adsorption spectroscopy	3010*
Acid digestion procedure for furnace atomic adsorption spectroscopy	3020*
Acid digestion of oils, greases, or waxes	3040*
Acid digestion of sludges (reserved)	3050*
Alkaline digestion	3060*
Organic Techniques	
Separatory funnel liquid-liquid extraction (8.84)	3510*
Continuous liquid-liquid extraction (9.01)	3520*
Acid-base cleanup extraction (8.25)	3530*
Soxhlet extraction (8.86)	3540*
Sonication extraction (8.85)	3550*
Inorganic Analytical Methods:	
Antimony	
Atomic absorption, direct aspiration method	7040*
Atomic absorption, graphite furnance method	7041*
Arsenic	
Atomic absorption, furnace method	7060*
Atomic absorption, gaseous hydride method	7061*
Atomic absorption, direct aspiration method	7080*
Atomic absorption, furnance method	7081*
Beryllium (reserved)	
Atomic absorption, direct aspiration method	7090*
Atomic absorption, furnance method	7091*
Cadmium (8.54)	
Atomic absorption, direct aspiration method	7030*
Atomic absorption, furnance method	7031*
Chromium	
Atomic absorption, direct aspiration method	7090*
Atomic absorption, furnance method	7091*
Hexavalent chromium: co-precipitation (8.545)	7195*
Hexavalent chromium: colorimetric (8.546)	7196*
Hexavalent chromium: chelation-extraction (8.547)	7197*
Copper (reserved)	
Atomic absorption, direct aspiration method	7210*
Atomic absorption, furnance method	7211*
Lead (8.56)	
Atomic absorption, direct aspiration method	7030*
Atomic absorption, furnance method	7031*
Mercury (8.57)	
In liquid waste (manual cold-vapor technique)	7470*
In solid or semisolid waste (manual cold-vapor technique) (reserved)	7471*
Nickel (8.57)	
Atomic absorption, direct aspiration method	7090*
Atomic absorption, furnance method	7091*
Hexavalent chromium: co-precipitation (8.545)	7195*
Hexavalent chromium: colorimetric (8.546)	7196*
Hexavalent chromium: chelation-extraction (8.547)	7197*
Osmium (reserved)	
Atomic absorption, direct aspiration method	7550*
Atomic absorption, furnance method	7551*
Selenium (8.59)	
Atomic absorption, direct aspiration method	7774*
Atomic absorption, furance method	7774*
Silver (8.60)	
Atomic absorption, direct aspiration method	7760*
Atomic absorption, furnace method	7761*
Thallium (reserved)	
Atomic absorption, direct aspiration method	7840*
Atomic absorption, furnace method	7841*
Vanadium (reserved)	
Atomic absorption, direct aspiration method	7910*
Atomic absorption, furnance method	7911*
Zinc (reserved)	
Atomic absorption, direct aspiration method	7950*
Atomic absoption, furnance method	7951*
Organic Analytical Method:	
Gas Chromatographic Methods	8010*
Halogenated volatile organics	8015*
Non-halogenated volatile organics	8020*
Aromatic volatile organics	8030*
Acrolein, acrylonitrile, acetonitrile	8040*
Phenols	8060*
Phthalate esters	8080*
Organochloride pesticides and PCBs	8090*
Nitroaromatics and cyclic ketones	8100*
Polynuclear aromatic hydrocarbons	8100*
Chlorinated hydrocarbons (including PCBs)	8120*
Organophosphate pesticides	8140*
Chlorinated herbicides	8150*
Gas Chromatographic/Mass Spectroscopy Methods	
GC/MS method for volatile organics	8240*
GC/MS method for semi-volatile organics packed column technique	8250*
GC/MS method for semi-volatile organics: capillary column technique	8270*
Miscellaneous Analytical Methods	
Total and amenable cyanide	9010*
Total organic halides (tox)	9020*
Sulfides	9030*
Fish Toxicity - Static Acute Fish Toxicity Test	DOE 80-12 Part A**
Rat Toxicity - Acute Oral Rat Toxicity Test	DOE 80-12 Part B**
Halogenated Hydrocarbons	WDOE 80-13***
Polycyclic Aromatic Hydrocarbons	WDOE 80-13***

*The referenced procedures are described in: U.S. Environmental Protection Agency. 1984. Test methods for evaluating solid waste. SW-846, Office of Water and Waste Management, Washington D.C.

**The referenced procedures are described in: Washington State Department of Ecology, Hazardous Waste Section. July 1981. DOE 80-12, Olympia, Washington.

***The referenced procedures are described in: Washington State Department of Ecology, Hazardous Waste Section. March 1982. WDOE 80-13, Olympia, Washington.

2K8506-12.2

TABLE C-10. VERIFICATION TESTING METHODS

Physical Description

A sample of waste is drawn from its container and the following physical properties are described:
-Physical State (e.g. solid, semi-solid or liquid)
-Color/Opacity
-Odor
-Viscosity
-Phase Layering
-Presence of Free Liquids

Ignitability

It is expected that both the Pensky-Martens and Setaflash closed cup tester, depending upon the waste stream, will be utilized by Rockwell to obtain a flash point with methods prescribed in ASTM 1010 and 1020.

pH

Using either full-range pH paper or a pH meter, the pH of a sample of liquid waste will be directly measured. For solid and semi-solid wastes, a sample is to be diluted 1:1 (water to solid) and the pH measured from the solution.

Water Reactivity

Under a hood, a 2 gram sample of solid or oily waste is to be mixed with 10 ml of water to determine if gas or heat is produced.

Cyanide Screen

To aproximately 20 ml of sample, caustic will be added to bring the pH to 12 of 13; then 5 to ml of ferrous sulfate solution will be added and the solution mixed. Five to 10 ml of concentrated sulfuric acid will then be added slowly until the pH is less than 1.0. The color of blue or green will indicate the presence of free or complexed cyanide.

Sulfide Screen

To approximately 20 ml of sample, concentrated sulfuric acid will be added slowly until the pH is less than 1.0. Immediately, a wet piece of lead acetate paper will be held over the sample while stirring the sample continuously. If the paper turns brown or black, sulfide content will be indicated.

Paint Filter Test

Into a standard paint filter supported on a ring stand, 100 ml of waste is added and allowed to drain for 5 minutes. The liquid content of the sample is then determined. This procedure is identified in SW-846, method 9095.

Radioactive Screen

All waste which is generated or stored in a radioactive zone will not be released to a nonradioactive storage or disposal site without proper screening. Unopened containers of chemical product may be externally surveyed for the presence of radioactivity. Liquid wastes from opened containers shall undergo scintillation counting and gamma energy analysis. The results must be at or below background before release to a nonradioactive zone. Background is defined to be < 1 pCi/cm^2 alpha and < 10 pCi/cm^2 beta/gamma. Opened containers of solid wastes are considered potentially contaminated internally and are to be surveyed prior to being released to a nonradioactive zone by standard radiation monitoring procedures. Released containers are affixed with a radiation release sticker applied by the radiation protection technologist.

Specific Gravity

The specific gravity of liquid wastes or wastes with a liquid phase will be determined with a hydrometer.

TABLE C-11. SAMPLING METHODS AND EQUIPMENT

MATERIAL	SAMPLING METHOD	SAMPLING EQUIPMENT
Extremely viscous liquid	ASTM D140-70	Tubing or trier
Crushed or powdered material	ASTM D364-75	Tubing, trier, auger, scoop, or shovel
Soil or rock-like material	ASTM D420-69	Tubing, trier, auger, scoop, or shovel
Soil-like material	ASTM D1452-65	Tubing, trier, auger, scoop, or shovel
Fly ash-like material	ASTM D2234-76	Tubing, trier, auger, scoop, or shovel
Containerized liquids	SW-846	Coliwasa or tubing

TABLE C-12. VERIFICATION TESTING PARAMETERS BASED ON IDENTIFYING HAZARD CHARACTERISTIC

WASTE CHARACTERISTIC	APPLICABLE WDOE WASTE CODES	VERIFICATION PARAMETER
Ignitable	D001; U, P, K, F, W Wastes with ignitable characteristic	Flash point
Corrosive	D002: U, P, K, F, W Wastes with corrosive characteristic	pH, %Acidity, % Alkalinity
Reactive*	D003; U, P, K, F, W Wastes with reactive characteristic, e.g.: Water Reactive Cyanide Bearing Sulfide Bearing	Specific to nature of reactive characteristic: Water Mix Test Cyanide Screen Sulfide Screen
Heavy Metals-EP Toxic	D004-D011; K, F, W Wastes with EP Toxicity characteristic	Physical Description
Pesticides-EP Toxic	D012-D017; W Wastes with EP Toxicity Characteristic	Physical Description
Toxic: NIOSH Toxic; Persistent; Carcinogenic	WT01, WT02, WP01, WP03, WC01, WC02; U and P Wastes	Physical Description
Liquid Wastes	Potentially Any Waste Code	Specific Gravity

*Pyrophoric and shock sensitive material will not be stored or disposed of at Rockwell TSD Facilities. These materials will require detonation by a WDOE approved entity.

FIGURE C-1. MAJOR NONRADIOACTIVE DANGEROUS WASTE GENERATING FACILITIES IN THE 100 AREAS OF THE HANFORD SITE

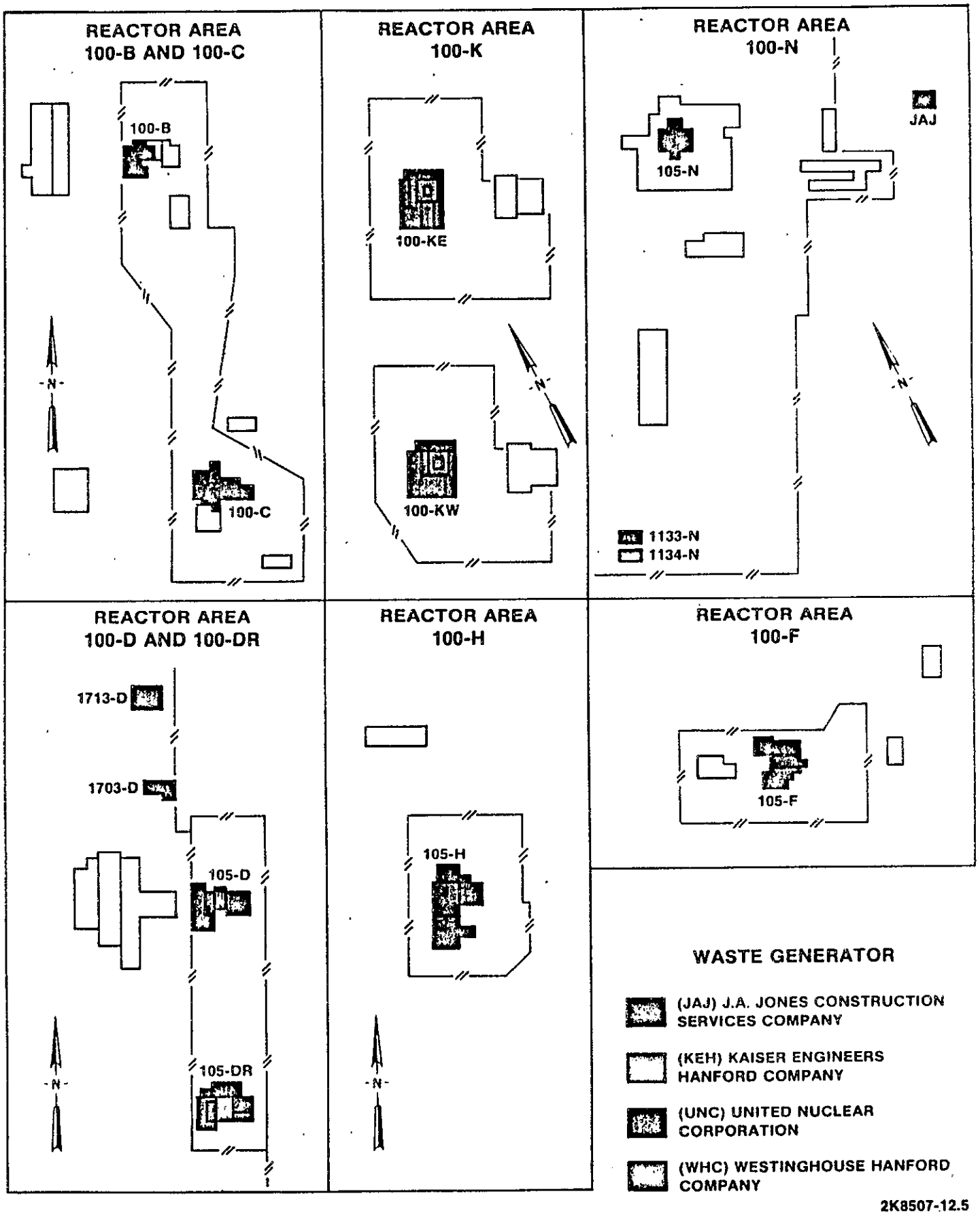
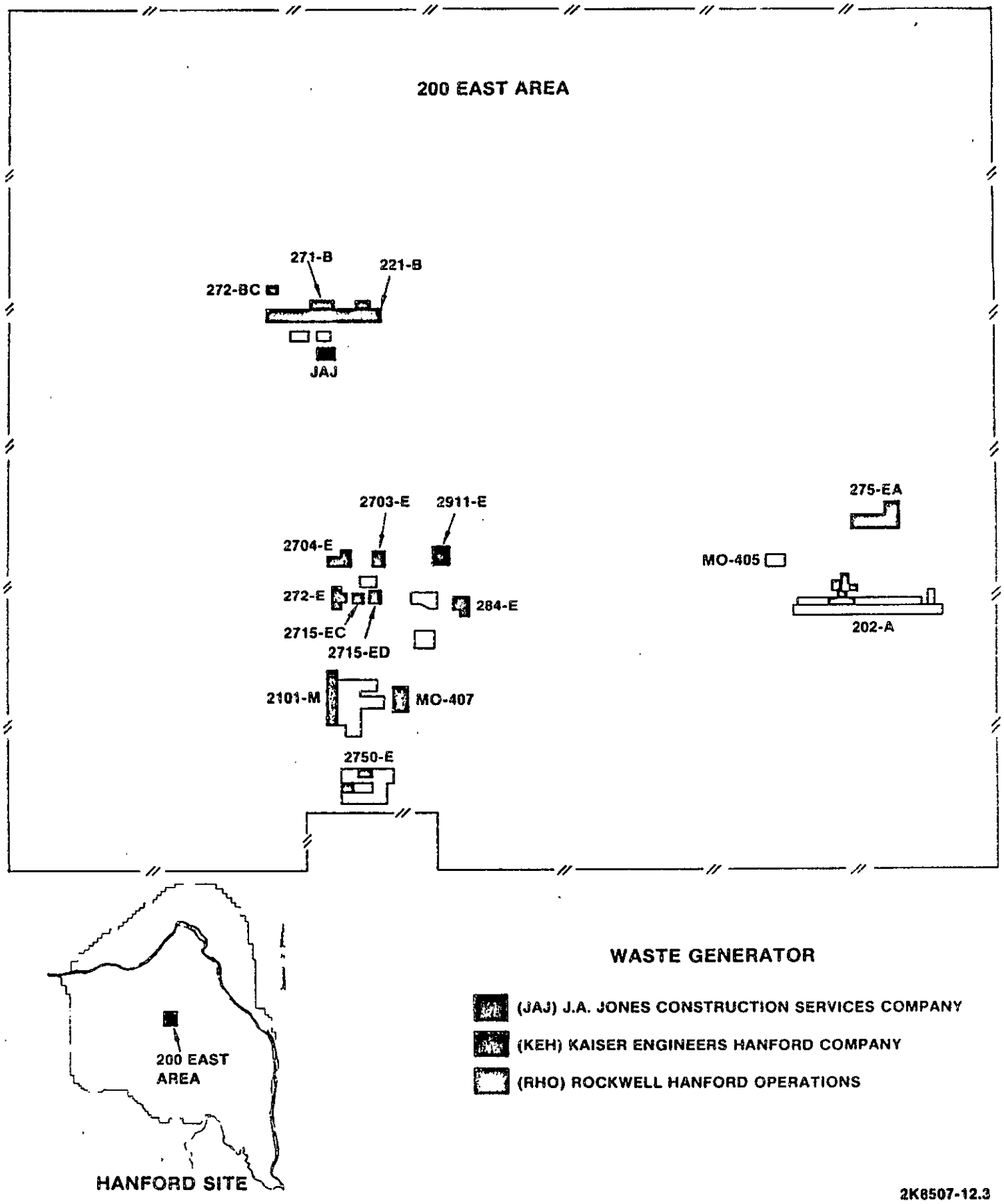
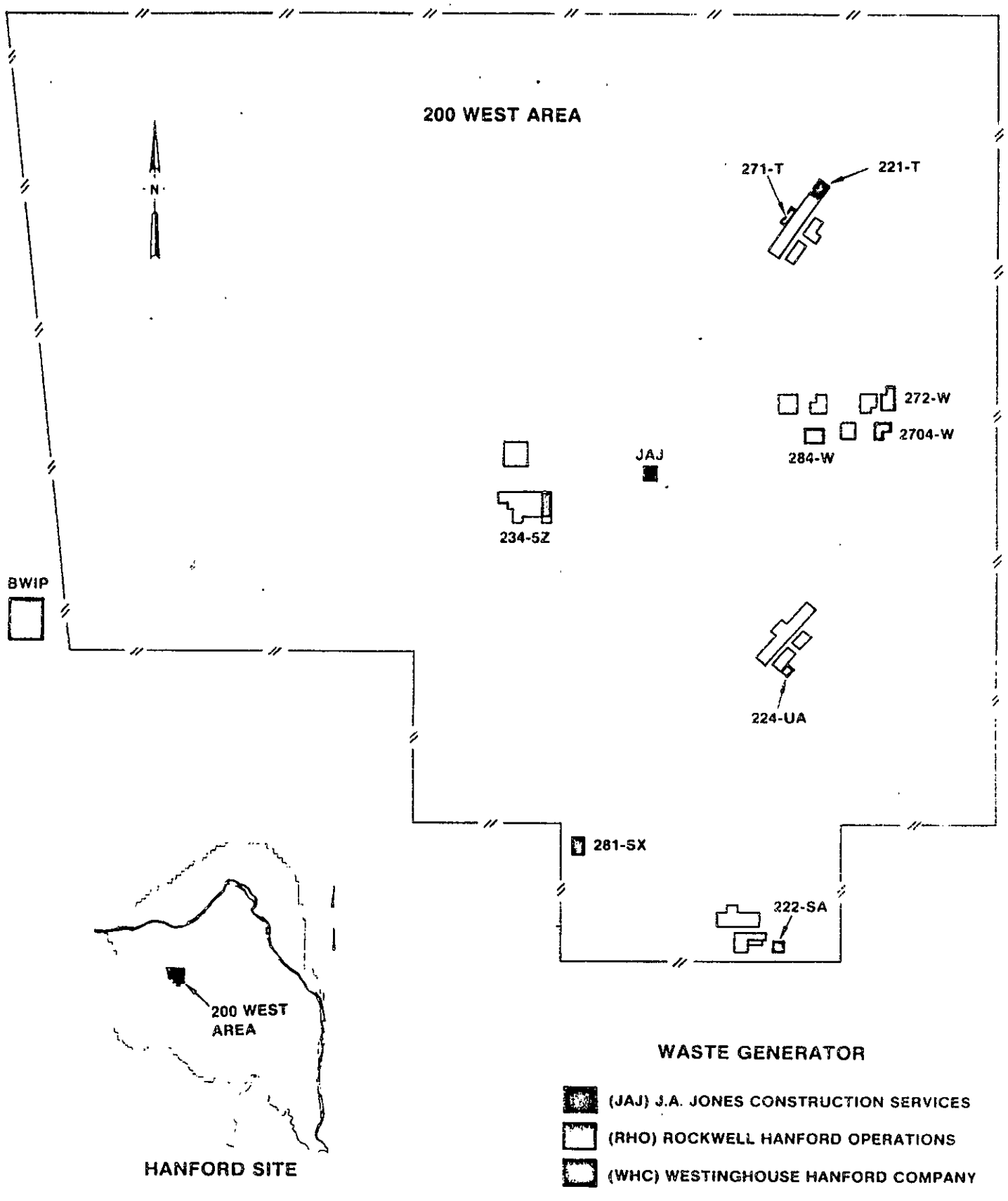


FIGURE C-2. MAJOR NONRADIOACTIVE DANGEROUS WASTE GENERATING FACILITIES IN THE 200 EAST AREA OF THE HANFORD SITE



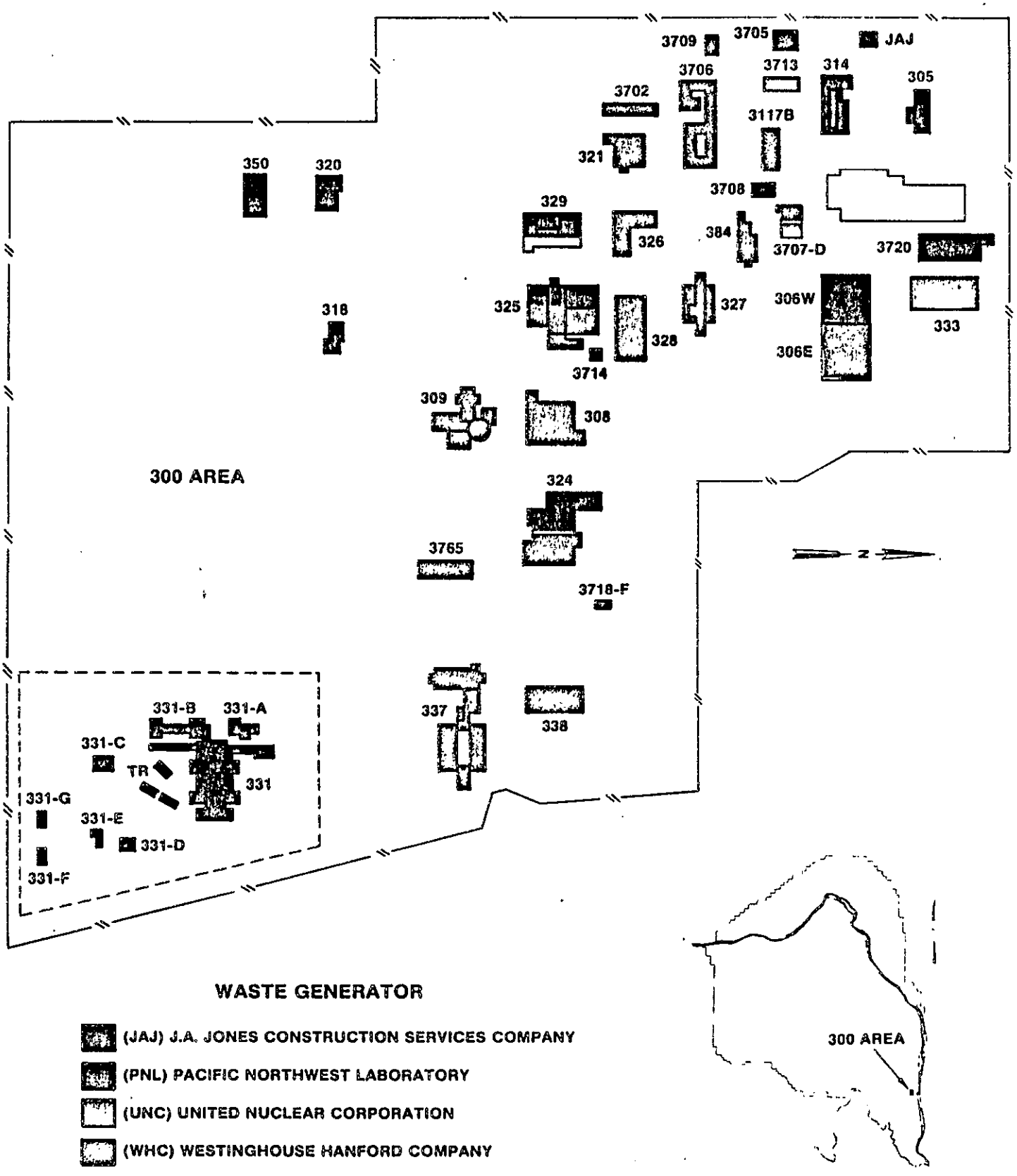
2K6507-12.3

FIGURE C-3. MAJOR NONRADIOACTIVE DANGEROUS WASTE GENERATING FACILITIES IN THE 200 WEST AREA OF THE HANFORD SITE



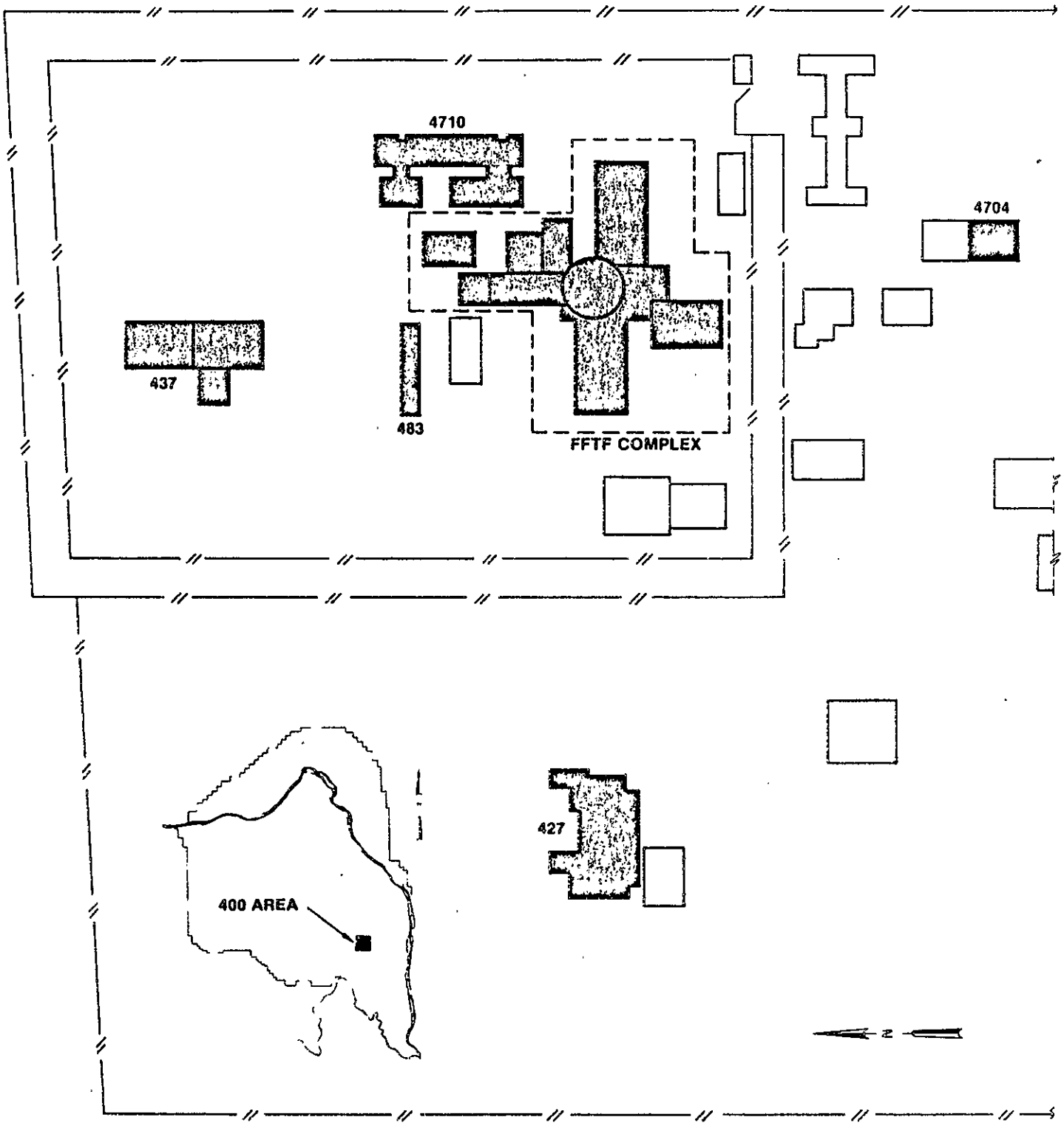
2K8507-12.2

FIGURE C-4. MAJOR NONRADIOACTIVE DANGEROUS WASTE GENERATING FACILITIES IN THE 300 AREA OF THE HANFORD SITE



2K8507-12.4

FIGURE C-5. MAJOR NONRADIOACTIVE DANGEROUS WASTE GENERATING FACILITIES IN THE 400 AREA OF THE HANFORD SITE

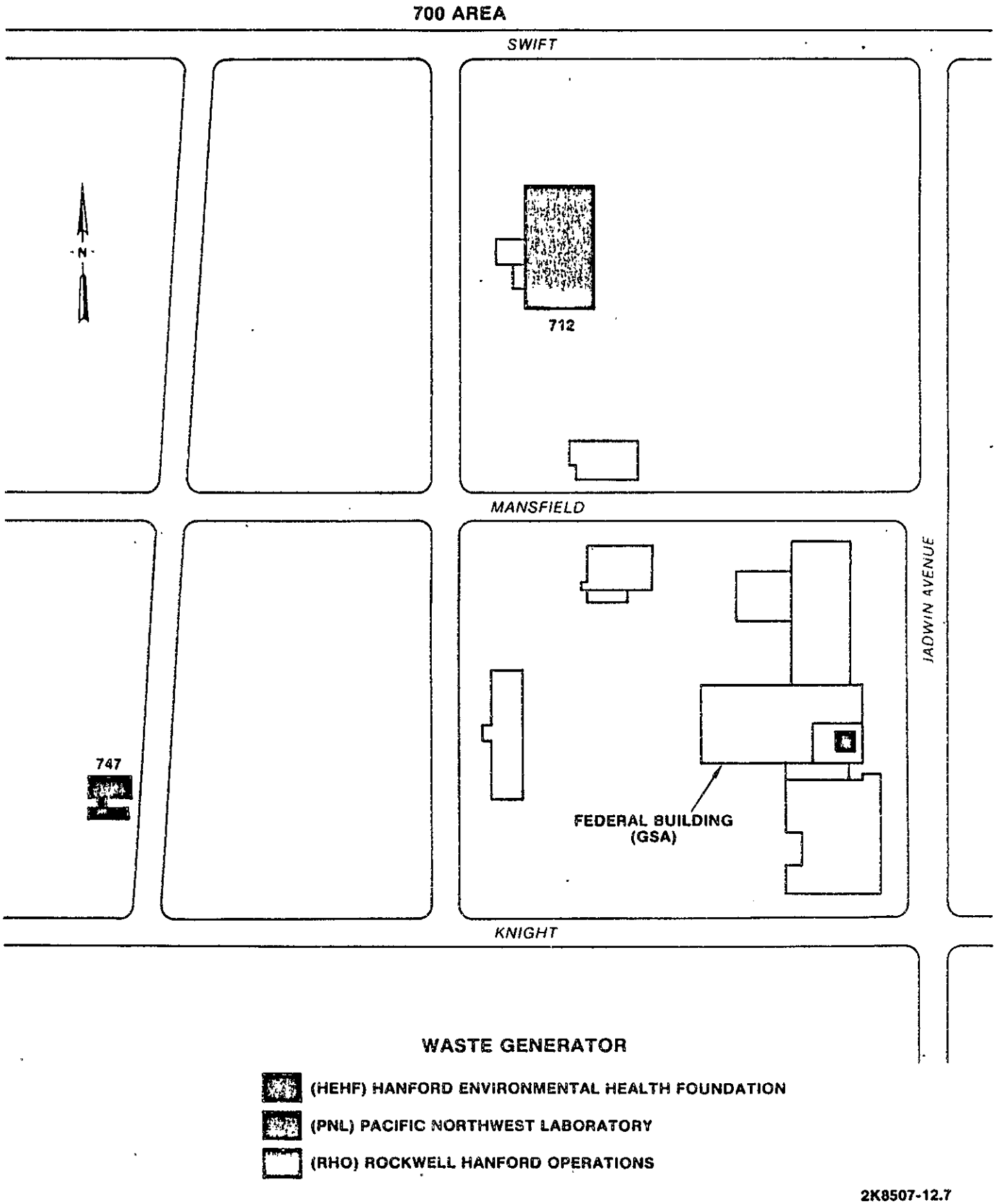


WASTE GENERATOR

(WHC) WESTINGHOUSE HANFORD COMPANY

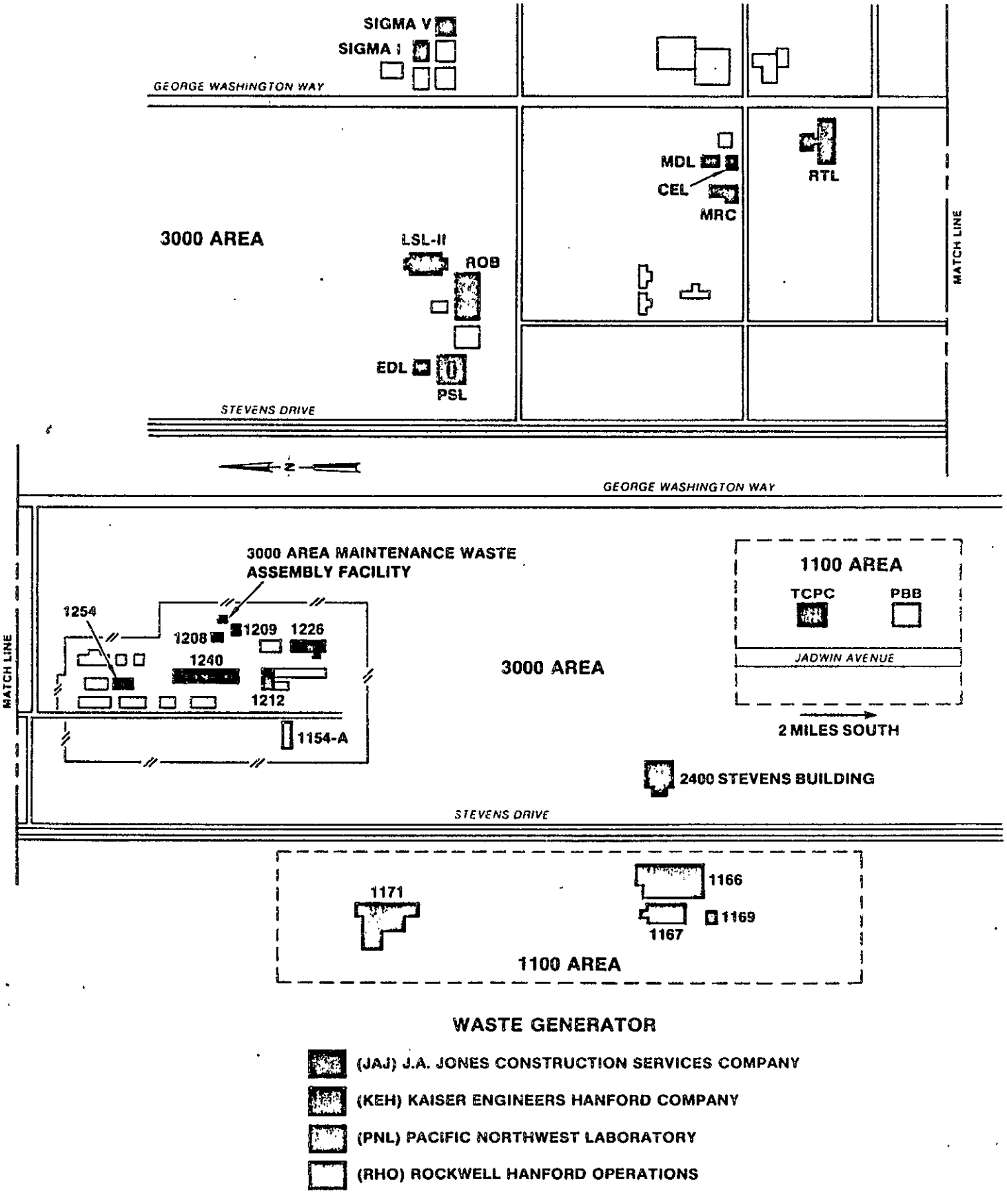
2K8507-12.1

FIGURE C-6. MAJOR NONRADIOACTIVE DANGEROUS WASTE GENERATING FACILITIES IN THE 700 AREA OF THE HANFORD SITE



2K8507-12.7

FIGURE C-7. MAJOR NONRADIOACTIVE DANGEROUS WASTE GENERATING FACILITIES IN THE 1100 AND 3000 AREAS OF THE HANFORD SITE



2K8507-12.6

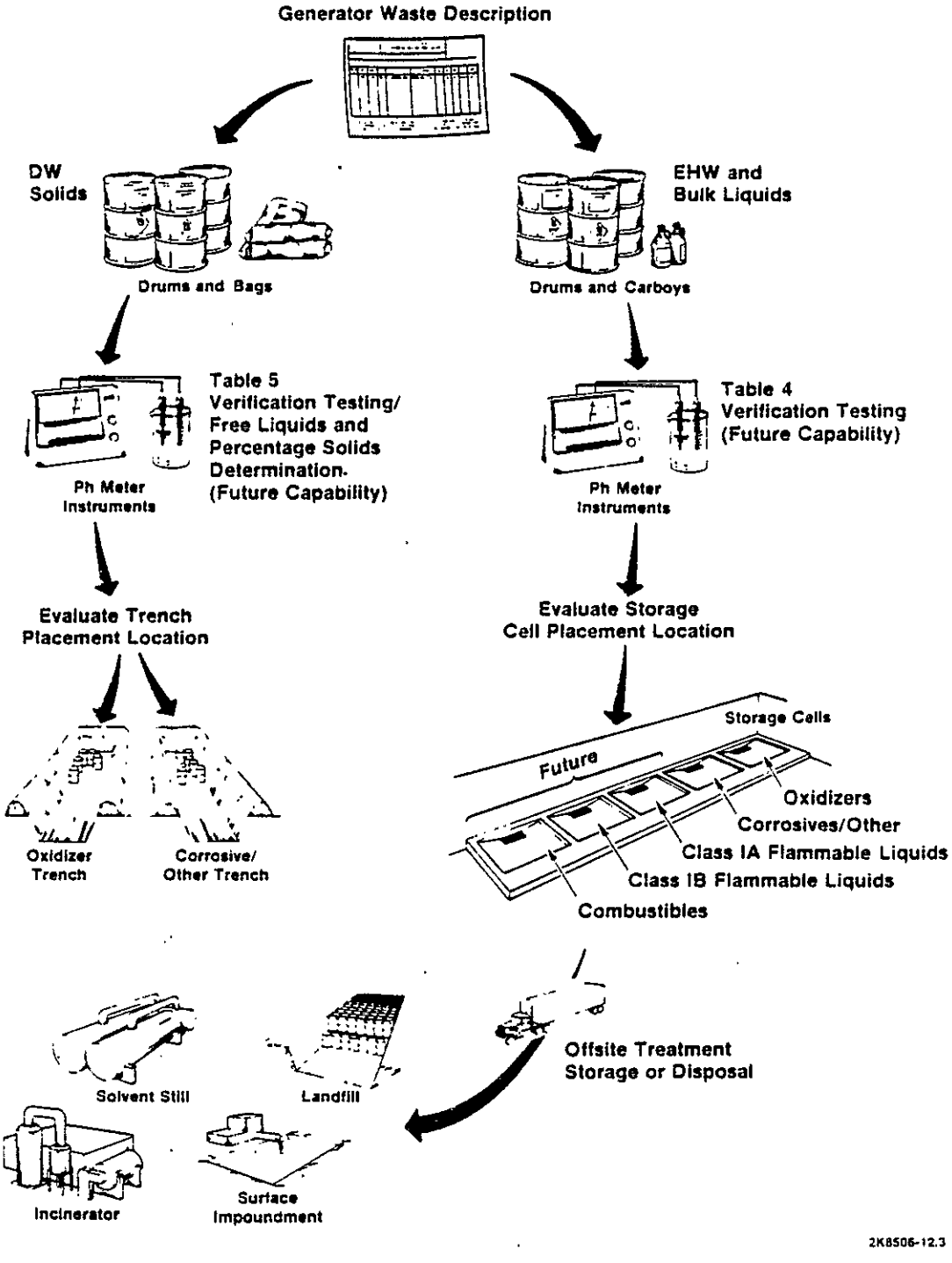


FIGURE C-8. GENERATOR WASTE DISPOSITION LOGIC DIAGRAM

WDOE WASTE DESIGNATION

DATE _____

ITEM/COMPOSITION _____

_____

_____

_____

_____

PHASE _____ DENSITY _____

1. DISCARDED CHEMICAL PRODUCT?
2. DANGEROUS WASTE SOURCE?
3. DANGEROUS WASTE MIXTURE?
   - TOXICITY? _____
   - PERSISTENCE? _____
   - CARCINOGENIC? _____
4. CHARACTERISTIC DANGEROUS WASTE?
   - IGNITABLE? _____
   - CORROSIVE? _____
   - REACTIVE? _____
   - EP TOXIC? _____

DETERMINATION: WASTE CLASS: _____ WASTE NUMBERS: _____

USDOT: PROPER SHIPPING NAME: _____

HAZARD CLASS: _____

ID#: _____

NOTES: _____

FIGURE C-9. NRDWL AND NRDWS TECHNICAL STAFF WORKSHEET FOR WASTE DECISION REVIEW

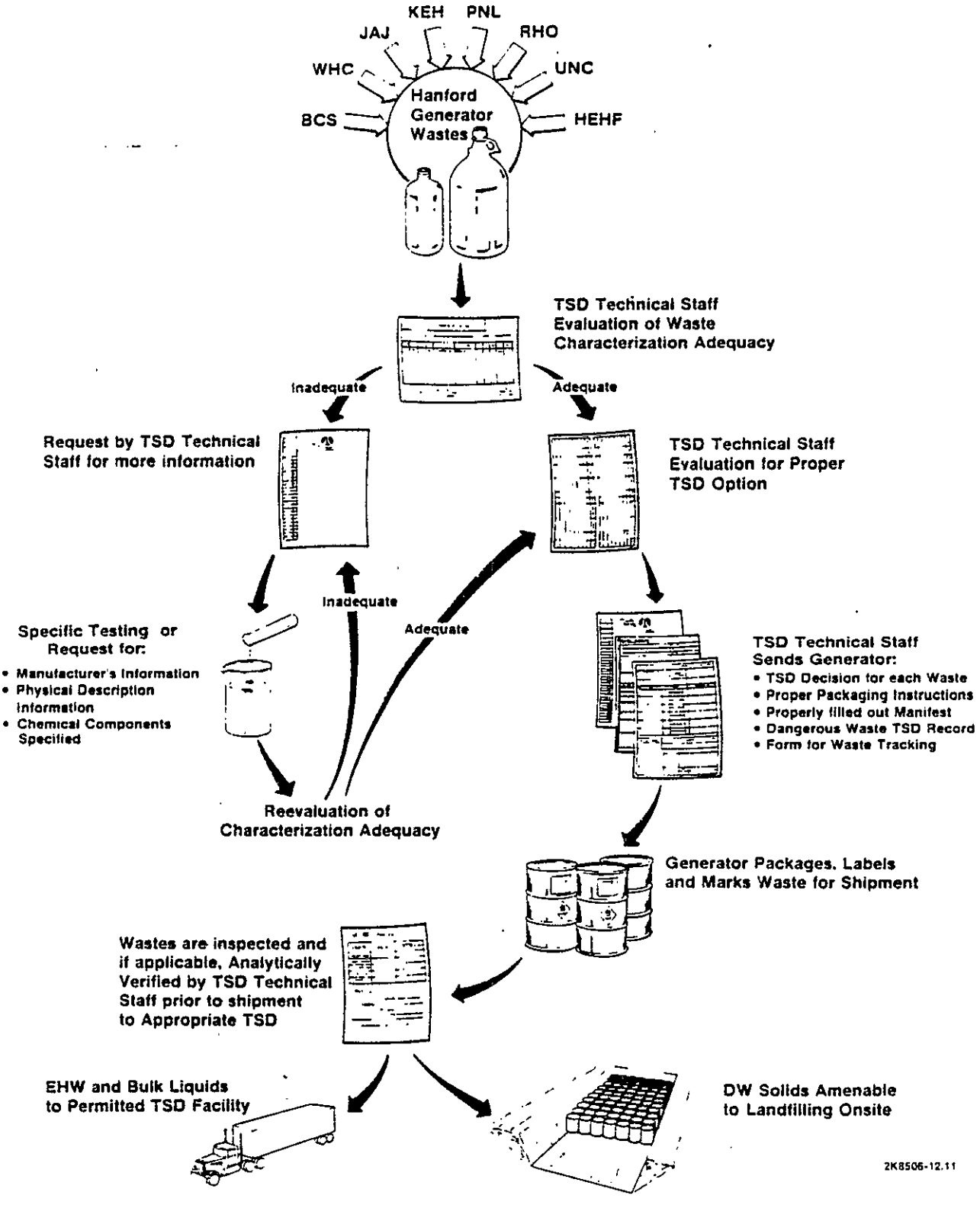


FIGURE C-10. DECISION FLOW CHART FOR DETERMINING WASTE DESIGNATION AND DISPOSITION AT THE NONRADIOACTIVE DANGEROUS WASTE LANDFILL AND STORAGE FACILITIES

Complete unshaded parts and forward to

SWP & DU
2750E/A119/200E
Rockwell

Rockwell Hanford Operations

CHEMICAL WASTE DISPOSAL REQUEST

Request Number

Requested by

Telephone Number

Address

Company

Manifest Numbers(s)

Signature _____ Date _____

Radiation Protection Unconditional Survey

Survey Number _____

Clearance Signature _____

WASTE DESCRIPTION (For additional items, continue on the back of this form)

Item No	No of Containers	Container Volume	Total Waste Quantity	Container Description	Waste Description	Chemical Components	Weight %	Physical State	Waste Status	Container Status	Accumulation Date	Generator Bldg	Waste Location

2K8508-16.16

FIGURE C-11. CHEMICAL WASTE DISPOSAL REQUEST FORM

DISPOSAL ANALYSIS WORKSHEET NO. _____ PAGE ___ OF ___

ITEM NO.	CONTAINER NO.	DOT SHIPPING NAME	DOT HAZARD CLASS	DOT I.D. NO.	DOT LABEL	EPA NUMBER	NO. OF CONTAINERS	TYPE OF CONTAINER	QUANTITY PER CONTAINER
ONSITE DISPOSAL									
OFFSITE DISPOSAL									

2K8506-12 4

FIGURE C-12. DISPOSAL ANALYSIS FORM

GENERATOR WASTE VERIFICATION - INSPECTION AND TESTING

	EXPECTED	VERIFIED
pH		
Flash Point		
Specific Gravity		
Cyanide Screen		
Sulfide Screen		
Water Mix		
Free Liquids		
Physical Description		

ARE CONTAINERS:

Closed? _____ In good physical condition? _____

Labels match manifest and Disposal Request Information _____

_____

_____

IS THERE A DISCREPANCY? _____

IF YES, WAS IT RESOLVED AND WHY _____

_____

_____

WASTE SHIPMENT: ☐ ACCEPTED ☐ REJECTED

ROCKWELL INSPECTOR _____ _____

SIGNATURE DATE

2K8506-12.7

FIGURE C-13. GENERATOR WASTE VERIFICATION TESTING DOCUMENTATION

COMPATIBILITY CHART

CARGO GROUPS \ REACTIVE GROUPS	1 NON OXIDIZING MINERAL ACIDS	2 SULFURIC ACID	3 NITRIC ACID	4 ORGANIC ACIDS	5 CAUSTICS	6 AMMONIA	7 ALIPHATIC AMINES	8 ALKANOLAMINES	9 AROMATIC AMINES	10 AMIDES	11 ORGANIC ANHYDRIDES	12 ISOCYANATES	13 VINYL ACETATE	14 ACRYLATES	15 SUBSTITUTED ALLYLS	16 ALKYLENE OXIDES	17 EPICHLOROHYDRIN	18 KETONES	19 ALDEHYDES	20 ALCOHOLS, GLYCOLS	21 PHENOLS CRESOLS	22 CAPROLACTAM SOLUTION		
1 NON OXIDIZING MINERAL ACIDS		X			X	X	X	X	X	X	X	X	X			X	X		A	E				1
2 SULFURIC ACID	X		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X		2
3 NITRIC ACID		X			X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X			3
4 ORGANIC ACIDS		X			X	X	X	X	C			X				X	X			F				4
5 CAUSTICS	X	X	X	X							X	X				X	X		X	X	X	X		5
6 AMMONIA	X	X	X	X						X	X	X	X			X	X		X					6
7 ALIPHATIC AMINES	X	X	X	X							X	X	X	X	X	X	X	X	X	X	X	X		7
8 ALKANOLAMINES	X	X	X	X							X	X	X	X	X	X	X	B	X					8
9 AROMATIC AMINES	X	X	X	C							X	X							X					9
10 AMIDES	X	X	X			X						X									X			10
11 ORGANIC ANHYDRIDES	X	X	X		X	X	X	X	X															11
12 ISOCYANATES	X	X	X	X	X	X	X	X	X	X					D					X		X		12
13 VINYL ACETATE	X	X	X			X	X	X																13
14 ACRYLATES		X	X				X	X																14
15 SUBSTITUTED ALLYLS		X	X				X	X				D												15
16 ALKYLENE OXIDES	X	X	X	X	X	X	X	X																16
17 EPICHLOROHYDRIN	X	X	X	X	X	X	X	X																17
18 KETONES		X	X				X	B																18
19 ALDEHYDES	A	X	X		X	X	X	X	X															19
20 ALCOHOLS, GLYCOLS	E	X	X	F	X		X					X												20
21 PHENOLS CRESOLS		X	X		X		X			X														21
22 CAPROLACTAM SOLUTION		X			X		X					X												22
30 OLEFINS		X	X																					30
31 PARAFFINS																								31
32 AROMATIC HYDROCARBONS			X																					32
33 MISCELLANEOUS HYDROCARBON MIXTURES			X																					33
34 ESTERS		X	X																					34
35 VINYL HALIDES			X																			X		35
36 HALOGENATED HYDROCARBONS		G			H		I																	36
37 NITRILES		X																						37
38 CARBON DISULFIDE							X	X																38
39 SULFOLANE																								39
40 GLYCOL ETHERS		X										X												40
41 ETHERS		X	X																					41
42 NITROCOMPOUNDS					X	X	X	X	X															42
43 MISCELLANEOUS WATER SOLUTIONS		X										X												43
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22		

(Letters refer to notes on following page)

From: The Management and Disposal of Hazardous Chemical Wastes. J.T. Baker Chemical Co., 1979.

FIGURE C-14. COMPATIBILITY CHART - J. T. BAKER, SOURCE

2K8506-12.9

FIGURE C-15. COMPATIBILITY CHART - U.S. EPA, SOURCE

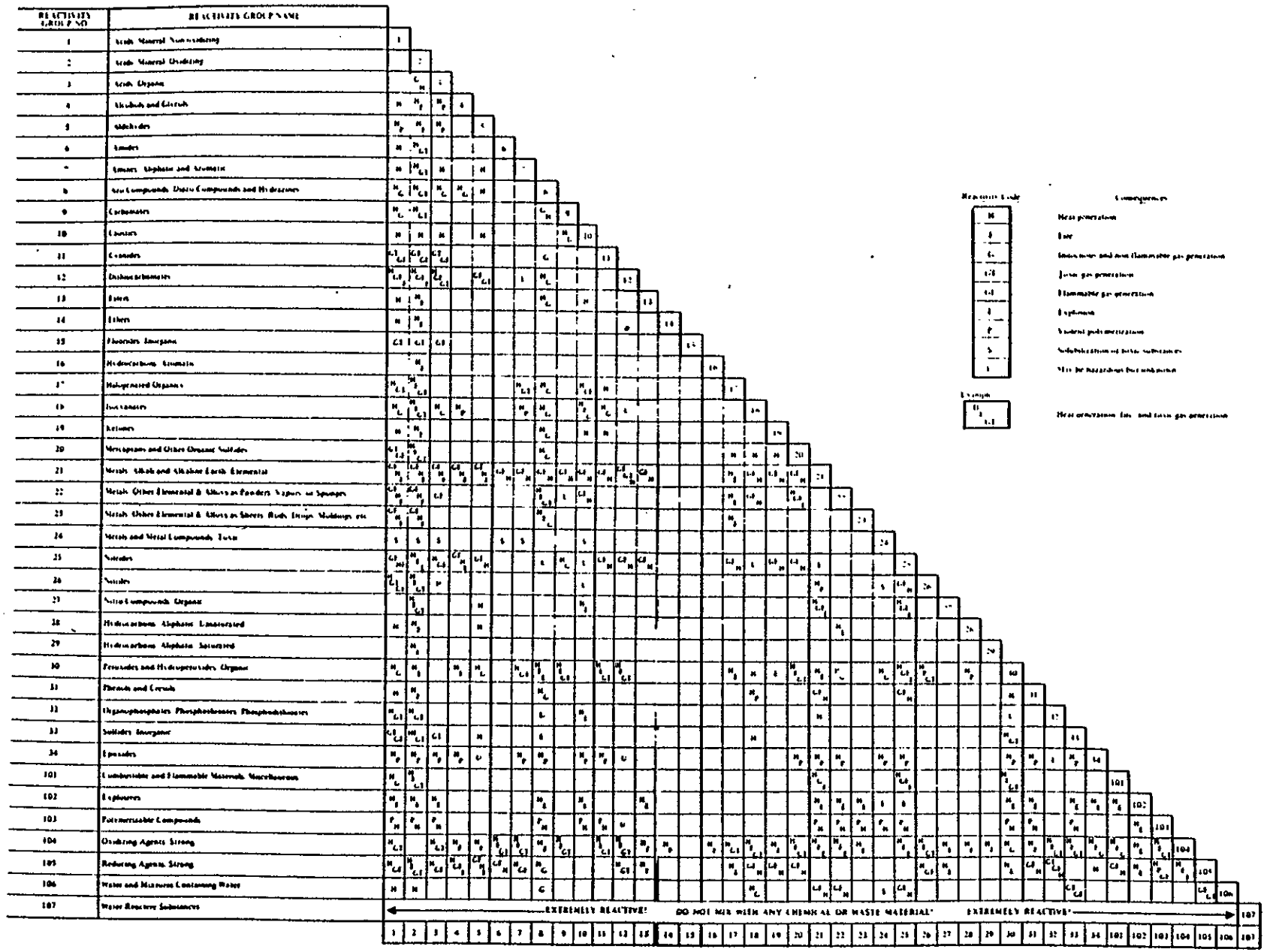


Figure 6. Hazardous waste compatibility chart.

Figure 6. Hazardous waste compatibility chart (continued).

From: A Method of Determining the Compatibility of Hazardous Wastes. U.S.E.P.A. Solid Waste Document

2K8506-12.10

SECTION D
PROCESS INFORMATION

D-1 CONTAINERS

This section describes the design features of the DOE-RL existing and proposed Nonradioactive Dangerous Waste Storage Facilities (NRDWS) and the Nonradioactive Dangerous Waste Landfill (NRDWL).

D-1a(1) Description of Containers

All containers accepted at the NRDWS must meet U. S. Department of Transportation (DOT) requirements for hazardous materials. The most common container types managed at the NRDWS are 55-, 30-, and 5-gallon metal drums. Fiber and plastic drums in these sizes are also accepted. Plastic and glass containers over 10 gallons are accepted for liquid wastes. Fiberboard boxes and paper and plastic bags are accepted if their integrity is intact and they meet DOT shipping requirements. Single-trip containers and nonreusable containers from which contents have been removed may not be reused except under the conditions specified in 49 CFR 173.28(p). Containers must be thoroughly cleaned to remove all nonregulated residues prior to reuse, thus preventing any potential for incompatibility of wastes. The compatibility of wastes with containers is determined by using DOT packaging specifications found in 49 CFR 173. All containers must be tightly and securely closed and structurally sound.

Containers which have deteriorated are packed in 60- or 80-gallon overpacks prior to shipment. Inside containers must be cushioned, if necessary, to prevent further breakage or leakage. Lab packs are accepted at the NRDWS if the inside containers are small (laboratory quantities) and are packed with nonbiodegradable, noncombustible absorbents at a ratio of four-to-one with the waste volume.

No noncontainerized wastes are accepted at the NRDWS.

D-1a(2) Container Management Practices

Dangerous waste containers are always kept closed during storage, and are never opened, handled, or stored in a manner that may cause them to rupture or to leak. The existing NRDWS building is not designed to allow the entry of

drum handling equipment. Drums and other containers are moved by hand into proper place. Prior to moving a drum, the drum is checked to ensure that it is structurally sound and is tightly closed.

The proposed NRDWS will be designed to allow the movement of drums by a drum forklift. This equipment is specifically designed for the safe handling of hazardous materials in containers to prevent any potential for rupture or leakage.

Specific packaging instructions are provided to the waste generator by the NRDWS technical staff detailing proper shipping specifications, e.g. container type. Prior to shipment to the NRDWS, waste packaging is inspected to ensure that containers are tightly and securely closed and are structurally sound.

Waste containers may be reopened at the existing NRDWS for the purposes of sampling. At the proposed NRDWS, wastes will be consolidated for the purposes of more efficient disposition to off-site TSD facilities. Verification sampling of wastes will also be performed at the proposed NRDWS. In these instances, waste containers will be reopened. Containers will be securely closed after reopening.

D-1a(3) Secondary Containment System Design and Operation

The existing NRDWS consists of a building with two concrete floored storage cells separated by a four inch high concrete curb with a sloped ramp between the two for access. Each cell can contain approximately 1000 gallons of spilled liquid. The outside of the existing NRDWS has not been designed to contain spills, leaks, and precipitation.

The proposed NRDWS will provide adequate secondary containment for all containers in storage (Figure D-1 and D-2). It will contain six separate storage cells, some of which are separated by two-hour rated concrete masonry unit (CMU) fire walls. Each cell will contain a collection trench which is sloped to a sump for ease of collection. The floor of each trench is sloped to the trench to eliminate standing liquids. Metal grates are provided to cover each trench. In addition to the trench, a four inch high concrete curb will surround each cell with a sloped ramp (percent slope of one-eighth inch

to one foot) on one side for access. The curb will provide additional containment capabilities in the event of a major spill that would exceed trench capacity. All areas of the proposed NRDWS used for approach or access to the storage cells are also sloped to trenches for the collection of leaks or spills. Loading and unloading areas are surrounded by a minimum two inch curb and are also sloped (one-eighth inch to one foot) to a collection trench.

D-1a(3)(a) Requirement for the Base or Liner to Contain Liquid

The floors and curbs of all storage cells in both the existing and proposed NRDWS are concrete and are free from seams. All cracks are to be repaired to maintain containment capabilities and the concrete is impervious to spills. The floors and walls of the proposed NRDWS will be sealed to a height of eight feet.

D-1a(3)(b) Containment System Drainage

The existing NRDWS has not been designed to drain and remove liquids resulting from leaks, spills, or precipitation. Drums are stored on pallets to elevate them off the floor and away from possible accumulated liquids. The proposed NRDWS will prevent the accumulation of liquids around drums by floors and trenches which are sloped to a sump.

D-1a(3)(c) Containment System Capacity

The existing NRDWS has a containment capacity of approximately 1000 gallons in each cell which is far greater than ten percent of the volume of the containers stored there. The proposed NRDWS secondary containment capacity will also far exceed ten percent of the volume of the containers to be stored. The collection trenches will be capable of containing 250 to 320 gallons of liquid while the four-inch curbing will allow an average of 1200 gallons to be contained.

D-1a(3)(d) Control of Run-On

Run-on into both the existing and proposed NRDWS buildings is prevented by the secondary containment curbing.

D-1a(4) Removal of Liquids from Containment Systems

Spilled or leaked waste and accumulated precipitation are removed from curbed cells and collection trenches with hand pumps for large spills, and with

absorbents for small spills. Inspections of these structures will reveal any accumulated liquids. Accumulated liquids are removed in a timely manner from these structures.

D-1b Test for Free Liquids

Both the existing and proposed NRDWS store liquid dangerous wastes. Therefore, this section is not applicable.

D-2 TANKS

This section is not applicable to the operation of the NRDWL or NRDWS.

D-3 WASTE PILES

This section is not applicable to the operation of the NRDWL or NRDWS.

D-4 SURFACE IMPOUNDMENTS

This section is not applicable to the operation of the NRDWL or NRDWS.

D-5 INCINERATORS

This section is not applicable to the operation of the NRDWL or NRDWS.

D-6 PROCESS INFORMATION

The Department of Energy-Richland Operation Office (DOE-RL) is submitting the information contained in this section for the Nonradioactive Dangerous Waste Landfill (NRDWL).

D-6a List of Waste

The list of regulated waste from a review of records that has gone into the landfill since November 19, 1980 is given in Appendix D-1. All future waste to be received into the landfill are listed in the Part A Application (see Section A).

D-6b Exemption Request

The liner exemption request required by this section is contained in Appendix D-2. This section is submitted in lieu of installing a double liner and leachate collection system as required by the Minimum Technological Requirements of the Hazardous and Solid Waste Amendments of 1984.

D-6c Liner Engineering Report

This section is not applicable because the Liner Waiver Exemption Request (see D-6b) has been submitted.

D-6d Liner System Foundation

This section is not applicable because the Liner Waiver Exemption Request (see D-6b) has been submitted.

D-6e Leachate Collection and Removal System

This section is not applicable because the Liner Waiver Exemption Request (see D-6b) has been submitted.

D-6f Run-on Control System

A run-on control system is not warranted at the NRDWL.

The NRDWL is actively maintained as a relatively level site with a maximum relief of less than one foot. The overall slope of the site is less than one foot and is primarily toward the northeast. The soil is sandy and very porous, and quickly absorbs all precipitation. The area surrounding the NRDWL is similar to that described above but has dune-like features with a relief of less than ten feet which tend longitudinally toward the landfill from the southwest. There is no evidence of erosional features that would suggest a drainage basin or channel which could possibly add to or cause run-on.

The only reasonable mechanism by which run-on into the active trenches can occur is by rainfall or snow melt over frozen ground. This type of weather condition occurs occasionally during the winter months, but no overland flow has ever been observed at or near the NRDWL. The flat, uneven frozen surface causes the precipitation to pond and does not allow overland travel. Even if some overland flow occurred, the active units of the NRDWL are protected by eight-foot spoil piles present along each side of the active units.

The total amount of water that could get into the trench would be the precipitation that falls on the open trench and the surrounding spoil pile. Assuming a 100-year, 24-hour storm event (two inches of rainfall) and the

following maximum trench dimensions: length = 500 feet; width = 36 feet (average of bottom and top of one-to-one slope); and depth = 20 feet, only one sixty-fourth of the total trench volume would be filled with run-on liquid under this condition. This liquid would be dissipated as soon as the underlying trench thaws. Since the containers in the NRDWL are covered with soil each day, the frozen ground would limit the contact between the liquid and interred regulated waste.

D-6f(1) Calculation of Peak Flows

This section is not applicable because no run-on controls are necessary (see D-6f).

D-6f(2) Design and Performance

This section is not applicable because no run-on controls are necessary (see D-6f).

D-6f(3) Construction

This section is not applicable because no run-on controls are necessary (see D-6f).

D-6f(4) Maintenance

This section is not applicable because no run-on controls are necessary (see D-6f).

D-6g Run-Off Control System

As demonstrated in D-6f, the effect of the 100-year, 24-hour storm event would not produce enough liquid to overtop the open trenches. Therefore, no run-off is possible.

D-6g(1) Calculation of Peak Flow

This section is not applicable because no run-off controls are necessary (see D-6g).

D-6g(2) Design and Performance

This section is not applicable because no run-off controls are necessary (see D-6g).

D-6g(3) Construction

This section is not applicable because no run-off controls are necessary (see D-6g).

D-6g(4) Maintenance

This section is not applicable because no run-off controls are necessary (see D-6g).

D-6h Management of Collection and Holding Units

This section is not applicable because no run-on (see D-6f) and no run-off (see D-6g) controls are necessary.

D-6i Control of Wind Dispersal

No regulated waste that would be subject to wind dispersal is placed in the NRDWL. All regulated wastes placed in the NRDWL are packaged in DOT-approved containers. Even if the integrity of these containers is breached, wind dispersal would still not be a problem because the containers are covered by eight feet (2.4 meters) of native soil at the end of each day. The wind could not blow that much soil away before regrading could be initiated.

D-6j Double Liner Exemption

This exemption no longer exists after the passage of the Hazardous and Solid Waste Amendments of 1984.

D-6k Bulk or Noncontainerized Free Liquids

No bulk or noncontainerized free liquids are placed in the NRDWL.

D-6l Containers Holding Liquids

Containers holding free liquid are not placed in NRDWL (liquid in lab-packs is not considered free liquid). Before containers holding free liquids are shipped to the NRDWL, generators absorb all free liquid on commonly used hazardous waste absorbent [see D-6l(3)(c)]. Absorbent in excess of the amount needed to absorb the free liquid is added to the container to insure continued absorption.

Administrative controls will insure that the above absorbent procedures are completed by the generators. Verification will be accomplished during the ten percent random inspections that will be carried out in the Waste Characteristic Section - Section C. A "Paint Filter Test" as described in the EPA Manual SW-969 (Test Protocols for Determining the "Free Liquid" Content of Hazardous Waste) will be performed during these inspections if any free liquid is observed in containers scheduled for shipment to NRDWL.

D-61(1) Removal of Free-Standing Liquid

The information required in this section is provided in Section D-61.

D-61(2) Restriction to Small Containers

All containers will be put into overpack containers or lab-packs.

D-61(3) Overpack Containers (Lab-Packs)

Administrative controls will insure that the information contained in Section D-1(3)(a) through D-1(3)(e) are completed at the generating site. Verification will be accomplished during the ten percent random inspections that will be carried out in the Waste Characteristic Section - Section C.

D-61(3)(a) Inside Containers

All inside containers of lab-packs that go into the NRDWL meet Department of Transportation (DOT) regulations (49 CFR Parts 173, 178, and 179). All of the inside containers are visually checked for integrity and the caps are security sealed. The maximum volumes of these inside containers are one gallon for glass containers and five gallons for plastic or metal containers. Waste and inside containers are compatible because the majority of these inside containers (approximately 80 percent) are the original containers that came from the manufacturers, and all other inside containers are checked for container-waste compatibility with the same references utilized in D-61(3)(d) before being put into lab-packs. Reactive regulated wastes are not put in the lab-packs.

D-61(3)(b) Overpack (Outside Container)

DOT-approved containers (49 CFR Parts 178 and 179) of less than or equal to 110 gallons are used for the outside containers of lab-packs. The amount of

liquid in the inside containers is calculated so that enough absorbent material (D-61) is placed in the overpack to completely absorb all the liquid. In addition, at least enough absorbent is added to the lab-pack to completely absorb any contained liquid. Absorbent material will be added to the overpack to completely fill up the outside container so that no void spaces exist.

D-61(3)(c) Absorbent Materials

Vermiculite and/or vermiculite-material is used as absorbent material in overpacks. Vermiculite is a hydrated magnesium-iron-aluminum silicate and therefore highly nonreactive to regulated wastes. Vermiculite is insoluble in water and organic solvents and is noncombustible. Its high void volume to surface area ratio accounts for its high absorbing capacity.

D-61(3)(d) Incompatible Wastes

Only regulated wastes that are compatible are placed in the same lab-pack and overpack. This compatibility is determined by the DOT hazard classes (49 CFR 173) and by information contained in the following sources: Dangerous Properties of Industrial Materials; Registry of Toxic Effects of Chemical Substances (RTECS); Merck Index; Handbook of Toxic and Hazardous Chemicals and Carcinogens; A Method for Determining the Compatibility of Hazardous Wastes (EPA-600/2-80-076); and other relevant sources. New sources for compatibility testing will be utilized when they become available.

D-61(3)(e) Reactive Wastes

Reactive wastes will not be put into lab-packs or overpacks before being rendered nonreactive. Reactive wastes are rendered nonreactive by detonation and/or by the addition of water. The resulting material will go through the WDOE designation procedures to determine if it is a regulated waste or not. If it is nonreactive and is not designated an extremely hazardous waste, it may be put in a container and sent to the landfill.

D-6m Containerized Wastes

Administrative controls will insure that the information contained in Section D-61(3)(a) through D-61(3)(e) are completed at the generator's facility.

Verification will be accomplished during the ten percent random inspections that will be carried out in the Waste Characteristic Section - Section C.

D-6m(1) Void Space

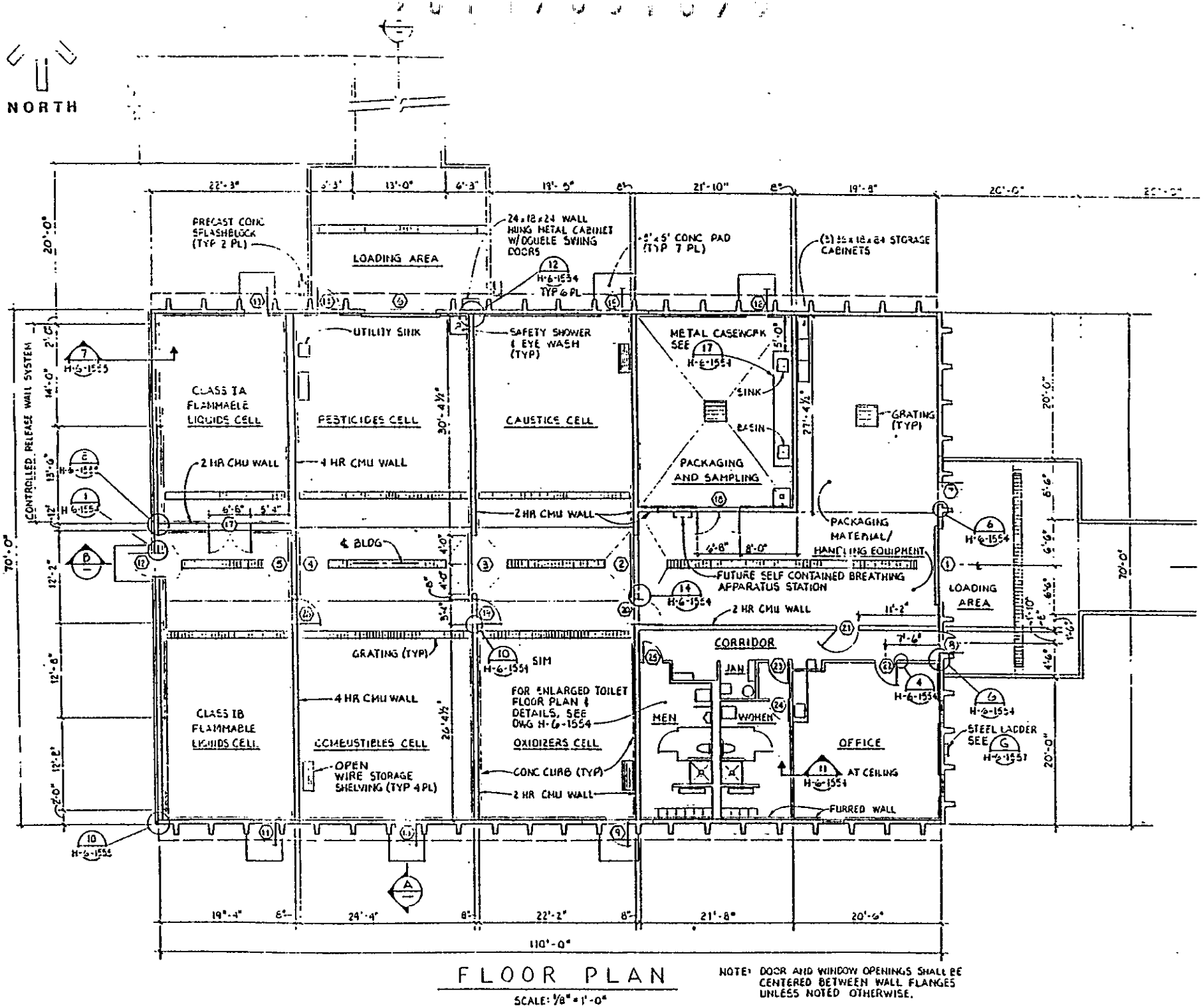
Containers will not be placed in the NRDWL unless they contain less than ten percent void space. If needed, the void space in the drums is reduced to above this level by the addition of absorbent material.

D-6m(2) Volume Reduction

No regulated containers (i.e., WDOE Extremely Hazardous Waste containers) are placed in the NRDWL. Nonregulated drums are not to be placed in the NRDWL unless they are crushed or shredded. Drum crushing and shredding is accomplished by a manufactured unit.

D-7 LAND TREATMENT

This section is not applicable to the operation of the NRDWL or NRDWS.



FLOOR PLAN

SCALE: 1/8" = 1'-0"

NOTE: DOOR AND WINDOW OPENINGS SHALL BE CENTERED BETWEEN WALL FLANGES UNLESS NOTED OTHERWISE.

FIGURE D-1. PROPOSED NONRADIOACTIVE DANGEROUS WASTE STORAGE FACILITY FLOOR PLAN

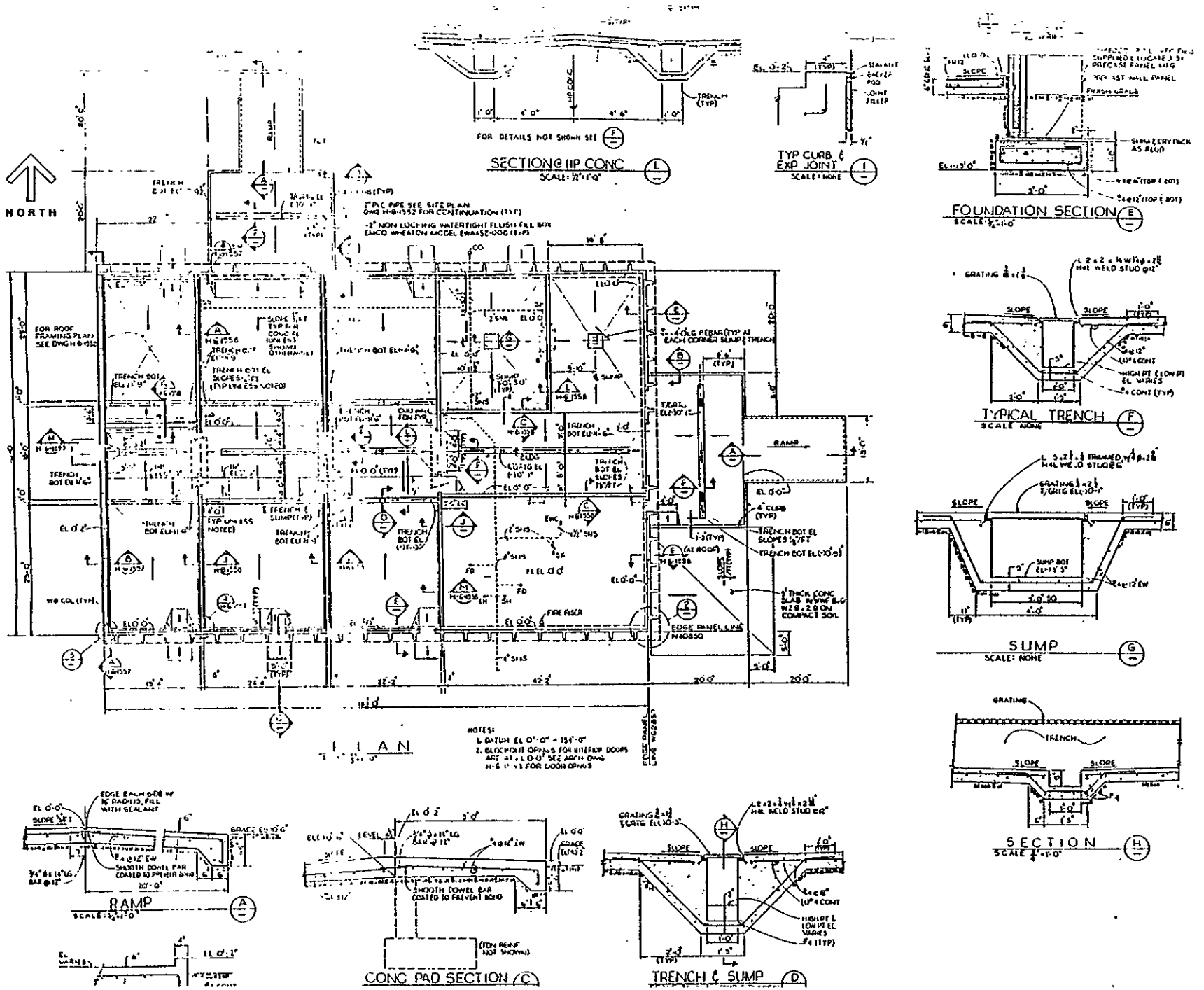


FIGURE D-2. PROPOSED NONRADIOACTIVE DANGEROUS WASTE STORAGE FACILITY SECONDARY CONTAINMENT FEATURES

APPENDIX D-1

REGULATED WASTE PLACED IN THE NONRADIOACTIVE DANGEROUS WASTE LANDFILL

APPENDIX D-1
REGULATED WASTE PLACED IN THE NONRADIOACTIVE DANGEROUS WASTE LANDFILL

Trench #33
1980 Small Quantity Laboratory Chemicals

Date	Quantity	Chemical
11-26-80	4 gal	Waste organic solvents- Methyl Isobutyl Ketone, Hexane, Methylene Chloride (absorbed on vermiculite)
12-26-80	4 gal	Waste Solvents Methyl Isobutyl Ketone, Hexane, Methylene Chloride, Ethanol double canned on Vermiculite in 25 and 50 lb tin cans (could be absorbed)
12-29-80	Small quantity laboratory reagents, Quantity less than 1 kg	Oxalate reagent Rhodium Sulfa Salt Mydroguinone . Cadmium Oxide Potassium Sulfate Ammonium compound Ammonium Oxalate Versenol 120 Dibutyl Hydrogen Phosphate N-Phenylbenzoyl-Dioxanic-Acid Dicyan Diamide 5-Sulfasalicylic Acid Quinaldine Bathophenarthvoline Disalfonic Acid, disodium salt Alizarin Ammonium Molybdate Potassium Hydroxyacetate Potassium Chloride Ammonium Citrate Ammonium Persulfate Sodium Hydrogen Carbonate Oxalic Acid Cesium Nitrate Sodium Nitrate Ethyldanthic Acid Ferrous Ammonium Sulfate Benzoic Oxaine Potassium Nitrate N-Phenylbenzo Hydroxamic Acid Sodium Nitrate Sodium Iodide A-Benzoic Oxime

APPENDIX D-1
(Continued)

REGULATED WASTE PLACED IN THE NONRADIOACTIVE DANGEROUS WASTE LANDFILL

Trench #33
1980 Small Quantity Laboratory Chemicals

Date	Quantity	Chemical
12-29-80 (continued)		Potassium Sodium Tartrate
		Sodium Bromide
		Sodium Nitrate
		Sodium Suflate
		Phosphorous Acid
		Sodium Bisulfate
		Potassium Cyanide
		Potassium Periodate
		Potassium Citrate
		2-Potassium Bromate
		Potassium Permanganate
		Magnesium Sulfate . 7water
		Bismuth metal
		Strontium Nitrate
		Lead Nitrate
		Phosphomolybdic Acid, 48 Hydrate
		Potassium Colbalticycinide
		Acid Tungstic
		Potassium Iodide
		Ceric Sulfate
		Dimethylglyoxime
		Barium Chloride
		Barium Chloride
		Diphenylthiocarbenzone
		Mercuric Sulfate
		Sodium Fluoride
		Ammonium Persulfate
		Diethyldithiocarbonic Acid
		Lead Hydrate
		Antimony Potassium Tartrate
		Na2SO4
		8-Quinolinal-8-Hydroxyquinoline
		Ammonium Persulfate
		Ammonium Carbonate
		Calcium Carbonate
		Citric Acid
		Potassium Sodium Tartrate
		Potassium Hydroxide
		Cupric Nitrate
		Potassium Hydroxide flakes
		Cupric Sulfate

APPENDIX D-1
(Continued)

REGULATED WASTE PLACED IN THE NONRADIOACTIVE DANGEROUS WASTE LANDFILL

Trench #33
1980 Small Quantity Laboratory Chemicals

Date	Quantity	Chemical
12-29-80 (continued)		Kaolin
		Sodium Phosphate, Monobasic
		Copper metal
		Hydrous Citric Acid
		Sodium Bismuthate
		Ammonium Chloride
		Cupric Sulfate
		Ammonium Sulfate
		Calcium Chloride
		Anhydrone
		Cesium Sulfate
		Cesium Nitrate
		Beryllium Nitrate
		Cesium Chloride
		Lithium Sulfate
		Potassium Bichromate
		Potassium Pyrosulfate
		Iodine
		Potassium Nitrate
		Lead Iodide
		Potassium Iodide
		Iodic Acid
		Silica Tungsten Acid
		Potassium Pyrosulfate
		Potassium Bisulfate
		Sodium Sulfide
		Sodium Tungstate
		Sodium Bromate
		Tin metal
		Sodium Nitrate
		Sodium Formate
		Sodium Phosphate, Tribasic
		Acid tungstic
		Sodium Phosphate, Dibasic
		Sodium Phosphate
		Sodium Vanadate
		Sodium Thiocyanate
		Zirconyl Nitrate
		Tungstic Acid
		Chromium Chloride
		Versenex 80

APPENDIX D-1
(Continued)

REGULATED WASTE PLACED IN THE NONRADIOACTIVE DANGEROUS WASTE LANDFILL

Trench #33
1980 Small Quantity Laboratory Chemicals

Date	Quantity	Chemical
12-29-80 (continued)		Versenex 120
		2-Versenex 100
		4-Hydroxylamine . Hydrochloric Acid
		Sodium Acetate
		Citric Acid
		Vinyl spray
		Zinc Oxide
		2-Thionyltrifluoroacetone
		Alizarine
		Benzoin-Oxime
		2,4-Dinotrodrphenylamine
		Thymophthalein
		2-Dimethylgloxime
		M-Cresolsulfonthalien
		-Hydroxy-Isohatynic Acid
		Acid Sulfosulicylic
		3,5-Diiodo-4-Pyriodone-N-Acetic Acid
		5-Cp-Dimethylammobenzyladine)
		Rhodamine
		Quinalizarin
		4,7-Dibromo-8-Hydroxyquinoline
		Violuric Acid
		Hydroxy-iso-butyric Acid
		2-carminin Acid
		Rhodizonic Acid Potassium Salt
		Phosphorus Acid
		Sodium Nitrate
		Nitric Acid
		Titanium Chloride
		Ammonium Bifluoride
		Potassium Iron (III) Cyanide
		Hydroquinone
		Hydroxyethylethylenediaminetriacetic
		Acid
		DOWEX-2
		Potassium Permanganate
		Lanthanum Nitrate
		Sodium Suflate
		Manganese metal chips
		Nickel Carbonate
		DOWEX SOW-X8

APPENDIX D-1
(Continued)

REGULATED WASTE PLACED IN THE NONRADIOACTIVE DANGEROUS WASTE LANDFILL

Trench #33
1980 Small Quantity Laboratory Chemicals

Date	Quantity	Chemical
12-29-80 (continued)		Sodium Sulfide
		Potassium Permanganate
		Calcium Nitrate
		Mercury Nitrate
		Di-Isobutylphthalate
		10% Ammonium Persulfate
		Dimethylglyoxime in Ethanol
		0.1N Sodium Hydroxide
		pH 4.4 Buffer
		Potassium Hydride Phthalate Buffer
		Acetic Acid in Trichloromethane
		Water extracted with PCT
		2:1 n-Butanol/Ethyl Acetate
		0.05% Xylenol Orange in Methanol
		10% Ammonium Molybdate
		DDTC in Carbon Tetrachloride
		Iron in Methanol
		0.1N Trichlorochromate
		3 g Cobalt Nitrate - Nitric Acid
		1N-2N 22.1 mg water
		1% Triethanol
		E3426
		P2246
		W-2N Methanol
		TTA Acetone
		4450 in Methanol
		Par water
		"AKS"
		E2942
		RO in water
		Spent Methanol
		E238
		Ortho-Phenol
		E3092
		EBT
		E2106
		0.5% PAN in Ethanol
		P7302 in Water
		PAN in Hexane
		PAN in Ethanol
		5.69N Tributyl Phosphate

APPENDIX D-1
(Continued)

REGULATED WASTE PLACED IN THE NONRADIOACTIVE DANGEROUS WASTE LANDFILL

Trench #33
1980 Small Quantity Laboratory Chemicals

Date	Quantity	Chemical
12-29-80 (continued)		Eosin
		XD
		P+PA
		Mercury solution
		Phenyl Acetate
		10% DIEPPA
		TTA solution 5M In Xylene
		Hydroxyethylethylenediaminetriacetic Acid
		TTA in Benzene
		Amyl Acetate spent
		Ethylene Dichloride
		Hydrochloric Acid and Ammonium Hydroxide
		0.1% Carminic Acid
		0.4M D12 EHPA
		Ammonium Carbonate strong in DDH2O
		ToPo Wash
		Benzene spent
		Sulfamic Acid
		Dimethylglyoxime
		Methyl Orange
		d-Tartaric Acid
		Periodic Acid
		Hydroxylamine Hydrochloride
		pH 10 Buffer
		Chloran Hydrate
		1% APDC
		(NH4)2 C6H5O7
		8N Sodium Hydroxide
		1% Sodium Hydrogen Sulfate
		50% Sodium Hydroxide
		6M Sulfuric Acid
		6N Ammonium Hydroxide
		Methyl Orange
		Ammonium Hydroxide
		Hydrogen Peroxide
		50% Sodium Hydroxide
		0.5M Ammonium Sulfate
		0.2N Hydrochloric Acid
		10.0 g/L Iron

APPENDIX D-1
(Continued)

REGULATED WASTE PLACED IN THE NONRADIOACTIVE DANGEROUS WASTE LANDFILL

Trench #33
1980 Small Quantity Laboratory Chemicals

Date	Quantity	Chemical
12-29-80 (continued)		1% Citric Acid
		-N Nitric Acid
		pH 2.5 acid spent
		2N Nitric Acid
		0.45M HDEHP in Isooctane
		1N Sulfuric Acid
		12M Nitric Acid
		DTPP
		Concentrated Phosphoric Acid
		1N Nitric Acid
		8M Ammonium Nitrate and 0.1M Nitric Acid
		Di2 EHPA
		0.4M Nitric Acid
		Acetic Acid
		3N Hydrochloric Acid
		1M Phosphoric Acid
		0.5M Hydrochloric Acid
		0.6M Nitrate and Sulfate
		100 g/L Sodium Sulfate
		10M Nitric Acid
		Saturated Oxalic Acid
		10% Ammonium Hydroxide . Hydrochloric Acid
		Concentrated Hydrochloric Acid
		Hydrogen Peroxide
		0.2N Nitric Acid
		Sodium Acetal and Acetic Acid
		Hydrogen Peroxide
		0.05M Sulfuric Acid
		0.05M Ammonium Formate
		Nitric Acid
		0.1M KHC8O4
		2M Ammonium Acetate
		8N Hydrochloric Acid
		Butyl Alcohol
		0.05% Quinalizarin
		0.01M Nitric Acid
		4N Nitric Acid
		pH 3.5 Chromium-Tungsten

APPENDIX D-1
(Continued)

REGULATED WASTE PLACED IN THE NONRADIOACTIVE DANGEROUS WASTE LANDFILL

Trench #33
1980 Small Quantity Laboratory Chemicals

Date	Quantity	Chemical
12-29-80 (continued)		8.5M Perchloric Acid + 0.5M Hydrochloric Acid
		1N Nitric Acid + 90% H3ON
		0.2M Hydrochloric Acid + 40% Ethanol
		Bromcresol Green in 0.1% Ethanol
		3M Hydrochloric Acid 20% Ethanol
		Bromcresol Purple
		0.1M Ammonium Chloride
		1 g/L Boron
		0.5 g/L Boron
		50% Phosphoric Acid
		1N Phosphoric Acid
		2M Ammonium Hydrogen Citrate
		0.1M Ortho-Phenol
		8.5M Perchloric Acid + 0.5M Hydrochloric Acid + 0.1M Hydrofluoric Acid
		3M Acetic Acid
		0.01% Methyl Orange
		Sulfuric Acid
		0.5M Nitric Acid - 70% Methanol
		Lead 1 g/L
		8.5M Perchloric Acid + 0.5M Hydrochloric Acid + 0.1M Hydrofluoric Acid
		3M Acetic Acid
		0.01% Methyl Orange
		Sulfuric Acid
		0.5M Nitric Acid - 70% Methanol
		Lead 1 g/L
		Dorex 50 Acetate
		1 ppm Lead
		10 g/L Ammonium Molybdate in 10% Sulfuric Acid . 5mL
		8N Sodium Hydroxide - 20% Sodium Oxygen Hydroxide
		0.1N Sulfuric Acid
		10M Hydrochloric Acid
		0.2M Ammonium Chloride
		0.2N Hydrochloric Acid

APPENDIX D-1
(Continued)

REGULATED WASTE PLACED IN THE NONRADIOACTIVE DANGEROUS WASTE LANDFILL

Trench #33
1980 Small Quantity Laboratory Chemicals

Date	Quantity	Chemical
12-29-80		30% Ammonium Tartrate
		8 - Hydroxyquinoline (8-HQ)
		5% Hydroxyquinoline in water
		1% Niobium + Acetic Acid in Chloroform
		Diphenylthiocarbazone (Dithizone) in Carbontectrachloride
		0.005M Azure Carbon
		1M Hydrochloride Acid + 0.1M Hydriodic Acid
		APDc in Hydrochloric Acid
		5% NA Tungsten
		Hydroquinone Solution
		Hydrogen Peroxide
		Benzene
		1% Methyl Glyoxime in Ammonium Hydroxide
		Solutions: Gold
		Copper
		Europium
		Potassium Iron (III) Cyanide
		Aluminum
		Barium Chloride
		Bromocresol Purple
		Cromium (III) cation
		8-Hydroxyquinoline
		Selenium 10 mg/L
		Aluminum 1 g/L
		Selenium (VI) cation in 10 g/L
		Butyl Cellosolve
		1M Sulfasulacylic Acid
		0.1% Alizarine in Hexanol
		0.2% PCT in Hexane
		30.7 g Manganese Chloride Hydrate/1L water
		11.1N Phosphoric Acid
		0.5N Phosphoric Acid
		TTA 0.5N in Xylene
		DDTC in Chloroform
		Hydroxide of Hyamin 1M
		10% Acetylacetate in Hexanol

APPENDIX D-1
(Continued)

REGULATED WASTE PLACED IN THE NONRADIOACTIVE DANGEROUS WASTE LANDFILL

Trench #33
1980 Small Quantity Laboratory Chemicals

Date	Quantity	Chemical
12-29-80 (continued)		15% Potassium Cyanide
		Ethylene Glycol
		D,D 1N Hydrochloric Acid
		Ludox Stock Solution
		2.5M Dimethylglyoxime
		20% ToPo in Benzene
		1.6N Nitrilotriacetic Acid
		5% ToPo in Cyclohexane
		Dowex, Chloroform
		Phosphoric Acid in water
		DHDECMP
		33% in Cyclohexane
		1% Boron
		Selenium (VI) in tap water
		Tin (dilute)
		Cold saturated Niobium 1 g/L
		Silver 10 mg/mL
		Manganese g/L
		Iron (III) cation
		Methyl Violet
		Titanium saturated 1 g/L
		Nickel (II) ion 10 mg/mL
		0.1% Phenyl red
		1% NPHA in Chloroform
		Barium (II) ion 10 g/L
		Mercury
		Thymol Phthalein
		Zinc (II) ion
		La Carrier 5 mg/mL
		Copper Selenium Oxide Hydrate 1.001 g Selenium/L
		3% APDC
		11 ppm Titanium in Sulfuric Acid
		Titanium 1 mg/mL
		3.3 ppm Cadmium and 6.7 ppm Cadmium and Beryllium 10 mg/mL
		Strontium (II) ion 10 mg/mL
		1 g/L Nickel
		Saturated Ammonium Carbonate
		Carbamic Acid

APPENDIX D-1
(Continued)

REGULATED WASTE PLACED IN THE NONRADIOACTIVE DANGEROUS WASTE LANDFILL

Trench #33
1980 Small Quantity Laboratory Chemicals

Date	Quantity	Chemical
12-29-80		Na4P2O2.10H2O 200 g/L
(continued)	4 L	1N Sodium Hydroxide Solition
	1 pt	Triethanolamine
	1 pt	Dimethyl Formamide
	1 L	Piperidime
	2 L	Di-isobutyl phthalate
	1 L	Biofluor
	1 L	10% TlOA
	1 pt	1/1 by volume Ethoxyethanol - Ethanol
	1 pt	Anisole
	1 L	2-Ethyl Hexylamine
	1 pt	p-cymene
	1 pt	Ethylene Glycol
	1 pt	Benzonitrile
	1 pt	Chlorobenzene
	1 pt	Monobromobenzene
	1 gal	Aropol WEP 666P
	1 gal	Ready-Solv Solution VI
	5 L	P-Dioxane
	1 pt	Hyamine Hydroxide
	1 pt	Aquosol
	1 gal	Unknown
	1 gal	Unknown
	1 gal	Oil
	1 pt	Formaldehyde solution

APPENDIX D-1
(Continued)

REGULATED WASTE PLACED IN THE NONRADIOACTIVE DANGEROUS WASTE LANDFILL

Trench #33
1981 Small Quantity Laboratory Chemicals
and Miscellaneous Solid Waste

Date	Quantity	Chemical
01-02-81	15 gal (90 lb)	Dioctyl Phthalate on Vermiculite
01-02-81	20 gal (120 lb)	Monoplex DOS, Dioctyl Sebacate
01-02-81	90 lb	Dioctyl Phthalate absorbed with Vermiculite
01-02-81	120 lb	Dioctyl Sebacate in Vermiculite
01-06-81	4 lb 2 pt 12 gal 4 kg	Ethyl Ether Toluene Tetrahydrofuran Mixture Tetrahydrofuran
02-0-81	1 gal (10 lb)	DTPA in water absorbed on Vermiculite
02-11-81	1 gal (10 lb)	Nitrilotriacetic Acid in water on Vermiculite
02-11-81	1 gal (4 lb)	1AX Solvent NPH/Tributyl Phosphate on Vermiculite
02-11-81	1 gal (8 lb)	Used mineral oil on Vermiculite
02-11-81	2 gal (10 lb)	Used transformer oil on Vermiculite
02-11-81	1 gal	Polyethylene Glycol
02-11-81	4 lb	NPH/Tributyl Phosphate in Vermiculite
02-11-81	10 lb	DTPA in water in Vermiculite
02-11-81	10 lb	Nitrilotriacetic Acid in water in Vermiculite
02-16-81	1 L 8 MT drums	10 ppm Beryllium liquid
02-25-81	1 L 500 mL	Oil TTA, Tributyl Phosphate

APPENDIX D-1
(Continued)

REGULATED WASTE PLACED IN THE NONRADIOACTIVE DANGEROUS WASTE LANDFILL

Trench #33
1981 Small Quantity Laboratory Chemicals
and Miscellaneous Solid Waste

Date	Quantity	Chemical
02-25-81 (continued)	X 2.5 L	Methylene Chloride, Tetrahydrofuran, Xylenes, Chloroform Hexane
03-05-81	1 lb	Potassium Chloride solution
	1 pt	Dimethyl Amino Benzaldehyde solution
	0.5 pt	Hexone
03-05-81	3 lb	Dibenzoyl Peroxide
	125 lb	Dioctyl Sebacate with Vermiculite
	500 mL	TTA and Tributyl Phosphate mixtures
	2500 mL	Mixture: Methylene Chloride, Tetrahydrofuran, Xylene's, Chloroform, Hexane
03-12-81	12.5 gal (125 lb)	Monoplex DOS Dioctyle Sebacate
03-16-81	4 lb	Potassium Dichromate
	24 pt	Methyl Alcohol
	0.5 lb	Silver Nitrate
	.25 lb	Ferrous Sulfate
	1 lb	Iodine
	2 lb	Potassium Iodate
	250 g	Dimethylamine Benzaldehyde
	.25 lb	Starch
	2 lb	Sodium Metavanadate
	2 lb	Potassium Iodide
	1 lb	Aluminium metal
	75 g	Resorcinol
	1.5 lb	Sodium Hydroxide (pellets)
	40 lb	Sodium Hydroxide
	70 lb	Flake caustic soda
	1 lb	Potassium Chloride saturate with Silver Chloride
	0.5 pt	P-dimethylamine Benzaldehyde
	0.5 pt	Hexone
	400 g	Hydrazine Dihydrochloride
	1 lb	Aluminium Nitrate
	1 lb	Potassium Permanganate
	1.25 lb	Sodium Sulfate

APPENDIX D-1
(Continued)

REGULATED WASTE PLACED IN THE NONRADIOACTIVE DANGEROUS WASTE LANDFILL

Trench #33
1981 Small Quantity Laboratory Chemicals
and Miscellaneous Solid Waste

Date	Quantity	Chemical
03-16-81	2 lb	Sodium Thiosulfate
(continued)	2 oz	Cerium Nitrate
	2 oz	Sulfamic Acid
	.25 lb	Strontium Nitrate
	0.5 lb	Sodium Acetate
	3 lb	Boric Acid
	1 lb	Sodium Chloride
	4 lb	Sodium Sulfite
	1 lb	Magnesium
	5 lb	Calcium Chloride
	250 lb	Boric Acid
	560 lb	Orocol
04-01-81	350 lb	Alkaline metal cleaner
	1 pt	pH 7 butter solution
04-01-81	350 lb	Alkaline metal cleaner
	22 lb	Sodium Hydroxide
	6 lb	Sodium Hydroxide pellets
	4 lb	Sodium Nitrite
	9 lb	Sulfuric Acid
04-15-81	105 lb	Cupric Sulfate
	7 lb	Chromium Nitrate
	14 lb	Potassium Sulfide
	8 lb	Sodium Acetate
	10 lb	Sodium Nitrate
	1 lb	Ammonium Nitrate
	1 lb	Potassium Fluoride
	12 oz	Sodium Peroxide
	2 qt	Hydrazine (64% in water)
	1 L	Acetaldehyde
	1 pt	Perchloric Acid
	1 pt	Methyl Iodide
	1 kg	Chlorosulfamic Acid
04-16-81	1 L	Acetaldehyde
	45 lb	Cupric Sulfate
	7 lb	Chromium Nitrate
	14 lb	Potassium Iodide
	8 lb	Sodium Acetate

APPENDIX D-1
(Continued)

REGULATED WASTE PLACED IN THE NONRADIOACTIVE DANGEROUS WASTE LANDFILL

Trench #33
1981 Small Quantity Laboratory Chemicals
and Miscellaneous Solid Waste

Date	Quantity	Chemical
04-16-81 (continued)	10 lb	Sodium Nitrate
	1 lb	Ammonium Nitrate
	1 lb	Potassium Fluoride
	1 lb	Sodium Peroxide
	1 lb	Potassium Fluoride
	12 oz	Sodium Peroxide
	2 qt	Hydrazine (65% in water)
	1 L	Acetaldehyde
	1 pt	Perchloric Acid
	1 pt	Methyl Iodide
	1 kg	Chlorosulfamic Acid
04-21-81	240 lb	Dioctyl Sebacate with Vermiculite
04-21-81	40 gal (240 lb)	Monoplex DOS Dioctyl Sebacate
05-26-81	1 pt	Hydrogen Peroxide
	few drops	Chlorotrimethylsilane
	4 oz	Unknown
	50 mL	Unknown
	100 mL	Hydrofluoric Acid
	1 pt	Ethyl Acetoacetate
	Qt bottle	Methyl Silane
	100 mL	Ultrex Nitric Acid
	1 L	Sulfuric Acid
	250 mL	
	500-1000 mL	Perchloric Acid
	700 mL & 1 pt	Sodium Hypochlorite
	300 mL	Hydrochloric Acid
	150 mL	Hydriodic Acid
	500 mL	Hydriodic Acid
	400 mL	Sulfuric Acid
	2 pt	Trichloroethylene
	.75 gal	Ethyl Ether
	5 pt	Ethylene Glycol
	0.5 pt	Chloroform
	1 gal	Methylformamide
	1 pt	Benzene
	8 lb	Ammonium Fluoride

APPENDIX D-1
(Continued)

REGULATED WASTE PLACED IN THE NONRADIOACTIVE DANGEROUS WASTE LANDFILL

Trench #33
1981 Small Quantity Laboratory Chemicals
and Miscellaneous Solid Waste

Date	Quantity	Chemical
05-26-81 (continued)	6 lb	Ammonium Oxalate
	7 lb	Magnesium Chloride
	45 gal	Benzyl-para-aminophenol
	1,200 mls	Mercury
07-09-81	1 pt	Hydrogen Peroxide
	Few drops	Chlorotrimethyl Silane
	4 oz	Unknown
	500 mL	Unknown
	1 pt	Ethyl Acetic Acetate
	Qt	Methyl Silane
	250 mL	Formalin
	1 pt	Sodium Hypochlorate
	0.5 pt	Iodine solution
	2 pt	Trichloroethylene
	.75 gal	Ethyl Ether
	5 pt	Ethylene Glycol
	0.5 pt	Chloroform
	1 gal	Methyl Formamide
	1 pt	Benzene
07-16-81	8 kg	Beryllium-liquid-10 ppm
	1200 mL	Mercury
	30 gal	Solvent refined coal
	45 gal	Benzalphapyrene
7-21-81	2,772 lb total	Reacted Lithium & Sodium products
08-13-81	30 g	Mercuric Nitrate
	1 L	Molybdate Reagent
	.75 L	Phosphorous Acid
	.75 L	Phorphorous Acid
	0.5 L	Phorphorous Trichloride
	.75 L	Ethone N: Enplate Solution (electroless Plating)
	1 L	Ethone NL-62 Enplate Solution (electroless Plating)
	1L	NA Hypobromite Solution

APPENDIX D-1
(Continued)

REGULATED WASTE PLACED IN THE NONRADIOACTIVE DANGEROUS WASTE LANDFILL

Trench #33
1981 Small Quantity Laboratory Chemicals
and Miscellaneous Solid Waste

Date	Quantity	Chemical
08-13-81 (continued)	.66 lb	Acid, Molybdic
	1 lb	Barium Hydroxide
	70 g	Bismuth Nitrate
	1 g	Elemental Boron
	70 g	Cadmium Nitrate (hydrate)
	.33 lb	Cadmium Chloride
	45 g	Cerium Nitrate (hydrate)
	.33 lb	Chromium Chloride
	40 g	Chromium Oxide
	760 g	Cobalt Nitrate (hydrate)
	.8 lb	Ammonium Nitrate
	1 lb	Cupric Chloride (hydrate)
	0.4 lb	Cupric Sulfate (hydrate)
	70 g	Cuprous Oxide
	75 g	Lithium Fluoride
	3 lb	Lanthanium Ammonium Nitrate . water
	0.9 lb	Magnesium Sulfate
	100 g	Manganese Chloride
	30 g	Mercuric Nitrate
	1 lb	Nickel Acetate
	160 g	Magnesium base alloy (chips)
	75 g	Lead Acetate . 3 water
	0.9 lb	Lead Dioxide
	80 g	Acid Phosphomolybdic
	1 L	Molybdate reagent
	.25 lb	Phosphorus
	.75 lb	Phosphorous Acid
	.75 lb	Phosphorous Acid
	.75 lb	Phosphorous Trichloride
	0.8 lb	Ammonium Hydrogen Phosphate
	1 lb	Potassium Hydrogen Phosphate
	1 lb	Sodium Hydrogen Phosphate
	1 lb	Disodium Hydrogen Phosphate
	.75 lb	Trisodium Phosphate (Tribasic)
	.66 lb	Sodium Hypophosphite
	.33 lb	Potassium Chloride
	.66 lb	Potassium Fluoride
	0.9 lb	Potassium Bromate
	0.2 lb	Potassium Hydroxide
	0.5 lb	Potassium Iodide

APPENDIX D-1
(Continued)

REGULATED WASTE PLACED IN THE NONRADIOACTIVE DANGEROUS WASTE LANDFILL

Trench #33
1981 Small Quantity Laboratory Chemicals
and Miscellaneous Solid Waste

Date	Quantity	Chemical
08-13-81 (continued)	.66 lb	Potassium Nitrate
	70 g	Potassium Meta-Periodate
	.75 lb	Potassium Thiocyanate
	1 L	Enthone NL-62
	0.4 lb	Sodium Bismuthate
	1 lb	Sodium Bromide
	1 lb	Sodium Fluoride
	1 L	Sodium Hypobromite Solution
	1 lb	Sodium Iodide
	1 lb	Sodium Nitrite
	.75 lb	Sodium Nitrate
	15 g	Sodium Stannate
	1 lb	Sodium Thiosulfate
	70 g	Sodium Vanadate
	100 g	Selenious Acid
	35 g	Silver Nitrate
	1 lb	Sulfur
	.75 lb	Zinc metal
	10 g	Thallous Acetate
	40 g	Stannic Chloride
	.75 lb	Acid Trichloroacetic
	1 lb	Zinc Nitrate
	1 lb	Barium Nitrate
	0.5 lb	Oakite
	15 lb total	
	4 lb	Ammonium Persulfate
	.75 lb	Ceric Sulfate
	1 lb	Magnesium Perchlorate
	.75 lb	Manganese Dioxide
08-24-81	200 gal (20 lb)	Fenemine
09-17-81	19,350 lb	Solvents, oils, paint and paint thinner mixed and unknown names. Material absorbed with Speedy Dry
09-17-81	43-45 gal drums 450 ea.	Solvents, oils, paint, thinner, unknown absorbed with Speedy Dry

APPENDIX D-1
(Continued)

REGULATED WASTE PLACED IN THE NONRADIOACTIVE DANGEROUS WASTE LANDFILL

Trench #33
1981 Small Quantity Laboratory Chemicals
and Miscellaneous Solid Waste

Date	Quantity	Chemical
09-17-81 continued	1 pt	Methyl Chloroform
	13 L	Benzene
	5 pt	Dye in Methanol
	1 pt	Ether
	sm Bottle	Chloroform
	200 mL	Mercury
	500 mL	Formaldehyde
	6 pt	Benzene
	7 pt	Benzene/Chlorotrimethyl Silane
	1 pt	p-dioxane
	1 pt	Methylchloroform
	2 gal	Potassium Permanganate/Sodium Hydroxide
	13 L	Benzene
	5 pt	Dye in Methanol
	1 pt	Ether
	1 pt	Chloroform (Methyl Chloroform)
	Petri dish	Iodine crystals
	Empty bottle	Dye grains
	5 gal	Chromium-Aluminum-Manganese-Sulfur-Iron powder
	3 gal	Nickel powder
	200 mL	Mercury (in concrete)
	500 mL	Formaldehyde
	6 pt	Benzene
	7 pt	Benzene/Chlorotrimethylsilone mix
	1 pt	P-Dioxane
	0.25 ft3	Mercury batteries (in concrete)
	0.5 ft3	Mercury contaminated material (in concrete)
09-21-81	1 metal drum no wt	Dilute Banvil Herbicide Chemical heel sorbed
09-24-81	200 lb	Feremire
10-22-81	1 drum, 350 lb, 55 gal	Solvent refined cool (clean up from chemical spill) heavy fraction
	.25 lb	Silver Chloride
	.25 lb	Silica powder
	.25 lb	Chromic Oxide

APPENDIX D-1
(Continued)

REGULATED WASTE PLACED IN THE NONRADIOACTIVE DANGEROUS WASTE LANDFILL

Trench #33
1981 Small Quantity Laboratory Chemicals
and Miscellaneous Solid Waste

Date	Quantity	Chemical
10-22-81 (continued)	.25 lb	Iron (II) Oxide
	1 lb	Potassium Cyanide (P098)
	.25 lb	Sodium Arsenate
	1 lb	Mercury Chloride
	1 lb	Sodium Perchlorate
	1 lb	Arsenic Oxide (P012)
	1 lb	Borium Perchlorate
	.25 lb	Thallous Formate
	2 lb	Nickel Chloride
	1 lb	Mercuric Chloride
11-16-81	4 gal	Nitric Acid
	5 L	Lead Nitrate
	1 qt	Benzene
	8 gal	Dioxone & water
	0.5 gal	Misc. unlabeled reagents
11-23-81	0.5 pt	Benzene
	500 mL	Hexane
	8 gal	Dioxane mixture
	5 gal	40% Nitric Acid
	1 L	72% Perchloric Acid
12-17-81	4 lb	Ethyl Ether
	2 pt	Toluene
	12 gal	Tetrahydrofuran with pump oil
	10 gal	Wood for derivatives
	3 lb	Potassium Bromide
	10 lb	Sodium Sulfite
	7 gal	Union Fluid LØ500
	1 qt	Paraffin oil
	1 pt	Perchloric acid
	5 gal	Pump oil
	1 pt	Xylene
12-23-81	1-55 gal drum 150 lb 40 gal	Dioctyl Sebacate with Vermiculite
12-23-81	120 lb	Dioctyl Sebacate with Vermiculite
12-23-81	40 gal (150 lb)	Dioctyl Sebacate (Monoplex DOS)
	20 gal (120 lb)	Dioctyl Sebacate (DOS) Monoplex DOS Plasticizer

APPENDIX D-1
(Continued)

REGULATED WASTE PLACED IN THE NONRADIOACTIVE DANGEROUS WASTE LANDFILL

Trench #33
1982 Small Quantity Laboratory Chemicals
and Miscellaneous Solid Waste

Date	Quantity	Chemical
01-07-82	14 pkg	Afrin Nasal Spray
	4 pkg	Wycillin Suspension
01-12-82	80 L	Iron (II) Nitrate liquid
	24 lb ea.	
	272 lb	Ferric Nitrate
01-25-63	6 g	Bisdihydroxy Phosphinyl
	10 g	Glyoxal-Bis-(2-Hydroxyanil)
	6 g	Eriochrome Blue Black R
	5 g	Acid Alizarin Black
	15 g	Eriochromschwarz T
02-03-82	4 gal (36 lb)	CALCl-Solve
	5 gal (35 lb)	Perchloroethylene
	1 gal (9 lb)	H2SO4 liq
	1 gal (8 lb)	Unknown liquid
	.66 gal (5 lb)	Ferric Chloride Etch Solution
	0.5 gal (3.5 lb)	Nitric Acid
	55 gal (500 lb)	50/50 35% Hydrazine in Sorbed Absorbent
02-12-82	400 lb	Kodak rapid fixer and hardner (contains sulfuric acid) and liquid developer (potassium hydroxide solution) that has been absorbed.
	0.5 gal (3.5 lb)	Nitric Acid
03-09-82	225 g	Ferrous Sulfide
	.75 lb	Lead Nitrate
	1 lb	Ferrous Sulfate
	0.5 lb	Magnesiuim Sulfate
	1 lb	Mercuric Oxide
	2 oz	Mercuric Chloride
	.75 lb	Magnesium Chloride
	1 lb	Mercurous Chloride
	1 lb	Lead oxide (low silver)
	3 oz	Tin metal
	75 g	t-o-Folylazo-o-Toliudine
	5 g	L-Trypotophane

APPENDIX D-1
(Continued)

REGULATED WASTE PLACED IN THE NONRADIOACTIVE DANGEROUS WASTE LANDFILL

Trench #33
1982 Small Quantity Laboratory Chemicals

Date	Quantity	Chemical
03-09-82 continued	1 lb	Trypticase Soy Agar
	.75 lb	Lead Acetate
	.25 lb	Zinc Oxide
	100 g	Special Vanadium Oxytrichbride corrosive material
	8 lb & 1 pt	Sodium Sulfite
	0.5 lb	Charcoal Bone
	1 lb	Diphenylamine
		Desoxycholic Acid
	.7 lb	Ethylenediamine, Tetraacetic Acid
	.7 lb	Salicylic Acid
	.13 lb	Magnesium Carbonate
	.6 lb	Sodium Dichromate
	.6 lb	Sodium Dichromate
		Iodine
	200 g	Triethanolamine
	0.5 lb	Sodium Salicylate
	0.5 lb	Sodium Dichromate
	.7 lb	Resorcinol
	.75 lb	Sodium Bisulfite, meta dry
	.25 lb	Sodium Bisulfite, meta dry
	1 lb	Sodium Fluoride
	1 lb	Sodium Bromate Crystal
	0.5 lb	Sodium Sulfite, meta
	2 oz	Sodium Iodide
	.25 lb	Sodium Oxalate
	1 lb	Sodium Fluoride
	.75 lb	Sodium Bisulfite, meta dry
	.75 lb	Sodium Sulfite
	10 g	Sodium Sulfite
	30 g	Potassium Oxalate
	12 oz	Potassium Permanganate
	12 oz	Potassium Iodide
	12 oz	Potassium Iodide
	12 oz	Potassium Iodide
	12 oz	Potassium Permanganate
	14 oz	Potassium Bromide
	2 oz	Sand sea
	.14 lb	Potassium Citrate
	2 lb	Potassium Permanganate
	12 oz	Potassium Chromate

APPENDIX D-1
(Continued)

REGULATED WASTE PLACED IN THE NONRADIOACTIVE DANGEROUS WASTE LANDFILL

Trench #33
1982 Small Quantity Laboratory Chemicals

Date	Quantity	Chemical
03-09-82 (continued)	1 lb	Potassium Pyrosulfate
	2 oz	Potassium Periodate
	12 oz	Potassium Iodate
	1 lb	Attasol
	25 g	Anion Exch. FLOC DE 50
	25 g	Anion Exch. FLOC AE 50
	15 g	Cation Exch. CM 70, Powder
	250 g	Maleic Acid (pellet)
	475 g	Iso-pentylacetate
	.25 lb	Hexadecyltrimethylammonium Bromide
	75 g	Iso-electric casein
	500 g	Maleic Anhydride
	60 g	Iso-electric casein
	100 g	n-Methylglucamine
	90 g	Glycerophosphate Sodium 5-1/2 water
	100 g	Iodacetamide
	8 g	L-inositoc
	3.5 oz	Methyl-Salicylaete
	70 g	Hood Mercaptoacetic Acid
	100 g	2 Mercaptoethane
	25 g	n-n-Methylenebisacrylamide
	108 g	Ethyl Chloride
	15 g	n-n-methylenebisacryilamide
	25 g	Hexamethyldisilane reagent
	15 g	DL-Di-Sodium Glycerophosphate
	4 g	Sodium Glycerophosphate
	95 g	Hydrazine Sulfate
	2.5 g	Glycogen
	50 g	Glucuronolacetone
	450 g	Diphenylamine
	90 g	Di-sodium Salt
	90 g	Butylated Hydroxytoluene
	.8 k	Chloramine T
	.25 lb	Ascarite
	.4 g	1-(-l-cystin)
	40 g	Bromphenylhydrazine Hydrochloride
	6 g	Xanthydrol
	90 g	Cholinchloride
	75 g	p-(Dimethamino)-Benzaldehyde
	100 g	p - Nitroaniline
	12 oz	Nordihydroguairetic Acid

APPENDIX D-1
(Continued)

REGULATED WASTE PLACED IN THE NONRADIOACTIVE DANGEROUS WASTE LANDFILL

Trench #33
1982 Small Quantity Laboratory Chemicals

Date	Quantity	Chemical
03-09-82 (continued)	12 oz	Oxyethylated-Tert-Octyl-Phenol Formaldehyde Polymer
	100 g	Phosphatidylethanotamine
	113 g	(Hood) Picric Acid
	44 g	(Hood) Potassium Cyanide
	18 g	Orcinol
	50 g	(Hood) Picric Acid
	25 g	4-Nitroquinolin N-Oxide
	.25 lb	Pyridine
	430 g	Oxalic Acid
	450 g	Propionic Acid
	15 gm	Picryl sulfonic
	.66 lb	Phosphorus Tungsten Acid
	.33 g	DL-Norcuecine
	.5 g	L-Proline
	5 g	Propylthiouracil
	4 g	DL-Alanin-Methyester-Dihydro-Chloride
	4 g	Alloxan
	g	Ammopyrine
	g	1-Amino-2-Naphthol-4-Sulfur
	1 lb	Ammonium Persulfate
	1 L	Ammonium Thiocyanate
	.75 lb	Arsenic Trioxide
	.13 lb	Barium Acetate
	1 lb	Barium Hydroxide
	.75 lb	Barium Hydroxide
	0.5 lb	Barium Hydroxide
	1 lb	Barium Chloride
	10 g	Benzidine clare
	14 oz	Chromium Trioxide
	8 oz	Calcium Carbonate
	8 oz	Calcium Hydroxide
	12 oz	Chromium Trioxide
	10 oz	Chromium Trioxide
	.13 lb	Cadmium Chloride Anhydrous
	2 oz	Cupric Oxide
	.13 lb	Calcium Chloride
	2.5 oz	Cupric Carbonate
	12 oz	Calcium Chloride
	2 oz	Calcium Chloride
	2 oz	Calcium Chloride

APPENDIX D-1
(Continued)

REGULATED WASTE PLACED IN THE NONRADIOACTIVE DANGEROUS WASTE LANDFILL

Trench #33
1982 Small Quantity Laboratory Chemicals

Date	Quantity	Chemical
03-09-82 (continued)	10 oz	Calcium Sulfate
	1 L	1N Sulfuric Acid
	.1 L	1/10N NA4SCN
	1 pt	2 Nesslers solution
	500 mL	2 Folin and Ciocalteus Phenal Reagent
	100 mL	Polyoxerelene Sorbitan Mono-Oleate
	100 mL	Solvene-350
	500 mL	2 Protosol
	50 mL each	Trizmal Buffer10 (bottles).
	100 g	Acetaldehyde
	1 qt	Ethylene Glycol Monomethyl Ether
	1 L	Kodak Rapid Fix Solution
	.75 lb	Phosphorous trichloride
	.5 lb	Glycerine
	.75 lb	Ethyl Acetate
	100 mL	X-100
	50 mL	5% Polystyrene in Benzene
	.75 lb	Hydriodic Acid
	mL	Beckman Filter Solvent
	90 g	Sebacyl Chloride
	3.5 oz	Contrad 70
	1 pt	Aerosol OT Cleaner
	.75 pt	Collodion
	10 vials, 1 mL each	Di-Sil-Prep
	2 lb	Triphenyltetrazolium Chloride 2 Ferrous Sulfate Solution
	3 oz	Methyl Salicylate
	27 mL	U-DTPA 32 mg/mL
	2 bottles, 420 mL each	Electrolyte
	175 gm	10% DTPA
	20 mL	Tris-Tetra Methylene-Phosphoric-Triamide
	mL	0.1 mmol Manganese Sodium DTPA
	25 mL	Foto-Flo Fluoro Surfactant
	2 vials, 15 mL each	Latex Particles - Polystyrene
	4 vials, 10 mL each	Grobax - Sodium Polyanethol Sulfonate 5%
	10 mL	Hydrogen-Gold DTPA

APPENDIX D-1
(Continued)

REGULATED WASTE PLACED IN THE NONRADIOACTIVE DANGEROUS WASTE LANDFILL

Trench #33
1982 Small Quantity Laboratory Chemicals

Date	Quantity	Chemical
03-09-82 (continued)	10 cc ampule	Calcium Gluconate - Glucoheptonate
	9 ampules, 10 mL each	Calcium Gluconate - Gluceptate
	50 g	d-limonene
	6 vials, 5 cc each	Madribon 10% (Sulfur)
	0.5 lb	Phosphorus Trichloride
	8 oz	Acrylamide
	.25 lb	Aluminum Oxide powder
	0.5 lb	Aluminum Potassium Sulfate crystal
	75 gm	Agarose
	.75 lb	Ammonium Sulfate Granular
	.5 lb	Amberlite IRC-50
	.25 lb	2-Bromoethylamineltycrobromide
	8 oz	Boiling Chips Micro-Porous
	.25 lb	Ferric Ammonium Sulfate crystal
	.25 lb	Fluorescein Sodium Salt
	.13 lb	Hydrazine Sulfate
	1 lb	Hydrazine Sulfate
	.25 lb	Lead Nitrate crystal
	.25 lb	Trichloroacetic Acid crystals
	.25 lb	Potassium Citrate crystal
	2 oz	Merculic Chloride crystal
	.13 lb	Potassium Bromate
	4 oz	Potassium Biphthalate
	4 oz	Sequlene
	.75 lb	Resorcinol crystals
	1 lb	Trishydroxymethylamine (TRIs) Methane
	1 lb	Zeo Karb H
	100 gm	An O
	1 lb	Z10 Cl
	3 oz	Acid Tungsten powder
	.25 lb	Sodium Pyrophosphate
	.25 lb	Sodium Phosphate Dibasic crystal
	0.5 lb	Sodium Acetate
	0.5 lb	Citric Acid Granular
	0.5 lb	Hydroxylamine Hydrochloride crystals
	2 oz	Iodine crystals (resublimed)
	1 lb	Sodium Diethyldithiocarbonate

APPENDIX D-1
(Continued)

REGULATED WASTE PLACED IN THE NONRADIOACTIVE DANGEROUS WASTE LANDFILL

Trench #33
1982 Small Quantity Laboratory Chemicals

Date	Quantity	Chemical
03-09-82 (continued)	10 gm	L-Lysine Ethyl Ester Dihydro-Chloride
	10 gm	S-Carboxyethyl-L-Cysteine
	10 gm	S-Carboxyethyl-L-Cysteine
	10 g	S-Carboxyethyl-L-Cysteine
	10 g	S-Carboxyethyl-L-Cysteine
	.25 lb	Cesium Chloride
	5 vials	Methyl Bis/B-Chlorethyl
	1 jar	Calcium Sodium
	1 jar	Calcium DTPA
	.25 lb	Methyl Metharylale
	.13 lb	Sodium Hydrogen Ethylenediaminetetra-acetic Acid
	90 g	Chelidamic Acid Monohydrate
	45	Sodium Taurochelate
	90 g	Sodium DTDA
	90 g	L-Ethylenedinitriloldi-o-cred
	45 g	n,n-Dicyclohexylcarbodiimide
	1 g	2,4,6-Triethyleneamino Triazin
	25 g	Salicylhydroxyamic Acid
	25 g	Aces
	125 g	DTPA
	90 g	Triethylene Tetraamine Tetrachloride
	50 g	Thielated Gelatin
	10 oz	Isocinchomeronic Acid
	8 oz	Microporous boiling chips
	25 g	2 Thiophenecarboxylic Acid
	oz	Cit-A 1 Water
	oz	DTPA Acid
	20 g	2-3 Dimethoxybenzoic
	g	Zirconium DTPA
	g	Zinc Hydrogen DTPA
	.25 lb	Sulfur compound
	45 g	Palmitic Acid
	5 g	PDT Disulfonate
	2 g	Phthaleincomplexore
	10 g	Phloridzin
	oz	5-Amino-3-Sulphosalicylic-Acid
	5 g	Thymine-5-Methyluracil
	g	Sodium Polystyrenesulfonate
	100 g	Sodium Chelate MA

APPENDIX D-1
(Continued)

REGULATED WASTE PLACED IN THE NONRADIOACTIVE DANGEROUS WASTE LANDFILL

Trench #33
1982 Small Quantity Laboratory Chemicals

Date	Quantity	Chemical
03-09-82 (continued)	50 g	Eriochromschwarz +
	60 g	Brenzkatechin
	50 g	Ethyl Glycine
		623 Dimethyloxybenzoil
	430 g	Procaine Hydrochloride
	90 g	Proplygaliate
	100 g	Polyvinyl Pyrrolidone Aiceut
	14 oz	Pyromellitic Acid
	75 g	2,5 Diphenyloxazole
	90 g	MPTT K+
	50 g	Polyvinyl Pyrrolidone
	90 g	Sodium Desoxycholate
	1 kg	Poly-Oxyethejiene-23-Lavrylether
	14 oz	Hydroquinone
	12 oz	Sorbitan Monolavrate
	1 lb	Dextrose
	50 g	Fat Black (microscope)
	450 g	Hexamethyenetetramine
	100 g	Dimethydithiacarbamic Acid Sodium Salt Dihydrate
	100 g	Dextran
	14 lb	Calcium Phytate
	90 g	5 Sulfosalicylic Acid
	25 g	n-Acytyl-Di-Penicillamine
	4 g	Neutral Red
	8 oz	Gelatin Powder
	100 g	5B Cholanic Acid 3,7,12 Tricue
	75 g	Acridin Orange
	20 g	Popop
	90 g	Ethylenedinitrilo Tetraacetic Acid Epsom salt
	100 g	Pl Dimethylamino
	75 g	4,4-Diamino-2,2-Biphenyl-Disulfate Acid
	100 g	Sodium Glocuranate
	100 g	N,N-Ethylennis (Forraini de)
		Acridin Orange
	4 g	Gramin
	10 g	Aurnic Acid Natural
	25 g	2,6 Dicarbonypyridine-N-Oside
	5 g	Batyl Alcohol

APPENDIX D-1
(Continued)

REGULATED WASTE PLACED IN THE NONRADIOACTIVE DANGEROUS WASTE LANDFILL

Trench #33
1982 Small Quantity Laboratory Chemicals

Date	Quantity	Chemical
03-09-82 (continued)	oz	Chel 300 Acid
	oz	Cyclohexamine-N,N,N,N,L-Tetraficetic Acid
	48 g	8 Ace + Oxyquinoline
	9 g	Dithizone
	20 g	Alizarin Reds
	10 g	Ammonium Rhodanilate
	90 g	25 Dimercapto-1,3,4-Thiadiazole
	1 lb	Fleischmann's Pure Dry Yeast
	.25 oz	Calcium Chloride crystal
	5 g	Ammonium Perrhenate
	2 oz	Bismuth Trioxide
	1 g	Calcium Fluoride
	1 lb	Ammonium Tetrasulfate Cerate
	1 g	Calcium Fluoride
	1 lb	Ammonium Tetrasulfate Cerate
	1 g	Fluorescein Isothiocyanate
	1 g	Benzenesulfohydroxamic Acid
	.25 lb	Barium Permanganate
	8 mL	Ferrous Surfactant
	5 g	Muroxide
	10 g	8-Mercaptopurine
	4 gm	3-Hydroxyflacene
	5 g	1-(2-Pyridylaze) 2-Naphthol Indicator Grade
	10 g	f-Mercaytopurine
	.25 lb	Nickle Oxide Powder
	200 g	Calcium Sulfamate
	5 g	Periodic Acid H5IO
	1 g	Acetyl-D-Phenylalanine
	1 gm	L-Thyrexine Sodium Salt
	.75 oz	Titanium Oxide Anhydrous
	.75 lb	Copper-Iron
	20 g	Silicon-Carbon
	.2 lb	Potassium Acid Phthalate crystals
	1 lb	Manganese Dioxide powder
	50 mg	Calcium Chloride
	1 oz	C-Chloromercuriphenol
	.25 lb	Potassium Iodate granular
	.25 lb	Potassium Persulfate
	.25 lb	Sodium Cobalt Nitrate powder

APPENDIX D-1
(Continued)

REGULATED WASTE PLACED IN THE NONRADIOACTIVE DANGEROUS WASTE LANDFILL

Trench #33
1982 Small Quantity Laboratory Chemicals

Date	Quantity	Chemical
03-09-82 (continued)	2 oz	Lead Sulfide powder
	1 lb	Zinc Metal granular
	4 oz	Sodium Cyanide granular
	20 g	Stannic Oxide
	1 lb	Silica Pow (200 Mesh)
	.25 lb	Sodium Permanganate
	.25 lb	Cesium Chloride
	5 g	L-Threchin-Methylester
	.25 lb	Acid Tungsten
	10 g	Dextran
	10 g	Vitastain
	1 g	DL-O-Tyucsinc
	1 g	DL-C-Phosphosenine
	1 g	Hydrocortisone Alcohol
	1 g	Palmitic Acid
	5 g	Phenol Red
	5 g	Alizanin Complexane
	5 g	Phenol Red
	10 g	Easin Y
	10 g	Calcein W
	5 g	Phenol Red
	2 vials, 15 mL ea.	Polystyrene - Latex particles
	1 g	Fuchsion Basic
	4 vials, 10 mL ea.	Grobax (Sodium Polyanethol Sulfonate 5%)
	90 g	Butylated Hydroxyanisole pellets
	2 g	Aluminum CP
	21 g	Girards P
	100 g	Arsanalic Acid
	2 g	Isatin-3-Oxime
	25 g	N-Acetyl-DL-Penicillamine
	5 g	Diphenic Acid
	100 g	L-Thiazolidine-4-Carboxylic Acid
	50 g	2-Guanidino-4-Ammonium Bromide
	60 g	Buffalo Balck NBR
	.25 lb	Beef Blood Serum
	mL	L-dyenkolic Acid
	mL	Glucoronolaetone
	25 g	D-(-)-Penicillamine
	25 g	Dimethyl Big Vanide Hydrochloric Acid
	20 g	Erio Glaucine
	12 g	Glycocyamine

APPENDIX D-1
(Continued)

REGULATED WASTE PLACED IN THE NONRADIOACTIVE DANGEROUS WASTE LANDFILL

Trench #33
1982 Small Quantity Laboratory Chemicals

Date	Quantity	Chemical
03-09-82 continued	20 g	EMPC
	5 g	Dihydro-ketoquinoxaline Carboxylic Acid
	10 g	Synthetic Arbotin
	Almost empty	Osmium Tetoxide
	5 g	2,6-Dihydroxy-Isonicotinic Acid
	5 g	4,4-Bis-Dimethylamino-Diphenylcarbinol
	500 mg	Deferal
	4 g	3,4-DL-Dihydroxyphenylalanine
	25 g	Diothylstibesterol
	5 g	Ethoxzolamide
	5 g	Dibenzoyl-Diamino Ethylene
	2 g	29-Dimethyl-1,10-Pherantnrolire
	2 g	4,7-Diphenyl-1,10-Phenanthraline
	5 g	Dihydronaphtlool Naphthofurofuran
	1 g	Neocuproine
	10 g	2-Nitrosolnaphtlool-4-Sulfuric Acid
	5 g	Beta-Alanine
	9 g	Calciferol
	5 g	Chondroitin Sulfate
	oz	N-(4-Amino 3 Carboxyphenyl Sulfonyl
	oz	Calmagite
	15 g	Calcein
	1 oz	Benzotriazol Purified
	5 g	Diazine Green
	2 g	Pan Indicator
	25 g	Imidazole-4,5-Dicarboxylic Acid
	25 g	Isatin
	2 g	Dipotassium Pentacalcium Dicalcein
	8 g	Sulfaethidole
	oz	Thio Michler's Ketone
	1 oz	Pepsin
	5 g	N-Acetyl-DC-Penicillamine
	25 g	2-Mercaptocihydrouracil Propionic Acid
	10 g	Nile Blue A
	0.5 g	DL-Proline
	10 g	2-Nitrosolnaphth-4-Sulfonic Acid
	5 g	2,4,6-Tripyridyl-S-Triazine
	5 g	DL-Penicillamine
	5 g	D-Penicillamine Disulfide

APPENDIX D-1
(Continued)

REGULATED WASTE PLACED IN THE NONRADIOACTIVE DANGEROUS WASTE LANDFILL

Trench #33
1982 Small Quantity Laboratory Chemicals

Date	Quantity	Chemical
03-09-82 continued	5 g	2-(DL-Penicillamine Acetone Adduct Hydrachloride)
	8 g, 10 g	2-(a,a-Dicarboxy-n,n-diformyl-4-Piperazinediaianine-Tetreathylester)
	.25 lb	Thiazolilidine-4-Carboxylic Acid
	.2 g	Polyaspartic Acid
	5 g	Hodizonic Acid, Potassium Salt
	.2	dl-Homocystine
	5 g	D-Penicillamin Puriss
	.1 g	4,7-Diphenyl-1,10-Phenanthroline
	5 g	7-Aminocephalosporanic Acid
	5 g	Potassium Chromium Sulfate
	5 g	1,2,3-Triketohydrinolene
	4 g	2,4,6,8-Tetrahydroxypyrimido Pyrimidine (54)
	1 g	Zincon
	10 g	Erichrome Blue Black
	8 g	p-Nitrobenzeneazocrornal
	1 g	Acetazolamide
	1 g	D-Serine
	2 g	Enemethyl Blue
	1.75 g	Poly-L-Glutamic Acid Sodium Salt
	0.5 lb	Sodium Anthraquinone Sulfenate
	8/g	Uric Acid
	85 g	4-N-Maleysulfanilamide
	100 g	2-Meraptobenzothiazolylbutyric Acid
	50 g	5-Salicylsulfonic Acid
	4 g	Naphthol-Beta
	75 g	1-(p-Sulfophhenyl)-5-Pyrazdene-3 Carboxylicaad
	g	4-Dimethylamino-Azobarizene
	.33 lb	Hydroxylamine Hydrochloride
	0.5 lb	De-Acutite Anich Exchanger
	0.5 lb	Ferric Nitrate crystals
	0.5 lb	Acid Citric Monohydrate crystal
	1 lb	Jaguar A-20-A
	.25 lb	Hydroxylamine Hydrochloride
	1 lb	Cupric Sulfate
	.75 lb	Ferric Ammonium Sulfate
	.25 lb	Pyrogallol
	4 oz	Phenylhydrazine Hydrochlorice
	1 lb	Potassium Phosphate Monobasic

APPENDIX D-1
(Continued)

REGULATED WASTE PLACED IN THE NONRADIOACTIVE DANGEROUS WASTE LANDFILL

Trench #33
1982 Small Quantity Laboratory Chemicals

Date	Quantity	Chemical
03-09-82 (continued)	10 g	Siractan AF #2 (Arabinogalactin)
	.75 lb	Potassium Iodide
	.75 lb	Beta-Methyl Umbelliferone
	1 lb	Paraformaldehyde
	1 lb	Potassium Permanganate crystals
	1 lb	Ferrous Ammonium Sulfate crystals
	200 g	Monogram ink (black)
	5 g	Guantec E-2
	5 g	2-Mercaptoacetanilide
	5 g	2-Mercaptoacetanilide
	5 g	2-Mercaptoacetanilide
	5 g	2-Mercaptoacetanilide
	5 g	2-Mercaptoacetanilide
	0.5 lb	Ferrous Ammonium Sulfate crystals
	20 g	Fluorescent Zinc Sulfide
	1 lb	Sodium Fluoride powder
	.25 lb	Schooghan
	100 g	2-Mercaptoacetanilide Carbonate
	1 lb	Potassium Chloride crystals
	200 g.	Rexyn RG 50 (H)
	0.5 lb	Magnesium Perchlorate
	1 lb	Purulic Chloride
	.75 lb	Lead Carbonate
	0.5 lb	Sodium Titanate
	1 lb	Seelex-C
	1 lb	Seelex-A-100
	1 lb	Morclire White Petroleum Jelly
	0.5 lb	Potassium Hydroxide
	1 lg	Phenol
	40 g	Zinc Oxide
	.25 lb	Hood Potassium Cyanide
	1 lb	Sulfur powder
	0.5 lb	Potassium Thiocyanate
	1 lb	Ammonium Carbonate
	.25 lb	Calcium Gluconate
	.75 lb	Potassium Thiocyanate
	15 g	2-Aminoethan-1-Hydrochloride
	.25 lb	Sodium Malonate water
	.13 lb	Sulfamic Acid
	.25 lb	Nitroso R Salt
	15 g	Phloriazin
	45 g	2-Mercaptoorotic Acid

APPENDIX D-1
(Continued)

REGULATED WASTE PLACED IN THE NONRADIOACTIVE DANGEROUS WASTE LANDFILL

Trench #33
1982 Small Quantity Laboratory Chemicals

Date	Quantity	Chemical
03-09-82 (continued)	3.5 oz	Sarkosyl N1-100
	20 g	Sudan Black B
	6 g	Crio Glaocine
	5 g	Violursavre
	oz	Calco Oil Red N-1700
	3 g	Sialic Acid Concentrate Assay
	8 oz	Calco Alizarine Cyanine Green Base
	22 g	Quinacrine Dihydrochloride
	8 oz	Alcofast Spirit Yellow Zirconium
	40 g	Thioacetamide
	8 g	Persantin Active Ingredient
	.2 g	Piperic Acid
	50 g	Insulin
	10 g	4-Methylumbelliferone
	10 g	Phenoxymethyl-Pencilloic Acid
	50 g	Luxol Hydrate
	1 g	2,4,6-Triamino-Pyrimidine
	4 g	Taurine
	2 g	2-Mercaptothiazoline
	10 g	Pheroxymethyl-Penicilloic Acid Hydrate
	1 oz	Thymol USP
	20 g	Alloxan
	15 g	Brilliant Ponceau
	0.5 lb	Zinc Chloride
	0.5 lb	Magnesium Chloride
	1 lb	Sodium Hydroxide
	0.5 lb	Sodium Bicarbonate
	1 lb	Potassium Chloride
	0.5 lb	Sodium Bisulfate Meta
	.75 lb	Potassium Iodide
	1 lb	Sodium Hydroxide
	1 lb	Surfylnol 104
	30 mL	Chromerce
	1 lb	Calcium Gluconate
	.25 lb	Potassium Cyanide
	1 lb	Sodium Thiosulfate
	1 lb	Calcium Chloridecihydrate
	1 lb	Sodium Bicarbonate
	0.5 lb	Sodium Phosphate
	1 lb	Potassium Carbonate
	.25 lb	Cupric Sulfate

APPENDIX D-1
(Continued)

REGULATED WASTE PLACED IN THE NONRADIOACTIVE DANGEROUS WASTE LANDFILL

Trench #33
1982 Small Quantity Laboratory Chemicals

Date	Quantity	Chemical
03-09-82	.13 lb	Potassium Cyanide
(continued)	.75 lb	Boric Acid
	0.5 lb	Ammonium Acetate
	33. lb	
	1 oz	Titanium Oxide Anhydrous
	1, .75 lb	3 Zinc Carbonate
	.75 lb	Ammonium Thiocyanate
	.33 lb	Anhydrone
	0.5 lb	Calcium Powder
	.75 lb	Potassium Sodium Tartrate
	0.5 lb	Zinc Oxide
	1 lb	Kojic Acid
	25 g	Used Drierite
	44 lb	Car Bopol 941
	4.5 lb	Drierite
		Cesium Hydrogen Sulfate
	125 mL	Hydrazine
	1-100mL boxes	Proceine Penicillin G
	3	Batteries AA
	10 g	Spermidin
	2	Service Batteries
	1	Duracell Battery
	500 mg	Lecithin
	100 mg	Deferrichrome
	1 g	Rhodotorulic Acid
	50 mL	Barentrifluoride-methanol
	10 g	Cyclopentadlenylthallium
		Chloroacetontrile
	50 g	Glutanaldehyde
	50 cc	Iron-Dextran Injectible
	100 g	T-Pyriclidinecarbodithicic Acid, Ammonium Salt
	2.1 oz	Acufine Developer
	4 oz	Soluble Powder-Terramycin
	.33 lb	Scotchcast Electrical Resin
	.67 lb	Scotchcast Electrical Resin
	.75 lb	Nitric Acid
	200 g	CH-USP Cholesterol
	1 lb	Bromine
	500 g	Ethylchloroformate
	1 pt	Ammonium Sulfide solution

APPENDIX D-1
(Continued)

REGULATED WASTE PLACED IN THE NONRADIOACTIVE DANGEROUS WASTE LANDFILL

Trench #33
1982 Small Quantity Laboratory Chemicals

Date	Quantity	Chemical
03-09-82 (continued)	1 g	B(2FVRYL)-Acrylic Acid
	1 g	Colchicine
	1 g	Ethyl-3-Indole Acetate
	1 g	Maleic Acid Hydrazide
	1 g	D-Napthalen-Acetamide
	0.1 g	Traumatic Acid
	10 g	Lysozyme 3X
	1 g	Carbonyl Bis (L-Methionine) -Nutraphenyl Este
	1 g	Carbonyl Bis (L-Methionine) -Nutraphenyl Este
	5 gm each. 2 bottles	Clelandi:Reagent (Dithiothreitol)
	1 g	Keflin
	1 g	DL-tallo-Crystathionine
	10 g	Histamine-Dihydrochloride
	1 g	Lysozyme
	5 g	B-Aminoproplanitrile, B
	50 g	Desferriaxamine B-Metharesulfonate
	5 g	Thiagel
	5 g	Thiagel
	.25 lb	Trypticase Soy Agar
	125 cc	LC 124 Liquid Crystals in Petroleum Ether Solution
	125 cc	LC 124 Liquid Crystals in Petroleum Ether Solution
	3 g	Desferrioxamine-B-Methanesulfonate
	1 g	Pourlese Ecatalase 30 1 g Standard 750 mg
	50 g	L-a-Phosphatidyl Choline [L-a-Lecithin]
	25 g	Lecithin Egg (highly purified)
	25 g	Lecithin Egg (highly purified)
	250 mL	Toluene spent
	100 g	Dizalmitin (1,2,41,3 mixture of of Isomers) (Sigma)
	2 vials ea. .1 g solid	Rebonuclease-A from Bovinepancreas
	.25 mg	Phosphatidyl Ethanolamine
	500 mg	BIS-DHB-1,3-Propane Diamine
	500 mg	DIS-DHB-Ethyenediamine
	25 mg	TS-6

APPENDIX D-1
(Continued)

REGULATED WASTE PLACED IN THE NONRADIOACTIVE DANGEROUS WASTE LANDFILL

Trench #33
1982 Small Quantity Laboratory Chemicals

Date	Quantity	Chemical
03-09-82 (continued)	500 mg	DIS-DHB Putrescline
	500 mg	BIS-DHB Octanedamive
	4 vials - 100 mg ea.	Cytochrome-C from horse heart
	4 vials - 100 mg ea.	Cytochrome-C from horse heart
	500 mg	Chtochrome-C from horse heart
	100 mg	Cytochrome-C, type 11-A, horse H
	100 mg	Cytochrome-C, type 11-A, horse H
	0.1 g	Methyl Palmitoleate
	3 vials, 1 g each	DL-Isocitric Lactone
	25 g	Tributyrin
	5 mL	Transaminase Chem. Control Sch.
	3 vials, 1 g each	N,N-Bis-(2-Carboximidoethyl) Tantarmide Dimethyl Estea Dihydlicchloride
	10 mg	Hemoglobin Standard
	2 vials, 1 g ea.	Pepsin 3X Cyst (Parcine Stomach Mucous)
	1 g	Pepsin
	2 vials, 25 mg ea.	Gangliosides
	25 mg	N-Acetyl Neuraminic Acid
	2.5 mL	Lactic Dehydrogenase Enzyme
	2 vials, 5 mL (3 ug/mL)	N-4-Nitrobenzo-Z-iva 1,3 Diazide Phosphetidyl Ethanolamine
	1 g	Pepsin Crystallizer
	100 mg	Cholesteryl Oleate
	1 g	4-Fluoro-3-Nitro-Phenylazide
	1 g	O-Phenyl
	500 mg	Peroxidase
	mg	Cyto-C
	2 vials, 0.1 g ea.	Cytidine-5-Diphospho Choline
	500 mg	Cytochrome-C, Type III
	1 mCi	NEC-084H Sodium Acetuate-1-C
	10 caps, 25 mg ea.	Fast Blue RR Salt
	5 g	2-Acetamido-2-Deoxy-1,2,3,4-Tetra--Acetyl-B-Diglueopyrabose
	0.1 g	Methyl Palmitoleate
	3 vials, 1 g each	DL-Isocitric Lactone
	25 g	Tributyrin
	5 ml	Transaminase Chem Control Sch.
	3 vials, 1 g each	N,N-Bis-(2-Carboximidoethyl) Tantarmide Dimethyl Estea Dihydlicchloride
	10 mg	Hemoglobin Standard

APPENDIX D-1
(Continued)

REGULATED WASTE PLACED IN THE NONRADIOACTIVE DANGEROUS WASTE LANDFILL

Trench #33
1982 Small Quantity Laboratory Chemicals
and Miscellaneous Solid Waste

Date	Quantity	Chemical
03-11-82	185 g powder	Nalco 66-B-619-5
	.5 gal liquid	H-230 Calgon Biocide
	1 gal	Pozzalon 300
	25 lb dry	Bromocide
	250 g	Sterotex-K
	70 lb	Turco-4502
	110 lb	Turco-4521
	300 lb	Nalclean-68 Scale Remover
	45 gal	Amerzine-TM-35 Catalyzed Hydrazine
	28 gal	Hydrazine 35% Sonbed
	5 lb	Sample #3, Project #1086
	15 lb	Sample #1, Project #1086
	100 lb	Nalclean 68
	30 lb	Bromicide
	55 gal	Calgon CL-77
	4 gal	Rodine 82A Acid Inhibitor
	44 lb	Calgon D-26 Deposit Inhibitor
	38 lb	Calgon H230 water Microbiocide
	1 gal	Betz 403
	2 gal	Betz 403
	0.5 gal	35% Hydrazine
	1 gal	Amerzine
	1 qt	Malco 310(B-6126)
	3 qt	Calgon CL-162
	1 qt	Calgon CL-246
	1 pt	10% Methylene Bis Thiocyanate
	.66 pt	NALCO 7323 (B-8118)
	.66 pt	NALCO 7326 (B-8251)
	.66 pt	NALCO 7326 (B-8264)
	.13 pt	15% Amerzine
	.25 pt	Nional
	3 qt	CL-246
	1 pt	Biosperse-201
	3 qt	CL-162
	1 qt	310-B-6126
	1 pt	7328 B-8251
	1 pt	7326 B-8264
	1 pt	7323 B-8118
	1 pt	Methylene Bis Thiocyanate 10%
	0.5 pt	Nional

APPENDIX D-1
(Continued)

REGULATED WASTE PLACED IN THE NONRADIOACTIVE DANGEROUS WASTE LANDFILL

Trench #33
1982 Small Quantity Laboratory Chemicals
and Miscellaneous Solid Waste

Date	Quantity	Chemical
03-11-82 (continued)	10 oz	Nalco 7324
	20 mL	Cat-Floc T
	.75 gal	Bentonite
	2 gal	Rodine 82-A
	25 mL	Amerzine
	1 gal	Pozzalon 300
	5 gal	D-26 Inhibitor
	5 gal	H-230 Biocide
	4 L	Betz 403
	2 gal	Rodine 82-A
	40 lb	Turco-4502
	6 L	Betz 403
	80 lb (est.)	Turco 4521
	30 lb (est.)	Oxalic Acid
	250 g	Sterotex - K
	185 g	Nalco 66 B-169-5
04-15-82	1 gal	Jenny Coil Cond. Cmpd #80 (has Hydrochloric Acid)
	11 pt	Lactated Ringer's Solution
	57 pt	Donnagel Suspension
04-29-82	1.5 lb	Ferric Chloride
	2 lb	Carbon powder
	4 lb	Cesium Chloride
	1.5 lb	Cuprous Chloride
	5 lb	Sodium Dithionate
	4.25 lb	Calcium Carbonate
	4.25 lb	Barium Hydroxide
	1 lb	Aluminum Nitrate
	2 lb	Barium Nitrate
	2 lb	Stannous Chloride
	1 lb	Lead Acetate
	2 lb	Magnesium Sulfate
	1 lb	Aluminum Silicate
	1 lb	Sodium Oxalate
	1 lb	Magnesium Sulfate
	4 oz	Cobalt Nitrate
	8 oz	Ammonium Thiocyanate
	3 lb	Hydroxylamine Hydrochloride

APPENDIX D-1
(Continued)

REGULATED WASTE PLACED IN THE NONRADIOACTIVE DANGEROUS WASTE LANDFILL

Trench #33
1982 Small Quantity Laboratory Chemicals
and Miscellaneous Solid Waste

Date	Quantity	Chemical
04-29-82 (continued)	1.25 lb	Sodium Acetate
	0.5 g	Potassium Chromate
	2 lb	Lithium Hydrochloride
	1.5 oz	Mercuric Nitrate
	1 lb	Potassium Iodate
	1 lb	Potassium Phosphate
	2 lb	Potassium Chloride
	3 lb	Ammonium Acetate
	10 oz	Cobalt Nitrate
	2 lb	Calcium Chloride
	4 oz	Barium Chloride
	8 oz	Sodium Bisulfite, Meta
	1 pt	Carmine
	3 oz	Magnifloc
	4 oz	Aurintricarboxylic Acid
	2 lb	8-Hydroxyquinoline
	5 lb	Potassium Thiocyanate
	5 lb	Pyrogalic Acid
	.5 lb	Potassium Acid Phthalate
	8 oz	Boric Acid
	1 lb	Salicylic Acid
	8 oz	Anti Foam 60
	3/8 lb	Dimethylgloxime
	1 lb	Hydrin-X
	2 oz	Sodium Cyanide
	2 lb	8-Hydroxyquinoline
	2.75 lb	Phenol
	10 g	C5H4NN:NC10H6OH pan powder
	2 oz	Potassium Ferrocyanide
	4 oz	Ammonium Citrate Dibasic
	12 oz	Aluminum
	1 kg	Sodium Gluconate
	12 oz	Separan
	4.5 lb	Sodium Sulfate
	4.5 lb	Sodium Phosphate
	5 lb	Sodium Sulfite
	7 lb	Ammonium Sulfate
	.4 lb	Cuprous Chloride
	8 pt	Perchloric Acid
	4 pt	Formic Acid

APPENDIX D-1
(Continued)

REGULATED WASTE PLACED IN THE NONRADIOACTIVE DANGEROUS WASTE LANDFILL

Trench #33
1982 Small Quantity Laboratory Chemicals
and Miscellaneous Solid Waste

Date	Quantity	Chemical
04-29-82 (continued)	1 pt	Zinc Chloride
	2 pt	Carbon Tetrachloride
	1 pt	Chloroform
	500 mL	Phenol Carbolic Acid
	.75 kg	50% Gluconic Acid
	1 pt	Formaldehyde
	2 gal	Acid
	1 L	ORSAT solution
05-04-82	55 gal	Spent Trichloroethyline absorbed in Vermiculite
[illegible]-05-82	3 L (12 lb)	Perchloric Acid
05-23-82	10 gal	Corrosive Mixture
	500 gm	Kepone
	1 gal	Hexane
05-27-82	1 pt	Dry 1,4-Dioxane-Diethylene Oxide Tech. Grape
06-25-82	550 gal	Ferrous Hydroxide (solid)
	30 gal	Chromic Nitrate
	10 gal	Corrosive mixtures
	500 g	Kepone
	15 lb	Phosphoric Acid
	1 gal	Hexane
	1 lb	Potassium Cyanide
	1 lb	Sodium Cyanide
08-17-82	1 gal	Nitric acid
	1 gal	Glacial Acetic Acid
	1 gal	Hydrochloric Acid
	1 gal	Chloroform
	4 lb	Ether
	1 L	Dimethyl Formamide
	9 gal	Mixed solvents (Tetrahydrofuran, Acetone, Methylene Chloride)

APPENDIX D-1
(Continued)

REGULATED WASTE PLACED IN THE NONRADIOACTIVE DANGEROUS WASTE LANDFILL

Trench #33
1982 Small Quantity Laboratory Chemicals
and Miscellaneous Solid Waste

Date	Quantity	Chemical
08-17-82 (continued)	50 lb	Mercury-concreted
	13 gal	Benzene-concreted
	3 gal	Mixed carcenogens-concreted
08-18-82	1 gal	Nitric Acid
	1 gal	Glacial HAC
	1 gal	Hydrochloric Acid
	1 gal	Chloroform
	4 lb	Ether
	1 L	Dimethyl formamide
	9 gal	Mixed solvents: THF, Acetone, Methylene Chloride
	50 lb	Mercury contaminated glasswear-concreted
	10 gal	Benzene absorbed and concreted
	3 gal	Mixed Carcinogens-concreted

APPENDIX D-1
(Continued)

REGULATED WASTE PLACED IN THE NONRADIOACTIVE DANGEROUS WASTE LANDFILL

Trench #31
1982 Small Quantity Laboratory Chemicals
and Miscellaneous Solid Waste

Date	Quantity	Chemical
11-05-82	210 lb	Lead Acid gel in battery
12-10-82	1 lb	Mercury absorbed and contained
12-17-82	4 ft3	Beryllium Copper

APPENDIX D-1
(Continued)

REGULATED WASTE PLACED IN THE NONRADIOACTIVE DANGEROUS WASTE LANDFILL

Trench #31
1983 Small Quantity Laboratory Chemicals
and Miscellaneous Solid Waste

Date	Quantity	Chemical
02-03-83	1,140 lb	Lithium Nitrite and reaction debris
03-21-83	10 lb	Phosphoric Acid
	170 mL	Gasoline
	4000 mL	Xylene
	1000 mL	Toluene
	1000 mL	Cyclohexane
	40 mL	Tetra-N-Propyl Ammonium Hydroxide
	400 mL	Di-N-Butyl Sulfoxide
	100 mL	2,4-D Amine
	200 mL	Dicamba
	200 mL	Teflon
	200 mL	Tordon
	500 mL	50% Hydrogen Peroxide
	200 mL	Type B polymer
	200 mL	Type A polymer
	2 gal	Ammonium Fluoride
04-12-83	2 bags	Misc. (herbicide contaminated rags, respirator cartridges, etc.)
04-14-83	11 lb	Sulfanilic Acid
	4 kg	Sulfanilamide
	500 g	Potassium Persulfate reduced
	250 g	Chloramine T
05-04-83	5 gal	Muriatic Acid
	1 gal	Hydrofluoric Acid
05-05-83	2 gal	p-Dioxane
	4 kg	1-Octanol
	2 qt	Triton x-100 (Alkyl-Lanyl-Polyether Alcohol)
	20 kg	1,2,4-Trichlorobenzene
05-12-83	48 lb	Ammonium Bifluoride
	25 lb	Calcium Fluoride
	600 lb	(Chel DTPA 41) Sodium Salt
	200 lb	Sodium Salt
	1,200 lb	Rare Earth Carbonate
	250 lb	Sodium Sulfate

APPENDIX D-1
(Continued)

REGULATED WASTE PLACED IN THE NONRADIOACTIVE DANGEROUS WASTE LANDFILL

Trench #31
1983 Small Quantity Laboratory Chemicals
and Miscellaneous Solid Waste

Date	Quantity	Chemical
05-12-83 (continued)	300 lb	Strontium Carbonate
	300 lb	Floculant
	15 gal	Tol floc coag. Floculant
	350 lb	Powdered clay olin 5004 coagulant aid
06-01-83	1 lb	Oxalic Acid
	1 lb	Sodium Hydroxide
	1 lb	Aluminum Chloride
	1 lb	Aluminum Nitrate
	3 pt	Hypo-phosphorus Acid
	1 lb	Magnesium Perchlorate
	1 lb	Arsenic Acid
	25 mL	Petroleum Ether
	3 lb	Magnesium Perchlorate
	10 pt	Hydroodic Acid
	20 pt	Hydroodic Acid
	.25 lb	Potassium Hydrogen Phthalate
	1 lb	Potassium Persulfate
	1 lb	Bromine
	1 pt	Cerric Sulfate in Sulfuric Acid
	1 lb	Sodium Hydroxide
	1 lb	Sodium Acetate
	5 lb	Ammonium Oxalate
	1 lb	Potassium Iodide
	1 lb	Potassium Chloride
	1 lb	Potassium Carbonate
	6.25 lb	Potassium Sodium Tartrate
	1 lb	Potassium Bromide
	1 lb	Potassium Carbonate
	2 lb	Potassium Phosphate
	5 lb	Cupric Sulfate
	500 mL	Ferric Ammonium Sulfate
	.25 lb	Ammonium Iodide
	8 lb	Barium Chloride
	.25 lb	Cerium Nitrate
	.25 lb	Lanthanum Nitrate
	1 lb	Mercuric Thiocyanate
	1 lb	Ammonium Oxalite
	12 lb, 1 lb	Sodium Meta Bisulfate
	10 lb	Sodium Bisulfate Monohydrate
	1 oz	Cupferron

APPENDIX D-1
(Continued)

REGULATED WASTE PLACED IN THE NONRADIOACTIVE DANGEROUS WASTE LANDFILL

Trench #31
1983 Small Quantity Laboratory Chemicals
and Miscellaneous Solid Waste

Date	Quantity	Chemical
06-01-83 (continued)	1 gal	Propylene Carbonate
	1 lb	Sodium Bicarbonate
	1 lb	Sodium Arsenite
	1 lb	Sodium Sulfate
	3 lb	Sodium Metasilicate
	1 lb	Sodium Phosphate
	.25 lb, .25 lb	Sodium Iodide
	1 lb	Sodium Hydrosulfate
	4 lb	Sodium Dithionite
	1 lb	Sodium Bromate
	1 lb, 1 lb	Sodium Oxalate
	1 lb	Sodium Chloride
	250 mL	Sodium Acetate
	1 lb, 7 lb	Sodium Fluoride
	1 lb	Sodium Sulfite
	1 lb	Ferrous Ammonium Sulfate
	2 lb	Ammonium Acetate
	1 lb	Ammonium Bifluoride
	2 lb	Ammonium Molybdate
	1 lb	Ammonium Phosphate
	2 lb	Ammonium Sulfate
	9 lb	Ascorbic Acid Powder
	1 lb	Sodium Acetate
	1 lb	Ferric Chloride
	1 lb	Cerric Nitrate
	1 lb	Sodium Carbonate
	2 lb	Ferrous Ammonium Sulfate
	25 mL	Tri-Sil Z
	50 mL	Ferrous Sulfamate
	1 qt	Potassium Permangate
	1 qt	Potassium Hydrogen Sulfate
	1 qt	Potassium Hydrogen Sulfate
	3 lb	Potassium Nitrate
	1 lb	Potassium Chloride
	1 lb	Potassium Carbonate
	.25 lb	Cupric Nitrate
	1 lb, .25 lb	Ferric Nitrate
	1 lb	Sodium Oxalate
	250 mL	Potassium Permanganate
	5 g	Bromo Cresol Purple Sodium
	2 lb	Ammonium Citrate

APPENDIX D-1
(Continued)

REGULATED WASTE PLACED IN THE NONRADIOACTIVE DANGEROUS WASTE LANDFILL

Trench #31
1983 Small Quantity Laboratory Chemicals
and Miscellaneous Solid Waste

Date	Quantity	Chemical
06-01-83 (continued)	25 g	Tetrapropylammonium Hydroxide
	1 lb	Sodium Bisulfate
	3 lb	Sodium Bisulfate Monohydrate
	1 lb	Sodium Carbonate
	6 lb	Sodium Chloride
	1 lb	Sodium Chromate
	15 lb	Sodium Nitrate
	.25 lb	Sodium Tartrate
	1 lb	Sodium Thiosulfate
	1 lb	Urea
	.25 lb	Acid Potassium Phthalate
	1 lb	Cuprous Chloride
	6 lb	Ferrous Ammonium Sulfate
	2 lb	Lithium Fluoride
	1 lb	Magnesium Chloride
	1 lb	Nickel Nitrate
	3 lb	Potassium Bromate
	1 lb	Potassium Fluoride
	250 g	Potassium Iodide
	100 g (top of drum)	Sulfamic Acid
	115 g	Hydroxylamine Hydrochloride
	125 mL	Dibutyl Phosphonate
	250 mL	Collodion
	1 pt	Methyl Isobutyl Ketone
	1 pt	Agle Sulanilic Acid in Acetic Acid
	125 mL	Lithium-10-Phenanthroline Ferrous Sulfate
	5 lb (top of drum)	Sulfamic Acid
	1 lb	O-Tolidine Dihydrochloride
	12 lb	Ascarite
	.25 lb (top of drum)	Glycolic Acid
	8 lb	Hydroxylamine Hydrochloride
	.25 lb	Diethylene-Triamine-Penta-Acetic Acid
	1 lb	Hydroxylamine Hydrochloride
	200 mL, 500 mL	Dibutyl Phosphonate
	200 mL	Dichlorodimethylsilane
	125 mL	N-Tridecane
	250 mL, 250 mL (bottom of barrel)	Formic Acid
	1 pt	Iso Amyl Alchol
	1 pt	Amyl Acetate

APPENDIX D-1
(Continued)

REGULATED WASTE PLACED IN THE NONRADIOACTIVE DANGEROUS WASTE LANDFILL

Trench #31
1983 Small Quantity Laboratory Chemicals
and Miscellaneous Solid Waste

Date	Quantity	Chemical
06-01-83 (continued)	1 gal	Methymethocylate
	1 gal	Tributylphosphate
	2 gal	Butylstearate
	1 pt	Iso Amyl Alcohol
	5 pt	Methylisobutyl Ketone
06-06-83	46 lb	Dioctyl Sebacate (absorbed)
	8835 g	Petroleum distillates
	1500 cc	Ethyl Acetate
	16.5 oz	Petroleum solvent & alcohol
	12 oz	Metal Check Remover E-59
	3 oz	Petroleum distillate and Diethyl Ether
06-22-83	125 lb	Turco 4502
06-27-83	24 oz	Sulfuric Acid
	8 oz	Potassium hydroxide solution
	8 oz	Sulfate solution
07-10-83	125 lb	Ferrous Sulfamate
	325 lb	Painter's waste (rags, thinner, etc.)
07-27-83	735 gal	Ferrous Hydroxide
	230 gal	Floor sweepings (Calcium Carbonate, Silica, Lithium Hydroxide (solid)
	75 lb	Cupric Nitrate
09-08-83	4.5 gal	Retort water (organic carbon 30,000-40,000 ppm C inorganic carbon 1,000-3,000 ppm C Ammonium ion 36,000 ppm (as ammonium ion Ammonium Anions: Sulfate = 23,000 ppm Disulfite = 46,000 ppm Sulfite = up to 2000 ppm

APPENDIX D-1
(Continued)

REGULATED WASTE PLACED IN THE NONRADIOACTIVE DANGEROUS WASTE LANDFILL

Trench #31
1983 Small Quantity Laboratory Chemicals
and Miscellaneous Solid Waste

Date	Quantity	Chemical
09-08-83 (continued)		Elements: (ppm)
		Arsenic - 7
		Boron - 45
		Barium - 0.2
		Calcium - 35.
		Cadmium - 0.4
		Chromium - 0.1
		Cobalt - 0.25
		Copper - 2 to 24
		Iron - 1
		Lithium - 4
		Magnesium - 1000
		Manganese - 0.1
		Molybdenum - 0.5
		Potassium - up to 70
		Sodium - 520
		Silicone - 20
		Strontium - 1.5
		Zinc - 3.5
	3 pt	1,4 Dioxane
	1 pt	Nitromethane
	2 pt	Methylene Chloride
	1 lb	Anhydrone
	4,500 mL	2-Butoxyethanol
	2 gal	Ethylene Dichloride
	5 kg	1,1,2,2-Tetrabromo-Methane
	1 gal	Micro resist rinse (N-Butyl Acetate)
	1 gal	Micro resist developer (petroleum distillates)
	0.5 pt	Ditridecyl Amine
	0.5 pt	Malachite green Hydrochloride
	.25 pt	Cobalt Molybdenate
	.25 pt	Calcium Sulfate
	1 pt	Quinizarin
	0.5 pt	Copper Oleate
	1 pt	Ethoxyquin
	1 lb	Dipentamethylene Thiuram Hexasulfide
	0.5 pt	Ethylene Glycol
	500 g	Tetramethyl Thiceram Disulfide
	1.5 kg	Guaiacol

APPENDIX D-1
(Continued)

REGULATED WASTE PLACED IN THE NONRADIOACTIVE DANGEROUS WASTE LANDFILL

Trench #31
1983 Small Quantity Laboratory Chemicals
and Miscellaneous Solid Waste

Date	Quantity	Chemical
09-08-83 (continued)	1 lb	Citric Acid crystals
	0.5 gal	Sorbitan Monooleate
	0.5 lb	Diphenyl-phosphoric Sulfide
	3 lb	Hydroxylamine Hydrochloride
	.25 pt	N,N-Dimethyl-p-Phenylene Diamine Sulfate
	160 lb	Copper Sulfate crystals
	1 pt	Heptane
	1 pt	1-Butanol
	1 gal	Tetrahydrofuran
	1,500 g	Ethanolamine
	.25 pt	Benzaldehyde
09-20-83	1 pt	Acetone
	1 lb	Butyl Alcohol
	1 pt	Glycerine (alcohol n.o.s.)
	1 lb	Dextrose Anhydrous
	1 lb	Potassium Dichloride
	5 lb	Sodium Chloride
	1 lb	Sodium Silica
	1 lb	Hydrofluoric Acid
	100 g	Sulfamic Acid (corrosive solid n.o.s.)
	1 lb	Trichloroacetate (corrosive solid n.o.s.)
	1 lb	Lithium Hydroxide (corrosive solid n.o.s.)
	5 lb	Sodium Hydroxide
	1 lb	Aluminum Nitrate
	.25 lb	Cupric Nitrate
	1 lb	Magnesium Nitrate
	1 lb	Magnesium Oxide
	1 lb	Potassium Nitrate
	1 lb	Potassium Permanganate
	4 oz	Silver Nitrate
	1 lb	Sodium Nitrate
	1 lb	Strontium Nitrate
	1 oz	Zirconium Nitrate
	1 lb	Calcium Carbonate
	1 lb	Ferric Oxide
	1 lb	Potassium Phosphate
	1 lb	Potassium Phosphate

APPENDIX D-1
(Continued)

REGULATED WASTE PLACED IN THE NONRADIOACTIVE DANGEROUS WASTE LANDFILL

Trench #31
1983 Small Quantity Laboratory Chemicals
and Miscellaneous Solid Waste

Date	Quantity	Chemical
09-20-83 (continued)	1 lb	Sodium Acetate
	1 lb	Sodium Bicarbonate
	1 lb	Aluminum Oxide (ORMA n.o.s.)
	1 lb	Ammonium Carbonate
	1 lb	Potassium Hydrogen Sulfate
	1 lb	Ammonium Chloride
	1 lb	Sodium Phosphate
10-04-83	6375 lb	Altrex metal cleaner
10-17-83	50 gal	Doctyl Sebacate (absorbed)
10-27-83	2 pt	Trichloroacetic Acid
	9 pt	Methyl Alcohol

APPENDIX D-1
(Continued)

REGULATED WASTE PLACED IN THE NONRADIOACTIVE DANGEROUS WASTE LANDFILL

Trench #28
1984 Small Quantity Laboratory Chemicals
and Miscellaneous Solid Waste

Date	Quantity	Chemical
02-03-84	6 lb	Sodium Hydrogen Sulfide
	1 lb	Sodium Chromate
	1 lb	Sodium Bichromate
	.5 lb	Potassium Chromate
	10 oz	1-Ethylquinelinium Iodide
	1 lb	Sodium Metabisulfite
	1 lb	Ferrous Sulfate
	.5 lb	Nickel Chloride
	1 kg	Calgon
	1 lb	Gelatine powder
	1 pt	Flexible Collodion
	1 L	Polyelectrolytes
	1 lb	Ammonium Sulfate
	1 lb	Aluminum Oxide
	32 oz	Glycenyl Triacetate
	800 g	Weldon 28 Component C
	32 oz	Ammonium Sulfide
	250 mL	Castor oil
	1 pt	Photo-flo 200
	100 g	Creosote
02-09-84	110 gal	Anhydrous Borax
	255 gal	Sodium Nitrate
	170 gal	Boric Acid
	240 gal	Sodium Nitrite
	145 gal	Sodium Nitrite, Borax, frit, sand, gravel
	22 gal	Boric Acid, frit, soda ash, silica, and warehouse sweepings
	120 gal	Boric Acid, Anhydrous Borax, brown sand
	175 gal	Boric Acid, Borax, Potassium Nitrate
	165 gal	Boric Acid, sand, fine frit, Borax, Sodium Nitrate
	220 gal	Boric Acid, frit, borax, Sodium Nitrate
	195 gal	Borax, sand, frit, empty chemical bags
	55 gal	Low Sodium Nitrate sludge
	55 gal	Normal Sodium Nitrate sludge
	275 gal	Sodium Carbonate sludge spiked
02-22-84	18 gal	Ammonium Hydroxide

APPENDIX D-1
(Continued)

REGULATED WASTE PLACED IN THE NONRADIOACTIVE DANGEROUS WASTE LANDFILL

Trench #28
1984 Small Quantity Laboratory Chemicals
and Miscellaneous Solid Waste

Date	Quantity	Chemical
03-16-84	200 mL	Butyl Alcohol
	1 pt	2-Propanol
	.5 pt	Butyl Ether
	1 L	Amyl Alchol
	.5 kg	n-Octylalcohol
	.5 pt	Normal Paraffin Hydrocarbon
	1,000 mL	Plexiglass cement
	1 pt	Iodobenzene
	2/3 pt	Combustible liquid, n.o.s.
	.5 L	Phosphenylchloride, Dichlorophenyl Phosphine
	500 mL	Indene
	1/8 pt	Diazald
	1 L	Tris (hydroxymethyl) Amino-Methane
	1 pt	Hypophosphorus Acid
	250 g	Antimonypentachloride
	1 L	Bromine
	1 pt	Hydriodic Acid
	1 pt	Dinoylnaphthalenesulfonic Acid
	450 g	Benzoyl Peroxide
	1 L	2,2-A20-bis-2-Methyl Propionitrile
	315 kg	Ceric Oxide
	54 ft3	Cerous Oxalate
	1 pt	Butyl Ether
	11 qt	Sulfurous Acid
	250 lb	Magnesium Nitrate
	100 lb	Bismuth Nitrate
	75 lb	Sodium Nitrate
	950 lb	Sodium Nitrite
	75 lb	Disodium Phosphate
	96 lb	Cesium Carbonate
	25 lb	Soda Ash
	5 gal	Kaowool Cement
	100 lb	Activated Aluminum
	30 lb	Sodium Fluoride
05-01-84	2 gal	Urethane Component A
	1 pt	Urethane Component B
	2 gal	Concentrated Chemical A/B

APPENDIX D-1
(Continued)

REGULATED WASTE PLACED IN THE NONRADIOACTIVE DANGEROUS WASTE LANDFILL

Trench #28
1984 Small Quantity Laboratory Chemicals
and Miscellaneous Solid Waste

Date	Quantity	Chemical
05-23-84	20 gal	Waste corrosive liquid, n.o.s. (Picrolonic Acid, Formic Acid, and Vanadous Formate all absorbed)
06-13-84	10 lb	Sodium Hydroxide
06-14-84	17 gal	Ammonium Hydroxide
06-20-84	0.5 kg	Zirconium Hydride
08-23-84	1 pt	Ammonium Sulfide
	1 pt	Ehtylacetate
	0.5 gal	Hexone
	6 pt	Butyl Alcohol
	1 qt	Hexone
	1 pt	Amyl Acetate
	1 pt	Ethyl Acetate
	3 kg	Methyl Ethyl Ketone
	1 pt	Hexone
	1 qt	Tetrahydrofuran
	1 pt	Perchloric Acid (70%)
	1 pt	Hydrogen Peroxide (30%)
	5 gal	Dichloromethane
	1 qt	Bis(2-ethylhexyl)2-hexylphosphonate
	1 qt	Mono-2-ethyl Hexylacid Orthophosphate
	1 kg	Octyl Alcohol
	5 L	Isopentyl Alcohol
	1 qt	Acetyl Acetone
	1 gal	Dimethyl Formamide
	1 L	Hexanol
	5 lb	Lactic Acid
	1 qt	Diisopropyl Ketone
	1 gal	Sulfuric Acid (93%)

APPENDIX D-1
(Continued)

REGULATED WASTE PLACED IN THE NONRADIOACTIVE DANGEROUS WASTE LANDFILL

Trench #19N
1984 Small Quantity Laboratory Chemicals
and Miscellaneous Solid Waste

Date	Quantity	Chemical
04-17-84	10 gal	Ferric Nitrate
	20 gal	Lithium Nitrate
	55 gal	Ferric Phosphate
	55 gal	Neodymium Nitrate
	55 gal	Aluminum Nitrate
	30 gal	Rare Earth Nitrate
	5 gal	Magnesium Nitrate
	5 gal	Kesel
	5 gal	Manganese Nitrate
06-13-84	2 lb	Sodium Nitrate
	20 lb	Sodium Nitrate
07-05-84	100 lb	Versene EDTA
	25 lb	Thiourea
	13 gal	Ethylene Glycol
	225 lb	Ammonium Persulfate
07-19-84	990 gal	Sodium Nitrite
	550 gal	Nickel, hydrated
09-05-84	400 lb	Metal Alloy - 40% Aluminum and 60% Calcium
09-24-84	10 gal	Dioctyl Sebacate
11-09-84	75 gal	Paint related material (paint sludge dried)
12-05-84	1 lb	Potassium Permanganate
	1 lb	Sodium Nitrate
	1 lb	Sodium Chromate
	5 lb	Sodium Hydroxide
	1 pt	Ethyl Acetate
	1 pt	Methanol
	1 qt	Isopropanol
	1 gal	Naphtha
	1 lb	Ammonium Nitrate
	1 lb	Ammonium Chloride
	1 qt	Ammonium Hydroxide
	2 qt	Ammonium Oxalate

APPENDIX D-1
(Continued)

REGULATED WASTE PLACED IN THE NONRADIOACTIVE DANGEROUS WASTE LANDFILL

Trench #19N
1984 Small Quantity Laboratory Chemicals
and Miscellaneous Solid Waste

Date	Quantity	Chemical
12-20-84	69 mL 230 mL	Refill SQE for Fyrite Oxygen Indicator Methanol
01-11-85	13 drums (55 gal)	Salt cake
05-14-85	3 drums (55 gal) 1 drum (55 gal)	Waste Calcium Nitrate Waste Sodium Nitrate

APPENDIX D-2

REQUEST FOR WAIVER FROM EPA REQUIREMENT FOR DOUBLE LINER/LEACHATE COLLECTION SYSTEM AT THE NRDW LANDFILL

TABLE OF CONTENTS

	PAGE
LIST OF ABBREVIATIONS	iii
LIST OF TABLES	iv
LIST OF FIGURES	v
1.0 PURPOSE	D-2.1
2.0 INTRODUCTION	D-2.2
2.1 DESCRIPTION OF NRDW LANDFILL	D-2.2
2.2 TECHNICAL OVERVIEW	D-2.3
3.0 WAIVER REQUEST SUMMARY	D-2.4
4.0 METEOROLOGICAL CONDITIONS	D-2.8
5.0 REGIONAL GEOLOGIC SETTING	D-2.9
5.1 INTRODUCTION	D-2.9
5.2 BASEMENT ROCKS	D-2.10
5.3 COLUMBIA RIVER BASALT GROUP	D-2.10
5.4 ELLENSBURG FORMATION	D-2.11
5.5 RINGOLD FORMATION	D-2.12
5.6 EARLY "PALOUSE" SOIL	D-2.13
5.7 HANFORD FORMATION	D-2.13
5.8 EOLIAN DEPOSITS	D-2.14
6.0 REGIONAL HYDROLOGIC SETTING	D-2.14
6.1 SURFACE HYDROLOGY OF THE HANFORD SITE AND SURROUNDING PASCO BASIN	D-2.14
6.2 GROUNDWATER HYDROLOGY OF THE UPPERMOST AQUIFER	D-2.15
6.2.1 Recharge	D-2.15
6.2.2 Movement	D-2.16
6.2.3 Discharge	D-2.16
6.2.4 Hydraulic Properties	D-2.17
6.2.5 Water Quality	D-2.17
6.3 GROUNDWATER HYDROLOGY OF THE UNDERLYING AQUIFER	D-2.17
6.3.1 Recharge	D-2.18
6.3.2 Movement	D-2.18
6.3.3 Discharge	D-2.18
6.3.4 Hydraulic Properties	D-2.18
6.3.5 Water Quality	D-2.19

TABLE OF CONTENTS

(Continued)

	PAGE
7.0 GEOLOGY OF THE NRDW LANDFILL	D-2.19
8.0 HYDROLOGY OF THE NRDW LANDFILL	D-2.22
8.1 HYDRAULIC PROPERTIES OF THE UPPERMOST AQUIFER	D-2.22
8.2 WATER QUALITY OF THE UPPERMOST AQUIFER	D-2.23
9.0 VADOSE ZONE HYDROLOGY OF THE NRDW LANDFILL	D-2.24
9.1 300 AREA LYSIMETER RECHARGE STUDY	D-2.25
9.2 200 AREA DEEP LYSIMETER RECHARGE STUDY	D-2.26
9.3 BC CRIB RECHARGE	D-2.26
9.4 RECHARGE TRANSPORT	D-2.26
9.5 MODEL EVALUATION	D-2.27
10.0 REFERENCES	R-1

LIST OF ABBREVIATIONS

in	inches
ft	feet
mi	miles
ft^2	square feet
ft^3	cubic feet
mi^2	square miles
mi^3	cubic miles
cm	centimeters
m	meters
km	kilometers
cm^3	cubic centimeters
m^2	square meters
km^2	square kilometers
m^3	cubic meters
km^3	cubic kilometers
ac	acres
gal	gallons
ac-ft/yr	acre-feet per year
mybp	million years before present
hrs	hours
yr	year
mg/ℓ	milligrams per liter
meq/ℓ	milliequivalents per liter
$mℓ/cm^3$	milliliters per cubic centimeter
mℓ	milliliter
mil	0.001 of an inch
cpm	counts per minute

LIST OF TABLES

TABLE NO.	TITLE
1	The Types of Assumptions That EPA Will Use in Reviewing the Request For Waiver
2	Representative Hydraulic Properties in the Uppermost Aquifer
3	Water Quality Samples Collected From the Basal Ringold Unit and the Hanford Formation in Well 699-10E-12
4	Ranges of Hydraulic Properties of the Underlying Aquifer From Wells DB-13, DB-14, DB-15, and ARH-DC-1
5	Mean and Range of Major Chemical Constituents Within Groundwater of the Underlying Aquifer (Mabton Interbed)
6	Depth to Water and Water-Table Elevations From Semi-Annual Measurements Between December 1975 and December 1984 at Five Wells Near the NRDW Landfill
7	Water Quality of the Unconfined Aquifer for the Pasco Basin and the Hanford Site
8	Volumetric Water Content in a Recharge Study Well
9	Travel-Time Equations and Example Calculation

LIST OF FIGURES

FIGURE NO.	TITLE
1	Location of the NRDW Landfill on the Hanford Site, Washington State
2	Site Plan For the NRDW Landfill
3	Geographic Extent of the Columbia River Basalt Group
4	Structural Geology of the Pasco Basin
5	Stratigraphic Nomenclature of the Pasco Basin
6	Generalized Geologic Cross Section Through the Hanford Site
7	Surface Water Bodies Including Ephemeral Streams on the Hanford Site
8	Differential Change in the Hanford Site Water Table Between January 1944 and January 1975
9	Hanford Site Water-Table Map
10	Areal Distribution of Hydraulic Conductivity From the Uppermost Aquifer at the Hanford Site
11	Equivalent Parts Per Million (EPM) Comparison of Uppermost Aquifer Waters From the Hanford Site and Surrounding Pasco Basin
12	Location of Wells DB-13, DB-14, DB-15, and ARH-DC-1
13	Potentiometric Surface Map of the Rattlesnake Ridge Aquifer Within the Hanford Site
14	NRDW Landfill Geologic Study Area Well Location Map and Location of Geologic Cross Sections A-A' and B-B'
15	NRDW Landfill Study Area Geologic Cross Section A-A'
16	NRDW Landfill Study Area Geologic Cross Section B-B'
17	Generalized Stratigraphic Column for the NRDW Landfill
18	Geologic Profile of Trench Number 26 at the NRDW Landfill
19	Tritium Plumes (pCi/ml) Within the Uppermost Aquifer From Disposal in the Separations Area
20	Groundwater Quality Map

LIST OF FIGURES

(Continued)

FIGURE NO.	TITLE
21	Gamma Activity at Depth in Well 299-E13-7 Monitoring the 216-B-20 Specific Retention Trench For the Years 1963 and 1968
22	Gamma Activity at Depth in Well 299-E13-7 Monitoring the 216-B-20 Specific Retention Trench for the Years 1976 and 1984

1.0 PURPOSE

The United States Department of Energy is responsible for operating a major chemical separations facility on the Hanford Site, Washington, including waste disposal operations on the site. Among the disposal operations, a Nonradioactive Dangerous Waste (NRDW) Landfill falls under the Washington dangerous waste regulations as defined in WAC 173-303 and the Federal hazardous waste regulations set forth in 40 CFR Part 264. Under these regulations, specific groundwater protection requirements apply to dangerous waste disposal sites. However, the U. S. Environmental Protection Agency (EPA) double liner and leachate collection system requirements may be waived in accordance with 40 CFR 264.301(d), when:

> ". . . alternative design and operating practices, together with operating characteristics, will prevent the migration of hazardous constituents into the ground water or surface water, at least as effectively as such liners and leachate collection systems."

The purpose of the waiver request is to address the physical conditions of the NRDW Landfill in order to demonstrate that no potential for contaminant migration to the uppermost aquifer exists during the interim operating, closure and post-closure care period. Guidance as given by the EPA in 40 CFR 264.301(d) and EPA (1982a, 1982b, 1985) is followed to detail the basis for relief from the liner and leachate collection system.

It should be noted that the liner/leachate collection system requirements of 40 CFR 264 are apparently incompatible with the requirements for land disposal of radioactive waste outlined in 10 CFR 61.61(a)6 which states that:

> "The disposal site must be designed to minimize to the extent practicable the contact of water with waste during storage, the contact of standing water with waste during disposal, and the contact of percolating or standing water with wastes after disposal."

The purpose of a liner/leachate collection system as required in 40 CFR 264 is to collect any leachate moving through the disposal unit. This could result in direct contact of the wastes with water after disposal. In addition, the

collection and treatment of leachate, might result in a significant radiation exposure to personnel. 10 CFR 61.43 requires that:

> "Every reasonable effort shall be made to maintain radiation exposures as low as is reasonably achievable".

2.0 INTRODUCTION

The NRDW Landfill, a portion of the Central Landfill, is located about five mi (eight km) southeast of the 200 Areas on the Hanford Site (Figure 1), and can be found on the U.S. Geological Survey Hanford, Washington 15 minute topographic sheet. The Central Landfill has been used by DOE for approximately ten years and covers about 76 ac (0.31 km^2). The northern quarter of the facility is allocated for disposal of nonradioactive dangerous waste materials and is referred to as the NRDW Landfill. Dangerous wastes have been disposed of in this section of the landfill since 1975. Sixteen trenches are dedicated to asbestos or chemical wastes. Chemical waste compositions and volumes for calendar year 1984 are listed in the Generator Annual Dangerous Waste Report (DOE RL, 1984). Figure 2 details the configuration of the hazardous waste trenches. Chemical trenches are limited to numbers 26, 28, 31, 33, 34, and 19-N of which only trenches 33 and 34 were in use prior to the ban on extremely hazardous wastes.

2.1 DESCRIPTION OF NRDW LANDFILL

Disposal trenches at the landfill are excavated on 46 ft (14 m) centers and are measured and flagged at intervals to insure non-intersecting trenches. Spoil piles are created on both sides of the trench during excavation. Each trench is about 400 ft (122 m) long, 13 ft (4 m) wide at the base, and 14 to 16 ft (4 to 5 m) deep. Prior to disposal of materials into the trenches, 8 to 10 in (20 to 25 cm) of ballast gravel" are bulldozed onto the bottom of the trench to allow heavy vehicle access. Currently, materials for disposal are buried only on Fridays in an effort to minimize wasted trench space. There is no continuous operational water supply at the NRDW Landfill. Drinking water supplies for operating personnel are transported to the site in 5-gal (19-l) containers.

2.2 TECHNICAL OVERVIEW

The EPA (1982a, 1982b, and 1985) guidance rules are followed in the preceding technical sections which support the request for liner waiver. The implementation regulation, which is 40 CFR 264.301(d), states that EPA can provide an exemption from the operating standards for liners and leachate collection systems, if:

> "...alternative design and operating practices, together with location characteristics, will prevent the migration of any hazardous constituent into the groundwater or surface water at least as effectively as such liners and leachate collection systems".

Table 1 outlines the "types of assumptions that EPA will use in determining whether an exclusion is warranted" (EPA, 1982b) for a groundwater monitoring program. Since either a waiver for groundwater monitoring or a liner/leachate collection system requires the same positive conclusion, the assumptions utilized by EPA for groundwater waivers will also be utilized for the liner/leachate collection system waiver. These types of assumptions are discussed in relationship to the hydrogeologic environment at the NRDW Landfill. Furthermore, these factors (assumptions) are among a group of factors that control waste migration to the groundwater. Therefore, the total meteorologic, geologic, and hydrologic picture is presented in order that the reader understand the complex environmental framework and the physical factors (in addition to those listed by the EPA) that control any contaminant migration from the NRDW Landfill.

Meteorological data including temperature extremes, occurrence and velocity of winds, precipitation and potential evapotranspiration are presented, as well as groundwater flow-path time. Recharge through the vadose zone to groundwater is considered. The various Hanford Site recharge studies are discussed in detail and a range of vadose zone flow-path times are calculated. A review of the literature conducted to investigate available models for recharge through the vadose zone is covered, and the applicability of these models to the NRDW Landfill is discussed.

3.0 WAIVER REQUEST SUMMARY

The environmental framework and hydrogeologic processes at the NRDW Landfill should be understood. First, conditions on the NRDW Landfill surface will be considered. Second, conditions and processes taking place below the surface of the NRDW Landfill will be considered. Third, these conditions and processes will be evaluated against the assumptions (as listed in Table 1) used by EPA in waiver request reviews.

The NRDW Landfill is located on the Hanford Site about eight mi (ten km) from the Columbia River. The Columbia River is the only surface water body that might impact the burial grounds by flooding. However, under the most severe flooding conditions, the closest floodplain is no closer than 7 mi (11 km) from the NRDW Landfill (see Section B of permit). There is essentially no potential for inundation of the burial grounds by surface water. Once the trenches have been filled and covered, no additional water will be introduced by an operational process.

The Hanford climate is mild, often windy and dry. The average precipitation is 6.3 in/yr (16 cm/yr) and the 100-year, 24-hour maximum predicted rainfall is two in (five cm) (See Section 4.0). Potential evapotranspiration rates greatly exceed annual precipitation rates, but much of this precipitation is received between November and February when evapotranspiration rates are least. Therefore, recharge to the water table occurs, but is expected to be low. The travel time of deep-draining moisture to some depth, such as the uppermost aquifer, can be determined if the recharge rate and volumetric water content of the sediments are known (Heller et al., 1985). The moisture travel time from the bottom of the NRDW trenches to groundwater is shown to be (Heller et al., 1985):

$$T = D/V = D/r/\theta = D\theta/r$$

where

- T = travel time to groundwater (yr)
- D = depth to groundwater [ft (cm)]
- V = velocity of water movement through the sediments [ft/yr (cm/yr)]
- θ = volumetric water content of the sediments
- r = recharge rate [ft/yr (cm/yr)]

Lysimeter measurements of recharge rates (r) have been conducted (see Section 9.0) and values range from 0.02 to 0.18 ft/yr (0.5 to 5.6 cm/yr). The minimum depth to groundwater (D) from the bottom of the trenches at the NRDW Landfill is approximately 105 ft (3200 cm) from the base of the trench. This is known from water-table measurements taken since 1975 from wells near the NRDW Landfill. The elevation of groundwater beneath the trenches is known to within 0.5 ft (15 cm). The volumetric water content (θ) was selected as the minimum of average values for three sediment types from a recharge study of sediments similar to those at the burial grounds (Heller et al., 1985). Average volumetric moisture contents ranged from 8 to 18 percent for the three sediment types. The most conservative value of eight percent was assumed for the travel-time calculation. Based on the measured recharge values, the worst-case travel-time from the burial ground trenches to the uppermost aquifer was 46 years, while the best case travel-time extended to 510 years.

Any waste migrating down through the sediment column would contact the uppermost aquifer first. A description of the sediment column is provided in Sections 5.0 and 7.0. Average porosity at the Hanford Site is 36 percent. The minimum depth from the NRDW Landfill surface to the water table is 125 ft (38 m). The aquifer thickness below the NRDW Landfill is approximately 220 ft (67 m). Groundwater flows from west to east to discharge to the Columbia River, the nearest natural surface water body, under a relatively shallow gradient of 5.5 ft/mi (1.05 m/km). The nearest potable groundwater well is at the Fast Flux Test Facility (FFTF), about 6.5 mi (10.4 km) to the southeast. Groundwater flow velocities are estimated at 1890 ft/yr (576 m/yr), based on modeling that utilizes the Hanford Pathline Calculation Program (HPCP). These result in aquifer flow-path times of 28 and 60 years, respectively, to the Columbia river and aquifer flow-path times of 18 and 39 years, respectively, to the FFTF drinking water supply wells.

The EPA has outlined nine assumptions which should be addressed in a request for waiver. The following discussions will evaluate known conditions at the NRDW Landfill against the stated assumptions.

- <u>The thickness of the soil from ground surface to the water table should be stated.</u> The depth from ground surface to groundwater at well 699-24-33 is approximately 121 ft (37 m). This is known from water-table measurements taken since 1975. This well is within

about 1000 ft (305 m) of the NRDW Landfill and its casing elevation is about 5 ft (1.5 m) lower than the Landfill. The water-table gradient below the site is nearly flat. Therefore, the depth to groundwater is about 125 ft (38 m) from the landfill surface.

- Travel-time calculations should be based on natural soil properties. All the investigations referenced concerning recharge rates have concentrated on measurements of recharge rates obtained either directly or indirectly from field studies. These field studies have been conducted in the 200 Areas [about 2.5 mi (4 km)] northwest of the landfill, in the 600 Area [about 4 mi (6.4 km) southeast], and in the 300 Areas [about 9 mi (14 km) southeast] of the Hanford Site (see Section 9.0).

- Travel-time calculations should be based on the least viscous liquid. Current burial ground management practices do not allow for disposal of bulk liquids and limit disposal to containerized materials packaged in absorbent inside of burial drums (see Section 2.1). The field investigations have been conducted to evaluate soil moisture (water) movement. Soil moisture will be the transport medium for movement of any waste through the sediment column; therefore, it is assumed to be the least viscous liquid.

- The travel time should be based on maximum hydraulic head, i.e., the regulated unit is full of water. This assumption is addressed concurrently with the response to the following assumption.

- The travel time should be based on a saturated sediment column from the regulated unit to the groundwater. There are only three means by which total saturation could occur at the NRDW Landfill: surface waters flooding the site for an extended period; flooding from an on-site water supply; and a precipitation event which could saturate the sediment column. As has been shown in Section B, there is essentially no potential for surface-water flooding, there is no operational water supply at the burial grounds, and the maximum 100-year precipitation event in a 24-hour period is two in (five cm). In order to achieve a maximum hydraulic head, it would require saturation of all pore space in the sediment column. Average porosity measured at the Hanford Site is 36 percent. Achieving saturation of each square foot of the sediment column would require 0.36 ft^2 water/ft^2 soil x 125 ft soil, or 45 ft (14 m) of water. There will not be a natural or man-made source for a supply of water this large at or near the NRDW Landfill. Therefore, there is no justification for assuming either a maximum hydraulic head or a

saturated sediment column. All calculations of travel-times, therefore, are based on field studies of the unsaturated conditions natural to the Hanford Site sediments.

- The effective porosity should be accounted for or assumed to be ten percent. The effective porosity is a term normally used to describe a saturated, i.e., groundwater, system. Since recharge rates through the sediment column were evaluated under the unsaturated natural state, "the effective porosity" was addressed by evaluation of the volumetric water content in the quasi-steady state sediment system. The volumetric water content [ft^2 water/ft^2 soil (m^2 water/m^2 soil)] is an expression of the volume of water/volume of soil, and is, therefore, the effective porosity of the unsaturated system (except for high clay-content soils). The effective porosity used in the calculations in this report was eight percent, which is more conservative than the ten percent recommended by EPA.

- Soil attenuation mechanisms. The solubility of wastes and waste/sediment interactions have not been utilized to increase the travel-time calculations in this report. However, it is likely that these factors will further limit potential concentrations and contaminant migration to the groundwater.

- The migration of fluids through the soil should be assumed to have begun when the regulated commenced operation. The start date of an active trench (unit) is the date at which regulated waste first entered the trench. This date has been used as the start date for calculating the travel-time during the operating period and the closure and post-closure care periods.

CONCLUSION

It has been shown that under the worst-case conditions, there is no potential for contaminant migration to the groundwater during the next 30 years.

- The only transport medium that will move a contaminant is recharge moisture.

- Any contaminant transported through the sediment column must be water soluble, since all other bulk liquids must be packaged in absorbent materials.

- Although the attenuative capacity of the soil has not been considered in the travel-time calculations, it is likely that the solubility of the wastes and waste/sediment interactions will further limit the potential concentration and contaminant migration to groundwater.

- Soil moisture movement through the sediment column has been estimated to occur over a range of rates. If one selects the minimum resulting travel time of 46 years to groundwater, there remains 36 years (since startup of disposal in 1975) before any contaminant could reach the water table.

Therefore, there is a minimum timeframe of 36 years (maximum of 500 years) during which no waste could contact the water table. Allowing a one-year closure period and a 30-year post-closure care period still allows for a five-year operating life of the facility prior to any waste arriving at the water table. This five-year operating life is well outside the current forecasted use of the NRDW Landfill. It is requested that the State of Washington allow a waiver to the liner/leachate collection system at the NRDW Landfill for the remainder of the five-year operational life.

4.0 METEOROLOGICAL CONDITIONS

Meteorological data are collected at a number of locations at the Hanford Site. Complete climatological data are available since 1945 for the Hanford Meteorological Station (HMS), located approximately five mi (eight km) west of the 200 East Area. Temperature and precipitation data from a nearby location are available for the period 1912 through 1943. A summary of these data, for the period through 1980, has been published by Stone et al. (1983). Data from the HMS are representative of the general climatic conditions that exist at the 200 East Area.

Average monthly temperatures range from a low of 29.3°F in January to a high of 76.4°F in July. The maximum monthly average temperature at the HMS during the winter is 44.5°F, and the minimum is 21.4°F, both occurring during February. The maximum monthly average temperature during the summer is 81.8°F in July, and the minimum is 63.0°F in June. The annual average relative humidity at the HMS is 54 percent, with a maximum of about 75 percent during the winter months and a minimum of about 35 percent during the summer months.

Average annual precipitation at the Hanford Meteorological Station is 6.3 in (16 cm). The months of November through February account for nearly one-half

of the annual precipitation. Fewer than one percent of the days have rainfall greater than 0.5 in (1.3 cm). Based on Hanford data, Stone et al. (1983) predicted that the maximum 24-hour rainfall event in a 100-year period would be two in (five cm). Total precipitation over the entire Pasco Basin is estimated at less than eight in (20 cm) annually. Mean annual run-off is generally less than 0.5 in (1.3 cm) for most of the basin and the basin-wide run-off coefficient, for all practical purposes, is zero (Leonhart, 1979).

Average annual evaporation can exceed 60 in (152 cm). Average annual lake evaporation ranges from approximately 39 to over 42 in (99 to over 107 cm). Actual evapotranspiration for a 6-inch (15 cm) water-holding-capacity soil (uncultivated) is approximately 7.5 to 8.5 in (19 to 22 cm) (Leonhart, 1979; Wallace, 1978). Studies by Last et al. (1976), Brown and Isaacson (1977), and Jones (1978) suggest nearly all percolated water was subsequently dispersed by evapotranspiration.

In summary, the Hanford climate is mild and dry with occasional periods of high winds. Summers are hot and dry; winters are less dry, but are relatively mild for this latitude. Average maximum temperatures occur in July, and average minimum temperatures occur in February. Average relative humidity is lowest in the summer and highest in the winter. Average annual precipitation is about 6.3 in (16 cm). The 100-year maximum predicted rainfall event in a 24-hour period is two in (five cm). Potential evapotranspiration rates greatly exceed annual precipitation rates, but much of this precipitation is received between November and February when evapotranspiration rates are least. The highest monthly average winds occur during the hot summer, creating very high evaporative potentials.

5.0 REGIONAL GEOLOGIC SETTING

5.1 INTRODUCTION

The Hanford Site in south-central Washington State is located in the Columbia Plateau Physiographic Province, which is generally defined by a thick accumulation of basaltic lava flows. These flows extend laterally from central Washington eastward into Idaho and southward into Oregon (Figure 2). Deformation of these lava flows has formed a series of broad structural and

topographic basins. The Hanford Site is located in one of these basins, the Pasco Basin, at the confluence of the Yakima and Columbia Rivers.

The Pasco Basin is bounded on the north by the Saddle Mountains; on the west by Umtanum Ridge, Yakima Ridge, and the Rattlesnake Hills; on the south by a series of doubly plunging anticlines which merge with the Horse Heaven Hills; and on the east by a broad monocline, locally known as the Jackass Mountain Monocline (Figure 3). Very little topographic relief exists within the Pasco Basin.

The stratigraphy underlying the Pasco Basin is divided into six major units. They are, in general ascending order: (1) the basement rocks, (2) the Columbia River Basalt Group, (3) the Ellensburg Formation, (4) the Ringold Formation, (5) the early "Palouse" soil, and (6) the Hanford Formation. Alluvium, colluvium and eolian sediments locally veneer the surface of the Pasco Basin. These six units are described below.

5.2 BASEMENT ROCKS

The basement rocks underlying the basaltic lava flows in the Pasco Basin are of uncertain composition. Pre-basalt rock types can be projected from the margins of the Columbia Plateau, 100 to 150 mi (160 to 240 km) away, and are inferred to exist locally in the central plateau area, perhaps beneath the Pasco Basin. For example, data from the Basalt Explorer Well northeast of the Pasco Basin indicate that sandstones and shales comparable to the sedimentary rocks of the Cascade Range may lie beneath the Pasco Basin. Recent magneto-telluric surveys (BWIP, 1978) indicate a very deep conductive section, possibly representing these sediments. Beneath these sediments are probably granitic rocks comparable to those in the Okanogan Highlands; the Snoqualmie Pass area of the Cascade Range; the Moscow Basin, Idaho; the base of the Basalt Explorer Well; and parts of the core of the Blue Mountains, Oregon. There, granitic rocks were intruded into largely Paleozoic and early Mesozoic metavolcanic and metasedimentary rocks whose equivalents might also occur beneath the Pasco Basin.

5.3 COLUMBIA RIVER BASALT GROUP

The regional geology surrounding the Pasco Basin is dominated by tholeiitic flood basalt province in the Columbia Plateau and adjacent Blue Mountains of

Washington, northern Oregon, and adjacent Idaho (Figure 2). The flood basalt province is a layered mass of more than 50.000 mi^3 (208,420 km^3) of basalt covering an area of more than 60,000 mi^2 (155,400 km^2). The flood basalts and associated rocks form a plano-convex lens. The upper surface of the lens slopes gently inward except where locally modified by fold systems (Figure 4). Basin deformation and the development of fold systems in the Columbia Plateau started between 16 and 13 million years before present and continued through Columbia River Basalt time (Bentley, 1977).

The basalts emanated from linear fissure systems in the eastern and southern portions of the Plateau (Swanson et al, 1975; Waters, 1961). Most of the basalt was emplaced during a three-million-year volcanic pulse between 16 and 13 million years before present during the Miocene Epoch (Baski and Watkins, 1973). However, sporadic fissure eruptions continued until about six million years before present (McKee et al., 1977).

The flood basalts are collectively designated the Columbia River Basalt Group, which have been subdivided into five formations (Figure 5) (Ledgerwood et al., 1978; Swanson et al., 1978). The lower two formations are the Imnaha Basalt (Hooper, 1974) and the Picture Gorge Basalt (Swanson et al., 1975). The upper three formations, the Grande Ronde Basalt, the Wanapum Basalt, and the Saddle Mountains Basalt collectively constitute the Yakima Basalt Subgroup (Swanson et al., 1978).

In the Pasco Basin near the center of the area covered by the Columbia Plateau, the basalt sequence is more than 10,000 ft (3,048 m) thick (Raymond and Tillson, 1968) and perhaps as much as 19,000 ft (5,791 m) thick (BWIP, 1978). In the Basin, a 5,000 ft (1,524 m) thick sequence of Columbia River Basalt apparently overlies a series of older basalt of Oligocene to Eocene age (Swanson et al., 1978). Approximately 100 basalt flows, including both Columbia River Basalt and older lavas have been identified from geophysical logs obtained from a 10,655 ft (3,248 m) deep borehole located along the western margin of the Pasco Basin (Swanson et al., 1978).

5.4 ELLENSBURG FORMATION

Within the upper part of the Columbia River Basalt sequence, sediments were transported into the central portion of the Columbia Plateau between basalt

eruptions. These sediments which include tuffs and tuffaceous sediments of many kinds, in part now altered to clay, form the Ellensburg Formation (Swanson et al., 1978). Many basalt flows above the Vantage sandstone interbed are capped locally by stream-deposited sediments. The extent and thickness of the sediments generally increase upward in the section.

About 15 million years ago, ancestral river systems were crossing central Washington, laying down trains of gravel, sand, silt, and clay comparable to today's Columbia River and Snake River sediments. As the plateau subsided, the ancestral Columbia River returned by gravity to the center of the Columbia Plateau, leaving sediment trains as a mark of its earlier courses. East of the present course of the Columbia River, sediments are virtually nonexistent between basalt flows. This attests to the ancestral Columbia River course being limited to the western half of the Columbia Plateau.

5.5 RINGOLD FORMATION

Deformation during the later stages of Columbia River Basalt volcanism resulted in the emergence of the Yakima fold system in the western Plateau. Growth of these folds created a system of structural ridges and basins, which include: the Ellensburg Basin, Quincy Basin, Yakima Basin, Pasco Basin and Umatilla Basin (Figure 2). Thick sequences of sediments transported from the surrounding highlands accumulated in these basins.

In the Pasco Basin, the Pliocene (Gustafson, 1978) Ringold Formation was deposited in response to a flattening of the gradient of the Columbia and Snake River systems, perhaps related to the uplift of the Horse Heaven Hills (Newcomb, 1958; Newcomb et al., 1972). The Ringold Formation in the Pasco Basin accumulated to a thickness of up to 1,200 ft (365 m).

The Ringold Formation can generally be divided into four units on the basis of texture: sand and gravel of the basal Ringold unit; clay, silt and fine sand with lenses of gravel of the lower Ringold unit; occasionally cemented sand and gravel of the middle Ringold unit; and silt and fine sand of the upper Ringold unit (Figures 5 and 6) (Brown, 1959).

The basal portion of the Ringold Formation is, in general, conformable with the surface of the underlying basalt bedrock. The lower Ringold unit is thickest in the central portion of the Pasco Basin and thins to the basin's margins. The matrix supported conglomerate of the middle Ringold unit overlies the lower unit. The upper Ringold unit is generally confined to the margins of the basin; elsewhere, it either was not deposited, or has been eroded by ancestral river systems and by Pleistocene catastrophic flooding of the basin.

5.6 EARLY "PALOUSE" SOIL

An eolian silt and fine sand (loess) overlie part of the eroded surface of the Ringold Formation in the western part of the Hanford Site (Figures 5 and 6) (Brown, 1970). Elsewhere, the silt was not deposited or was eroded during Pleistocene catastrophic flooding. The silt is considered to be the equivalent to early loesses of the Palouse Hills in eastern Washington and western Idaho. It indicates a climate comparable to that of today, with effective wind transport and deposition of sediment.

5.7 HANFORD FORMATION

The Ringold Formation and the basalts and sedimentary interbeds were locally eroded and truncated by multiple floods that occurred as ice-dammed lakes released catastrophic torrents of water and ice when the ice dams were breached during Pleistocene glaciation (Bretz, 1959; Baker, 1973; Fecht and Tallman, 1978). The floods scoured the land surface, leaving a network of buried channels crossing the Pasco Basin.

The glaciofluvial sediments in the Pasco Basin, informally named the Hanford Formation, were deposited on the Columbia River Basalt Group and Ringold Formation (Figures 5 and 6). These sediments can be divided into the coarser sand and gravel which are referred to as the Pasco Gravels (Brown, 1975), and the finer sand and silt units called the Touchet Beds (Flint, 1938).

The Touchet Beds represent low-energy (slackwater) sediments deposited in Glacial Lake Lewis, which formed when flood waters were backed up behind the Wallula Gap constriction (Flint, 1938). The Pasco Gravels represent high-energy deposition in areas of more rapid water flow. In general, the Touchet

Beds are found on the margins of the basin and the Pasco Gravels in and near the center of the basin. The characteristic variability of sediment size and degree of sorting within the "gravel" unit can be attributed to changes in water velocity and water level which occurred during the flooding process. The thickness of the Hanford Formation varies significantly within the basin, with the thickest occurrence in the region of buried channels.

5.8 EOLIAN DEPOSITS

Loess and sand dunes mantle the surface of the Pasco Basin (Lillie et al., 1978). These deposits are primarily reworked sediments of the Hanford Formation from surrounding areas. The thickness of the wind-blown sediments varies considerably, ranging from zero to more than 30 ft (9 m) in some dunes. The land surface has been only slightly modified since the deposition of the Hanford Formation. Eolian erosion and deposition have resulted in minor deflation and deposition of sand and silt veneers up to 25 ft (8 m) thick.

6.0 REGIONAL HYDROLOGIC SETTING

6.1 SURFACE HYDROLOGY OF THE HANFORD SITE AND SURROUNDING PASCO BASIN

In the Pasco Basin, the Columbia River receives surface drainage from several adjacent basins (DOE, 1984). These major tributaries include the Yakima, Snake, and Walla Walla Rivers. No perennial streams are supported by hydrologic systems operating solely within the Pasco Basin. Streamflow within the Pasco Basin is recorded as inflow at the U.S. Geological Survey gage below Priest Rapids Dam and outflow at the gage below McNary Dam. Average annual flow at these stations is 87 x 10^6 and 140 x 10^6 ac-ft/yr, (10 x 10^{12} and 17 x 10^{12} m^3/yr) respectively. A total gaged flow of approximately 45 x 10^6 ac-ft/yr enters from tributaries, and an additional 2.3 x 10^5 ac-ft/yr enter as irrigation returns.

The Hanford Site occupies approximately one-third of the land area within the Pasco Basin. Primary surface-water features associated with the Hanford Site include the Columbia and Yakima Rivers. Several artificial surface ponds and ditches are present, and are generally associated with fuel and waste processing activities (Figure 7).

Flow from approximately two-thirds of the Hanford Site is considered to drain directly into the Columbia River, although run-off is extremely low, if not zero. The section of the Columbia River along the Hanford Site reach has been inventoried and is described in detail in the U.S. Army Corps of Engineers (COE, 1977). Flow along this reach is controlled by the Priest Rapids Dam. Several drains and intakes are also present along this reach. Most notably, these include irrigation outfalls from the Columbia Basin Irrigation Project and Hanford Site intakes for the on-site water export system.

West Lake, a shallow pond [three ft (one m) deep], is the only natural pond on the Hanford Site. The pond generally averages 10 ac (30 km^2) in size. A number of man-made ditches and ponds are used for the routine disposal of chemical processing cooling waters, plant cooling water and several laboratory waste water streams (ERDA, 1975).

The Cold Creek watershed (area draining into Cold Creek) is located along the western boundary of the Pasco Basin. The 200 East Area lies outside the Cold Creek watershed. Cold Creek, trending northwest-southeast within the wash, is the only defined channel within the southeastern portion of the Hanford Site watershed (see Figure 7). The drainage system within the Cold Creek watershed may be described as ephemeral and discontinuous.

6.2 GROUNDWATER HYDROLOGY OF THE UPPERMOST AQUIFER

In this section the general characteristics of the regional hydrology are described (Gephart et al., 1979; Graham et al., 1981). The uppermost aquifer is unconfined, and within the boundaries of the Pasco Basin, lies in the Hanford glaciofluvial sands and gravels and the Ringold silts and gravels (Figures 5 and 6). The aquifer is dominated by the middle member of the Ringold Formation, consisting of sorted sands and gravels of varying induration. The bottom of the aquifer is the basalt surface or, in some areas, the clay zones of the lower member of the Ringold Formation. The aquifer is over 230 ft (70 m) thick in some areas, and thins to zero thickness along the flanks of the bordering structures.

6.2.1 Recharge

Major sources of natural recharge to the uppermost and unconfined aquifer are rainfall and run-off from the higher bordering elevations, water infiltrating

from small ephemeral streams, and river water along influent reaches of the Yakima and Columbia Rivers. The principal source of recharge occurs along the periphery of the basin where precipitation and run-off infiltrate to the water table. Small ephemeral streams draining the western slopes, such as Cold Creek and Dry Creek (Figure 7), lose water to the ground as they spread out on the valley plain. Within the basin, upward leakage from the lower basalt aquifers may enter the unconfined aquifer. Little, if any, recharge to the groundwater occurs from percolating rainfall on the broad areas of the desert terrain due to a high rate of evapotranspiration.

Artificial recharge to the groundwater occurs in the basin from two sources, agricultural irrigation and waste water disposal operations at Hanford. Agricultural irrigation on the eastern and northern sides of the Columbia River and in Cold Creek Valley to the west of the Hanford Site causes an undetermined amount of recharge to the system. Possibly as much as 40 percent of this irrigation water reaches the water table (U.S. Bureau of Reclamation, 1971). Artificial recharge from Hanford waste water disposal practices occurs principally from 200 East and 200 West Areas (the Separations Area). Although these discharges have been concentrated in U Pond, B Pond, and Gable Mountain Pond, the historical effects on the flow system have been widespread. Figure 8 shows the change in water table between January 1944 and January 1975. Beneath the Separations Area, the two groundwater mounds have developed in response to large volumes of discharge to U Pond and B Pond (Figure 9). Under U Pond the water table has risen in excess of 85 ft (26 m) since the start of disposal operations. The mound under B Pond has risen more than 30 ft (9 m).

6.2.2 Movement

From the recharge areas, the groundwater flows downgradient to the discharge areas, primarily the Columbia River. This general flow pattern is interrupted locally by the two groundwater mounds in the Separations Area. These mounds alter the flow around them as evidenced by the groundwater mound beneath 200 West Area (Figure 9).

6.2.3 Discharge

Groundwater discharge from the unconfined aquifer is principally to the Columbia River. There are lesser amounts of discharge to the Snake and Yakima

River. Discharge of the unconfined aquifer flowing under Hanford is almost exclusively to the Columbia River north of Richland, Washington. Downward leakage to the lower confined aquifer has occurred under the eastern groundwater mound. The rise in the water table above the potentiometric surface of the confined aquifer provides the potential for this leakage (Graham et al., 1984).

6.2.4 Hydraulic Properties

The geologic and hydraulic properties of the Pasco Basin sediments are highly variable. The range of hydraulic conductivities can be several orders of magnitude. Figure 10 shows the areal distribution and range of hydraulic conductivities at the site. There have been numerous aquifer tests performed in the Pasco Basin, the majority of which were done on the Hanford Site. Gephart et al. (1979) presents results from more than 100 tests on the Pasco Basin. These results are summarized in Table 2.

6.2.5 Water Quality

Table 3 presents the mean of major chemical constituent concentrations in the groundwater in the basal Ringold unit and the Hanford Formation glaciofluvial sediments. Figure 11 provides an Equivalent Parts Per Million (EPM) comparison for selected ions of the unconfined aquifer from the Hanford Site and the Pasco Basin.

6.3 GROUNDWATER HYDROLOGY OF THE UNDERLYING AQUIFER

The underlying aquifer is generally confined and consists of sedimentary interbeds and/or interflow zones which occur between dense basalt flows in the Columbia River Basalt Group (Figures 5 and 6) (Graham et al., 1981). In some areas of the Hanford Site, post-glacial flood waters and the ancestral Columbia River eroded portions of the basaltic rock that separate the upper unconfined aquifer from the underlying confined aquifer (Graham, et al., 1984). The main water-bearing portion of the interflow zone occurs within a network of interconnecting vesicles and fractures of the flow tops or flow bottoms. The confining layers are dense basalt flows. Vertical cooling joints and fractures within the confining layers can permit localized leakage. This appears to be more prevalent in near-surface basalt flows.

Confined aquifers are known to underlie the Separations Area to a depth of 5,660 ft (1,725 m) as evidenced from borehole ARH-DC-1 (Figure 12). Additional aquifers may exist at greater depths. The confined aquifers are continuous throughout most of the Pasco Basin, except where the aquifers have been eroded or stratigraphically pinched out. The thicknesses of the aquifers vary from over 170 ft (52 m) with the Mabton interbed, to a few inches in some basalt flow contacts.

6.3.1 Recharge

Recharge to the Saddle Mountains Basalt occurs primarily at outcrops and near-surface subcrops as water infiltrates from precipitation and stream run-off. These recharge areas are the Rattlesnake Hills, Yakima Ridge, Umtanum Ridge, and the Saddle Mountains (Figures 3 and 7). Artificial recharge occurs from irrigation and irrigation run-off along the eastern and northeastern sections of the Pasco Basin.

6.3.2 Movement

The potentiometric surface for the underlying aquifer is influenced by the areas of recharge and discharge. The potentiometric surface gradient indicates the groundwater flow direction. In the Pasco Basin, this movement is assumed to conform closely with the regional dip of the basalts. However, in the Separations Area, flow is toward the Gable Mountain-Gable Butte area. Present day water levels show that the water table lies above the potentiometric surface of the underlying aquifer under major disposal ponds, creating the potential for aquifer leakage from the uppermost to the underlying aquifers in these areas.

6.3.3 Discharge

The major discharge area for the Saddle Mountains Basalt aquifers is presently assumed to be the Columbia River near Richland, Washington (Gephart, et al., 1979). In this area, the potentiometric surface lies above the mean stage of the river. Minor discharge also occurs to the Yakima River west of Richland and the Columbia River north of Umtanum Ridge.

6.3.4 Hydraulic Properties

Hydraulic conductivity values for the Saddle Mountains Basalt aquifers were obtained primarily by pump tests conducted at wells within the Hanford Site

(Figure 12). The ranges of hydraulic properties for the underlying aquifers in these wells are presented in Table 4.

6.3.5 Water Quality

Table 5 lists the mean and range of major chemical constituent concentrations for the groundwater in the Mabton interbed. The Mabton interbed is used to represent the confined aquifer system of the Saddle Mountains Basalt since it is extensive throughout the Pasco Basin and contains the most reported chemical analyses (Gephart, et al., 1979). On the average, the confined system contains much lower total dissolved solids than the unconfined aquifer and is of a sodium bicarbonate chemical type. This confined aquifer is also characteristically low in nitrate because of its isolation from surface contaminants. However, in the B Pond/Gable Mountain Pond area, intermixing of groundwater from the unconfined aquifer has occurred, as indicated from elevated nitrate and tritium concentrations in the Rattlesnake Ridge aquifer.

A small, depleted, low-pressure natural gas field (in production from 1929 to 1941) is present at the southern edge of the Hanford Site, 7 mi (11 km) south of the Separations Area. Interpretation of carbon and hydrogen isotopic data for methane gas from the underlying aquifers of the Wanapum and Saddle Mountains Basalts in the vicinity of the Hanford Site suggest the gas probably originated at shallow depths, from terrestrial carbonaceous matter in the interbeds of the Ellensburg Formation rather than from marine sediments at depth (DOE, 1984). The impact of these naturally-occurring hydrocarbons on groundwater geochemistry has not been assessed for either the uppermost aquifer or the underlying aquifer.

7.0 GEOLOGY OF THE NRDW LANDFILL

The NRDW Landfill geologic study area encompassed an area 4.5 mi by 5.0 mi (7.2 km by 15.2 km) (Figure 14) in order to provide sufficient well data to allow construction of two geologic cross-sections oriented approximately perpendicular to each other. Rock stratigraphic units were used that follow the stratigraphic nomenclature of Myers and Price (1981). Data gathered by other workers (Puget Sound Power and Light Company, 1981; Routson and Fecht, 1979; Fecht and Lillie, 1982) were re-evaluated and assigned a stratigraphic

position based on rock-stratigraphic criteria. The locations of wells referred to in the text and used to construct cross-sections are shown in Figure 14. Geologic cross-sections showing stratigraphic relations are given in Figures 15 and 16.

The unsaturated (vadose) zone beneath the NRDW Landfill is about 125 ft (38 m) in thickness and sediments within this zone are composed predominantly of gravels and sands of the Pleistocene Hanford Formation. The top of the uppermost aquifer, the water table, marks the lower boundary of the unsaturated zone. The bottom of the uppermost aquifer generally coincides with the top of the Saddle Mountains Basalt.

Five drill holes (699-19-27, 699-21-30, 699-23-33, 699-25-31, 699-28-30) penetrate to the Elephant Mountain Member of the Saddle Mountains Basalt of the Columbia River Basalt Group (see Figure 7 and 8). The Elephant Mountain Member consists of two basalt flows and averages about 145 ft (44 m) in thickness in the study area. The Miocene to Pliocene Ringold Formation overlies the Elephant Mountain Member and ranges in thickness from 245 to 520 ft (75 to 150 m) in the study area. The Ringold Formation has been divided into four textural units following Myers and Price (1981), the basal, lower, middle, and upper units.

The basal Ringold unit overlies the Elephant Mountain Member throughout the study area and varies in thickness from 45 to 95 ft (14 to 29 m). This unit is chiefly a gravel to silty, sandy gravel with minor medium- to fine-grained sand and silt or clay lens. The lower Ringold unit overlies the basal unit throughout the study area except at well 699-14-47 where Routson and Fecht (1979) suggest it pinches out against the basal unit. Where wells were completed through the lower unit, measurements indicate the thickness varies from 45 to 250 ft (14 to 76 m). The texture of this unit ranges from clay to gravelly sandy clay to silty sand with some gravel.

The sandy gravel to gravelly sand of the middle Ringold unit is present throughout the study area. The thickness, where measured, ranges from 90 to 219 ft (27 to 67 m). The upper Ringold unit is present in the more easterly portion of the study area and ranges in thickness from 28 to 84 ft (eight to

26 m). This unit consists of gravelly silty sands, sandy silts, and minor clay and gravel lenses. Caliche horizons are common.

The Hanford Formation blankets the Ringold Formation throughout the study area and varies in thickness from 150 to 244 ft (46 to 74 m). The Pasco gravels facies of the Hanford Formation is the only facies present and the texture ranges from gravel to silty sandy gravel to sand. The coarser portion of the Pasco gravels is composed of boulder to fine pebble-sized gravels with relatively high basalt percentages (up to 50 percent). The finer portions of the Pasco gravels are composed of either gray medium to very coarse sand with high basalt percentages or brown very fine to very coarse, largely non-basaltic sands. The uppermost textural unit present in the study area is sand to sandy gravel. The sand units are thicker towards the east and southeast, while gravels and silty sandy gravels are more abundant westwards. Lower in the section, gravels and silty sandy gravel units are more abundant; open-work gravels are common near the base of the Hanford Formation. A generalized stratigraphic column for the landfill is shown in Figure 17.

Field observations in the recently excavated waste disposal Trench Number 26 (see Figure 2 for location) show about 14 ft (4 m) of Hanford Formation sands overlain by about 5 ft (1.5 m) of eolian sands. Of the Hanford Formation sands, about 1.3 ft (0.4 m) of very coarse to coarse gray sand was exposed at the base of the trench (Figure 18). The massively bedded sand grades to finer sand upwards and the contact with the overlying unit is indicated by a powdery calcium carbonate horizon about 0.25 to 0.5 in (0.6 to 1.3 cm) thick. The tabular cross-bedding and brown color of the overlying 5 ft (1.5 m) of slightly silty, very fine to medium sand contrast well with the lowermost sand unit. Laminations of fine and very fine sand alternate with medium sands and incline about 12 degrees to the south. The contact with the overlying unit is sharp, non-planar, and marked by a thin yellowish crust. About 8 ft (2.4 m) of horizontally-bedded, slightly pebbly medium to coarse gray sand overlie the very fine to medium sand unit. The contact with the overlying eolian unit appears gradational over about 6 in (15 cm), and is marked by a powdery peach colored calcium carbonate horizon about 0.5 to 2 in (1.3 to 5 cm) thick. The overlying eolian sand is light brown in color and contains sparse cobbles, pebbles and rootlets. No bedding structures were observed.

In summary, the Elephant Mountain Member is the bedrock for the bottom of the uppermost aquifer under the NRDW Landfill. The stratigraphic column above the Elephant Mountain Member consists of the layered sediments of the Hanford and Ringold Formations to a thickness of 640 ft (195 m) under the NRDW Landfill. The vadose zone (unsaturated) occurs in the top 125 ft (38 m) of the Hanford Formation before contacting the water table. The variable textures of the layered sedimentary units form a complex vadose zone system which greatly impacts liquid migration through the system. Medium and fine sand units form the upper Hanford sediments locally at the NRDW Landfill. Sediments are coarser-grained sands and gravels at depth.

8.0 HYDROLOGY OF THE NRDW LANDFILL

8.1 HYDRAULIC PROPERTIES OF THE UPPERMOST AQUIFER

The primary aquifer of interest under the NRDW Landfill is the uppermost aquifer. Groundwater flow in the uppermost aquifer under the Landfill occurs from west-northwest and east-southeast toward the Columbia River (Figure 9). Depth to groundwater at the nearest well (see Figures 1 and 9), 699-24-33 is 121.19 ft (37 m). The water table elevation at well 699-24-33 is 403.02 ft (122.84 m) msl, and at the uppermost well 699-28-40 is 403.78 ft (123.07 m) msl. The water table gradient between these wells is 0.52 ft/mi (0.098 m/km). Therefore, the water table beneath the Landfill is known to at least within 0.5 ft (1.3 cm) and the depth to water directly beneath the Landfill is 125 ±0.5 ft (38 ± 0.013 m). Table 6 gives depth to water and water table elevation data from semi-annual measurements since 1975 for five wells monitoring the unconfined aquifer near the Landfill.

The aquifer transmissivity has been reported at 373,000 ft/day (113,690 m/day), with hydraulic conductivity of 8,600 ft/day (2621 m/day) for well 699-24-33 (Gephart et al., 1979). Transmissivities generally within the NRDW Landfill study area range above 1,000 to 10,000 ft/day (305 to 3048 m/day). These are among the highest on the Hanford Site.

Flow occurs regionally from west to east and the head drop from the Landfill to the aquifer discharge at the Columbia River is about 55 ft (16.8 m) in ten

mi (16 km), or 5.5 ft/mi (1.05 m/km). Groundwater flow velocities have been estimated at five ft/day based on average tritium contaminant plume migration from 200 East Area (Graham et al., 1981) (Figure 19). Flow path time calculations based on this estimated flow velocity from the NRDW Landfill Site give a travel time of 28 years to the Columbia River following flow-paths through equipotential lines (Figure 9). Flow path time calculations based on the Hanford Pathline Calculation Program (HPCP) (Friedrichs et al., 1977) give a travel time of 60 years to the Columbia River.

In summary, the uppermost aquifer is the aquifer of interest. Flow occurs regionally from west to east and the head drop from the NRDW Landfill to the aquifer discharge at the Columbia River is 5.5 ft/mi (1.05 m/km). Flow path time to the Columbia River has been estimated at 28 years. Hydraulic conductivities and transmissivities in the uppermost aquifer under the NRDW Landfill are high and occur in the layered sediments of the Hanford Formation.

8.2 WATER QUALITY OF THE UPPERMOST AQUIFER

Chemical analyses are available for well samples collected on the Hanford Site between the years 1974 and 1984 by the U.S. Geological Survey (USGS), the Pacific Northwest Laboratory (PNL) and Rockwell Hanford Operations (Rockwell). These analytical results are reported in annual documents by PNL (Raymond et al., 1976; Myers et al., 1976, 1977; Myers, 1978; Eddy, 1979; Eddy and Wilbur, 1980, 1981; Eddy et al., 1982, 1983; Prater et al., 1984) and Rockwell (Wilbur and Graham, 1982; Wilbur et al., 1983; Law and Allen, 1984). Water quality data of the uppermost aquifer elsewhere in the Pasco Basin were obtained by the USGS. The means, standard deviations, and ranges for the various constituents of two data sets for the years 1974 through 1979 are given in Table 7.

These waters are principally a calcium-bicarbonate type, although considerable variability in chemical composition exists between individual samples. This is primarily attributed to natural variability of sediments within the aquifer. The chemical character of the groundwater is influenced by its proximity to recharge areas, its rate of movement, and the chemical and physical nature of the sediments it flows through. Some of the variation between the Hanford groundwater samples and the Pasco Basin groundwater samples is attributed to liquid waste disposal at Hanford. The high nitrate concentrations in Hanford

waters are the result of waste disposal; Law and Allen (1984) present a nitrate isopleth map for the Hanford Site.

Water quality at the Landfill is similar to the regional uppermost aquifer. Figure 20 provides Stiff diagrams for wells in the vicinity of the NRDW Landfill. As can be seen, calcium bicarbonate waters dominate the site locally.

Water quality is an important consideration because water from the uppermost aquifer is pumped from wells 499-SO-7 and 499-SO-8 for drinking water use (Maas, 1984). These wells are located at the Fast Flux Test Facility (FFTF) site (Figure 9), which is downgradient from the NRDW Landfill approximately 6.5 mi (10.4 km) southeast.

9.0 VADOSE ZONE HYDROLOGY OF THE NRDW LANDFILL

Recharge to groundwater in areas without artificial and surface water sources results from the infiltration and redistribution of natural precipitation. After the burial operations are completed at a landfill trench, the primary source for recharge will be percolation through the sediments surrounding the buried solid waste. The movement of precipitation is a continuous cyclic process. The cycle is initiated with entrance of precipitation into the soil by infiltration. This is followed by temporary storage and redistribution of water in the sediments. The final part of the cycle is the removal of water from the sediments by evaporation, transpiration (plant uptake) and deep drainage (recharge) to a water table.

This cycle can reasonably be viewed as a quasi-steady-state process on the average in the deep sediments. The moisture content in the deeper sediments below a landfill tends to remain constant (Jones, 1978; Last et al., 1976). The travel time of deep draining moisture to some depth, such as the groundwater, can be determined if the recharge rate and volumetric water content of the sediment are known (Heller et al., 1985). The recharge rate is the depth (amount) of water entering the groundwater in a year. The volumetric water content is an expression of the volume of water to the volume of soil. It is, in essence, the effective porosity of the unsaturated system. The average

volumetric water content was found to vary from 8 to 18 percent in three sediment types in a well in similar sediments to those found at the landfill (Heller et al., 1985). Table 8 lists the volumetric water content in the study-well as a function of depth. The most conservative value (eight percent) was used to minimize calculated travel time. Dividing the recharge (cm/yr) by the volumetric water content will give the depth that the recharge will travel in a year (the velocity). Dividing the depth to groundwater by the velocity gives the time it will take recharge to travel from the bottom of a landfill to groundwater. Table 9 details these equations and shows a sample calculation.

Studies at the Hanford Site have focused on determining recharge directly, rather than subtracting evapotranspiration from precipitation. Potential evapotranspiration is greater than precipitation at the Hanford Site, and thus, recharge has been evaluated directly because subtracting numbers of about the same value may result in a number of limited precision.

Two types of studies have been conducted to determine recharge. In the first type of study, moisture content in two lysimeter studies was followed to estimate recharge. In the second type of study, the movement of buried unsorbed radioactive wastes as a function of time has been evaluated to estimate recharge.

9.1 300 AREA LYSIMETER RECHARGE STUDY

The 300 Area lysimeter facility consists of two large 9.8 ft (3 m) diameter by 24.9 ft (7.6 m)-deep cylindrical culverts, four smaller 2 ft (0.6 cm) diameter by 24.9 ft (7.6 m)-deep caissons, and two 4.9 x 4.9 ft^2 (0.45 x 0.45 m^2) and 4.9 ft (1.5 m)-deep weighing lysimeters. Drainage is measured directly in the weighing lysimeters and in the deep lysimeters by collecting and recording the amount of water that has collected at the bottom of these lysimeters. Recharge rate has been measured for the period 1980-1983. These four years have all had above-normal precipitation with 1983 having a total of 11 in (28 cm) (the third highest on record). Recharge rate for the various years averaged 1.2 in/yr (3.0 cm/yr) with a range of 0.4 - 2.2 in/yr (1.1-5.6 cm/yr) (Gee et al., 1981, Jones and Gee, 1984).

9.2 200 AREA DEEP LYSIMETER RECHARGE STUDY

A 9.8 ft wide by 59 ft deep (3 m x 18 m) closed bottom lysimeter was established on the Hanford 200 Area plateau in 1971. The closed bottom assures that recharge will collect in the bottom of the lysimeter. Moisture content was monitored in the lysimeter by the means of a neutron probe with an accuracy of about 0.5 percent moisture (Jones, 1978). Detectable moisture change has not been observed below a depth of 39.4 ft (12 m) (Jones, 1978). Considering the limitations of the measurements the maximum recharge rate was determined to be 0.2 in/yr (<0.5 cm/yr).

9.3 BC CRIB RECHARGE

Liquid waste was placed in the 216-B-20 specific retention trench in 1956 (Fecht et al., 1977). Thus, this waste has been leached by any recharge for 28 years. The waste is known to contain poorly sorbed gamma emitting radionuclides and would be readily transported with any moisture in a manner analogous to the transport of many hazardous wastes (e.g., organic solvents). Down-well total gamma (scintillation probe) logs have been taken periodically (four times) from 1963-1984 (Addition et al., 1978). Figures 16 and 17 are total gamma logs of well E13-7 monitoring the 216-B-20 Trench for 1963, 1968, 1978 and 1984, respectively. It can be seen that the waste front was transported <6.6 ft (2 m) over this 21-year period. Assuming a sediment moisture content of eight percent (Heller et al., 1985), the calculated recharge rate would be 0.3 in/yr (<0.8 cm/yr).

9.4 RECHARGE TRANSPORT

From the above studies, it can be seen that recharge rate at the Hanford Site tends to be low. It is estimated to range from about <0.2 in/yr to 2.2 in/yr (<0.5 cm/yr to 5.6 cm/yr) with the deepest-longest term studies supporting the lowest estimates. Using the maximum and minimum established values of 2.2 in/yr (5.6 cm/yr) and 0.2 in/yr (<0.5 cm/yr) for the recharge rate, recharge would be transported toward groundwater at 27.5 in/yr (70 cm/yr) and 2.5 in/yr (6.3 cm/yr) respectively, based on a sediment moisture content of eight percent (Heller et al., 1985). At this rate, it requires between 46 years and 510 years for the initial recharge to travel the approximately 105 ft (3200 cm) from the bottom of a waste trench to the surface of the uppermost aquifer.

In review, water is the transporting medium for moving waste from the disposal trench to the groundwater. Studies have been conducted to directly estimate recharge rate, and bounding rates have been estimated. The highest recharge rates were found for the shallowest, shortest-term studies during a year of near maximum expected rainfall. Deeper and in situ based recharge measurements, which can be expected to give more average recharge rates, result in almost an order of magnitude lower values. The minimum travel time of 46 years through the vadose zone to groundwater is conservative.

9.5 MODEL EVALUATION

The use of models to evaluate recharge is an indirect approach. Recharge is essentially estimated from the difference between precipitation and evapotranspiration (ET) (or ET and run-off for humid sites). For arid sites, such as Hanford, precipitation and evapotranspiration approach the same value. Relatively small errors in either of these quantities can result in a large error in recharge. Furthermore, annual estimated ET can have large errors (50 percent or more). Methodologies currently available for estimating ET work well only in irrigated or humid areas. There appears to be no feasible way to directly measure ET for desert plants except in somewhat limited-sized weighing lysimeters. Such measurements have not been made at Hanford, although they are in the planning stage.

Three models were considered for refining or confirming Hanford recharge values. These models are HELP, UNSAT1D, and CREAMS (Thompson and Tyler, 1984; Peck et al., 1981). All three of these models utilize water balance approaches.

The CREAMS hydrology model is essentially a deterministic, lumped input, lumped parameter type model. Its hydrology submodel is a simplified representation of the hydrology cycle and incorporates only those components of the cycle that directly affect erosion, sedimentation, and chemical processes in agricultural systems.

The HELP model utilizes a deterministic water budget code which performs a sequential daily analysis to determine run-off, evapotranspiration, percolation. and lateral drainage to obtain daily, monthly, and annual water budgets.

UNSAT1D is a sophisticated flow code that solves the differential equation describing groundwater flow under saturated and partially saturated conditions. This equation accounts for fluid movement from both capillary and gravitational forces. The solution scheme of UNSAT1D is finite-difference-based and allows for the rapid numerical evaluation of the governing differential equation. The code has been verified with analytical solutions. The UNSAT1D code requires site-specific input data and a thorough understanding of unsaturated flow theory.

UNSAT1D is designed for use under varied field conditions. Water application can come from precipitation, irrigation, or ponding. Actual evapotranspiration can be estimated as a function of moisture content and potential evapotranspiration (PET). The hydraulic properties of the soils can be defined as polynomials or user-defined mathematical equations. The lower boundary conditions can be water table, dynamic, qausi-dynamic, or unit gradient.

The CREAMS and HELP models are similar in most respects and should give similar results for determining recharge. For example, ET and run-off are determined using nearly identical methods, and percolation is determined by slightly different, but comparable, deterministic methods. A comparison of HELP and UNSAT1D was made (Thompson and Tyler, 1984). Those models were found to give similar results for humid areas; however, the UNSAT1D code was found to give more representative results for arid areas and dryer soil conditions. None of the models can be expected to give precise recharge values since they are water balance approaches. However, the UNSAT1D model can be used to verify the reasonableness of recharge values derived from direct measurements. The deterministic models do not offer this possibility.

Five wells were characterized from the surface to groundwater at Hanford to determine the soil parameters required by the UNSAT1D model (Heller et al., 1985). The moisture transport governing equations were rearranged to allow the calculation of a measured parameter (moisture content) from the recharge. Moisture content is the parameter which links all of the moisture transport governing equations, and the model is sensitive to its value. Substituting

the recharge from previous, direct measurements 0.2 to 2.2 in/yr (0.5 to 5.0 cm/yr) into the equations closely predicted the water content measured in the sediments (Heller et al., 1985). This is strong indication that recharge is in the range of 0.2 to 2.2 in/yr (0.5 to 5.0 cm/yr).

10.0 REFERENCES

Additon, M. K., K. R. Fecht, R. L. Jones, and G. V. Last, 1978, Scintillation Probe Profile 200 East Area Crib Monitoring Well, RHO-LD-28, Rockwell Hanford Operations, Richland, Washington.

ARCO, 1975, Atlantic Richfield Hanford Company Presentation to Dr. R. R. Chambers, Richland, Washington, June 25-26.

Baker, V. R., 1973, Paleohydrology and Sedimentology of the Lake Missoula Flooding in Eastern Washington, Geological Society of America Special Paper 144.

Baksi, A. K., and N. D. Watkins, 1973, "Volcanic Production Rates - Comparison of Oceanic Ridges, Islands, and Columbia Plateau Basalts," Science, 180, pp. 493-496.

Bentley, R. D., 1977, Stratigraphy of the Yakima Basalts and Structural Evolution of the Yakima Ridges in the Western Columbia Plateau, Geological Excursions in the Pacific Northwest, Geological Society of America 1977 Annual Meeting, pp. 339-389.

Bretz, J. H., 1959, Washington's Channeled Scabland, Washington Division of Mines and Geology, Bulletin 45.

Brown, D. J., 1959, Subsurface Geology of the Hanford Separation Areas, HW-61780, General Electric Electric Company, Richland, Washington.

Brown, D. J., 1970, An Eolian Deposit Beneath 200 West Area, HW-67549, General Electric Company, Richland, Washington.

Brown, D. J., and R. E. Isaacson, 1977. The Hanford Environment as Related to Radioactive Waste Burial Grounds and Transuranium Waste Storage Facilities, ARH-ST-155, Atlantic Richfield Hanford Company, Richland, Washington.

Brown, R. E., 1975, "Groundwater and the Basalts in the Pasco Basin." Proceedings of the Thirteenth Engineering Geology and Soils Engineering Symposium, Moscow, Idaho.

BWIP (Basalt Waste Isolation Program), 1978, Annual Report - Fiscal Year 1978, RHO-BWI-78-100, Rockwell Hanford Operations, Richland, Washington.

COE (U.S. Army Corps of Engineers), 1977, Reach Inventory, Columbia River Headwater McNary Reservoir to Grande Coulee Dam, CRT-34, U.S. Army Corps of Engineers, North Pacific Division, Portland, Oregon.

DOE (U.S. Department of Energy, Office of Civilian Radioactive Waste Management), 1984, Draft Environmental Assessment Reference Repository Location, Hanford Site, Washington, DOE/RW-0017, Rockwell Hanford Opeations for the U.S. DOE, Richland, Washington.

DOE RL, (U. S. Department of Energy) Richland, Operations Office, 1984, "Calendar Year 1984 Generator Annual Dangerous Waste Report", TSD Facility Annual Dangerous Waste Report, Richland, Washington.

REFERENCES

(Continued)

Eddy, P. A., 1979, Radiological Status of Ground Water Beneath the Hanford Project, January - December, 1978, PNL-2899, Pacific Northwest Laboratory, Richland, Washington.

Eddy, P. A., and J. S. Wilbur, 1980, Radiological Status of the Groundwater Beneath the Hanford Project, January - December, 1979, PNL-3346, Pacific Northwest Laboratory, Richland, Washington.

Eddy, P. A., and J. S. Wilbur, 1981, Radiological Status of the Ground Water Beneath the Hanford Site, January - December, 1980, PNL-3768, Pacific Northwest Laboratory, Richland, Washington.

Eddy, P. A., C. S. Cline, and L. S. Prater, 1982, Radiological Status of the Ground Water Beneath the Hanford Site, January - December, 1981, PNL-4237, Pacific Northwest Laboratory, Richland, Washington.

Eddy, P. A., L. S. Prater, and J. T. Rieger, 1983, Groundwater Surveillance at the Hanford Site for CY 1982, PNL-4659, Pacific Northwest Laboratory, Richland, Washington.

EPA (Environmental Protection Agency), 1982a, Groundwater Monitoring Guidance For Owners and Operators of Interim Status Facilities. Instructions For Complying With 40 CFR Part 275, Subpart F, SW-963, U.S. Environmental Protection Agency, Washington, D.C.

EPA (Environmental Protection Agency), 1982b, Hazardous Waste Mangement System: Permitting Requirements For Land Disposal Facilities, Federal Register (32293) Vol. 47, No. 143, Monday, July 27, 1982.

EPA (Environmental Protection Agency), 1985, Hazardous Waste Management System: Final Rule, Federal Register (SWH-FRL 2724-6), Vol. 50, No. 135, Monday, July 15, 1985.

ERDA (U. S. Energy Research and Development Administration), 1975, Final Environmental Statement - Waste Management Operations, Hanford Reservation, Richland, Washington, ERDA-1538, 2 Volumes, U.S. Energy Research and Development Administration, Washington, D.C.

Fecht, K.R., G.V. Last, and K.R. Price, 1977, Evaluation of Scintillation Probe Profiles From 200 Area Crib Monitoring Wells, Vol. 11, ARH-ST-156, Rockwell Hanford Operations, Richland, Washington.

Fecht, K. R., and A. M. Tallman, 1978, "Bergmounds Along the Western Margin of the Channeled Scablands" Geological Society of America Abstracts with Program, 10, p. 400.

Fecht, K. R., and J. T. Lillie, 1982, The Catalog of Borehole Litholgic Logs From the 600 Area, Hanford Site, RHO-LD-58, Rockwell Hanford Operations, Richland, Washington.

REFERENCES

(Continued)

Flint, R. F., 1938, Origin of the Cheney-Palouse Scabland Tract, Geological Society of America Bulletin, 49, pp. 461-524.

Friedrichs, D. R., C. R. Cole, R. C. Arnett, 1977, Hanford Pathline Calculations Program - Theory, Error Analysis and Applications, ARH-ST-149, Atlantic Richfield Hanford Company, Richland, Washington.

Gee, G. W., A. C. Campbell, P. K. Wierenga, and T. L. Jones, 1981. Unsaturated Moisture and Radionuclide Transport, PNL-3616, Pacific Northwest Laboratory, Richland, Washington.

Gephart, R. E., et al., 1979, Hydraulic Studies Within the Columbia Plateau, Washington: An Integration of Current Knowledge, RHO-BWI-ST-5, Rockwell Hanford Operations, Richland, Washington.

Graham, M. J., M. D. Hall, S. R. Strait, and W. R. Brown, 1981, Hydrology of the Separations Area, RHO-ST-42, Rockwell Hanford Operations, Richland, Washington.

Graham, M. J., G. V. Last, and K. R. Fecht, 1984, An Assessment of Aquifer Intercommunication in the B-Pond/Gable Mountain Pond Area, Hanford Site, RHO-RE-ST-12P, Rockwell Hanford Operations, Richland, Washington.

Gustafson, E. P., 1978, "The Vertebrate Faunas of the Pliocene Ringold Formation, South-Central Washington," Museum of Natural History Bulletin No. 23, University of Oregon, Eugene, Oregon.

Heller, P. R., G. W. Gee, and D. A. Meyer, 1985, Moisture and Textural Variations in Unsaturated Soil/Sediments Near the Hanford Wye Barricade, PNL-5377, Pacific Northwest Laboratory, Richland, Washington.

Hooper, P. R., 1974, Petrology and Chemistry of the Rock Creek Flow, Columbia River Basalt, Idaho, Geological Society of America Bulletin, 84, pp. 15-26.

Jones, T. L., 1978, Sediment Moisture Relations: Lysimeter Project 1976-1977 Water Year, RHO-ST-15, Rockwell Hanford Operations, Richland, Washington.

Jones, T. L., and G. W. Gee, 1984, Asssessment of Unsaturated Zone Transport for Shallow Land Burial of Radioactive Waste, PNL-4747, Pacific Northwest Laboratory, Richland, Washington.

Last, G. V., P. G.,Easley, and D. J. Brown, 1976, Soil Moisture Transport During the 1974-1975 and 1975-1976 Water Years, ARH-ST-146, Atlantic Richfield Hanford Company, Richland, Washington.

Law, A. G., and R. M. Allen, 1984, Results of the Separations Area Groundwater Monitoring Network for 1983, RHO-RE-SR-84-24P, Rockwell Hanford Operations, Richland, Washington.

REFERENCES

(Continued)

Ledgerwood, R. K., C. W. Myers, and R. W. Cross, 1978, Pasco Basin Stratigraphic Nomenclature, RHO-BWI-LD-1, Rockwell Hanford Operations, Richland, Washington.

Leonhart, L. S., 1979, Surface Hydrologic Investigations of the Columbia Plateau Region, Washington, RHO-BWI-ST-6, Rockwell Hanford Operations, Richland, Washington.

Lillie, J. T., A. M. Tallman, and J. A. Caggiano, 1978, Preliminary Map of the Late Cenozoic Sediments in the Western Half of the Pasco Basin, RHO-BWI-LD-8, Rockwell Hanford Operations, Richland, Washington.

Maas, L. J., 1984, Hanford Sanitary Water Quality Surveillance CY1983, HEHF-42, Hanford Environmental Health Foundation, Richland, Washington.

McKee, E. H., D. A. Swanson, and T. L. Wright, 1977, "Duration and Volume of Columbia River Basalt Volcanism, Washington, Oregon, and Idaho," Geological Society of America Abstract with Programs, 9, pp. 463-464.

Myers, C. W., and S. M. Price, 1981, Subsurface Geology of the Cold Creek Syncline, RHO-BWI-ST-14, Rockwell Hanford Operations, Richland, Washington.

Myers, D. A., 1978, Environmental Monitoring Report on the Radiological Status of Ground Water Beneath the Hanford Site, January - December, 1977, PNL-2624, Pacific Northwest Laboratory, Richland, Washington.

Myers, D. A., J. J. Fix, P. J. Blummer, J. R. Raymond, V. L. McGhan, and E. L. Hilty, 1976, Environmental Monitoring Report of the Ground Water Beneath the Hanford Site, January - December, 1975, BNWL-2034, Battelle Pacific Northwest Laboratory, Richland, Washington.

Meyers, D. A., J. J. Fix, and J. R. Raymond, 1977, Environmental Monitoring Report of the Hanford Site January - December, 1976, BNWL-2119, Battelle Pacific Northwest Laboratory, Richland, Washington.

Newcomb, R. C., 1958, "Ringold Formation of Pleistocene Age in Type Locality, The White Bluffs, Washington," American Journal of Science, 256, pp.328-340.

Newcomb, R. C., J. R. Strand, and F. J. Frank, 1972, Geology and Groundwater Characteristics of the Hanford Reservation of the U. S. Atomic Energy Commission, Washington, U. S. Geological Survey Professional Paper 717, U.S. Government Printing Office, Washington, D.C.

Peck, E. L., R. S. McGivey, T. M. Keefer, E. P. Johnson, and J. L. Erekson, 1981, Review of Hydrologic Models for Evaluating Use of Remote Sensing Capabilities, NASA CR 166674, Hydex Corporation, Fairfax, Virginia.

Prater, L. S., J. T. Rieger, C. S. Cline, E. J. Jensen, T. Liikalla, K. R. Oster, and P. A. Eddy, 1984, Ground-Water Surveillance at the Hanford Site for CY1982, PNL-5041, Pacific Northwest Laboratory, Richland, Washington.

REFERENCES

(Continued)

Puget Sound Power and Light Company, 1981, Preliminary Safety Analysis Report Skagit/Hanford Nuclear Project, Amendment 23, Vol. 6, Bellevue, Washington.

Raymond, J. R., D. A. Myers, J. J. Fix, V. L. McGhan, and P. M. Shrotke, 1976, Environmental Monitoring Report on the Radiological Status of Ground Water Beneath the Hanford Site, January - December, 1974, BNWL-1970, Battelle Pacific Northwest Laboratory, Richland, Washington.

Raymond, J. R., and D. D. Tillson, 1968, Evaluation of a Thick Basalt Sequence in South-Central Washington, BNWL-776, Battelle Pacific Northwest Laboratory, Richland, Washington.

Routson, R. C. and K. R. Fecht, 1979, Soil (Sediment) Properties of Twelve Hanford Wells, RHO-LD-82, Rockwell Hanford Operations, Richland, Washington.

Schatz, A. L., 1985, The Unconfined Aquifer and Rattlesnake Ridge Aquifer Water-Level Measurements, Data Maps December 1984, H-2-38396, Rev. 18, Hanford Reservation Water-Table Map, Richland, Washington.

Stone, W. A., J. M. Thorp, O. P. Gifford, and D. J. Hoitnik, 1983, Climatological Summary for the Hanford Area, PNL-4622, Pacific Northwest Laboratory, Richland, Washington.

Swanson, D. A., T. L. Wright, and R. T. Helz, 1975, "Linear Vent Systems and Estimated Rates of Magma Production and Eruption for the Yakima Basalt on the Columbia Plateau," American Journal of Science, 275, pp. 877-905.

Swanson, D. A., T. L. Wright, P. R. Hooper, and R. D. Bentley, 1978, Revisions in Stratigraphic Nomenclature of the Columbia River Basalt Group, U.S. Geological Survey Bulletin 1457, U.S. Government Printing Office, Washington, D.C.

Tallman, A. M., K. R. Fecht, M. C. Marratt, and G. V. Last, 1979, Geology of the Separtion Areas, Hanford Site, South-Central Washington, RHO-ST-23, Rockwell Hanford Operations, Richland, Washington.

Thompson, F. L., and S. W. Tyler, 1984, Comparison of Two Groundwater Flow Models-UNSAT1D and HELP, EPRI CS-3695, Project 1406-1 Topical Report, Battelle Pacific Northwest Laboratory, Richland, Washington.

U.S. Bureau of Reclamation, 1971, Columbia Basin Project, Deep Percolation as a Percentage of Water Allotment, WTL Code 493, Ephrata, Washington.

Wallace, R. W., 1978, A Comparison of Evapotranspiration Estimates Using DOE Hanford Climatological Data, PNL-2698, Pacific Northwest Laboratory, Richland, Washington.

Waters, A. C., 1961, "Stratigraphic and Lithologic Variations in Columbia River Basalt," American Journal of Science, 259, pp. 583-611.

REFERENCES

(Continued)

Wilbur, J. S., and M.J. Graham, 1982, Results of the Separations Area Ground-Water Monitoring Network for 1981, RHO-HS-SR-5P, Rockwell Hanford Operations, Richland, Washington.

Wilbur, J. S., M. J. Graham, and A. H. Lu, 1983, Results of the Separations Area Monitoring Network for 1982, RHO-RE-SR-83-24, Rockwell Hanford Operations, Richland, Washington.

TABLE 1

THE TYPES OF ASSUMPTIONS THAT EPA WILL USE IN REVIEWING THE REQUEST FOR WAIVER

ASSUMPTION	DISCUSSION SECTION IN TEXT	REFERENCE PAGE
Thickness of the soil from ground surface to the water table should be stated	Waiver Request Summary Geology of the NRDW Landfill Hydrology of the NRDW Landfill	D-2.4 D-2.9; D-2.20 D-2.14; D-2.22
Travel-time calculations should be based on natural soil properties	Waiver Request Summary Vadose Zone Hydrology	D-2.4 D-2.24
Travel-time calculations should be based on least viscous fluid	Waiver Request Summary Vadose Zone Hydrology	D-2.4 D-2.24
Travel time should be based on maximum hydraulic head, i.e., the regulated unit is full of water	Waiver Request Summary Meterological Conditions Vadose Zone Hydrology	D-2.4 D-2.8 D-2.24
Travel time should be based on a saturated sediment column from the regulated unit to the groundwater	Waiver Request Summary Meteorological Conditions Vadose Zone Hydrology	D-2.4 D-2.8 D-2.24
Effective porosity should be accounted for or else assumed to be ten percent	Waiver Request Summary Vadose Zone Hydrology	D-2.4 D-2.24
Soil attenuation mechanisms should be ignored	Waiver Request Summary Vadose Zone Hydrology	D-2.4 D-2.24
Migration of fluids through the soil should be assumed to have begun when the regulated unit commenced operation	Waiver Request Summary	D-2.4

TABLE 2

REPRESENTATIVE HYDRAULIC PROPERTIES IN THE UPPERMOST AQUIFER*

STRATIGRAPHIC INTERVAL	HYDRAULIC CONDUCTIVITY (ft/day)	(m/day)
Hanford Formation (informal name)	500-20,300	150-6,100
Undifferentiated Hanford and Middle Ringold Unit	100-7,000	30-2,100
Middle Ringold Unit	20-600	6-180
Lower Ringold Unit	0.1-10.0	0.03-3.0

*Modified after Gephart, et al., 1979

TABLE 3

WATER QUALITY OF SAMPLES COLLECTED FROM THE BASAL RINGOLD UNIT AND THE HANFORD FORMATION IN WELL 699-10E-12*

	HANFORD FORMATION		BASAL RINGOLD UNIT	
pH	7.5		7.9	
Specific conductance (μmhos/cm)	223		285	
CONSTITUENTS	mg/l	EPM**	mg/l	EPM
HCO_3^-	120.0	1.967	188.0	3.081
Cl^-	5.7	0.161	14.2	0.400
$SO_4^=$	24.0	0.500	3.0	0.062
NO_3^-	16.8	0.271	0.22	0.004
Total Anions		2.898		3.548
Na^+	20.5	0.892	55.0	2.392
K^+	7.1	0.182	8.6	0.220
Ca^{++}	22.0	1.098	12.0	0.599
Mg^{++}	6.8	0.559	3.7	0.304
Total Cations		2.73		3.516

*After Graham, et al., 1981

**EPM = Equivalent parts per million

TABLE 4

RANGES OF HYDRAULIC PROPERTIES IN THE UNDERLYING AQUIFER FROM WELLS DB-13, DB-14, DB-15, AND ARH-DC-1*

AQUIFER	TRANSMISSIVITY		THICKNESS		HYDRAULIC CONDUCTIVITY	
	m^2/day	ft^2/day	m	ft	m/day	ft/day
Elephant Mtn. Interflow [a]	569	6120	0.9	3	622	2040
Rattlesnake Ridge Interbed	0.8-28.5	8-307	15-25	50-82	0.03-1.8	0.10-6
Selah Interbed	0.8-43	9-462	6-11	20-36	0.1-7	0.4-23
Cold Creek Interbed	13-774	141-8326	14-29	46-94	0.5-55	1.50-181
Umatilla Interflow[b]	116	1253	1.8	6	55	179
Mabton Interbed	13-177	136-1900	26-34	86-111	0.5-6	1.6-20

*After Graham, et al., 1981

[a] From Well DB-13

[b] From Well DB-15

TABLE 5

MEAN AND RANGE OF MAJOR CHEMICAL CONSTITUENT CONCENTRATIONS WITHIN GROUNDWATER OF THE UNDERLYING AQUIFER (MABTON INTERBED)*

CONSTITUENT	CONCENTRATION RANGE (mg/l)	CONCENTRATION MEAN (mg/l)
Anions		
HCO_3^-	169-267	217
Cl^-	4.3-63	20
$SO_4^=$	0.3-18	4.0
NO_3^-	<0.5	<0.5
F^-	0.1-8	2.2
Cations		
Na^+	36-122	83
K^+	7.7-14	11
Ca^{++}	0.5-22	4.7
Mg^{++}	0.1-12	1.8

*Modified after Gephart, et al., 1979

TABLE 6

DEPTH TO WATER AND WATER-TABLE ELEVATIONS FROM SEMI-ANNUAL MEASUREMENTS BETWEEN DECEMBER 1975 AND DECEMBER 1984 AT FIVE WELLS NEAR THE NRDW LANDFILL

	DEPTH TO WATER TABLE FROM TOP OF WELL CASING (ft)				
	699-20-20	699-20-39	699-24-33	699-28-40	699-31-31
Dec - 75	105.74	137.93	122.42	157.38	127.76
Jun - 76	105.82	138.17	122.74	157.40	127.86
Dec - 76	105.89	138.24	122.78	157.50	127.90
Jun - 77	105.91	138.22	127.74	157.48	127.87
Dec - 77	105.90	138.24	122.67	157.43	127.76
Jun - 78	105.90	138.13	122.77	157.45	127.89
Dec - 78	106.06	138.47	122.90	157.69	128.01
Jun - 79	106.10	138.40	122.99	157.64	128.10
Dec - 79	106.14	138.30	122.89	157.66	128.02
Jun - 80	106.13	138.50	123.00	157.77	128.09
Dec - 80	106.13	138.55	122.95	157.62	128.04
Jun - 81	106.23	138.45	123.08	157.78	128.15
Dec - 81	105.90	138.59	122.99	157.80	128.08
Jun - 82	106.26	138.58	123.15	157.93	127.93
Dec - 82	106.18	138.53	122.98	157.55	128.05
Jun - 83	106.06	138.38	122.88	157.48	127.97
Dec - 83	105.88	137.99	122.38	156.98	127.47
Jun - 84	105.42	137.23	121.72	156.16	126.79
Dec - 84	105.75	136.69	121.19	155.66	126.23
Casing Elevation (ft-msl)	505.58	539.98	524.22	559.44	529.32
	WATER TABLE ELEVATION (ft-msl)*				
Dec - 75	399.84	402.05	401.80	402.06	401.56
Jun - 76	399.76	401.81	401.48	402.04	401.46
Dec - 76	399.69	401.74	401.44	401.94	401.42
Jun - 77	399.67	401.76	401.48	401.96	401.45
Dec - 77	399.68	401.74	401.55	402.01	401.56
Jun - 78	399.68	401.85	401.45	401.99	401.43
Dec - 78	399.52	401.51	401.32	401.75	401.31
Jun - 79	399.48	401.58	401.23	401.80	401.22
Dec - 79	399.44	401.68	401.33	401.78	401.30
Jun - 80	399.45	401.48	401.22	401.67	401.23
Dec - 80	399.45	401.43	401.27	401.82	401.28
Jun - 81	399.35	401.53	401.14	401.66	401.17
Dec - 81	399.68	401.39	401.23	401.64	401.24
Jun - 82	399.32	401.40	401.07	401.51	401.39
Dec - 82	399.40	401.45	401.24	401.89	401.27
Jun - 83	399.52	401.60	401.34	401.96	401.35
Dec - 83	399.70	401.99	401.84	402.46	401.85
Jun - 84	400.16	402.75	402.50	403.28	402.53
Dec - 84	399.83	403.29	403.02	403.78	403.09

*Water table elevation is calculated from casing elevation minus depth to water.

TABLE 7

WATER QUALITY OF THE UNCONFINED AQUIFER FOR THE PASCO BASIN AND THE HANFORD SITE

CONSTITUENT	LOCATION	NO OF SAMPLES	MEAN	STANDARD DEVIATION	RANGE
Temperature, (°C)	Pasco Basin	193	13.5	2.6	3.1-21.2
	Hanford	89	19.2	3.2	14.5-39.1
Spec. Cond. (μmhos/cm)	Pasco Basin	184	323	162	125-1,250
	Hanford	99	409	117	194-927
pH (pH Units)	Pasco Basin	3	7.6	0.5	7.2-8.1
	Hanford	104	7.9	0.3	7.0-9.4
Ca^{++} (mg/l)	Pasco Basin	15	31.5	9.2	20.0-54.0
	Hanford	101	41.5	12.5	12.0-92.0
Mg^{++} (mg/l)	Pasco Basin	15	11.6	4.0	6.9-23.0
	Hanford	101	11.1	3.7	3.1-29.0
Na^{+} (mg/l)	Pasco Basin	17	15.8	9.6	5.9-43.0
	Hanford	101	22.6	10.4	2.9-64.0
K^{+} (mg/l)	Pasco Basin	16	3.1	1.0	1.4-4.9
	Hanford	101	6.2	1.9	1.9-13.0
HCO_3^- (mg/l)	Pasco Basin	16	166	44	82-244
	Hanford	101	146	38	53-314
Cl^- (mg/l)	Pasco Basin	16	4.7	4.1	2.6-19.0
	Hanford	101	11.1	6.6	2.5-32.0
$SO_4^=$ (mg/l)	Pasco Basin	16	10.9	9.2	5.1-43.0
	Hanford	100	47.2	33.5	2.7-190.0
NO_3^- (mg/l)	Pasco Basin	not available			
	Hanford	101	26.0	39.0	0.05-270.0

TABLE 8

VOLUMETRIC WATER CONTENT IN A RECHARGE STUDY WELL*

SAMPLE NUMBER	DEPTH (m)	VOLUMETRIC MOISTURE (ml/cm^3 x 100)
3-1	1.6	9.98
3-2	3.6	11.30
3-3	5.2	14.80
3-4	6.9	8.16
3-5	8.5	7.19
3-6	10.2	7.74
3-7	11.6	8.31
3-8	13.5	9.40
3-9	15.1	10.50
3-10	16.6	9.04
3-11	18.4	11.50
3-12	20.0	9.35
3-13	21.7	11.00
3-14	23.3	8.53
3-15	24.8	6.92
3-16	26.7	6.80
3-17	28.2	6.02

*After Heller et al., 1985

TABLE 9

TRAVEL-TIME EQUATIONS AND EXAMPLE CALCULATION*

r = Recharge rate

θ = Volumetric water content

v = Velocity of water movement through the sediments

D = Depth to groundwater

T = Travel time to groundwater

The water velocity, v, can be defined as follows:

$$v = r/\theta$$

and travel time, T, can be defined as follows:

$$T = D/v$$

Example: Assuming r = 2.2 in/yr (5.6 cm/yr)
θ = 8%
D = 159 ft (4846 cm)

v = 2.2 in/yr (5.6 cm/yr)/0.08 = 2.75 in/yr (70 cm/yr)

T = 159 ft (4846 cm)/27.5 in/yr (70 cm/yr) = 69 years

*Derivation and discussion of this formula is available in Heller et al., 1985.

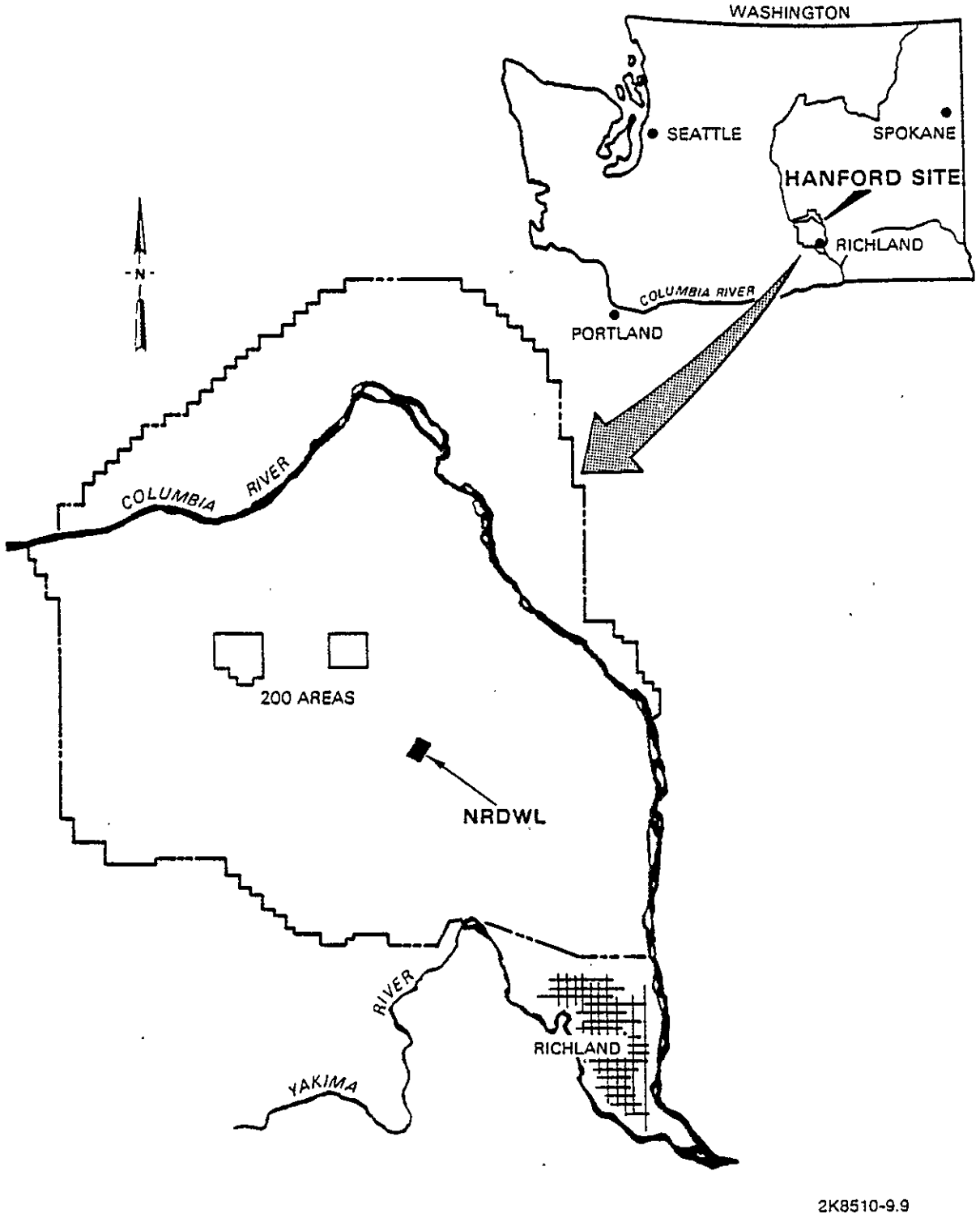


FIGURE 1. LOCATION OF THE NRDW LANDFILL ON THE HANFORD SITE, WASHINGTON STATE

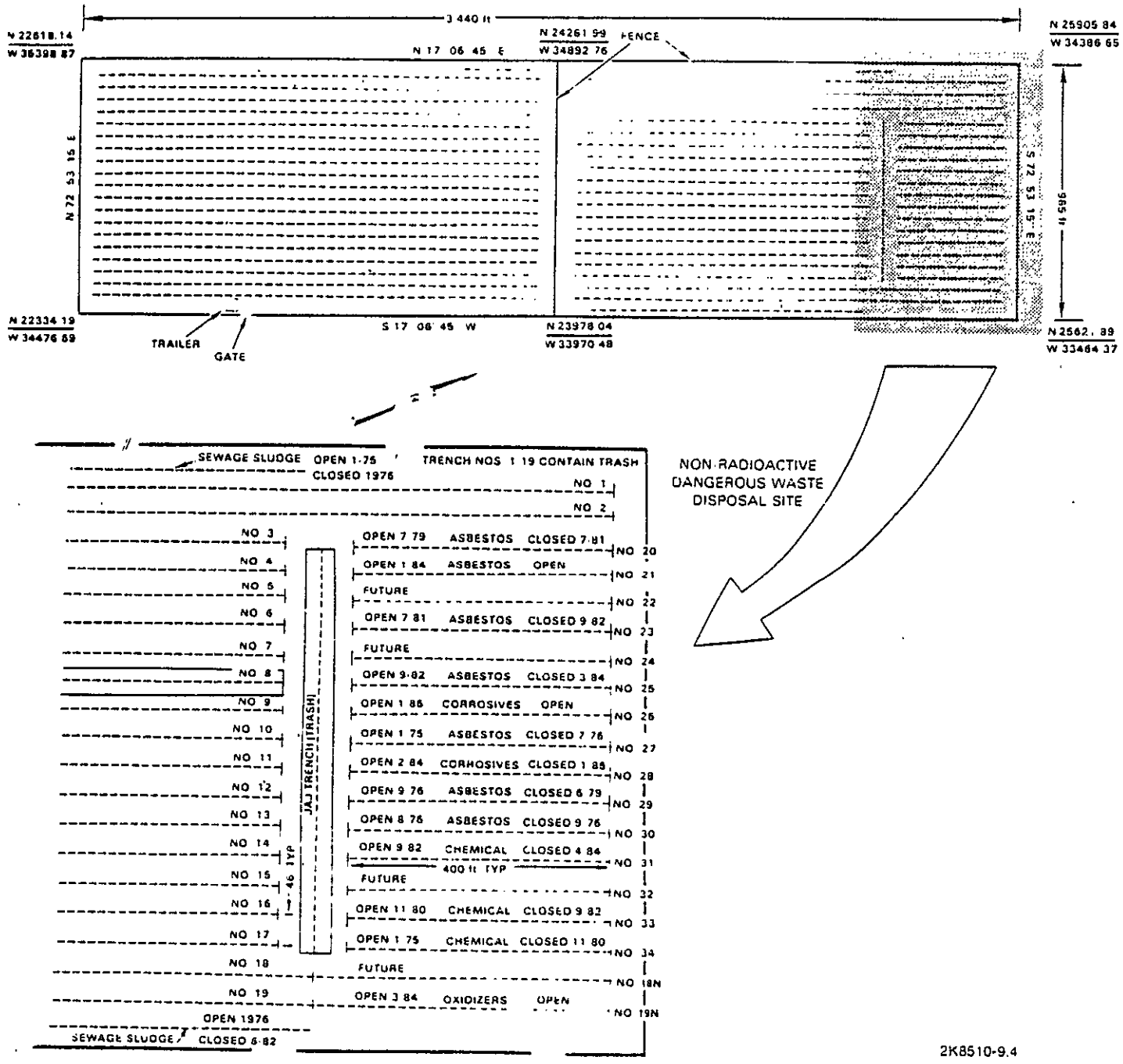


FIGURE 2. SITE PLAN FOR THE NRDW LANDFILL

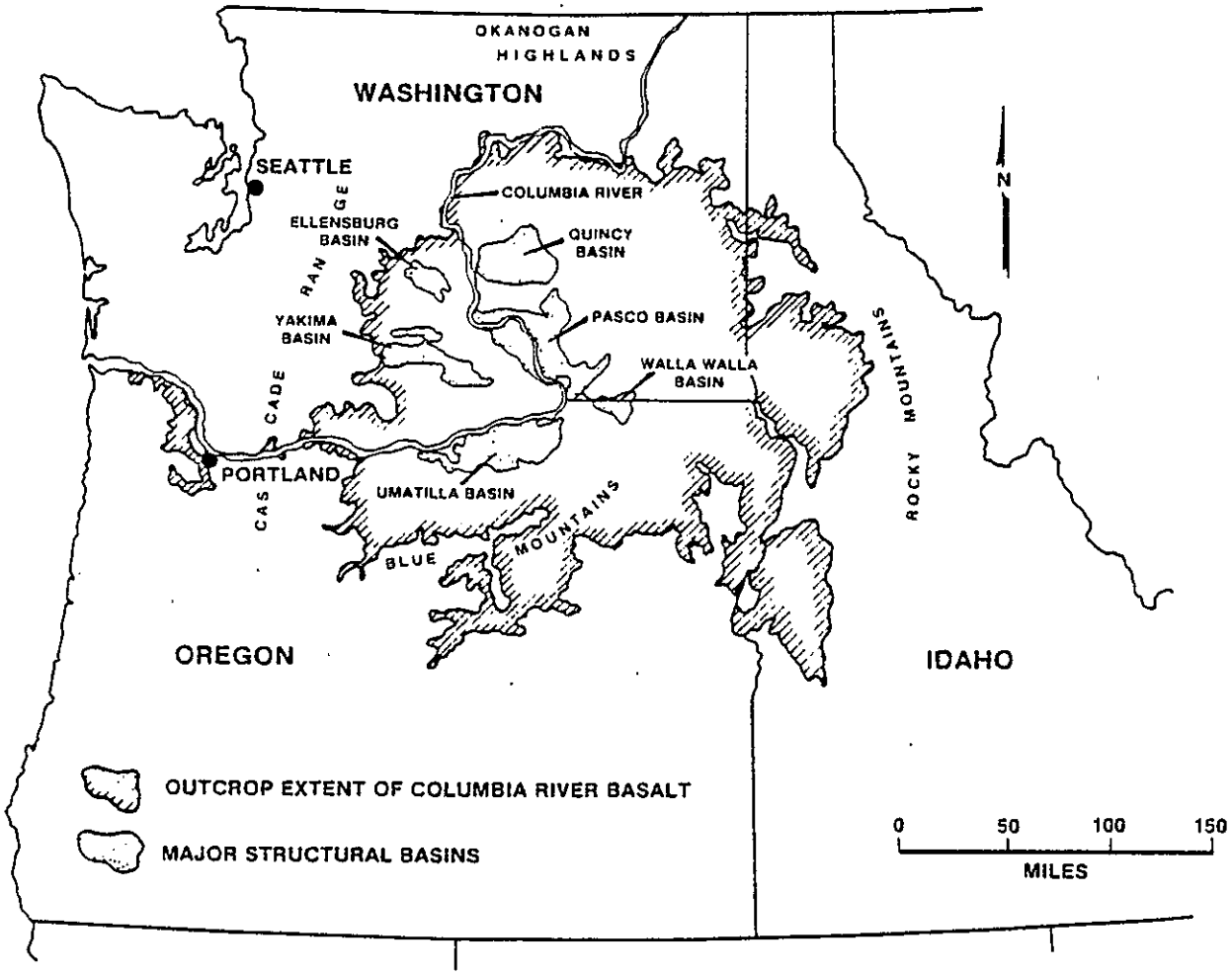


FIGURE 3. GEOGRAPHIC EXTENT OF THE COLUMBIA RIVER BASALT GROUP (AFTER TALLMAN ET AL., 1979)

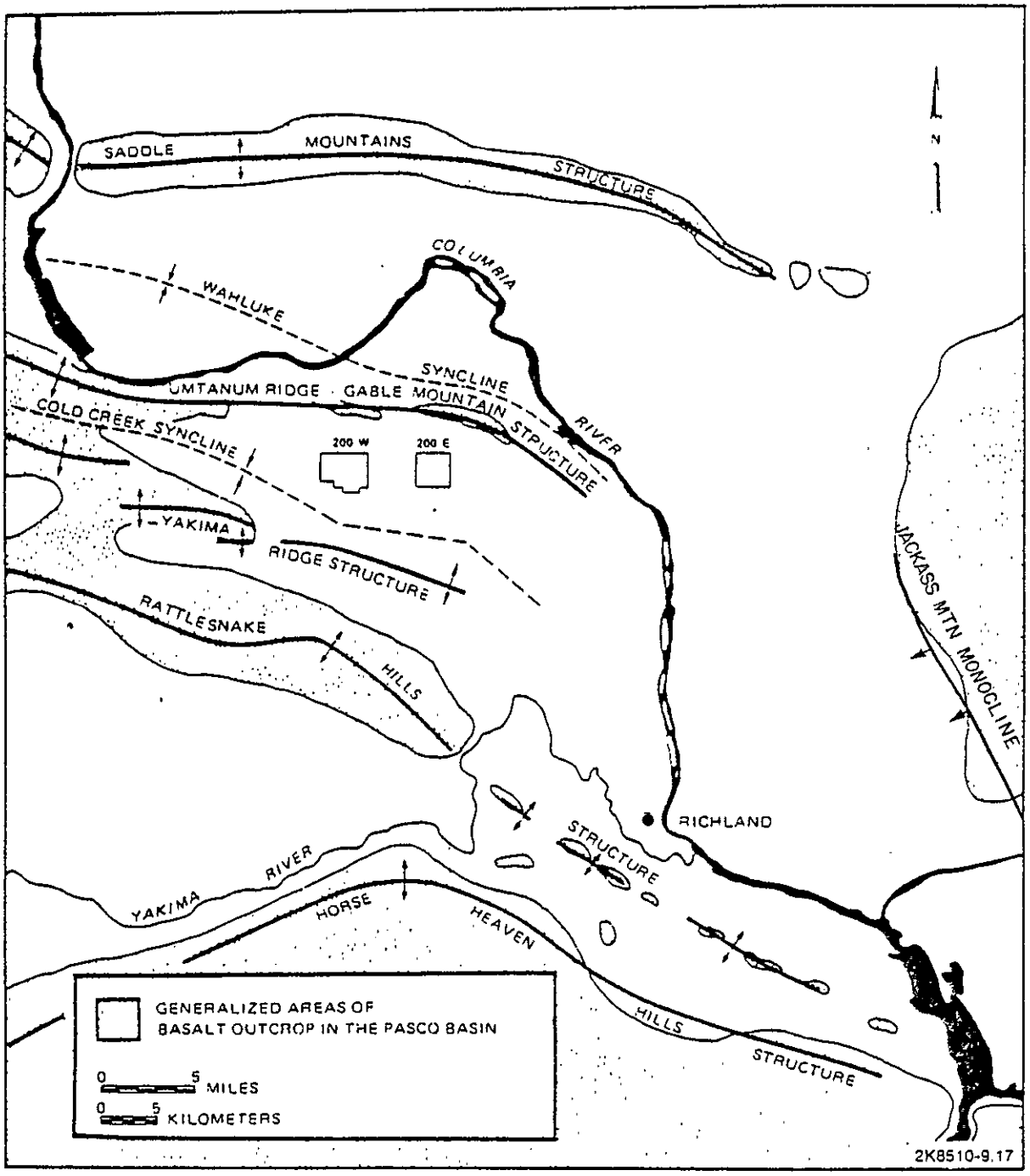
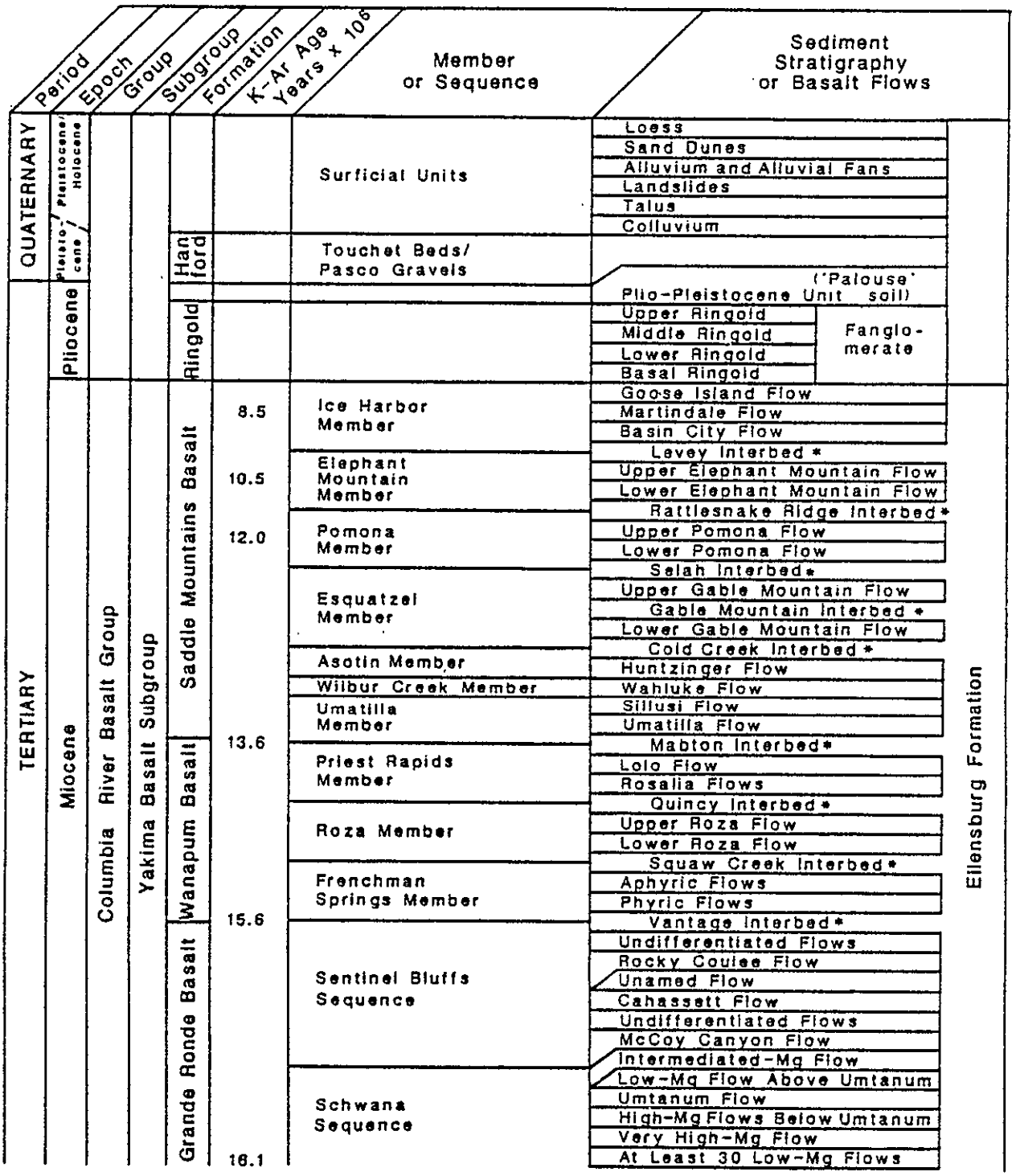


FIGURE 4. STRUCTURAL GEOLOGY OF THE PASCO BASIN
(MODIFIED AFTER DOE, 1984)



* The interbeds are stratigraphically contained in the Ellensburg Formation

FIGURE 5. STRATIGRAPHIC NOMENCLATURE OF THE PASCO BASIN (AFTER DOE, 1984)

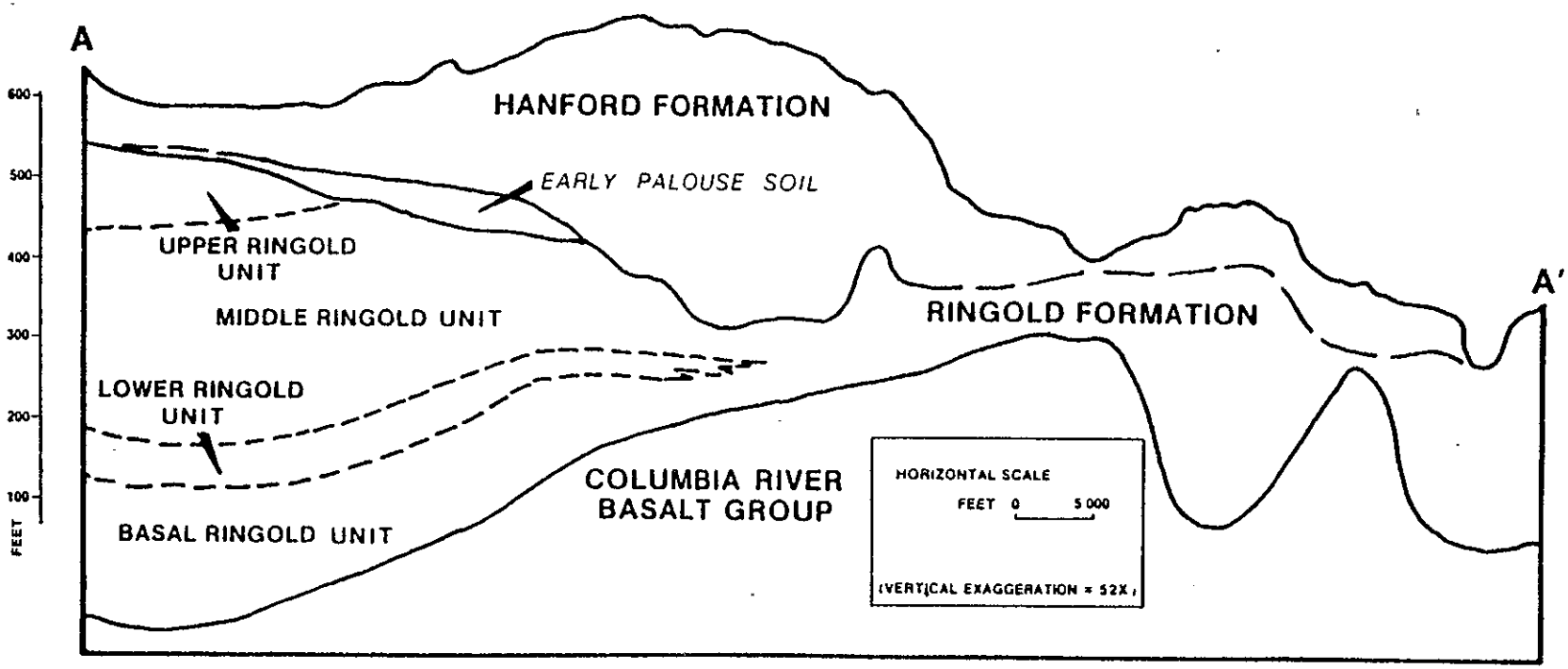


FIGURE 6. GENERALIZED GEOLOGIC CROSS SECTION THROUGH THE HANFORD SITE (AFTER TALLMAN ET AL., 1979)

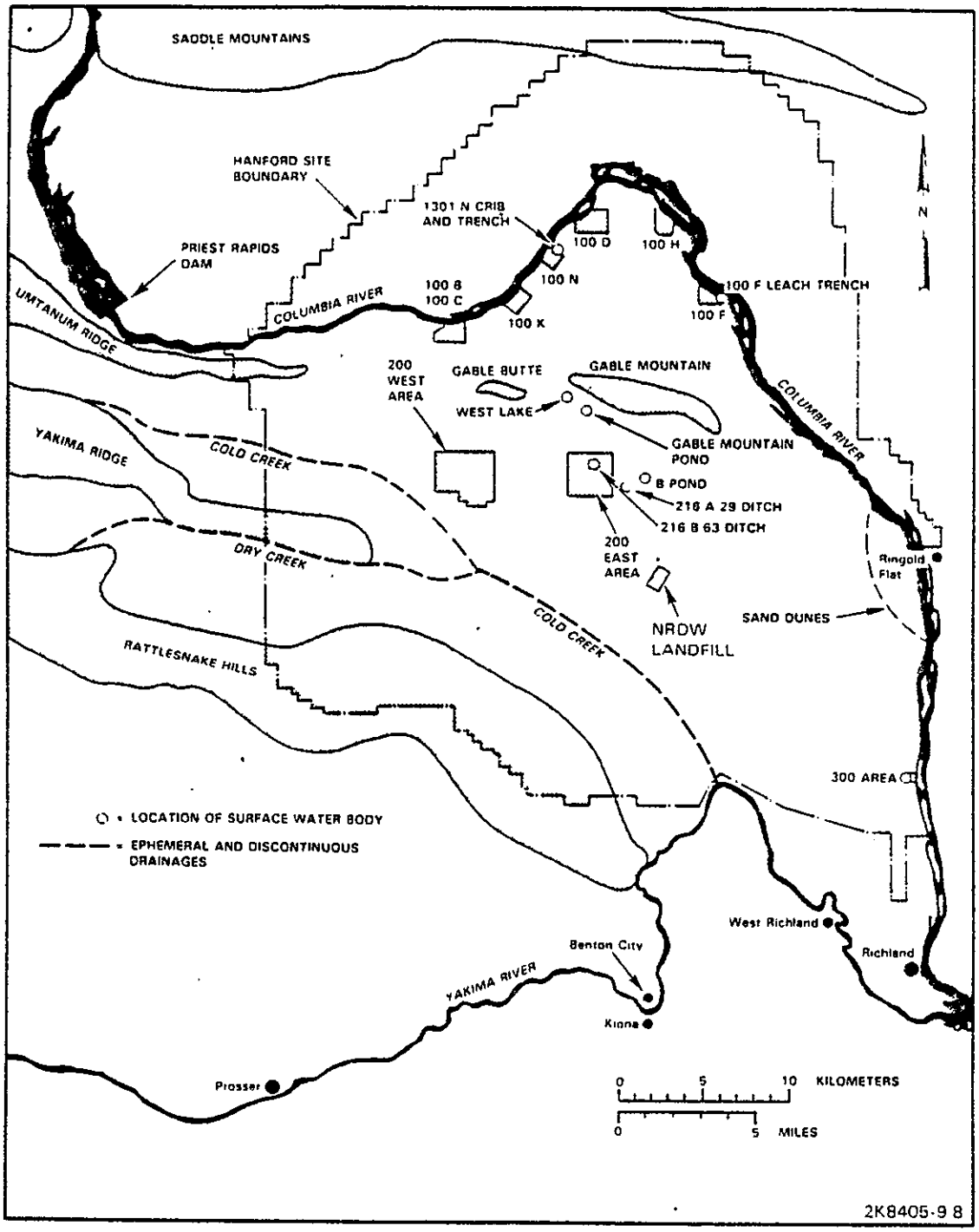


FIGURE 7. SURFACE WATER BODIES INCLUDING EPHEMERAL STREAMS ON THE HANFORD SITE (AFTER DOE, 1984)

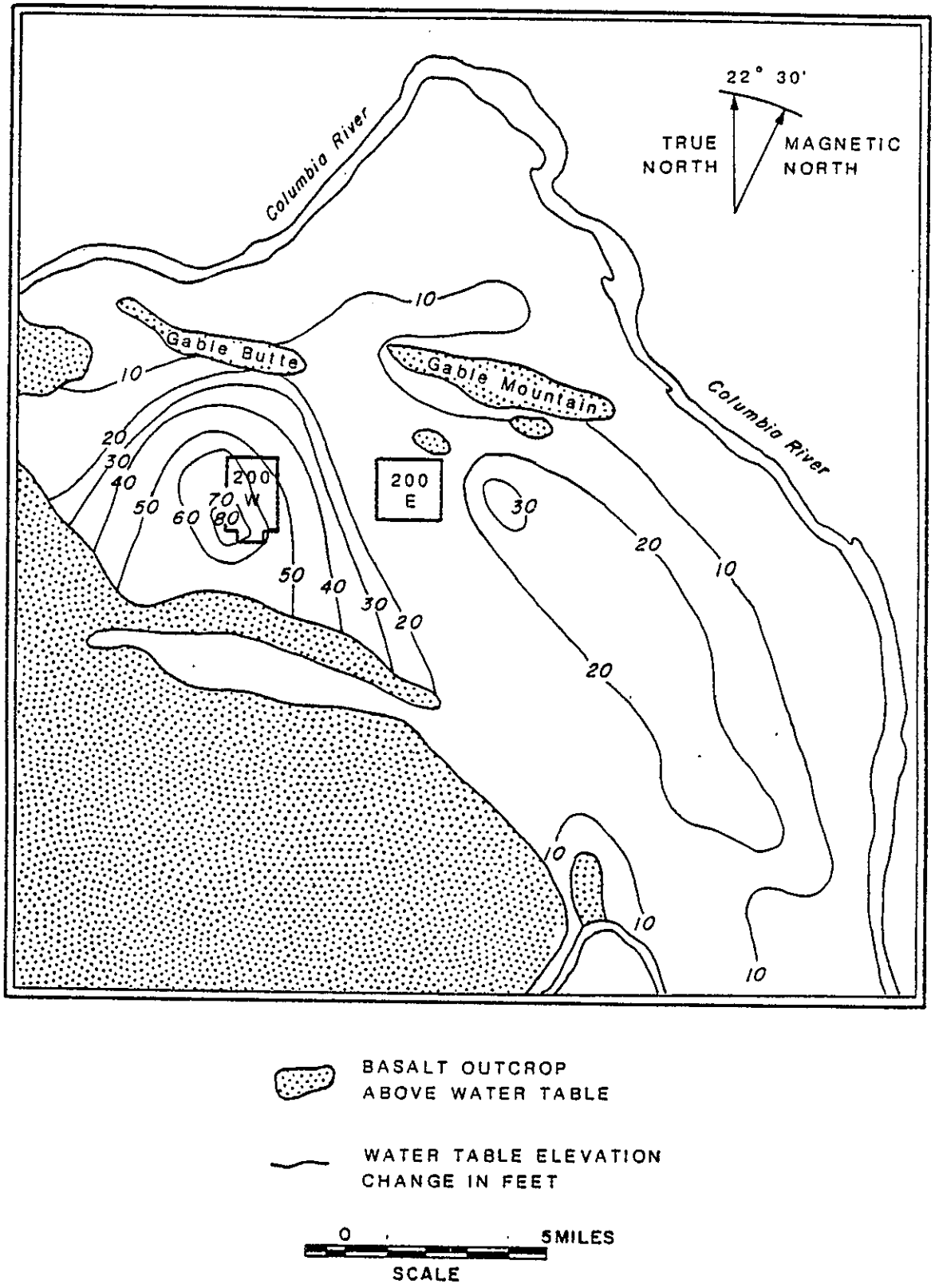


FIGURE 8. DIFFERENTIAL CHANGE IN THE HANFORD SITE WATER TABLE BETWEEN JANUARY 1944 AND JANUARY 1975 (AFTER ARCO, 1975)

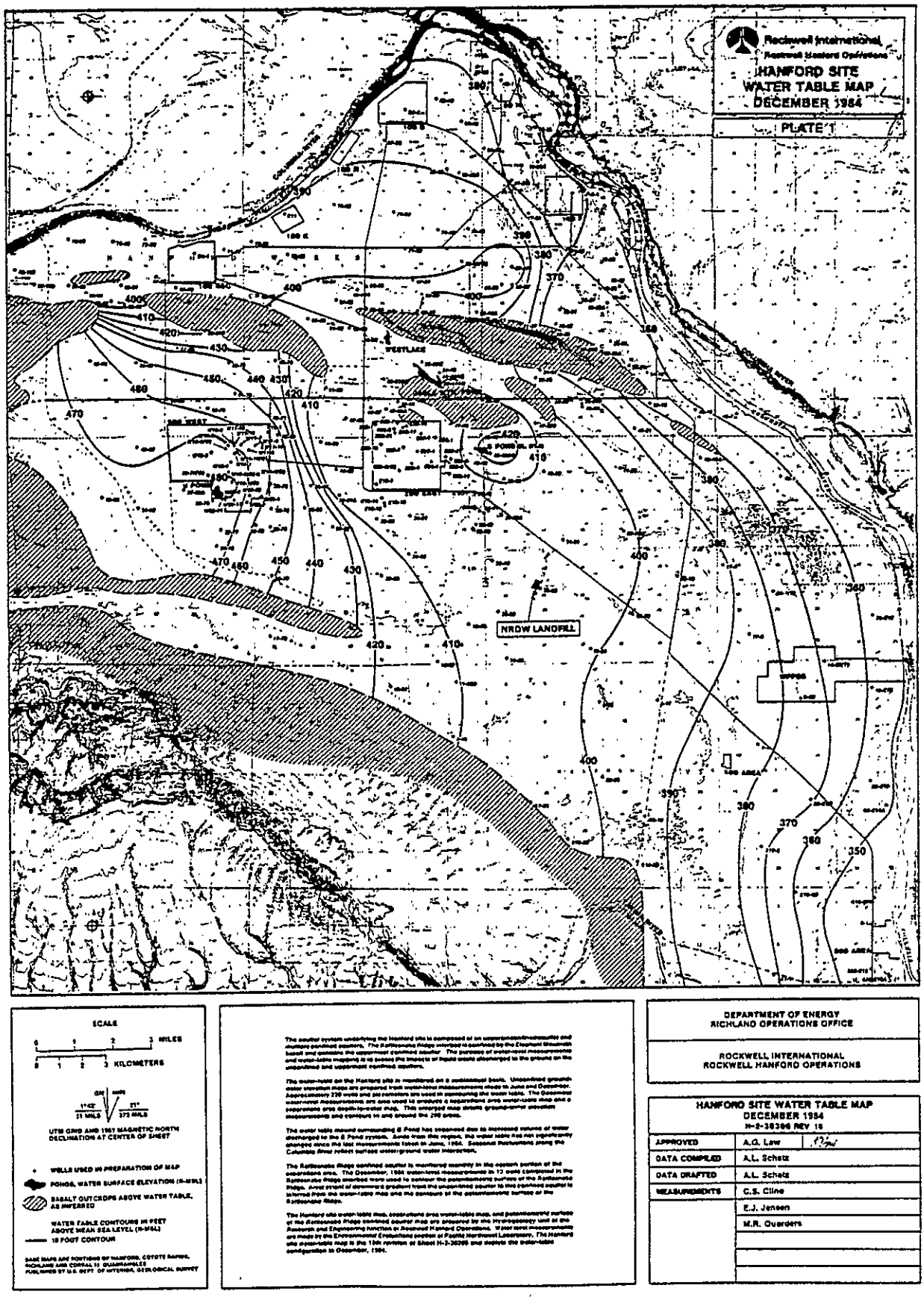


FIGURE 9. HANFORD SITE WATER-TABLE MAP (AFTER SCHATZ, 1985)

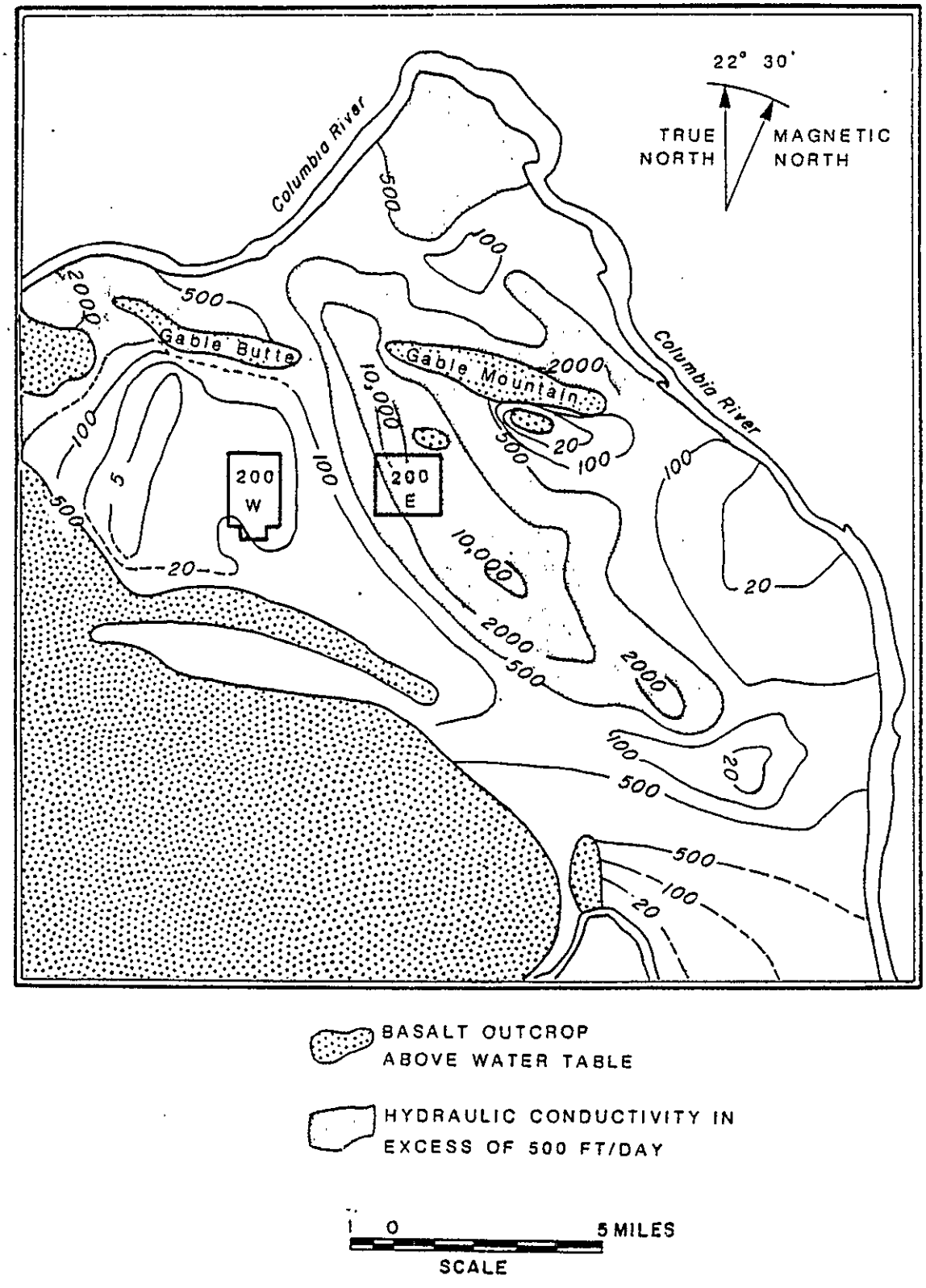


FIGURE 10. AREAL DISTRIBUTION OF HYDRAULIC CONDUCTIVITY FROM THE UPPERMOST AQUIFER AT THE HANFORD SITE (AFTER ARCO, 1975)

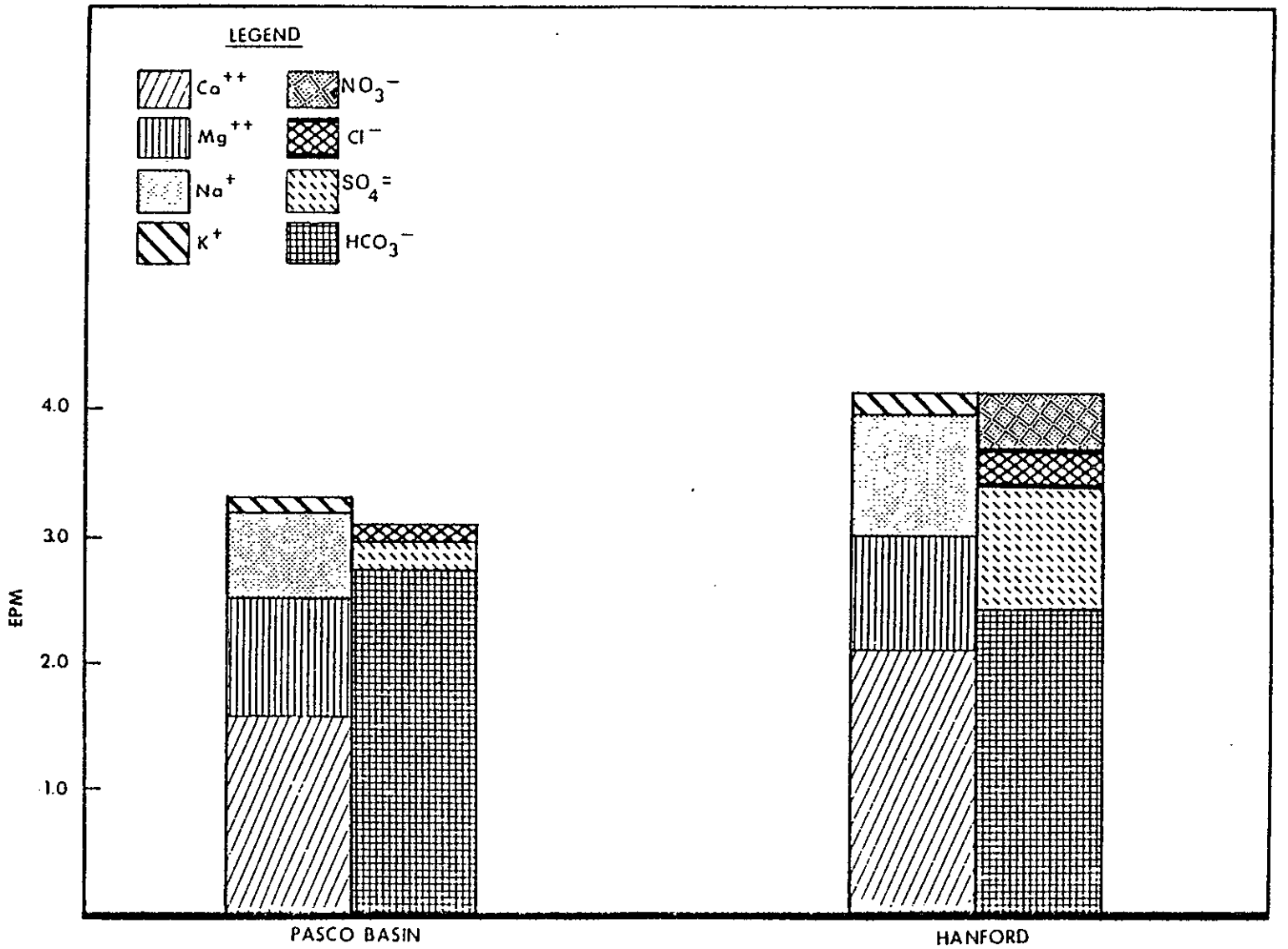


FIGURE 11. EQUIVALENT PARTS PER MILLION (EPM) COMPARISON OF UPPERMOST AQUIFER WATERS FROM THE HANFORD SITE AND SURROUNDING PASCO BASIN (AFTER GRAHAM ET AL., 1981)

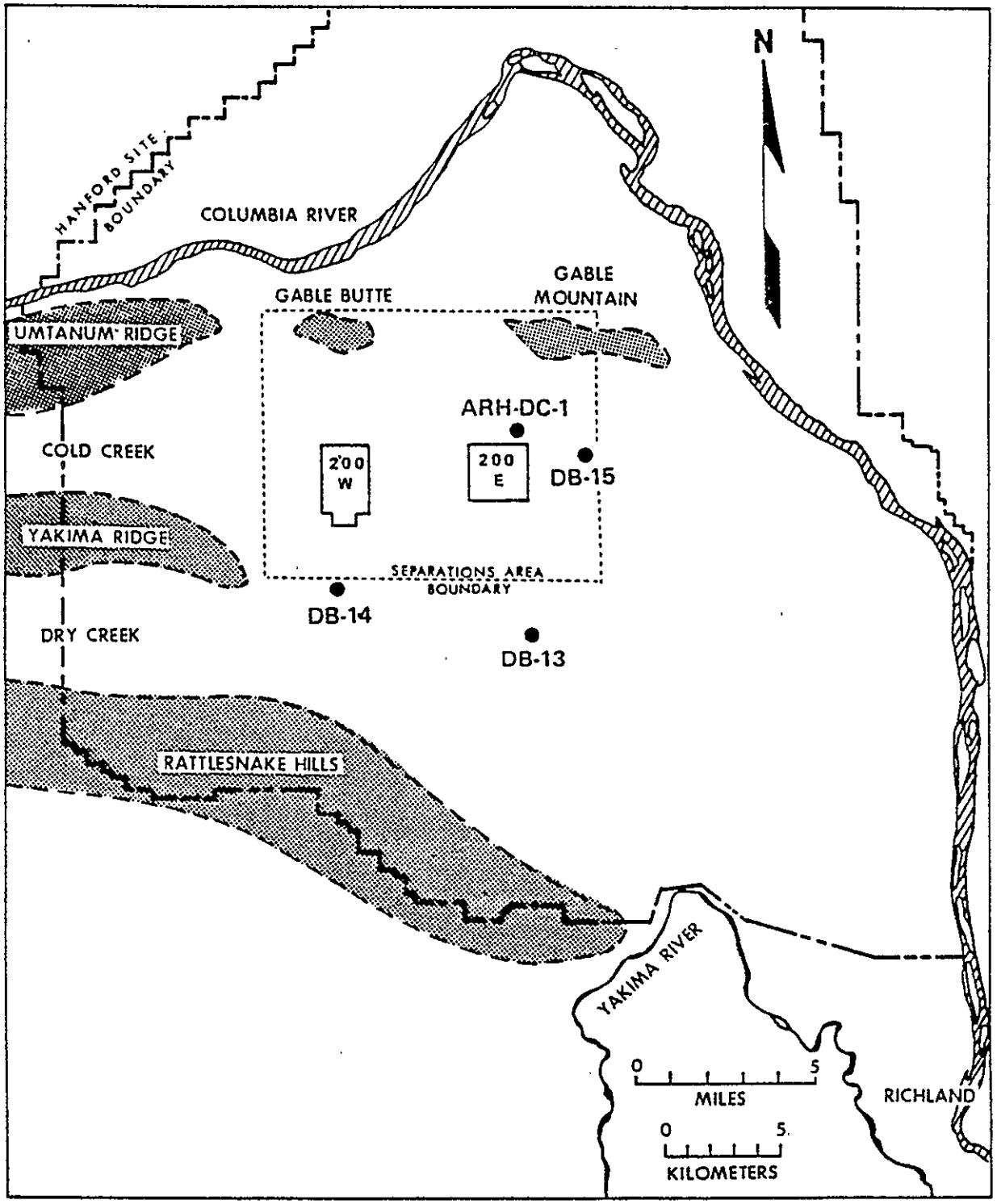


FIGURE 12. LOCATION OF WELLS DB-13, DB-14, DB-15, AND ARH-DC-1 (AFTER GRAHAM ET AL., 1981)

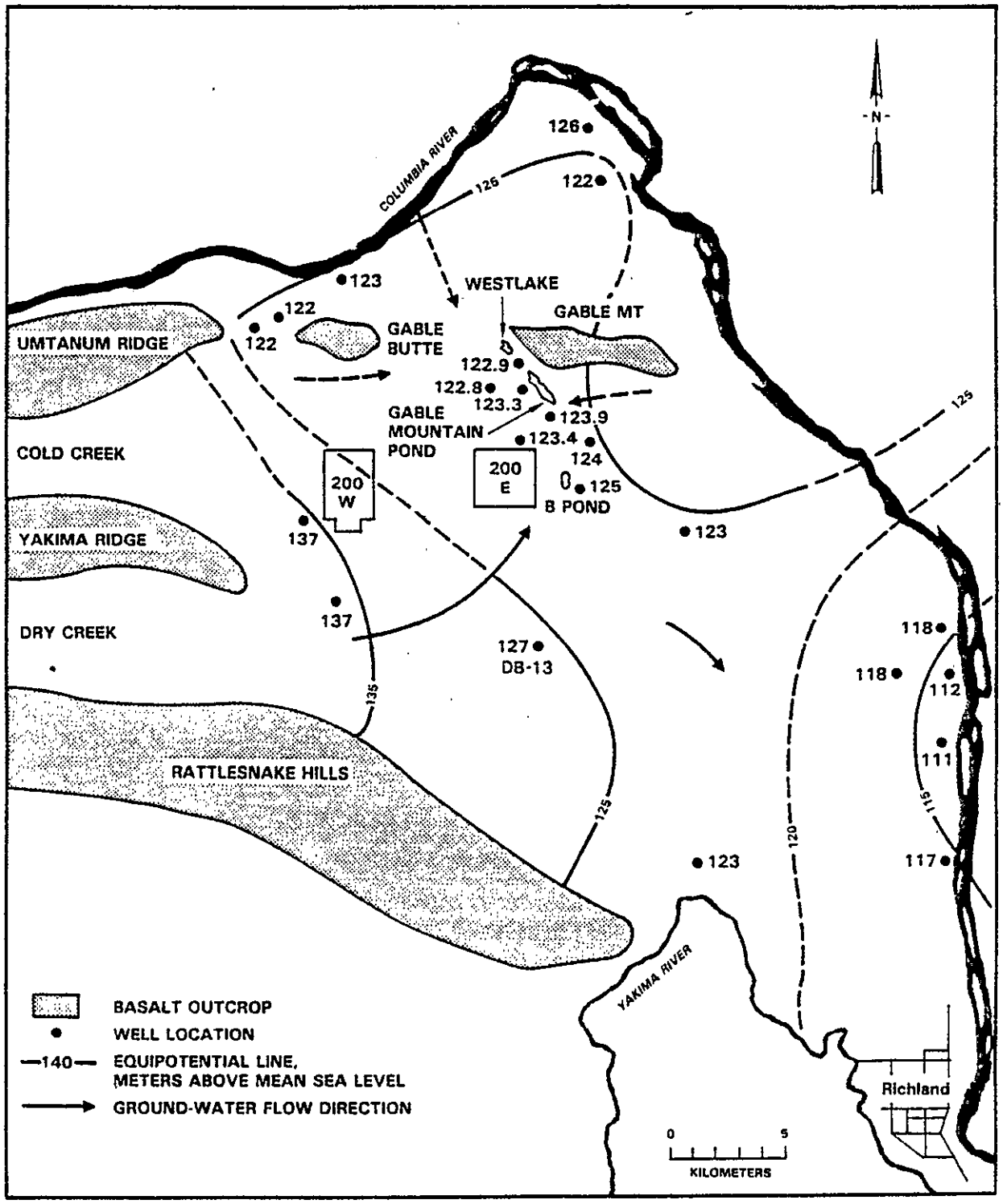


FIGURE 13. POTENTIOMETRIC SURFACE MAP OF THE RATTLESNAKE RIDGE AQUIFER WITHIN THE HANFORD SITE (AFTER GRAHAM ET AL., 1984)

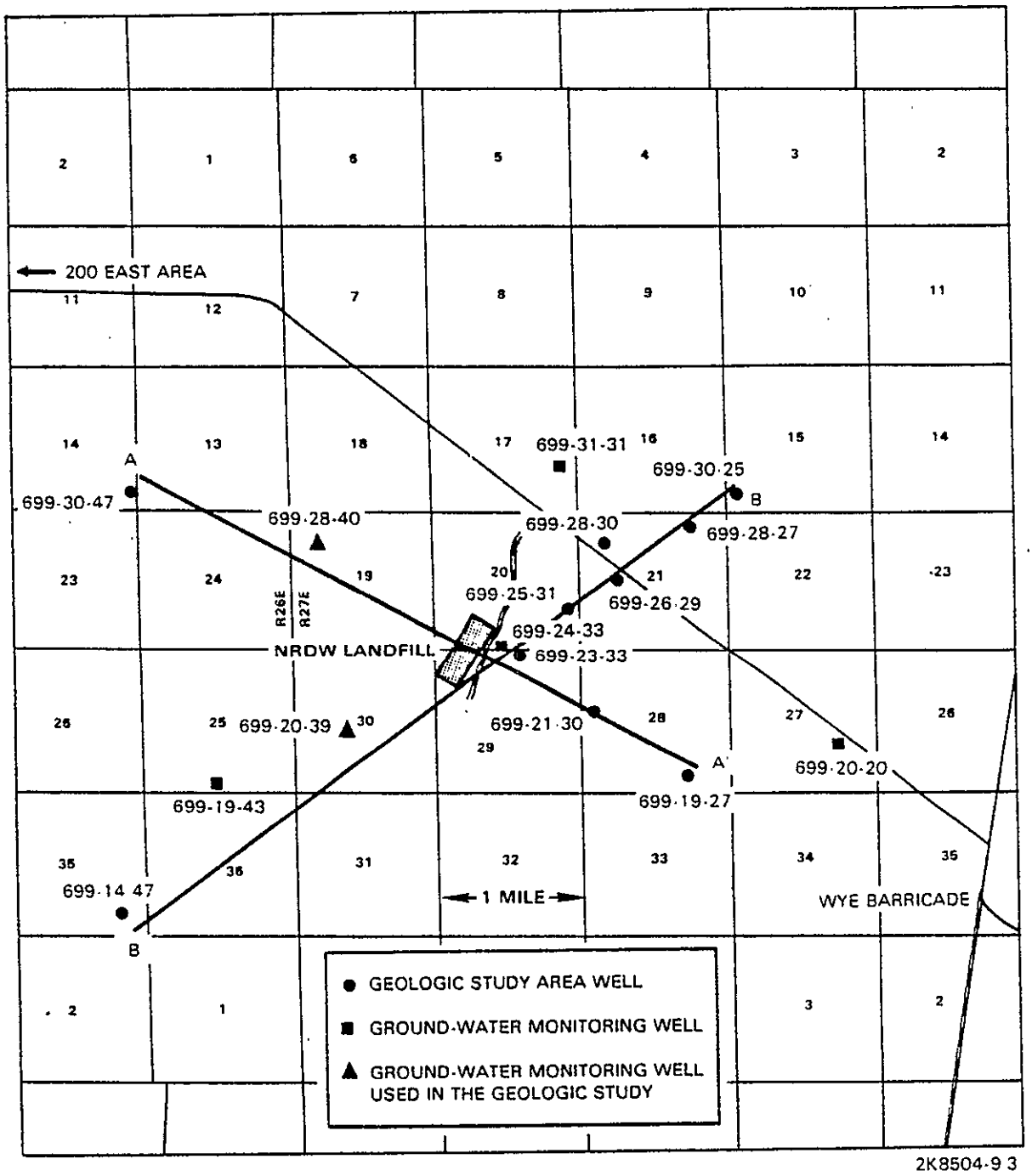


FIGURE 14. NRDW LANDFILL GEOLOGIC STUDY AREA WELL LOCATION MAP AND LOCATION OF GEOLOGIC CROSS SECTIONS A-A' AND B-B'

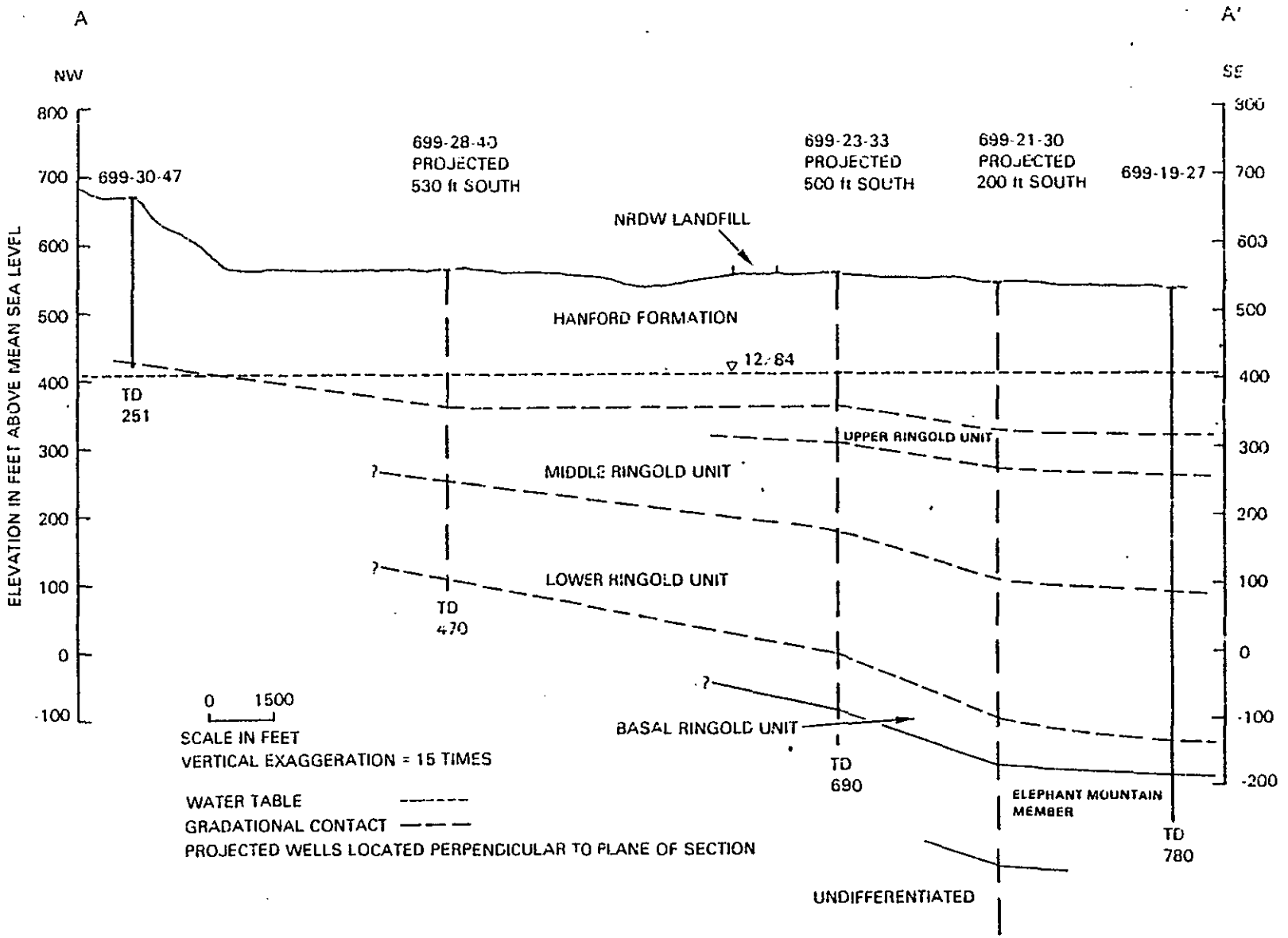


FIGURE 15. NRDW LANDFILL STUDY AREA GEOLOGIC CROSS SECTION A-A'

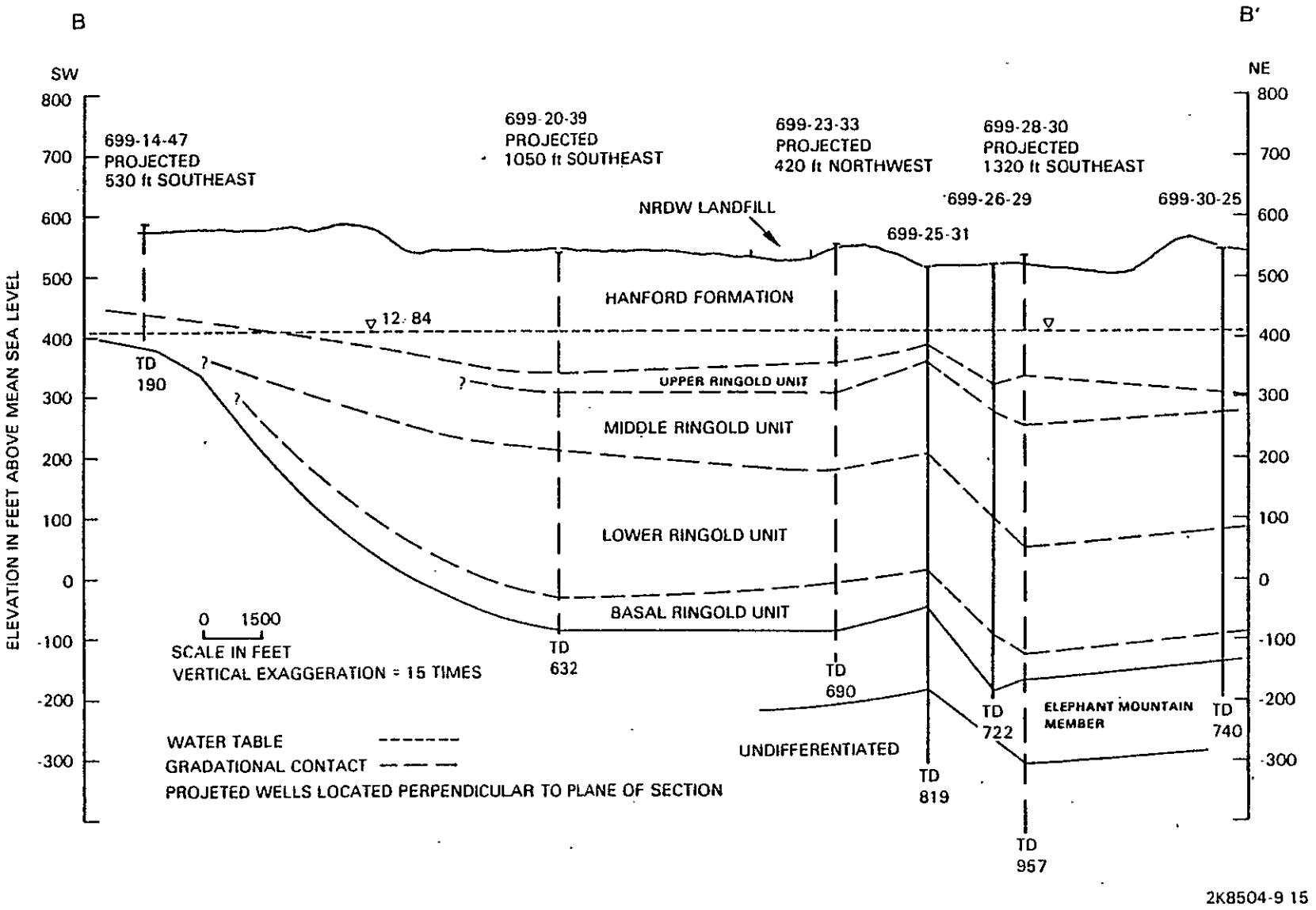


FIGURE 16. NRDW LANDFILL STUDY AREA GEOLOGIC CROSS SECTION B-B'

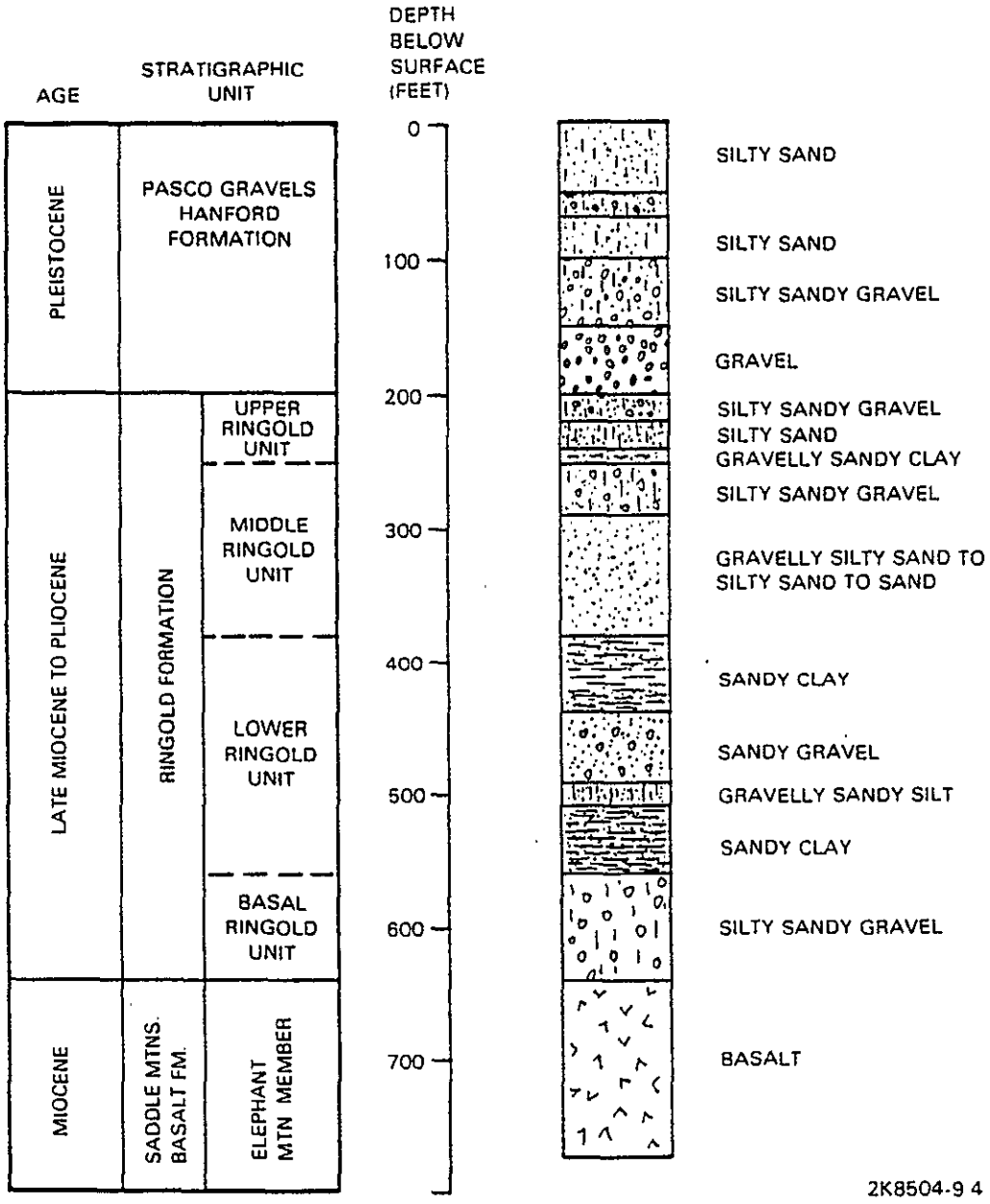
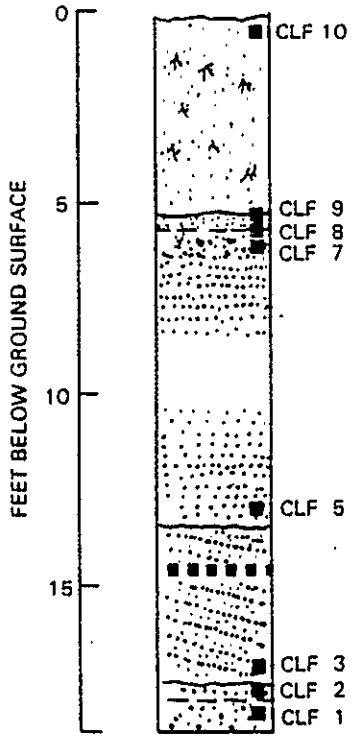


FIGURE 17. GENERALIZED STRATIGRAPHIC COLUMN FOR THE NRDW LANDFILL

GEOLOGIC PROFILE OR TRENCH NO. 26, NRDW LANDFILL



LIGHT BROWN MEDIUM TO FINE SAND
GRAINS ARE SUBROUNDED TO ROUNDED AND WELL SORTED. SPARSE COBBLES, PEBBLES, AND ROOTLETS. NO BEDDING STRUCTURES OBSERVED.

GRAY SLIGHTLY PEBBLY MEDIUM TO COARSE SAND
GRAINS ARE SUBANGULAR TO SUBROUNDED AND WELL SORTED. HORIZONTALLY BEDDED. CALICHE HORIZON 6 INCHES FROM TOP.

BROWN SLIGHTLY SILTY VERY FINE TO MEDIUM SAND
GRAINS ARE SUBANGULAR TO SUBROUNDED AND MODERATELY WELL SORTED. TABULAR CROSS BEDDING.

GRAY VERY COARSE TO COARSE SAND
GRAINS ARE SUBANGULAR TO SUBROUNDED AND MODERATELY WELL SORTED. MASSIVELY BEDDED
CALICHE HORIZON 4" FROM TOP.

SEDIMENT SAMPLE LOCATION ■

BASE OF TRENCH ■■■■■■

MECHANICAL ANALYSIS, %

SAMPLE	FP	VFP	VCS	CS	MS	FS	VFS	>VFS
CLF 10	-	.07	00.08	16.38	45.09	30.17	05.64	02.06
CLF 9	.27	.53	05.40	25.08	17.05	25.22	23.16	03.52
CLF 8	.13	.85	12.47	49.15	11.68	04.50	03.72	17.49
CLF 5	-	.20	03.98	54.68	33.69	05.30	01.73	00.86
CLF 3	-	.07	00.40	05.70	26.60	37.60	24.60	04.62
CLF 1	-	1.65	29.60	52.20	10.30	02.50	01.30	00.53

FP - FINE PEBBLES
VFP - VERY FINE PEBBLES
VCS - VERY COARSE SAND
CS - COARSE SAND
MS - MEDIUM SAND
VFS - FINE SAND
VFS - VERY FINE SAND
>VFS - SILT AND CLAY

2K8504-9.7

FIGURE 18. GEOLOGIC PROFILE OF TRENCH NUMBER 26 AT THE NRDW LANDFILL

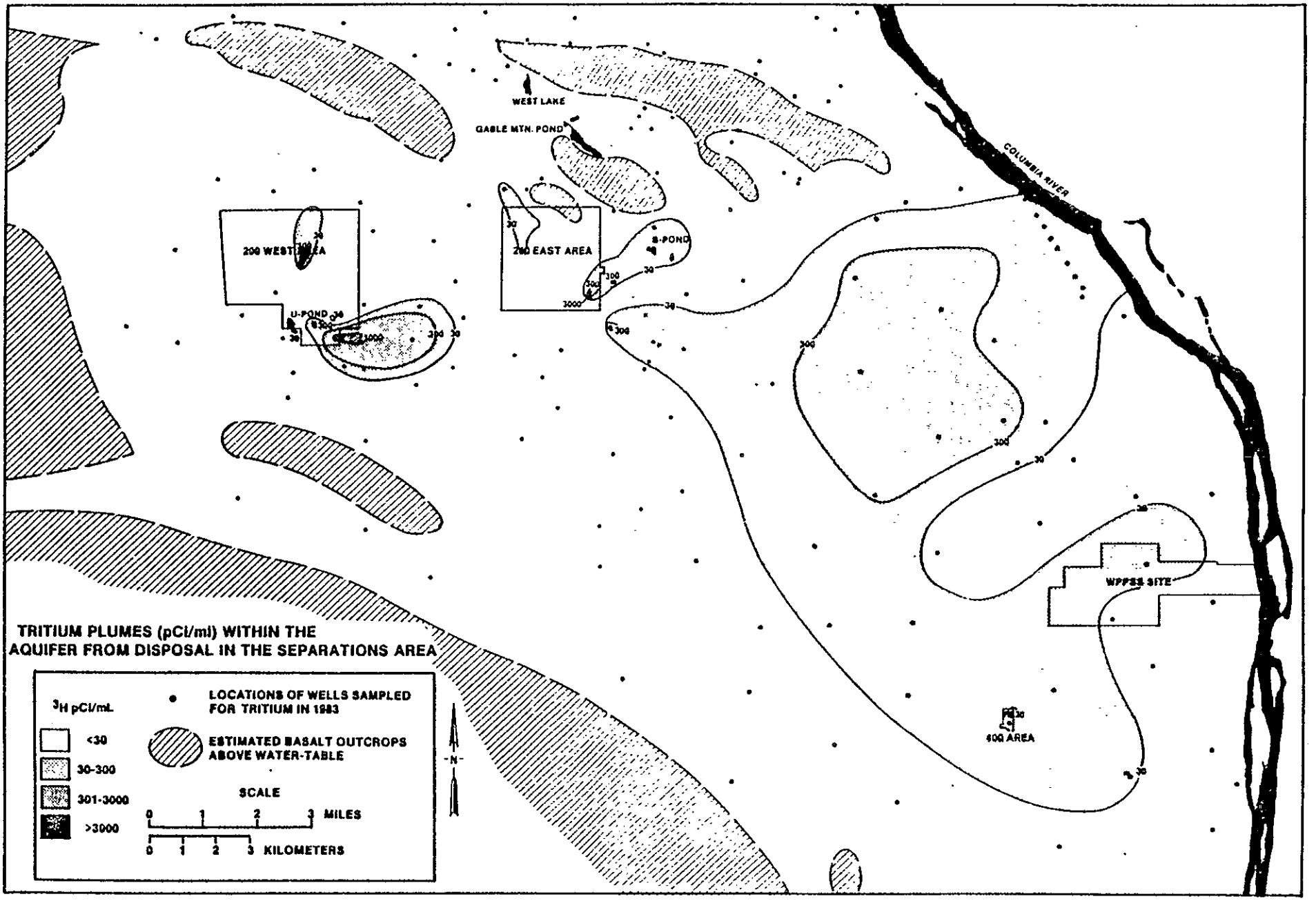


FIGURE 19. TRITIUM PLUME (pCi/mℓ) WITHIN THE UPPERMOST AQUIFER FROM DISPOSAL IN THE SEPARATIONS AREA (AFTER LAW AND ALLEN, 1984)

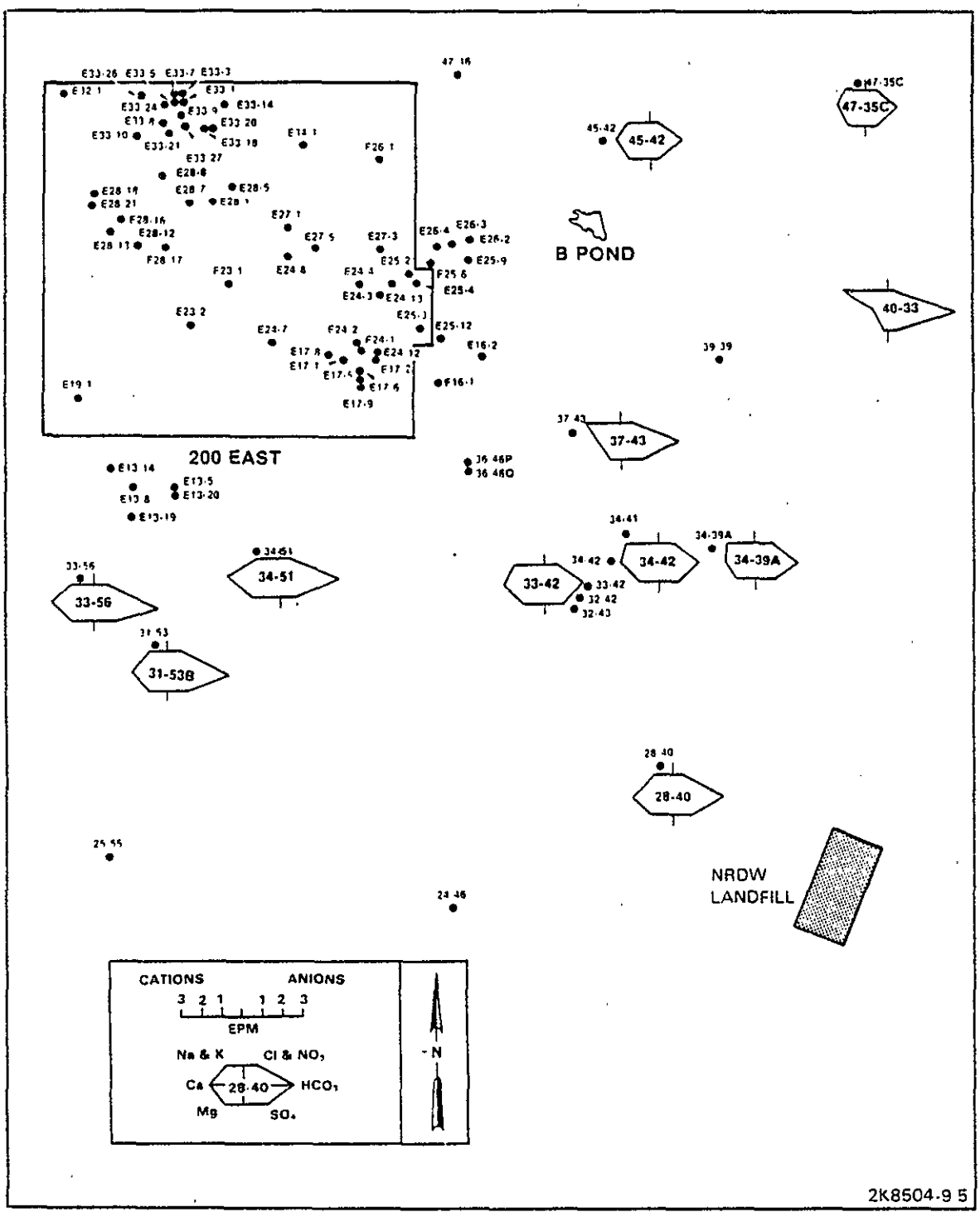


FIGURE 20. GROUNDWATER QUALITY MAP

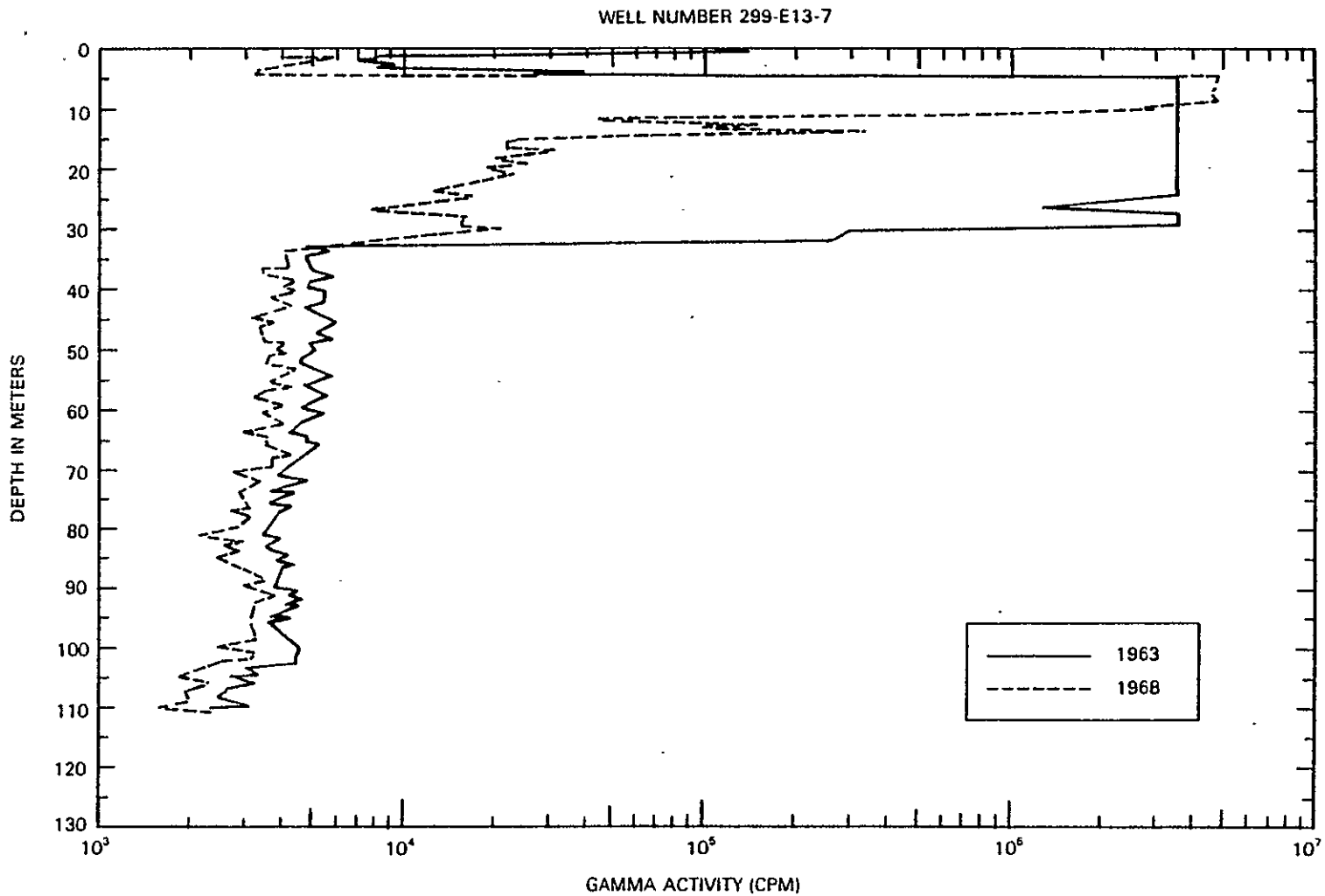


FIGURE 21. GAMMA ACTIVITY AT DEPTH IN WELL 299-E13-7, MONITORING THE 216-B-20 SPECIFIC RETENTION TRENCH FOR THE YEARS 1963 AND 1968 (MODIFIED AFTER ADDITON ET AL., 1978)

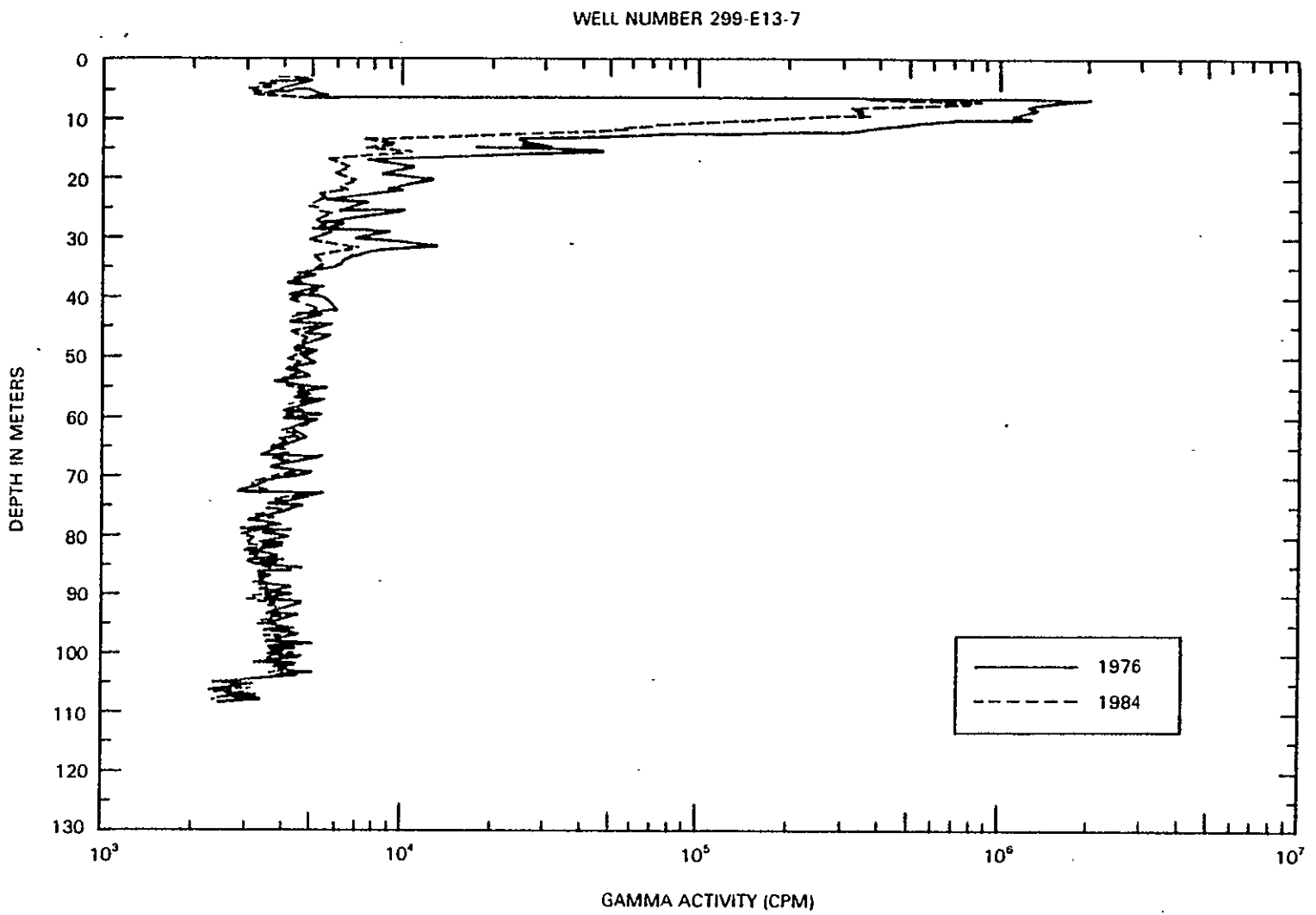


FIGURE 22. GAMMA ACTIVITY AT DEPTH IN WELL 299-E13-7, MONITORING THE 216-B-20 SPECIFIC RETENTION TRENCH FOR THE YEARS 1976 AND 1984 (MODIFIED AFTER ADDITON ET AL., 1978)

SECTION E
GROUNDWATER MONITORING

E-1 EXEMPTION FROM GROUNDWATER PROTECTION REQUIREMENTS

E-1a Surface Impoundment

There are no surface impoundments in the NRDWL facility.

E-1b Waste Piles

There are no waste piles in the NRDWL facility.

E-1c Landfills

The condition that the NRDWL has been designed and is being operated in compliance with WAC 173-303-665(3) does not apply.

E-1d No Migration

A waiver is being sought to exempt the NRDWL facility from the groundwater protection requirements of WAC 173-303-645 pursuant to Section 645(b)(iii). The waiver request was prepared in June 1985 and is on file with WDOE. A copy of the waiver request is appended to the Part B Permit Application as Appendix E-1.

The waiver request demonstrates that there is no potential for migration of liquid from waste disposal trenches in the NRDWL to the uppermost aquifer during the active life of the regulated units (including closure periods) and the post-closure care period. The minimum travel time from the base of trenches to the uppermost aquifer is determined to be 46 years, using an eight percent volumetric water content and the maximum measured recharge rate of 0.184 feet per year. The landfill was opened in 1975 and is scheduled for closure in 1990. Assuming a one-year closure period and a 30-year post-closure period, liquid migrating from the landfill will not reach the uppermost aquifer until the post-closure care period expires.

E-2 INTERIM STATUS PERIOD GROUNDWATER MONITORING DATA

This section is omitted. There is no potential for migration of liquid from regulated units in the NRDWL to the uppermost aquifer during their active life and post-closure care period.

E-3 AQUIFER IDENTIFICATION

The uppermost aquifer at the Hanford Site is represented by the Hanford Formation glaciofluvial sands and gravels and the Ringold Formation silts and gravels. The underlying aquifer consists of sedimentary interbeds of the Ellensburg Formation and interflow zones which occur between dense basalt flows in the Columbia River Basalt Group. A discussion of these aquifers and their hydrogeologic properties are included in the groundwater monitoring waiver request (Appendix E-1).

E-4 CONTAMINANT PLUME DESCRIPTION

This section is omitted.

E-5 GROUNDWATER MONITORING PROGRAM

This section is omitted. A waiver from establishing a groundwater monitoring program in accordance with 40 CFR 264.97 and WAC 173-303-645(8) is being sought on the basis of "no migration".

E-6 DETECTION MONITORING PROGRAM

This section is omitted. A waiver is being sought to exempt the facility from compliance with 40 CFR 264.98 and WAC 173-303-645(9).

E-7 COMPLIANCE MONITORING PROGRAM

This section is omitted.

E-8 CORRECTIVE ACTION PROGRAM

This section is omitted.

APPENDIX E-1

REQUEST FOR WAIVER FROM WAC REQUIREMENT FOR GROUND-WATER MONITORING AT THE NON-RADIOACTIVE DANGEROUS WASTE LANDFILL, HANFORD SITE, WASHINGTON STATE

Request for Waiver from WAC Requirement For Ground-Water Monitoring at the Non-Radioactive Dangerous Waste Landfill, Hanford Site, Washington State

June 1985

TABLE OF CONTENTS

Page

PURPOSE.....5

INTRODUCTION.....7

Description of NRDW Landfill.....7

Technical Overview.....10

WAIVER REQUEST SUMMARY.....12

METEOROLOGICAL CONDITIONS.....18

GEOLOGIC CONDITIONS.....21

Physiographic Setting.....21

Regional Geologic Setting.....21

Geologic Structure.....24

Geomorphology of the NRDW Landfill.....24

Geology and Stratigraphy of the NRDW Landfill.....26

HYDROLOGIC CONDITIONS.....35

Surface Water in the Pasco Basin Region.....35

Hanford Site.....35

Surface Flooding Potential.....37

Flood History of the Columbia River.....37

Flood Potential.....38

Cold Creek Watershed.....42

Regional Hydrology of the Unconfined Aquifer.....42

Regional Recharge.....43

Movement.....44

Discharge.....44
Hydraulic Properties.....44
The NRDW Landfill Hydrology.....45
Ground-Water Quality.....47

VADOSE ZONE RECHARGE.....51
300 Area Lysimeter Recharge Study.....53
200 Area Deep Lysimeter Recharge Study.....54
BC Crib Recharge.....54
Recharge Transport.....57
Model Evaluation.....57

CERTIFICATION BY A QUALIFIED GEOLOGIST.....60
REFERENCES.....61

LIST OF FIGURES AND TABLES

FIGURES:

Page

1. Location of the NRDW Landfill On the Hanford Site, Washington State....8
2. Site Plan for the NRDW Landfill....9
3. Wind Rose for the Hanford Telemetry Network (After Stone et al., 1983)....19
4. General Topography of the Hanford Site, Pasco Basin, Washington....22
5. Generalized Structural Features of the Pasco Basin, Washington....25
6. NRDW Landfill Geologic Study Area Well Location Map and Location of Geologic Cross Sections A-A' and B-B'....27
7. NRDW Landfill Study Area Geologic Cross Section A-A'....28
8. NRDW Landfill Study Area Geologic Cross Section B-B'....29
9. General Stratigraphy of the NRDW Landfill....31
10. Geologic Profile of Trench Number 26 at the NRDW Landfill....33
11. Surface Water Bodies Including Ephemeral Creeks on the Hanford Site....36
12. Flooded Area During the 1894 Flood (after ERDA, 1976)....39
13. Flooded Area for the Probable Maximum Flood (after ERDA, 1976)....40
14. Flooded Area Resulting From a 50 Percent Breach of Grand Coulee Dam (after ERDA, 1976)....41
15. Ground-Water Quality Map (after Graham, 1981)....50

16. Gamma Activity at Depth in Well 299-E13-7 Monitoring the 216-B-20 Specific Retention Trench for the Years 1963 and 1968.....55

17. Gamma Activity at Depth in Well 299-E13-7 Monitoring the 216-B-20 Specific Retention Trench for the Years 1976 and 1984.....56

TABLES:

1. The Type of Assumptions that EPA Will Use in Reviewing the Request for Waiver and the Section of the Text in which Each is Discussed.....11

2. Representative Hydraulic Properties of the Unconfined Aquifer (after Gephart et al., 1979).....45

3. Depth to Water and Water Table Elevations From Semi-annual Measurements between December, 1975 and December, 1984 at Five Wells Near the NRDW Landfill.....46

4. Water Quality of the Unconfined Aquifer for the Pasco Basin and the Hanford Site.....49

5. Volumetric Water Content in a Recharge Study Well (Heller et al., 1985).....52

6. Travel Time Equations and Example Calculation.....53

PLATE 1. Hanford Site Water Table Map, December 1984

PURPOSE

The United States Department of Energy is responsible for operating a major chemical separations facility on the Hanford Site, Washington, including waste disposal operations on the site. Among the disposal operations, a Non-Radioactive Dangerous Waste (NRDW) Landfill falls under the dangerous waste regulations as defined in WAC 173-303. WAC 173-303-645 states that specific ground-water monitoring requirements apply to dangerous waste disposal sites. However, the Environmental Protection Agency (EPA) ground-water monitoring requirements may be waived at hazardous waste disposal facilities as specified in 40 CFR 265.90(c):

> "All or part of the ground-water monitoring requirements of this subpart may be waived if the owner or operator can demonstrate that there is a low 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."

Additionally, the WAC 173-303-645(1)(b) (iii) addressing final facility status states that the owner or operator of a landfill is not subject to the ground-water monitoring requirements if:

> "The department finds that there is no potential for migration of liquid from a regulated unit to the uppermost aquifer during the active life of the regulated unit (including the closure period) and the post-closure care period. This demonstration must be certified by a qualified geologist or geotechnical engineer. In order to provide an adequate margin of safety in the prediction of potential migration of liquid, the

owner or operator must base any predictions made under this subsection on assumptions that maximize the rate of liquid migration."

The purpose of the waiver request is to address the physical conditions of the NRDW Landfill in order to demonstrate that no potential for contaminant migration to the uppermost aquifer exists during the interim operating, closure and post closure period. Guidance as given by the EPA in 40 CFR 264.90(b)(4) and EPA (1982a, 1982b) is followed to detail the basis for request for relief from the monitoring requirements.

INTRODUCTION

The NRDW Landfill, a portion of the Central Landfill, is located about 5 miles southeast of the 200 Areas on the Hanford Site (Figure 1), and can be found on the U.S. Geological Survey Hanford, Washington 15 minute topographic sheet. The Central Landfill has been used by DOE for approximately ten years and covers about 76 acres land area. The northern quarter of the facility is allocated for disposal of non-radioactive dangerous waste materials and is referred to as the NRDW Landfill. Dangerous wastes have been disposed to this section of the landfill since 1975. Sixteen trenches are dedicated to asbestos or chemical wastes. Chemical waste compositions and volumes for calendar year 1984 are listed in the Generator Annual Dangerous Waste Report (DOE RL, 1984). Figure 2 details the configuration of the hazardous waste trenches. Chemical trenches are limited to numbers 26, 28, 31, 33, 34, and 36, of which only trenches 33 and 34 were in use prior to the ban on extremely hazardous wastes.

DESCRIPTION OF NRDW LANDFILL

Disposal trenches at the Landfill are excavated on 46 foot centers and are measured and flagged at intervals to insure non-intersecting trenches. Spoil piles are created on both sides of the trench during excavation. Each trench is about 400 feet long, 13 feet wide at the base, and 14 to 16 feet deep. Prior to disposal of materials into the trenches, 8 to 10 inches of "ballast gravel" are bulldozed onto the bottom of the trench to allow heavy vehicle access. Currently, materials for disposal are buried only on Fridays in an effort to minimize wasted trench space. There is no continuous operational water supply at the NRDW Landfill. Drinking water supplies for operating personnel are transported to the site in five-gallon containers.

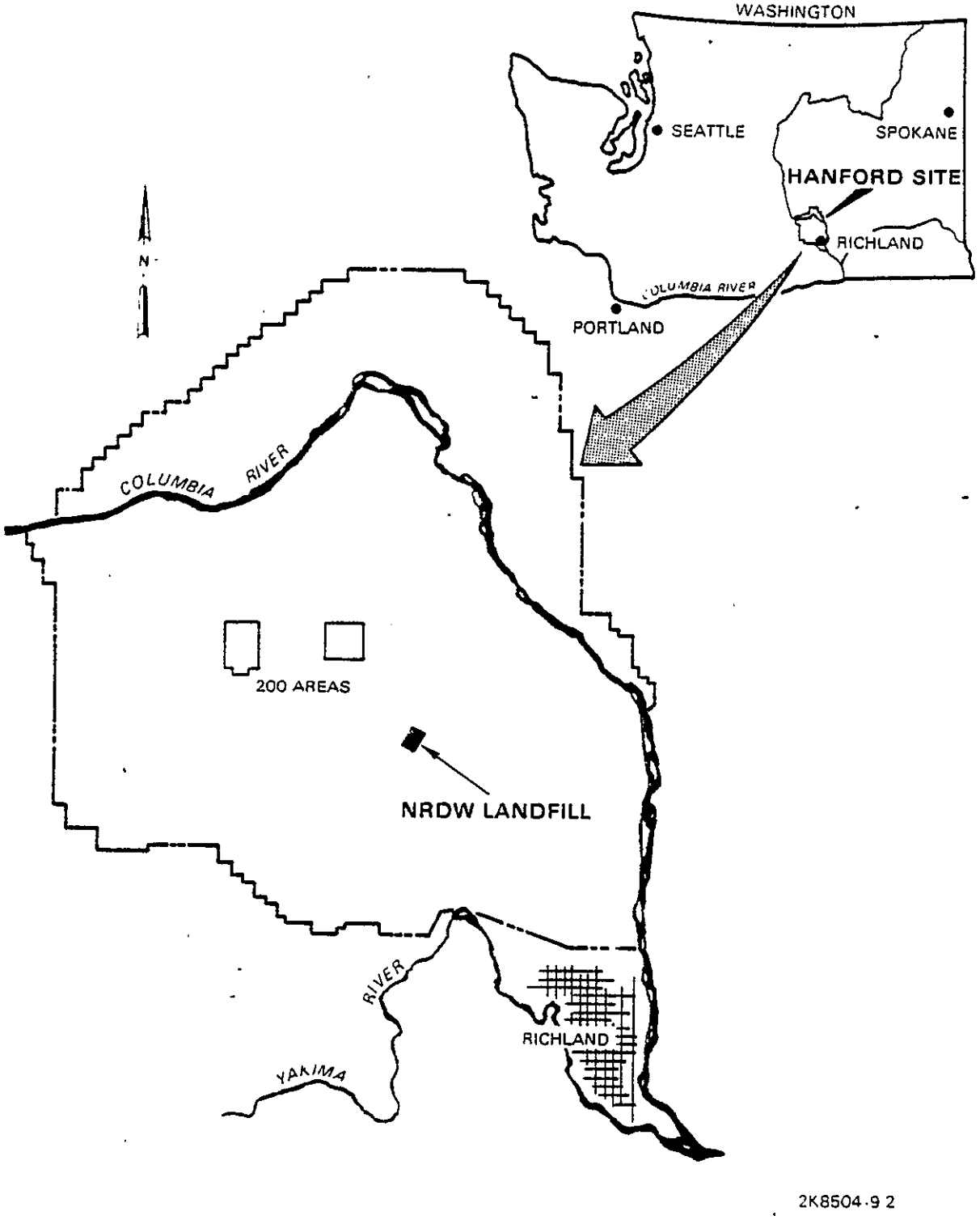


Figure 1. Location of the NRDW Landfill on the Hanford Site, Washington State.

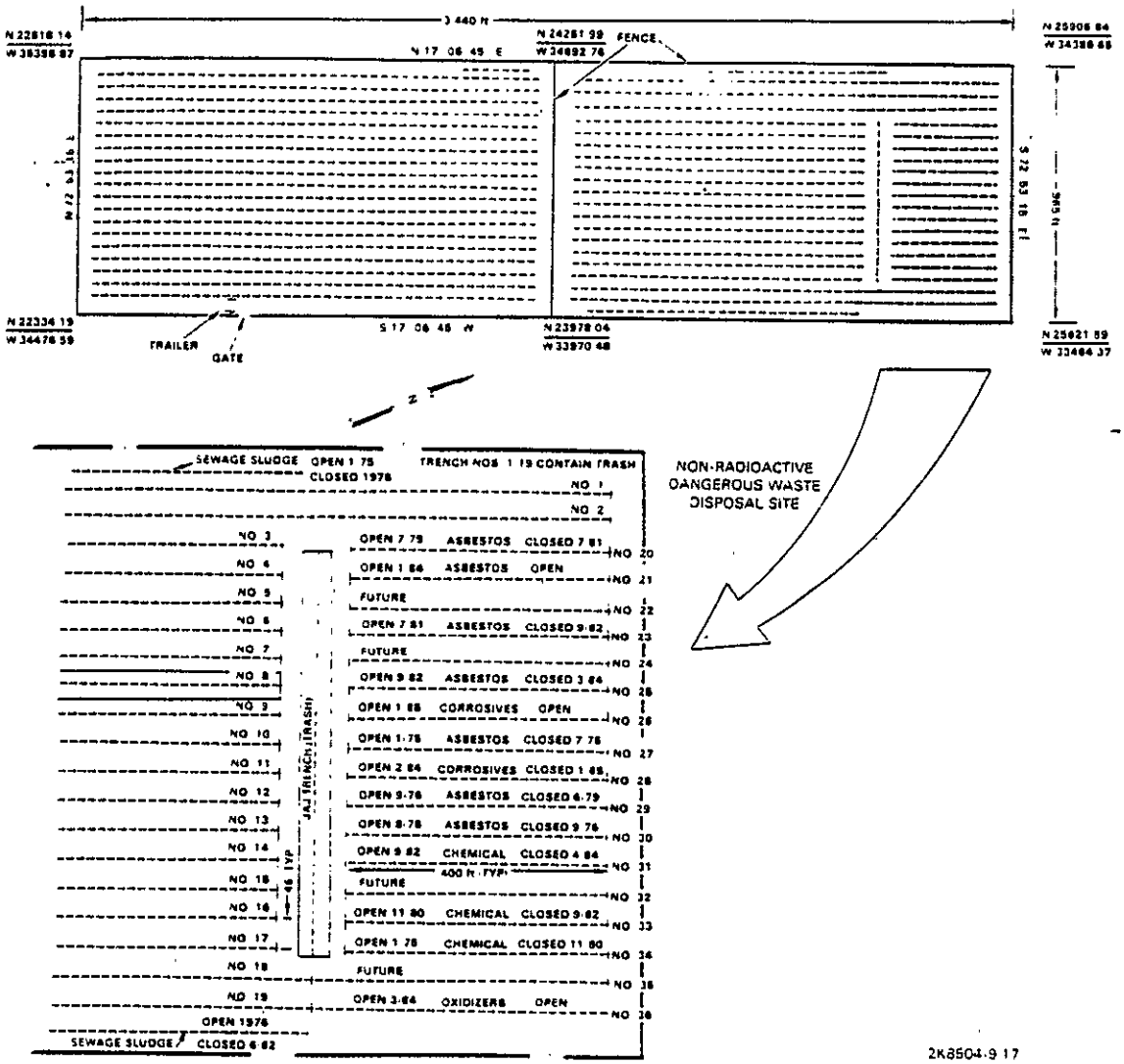


Figure 2. Site Plan for the NRDW Landfill.

TECHNICAL OVERVIEW

The EPA (1982a, 1982b) guidance rules are followed in the proceeding technical sections which support the request for waiver. Table 1 outlines the "types of assumptions that EPA will use in determining whether an exclusion is warranted" (EPA, 1982b) and lists the section of the report where each is covered in detail. These "types of assumptions" are discussed in relationship to the hydrogeologic environment at the landfill. Furthermore, these factors (assumptions) are among a group of factors that control waste migration to the ground water. Therefore, the total meteorlogic, geologic and hydrologic picture is presented in order that the reader understand the environment and all of the physical factors (additional to those listed by the EPA) controlling any contaminant migration from the NRDW Landfill.

Meteorological data including temperature extremes, occurrence and velocity of winds, precipitation and potential evapotranspiration are presented in detail because these factors impact the amount of moisture available to transport waste through the sediment column to the ground water. The geology discussion emphasizes the depth of sediments, depth to water-table and the variable geologic strata through which any waste must be transported to reach ground water. The potential for surface waters inundating the NRDW Landfill is considered. Hydraulic conductivities and transmissivities of the aquifer are presented as well as ground-water flow-path time. Recharge through the vadose zone to ground-water is considered. The various Hanford Site recharge studies are discussed in detail and a range of vadose zone flow-path times is calculated. A review of the literature conducted to investigate available models for recharge through the vadose zone is covered, and the applicability of these models to the NRDW Landfill is discussed.

Table 1. The Types of Assumptions that EPA Will Use in Reviewing the Request for Waiver and the Section of the Text in which Each is Discussed.

Assumption*	Discussion Section in Text	Reference Page
The thickness of the soil from ground surface to the water-table should be stated	Waiver Request Summary	14
	Geology and Stratigraphy of the NRDW Landfill	26
	The NRDW Landfill Hydrology	45
Travel time calculations should be based on natural soil properties	Waiver Request Summary	14
	Vadose Zone Recharge	51
Travel time calculations should be based on least viscous fluid	Waiver Request Summary	14
	Vadose Zone Recharge	51
The travel time should be based on maximum hydraulic head i.e. the regulated unit is full of water	Waiver Request Summary	14
	Meteorological Conditions	20
	Surface Flooding Potential	38
	Vadose Zone Recharge	51
The travel time should be based on a saturated sediment column from the regulated unit to the ground water	Waiver Request Summary	15
	Meteorological Conditions	20
	Surface Flooding Potential	38
	Vadose Zone Recharge	51
The effective porosity should be accounted for or else assumed to to be 10 percent	Waiver Request Summary	15
	Vadose Zone Recharge	51
Soil attenuation mechanisms should be ignored	Waiver Request Summary	16
	Vadose Zone Recharge	51
The migration of fluids through the soil should be assumed to have begun when the regulated unit commenced operation	Waiver Request Summary	16
The request for waiver must be certified by a qualified geologist	Waiver Request Summary	16
	Certification by a Qualified Geologist	60

* Taken from EPA (1982b)

WAIVER REQUEST SUMMARY

The NRDW Landfill is centrally located on the Hanford Site and about 10 miles from the Columbia River. The Columbia River is the only surface water body that might impact the Landfill by flooding. However, under the most severe flooding conditions, flood waters would penetrate no closer than 7 miles from the NRDW Landfill. There is essentially no potential for inundation of the landfill site by surface water. Furthermore, there is no continuous operational water supply. Small quantities of drinking water are transported to the site in five-gallon containers.

The Hanford climate is mild, often windy and dry. The average precipitation is 6.3 in/yr and the 100 year, 24 hour maximum predicted rainfall is 2.0 inches. Potential evapotranspiration rates greatly exceed annual precipitation rates. Therefore recharge to the water table can be expected to be low. The moisture travel time from the bottom of the NRDW trenches to ground water is shown to be (Heller et al., 1985):

$$T = D/V = D/r/\theta = D\theta/r$$

where T = Travel time to ground water (years)
D = Depth to ground water (cm)
V = Velocity of water movement through the sediments
θ = Volumetric water content of the sediments
r = Recharge rate (cm/year).

Direct measurements of recharge rate (r) have been conducted and values range from 0.5 to 5.6 cm/yr. The depth to groundwater (D) is 105 feet (3200 cm) from the base of the NRDW trenches. This is known from semiannual water-table measurements taken since 1975 from five wells around the landfill. The elevation of ground water beneath the landfill is known to ± 0.5 feet (15 cm). The volumetric water content (θ) was selected as the minimum of average values for three sediment types from a recharge study of sediments similar to those at the landfill (Heller et al., 1985). Average volumetric moisture contents ranged from 8-18 percent for the three sediment types. The most conservative value of 8 percent was assumed for the travel time calculation. Based on the measured recharge values, travel time from the landfill to ground water ranged from 510 to 46 years.

The unconfined aquifer is the aquifer recharged, since any waste migration through the sediment column would contact this aquifer first. The depth from the NRDW Landfill surface to ground water is 125 feet. The aquifer thickness below the NRDW Landfill is 220 feet. Ground-water flows from west to east to discharge at the Columbia River, the nearest surface water body, under a relatively shallow 5.5 ft/mile head gradient. The nearest potable ground-water well is at the Fast Flux Test Facility (FFTF) about 6.5 miles to the southeast. Ground-water flow velocities are estimated at 1890 ft/yr based on tritium transport and modeled, utilizing the Hanford Pathline Calculation Program (HPCP), at 880 ft/yr. These result in aquifer flow path-times of 28 and 60 years, respectively, to the Columbia River and aquifer flow times of 18 and 39 years respectively to the FFTF drinking water supply wells.

The EPA has outlined nine assumptions which should be addressed in a request for waiver. The following discussions will evaluate known conditions at the site against the stated assumptions.

o <u>The thickness of the soil from ground surface to the water table should be stated.</u>

The depth to ground water at well 699-24-33 is 121 feet. This is known from semi-annual water table measurements since 1975. This well is within about 1000 feet of the NRDW Landfill and its casing elevation is about 5 feet lower than the Landfill. The water table gradient below the site is nearly flat. Therefore, depth to ground water is about 125 feet from the landfill surface.

o <u>Travel time calculations should be based on natural soil properties.</u>

All the investigations referenced concerning recharge rates have concentrated on measurements of recharge rates either directly or indirectly in field studies. These field studies have been conducted in the 200 Area (about-2.5 miles northwest of the landfill) in the 600 Area (about 4 miles southeast) and in the 300 Areas (about 9 miles southeast) of the Hanford Site.

o <u>Travel time calculations should be based on the least viscous liquid.</u>

Current landfill management practices do not allow for disposal of bulk liquids and limit disposal to containerized materials packed in absorbent inside of burial drums. The field investigations have been conducted to evaluate soil moisture (water) movement. Soil moisture will be the transport medium for movement of any waste through the sediment column, therefore, it is assumed to be the least viscous liquid.

o <u>The travel time should be based on maximum hydraulic head i.e. the regulated unit is full of water.</u>

This assumption is addressed concurrently with the response to the following assumption.

- <u>The travel time should be based on a saturated sediment column from the regulated unit to the ground water.</u>

There are only three means by which total saturation could occur at the NRDW Landfill: surface waters flooding the site for an extended period, flooding from an onsite water supply, and a precipitation event which could saturate the sediment column. As has been shown, there is essentially no potential for surface water flooding, there is no operational water supply on the landfill and the maximum 100 year precipitation event in a 24 hour period is 2.0 inches. In order to achieve a maximum hydraulic head, it would require saturation of all pore space in the sediment column. Total porosity measured in well 699-30-47 averaged 36.3 percent in 46 samples throughout the depth of the well. Achieving saturation of the sediment column would require 0.363 ft water/ft soil x 125 ft soil = a 45 foot depth of water. There is no natural or manmade source for a supply of water this large at or near the landfill. Therefore, there is no justification for assuming maximum hydraulic head and a saturated sediment column. All calculations of travel times then are based on field studies of the unsaturated conditions natural to the Hanford site sediments.

- <u>The effective porosity should be accounted for or else assumed to be 10 percent.</u>

The effective porosity is a term normally used to describe a saturated, i.e. ground-water, system. Since recharge rates through the sediment column were evaluated under the unsaturated natural state, "the effective porosity" was addressed by evaluation of the volumetric water content in the quasi-steady state sediment system. The volumetric water content (cm water/cm soil) is an expression of the volume of water/volume of soil percentage at which a soil drains under unsaturated equilibrium conditions and is, therefore, the effective porosity of the unsaturated system. The effective porosity used in the

calculations in this report was 8 percent which is more conservative than the 10 percent recommended by EPA.

o Soil attenuation mechanisms should be ignored.

Solubility of wastes and waste sediment interactions have not been utilized to increase travel time calculations.

o The migration of fluids through the soil should be assumed to have begun when the regulated unit commenced operation.

The landfill was opened in 1975. This date has been used as the start date for calculating the travel time during the interim operating period and the closure and post closure periods.

o The request for waiver must be certified by a qualified geologist.

The request for waiver from ground-water monitoring requirements at the NRDW Landfill has been certified by W. H. Chapman-Riggsbee, a licensed professional geologist in the State of Oregon.

It has been shown that under worst case conditions, there is no potential for contaminant migration to the ground water during the next 30 years. Any contaminant transported through the sediment column must be water soluble. The transport medium which will move a contaminant is recharge moisture. Solubility of wastes and waste-sediment interactions will likely limit the concentrations of transported wastes to low values, however, soil attenuation mechanisms have not been considered in the travel time calculations. Soil moisture movement through the sediment column has been estimated to occur over a range of rates. If one selects the minimum resulting travel time of 46 years to ground water there remain 36 years (since startup of disposal in 1975) before any contaminant could reach the water-table.

There is a time frame of a minimum of 36 years (maximum of 500 years) during which no waste could contact the water-table. Ground-water monitoring during this period would serve no useful purpose prior to waste arriving at the water table (if time is allowed for baseline characterization). It is requested that the State of Washington allow a waiver to the WAC ground-water monitoring requirement for a 30 year period. This would allow for a 1 year period (the 31st year) to emplace monitoring structures and a minimum of a 5 year period to collect baseline data after the 30 year waiver.

METEOROLOGICAL CONDITIONS

Meteorological data are collected at a number of locations on the Hanford Site. These locations bound the NRDW Landfill. Complete climatological data are available since 1945 for the Hanford Meteorological Station (HMS), located approximately 7 miles northwest of the Landfill. Temperature and precipitation data from a nearby location are available for the period 1912 through 1943. A summary of these data, for the period through 1980, has been published by Stone et al. (1983). Data from the HMS are representative of the general climatic conditions that exist at the NRDW Landfill.

Wind data are collected routinely at the Hanford Site by the HMS and by a series of wind telemetry stations that are distributed on and around the Hanford Site. Figure 3 indicates the wind direction frequency distributions at the HMS and 12 of the telemetry stations. The dominant wind directions at the NRDW Site are from the Northwest and West. For the 26-year period of 1955 through 1980, prevailing wind directions are from the northwest in all months. Secondary maximum frequencies are from southwesterly winds. Monthly average wind speeds are lowest during the winter months averaging 6 to 7 miles per hour, and highest during the summer months averaging 9 to 10 miles per hour.

Average monthly temperatures range from a low of 29.3 degrees Fahrenheit (F) in January to a high of 76.4 F in July. The maximum monthly average temperature at the HMS during the winter is 44.5 F, and the minimum is 21.4 F, both occurring during February. The maximum monthly average temperature during the summer is 81.8 F in July, and the minimum is 63.0 F in June. The annual average relative humidity at the HMS is 54 percent, with a maximum of about 75 percent during the winter months and a minimum of about 35 percent during the summer months.

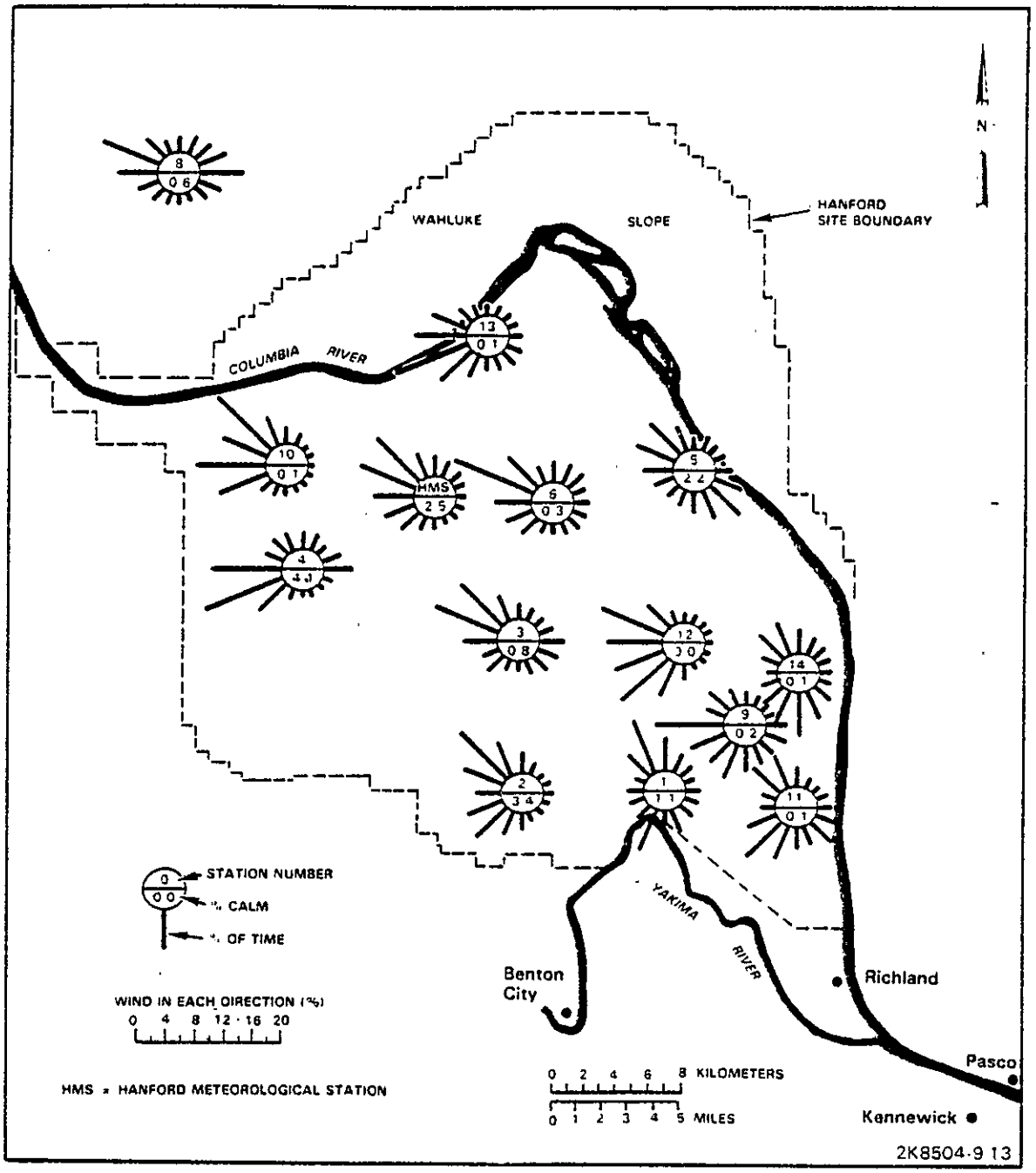


Figure 3. Wind Rose for the Hanford Telemetry Network (after Stone et. al., 1983). (The points of the rose represent the directions from which the winds blow toward the center of the rose. The lengths of the points represent the percent of time the wind blows from that direction.)

Average annual precipitation at the Hanford Meteorological Station is 6.3 inches. The months of November through February account for nearly half of the annual precipitation. Fewer than 1 percent of the days have rainfall greater than 0.5 inches. Based on Hanford data, Stone et al. (1983) predicted that the maximum 24 hour rainfall event in a 100 year period would be 2.0 inches. Total precipitation over the entire Pasco Basin is estimated at less than 8 inches annually. Mean annual runoff is generally less than 0.5 inches for most of the basin and the basin-wide runoff coefficient, for all practical purposes, is zero (Leonhart, 1979).

Average annual evaporation can exceed 60 inches. Average annual lake evaporation ranges from approximately 39 to over 42 inches. Actual evapotranspiration for a 6 inch water-holding-capacity soil (uncultivated) is approximately 7.5 to 8.5 inches (Leonhart, 1979, Wallace, 1978). Studies by Last et al. (1976), Brown and Isaacson (1977), and Jones (1978) suggest nearly all percolated water was subsequently dispersed by evapotranspiration.

In summary, the Hanford climate is mild and dry with occasional periods of high winds. Summers are hot and dry; winters are less dry but are relatively mild for this latitude. Average maximum temperatures occur in July, and average minimum temperatures occur in February. Average relative humidity is lowest in the summer and highest in the winter. Average annual precipitation is about 6.3 inches. The 100 year maximum predicted rainfall event in a 24 hour period is 2.0 inches. Potential evapotranspiration rates greatly exceed annual precipitation rates and highest monthly average winds occur during the hot summer creating very high evaporative potentials.

GEOLOGIC CONDITIONS

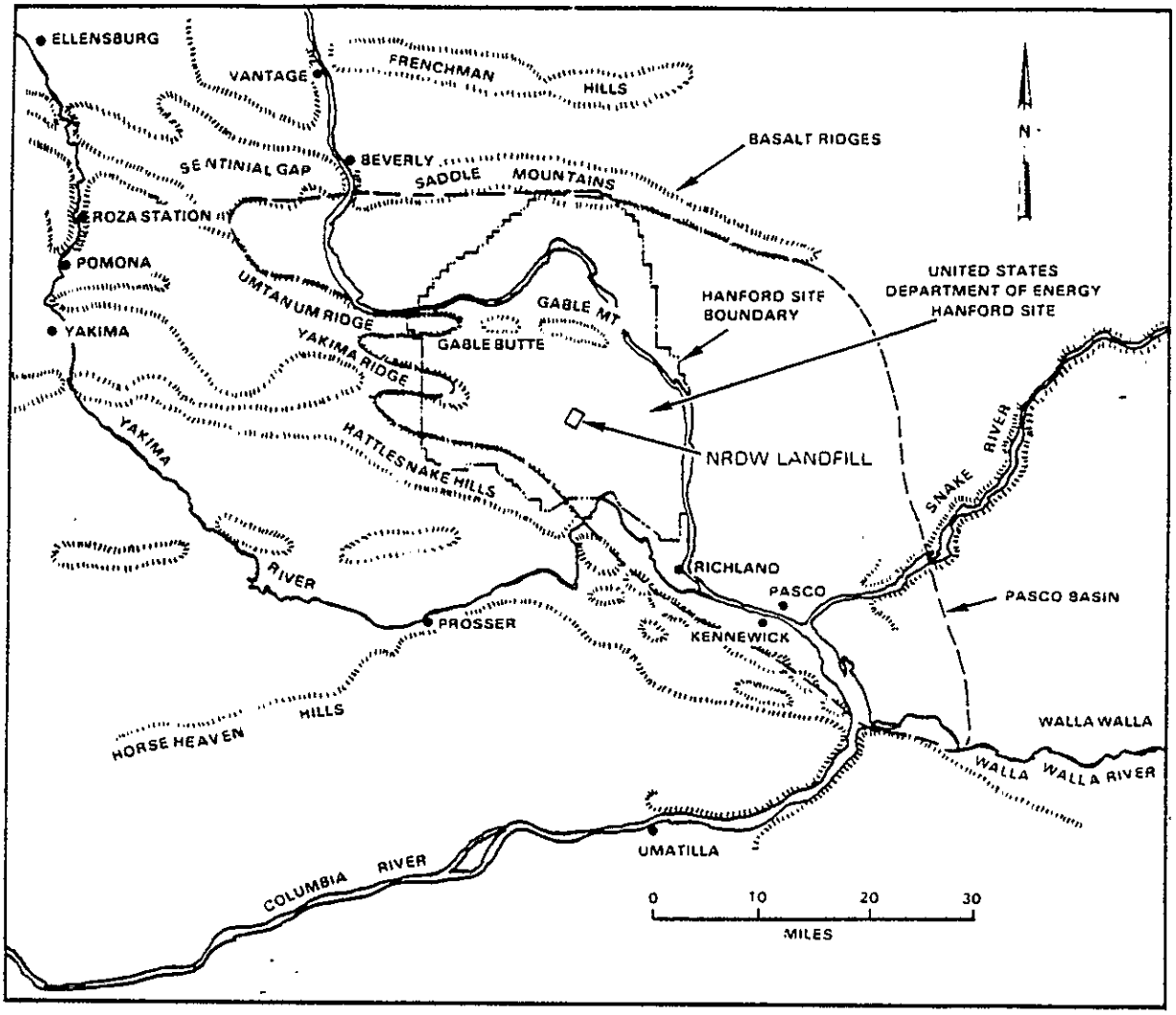
PHYSIOGRAPHIC SETTING

The Columbia Plateau Physiographic Province as defined by Freeman et al. (1945) is characterized by a thick sequence of tholeiitic flood basalts. This Province can be subdivided into smaller regions, one of which, the Columbia Basin Section, forms a broad topographic and structural basin and represents the interior lowland portion of the Columbia Plateau. The Pasco Basin, location of the Hanford Site, is one of several structural and topographic subbasins within the Columbia Basin section of the western Columbia Plateau. The general topography of the region is shown in Figure 4.

REGIONAL GEOLOGIC SETTING

The Columbia Plateau is primarily underlain by Miocene tholeiitic flood basalts known as the Columbia River Basalt Group (Swanson et al., 1979b). The basalts of this group emanated from a series of linear fissures in the eastern and southern portion of the Plateau and extend laterally into western Idaho, Oregon, and eastern Washington. Most of the basalt was emplaced between 16.5 and 14.5 million years before present, although sporadic fissure eruptions continued until about 6 million years before present.

About 15 million years ago and during the increasingly sporadic basalt eruptions, ancestral river systems transported epiclastic and volcaniclastic sediments onto the Columbia Plateau. These Miocene subfluvial sediments are known as the Ellensburg Formation and are interbedded with and locally overlie the upper basalt sequence.



2K8504-9 11

Figure 4. General Topography of the Hanford Site, Pasco Basin, Washington.

Deformation during the Columbia River Basalt volcanism resulted in formation of the broad structural and topographic basin known as the Columbia Basin. During the late Miocene and early Pliocene epochs sediments transported from the surrounding highlands accumulated in these basins. In the Pasco Basin the approximately 1200 feet of fluvial and lacustrine sediments are termed the Ringold Formation and were deposited by the Columbia and Snake river systems (Tallman et al., 1979).

During the Pleistocene epoch the Pasco Basin was inundated by floodwaters from multiple catastropic floods when ice dams failed along the glacier margins in northern Montana, Idaho, Washington, and southern British Columbia. Enormous volumes of water from glacial Lake Missoula surged across eastern Washington, scouring the plateau surface and emptying into the Pasco Basin. Temporary impoundment behind the under-sized water gap at Wallula resulted in formation of a large lake estimated to have reached 1160 feet above mean sea level (msl) (Myers and Price, 1981). Sediments deposited throughout the Pasco Basin during these flooding events are informally referred to as the Hanford formation and have been divided into a fine and coarse facies, known as the Touchet beds (Flint, 1938) and Pasco gravels (Brown, 1975), respectively.

Loess, alluvium, colluvium, dune sand and landslide deposits occur throughout the Pasco Basin (Myers and Price, 1981). Loess, comprised of eolian fine sands and silts, mantles much of the basin in variable thicknesses. Alluvium occurs in the floodplains of the Yakima and Columbia rivers and in the Cold Creek and Dry Creek valleys; deposits below the elevation of Pleistocene flooding are considered Holocene but deposits higher in elevation range in age from Pleistocene to present. Colluvium is present on ridge flanks and is primarily Holocene although at elevations above flood level it is in part

Pleistocene. Landslide deposits range in age from Pleistocene to Holocene depending on the materials involved. Dune sand is present throughout the Pasco Basin. Active dunes are present in the central basin and to the north and east along the Columbia River; stabilized dunes occur in the south central basin.

GEOLOGIC STRUCTURE

The NRDW Landfill is located on the Hanford Site in the central part of the Pasco Basin. The Pasco Basin is bounded on three sides by west and northwest trending anticlinal ridges, the Yakima folds, which are separated by broad synclinal troughs. The Landfill lies just north of the axis of the buried Cold Creek syncline which trends east-west and plunges eastward into the Pasco Basin. The Cold Creek syncline is located between the Gable Butte-Gable Mountain-Southeast anticlines on the north and northeast and the Yakima Ridge anticline on the west and southwest (Figure 5). Two subtle depressions on the basalt surface at depth, collectively termed the Wye Barricade depression (Myers and Price, 1981), are present along the trough line of the Cold Creek syncline in the vicinity of the NRDW Landfill. Geologic cross sections indicate the NRDW Landfill is situated just south of the northern sub-depression and west of the southern sub-depression.

GEOMORPHOLOGY OF THE NRDW LANDFILL

The terrain surrounding the landfill is relatively flat and the average elevation is about 540 feet msl. Relief is provided by low stabilized longitudinal dunes that trend southwest-northeast through the area. A small active dune field is present about one mile to the east, but the prevailing wind

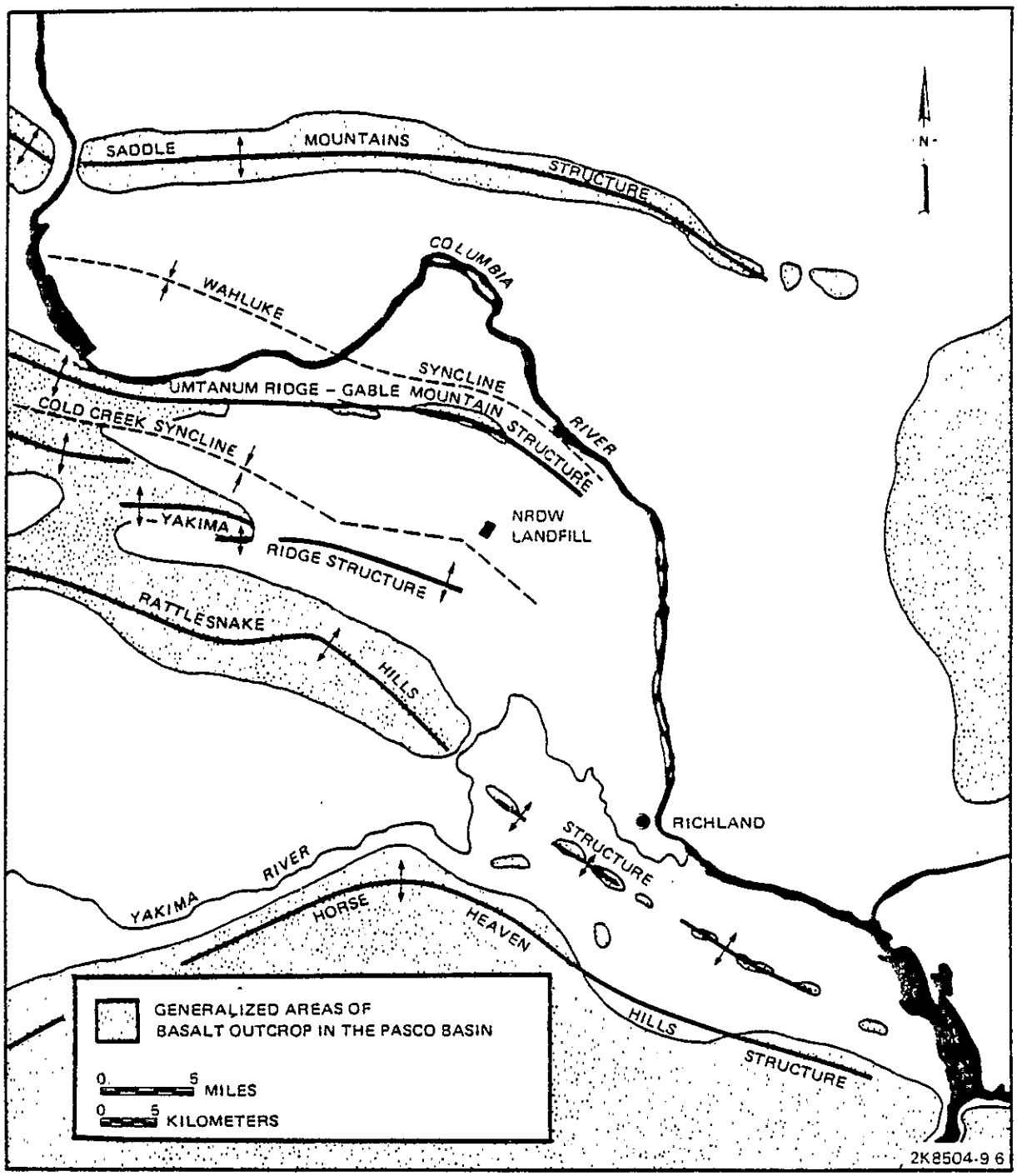


Figure 5. Generalized Structural Features of the Pasco Basin, Washington.

direction is from the northwest, away from the site. Several isolated patches of gravel lag deposits are scattered throughout the dune deposits. The present geomorphology reflects a mature geologic environment generally lacking fluvial erosion or aggradational features and undergoing very slow modification of the landscape only by eolian deflation and deposition. Sagebrush and cheatgrass are the major types of vegetation, however, severe range fires during the summer of 1984 greatly reduced the surrounding groundcover and excavation activities at the Landfill have essentially removed all local vegetation.

GEOLOGY AND STRATIGRAPHY OF THE NRDW LANDFILL

The NRDW geologic study area encompassed an area 4.5 miles by 5 miles (Figure 6) in order to provide sufficient well data to allow construction of two geologic cross sections oriented approximately perpendicular to each other. Rock stratigraphic units were used that follow the stratigraphic nomenclature of Myers and Price (1981). Data gathered by other workers (PSPL, 1981, Routson and Fecht, 1979, Fecht and Lillie, 1982) were re-evaluated and assigned a stratigraphic position based on rock-stratigraphic criteria. The locations of wells referred to in the text and used to construct cross sections are shown in Figure 6. Geologic cross sections showing stratigraphic relations are given in Figures 7 and 8.

The unsaturated (vadose) zone beneath the Landfill is about 125 feet in thickness and sediments within this zone are composed predominantly of gravels and sands of the Pleistocene Hanford formation. The top of the unconfined aquifer, the water-table, marks the lower boundary of the unsaturated zone. The bottom of the unconfined aquifer generally coincides with the top of basalt.

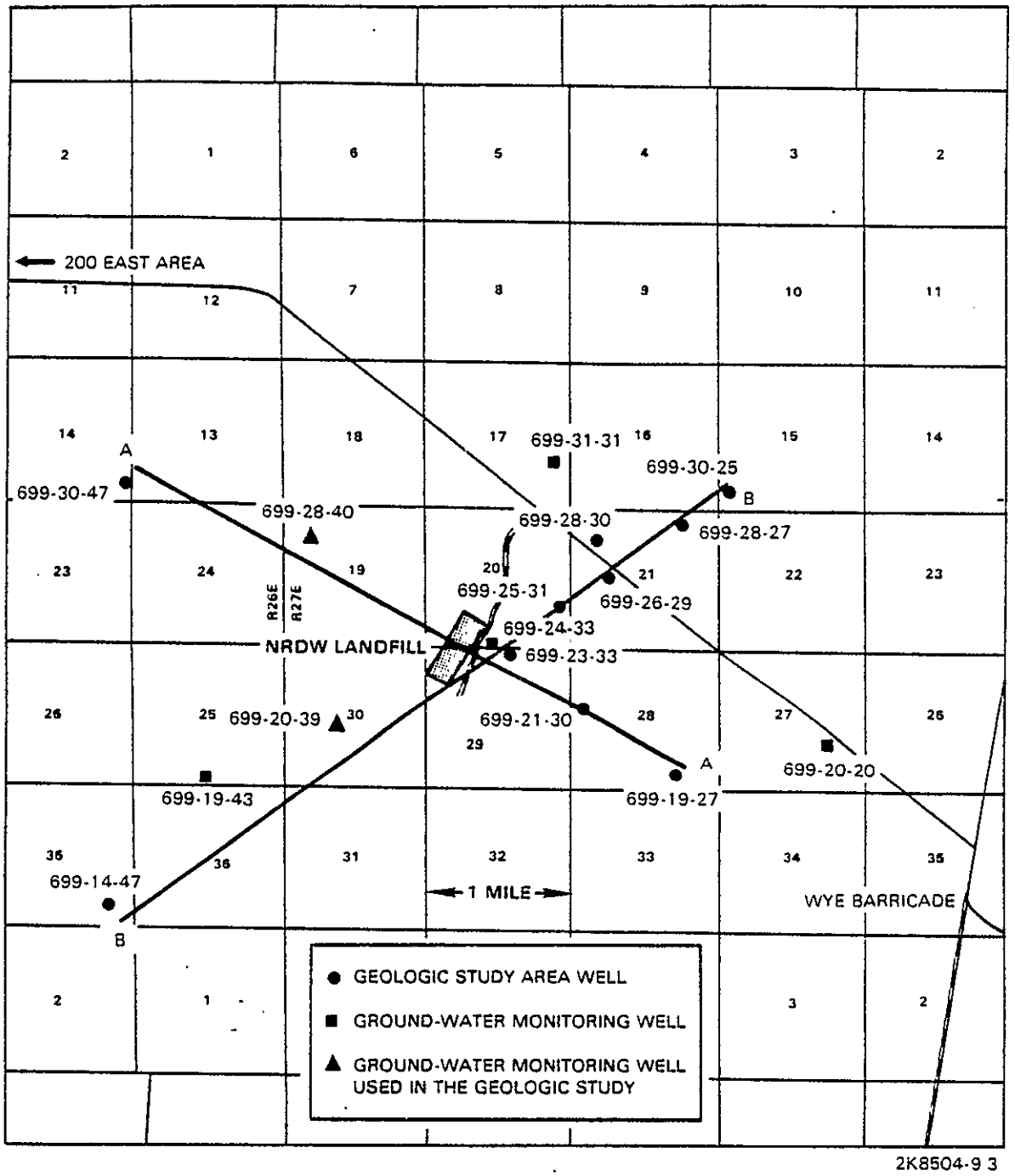


Figure 6. NRDW Landfill Geologic Study Area Well Location Map and Location of Geologic Cross Sections A-A' and B-B'.

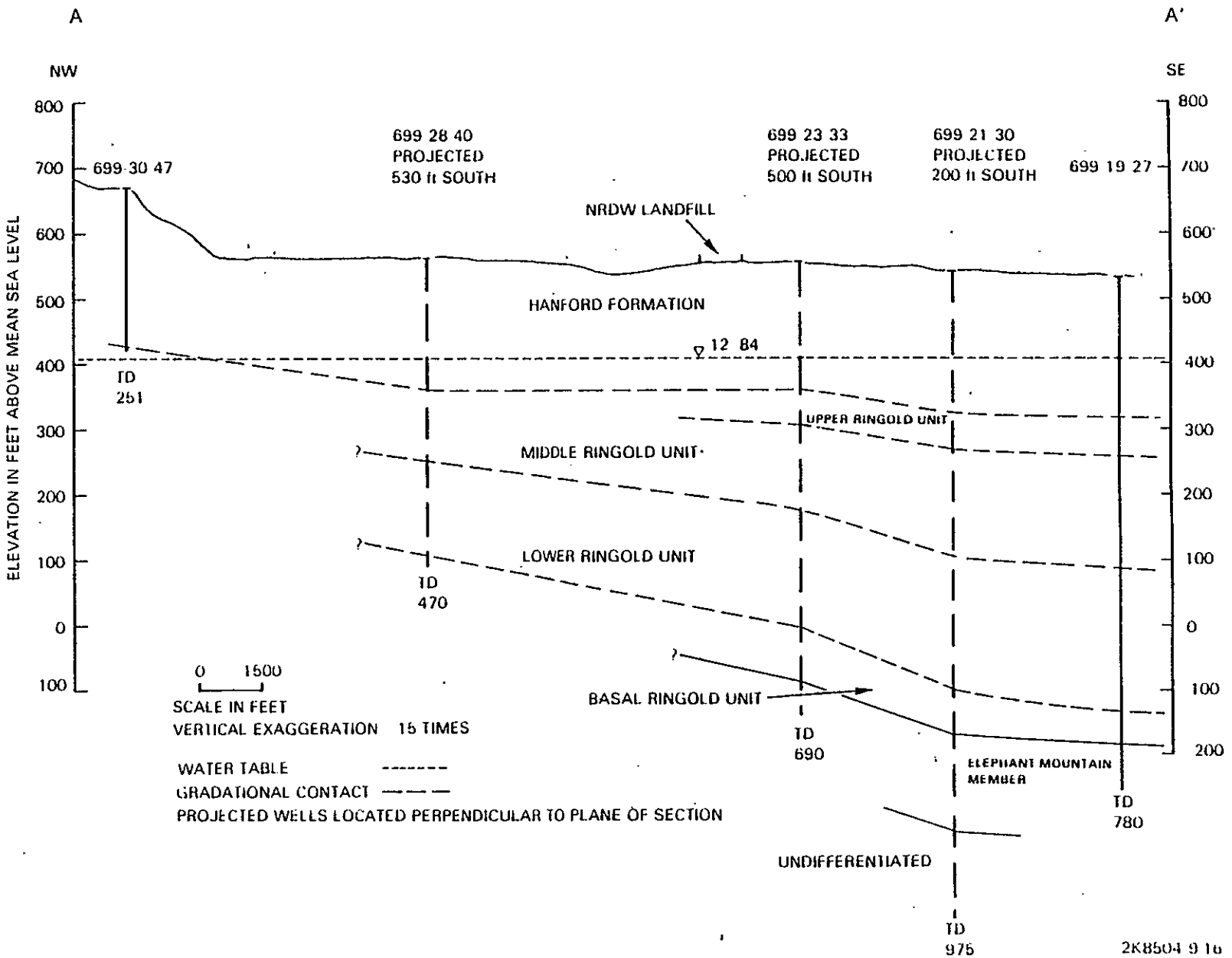


Figure 7. NRDW Landfill Study Area Geologic Cross Section A-A'.

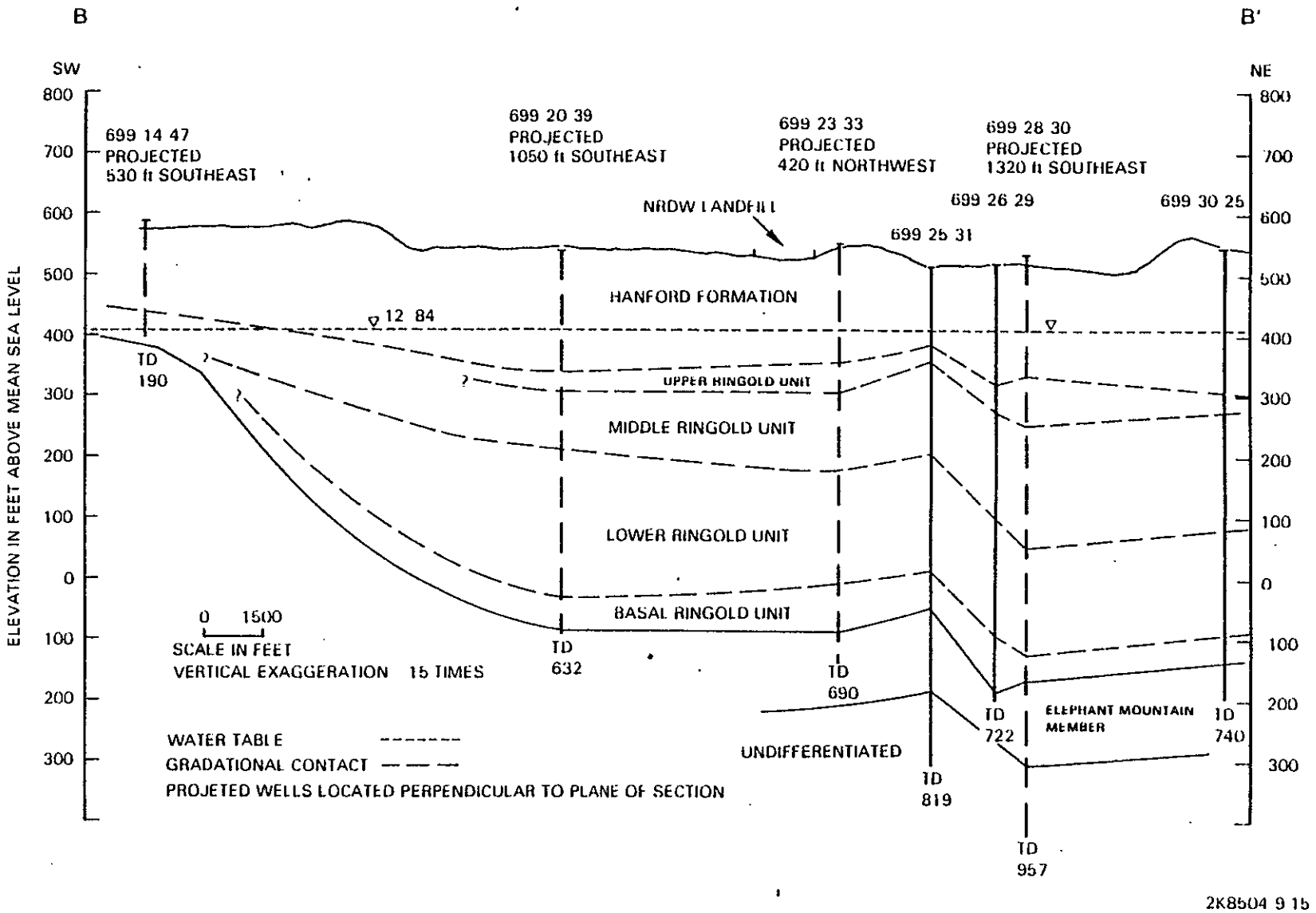


Figure 8. NRDW Landfill Study Area Geologic Cross Section B-B'.

Three major stratigraphic units underlie the NRDW Landfill: the Columbia River Basalt Group which forms the bedrock beneath the site, the Ringold Formation which overlies the basalt sequences, and the (informal) Hanford formation which unconformably overlies the Ringold Formation (Figure 9). Eolian sands veneer the Hanford formation but are not shown on the cross sections due to the difficulty in determining vertical extent on the basis of well sample textures.

Five drill holes (699-19-27, 699-21-30, 699-23-33, 699-25-31, 699-28-30) penetrate to the Elephant Mountain Member of the Saddle Mountains Basalt Formation, Columbia River Basalt Group (see Figure 7 and 8). The Elephant Mountain Member consists of two basalt flows and averages about 145 feet in thickness in the study area. The Miocene to Pliocene Ringold Formation overlies the Elephant Mountain basalt and ranges in thickness from 245 to 520 feet in the study area. The Ringold Formation has been divided into four textural units following Myers and Price (1981), the basal, lower, middle and upper units.

The basal Ringold unit overlies the Elephant Mountain flow throughout the study area and varies in thickness from 45 to 95 feet. This unit is chiefly a gravel to silty, sandy, gravel with minor medium to fine grained sand and silt or clay lenses. The lower Ringold unit overlies the basal unit throughout the study area except at well 699-14-47 where Routson and Fecht (1979) suggest it pinches out against the basal unit. Where wells were completed through the lower unit, measurements indicate the thickness varies from 45 to 250 feet. The texture of this unit ranges from clay to gravelly sandy clay to silty sand with some gravel.

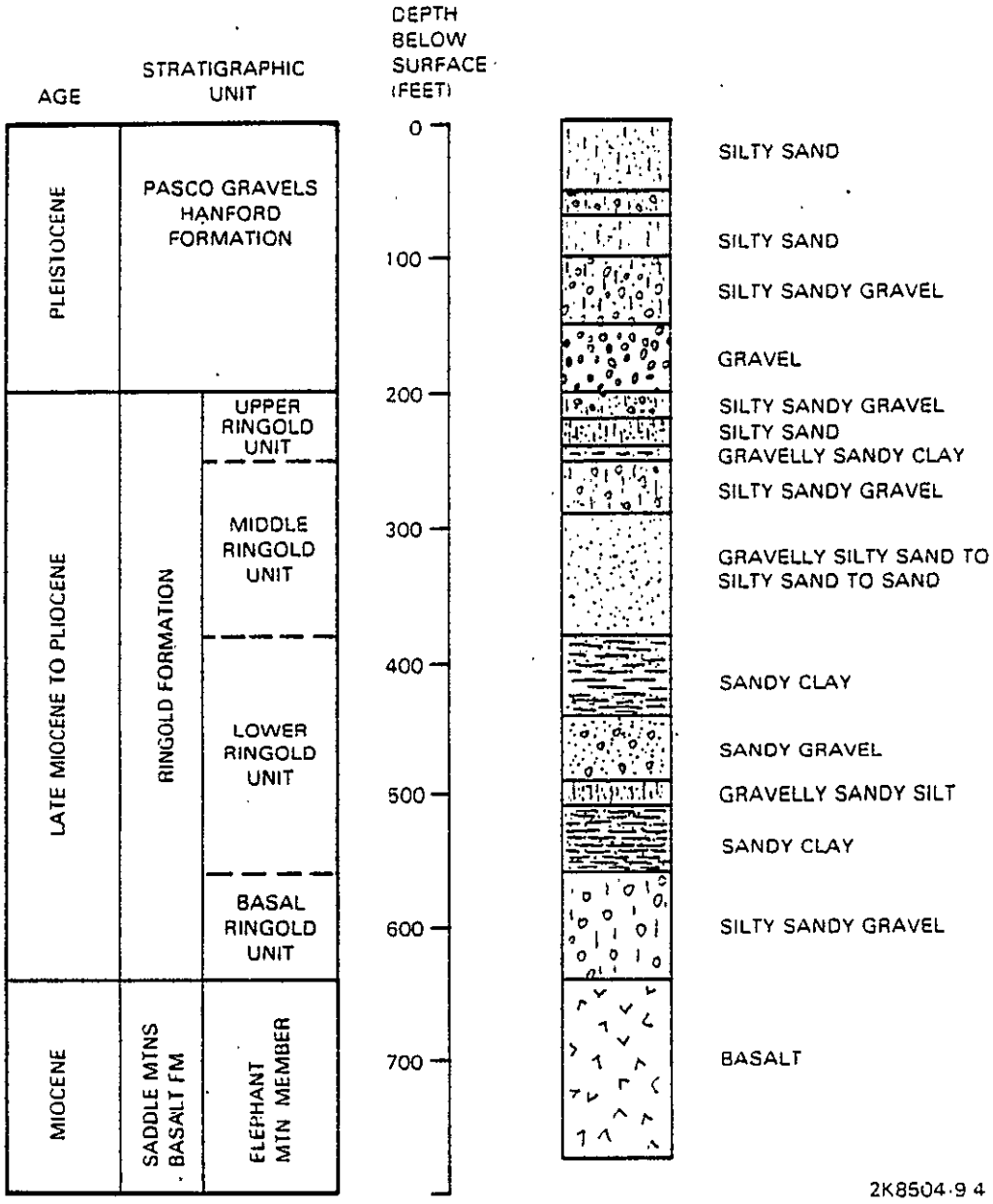


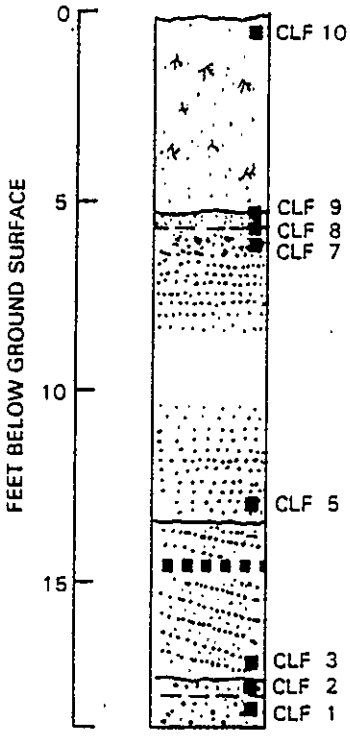
Figure 9. General Stratigraphy of the NRDW Landfill.

The sandy gravel to gravelly sand of the middle Ringold unit is present throughout the study area. The thickness, where measured, ranges from 90 to 219 feet. The upper Ringold unit is present in the more easterly portion of the study area and ranges in thickness from 28 to 84 feet. This unit consists of gravelly silty sands, sandy silts, and minor clay and gravel lenses. Caliche horizons are common.

The Hanford formation blankets the Ringold Formation throughout the study area and varies in thickness from 150 to 244 feet. The Pasco gravels facies of the Hanford formation is the only facies present and the texture ranges from gravel to silty sandy gravel to sand. The coarser portion of the Pasco gravels is composed of boulder to fine pebble sized gravels with relatively high basalt percentages (up to 50 percent). The finer portions of the Pasco gravels are composed of either gray medium to very coarse sand with high basalt percentages or brown very fine to very coarse largely non-basaltic sands. The uppermost textural unit present in the study area is a sand to sandy gravel. The sand units are thicker towards the east and southeast while gravels and silty sandy gravels are more abundant westwards. Lower in the section, gravels and silty sandy gravel units are more abundant; open-work gravels are common near the base of the Hanford formation.

Field observations in the recently excavated waste disposal Trench Number 26 (see Figure 2 for location) show about 14 feet of Hanford formation sands overlain by about 5 feet of eolian sands. Of the Hanford formation sands, about 1.3 feet of very coarse to coarse gray sand was exposed at the base of the trench (Figure 10). The massively bedded sand grades to finer sand upwards and the contact with the overlying unit is indicated by a powdery calcium

GEOLOGIC PROFILE OR TRENCH NO. 26, NRDW LANDFILL



LIGHT BROWN MEDIUM TO FINE SAND GRAINS ARE SUBROUNDED TO ROUNDED AND WELL SORTED SPARSE COBBLES, PEBBLES, AND ROOTLETS. NO BEDDING STRUCTURES OBSERVED.

GRAY SLIGHTLY PEBBLY MEDIUM TO COARSE SAND GRAINS ARE SUBANGULAR TO SUBROUNDED AND WELL SORTED. HORIZONTALLY BEDDED. CALICHE HORIZON 6 INCHES FROM TOP.

BROWN SLIGHTLY SILTY VERY FINE TO MEDIUM SAND GRAINS ARE SUBANGULAR TO SUBROUNDED AND MODERATELY WELL SORTED. TABULAR CROSS BEDDING

GRAY VERY COARSE TO COARSE SAND GRAINS ARE SUBANGULAR TO SUBROUNDED AND MODERATELY WELL SORTED. MASSIVELY BEDDED. CALICHE HORIZON 4" FROM TOP

SEDIMENT SAMPLE LOCATION ■

BASE OF TRENCH ■■■■■■

MECHANICAL ANALYSIS, %

SAMPLE	FP	VFP	VCS	CS	MS	FS	VFS	>VFS
CLF 10	-	07	00.08	16.38	45 09	30.17	05.64	02.06
CLF 9	.27	53	05.40	25.08	17.05	25.22	23.16	03 52
CLF 8	.13	.85	12.47	49.15	11 68	04 50	03 72	17 49
CLF 5	-	20	03 98	54 68	33.69	05.30	01 73	00.86
CLF 3	-	07	00.40	05.70	26.60	37 60	24 60	04.62
CLF 1	-	1.65	29.60	52.20	10.90	02.50	01 30	00.53

FP - FINE PEBBLES
VFP - VERY FINE PEBBLES
VCS - VERY COARSE SAND
CS - COARSE SAND
MS - MEDIUM SAND
VFS - FINE SAND
VFS - VERY FINE SAND
>VFS - SILT AND CLAY

2K8504-9 7

Figure 10. Geologic Profile of Trench Number 26 at the NRDW Landfill.

carbonate horizon about 0.25 to 0.5 inch thick. The tabular cross bedding and brown color of the overlying 5 feet of slightly silty very fine to medium sand contrast well with the lowermost sand unit. Laminations of fine and very fine sand alternate with medium sands and incline about 12 degrees to the south. The contact with the overlying unit is sharp, non-planar, and marked by a thin yellowish crust. About 8 feet of horizontally bedded slightly pebbly medium to coarse gray sand overlie the very fine to medium sand unit. The contact with the overlying eolian unit appears gradational over about 6 inches, and is marked by a powdery peach colored calcium carbonate horizon about 0.5 to 2 inches thick. The overlying eolian sand is light brown in color and contains sparse cobbles, pebbles and rootlets. No bedding structures were observed.

In summary, the Elephant Mountain Basalt Flow is the bedrock for the bottom of the uppermost aquifer under the Landfill. The stratigraphic column above the Elephant Mountain basalt consists of the layered sediments of the Hanford and Ringold Formations to a thickness of 640 feet under the NRDW Landfill. The vadose zone (unsaturated) occurs in the top 125 feet of the Hanford formation before contacting the water-table. The variable textures of the layered sedimentary units form a complex vadose zone system which greatly impacts liquid migration through the system. Medium and fine sand units form the upper Hanford sediments locally at the NRDW Landfill. Sediments are coarser grained sands and gravels at depth.

HYDROLOGIC CONDITIONS

SURFACE WATER IN THE PASCO BASIN REGION

In the Pasco Basin, the Columbia River receives surface drainage from several adjacent basins (DOE, 1984). These major tributaries include the Yakima, Snake, and Walla Walla Rivers. No perennial streams are supported by hydrologic systems operating solely within the Pasco Basin. Streamflow within the Pasco Basin is recorded as inflow at the U.S. Geological Survey gage below Priest Rapids Dam and outflow at the gage below McNary Dam. Average annual flow at these stations is 87 million and 140 million acre-feet per year, respectively. A total gaged flow of approximately 45 million acre-feet per year enters from tributaries, and an additional 230,000 acre-feet per year enter as irrigation returns.

HANFORD SITE

The Hanford Site occupies approximately one-third of the land area within the Pasco Basin. Primary surface-water features associated with the Hanford Site include the Columbia and Yakima Rivers. Several artificial surface ponds and ditches are present, and are generally associated with fuel and waste processing activities (Figure 11).

Flow from approximately two-thirds of the Hanford Site is considered to drain directly into the Columbia River, although runoff is extremely low, if not zero. The section of the Columbia River along the Hanford Site reach has been inventoried and is described in detail by the U.S. Army Corps of Engineers (COE, 1977). Flow along this reach is controlled by the Priest Rapids Dam.

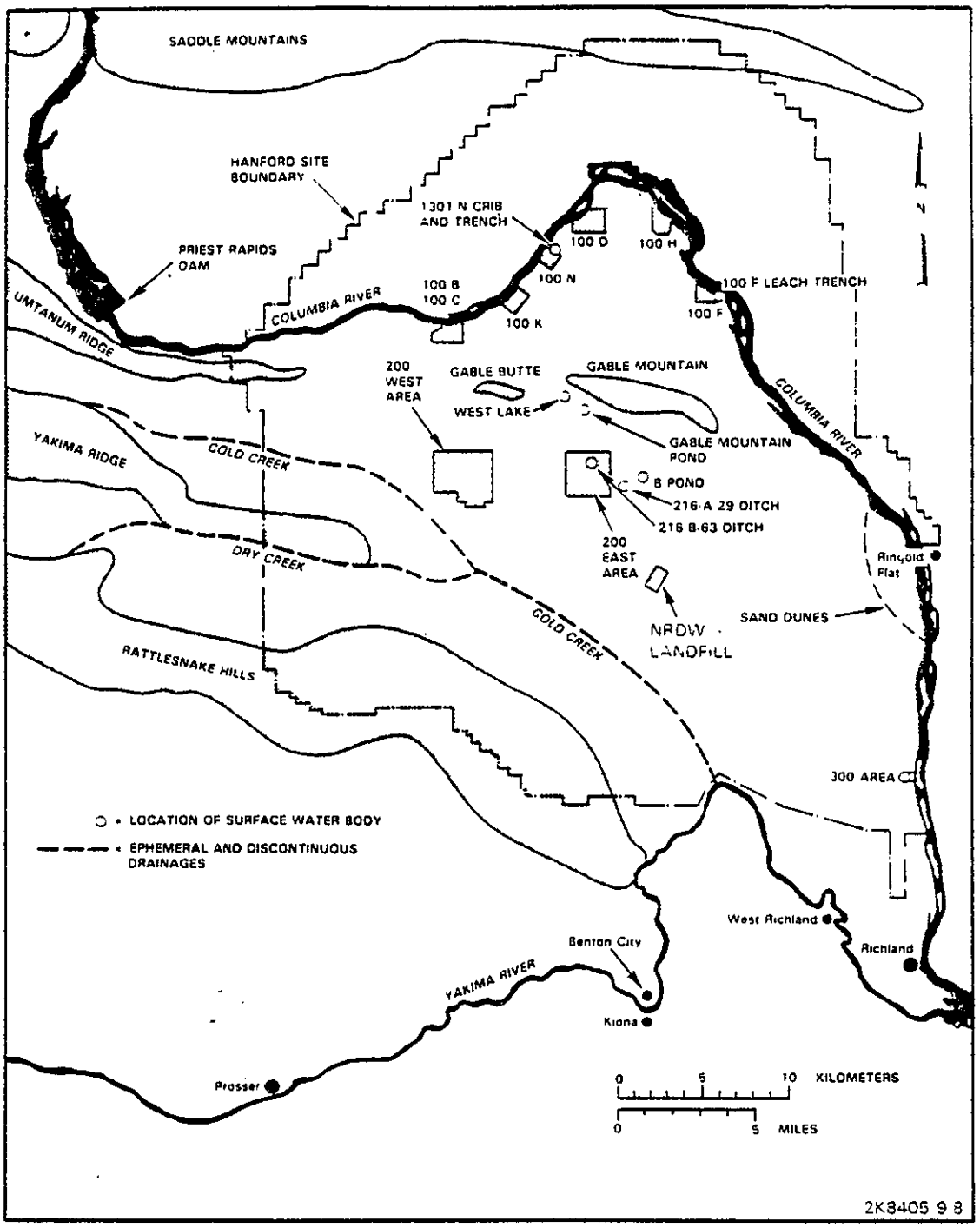


Figure 11. Surface Water Bodies Including Ephemeral Creeks on the Hanford Site.

Several drains and intakes are also present along this reach. Most notably, these include irrigation outfalls from the Columbia Basin Irrigation Project and Hanford Site intakes for the onsite water export system.

West Lake, a shallow pond (3 feet deep), is the only natural pond on the Hanford Site. The pond generally averages 10 acres in size. A number of manmade ditches and ponds are used for the routine disposal of chemical processing cooling waters, plant cooling water and several laboratory waste water streams (ERDA, 1975).

SURFACE FLOODING POTENTIAL

Several documents contribute to our understanding and evaluation of flooding potentials within the Pasco Basin. The U.S. Army Corps of Engineers (COE, 1951) investigated artificial flooding along the Columbia River, based on failure scenarios of the Grand Coulee Dam. Other reports include those by U.S. Energy Research and Development Administration (ERDA, 1976), U.S. Federal Emergency Management Agency (FEMA, 1980), and Washington Public Power Supply System (WPPSS, 1981). Cummans et al. (1975) summarized a methodology for determining flooding characteristics of small watersheds, such as the Cold Creek drainage area.

Flood History of the Columbia River

Major floods on the Columbia River are characteristically the result of rapid melting of the winter snowpack over a wide area augmented by above-normal precipitation. The maximum historical flood on record occurred June 7, 1894. The peak discharge at the Hanford Site was 740,000 cubic feet per second (cfs). The largest recent flood took place in 1948 with an observed peak discharge of

690,000 cfs at the Hanford Site. The probability of flooding at the magnitude of the 1894 and 1948 floods has been greatly lowered due to upstream regulation at Priest Rapids Dam (see Figure 11). The 1894 flood inundated areas below 400 feet msl. The flood plain associated with the flood is shown in Figure 12. A flood of this magnitude would inundate sections of Richland but would not reach the NRDW Landfill, which has a land surface elevation of about 540 feet msl.

Flood Potential

Associated with the evaluation of flood potential is the concept of the probable maximum flood, which is determined from the upper limit of precipitation falling on a drainage area and other hydrologic factors (such as antecedent moisture conditions, snowmelt, and tributary conditions) that result in maximum runoff. The probable maximum flood for the Columbia River below Priest Rapids Dam has been calculated to be 1.4 million cfs (COE, 1951, 1969). The flood plain associated with the probable maximum flood is shown in Figure 13. This flood would not reach the Landfill.

Potential dam failures on the Columbia River have also been extensively evaluated. Upstream dam failures may arise from a number of causes, however, the magnitude of the resulting flood depends on the degree of breach. The U.S. Army Corps of Engineers (COE, 1951) evaluated the effects of a 50 percent breach of the Grand Coulee Dam. The resulting land inundated would not include the Landfill (Figure 14).

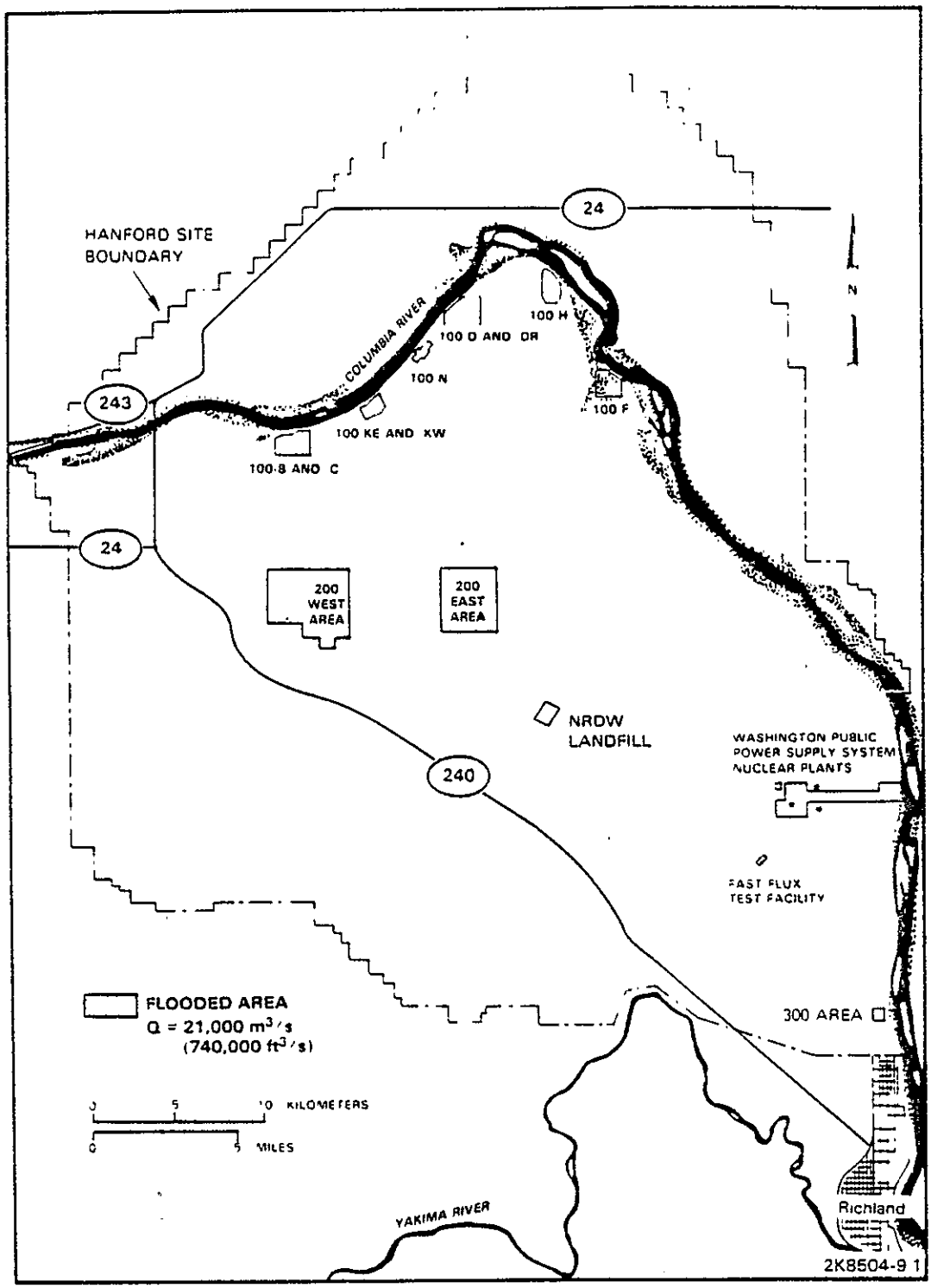


Figure 12. Flooded Area During the 1894 Flood (after ERDA, 1976).

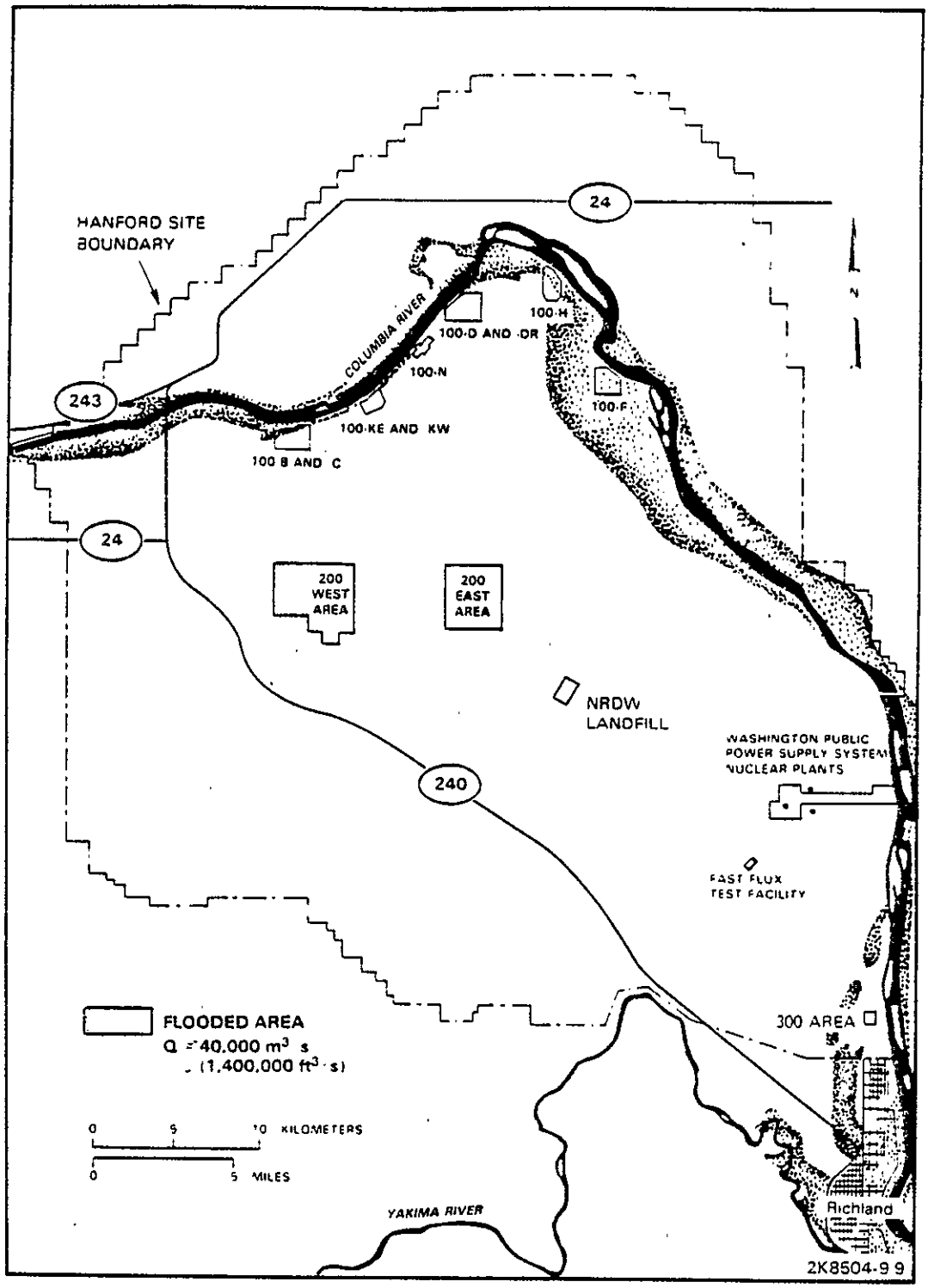


Figure 13. Flooded Area for the Probable Maximum Flood (after ERDA, 1976).

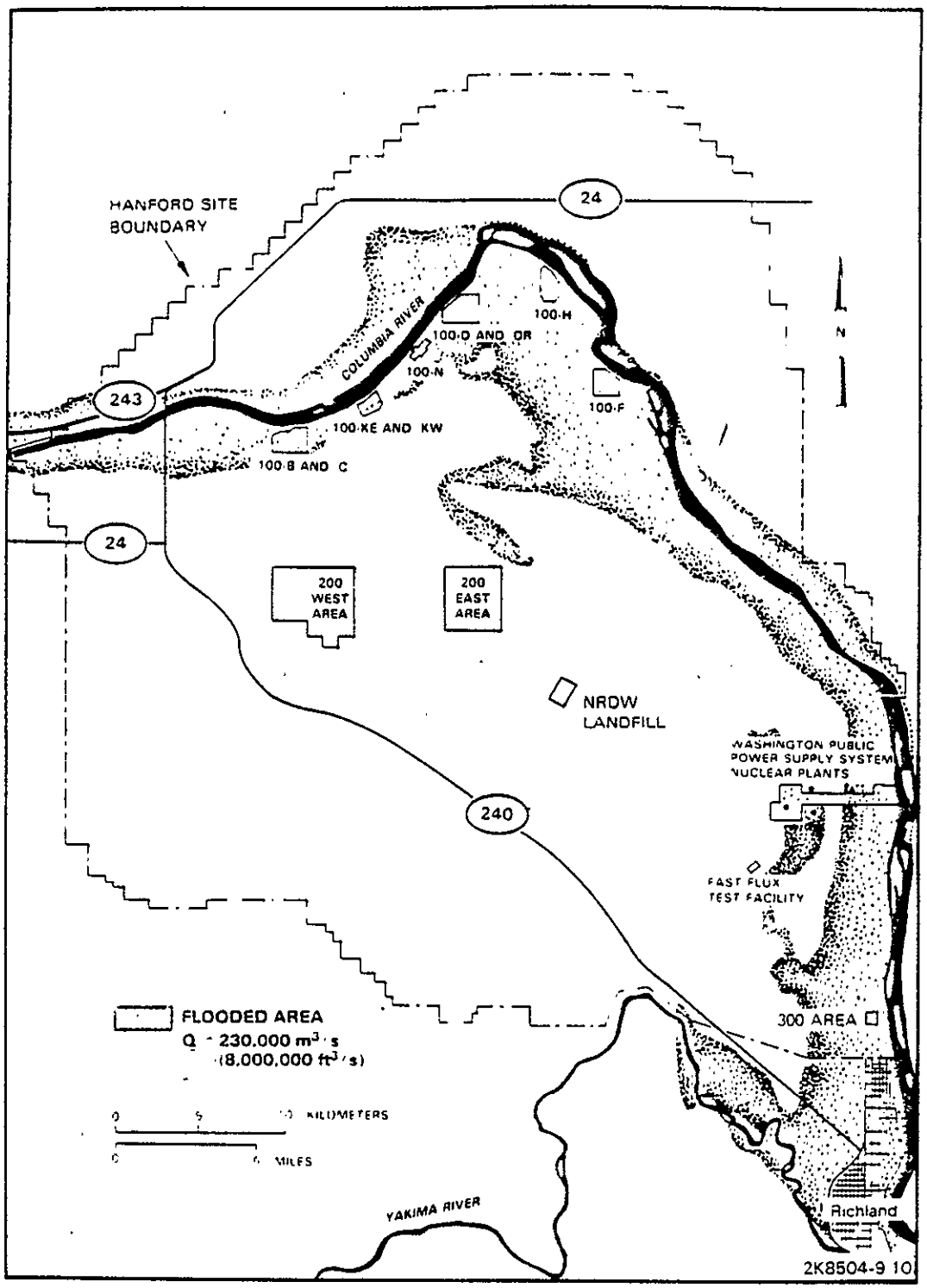


Figure 14. Flooded Area Resulting From a 50 Percent Breach of Grand Coulee Dam (after ERDA, 1976).

Cold Creek Watershed

The Cold Creek watershed (area draining into Cold Creek) is located along the western boundary of the Pasco Basin. The NRDW Landfill lies outside the Cold Creek watershed. Cold Creek, trending northwest-southeast within the wash, is the only defined channel within the southeastern portion of the Hanford Site watershed (see Figure 11). The drainage system within the Cold Creek watershed may be described as ephemeral and discontinuous. There are no potential impacts at the Landfill from flooding of this watershed.

To summarize, surface water drainage to the Columbia River in the Pasco Basin comes from major tributaries including the Snake, Yakima, and Walla Walla Rivers. Surface water runoff is essentially zero. The worst case flooding conditions evaluated, a 50 percent breach of Grand Coulee Dam, indicate flood water will only reach within approximately 7 miles of the NRDW Landfill.

REGIONAL HYDROLOGY OF THE UNCONFINED AQUIFER

In this section the general characteristics of the regional hydrology are described (Gephart et al., 1979, Graham, 1981). The unconfined aquifer, within the boundaries of the Pasco Basin, lies in the Hanford glaciofluvial sands and gravels and the Ringold silts and gravels. The aquifer is dominated by the middle member of the Ringold formation, consisting of sorted sands and gravels of varying induration. The bottom of the aquifer is the basalt surface or, in some areas, the clay zones of the lower member of the Ringold formation. The aquifer is over 230 feet thick in some areas, and thins to zero thickness along the flanks of the bordering structures.

Regional Recharge

Major sources of natural recharge to the unconfined aquifer are rainfall and runoff from the higher bordering elevations, water infiltrating from small ephemeral streams, and river water along influent reaches of the Yakima and Columbia Rivers. The principal source of recharge occurs along the periphery of the basin where precipitation and runoff infiltrate to the water-table. Small ephemeral streams draining the western slopes, such as Cold Creek and Dry Creek, lose water to the ground as they spread out on the valley plain. Within the basin, upward leakage from the lower basalt aquifers may enter the unconfined aquifer. Little, if any, recharge to the ground water occurs from percolating rainfall on the broad areas of the desert terrain due to a high rate of evapotranspiration.

Artificial or synthetic recharge to the ground water occurs in the basin from two sources, agricultural irrigation and waste water disposal operations at Hanford. Agricultural irrigation on the eastern and northern sides of the Columbia River and in Cold Creek Valley to the west of the Hanford Site causes an undetermined amount of recharge to the system. Possibly as much as 40 percent of this irrigation water reaches the water table (U.S. Bureau of Reclamation, 1971). Synthetic recharge from Hanford waste water disposal practices occurs principally from the 200 East and 200 West Areas (the Separations Area). Although these discharges have been concentrated in U-Pond, B-Pond, and Gable Mountain Pond, the effects on the flow system have been widespread. Beneath the Separations Area, two ground-water mounds have developed in response to large volumes of discharge to U-Pond and B-Pond. Under U-Pond, the water table has risen in excess of 85 feet since the start of disposal operations. The mound under B-Pond has risen more than 30 feet.

Movement

From the recharge areas, the ground water flows downgradient to the discharge areas, primarily the Columbia River. This general flow pattern is interrupted locally by the two ground-water mounds in the Separations Area. These mounds alter the flow around them as evidenced by the ground-water mound beneath 200 West Area (Plate 1).

Discharge

Ground-water discharge from the unconfined aquifer is principally to the Columbia River. There are lesser amounts of discharge to the Snake and Yakima Rivers. Discharge of the unconfined aquifer flowing under Hanford is almost exclusively to the Columbia River north of Richland, Washington. Downward leakage to the lower confined aquifer has occurred under the eastern ground-water mound. The rise in the water table above the potentiometric surface of the confined aquifer provides the potential for this leakage (Graham et al., 1984).

Hydraulic Properties

The geologic and hydraulic properties of the Pasco Basin sediments are highly variable. The range of hydraulic conductivities can be several orders of magnitude. There have been numerous aquifer tests performed in the Pasco Basin, the majority of which were done on the Hanford Site. Gephart et al. (1979) presents results from more than 100 tests on the Pasco Basin. These results are summarized in Table 2.

TABLE 2. Representative Hydraulic Properties of the Unconfined Aquifer (after Gephart et al., 1979).

Stratigraphic Interval	Hydraulic Conductivity (ft/day)
Hanford formation (informal name)	500-20,300
Undifferentiated Hanford and Middle Ringold Unit	100-7,000
Middle Ringold Unit	20-600
Lower Ringold Unit	0.1-10.0

THE NRDW LANDFILL HYDROLOGY

The primary aquifer of interest under the NRDW Landfill is the unconfined aquifer. Ground-water flow in the unconfined aquifer under the Landfill occurs from West-Northwest to East-Southeast toward the Columbia River (Plate 1). Depth to ground water at the nearest well (see Figure 6, Plate 1), 699-24-33 is 121.19 feet. The water table elevation at well 699-24-33 is 403.02 feet msl and at the upgradient well 699-28-40 is 403.78 feet msl. The water table gradient between these wells is 0.52 feet/mile. Therefore, the water table beneath the landfill is known to at least within 0.5 feet and the depth to water directly beneath the landfill is 125 ± 0.5 feet. Table 3 gives depth to water and water table elevation data from semi-annual measurements since 1975 for five wells monitoring the unconfined aquifer near the Landfill.

The aquifer transmissivity has been reported at 373,000 ft^2 /day with hydraulic conductivity of 8,600 ft/day for well 699-24-33 (Gephart et al., 1979). Transmissivities generally within the NRDW study area range above 1000 to 10,000 ft^2/day. These are among the highest on the Hanford Site.

Table 3. Depth to Water and Water Table Elevations From Semi-annual Measurements between December, 1975 and December, 1984 at Five Wells Near the NRDW Landfill.

	Depth to Water Table From Top of Well Casing (feet)				
	699-20-20	699-20-39	699-24-33	699-28-40	699-31-31
Dec - 75	105.74	137.93	122.42	157.38	127.76
Jun - 76	105.82	138.17	122.74	157.40	127.86
Dec - 76	105.89	138.24	122.78	157.50	127.90
Jun - 77	105.91	138.22	127.74	157.48	127.87
Dec - 77	105.90	138.24	122.67	157.43	127.76
Jun - 78	105.90	138.13	122.77	157.45	127.89
Dec - 78	106.06	138.47	122.90	157.69	128.01
Jun - 79	106.10	138.40	122.99	157.64	128.10
Dec - 79	106.14	138.30	122.89	157.66	128.02
Jun - 80	106.13	138.50	123.00	157.77	128.09
Dec - 80	106.13	138.55	122.95	157.62	128.04
Jun - 81	106.23	138.45	123.08	157.78	128.15
Dec - 81	105.90	138.59	122.99	157.80	128.08
Jun - 82	106.26	138.58	123.15	157.93	127.93
Dec - 82	106.18	138.53	122.98	157.55	128.05
Jun - 83	106.06	138.38	122.88	157.48	127.97
Dec - 83	105.88	137.99	122.38	156.98	127.47
Jun - 84	105.42	137.23	121.72	156.16	126.79
Dec - 84	105.75	136.69	121.19	155.66	126.23
Casing Elevation (ft-msl)	505.58	539.98	524.22	559.44	529.32
	Water Table Elevation (ft-msl)*				
Dec - 75	399.84	402.05	401.80	402.06	401.56
Jun - 76	399.76	401.81	401.48	402.04	401.46
Dec - 76	399.69	401.74	401.44	401.94	401.42
Jun - 77	399.67	401.76	401.48	401.96	401.45
Dec - 77	399.68	401.74	401.55	402.01	401.56
Jun - 78	399.68	401.85	401.45	401.99	401.43
Dec - 78	399.52	401.51	401.32	401.75	401.31
Jun - 79	399.48	401.58	401.23	401.80	401.22
Dec - 79	399.44	401.68	401.33	401.78	401.30
Jun - 80	399.45	401.48	401.22	401.67	401.23
Dec - 80	399.45	401.43	401.27	401.82	401.28
Jun - 81	399.35	401.53	401.14	401.66	401.17
Dec - 81	399.68	401.39	401.23	401.64	401.24
Jun - 82	399.32	401.40	401.07	401.51	401.39
Dec - 82	399.40	401.45	401.24	401.89	401.27
Jun - 83	399.52	401.60	401.34	401.96	401.35
Dec - 83	399.70	401.99	401.84	402.46	401.85
Jun - 84	400.16	402.75	402.50	403.28	402.53
Dec - 84	399.83	403.29	403.02	403.78	403.09

*Water Table Elevation is calculated from casing elevation minus depth to water

Flow occurs regionally from west to east and the head drop from the Landfill to the aquifer discharge at the Columbia River is about 55 feet in 10 miles or 5.5 feet/mile. Ground-water flow velocities have been estimated at 5 feet/day based on average tritium contaminant plume migration from 200 East Area (Graham, 1981). Flow path-time calculations based on this estimated flow velocity from the NRDW Site give a travel time of 28 years to the Columbia River following flow-paths through equipotential lines (Plate 1). Flow path-time calculations based on the Hanford Pathline Calculation Program (HPCP) (Friedrichs et al., 1977) give a travel time of 60 years to the Columbia River.

In summary, the uppermost or unconfined aquifer is the aquifer of interest. Flow occurs regionally from west to east and the head drop from the NRDW Landfill to the aquifer discharge at the Columbia River is 5.5 feet/mile. Flow path-time to the Columbia River has been estimated at 28 years. Hydraulic conductivities and transmissivities in the aquifer under the NRDW Landfill are high and occur in the layered sediments of the Hanford formation.

GROUND-WATER QUALITY

Chemical analyses are available for well samples collected on the Hanford Site between the years 1974 and 1984 by the U.S. Geological Survey (USGS), the Pacific Northwest Laboratory (PNL) and Rockwell Hanford Operations (Rockwell). These analytical results are reported in annual documents by PNL (Raymond et al., 1976; Myers et al., 1976, 1977; Myers, 1978; Eddy, 1979; Eddy and Wilbur, 1980, 1981; Eddy et al., 1982, 1983; Prater et al., 1984) and Rockwell (Wilbur and Graham, 1982; Wilbur et al., 1983; Law and Allen, 1984). Water quality data of the unconfined aquifer elsewhere in the Pasco Basin were obtained by

the USGS. The means, standard deviations, and ranges for the various constituents of two data sets for the years 1974 thru 1979 are given in Table 4.

These waters are principally a calcium-bicarbonate type, although considerable variability in chemical composition exists between individual samples. This is primarily attributed to natural variability of sediments within the aquifer. The chemical character of the ground water is influenced by its proximity to recharge areas, its rate of movement, and the chemical and physical nature of the sediments it flows through. Some of the variation between the Hanford ground-water samples and the Pasco Basin ground-water samples is attributed to liquid waste disposal at Hanford. The high nitrate concentrations in Hanford waters are the result of waste disposal; Law and Allen (1984) present a nitrate isopleth map for the Hanford Site.

Water quality at the landfill is similar to the regional unconfined aquifer. Figure 15 provides stiff diagrams for wells in the vicinity of the NRDW Landfill. As can be seen, calcium bicarbonate waters dominate the site locally.

Water quality is an important consideration because water from the unconfined aquifer is pumped from wells 499-S0-7 and 499-S0-8 for drinking water use (Maas, 1984). These wells are located at the Fast Flux Test Facility (FFTF) site (see Plate 1) which is downgradient from the NRDW Landfill approximately 6.5 miles southeast.

TABLE 4. Water Quality of the Unconfined Aquifer for the Pasco Basin and the Hanford Site.

Constituent	Location	No. of Samples	Mean	Standard Deviation	Range
Temperature Degrees Celsius	Pasco Basin	193	13.5	2.6	3.1-21.2
	Hanford	89	19.2	3.2	14.5-39.1
Spec. Cond. μmhos/cm	Pasco Basin	184	323	162	125-1,250
	Hanford	99	409	117	194-927
pH pH Units	Pasco Basin	3	7.6	0.5	7.2-8.1
	Hanford	104	7.9	0.3	7.0-9.4
Ca^{++} mg/l	Pasco Basin	15	31.5	9.2	20.0-54.0
	Hanford	101	41.5	12.5	12.0-92.0
Mg^{++} mg/l	Pasco Basin	15	11.6	4.0	6.9-23.0
	Hanford	101	11.1	3.7	3.1-29.0
Na^{+} mg/l	Pasco Basin	17	15.8	9.6	5.9-43.0
	Hanford	101	22.6	10.4	2.9-64.0
K^{+} mg/l	Pasco Basin	16	3.1	1.0	1.4-4.9
	Hanford	101	6.2	1.9	1.9-13.0
HCO_3^- mg/l	Pasco Basin	16	166	44	82-244
	Hanford	101	146	38	53-314
Cl^- mg/l	Pasco Basin	16	4.7	4.1	2.6-19.0
	Hanford	101	11.1	6.6	2.5-32.0
$SO_4^=$ mg/l	Pasco Basin	16	10.9	9.2	5.1-43.0
	Hanford	100	47.2	33.5	2.7-190.0
N as NO_3^- mg/l	Pasco Basin	not available			
	Hanford	101	26.0	39.0	0.05-270.0

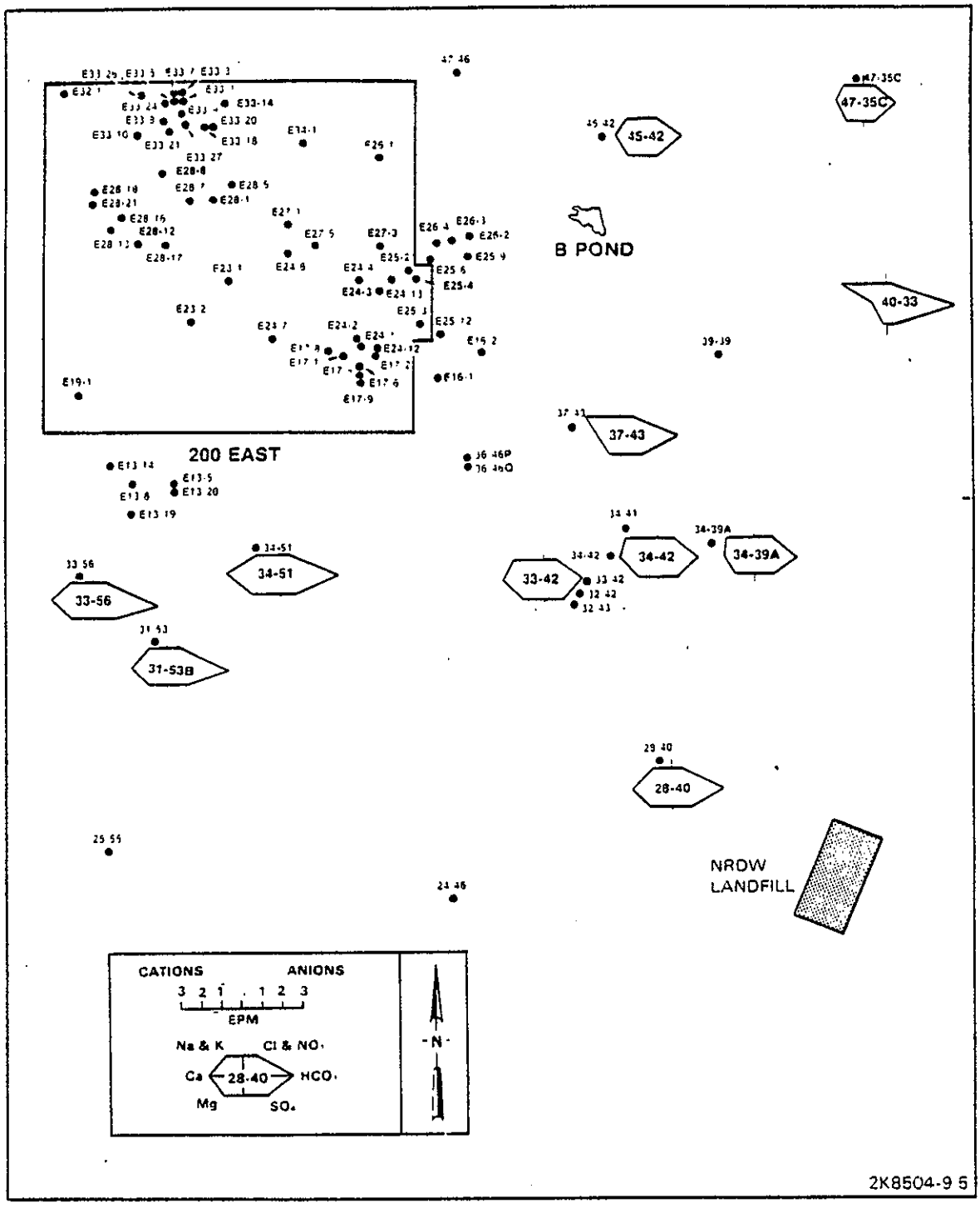


Figure 15. Ground-Water Quality Map (after Graham, 1981).

VADOSE ZONE RECHARGE

Recharge to ground water in areas without artificial and surface water sources results from the infiltration and redistribution of natural precipitation. After the burial operations are completed at a landfill, the primary source for recharge will be percolation through the sediments surrounding the buried solid waste. The movement of precipitation is a continuous cyclic process. The cycle is initiated with entrance of precipitation into the soil by infiltration. This is followed by temporary storage and redistribution of water in the sediments. The final part of the cycle is the removal of water from the sediments by evaporation, transpiration (plant uptake) and deep drainage (recharge) to a water table.

This cycle can reasonably be viewed as a quasi-steady state process on the average in the deep sediments. The moisture content, in the deeper sediments below a landfill, tends to remain constant (Jones, 1978, Last et al., 1976). The travel time of deep draining moisture to some depth, such as the ground water, can be determined if the recharge rate and volumetric water content of the sediment are known (Heller et al., 1985). The recharge rate is the depth (amount) of water entering the ground water in a year. The volumetric water content is an expression of the volume of water/volume of soil percentage at which a soil drains under the quasi-steady state natural sediment conditions. It is in essence the effective porosity of the unsaturated system. The average volumetric water content was found to vary from 8-18 percent in three sediment types in a well in similar sediments to those found at the landfill (Heller et al., 1985). Table 5 lists the volumetric water content in the study-well as a function of depth. The most conservative value (8 percent) was used to minimize calculated travel time. Dividing the recharge (cm/yr) by the volumetric water content will give the depth that the recharge will travel in a year, the

velocity. Dividing the depth to ground water by the velocity gives the time it will take recharge to travel from the bottom of a landfill to ground water. Table 6 details these equations and shows a sample calculation.

Table 5. Volumetric Water Content in a Recharge Study Well (Heller et al., 1985).

Sample Number	Depth (m)	Volumetric Moisture ($ml/cm^3 \times 100$)
3-1	1.6	9.98
3-2	3.6	11.3
3-3	5.2	14.8
3-4	6.9	8.16
3-5	8.5	7.19
3-6	10.2	7.74
3-7	11.6	8.31
3-8	13.5	9.40
3-9	15.1	10.5
3-10	16.6	9.04
3-11	18.4	11.5
3-12	20.0	9.35
3-13	21.7	11.0
3-14	23.3	8.53
3-15	24.8	6.92
3-16	26.7	6.80
3-17	28.2	6.02

Studies at Hanford have focused on determining recharge directly, rather than subtracting evapotranspiration from precipitation. Potential evapotranspiration is greater than precipitation at Hanford and thus recharge has been evaluated directly, because subtracting numbers of about the same value may result in a number of limited precision.

Two types of studies have been conducted to determine recharge. In the first type of study, moisture content in two lysimeter studies was followed to estimate recharge. In the second type of study, the movement of buried unsorbed radioactive wastes as a function of time has been evaluated to estimate recharge.

Table 6. Travel Time Equations and Example Calculation. Derivation and Discussion of this Formula is Available in Heller et al. (1985).

---

r = Recharge rate

θ = Volumetric water content

v = Velocity of water movement through the sediments

D = Depth to ground water

T = Travel time to ground water

The water velocity, v, can be defined as follows:

$$v = r/\theta$$

And travel time, T, can be defined as follows:

$$T = D/v$$

Example: Assuming r = 5.6 cm/yr, θ = 8% and D = 3200 cm (105 ft)

$$v = 5.6 \text{ cm/yr}/0.08 = 70 \text{ cm/yr}$$

$$T = 3200 \text{ cm}/70 \text{ cm/yr} = 46 \text{ years}$$

---

300 AREA LYSIMETER RECHARGE STUDY

The 300 Area lysimeter facility consists of 2 large 9.8 feet in diameter by 24.9 feet deep cylindrical culverts, four smaller 2 feet in diameter by 24.9 feet-deep caissons, and two 4.9 x 4.9 feet square and 4.9 feet deep weighing lysimeters. Drainage is measured directly in the weighing lysimeters and in the deep lysimeters by collecting and recording the amount of water that has collected at the bottom of these lysimeters. Recharge rate has been measured for the period 1980-1983. These four years have all had above normal precipitation with 1983 having a total of 11 inches (the third highest on record).

Recharge rate for the various years averaged 3.0 cm/yr with a range of 1.1-5.6 cm/yr (Gee et al., 1981, Jones and Gee, 1984).

200 AREA DEEP LYSIMETER RECHARGE STUDY

A 9.8 foot wide by 59 foot deep closed bottom lysimeter was established on the Hanford 200 Area plateau in 1971. The closed bottom assures that recharge will collect in the bottom of the lysimeter. Moisture content was monitored in the lysimeter by the means of a neutron probe with an accuracy of about 0.5 percent moisture (Jones, 1978). Detectable moisture change has not been observed below a depth of 39.4 feet (Jones, 1978). Considering the limitations of the measurements the maximum recharge rate was determined to be <0.5 cm/yr.

BC CRIB RECHARGE

Waste was placed in the 216-B-20 specific retention trench in 1956 (Fecht et al., 1977). Thus, this waste has been leached by any recharge for 28 years. The waste is known to contain poorly sorbed gamma emitting radionuclides and would be readily transported with any moisture. Down well total gamma (scintillation probe) logs have been taken periodically (four times) from 1963-1984. Figures 16 and 17 are total gamma logs of well E13-7 monitoring the 216-B-20 Trench for 1963, 1968, and 1976, 1984, respectively. It can be seen that the waste front was transported <6.6 feet over this 21-year period. Assuming a sediment moisture content of 8 percent (Heller et al., 1985), the calculated recharge rate would be <0.8 cm/yr.

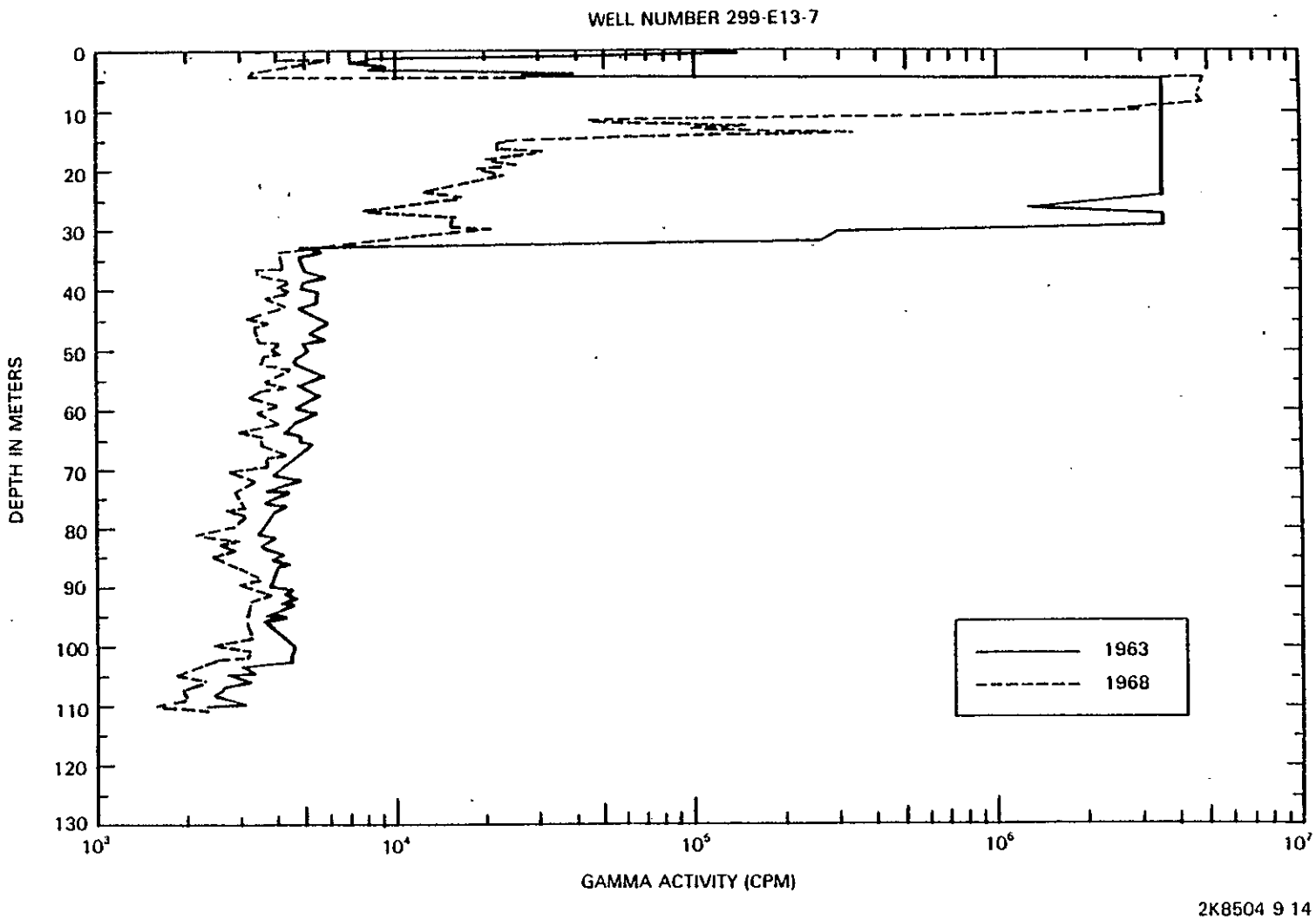


Figure 16. Gamma Activity at Depth in Well 299-E13-7 Monitoring the 216-B-20 Specific Retention Trench for the Years 1963 and 1968.

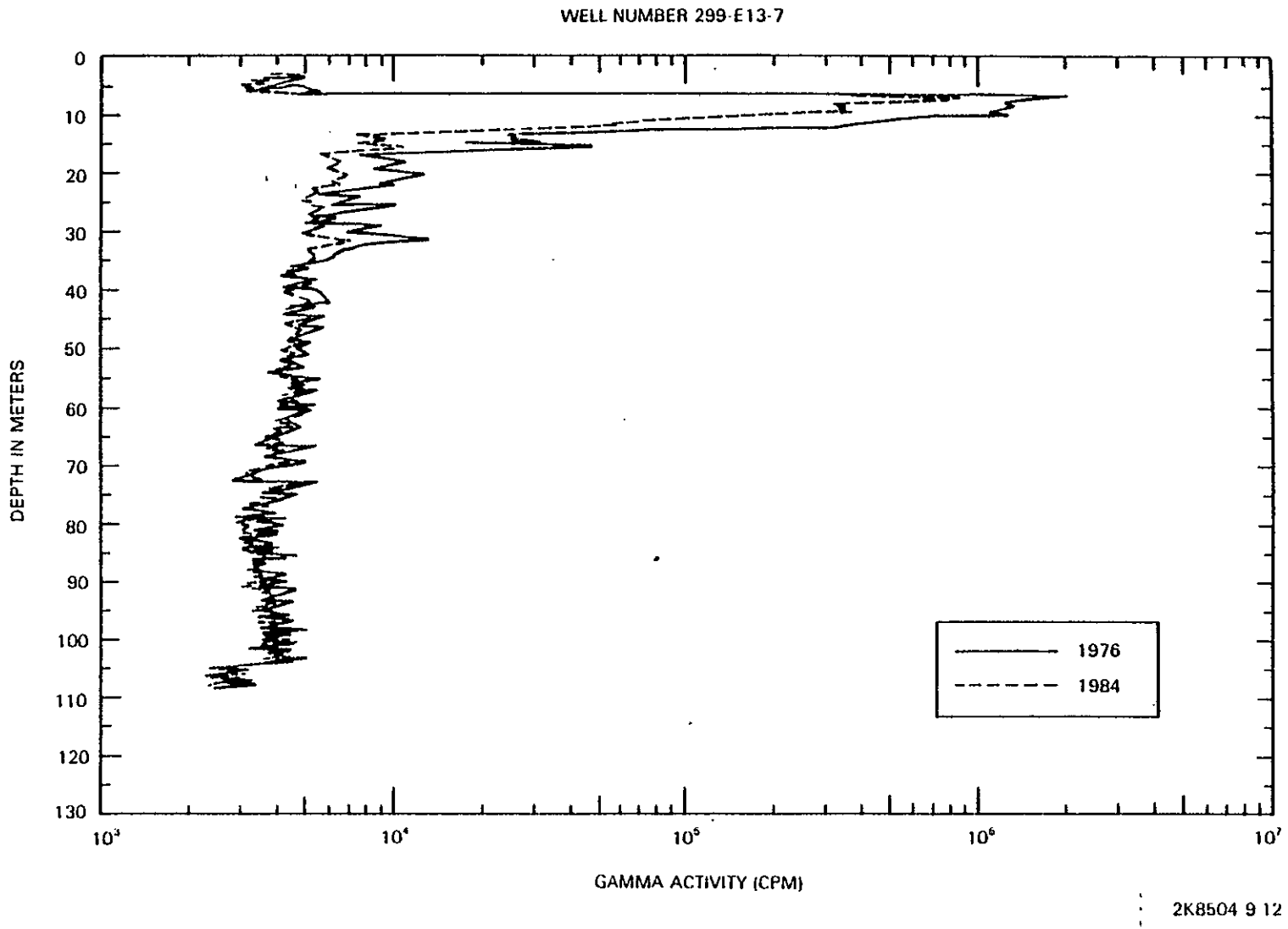


Figure 17. Gamma Activity at Depth in Well 299-E13-7 Monitoring the 216-B-20 Specific Retention Trench for the Years 1976 and 1984.

RECHARGE TRANSPORT

From the above studies it can be seen that recharge rate on the Hanford site tends to be low. It is estimated to range from about <0.5 cm/yr to 5.6 cm/yr with the deepest-longest term studies supporting the lowest estimates. Using the maximum and minimum estimated values of 5.6 cm/yr and <0.5 cm/yr for the recharge rate, recharge would be transported toward ground-water at 70 cm/yr and 6.3 cm/yr, respectively based on a sediment moisture content of 8 percent (Heller et al., 1985). At this rate it requires between 46 years and 510 years for the initial recharge to travel the approximate 105 feet (3200 cm) from the bottom of a waste trench to ground water.

In review, water is the transporting medium for moving waste from the disposal trench to the ground water. Studies have been conducted to directly estimate recharge rate, and bounding rates have been estimated. The highest recharge rates were found for the shallowest shortest term studies during a year of near maximum expected rainfall. Deeper and in situ based recharge measurements, which can be expected to give more average recharge rates, result in almost an order of magnitude lower values. The minimum travel time of 46 years through the vadose zone to groundwater is conservative.

MODEL EVALUATION

The use of models to evaluate recharge is an indirect approach. Recharge is essentially estimated from the difference between precipitation and evapotranspiration (ET) (or ET and runoff for humid sites). For arid sites, such as Hanford, precipitation and evapotranspiration approach the same value. Relatively small errors in either of these quantities can result in a large

error in recharge. Furthermore, annual estimated ET can have large errors (50 percent or more). Methodologies currently available for estimating ET work well only in irrigated or humid areas. There appears to be no feasible way to directly measure ET for desert plants except in somewhat limited sized weighing lysimeters. Such measurements have not been made at Hanford, although they are in the planning stage.

Three models were considered for refining or confirming Hanford recharge values. These models are HELP, UNSAT1D, and CREAMS (Thompson and Tyler, 1984, Peck et al., 1981). All three of these models utilize water balance approaches.

The CREAMS hydrology model is essentially a deterministic, lumped input, lumped parameter type model. Its hydrology submodel is a simplified representation of the hydrology cycle and incorporates only those components of the cycle that directly affect erosion, sedimentation, and chemical processes in agricultural systems.

The HELP model utilizes a deterministic water budget code which performs a sequential daily analysis to determine runoff, evapotranspiration, percolation, and lateral drainage to obtain daily, monthly, and annual water budgets.

UNSAT1D is a sophisticated flow code that solves the differential equation describing groundwater flow under saturated and partially saturated conditions. This equation accounts for fluid movement from both capillary and gravitational forces. The solution scheme of UNSAT1D is finite-difference-based and allows for the rapid numerical evaluation of the governing differential equation. The code has been verified with analytical solutions. The UNSAT1D code requires site-specific input data and a thorough understanding of ground-water flow theory.

UNSAT1D is designed for use under varied field conditions. Water application can come from precipitation, irrigation, or ponding. Actual evapotranspiration can be estimated as a function of moisture content and potential evapotranspiration (PET). The hydraulic properties of the soils can be defined as polynomials or user-defined mathematical equations. The lower boundary conditions can be water table, dynamic, quasi-dynamic, or unit gradient.

The CREAMS and HELP models are similar in most respects and should give similar results for determining recharge. For example, ET and runoff are determined using nearly identical methods, and percolation is determined by slightly different, but comparable, deterministic methods. A comparison of HELP and UNSAT1D was made (Thompson and Tyler, 1984). Those models were found to give similar results for humid areas, but the UNSAT1D code was found to give more representative results for arid areas and dryer soil conditions. None of the models can be expected to give precise recharge values since they are water balance approaches. However, the UNSAT1D model can be used to verify the reasonableness of recharge values derived from direct measurements. The deterministic models do not offer this possibility.

Five wells were characterized from the surface to ground water at Hanford to determine the soil parameters required by the UNSAT1D model (Heller et al., 1985). The moisture-transport-governing equations were rearranged to allow the calculation of a measured parameter (moisture content) from the recharge. Moisture content is the parameter which links all of the moisture transport governing equations, and the model is sensitive to its value. Substituting the recharge from previous, direct measurements (0.5 - 5.0 cm/yr) into the equations closely predicted the water content measured in the sediments (Heller et al., 1985). This is strong indication that recharge is in the range of 0.5 - 5.0 cm/yr.

CERTIFICATION BY A QUALIFIED GEOLOGIST

I, W. H. Chapman-Riggsbee, a certified professional geologist, hereby certify, to the best of my knowledge and belief, that the information contained in this report is accurate and factual and that the conclusions reached herein have been attained by the appropriate application of geologic and hydrologic principles.

W. H. Chapman-Riggsbee
Signature

6/28/85
Date

State of Oregon Certificate Number 473
State Professional Geologist License Number

Rockwell Hanford Operations, P. O. Box 800, Richland, Washington, 373-2961
Business Address and Telephone Number

REFERENCES

Brown, R. E., 1975. Ground Water and the Basalts in the Pasco Basin, in Proceedings of the Thirteenth Engineering Geology and Soils Engineering Symposium, April 2, 3, 4, 1975, Moscow, Idaho.

Brown, D. J. and R. E. Isaacson, 1977. The Hanford Environment as Related to Radioactive Waste Burial Grounds and Transuranium Waste Storage Facilities, ARH-ST-155, Atlantic Richfield Hanford Company, Richland, Washington.

COE (U.S. Army Corps of Engineers), 1951. Artificial Flood Possibilities on the Columbia River, U.S. Army Corps of Engineers, Washington District, Washington, D.C.

COE (U.S. Army Corps of Engineers), 1969. Lower Columbia River Standard Project Flood and Probable Maximum Flood. U.S. Army Corps of Engineers, North Pacific Division, Portland, Oregon.

COE (U.S. Army Corps of Engineers), 1977. Reach Inventory, Columbia River Headwater McNary Reservoir to Grande Coulee Dam, CRT-34, U.S. Army Corps of Engineers, North Pacific Division, Portland, Oregon.

Cummans, J. E., M. R. Collings, and E. G. Nassar, 1975. Magnitude and Frequency of Floods in Washington, Open-File Report 74-336, U.S. Geological Survey, Tacoma, Washington.

DOE (U.S. Department of Energy), Office of Civilian Radioactive Waste Management), 1984. Draft Environmental Assessment Reference Repository Location, Hanford Site, Washington, DOE/RW-0017, Rockwell Hanford Operations for the U.S. DOE., Richland, Washington.

DOE RL (U.S. Department of Energy), Richland, Operations Office, 1984. Calendar Year 1984 Generator Annual Dangerous Waste Report, TSD Facility Annual Dangerous Waste Report, Richland, Washington.

Eddy, P. A., 1979. Radiological Status of the Ground Water Beneath the Hanford Project, January-December, 1978, PNL-2899, Pacific Northwest Laboratory, Richland, Washington.

Eddy, P. A., C. S. Cline, and L. S. Prater, 1982. Radiological Status of the Ground Water Beneath the Hanford Site, January-December, 1981, PNL-4237, Pacific Northwest Laboratory, Richland, Washington.

Eddy, P. A., L. S. Prater, and J. T. Rieger, 1983. Groundwater Surveillance at the Hanford Site for CY 1982, PNL-4659, Pacific Northwest Laboratory, Richland, Washington.

Eddy, P. A. and J. S. Wilbur, 1980. Radiological Status of the Ground Water Beneath the Hanford Project, January-December, 1979, PNL-3346, Pacific Northwest Laboratory, Richland, Washington.

Eddy, P. A. and J. S. Wilbur, 1981. Radiological Status of the Ground Water Beneath the Hanford Site January-December, 1980, PNL-3768, Pacific Northwest Laboratory, Richland, Washington.

EPA (Environmental Protection Agency), 1982a. Ground-Water Monitoring Guidance For Owners and Operators of Interim Status Facilities. Instructions For Complying With 40 CFR Part 265, Subpart F, SW-963, U.S. Environmental Protection Agency, Washington, D.C.

EPA (Environmental Protection Agency), 1982b. Hazardous Waste Management System; Permitting Requirements For Land Disposal Facilities. Federal Register (32293) Vol. 47, No. 143 Monday, July 26, 1982.

ERDA (U.S. Energy Research and Development Administration), 1975. Final Environmental Statement - Waste Management Operations, Hanford Reservation, Richland, Washington, ERDA-1538, 2 Volumes, U. S. Energy Research and Development Administration, Washington, D.C.

ERDA (U.S. Energy Research and Development Administration), 1976. Evaluation of Impact of Potential Flooding Criteria on the Hanford Project, RLO-76-4, Richland, Operations Office, U.S. Energy Research and Development Administration, Richland, Washington.

Fecht, K. R., G. V. Last, and K. R. Price, 1977. Evaluation of Scintillation Probe Profiles From 200 Area Crib Monitoring Wells Volume II) ARH-ST-156, Rockwell Hanford Operations, Richland, Washington.

Fecht, K. R. and J. T. Lillie, 1982. The Catelog of Borehole Lithologic Logs From the 600 Area, Hanford Site, RHO-LD-58, Rockwell Hanford Operations, Richland, Washington.

FEMA (U.S. Federal Emergency Management Agency), 1980. Flood Insurance Study: Benton County, Washington, Federal Emergency Management Agency, Federal Insurance Administration, Washington, D. C.

Flint, R. F., 1938. Origin of the Cheney-Palouse Scabland Tract, Geological Society of America Bulletin, v.49, p.461.

Freeman, O. W., J. D. Forrester, and R. L. Lupher, 1945. Physiographic Divisions of the Columbia Intermontane Province, Association of American Geologist Annals, Vol. 35, p. 53-75.

Friedrichs, D. R., C. R. Cole, R. C. Arnett, 1977. Hanford Pathline Calculation Program - Theory, Error Analysis and Applications, ARH-ST-149, Atlantic Richfield Hanford Company, Richland, Washington.

Gee, G. W., A. C. Campbell, P. J. Wierenga, and T. L. Jones, 1981. Unsaturated Moisture and Radionuclide Transport, PNL-3616, Pacific Northwest Laboratory, Richland, Washington.

Gephart, R. E., R. C. Arnett, R. G. Baca, L. S. Leonhart, and F. A. Spane, Jr., 1979. Hydrologic Studies Within the Columbia Plateau, Washington: An Integration of Current Knowledge, RHO-BWI-ST-5, Rockwell Hanford Operations, Richland, Washington.

Graham, M. J., M. D. Hall, S. R. Strait, and W. R. Brown, 1981. Hydrology of the Separations Area, RHO-ST-42. Rockwell Hanford Operations, Richland, Washington.

Graham, M. J., G. V. Last, K. R. Fecht, 1984, An Assessment of Aquifer Intercommunication in the B Pond-Gable Mountain Pond Area of the Hanford Site. RHO-RE-ST-12P, Rockwell Hanford Operations, Richland, Washington.

Heller, P. R., G. W. Gee, and D. A. Meyer, 1985, Moisture and Textural Variations in Unsaturated Soil/Sediments Near the Hanford Wye Barricade, PNL-5377, Pacific Northwest Laboratory, Richland, Washington.

Jones, T. L., 1978. Sediment Moisture Relations: Lysimeter Project 1976-1977 Water Year, RHO-ST-15, Rockwell Hanford Operations, Richland, Washington.

Jones, T. L., G. W. Gee, 1984. Assessment of Unsaturated Zone Transport for Shallow Land Burial of Radioactive Waste, PNL-4747, Pacific Northwest Laboratory, Richland, Washington.

Last, G. V., P. G. Easley, and D. J. Brown, 1976. Soil Moisture Transport During the 1974-1975 and 1975-1976 Water Years, ARH-ST-146, Atlantic Richfield Hanford Company, Richland, Washington.

Law, A. G. and R. M. Allen, 1984, Results of the Separations Area Ground-Water Monitoring Network for 1983, RHO-RE-SR-84-24P, Rockwell Hanford Operations, Richland, Washington.

Leonhart, L. S., 1979. Surface Hydrologic Investigations of the Columbia Plateau Region, Washington, RHO-BWI-ST-6, Rockwell Hanford Operations, Richland, Washington.

Maas, L. J., 1984. Hanford Sanitary Water Quality Surveillance CY 1983, HEHF-42 Hanford Environmental Health Foundation, Richland, Washington.

Myers, C. W. and S. M. Price, editors, 1981. Subsurface Geology of the Cold Creek Syncline, RHO-BWI-ST-14. Rockwell Hanford Operations, Richland, Washington.

Myers, D. A., 1978. Environmental Monitoring Report on the Status of Ground Water Beneath the Hanford Site, January-December, 1977, PNL-2624, Pacific Northwest Laboratory, Richland, Washington.

Myers, D. A., J. J. Fix, P. J. Blummer, J. R. Raymond, V. L. McGhan and E. L. Hilty, 1976. Environmental Monitoring Report of the Ground Water Beneath the Hanford Site, January-December 1975, BNWL-2034, Battelle Pacific Northwest Laboratory, Richland, Washington.

Myers, D. A. J. J. Fix and J. R. Raymond, 1977. Environmental Monitoring Report Of the Hanford Site, January-December, 1976, BNWL-2119, Battelle Pacific Northwest Laboratory, Richland, Washington.

Peck, E. L., R. S. McGivey, T. N. Keefer, E. P. Johnson, and J. L. Erekson, 1981, Review of Hydrologic Models for Evaluating Use of Remote Sensing Capabilities, NASA CR 166674, Hydex Corporation, Fairfax, Virginia.

Prater, L. S., J. T. Rieger, C. S. Cline, E. J. Jensen, T. Liikalla, K. R. Oster, P. A. Eddy, 1984, Ground-Water Surveillance at the Hanford Site for CY1982. PNL-5041, Pacific Northwest Laboratory, Richland, Washington.

PSPL (Puget Sound Power and Light), 1981. Skagit/Hanford Preliminary Nuclear Project Preliminary Safety Analysis Report, Amendment 23, Vol. 6.

Raymond, J. R., D. A. Myers, J. J. Fix, V. L. McGhan and P. M. Shrotke, 1976. Environmental Monitoring Report on the Radiological Status of Ground Water Beneath the Hanford Site, January-December, 1974, BNWL-1970, Battelle Pacific Northwest Laboratory, Richland, Washington.

Routson, R. C. and K. R. Fecht, 1979. Soil (Sediment) Properties of Twelve Hanford Wells: RHO-LD-82, Rockwell Hanford Operations, Richland, Washington.

Stone, W. A., J. M. Thorp, O. P. Gifford and D. J. Hoitnik, 1983. Climatological Summary for the Hanford Area, PNL-4622, Pacific Northwest Laboratory, Richland, Washington.

Swanson, D. A., T. L. Wright, P. R. Hooper and R. D. Bently, 1979b. Revisions in Stratigraphic Nomenclature of the Columbia River Basalt Group, United States Geological Survey Bulletin 1457-H.

Tallman, A. M., K. R. Fecht, M. C. Marratt and G. V. Last, 1979. Geology of The Separations Areas, Hanford Site, South-Central Washington, RHO-ST-23, Rockwell Hanford Operations, Richland, Washington.

Thompson, F. L. and S. W. Tyler, 1984, Comparison of Two Groundwater Flow Models-UNSAT1D and HELP, EPRI CS-3695, Project 1406-1 Topical Report, Battelle Pacific Northwest Laboratory, Richland, Washington.

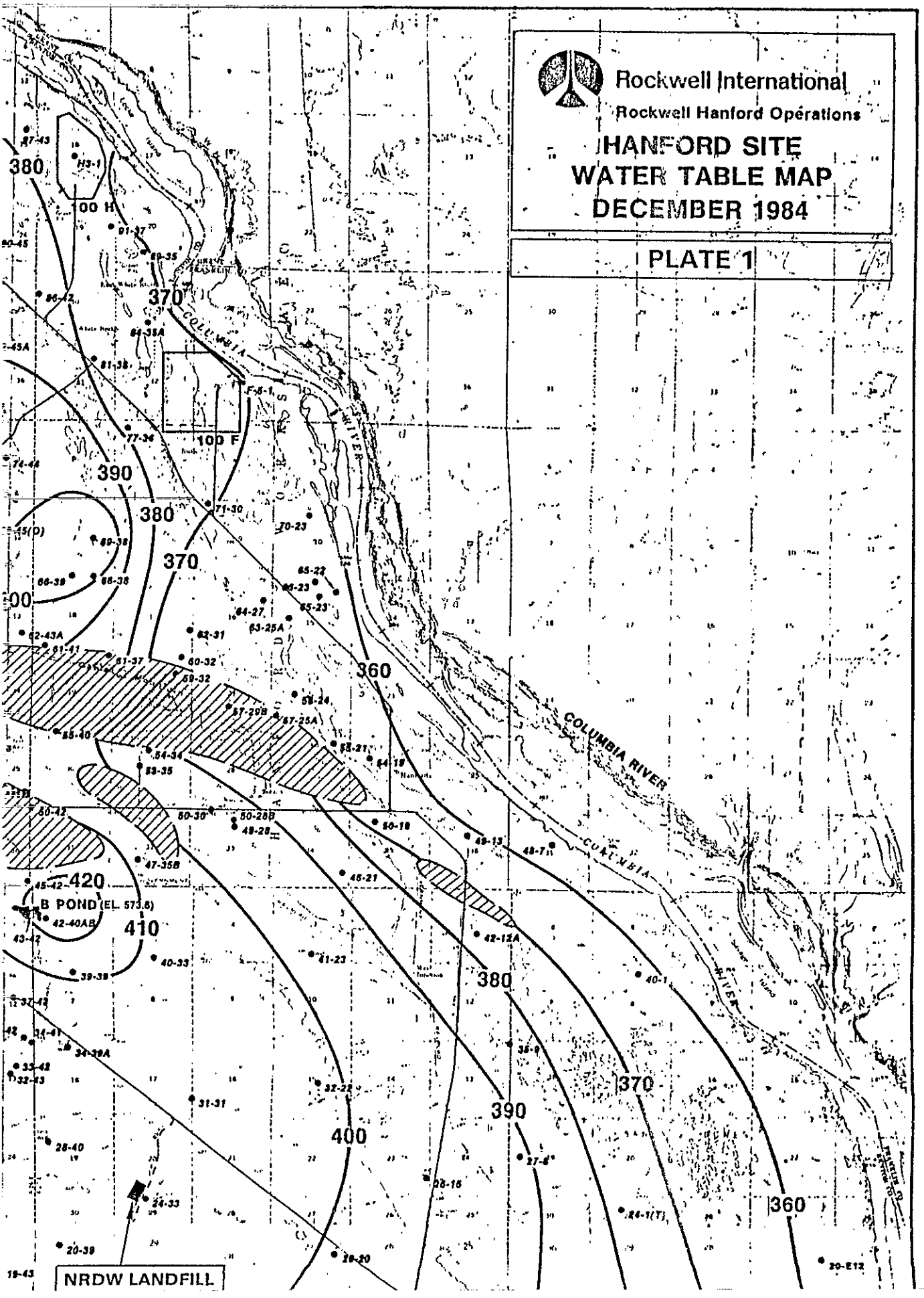
U.S. Bureau of Reclamation, 1971. "Columbia Basin Project, Deep Percolation As a Percentage of Water Allotment: WTL Code 493," Ephrata, Washington.

Wallace, R. W., 1978. A Comparison of Evapotranspiration Estimates Using DOE Hanford Climatological Data, PNL-2698, Pacific Northwest Laboratory, Richland, Washington

Wilbur, J. S. and M. J. Graham, 1982. Results of the Separations Area Ground-Water Monitoring Network for 1981, RHO-HS-SR-5P, Rockwell Hanford Operations, Richland, Washington.

Wilbur, J. S. and M. J. Graham, and A. H. Lu, 1983. Results of the Separations Area Ground-Water Monitoring Network for 1982, RHO-RE-SR-83-24P, Rockwell Hanford Operations, Richland, Washington.

WPPSS (Washington Public Power Supply System), 1981. Final Safety Analysis Report: WPPSS Nuclear Project No. 2, Richland, Washington.


Rockwell International
Rockwell Hanford Operations
HANFORD SITE
WATER TABLE MAP
DECEMBER 1984
PLATE 1
100 H
100 F
COLUMBIA RIVER
B POND (EL. 573.6)
NRDW LANDFILL
380
370
390
380
370
360
420
410
380
390
370
400
360

SECTION F
PROCEDURES TO PREVENT HAZARDS

F-1 SECURITY

The Hanford Site maintains an effective site security program for the protection of Government property, classified information, and special nuclear material. Security requirements for hazardous wastes are met by this program. The security systems on site will prevent unknowing entry and will minimize the possibility for unauthorized entry of persons or livestock into any of the hazardous waste facilities.

Unauthorized or unintended entry to hazardous waste facilities is prevented by (1) 24-hour surveillance systems in the form of manned barricades at the entries to controlled access areas, or (2) fences, gates, locks, and warning signs, or (3) combinations of both. Only personnel who have been granted a security clearance from the U.S. Department of Energy are permitted to enter Hanford Controlled Access Areas. In addition, Hanford Patrol provides surveillance patrols of the controlled areas.

Site personnel receive adequate training on Hanford Site security regulations in the form of required security education and on-the-job training. Procedures for ensuring personnel compliance with security requirements, providing security education, and training personnel are developed and maintained on the Hanford Site. Performance of periodic security compliance audits and inspections ensure that these procedures are followed.

F-1a Security Procedures and Equipment

F-1a(1) 24-Hour Surveillance System

The NRDWL and both the existing and proposed NRDWS are located within the Hanford Controlled Access Area which is controlled by the Hanford Patrol on a 24-hour basis. Detonation activities will only occur with Hanford Patrol personnel present and, therefore, surveillance is maintained during all detonating operations. Unauthorized or unintended entry into detonation areas is prevented by the Hanford Patrol who secure the area prior to detonation of the chemicals. The detonation activities normally take less than one hour to perform.

F-1a(2)(a) Barrier

The NRDWL is surrounded by a galvanized woven wire fence ten feet in height. The lower eight feet have openings of four by eight inches and the top two feet have openings of four by six inches. The outside storage area of the existing NRDWS is located in the Hanford Site Controlled Access Area within the 200 West Area.

F-1a(2)(b) Means to Control Entry

The NRDWL fence is equipped with gates which are locked when unattended by the landfill operator. The existing NRDWS building is locked when unattended as will be the proposed NRDWS.

F-1a(3) Warning Signs

The NRDWL and the existing NRDWS are equipped with signs denoting the legend "Danger-Unauthorized Personnel Keep Out" at each entrance to the active portion of the facility. These signs are legible from a distance of at least 25 feet. The NRDWS also maintains "No Smoking" signs at the facility's active portion. The proposed NRDWS will be equipped with these signs at the active portion of the facility. Also, low-pressure sodium lighting which is automatically controlled by photoelectric sensors will allow warning signs to be legible at night from a distance of 25 feet. All signs are posted in distinct locations and in sufficient numbers so that they can be seen from any approach route to the unit. All signs are in English, the predominant language used in the area surrounding the units.

F-1b Waiver

Waivers of the security procedures and equipment requirements for the NRDWL and NRDWS will not be pursued by the U.S. Department of Energy, Richland Operations Office (DOE-RL).

F-2 INSPECTION SCHEDULE

F-2a General Inspection Requirements

Inspections at the NRDWL and NRDWS are designed to detect and correct malfunctions and deterioration which could threaten human health or which could

result in releases of dangerous wastes from the unit. Remedial action to correct deficiencies is to be specified on unit inspection schedules along with the date the action took place. Inspection schedules and procedures are kept by operating personnel in the administrative office building (2750E, 200 East Area) and retained for a period of three years.

Tables F-1 and F-2 present facility inspection procedures which provide the detail required to properly inspect the NRDWL and NRDWS, respectively. Inspection frequencies are defined within these procedures based on the rate of possible deterioration and/or the specific regulatory requirements. Actual unit inspection schedule forms for these units are included in Figures F-1 and F-2.

After detonation, no discernable debris or ash remains, therefore, documented inspections are not applicable.

F-2a(1) Type of Problems

Tables F-1 and F-2 identify the types of problems to look for during inspections of the NRDWL and NRDWS.

F-2a(2) Frequency of Inspections

Tables F-1 and F-2 identify the frequency of inspection for each item.

F-2b(1) Container Inspection

Figure F-2 presents the form used to document weekly inspections of containers and container storage areas.

The existing NRDWS consists of a metal building which is divided into two containment cells. Segregation of chemical wastes is accomplished based on hazard class. This facility will be closed under interim status because its small capacity will not accommodate Hanford Site waste generation rates. Surplus drums and empty containers must be stored outside of the building. Areas subject to potential spillage, facility structures, container condition evaluation, and safety and emergency equipment are inspected at the existing storage unit.

The proposed NRDWS will have adequate capacity and provide a safe working environment for handling dangerous and extremely hazardous wastes. This facility has been designed to meet all final permit standards and is proposed for completion in May of 1986. It is anticipated that inspection schedules and procedures will be similar to those currently in use at the existing storage facility, although the new facility will expand equipment, structures, and areas currently inspected. At this time, the full list of specific items to be inspected is undetermined. Schedules and procedures will be developed as this information becomes available. Anticipated additions will include:

- Alarm system
- Building intercom system
- Telephone system
- Water supply and sprinkler system for firefighting
- Catch basins/sumps
- Portable pumps
- Mercury-rated vacuum cleaner

F-2b(2) Tank Inspection

This section is not applicable to the operation of the NRDWL and the NRDWS.

F-2b(3) Waste Pile Liner Inspection for Exemption from Groundwater Protection Requirement

This section is not applicable to the NRDWL or the NRDWS.

F-2b(4) Waste Pile Inspection

This section is not applicable to the NRDWL or the NRDWS.

F-2b(5) Surface Impoundment Inspection

Surface impoundment inspections are not applicable to the operation of the NRDWL and NRDWS.

F-2b(6) Incinerator Inspection

Incinerator inspections are not applicable to the operation of the NRDWL and NRDWS.

F-2b(7) Landfill Inspection

Table F-1 presents the form used to document NRDWL inspection. The NRDWL consists of a series of unlined trenches. According to WAC 173-303-665

(4)(b), existing landfills must be inspected weekly and after storms for structural deterioration of run-on and run-off control systems, accumulation of liquids in the leak detection system, and the presence of leachate in, and proper functioning of, leachate collection and removal systems. These systems are currently not in use at the landfill. Currently, the landfill is visually inspected for the presence of deterioration of trench integrity, the presence of run-on/run-off in open trenches, and for potential spillage along roadways and other areas subject to spills. Safety and emergency equipment is checked at the unit for proper functioning and to assure that adequate supplies are available.

F-2b(7)(a) Run-on and Run-off Control Systems

The presence of run-on/run-off at the NRDWL is noted in the inspection log and remediation of the problem is documented.

F-2b(7)(b) Leak Detection System

The NRDWL will seek an exemption from the requirements to include leak detection systems, therefore this inspection requirement is not applicable.

F-2b(7)(c) Wind Dispersal Control System

Wastes are covered immediately upon placement in the landfill, therefore precluding the problem of fugitive dusts. Trench integrity is inspected to ensure that problems such as serious erosion, settling or uneveness can be immediately corrected to avoid the uncovering of buried waste.

F-2b(7)(d) Leachate Collection and Removal System

The NRDWL will seek an exemption from these requirements, therefore this inspection requirement is not applicable.

F-2b(8) Land Treatment Facility Inspection

Land treatment facility inspections are not applicable to the operation of the NRDWL and NRDWS.

F-3 WAIVER OR DOCUMENTATION OF PREPAREDNESS AND PREVENTION REQUIREMENTS

F-3a Equipment Requirements

F-3a(1) Internal Communications

Operators at the NRDWL are equipped with hand-held two-way radios in the office trailer and are carried at all times in the heavy equipment used during waste placement in the trenches. The existing NRDWS is an unmanned unit. When working at the NRDWS, the operator carries a hand-held two-way radio at all times. Personnel in the office area and waste storage will be supplied with hand-held two-way radios.

F-3a(2) External Communications

The NRDWL and the existing NRDWS are equipped with external communication devices in the form of hand-held two-way radios. Fire, security, and patrol personnel can be summoned by these radios. The proposed NRDWS will be equipped with hand-held two-way radios, a standard telephone service, and a voice intercom or building announcing (P.A.) system capable of being heard above normal operations and in all areas of the unit. This system will have its main station in the main office with substations provided in the waste handling areas. A unit fire alarming system will be tied into the 200 East fire alarm Gamewell loop for immediate summoning of fire control equipment and personnel.

F-3a(3) Emergency Equipment

Many kinds of emergency equipment are available for immediate use at the NRDWL and NRDWS. The Hanford Site maintains a large inventory of heavy equipment, hand tools, new drums, and absorbent material. The Hanford Site is also equipped with fire departments capable of handling a worst-case scenario fire situation at either unit. Emergency Response and cleanup functions are available for emergencies as described in Section G - Contingency Plan.

The NRDWL is not equipped with fire control equipment because ignitable wastes are not buried at the landfill in other than a solid form and in closed, nonleaking containers. In the unlikely event that a fire occurs at the landfill, personnel are instructed to radio the 200 East Fire Station for assistance. Spill control equipment is not maintained at the NRDWL due to the high

solid content nature of wastes in the landfill. Should a container rupture, a new container will be brought in and hand tools used to repackage the material. All of this equipment is available within ten miles of the site. Likewise, decontamination equipment for use on heavy equipment is available close to the landfill site.

The existing NRDWS is equipped with a fire extinguisher rated ABC for use on a variety of chemical fires. Spill control equipment consists of adequate supplies of nonbiodegradable absorbents and overpack drums. Decontamination equipment, as in the case of the NRDWL, is available within minutes from various areas of the Hanford Site depending on the nature of the spill or cleanup operation. Emergency equipment such as personal protection equipment and two escape packs are also available at the NRDWS.

F-3a(4) Water for Fire Control

Water for fire control will be supplied by the Hanford Site Fire Departments for fires requiring high water volumes and pressure at the NRDWL and the existing NRDWS. The proposed NRDWS will be equipped with automatic fire sprinkler systems as an immediate action to a fire with the Fire Department being summoned to supply additional water volume and pressure needs.

F-3b Aisle Space Requirement

The north and south sides of the NRDWL are open for easy unobstructed access by the fire department. The existing NRDWS will maintain sufficient aisle space between drums both inside and outside of the unit. The existing NRDWS is located in an area which is isolated from any other buildings on the Hanford Site. The unit can be easily reached from all sides by fire control equipment. The proposed NRDWS will be sufficiently large enough to preclude the condition of inadequate aisle space and will allow for easy access of waste with a forklift on fire control equipment.

F-4 PREVENTIVE PROCEDURES, STRUCTURES, AND EQUIPMENT

F-4a Unloading Operations

Procedures have been developed at the NRDWL which effectively minimize the potential for breakage, puncture or opening of dangerous waste containers to

be buried. Each container is loaded onto trucks equipped with mechanical taillifts. Containers are then individually removed by hand from the taillifts at ground level and carefully positioned in the trench to conserve as much space as possible. Containers are handled manually at the existing NRDWS so as to prevent rupture, etc. The proposed NRDWS will utilize drum forklifts or dollies specifically designed for the safe handling of dangerous chemicals.

F-4b Run-Off

The NRDWL is designed to prevent run-off of precipitation which has come into contact with waste. All precipitation drains into the trench, owing to the cross-sectional V-shaped trench design, and not out into other areas of the facility. Contaminated run-off from the existing NRDWS will be precluded by assuring that the cement pad is kept free from hazardous waste spills or container leakage. The proposed NRDWS will only store wastes inside covered curbed areas therefore not allowing contamination of precipitate run-off.

F-4c Water Supplies

Neither the NRDWL or the NRDWS are located in areas where water supplies could become contaminated from any route of exposure.

F-4d Equipment and Power Failure

No situation would require mitigation of effects of power failure and power outage at the NRDWL and existing NRDWS because these units are not supplied with power. The proposed NRDWS will be tied into the 200 East fire alarm Gamewell loop for the immediate summons of fire department personnel in the event of a power failure.

F-4e Personnel Protection Equipment

Personnel protection equipment (coveralls and gloves) are used at both the NRDWL and the existing NRDWS. The existing NRDWS also maintains full-face chemical respirators with an assortment of cartridges applicable to the wastes in storage, and an emergency escape air pack. The proposed NRDWS will maintain this equipment as well as self-contained breathing apparatus for emergency use.

F-5 PREVENTION OF REACTION OF IGNITABLE, REACTIVE, OR INCOMPATIBLE WASTES

F-5a Precautions to Prevent Ignition of Ignitable Reactive Waste

Wastes are rendered non-reactive prior to shipment to the NRDWL. Ignitable wastes are packaged such that the waste is in solid form and is in nonleaking containers so that ignition could not occur. When handling ignitable or reactive wastes at the NRDWS, smoking is prohibited as evidenced by "No Smoking" signs posted in the waste handling areas. Other sources of ignition, such as open flames, cutting and welding, presence of hot surfaces, frictional heat, sparks (static, electrical, or mechanical), spontaneous ignition, and radiant heat are not used in areas of waste handling.

F-5b General Precautions for Handling Ignitable or Reactive Waste and Mixing of Incompatible Waste

Based upon the hazard characteristics identified by the generator, specific packaging instructions are provided by the NRDWL and NRDWS TSD technical staff. Instructions take into consideration the ignitability, reactivity and potential incompatibilities of the waste stream. Consideration for compatibility of the waste with the container is determined at this time as well.

Instructions are in compliance with DOT regulations at all times. If multiple waste types are to be placed in a single container (e.g., lab packs), compatibility analyses are performed and potentially incompatible wastes are packaged in separate containers. In no case are wastes of differing hazard classes packaged together. Wastes designated as EHW are packaged into a compatible lab pack and stored at the NRDWS prior to transport to an offsite TSD. Lab-packed wastes designated as DW are put in the landfill on-site. A mixture of EHW and DW wastes will always be designated as EHW and shipped offsite.

Ignitable and reactive wastes must be stored and placed in the landfill in closed, nonleaking containers. Liquid ignitable and reactive wastes will not be put in the landfill except in the form of lab packs which are packaged with at least a four-to-one ratio of nonbiodegradable absorbent to liquid waste. Dangerous wastes are never placed in an unwashed container that previously held an incompatible waste or material.

The existing NRDWS segregates waste in main curbed cells which segregate oxidizing materials from corrosive, organic, ignitable, and other waste types. Should wastes be encountered which are not compatible with either cell (as determined in the initial generator waste analysis), containers are isolated outside the building.

The proposed NRDWS will have cells which segregate wastes based on the following National Fire Protection Association waste categories: Class IA Flammable Liquids, Class IB Flammable Liquids, Combustibles, Corrosives, and Oxidizers. This expansion will further preclude the possibility of waste incompatibilities.

F-5c Management of Ignitable or Reactive Waste in Containers

The NRDWL and the existing and proposed NRDWS are located over five miles from the boundary of the Hanford Site (Figure B-7).

F-5d Management of Incompatible Wastes in Containers

This information is included in F-5b.

F-5e Management of Ignitable or Reactive Waste in Tanks

Tanks are not applicable to the operation of the NRDWL and NRDWS.

F-5f Management of Incompatible Wastes in Tanks

Tanks are not applicable to the operation of the NRDWL and NRDWS.

F-5g Management of Ignitable or Reactive Wastes Placed in Waste Piles

Waste piles are not applicable to the operation of the NRDWL and NRDWS.

F-5h Management of Incompatible Wastes Placed in Waste Piles

Waste piles are not applicable to the operation of the NRDWL and NRDWS.

F-5i Management of Ignitable or Reactive Wastes Placed in Surface Impoundments

Surface impoundments are not applicable to the operation of the NRDWL and NRDWS.

F-5j Management of Incompatible Wastes Placed in Surface Impoundments

Surface impoundments are not applicable to the operation of the NRDWL and NRDWS.

F-5k Management of Ignitable or Reactive Wastes Placed in Landfills

Ignitable wastes will only be placed in the landfill in closed nonleaking containers per U. S. Department of Transportation regulations. Ignitable wastes will either be in solid form (solid content greater than 70 percent) or in the form of lab packs (small laboratory quantities potentially in liquid form) which are surrounded by nonbiodegradable absorbents in a four-to-one ratio absorbent to liquid volume. Reactive wastes will not be put in the landfill unless they can be rendered non-reactive as defined in WAC 173-303-090(7).

F-5l Management of Incompatible Wastes Placed in Landfills

Wastes are placed in one of two trenches at the NRDWL: the "Oxidizer" trench and the "Corrosive" trench. All oxidizing material is placed in the former while corrosive material as well as all other waste types are placed in the latter. Should incompatible wastes require placement in a single trench, this possibility is noted by the NRDWL technical staff and the operator is instructed to separate wastes with enough trench fill (approximately three to five feet from the direction of the placed waste) to preclude potential incompatibilities should the drums rupture during placement. This potential is considered remote owing to the high solids content of wastes landfilled at the NRDWL.

F-5m Management of Ignitable or Reactive Wastes Placed in Land Treatment Units

Land treatment units are not applicable to the operation of the NRDWL.

F-5n Management of Incompatible Wastes in Land Treatment Units

Land treatment units are not applicable to the operation of the NRDWL.

TABLE F-1
(Continued)

SAFETY/EMERGENCY EQUIPMENT

Two-way Radios - If radios have not been used routinely, check two-way radios used during unloading and landfilling activities for proper functioning. This can be accomplished by turning the radio on and transmitting a message to another user for a radio check. Improper operation of a radio should be reported to Rockwell Hanford Operations Telecommunication Department and arrangements made to replace the radio in use. Radio checks are to be made on a monthly basis.

TABLE F-1

INSPECTION PROCEDURES FOR THE NONRADIOACTIVE DANGEROUS WASTE LANDFILL

The purpose of these inspection procedures is to detect potential malfunctions or deterioration in equipment, structures, or areas at the Nonradioactive Dangerous Waste Landfill (NRDWL) which may cause, or may be leading to, releases of hazardous wastes which could pose a threat to human health or the environment. Inspection logs have been developed which identify the specific equipment to be inspected and at what frequency. The following procedures detail how each item identified on the inspection log will be inspected and the frequency for inspection.

AREAS SUBJECT TO SPILLS

Loading/Unloading Areas - Loading/unloading areas are typically located at the working face of the trenches. Walk these areas and observe for evidence of spillage. These areas are to be inspected daily when in use, which is normally once per week on a Friday.

Roadways - Roadways entering the landfill from the highway to the landfill office trailer and roadways from the office trailer to the trench area are to be observed for signs of spillage. Roadways are to be inspected daily when in use (normally once per week on Friday) for hazardous waste.

STRUCTURES

Fences - Perimeter fences are to be inspected on a monthly basis for evidence of breaches. Concurrently, warning signs posted on perimeter fences are to be inspected for deterioration. Signs are to be clearly visible to vehicular traffic.

Trench Integrity - At least monthly and after storms, both covered trenches and unused portions of trenches are to be inspected for signs of serious erosion of the trench cover of covered trenches, and of trench sides of unused trenches. Inspect for evidence of settling or uneveness at covered trenches and evidence of subsidence or erosion rivulets at unused trenches.

Run-on/Run-off - The presence of run-on or run-off in open trenches is to be inspected weekly and after storms. A description of the location and quantity of run-on or run-off and whether wastes interface with pooled water must be noted.

TABLE F-2

INSPECTION PROCEDURES FOR THE NONRADIOACTIVE DANGEROUS WASTE STORAGE FACILITY, 2727-S BUILDING

The purpose of these procedures is to detect potential malfunctions or deterioration in equipment, structures, or areas at the Nonradioactive Dangerous Waste Storage Facility (NRDWS) which may cause, or may be leading to, releases of hazardous wastes which could pose a threat to human health or the environment. Inspection logs have been developed which identify the specific equipment to be inspected and at what frequency. The following procedures detail how each item will be inspected and the frequency for inspection.

AREAS SUBJECT TO SPILLS

Loading/Unloading Areas - Loading/unloading areas are typically located directly northeast of the storage building in an area approximately 50 by 50 feet from the roadway to the storage building. Walk this area and observe for evidence of spillage. This area is to be inspected daily when in use. Inspections are to be made after waste is unloaded.

STRUCTURES

Cement Pad - The cement pad, both inside and outside the building is to be inspected for signs of deterioration which could allow chemical release to the soil should a spill occur. Inspect for cracks or areas of wear in the cement. The cement pad is to be inspected monthly for deterioration.

Curbing - Curbing, located inside the storage building, is to be inspected for signs of deterioration which could allow chemical release to the soil should a spill occur. Inspect for cracks or areas of wear in the cement. Curbing is to be inspected monthly for deterioration.

Roofing/Walls - The storage building roof and walls are to be inspected monthly for signs of deterioration which could lead to precipitation entering the building. Inspect for evidence of rainfall accumulation within the building.

Signs - Warning signs posted around the facility are to be inspected monthly for signs of deterioration. Signs are to be clearly visible to vehicular traffic.

TABLE F-2
(Continued)

CONTAINER CONDITION

Each container is to be inspected on a weekly basis for evidence of deterioration of structural integrity and to ensure that Hazardous Waste labels and Department of Transportation labels are legible. All drums are stored closed. Inspect for proper lid or bung closure. Inspect for structural defects, such as bulging or creasing, as evidenced by the presence of paint peeling off the drum and for corrosion, as evidenced by rust accumulation on the drum.

SAFETY/EMERGENCY EQUIPMENT

Spill Control Equipment - Adequate supplies of absorbents and overpack drums are to be available at the storage facility at all times. Inventories of these items are to be made monthly.

Eyewash - Check the gauge located on the eyewash to ensure that proper pressure is maintained in the system. The gauge level is to be within the green zone.

Fire Extinguisher - Fire extinguishers are to be inspected each month. Inspection procedures have been detailed in the attached excerpt from RHO-MA-221, Accident Prevention Standards, Volume 1, Number 6.7, Pages 3 and 4.

Two-way Radios - If radios have not been used routinely, check two-way radios used during unloading and landfilling activities for proper functioning. This can be accomplished by turning the radio on and transmitting a message to another user for a radio check. Improper operation of a radio should be reported to Rockwell Hanford Operations Telecommunication Department and arrangements made to replace the radio in use. Radio checks are to be made on a monthly basis.

PERSONNEL PROTECTION EQUIPMENT

Protective clothing, gloves, respirators with appropriate chemical cartridges to handle dangerous wastes in storage at the facility, and escape packs are to be inventories on a monthly basis to determine if adequate supplies are available to personnel.

INSPECTION LOG
NONRADIOACTIVE DANGEROUS WASTE LANDFILL
CENTRAL LANDFILL/600 AREA

DATE: _____

TIME: _____

	STATUS		
	NO PROBLEMS NOTED	REQUIRED REMEDIAL ACTIONS/DATE	SEE COMMENTS
1. AREAS SUBJECT TO SPILLS			
A. LOADING/UNLOADING AREAS	☐	☐ _____	☐
B. ROADWAYS	☐	☐ _____	☐
2. STRUCTURES			
A. FENCES	☐	☐ _____	☐
B. SIGNS	☐	☐ _____	☐
C. TRENCH INTEGRITY			
- COVERED TRENCHES	☐	☐ _____	☐
- UNUSED TRENCHES	☐	☐ _____	☐
- RUN-ON/RUN-OFF	☐	☐ _____	☐
3. SAFETY/EMERGENCY EQUIPMENT			
A. TWO-WAY RADIOS	☐	☐ _____	☐

4. COMMENTS

5. INSPECTOR SIGNATURE

_____
PRINT NAME

_____
SIGN NAME

2K8508-3.2

FIGURE F-1 INSPECTION LOG, NONRADIOACTIVE DANGEROUS WASTE LANDFILL CENTRAL LANDFILL/600 AREA

INSPECTION LOG
NONRADIOACTIVE DANGEROUS WASTE STORAGE FACILITY
2727-S BUILDING/200 WEST AREA

DATE: _____

TIME: _____

	STATUS		
	NO PROBLEMS NOTED	REQUIRED REMEDIAL ACTIONS/DATE	SEE COMMENTS
1. AREAS SUBJECT TO SPILLS			
A. LOADING/UNLOADING AREAS	☐	☐ _____	☐
2. STRUCTURES			
A. CEMENT PAD	☐	☐ _____	☐
B. CURBING	☐	☐ _____	☐
C. ROOF/WALLS	☐	☐ _____	☐
D. SIGNS	☐	☐ _____	☐
3. CONTAINER CONDITION			
A. CLOSED	☐	☐ _____	☐
B. STRUCTURAL DEFECTS	☐	☐ _____	☐
C. CORROSION	☐	☐ _____	☐
D. LABELS REQUIRED	☐	☐ _____	☐
E. EVIDENCE OF LEAKAGE	☐	☐ _____	☐
4. SAFETY/EMERGENCY EQUIPMENT			
A. ABSORBENTS	☐	☐ _____	☐
B. OVERPACK DRUMS	☐	☐ _____	☐
C. EYEWASH	☐	☐ _____	☐
D. FIRE EXTINGUISHER	☐	☐ _____	☐
E. TWO-WAY RADIOS	☐	☐ _____	☐
F. PROTECTIVE CLOTHING	☐	☐ _____	☐
G. GLOVES	☐	☐ _____	☐
H. RESPIRATORS/CARTRIDGES	☐	☐ _____	☐
I. ESCAPE PACK	☐	☐ _____	☐

5. COMMENTS

6. INSPECTOR SIGNATURE

_____
PRINT NAME

_____
SIGN NAME

2K8508-3.1

FIGURE F-2. INSPECTION LOG, NONRADIOACTIVE DANGEROUS WASTE STORAGE FACILITY 2727-S BUILDING/200 WEST AREA

SECTION G
CONTINGENCY PLAN

The information contained herein is submitted in accordance with the requirements for a contingency plan, as contained in 40 CFR 270.14(b)(7) and 264 Subpart D and WAC 173-303-350 and -360. The intent of these regulations is to ensure that facilities which treat, store, or dispose of hazardous wastes have established the necessary planned procedures to follow in the event an emergency situation arises.

The contingency plan, which appears in Appendix G-1, establishes policy and creates procedures for spill prevention, containment, and countermeasures to minimize any adverse impact to the environment, to reduce safety and health hazards, and to meet standards which define the acceptable management of hazardous waste. The standards in this plan apply to all areas of the facility that handle chemicals and treat, store, or dispose of hazardous waste. Information on the hazardous properties of the various chemicals used in the facility, the safeguards to protect personnel from exposure, and the proper handling, storage and disposal of the hazardous materials is available on the site.

G-1 GENERAL INFORMATION

Rockwell Hanford Operations (Rockwell) presently maintains the Nonradioactive Dangerous Waste Landfill and the existing Nonradioactive Dangerous Waste Storage Facility. A proposed Nonradioactive Storage Facility is expected to be operational in calendar year 1986. The Nonradioactive Dangerous Waste Storage Facility is located in the 2727-S Building in the 200 West area of the Site and is used to store liquid Dangerous Waste, liquid Extremely Hazardous Waste and solid Extremely Hazardous Waste. Fires, explosions, solid and liquid spills, and toxic fume generation are all potential hazards at this facility. Wastes may be toxic, corrosive, ignitable or reactive in nature. The facility is a nonstaffed facility, but when staff is present, they are equipped with portable two-way radios.

The Nonradioactive Dangerous Waste Landfill is used for the disposal of Solid Dangerous Waste and is located in the 600 Area of the Hanford Site at the

Central Landfill Site located approximately one mile southwest of Route 4 South at milepost eight. The hazard potential at this facility is low relative to that of the storage facility. The greatest hazard potential is from solid spills; fires, explosions and toxic fume generation have a remote potential of occurrence. The landfill is presently manned by one day shift operator. Emergency messages are relayed to and from the operator by use of a portable two-way radio.

The location of both TSD Facilities is shown in Figure G-1, The Hanford Area map.

The contingency plan is designed to minimize hazards to human health and the environment from fires, explosions or any unplanned sudden or non-sudden release of hazardous waste or hazardous waste constituents to air, soil or surface water. The provisions of the plan will be carried out immediately whenever there is a fire, explosion, or release of hazardous waste or hazardous waste constituents which could threaten human health or the environment.

This plan can be revised only by the Office of Emergency Preparedness (OEP) based on information determined by that organization or on information made known to the OEP by the manager(s) of either or both TSD facilities. Generally, the types of changes that warrant a revision are:

- Revision of the facility permit
- An error(s) is found in the plan
- In an emergency situation, the plan is found to be inadequate or incomplete
- The facility manager or the Emergency Action Coordinator(s) change
- The emergency equipment list changes
- The facility changes in such a manner that the plan is nc longer correct or viable

Copies of this plan are located inside the east door of 2727-S and inside the door of the operator's shack at the landfill. Additional copies are located

at the Patrol Operations Center (POC), at the Rockwell Emergency Coordination Center (ECC) in Building 2750E in the 200 East area, with the facility managers, with the Emergency Action Coordinators (EAC), and with all groups that may be involved in emergency response.

G-2 EMERGENCY COORDINATORS

The overall responsibility for the protection of TSD facility personnel and property lies with the Facility Manager or his delegate. This person shall identify Emergency Action Coordinators (EACs) who are responsible for directing initial actions in the event of an emergency at an assigned building/location. This responsibility includes the direction of emergency response groups such as Patrol, Fire Department, etc. If an emergency occurs, the EAC shall remain in charge with support provided by the Emergency Director (ED). Mr. G. R. Cox has been designated as the primary emergency coordinator. The EACs have the authority to commit all necessary resources including equipment and personnel in the case of emergency.

The emergency chain of command for the TSD facilities is shown below.

		Work Phone	Home Phone
Nonradioactive Dangerous Waste Landfill			
R.C. Funderberg 1171/3	Manager, Road and Track Maintenance and Equipment Operations	376-6612	783-3676
Nonradioactive Dangerous Waste Storage Facility			
D.M. Craig 2752E/D102	Manager, Facilities Management	373-1353	627-1517
Emergency Action Coordinators - Both Facilities			
G.R. Cox (Primary) 222T/103	Safety Engineer, Industrial Hygiene and Safety	373-4032	575-0823
A.W. Lilly	Industrial Hygienist Industrial Hygiene and Safety	373-2627	586-4864

At least one of the Emergency Action Coordinators will be on-call at all times and available to respond to an emergency. The emergency Action Coordinators are thoroughly familiar with all aspects of this contingency plan, all operations and activities at the facilities, the types and characteristics of the waste being handled, the location of all records in the facilities and the layout of the facilities.

G-3 IMPLEMENTATION OF THE CONTINGENCY PLAN

The decision by the EAC to implement the contingency plan depends on whether an actual incident such as a fire, explosion, chemical spill, or release of hazardous waste constituents threatens human health or the environment. Immediately after being notified of an emergency incident, the EAC will proceed to the site and evaluate the situation. The following are situations that would warrant implementation of the contingency plan:

- o A fire and/or explosion occurs, such that
  - The potential for human injury exists
  - Toxic fumes are released
  - The fire could spread on site or off site and possibly ignite other flammable materials or cause heat-induced explosions
  - The use of water and/or chemical fire suppressants could result in contaminated run-off
  - An imminent danger exists that an explosion could ignite other hazardous waste at the facility and possibly result in the release of toxic materials
- o A spill or release of a hazardous material occurs such that
  - The spill could result in the release of flammable liquids or vapors, thus causing a fire or gas explosion hazard
  - The spill could cause the release of toxic liquids or fumes
  - The spill can be contained on-site, but the potential exists for groundwater contamination
  - The spill cannot be contained on site, resulting in off-site soil contamination and/or ground or surface water pollution

Many ways of discovering a spill or release of chemicals are available. This includes routine and scheduled inspections of areas by operating personnel; unusual or strong chemical odors may indicate a leak.

Activation of the appropriate emergency organization is initiated by instrumentation and/or notification of the Patrol Operations Center (POC). Based upon the type and magnitude of the emergency event, the POC will notify the Rockwell Emergency Director (ED).

Following discussions with the Director, Safety and Quality Assurance, and the Functional Director with principal responsibility for stabilization and recovery, the Executive On-Call and the ED shall agree upon preliminary subclassification for the event (see below) and determine the appropriate level of response. As additional information on the event becomes available, the Executive On-Call and the ED shall revise the classification of the event and the response level accordingly.

The following excerpt from RHO-MA-111, The Rockwell Hanford Operations Emergency Plan, lists the classifications of emergencies involving hazardous waste that can occur on the Hanford Site. The likelihood of an on-site hazardous waste emergency posing a health hazard to off-site personnel is remote, but is considered here as a "worst case" possibility.

Unusual Event

An unusual event that indicates a potential degradation of the level of safety or security of the plant. (Examples: fires, security threats, attempted entry or sabotage, natural disasters, minor explosions with limited impact, toxic or flammable gas release external to facilities, etc.)

Alert

An event that involves one or more of the following:

1. Plant fatality
2. Serious injury

3. Actual or potential substantial degradation of the level of safety or security at the plant

The purpose of the alert is to assure that emergency personnel are available to readily respond if the situation becomes more serious, and to provide DOE-RL with current status information. This level of event involves conditions where significant personnel contamination or exposure has or could occur. (Examples: loss of power resulting in containment compromise, severe natural phenomena, known explosive damage to facility, release of toxic or flammable gases into a facility, or events requiring evacuation of a plant facility.)

Site Emergency

An event that involves actual or likely major failures of plant safety/security functions needed for protection of the public and environs. A Site Emergency requires that on-site emergency response centers be activated and that DOE-RL make off-site notification to assure that all needed support centers are manned, assure that monitoring teams are dispatched, that personnel required for evacuation of near-site areas are at duty stations, and that information is provided to the public through offsite notifications. Such an event involves conditions where significant releases of chemical wastes are likely to or are occurring and would cause exposure in the surrounding populace.

General Emergency

An event that involves actual or imminent substantial degradation of plant safety and/or security systems. The purpose of the General Emergency declaration is to initiate predetermined protective actions for the public, provide for continuous assessment of information, initiate any additional measures as indicated by actual or potential releases, provide for consultation with off-site authorities, and to provide information updates to the public through off-site authorities.

G-4 EMERGENCY RESPONSE PROCEDURES

G-4a Notification

Nonradioactive Dangerous Waste Treatment, Storage and Disposal Facilities

In the event of an emergency, the Patrol Operations Center (POC) will be notified first; subsequently, the Emergency Action Coordinator; all personnel

in the affected area; and appropriate federal, state, or local authorities (Section G-8) will also be notified. Figure G-2 depicts the chain of notification for an emergency at Rockwell Facilities.

The Patrol Operations Center (POC)

The Patrol Operations Center should consider notifying the following persons/groups in the event of a hazardous waste spill/incident:

- Patrol Management
- The Fire Department/Hazardous Materials Response Team
- Rockwell Emergency Director
- DOE-RL Safety Duty Officer
- DOE-RL Security Duty Officer
- Pacific Northwest Labs (PNL) Exposure Evaluator

Emergency Action Coordinator (EAC)

The EAC should consider the following actions in the event of a nonradioactive hazardous waste spill/incident:

- Notification of facility manager
- Evacuation of immediate area
- Account for personnel known or thought to have been in facility. Report unaccounted for/missing personnel to the Emergency Director or 811
- Provide assistance to the Hazardous Materials Response Team and other outside support organizations as requested
- For spills and discharges over the CERCLA/WDOE reportable quantity, contact the Process Engineering Department and initiate notification procedures

G-4b Identification of Dangerous Materials

The EAC will immediately identify the character, exact source, amount, and extent of the release. Several methods are available for the identification of any spilled or discharged hazardous waste. The normal emergency notification procedure (Section G-4a) includes notifying the PNL exposure evaluator who, if unable to identify the hazardous waste, has at his disposal any PNL personnel that he feels would be of assistance.

In addition, the following Rockwell Industrial Hygiene and Safety Department staff may be contacted directly for expert consultation during emergencies involving nonradioactive hazardous materials.

Name	Work Phone	Home Phone	Pager
R. C. Beagley	373-2424	627-1312	85-398
H. N. Bowers	373-2704	627-4817	85-398
G. R. Cox	373-4032	575-0823	85-802
A. W. Lilly	373-2627	586-4864	85-802

For assistance from the Hanford Environmental Health Foundation, the following may be contacted:

Environmental Health

Name	Work Phone
R. D. Gilmore	376-7037
L. J. Maas	376-7040
D. E. Anderson	376-7355

Medical

Area	Phone Number
100	373-1603
200	373-2703
300/400 FFTF Areas	376-3303
700, 1100, 3000 Areas	376-6403

Identification of the spilled waste can be made by visual inspection, by sampling, and by reference to facility inventory records and shipping manifests. During late 1985 and early 1986, several computer tracking systems and data bases were constructed to aid in hazardous waste identification. The EAC for the facility will be aware of these computer systems and how to utilize them.

Standby service is also available from the Chemical Emergency Information Center (Chemtrec) by calling 1-800-424-9300.

G-4c Assessment

Once the spilled/ignited hazardous waste has been positively identified by the individuals listed in Section G-4b, it should be possible to determine the

extent of the danger posed by the spill/fire. If the individuals present who performed the identification are uncertain of the danger, additional assessment aid can be obtained from the following sources:

The Rockwell Hazardous Material Response Team

The Chemtrec Information Center (1-800-424-9300)

The United States Department of Transportation Emergency Response Guidebook (DOT P 5800.3), copies of which are available from the Hazardous Materials Response Team, EACs, and the Emergency Director

If consultation with the above sources does not result in a positive assessment of the danger to human health presented by the fire/spill, a worst case condition should be assumed and evacuation procedures should be initiated. Likewise, if a positive assessment of the spill/fire is made and a danger to human health is indicated, evacuation procedures should be initiated. The EAC at the scene of the incident is responsible for initiating any evacuation.

Individuals performing a spill/fire assessment should keep in mind that it is necessary to assess both the direct and indirect hazards posed by the spill/fire.

G-4d Control Procedures

An overview of the emergency plan of action is outlined in Figure G-3. The nonradioactive treatment, storage and disposal facilities are easily accessible by firefighting and other emergency equipment. The actions described below will be taken in the event of a hazardous waste spill.

G-4d(1) Spill or Material Release. In the event of a major emergency involving a chemical or hazardous waste spill, the following general procedures will be followed for safe and rapid response and control of the situation:

1. The discoverer of the spill will immediately call the POC at 811 and contact the EAC. The discoverer may also activate the emergency alarm. Provide as much information as possible to the POC without personal risk. Calling the POC on 811 will cause the following individuals/organizations to be notified without any further action on the part of the caller; i.e., the POC will handle all notifications:

Patrol Management
Fire Department/Hazardous Materials Response Team
Rockwell Emergency Director
DOE-RL Safety Duty Office
DOE-RL Security Duty Officer
Pacific Northwest Labs (PNL) Exposure Evaluator

2. The EAC will proceed directly to the scene.

3. The EAC will obtain all necessary information pertaining to the incident.

4. The POC, while in contact with the EAC, will contact and deploy the necessary in-plant personnel, such as the Fire Department and Security Department.

5. The Security Department will set up roadblocks within the plant to route traffic away from the emergency scene.

6. The emergency medical technicians will remove injured personnel to a safe location, apply first aid, and prepare them for transport to the Medical Department or Kadlec Hospital. Doctors and nurses will be on standby at the medical facility during the day shift.

7. The Hazardous Materials Response Team will contain the spill and will provide guidance to the Decontamination and Decommissioning Operations Group and/or the Road and Track Maintenance Department to clean up the affected area. If possible, vapors will be contained by vapor-suppressing foam. The Hazardous Materials Response Team will ensure that spilled material is properly collected and disposed of, and that no spill material enters the storm drain system. These personnel will be equipped with proper protective equipment, such as Scott air paks.

8. The Fire Department/Hazardous Materials Response Team will ensure that any flammable liquid spills do not ignite. In the event a fire results, the Fire Department will control the fire using water, foam and powders, as necessary.

9. All emergency equipment will be cleaned and fit for its intended use immediately after cleanup procedures are complete.

If the spill results in the formation of a toxic vapor that is released to the atmosphere, the plant-wide evacuation alarm will be sounded. Information on alarms and communication equipment can be found in Section G-5e.

G-4d(2) <u>Fire or Explosion</u>

The following actions will be taken in the event of a fire or explosion.

1. The discoverer of the fire should immediately extinguish the fire, with help from others, if it can be done safely.

2. If the fire cannot be safely and immediately controlled, the discoverer should activate the emergency alarm and then call the Patrol Operations Center (POC) at 811. Provide as much information as possible without personal risk. Calling the POC on 811 will cause the following individuals/organizations to be notified without any further action on the part of the caller, i.e., the POC will handle all notification.

   Patrol Management
   Fire Department/Hazardous Materials Response Team
   Rockwell Emergency Director
   DOE-RL Safety Duty Officer
   DOE-RL Security Duty Officer
   Pacific Northwest Labs (PNL) Exposure Evaluator

3. The discoverer should notify the facility Emergency Action Coordinator (EAC), who will proceed directly to the scene.

4. Upon activation of the alarm, the emergency alarm will sound in most of the affected area.

5. All personnel at the affected area(s) should immediately evacuate and assemble at their designated assembly point and standby for further instructions over the public address (PA) system. The local EACs are to account for all employees in their respective jurisdictions.

6. The discoverer should immediately locate his EAC and give details of the situation.

7. The Fire Department and the Hazardous Materials Response Team will immediately proceed to the affected area.

8. The EAC and/or the discoverer of the fire will relay pertinent information to the Fire Department/Hazardous Materials Response Team.

9. The Security Department will be responsible for setting up roadblocks within the plant and the emergency medical technicians (EMTs) for first aid assistance.

10. Under direction of the EAC, the Fire Captain and the Fire Department will initiate actions necessary to control the fire.

11. The EAC will give any instruction to personnel over the PA system, sound the facility-wide evacuation alarm, and request assistance from any other facility personnel as the situation warrants.

12. The area doctor and nurses will be contacted, and they will man the emergency phone or report to the scene as required during the day shift only.

13. The EMTs will remove injured personnel to a safe location, apply first aid, and prepare for transport to the Medical Department or Kadlec Hospital.

14. The seriously injured will be transported to an area medical facility or Kadlec Hospital for medical treatment.

15. After the fire or explosion has been extinguished and no threat to human health exists, the EAC at the scene will announce the "all clear" signal.

16. All emergency equipment used in the emergency will be cleaned and fit for use after cleanup procedures are complete.

The initial response to any emergency will be to protect human health and safety and then the environment. Identification, containment, treatment, and disposal assessment will be secondary responses.

Stabilization of nonradioactive hazardous materials spills/incidents beyond the capacity of the Fire Department will be performed by the Hazardous Materials Response Team. The Rockwell Hazardous Material Response Team will consist of four Fire Department personnel (one team leader and three fire fighters). Team members are trained to identify and control unplanned releases of hazardous materials, as practicable, using equipment specifically designed for hazardous material response. Upon arrival at the spill/incident scene, the Hazardous Material Response Team Leader will be briefed by the Fire Department officer-in-charge. The Fire Department officer-in-charge shall be the primary contact for all activities conducted at the scene during stabilizations. The Fire Department shall remain in a standby mode at the scene should assistance be required. Appendix F of the report located in Appendix G-1 describes training requirements for the Hazardous Materials Response Team.

The goals of the Hazardous Materials Response Team are to:

- <u>Identify materials involved</u> - Safety and Quality Assurance will be contacted to provide technical expertise on the incident material.

- <u>Contain materials involves</u> - Damming or diking of large spills will be accomplished with the use of available equipment.

- <u>Neutralize materials involved</u> - Applicable materials will be neutralized if it is necessary to expedite safe cleanup.

- <u>Provide guidance for cleanup operations</u> - Cleanup operations will be provided by the Decontamination and Decommissioning Operations Group and/or the Road and Track Maintenance Department.

- Provide formal documentation of incident.

The following information should be considered by the EAC in the event of a nonradioactive hazardous material spill/incident.

Event	Event Categories	Action Options
Stress	Thermal, Mechanical, Chemical	Influence applied stress - move stressed system, shield stressed system, redirect impingement
Breach	Consumption (catastrophic, disintegration), cracking, punctures, splits, tears	Influence breach size - activate venting devices, chill contents, limit stress level
Release	Liquid or vaporous flow (steady, pulsating, diminishing)	Influence quantity size - change container position, minimize pressure differential, cap off breach
Engulfment	Hemispherical, spherical, conical, plume, circular, stream, irregular	Influence size of danger zone - erect dikes or barriers, dilute, initiate controlled ignition
Impingement	Transient, lingering, permanent	Influence exposures impinged - provide shielding, begin evacuation
Harm	Thermal, chemical, mechanical, asphyxiation, etiological	Influence severity of injury - Rinse off contaminants, increase distance from source, provide shielding

G-4e Prevention of Recurrence

The EAC is responsible for taking all necessary steps to ensure that a secondary release, fire, or explosion does not recur after the initial spill/incident. Procedures that will be implemented may include:

- Inspection of containment for leaks or cracks
- Inspection for gas generation
- Isolation of residual waste materials
- Reactivation of adjacent operations only after all cleanup of residual waste materials is achieved

G-4f Storage and Treatment of Released Material

Immediately after an emergency, the EAC (with support from the Hazardous Materials Response Team) will make arrangements for treatment, storage or disposal of recovered waste, contaminated soil, surface water, or any other contaminated material. The EAC will deploy and utilize any emergency equipment that he deems necessary to carry out these tasks.

The Process Engineering Department will properly identify all cleanup materials/debris according to WAC 173-303 dangerous waste designation procedures. This will occur as soon as possible after the emergency situation has ended to allow for proper treatment, storage or disposal of the material. The EAC is responsible for obtaining all the necessary information required by the Process Engineering Department to make a designation determination.

Hazardous wastes will be transported to the Nonradioactive Dangerous Waste Landfill if they are in solid form and designated as "Dangerous Waste" according to WAC 173-303. Wastes which are designated as "Extremely Hazardous Waste" or are liquid and are designated as "Dangerous Waste", will be transported to the Nonradioactive Dangerous Waste Storage Facility for temporary storage and/or sent off-site to a commercial treatment or disposal site. If the landfill or storage facility is not operational after the emergency, the waste will be transported to an interim storage facility at the Hanford Site. The Process Engineering Department is responsible for disposal requests for all hazardous wastes generated on the Hanford Site.

Once the situation has stabilized, cleanup procedures will be implemented by the Decontamination and Decommissioning Group and/or the Road and Track Maintenance Department. The following actions will be taken:

- Small spills will be treated with absorbent material and the residue packed in drums for disposal.
- Leaking drums will be placed in overpack drums.
- All chemically contaminated soils and cleanup debris will be thoroughly cleaned up and contained for disposal.

- At all times, efforts will be made to segregate incompatible wastes during cleanup operations.

- The EAC has the responsibility to make cleanup arrangements. The Decontamination and Decommissioning Group will assure that all response equipment is decontaminated and readied for service or, if not fit for further use, is disposed of properly by excessing, salvaging or burial.

For Spills/Incidents in the 100 and 200 Areas

The Decontamination and Decommissioning Operations Group shall provide manpower and equipment for use in the cleanup of nonradioactive hazardous materials spills/incidents within the 100 and 200 Areas. Requests for Decontamination and Decommissioning Operations Group services can be made as follows:

- 373-4329

For Spills/Incidents in the 300, 400, 600, 700, 1100 and 3000 Areas

Manpower and equipment for use in the cleanup of nonradioactive hazardous materials in the 300, 400, 600, 700, 1100 and 3000 Areas shall be provided by the Road and Track Maintenance Department. Requests for Road and Track Maintenance services can be made as follows:

- 376-6612
  or
- 376-7266

G-4g Incompatible Waste

As indicated in Section G-4f, every effort will be made to segregate incompatible wastes during cleanup operations. The Emergency Action Coordinator at the scene will ensure that within the area affected by the spill/fire, no additional waste that may be incompatible with the released material is treated, stored or disposed of until all cleanup procedures are completed.

G-4h Post-Emergency Equipment Maintenance

All equipment used during scene stabilization and cleanup operations will be decontaminated and readied for future use by the Decontamination and Decommissioning Operations Group. All persons involved in the cleanup will shower

and remove any contaminated clothing as necessary. Fire extinguishers will be recharged and expended supplies will be replaced.

It will be the responsibility of the Emergency Action Coordinator at the scene to ensure that all equipment is cleaned and fit for its intended use prior to the resumption of operations at the affected facility. Depleted stocks of neutralizing laboratory materials will be replenished, self-contained breathing apparatus cleaned and refilled, protective clothing cleaned, etc. Rockwell will notify DOE-RL, who in turn will notify the regional administrator and necessary local and state authorities, that cleanup procedures have been completed and all emergency equipment has been cleaned and is fit for use. This action should be completed prior to the resumption of operations at the facility.

G-4i Container Spills and Leakage

Procedures for the identification, hazard assessment, spill control, storage and treatment of spilled material and post-emergency cleanup of container spills and leakage is contained in Sections G-4b through G-4h.

G-4j Tank Spills and Leakage

There are no tanks at the nonradioactive TSD facilities; therefore, this section is not applicable.

G-4k Waste Pile Spills and Leakage

There are no waste piles at the nonradioactive TSD facilities; therefore, this section is not applicable.

G-4l Surface Impoundments Spills and Leakage

There are no surface impoundments at the nonradioactive TSD facilities; therefore, this section is not applicable.

G-4m Incineration Spills and Leakage

There are no incinerators at the nonradioactive TSD facilities; therefore, this section is not applicable.

G-4n Landfill Leakage

G-4n(1) Notification

The Washington State Department of Ecology will be notified in writing of the incident within seven days.

G-4n(2) Remedial Action

Refer to the Contingency Plan in Appendix G-1.

G-4n(3) Detection Monitoring Program

Refer to Section E for a discussion of Groundwater Monitoring at the NRDWL.

G-5 EMERGENCY EQUIPMENT

The locations of emergency equipment which can be used in the event of an emergency at the nonradioactive TSD facilities are discussed in the following sections. The locations of emergency services at Hanford are shown in Figure G-5.

G-5a Hanford Fire Department

The following is a description of equipment presently available from the Hanford Fire Department, which could be used in a nonradioactive hazardous materials incident.

Telesqurts - Located at 609, 609-A and 3709-A Fire Stations

The Fire Department presently has three Telesqurt trucks. Each Telesqurt has the capability to pump 1500 gallons per minute of water with a 50-foot boom. A limited amount of rescue equipment is carried on board each truck, including SCBA units for the firefighting crew.

MX-3 - Located at 3709-A Fire Station

The MX-3 is a multichemical truck designed to combat metal-type fires such as sodium and lithium. Each dry chemical agent is carried on board in a separate container. The first container holds 1000 pounds of NaX extinguishing powder for use on sodium fires. The second container holds 500 pounds of microspheroids for use on lithium fires. Each of these containers is automatically pressurized and activated from the truck cab. Two SCBA units and two metal fire protective suits are located on board the truck.

Attack 1 - Located at 609-A Fire Station

Attack 1 is a four-wheel-drive, triple combination truck capable of off-road travel. This unit carries 450 pounds of Purple K dry powder extinguishment, 300 gallons of three percent AFFF concentrate foam, 300 gallons of three percent AFFF premix foam, and 300 pounds of 1211 Halon suppressant. All three agents are dispersed through 150 feet of booster-type hose designed for each particular agent. The AFFF premix solution can also be dispersed from a rooftop turret nozzle. Two SCBA units, a four-kilowatt diesel generator and various small tools are also stored on this truck.

Squad 3 - Located at 3709-A Fire Station

Squad 3 is a van containing various light duty to heavy duty tools and equipment including:

- Acetylene torch
- Four-kilowatt generator
- Block and tackle sets
- Chlorine patch kit
- Emergency lighting

Rescue Trailer - Located at 609 Fire Station

This four-ton trailer contains miscellaneous rescue equipment which includes:

- Block and tackle sets
- Light to heavy duty ropes
- Hand and power tools
- Six-kilowatt gasoline generator

G-5b Cleanup Support Equipment

The following is a compilation of support equipment presently located at the Hanford Site that is available for use during a nonradioactive hazardous material emergency:

1. Decontamination and Decommission Operations Group

   200 Areas

   55-gallon drums

   Sheet plastic

   Dump trucks

   Front loaders

Water trucks

Fabrifilm

2. Road and Track Maintenance Department

1100/600 Areas	200/600 Areas
2 - 75-ton Cranes	1 - 60-ton Crane
3 - 14-ton Cranes (self-propelled)	1 - 40-ton Crane
2 - 5-ton Cranes	1 - 25-ton Crane
4 - Motor Patrol Blades	3 - Motor Patrol Blades
4 - Tracked Dozers	12 - Tracked Dozers
2 - Front Loaders	5- Scrapers
1 - Tracked Loader	3 - Front Loaders
2 - Water Trucks (5000 gal)	1 - Water Wagon (9000 gal)
2 - Water Trucks (4000 gal)	1 - Water Wagon (8000 gal)
2 - Backhoes	1 - Water Truck (4000 gal)
5 - Dump Trucks (10 yd)	1 - Water Truck (2500 gal)
	1 - Backhoe

G-5c Emergency Director (ED) Vehicle

The primary role of the ED is to serve as a communicator between the event scene and the Rockwell Emergency Control Center (ECC). The ED's only communication responsibility is to notify the executive on call and make subsequent status reports to the executive on call or the ECC if activated. The Emergency Director may assume senior management responsibility at the event site if, in the opinion of the ED, the EAC is unable to effectively manage the emergency recovery.

The ED is assigned a vehicle for use in emergency response situations. Listed below is the equipment inventory of the emergency vehicle.

A. Console

- o Ten channel scanner (no transmit capabilities):

  Instruction book located on top

- o Mobile telephone (625-6015). (Key should be left in place and in the off position when unused.)

- Six-channel base station (leave key in unlocked position; left microphone activates):

  Channel 1 - Hanford Patrol
  2 - Hanford Fire
  3 - Hanford Patrol (tactical net)
  4 - Safety Net
  5 - Transportation
  6 - Transportation

- Emergency light controls:

  "Back" - rear flashing lights only
  "Front" - front flashing lights only

B. Glove Compartment

- Small flashlight
- Vehicle Accident Report form
- Windshield scraper
- Felt tip pen

C. Front Seat

- Fire Extinguisher (mounted on floor on passenger side)

D. Rear Seat

- White cardboard box containing:
  - Hanford Site telephone directory
  - Tri-Cities telephone directory
  - Contingency Plans
  - Hanford Site building and structures listing
  - Assorted site plans, including Hanford Site, 200-E, 200-W, 300, 400, 3000 and 100-D, DR, F, H, K, and N Areas
  - Firefighters Handbook of Hazardous Materials
  - Emergency Response Guidebook on Hazardous Materials
  - Emergency Director Logbook
  - Clipboard with ED Field Guide, notebook paper, Hanford emergency response map guide
  - RHO-MA-111, "Emergency Plan" (two volumes)

- Hard hat

- Camera bag containing camera, film, flashbars, binoculars and cassette tape recorder

E. Trunk Compartment

- Bumper jack and stand

- Spare tire

- Shovel

- o 30-Minute Scott Air-pack with mask

- o Orange cloth bag #1
  - Bunker coat
  - Masking tape
  - Rubber gloves and hood
  - Blanket
  - Coveralls

- o Orange cloth bag #2
  - Fire boots (various sizes) and gloves

- o Flag standard for Command Post

- o White storage case containing:
  - Assorted Hanford Area maps
  - Assorted graph paper and note pads
  - Pens, pencils, etc.
  - Stapler and staples
  - Ruler
  - Hard hat
  - Masking tape

G-5d Emergency Medical Equipment, Facilities and Personnel

Hanford Environmental Health Foundation maintains its own occupational medical staff which provides on-site medical assistance in the worksite environment. Additional emergency medical service is provided as needed.

100-N Medical Aid Station (811)

1 - Registered Nurse (RN) certified as emergency medical technician (EMT), available 24 hours per day, seven days per week

1 - Bed

1 - Portable O_2 unit

1 - Life Pak 5 (life support equipment)

1 - Ambulance equipped for life support services (ambulances are located at area fire stations)

1 - Standby ambulance

1 - Completely equipped Medical Aid Station

1 - Portable two-way radio on Patrol and Fire Frequency

200 East and West Medical Aid Stations (811)

1 - RN with EMT certification stationed in 200 East and 200 West Monday through Friday during the day shift. The rest of the time, one nurse operating from the 200 East station covers both areas.

1 - Bed (West)

2 - Beds (East)

1 - Portable O_2 units

1 - Life Pak 5

1 - Ambulance equipped for life support services

1 - Standby ambulance

1 - Completely equipped Medical Aid Station

1 - Portable two-way radio on Patrol and Fire Frequency

400 Area Medical Aid Station (811)

1 - RN with EMT certification is available 24 hours per day, seven days per week

2 - Beds

1 - Portable O_2 unit

1 - Life Pak 5

1 - Completely equipped Medical Aid Station

1 - Portable two-way radio on Patrol and Fire Frequency

300 Area Medical Aid Station (376-3303) (811)

2 - RNs with EMT certification on duty, one from 7:00 a.m. to 3:30 p.m. and one RN from 3:30 p.m. to 11:50 p.m., Monday through Friday

1 - Bed

1 - Portable O_2 unit

1 - Life Pak 5

1 - Ambulance equipped for life support services (ambulances are located at area fire stations)

1 - Standby ambulance

1- Completely equipped Medical Aid Station

1 - Portable two-way radio on Patrol and Fire Frequency

G-5e Emergency Communication Systems

Responsibility and Use of 811

The 811 emergency notification system provides a uniform and easy-to-remember mechanism for activating emergency response measures and providing accurate and timely communication about unplanned incidents to top management. Rockwell employees and managers are expected to use the 811 system for immed-

iate notification of incidents that impact (or potentially impact) the safety of personnel, the environment, or the continuity of facility operations. Examples, but not necessarily an inclusive list, follow:

- Bomb threats
- Explosions
- Fires
- Injury or serious illness
- Security violations
- Vehicle accidents
- Failure of emergency equipment or safety systems
- Incidents requiring facility evacuation or curtailment of major facility operations
- Power outages or other utility disruptions
- Major equipment or facility damage
- Flooding
- Natural disasters
- Occurrences involving hazardous materials
- Other accidents or incidents impacting, or potentially impacting, facility operations or personnel

Should there be a doubt whether an incident warrants an 811 call, always error in favor of the call - Call 811.

Commercial Telephone Systems

The Hanford Site commercial telephone system is a model GTD 4600, all digital system with programmable features. The system currently has a 3800 line capacity with 260 trunks in use. The Rockwell Telecommunications department provides the interface between the site contractors and the commercial telephone company.

Radio (UHF and VHF)

The radio communication network is extensive at Hanford. The various available emergency response groups and type of radio net are listed in Table G-1.

TABLE G-1
HANFORD SITE RADIO NETWORKS

- o Site Radio Nets
  - Patrol
  - Fire
  - Transportation and Electrical Utilities
  - Atmospheric Physics, Radiation Monitoring and 200 Area Maintenance
  - J. A. Jones
  - DOE Alpha Net
  - Hanford Emergency and Safety Net
- o Off-Site Radio Nets
  - Washington State Patrol
  - Benton County Sheriff
  - Richland Police
  - Kennewick Police

RADIO PAGING SYSTEM OPERATION

The following describes the method of accessing and using the paging system:

376 exchange (North Richland) and 373 exchange (200 Area) users:

Dial paging access number 85.

Wait until a continuous tone is received, then dial in the three-digit pager code number.

If the terminal is ready to page the receiver, a beeping signal will be heard for a few seconds.

If the terminal is busy, a ring back signal (the sound heard when the telephone called is ringing) will be heard. The ring back signal will continue until the terminal is ready for your paging call, then the beeping "acknowledgement" will be heard.

When the beeping signal stops, then state the voice message to be sent to the paging receiver dialed.

When the voice message is completed, hang up the telephone.

Telephone Crash Alarm Systems

There are several telephone crash alarm systems available for use by Hanford contractors. These systems are activated by Patrol upon request from management personnel when proper identification and a message to be transmitted is provided. Proper identification consists of requestor's name, job title, and call-back number. Patrol will verify person making the request by implementing a call-back. It is also the contractor's responsibility to assure the listing for crash alarms are up-to-date and correct. Test schedules and user requirements for crash alarm telephone systems follow.

Crash Alarm Tests. The crash alarm system will normally be tested on Friday of each week.

Response to a Crash Alarm. When the crash alarm is activated, idle crash alarm telephones will sound a continuous ring instead of their normal intermittent ring. Crash alarm telephones in use will automatically be switched to the emergency network. Crash alarm telephones on hold will not ring.

The effectiveness of the crash alarm telephone system is dependent upon prompt and proper response. Personnel who are responsible for crash alarm telephones should provide instructions in use.

The following instructions apply to all Rockwell Crash Alarm telephone systems:

- If your crash alarm telephone rings, answer promptly. Listen and keep quiet. Do not talk unless asked a specific question. It is not necessary to identify the extension until a roll call is taken. Do not hang up until told to do so.
- If you are using your telephone and it is automatically switched on to the system, listen.

G-6 COORDINATION AGREEMENTS

The presence of more than one DOE contractor on the Hanford Site allows for the mutual sharing of emergency equipment and personnel. All contractors have sufficient familiarity with the operations of each other to be of assistance with a minimum of direction.

The Department of Energy has Memoranda of Understanding (MOU) in place with the local police and fire departments, hospitals, and contractors for coordination agreements for actions in the case of emergency. These MOUs establish a framework of cooperation between these groups in the planning for and response to emergencies at the Hanford Site which might have offsite consequences.

Coordinated Emergency services agreements (MOUs) have been established in writing between the Department of Energy, Richland Operations office, and the:

- State of Washington
- Benton and Franklin Counties
- Washington Public Power Supply System
- Washington Public Power Supply System and Hanford Environmental Health Foundation
- Federal Aviation Administration Department of Transportation
- National Weather Service
- Our Lady of Lourdes Hospital
- Kadlec Hospital
- Kennewick General Hospital
- Coast Guard and Washington Public Power Supply System
- States of Washington and Oregon and Washington Public Power Supply System (Radiological Assistance Response)

In addition to the emergency equipment, supplies and personnel described in Section G-5, the following services are on-call at the discretion of the Emergency Director or of DOE-RL.

<u>Pacific Northwest Laboratory (PNL)</u>

Single Point of Contact - The PNL Exposure Evaluator on 376-2222 fulfills the single point of contact role for PNL.

Atmospheric Sciences. Technical Support - The PNL forecaster is available 24 hours a day and will provide, upon request, the current wind speed and direction at the accident site and indicate possible affected areas. The forecaster will also provide stability and mixing layer information upon request. The contractor who experienced the event is required to provide the location, time, and amount of chemical release. After receiving this information, the forecaster will call back within 15 minutes and give the event contractor's representative the following information:

- Estimated time of arrival of the plume at the affected areas
- Estimated concentration at the affected areas, based upon normalized release rates and meteorological models (Mesoscale diffusion model).

The source of the release, the time of the release, the current and forecasted mixing level, and the stability information are put into the model, as well as the current and forecasted wind conditions. The output from this information is a series of maps showing contours of concentration. From these maps the direction of the plume is determined. This information will be updated at 30-minute intervals as long as it is needed.

Unified Dose Assessment Center - The Unified Dose Assessment Center (UDAC), which is located in the Federal Building, Room G-45, adjacent to the DOE-RL-ECC will be set up upon activation of the DOE-RL-EACT.

The primary purpose of the UDAC is to provide environmental and dosimetry evaluations and consultation services in the areas of industrial hygiene, biology, radiation monitoring, and meteorology.

The UDACs responsibilities include:

1. Assessing the consequences of accidents or events on the Hanford Site having potential on-site and/or off-site consequences.
2. Making recommendations for coping with recovery from such an event.

The PNL maintains a staff of selected expert technical personnel to provide DOE-RL with advice on these matters.

Hanford Environmental Health Foundation (HEHF)

The Hanford Environmental Health Foundation (HEHF) provides emergency medical and industrial hygiene services to DOE-RL and the Hanford contractors. The HEHF emergency directors are responsible for coordinating these emergency actions and assuring that all necessary measures are employed by HEHF to handle medical and industrial hygiene services in emergency situations affecting Hanford. The HEHF will respond to requests for radiological assistance from off the site (local hospitals). The HEHF Procedures are contained in the HEHF Emergency Preparedness Guide.

Medical and administrative personnel are responsible for staffing the EDC and keeping it in a state of readiness for emergencies.

J. A. Jones Construction Services Company (JAJ)

The Hanford Site construction services contractor is J. A. Jones. J. A. Jones maintains a large inventory of heavy equipment and trained equipment operators. Both equipment and personnel may be used in large-scale surface decontamination, emergency repairs in radiologically controlled areas, and in fire suppression support.

UNC Nuclear Industries (UNC)

Single Point of Contact - for UNC is 373-3333.

UNC maintains ECCs in Room 402 of the Federal Building and in the 1124-N Trailer in the 100 Area. In addition to these management ECCs, the 300 Area ECC maintained by WHC is also used for a UNC event. The 300 Area ECC is staffed by the UNC 300 Area Emergency Director.

Westinghouse Hanford Company

The Westinghouse Hanford Company operates an ECC in Room B-2, 3701-D Building, 300 Area, in the 300 Area Patrol Headquarters. It is an alternate ECC for RL-EACT in the event the Federal Building is uninhabitable. For further information, see WHC MG-30 Emergency Preparedness Guide, Emergency Facilities and Equipment.

U.S. Department of Energy - Richland Operations (376-6165)

The DOE-RL Emergency Control Center is located in Room G-45 in the secured area of the Federal Building, Richland, Washington. The DOE-RL ECC is close to the assigned staff personnel, the RL Communications Center, and additional office space.

The DOE-RL-ECC is equipped with telephones, radios, emergency plans, maps, a status board, and a 20-channel tape recorder. It also has an emergency power generator routinely serviced by GSA for use if primary power is lost.

Kadlec Hospital (946-4611)

Fully equipped, American Hospital Association Certified General Hospital that can treat both radioactive contaminated and noncontaminated cases. Kadlec has Emergency Room service with Resident Physician available at all hours.

Emergency Decontamination Center (748 Building)

Capability for body wash and two decontamination surgical cells. Has special decontamination litter with hoist and monorail. The EDC, adjacent to the Kadlec Hospital in Richland, has equipment for performing surgery on severely contaminated injured persons. Hospital service is also available at Kadlec Hospital.

NOTE: Emergency power to the EDC will be supplied by a diesel generator provided to the facility by Rockwell Maintenance and Transportation Department. Requests for this equipment should be made to Rockwell via the Bus Dispatcher on 376-7266.

Other Organizations

The DOE-RL has formal agreements with Kennewick General Hospital, Kennewick, Washington; and Our Lady of Lourdes Hospital, Pasco, Washington to provide backup medical assistance. the DOE-RL has a mutual aid agreement with the Washington Public Power Supply System (WPPSS) and the City of Richland to provide backup ambulance service. The City of Richland has mutual aid agreements with Pasco and Kennewick to provide additional ambulance, fire, and law enforcement services.

G-7 EVACUATION PLAN

Both of the existing TSD facilities are essentially nonstaffed facilities, thus virtually eliminating the need for evacuation of the facilities. The Nonradioactive Dangerous Waste Storage is located close enough to other facilities that a large spill resulting in a toxic cloud could result in the evacuation of some facilities.

All Rockwell Hanford staff facilities have evacuation plans which include emergency signal identification, staging area location and, if required, plans for the use of the standby evacuation buses. All of these instructions are in each facility emergency plan. Several excerpts from a representative facility emergency plan are reproduced below.

Present Siren Coverage

Two siren signals are currently in use:

1. Steady sirens are activating to inform personnel that an alert/evacuation is occurring. People are required to meet at their assembly area(s) for instructions upon hearing the steady siren.

2. A wailing siren signal requires people to stay under cover. This siren may be used to protect personnel from radioactive fallout, hazardous material releases, adverse weather, etc.

200 Area Sirens are currently located as follows:

200 East Area	200 West Area
202-A Roof	200-S Roof
271-CR Roof	271-T Roof
271-B Roof	224-U Roof
241-BX Tank Farm Pole	234-5 Z Roof
2750-E Roof	284-W Roof
2704-E	
284-E Roof	
244-AR Pole	

NOTE: Area sirens in the 200 Areas are presently being tested on the last Friday of the month.

Messenger/Mobile Contact

In the event the telephone communication systems fail, a mobile Patrol unit

can be pressed into service to either deliver messages or establish radio contact with any building on the Hanford Site.

Staging Areas

Nonradioactive Dangerous Waste Storage Facility

The existing storage facility is not staffed and therefore does not have an evacuation staging area.

Nonradioactive Dangerous Waste Landfill

The landfill is currently manned by one operator on day shift and does not have an evacuation staging area.

Evacuation Buses

Evacuation buses shall be provided to transport plant personnel away from work places under the following emergency conditions:

1. Local disasters such as a nuclear excursion where immediate, short transport distance is required
2. Any disaster where movement of personnel away from the 200 Areas is required
3. Enemy attack - take personnel to best available cover or transport to 1100 Area bus lot if Planning Manager's time allows

Responsibilities - Plant Managers/Building Superintendents. Building Superintendents/Facility Managers having buses assigned in their areas of responsibility (RHO-MA-100, Policy 9-28) shall be responsible for assuring trained bus drivers are assigned sufficiently to move all buses on day shift and to move all employees on other shifts. A listing of qualified drivers shall be maintained, with their location, and forwarded to Emergency Planning annually.

Responsibilities - Bus Drivers. Bus drivers shall start and warm up their buses once each month; inspect bus for mechanical defects, complete a Monthly Inspection Report and forward it to Emergency Planning with a copy to the Building Superintendent. Mechanical trouble shall be reported immediately to

the OEP, telephone 373-4307. Buses needing cleaning shall be reported to Emergency Planning to schedule cleaning.

Each driver shall make a practice run two times per year to maintain familiarity with bus operation. Observe all traffic rules such as signals, stop signs, rail crossings, etc. during practice. Complete and submit a Monthly Inspection Report to Emergency Planning for filing. A file shall be kept for each bus.

Maintenance. Periodic cleaning and mechanical maintenance for evacuation buses at 1100 Area shops shall be provided by the Maintenance Department.

Location of Evacuation Buses. Buses are stationed throughout the 200 Areas; for locations see Appendix 10.3, 200 Area Evacuation Plan.

G-8 REQUIRED REPORTS

This section delineates DOE-RL's statutory responsibility for the reporting of any hazardous waste incidents. The DOE-RL is aware of these reporting requirements and will prepare and submit the required reports.

Emergency incident reports will be submitted to appropriate state and federal agencies within 15 days of the occurrence of an emergency. The report shall include the following:

- Name, address and phone number of the facility owner/operator
- Name, address and phone number of the facility
- Date, time and type of incident
- Name of material(s) involved
- Quantity of material(s) 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

Records which identify the time, date and details of an emergency incident will be kept on file in the Rockwell Office of Emergency Preparedness in the files of the Rockwell function responsible for the operation of the facility involved, and at the DOE-RL office in the Richland Federal Building. Additional copies would be made available to other interested parties.

49 CFR 171.15 Immediate Notice of Certain Hazardous Materials Incidents

a) At the earliest practicable moment, each carrier who transports hazardous materials (including hazardous wastes) shall give notice in accordance with paragraph (b) of this section after each incident that occurs during the course of transportation (including loading, unloading and temporary storage) in which as a direct result of hazardous materials:

1. A person is killed.
2. A person received injuries requiring his hospitalization.
3. Estimated carrier or other property damage exceeds $50,000.
4. Fire, breakage, spillage, or suspected radioactive or chemical contamination occurs involving shipment of radioactive or chemical material (see also 174.45, 175.45, 176.48, 177.807 of this subchapter).
5. Fire, breakage, spillage, or suspected contamination occurs involving shipment of etiologic agents.
6. A situation exists of such a nature that, in the judgment of the carrier, it should be reported in accordance with paragraph (b) of this section, even though it does not meet the criteria of paragraph (a) (1), (2), or (3) of this section; e.g., a continuing danger of life exists at the scene of the incident.

b) Each notice required by paragraph (a) of this section shall be given to the Department by telephone (toll-free) on 800-424-8802 or (toll call) on 202-426-2675. Notice involving etiologic agents may be given the Director, Center for Disease Control, U.S. Public Health Service, Atlanta, Georgia, Area Code (404) 633-5313, in place of the notice to the Department. Each notice must include the following information:

1. Name of reporter.
2. Name and address of carrier represented by reporter.
3. Phone number where reporter can be contacted.
4. Date, time and location of incident.
5. The extent of injuries, if any.
6. Classification, name and quantity of hazardous materials involved, if such information is available.
7. Type of incident and nature of hazardous material involvement and whether a continuing danger to life exists at the scene.

c) Each carrier making a report under this section shall also make the report required by 171.16.

WASHINGTON STATE ADMINISTRATIVE CODES

WAC 173-303-145 Spills and Discharges Into the Environment

Any person who is responsible for a nonpermitted spill or discharge shall immediately notify the individuals and authorities described for the following situations:

a) For spills or discharges onto the ground or into groundwater or surface water, notify all local authorities in accordance with the local emergency plan. If necessary, check with the local emergency service coordinator and the fire department to determine all notification responsibilities under the local emergency plan. Also, notify the appropriate regional office of the department of ecology.

b) For spills or discharges which result in emissions to the air, notify all local authorities in accordance with the local emergency plan. If necessary, check with the local emergency service coordinator and the fire department to determine all notification responsibilities under the local emergency plan. Also, in western Washington notify the local air pollution control authority, or in eastern Washington notify the appropriate regional office of the Department of Ecology.

WAC 173-303-270 Discharges During Transport

In the event of a spill or discharge of dangerous waste during transportation, the transporter shall comply with the requirements of WAC 173-303-145, Spills and Discharges Into the Environment. In addition to the notices required by WAC 173-303-145, the transporter shall provide the following notifications:

a) Give notice to the generator of the waste that a discharge has occurred.

b) Give notice to the National Response Center (800-424-8802) or (202-426-2675), if required by 49 CFR 171.15.

c) Report in writing as required by 49 CFR 171.16 to the Director, Office of Hazardous Materials Regulations, Materials Transportation Bureau, Department of Transportation, Washington, D.C., 20590.

d) For a water (bulk shipment) transporter, give the same notice as required by 33 CFR 153.203 for oil and hazardous substances.

49 CFR 171.16 Detailed Hazardous Materials Incident Reports

a) Each carrier who transports hazardous materials shall report in writing in duplicate on DOT Form F 5800.1 to the Department within 15 days of the date of discovery, each incident that occurs during the course of transportation (including loading, unloading, or temporary storage) in which, as a direct result of the hazardous materials, any of the circumstances set forth in 171.15(a) occurs or there has been an unintentional release of hazardous materials from a package (including a tank) or any quantity of hazardous waste has been discharged during transportation. If a report pertains to a hazardous waste discharge:

1. A copy of the hazardous waste manifest for the waste must be attached to the report.

2. An estimate of the quantity of the waste removed from the scene, the name and address of the facility to which it was taken, and the manner of disposition of any unremoved waste, must be entered in Part H of the report (Form F5800.1).

b) Each carrier making a report under this section shall send that report to the Information Systems Manager, Materials Transportation Bureau, Department of Transportation, Washington, D.C. 20590.

c) Except as provided in paragraph (d) of this section, the requirements of paragraph (a) of this section do not apply to incidents involving the unintentional release of hazardous materials being transported under the following proper shipping names:

1. Consumer commodity

2. Battery, Electric Storage, wet, filled with acid or alkali

3. Paint, Enamel, Lacquer, Stain, Shellac or Varnish Aluminum, Bronze, Gold, Wood filler, liquid or Lacquer-base liquid when shipped in packages of five gallons or less

d) The exceptions to incident reporting provided in paragraph (c) of this section do not apply to:

1. Incidents required to be reported under 171.15(a)

2. Incidents involving transportation aboard aircraft

3. Incidents involving the transportation of hazardous waste

CERCLA/WDOE NOTIFICATION PROCEDURES

In the event that a chemical release exceeds the CERCLA or WDOE reportable quantities, data regarding the release will be compiled on the CERCLA/WDOE Hazardous Substance Release Report and telephone notifications made within 24 hours of knowledge that a release has occurred. Contact the Solid Waste Processing & Disposal Unit (3-4258) or (3-3516) if there is any question as to whether the release exceeds the reportable quantity. The release report (Attachment B), will be prepared as follows:

- Copy information, if known, regarding substance name, composition, weight percent of constituents, and specific gravity or weight. Add other information that may be available to characterize the nature of the release.

- Enter name of facility and location of release.

- Enter quantity of release and exact point (e.g. tank number) of release.

- Enter cause (e.g., spill, overflow, pump leak).
- Enter time, date, and duration of release.
- Enter location to which the spill has drained (e.g., CSL, 216-Z-20).
- Enter extent of injuries, damage, and approximate value of chemicals lost.
- Describe immediate corrective actions (e.g., lock and tag valve, repairs). Indicate whether an Off-Normal or Unusual Occurrence report is being initiated.
- Describe long-term actions that could or will be needed to prevent similar events in the future (e.g., procedural changes, equipment modifications).
- Provide name and telephone number of person delegated the responsibility to obtain and provide additional information that will be required.
- Plant Operations shall initiate telephone contact with the Department of Energy, Richland Operations Office (DOE-RL) SQA Duty Officer immediately upon identification of the above information and record time and date of contact on the release report. Although the officer on duty and the telephone number changes weekly, the correct telephone number can be obtained from the Hanford Patrol Operations Center on 3-3800. The DOE-RL is responsible for contacting the National Response Center by telephone within 24 hours.
- Plant Operations shall initiate telephone contact with the following Rockwell personnel, and record time and date of contact on the release report.

Number	Name	Organization
3-4258	D.R. Groth	SWP&D Unit, Process Engineering Dept.
3-1184	W.F. Heine	Hazardous Waste Management Program
3-2424	R.C. Beagley	Industrial Hygiene and Safety
___	___	Plant Manager, if applicable
___	___	Plant Program Manager, if applicable

- Transmit original copy of report to the Manager, SWP&D Unit, 2750-E/A105/200-E, and transmit copies of the report to all Rockwell personnel listed within two days. The Hazardous Waste Prograqm Manager will submit written notification to DOE-RL within seven days of the release.

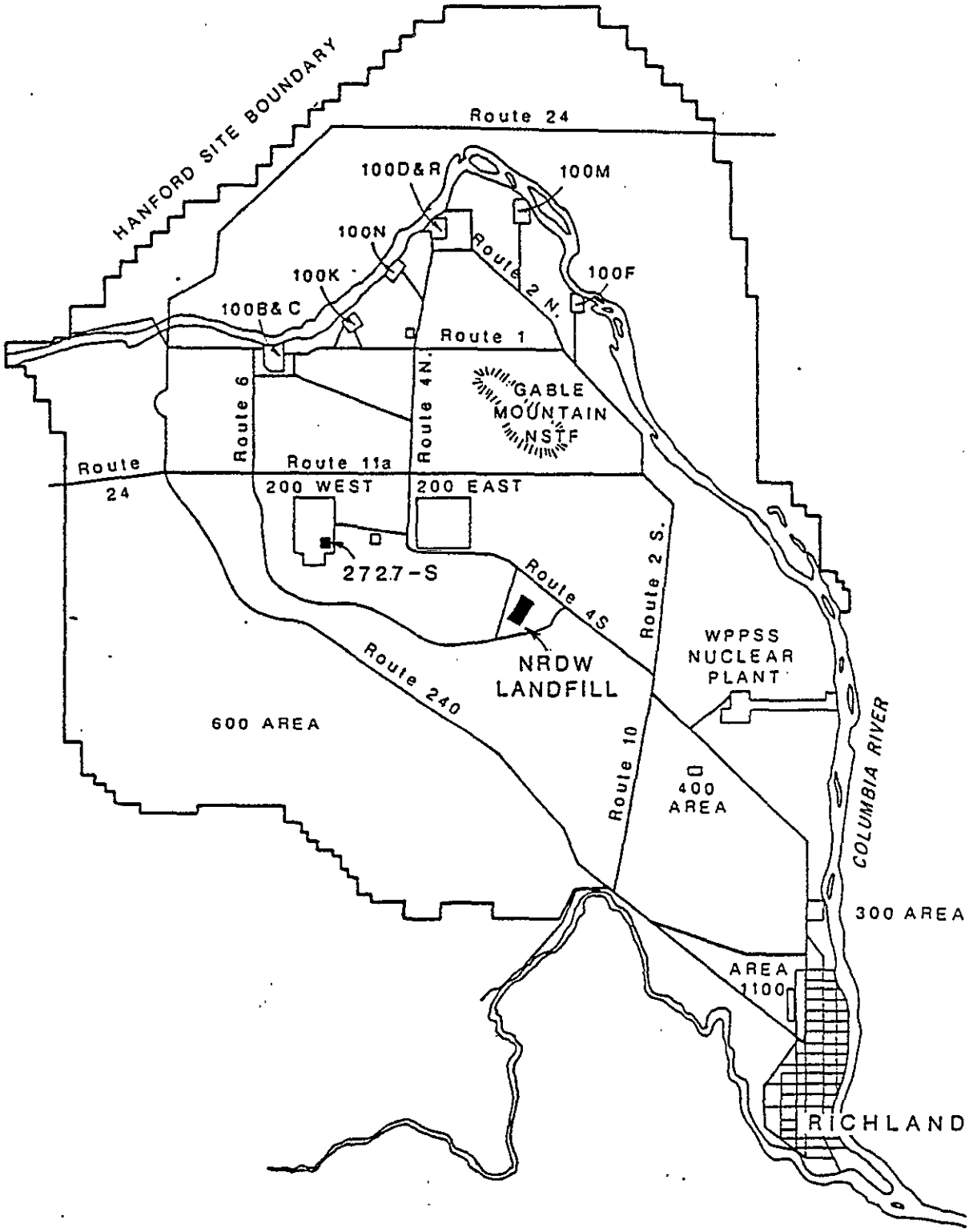


FIGURE G-1. HANFORD SITE MAP

SHOCK SENSITIVE OR POTENTIALLY EXPLOSIVE CHEMICAL DEMOLITION SITES

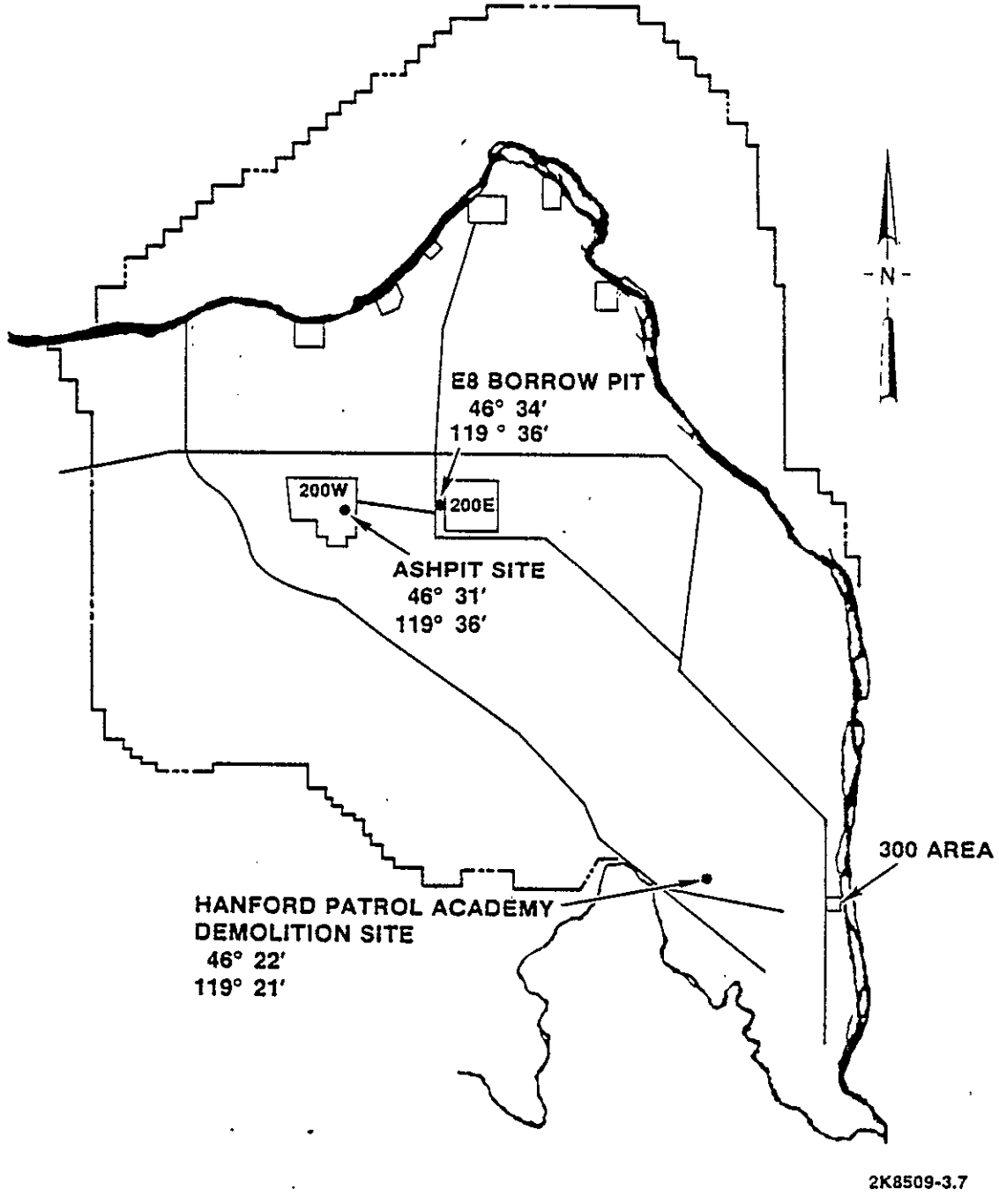


FIGURE G-2. SHOCK SENSITIVE OR POTENTIALLY EXPLOSIVE CHEMICAL DEMOLITION SITES

NOTIFICATIONS

The notification sequence for all locations is identified according to the following flow diagram:

EMERGENCY NOTIFICATION SEQUENCE - HAZARDOUS MATERIAL/WASTE

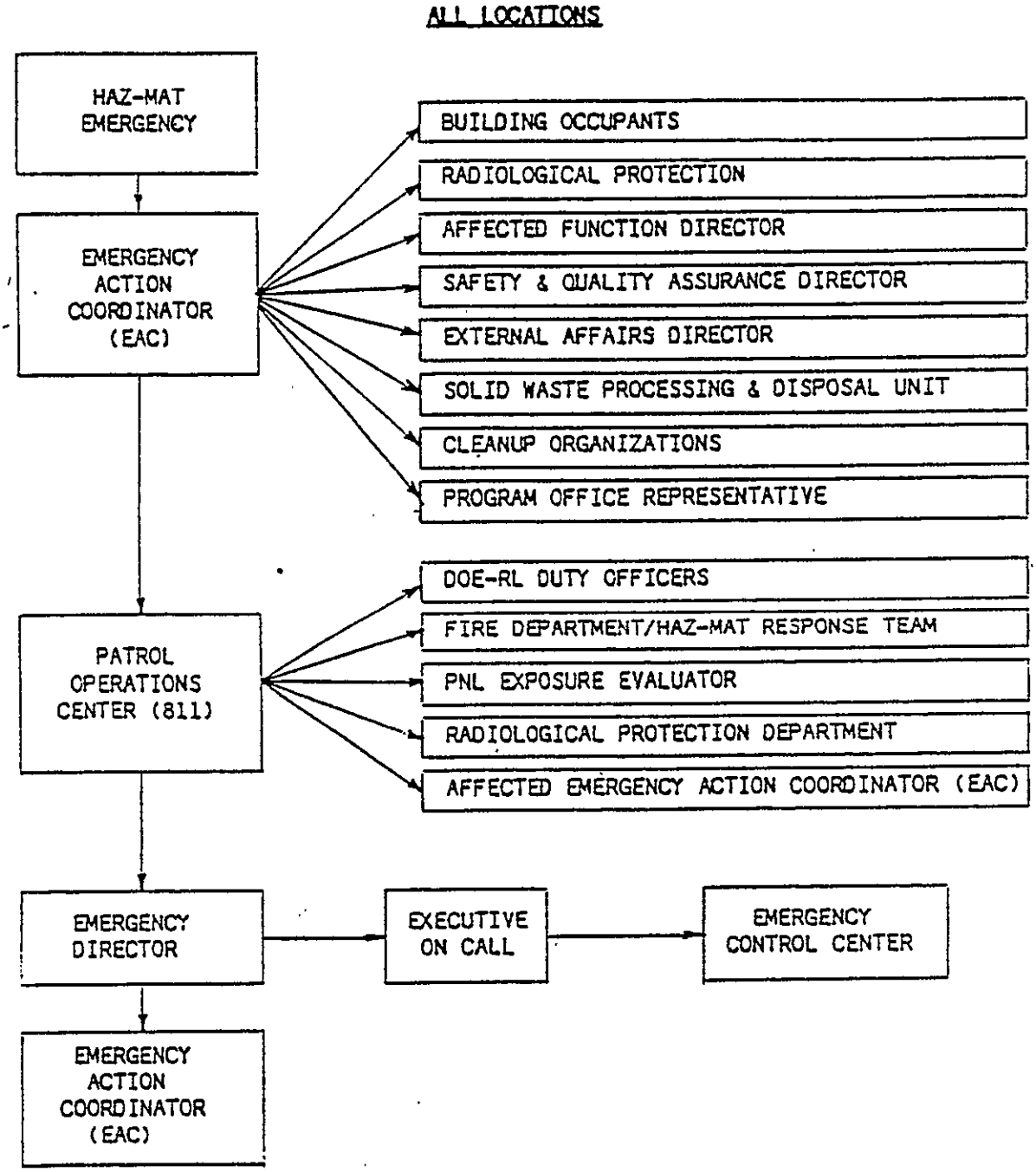


FIGURE G-3. EMERGENCY NOTIFICATION SEQUENCE - HAZARDOUS MATERIAL/WASTE

APPENDIX G-1

HAZARDOUS MATERIAL/WASTE CONTINGENCY PLAN

ROCKWELL HANFORD OPERATIONS

HAZARDOUS MATERIAL/WASTE CONTINGENCY PLAN

Revised October 16, 1985

Prepared by
J. M. Thurman, Specialist
Office of Emergency Preparedness

ROCKWELL HANFORD OPERATIONS
HAZARDOUS MATERIAL/WASTE
CONTINGENCY PLAN

TABLE OF CONTENTS

	Page
Introduction	1
Purpose	1
Scope	1
Responsibilities	2
Notifications	3
Initial Response Procedure	4
Scene Stabilization	7
Cleanup	8
Post Emergency Procedures	9

Appendix A
Hazardous Materials Inventory and Location

Appendix B
Hazardous Materials Transportation Data

Appendix C
CHART - DOT Hazardous Materials Warning Labels

Appendix D
Expertise Contact List

Appendix E
Hazardous Materials Response Team Vehicle/Equipment

Appendix F
Hazardous Materials Response Team Training Requirements

Appendix G
Cleanup Support Equipment

Appendix H
Nonradioactive Hazardous Materials Notification Regulations

Appendix I
Fire Department Support Equipment

Appendix J
CERCLA/WDOE Notification Procedures

HAZARDOUS MATERIAL/WASTE CONTINGENCY PLAN

INTRODUCTION

Hazardous materials are transported, used and stored by Rockwell Hanford Operations (Rockwell) and other contractors throughout the Hanford Site. These materials are used to support nuclear production, waste processing, research and engineering programs, power generation and site services activities conducted within the Hanford Site. The types of hazardous materials required to support such diverse activities include explosives, compressed gases, flammable and combustible fluids, flammable solids, oxidizers and organic peroxides, toxic materials, reducing agents and corrosives. Shipments of these materials via truck and railcar have been made routinely in the past and will most likely continue well into the future. In the event of an unplanned release of these hazardous materials, a mechanism for prompt, orderly response must be in place to ensure minimal impact on personnel, property and the environment. In addition, hazardous wastes are stored and disposed of by Rockwell. The types of waste managed parallel hazardous materials used on the Hanford Site.

PURPOSE

The primary objective of this plan is to provide a series of response actions which will act to minimize the adverse effects of any hazardous material/waste that is accidentally released. Additionally, this plan identifies and describes supplemental information to support the primary objective as follows:

- o Hazardous material storage locations
- o Hazardous material transportation data
- o Expertise contact list
- o Response team equipment
- o Response team training requirements
- o Cleanup equipment
- o Regulatory notification requirements

SCOPE

This plan provides primary coverage for all areas within the boundaries of the Hanford Site that do not have existing emergency plans for hazardous material/waste response. In addition, this plan provides supplemental coverage for facilities and other locations that have existing response plans for handling hazardous material/waste emergencies. Existing response plans for locations within specific facilities/facility jurisdictions will be found in RHO-MA-111, Rockwell Emergency Plan, Section 11, Facility Supplements, according to facility name.

This plan addresses response to hazardous nonradioactive material/waste and hazardous radioactive mixed waste emergencies only. Response to emergencies involving strictly radioactive materials is covered in existing documents.

RESPONSIBILITIES

Rockwell, as the Hanford Site Services Contractor, is responsible for procuring, handling and transporting hazardous materials to Hanford Site customers. Also, as a customer, Rockwell has the responsibility for the safe usage, control, storage, and disposal of these materials. The charter for hazardous waste storage and disposal, fire suppression and rescue, law enforcement and traffic control is maintained by Rockwell. maintained by Rockwell.

Specific responsibilities for emergency response within Rockwell are assigned as follows:

Activity	Responsible Organization
o Initial accident response	o Building occupants, Hanford Fire Department; Radiological Protection Department
o Scene Stabilization	o Hazardous Materials Response Team
o Technical expertise	o Safety & Quality Assurance, Research & Engineering, Traffic Department
o Cleanup	o Building occupants, Decontamination and Decommissioning (D&D) Operations Group, Road & Track Maintenance Department
o Scene security	o Hanford Patrol

Supplemental coverage to facilities by outside organizations (i.e., Hanford Fire Department, Haz-Mat Response Team, D&D Operations, etc.) will be provided only when the facility Emergency Action Coordinator (EAC) has determined that the emergency exceeds existing facility response capabilities.

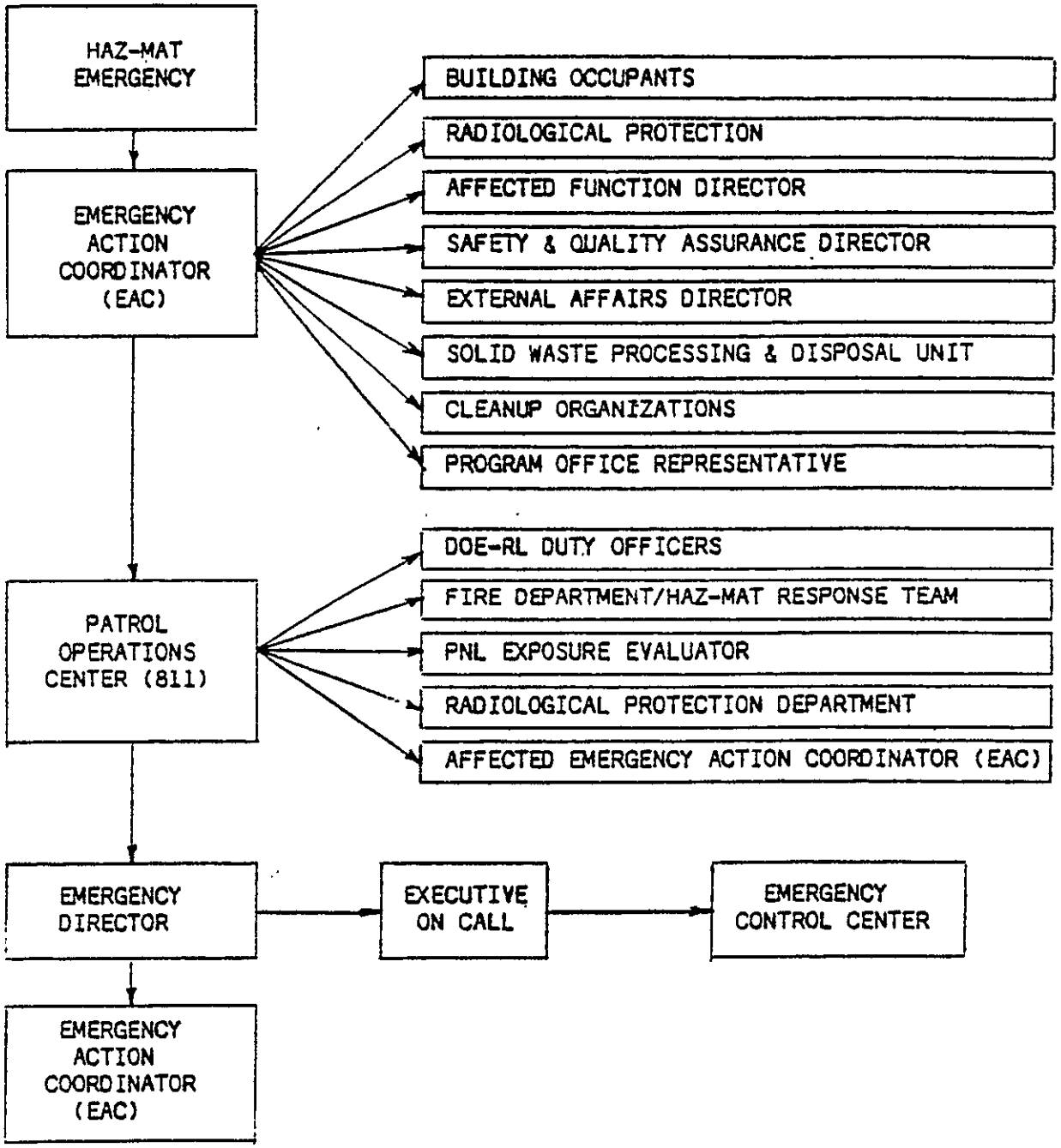
In addition, Rockwell will provide support for jurisdictions identified by mutual aid agreements.

NOTIFICATIONS

The notification sequence for all locations is identified according to the following flow diagram:

EMERGENCY NOTIFICATION SEQUENCE - HAZARDOUS MATERIAL/WASTE

ALL LOCATIONS



OTHER NOTIFICATIONS

State and federal law (Appendix H) requires that the Department of Energy, Richland Operations Office (DOE-RL) make the following notifications in the event of a spill/incident involving hazardous material/waste Immediate notifications are as noted.

- For spills or discharges onto the ground or into ground water or surface water, and into the atmosphere (WAC173-303-145):

  - Washington State Department of Ecology
    Yakima Regional Office
    Phone (509) 575-2490

- For spills or discharges occurring during transport (WAC173-303-270):

  - Washington State Department of Ecology
    Yakima Regional Office
    Phone (509) 575-2490

  - Generator of spilled material(s) (Immediate)

  - National Response Center, if required by Federal Regulation 49CFR 171.15 (Immediate)

    Phone: (800) 424-8802 or (202) 426-2675

  - Also report in writing, as required by Federal Regulation 49CFR 171.16, to the:

    Director, Office of Hazardous Materials Regulations
    Materials Transport Bureau
    Department of Transportation
    Washington, D. C. 20590

- For any spills or discharges which occur within or pose a threat to a municipality:

  - City and county officials that may be affected (Immediate)

  - Above notifications, as applicable

INITIAL RESPONSE PROCEDURE

The person that discovers a hazardous material/waste spill/incident shall notify the following:

- Patrol Operations Center (POC) on 811

- Plant Emergency Action Coordinator (EAC)

Patrol Operations Center (POC)

The POC shall relay this information to:

- o Rockwell Emergency Director
- o Patrol Management
- o Fire Department/Hazardous Materials Response Team
- o Radiological Protection Department
- o DOE-RL Safety Duty Officer
- o DOE-RL Security Duty Officer
- o PNL Exposure Evaluator

Emergency Action Coordinator (EAC)

The following actions should be considered in the event of a hazardous material/waste spill/incident:

[ ] Notify facility personnel.

[ ] Evacuate immediate area.

[ ] Call 811 (POC). Assure that Fire Department/Hazardous Materials Response Team has been notified.
Relay pertinent information.
Request additional assistance as required.

[ ] Contact Radiological Protection Group if radiological hazards are involved.

[ ] Instruct facility personnel to carry out emergency/shutdown assignments as directed.

[ ] Account for facility personnel. Report unaccounted/missing personnel to the Emergency Director or 811.

[ ] Implement specific facility response actions as listed in the Rockwell Emergency Plan (RHO-MA-111) facility supplement.

[ ] Notify the Directors of Safety and Quality Assurance, External Affairs and the affected function.

[ ] Provide assistance to Hazardous Materials Response Team and other outside support organizations as requested.

[ ] For spills or discharges over the CERCLA/WDOE reportable quantity, contact the Solid Waste Processing & Disposal Unit and initiate notification procedures as described in Appendix J.

[ ] Notify appropriate Rockwell Program Office representative.

[ ] Notify cleanup organizations as required.

Fire Department

The Fire Department can supply a wide variety of equipment and trained personnel to support initial response efforts. The resources and capabilities of the Fire Department are listed in Appendix I. In the event that a spill/incident cannot be stabilized by the Fire Department, the officer-in-charge can request the Hazardous Materials Response Team.

Spills/incidents which involve mixed chemical and radiological hazards require the following supplemental information:

- In any situation where a high radiation field may be encountered and a Radiation Protection Technologist is not yet present, firefighters shall make initial precautionary radiation measurements using their HPCs (high-range survey instruments). The following limits apply:

  To save a life

  - 100 rem total individual dose
  - No pregnant females
  - Volunteers only

  To reduce a serious hazard that threatens worker or public health or large property loss

  - 25 rem total individual dose

  Generally, high radiation fields will not be encountered. However, measurements should be taken as a precaution for any incident involving a waste tank car or cask car from either the 100 Area or the 300 Area.

- The Radiation Protection Technologist(s) will set up the radiation/contamination control zone and will survey emergency personnel and equipment out of the zone. These actions will be coordinated through the Fire Department officer-in-charge at the scene.

- Clothing and equipment used by firefighters for protection against hazardous chemicals is also adequate for protection against airborne radioactive contamination.

- Fires in fissile facilities or during transportation of fissile material are a special category. Guidelines for fighting such fires are presented in the Nuclear Criticality Safety Standards manual, RHO-MA-136, Section VI, and in letters of instruction from the Manager, Criticality Engineering & Analysis to the Fire Department.

Utilities & Telecommunications/Utilities Maintenance

The Utilities Maintenance Group is prepared to provide manpower, protective clothing, cleanup equipment and technical expertise in support of a spill/incident which involves Polychlorinated Biphenyls (PCBs). Appendix D lists points of contact for the Utilities & Maintenance Group.

SCENE STABILIZATION

Hazardous Materials Response Team.

Stabilization of hazardous materials/waste spills/incidents beyond the capacity of the Fire Department will be performed by the Hazardous Materials Response Team. The Rockwell Hazardous Material Response Team will consist of four Fire Department personnel (one team leader and three firefighters). Team members are trained to identify and control unplanned releases of hazardous materials, as practicable, using equipment specifically designed for hazardous material response. Upon arrival at the spill/incident scene, the Hazardous Material Response Team Leader will be briefed by the Fire Department officer-in-charge. The Fire Department officer-in-charge shall be the primary contact for all activities conducted at the scene during stabilizations. The Fire Department shall remain in a standby mode at the scene should assistance be required. Appendix F describes training requirements for the Hazardous Materials Response Team.

The goals of the Hazardous Materials Response Team are to:

- Identify materials involved - Safety and Quality Assurance will be contacted to provide technical expertise on the incident material.
- Contain materials involved - Damming or dyking of large spills will be accomplished with the use of available equipment.
- Neutralize materials involved - Applicable materials will be neutralized if it is necessary to expedite safe cleanup.
- Provide guidance for cleanup operations - Cleanup operations will be provided by the Decontamination and Decommissioning Operations Group and/or the Road and Track Maintenance Department. Appendix E lists emergency equipment that will be available in a proposed Emergency Response Vehicle for use by the Hazardous Materials Response Team.
- Provide formal documentation of incident.

The following information should be considered in the event of a hazardous material/waste spill/incident:

Event	Event Categories	Action Options
Stress	Thermal, Mechanical, Chemical	Influence applied stresses -- Move stressed system, shield stressed system, redirect impingement
Breach	Consumption (catastrophic, disintegration), cracking, punctures, splits, tears	Influence breach size -- Activate venting devices, chill contents, limit stress level
Release	Liquid or vaporous flow (steady, pulsating, diminishing)	Influence quantity size -- Change container position, minimize pressure differential, cap off breach

Engulfment	Hemispherical, spherical, conical, plume, circular, stream, irregular	Influence size of danger zone -- Erect dikes or barriers, dilute, initiate controlled ignition
Impingement	Transient, lingering, permanent	Influence exposures impinged -- Provide shielding, begin evacuation
Harm	Thermal, chemical, mechanical, asphyxiation, etiological	Influence severity of injury -- Rinse off contaminants, increase distance from source, provide shielding

Upon completion of stabilization/neutralization activities, the Emergency Action Coordinator shall contact the cleanup organization assigned to the involved area for removal of contaminated soil and other materials.

CLEANUP PROCEDURES

Immediately upon scene stabilization, cleanup procedures will be implemented by the assigned organizations. These actions include the following:

- Small spills will be treated with absorbent material and the residue packed in drums for disposal.
- Leaking drums will be placed in overpack drums.
- All chemically contaminated soils and cleanup debris will be thoroughly cleaned up and contained for disposal.
- At all times, efforts will be made to segregate incompatible wastes during cleanup operations.
- All response equipment will be decontaminated, restocked or disposed of properly.

For Spills/Incidents in the 100 and 200 Areas

The Decontamination and Decommissioning Operations Group shall provide manpower and equipment for use in the cleanup of hazardous material/waste spills/incidents within the 100 and 200 Areas. Requests for Decontamination and Decommissioning Operations Group services can be made as follows:

- 373-4329

For Spills/Incidents in the 300, 400, 600, 700, 1100 & 3000 Areas

Manpower and equipment for utilization in the cleanup of spilled hazardous material/waste in the 300, 400, 600, 700, 1100 and 3000 Areas shall be provided by the Road and Track Maintenance Department. Requests for Road and Track Maintenance services can be made as follows:

- 376-6612

  or
- 376-7266

For Spills/Incidents Involving Polychlorinated Biphenyls (PCBs)

Special procedures, trained personnel and equipment are required for cleanup of a spill/incident which involves PCBs. The Utilities Maintenance Group shall provide these services and can be contacted as follows:

o 373-2320 (24-hr dispatcher)

POST-EMERGENCY PROCEDURES

Post-emergency procedures are designed to prevent recurrence of the incident, to facilitate cleanup and disposal of residuals, and chemical decontamination of equipment.

Prevention of Recurrence

The EAC is responsible for taking all necessary steps to ensure that a secondary release, fire, or explosion does not recur after the initial spill/incident. Procedures that will be implemented may include:

- o Inspection of containment for leaks or cracks
- o Inspection for gas generation
- o Isolation of residual waste materials
- o Reactivation of adjacent operations only after all cleanup of residual waste materials is achieved.

Treatment, Storage, or Disposal of Released Material

The Process Engineering Department is responsible for assuring that all cleanup materials/debris is properly identified according to WAC 173-303 dangerous waste designation procedures. This will occur as soon as possible once the emergency situation has ended to allow for proper treatment, storage or disposal of the material. The EAC is responsible for obtaining all the necessary information required by the Process Engineering Department to make a designation determination.

Hazardous wastes will be transported to the Nonradioactive Dangerous Waste Landfill if they are in solid form and designated as "Dangerous Waste" according to WAC 173-303. Wastes which are designated as "Extremely Hazardous Waste" or are liquid and are designated as "Dangerous Waste", will be transported to the Nonradioactive Dangerous Waste Storage Facility and properly dispositioned offsite to a commercial treatment or disposal site. The Process Engineering Department is responsible for disposal requests for all hazardous wastes generated on the Hanford Site.

Equipment Chemical Decontamination and Maintenance

All equipment used during scene stabilization and cleanup operations will be decontaminated and readied for future use. All personnel involved in these activities will shower and remove any contaminated clothing as necessary. Fire extinguishers will be recharged, and equipment will be replaced.

APPENDIX A

HAZARDOUS MATERIALS INVENTORY AND LOCATION

A system is currently in use by Rockwell Hanford Operations (Rockwell) that tracks the inventory and location of selected hazardous materials. The system maintains an accurate inventory of identified materials from receipt in stores to use in an operation or facility. This traceability will be accomplished by requiring Rockwell organizations to perform a point-in-time inventory and then provide input to the inventory system on each hazardous material order obtained through Purchasing and Stores. In conjunction with the inventory, the system will provide hazards information for the toxicity, flammability, reactivity, and carcinogenicity of the material. This information can be accessed by any function onsite that has a need for the information, such as the Hanford Fire Department, emergency response teams, and safety groups for response to hazardous materials emergencies.

The system, when accessed, will provide the following information:

- Where a specific chemical is located
- What chemicals are located in a specific location
- What the hazards of a specific chemical are
- What safety precautions to take when working with a chemical
- Emergency response to a chemical accident.

Current plans call for this system to be in place by September 30, 1985.

APPENDIX B

HAZARDOUS MATERIALS TRANSPORTATION DATA

Hazardous materials of various quantities and concentrations are transported on the roads and railroads throughout the Hanford Site. Since there is a potential for an accident involving any of these shipments, a method of identifying these shipments and their contents needs explanation.

Types of Shipments

There are four types of shipments of hazardous materials to locations onsite that access Hanford rail and roadways. They are:

1. Bulk shipments by rail
2. Routine bulk shipments by truck that do not stop at the 1100 Area
3. Nonroutine bulk shipments that stop at 1100 Area with invoice slip
4. Reagent or less-than-bulk quantities of material shipped from Rockwell Stores

Identification of Contents

The identification of the contents and quantities of these shipments is specific to each type of shipment. Most railroad shipments are primarily during the day shift with a few during the offshifts. Identification of contents can be made in two ways--locate the Department of Transportation (DOT) chemical identification number and refer to DOT Hazardous Material Emergency Response Guidebook for chemical name, or call the 24-hour railroad dispatcher on 376-6935.

For truck shipments of bulk materials that come onsite, but do not stop at Stores, identification is made by the invoice carried in the truck, or by identifying the company hauling the material and contacting 376-2438, Rockwell Essential Material Buyer, for information on expected shipments by that company at that particular time. The storekeeper may also be called at the point of dispersion (373-2367) or at their office in 2101-M (373-1850.) These shipments occur throughout the week, mainly during the day shift. For those truck shipments of bulk materials that stop at the 1100 Area prior to proceeding onsite, the identification can be made by noting the DOT identification number or by calling 376-6200, Manager of Receiving and Shipping, for specific invoice information. These shipments occur throughout the week, mainly during the day shift, but sometimes during the hours just preceding and after this shift.

For those reagent or less-than-bulk quantities of chemicals that are transported from Stores by Rockwell vehicles, the chemical contents of the vehicle can be identified by either the manifest in the cab of the truck or by calling 376-6200, Manager of Receiving and Shipping, for shipment control.

In addition to shipments to onsite locations, there are shipments of hazardous materials within the 200 Areas from one point to another and shipments of hazardous materials and wastes to offsite locations.

These shipments are:

- Transfer of hazardous materials from 200 Area warehouse to a facility for use
- Transfer of chemicals from facility operating streams to another facility
- Transfer of hazardous waste to site boundary for offsite shipments.

The identification of the contents and quantities of these shipments can be determined in the following manner:

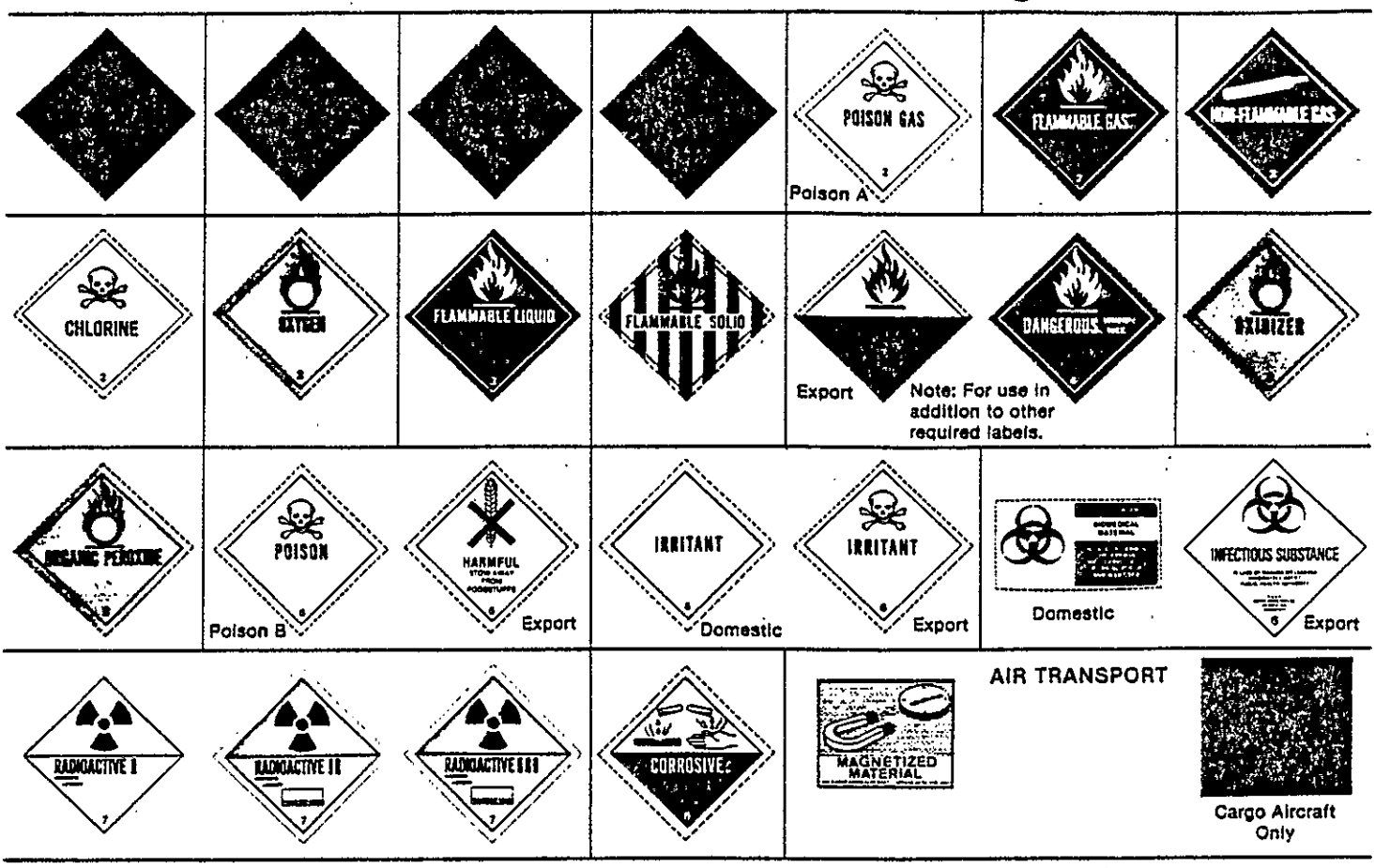
> Contents of interarea shipments of chemicals that are part of the facility operating streams can be identified by the shipping order in the vehicle or by contacting 373-2323, PUREX Support Services Shift Office. For the transfer of hazardous materials from a 200 Area warehouse to a facility for use, the Essential Materials Coordinator should be contacted on 373-2899. No manifest will be found in the vehicle. For the transfer of hazardous waste to the site boundary for offsite shipment, the contents can be found in a manifest in the vehicle.

BULK SHIPMENTS OF
NONRADIOACTIVE HAZARDOUS MATERIALS
ROUTINELY RECEIVED AT HANFORD SITE

CONTRACTOR	MATERIAL	DELIVERY RATE	AMOUNT PER DELIVERY*	TRANSPORT
Rockwell	ANN, Aluminum Nitrate-50%	3/month	20 Tons	Truck (Tanker)
"	AFAN, Ammonium Fluoride (Ammonium Nitrate Solution)	1/week	20 Tons	" (Tanker)
"	Ammonia, Anhydrous	1/quarter	18 Tons	" (Tanker)
"	Citric Acid	1/year	24 Tons	" (Pkg.)
"	Ferric Nitrate	1/year	2 Tons	" (Pkg.)
"	Hydrogen Peroxide, 50%	1/week	4,000 Gal.	" (Tanker)
"	Mercuric Nitrate	1/year	500 Lbs.	" (Drums)
"	HEDTA	1/quarter	4,000 Gal.	" (Tanker)
"	Nitric Acid - 57% Solution	1-2/week	4,000 Gal.	" (Tanker)
"	Liquid Nitrogen	1/week	100,000 CFT.	" (Tanker)
"	Oxalic Acid	2/year	10 Tons	" (Pkg.)
"	Potassium Hydroxide - 50% Solution	1/quarter	100 Tons	Rail
"	Potassium Permanganate	2-3/year	3 Tons	Truck (Drums)
"	Silver Nitrate	1/year	500 Lbs.	" (Drums)
"	Sodium Fluoride	1/year	1,000 Lbs.	" (Pkg.)
"	Sodium Hydroxide - 50% Solution	2/month	10,000 Gal.	Rail
"	Sodium Nitrate	1-2/year	20 Tons	Truck/Rail (Pkg.)
"	Sodium Nitrite	2-4/year	20 Tons	Truck/Rail (Pkg.)
"	Sodium Sulfate	6/year	20 Tons	Truck (Pkg.)
"	Sodium Sulfite	2/year	2 Tons	" (Pkg.)
"	Sulfamic Acid	1/year	10 Tons	" (Pkg.)
"	Sulfuric Acid - 93% Solution	1/year	4,000 Gal.	" (Tanker)
"	Hydrazine - 35% Solution	2/year	1,300 Gal.	" (Drums)
"	Tributyl Phosphate	1/year	10,000 Gal.	Rail
"	1,1,1, Trichloroethane	2/year	1,300 Gal.	Truck (Drums)
"	Turco, 4502-D	2/year	5 Tons	" (Drums)
"	Turco, 4518	2/year	3 Tons	" (Drums)
"	Turco, Fab. 5589	2/year	500 Gal.	" (Drums)
"	Turco, Fabrifilm	2/year	1,000 Gal.	" (Drums)
"	Turco, Deseal	2/year	500 Gal.	" (Drums)
"	Turco, 4512-A	2/year	2 Tons	" (Drums)
UNC	Ammonium Hydroxide	6/year	30 Tons	Truck
"	Chlorine	4/year	15 Tons	"
"	Helium	28/year	300,000 CFT	Rail
"	Morpholine	1/year	920 Lbs.	Truck
"	Sodium Hydroxide	14/year	47 Tons	Truck/Rail
"	Sulfuric Acid	10/year	50 Tons	Truck/Rail
"	#6 Fuel Oil	68/year	65,000 Gal.	Truck
"	Diesel Oil	20/year	24,000 Gal.	"

* = Average

DOT Hazardous Materials Warning Labels



General Guidelines on Use of Labels

1. The Hazardous Materials Tables, Sec. 172.101 and 172.102, identify the proper label(s) for the hazardous materials listed.

2. Any person who offers a hazardous material for shipment *must label* the package, if required. [Sec. 172.400(a)]

3. Labels *may* be affixed to packages (even though not required by the regulations) provided *each* label represents a hazard of the material in the package. [Sec. 172.401]

4. Label(s), when required, *must* be printed on or affixed to the surface of the package near the proper shipping name. [Sec. 172.406(a)]

5. When two or more different labels are required, display them next to each other. [Sec. 172.406(c)]

6. When two or more packages containing compatible hazardous materials are packaged within the same overpack, the outside container *must* be labeled as required for each class of material contained therein. [Sec. 172.404(b)]

7. Material classed as an **Explosive A, Poison A,** or **Radioactive Material** also meeting the definition of another hazard class *must* be labeled for *each* class. [Sec. 172.402(a)]

8. Material classed as an **Oxidizer, Corrosive, Flammable Solid,** or **Flammable Liquid** that also meets the definition of a Poison B *must* be labeled POISON, in addition to the hazard class label. [Sec. 172.402(a)(3) and (5)]

9. Material classed as a **Flammable Solid** that also meets the definition of a water-reactive material *must* be labeled with FLAMMABLE SOLID and DANGEROUS WHEN WET labels. [Sec. 172.402(a)(4)]

10. Material classed as a **Poison B, Flammable Liquid, Flammable Solid,** or **Oxidizer** that also meets the definition of a Corrosive material *must* be labeled CORROSIVE in addition to the class label. [Sec. 172.402(a)(6) through (9)]

Hazardous Materials Class Numbers

Hazardous materials class numbers associated with the hazard classes.

Class 1- Explosives
Class 2- Gases (Compressed, liquefied or dissolved under pressure)
Class 3- Flammable liquids
Class 4- Flammable solids or Substances
Class 5- Oxidizing Substances
Class 6- Poisonous and Infectious Substances
Class 7- Radioactive Substances
Class 8- Corrosives
Class 9- Miscellaneous dangerous Substances

NOTE: For requirements, see Sec. 172.102(h), 172.332(c)(3) and 172.407(g).

This chart is designed as a reference. For more complete details, refer to the *Code of Federal Regulations*, Title 49, Parts 100-177

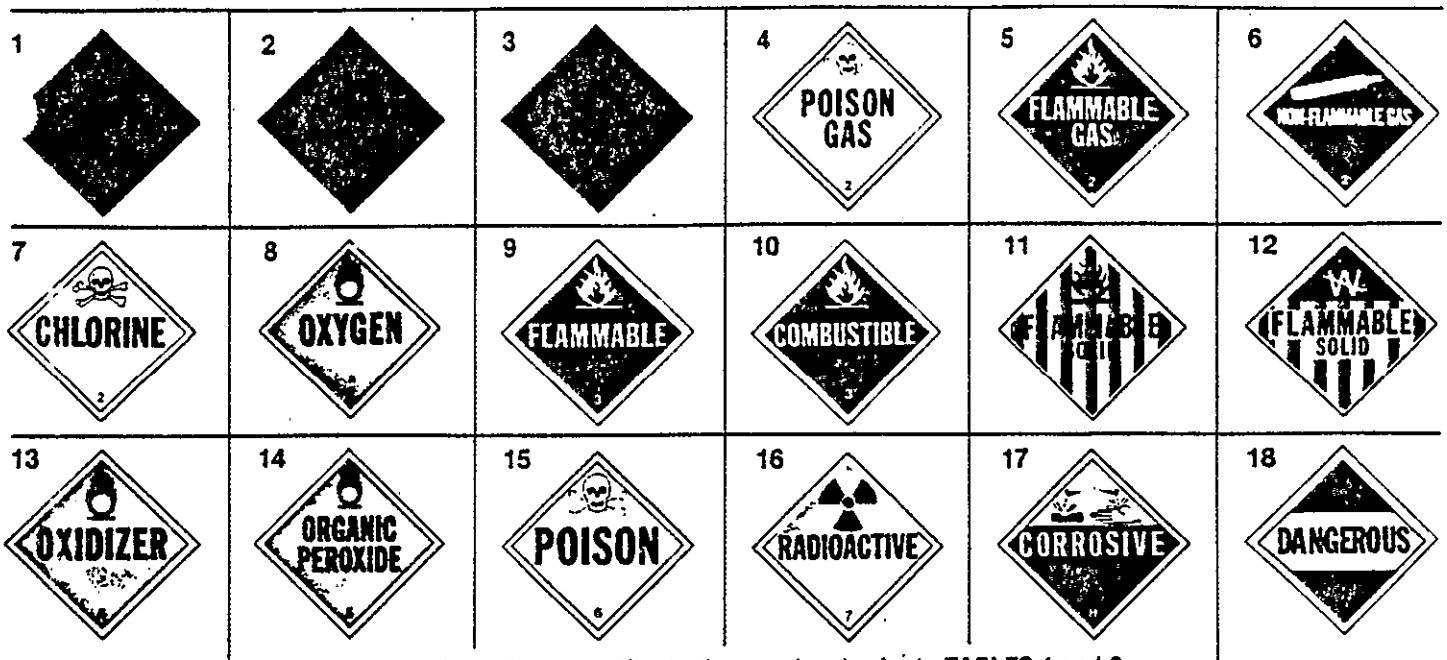
U.S. Department of Transportation

Research and Special Programs Administration

Materials Transportation Bureau
Washington, D.C. 20590

Chart 7 September 1982
Revised

DOT Hazardous Materials Warning Placards

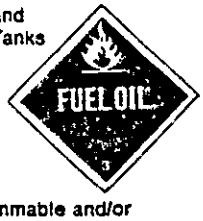


★ Numbers in each square (illustration numbers) refer to TABLES 1 and 2.

Use a square background for "large quantity" shipments requiring special routing.

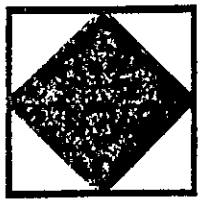
HIGHWAY TRANSPORT

Cargo and Portable Tanks



May be substituted for Flammable and/or Combustible placard. See Sec. 172.542 and 172.544

RAIL TRANSPORT



Use a square background for the above placards.

TABLE 1

Hazard Classes	★ No.
Class A explosives	1
Class B explosives	2
Poison A	4
Flammable solid (DANGEROUS WHEN WET label only)	12
Radioactive material (YELLOW III label)	16
Radioactive material:	
Uranium hexafluoride, fissile (containing more than 0.7% U^{235}	16 & 17
Uranium hexafluoride, low-specific activity (containing 0.7% or less U^{235}	16 & 17

Guidelines

- Placard motor vehicles, freight containers, and rail cars containing *any quantity* of hazardous materials listed in TABLE 1.
- Placard motor vehicles and freight containers containing 1,000 pounds or more gross weight of hazardous materials classes listed in TABLE 2.
- Placard freight containers 640 cubic feet or more containing any quantity of hazardous materials classes listed in TABLES 1 and/or 2 when offered for transportation by air or water. Under 640 cubic feet, see Sec. 172.512(b).
- Placard rail cars containing *any quantity* of hazardous materials classes listed in TABLE 2 except when less than 1,000 pounds gross weight of hazardous materials are transported in TOFC (Trailer on Flat Car) or COFC (Container on Flat Car) service.

TABLE 2

Hazard Classes	★ No.
Class C explosives	18
Blasting agent	3
Nonflammable gas	6
Nonflammable gas (Chlorine)	7
Nonflammable gas (Fluorine)	15
Nonflammable gas (Oxygen, pressurized liquid)	8
Flammable gas	5
Combustible liquid	10
Flammable liquid	9
Flammable solid	11
Oxidizer	13
Organic peroxide	14
Poison B	15
Corrosive material	17
Irritating material	18

UN and NA Identification Numbers

1. UN (United Nations) or NA (North American) numbers are found in Sec. 172.101, 172.102 and the Emergency Response Guidebook.
2. The four-digit UN or NA numbers are used to identify the hazardous materials involved.

   NA numbers are used only in the USA and Canada.
4. UN or NA numbers must be displayed on Tank Cars, Cargo Tanks and Portable Tanks.
5. When ID numbers are displayed on placards, ORANGE PANELS are not required.

6. When ID numbers are displayed on ORANGE PANELS, appropriate placards are also required.

7. EUROPEAN NUMBERING SYSTEM- Top numbers represent the Hazard Index. The bottom numbers are the required UN identification numbers.

For more compete details on Identification Numbers see Sec. 172.300 through 172.338

APPENDIX D

EXPERTISE CONTACT LIST

The following personnel may be contacted for expert consultation during emergencies involving hazardous materials:

ROCKWELL

Industrial Hygiene & Safety Department

Name	Work Phone	Home Phone	Pager
R. C. Beagley	373-2424	627-1312	85-398
H. N. Bowers	373-2704	627-4817	85-398
G. R. Cox	373-4032	575-0823	85-802
A. W. Lilly	373-2627	586-4864	85-802
M. L. Rosbach	373-2627	375-0100	85-802

Traffic Department

D. L. McCall	376-6151	946-9916
C. D. Hansen	376-7494	582-3877
E. F. Votaw	376-7171	545-5251

Polychlorinated Biphenyl (PCB) Assistance

Rockwell Electrical Dispatcher - 373-2320 (24 hours)

HANFORD ENVIRONMENTAL HEALTH FOUNDATION (HEHF)

Environmental Health

Name	Work Phone
R. D. Gilmore	376-7037
L. J. Maas	376-7040
D. E. Anderson	376-7355

Medical

Area	Phone Number
100	373-1603
200	373-2703
300/400 FFTF Areas	376-3303
700,1100,3000 Areas	376-6403

Chemical Emergency Information - Chemtrec

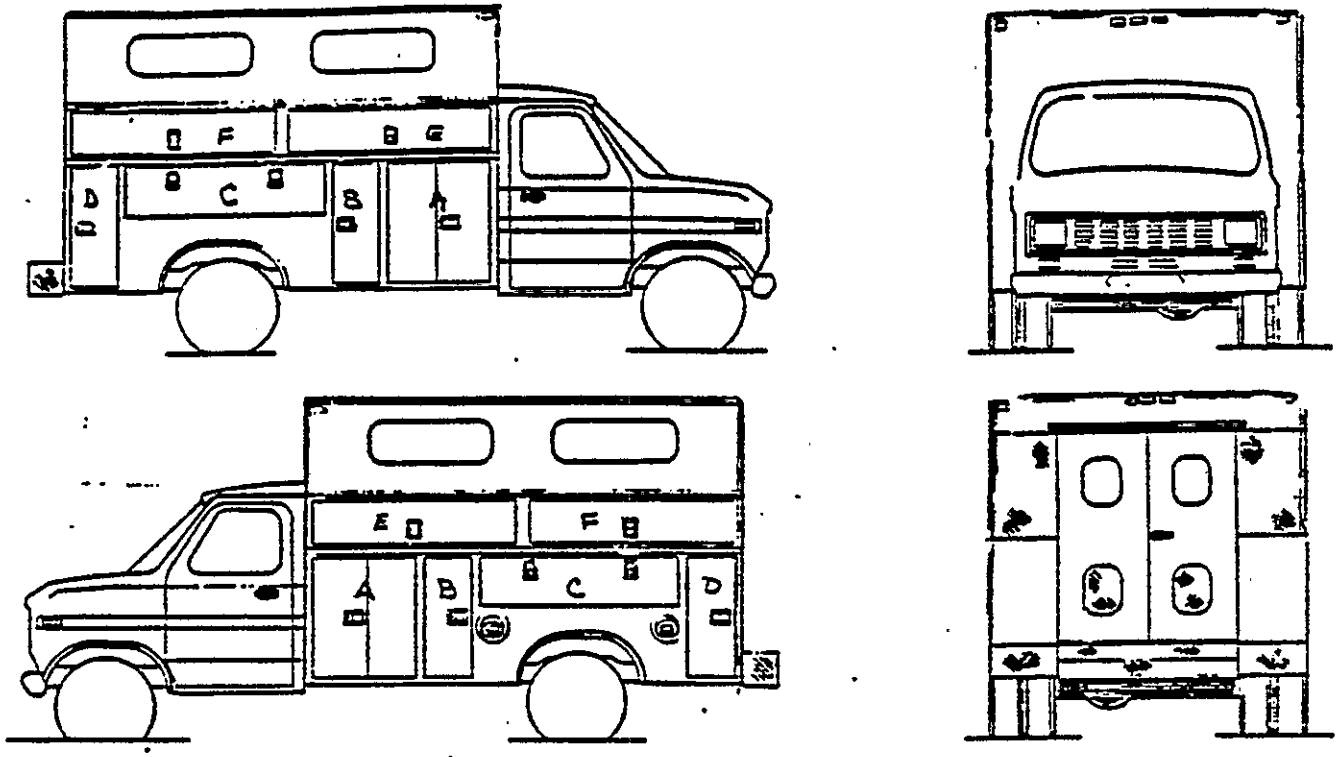
(Toll Free) 1-800-424-9300

APPENDIX E

HAZARDOUS MATERIALS RESPONSE TEAM/VEHICLE EQUIPMENT

The attached listing describes, using typical specifications, a specialized vehicle and on board equipment inventory necessary to completely outfit a state of the art, four member Hazardous Materials Response Team. This is a proposed project.

HAZARDOUS MATERIALS RESPONSE TEAM VEHICLE



RT-1A ALUMINUM BODY
WALK THROUGH RESCUE VEHICLE

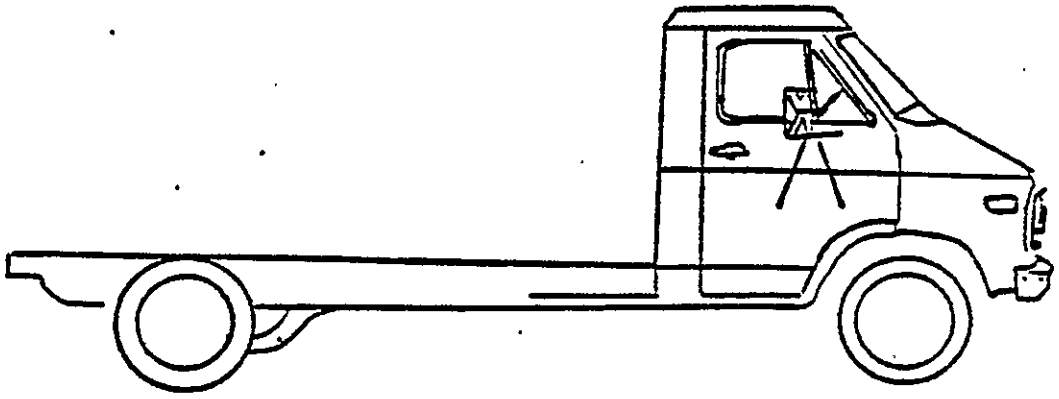
RESCUE VEHICLE

MODEL:	RT-1
Cab to Axle:	138"
Length (body)	128"
Length (overall)	228"
Height:	103"
Rear Step depth	10"

TYPE:	WALK THROUGH
GVW:	10,250

INTERIOR BODY DIMENSIONS

Interior Body Length:	128"
Interior Body Width:	93"
Interior Walkway Width:	53"
Interior Walkway Length:	128"
Interior Walkway Height:	72"



CUTAWAY CHASSIS

CHASSIS (STANDARD EQUIPMENT)

MANUFACTURER:	FORD (or equivalent)
MODEL:	E-350 R.V.
GVW:	10,250 LBS
CAB TO AXLE:	79.6"
WHEELBASE:	138"
FRONT AXLE:	3,850 LB
REAR AXLE:	7,320 LB 4:10 LIMITED SLIP
FRONT SPRINGS:	3,700 LB
REAR SPRINGS:	7,320 LB
ENGINE:	460 V8 4BBL.
TRANSMISSION:	AUTOMATIC
ALTERNATOR:	130 AMP
BATTERY:	DUAL W/COLE HERSEE M705 SWITCH
FUEL TANK:	DUAL 40 GALLON TOTAL CAPACITY
HEATER:	HIGH OUTPUT
INSTRUMENTATION:	OIL, AMP, TEMPERATURE, FUEL
MIRRORS:	BRIGHT, SWING-OUT, RECREATIONAL
GLASS:	TINTED
WIPERS:	2 SPEED W/WASHER
TIRES:	8:75 x 16.5 HIGHWAY TREAD-FRONT MUD AND SNOW-REAR

GENERAL SPECIFICATIONS

Wheelbase	138"
Cab to Axle	79.8"
Body Length	128"
Walkway Length	128"
Walkway Width	53"
Walkway Height	72"
Overall Width	93"
Overall Height	103"
Overall Length	228"

COMPARTMENT DIMENSIONS (Same Both Sides of Vehicle)

A) 35" Wide x 39" High x 24" Deep

B) 16" Wide x 39" High x 20" Deep

C) 59" Wide x 19" High x 20" Deep

D) 18" Wide x 39" High x 20" Deep

E) 64" Wide x 16" High x 20" Deep

F) 64" Wide x 16" High x 20" Deep

ABOVE ALL EXTERIOR COMPARTMENTS ARE INTERIOR STORAGE COUNTERS.

STANDARD FEATURES

(2) Shelves in Compartments "B".

(1) Full length material tray with adjustable dividers on 4" centers in compartments "E".

(5) Rope Hooks with swivels in compartments "D".

Compartments "E" and "F" roadside are accessable both from outside and inside. Inside access is through sliding plexiglass doors.

Access to rear of vehicle is through double rear doors. Each door has (2) 11" x 14" windows.

Upper body has two (2) 12" x 36" windows on each side.

Interior has seating for crew provided by a squad bench measuring 88" long x 24" wide x 18" from floor. Storage area is under seat.

ON BOARD EQUIPMENT LIST FOR HAZARDOUS MATERIALS VEHICLES

Description	
A. Suit and Protective Clothing	
° Chemical protective suits/encapsulated (butyl and neoprene), modified to accept both self-contained breathing apparatus and umbilical-fed air, sizes to be selected later	4 ea
° Splash apron (neoprene/butyl) large	8 ea
° Proximity suit, heavy weight Hycar apron, 37" x 46" straight cut bib	4 ea
° Acid Suit (jacket/trousers yellow)	4 ea
B. Breathing Apparatus	
° Positive pressure self-contained breathing apparatus (MSA type SCBA)	4 ea
° Spare cylinder for SCBA (30 minute tanks)	8 ea
° MSA full face cartridge type respirator	8 ea
° Cartridges GMC-H, GMC, GMP, GMC-s	1 box ea type
° 5-15 minute escape mask (MSA)	4 ea
° 3 cylinder cascade with manifold (air supply)	1 ea
C. Gloves	
° Neoprene 14"	12 pairs
° Butyl 14" (sizes 9, 10, 11)	4 pairs ea size
° Viton 11" (sizes 8, 9, 10)	4 pairs ea size
° Natural rubber 8" (sizes 9, 10, 11)	4 pairs ea size
° Surgical (med., large)	2 boxes ea size
° High voltage lineman's	4 pairs
D. Other Protective Clothing	
° TYVEC Coverall (must accommodate MSA SCBA) 18/case (1 case medium, 1 case large)	2 cases
° Raingear (jacket, pants) vinyl polyester, large	4 pairs

° Coverall, abanda, TYVEC material, non-sparking zipper (1 case medium, 1 case large)	2 cases
° High visibility vests (orange)	8 ea
° Goggles (polycarbonate lense)	8 ea
° Hardhats with headband suspension	8 ea
° Face shields (full) 10" x 19" x .060 (acetate window)	8 ea
° Boots (neoprene, steel toe and midsole) (knee high) sizes to be selected later	8 pairs
° Boot cover, (fit all sizes) disposable	1 case
° Safety harness, parachute type, full body	4 ea
° Ear protectors, 200 pouches per carton	2 cartons
° Turn out pants/jacket (large)	4 sets

LEAK CONTROL EQUIPMENT

A. Chlorine Kits

° "A" Kits	1 ea
° "B" Kits	1 ea
° "C" Kits	1 ea

B. Patches/Adhesives/Valve

° Bungs (for 55 gallon drum)	50 ea
° Drum gaskets (55 gallon)	50 ea
° Epoxy Kit	50 ea
° Caulking compound	2 cartons
° Patch Kit (assorted patches)	3 kits
° Wooden Plug Kit (assorted plugs) 1/2", 1", 1-1/2", 2"	1 kit
° Rubber Plug Kit (assorted plugs) 1/2", 1", 1-1/2", 2"	1 kit
° Mastic (14 oz. containers)	2 containers

C. Tape

° Duct, 2" x 300'	4 rolls
° Teflon Thread, 1" x 300'	4 rolls
° Barricade, 3/4" x 50 yds. (red & white striped)	6 rolls
° Friction, 3/4" x 300'	2 rolls
° Electrical, 1" x 300'	2 rolls
° Box sealing/packing (paper with glue backing)	2 rolls
° Masking, 1" x 300'	6 rolls

D. Connective Pieces

° Pipe Pieces (6 feet) 1/2", 3/4", 1", 1-1/2", 2"	2 ea size
° Pipe Union, 1-1/2", 3/4", 1", 1-1/2", 2"	5 ea size
° Pipe Caps, 1/2", 3/4", 1", 1-1/2", 2"	5 ea size
° Hose Clamps, 1/4", 1/2", 3/4", 1", 1-1/2", 2"	5 ea size
° Saddle Clamps, 1/2", 3/4", 1", 1-1/2", 2", 3", 4", 5", 6"	2 ea size
° Couplings (galvanized) 1/2", 3/4", 1", 1-1/2", 2"	3 ea size

E. Sorbents and Containers

° Absorbent pads (3M type 157, 3/8" x 36" x 36") (50 per bale)	2 bales
° Vermiculite, 3 cu. ft.	2 bags
° Plastic can liners/bags (55 gallon)	3 boxes
° Recovery drum sets, 12, 55, 85 gallon	2 sets
° Bag sorbent (27# bale)	2 bales
° Diatomaceous earth, 3 cu. ft. bag	3 bags
° Sponges, 2" x 4" x 6"	4 dozen
° Nylon salvage covers (vinyl laminated nylon) 12' x 18' (10 oz.)	2 ea

F. Chemical Neutralizing Agents

° Acid neutralizing agent (neutrasorb 100# box)	2 boxes
(neutrasol - 2-2-1/2 gallon container/carton)	2 cartons
° Caustic neutralizer (neutracit-2, 50# box)	2 boxes

G. Biological Neutralizing Agent

° Chlorox	4 gallons

H. Suppression Equipment

° Extinguishers capable of handling Class A, B, C, and D fires (20#)	1 ea type

I. Hand Tools, Nonsparking Where Possible

° Screwdrivers	
Square end, 1", 2", 3-1/2"	1 ea size
Flathead, 5/16" x 8", 1/4" x 6", 3/8" x 12"	1 ea size
Phillipshead, #2 - 8", #4 - 8"	1 ea size
° Wrenches	
Hex Key/Allen, 1/4", 5/16", 3/8", 5/8", 1/2"	1 ea size
Crescent, 2-", 16", 12", 10"	1 ea size
Pipe, 3" x 24", 2-1/2" x 18", 2" x 14"	1 ea size
Basin - adjustable (4")	1 ea
Bung - universal, nonsparking	1 ea
Drum (standard) 17-1/2" length	1 ea
Socket ratchet - 3/4" drive	1 ea
Sockets - 3/4" drive, 1", 1-1/16", 1-1/8", 1-1/4", 1-3/8", 1-7/16", 1-1/2", 1-5/8", 1-3/4", 1-7/8"	1 ea size
Socket ratchet, 1/2" drive, 14-piece set, 7/16" thru 1-1/4"	1 set
Socket ratchet - 1/2" drive	1 ea
Reversing pipe wrench, 12" with 15"	1 ea
Standard combination box/open end, 1/2", 5/16", 11/32", 3/8", 7/16", 9/16", 5/8", 11/16", 3/4", 13/16", 7/8", 1", 1-1/16"	1 ea size
° Metric combination wrenches open/box, 6-25 mm	1 ea size
° Gas and water meter key	1 ea
° Brace, 1/2" frame, 10" sweep	1 ea
Bits, 1/2", 5/8", 3/4", 1"	1 ea
° Drill (electric) 1/2" chuck	1 ea
Drill set, 5/16", 3/8", 7/16", 1/2" (short length)	1 set
5/8", 3/4", 1" (large diameter)	1 set
° Punch set, 1/8", 5/32", 3/16", 1/4, 1/2"	1 ea size

° Pliers	
Slip joint, 8" length, 1" jaw	1 ea
Needle nosed, 8", 6", plastic covered handles	1 ea size
Channel lock, 16", 12", 9-1/2", plastic covered handles	1 ea size
Side cutting, 7", 8-1/2", plastic covered handles	1 ea size
Vise grip (straight jaw) 10"	1 ea
Battery	1 ea
° Wire brush, 10"	2 ea
° Hammer	
Ballpeen, 32 oz., 16 oz., (wooden handle)	1 ea size
Curved claw, 16 oz. (fiberglass handle)	1 ea
Straight claw, 16 oz. (fiberglass handle)	1 ea
Sledge, 4# head, 15" handle	1 ea
° Bolt cutters, 24" (alloy steel) (straight cut)	1 ea
° Putty knife, 1-5/16" x 3"	3 ea
° Paint brushes, 3", 4", polyester bristle	2 ea size
° Tape measure, 3/8" x 100', steel tape	2 ea
° Folding ruler (wooden) 6"	2 ea
° Pipe wire (4")	1 ea
° Welding kit - two-stage oxyacetylene welding outfit with Sav-fuel thumbwheel torch	1 kit
° Wood chisels, 1/4", 1/2", 3/4", 1" blade (plastic handle)	1 ea size
° Cold chisels, 5/8", 7/8", 3/4" blade	1 ea size
° Hacksaw 10" - 12" adjustable	1 ea
Hacksaw blades, 12" (24 teeth/inch, high speed design, 5 per package)	5 pkgs.
° Keyhole saw	1 ea
° Tin snips, 12" with plastic covered handle (straight cut)	1 ea
° Banding tool/band, 1"	1 ea
° Level, aluminum 36"	1 ea

° Pipe crimping tool, 3/4"	1 ea
° Pipe cutters, 1/8" - 2"	1 ea

J. Containment Equipment - Nonsparking Where Possible

° Shovels	
Square point long wooden handle, 9" square top socket	2 ea
Round point long wooden handle, 9" round top socket	2 ea
° Pry bar, 3/4" x 24", 1/2" x 12"	2 ea size
° Safety line, 7/32" x 100' roll (nylon 500#)	2 rolls
° Rake, long wooden handle (16" metal)	2 ea
° Broom	
Push, 24" head (long wooden handle)	2 ea
Sweep, 12" head (polypropylene fiber)	2 ea
° Lantern lights (battery-type)	2 ea
° Battery jumper cables (8' - 10')	1 set
° Drum truck, 1000 lbs. capacity, 61" high x 33" wide	1 ea
° Vacuum cleaner (commercial type, large capacity, wet-dry, 13 gallon liquid or 1.8 bushels of dry debris, 10' hose & attachments)	1 ea
° Funnels, 6", 8", 12" (polyethylene)	1 ea size
° Drum dollies for 55 gallon drum, 6" high x 23-1/2" diameter	2 ea
° Chemical bucket (5 gal.) butyl rubber	3 ea
° Dust pans (standard 12" plastic)	3 ea
° Squeegee (24" blade) long wooden handle	2 ea

MONITORING EQUIPMENT

A. Chemical Monitoring

° Combustible gas and oxygen detector and calibration kit (ranges: 0-100% LEL, 0-500ppm, 0-25% oxygen)	1 ea
° CO-indicator	1 ea
° Multi-gas detector kit (extension hose, air current kit, tubes)	1 ea

° pH indicator meter (full range) 0-13 Range, Battery (accuracy of .05pH)	1 ea
° Color reagent kit - cyanide, hexavalent chromium	1 ea
° Water sample test kit (standard)	1 ea
° Fluorescent dye (red, green)	1 ea
° Ultraviolet light, hand held, 110 volts	1 ea
° Radiation detector (full range)	1 ea
° Radiation dosimeter badges	4 ea
° Ice chest (for sample storage, 25 gallon, metal)	1 ea
° Photoionization detector, gas chromotography	1 ea

B. Environmental Monitoring

° Tracers	
Color smokebomb	1 case
Confetti, Chaff	1 box
° Indicating wind system, AC, DC, recording cup and vane anemometer with meter telescoping mast	1 ea

C. Medical/First Aid

° First aid kit (36 units)	1 ea
° Resuscitator	1 ea
° Wool fire blankets	4 ea
° Portable decontamination unit	1 ea
° Decontamination wading pools, 1' x 6'	3 ea

D. Supplies and Equipment

° Hand cleaner (waterless)	2 quarts
° Binoculars (7x15 power, zoom, 35mm)	1 ea
° Soap, green	2 gallons
° Flashlight (nonsparking)	4 ea
° Wheel chock, large	1 ea
° Waxpaper (12" roll)	6 rolls

- Exterior cords (14 gauge, 3 prong, 100') with locking connections — 3 ea
- Ladder (6 ft. aluminum with rubber footing) — 1 ea
- Stakes, wooden (18") — 100 ea
- Flares (electric, nonsparking — 12 ea
- Reflective triangles — 6 ea

ONBOARD REFERENCE LITERATURE

Hazardous Materials 1984 Emergency Response Guidebook

U.S. Department of Transportation
Materials Transportation Bureau
Washington, D.C. 20590

Chemical Hazards Response Information System

CHRIS - CG446-2
U.S. Government Printing Office
Washington, D.C. 20402

Dangerous Properties of Industrial Materials (5th Edition)

N. Irving Sax, Author
Van Nostrand Reinhold Company
450 West 33rd Street
New York, N.Y. 10001

The Merck Index

Paul G. Stecher, Editor
Merck and Company
Rahway, New Jersey

Emergency Handling of Hazardous Materials in Surface Transportation

Bureau of Explosives
Association of American Railroads
1920 "L" Street NW
Washington, D.C. 20036

Emergency Materials Tariff 111E

American Trucking Association
Traffic Department
1616 "P" Street, NW
Washington, D.C. 20036

NIOSH/OSHA Pocket Guide to Chemical Hazards

U.S. Government Printing Office
Washington, D.C. 20402

Hazardous Materials - A Guide for Firefighters

Chief Myron P. Gerton (Ret.)
Rocky Mountain Arsenal Fire Department
Colorado Division of Highway Safety
4201 East Arkansas Avenue
Denver, Co. 80237

Fire Protection Guide on Hazardous Materials (7th Edition)

National Fire Protection Association
Boston, Mass.

The Condensed Chemical Dictionary (10th Edition)

Gessner G. Hawley, Editor
Van Nostrand Reinhold Company
450 West 33rd Street
New York, N.Y. 10001

Code of Federal Regulations

Title 49 - Parts 100-199
U.S. Government Printing Office
Washington, D.C. 20402

Hazardous Materials Transportation (November, 1979)

Department of California Highway Patrol
Sacramento, California 95803

Recognition and Management of Pesticide Poisonings

U.S. Environmental Protection Agency
Office of Pesticide Programs
Washington, D.C. 20460

Chlorine Manual

The Chlorine Institute, Inc.
325 Madison Avenue
New York, N.Y. 10017

Do's and Don'ts

Institute of Makers of Explosives
420 Lexington Avenue
New York, N.Y.

APPENDIX F

HAZARDOUS MATERIALS RESPONSE TEAM

TRAINING REQUIREMENTS

The following information outlines a suggested program for training of a Hazardous Materials Response Team for the Hanford Site.

A. **Team Concept**

1. Two officers per shift to be trained as team leaders.
2. All shift personnel to receive training
3. When incident occurs, the team leader will select the 3 firefighters to complete Haz-Mat team.

B. **Proposed Training**

1. Standards: Orange County California Haz-Mat levels of training as a guide (after being reviewed).

2. EPA Hazardous Material response at Cincinnati, Ohio. (7 personnel) (40 hours)

3. Haz-Mat hands on training on site (40 hours) Same as command school.

4. Haz-Mat transportation emergencies on site (40 hours) (Slide tape with workbooks).

5. National Fire Academy, Hazardous Material Tactical Consideration (80 hours) at the fire academy (7 personnel)

6. Conduct two Haz-mat drills per year - minimum.

7. Second year training to be reinforcing and update for selected personnel.

C. **Training Cost**

1. EPA Haz-Mat training - 40 hours. Class $770 + room and board
   $4,500 + $6,500 overtime = $15,270

2. Hands on training - 40 hours - $8,000

3. Fire Academy - 7 personnel - 80 hours - Transportation and room and board - $8,000 + $10,000 overtime = $18,000.

APPENDIX G

CLEANUP SUPPORT EQUIPMENT

The following is a compilation of support equipment presently located at the Hanford Site that is available for use during a hazardous material/waste emergency:

1. Decontamination and Decommission Operations Group

   200 Areas

   55-gallon Drums

   Sheet Plastic

   Dump Trucks

   Front Loaders

   Water Trucks

   Fabrifilm

2. Road and Track Maintenance Department

1100 Area	200 Areas
2 - 75-ton Cranes	1 - 60-ton Crane
3 - 14-ton Cranes (self-propelled)	1 - 40-ton Crane
2 - 5-ton Cranes	1 - 25-ton Crane
4 - Motor Patrol Blades	3 - Motor Patrol Blades
4 - Tracked Dozers	12 - Tracked Dozers
2 - Front Loaders	5 - Scrapers
1 - Tracked Loader	3 - Front Loaders
2 - Water Trucks (5,000 gal.)	1 - Water Wagon (9,000 gal.)
2 - Water Trucks (4,000 gal.)	1 - Water Wagon (8,000 gal.)
2 - Backhoes	1 - Water Truck (4,000 gal.)
5 - Dump Trucks (10 yd.)	1 - Water Truck (2,500 gal.)
	1 - Backhoe

APPENDIX H

HAZARDOUS MATERIAL/WASTE NOTIFICATION REGULATIONS

WASHINGTON STATE ADMINISTRATIVE CODES

WAC 173-303-145 Spills And Discharges Into The Environment

(1) Purpose and Applicability.

This section sets forth the requirements for any person responsible for a spill or discharge into the environment, except when such release is otherwise permitted under state or federal law. For the purposes of complying with this section, a transporter who spills or discharges dangerous waste or hazardous substances during transportation will be considered the responsible person. This section shall apply when any dangerous waste or hazardous substance is intentionally or accidentally spilled or discharged into the environment (unless otherwise permitted) such that public health or the environment are threatened, regardless of the quantity of dangerous waste or hazardous substance.

(2) Notification.

Any person who is responsible for a nonpermitted spill or discharge shall immediately notify the individuals and authorities described for the following situations:

(a) For spills or discharges onto the ground or into groundwater or surface water, notify all local authorities in accordance with the local emergency plan. If necessary, check with the local emergency service coordinator and the fire department to determine all notification responsibilities under the local emergency plan. Also, notify the appropriate regional office of the department of ecology; and

(b) For spills or discharges which result in emissions to the air, notify all local authorities in accordance with the local emergency plan. If necessary, check with the local emergency service coordinator and the fire department to determine all notification responsibilities under the local emergency plan. Also, in western Washington notify the local air pollution control authority, or in eastern Washington notify the appropriate regional office of the department of ecology.

(3) Mitigation and Control.

The person responsible for a nonpermitted spill or discharge shall take appropriate immediate action to protect human health and the environment (e.g., diking to prevent contamination of state waters, shutting of open valves).

(a) In addition, the department may require the person responsible for a spill or discharge to:

(i) Clean up all released dangerous wastes or hazardous substances, or to take such actions as may be required or approved by federal, state, or local officials acting within the scope of their official responsibilities. This may include complete or partial removal of released dangerous wastes or hazardous substances as may be justified by the nature of the released dangerous wastes or hazardous substances, the human and environmental circumstances of the incident, and protection required by the Water Pollution Control Act, chapter 90.48 RCW;

(ii) Designate and treat, store or dispose of all soils, waters or other materials contaminated by the spill or discharge in accordance with this chapter 173-303-WAC. The department may require testing in order to determine the amount or extent of contaminated materials, and the appropriate designation, treatment, storage, or disposal for any ((substances)) materials resulting from clean-up; and

(iii) If the property on which the spill or discharge occurred is not owned or controlled by the person responsible for the incident, restore the area impacted by the spill or discharge, and replenish resources (e.g., fish, plants) in a manner acceptable to the department.

(b) Where immediate removal or temporary storage of spilled or discharged dangerous wastes or hazardous substances is necessary to protect human health or the environment, the department may direct that removal be accomplished without a manifest, by transporters who do not have EPA/State identification numbers.

(4) Nothing in WAC 173-303-145 shall eliminate any obligations to comply with reporting requirements which may exist in a permit or under other state or federal regulations.

WAC 173-303-270 Discharges During Transport

In the event of a spill or discharge of dangerous waste during transportation, the transporter shall comply with the requirements of WAC 173-303-145, Spills and discharges into the environment. In addition to the notices required by WAC 173-303-145, the transporter shall provide the following notifications:

(1) Give notice to the generator of the waste that a discharge has occurred;

(2) Give notice to the National Response Center (800-424-8802) or (202-426-2675), if required by 49 CFR 171.15;

(3) Report in writing as required by 49 CFR 171.16 to the Director, Office of Hazardous Materials Regulations, Materials Transportation Bureau, Department of Transportation, Washington, D.C., 20590; and,

(4) For a water (bulk shipment) transporter, give the same notice as required by 33 CFR 153.203 for oil and hazardous substances.

49CFR 171.15 Immediate Notice of Certain Hazardous Materials Incidents

(a) At the earliest practicable moment, each carrier who transports hazardous materials (including hazardous wastes) shall give notice in accordance with paragraph (b) of this section after each incident that occurs during the course of transportation (including loading, unloading and temporary storage) in which as a direct result of hazardous materials--

(1) A person is killed;
(2) A person received injuries requiring his hospitalization;
(3) Estimated carrier or other property damage exceeds $50,000;
(4) Fire, breakage, spillage, or suspected radioactive contamination occurs involving shipment of radioactive material (See also 174.45, 175.45, 176.48, and 177.807 of this subchapter); or
(5) Fire, breakage, spillage, or suspected contamination occurs involving shipment of etiologic agents; or
(6) A situation exists of such a nature that, in the judgment of the carrier, it should be reported in accordance with paragraph (b) of this section even though it does not meet the criteria of paragraph (a) (1), (2), or (3) of this section; e.g., a continuing danger of life exists at the scene of the incident.

(b) Each notice required by paragraph (a) of this section shall be given to the Department by telephone (toll-free) on 800-424-8802 or (toll-call) on 202-426-2675. Notice involving etiologic agents may be given the Director, Center for Disease Control, U.S. Public Health Service, Atlanta, Ga., Area Code (404) 633-5313, in place of the notice to the Department. Each notice must include the following information:

(1) Name of reporter.
(2) Name and address of carrier represented by reporter.
(3) Phone number where reported can be contacted.
(4) Date, time and location of incident.
(5) The extent of injuries, if any.
(6) Classification, name and quantity of hazardous materials involved, if such information is available.
(7) Type of incident and nature of hazardous material involvement and whether a continuing danger to life exists at the scene.

(c) Each carrier making a report under this section shall also make the report required by 171.16.

49CFR 171.16 Detailed Hazardous Materials Incident Reports

(a) Each carrier who transports hazardous materials shall report in writing in duplicate on DOT Form F 5800.1 to the Department within 15 days of the date of discovery, each incident that occurs during the course of transportation (including loading, unloading, or temporary storage) in which, as a direct result of the hazardous materials, any of the circumstances set forth in 171.15(a) occurs or there has been an unintentional release of hazardous materials from a package (including a tank) or any quantity of hazardous waste has been discharged during transportation. If a report pertains to a hazardous waste discharge --

(1) A copy of the hazardous waste manifest for the waste must be attached to the report, and
(2) An estimate of the quantity of the waste removed from the scene, the name and address of the facility to which it was taken, and the manner of disposition of any unremoved waste, must be entered in Part H of the report (Form F5800.1).

(b) Each carrier making a report under this section shall send that report to the Information Systems Manager, Materials Transportation Bureau, Department of Transportation, Washington, D.C. 20590.

(c) Except as provided in paragraph (d) of this section, the requirements of paragraph (a) of this section do not apply to incidents involving the unintentional release of hazardous materials being transported under the following proper shipping names:

(1) Consumer commodity
(2) Battery, ELECTRIC STORAGE, wet, filled with acid OR alkali.
(3) Paint, Enamel, Lacquer, Stain, Shellac or Varnish Aluminum, Bronze, Gold, Wood filler, liquid or Lacquer base liquid when shipped in packagings of five gallons or less.

(d) The exceptions to incident reporting provided in paragraph (c) of this section do not apply to:

(1) Incidents required to be reported under 171.15(a);
(2) Incidents involving transportation aboard aircraft; nor
(3) Incidents involving the transportation of hazardous waste.

DEPARTMENT OF TRANSPORTATION (DOT) FORM F 5800.1

(See following pages -5 and -6)

524 (1/71)

DEPARTMENT OF TRANSPORTATION

Form Approved OMB No. 04-5413

HAZARDOUS MATERIALS INCIDENT REPORT

INSTRUCTIONS: Submit this report in duplicate to the Secretary, Hazardous Materials Regulations Board, Department of Transportation, Washington, D.C. 20590. (ATTN. Opr. Div.). If space provided for any item is inadequate, complete that item under Section H, "Remarks", keying to the entry number being completed. Copies of this form, in limited quantities, may be obtained from the Secretary, Hazardous Materials Regulations Board. Additional copies in this prescribed format may be reproduced and used, if on the same size and kind of paper.

A INCIDENT

1. TYPE OF OPERATION
   1 ☐ AIR 2 ☐ HIGHWAY 3 ☐ RAIL 4 ☐ WATER 5 ☐ FREIGHT FORWARDER 6 ☐ OTHER *(Identify)* _____

2. DATE AND TIME OF INCIDENT *(Month - Day - Year)* _____ a.m. _____ p.m.

3. LOCATION OF INCIDENT

B REPORTING CARRIER, COMPANY OR INDIVIDUAL

4. FULL NAME

5. ADDRESS *(Number, Street, City, State and Zip Code)*

6. TYPE OF VEHICLE OR FACILITY

C SHIPMENT INFORMATION

7. NAME AND ADDRESS OF SHIPPER *(Origin address)*

8. NAME AND ADDRESS OF CONSIGNEE *(Destination address)*

9. SHIPPING PAPER IDENTIFICATION NO.

10. SHIPPING PAPERS ISSUED BY
    ☐ CARRIER ☐ SHIPPER
    ☐ OTHER *(Identify)* _____

D DEATHS, INJURIES, LOSS AND DAMAGE

DUE TO HAZARDOUS MATERIALS INVOLVED

11. NUMBER PERSONS INJURED

12. NUMBER PERSONS KILLED

13. ESTIMATED AMOUNT OF LOSS AND/OR PROPERTY DAMAGE INCLUDING COST OF DECONTAMINATION *(Round off in dollars)*
    $

14. ESTIMATED TOTAL QUANTITY OF HAZARDOUS MATERIALS RELEASED

E HAZARDOUS MATERIALS INVOLVED

15. CLASSIFICATION (Sec. 172.4)	16. SHIPPING NAME (Sec. 172.5)	17. TRADE NAME

F NATURE OF PACKAGING FAILURE

18. *(Check all applicable boxes)*

(1) DROPPED IN HANDLING	(2) EXTERNAL PUNCTURE	(3) DAMAGE BY OTHER FREIGHT
(4) WATER DAMAGE	(5) DAMAGE FROM OTHER LIQUID	(6) FREEZING
(7) EXTERNAL HEAT	(8) INTERNAL PRESSURE	(9) CORROSION OR RUST
(10) DEFECTIVE FITTINGS, VALVES, OR CLOSURES	(11) LOOSE FITTINGS, VALVES OR CLOSURES	(12) FAILURE OF INNER RECEPTACLES
(13) BOTTOM FAILURE	(14) BODY OR SIDE FAILURE	(15) WELD FAILURE
(16) CHIME FAILURE	(17) OTHER CONDITIONS *(Identify)*	19. *SPACE FOR DOT USE ONLY*

Form DOT F 5800.1 (10-70)

G PACKAGING INFORMATION - *If more than one size or type packaging is involved in loss of material show packaging information separately for each. If more space is needed, use Section H "Remarks" below keying to the item number.*

	ITEM		#1	#2	#3
20	TYPE OF PACKAGING INCLUDING INNER RECEPTACLES *(Steel drums, wooden box, cylinder, etc.)*				
21	CAPACITY OR WEIGHT PER UNIT *(55 gallons, 65 lbs., etc.)*				
22	NUMBER OF PACKAGES FROM WHICH MATERIAL ESCAPED				
23	NUMBER OF PACKAGES OF SAME TYPE IN SHIPMENT				
24	DOT SPECIFICATION NUMBERS ON PACKAGES *(21P, 17E, 3AA, etc., or none)*				
25	SHOW ALL OTHER DOT PACKAGING MARKINGS *(Part 178)*				
26	NAME, SYMBOL, OR REGISTRATION NUMBER OF PACKAGING MANUFACTURER				
27	SHOW SERIAL NUMBER OF CYLINDERS, CARGO TANKS, TANK CARS, PORTABLE TANKS				
28	TYPE DOT LABELS APPLIED				
29	IF RECONDITIONED OR REQUALIFIED, SHOW	A	REGISTRATION NO. OR SYMBOL		
		B	DATE OF LAST TEST OF INSPECTION		
30	IF SHIPMENT IS UNDER DOT OR USCG SPECIAL PERMIT, ENTER PERMIT NO.				

H REMARKS - Describe essential facts of incident including but not limited to defects, damage, probable cause, stowage, action taken at the time discovered, and action taken to prevent future incidents. Include any recommendations to improve packaging, handling, or transportation of hazardous materials. Photographs and diagrams should be submitted when necessary for clarification.

31. NAME OF PERSON PREPARING REPORT *(Type or print)*	32. SIGNATURE
33. TELEPHONE NO. *(Include Area Code)*	34. DATE REPORT PREPARED

Reverse of Form DOT F 5800.1 (10-70)

APPENDIX I

FIRE DEPARTMENT SUPPORT EQUIPMENT

INTRODUCTION

The following is a description of equipment presently available from the Fire Department which could be used in a hazardous material/waste incident.

Telesqurts - Located at 609, 609-A and 3709-A Fire Stations

The Fire Department presently has three Telesqurt trucks. Each Telesqurt has the capability to pump 1500 gpm of water with a 50-foot boom. A limited amount of rescue equipment is carried on board each truck, including SCBA units for the firefighting crew.

MX-3 - Located at 3709-A Fire Station

The MX-3 is a multichemical truck designed to combat metal-type fires such as Sodium and Lithium. Each dry chemical agent is carried on board in a separate container. Stored in the first container is 1,000 lbs. of NaX extinguishing powder for use on Sodium fires. The second container holds 500 lbs. of micro-spheroids for use on Lithium fires. Each of these containers is automatically pressurized and activated from the truck cab. Two SCBA units and two metal fire protective suits are located on board the truck.

Attack 1 - Located at 609-A Fire Station

Attack 1 is a four-wheel-drive, triple combination truck capable of offroad travel. This unit carries 450 lbs. of Purple K dry powder extinguishment, 300 gal. of 3% AFFF concentrate foam, 300 gal. of 3% AFFF premix foam, and 300 lbs. of 1211 Halon suppressant. All three agents are dispersed through 150 feet of booster-type hose designed for each particular agent. The AFFF premix solution can also be dispersed from a rooftop turret nozzle. Two SCBA units, a 5kW diesel generator and various small tools are also stored on this truck.

Squad 3 - Located at 3709-A Fire Station

Squad 3 is a van-type vehicle containing various light duty to heavy duty tools and equipment including:

- o Acetylene torch
- o 4kW generator
- o Block and tackle sets
- o Chlorine patch kit
- o Emergency lighting

Rescue Trailer - Located at 609 Fire Station

This trailer is a 4-ton model containing miscellaneous rescue equipment which includes:

- o Block and tackle sets
- o Light to heavy duty ropes
- o Hand and power tools
- o 6 kW gasoline generator
- o Emergency lighting

- Plant Operations shall initiate telephone contact with the following Rockwell personnel, and record time and date of contact on the release report.

Number	Name	Organization
3-4258	D. R. Groth	SWP&D Unit, Process Engineering Dept.
3-4981	L. L. Powers	Hazardous Waste Management Program
3-2424	R. C. Beagley	Industrial Health and Safety
--	--	Plant Manager, if applicable
--	--	Plant Program Manager, if applicable

- Transmit original copy of report to the Manager, SWP&D Unit, 2750-E/A105/200-E, and transmit copies of the report to all Rockwell personnel listed within two days. The Hazardous Waste Program Manager will submit written notification to DOE-RL within seven days of the release.

APPENDIX J

CERCLA/WDOE NOTIFICATION PROCEDURES

In the event that a chemical release exceeds the CERCLA or WDOE reportable quantities (RQ) amount, data regarding the release will be compiled on the CERCLA/WDOE Hazardous Substance Release Report and telephone notifications made within 24 hours of knowledge that a release has occurred. Contact the Solid Waste Processing & Disposal Unit (3-4258) or (3-3516) if there is any question as to whether the release exceeds the RQ amount. The release report, Figure J-1, will be prepared as follows:

- Copy information, if known, regarding substance name, composition, weight percent of constituents, and specific gravity or weight. Add other information that may be available to characterize the nature of the release.
- Enter name of facility and location of release.
- Enter quantity of release and exact point (e.g. tank number) of release.
- Enter cause (e.g., spill, overflow, pump leak).
- Enter time, date, and duration of release.
- Enter location that spill has drained to (e.g., CSL, 216-Z-20).
- Enter extent of injuries, damage, and approximate value of chemicals lost.
- Describe immediate corrective actions (e.g.,lock and tag valve, repairs). Indicate whether an Off-Normal or Unusual Occurrence report is being initiated.
- Describe long-term actions that could or will be needed to prevent similar events in the future (e.g., procedural changes, equipment modifications).
- Provide name and telephone number of person delegated the responsibility to obtain and provide additional information that will be required.
- Plant Operations shall initiate telephone contact with the Department of Energy, Richland Operations Office (DOE-RL) SQA Duty Officer immediately upon identification of the above information, and record time and date of contact on the release report. Although the officer on duty and the telephone number changes weekly, the correct telephone number can be obtained from the Hanford Patrol Operations Center on 3-3800. The DOE-RL is responsible for contacting the National Response Center by telephone within 24 hours.

FIGURE J-1

CERCLA/WDOE HAZARDOUS SUBSTANCE RELEASE REPORT

Substance Characterization, Including Name, Composition, % Wt., Sp.G, and RQ:
Facility and Location:
Quantity and Source:
Cause:
Time, Date and Duration of Release:
Location That Spill Has Drained To:
Injuries or Property Damage:
Immediate Corrective Actions and Recommended Long-Term Actions:
For Additional Information, Contact:
Telephone Contacts, Time and Date: SQA Duty Officer 6-____ _____. L. L. Powers 3-2481 _____. D. R. Groth 3-4258 _____. Plant Manager 3-____ _____. R. C. Beagley 3-2424 _____. Plant Program Manager 3-____ _____.
Signatures and Date: Shift Support Manager _____ Date _____ Shift Manager _____ Date _____ Plant Manager _____ Date _____ Proc. Eng. Group Mgr. _____ Date _____

NOTE: This is an auditable report. Send original to:

Manager, Solid Waste Processing and Disposal Unit,
2750-E/A105/200-E.

APPENDIX G-2

MEMORANDA OF UNDERSTANDING

MEMORANDUM OF UNDERSTANDING
BETWEEN STATE OF WASHINGTON
AND
DEPARTMENT OF ENERGY
RICHLAND OPERATIONS OFFICE
EMERGENCY PREPAREDNESS AND RESPONSE

I. BACKGROUND AND PURPOSE

This memorandum of understanding establishes a framework of cooperation between the State of Washington and the Department of Energy, Richland Operations Office, in the planning for and response to emergencies at the Hanford Site which might have offsite consequences.

II. RESPONSIBILITIES

The Department of Energy's Richland Operations Office (RL) is responsible for responding to all emergencies contained within the federally operated facilities located within the Hanford Site boundaries. In the event that a Hanford emergency has offsite public health implications, RL and the State will coordinate implementation of their emergency plans.

RL will provide support and assistance to the State of Washington in the preparation, implementation and recovery phases of emergency responses affecting the offsite environment by:

- Coordinating the activities of Federal agencies which are parties to the Federal Radiological Monitoring and Assessment Plan (FRMAP).
- Assisting in radiological monitoring and decontamination; radiation exposure evaluation and radiation health hazards assessment.
- Providing medical advice on emergency treatment of persons exposed to radiation and technical advice on radioactive contamination.
- Cooperating with appropriate officials in the development of the State plan for coping with emergencies occurring on the Hanford Site.

III. OFF NORMAL EVENTS, EMERGENCY ACTION LEVELS AND RESPONSE ACTIONS

Off Normal Event - A non-emergency event of general public interest. RL will inform the Department of Social and Health Services (DSHS) Radiation Control Section of such events before the close of the next working date of the event or prior to its issuance of a news release, whichever comes first.

Four classes of emergency action levels will be utilized. These classes are: (1) unusual event, (2) alert, (3) site area emergency, and (4) general emergency. The description of these classes and RL's interpretation as applicable to the Hanford Site, along with the expected response actions of RL and the State relative to each class, are as follows:

1. Unusual Event

This class is described as an unusual event in progress or having occurred which indicates a potential degradation of the level of safety of the plant. No releases of radioactive material requiring

offsite response or monitoring are expected unless further degradation of the safety system occurs.

> The event involves conditions with little or no potential for offsite release of radioactive material. Events which fall into this category may include a significant unusual occurrence or other event with potential for public interest.

The purpose of notification to the State is to assure that the first step in any response later found to be necessary has been carried out and to provide current information on unusual events.

RL will inform the State of the nature of the unusual condition and close out with verbal summary within 24 hours or escalate the event to a more severe class.

2. Alert

This class is described as an event in progress or having occurred which involves an actual or potential substantial degradation of the level of safety of the plant.

> This event involves conditions where limited releases of radioactivity might occur which could produce a whole body dose rate at the site boundary equal to or greater than .5 mR/hr, but not greater than 50 mR/hr.

The purpose of the alert to the State is to assure that emergency personnel are readily available to respond if the situation becomes more serious or to perform confirmatory radiation monitoring, if required, and provide current status information.

RL will:

- Inform the State of alert status and reason for the alert.
- Activate its emergency control center and press center.
- Dispatch onsite monitoring teams and associated communications.
- Provide continual status updates to the State, at least at 15-minute intervals.
- Provide periodic meteorological assessments to the State, and if any releases are occurring, dose assessments for actual releases.
- Activate Unified Dose Assessment Center, perform offsite monitoring and evaluation, and provide information to the State, until the State monitoring team is activated and operating.
- Close out by verbal summary within 8 hours or escalate to a more severe class.

When notified by RL, the State will:

- Activate its emergency operations center.
- Alert to standby status key emergency personnel including monitoring teams.
- Provide confirmatory offsite radiation monitoring and ingestion pathway dose projections, as necessary.
- Maintain alert status until verbal closeout or the event is escalated to a more severe class.

3. Site Area Emergency

This class is described as an event in progress or having occurred which involves actual or likely major failures of plant functions needed for protection of the public.

Such an event involves conditions where significant releases of radioactivity are likely or are occurring which could result in a whole body exposure rate at the site boundary equal to or greater than 50 mR/hr. The projected dose at the site boundary must not exceed a 1 rem whole body dose or the event will qualify as a General Emergency.

A Site Area Emergency may be declared as a result of either of the following:

1. If it is obvious from the start that the event is going to have the defined impacts, or
2. As information on the event becomes more definitive, it becomes obvious the event is going to develop into the defined impact.

In either case, emergency radiation monitoring teams would be requested.

4. General Emergency

This class is described as an event in progress or having occurred which involves actual or imminent substantial degradation of plant safety systems.

The event involves actual or imminent significant release of radioactive material to the offsite environment which could result in a dose equal to or exceeding 1 rem whole body or 5 rem thyroid. If, during or at the beginning of an event, there is imminent danger to the public a General Emergency would be identified and immediate notifications would be made requesting immediate response actions.

The purpose of the Site Area and General Emergency notifications to the State is (1) initiate predetermined protection actions for the public, (2) provide continuous assessment of information from RL and offsite measurements, (3) initiate additional measures as indicated by event release or potential release, and (4) provide current information for consultation with the State and the public.

For both a Site Area and General Emergency, RL will:

- Notify the State of the emergency status and reason for the emergency.
- Activate its emergency control center and press center.
- Dispatch onsite and offsite monitoring teams and associated communications.
- Provide plant status updates at least at 15-minute intervals to the State.
- Dispatch a management representative to the Washington State Emergency Operations Center.
- Provide technical and management consultation with the State as required.
- Provide meteorological and dose assessments to the State via the Unified Dose Assessment Center.
- Close out by verbal summary within eight hours, or, if site area emergency needs to be escalated to general emergency so advise.

When notified by RL, the State will:

- Provide immediate public notification on emergency status and provide public updates.
- Activate its emergency operations center.
- Dispatch key emergency personnel including monitoring teams.
- Provide offsite monitoring results to RL through the Unified Dose Assessment Center.
- Continuously assess information obtained from this Center and the offsite monitoring teams with regard to changes to protective actions already initiated for public mobilizing evacuation resources or sheltering.
- Provide Public Information Officer at the RL Press Center.
- Maintain emergency status until closeout or reduction of emergency class.

IV. AREAS OF COOPERATION

A. Notification

1. The Department of Social and Health Services will be notified of off normal events.

2. The Department of Emergency Management will be the single point of contact for notification to the State regarding emergencies. Notification will be provided to the State within fifteen minutes after classification of the emergency, and will be based upon the emergency action levels described above.

   Authentication of the notification call to the State will be effected by a return call to RL.

B. Radiation Control and Meteorology Data

RL will conduct evaluations of radiation hazards through direct and field radiation readings within the Hanford Site and will perform offsite monitoring and evaluation until the State monitoring team is activated and operating. RL will provide radios for the State monitoring teams.

The State will provide or arrange for needed radiation monitoring outside the Hanford Site to conduct evaluations of radiation hazards through direct and field radiation readings, and to determine contamination levels of environmental samples as appropriate.

Communications and liaison of dose assessments and current status on meteorological and radiological conditions will be accomplished through a Unified Dose Assessment Center located in the Federal Building, Richland, Washington. The State will send a representative to this Center. The radiation data and monitoring activities of the offsite agencies present during an emergency will be coordinated with the State.

C. Recovery Period

RL will provide assistance to minimize radiation health hazards, decontamination problems, etc., to the State which serves as the lead agency supporting local governments during post-accident periods.

D. Training and Exercises

RL and State should conduct an annual emergency response exercise designed to assess emergency response capabilities and provide needed training. Cooperative arrangements for such exercises and training must be agreed to in advance.

E. Public Affairs

At the request of the State, RL will assist the State in its development of educational materials concerning radiation and its hazards and information regarding appropriate actions to be taken by the general public in the event of an accident involving radioactive materials.

F. Ingestion Pathway

The State, with support from RL, will implement protective measures for the 20-mile ingestion exposure pathway emergency planning zone around the Hanford Site.

G. Reentry

The State, with support from RL, will continually assess the emergency situation. They will determine the extension of or when the relaxation of protective measures should begin.

H. Emergency Public Information

During an emergency, preliminary media releases from RL and from the State will be coordinated. For a Site Area or General Emergency, RL will activate the joint Hanford Emergency Press Center, and the State and RL spokepersons will jointly prepare and release information statements from that location.

V. TERM OF AGREEMENT

This agreement will become effective upon signature and continue until cancelled by either party by written notice to the other. Amendments or modification to this Agreement may be made upon written agreement by both parties to the Agreement.

APPROVED FOR STATE OF WASHINGTON:

Governor Booth Gardner — Date

APPROVED FOR THE DEPARTMENT OF ENERGY
RICHLAND OPERATIONS OFFICE:

Michael J. Lawrence
Manager — Date

MEMORANDUM OF UNDERSTANDING
BETWEEN
BENTON COUNTY, WASHINGTON
AND
FRANKLIN COUNTY, WASHINGTON
AND
DEPARTMENT OF ENERGY
RICHLAND OPERATIONS OFFICE
EMERGENCY PREPAREDNESS AND RESPONSE

I. BACKGROUND AND PURPOSE

This memorandum of understanding reaffirms the established framework of cooperation among Benton County and Franklin County located in the State of Washington and the Department of Energy, Richland Operations Office, in the planning for and response to emergencies at the Hanford Site which might have offsite consequences.

II. RESPONSIBILITIES

The Department of Energy's Richland Operations Office (RL) is responsible for responding to all emergencies contained within the federally operated facilities located within the Hanford Site boundaries. In the event that a Hanford emergency has offsite public health implications, RL and the Counties will coordinate implementation of their emergency plans. RL will provide support and assistance to the Counties in the preparation and implementation of emergency responses affecting the offsite environment by:

- Coordinating the activities of Federal agencies which are parties to the Federal Radiological Monitoring and Assessment Plan (FRMAP).
- Assisting in radiological monitoring and decontamination, radiation exposure evaluation, and radiation health hazards assessment.
- Providing medical advice on emergency treatment of persons exposed to radiation and technical advice on radioactive contamination.
- Coordinating with appropriate officials in the development of the Counties' plan for coping with radiological incidents occurring on the Hanford Site.

III. EMERGENCY ACTION LEVELS AND RESPONSE ACTIONS

Four classes of emergency action levels will be utilized. These classes are: (1) unusual event (2) emergency alert, (3) site area emergency, and (4) general emergency. The description of these classes and RL's

interpretation as applicable to the Hanford Site, along with the expected response actions of RL and the Counties relative to each class, are as follows:

1. Unusual Event

   This class is described as an unusual event in process or having occurred which indicates a potential reduction of the level of safety of the plant. No releases of radioactive material requiring offsite response or monitoring are expected unless further reduction of the safety system occurs.

   The event involves conditions with little or no potential for offsite release of radioactive material. Events which fall into this category may include a significant unusual occurrence or other event with potential for public interest.

   The purpose of the notification by RL to the Counties is to assure that the first step in any response later found to be necessary has been carried out and to provide current information on unusual events. RL will inform Benton County promptly of the nature of the unusual condition and close out with verbal summary within 24 hours after conclusion of event or escalate the event to a more severe class. Benton County will notify Franklin County.

2. Alert

   This class is described as an event in process or having occurred which involves an actual or potential substantial reduction of the level of safety of the plant.

   This event involves conditions where limited releases of radioactivity might occur which could produce a whole body dose rate at the site boundary equal to or greater than .5 mR/hr., but not greater than 50 mR/hr.

   The purpose of the notification of the alert by RL to the Counties is to assure that emergency personnel are readily available to respond if the situation becomes more serious or to perform confirmatory radiation monitoring, if required, and provide current status information.

   RL will:

   - Promptly inform the Benton County Emergency Dispatch Center of the emergency alert status.
   - Activate its emergency control center and press center.

- Dispatch onsite monitoring teams and their associated communications.

- Provide continual status updates to the Benton and Franklin Counties Emergency Operations Center (EOC), at least every 15 minutes.

- Provide periodic meteorological assessments to the Benton and Franklin Counties EOC, and, if any releases are occurring, dose estimates for actual releases.

- Activate the Unified Dose Assessment Center, perform offsite monitoring and evaluation, and provide information to the Benton and Franklin Counties EOC until the State of Washington monitoring team is activated, operating, and assumes responsibility.

- Close out by verbal summary within eight hours after conclusion of event or, if appropriate, escalate to a more severe class.

When notified by RL, Benton County will:

- Notify the Franklin County Emergency Dispatch Center.

- Activate its emergency operations center.

- Provide liaison between RL and Franklin County in coordinating the required actions by Franklin County.

- Alert to standby status key emergency personnel.

- Maintain alert status until verbal closeout or the event is escalated to a more severe class.

When notified by the Benton County Emergency Dispatch Center, Franklin County will:

- Coordinate necessary actions with Benton County.

- Alert to standby status key emergency personnel.

- Maintain alert status until verbal closeout or the event is escalated to a more severe class.

3. Site Area Emergency

This class is described as an event in process or having occurred which involves actual or likely major failures of plant functions needed for protection of the public.

Such an event involves conditions where significant releases of radioactivity are likely or are occurring which could result in a whole body exposure rate at the site boundary equal to or greater than 50 mR/hr. The projected dose at the site boundary must not exceed a 1 rem whole body dose or the event will qualify as a General Emergency.

A Site Area Emergency may be declared as a result of either of the following:

1. If it is obvious from the start that the event is going to be a Site Emergency.

2. As information on the event becomes clearer, it becomes obvious the event is going to develop into a Site Area Emergency.

4. General Emergency

This class is described as an event in process or having occurred which involves actual or imminent substantial reduction of plant safety systems.

The event involves actual or imminent significant release of radioactive material to the offsite environment which could result in a dose equal to or exceeding 1 rem whole body or 5 rem thyroid. If, during or at the beginning of an event, there is imminent danger to the public, a General Emergency would be identified and immediate notifications would be made requesting immediate response actions.

The purpose of the Site Area and General Emergency notification by RL to the Counties is to (1) initiate predetermined protective actions for the public, (2) provide continuous assessment of information from RL and offsite measurements, (3) initiate additional measures as indicated by event release or potential release, and (4) provide current information for consultation with the Counties and the public.

For both a Site Area and General Emergency, RL will:

- Promptly notify the Benton County Emergency Dispatch Center of the emergency status and the reason for the emergency.

- Activate its emergency control center and press center.

- Dispatch onsite and offsite monitoring teams and their associated communications.

- Provide plant status updates at least every 15 minutes to the Benton and Franklin Counties EOC.

- Provide periodic press briefings.

- Provide technical and management consultation to the Benton and Franklin Counties EOC as required.

- Provide meteorological and dose estimates to the Benton and Franklin Counties EOC.

- Close out by verbal summary within eight hours after conclusion of event, or, if the site area emergency needs to be escalated to general emergency, so advise.

When notified by RL, Benton County will:

- Notify the Franklin County Emergency Dispatch Center.

- Provide liaison between RL and Franklin County for Franklin County's required actions.

- Provide immediate public notification about the emergency status and provide public updates.

- Activate its emergency operations center.

- Dispatch key emergency personnel.

- Continuously assess information obtained from RL, with regard to changes to the protective actions already initiated for public evacuation and/or sheltering.

- Provide a Public Information Officer at the Hanford Emergency Press Center.

- Maintain emergency status until closeout or reduction of emergency class.

When notified by the Benton County Emergency Dispatch Center, Franklin County will:

- Provide immediate public notification of the emergency status and provide public updates.

- Establish a joint Emergency Operations Center with Benton County.

- Dispatch key personnel.

- Maintain emergency status until closeout or reduction of emergency class.

IV. AREAS OF COOPERATION

- Notification

  The Benton County Emergency Dispatch Center will be the single point of contact for notification to Benton and Franklin Counties. Notification will be based upon the emergency action levels described above. Authentication of the notification call to the Counties will be effected by a return call to RL.

- Radiation Control and Meteorology Data

  Communications and liaison of dose assessments and current status about meteorological and radiological conditions will be accomplished through the RL Emergency Control Center. This information will be provided to the Benton and Franklin Counties EOC via the Unified Dose Assessment Center.

- Recovery Period

  RL will provide assistance during post-accident periods to minimize radiation health hazards and decontamination problems to the State's Washington Fixed Nuclear Facility Reentry and Recovery Task Force, of which the counties are a member.

- Training and Exercises

  RL and the Counties will conduct an annual emergency response exercise designed to assess emergency response capabilities and provide needed training. Cooperative arrangements for such exercises and training will be agreed to in advance.

- Public Affairs

  At the request of the Counties, RL will assist the Counties in the development of educational materials concerning radiation and its hazards and information regarding appropriate actions to be taken by the general public in the event of an accident involving radioactive materials.

- Warning to the Public

  The Counties, with support from RL, will implement protective measures for the emergency planning zone around the Hanford Site.

- Emergency Public Information

  During an emergency, preliminary media releases from RL and from the Counties will be coordinated. For a Site Area or General Emergency, RL will activate the joint Hanford Emergency Press Center, and the Counties and RL spokespersons will jointly prepare and release information statements from that location.

V. TERMS OF AGREEMENT

This agreement will become effective upon signature and continue until cancelled by either party by written notice to the other. Amendments or modification to this Agreement may be made upon written agreement by both parties to the Agreement.

APPROVED FOR BENTON COUNTY, STATE OF WASHINGTON:

_____ 10-1-84
Date

APPROVED AS TO FORM:

_____ 9-26-84
Deputy Prosecuting Attorney Date

APPROVED FOR FRANKLIN COUNTY, STATE OF WASHINGTON:

_____ 10-11-84
Date

APPROVED FOR THE DEPARTMENT OF ENERGY
RICHLAND OPERATIONS OFFICE:

_____ 8/27/84
Michael J. Lawrence, Manager Date

(THIS PAGE INTENTIONALLY LEFT BLANK)

Department of Energy
Richland Operations Office
P.O. Box 550
Richland, Washington 99352

April 7, 1982

Mr. Don Goodwin, Chairman
Board of County Commissioners
Grant County Courthouse
Ephrata, Washington 98823

Dear Mr. Goodwin:

RADIOLOGICAL EMERGENCY PLANNING AND RESPONSE

The purpose of this letter is to establish a framework of cooperation between the Department of Energy, Richland Operations Office (RL), and Grant County, in the planning for and response to emergencies at the Hanford Site which might have consequences in Grant County.

RL is responsible for responding to all emergencies contained within the federally operated facilities located within the Hanford Site boundary. Accident analyses conducted at Hanford indicate that we do not have an accident potential that would require anything more than a notification to the residents living in Grant County within ten miles of the Department of Energy's N Reactor. We do not anticipate an accident that would require evacuation. However, in the unlikely event of a Hanford emergency that would have health implications in Grant County, we would like to formalize a response plan with you.

The plume exposure pathway emergency planning zone for N Reactor is 4.5 miles which does not extend beyond the Hanford Site. In order to be compatible with other public utilities at Hanford, we are adopting a contingency planning zone within ten miles of the N Reactor which does extend into Grant County.

RL will provide support and assistance to Grant County in the preparation and implementation of emergency response affecting Grant County by coordinating the activities of federal agencies which are parties to the Federal Radiological Assistance Response and Monitoring Program; assisting in radiological monitoring and decontamination, radiation exposure evaluation, and radiation health hazards assessment; providing medical advice on emergency treatment of persons exposed to radiation and technical advice on radioactive contamination, including protective response recommendations; and coordinating with your Department of Emergency Services in the development of plans for coping with radiological incidents occurring on the Hanford Site.

Four classes of emergency action levels have been adopted: Unusual Event, Alert, Site Emergency, and General Emergency. It is expected that we would provide notification only to you for the unusual event and alert categories, and would provide protective response recommendations, if appropriate, for the site and general emergency categories.

For a site or general emergency category, we are prepared to send a representative to the Grant County Emergency Operations Center for advice and consultation. We would provide information to you as it develops for your public notification and appropriate protective response measures.

To assist in the notification to the residents living within the contingency planning zone of the N Reactor, RL will provide tone activated radios which may be used in conjunction with your activation of the emergency broadcast system. We will rely upon the Grant County Sheriff's Department to provide any required evacuation and law enforcement control for the residents of Grant County.

RL will conduct an annual emergency response exercise designed to assess emergency response capabilities and provide needed training. Cooperative arrangements for such exercises and training will be agreed to in advance.

RL will assist in the development of educational materials concerning radiation and its hazards and information regarding appropriate actions to be taken by the residents of Grant County within the contingency emergency planning zone in the event of an emergency involving radioactive materials.

RL will be responsible for preparing an initial press release. The press release will be coordinated with Grant County before issuance to the media unless circumstances make this an impossibility. Grant County is invited to send a media liaison to the Hanford Press Center in Richland for issuances of releases and press briefings. It is expected that all subsequent releases of information will be coordinated between RL and Grant County.

If these arrangements meet with your approval, I would appreciate your signing and returning one copy of this letter.

We look forward to our continued good working relationships with your Department of Emergency Services.

Very truly yours,

Jack L. Rhoades, Assistant Manager
for Safety, Security and Quality
Assurance

SQA:PHT

APPROVED: Don Goodwin
Don Goodwin, Chairman
Board of County Commissioners
Grant County

MEMORANDUM OF UNDERSTANDING

BETWEEN

WASHINGTON PUBLIC POWER SUPPLY SYSTEM

AND

DEPARTMENT OF ENERGY

RICHLAND OPERATIONS OFFICE

EMERGENCY PREPAREDNESS AND RESPONSE

I. BACKGOUND AND PURPOSE

This memorandum of understanding reaffirms the established framework of cooperation between the Washington Public Power Supply System (Supply System) and the Department of Energy, Richland Operations Office (RL), in the planning for and response to emergencies at the Hanford Site.

II. RESPONSIBILITIES

RL is responsible for direction and overview for all emergency response actions required within the Hanford Site, excluding the nonfederally operated facilities. RL will provide required assistance to the Supply System from the Supply System site boundary to the Hanford Site boundary.

III. AREAS OF COOPERATION

Notification - Both parties are responsible for providing prompt notification to the other in the event of an emergency impacting the other's facilities or operations.

Because of the proximity of the Fast Flux Test Facility, and associated facilities in the 400 Area, special arrangements concerning notification are established. This notification will be necessary in the event of a potential event which could affect the other facility and should include recommendations for protective measures. Each facility shall maintain provisions in their respective emergency procedures to ensure direct and timely notification of the adjacent facility.

Traffic Control - RL will provide control of the Hanford Site highway and rail traffic in the event of a major emergency at the Supply System. Traffic control will be initiated through notification to the Hanford Patrol Emergency Office (PEO).

Communications Equipment - The Supply System will use existing RL communications systems through the PEO contact for emergency communications between the Supply System and DOE. The Supply System will continue to provide emergency communications capability in the form of shortwave

radio and telephone links between the PEO, county offices, Supply System facilities for coordination of emergency response activities outside of the Supply System site. Use of the PEO contact by the Supply System will be limited to activities associated with emergency preparedness.

The Supply System has installed and will continue to maintain a tone-controlled transceiver in the PEO, Federal Building, at no expense to the U. S. Government, to be operated on the same frequency as the other radios designated for the Supply System emergency system. This radio can be utilized by either party for notification purposes. RL, through the PEO, will participate in periodic testing, as necessary, to assure operation of the transceiver and meet any regulatory requirement for this function.

Emergency Decontamination Center - The Supply System will continue to include the Emergency Decontamination Center (EDC) as a resource for its emergency planning effort. RL will be reimbursed on a full cost recovery basis for use of the EDC.

Emergency Facilities and Equipment - Mutual assistance, as needed, will be provided in the use of facilities and equipment for personnel decontamination, first aid, evacuation reassembly areas, respiratory protective equipment, protective clothing, vehicles, including ambulances, survey instruments, and resources for river evacuation.

Radiation Control and Meteorology Data - In addition to the provisions contained within the Federal Assistance Radiological Program Agreement among RL, the Supply System, and the State of Washington, environmental and meteorology data, and radiological release evaluation data will be exchanged. Field monitoring teams, dose assessment assistance and aerial monitoring will be provided as needed. If the emergency is in an RL facility or outside the Supply System fence boundary, RL will have primary dose assessment and associated protective measure responsibility. If the emergency originates at the Supply System, the Supply System will have primary responsibility for the dose assessment and associated protective measure responsibilities. In either case, each respective party will provide a liaison representative at the primary assessment center.

Training and Exercises - Cooperative arrangements for exercises and training will be agreed to in advance.

Public Information - In cooperation with the Counties, RL and the Supply System will jointly assist the Counties in the development of educational materials concerning radiation and its hazards and information regarding appropriate actions to be taken by the general public in the event of an accident involving radioactive materials.

Media - If the emergency originates on the Hanford Site, outside the Supply System site boundary, RL will have primary media responsibility. If the emergency originates at the Supply System, the Supply System will have the primary media responsibility.

VI. TERMS OF AGREEMENT

The specific areas of assistance, as defined above, will be provided based upon availability, and are limited to those emergency actions necessary to protect onsite personnel, the public health and safety and the environment in the event of a major emergency at the Hanford Site.

This agreement will become effective upon signature and it will continue until it is cancelled by either party by written notice to the other party. This agreement may be amended or modified only upon written agreement by both parties to the agreement.

APPROVED FOR THE DEPARTMENT OF ENERGY - RICHLAND OPERATIONS OFFICE:

Alex G. Fremling, Manager — December 27, 1982
Date

APPROVED FOR THE WASHINGTON PUBLIC POWER SUPPLY SYSTEM:

R. L. Ferguson, Managing Director — December 8, 1982
Date

(THIS PAGE INTENTIONALLY LEFT BLANK)

DEPARTMENT OF TRANSPORTATION
FEDERAL AVIATION ADMINISTRATION

SEATTLE AIR ROUTE TRAFFIC CONTROL CENTER
3101 Auburn Way South
Auburn, Washington 98002

AUG 2 8 1990

Ms. Pat Turner
Emergency Preparedness Coordinator
United States Dept. of Energy
P.O. Box 550
Richland, Washington 99352

Dear Ms. Turner:

This letter is in response to your request during our conversation regarding development of an emergency response plan for the Hanford Plant near Richland, Washington.

When notified, we will establish flight restrictions within a 10 NM radius of the Pasco VORTAC 298 radial 26 NM fix (the center of the Hanford site) at altitudes 10,000 feet mean sea level and below. We have described the above area based upon your request and to meet NOTAM requirements. These dimensions may be adjusted as you determine appropriate. Seattle Center supervisors and other FAA facilities concerned will be briefed on this matter and a copy of this correspondence will be maintained in our operations area so as to expedite the initial coordination process.

The Notice to Airmen that we originate would designate Walla Walla Flight Service Station as the coordination facility. Walla Walla FSS would serve as the primary communications facility for coordination between your department, disaster control authorities and affected aircraft once the restrictions have been established. Walla Walla FSS's telephone number is FTS 442-5422.

Seattle Center will control aircraft under our jurisdiction to avoid the designated airspace. Any flights associated with your operation may be flown within the established restricted area at your discretion. It may be beneficial, however, that these flights be in direct radio communication with and under the radar surveillance of Seattle Center. Radio frequencies for this service are 132.6 or 125.0.

To establish flight restrictions we request you take the following actions:

1. Notify the Seattle Center Assistant Chief on duty.

   a. Emergency Phone Number - (206) 833-6814. Note: This number is answered by the supervisor in charge and is a recorded line.

b. Additional Phone Numbers Through Our Switchboard

FTS 396-5251, Extension 222 (Changing to 390-1222 on 9/15/80)

(206) 833-6800, Extension 222

(206) 767-2540, Extension 222

c. Back-up Notification Method - Contact Walla Walla FSS Supervisor.

2. Name and organization making the request. Provide phone number for call-back and verification.

3. Briefly describe the situation.

4. Define the airspace requested and duration, if known.

5. Additional information such as radio call signs of sampling aircraft. Your approval of other flights to enter or depart may be coordinated at a later time.

Please contact our office at Seattle Center, (206) 833-6800, extension 242 or 244, if you have further questions or need additional information.

WILLIAM T. ABERNATHY
Chief, Seattle Center

Department of Energy
Richland Operations Office
P.O. Box 550
Richland, Washington 99352

JAN 25 1985

Mr. Herbert P. Benner, Chief
Meteorological Services Division
National Weather Service
Western Regional Headquarters
P. O. Box 11188, Federal Building
Salt Lake City, Utah 84147

Dear Mr. Benner:

EMERGENCY PREPAREDNESS AND PLANNING

The purpose of this letter is to establish an agreement between the Department of Energy, Richland Operations Office (DOE-RL) and the National Weather Service (NWS), Washington area. The agreement would define responsibilities in planning and preparedness for and response to emergencies at the Hanford Site. The contents of this agreement have been discussed by R. J. Hutcheon, NWS, and D. R. Elle, DOE-RL.

In large part, this agreement represents a formalization of activities that are already ongoing. The following conditions would be applicable to this agreement.

The Department of Energy will provide to the National Weather Service:

1) Notification of emergencies occurring on the Hanford Site upon activation of the DOE Emergency Control Center.

2) Meteorological information including routine hourly surface observations and special observations via AFOS. This information will be provided by the Hanford Meteorology Station operated by the Pacific Northwest Laboratory. In the event of emergencies on the Hanford Site, hourly observations will be supplemented (in the Remarks Section) with observations from the telemetry station on Rattlesnake Mountain (Station #20) and from other reporting stations as necessary. These supplemental observations will consist of station number, wind speed and wind direction. Wind speed and direction will be reported in accordance with Federal Meteorological Handbook No. 1 (Surface Observations). (Special observations may be omitted when the forecaster's workload is such that other duties take precedence.)

The National Weather Service will provide to the Department of Energy:

1) Names, 24-hour telephone numbers, locations and areas of responsibility of NWS offices that may be involved with unusual events, incidents or emergencies on the Hanford Site.

2) Synoptic scale weather information and forecasts in support of activities to mitigate unusual events, incidents or emergencies on the Hanford Site.

The provisions in this letter are believed to be responsive to the needs identified by both DOE-RL and the NWS. This agreement may be terminated by either party upon thirty days written notice to the other party. If these arrangements meet with your approval, please sign and return one copy of this letter.

Sincerely,

Michael J. Lawrence

Michael J. Lawrence
Manager

SQA:DRE

APPROVED:

J. Mark Fair
Acting ~~Herbert P. Benner~~, Chief
Meteorological Services Division

Jan. 29, 1985
Date

Department of Energy
Richland Operations Office
P.O. Box 550
Richland, Washington 99352

OCT 0 1 1984

Mr. Willis Bultje, Administrator
Our Lady of Lourdes Hospital
520 North 4th
Pasco, Washington 99301

Dear Mr. Bultje:

As discussed with you on September 20, 1984, the Richland Operations Office of The Department of Energy (DOE) would like to renew the July 3, 1975, agreement with Our Lady of Lourdes Hospital. This agreement provides assurance that in the event of a major radiation accident involving personnel of DOE and its Hanford contractors or subcontractors, the persons affected will be admitted to your facility for appropriate care.

As previously stated, the following conditions will be applicable to the agreement:

1. DOE will provide health physics services and available supporting assistance as requested by Our Lady of Lourdes or the attending physician.

2. The responsibilities of Our Lady of Lourdes will be limited to activities performed at the hospital.

3. Our Lady of Lourdes has the right to limit admission of such patients to those numbers as can be properly handled.

4. Our Lady of Lourdes would serve as one of the backup facilities to DOE's emergency decontamination center in Richland.

5. These arrangements may be terminated by Our Lady of Lourdes or by DOE upon written notice to the other, which notice shall not become effective within less than 30 days after the date thereof.

If these arrangements meet with your approval, I will appreciate your signing and returning one copy of this letter.

Thank you for your consideration.

Sincerely,

Michael J. Lawrence

Michael J. Lawrence
Manager

SQA:KAB

APPROVED:

BY

Title

Date October 3, 1984

Department of Energy
Richland Operations Office
P.O. Box 550
Richland, Washington 99352

OCT 0 1 1984

Mr. Jon Davis, Acting Administrator
Kadlec Hospital
888 Swift Boulevard
Richland, Washington 99352

Dear Mr. Davis:

As discussed with you on September 19, 1984, the Richland Operations Office of The Department of Energy (DOE) would like to renew the July 3, 1975, agreement with Kadlec Hospital. This agreement provides assurance, subject to the conditions noted below, that in the event of a radiation accident involving personnel of DOE, its Hanford contractors or subcontractors, the persons affected will be admitted to Kadlec Hospital for appropriate care.

We would also like to confirm our understanding that Kadlec Hospital (Kadlec) will, within the extent of its capability, provide necessary personnel and equipment to care for patients in the Hanford Emergency Decontamination Center (EDC). The following conditions would be applicable to these arrangements.

1. Patients will be admitted by a physician who has staff privileges at Kadlec.

2. DOE will provide health physics services and available supporting assistance as requested by Kadlec or the attending physician.

3. The responsibilities of Kadlec will be limited to activities performed at the hospital and at the EDC.

4. Kadlec has the right to limit admission of such patients to those numbers as can be properly handled.

5. These arrangements may be terminated by Kadlec or by DOE upon written notice to the other, which notice shall not become effective within less than 30 days after the date thereof.

If these arrangements meet with your approval, I will appreciate your signing and returning one copy of this letter.

Thank you for your consideration.

Sincerely,

Michael J. Lawrence

Michael J. Lawrence
Manager

SQA:KAB

APPROVED:

BY Jon R. Davis

Title Acting Administrator

Date 10/8/84

Department of Energy
Richland Operations Office
P.O. Box 550
Richland, Washington 99352

OCT 0 1 1984

Mr. Michael R. Fraser, Administrator
Kennewick General Hospital
900 South Auburn
Kennewick, Washington 99336

Dear Mr. Fraser:

As discussed with you on September 19, 1984, the Richland Operations Office of The Department of Energy (DOE) would like to renew the July 3, 1975, agreement with Kennewick General Hospital. This agreement provides assurance that in the event of a major radiation accident involving personnel of DOE and its Hanford contractors or subcontractors, the persons affected will be admitted to your facility for appropriate care.

As previously stated, the following conditions will be applicable to the agreement:

1. DOE will provide health physics services and available supporting assistance as requested by Kennewick General or the attending physician.

2. The responsibilities of Kennewick General will be limited to activities performed at the hospital.

3. Kennewick General has the right to limit admission of such patients to those numbers as can be properly handled.

4. Kennewick General would serve as one of the backup facilities to DOE's emergency decontamination center in Richland.

5. These arrangements may be terminated by Kennewick General or by DOE upon written notice to the other, which notice shall not become effective within less than 30 days after the date thereof.

If these arrangements meet with your approval, I will appreciate your signing and returning one copy of this letter.

Thank you for your consideration.

Sincerely,

Michael J. Lawrence

Michael J. Lawrence
Manager

SQA:KAB

APPROVED:

BY Michael K. Fraser

Title Administrator

Date Oct 8, 1984

MEMORANDUM OF UNDERSTANDING

AMONG

U. S. DEPARTMENT OF TRANSPORTATION, COAST GUARD

AND

U. S. DEPARTMENT OF ENERGY, RICHLAND OPERATIONS OFFICE
WASHINGTON PUBLIC POWER SUPPLY SYSTEM
BENTON COUNTY, WASHINGTON

I. BACKGROUND AND PURPOSE

This memorandum of understanding establishes a framework of cooperation among the U. S. Department of Transportation, Coast Guard, and the U. S. Department of Energy, Richland Operations Office, the Washington Public Power Supply System, and Benton County, Washington in the planning for and response to radiological emergencies within the Hanford Site which may have consequences extending to the Columbia River.

II. REQUIREMENTS

The Department of Energy's Richland Operations Office (RL) has the primary responsibility for responding to all radiological emergencies generated within its facilities and contained within the Hanford Site boundaries. The Washington Public Power Supply System (Supply System) has the primary responsibility for responding to all radiological emergencies generated within its facilities. Benton and Franklin Counties are responsible for the safety of persons, property, and the environment outside the Hanford Site boundaries within their respective jurisdictional areas. The Coast Guard, Captain of the Port, Portland, Oregon is responsible for the safety of persons, property and environment in those navigable waters and their immediately adjacent shorelines, up to the high water mark, within his jurisdiction (33 CFR 165). The waters and the immediately adjacent shorelines to the DOE Hanford Site are a part of this jurisdiction.

III. EMERGENCY CLASSIFICATIONS, NOTIFICATION AND EXECUTION

Four classifications of emergencies will be utilized: unusual event, alert, site area emergency, and general emergency. The description of these classifications and the expected response actions are as follows:

Unusual Event - An event in process or having occurred which indicates a potential reduction of the level of safety of a facility. No releases of radioactive material requiring Coast Guard response are expected in an unusual event, therefore, no notification will be provided to the Coast Guard.

Alert - An event in process or having occurred which involves an actual or potential substantial reduction in the level of safety of a facility.

Site Area Emergency - An event in process or having occurred which involves actual or likely major failures of those facility functions needed for the protection of the public.

General Emergency - An event in process or having occurred which involves actual or imminent substantial reduction of facility safety systems.

RL or the Supply System, whichever has the emergency, will notify the Officer of the Day, Coast Guard, Kennewick Station by telepone of the alert, site area, or general emergency. Radio notification to Kennewick Station will be used as an alternate means of communication (157.1 mhz). Based upon the recommendation of RL or Supply System, the Coast Guard will establish a safety zone on the Columbia River and adjoining shoreline up to the high water mark and coordinate an evacuation of the river. The Coast Guard will provide call back verification.

RL will provide during a Hanford site area or general emergency:

- One Hanford Patrol boat, boat operator, and radiation monitor at the Old Hanford Townsite boat ramp to cooperate with the Coast Guard in its response.
- A Patrolman at Vernita Bridge to prevent launching of rafts, canoes, etc.
- Protective clothing and dosimeters for Coast Guard personnel, if required.
- Assistance in conducting surveys and decontamination operations of boats until the Washington State RADCON teams arrive. Decontamination locations will be at Leslie Groves Park and/or the boat ramps near the Old Hanford Townsite or Vernita Bridge, as appropriate.

The Supply System will provide during a Hanford site area or general emergency:

- Helicopter transportation, if available, for Coast Guard personnel from the Kennewick Station to the Old Hanford Townsite boat ramp.
- Protective clothing and dosimeters for Coast Guard personnel, if required.
- Assistance in conducting surveys and decontamination operations of boats, until the Washington State RADCON teams arrive. Decontamination locations will be at Leslie Groves Park and/or the boat ramp near the Old Hanford Townsite, as appropriate.

The Coast Guard, Kennewick Station, and the Captain of the Port, Portland, Oregon contingent upon other operational priorities existing at the time of notification, will provide during a Hanford site area or general emergency:

- Coast Guard personnel to establish a safety zone based upon RL or the Supply System recommendation and coordinate evacuation of the river.
- Coast Guard personnel and equipment to patrol the safety zone and make appropriate radio broadcasts.
- Termination of the safety zone when the Captain of the Port, Portland, Oregon has been satisfied by appropriate authority that the danger no longer exists.

Benton County will provide during a Hanford site area or general emergency:

- Activation of the siren system, based upon a recommendation by RL or Supply System and broadcast over the emergency broadcast system network to evacuate the Columbia River.
- A Sheriff's boat (Benton County boat primary, Franklin County boat alternate), if available, to proceed upriver from the Kennewick Coast Guard Station with Coast Guard personnel, to the Old Hanford Townsite boat ramp.
- Transportation for a Coast Guard Petty Officer from the Kennewick Coast Guard Station to the Old Hanford Townsite boat ramp.
- A Richland policeman at Leslie Groves Park to assist in establishing the safety zone until the Coast Guard arrives.
- Support and assistance to the Coast Guard, as required.
- Arrangements with the Franklin County Sheriff for backup boat, if required.

IV. TRAINING AND EXERCISES

Radiological response training for Coast Guard personnel will be provided by RL. Annual refresher training will be provided.

A monthly communications exercise will be conducted, initiated by RL or the Supply System.

An annual exercise will be conducted to test notification and operational aspects of an emergency response.

V. TERM OF CONTRACT

This agreement will become effective upon signature and continue until cancelled by any one or more parties by written notice to the other parties. Amendments or modification to this Agreement shall be in writing and signed by all parties to the Agreement.

APPROVED FOR THE U. S. COAST GUARD:

Captain of the Port, Portland, Oregon

Date 21 May 1982

APPROVED FOR THE WASHINGTON PUBLIC POWER SUPPLY SYSTEM:

W. T. Taylor

Health and Safety Programs Manager

Date June 2, 1982

APPROVED FOR BENTON COUNTY, STATE OF WASHINGTON:

Paulette H. Vozzalensky

Director, Emergency Services

Date 3 June 1982

R. L. Rupp

Sheriff

Date June 10, 1982

APPROVED FOR THE DEPARTMENT OF ENERGY, RICHLAND OPERATIONS OFFICE:

Manager

Date June 17, 1982

MEMORANDUM OF UNDERSTANDING
BETWEEN
STATE OF WASHINGTON
STATE OF OREGON
WASHINGTON PUBLIC POWER SUPPLY SYSTEM
AND
U.S. DEPARTMENT OF ENERGY
RICHLAND OPERATIONS OFFICE

RADIOLOGICAL ASSISTANCE RESPONSE

I. BACKGROUND AND PURPOSE

The Memorandum of Understanding establishes a framework of cooperation between the Washington Public Power Supply System (the Supply System), and the State of Oregon and Washington, and the Department of Energy, Richland Operations Office (DOE-RL), in the planning for and provision and/or coordination of Federal emergency radiological assistance, if required, in the event of an accident at the Supply System's Nuclear Power Plant(s) located near Richland, Washington.

The Federal Radiological Monitoring and Assessment Plan (FRMAP) provides for coordination between signatory Federal Agencies and for the coordination among Federal, State, and local resources in the event that multiagency radiological emergency action is needed to protect public health and safety after the occurrence of a radiological incident. The FRMAP provides for DOE-RL administration, coordination, and implementation of Federal radiological assistance to State government.

The parties hereto desire to implement the provisions of the FRMAP with respect to the Supply System's nuclear plant(s) near Richland, Washington. DOE-RL will coordinate Federal radiological assistance furnished to the Supply System and States of Oregon and Washington, in accordance with the Federal Radiological Monitoring and Assessment Plan.

II. RESPONSIBILITIES

To the extent available, the Department of Energy's Richland Operations Office will provide or arrange for emergency radiological assistance in the following four categories:

1. Field Monitoring - Provide two-person teams, as required, sustainable for a 24-hour-a-day operation.

2. Dose Assessment Assistance - Consisting of personnel with expertise in the following areas:

   - Plume Radiation Monitoring
   - Ingestion Pathways Radiation Exposures
   - Emergency Worker Radiation Control (exposure evaluation)

3. Aerial Monitoring System (AMS)

4. Other technical support as requested by the Supply System and the States of Oregon and Washington, and as available through FRMAP. DOE-RL will provide to the parties of the agreement the DOE-RL FRMAP plan, procedures, and lists of available resources, support, etc.

III. NOTIFICATION OF PROCEDURES

The State of Washington delegates to the Supply System the responsibility to notify DOE-RL of an emergency at a Supply System nuclear plant in the interest of public safety.

The Supply System will notify DOE-RL of a radiological emergency at its nuclear plant(s). Upon verification of the information by telephone, DOE-RL will maintain a state of readiness to deploy resources (standby) or activate its teams and provide assistance in the following emergency classifications:

Type of Assistance	Emergency Alert	Site Emergency	General Emergency
Field Monitoring	Standby/Activation	Standby/Activation	Activation
Dose Assessment Assistance	Standby	Standby/Activation	Activation
Aerial Monitoring	Standby	Standby/Activation	Activation
Other Technical Support	Standby	Standby/Activation	Activation

IV. RESPONSE TIMES

Upon notification and subject to availability of personnel and equipment, DOE-RL will alert and notify its emergency response teams who will be directed to report to predetermined locations as soon as possible. Field monitoring teams, as required, will be furnished to the Supply System, Emergency Operations Facility (EOF), within 1 to 2 hours. In addition, DOE-RL will provide or secure other services as requested and as available as provided in the FRMAP as soon as possible.

V. CONCEPT OF OPERATIONS

DOE-RL will coordinate the Federal radiological assistance response by maintaining liaison with the Supply System EOF. DOE-RL response shall be in accordance with the DOE-RL Region 8 Radiological Assistance Plan and the FRMAP agreement. The Oregon and Washington representatives together with DOE-RL and the Supply System will jointly coordinate and direct field monitoring and dose assessment. The following areas of responsibility are defined as:

Supply System - from the plant(s) to the exclusion boundary

DOE-RL - from the exclusion boundary to the Hanford Site boundary

State of Washington - from the Hanford Site boundary to State's border

State of Oregon - from the Washington/Oregon border to areas within Oregon

The senior Washington State DSHS representative present at the Supply System EOF will be in charge of all dose assessment activities off the Hanford Site.

This will include the formulation of protective action recommendations to the general population. The senior Oregon State representative present at the Supply System EOF will be in charge of coordinating any offsite dose assessment and monitoring activities conducted within the State of Oregon. These agencies agree to immediate exchange of all dose assessment and field monitoring information so that expeditious decisions can be made on necessary protective actions within the areas of responsibility defined above. Prior to the arrival of DSHS representatives at the Supply System EOF, the Supply System shall be responsible for making initial dose assessments and protective action recommendations to local officials. Field monitoring personnel supplied by DOE-RL shall, to the extent possible, be equipped with their own radiation field monitoring equipment which shall be compatible with equipment used by the Supply System and the States of Oregon and Washington field teams. DOE-RL will work with the Supply System and the States of Oregon and Washington to develop standard operating procedures for communications and field monitoring, including calibration of field instruments. The Supply System will make available a dedicated telephone at its EOF for communication to DOE-RL.

VI. DRILLS AND EXERCISES

DOE-RL will participate at its own expense in drills and exercises at the Supply System Nuclear Plant(s) at the request of the Supply System and States of Washington and Oregon. It is not anticipated that a full response will be required more often than once every three years. DOE-RL may exercise portions of its emergency response capabilities at its discretion on a more frequent basis.

VII. TERM OF AGREEMENT

This Agreement will become effective upon signature and continue until cancelled by any party by written notice to the others. Amendments or modifications to this Agreement may be made upon written agreement by all parties to the Agreement.

DOE-RL radiological assistance is limited to those emergency actions necessary to protect people from unnecessary radiation exposure, to minimize injury, and to reduce the accidental contamination of the environment from radioactive material. As soon as the immediate hazards are brought under control, and there is reasonable assurance that the public health and safety are being protected, DOE-RL emergency radiological assistance will be terminated and other assistance will be provided as required and agreed upon by the parties of this Agreement.

The parties hereto have executed this agreement this eleventh day of June, 1981.

Governor John D. Spellman
State of Washington

Governor Victor W. Atiyeh
State of Oregon

Robert L. Ferguson, Manager
Washington Public Power Supply System

Alex G. Fremling, Manager
Richland Operations Office
Department of Energy

Approved as to Form

SECTION H
PERSONNEL TRAINING

The information contained in this section outlines the Personnel Training Program for Rockwell Hanford Operations (Rockwell) Hazardous Waste Management Program (HWMP) in accordance with the requirements of the WAC-173-303-330 and 40 CFR 264 and 270. Any new information or corrections to this section will be furnished when available.

H-1 OUTLINE OF TRAINING PROGRAM

The Rockwell Industrial Hygiene and Safety (IH&S) Department, in cooperation with the Employee and Organization Development (E&OD) Department is responsible for the development and administration of the comprehensive training program for persons involved in the HWMP. The Staff Hazardous Waste Engineer from the IH&S Department shall be the certified instructor conducting all training. A training manual will be developed by the IH&S Department within the next year and maintained by the E&OD Department, which will detail the following training program elements:

A. Rockwell policies and standards concerning hiring criteria, job specifications, position descriptions, and performance standards.

B. Organization of the HWMP.

C. General health, safety, and environmental policy pertaining to HWMP personnel.

D. A description of the training module, course content, test methods, and training methods which will be utilized.

E. A general description of the treatment, storage, and disposal (TSD) facilities and procedures

F. Emergency response procedures and implementation of the contingency plan.

G. Training administration and record keeping procedures.

H. See Appendix H-1, "Training Outline".

H-1a Introductory Training By Job Title and Duties

The Staff Hazardous Waste Engineer from the IH&S Department will direct new employees so that successful completion of introductory training will be accomplished during the first six months of employment. New employees will not work unsupervised until introductory training is complete. Introductory classroom and on-the-job training will be provided for each position described. The training course/job descriptions matrix depicted in Figure H-1 outline how the various modules will be covered for each job title.

A. See Appendix H-2, "Job Titles & Descriptions".

B. Continuing Training - The Staff Hazardous Waste Engineer will provide additional/recurring training on a yearly, recertification basis. This will consist of an annual recertification exam for each job description listed in Appendix H-2. New modules not directly related to a job description may also be presented in order to provide additional background and/or cross training. These course modules will be offered, at a minimum, on a quarterly basis, or as the need arises.

H-1b Training Content, Frequency, and Techniques

Training and required courses of study will be divided into modules which are specific to appropriate training topics. Fourteen modules will be provided, and offered on a quarterly or as-needed basis. A description of each module follows:

A. Module One

Title: Introduction to the Hazardous Waste Management Program

Time: Three hours

Method: Lecture/Question and Answer

Conducted By: Staff Hazardous Waste Engineer

Course Content:

1. Description of HWMP organization
2. Review job descriptions of individuals within the program
3. Performance standards
4. General health, safety, and environmental policies which govern all aspects of the program
5. General description of the authority and regulations of government agencies which interface with the HWMP, including WDOE, USDOE, USEPA, and OSHA
6. Training program requirements

7. General description of the Rockwell HWMP facilities and associated operations

Reading Assignment: Read the training manual, EPA and WDOE permits, and review the Part A permit application.

A. Module Two

Title: Tour of HWMP Facilities

Time: Two hours

Method: Tour/Lecture/Question and Answer

Conducted By: Staff Hazardous Waste Engineer

Course Content:

1. Locate the work station of the emergency dispatcher
2. Tour the fire department (Emergency Response Vehicle/Storage area)
3. Tour the Hazardous Waste storage building (2727-S)
4. Tour the waste analysis laboratory
5. Tour the Hanford Site and locate principal Rockwell waste generation points
6. Tour the central landfill and familiarize with layout/operations

Reading Assignment: Study schematic and topographic maps of the Hanford Site.

C. Module Three

Title: General Aspects of Handling, Storage, Treatment, and Transportation of Hazardous Wastes

Time: Four hours

Method: Lecture/On-the-Job Training (OJT)

Conducted By: Staff Hazardous Waste Engineer/Involved Managers

Course Content:

1. Recognition of potential chemical hazards
2. Comprehension of chemical hazards associated with waste materials including toxicology and health effects
3. Basic concepts of the chemistry of hazardous materials
4. Classification of materials into categories which present similar health, safety, or environmental threats
5. Physical and chemical properties of materials in broad hazard classifications
6. General methods and procedures for handling, storing, treating, and disposing of wastes which mitigate the hazardous nature of various materials.

7. Location and use of reference materials which contain information relating to toxicology, chemical characteristics, recommended first aid procedures in the event of exposure, and recommended storage and handling procedures.

   Reading Assignment: Review NIOSH/OSHA publication - "Occupational Health Guidelines for Chemical Hazards."

   Evaluation: Administer written test

D. Module Four

Title: Concepts of the Chemistry of Hazardous Materials

Time: Four hours

Method: Lecture

Conducted By: Staff Hazardous Waste Engineer

Course Content:

1. Definitions of factors which cause materials to be hazardous:
   a. Toxic materials
   b. Reactive materials
   c. Materials which react to produce toxic hazards
   d. Explosives
   e. Environmental toxins and contaminants
   f. Corrosives/caustics
   g. Carcinogens, teratogens, mutagens
   h. Radioactive materials
2. Thermodynamic aspects of chemical reactions
3. Factors which influence reaction rates
4. Chemical equilibrium
5. Definitions of factors relating to fire and explosion hazards:
   a. Flash point
   b. Fire point
   c. Auto ignition point
   d. Upper and lower explosive limits
   e. Vapor density
   f. Ignition sources
   g. Flammability classification systems
6. Concepts of detonation and deflagration.
7. Boiling liquid expanding vapor explosion (BLEVE)
8. Classes of chemicals with potential explosive hazards:
   a. Nitrogen compounds
   b. Organic peroxides
9. Classes of toxic materials:
   a. Heavy metals
   b. Organic solvents
   c. Pesticides

d. Toxic gases

10. Definition of factors relating to corrosivity:

    a. pH, acidity, alkalinity
    b. Acid/base strength
    c. Neutralization
    d. Buffer systems

11. Definiton of factors relating to reactivity of wastes:

    a. Water reactive
    b. Air reactive
    c. Oxidation and reduction

12. Definition and explanation of factors relating to carcinogenicty, mutagenicity, and teratogenicity.

13. Definition and explanation of factors relating to radioactive hazards

14. Definition and explanation of factors relating to hazards associated with infectious materials

15. Administer written test.

E. Module Five

Title: Procedures for Handling, Storing, Treatment, Packaging, and Transportation of Wastes

Time: Four hours

Method: Lecture/Demonstration/OJT

Conducted By: Staff Hazardous Waste Engineer

Course Content:

1. Procedures for pickup and transportation of wastes from on-site generation points to the Hazardous Waste Storage Building (2727-S) and the Central Landfill.

2. Procedure for acquiring samples of wastes intended for analysis.

3. Description of record keeping and administrative procedures relating to waste pickup, analysis, transportation, and disposal.

4. Review of health, safety, and environmental policies relating to handling, storing, treatment, packaging, and transportation of wastes including brief risk assessment.

5. General description of policies relating to the use of personal protective equipment.

6. Concepts and procedures relating to chemical compatibility and container segregation.

7. Spill/release prevention, cleanup, and reporting.

8. Standards of primary container integrity and labeling.

9. Standards of secondary container integrity and labeling.

10. Utilization of space and layout of storage areas within the Hazardous Waste Storage Building (2727-S) and at the Central Landfill.
11. Methods of packing primary and secondary containers.
12. Spill prevention procedures, equipment, and cleanup.
13. Identification of possible routes of access by which contaminants could enter the environment.
14. Identification of methods by which materials could enter the body.
15. Methods by which materials may be neutralized prior to packaging and transportation.
16. Procedures for emplacement of waste at the Central Landfill.
17. Procedures for sealing and labeling containers intended for transportation to the disposal site (on and off the site).
18. Procedures for loading chemical transportation vehicles for shipment to the disposal site (on and off the site).
19. Administrative requirements related to transportation of wastes to the disposal site (on and off the site).
20. TSD facility inspection requirements.
21. Procedures for dealing with non-sudden releases (e.g., leakers).
22. Drum handling/forklift procedures overview.

Reading Assignment: Review pertinent section of Part A application and the Central Landfill Operations Manual.

Evaluation: Administer written exam. Observe trainees during participation in demonstrations.

F. Module Six

Title: Use of Personal Protective Equipment and Emergency Equipment Located at the HWMP Facilities

Time: Two hours

Method: Demonstration/Lecture/Tour/OJT

Conducted By: Industrial Hygienist, Hanford Fire Department Personnel, and Staff Hazardous Waste Engineer.

Course Content:

1. Policies and procedures concerning use of personal protective equipment including:
   a. Eye protection
   b. Face protection
   c. Hand protection/gloves
   d. Lab coats
   e. Protective footwear
   f. Encapsulation suits

2. Policies and procedures concerning use of self-contained breathing apparatus, filter masks, organic vapor masks, and dust cartridge respirators.
3. Location and contents of first aid kits.
4. Policies and procedures concerning use of bomb blanket (discussion of other resources available for handling suspected dangerous explosives).
5. Capabilities of "Acid King," "chemturion," "fyrepel," and "Tyvex" encapsulation suits. Policies and procedures governing utilization of encapsulation suits.
6. Location and use of portable fire extinguishers at HWMP facilities.
7. Location and use of fire alarms at HWMP facilities.
8. Utilization of over pack drums for spill/leak containment.
9. Utilization of absorbant pillows and/or other appropriate absorbant materials.
10. Overview of fire department equipment, capabilities, and general emergency response procedures.

Evaluation: Observation of trainees during participation in demonstrations.

G. Module Seven

Title: Emergency Procedures/Implementation of the Rockwell Hazardous Materials Contingency Plan

Time: Two hours

Method: Lecture/Question and Answer

Conducted By: Emergency Coordinator

Course Content:

1. Definition of emergency and/or conditions which will prompt implementation of the contingency plan.
2. Roles of HWMP personnel, Hanford Fire Department, Hanford Police Department, and Rockwell administrators in an emergency.
3. Notification procedures.
4. Staging areas.
5. Utilization of monitoring equipment.
6. Spill containment procedures.
7. Routes of access/egress from facilities.
8. Activation/use of fire suppression equipment.
9. Procedures for suspending operations during emergency conditions.
10. Facility decontamination procedures.

11. Actions to take in the event of an accident while transporting hazardous wastes in motor vehicles.
12. Evaluation methods and procedures.
13. Procedures for handling emergencies involving hazardous materials which threaten to enter or have entered the air, surface water, or groundwater.
14. Run-off and run-on control.
15. Aspects of the interface with federal, state, county, and city agencies which may have long-term or immediate involvement in emergencies.
16. Use of eye washes and deluge showers.

Reading Assignment: Read the Rockwell Hazardous Materials Contingency plan and the DOT publication, "Emergency Action Guide for Selected Hazardous Materials."

Evaluation: Administer written exam.

H. Module Eight

Title: Protecting the Environment from Contamination by Hazardous Waste/Decontamination Procedures

Time: Two hours

Method: Lecture/Discussion

Conducted By: Certified Industrial Hygienist and Staff Hazardous Waste Engineer

Course Content:

1. Mechanisms by which contaminants enter the human body and other biological systems.
2. Factors related to pesticide exposure.
3. Description of Hanford Site water and sewage systems.
4. Description of threats to the community posed by airborne contaminants.
5. Delayed health effects of frequent low-level exposure to hazardous materials.
6. Medical surveillance.
7. Description of the topography in the vicinity of HWMP facilities which relates to the potential for water contamination.
8. Ground and surface water systems on the Hanford Site.
9. Flood plain information.
10. Water sampling and analysis procedures.
11. Facility decontamination procedures.
12. Environmental decontamination procedures.

13. Dangers associated with PCBs.
14. Suspension of operations in the event of a contamination incident.
15. Personal decontamination including:
    a. Decontamination of clothing and body surfaces
    b. Use of deluge showers and eyewashes

Reading Assignment: Study topographic maps, flood plain maps, and water system schematics of the Hanford Site.

Evaluation: Administer written exam.

I. Module Nine

Title: Waste Sampling Procedures

Time: Two hours

Method: Discussion

Conducted By: Senior Chemist and Staff Hazardous Waste Management Engineer

Course Content:

1. Review procedures for acquiring samples.
2. Review procedures for record keeping and notification concerning analysis results.
3. Review operation and capabilities of analytical apparatus.
4. Review calibration maintenance and repair procedures for analytical apparatus.
5. Review specific test methods to be utilized for "knowns," "unknowns," and varieties of chemical species.
6. Review policies and procedures related to safe handling and disposition of samples in the laboratory.

Reading Assignment: Review the EPA waste analysis plan, SW-846, and other authoritative references relating to analytical procedures.

Evaluation: Confirm understanding by oral responses during discussion.

J. Module Ten

Title: Record Keeping and Administrative Procedures

Time: One hour

Method: Discussion/OJT

Conducted By: Staff Hazardous Waste Engineer; and Specialist, Employee & Organization Development Department.

Course Content:

1. Maintenance of personnel files and position descriptions.

2. Maintenance of training records and log.
3. Maintenance of permits, permit applications, and comprehensive plans.
4. Maintenance of forms and records related to chemical disposal requests and wastes analysis lab test results to include off-site incinerated materials and volumes, stored wastes, and transported wastes.
5. Maintenance of inspection logs.

Reading Assignment: Read permit applications

Evaluation: Oral

K. Module Eleven

Title: First Aid Training

Time: Eight hours

Method: Lecture/Demonstration

Conducted By: WISH certified instructor

Course Content:

1. Standard industrial first aid instruction, including CPR.

L. Module Twelve

Title: Review of Procedures and Use of SCBA Equipment and Encapsulation Suits

Time: Two hours

Method: Discussion/Demonstration

Conducted By: Hanford Fire Department Specialist and Respiratory Protection Department Specialist

Course Content:

1. Review of procedures and use of SCBA equipment, chemturion, and fyrepel encapsulation suits.
2. Practice using equipment.

Evaluation: Oral/Observation

M. Module Thirteen

Title: Radio Procedures

Time: One hour

Method: Discussion/Demonstration

Conducted By: Hanford Dispatcher

Course Content:

1. Review radio operations and capabilities.
2. Review policies concerning use of the radio.
3. Review use of call signs and standard voice communication procedures.

Evaluation: Oral/Observation

N. Module Fourteen

Title: Simulated Hazardous Materials Emergency Incident

Time: Two hours

Method: Programmed problem solving and decision making exercise. Group participation and simulation.

Conducted By: Emergency Coordinator

Course Content:

1. The Office of Emergency Planning will develop a written, programmed simulation of events leading to an emergency involving hazardous materials. Participants will respond to changing events by describing their activities and decisions at each point as the situation develops.

Evaluation: Group evaluation

H-1c Training Director

The Staff Hazardous Waste Engineer from the IH&S Department presently is Mr. G. R. Cox. Mr. Cox has a Master of Science degree and has attended numerous training courses and seminars relating to hazardous waste management. He is backed up by a certified Industrial Hygienist and a Safety Engineer; Mr. A. W. Lilly and Mr. M. R. Romsos. Mr. Cox is a Rockwell certified instructor and is qualified to administer and conduct training. Mr. Cox has six years of experience in hazardous waste management, and he has helped develop the Nonradioactive Hazardous Materials Contingency Plan. Future personnel hired into this position will have academic qualifications and experience sufficient to qualify them to conduct all required training including that related to contingency plan implementation.

H-1d Relevance of Training to Job Position

Titles, job descriptions, and requisite qualifications of personnel involved in the HWMP are set forth in Appendix H-2. (Comprehensive detailed job descriptions for each position are maintained by the Rockwell Personnel Office. The identity of individuals who occupy these positions is also

recorded there). Figure H-1 depicts the detail of each job description's training from the modular format.

The Staff Hazardous Waste Engineer will conduct an annual training review each December which will consist of the following elements:

1. Review training records to ensure that training has been provided in accordance with the plan set forth in this document.

2. Placement of a signed "memo for the record" in the training file of each program participant indicating that the annual review has been accomplished.

3. Review content of training modules in order that modules reflect current practices and lessons learned.

4. Conduct a group meeting of all HWMP participants and get feedback and ideas concerning relevance and adequacy of training.

H-1e Training for Emergency Response

Training is adequate to ensure that personnel are able to respond effectively to emergencies and are familiar with emergency procedures, emergency equipment and emergency systems. This is assured by training encompassing specific topics. These topics are covered in Section H-1.b modular training as follows:

1. Using, inspecting, repairing, and replacing facility emergency and monitoring equipment. Included in modules 5, 6, 7, 11, 12, 13, and 14.

2. Parameters for automatic waste feed cutoff. (There are no automatic waste feed systems at any Rockwell facilities).

3. Communications and alarm systems. Included in modules 2, 5, 6, 7, 13, and 14 where applicable in operation of a facility.

4. Response to fire and explosions. Included in modules 3, 4, 5, 6, 7, 8, 11, 12, 13, and 14.

5. Response to groundwater contamination. Technical expertise is available. Technology and response techniques have been developed and implemented.

6. Shutdown of operations. Included in modules 7, 8, and 14, where applicable, in operation of a facility.

H-2 IMPLEMENTATION OF TRAINING PROGRAM

The training program is currently being implemented. A detailed schedule will be prepared starting October 1, 1985, which commences the new fiscal year for Rockwell, and will outline the personnel training for the year.

All employees will receive training within six months of their date of hire or their transfer to a new position. Personnel will not work in unsupervised positions until they successfully complete the training course. Records of each individual's formal training are maintained in the E&OD Department's office. Training records of current employees will be 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 IH&S Department's office and is available for review by all waste handling and management personnel, emergency response personnel, and all regulatory agencies. Provisions are made for updating and reviewing courses, as necessary, to ensure RCRA compliance.

JOB TITLE	MODULE NUMBER/TITLE													
	1/ INTRO TO PROGRAM	2/ TOUR OF FACILITIES	3/ GENERAL	4/ CONCEPTS	5/ PROCEDURES	6/ PERSONAL PROTECTION	7/ EMERGENCY PROCEDURES	8/ ENVIRON-MENTAL PROTECTION FROM SPILLS	9/ WASTE SAMPLING	10/ RECORDS	11/ FIRST AID	12/ SCBA ENCAP-SULATION	13/ RADIO PROCED.	14/ HAZ. MAT. INCIDENT
PROJECT MANAGER	B	C	B	C	C	C	A	A	C	A	C	C	C	C
ENGINEER	B	C	B	C	C	C	A	A	C	A	C	C	C	C
OPERATOR (CHEMICAL, NUCLEAR, HEAVY EQUIPMENT)	A	A	A	C	A	A	A	C	C	A	C	A	C	B
CHEMICAL TECHN.	A	C	A	A	C	A	A	C	A	C	C	C	C	B
LIGHT- & HEAVY-DUTY DRIVERS & RIGGERS	A	A	A	C	A	A	A	C	C	A	C	A	C	B
SECRETARY	A	C	C	C	C	C	C	C	C	A	C	C	C	C
DECONTAMINATION & DECOMMISSION WORKERS	A	C	B	C	C	A	A	A	C	C	C	C	C	A
FIREFIGHTER	A	C	B	C	C	A	A	A	C	C	C	A	A	A

A = EXTENSIVE INSTRUCTION

B = LIMITED INSTRUCTION

C = BROAD COVERAGE INSTRUCTION

FIGURE H-1. LEVEL OF TRAINING FOR HAZARDOUS WASTE PERSONNEL

APPENDIX H-1

NONRADIOACTIVE HAZARDOUS WASTE SAFETY TRAINING

NONRADIOACTIVE HAZARDOUS WASTE SAFETY TRAINING

I. General Introduction
   - A. Introduction to Hazardous Waste Management Program
   - B. Tour of HWMP Facilities
   - C. General Handling, Storage, Treatment, Transportation

II. Specify Safety Isssues
   - A. Chemistry of Hazardous Materials
   - B. Handling, Storage, Treatment, Packaging, and Transportation Procedures
   - C. Emergency/Protective Equipment
   - D. Hazardous Materials Contingency Plan
   - E. Environmental Protection Procedures

III. Administrative Procedures
   - A. Waste Sampling
   - B. Record/Administration

IV. Emergency Training
   - A. First Aid
   - B. Encapsulation/SCBA Equipment
   - C. Radio Transmission
   - D. Simulated Hazardous Materials Emergency

APPENDIX H-2

JOB TITLES & DESCRIPTIONS FOR HAZARDOUS WASTE PROGRAM PERSONNEL

Job Title:

Project Manager

Level of Responsibility:

Overall management of the Hazardous Waste Management Program

Qualifications:

Academic degree and experience (Waste Management or related field)

Job Elements:

- Overall planning, coordination, and guidance of the Hazardous Waste Program
- Permit revision/maintenance
- Submission of records/reports
- Program development
- Liaison with Department of Energy, State, and Federal agencies

Job Title:

Engineer (Safety, Chemical, and Process)

Level of Responsibility:

Develop and implement program elements

Qualifications:

Academic degree and experience (Waste Management or related field)

Job Elements:

- Develop and implement necessary program elements
- Prepare permits/revisions
- Prepare reports/maintain records
- Interface with Hazardous Waste Management Program personnel
- Audit/overview of program
- Advise generator as to proper packaging, labeling, and manifestation
- Prepare/schedule waste disposals

Job Title:

Operator (Chemical, Nuclear, and Heavy Equipment)

Level of Responsibility:

Actual hands-on handling, packaging, labeling, disposition of hazardous waste

Qualifications:

Experience and qualification testing

Job Elements:

- Implementation of Hazardous Waste Management Program elements by procedure
- Packaging/labeling of hazardous waste for shipment
- Handling of hazardous waste prior to disposition
- Loading of hazardous waste for shipment

Job Title:

Chemical Technician

Level of Responsibility:

Handling of samples and analytical equipment

Qualifications:

Academic degree or qualification testing

Job Elements:

- o Receive and log samples
- o Quality Control
  - Training
  - Record keeping
  - Equipment maintenance
- o Analyze samples as per Environmental Protection Agency and State of Washington protocol

Job Title:

Light- and Heavy-Duty Drivers and Riggers

Level of Responsibility:

Transportation of hazardous waste

Qualifications:

Experience and qualification testing

Job Elements:

- Inspect and verify shipments as to proper packaging, labeling, and manifestations
- Loading hazardous waste for shipment
- Transportation of hazardous waste as per Department of Transportation regulations

Job Title:

Decontamination and Decommissioning Worker

Level of Responsibility:

Hazardous material spill cleanup

Qualifications:

Experience and qualification by testing

Job Elements:

- Provide response to spill of hazardous materials for purposes of cleanup
- Stabilize area after cleanup operations

Job Title:

Firefighter

Level of Responsibility:

Hazardous material incident response

Qualifications:

Education, experience, and extensive training

Job Elements:

- Provide preliminary response to hazardous material spill incidents
- Initiate stabilization activities at site of incident

Job Title:

Secretary

Level of Responsibility:

Clerical support of program

Qualifications:

Experience and qualification by testing

Job Elements:

- Typing/filing of Hazardous Waste Management Program reports
- Records maintenance
- Typing of manifests
- Maintenance of budget/personnel records
- Correspondence

SECTION I

CLOSURE AND POST-CLOSURE REQUIREMENTS

The purpose of this section is to demonstrate that the U.S. Department of Energy-Richland Operations Office (DOE-RL) has considered all that is necessary to adequately close and to administer the required post-closure activities for the Nonradioactive Dangerous Waste Landfill (NRDWL) and the existing and proposed Nonradioactive Dangerous Waste Storage Facilities (NRDWS).

Both closure and post-closure activities for the NRDWL will be implemented during their respective time periods. The closure period will begin at the time of the final acceptance of waste and will end when closure, in accordance with this approved closure plan, is certified by a professional engineer. The post-closure care period is defined to start at the time that an independent registered professional engineer certifies that closure is complete and will end 30 years thereafter, unless the regulating agency specifies a longer or shorter time based on cause.

For the existing and proposed NRDWS, this closure plan will be implemented during the closure period which will begin at the time of the final acceptance of waste and will end when closure, in accordance with this approved closure plan, is certified by an independent registered professional engineer. Since no regulated waste will remain at either of these storage facilities, there is no Post-Closure Plan for them in Section I-2.

At the time of this application, the Environmental Protection Agency (EPA) is the regulating authority for the landfill while the Washington Department of Ecology (WDOE) is the regulating authority for the two storage facilities. At the time of the implementation of these closure and post-closure activities, it is possible that either Washington Department of Ecology (WDOE) and/or Environmental Protection Agency (EPA) may be the regulating authority. Submittals required in this Section will be sent to the appropriate authority at the time of closure. The addresses of these possible regulating authorities are as follows:

Regional Administrator
Region X
U.S. Environmental Protection Agency
1200 Sixth Avenue
Seattle, Washington 98101; and

Director
Washington Department of Ecology
Mail Stop PV-aa
Olympia, Washington 98504

The NRDWL is a regulated waste land disposal unit. No radioactive waste is stored and/or disposed at this unit; all references to contamination and decontamination will be to regulated waste that is not radioactive. The NRDWL is a subset of the Chemical Landfill (Asbestos and Chemical Trenches) which in turn is a subpart of the Central Landfill. The Central Landfill is located in the 600 Area and indicated on a Hanford Site map in Figure I-1. The layout of the Central Landfill Area is shown in Figure I-2. The location and layout of the proposed NRDWS are shown in Figures I-3 and I-4. Figures I-5 and I-6 illustrate the location and layout of the existing NRDWS.

Appendix I-1 contains the location of official copies of the closure plans for the NRDWL and the proposed and existing NRDWS. The person responsible for storing and updating the official copies of the plans is listed in Appendix I-2. The certification of closure is in Appendix I-3.

I-1 CLOSURE PLANS

I-1a Closure Performance Standard

The closure performance standard is that NRDWL will be closed in a manner that minimizes further maintenance and that minimizes post-closure escape of regulated waste to the extent necessary to protect human health and the environment.

The closure performance standard for the existing and proposed NRDWS is that all regulated waste, regulated contaminated materials (if any), and regulated contaminated soil (if any), will be removed within 180 days of receiving the last shipment of regulated waste from the unit so there will be no threat to human health or the environment.

I-1b Partial and Final Closure Activities

The DOE-RL does not expect to perform partial closure of the drum storage areas during the active life of the existing and proposed NRDWS. Therefore, all closure activities at these units will be for final closure.

New trenches are dug at NRDWL immediately before use with a crawler crane using a drag line. The dimensions of the trenches are approximately 14 feet (4.2 meters) deep, 42 feet (12.7 meters) wide at the top, and 12 feet (3.6 meters) wide at the bottom. Partial closure is performed at the end of each day that regulated waste is put into a trench. This is accomplished by a bulldozer covering the regulated waste containers with approximately 10 feet (3.0 meters) of native soil from the top of the trench. Each day's fill constitutes one cell. This process is continued until the trench is completely filled, at which time the trench area is graded with a road-grader. The closure status of each of the trenches is given in Section I-1c.

The DOE-RL will initiate and monitor the closure and cleanup activities. Personnel involved in the closure activities will be under the supervision of a person knowledgeable in the safe handling of regulated waste. Personnel will wear protective outer clothing, gloves, boot covers, and other appropriate protection as needed. The DOE-RL will determine the degree of personnel protection required.

At least 180 days prior to the date of receiving the last waste shipment, DOE-RL will notify the appropriate regulating authority of the intent to close the NRDWL, and the existing and proposed NRDWS.

Within 30 days after receiving the last waste shipment, DOE-RL will direct one of the site contractors to implement this approved closure plan. A list of the closure events for all three facilities is given in Section I-1g.

NRDWL

At the landfill, within 90 days of receiving the last waste shipment, all waste drums not to be put in the landfill will be loaded by hand or forklift onto a semi-trailer truck (or other suitable vehicle), and transported to an appropriate treatment/ storage/disposal (TSD) facility. This facility may or

may not be on the Hanford Site. Any waste scrap or residue remaining will be placed in an empty container and transported as above.

Within 100 days of receiving the last waste shipment, the regulated portions of the NRDWL will be graded with a roadgrader such that the surface is crowned and slopes two to five percent toward each side. A standard roadgrader will be used for this operation. The entire area from Trench No. 26 to Trench No. 36 (not all of which is part of NRDWL) will be prepared for closure. Having established the cover slope, gravel will be delivered by dump trucks and deposited around the perimeter or closure area. A tracked bulldozer will be used to spread the gravel to a nominal 6 inches (15 centimeters) thickness over the closure area. Grade stakes will be used to assure that minimum thickness is maintained. Technical information regarding the gravel layer is provided in Section I-1e(2).

Within 110 days of receiving the last waste shipment, a geotextile (Mirafi) will be put in place over the gravel layer. The geotextile fabric will be put in place by hand. Each roll [measuring 12.5 feet (3.8 meters) wide by 360 feet (110 meters) long] will overlap preceding rolls by at least 1.5 feet (0.5 meters).

Within 140 days of receiving the last waste shipment, the fine-soil top layer of the multilayer system will be put in place. At the present time, a borrow pit with soil of the desired characteristics is approximately ten miles away from the NRDWL. This fine soil will be deposited by dump truck directly over the geotextile near the perimeter of the geotextile. The fine soil will be pushed over the geotextile by a tracked bulldozer. This procedure will provide initial protection of the geotextile. Following the placement of the initial soil cover, the remaining backfill will be hauled onto the closure area utilizing dump trucks, scrapers, and/or a tracked bulldozer. Grade stakes will again be used to assure that a minimum 3.3 feet (1.0 meter) of soil cover depth is maintained. The closure area will then be graded such that the surface slopes two to five percent from the center toward the edges. The final cover depth of 3.3 feet (1.0 meter) will be maintained over the perimeter of the closure area and the side slopes will be graded three-to-one beyond that point. The cover system will extend at least 10 feet (3.0

meters) from the perimeter edge of the trenches as shown in Figure I-7. Technical information regarding the fine soil layer is provided in Section I-1e(2).

Within 150 days of receiving the last waste shipment, ground preparation will be done as necessary. This will involve the use of a spring tooth harrow and packer, both of which are pulled by a tracked bulldozer or standard wheel tractor. These ground preparation practices follow standard dry land farm practices which will not penetrate the 1.2 meter top soil depth.

Within 160 days of receiving the last waste shipment, fertilizing and seeding of the closure area will be completed. Fertilizer will be applied at a rate of 125 pounds available nitrogen per acre by a gravity-fed commercially available fertilizer spreader. Seeding of the perennial grasses will be performed at a rate of 15 pounds per acre by a calibrated native grass drill. Both pieces of equipment will be towed by a small wheel tractor. If the seeding is not completed between the first of October and the first of December, the seeding area will be irrigated. A water truck will drive over the area dispensing enough water to wet the upper 6 inches (15 centimeters) of soil. Technical information regarding vegetation is provided in Section I-1e(2).

Within 170 days of receiving the last waste shipment, the closure area will be mulched. Mulching is performed with a powered mulcher designed to provide uniform application. Approximately one ton of straw per acre will be applied. The mulch is anchored into place with a crimper to provide initial surface protection. Both of these pieces of equipment will be towed by a small wheel tractor. Figure I-7 provides a cross section view of the multilayer cover system as finally installed. Figure I-8 provides an aerial view of the closure area.

Within 180 days of receiving the last waste shipment, the equipment will be nonradioactive "decontaminated" and the residues shipped off site. These procedures are provided in Section I-1d.

NRDWS

At the existing NRDWS, within 30 days after receiving the last regulated waste shipment, DOE-RL will direct one of the site contractors to implement this approved closure plan. A list of closure events is provided in Section I-1g.

Within 30 days after receiving the last shipment, representative soil borings will be taken around the concrete pad and will be analyzed. The procedures for sampling, analyzing and evaluating these samples are given in Section I-1d(1).

Within 90 days after receiving the last anticipated waste shipment, all drums (most are stored on pallets) will be loaded by hand truck or forklift onto a semi-trailer truck (or similar vehicle) and transported to an appropriate treatment/storage/disposal (TSD) facility. The TSD facility may or may not be located at the Hanford Site. Any waste scrap or residue remaining, including broken pallets, will be decontaminated as described in Section I-1d.

Within 120 days after receipt of the last waste shipment, the concrete pad will be regulated waste and decontaminated as outlined in Section I-1d(1).

Within 180 days of receipt of the last waste shipment, contaminated soil (if any) will be removed from around the concrete pad. Any such soil will be treated as a regulated waste [see Section I-1d(1)]. Within the same time frame, the equipment will be decontaminated as outlined in Section I-1d.

Within 180 days of receipt of the last waste shipment, DOE-RL will submit the required certification of closure to the regulatory authority, as described in Appendix I-3.

Proposed NRDWS

Within 30 days after receipt of the last regulated waste shipment, DOE-RL will direct one of the site contractors to implement this approved closure plan. A list of closure events is provided in Section I-1g.

Within 90 days after receipt of the last waste shipment, all drums (most will be stored on pallets) will be loaded by hand truck or forklift onto a semi-

trailer truck (or similar vehicle) and transported to an appropriate TSD facility. The TSD facility may or may not be located on the Hanford Site. Any waste scrap or residue remaining, including broken pallets, will be decontaminated as described in Section I-1d.

Within 120 days after receipt of the last waste shipment, the concrete pad will be decontaminated as outlined in Section I-1d(1).

Within 180 days after receipt of the last waste shipment, the equipment will be decontaminated as outlined in Section I-1d. In the same time frame, DOE-RL will submit the required certification of closure (Appendix I-3) to the regulating authority.

Demolition Sites

At Demolition Sites, within 30 days after receipt of the last regulated waste shipment, DOE-RL will direct one of the site contractors to implement this approved closure plan. A list of closure events is provided in Section I-1g.

Within 30 days after receiving the last waste shipment, representative soil borings will be taken and evaluated by a laboratory analysis. The procedures for sampling and evaluating these samples are given in Section I-1d(1).

Within 180 days after receipt of the last waste shipment, regulated waste contaminated soil (if any) will be removed from around the concrete pad. Any such soil will be treated as a regulated waste [see Section I-1d(1)].

Within 180 days of receiving the last waste shipment, the equipment will be treated as regulated waste and decontaminated as outlined in Section I-1d.

Within 180 days of receiving the last waste shipment, DOE-RL will submit the required certification of closure given to the regulating authority as described in Appendix I-3.

I-1c Maximum Waste Inventory

NRDWL

Each of the NRDWL trenches has an estimated capacity of 700 cubic yards; the total capacity of the NRDWL is 7,000 cubic yards, of which 4,200 cubic yards have not been excavated. Until the approval of the liner-waiver exemption, only Trench 19N, which was excavated prior to November 8, 1984, is being used. This trench is 20 percent full and has a capacity of 560 cubic yards.

The following table includes the opening and closing dates for the trenches at the NRDWL.

TABLE I-1

NRDWL TRENCH STATUS

TRENCH NUMBER	OPENED	CLOSED
22	Not opened	--
23	Not regulated	--
24	Not opened	--
25	Not regulated	--
26	Jan. 1985	Active (has not received regulated waste)
27	Not regulated	--
28	Feb. 1984	Jan. 1985
29	Not regulated	--
30	Not opened	--
31	Sept. 1982	Apr. 1984
32	Not opened	--
33	Nov. 1980	Sept. 1982
34	Not regulated	--
18N	Not opened	--
19N	Mar. 1984	Active (20% full)

NOTE: Of 150 feet of Trench 19N which have been excavated, only 70 feet have been used for regulated waste landfill.

The maximum unclosed portion of the facility through its life would be the following eight trenches: 26, 28, and 31 through 19N, as shown in Figure I-8. Trenches 30, 32, and 18N have not been opened. Trenches 28, 31 and 33 have completed partial closure as described in Section I-1b. Trench 34 was closed prior to November 19, 1980 and is not regulated under RCRA. Only Trench 19N, located at the southern end of the regulated area, is open and active and capable of immediately receiving waste. Trench 26 is open but not receiving waste. Trenches 27 and 29 are not regulated units because asbestos is the only waste which has gone into these trenches. Although Trenches 26, 27, 29, 30, 32, and 18N have not received regulated waste, the entire area from Trench 26 to 19N will be covered with the multilayer cover system.

Existing NRDWS

The maximum unclosed portion of the existing NRDWS is the limit of the concrete pad in and around the building, as illustrated in Figure I-2.

The maximum estimated inventory of waste is 772 drums. This total contains drums of the following sizes (not including over-packs); 55 gallons, 30 gallons, and 5 gallons. Some of these drums are empty, some contain lab-packs, some are partially full, and some are full. Therefore, the range of waste volume present at any one time may vary within the limits in Table I-2.

TABLE I-2

WASTE INVENTORY (EXISTING NRDWS)

OPERATION	# DRUMS	SIZE (gal)	2/3 FILLED (gal)	3/3 FILLED (gal)
Normal	60	55	2,200	3,330
	30	30	600	900
	10	5	33	50
TOTAL	100		2,833	4,250
Maximum	772	55	28,307	42,460

The normal volume of waste estimated to be stored at any one time is not expected to exceed 4,250 gallons, and the maximum estimated volume would not exceed 42,460 gallons.

Proposed NRDWS

The maximum unclosed portion of the facility is the limit of the concrete pad in and around the building, as illustrated in Figure I-2.

The maximum estimated inventory of waste is 484 drums. This total includes drums of the following sizes (not including over-packs); 55 gallons, 30 gallons, and 5 gallons. Some of these drums are empty, some contain lab-packs, some are partially full, and some are full. The range of waste volume may vary within limits outlined in Table I-3.

TABLE I-3

WASTE INVENTORY (PROPOSED NRDWS)

OPERATION	# DRUMS	SIZE (gal)	2/3 FILLED (gal)	3/3 FILLED (gal)
Normal	60	55	2,200	3,300
	30	30	600	900
	10	5	33	50
TOTAL	100		2,833	4,250
Maximum	484	55	17,569	26,620

The normal volume of waste estimated to be stored at any one time is not expected to exceed 4,250 gallons, and the maximum estimated volume would not exceed 26,620 gallons.

Demolition Sites

No waste inventory is kept at the three demolition sites.

I-1d Inventory Removal, Disposal or Decontamination of Equipment

A variety of machinery will be used for the final closure activity at NRDWL. The first six machines listed below are in general use around the Hanford Site. The remaining machines are used regularly in the surface stabilization of solid, low-level radioactive burial grounds at Hanford.

- Tracked bulldozer
- Roadgrader
- Dump trucks
- Flatbed truck
- Hand cart

- Waste truck
- Medium size wheel tractor
- Fertilizer spreader
- Spring tooth harrow
- Native grass drill
- Powered straw mulcher
- Crimper
- Water truck (as required)

All tools and machinery such as hand carts, forklifts, bulldozers, etc., which come into contact with the regulated waste disposed of in the landfill, will be steam cleaned. If the item is steam cleaned, the cleaning residues will be collected on a plastic ground cover and then transferred to a drum. The cleaning residues will be treated as a regulated waste.

All other cleanup material such as gloves, sweepings, rags, etc., will be placed in a drum and treated as a regulated waste. The drums generated for decontamination activities will be transported to a regulated TSD unit.

The inventory removal and disposal information required by this section for the existing and proposed NRDWS is contained in Section I-1b. Information required on the decontamination of equipment is addressed below.

The following machinery will be used in the final closure activity of the storage facilities: flatbed truck (or similar vehicle); forklift; and hand cart. All this machinery and other tools that come into contact with the regulated waste will be steam cleaned or placed into a regulated waste drum. If an item is steam cleaned, the cleaning residue will be collected on a plastic ground cover. The ground cover will be contoured such that the cleaning residue is contained on the plastic. The cleaning residue will be tested for TOC and TOX. If any of these parameters test positive, the cleaning residue, the plastic ground cover and all other cleanup material (i.e., gloves, sweepings, rags, etc.) will be placed in drums and considered a regulated waste. If regulated waste drums are generated by this activity, they will be transported to a TSD facility.

I-1d(1) <u>Closure of Containers</u>

This section applies only to the existing and proposed NRDWS.

Concrete Pad

The concrete pads inside and outside the storage buildings (existing and proposed) will be washed down with a soap solution and, if needed, with a hydrochloric acid solution. Disposable rags will be used for this washing. The residual water generated from this cleaning will be collected in a plastic-lined trench along one edge of each concrete pad. The residual water in the trench will be collected in containers, stored, and tested for pH, TOC and TOX. If the TOC and/or TOX values are statistically greater than for the decontamination water, or if pH values are less than 2.0 or greater than 12.5, the residual water and the associated disposal rags will be treated as regulated waste and shipped off site to a TSD facility.

Surrounding Soil

Since the concrete paved storage area outside the existing NRDWS does not have run-off controls during interim status, the soil surrounding the paved storage area may be contaminated by regulated waste. Therefore, representative soil borings will be taken and evaluated by laboratory analysis. The procedures for collecting and evaluating these samples are given below.

Soil borings will be taken 3.3 feet (1.0 meter) out from the concrete pad, from 0 to 3.3 feet (0 to 1.0 meter) in depth, and at three different locations. The locations will be chosen at the points where spills and run-off would be most likely. These soil borings will be shaken together to obtain a homogeneous mixture. A representative background sample will also be taken. The soil samples (one test and one background) will be analytically screened for TOC and TOX.

If the analytical values of the test soil exceed the background soil sample, a comprehensive soil sample program will be designed. If significant concentrations of regulated chemical constituents are present in the soil, the contaminated soil will be removed. After the soil is removed, additional representative soil samples will be analyzed to demonstrate that all the contaminated soil is removed. If contamination still exists, more soil will be removed followed by more testing until all contaminated soil is removed.

I-1d(2) Closure of Tanks

This section is not applicable to the NRDWL or either NRDWS.

I-1d(3) Closure of Waste Piles

This section is not applicable to the NRDWL or the NRDWS.

I-1d(4) Closure of Surface Impoundment

This section is not applicable to the NRDWL or either NRDWS.

I-1d(5) Closure of Incinerators

This section is not applicable to the NRDWL or either NRDWS.

I-1d(6) Closure of Land Treatment Facilities

This section is not applicable to the NRDWL or either NRDWS.

I-1e Closure of Disposal Units

This section applies only to the NRDWL.

I-1e(1) Disposal Impoundments

This section is not applicable to the NRDWL.

I-1e(2) Cover Design

Final Cover General Design Description

A multilayer cover will be used for closure of the NRDWL. The cover will consist of 3.6 feet (1.2 meters) deep revegetated soil underlain by a woven synthetic geotextile fabric and 6 inches (15 centimeters) of gravel. The 3.6 feet of soil will provide storage for annual precipitation and support the establishment and growth of a perennial grass cover that will stabilize the surface and enhance soil-water removal. The geotextile will minimize the sifting of fines into the gravel interstices. The gravel layer will serve as a capillary barrier between the cover soil and waste zone, increasing the amount of water storage potential in the upper soil layer and maintaining greater levels of plant available moisture.

Concept and Function of the Multilayer Cover

Soil-water moves in response to pressure-head differences. The pressure heads are positive in saturated soils because of hydrostatic forces and negative in

unsaturated soils because of capillary forces. In unsaturated soil, water movement is influenced both by capillary forces and by gravity. For relatively salt-free soils, the combination of capillary and gravitational heads determines the total hydraulic head, usually expressed in terms of length (centimeters or meters) of an equivalent water column. Infiltration into either uniform or layered soils can be predicted by properly characterizing the gradient of hydraulic head and hydraulic conductivity. Another simple, yet basic, soil-water concept is the soil-water outflow law [Richards, L. A., 1950 "Law of Soil Moisture", Trans. Amer. Geophys. Union, 31 (5): 750-756]. This law states that water will not move from soil into an open cavity until the water pressure in the soil is atmospheric or greater. For layered soils, this means that water will not move from fine soil into very coarse soils until the soil at the boundary between the soil layers is virtually saturated [i.e., until the water pressure (capillary pressure) in the fine soil, at the boundary is near or equal to zero]. This basic law is fundamental to understanding the concept of a multilayer cover.

The final cover intended for use at the NRDWL is based on the concept just described. The gravel layer underlying the cover soil serves as a capillary barrier. As moisture infiltrates the cover soil, a wetting front moves downward through the fine soil pores to the point of contact with the large-pored (gravel) layer. The volume of pores capable of holding water at the tensions which exist at the wetting front and water-filled cross section is reduced. Before the wetting front can advance, the soil-water pressure at that point must increase until it is large enough to allow the pores to fill with water. The overlying soil will retain considerably more water at this point, than would the same soil depth had a coarse (gravel) layer not been present.

Fine Soil for Final Cover

In order for a multilayer cover to be effective in eliminating drainage, it must be capable of storing at a minimum the anticipated annual precipitation, and preferably the maximum expected amount. The greatest annual rainfall recorded at Hanford to date is approximately 11 inches (28 centimeters). There is a greater than 95 percent probability that the 11 inches total will not be exceeded (see Figure I-9). This precipitation has been established as a design criterion.

To meet this criterion, the cover soil must exhibit certain inherent characteristics. It must be a medium- to fine-textured soil with a relatively high water holding capacity. The soils characteristic of the NRDWL consist primarily of Rupert sands. The Rupert series correlates very closely to the Quincy series described in the soil survey for the Benton County area of southeastern Washington (USDA, 1971). These soils are coarse-textured and typically exhibit very rapid permeability and low water-holding capacity. The final cover soil, meeting the criteria of higher water-holding capacity and less permeability, will have to be obtained from selected sites outside of the immediate areas surrounding the NRDWL. The most promising soil identified thus far belongs to the Esquatzel series. Esquatzel series soils are typically deep and medium-textured, and exhibit moderate permeability and high water-holding capacity. Relatively uniform deposits of this soil type have been indicated approximately 10 miles (16 kilometers) northwest of the NRDWL, however, further investigations and soil analyses are planned to locate a source of suitable materials nearer by.

In lieu of detailed soils data, the Benton County Soil Survey was used to obtain estimated properties of the Esquatzel series soils. These estimated properties are as follows:

- Textural class: fine sandy loam
- Unified class: ML
- Permeability: 2.0 - 6.0 centimeters per hour
- Water-holding capacity 0.16 - 0.20 centimeters per centimeter soil

Based on the estimated minimum water-holding capacity of 0.16 inches per inch (0.16 centimeters water per centimeter) soil, a non-layered 4 feet (1.2 meters) deep soil profile will retain 7.8 inches (20 centimeters) of water.

Gravel for Final Cover

Materials ranging in size from coarse washed sand to cobble-sized rock could be used to achieve the textural change necessary for the capillary barrier, however, 1/4 to 1/2 inch (6 to 12 millimeters) gravel is easily handled and

provides a stable base over which the remainder of the barrier can be constructed. The gravel is also available on the site at the concrete batch plant, which is located approximately 6 miles (9.6 kilometers) away. The thickness of the gravel will be at least 6 inches (15 centimeters).

Geotextile for Final Cover

The textural change between the soil and the gravel layer will be maintained by use of a woven synthetic geotextile fabric. The geotextile is commonly used for load distribution and subgrade stabilization during roadway construction and offers excellent resistance to installation abuse. The product chosen is manufactured by Mirafi Construction Fabrics (Product No. 600X) which offers the following tested properties:

TABLE I-4
PROPERTIES OF MIRAFI GEOTEXTILE

600X FABRIC	UNIT	TEST METHOD	TYPICAL VALUES
Grab Tensile Strength	lb	ASTM D-1682-64	300
Grab Tensile Elongation	%	ASTM D-1682-64	35 (Max)
Burst Strength	psi	ASTM D-3786-80	600
Trapezoid Test Strength	lb	ASTM D-1117-80	120
Puncture Resistance	lb	ASTM D-3787-80	130

This particular product has been used in barrier construction at Hanford to prevent soil fines from sifting into the underlying gravel layer and this experience should prove useful during construction of the final cover at the NRDWL.

Vegetative Cover

Having established the ability of the final cover to safely store annual precipitation, a mechanism for removal of the stored soil-water must be provided. While estimates of annual evaporation closely approximate the annual precipitation, these estimates relate more accurately to total potential evaporation.

To prevent the eventual accumulation of moisture and the possibility of drainage through the gravel barrier, a vegetative cover will be established to enhance soil-water removal.

The two perennial wheatgrasses selected for revegetation of the final cover are Siberian wheatgrass (Agropyron sibericum) and thickspike wheatgrass (Agropyron dasytachyum), both of which have been used routinely with good success at Hanford. These species are drought tolerant and well suited to the medium- to coarse-textured local soils.

Once established, the vegetative cover will assure effective removal of much available moisture (i.e., water held at less than -15 bars) throughout the four-foot deep soil layer. The soil layer depth is sufficient to support and contain the effective rooting depth of the intended plant cover, and similar plant covers are known to be effective in exploiting soil water to depths of at least four feet. Plant root penetration into the gravel barrier is not expected to occur because of the gravel pore size and resultant lack of available moisture.

I-1e(3) Minimization of Liquid Migration

The primary objective of a cover system design is to prevent water infiltration into underlying waste zones where contact may leach contaminants into the groundwater. Most cover designs typically rely on impermeable barriers. An impermeable barrier as envisioned by the EPA at the present time would consist of clay and/or a synthetic liner. However, the use of clays in an arid environment is unacceptable because an optimum moisture content necessary to maintain the integrity and intended purpose of the clay liner cannot be assured. The possibility of eventual desiccation could result in clay shrinkage and cracking with a subsequent loss of integrity. Synthetic liners would not be affected by the arid environment. However, their effectiveness relies heavily on the methods and care under which they are installed. Synthetic liners would be a barrier to both downward and upward moisture movement, but over time, condensate could collect on the bottom side of the liner, which would act as a diverting mechanism for moisture to reenter the waste confinement zone. Therefore, neither clay nor synthetic material will fulfill the intent of the regulations, which are to prevent the entry of liquids into the closed waste containment area.

Recent research related to the long-term disposal of radioactive waste has shown that multilayer cover systems are effective in minimizing and preventing liquid migration into a buried waste zone in arid environments. Multilayer systems can use the natural material of rock and soil to provide a durable and long lasting cover system.

The basis for the multilayer approach is the soil-water outflow law which states that water will not move from a fine-pore soil into much larger pores until the water is atmospheric or greater. For layered soils, this means that water will not move from fine soil into very coarse soils until the soil at the boundary between the soil layers approaches saturation. Field observations of layered soils indicate that significant increases in soil-water storage can be attained when soils are underlain by coarse-textured materials. This is particularly true when the soil is moderately fine-textured. Table I-7, (Miller, D. E., 1973, "Water Retention and Flow in Layered Soil Profiles", Field Soil Water Regime, R. R. Bruce, pp. 107-177, Soil Science Am. Special #5, Madison, Wisconsin) shows the effect of layering on water storage in an overlying soil.

TABLE I-5

WATER RETENTION IN LAYERED SOILS

	STORED WATER (cm Water/60 cm Soil) TEXTURE		
SOIL MATERIAL	LOAMY SAND	LOAM	SILT LOAM
Soil underlain by sand layer (at 60 cm depth)	16.4	17.4	20.0
Uniformly deep soil with no layer	6.7	11.4	16.7
Ratio layered/uniform	2.5	1.5	1.2

The greater water retention is attributed to the textural differences between the upper soil and the gravel barrier. The coarser the underlying material, the less flow is expected until nearly saturated conditions prevail. The effectiveness of the multilayer cover to prevent or minimize liquid migration will thus be assured by:

- Highly nonlinear nature of unsaturated hydraulic conductivity across the fine soil/coarse gravel interface
- Water-holding capacity of the final cover soil
- Combined effects of evaporation and transpiration for the removal of accumulated soil water.

The soil of the multilayer cover system is a fine sandy loam. As a textural class, sandy loam is intermediate between loam and loamy sand. From the above table, it can thus be inferred that moisture retention in a sandy loam soil underlain by coarse material (i.e., a gravel barrier) can be increased by a factor of at least 1.5. As stated previously in section I-1e(2), a nonlayered 4 feet (1.2 meters) deep sandy loam soil profile will hold 7.8 inches (20 centimeters) of water, which is 2 inches (5 centimeters) more than the average annual precipitation and 3 inches (8 centimeters) less than the maximum recorded precipitation. Utilizing the above inferred increase in moisture retention capacity attributable to the presence of a gravel barrier, the estimated 7.8 inches (20 centimeters) total water retention capacity is increased to 11.7 inches (30 centimeters). Referring to Figure I-9, the probability that annual precipitation will exceed this amount is estimated to be less than one percent.

I-1e(4) Maintenance Needs

Experience gained with Hanford Site surface stabilization (500 acres) since 1978 has shown that very little maintenance is required following the successful establishment of the vegetative cover. Successful establishment generally requires from two to three years. During this establishment period, the straw mulch applied for initial stabilization and the natural emergence of cheatgrass (*Bromus tectorum*) which is ubiquitous to southeastern Washington, combine to protect the soil cover from erosion by wind. Also, periodic observations by trained personnel are made to evaluate seedling progress and recommend any necessary corrective actions. Herbicides are often used in the spring to selectively control annual broadleaf species which compete for available moisture and nutrients. Herbicide applications are discontinued following the establishment of perennial grasses.

Fertilizer applications after closure are sometimes needed to stimulate plant vigor during the second or third year. Some instances of apparently increased small rodent activity have been recorded, primarily in the form of burrowing into trench cover side slopes. This potential problem has been practically eliminated by decreasing the side slope angles to three-to-one. The only other maintenance resulting from periodic surveillance has been the manual removal of deep rooting shrubs which might penetrate the soil cover. No additional backfilling has been required as a result of wind or water erosion to date. Maintenance of the NRDWL final cover is not expected to be dissimilar from that experienced to date on other Hanford stabilization projects.

I-1e(5) Drainage and Erosion

No artificial drainage will be incorporated into the final cover system. Soil permeability and typical rainfall intensities are such that water erosion has not been a problem at Hanford. The greatest potential arises in the late winter when rapid snow melts may occur over frozen ground. No significant erosion has been recorded during routine surveillance of areas stabilized to date. Also, final cover slopes will be such that erosion will not be induced should rapid snow melt occur.

Initial erosion/abrasion protection will be provided by application of a straw mulch. The entire cover and immediate surrounding area disturbed during construction will be mulched at a rate of one ton of straw per acre. Mulching is an integral part of the revegetation process at Hanford and its use has proven very successful in minimizing seedling damage and soil loss by winds. Once established, the perennial grasses will provide the protection necessary to minimize erosion over the long term. Little erosional effect has been recorded on other areas (500 acres) stabilized to date.

I-1e(6) Settlement and Subsidence

Complete records have not been kept at the NRDWL since November 19, 1980. However, information obtained from waste management personnel involved with the NRDWL indicates that possibly a considerable number of empty drums may have been buried. This situation may have an impact on settlement and subsidence during the post-closure time period.

Some factors which may minimize the potential for settlement and subsidence are the low waste volume/backfill ratio, the dry Hanford climate; and the soil loading experience to date. Unlike most commercial landfills, Hanford uses relatively shallow v-shaped trenches that contain approximately 30 percent waste and 70 percent backfill. In this manner, the void volumes are minimized and are less likely to manifest themselves at the surface. The dry Hanford climate and the low corrosivity of the local soils combine to make it less likely that metal containers will degrade significantly in the post-closure time period. Also, with the exception of two trenches, the landfill has been closed for between one to ten years, during which time the natural effects of soil loading have been imposed. During this interim closure period, no observable settlement or subsidence has been noted.

General localized settlement should not prove detrimental to the integrity of the multilayer cover. Significant subsidence events could however, disrupt the final covers integrity and reduce its effectiveness in preventing liquid migration. The geotextile will lend some support to the soil cover by providing load distribution should subsidence occur. Subsidence will be monitored through periodic surface measurements taken from permanent benchmarks and concrete perimeter posts. Possible maintenance actions are contained in the post-closure plan (I-2).

I-1e(7) Cover Permeability

Since no bottom liners (clay or synthetic) have been used at the NRDWL, the final cover system permeability need only exceed that of the underlying native soil. In lieu of detailed soils data, the Benton County Soil Survey was used to obtain estimated properties for Quincy series soils which correlate very closely to the Rupert series encountered at the NRDWL. These estimated properties are as follows:

- Textural class: loamy sand
- Unified class: SM
- Permeability: 25 centimeters per hour
- Water-holding capacity: 0.10 centimeters per centimeter soil

Referring to the estimated properties presented earlier for the Esquatzel series soils, the final cover soil has an estimated permeability of 0.8 to 2.5 inches per hour (2.0 to 6.0 centimeters per hour) compared to greater than 9.8 inches per hour (25.0 centimeters per hour) for the underlying native soil. Therefore, the permeability of the final cover soil (excluding the retarding effect of the cover system) is less than that of the native NRDWL soils and the potential for a "bathtub" effect in the waste area can be considered non-existent.

I-1e(8) Freeze/Thaw Effects

This Section is not applicable. The multilayer cover system could only be disrupted by a frost penetration down to the geotextile. The upper layer of soil is a homogeneous mixture unlikely to be affected by upheaval caused by expanding ice crystals. The depth of the geotextile is approximately 46 inches, while the greatest frost penetration of record (1952 to 1980) is 36 inches.

I-1f Continuance of Operations

During closure activity, neither groundwater monitoring nor run-on/run-off nor wind dispersal control need to be monitored because this information is not applicable to this facility as per E-1 (NRDWL), D-6f and g (NRDWL), and D-6i (NRDWL). This section is not applicable to the existing or proposed NRDWS.

I-1g Schedule for Closure

The DOE-RL plans to initiate closure of NRDWL before calendar year 1990. The DOE-RL will close the NRDWL within 180 days of the receipt of the final volume of regulated waste. The following schedule will be completed on or before the time indicated below.

TABLE I-6

CLOSURE SCHEDULE (NRDWL)

TIME (Day)	ACTIVITY
-180	Notification of intent to close
0	Final waste accepted
+30	Closure plan initiated

+90	All on-site waste disposal completed
+90	Removal of all waste drums not to be disposed
+100	Placement of gravel layer of multilayer cover
+110	Placement of geotextile
+140	Placement of fine soil layer of multilayer cover
+150	Ground preparation
+160	Fertilization and seeding
+170	Mulching
+180	Nonradioactive decontamination complete (if needed)
+180	Certification completed

The DOE-RL plans to initiate closure of the existing and proposed NRDWS before 1990 and 2050, respectively. Within 180 days of the final receipt of regulated waste, the following schedule will be completed on or before the time indicated below.

TABLE I-7

CLOSURE SCHEDULE (EXISTING AND PROPOSED NRDWS)

TIME (Day)	ACTIVITY
-180	Notification of intent to close
0	Final regulated waste accepted
+30	Closure initiated
+30	Soil samples taken
+90	Removal of all stored regulated waste drums
+120	Decontamination of concrete pad
+180	Certification completed

The DOE-RL plans to initiate closure of the Demolition Sites by 2050. Within 180 days of the final demolition, the following schedule will be completed on or before the time indicated below.

TABLE I-8

CLOSURE SCHEDULE (DEMOLITION SITES)

TIME (Day)	ACTIVITY
-180	Notification of intent to close
0	Final regulated waste accepted
+30	Closure initiated
+30	Soil samples taken
+180	Certification completed

I-1h Extensions for Closure Time

If before or during the start of closure operations for NRDWL it appears that closure may take more than 180 days, a demonstration will be made to the appropriate regulatory authority to explain the need to extend the 180 day closure time to protect human health and the environment.

If the soil surrounding the existing or proposed NRDWS is contaminated and if extensive sampling and analysis are required, the removal of all the soil may take longer than 180 days. If this situation occurs, a demonstration will be made to the appropriate regulatory authority to explain the need to extend the 180-day closure time to protect human health and the environment.

I-2 POST-CLOSURE PLAN

This section is applicable only to the NRDWL and does not apply to the existing or proposed NRDWS.

I-2a Inspection Plan

An engineer or scientist with experience in the construction and function of a multilayered cover system will perform the following monitoring activities semiannually for the first five years and annually for the remainder of the post-closure period:

a. Evaluation of settling/subsidence
b. Evaluation of vegetative cover
c. Evaluation of bench marks
d. Evaluation of security
e. Evaluation of rodent intrusion
f. Evaluation of erosion

Maintenance action will be initiated within 90 days if the inspection reveals that the integrity of the final containment structure can potentially be breached.

A potential breach is defined below along with the possible maintenance action:

a. Settling/subsidence greater than three feet will initiate maintenance action. Maintenance action may include injecting a grout into identified void spaces and reestablishing the integrity of the multilayer cover system; or stabilizing the

settling/subsidence area and relaying the multilayer system over the affected area. If, at the time of maintenance action, new products and/or information are available to perform the needed repair in a comparable manner to the actions listed above, those maintenance actions may be considered in lieu of the above proposed actions.

b. Vegetative cover less than ten percent after two years of closure (seeding) will initiate maintenance action. Maintenance action will include reseeding and possible fertilizer application.

c. Bench marks damaged or out of alignment will initiate maintenance action. Maintenance action will include replacement of damaged bench marks and resurveying of bench marks found to be out of alignment.

d. Damage to the eight-foot enclosing fence which allows access to the NRDWL will initiate maintenance action. Maintenance action will include repair of the fence.

e. Rodent intrusion in densities that are judged to threaten the integrity of the multilayer system will initiate maintenance action. Maintenance action might include the use of chemical deterrent and/or trapping.

f. Erosion damage that results in the loss of 0.5 meters of the fine topsoil will initiate maintenance action. Maintenance action will include replacement of the fine topsoil at the affected area, reseeding, and performing other selected tasks to insure a vigorous vegetative growth.

I-2b Monitoring Plan

This section is not applicable because it is anticipated that the groundwater waiver demonstration per 40 CFR 264.90(b)(4) and WAC 173-303-645(1)(b)(iii) and the liner waiver exemption request per 40 CFR 264.301(b) and WAC 173-303-665(4)(b) will be accepted by the regulating agencies.

I-2c Maintenance Plan

No monitoring systems (groundwater monitoring, leak detection system, and leachate collection system) need to be kept functional because none are presently required. It is anticipated that groundwater and liner waivers will be approved by regulating authority.

During the post-closure care period, the maintenance organizations are directed to maintain the integrity of the waste containment system.

Experience gained since 1978 with land disposal radioactive containment systems has shown that the waste containment system will remain intact if the vegetative cover is successfully established. Invading plants, primarily Russian thistle (Salsola Kali), which have root systems that can extend into the waste zones are the greatest potential problem. The active elimination of these invading species for two years after seeding will give the vegetative cover time to become firmly established.

Each Spring (generally between March 15, and April 15) for two to three years following closure, selective herbicides 2,4-D amine and dicamba (or their equivalent) will be applied to the closure area to minimize the establishment of deep rooting broadleaf annual plants that compete with the grasses for moisture and nutrients. Field application rates of 0.57 to 1.32 pounds per acre with 2,4-D amine and 0.19 to 0.44 pounds per acre with dicamba have proven effective in controlling undesirable broadleaf species. Selective herbicide applications will be discontinued following successful establishment of the perennial grass cover. Following establishment of the perennial grass cover, manual removal of deep rooting shrubs may be required periodically.

Soil permeabilities and rainfall intensities at Hanford are such that water erosion has been practically nonexistent. However, the potential for erosion from wind is possible, particularly during the period of vegetative establishment. Current mulching practices, which will be implemented during closure, have been quite effective at minimizing wind erosion. When combined with periodic observations, potential problems are identified and corrective measures taken. In no instance to date has there been a need to import or provide additional backfill as a result of erosion.

Maintenance of bench marks has not been a problem to date. The arid environment moderates the vegetative growth so that the bench marks are easily observable, but enough ground cover exists so that drifting sand does not overrun the bench marks. If for some reason during the inspection a bench mark needs to be replaced, replacement will be completed within 90 days of the observation.

I-2d Land Treatment

This section is not applicable because the NRDWL is a land disposal facility.

I-3 NOTICE IN DEED

This section applies only to the NRDWL and does not apply to the existing or proposed NRDWS.

Notice to Local Land Authority

The DOE-RL will file, within 90 days after the start of post-closure care period, the following documents, or similar documents, to the local land use authority and the regulating authority. The land use authority is the Benton County Planning Department which is located at Courthouse Building, Prosser, Washington, 99350.

a. A survey plat indicating the location and dimensions of landfill cells to the extent the information exists and with respect to permanently surveyed bench marks will be submitted. This plat will be prepared by a certified professional land surveyor.

b. The following note is to accompany the survey plat:
   This plat describes real property in which hazardous wastes have been disposed and buried in accordance with requirements of 40 CFR Part 264 and/or WAC 173-303. Although this hazardous waste disposal facility is now closed, public health, environmental safety, and regulations issued by the EPA in 40 CFR 264.119 and/or the WDOE in WAC 173-303-610(9) require that post-closure use of the property never be allowed to disturb the integrity of the final cover unless it can be demonstrated that any proposed disturbance will not increase any risk to the human health or the environment.

c. A record of the type, location, and quantity of hazardous wastes disposed of within each cell or area of the facility to the extent that the information exists will be submitted. During the post-closure care period, any changes to this record will be submitted to the regulating authority.

Notice in Deed to Property

The DOE-RL will, in accordance with state law, sign, notarize, and attach the following notation to the deed of NRDWL within 180 days of the start of the post-closure care period:

TO WHOM IT MAY CONCERN:
The U.S. Department of Energy-Richland Operations Office, an operations office of the U.S. Department of Energy, which is a Department of the United States Government, the undersigned, whose local address is the Federal Building, 825 Jadwin Avenue, City of Richland, County of Benton, State of Washington, hereby gives the following notice as required by 40 CFR 270.14(b)(14) and/or WAC 173-303-806(4)(a)(xiv).

a. The U.S. Department of Energy is, and since April 1943, has been in possession in fee simple of the following described lands (legal description).

b. Since November 19, 1980, the U.S. Department of Energy-Richland Operations Office has disposed of hazardous and/or dangerous waste under the terms of regulations promulgated by the United States Environmental Protection Agency and/or Washington Department of Ecology to the above-described land.

c. The future use of the above-described land is restricted under the terms of 40 CFR 264.117(c) and/or WAC 173-303-610(7).

d. Any and all future purchasers of this land should inform themselves of the requirements of the regulations and ascertain the amount and nature of wastes disposed on the above-described property.

e. U.S. Department of Energy-Richland Operation Office have filed a survey plat with the Benton County Planning Department and with the United States Environmental Protection Agency Region X and/or Washington Department of Ecology showing the location and dimensions of landfill cells and a record of the type, location and quantity of waste disposal within each area of the facility.

I-4 CLOSURE COST ESTIMATE

This section is not applicable because federal facilities are exempt from this section per 40 CFR 264.140(c) and WAC 173-303-670-(1)(c).

I-5 FINANCIAL ASSURANCE MECHANISM FOR CLOSURE

This section is not applicable because federal facilities are exempt from this section per 40 CFR 264.140(c) and WAC 173-303-670-(1)(c).

I-6 POST-CLOSURE COST ESTIMATE

This section is not applicable because federal facilities are exempt from this section per 40 CFR 264.140(c) and WAC 173-303-670-(1)(c).

I-7 FINANCIAL ASSURANCE MECHANISM FOR POST-CLOSURE CARE

This section is not applicable because federal facilities are exempt from this section per 40 CFR 264.140(c) and WAC 173-303-670-(1)(c).

I-8 LIABILITY REQUIREMENTS

This section is not applicable because federal facilities are exempt from this section per 40 CFR 264.140(c) and WAC 173-303-670-(1)(c).

HANFORD DISPOSAL FACILITY

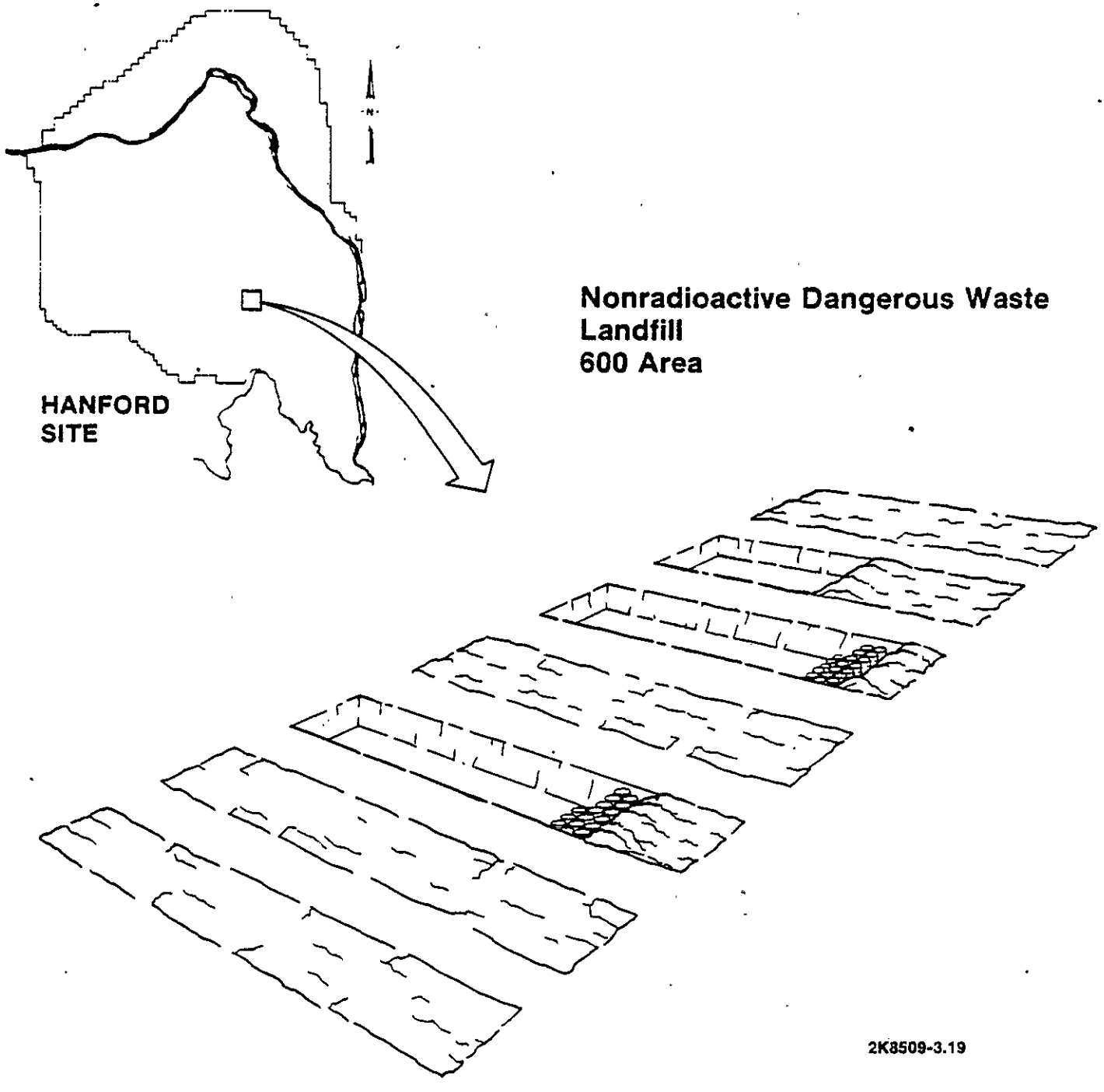
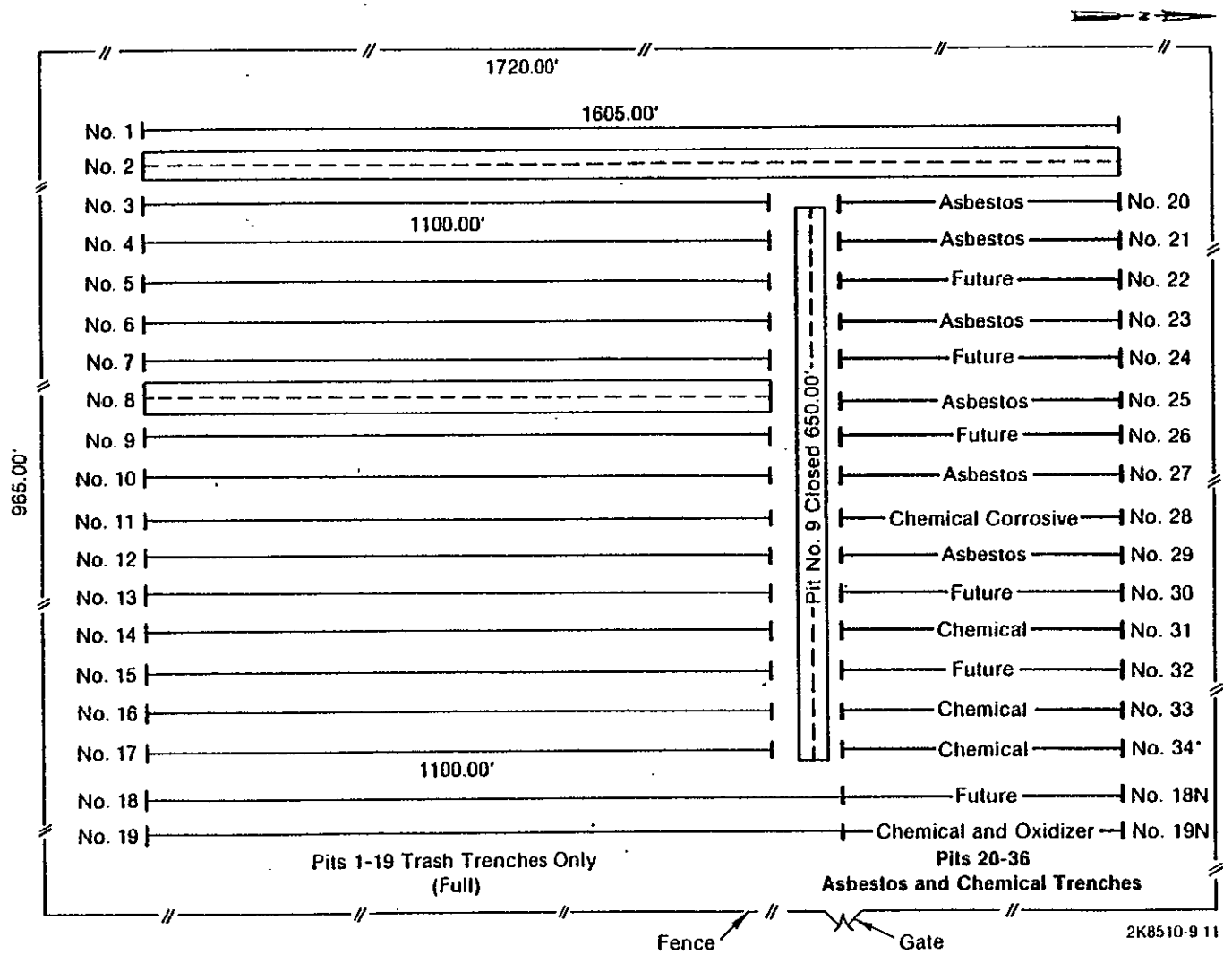


FIGURE I-1. HANFORD DISPOSAL FACILITY

CENTRAL LANDFILL 600 AREA HANFORD SITE

46° 30' 40" N 119° 27' 50" W

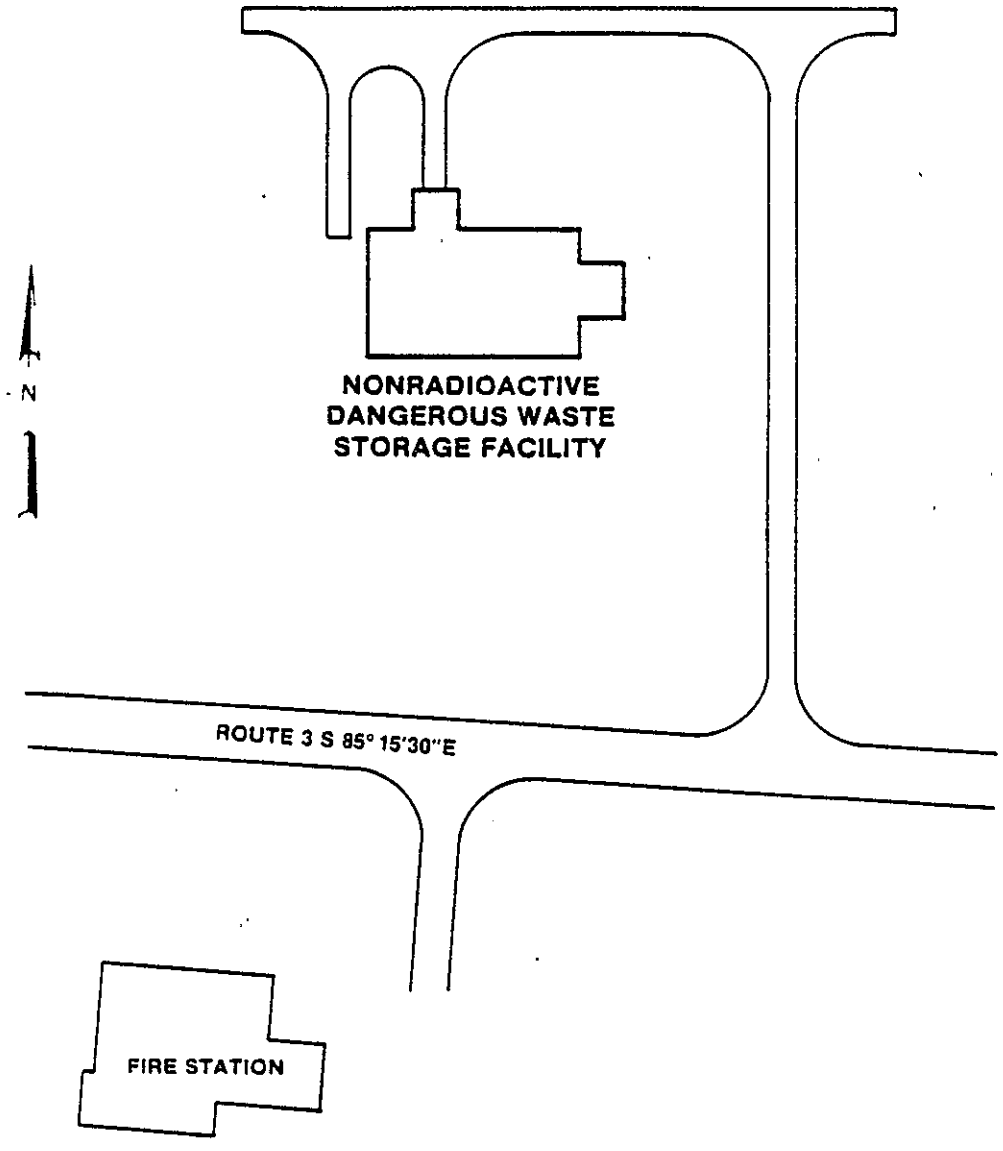


TRENCH NONREGULATED CLOSED PREVIOUS TO NOVEMBER 19, 1980

FIGURE I-2. CENTRAL LANDFILL 600 AREA, HANFORD SITE

WA7890008967

LOCATION OF PROPOSED NONRADIOACTIVE DANGEROUS WASTE STORAGE FACILITY

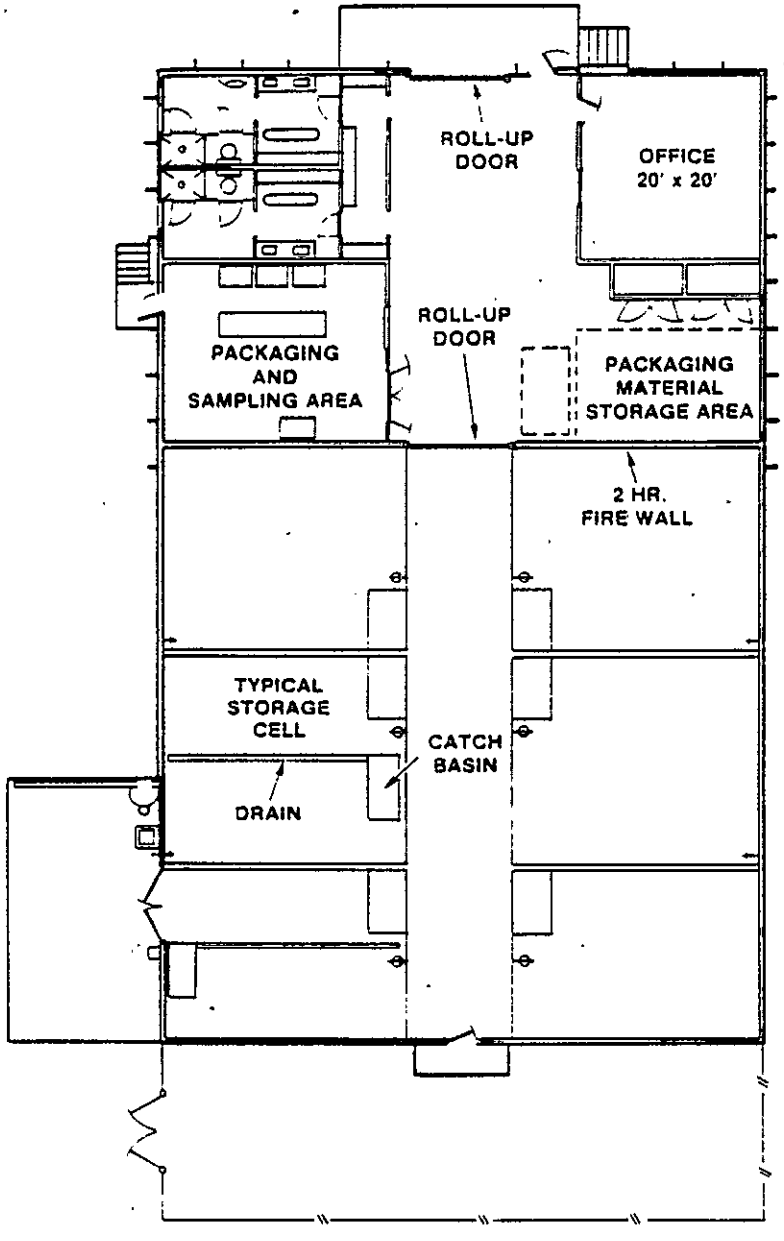


SITE PLAN

2K8509-3.22

FIGURE I-3. LOCATION OF PROPOSED NONRADIOACTIVE DANGEROUS WASTE STORAGE FACILITY

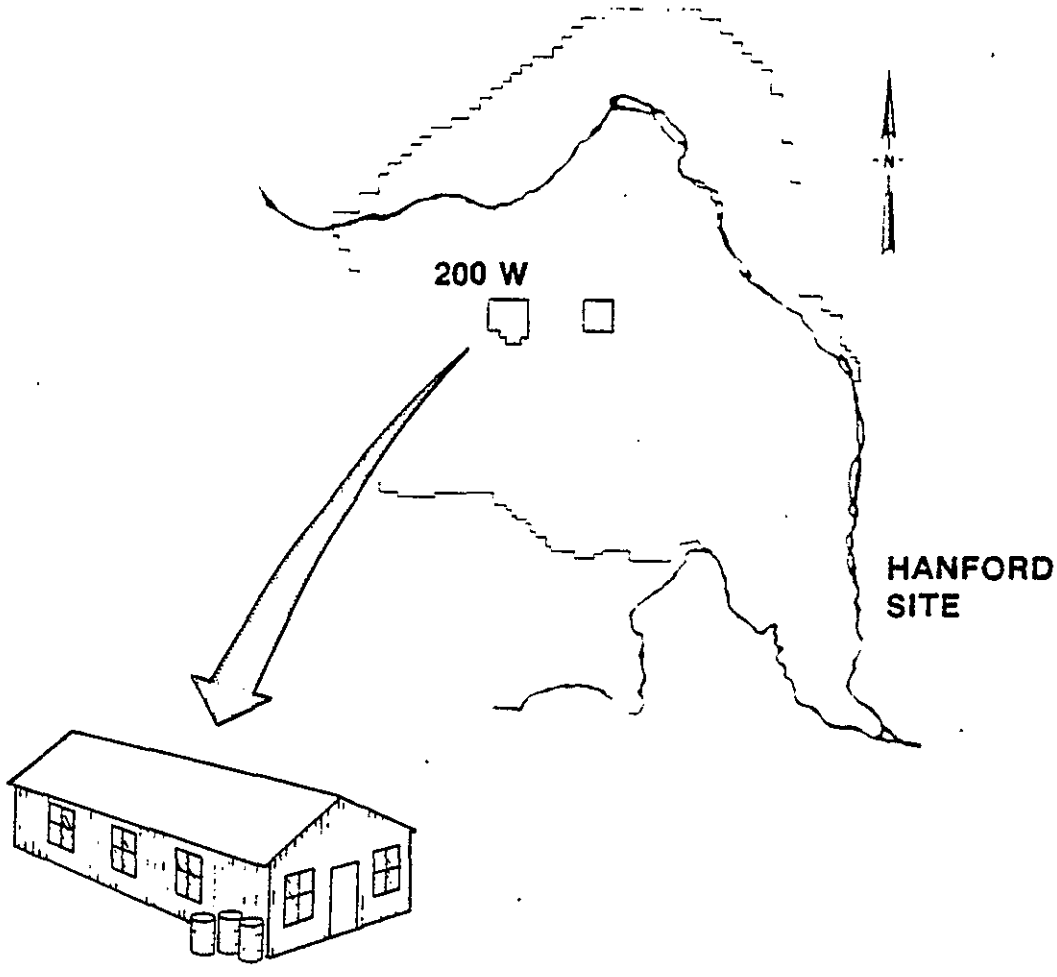
NONRADIOACTIVE DANGEROUS WASTE STORAGE FACILITY



2K8509-3.21

FIGURE I-4. PROPOSED NONRADIOACTIVE DANGEROUS WASTE STORAGE FACILITY

HANFORD STORAGE FACILITY

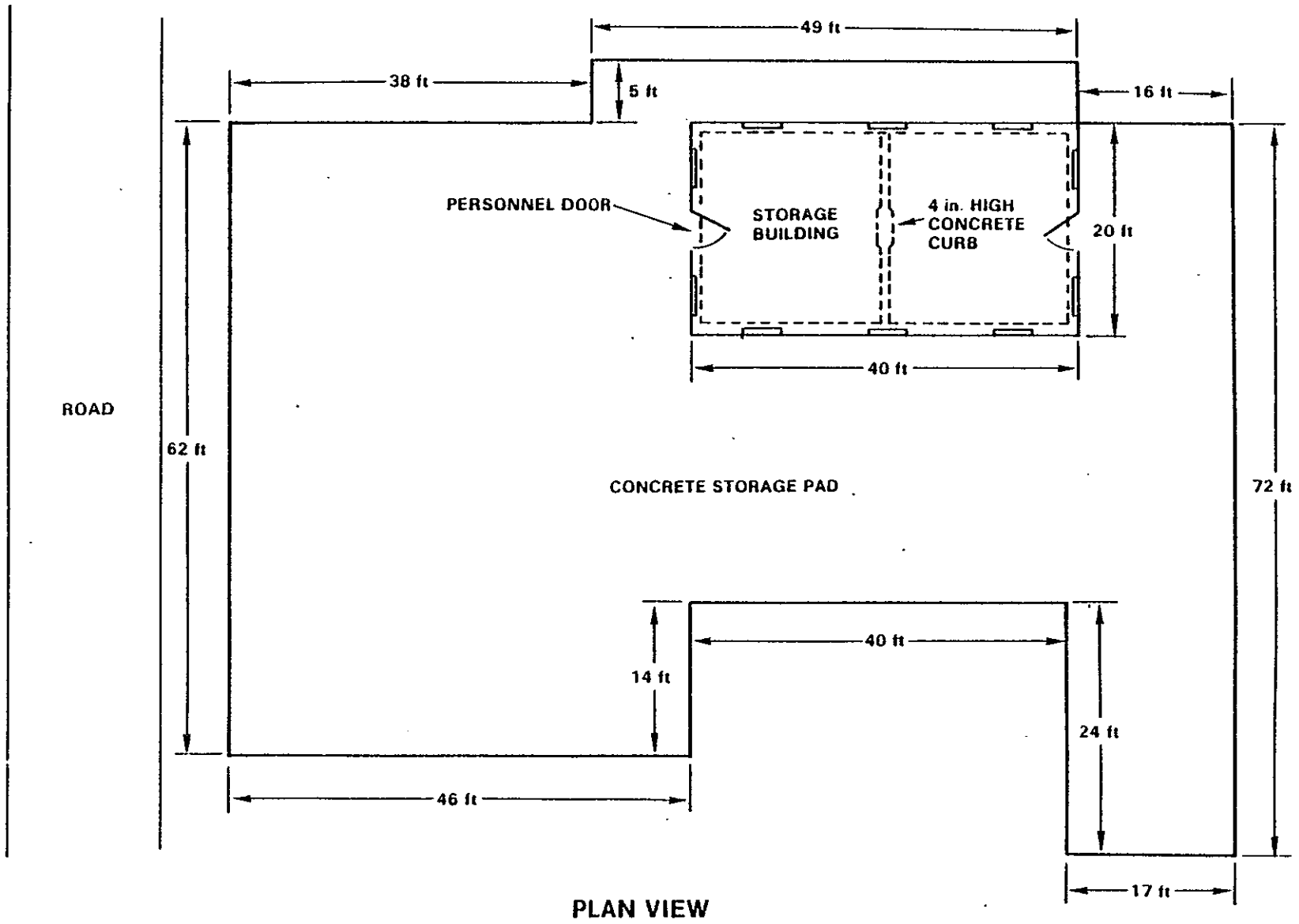


Nonradioactive Dangerous Waste Storage Facility 2727-S, Rockwell Hanford Operations 200 W Area

2K8509-3.15

FIGURE I-5. EXISTING HANFORD STORAGE FACILITY

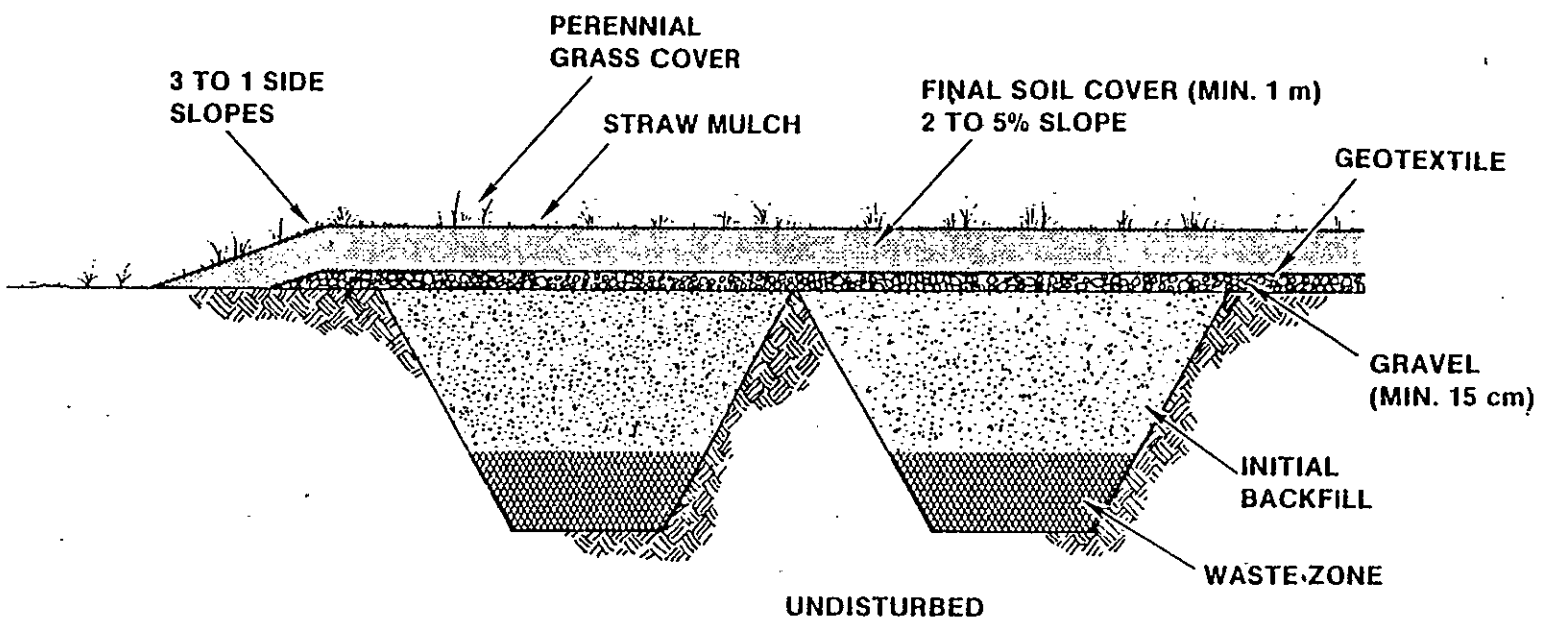
NONRADIOACTIVE DANGEROUS WASTE STORAGE FACILITY



2K8509-3.17

FIGURE I-6. PLAN VIEW OF EXISTING NONRADIOACTIVE DANGEROUS WASTE STORAGE FACILITY

MULTILAYER COVER SYSTEM



2K8509-3.18

FIGURE 1-7. MULTILAYER COVER SYSTEM

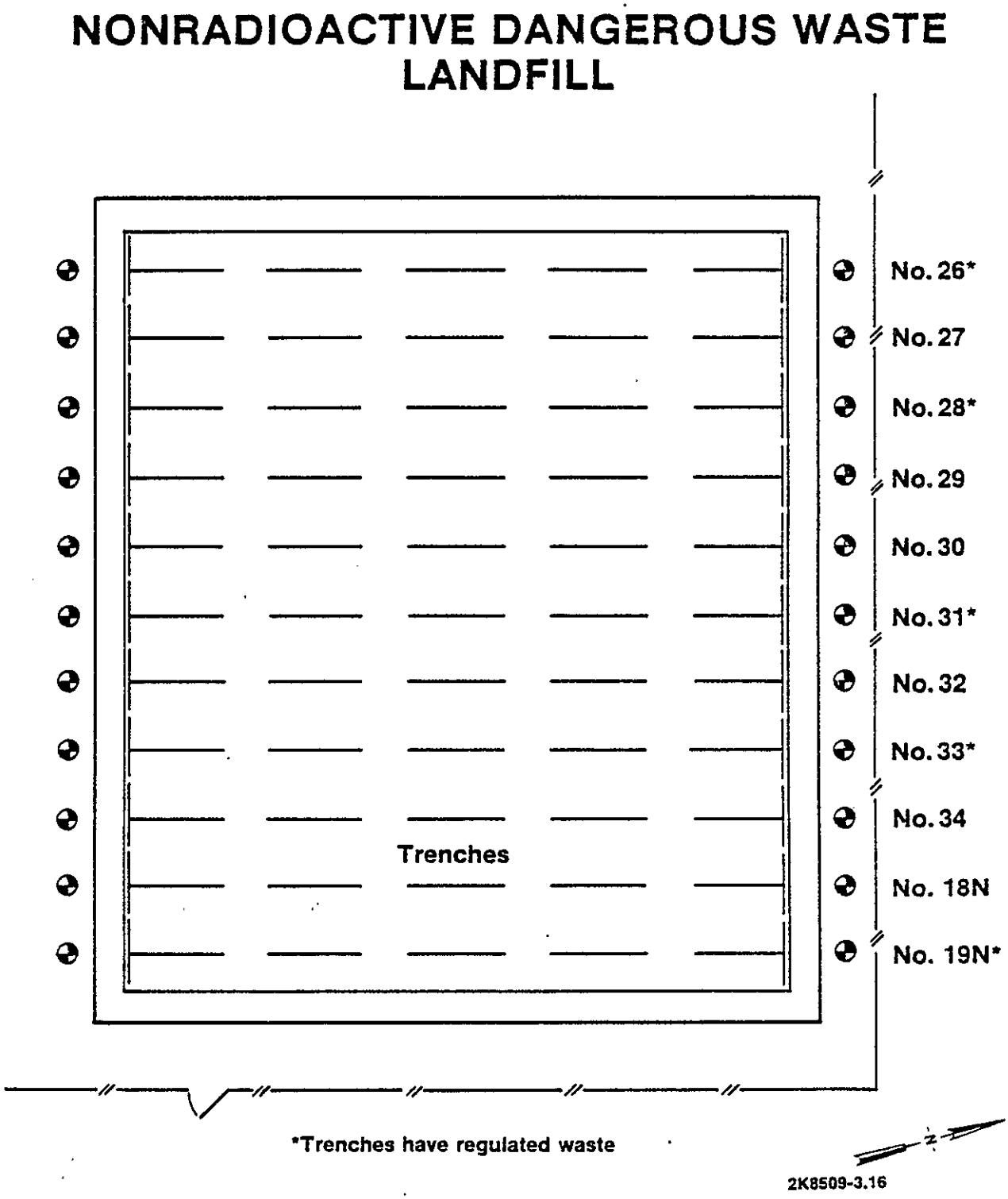
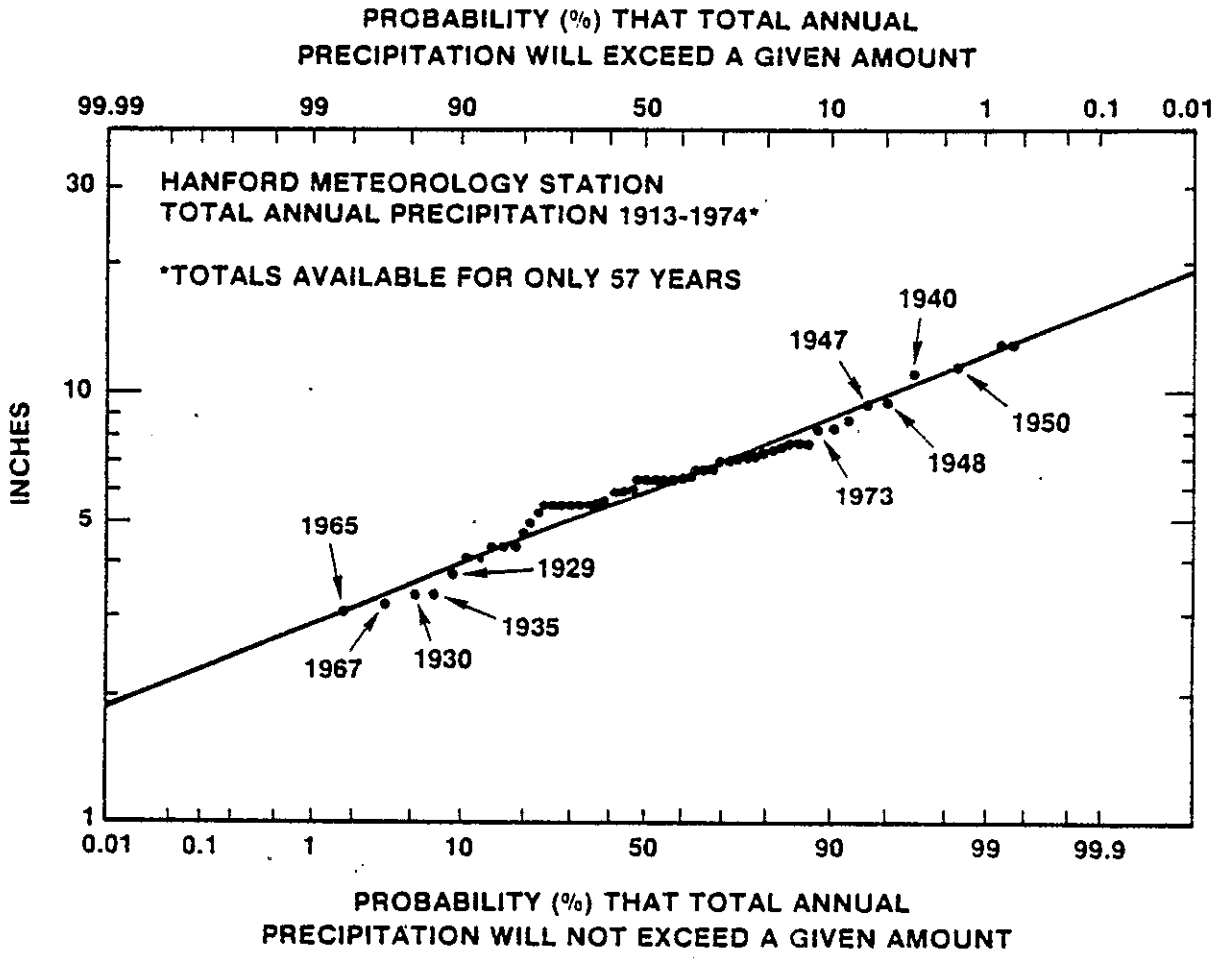


FIGURE I-8. NONRADIOACTIVE DANGEROUS WASTE LANDFILL

TOTAL ANNUAL PRECIPITATION PROBABILITY DIAGRAM



2K8509-3.20

REFERENCE: FINAL ENVIRONMENTAL STATEMENT ERDA-1538, WASTE MANAGEMENT OPERATIONS, HANFORD RESERVATION, RICHLAND, WASHINGTON P.II.3-E-33

FIGURE I-9. TOTAL ANNUAL PRECIPITATION PROBABILITY DIAGRAM

APPENDIX I-1

LOCATION OF NRDWL CLOSURE/POST-CLOSURE PLAN

Two copies of the NRDWL Closure and Post-Closure Plan are official copies of the closure plan. These official copies are located at the following office:

U.S. Department of Energy-Richland Operations Office
Federal Building
825 Jadwin Avenue
Post Office Box 550
Richland, WA 99352

APPENDIX I-2

RESPONSIBLE PERSON FOR STORAGE AND UPDATING OF COPIES OF CLOSURE/POST-CLOSURE PLAN

If a permit modification is requested during the active life of any of the facilities which changes the operating plans for facility design, the closure plans and post-closure plans will be modified at the same time. In all other cases, a request for modification of a closure plan and post-closure plan will be completed within 60 days after a change in operating plans, facility design or events which affect that facility's closure plan. The following office will be responsible for updating the official copies of the closure plan for the NRDWL, the existing NRDWS, and the proposed NRDWS.

Chief
Radiological and Environmental Safety Branch
Environment, Safety and Health Division
U.S. Department of Energy - Richland Operations Office
Federal Building - Room 619
825 Jadwin Avenue
P.O. Box 550
Richland, WA 99352
(509) 376-7387

APPENDIX I-3

CERTIFICATIONS OF CLOSURE

CERTIFICATION OF CLOSURE FOR THE NRDWL

When closure is completed, DOE-RL will submit to the regulating authority both a self-certification and a certification by an independent registered professional engineer that the NRDWL has been closed in accordance with the specification of this approved closure plan.

Owner/Operator Closure Certification

The DOE-RL will self-certify with the following document or a document similar to it:

> I, (name), an authorized representative of the U.S. Department of Energy-Richland Operation Office located at the Federal Building, 825 Jadwin Avenue, Richland, Washington, hereby state and certify that the Nonradioactive Dangerous Waste Landfill in the 600 Area, to the best of my knowledge and belief, has been closed in accordance with the attached approved closure plan, and that the closure was completed on (date). (Signature and date)

Professional Engineer Closure Certification

The DOE-RL will engage an independent registered professional engineer to certify that the NRDWL facility has been closed in accordance with this approved closure plan. The DOE-RL will require the engineer to sign the following document or a document similar to it:

> I, (name), a certified professional engineer, hereby certify, to the best of my knowledge and belief, that I have made visual inspection(s) of the Nonradioactive Dangerous Waste Landfill and that closure of the aforementioned facility has been performed in accordance with the attached approved closure plan. (Signature, date, state professional engineer license number, business address, and phone number).

CERTIFICATION OF CLOSURE FOR THE EXISTING NRDWS

When closure is completed, DOE-RL will submit to the regulating authority both a self-certification and a certification by an independent registered professional engineer that the existing NRDWS has been closed in accordance with the specification of this approved closure plan.

Owner/Operator Closure Certification

The DOE-RL will self-certify with the following document or a document similar to it:

> I, (name), an authorized representative of the U.S. Department of Energy-Richland Operation Office located at the Federal Building, 825 Jadwin Avenue, Richland, Washington, hereby state and certify that the Nonradioactive Dangerous Waste Storage Facility 2727-S in the 200 West Area, to the best of my knowledge and belief, has been closed in accordance with the attached approved closure plan, and that the closure was completed on (date). (Signature and date)

Professional Engineer Closure Certification

The DOE-RL will engage an independent registered professional engineer to certify that the existing NRDWS facility has been closed in accordance with this approved closure plan. The DOE-RL will require the engineer to sign the following document or a document similar to it:

> I, (name), a certified professional engineer, hereby certify, to the best of my knowledge and belief, that I have made visual inspection(s) of the Nonradioactive Dangerous Waste Storage Facility 2727-S and that closure of the aforementioned facility has been performed in accordance with the attached approved closure plan. (Signature, date, state professional engineer license number, business address, and phone number).

CERTIFICATION OF CLOSURE FOR THE PROPOSED NRDWS

When closure is completed, DOE-RL will submit to the regulating authority both a self-certification and a certification by an independent registered professional engineer that the proposed NRDWS has been closed in accordance with the specification of this approved closure plan.

Owner/Operator Closure Certification

The DOE-RL will self-certify with the following document or a document similar to it:

> I, (name), an authorized representative of the U.S. Department of Energy-Richland Operation Office located at the Federal Building, 825 Jadwin Avenue, Richland, Washington, hereby state and certify that the Nonradioactive Dangerous Waste Storage Facility 616, to the best of my knowledge and belief, has been closed in accordance with the attached approved closure plan, and that the closure was completed on (date). (Signature and date)

Professional Engineer Closure Certification

The DOE-RL will engage an independent registered professional engineer to certify that the proposed NRDWS facility has been closed in accordance with this approved closure plan. The DOE-RL will require the engineer to sign the following document or a document similar to it:

> I, (name), a certified professional engineer, hereby certify, to the best of my knowledge and belief, that I have made visual inspection(s) of the Nonradioactive Dangerous Waste Storage Facility 616 and that closure of the aforementioned facility has been performed in accordance with the attached approved closure plan. (Signature, date, state professional engineer license number, business address, and phone number).

CERTIFICATION OF CLOSURE FOR THE DEMOLITION SITES

When closure is completed, DOE-RL will submit to the regulating authority both a self-certification and a certification by an independent registered professional engineer that the Demolition Sites have been closed in accordance with the specification of this approved closure plan.

Owner/Operator Closure Certification

The DOE-RL will self-certify with the following document or a document similar to it:

> I, (name), an authorized representative of the U.S. Department of Energy-Richland Operation Office located at the Federal Building, 825 Jadwin Avenue, Richland, Washington, hereby state and certify that the Demolition Sites (E8 Borrow Pit, Ash Pit Site, and Hanford Patrol Academy Site) in the 200 West Area, to the best of my knowledge and belief, have been closed in accordance with the attached approved closure plan, and that the closure was completed on (date). (Signature and date)

Professional Engineer Closure Certification

The DOE-RL will engage an independent registered professional engineer to certify that the Demolition Sites have been closed in accordance with this approved closure plan. The DOE-RL will require the engineer to sign the following document or a document similar to it:

> I, (name), a certified professional engineer, hereby certify, to the best of my knowledge and belief, that I have made visual inspection(s) of the Demolition Sites (E8 Borrow Pit, Ash Pit Site, and Hanford Patrol Academy Site) and that closure of the aforementioned facilities has been performed in accordance with the attached approved closure plan. (Signature, date, state professional engineer license number, business address, and phone number).

SECTION J
OTHER FEDERAL LAWS

In conformance with the requirements of 40 CFR, Section J, Other Federal Laws: 270.14(b), 270.3, the following Federal Laws have been reviewed and the U.S. DOE Hanford facility is operated pursuant to the rules and/or regulations promulgated under these acts.

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 development, 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 (PL 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 to 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.

The Hanford facility is also operated pursuant to the rules and/or regulations promulgated under the Clean Water Act, the Clean Air Act and its subsequent amendments, as well as the requirements of other applicable Federal laws through ongoing facility planning and operational monitoring/compliance activities of the Safety and Quality Assurance Divisions.

SECTION K
CERTIFICATION

Certification for the Nonradioactive Dangerous Waste Landfill and Storage Facilities Part B Permit Application is included in the Certification Statement submitted by the U.S. Department of Energy, Richland Operations Office, in the cover letter accompanying the complete Part B Permit Application for the Hanford Site.