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DOE/RL-94-28
Revision 0

UC-630,721

State Waste Discharge Permit Application

400 Area Septic System

Date Published
June 1994

United States
Department of Energy
P.O. Box 550
Richland, Washington 99352

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Department of Energy
Richland Operations Office
P.O. Box 550
Richland, Washington 99352

JUN 23 1994

94-RPS-236

Mr. David C. Nylander
Nuclear Waste Program
State of Washington
Department of Ecology
P.O. Box 1386, MSIN 91-05
Richland, Washington 99352-0539

Dear Mr. Nylander:

STATE WASTE DISCHARGE PERMIT APPLICATIONS FOR THE TABLE 4 MISCELLANEOUS STREAMS

Transmitted herein are the State Waste Discharge Permit (SWDP) Applications for the "Miscellaneous Streams." The Miscellaneous Streams are identified on Table 4 of Ecology Consent Order DE 91NM-177 (216 Consent Order). The permit applications include the following:

- State Waste Discharge Permit Application - 100-N Sewage Lagoon (DOE/RL-94-22)
- State Waste Discharge Permit Application - 183-N Backwash Discharge Pond (DOE/RL-94-23)
- State Waste Discharge Permit Application - 200-E Chemical Drain Field (DOE/RL-94-24)
- State Waste Discharge Permit Application - 200-E Powerhouse Ash Pit (DOE/RL-94-25)
- State Waste Discharge Permit Application - 200-W Powerhouse Ash Pit (DOE/RL-94-26)
- State Waste Discharge Permit Application - 400 Area Septic System (DOE/RL-94-28).

Section 6, Table 4 of the 216 Consent Order identifies eleven miscellaneous streams which require the submittal of Washington Administrative Code (WAC) 173-216 SWDP Applications by June 30, 1994. Of the eleven streams identified, the five following streams do not require permitting under WAC 173-216:

- 300 Area Powerhouse Ash Waste Water (will be permitted under a National Pollutant Discharge Elimination System [NPDES] permit)
- 300 Area Filter Backwash streams (will be permitted under a NPDES permit)

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- 234-5Z Ventilation Steam Condensate/Dry Air Compressor Cooling Water (will be rerouted to and permitted under the 200 Areas Treated Effluent Disposal Facility)

- 209-E Building Steam Condensate (has been eliminated)

- 300 Area Sanitary Sewer (will be rerouted to the City of Richland Publicly Owned Treatment Works before June 1995).

The enclosed WAC 173-216 permit applications were prepared for the remaining six streams, and thus fulfill the requirements of the 216 Consent Order.

State Environmental Policy Act (SEPA) environmental checklists were not prepared for the "Miscellaneous Streams" listed on Table 4 of the 216 Consent Order. The SEPA regulations [WAC 197-11-855(1)] exempt the existing streams from the SEPA process.

Should you have any questions or require any additional information regarding these permit applications, please contact Mr. J. E. Rasmussen on (509) 376-2247.

Sincerely,

Steven H. Wisness, Acting Program Manager
Office of Environmental Assurance,
Permits, and Policy

EAP:JET

Enclosures

cc w/o encl:
Administrative Records
B. P. Atencio, WHC
J. J. Luke, WHC
M. A. Selby, Ecology
J. E. Turnbaugh, WHC

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FOREWORD

As part of the *Hanford Federal Facility Agreement and Consent Order* negotiations (Ecology et al. 1994), the U.S. Department of Energy, Richland Operations Office, the U.S. Environmental Protection Agency, and the Washington State Department of Ecology agreed that liquid effluent discharges to the ground on the Hanford Site which affect groundwater or have the potential to affect groundwater would be subject to permitting under the structure of Chapter 173-216 (or 173-218 where applicable) of the *Washington Administrative Code*, the State Waste Discharge Permit Program. As a result of this decision, the Washington State Department of Ecology and the U.S. Department of Energy, Richland Operations Office entered into *Consent Order No. DE 91NM-177*, (Ecology and DOE-RL 1991).

The *Consent Order No. DE91NM-177* requires a series of permitting activities for liquid effluent discharges. Liquid effluents on the Hanford Site have been classified as Phase I, Phase II, and Miscellaneous Streams. The *Consent Order No. DE91NM-177* establishes milestones for State Waste Discharge Permit application submittals for all Phase I and Phase II streams, as well as the following 11 Miscellaneous Streams as identified in Table 4 of the *Consent Order No. DE91NM-177.*

- 209-E Building Steam Condensate
- 400 Area Sanitary Waste Water
- 200-W Powerhouse Ash Waste Water
- 200-E Powerhouse Ash Waste Water
- 300 Area Powerhouse Ash Waste Water
- 100-N Sanitary Sewer System
- 300 Area Filter Backwash
- 300 Area Sanitary Sewer System
- 234-5Z Steam Condensate/Dry Air Compressor Cooling
- 272-E, 2703-E Buildings Waste Water
- 183-N Filter Backwash Waste Water.

This document constitutes the State Waste Discharge Permit application for the 400 Area Septic System. The influent to the system is domestic waste water. Although the 400 Area Septic System is not a Public Owned Treatment Works, the Public Owned Treatment Works application is more applicable than the application for industrial waste water. Therefore, the State Waste Discharge Permit application for Public Owned Treatment Works Discharges to Land was used.

The 400 Area Sanitary Waste Water is generated from standard sanitary processes and discharged to the 400 Area Septic System. The 400 Area Sanitary Waste Water is presently being managed through the use of gravity collection lines, a septic tank, and a

surface disposal pond. There are approximately 700 employees in the 400 Area who use the domestic waste water system.

A number of options for modifying the sewer system have been evaluated in order to eliminate the current surface infiltration pond. In 1991 a tie line that would route sanitary waste water from the 400 Area to the Washington Public Power Supply System was completed. Department of Energy, Richland Operations Office has been negotiating a contract with the Washington Public Power Supply System; however, to date, no agreement has been reached.

An engineering study of the various systems to determine the best alternative for the 400 Area Sanitary Sewage, in case the Department of Energy, Richland Operations Office and the Washington Public Power Supply System fail to reach an agreement, was performed in 1993. The recommendation of the Engineering Study was to pursue a fully lined surface evaporation pond. The Department of Energy, Richland Operations Office and Westinghouse Hanford Company are currently evaluating the construction of a fully lined evaporative lagoon treatment system.

CONTENTS

FOREWORD iii

CONTENTS v

GLOSSARY vii
METRIC CONVERSION CHART viii

1.0 PERMIT APPLICATION Application-1

2.0 REFERENCES 2-1

APPENDICES:

A GENERAL INFORMATION A-1
B TREATMENT PLANT INFORMATION B-1
C WASTE WATER INFORMATION C-1
D SLUDGE MANAGEMENT AND DISPOSAL D-1
E SITE ASSESSMENT E-1

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GLOSSARY

BMP	best management practice
BOD	biological oxygen demand
CFR	Code of Federal Regulations
COD	chemical oxygen demand
DOE	U.S. Department of Energy
DOE-RL	U.S. Department of Energy, Richland Operations Office
Ecology	Washington State Department of Ecology
EPA	U.S. Environmental Protection Agency
gpd	gallons per day
GWQC	Ground Water Quality Criteria
MGD	million gallons per day
mg/L	milligrams per liter
PNL	Pacific Northwest Laboratory
POTW	Public Owned Treatment Works
PSPL	Puget Sound Power and Light Company
RCRA	Resource Conservation and Recovery Act
RCW	Revised Code of Washington
SWDP	State Waste Discharge Permit
TKN	total Kjedldahl nitrogen
ug/L	micrograms per liter
USGS	United States Geological Survey
WAC	Washington Administrative Code
WHC	Westinghouse Hanford Company
WPPSS	Washington Public Power Supply System

METRIC CONVERSION CHART

INTO METRIC UNITS			OUT OF METRIC UNITS		
If you know	**Multiply by**	**To get**	**If you know**	**Multiply by**	**To get**
Length			**Length**		
inches	2.54	centimeters	centimeters	0.393	inches
feet	0.3048	meters	meters	3.2808	feet
yards	0.914	meters	meters	1.09	yards
miles	1.609	kilometers	kilometers	0.62	miles
Area			**Area**		
square feet	0.092	square meters	square meters	10.7639	square feet
square yards	0.836	square meters	square meters	1.20	square yards
square miles	2.59	square kilometers	square kilometers	0.39	square miles
acres	0.404	hectares	hectares	2.471	acres
Mass (weight)			**Mass (weight)**		
ounces	28.35	grams	grams	0.0352	ounces
pounds	0.453	kilograms	kilograms	2.2046	pounds
short ton	0.907	metric ton	metric ton	1.10	short ton
Volume			**Volume**		
fluid ounces	29.57	milliliters	milliliters	0.03	fluid ounces
quarts	0.95	liters	liters	1.057	quarts
gallons	3.79	liters	liters	0.26	gallons
cubic feet	0.03	cubic meters	cubic meters	35.3147	cubic feet
cubic yards	0.76	cubic meters	cubic meters	1.308	cubic yards
Temperature			**Temperature**		
Fahrenheit	subtract 32 then multiply by 5/9ths	Celsius	Celsius	multiply by 9/5ths, then add 32	Fahrenheit

Source: Lindeburg 1990.

1.0 PERMIT APPLICATION

This section presents the State Waste Discharge Permit (SWDP) application for the 400 Area Septic System. The 400 Area Sanitary Waste Water is generated from standard sanitary processes and is discharged to the 400 Area Septic System. The 400 Area Sanitary Waste Water is presently being managed through the use of gravity collection lines, a septic tank, and a surface disposal pond. There are approximately 700 employees in the 400 Area who use the domestic waste water system.

1.1 ORGANIZATION

The Washington Administrative Code (WAC) 173-216 SWDP application form for the 400 Area Septic System is presented in this section. Information required by the SWDP application form is provided on the form when adequate space is available. Otherwise, information is provided in the appendices as noted on the completed form. The appendices follow precisely the format of the SWDP application and are designed to supplement the permit application form. Appendix A contains site location maps referenced in Section A of the permit application form. Appendices B through E correspond to Sections B through E in the permit application form. Within each appendix, those questions which require additional space have been restated and the answer directly follows the question. The questions in the appendices are worded precisely as they are in the application form, and are highlighted in bold capital letters which are underlined.

1.2 STATE WASTE DISCHARGE PERMIT APPLICATION FORM

The following pages contain the SWDP application for the 400 Area Septic System.

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WASHINGTON STATE DEPARTMENT OF ECOLOGY

STATE WASTE DISCHARGE PERMIT APPLICATION FOR POTW DISCHARGES TO LAND

FOR STATE USE ONLY			
Date Application Received		Date Fee Paid		Application/ Permit No.	
Date Application Accepted				Facility No.	
Temporary Permit Effective Date				Temporary Permit Expiration Date	

This application is for a waste discharge permit as required in accordance with provisions of Chapter 90.48 RCW and Chapter 173-216 WAC. Additional information may be required. Information previously submitted and applicable to this application should be referenced in the appropriate section.

SECTION A. GENERAL INFORMATION

1. Applicant Name: U.S Department of Energy, Richland Operations Office

2. Facility Name: 400 Area Septic System
(If different from applicant)

3. Unified Business Identification Number (UBI #): 91-0565159 (DOE tax exempt number)

4. Mailing Address: P.O. Box 550
Street
Richland, WA 99352
City/State Zip

5. Facility Address: 400 Area - Hanford Site
Street
See Maps in Appendix A.
City/State Zip

6. Person to contact who is familiar with the information contained in this application:
J.E. Rasmussen — US DOE, Branch Chief, Regulatory Permits — 509-376-2247
Name Title Telephone

7. Check One: ☐ Permit Renewal ☒ Existing Unpermitted Discharge
☐ Proposed Discharge
Anticipated date of discharge: _____

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

Signature* — Date: 6/23/94

Acting Program Manager, Office of Environmental Assurance, Permits and Policy
Title

Steven H. Wisness
Printed Name

*Applications must be signed by either a principal executive officer or a ranking elected official.

SECTION B. TREATMENT PLANT INFORMATION

1. Identify communities or areas connected to the Public Owned Treatment Works (POTW):

	Name	Population Served
a.	See Appendix B, Item 1.	
b.		
c.		
d.		

2. Identify all industries connected to the POTW or to the collection system by type of industry, name, address, and telephone number. Attach extra sheet(s) if needed.

See Appendix B, Item 2.

3. Plant Design and Operation Manuals:

	Type	Copy at POTW Yes	Copy at POTW No
a.	Engineering Report	☒	☐
b.	Operation and Maintenance Manual	☐	☒

NOTE: There are maintenance procedures in place for this system, but no O&M manuals have been developed.

4. Plant Design Data: ***See Appendix B, Item 4.**

a.	Average Influent Flow for Maximum Month (MGD):	0.023*
b.	Influent BOD Load (lbs/day):	46.1*
c.	Influent SS Load (lbs/day):	64.03*
d.	Began Operation (year):	1978
e.	Last Major Revision (year):	1983
f.	Planned Revisions (year):	1996*
g.	Design Population:	700

5. Attach a simple schematic drawing of POTW indicating process and process discharge in MGD (*attachments should be 11 x 17", or smaller*). Include all unit processes identified in question B.6. **See Appendix B, Item 5.**

6. Check appropriate unit process.

Treatment	Unit Process	Check
Preliminary Treatment	Manually Operated Bar Screens	
	Mechanically Operated Bar Screens	
	Grit Removal	
	Pre-Aeration	
	Comminutors/Grinders	
	Other (*specify*)	
Primary Treatment	Primary Sedimentation Tank/Clarifiers	
	Other (*specify*) ~50,000 Gallon Septic Tank	✓
Secondary Treatment	Oxidation Ditch	
	Aerated Lagoon	
	Non-aerated Lagoon	
	Secondary Clarifiers	
	Polishing Ponds	
	Other (*specify*)	
Additional Treatment	Coagulation	
	Filtration	
	Storage (Lined Lagoon)	
	Storage (Unlined Lagoon)	
	Other (*specify*)	
Disinfection	Chlorination	
	Other (*specify*)	

	Method	Check	Method	Check
Land Application	Drainfield		Flood Irrigation	
	Rapid Infiltration		Ridge and Furrow Irrigation	
	Constructed Wetlands		Subsurface Irrigation	
	Sprinkler Irrigation		Other - Infiltration Pond	✓

SECTION C. WASTEWATER INFORMATION

1. Provide measurements for treated wastewater prior to land application for the parameters listed below, unless waived by the permitting authority. All analytical methods used to meet these requirements shall, unless approved otherwise in writing by Ecology, conform to the Guidelines Establishing Test Procedures for the Analysis of Pollutants Contained in 40 CFR Part 136.

Parameter	Concentrations Measured	Analytical Method	Detection Limit
pH	See Appendix C, Item 1.		
Conductivity			
Total Dissolved Solids			
Total Suspended Solids			
BOD (5 day)			
Total Residual Chlorine			
Ammonia-N			
TKN-N			
Nitrate-N			
Ortho-phosphate-P			
Total-phosphate-P			
Total Oil & Grease			
Calcium			
Magnesium			
Sodium			
Potassium			
Chloride			
Sulfate			
Fluoride			
Cadmium (total)			
Chromium (total)			
Lead (total)			
Mercury			
Selenium (total)			
Silver (total)			
Copper (total)			
Iron (total)			
Manganese (total)			
Zinc (total)			
Barium (total)			
Fecal Coliform			
Total Coliform			

2. Has the effluent been analyzed for any other parameters than those identified in question C.1? If so, when? Attach results. *(Note: Ecology may require additional testing.)* **See Appendix C, Item 2.**

SECTION D. SLUDGE MANAGEMENT AND DISPOSAL

1. Sludge Management Plan ☐ Yes ☒ No
   Plan approved by: **See Appendix D, Item 1.**

   ☐ Local Health District _____
   Date approved

   ☐ Department of Ecology _____
   Date approved

2. Describe sludge generation, stabilization, utilization, and disposal. Attach extra sheets as necessary.

   The septic tank accumulates settleable solids. The solids from the septic tank are scheduled to be pumped every three to five years as needed per the septic system maintenance procedure. The solids are disposed of in the 100-N Sanitary Sewer.

SECTION E. SITE ASSESSMENT

1. Give the legal description of the land treatment site(s). Give the acreage of each land treatment site(s). Attach a copy of the contract(s) authorizing use of land for treatment.

   See Appendix E, Item 1.

2. List all environmental control permits or approvals needed for this project; for example, septic tank permits, sludge application permits, or air emissions permits.

   See Appendix E, Item 2.

3. Attach a United States Geological Survey (USGS) topographic map. Show the following on this map:
   a. Location and name of internal and adjacent streets
   b. Surface water drainage systems within ¼ mile of the site
   c. All wells within 1 mile of the site
   d. Chemical and product handling and storage facilities
   e. Infiltration sources, such as drainfields and lagoons within ¼ mile of the site
   f. Wastewater discharge points including bypasses
   g. Other activities and land uses within ¼ mile of the site

See Appendix E, Item 3.

4. Attach well logs and well I.D.# when available for all wells within 500 feet and any available water quality data.

See Appendix E, Item 4.

5. Describe soils on the site using information from local soil survey reports. *(Submit on separate sheet.)*

   See Appendix E, Item 5.

6. Describe the local geology and hydrogeology within one mile of the site. *(Submit on separate sheet.)*

   See Appendix E, Item 6.

7. List the names and addresses of contractors of consultants who provided information and cite sources of information by title and author.

See Appendix E, Item 7.

2.0 REFERENCES

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APPENDICES

APPENDIX A GENERAL INFORMATION A-1

APPENDIX B TREATMENT PLANT INFORMATION B-1

APPENDIX C WASTE WATER INFORMATION C-1

APPENDIX D SLUDGE MANAGEMENT AND DISPOSAL D-1

APPENDIX E SITE ASSESSMENT E-1

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APPENDIX A

GENERAL INFORMATION

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CONTENTS

FIGURES

A-1 General Hanford Site Map. A-1
A-2 Location of the 400 Area Septic System. A-2

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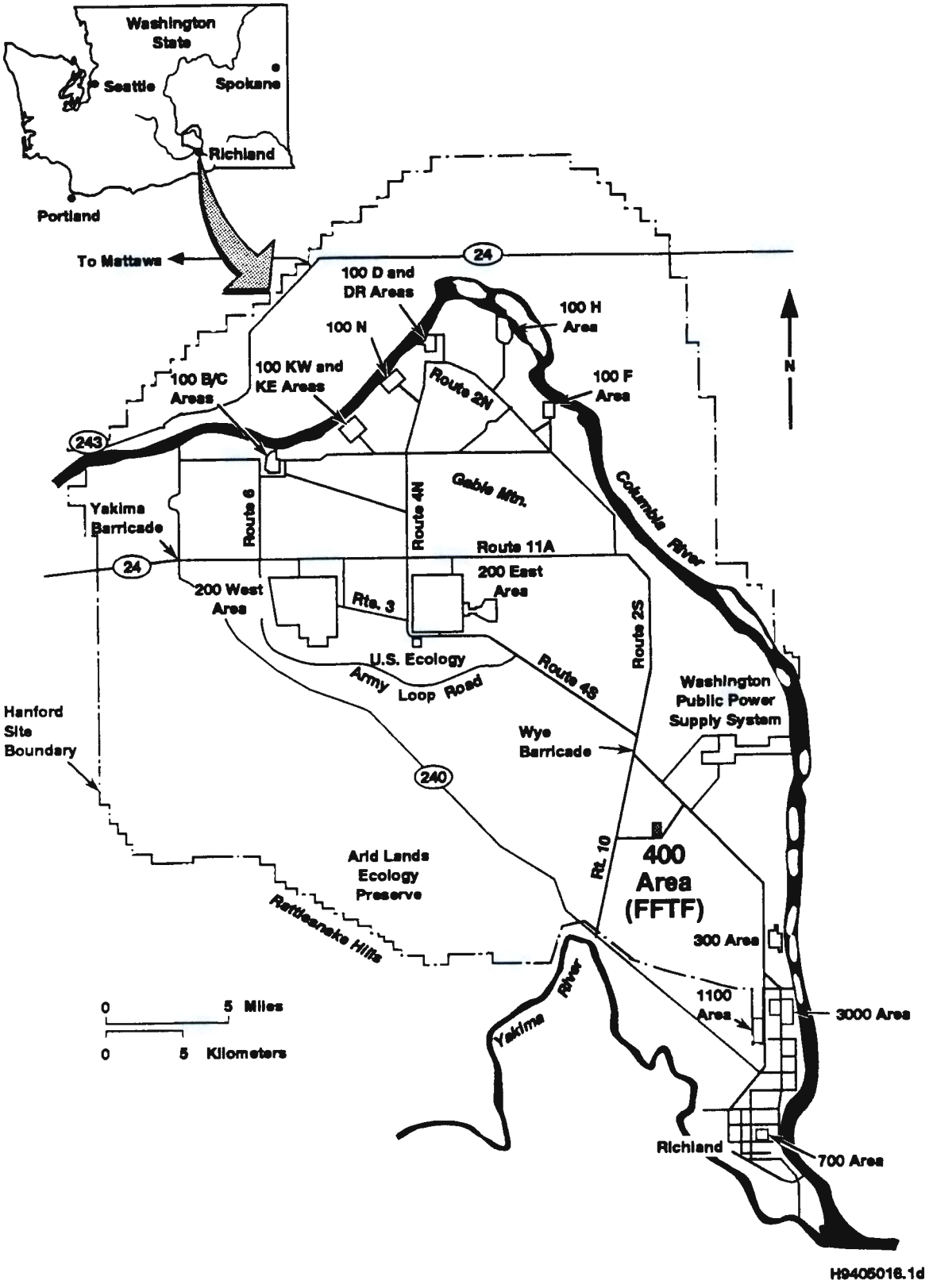

Figure A-1. General Hanford Site Map.

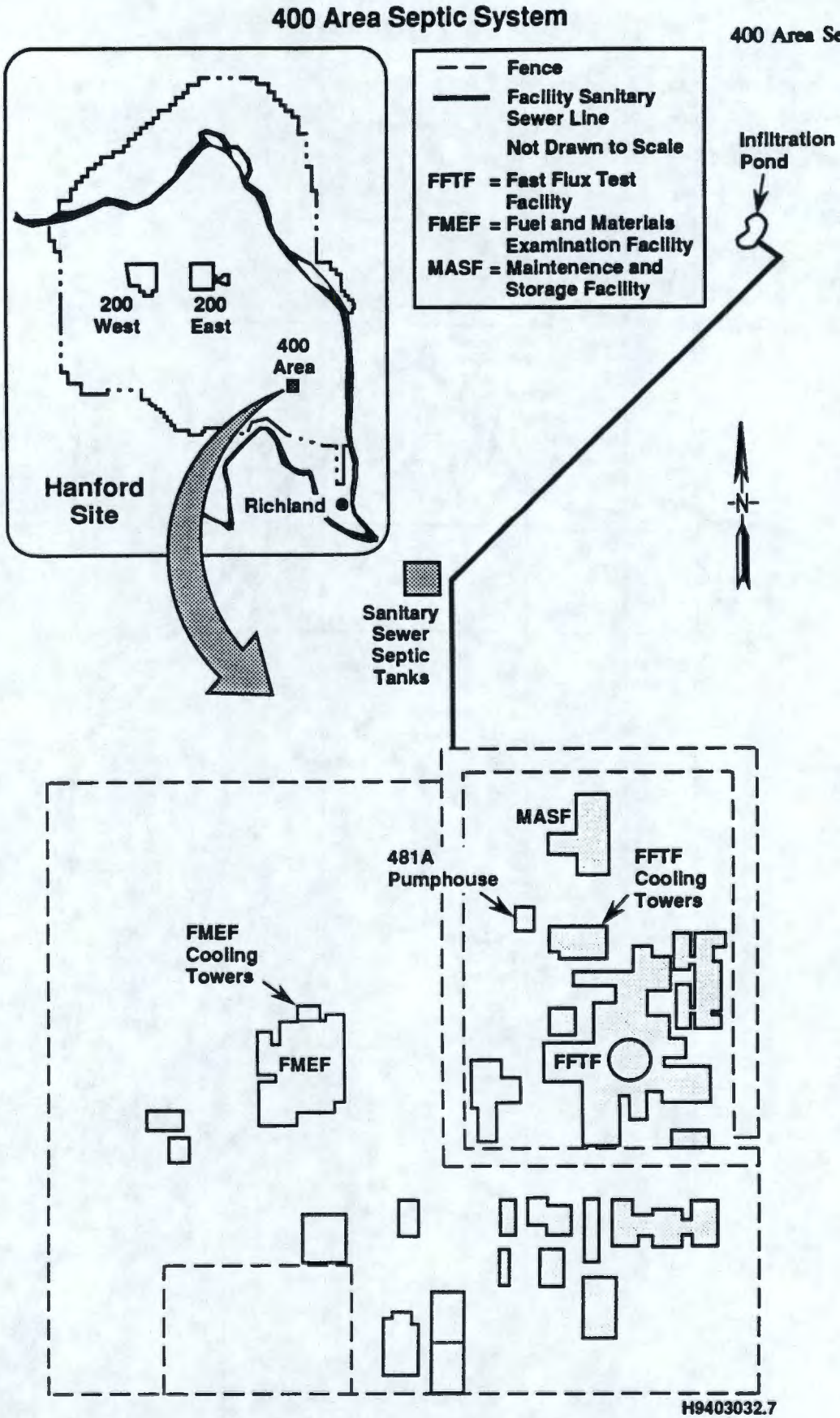

Figure A-2. Location of the 400 Area Septic System.

APPENDIX B

TREATMENT PLANT INFORMATION

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CONTENTS

SECTION B, ITEM 1
IDENTIFY COMMUNITIES OR AREAS CONNECTED TO THE PUBLIC OWNED TREATMENT WORKS (POTW): B-1

SECTION B, ITEM 2
IDENTIFY ALL INDUSTRIES CONNECTED TO THE POTW OR TO THE COLLECTION SYSTEM BY TYPE OF INDUSTRY, NAME, ADDRESS, AND TELEPHONE NUMBER. ATTACH EXTRA SHEET(S) IF NEEDED. B-1

SECTION B, ITEM 4a, 4b, and 4c. B-3

SECTION B, ITEM 4f
PLANNED REVISIONS (YEAR): B-3

SECTION B, ITEM 5
ATTACH A SIMPLE SCHEMATIC DRAWING OF POTW INDICATING PROCESS AND PROCESS DISCHARGE IN MGD *(ATTACHMENTS SHOULD BE 11" X 17", OR SMALLER)* .
INCLUDE ALL UNIT PROCESSES IDENTIFIED IN QUESTION B.6. ..... B-3

TABLE

B-1 Buildings Connected to the 400 Area Septic System B-2

FIGURE

B-1 Schematic Diagram for the 400 Area Septic System B-4

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SECTION B, ITEM 1

IDENTIFY COMMUNITIES OR AREAS CONNECTED TO THE PUBLIC OWNED TREATMENT WORKS (POTW):

Column one of Table B-1 identifies buildings connected to the 400 Area Septic System.

SECTION B, ITEM 2

IDENTIFY ALL INDUSTRIES CONNECTED TO THE POTW OR TO THE COLLECTION SYSTEM BY TYPE OF INDUSTRY, NAME, ADDRESS, AND TELEPHONE NUMBER. ATTACH EXTRA SHEET(S) IF NEEDED.

Columns two, three, and four in Table B-1 identify building name, industries (types of buildings) connected to the 400 Area Septic System, and the 400 Area occupancy. The 400 Area buildings discharging waste to the 400 Area Infiltration Pond have been identified and classified as "administrative" or "process" buildings. Buildings that do not contain processes, and generate domestic waste water from bathroom and kitchen use only are classified as "administrative." Buildings with functions or purposes other than administrative are classified as "process" (even though they may only generate sanitary waste from bathroom and kitchen use).

Table B-1. Buildings Connected to the 400 Area Septic System

(Sheet 1 of 1)

Building Number	Building Name	Building Classifications	Occupancy
427	FMEF	Administrative	700
436	400 Area Training Building	Process	
437	MASF	Administrative	
4701-A	Guard Station	Process	
4701-B	Guard Station	Administrative	
4701-C	Guard Station	Administrative	
4702	Office Building	Administrative	
4703	FFTF Control Building	Administrative	
4704-N	Computer Maintenance	Process	
4704-S	Fire Station	Administrative	
4706	Support Services Building	Administrative	
4707	Site Support Building	Administrative	
4710	Operations Support Building	Administrative	
4713-A	Maintenance and Storage	Administrative	
4713-B	Maintenance and Storage	Process	
4719	Medical Aid Station	Process	
4722-B	Carpenter Shop	Administrative	
4722-C	Paint Shop	Process	
4732-A	Warehouse	Process	
4734-D	Warehouse	Process	
4790	Patrol Headquarters	Process	
4862	FMEF	Administrative	

SECTION B, ITEM 4a, 4b, and 4c.

No original design data is available for the 400 Area Septic System. Information provided in Items 4a, 4b, and 4c are actual operational values. Data in Item 4a is from the Bovay Engineering Report, (Bovay 1993). Data in Item 4b is from the Characterization Report, (WHC 1993a). Data in Item 4c is from recent sampling conducted by Westinghouse Hanford Company.

SECTION B, ITEM 4f

PLANNED REVISIONS (YEAR):

As it is currently configured, the 400 Area sanitary sewer system domestic waste water receives primary treatment in the existing septic tank. The effluent is then gravity fed to an unlined infiltration pond north of the 400 Area.

There are two alternate discharge routes that are being considered for revision of the system. The first alternative involves the tie-in routing domestic waste water from the 400 Area to the Washington Public Power Supply System (WPPSS) Waste Water Treatment Facility which was installed in 1991. However, the waste water flow was never intentionally routed through this line due to the lack of a formal contract with WPPSS. This tie-in is currently plugged.

DOE-RL has been negotiating a contract with representatives from WPPSS since the initial installation of the tie line. As of this time no agreement has been reached. Bovay Northwest was contracted to perform an engineering study to determine the best alternative solution for resolving the issue, should the DOE-RL/WPPSS negotiations fail to reach an agreement. The engineering study was distributed in September of 1993 (Bovay 1993).

The engineering study listed seven possible options for bringing the system into compliance. The study rated the seven recommendations based on capital cost, operating cost, future expandability, and regulatory considerations. After rating all of the options using the above criteria, the second alternative, a fully lined evaporative lagoon treatment system, was recommended if an agreement to connent the tie-in was not reached. This system would eliminate any discharges to the ground.

The evaporative lagoon will be able to accommodate future flows. This revision would use the existing septic tank, but would also add a new pump pit if required to accommodate future flows and populations. Funding for this project has been given priority for Fiscal Year 1995 General Plant Project funding. Should this funding be available for Fiscal Year 1995, the project would be completed in mid-1996. If Fiscal Year 1995 funding is not

available, the routine funding process will be followed and the system would not be operational until early 1998.

SECTION B, ITEM 5

ATTACH A SIMPLE SCHEMATIC DRAWING OF POTW INDICATING PROCESS AND PROCESS DISCHARGE IN MGD *(ATTACHMENTS SHOULD BE 11" X 17", OR SMALLER)*. INCLUDE ALL UNIT PROCESSES IDENTIFIED IN QUESTION B.6.

A schematic drawing for the 400 Area Septic System is provided as Figure B-1.

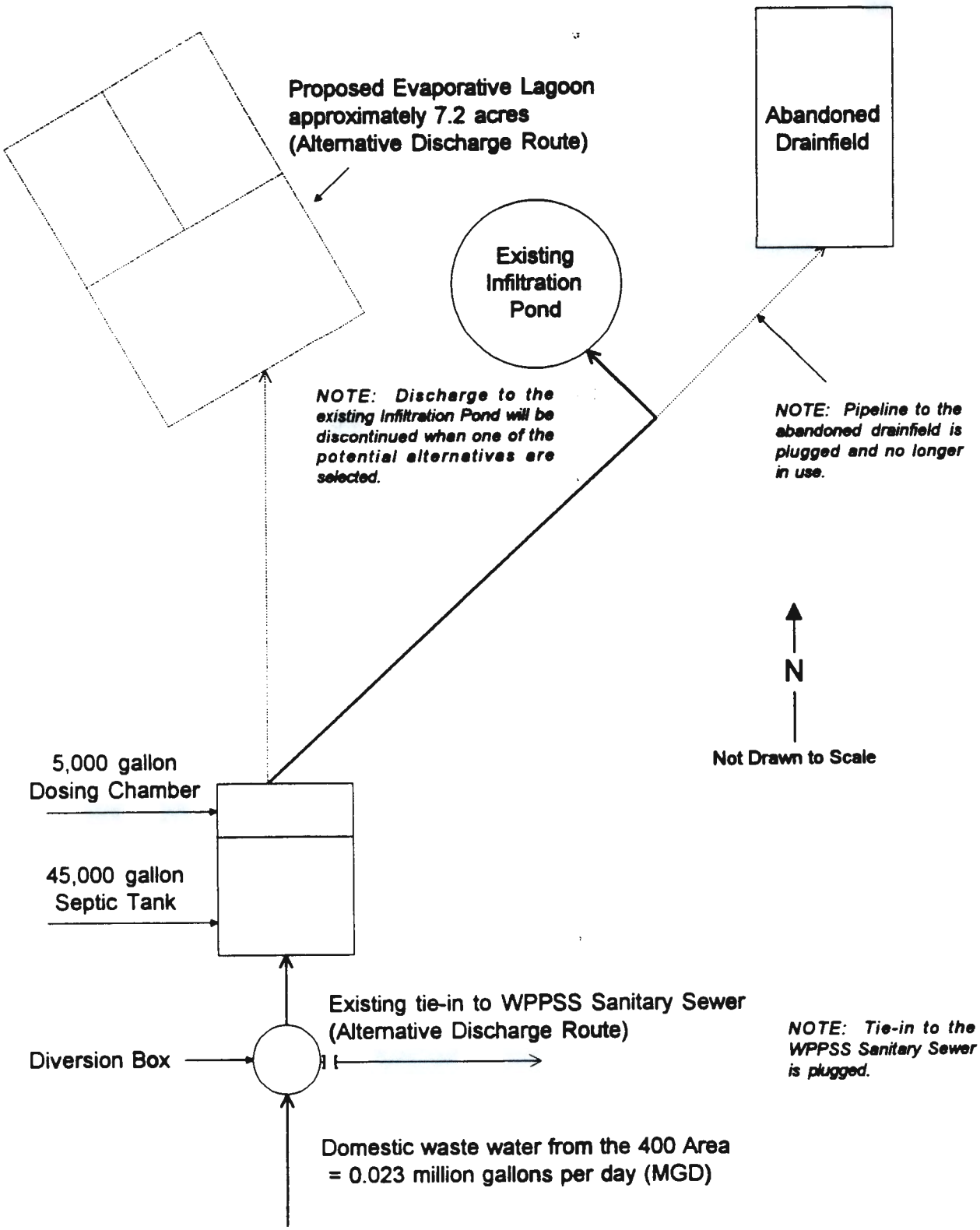

Figure B-1. Schematic Diagram for the 400 Area Septic System.

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APPENDIX C

WASTE WATER INFORMATION

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CONTENTS

SECTION C, ITEM 1
PROVIDE MEASUREMENTS FOR TREATED WASTE WATER PRIOR TO LAND APPLICATION FOR THE PARAMETERS LISTED BELOW, UNLESS WAIVED BY THE PERMITTING AUTHORITY. ALL ANALYTICAL METHODS USED TO MEET THESE REQUIREMENTS SHALL, UNLESS APPROVED OTHERWISE IN WRITING BY ECOLOGY, CONFORM TO THE GUIDELINES ESTABLISHING TEST PROCEDURES FOR THE ANALYSIS OF POLLUTANTS CONTAINED IN 40 CFR PART 136. ..... C-1

SECTION C, ITEM 2
HAS THE EFFLUENT BEEN ANALYZED FOR ANY OTHER PARAMETERS THAN THOSE IDENTIFIED IN QUESTION C.1? IF SO, WHEN? ATTACH RESULTS. *NOTE: ECOLOGY MAY REQUIRE ADDITIONAL TESTING.)* C-1

TABLE

C-1 400 Area Sanitary Sewer Data C-2

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SECTION C

All available data is provided in Table C-1. Therefore, Items 1 and 2 are combined and addressed in Table C-1.

SECTION C, ITEM 1

PROVIDE MEASUREMENTS FOR TREATED WASTE WATER PRIOR TO LAND APPLICATION FOR THE PARAMETERS LISTED BELOW, UNLESS WAIVED BY THE PERMITTING AUTHORITY. ALL ANALYTICAL METHODS USED TO MEET THESE REQUIREMENTS SHALL, UNLESS APPROVED OTHERWISE IN WRITING BY ECOLOGY, CONFORM TO THE *GUIDELINES ESTABLISHING TEST PROCEDURES FOR THE ANALYSIS OF POLLUTANTS CONTAINED IN 40 CFR PART 136.*

SECTION C, ITEM 2

HAS THE EFFLUENT BEEN ANALYZED FOR ANY OTHER PARAMETERS THAN THOSE IDENTIFIED IN QUESTION C.1? IF SO, WHEN? ATTACH RESULTS. *NOTE: ECOLOGY MAY REQUIRE ADDITIONAL TESTING.)*

The samples and resultant data presented in Table C-1 were obtained in accordance with a sampling and analysis plan (WHC 1993b). The data confirm process knowledge information and show that the stream is consistent with the expected effluent from typical septic tank treatment systems. The constituent concentrations are consistent with typical waste water streams as discussed in Metcalf and Eddy (1991) and the EPA design manual (EPA 1980).

Two constituents, iron (Fe) and manganese (Mn) were measured above the WAC-173-200 Ground Water Quality Criteria (GWQC). Iron was detected at 6620 ug/L (GWQC=300 ug/L). Manganese was detected at 149 ug/L (GWQC=50 ug/L). The source of these metals is not known for certainty, but is thought to be the metal piping within the 400 Area.

Table C-1. 400 Area Sanitary Sewer Data.
Sheet 1 of 3

EFFLUENT [a]						
CONSTITUENT	n	MEAN CONC.	S.D.	UNITS	METHOD [b]	D.L. [c]
Waste Water Parameters [d]						
Conductivity	2	952	11	umho/cm	120.1	6
pH	2	7.4 (J2)	N/A	pH	9040	0.1
TDS	2	438	15	mg/L	160.1	5
TSS	2	348	342	mg/L	160.2	5
BOD	2	190	N/A	mg/L	5210	2
TKN	2	78.4	2.0	mg/L	351.3	1.0
Total Phosphorous	2	7.1	0.4	mg/L	365.2	0.05
Total Oil and Grease	2	99	104	mg/L	9070	5
Coliform Bacteria (Bact.)	2	ND	N/A	Bact./ 100 ml	9131/9132	1
Metals						
Ca	2	45750	919	ug/L	6010	10 (P)
Mg	2	12200	282	ug/L	6010	30 (P)
Na	2	52200	989	ug/L	6010	29 (P)
K	2	25700	424	ug/L	6010	5000
Cd	2	1.9 (U,B)	0.2	ug/L	6010	1.7
Cr	2	10.4 (B1)	0.7	ug/L	6010	7 (P)
Pb	2	17.3 (B2)	0.1	ug/L	6010	11
Se	2	33 (U2)	N/A	ug/L	6010	33
Ag	2	2.1 (UJ2)	N/A	ug/L	6010	2.1
Cu	2	145	3	ug/L	6010	6 (P)
Fe	2	6620	877	ug/L	6010	7 (P)

Table C-1. 400 Area Sanitary Sewer Data.
Sheet 2 of 3

EFFLUENT [a]						
CONSTITUENT	n	MEAN CONC.	S.D.	UNITS	METHOD [b]	D.L. [c]
Metals (continued)						
Mn	2	149	13	ug/L	6010	2 (P)
Zn	2	1225	7	ug/L	6010	2 (P)
Ba	2	269	4	ug/L	6010	2 (P)
As	2	15.6 (U,B)	0.1	ug/L	6010	1 (P)
Anions						
Fl^-	2	0.5	0.3	mg/L	300.0	0.1
Cl^-	2	44	3	mg/L	300.0	2
$SO_4^=$	2	36	3	mg/L	300.0	2-10
$NO_2^=$, NO_3^-	2	0.44	0.06	mg/L	353.2	0.05
Screening						
TOC	3	93	1	mg/L	9060	1
TOX	2	0.50 (U)	N/A	mg/L	9020	0.50
Radionuclides [e]						
Gross Alpha	2	7.9 (J2)	4.4	pCi/L	EP-10	2-3
Gross Beta	2	27 (J2)	3.5	pCi/L	EP-10	2-4
Tritium	2	6650	71	pCi/L	EP-20	200
Sr-89	2	0.16 (U2)	0.09	pCi/L	RC-303,304 306,309	0.5
Sr-90	2	-0.32 (U2)	0.55	pCi/L	RC-303,304 306,309	0.9-1

Table C-1. 400 Area Sanitary Sewer Data.
Sheet 3 of 3

BOD = Biological Oxygen Demand
PAH = Polycyclic Aromatic Hydrocarbons
SVOC = Semi-Volatile Organic Compound
TDS = Total Dissolved Solids
TIC = Tenatively Identified Compound
TKN = Total Kjeldahl Nitrogen
TOC = Total Organic Carbon
TOX = Total Organic Halide
TSS = Total Suspended Solids
VOC = Volatile Organic Compound

mg/L = milligrams per liter
pCi/L = picocuries per liter
ug/L = micrograms per liter
umho/cm = micromhos per centimeter
N/A = Not Applicable
ND = Not Detected

a n = Number of sample results averaged.
mean conc = mean concentration
S.D. = one standard deviation about the mean

b Three digit numbers with a decimal (i.e., 120.1, 300.0 etc.) are from EPA 1979. Four digit procedure numbers (i.e., 6010, 9131 etc.) are from EPA 1992. Four digit numbers with a letter following (i.e., 5210B) are from "Standard Methods for the Examination of Water and Wastewater", 18th Edition, (APHA, 1992).

c D.L. detection level as reported by the laboratory or procedures (P) if no D.L. was reported with the data.

d Qualifiers which may appear in this table are:
(U) - Indicates the compound or analyte was analyzed for and not detected in the sample. The value reported is the sample quantitation limit (D.L.) corrected for sample dilution by the laboratory.
(J) - Indicates the compound or analyte was analyzed for and detected, but due to a QC deficiency identified during data validation, the associated quantitation limit is an estimate. This flag is also used when estimating concentrations of TICs or when the presence of a target compound is confirmed at a concentration of less than the D.L. but greater than the instrument detection limit.
(B) - This flag applies to results in which the analyte was detected in both the sample and the associated blank. For the metals, (B) also indicates the analyte concentration is less than the D.L. but greater than the instrument detection level.
Data qualifiers may appear in combinations. An alpha numeric combination (i.e., U2) indicates that two of the sample results used in the mean had a (U) qualifier. Two qualifiers separated by a comma (i.e., B,U) indicates that one of the samples in the mean has a (B) qualifier and one has a (U) qualifier.

e Contractor internal laboratory procedures are used for radiochemical analysis.

APPENDIX D

SLUDGE MANAGEMENT AND DISPOSAL

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CONTENTS

SECTION D, ITEM 1
SLUDGE MANAGEMENT PLAN D-1

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SECTION D, ITEM 1

SLUDGE MANAGEMENT PLAN

Implementation of the revisions to the system that were discussed in Appendix B, Item 4f, will include a fully compliant Sludge Management Plan.

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APPENDIX E

SITE ASSESSMENT

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CONTENTS

SECTION E, ITEM 1
GIVE THE LEGAL DESCRIPTION OF THE LAND TREATMENT SITE(S). GIVE THE ACREAGE OF EACH LAND TREATMENT SITE(S). ATTACH A COPY OF THE CONTRACT(S) AUTHORIZING USE OF THE LAND FOR TREATMENT. E-1

SECTION E, ITEM 2
LIST ALL ENVIRONMENTAL CONTROL PERMITS OR APPROVALS NEEDED FOR THIS PROJECT; FOR EXAMPLE, SEPTIC TANK PERMITS, SLUDGE APPLICATION PERMITS, OR AIR EMISSIONS PERMITS. E-1

SECTION E, ITEM 3
ATTACH A UNITED STATES GEOLOGICAL SURVEY (USGS) TOPOGRAPHIC MAP. SHOW THE FOLLOWING ON THIS MAP: E-2

SECTION E, ITEM 4
ATTACH WELL LOGS AND WELL I.D.# WHEN AVAILABLE FOR ALL WELLS WITHIN 500 FEET AND ANY AVAILABLE WATER QUALITY DATA. E-2

SECTION E, ITEM 5
DESCRIBE SOILS ON THE SITE USING INFORMATION FROM LOCAL SOIL SURVEY REPORTS. E-2

SECTION E, ITEM 6
DESCRIBE THE REGIONAL GEOLOGY AND HYDROGEOLOGY WITHIN ONE MILE OF THE SITE. E-5

SECTION E, ITEM 7
LIST THE NAMES AND ADDRESSES OF CONTRACTORS OR CONSULTANTS WHO PROVIDED INFORMATION AND CITE SOURCES OF INFORMATION BY TITLE AND AUTHOR. E-12

TABLE

E-1 Analytical Data for Well 699-2-7 ..... E-3

FIGURES

E-1 Hanford Soils Map E-13
E-2 Soils Map for the 400 Area Septic System E-14
E-3 Hanford Geologic Map E-15
E-4 Legend for Hanford Geologic Map E-16
E-5 Regional Stratigraphic Column E-17
E-6 Geology Map for the 400 Area Septic System E-18
E-7 Line of Cross-Section for the 400 Area E-19
E-8 Cross-Section for the 400 Area E-20
E-9 Hanford Water Table Map E-21

SECTION E, ITEM 1

GIVE THE LEGAL DESCRIPTION OF THE LAND TREATMENT SITE(S). GIVE THE ACREAGE OF EACH LAND TREATMENT SITE(S). ATTACH A COPY OF THE CONTRACT(S) AUTHORIZING USE OF THE LAND FOR TREATMENT.

Legal Description:

SW 1/4, NE 1/4, Section 18, Township 11N, Range 28E, Benton County, WA.

The land treatment site has the following acreage:

400 Area Infiltration Pond (Total Area): 0.10 acre

A specific contract authorizing use of the 400 Area Infiltration Pond for a land treatment site does not exist, but the Hanford Site was created by the U.S. Government to serve as a research and production facility for federal government nuclear projects. The Hanford Site has been in use since the early 1940's and all disposal facilities, such as the 400 Area Infiltration Pond, have been authorized by the U.S. Government.

SECTION E, ITEM 2

LIST ALL ENVIRONMENTAL CONTROL PERMITS OR APPROVALS NEEDED FOR THIS PROJECT; FOR EXAMPLE, SEPTIC TANK PERMITS, SLUDGE APPLICATION PERMITS, OR AIR EMISSIONS PERMITS.

There are no additional permits specifically required for this system in its current configuration. The following permits are general permits for the Hanford Site.

- Hanford Site Radioactive Air Emissions Permit: Number FF-01
- Hanford Site Dangerous Waste Permit: Number WA7890008967
- National Pollutant Discharge Elimination System General Permit: Number WA-R-00-A17F.

The planned revision discussed in Appendix B, Item 4f will require submittal of a 240-Engineering Report and all of the required authorizations will be obtained prior to beginning construction.

SECTION E, ITEM 3

ATTACH A UNITED STATES GEOLOGICAL SURVEY (USGS) TOPOGRAPHIC MAP. SHOW THE FOLLOWING ON THIS MAP:

- **a. Location and name of internal and adjacent streets**
- **b. Surface water drainage systems within 1/4 mile of the site**
- **c. All wells within 1 mile of the site**
- **d. Chemical and product handling and storage facilities**
- **e. Infiltration sources, such as drain fields and lagoons within 1/4 mile of the site**
- **f. Waste water discharge points (DP) including bypasses**
- **g. Other activities and land uses within 1/4 mile of the site.**

Drawing H-13-000098 addresses the above items as applicable. Although this drawing is not a USGS topographic map, it was derived from the Hanford Site topographic map database. The Hanford Site map database provides more detail and allows the items to be addressed at a more appropriate scale than a USGS map. The waste water discharge point shown for the waste stream on Drawing H-13-000098 includes all component substreams prior to discharge. No chemical or product handling and storage areas are related directly to the disposal areas, thus none are shown on Drawing H-13-000098. The 400 Area Percolation Ponds, which are part of the process sewer system, are located within 1/4 mile of the 400 Area Infiltration Pond.

SECTION E, ITEM 4

ATTACH WELL LOGS AND WELL I.D.# WHEN AVAILABLE FOR ALL WELLS WITHIN 500 FEET AND ANY AVAILABLE WATER QUALITY DATA.

The only well within 500 feet of the 400 Area Infiltration Pond is 699-2-7. Available analytical data for well 699-2-7 is presented in Table E-1. No well log is available for well 699-2-7.

SECTION E, ITEM 5

DESCRIBE SOILS ON THE SITE USING INFORMATION FROM LOCAL SOIL SURVEY REPORTS.

The most recent study of the soil on the Hanford Site was done by Hajek (1966). This study presents a soil map and descriptive report of soils in the Benton County portion of the Hanford Site. On the basis of morphologic and genetic characteristics, 13 soil types were identified. An approximate land use capability classification is provided for these soils on the basis of soil limitations for, and damage risks associated with,

Table E-1. Analytical Data for Well 699-2-7.[1]
(Sheet 1 of 2)

DATE	ANALYTE	CODE[2]	VALUE	UNITS
03-Mar-86	Nitrate		96	mg/L
24-Jun-86	Nitrate		69	mg/L
13-Aug-86	Nitrate		37,200	ppb
07-Nov-86	Nitrate		33,400	ppb
26-Jan-87	Nitrate		34,300	ppb
31-May-87	Nitrate		28,300	ppb
24-Jul-87	Nitrate		32,900	ppb
21-Oct-87	Nitrate		48,600	ppb
27-Jan-88	Nitrate		39,900	ppb
30-Jan-89	Nitrate		55,500	ppb
13-Apr-90	Nitrate		73,400	ppb
18-Dec-91	Nitrate		15,000	ppb
07-Feb-92	Nitrate		69,000	ppb
30-Apr-92	Nitrate		78,000	ppb
18-Aug-92	Nitrate		82,000	ppb
03-Dec-92	Nitrate		83,000	ppb
02-Feb-93	Nitrate		79,000	ppb
14-May-93	Nitrate		88,000	ppb
19-Aug-93	Nitrate		78,000	ppb
18-Nov-93	Nitrate		93,000	ppb
03-Mar-86	Tritium		16,000	pCi/L
24-Jun-86	Tritium	U	13,000	pCi/L
13-Aug-86	Tritium		12,900	pCi/L
07-Nov-86	Tritium		12,100	pCi/L

Table E-1. Analytical Data for Well 699-2-7.[1]
(Sheet 2 of 2)

DATE	ANALYTE	CODE[2]	VALUE	UNITS
26-Jan-87	Tritium		6,790	pCi/L
31-May-87	Tritium		10,900	pCi/L
24-Jul-87	Tritium		10,700	pCi/L
21-Oct-87	Tritium		13,300	pCi/L
27-Jan-88	Tritium		13,300	pCi/L
30-Jan-89	Tritium		12,300	pCi/L
13-Apr-90	Tritium		14,300	pCi/L
21-Mar-91	Tritium		11,900	pCi/L
18-Dec-91	Tritium		12,200	pCi/L
18-Dec-91	Tritium		12,300	pCi/L
07-Feb-92	Tritium		11,700	pCi/L
30-Apr-92	Tritium		13,100	pCi/L
18-Aug-92	Tritium		13,500	pCi/L
03-Dec-92	Tritium		13,100	pCi/L
02-Feb-93	Tritium		14,100	pCi/L
14-May-93	Tritium		14,500	pCi/L
19-Aug-93	Tritium		15,100	pCi/L
18-Nov-93	Tritium		15,100	pCi/L

[1] Source: Westinghouse Hanford Company Geohydrology Support Functions GeoDAT Database
[2] Code: U = Undetected

agricultural use. Approximate engineering classifications for these soils, using the Unified Soil Classification System, are also provided in Hajek (1966). The soil types mapped on the Hanford Site are shown on Figure E-1. There is no soil data for the north slope of the Hanford Site. The soil present in the vicinity of the 400 Area consists of the Quincy sand (Rupert sand) and a small amount of Burbank loamy sand. A map depicting the soils within one mile of the 400 Area Infiltration Pond is provided as Figure E-2.

The Quincy sand (Rupert sand) represents one of the most extensive soils at the Hanford Site. The soil is a brown to grayish brown, moderately deep, coarse sand. Quincy soils will develop under grass and sagebrush in coarse alluvial deposits mantled by wind-blown sand. Relief characteristically consists of hummocky terraces and dune-like ridges. The surface and subsoil of the Quincy sand (Rupert sand) were assigned to Group SM (silty sand), which consists of coarse-grained soils composed predominantly of sands with more than 12 percent fines.

The Burbank loamy sand is a dark grayish brown, coarse-textured, excessively drained soil underlain by gravel. The surface soil is usually about 16 inches thick, but can be as much as 30 inches. The gravel content of the subsoil may range from 20 to 80 percent (by volume). The surface of the Burbank loamy sand is Group SM (silty sand) and the subsoil is Group GM (silty gravel) to GP (poorly graded gravel). Group GM (silty gravel) are coarse-grained soils composed predominantly of gravels with more than 12 percent fines. Group GP (poorly graded gravel) contains coarse-grained soils that are predominantly well-sorted gravels with less than 5 percent fines.

SECTION E, ITEM 6

DESCRIBE THE REGIONAL GEOLOGY AND HYDROGEOLOGY WITHIN ONE MILE OF THE SITE.

REGIONAL GEOLOGY

A summary of the regional geologic characteristics of the Pasco Basin and the Hanford Site is presented below in terms of stratigraphy and structure. WHC (1992b), WHC (1991b), and WHC (1991d) may be consulted for additional detail. Figure E-3 is a map depicting the geology of the Hanford Site. Figure E-4 is a legend explaining Figure E-3.

REGIONAL STRATIGRAPHY

The Hanford Site lies within the Pasco Basin, a regional structural and topographic, sediment-filled depression. The sediments of the Pasco Basin are underlain by Miocene-age basalt of the Columbia River Basalt Group, a thick sequence of flood basalts that covers a large area in eastern Washington, western Idaho and northeastern Oregon. The sediments overlying the basalts, from oldest to youngest, include: the Miocene-Pliocene Ringold Formation, local alluvial deposits of possible late Pliocene or probable early Pleistocene age, local "Palouse" soil of mostly eolian origin, glaciofluvial deposits of the Pleistocene Hanford formation, and surficial Holocene eolian and fluvial sediments. The generalized stratigraphy of the Hanford Site is described from the oldest to youngest formation in the following paragraphs. The regional stratigraphy is depicted on Figure E-5.

Columbia River Basalt Group and the Ellensburg Formation

The Columbia River Basalt Group consists of an assemblage of tholeiitic, continental flood basalts of Miocene Age with an accumulated thickness in excess of 10,000 feet within the Pasco Basin. These flows cover an area of more than 63,000 square miles in Washington, Oregon, and Idaho and have an estimated volume of about 40,800 cubic miles. The majority of the flows were erupted 14.5 to 17 million years ago (WHC 1991b).

The Columbia River Basalt Group is formally divided into five formations (from oldest to youngest): Imnaha Basalt, Picture Gorge Basalt, Grande Ronde Basalt, Wanapum Basalt, and Saddle Mountains Basalt. Of these, all are present within the Pasco Basin except for the Picture Gorge Basalt. The Saddle Mountains Basalt, is divided into seven members (from oldest to youngest); the Umatilla, Wilbur Creek, Asotin, Esquatzel, Pomona, Elephant Mountian, and Ice Harbor Members, and forms the uppermost basalt unit throughout most of the Pasco Basin. The Elephant Mountain Member is the uppermost unit beneath most of the Hanford Site, except near the 300 Area where the Ice Harbor Member is found and north of the 200 Areas where the Saddle Mountains Basalt has been eroded down to the Umatilla Member in the Gable Gap area (WHC 1991b). The Elephant Mountain Member has also been locally eroded in the vicinity of the northeast corner of the 200 East Area (WHC 1991b). On anticlinal ridges bounding the Pasco Basin, erosion has removed the Saddle Mountains Basalt, exposing the Wanapum and Grande Ronde basalts (WHC 1991b).

The Ellensburg Formation consists of all sedimentary units that occur between the basalt flows of the Columbia River Basalt Group in the central Columbia Basin (Reidel and Fecht 1981). The Ellensburg Formation generally consists of two main lithologies: volcaniclastics and siliciclastics. The volcaniclastics consist mainly of primary pyroclastic air fall deposits and reworked epiclastics derived from volcanic terrains west of the

Columbia Plateau. Siliciclastic strata consist of clastic, plutonic, and metamorphic detritus derived from the Rocky Mountain terrains to the east.

At the Hanford Site, the three uppermost units of the Ellensburg Formation are the Levy interbed, the Rattlesnake Ridge interbed, and the Selah interbed. The Levy interbed is confined to the vicinity of the 300 Area. The Rattlesnake Ridge and Selah interbeds are found beneath most of the Hanford Site (WHC 1992d).

Suprabasalt Sediments

The suprabasalt sedimentary sequence at the Hanford Site is up to approximately 750 feet thick in the west-central Cold Creek syncline, while it pinches out against the anticlinal ridges that bound or are present within the Pasco Basin (WHC 1991a). The suprabasalt sediments are dominated by laterally extensive deposits of the late Miocene to Pliocene-age Ringold Formation and the Pleistocene-age Hanford formation. Locally occurring strata separating the Ringold and Hanford formations are assigned to the informally defined Plio-Pleistocene unit, early "Palouse" soil, and pre-Missoula gravels, which comprise the remainder of the sequence (DOE-RL 1993).

Ringold Formation. Overlying the Columbia River Basalt Group is the late Miocene to Pliocene-age Ringold Formation (Fecht et al. 1987, DOE 1988). The Ringold Formation accumulated to a thickness of up to 1,200 feet in the Pasco Basin (Tallman et al. 1979). On the Hanford Site, the Ringold Formation is up to 600 feet thick in the deepest part of the Cold Creek syncline south of the 200 West Area and 560 feet thick in the western Wahluke syncline near the 100-B Area (WHC 1991b). The Ringold Formation pinches out against the anticlinal flanks that bound or are present within the Pasco Basin, and is largely absent in the northern and northeastern parts of the 200 East Area and adjacent areas to the north (WHC 1991b, WHC 1992b). The recent studies of the Ringold Formation (WHC 1991c) indicate it is best described on the basis of sediment facies associations and their distribution. The facies associations have been divided into fluvial gravel, fluvial sand, overbank deposits, lacustrine deposits, and alluvial fans. The lower Ringold contains five separate stratigraphic intervals dominated by fluvial gravels, which have been designated units A, B, C, D, and E, from oldest to youngest. These gravel units are separated by basin-wide overbank and lacustrine deposits (WHC 1992b). A more detailed discussion of the Ringold Formation stratigraphy can be found in WHC (1991c).

Post-Ringold Pre-Hanford Sediments. Thin alluvial deposits situated stratigraphically between the Ringold Formation and Hanford formation are found within the Pasco Basin. The three informally defined units include: the Plio-Pleistocene unit, the early "Palouse" soil, and the Pre-Missoula gravels. The Plio-Pleistocene unit and early "Palouse" soil are not found in or near the 200 East Area; they are found to the west of the site area near the eastern boundary of the 200 West Area. The pre-Missoula gravels are not found in the site area. The Plio-Pleistocene unit and early

"Palouse" soil are described in detail in PNL (1989) and WHC (1991d). The pre-Missoula gravels are discussed in PSPL (1982) and Fecht et al. (1987).

Hanford Formation. The informally designated Hanford formation consists of unconsolidated, glaciofluvial sediments that were deposited during several episodes of cataclysmic flooding during the Pleistocene Epoch. The sediments are composed of pebble- to boulder-size gravel, fine- to coarse-grained sand, and silt. These sediments are divided into three facies: gravel dominated, sand-dominated, and silt-dominated (WHC 1992b). These facies are referred to as coarse-grained deposits, plane-laminated sand facies, and rhythmite facies, respectively (Baker et al. 1991). The silt-dominated deposits are also referred to as "Touchet" Beds, and the gravel-dominated facies generally correspond to the Pasco gravels.

The Hanford formation is thickest in the vicinity of the 200 Areas where it is up to 350 feet thick (WHC 1992b). The formation was deposited by cataclysmic flood waters that originated from glacial lake Missoula (Fecht et al. 1987, DOE 1988, Baker et al. 1991). The deposits are absent from ridges above approximately 1,180 feet above mean sea level, the highest level of cataclysmic flooding in the Pasco Basin (WHC 1991b).

Holocene Surficial Deposits. Holocene surficial deposits consist of silt, sand, and gravel that form a < 16-feet veneer across much of the Hanford Site. These sediments were deposited by eolian and alluvial processes (WHC 1991b).

REGIONAL GEOLOGIC STRUCTURE

The Hanford Site is located within the Pasco Basin near the eastern edge of the Yakima Fold Belt. The Yakima Fold Belt consists of a series of segmented, narrow, asymmetric, east-west trending anticlines separated by broad synclines or basins that, in many cases, contain thick accumulations of Neogene- to Quaternary-aged sediments (DOE 1988, Smith et al. 1989). The Pasco Basin is one of the larger structural basins of the fold belt.

The northern limbs of the anticlines of the Yakima Fold Belt generally dip steeply to the north or are vertical. The southern limbs generally dip at relatively shallow angles to the south. Thrust or high-angle reverse faults with fault planes that strike parallel or subparallel to the axial trends are principally found on the north sides of the anticlines. The amount of vertical stratigraphic offset associated with these faults varies (WHC 1991b).

Deformation of the Yakima Folds occurred under north-south compression and was contemporaneous with the eruption of the basalt flows. The fold belt was enlarging during the eruption of the Columbia River Basalt Group and continued to enlarge through the Pliocene, into the Pleistocene, and perhaps to the present (WHC 1991b).

The Pasco Basin is a structural depression bounded on the north by the Saddle Mountain anticline; on the west by the Umtanum Ridge, Yakima Ridge, and Rattlesnake Hills anticlines; and on the south by the Rattlesnake Mountain anticline. The Palouse slope, a west-dipping monocline, bounds the Pasco Basin on the east. The Pasco Basin is divided into the Wahluke and Cold Creek synclines by the Gable Mountain anticline, the eastern extension of the Umtanum Ridge anticline.

The Cold Creek syncline lies between the Umtanum Ridge-Gable Mountain uplift and the Yakima Ridge uplift, and is an asymmetric and relatively flat-bottomed structure. The bedrock of the northern limb dips gently to the south, and the southern limb dips steeply to the north. The deepest parts of the Cold Creek syncline, the Wye Barricade depression, and the Cold Creek depression are located approximately 7.5 miles southeast of the 200 Areas and just to the west-southwest of the 200 West Area, respectively (Tallman et al. 1979).

LOCAL GEOLOGY

The three primary geologic units beneath the 400 Area are: the Elephant Mountain Member of the Saddle Mountains Basalt Formation, the Ringold Formation, and Hanford formation. The following discussion focuses on the suprabasalt sediments in the vicinity of the 400 Area. This information has been summarized from the *Groundwater Impact Assessment Report for the 400 Area Ponds* (WHC 1992). Figure E-6 is a map depicting the geology within one mile of the 400 Area Sanitary Lagoon. A local cross-section has also been included for more detailed information. The line of cross section is shown on Figure E-7 and the cross section is provided on Figure E-8.

Saddle Mountain Basalt Formation

The uppermost basalt flow in the 400 Area is the Elephant Mountain Member, which is located approximately 594 feet below ground surface. The basalt consists of flow breccia from a depth of 594 to 626 feet, underlaid by scoria to a depth of 641 feet. Hard dense basalt extends downward from the scoria to the bottom of the hole at 649 feet. The dense basalt contains horizontal to sub-horizontal flow structures and fractures dipping at 25 degrees.

Ringold Formation

The Ringold Formation overlies the Elephant Mountain Member Basalt. The Ringold Formation is approximately 262 feet thick and is composed of fluvial gravels and overbank and lacustrine deposits. The fluvial gravels are approximately 138 feet thick. Overlying the fluvial gravels are the overbank and lacustrine deposits, composed of thinly bedded silt and clay. The thickness of the overbank and lacustrine deposits is

approximately 219 feet. The contact between the Ringold Formation and the Hanford formation is not well defined in the 400 area.

Overlying the overbank and lacustrine sediments are light brown and brown-gray silty sands that are both locally gravelly and clay-like. The thickness of sands is approximately 45 feet. Dense, light gray-brown fluvial sandy gravels overlie the silty sands and are approximately 39 to 69 feet thick. Because of the lack of stratigraphic detail in the 400 Area, this unit may be part of the Hanford formation.

Hanford Formation

The contact between the Ringold Formation and Hanford formation in the 400 area is not completely understood. The Hanford formation near the 400 Area appears to be dominated by the sand-dominated facies (WHC 1992c).

Overlying the Ringold Formation are dense, well-graded, gray gravelly sands consisting of light gray, fine to medium sand with some gravel. The thickness of this unit is up to 69 feet. Overlying the gravelly sands are horizontally stratified gray-brown, poorly graded, fine- to medium-grained dense sands that are locally silty and gravelly. Individual bedding layers range from a fraction of an inch to several inches. The thickness of the horizontally stratified sands ranges from 120 to 180 feet.

Under the 400 Area, the sand units have unique structural features known as "sand" dikes or clastic dikes. These dikes were encountered in excavations created during construction of the FFTF and are apparently common in the area. The dikes are composed of silt and sand in distinct bands (or beds) paralleling the dike walls and separated by a thin laminae of silty material. The width of the dikes ranges from several inches to six feet. The near-vertical deposits exhibit cross lamination and dewatering features. The vertical extent of the dikes is unknown. The dikes have been interpreted as non-tectonic structures related to rapid loading and unloading during cataclysmic flooding (Baker et al. 1991).

Holocene Surficial Deposits

The Hanford formation is overlain by eolian deposits that blanket the ground surface of the 400 Area. These deposits consist of five to 15 feet of eolian, fine- to medium-grained sand dunes characterized by cross-bedding. The sand is derived from the top of the Hanford formation, and is stabilized on the ground surface by growths of sagebrush and grass.

REGIONAL HYDROGEOLOGY

The hydrogeology of the Pasco Basin has been broadly characterized as consisting of four primary hydrogeologic units (DOE 1988). These units correspond to the upper

three formations of the Columbia River Basalt Group (Grande Ronde Basalt, Wanapum Basalt, and Saddle Mountains Basalt) and the suprabasalt sediments. The basalt aquifers consist of the flood basalts of the Columbia River Basalt Group and relatively minor amounts of intercalated fluvial and volcaniclastic sediments of the Ellensburg Formation. Confined zones in the basalt aquifers are present in the sedimentary interbeds and/or interflow zones that occur between dense basalt flows. The main water-bearing portions of the interflow zones are networks of interconnecting vesicles and fractures of the basalt flow tops and bottoms (DOE 1988).

The uppermost aquifer is part of a flow system that is local to the Pasco Basin, as are the uppermost basalt interbed aquifers (Gephart et al. 1979, DOE 1988). The uppermost aquifer system is regionally unconfined and occurs within the glaciofluvial sands and gravels of the Hanford formation and the fluvial/lacustrine sediments of the Ringold Formation. Confined to semi-confined aquifers of more limited extent also occur in the suprabasalt sediments of the Pasco Basin. These confined zones are generally located within the local flow system, between the unconfined aquifer and the underlying basalt surface. Groundwater in these aquifer systems is most likely recharged and discharged locally. Deeper in the basalt, interbed aquifer systems are part of the regional, or interbasin, flow system, which extends outside the margins of the Pasco Basin (DOE 1988). A water table map of the Hanford Site is provided as Figure E-9.

LOCAL HYDROGEOLOGY

The primary hydrostratigraphic units in the 400 Area are the confined aquifer system of the Saddle Mountain Basalt Formation and Ellensburg Formation, and the unconfined to confined aquifer system of the Ringold Formation and the Hanford formation. The following discussion focuses on the hydrogeology of the suprabasalt sediments.

Sediments overlying the Elephant Mountain flow total approximately 600 feet thick. Approximately 440 feet of the lower portion of these sediments are saturated and comprise what is probably a single unconfined aquifer. Locally confined or semiconfined conditions may, however, be present within this unconfined aquifer in areas where relatively impermeable cemented or fine-grained materials act as confining layers. The water table of the unconfined aquifer is located roughly at the contact between the Ringold Formation and Hanford formation. This location corresponds to a depth of approximately 160 feet, and an elevation of about 390 feet above mean sea level.

Groundwater in the vicinity of the 400 Area moves in the unconfined aquifer to the southeast. Pumping of the production well 499-S1-8J at a depth of 360 to 390 feet within the 400 Area may result in drawdown in proximity to the well, but a noticeable cone of depression is not evident with the present water level data. Disposal of sanitary and process sewer effluent may have produced a small mound of groundwater beneath the

sewage lagoon and the 400 Area ponds. The height of the groundwater mound is estimated to be one foot, based on water level data from wells in the vicinity of the 400 Area ponds.

SECTION E, ITEM 7

LIST THE NAMES AND ADDRESSES OF CONTRACTORS OR CONSULTANTS WHO PROVIDED INFORMATION AND CITE SOURCES OF INFORMATION BY TITLE AND AUTHOR.

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Enserch Environmental Corp.
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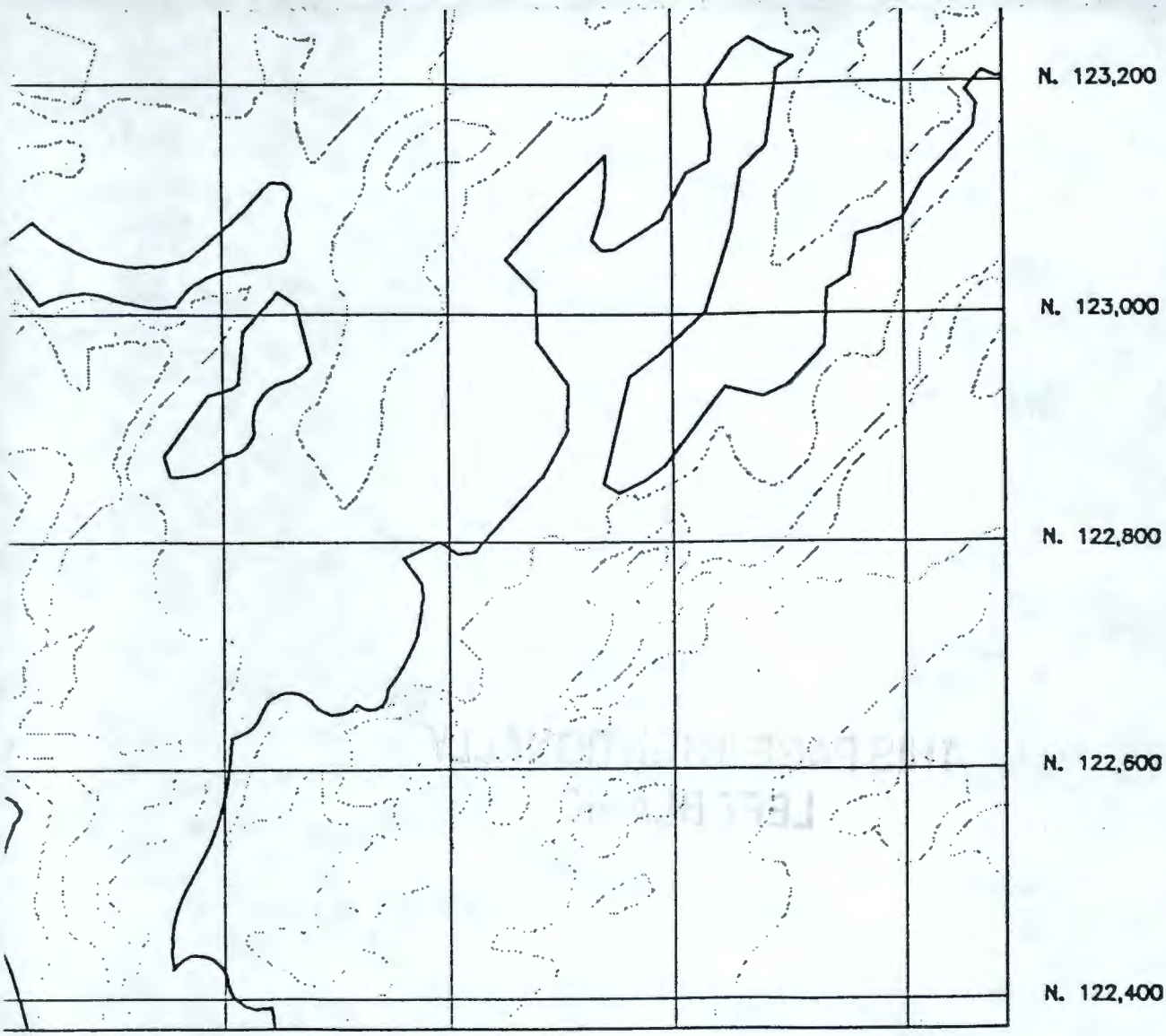
Richland, WA 99352

Golder Associates Inc.
1933 Jadwin Avenue, Suite 125
Richland, WA 99352

Hart Crowser, Inc.
1201 Jadwin Avenue, Suite 204
Richland, WA 99352

References: Sources of information used for Section E are included in REFERENCES.



THIS MAP IS TO BE USED FOR REFERENCE PURPOSES ONLY.
DO NOT USE THIS MAP FOR CONSTRUCTION PURPOSES.

N	RAFAEL TORRES	DATE 4-26-94
XED		5-10-94
APVD		5-10-94
ENGR	B.P. Atencio	5-10-94
D		5-10-94
D		
D		
D		
D		
D		

U.S. DEPARTMENT OF ENERGY
DOE Field Office, Richland
Westinghouse Hanford Company

400 AREA INFILTRATION POND

SIZE	BLDG NO	INDEX NO	DWG NO	REV
F	400G	0110	H-13-000098	0

SCALE SHOWN | EDT 604324 | SHEET 1 OF 1

CHK PRINT ☐ DATE | COMMENT PRINT ☐ DATE

DWG NO H-13-000098 SH 1 OF 1 REV 0

A

2 1

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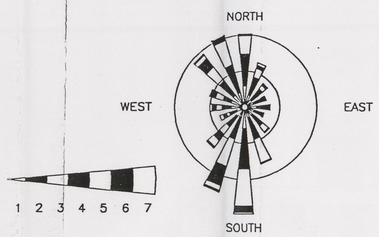
WIND ROSE FOR: FFTF
% CALM WINDS = .4
STATION NO.9

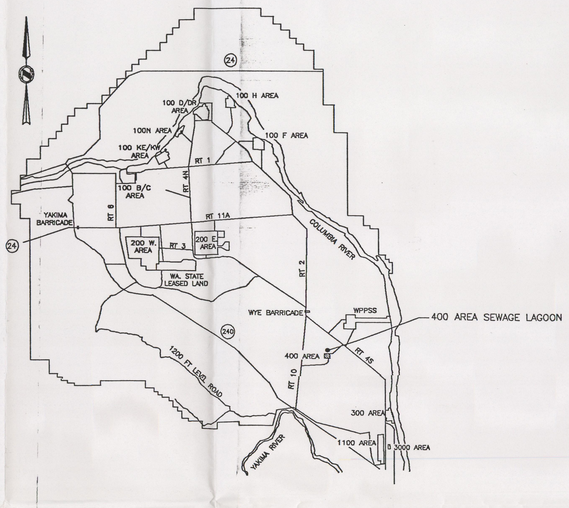
PERIOD COVERED
1/1/93 – 12/31/93



PADDLES INDICATE DIRECTION WIND IS COMING FROM.
RADIAL GRIDS REPRESENT 5.0% AND 10.0% OCCURRENCE.

WIND CLASS	MILES/HOUR
1--------	>1.0 – 3.0
2--------	4.0 – 7.0
3--------	8.0 – 12.0
4--------	13.0 – 18.0
5--------	19.0 – 24.0
6--------	25.0 – 31.0
7--------	32.0 +

WIND ROSE



KEY PLAN
SCALE: NONE

LEGEND

Y.47,000 X.43,000	HANFORD PLANT COORDINATES (FEET)
E.578,250 N.136,000	WASHINGTON STATE COORDINATES (METERS)
	INDEX CONTOUR (METERS)
	INTERMEDIATE CONTOUR
	IMPROVED ROAD
	UNIMPROVED ROAD
	DIRT ROAD
	SIDEWALKS\PARKING LOTS
	RAILROADS
	SECURITY,WARNING,MISC FENCES
	POST & CHAIN (CRIB,BURIAL GROUND FENCES)
	PERIMETER FENCES
	BUILDINGS/STRUCTURES & TOWERS
242–A	BUILDING NUMBER
	MOBILE OFFICES
N–27	WELL
	ABANDONED WELL
	TANKS
216–A–42	CRIB
218–E–10	BURIAL GROUND
DP	DISCHARGE POINT

GENERAL NOTES:

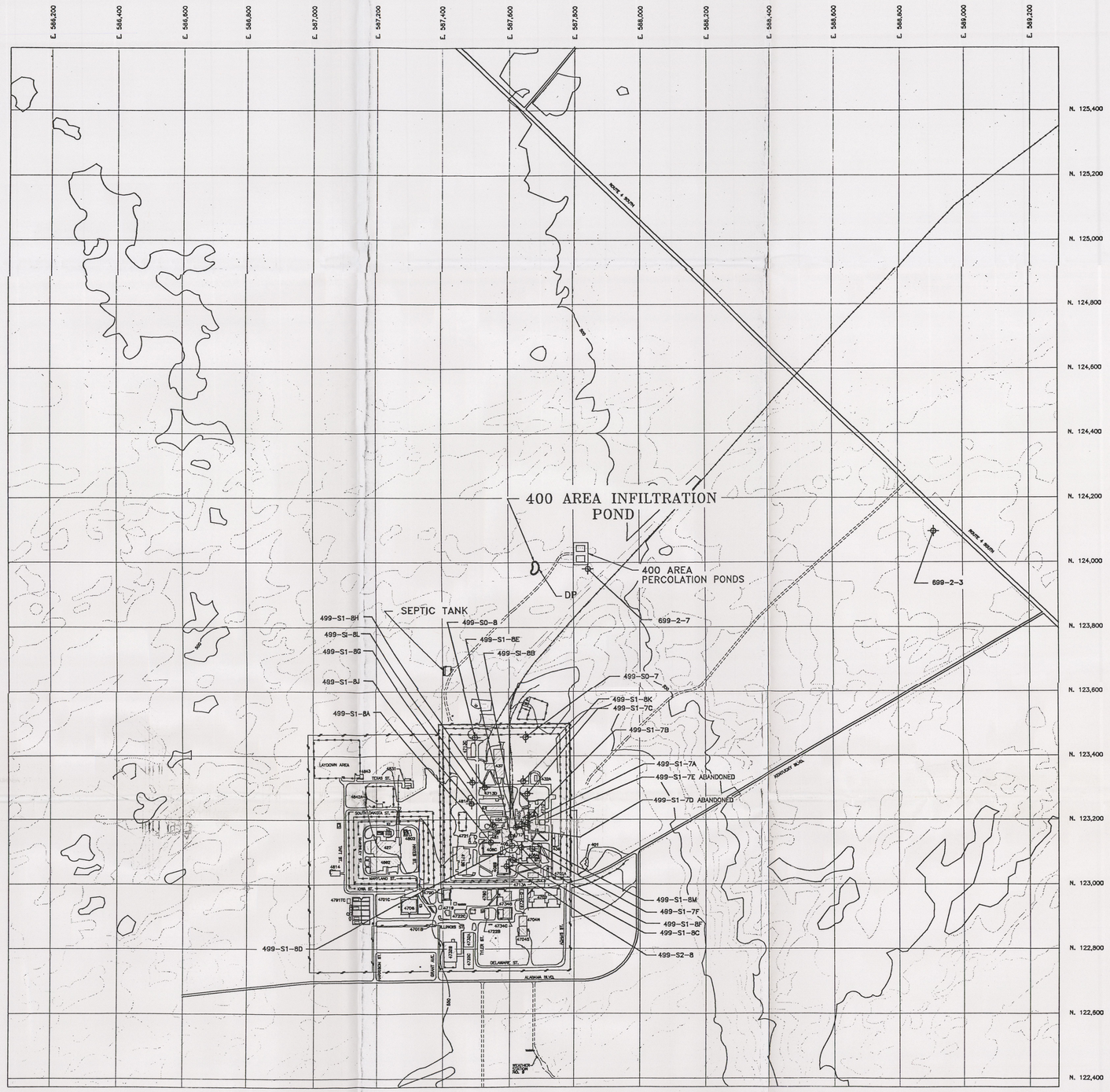
1. THIS MAP WAS PRODUCED BY MAPPING SERVICES.
2. THE WASHINGTON COORDINATE SYSTEM OF 1983 SOUTH ZONE WAS ADDED TO THE 7 1/2 MINUTE USGS QUADRANGLE MAP THAT WAS DIGITIZED BY AUSTIN MCDANIEL CORPORATION IN 1989 (DRAWING H–6–2436). THE BASE MAP WAS THE GABLE BUTTE 1986 PROVISIONAL EDITION. CONTOUR INTERVAL 10 FEET.
7. ENTIRE AREA SHOWN IS WITHIN TOWNSHIP 11 NORTH AND RANGES 27 AND 28 EAST.

SITE PLAN
SCALE: 1:6000

0 60 120 240 360 480

1 cm = 60 meters

0 400 600 800 1200 1600 2000 FEET



OFFICIAL RELEASE BY WHO
DATE MAY 10 1994

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DWG NO	TITLE
H–6–2436 (SHT 45)	HANFORD AREA USGS TOWNSHIP MAP HORN–NE QUADRANT
H–6–2436 (SHT 46)	HANFORD AREA USGS TOWNSHIP MAP WOOD–NW QUADRANT
H–6–2436 (SHT 54)	HANFORD AREA USGS TOWNSHIP MAP HORN–SE QUADRANT
H–6–2436 (SHT 55)	HANFORD AREA USGS TOWNSHIP MAP WOOD–SW QUADRANT
H–13–000401	400 AREA TOPOGRAPHIC MAP
H–13–000402	400 AREA TOPOGRAPHIC MAP

DRAWING TRACEABILITY LIST

REF NUMBER	TITLE
NEXT USED ON	H–13–000401

REFERENCES

REV REL	REV NO	DESCRIPTION	REV BY DATE	CHK BY DATE	DFTG APVD DATE	COG ENGR	OTHER	OTHER

REVISIONS

CADFILE N000098A CADCODE DOS:6.0:ACD2:12.0:SS

		DATE
DRAWN	RAFAEL TORRES	4–28–94
CHECKED		5–10–94
DFTG APVD		5–10–94
COG ENGR		5–10–94
APVD		5–10–94
APVD		
APVD		
APVD		
APVD		
APVD		

APPROVALS BY/DATE

U.S. DEPARTMENT OF ENERGY
DOE Field Office, Richland
Westinghouse Hanford Company

400 AREA INFILTRATION POND

SIZE	BLDG NO	INDEX NO	DWG NO	REV
F	400G	0110	H–13–000098	0

SCALE SHOWN EDT 604324 SHEET 1 OF 1

CHK PRINT ☐ DATE COMMENT PRINT ☐ DATE

DWG NO H–13–000098 SH 1 OF 1 REV 0

54–6000–027(5/89)

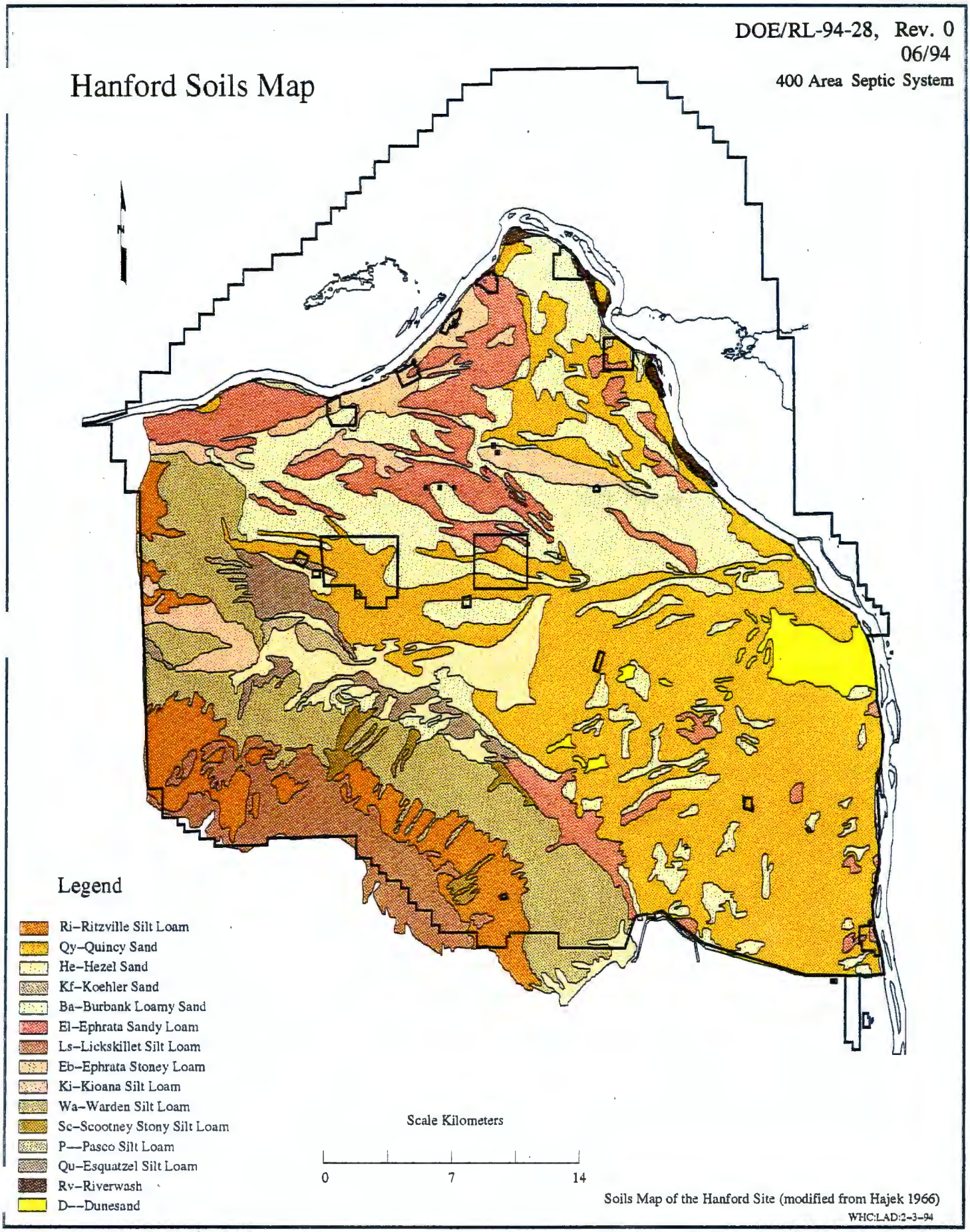

Figure E-1. Hanford Soils Map.

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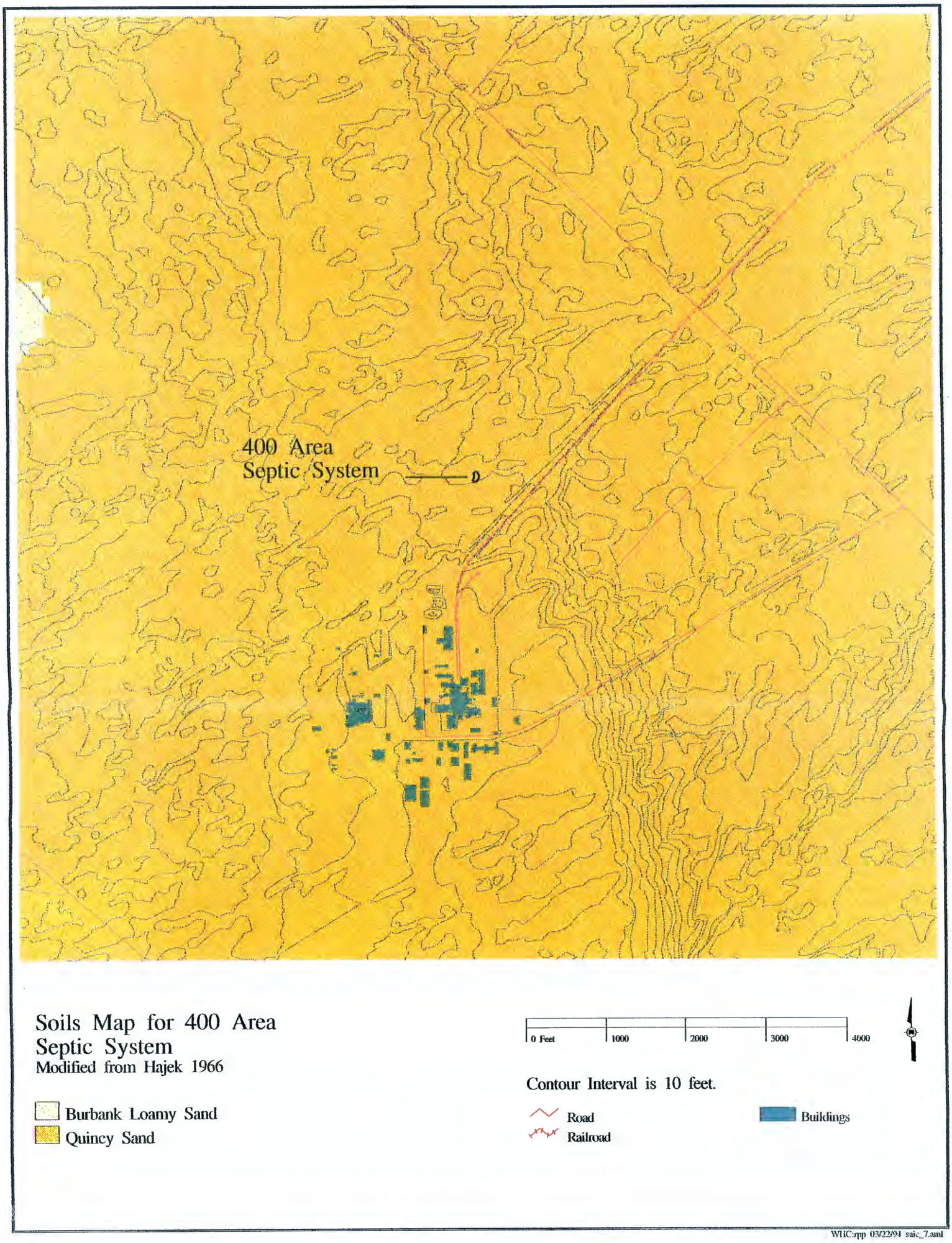

Figure E-2. Soils Map for the 400 Area Septic System.

9513316.2420

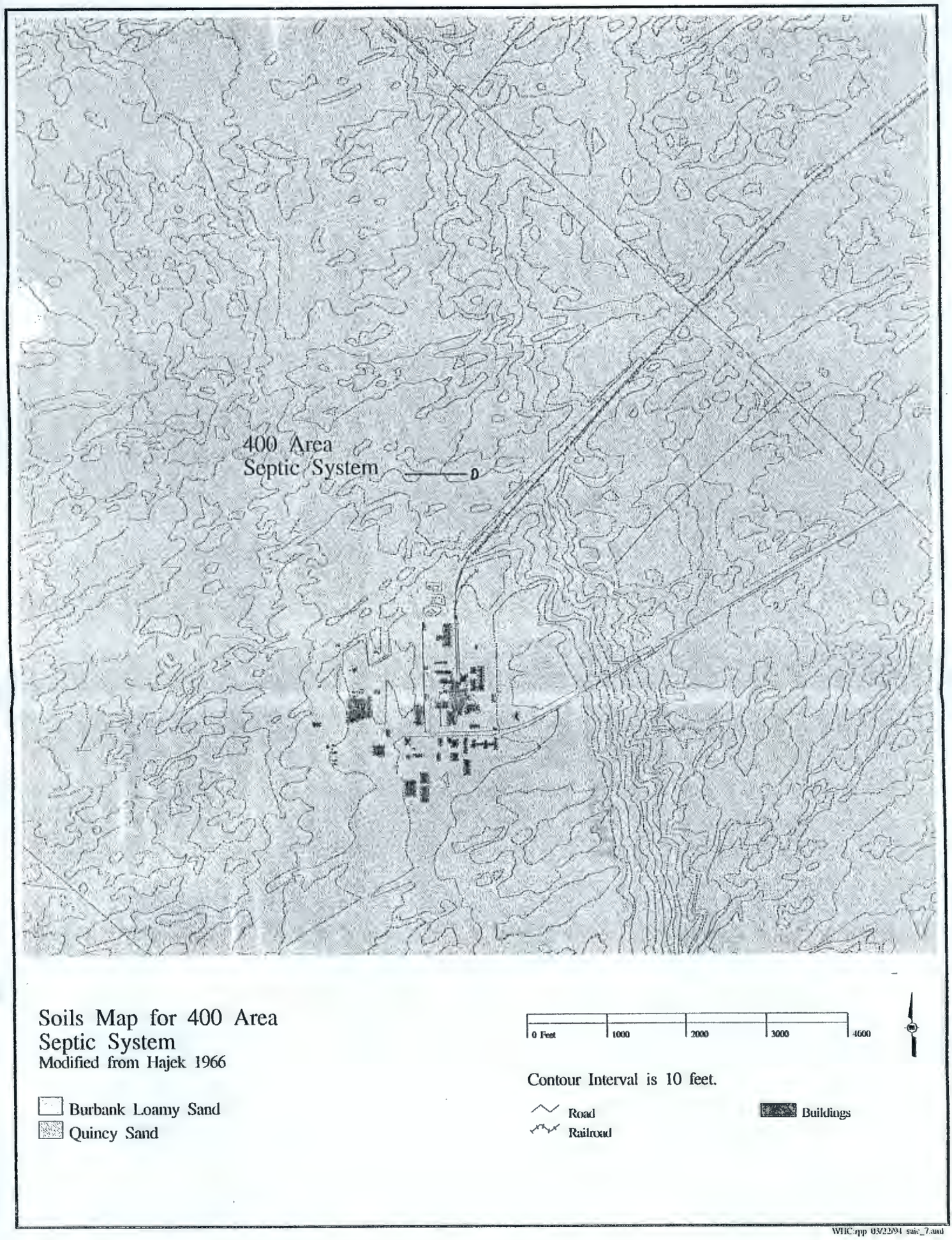

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Figure E-2. Soils Map for the 400 Area Septic System.

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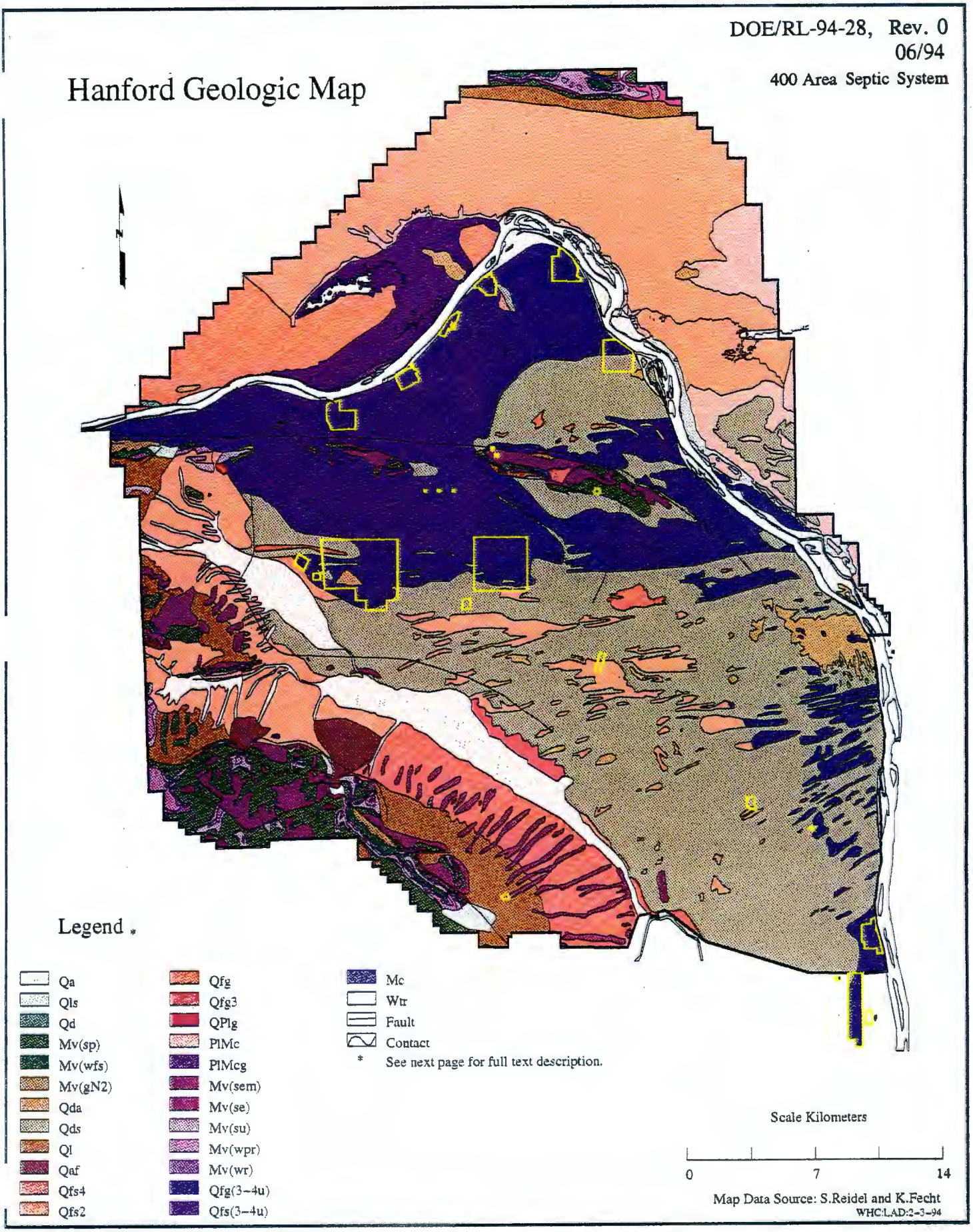

Figure E-3. Hanford Geologic Map.

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Legend

- Qa–Alluvium (Holo.–Pleis.)
- Qls–Mass–wasting deposits (Holo.–Pleis.)
- Qd–Dune sand (Holocene)
- Mv(sp)–Saddle Mt Basalt, Pomona Mbr (M. Mio.)
- Mv(wfs)–Wanapum Basalt, Frenchman Spr. Mbr (M. Mio.)
- Mv(gN2)–Grande Ronde Basalt, U. flow–normal pol. (M. Mio.)
- Qda–Dune sand, active (Holocene)
- Qds–Dune sand, stabilized (Holocene)
- Ql–Loess (Holocene to Pleistocene)
- Qaf–Alluvial fans (Holo.–Pleis.)
- Qfs4–Outburst flood dep.(Pleis.), silt & sand, youngest
- Qfs2–Outburst flood dep.(Pleis.), silt & sand, 2nd oldest
- Qfg–Outburst flood dep.(Pleis.), gravels, undiv.
- Qfg3–Outburst flood dep.(Pleis.), gravels, 2nd youngest
- QPlg–Gravel (Pleistocene to Pliocene)
- PlMc–Ringold Fm., Continental sed. (Plio.–Mio.)
- PlMcg–Ringold Fm., Conglomerate (Plio.–Mio.)
- Mv(sem)–Saddle Mt Basalt, Elephant Mt Mbr (U. Mio.)
- Mv(se)–Saddle Mt Basalt, Esquatzel Mbr (M. Mio.)
- Mv(su)–Saddle Mt Basalt, Umatilla Mbr (M. Mio.)
- Mv(wpr)–Wanapum Basalt, Priest Rapids Mbr (M. Mio.)
- Mv(wr)–Wanapum Basalt, Roza Mbr (M. Mio)
- Qfg(3–4u)–Outburst flood dep., gravels, undif.
- Qfs(3–4u)–Outburst flood dep., sands, undif.
- Mc–Cont. sed. dep.–interbeds in Columbia R. Basalt
- WTR–Water
- FAULT–Fault
- CONTACT–Contact between geologic units

Map source data: S.Reidel and K.Fecht
Map source data date: January 1994
Map source data scale: 1:100,000

WHC:LAD:3-22-94

Figure E-4. Legend for Hanford Geologic Map.

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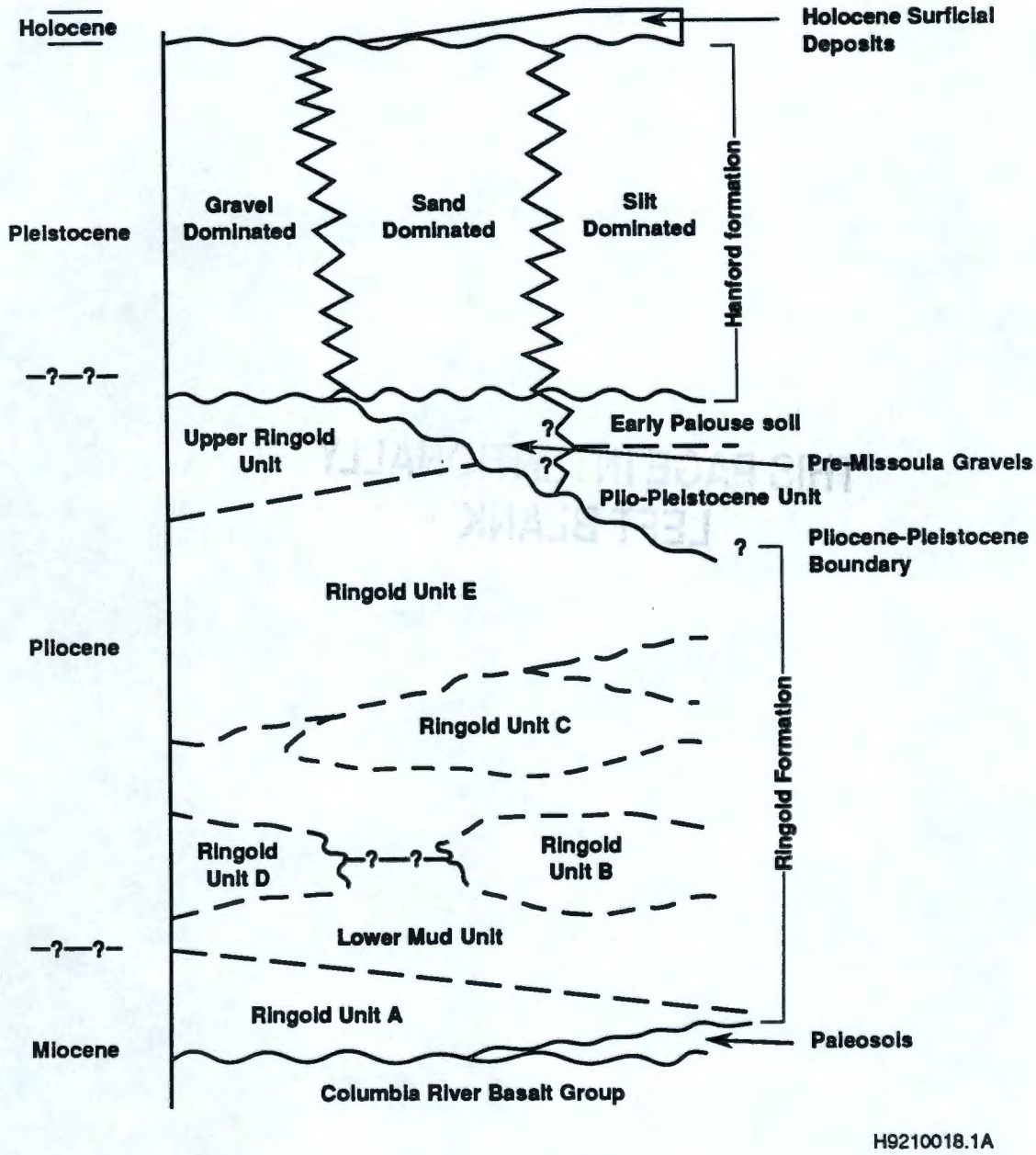

Figure E-5. Regional Stratigraphic Column.

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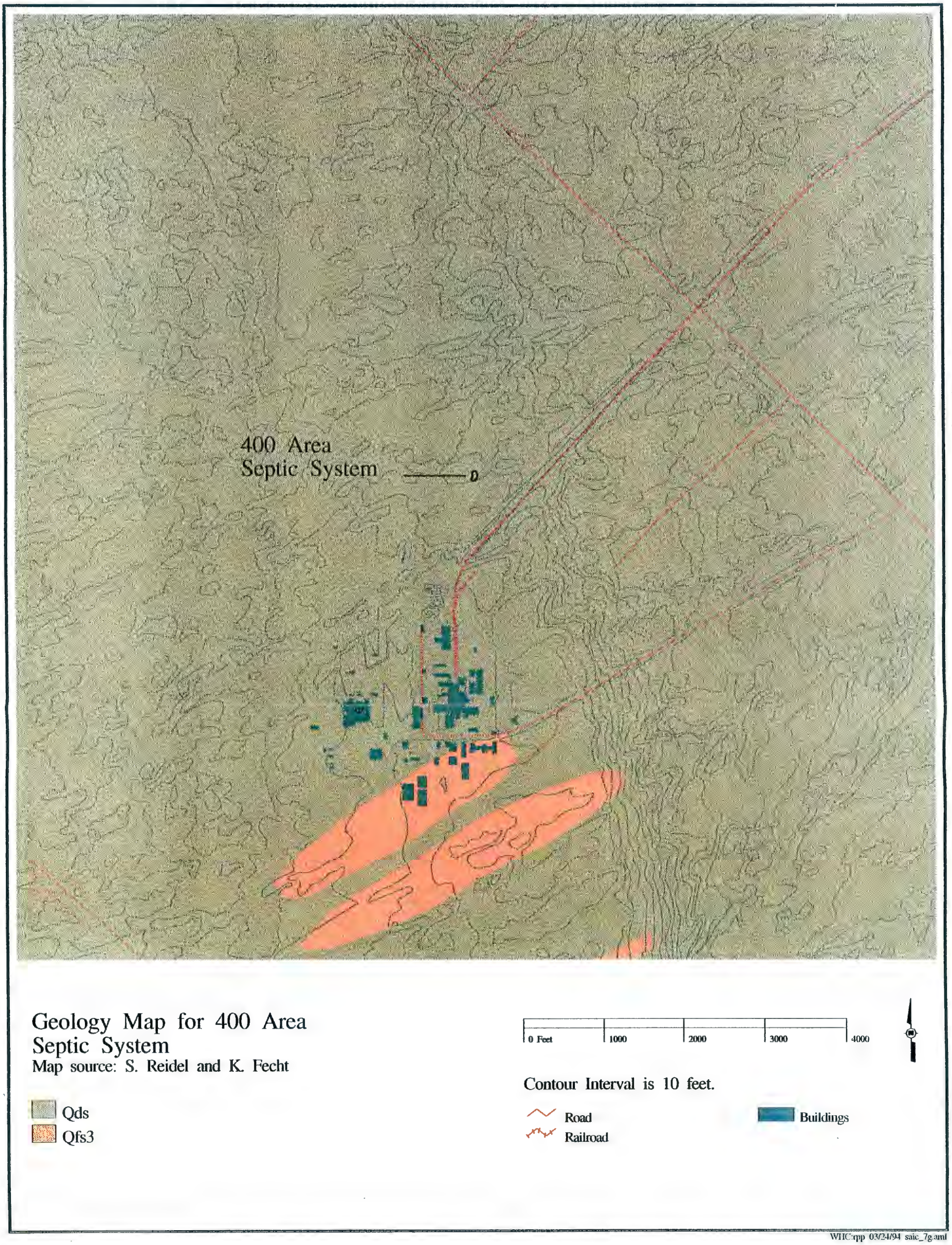

Figure E-6. Geology Map for the 400 Area Septic System.

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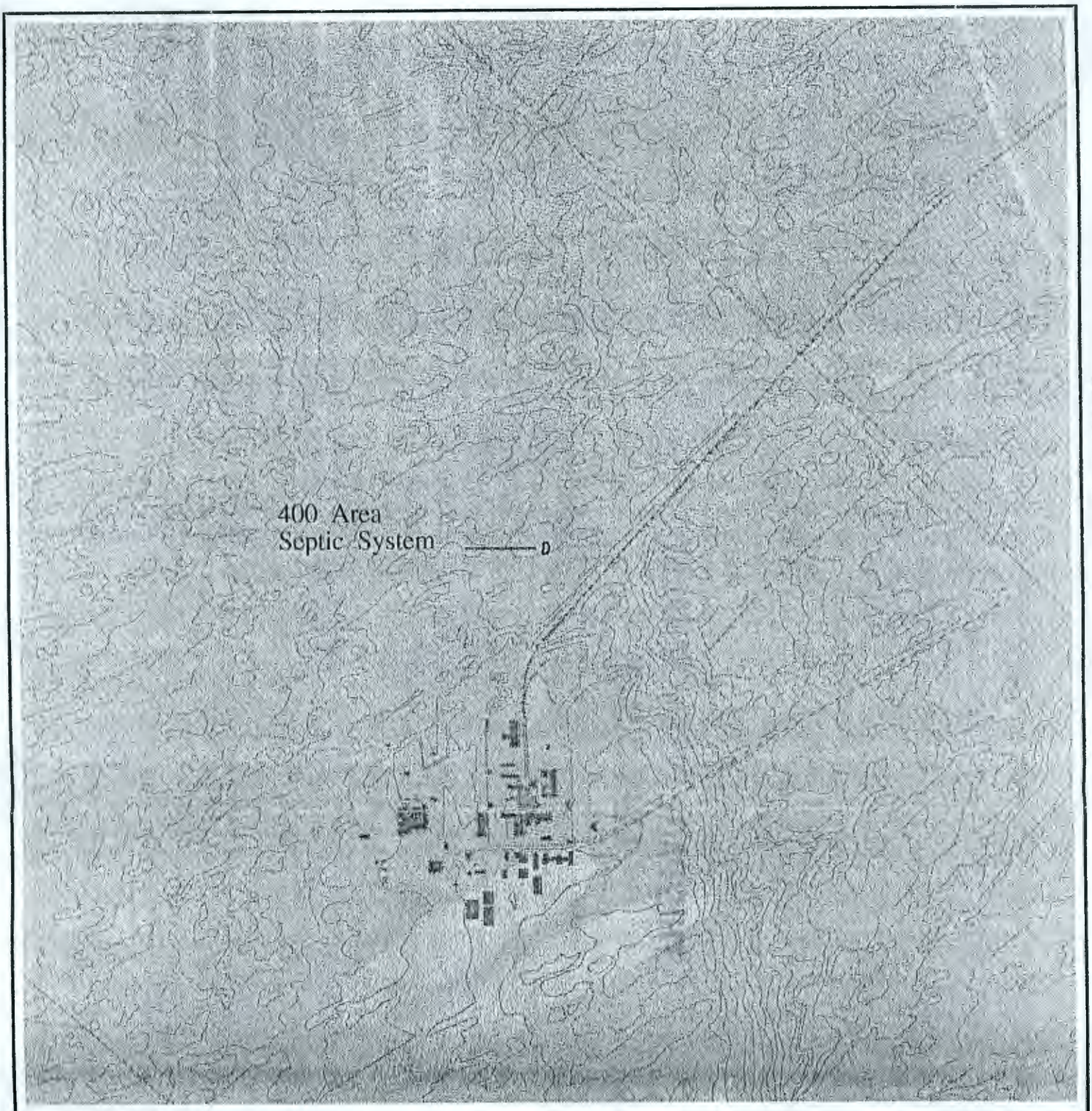

Geology Map for 400 Area Septic System
Map source: S. Reidel and K. Fecht

Qds
Qfs3

0 Feet | 1000 | 2000 | 3000 | 4000

Contour Interval is 10 feet.

Road
Railroad
Buildings

WHC:app 03/24/94 saic_7g.aml

Figure E-6. Geology Map for the 400 Area Septic System.

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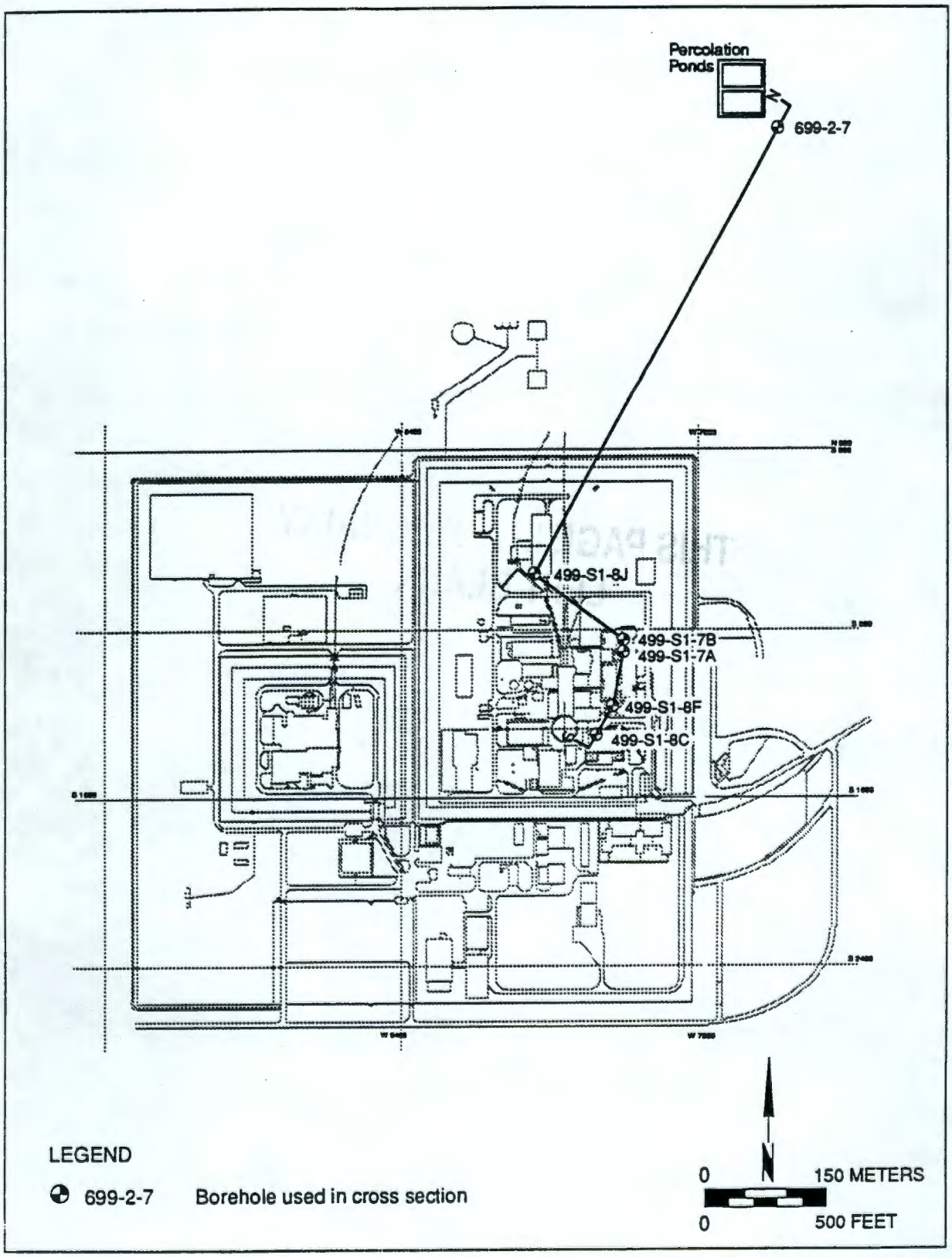

913 1728R/24243/10-16-92

Figure E-7. Line of Cross-Section for the 400 Area.

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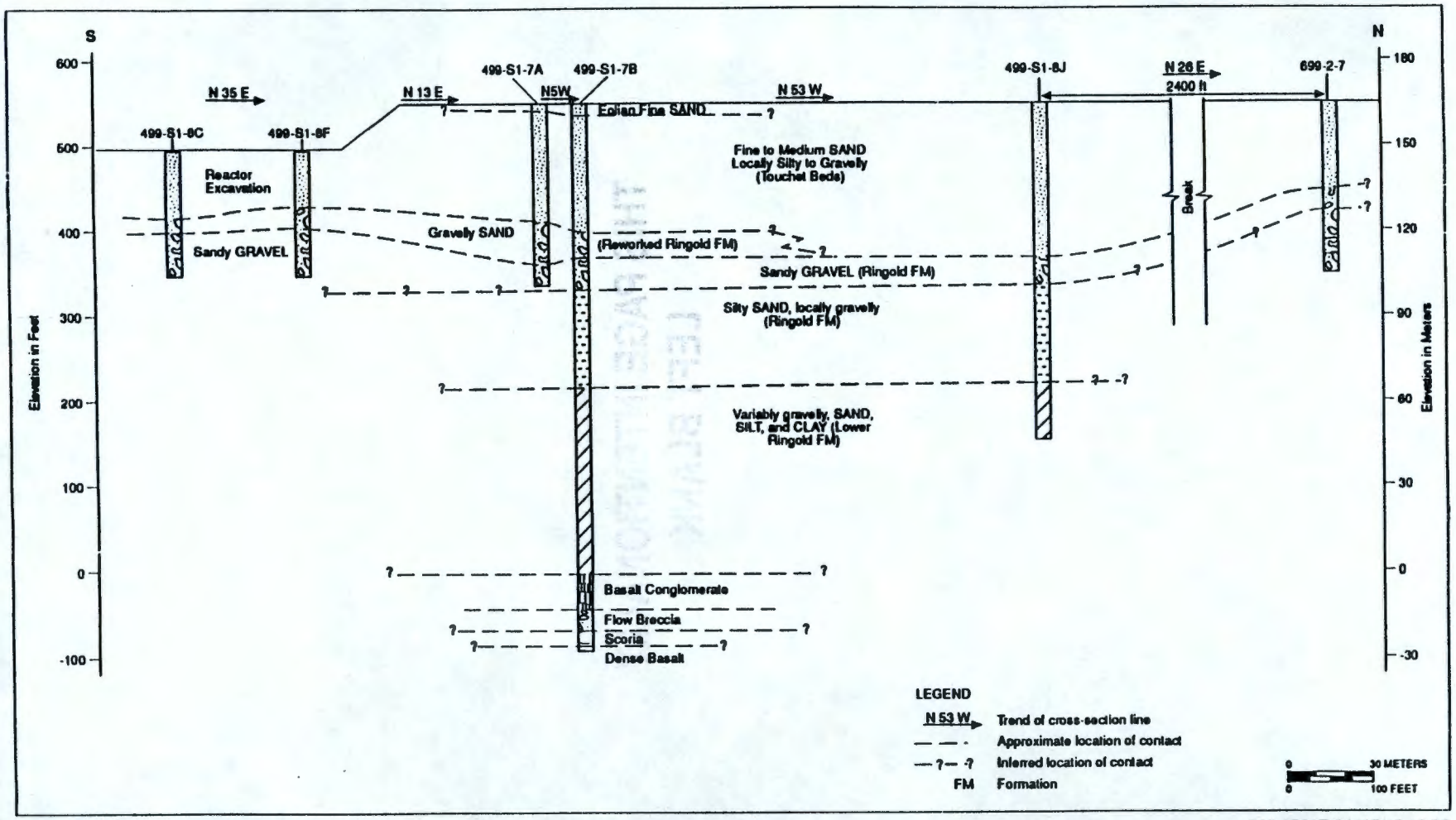

913 1728R/24215/10-16-92

Figure E-8. Cross-Section for the 400 Area.

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Hanford Water Table Map

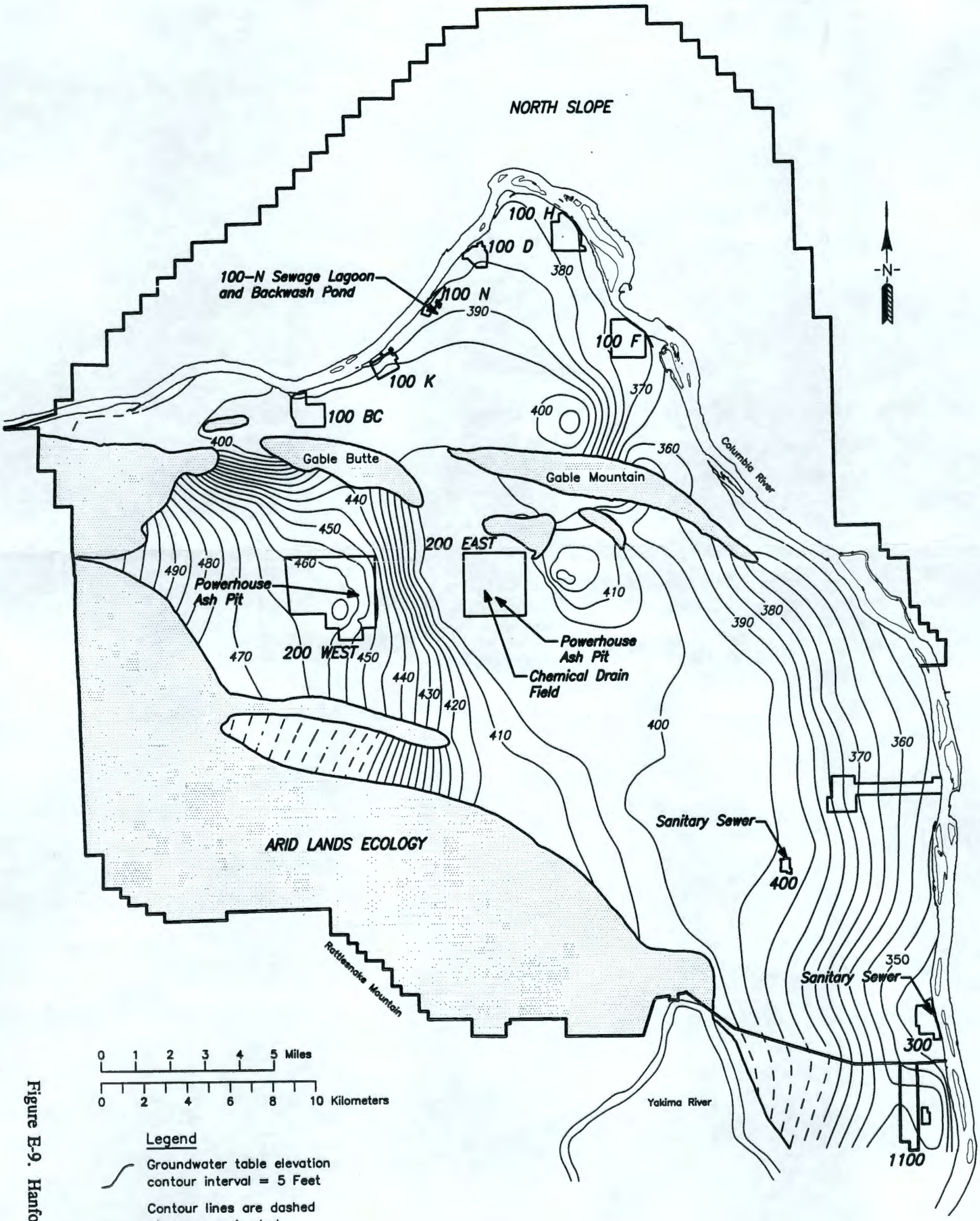
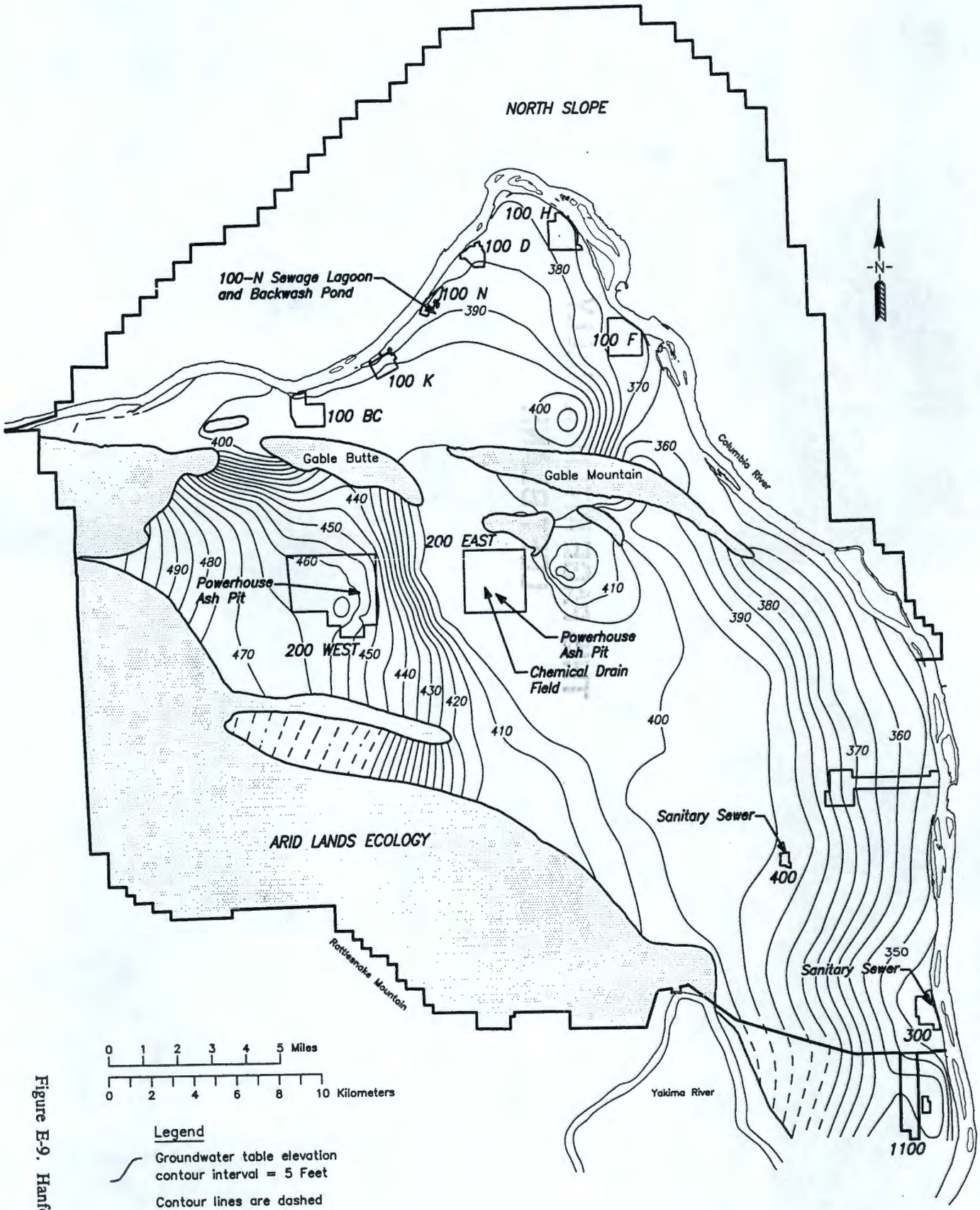


Figure E-9. Hanford Water Table Map.

Hanford Water Table Map



Legend

Groundwater table elevation contour interval = 5 Feet

Contour lines are dashed where approximated

Areas where the basalt surface is above the water table

Source: Modified from WHC-EP-0394-7 (Kasza, et. al.)

WHC: JJA: 4-4-93

Figure E-9. Hanford Water Table Map.

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