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Department of Energy
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Richland, Washington 99352

JUN 30 1993

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93-LWD-079

Mr. George C. Hofer
Hanford Project Manager
U. S. Environmental Protection Agency
1200 Sixth Avenue
Seattle, Washington 98101

Mr. Roger Stanley
Hanford Project Manager
State of Washington
Department of Ecology
P.O. Box 47600
Olympia, Washington 98504-7600

Dear Messrs. Hofer and Stanley:

PRESENTATION OF 216-S-26 CRIB GROUNDWATER IMPACT ASSESSMENT PLAN

Reference: Letter, S. H. Wissness, RL, to P. T. Day, EPA, and D. B. Jansen, Ecology, "Transmittal of Groundwater Impact Assessment Methodology Implementation Schedule - Milestone M-17-13A," dated August 19, 1992. 22919

The purpose of this letter is to transmit the 216-S-26 Crib Groundwater Impact Assessment Plan, an interim compliance milestone under the Hanford Federal Facilities Consent Order (Tri-Party Agreement) Milestone M-17-00A, as per the implementation schedule referenced above. The plan is consistent with the groundwater impact assessment methodology and proposes an approach to assessing impacts to the soil and groundwater resulting from discharge of 222-S Laboratory wastewater to the 216-S-26 Crib.

Please note that the commitment date for presenting this Groundwater Impact Assessment Plan is June 1993. Presentation of this plan during the month of June was agreed not practicable because of schedule conflicts among the various meeting participants. The plan presentation will be rescheduled to a date convenient to all participants. This arrangement was verbally agreed upon under RL guidance between WHC, EPA and Ecology on April 27, 1993.

Enclosed with this letter is the subject plan in the form of a briefing package. Submission of this package is considered to satisfy the June 1993 commitment for this liquid effluent disposal site.

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Should you have any questions on this material, please contact Mr. Marvin J. Furman of my staff on (509) 376-7062.

Sincerely,

D Bryson for
June M. Hennig, Director
Waste Management Division

WMC:MJF

Enclosure

cc w/encl:
K. Kowalik, Ecology
D. R. Sherwood, EPA
B. A. Austin, WHC

cc w/o encl:
K. Kowalik, Ecology
D. R. Sherwood, EPA
B. A. Davis, MACTEC
D. E. Kelley, WHC
A. J. Knepp, WHC
D. R. Speer, WHC
L. E. Borneman, WHC
T. B. Veneziano, WHC
G. J. Warwick, WHC
D. K. Tyler, WHC

Groundwater Impact Assessment Plan for the 216-S-26 Crib

J.W. Lindberg
Westinghouse Hanford Company
Geosciences Function

Groundwater Impact Assessment Plan for the 216-S-26 Crib

- Receiving Site Description and History
- Effluent Characteristics/Constituents of Interest
- Impact of Adjacent Facilities and Past-practice Operations
- Regulatory Requirements and Status
- Preliminary Conceptual Model
- Technical Issues/Data Needs Summary
- Project Schedule

Receiving Site Description and History

Purpose

- Receive wastewater from 222-S Laboratory Complex

  - The 222-S Laboratory provides analytical services to the 200 Area operations, including radioactive samples
  - Analytical services for the following waste management plants:

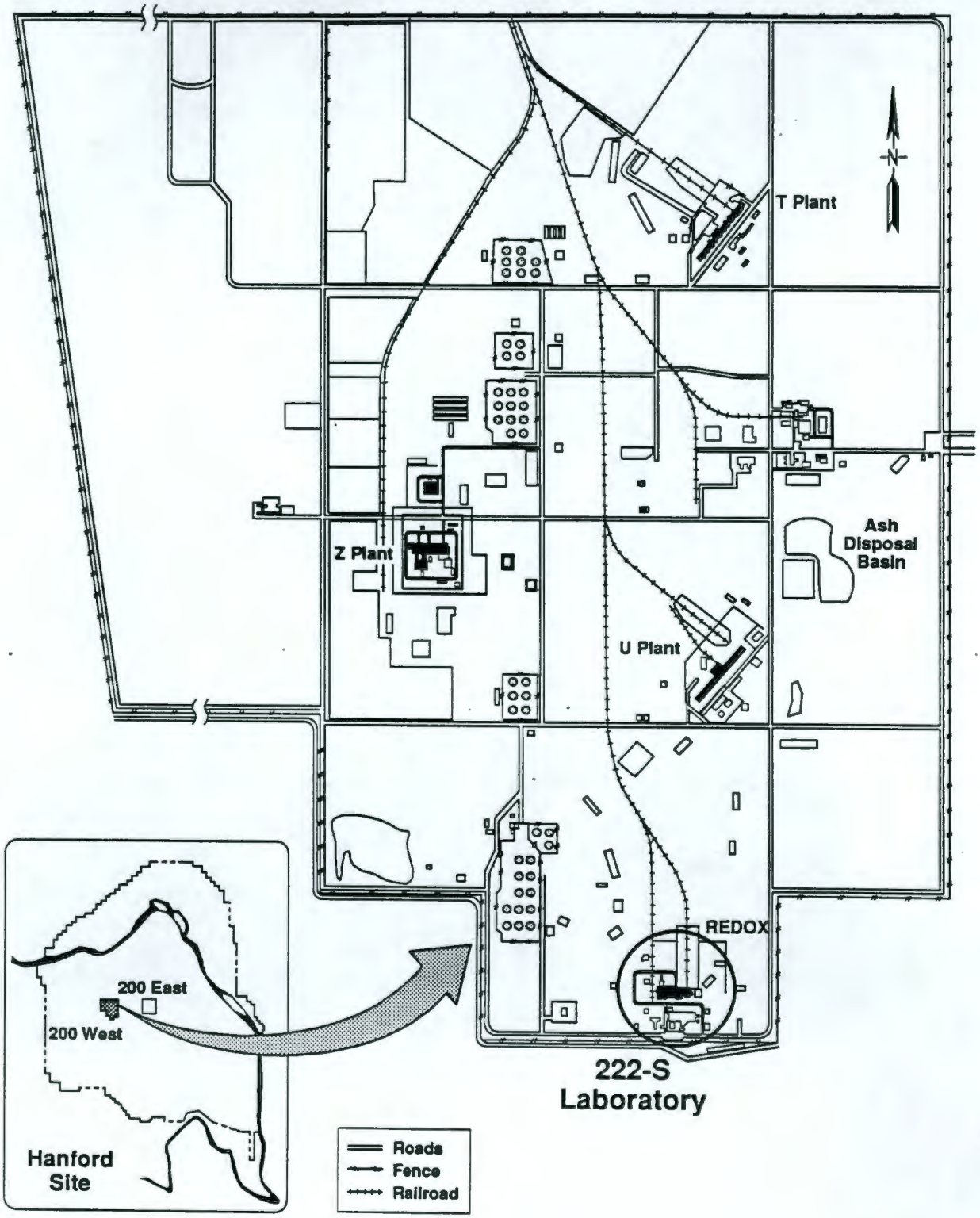
Tank Farms	B Plant	242-A Evaporator
PUREX	PFP	UO_3 Plant
Waste Encapsulation Storage Facility		Environmental Monitoring

  - Main role -- Characterize the waste stored in single-shell tanks
  - Other activities involving essential materials, research, and development.

Location

- Southern part of 200 West Area

Location of the 222-S Laboratory



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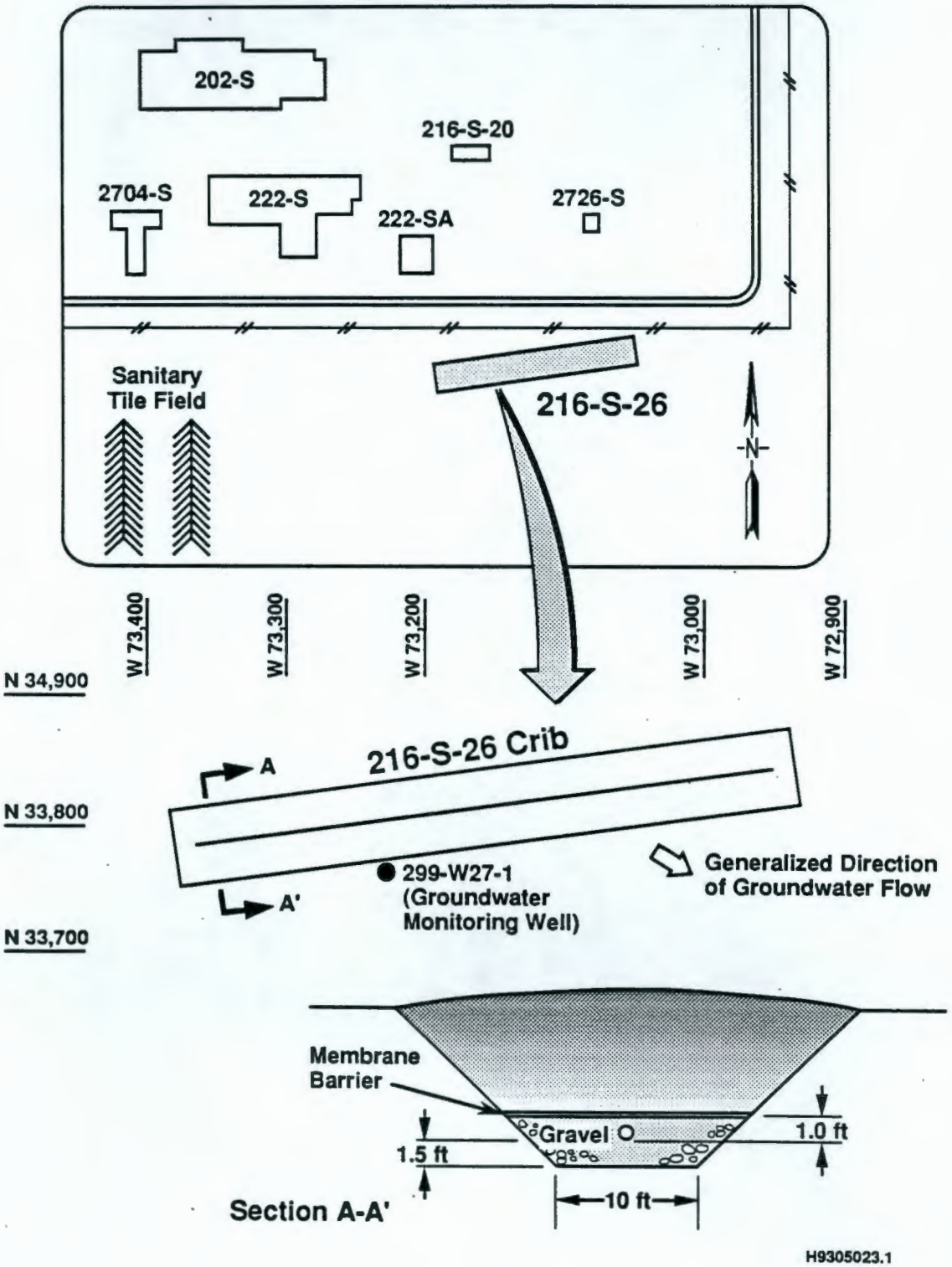
Site Map of 216-S-26 Crib Showing Well Locations



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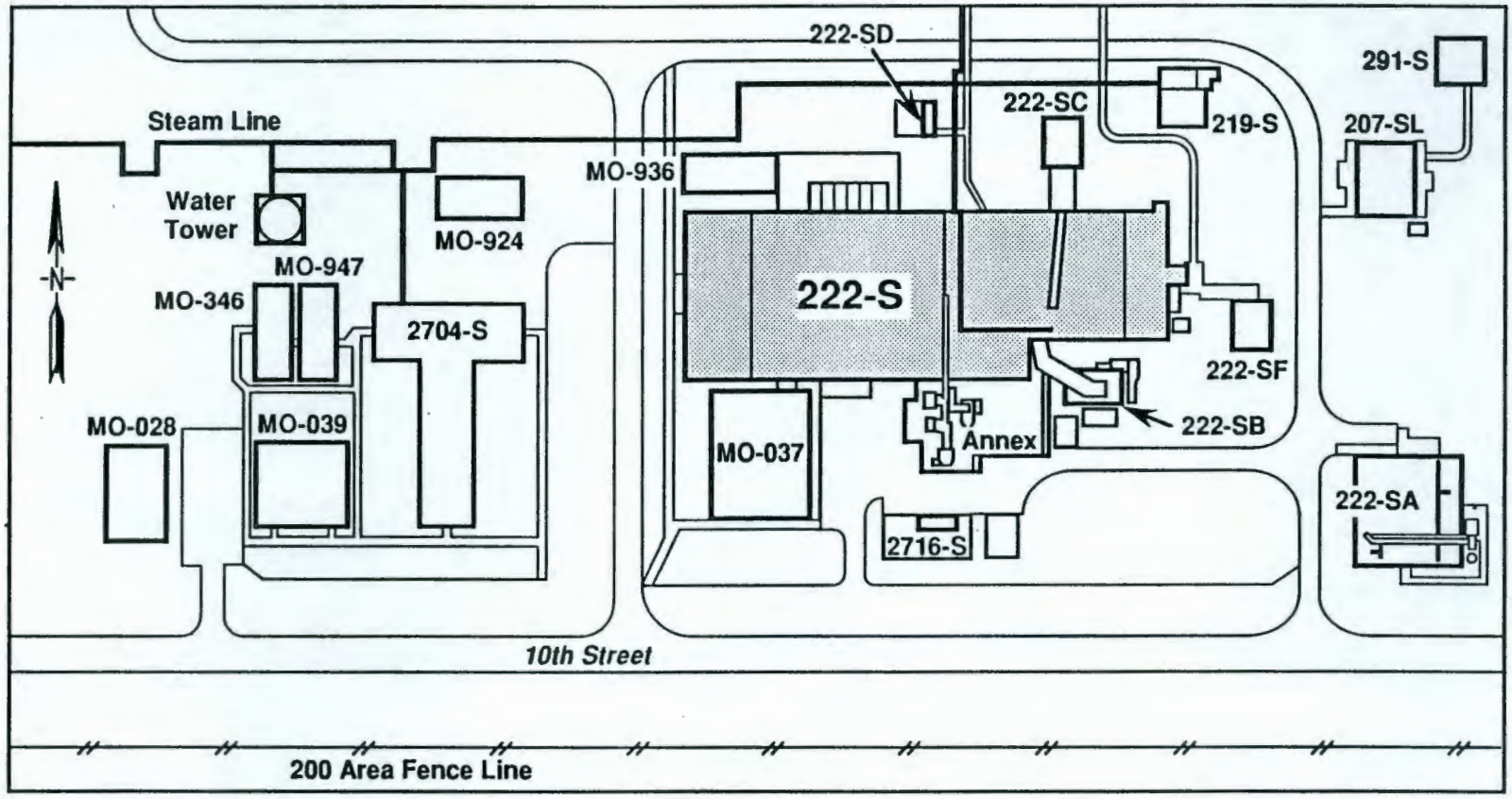
The 222-S Laboratory and Associated Facilities



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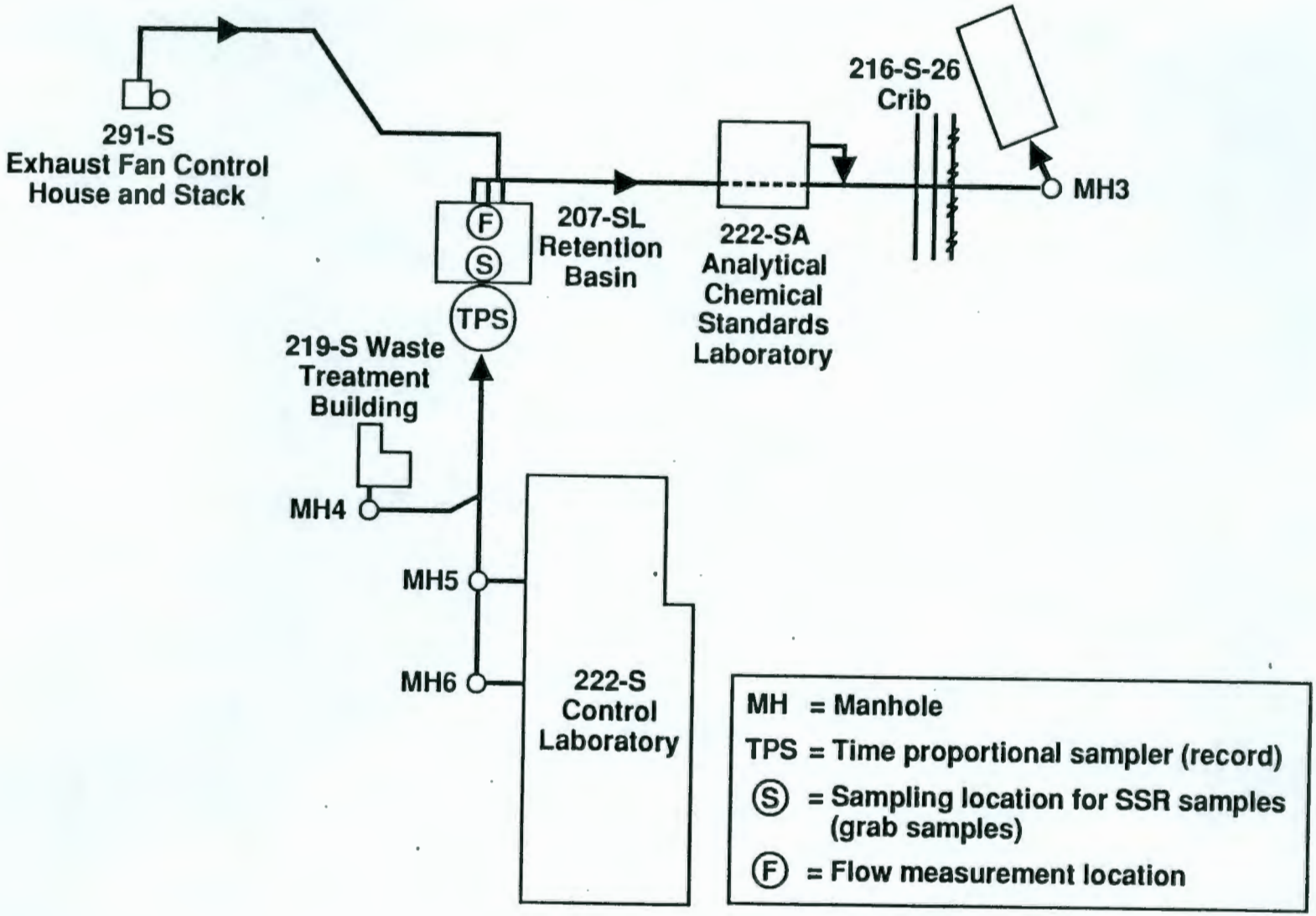
222-S Laboratory Wastewater System



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Receiving Site Description and History (cont.)

History

- 1984 -- Constructed and put into service
- Past-practice
  - 1952 to 1973, S-19 Pond and S-20 Crib
  - 1973 to 1984, S-19 Pond

Crib Characteristics

- Length -- 128 m
- Width -- 3 m
  - 15 cm vitrified clay perforated distribution pipe runs length of crib
  - 3/4 m gravel lines bottom of crib
  - Membrane barrier over gravel
  - 3 m of earth over membrane

Receiving Site Description and History (cont.)

Sources of Wastewater

- 222-S Laboratory
- 219-S Waste Storage Facility
  - Wastewater flows to 207-SL Retention Basins.
  - Wastewater held until sampled and analyzed and determined to comply with regulations *(WHC-CM-7-5, Environmental Compliance Manual).*
  - Wastewater not meeting regulations goes to 219-S Waste Handling Facility and eventually to underground storage tanks.
  - Wastewater meeting regulations goes to 216-S-26 Crib.
- 222-SA Analytical Chemical Standards Laboratory
- 291-S Exhaust Fan Control House and Stack
  - Wastewater discharged from these sources goes directly to the S-26 Crib
  - Wastewater considered nonradioactive and nonhazardous

Receiving Site Description and History (cont.)

222-S Laboratory

- Sources of wastewater sent to 207-SL Retention Basin (Note: wastewater known to be contaminated sent to 219-S Waste Storage Facility)

  - Sinks and drains in the glassblowing shop
  - Distilled water overflow and drain
  - Backflush and drain from deionized water unit and floor drain near this unit
  - Flash-tank overflow and drain lines (cooling water from supply fans, condensate from booster coils, and condensate from the reheat and preheat coil on supply fans)

- Flow - 6,800 gal/8 hr shift (4.8×10^5 gal/month or 1.8×10^6 L/month)

Receiving Site Description and History (cont.)

219-S Waste Storage Facility

- Sources of wastewater sent to 207-SL Retention Basin
  - Water from Tanks 101, 102, and 103 cooling water jackets
  - Operating gallery sump no. 8
  - Steam condensate from operating gallery
  - This stream is considered to be nonradioactive and nonhazardous. However, a remote chance for spill exists, therefore, waste stream is sent to 207-SL Retention Basin.
- Flow - Estimated to be approximately 1,000 gal/yr (3,785 L/yr)

Receiving Site Description and History (cont.)

222-SA Analytical Chemical Standards Laboratory

- Sources - A "cold" laboratory supplying standards for use in other laboratories such as PUREX. The nonhazardous discharges originate from:

Laboratory sinks	Glass washer
Fume hoods	Vacuum pumps (cooling water)
Safety eye wash/showers	

  - Administrative controls prevent dangerous wastes in stream (operating procedures for disposal of liquid wastes to lab sinks and drains specifically state that hazardous chemicals may not be disposed to this stream).
  - Wastewater considered nonradioactive and nonhazardous
  - Consequently, wastewater not routinely sampled and analyzed.
  - In the past, wastewater discharged to S-26 Crib.
  - In the future, Sampling and Analysis Plan (SAP) indicates that discharges of this stream will go to 207-SL Retention Basin

- Flow - Estimate 1,000 gal/day

Receiving Site Description and History (cont.)

291-S Exhaust Fan Control House and Stack

- Sources - Cooling water from Stack Fan House and steam condensate from emergency fan.

  - Warm weather - Valve is kept closed except when the fan is running
  - Colder weather - Valve is left partially open to allow a small volume of water to prevent freezing
  - No credible potential for contamination with hazardous or radioactive wastes
  - Stream not sampled because of low flow and low probability for contamination
  - Wastewater goes directly to S-26 Crib

- Flow - Approximately 6-8 gal/min when emergency fan is activated. The fan and cooling water system operate approximately 30 hr/yr. The maximum discharge is expected to be approximately 14,000 gal/yr.

Effluent Characteristics/Constituents of Interest

- Chemical constituents detected in effluent:

Aluminum*	Iron*	Uranium
Barium	Magnesium	Vanadium
Beryllium(1)	Manganese	Zinc
Boron	Mercury	TDS
Cadmium(1)	Nickel(1)	TOC
Calcium	Potassium	Total Carbon
Chloride	Silicon	TOX
Chromium	Sodium	Fluoride
Copper	Strontium	Sulfate

(1) Indicates one analytical result

* Indicates constituent that exceeds WAC 173-200-040, Groundwater Quality Criteria List (WWQS) or in the case of aluminum exceeds the 54 FR 22062 Drinking Water Standard

Reference: WHC-EP-0342, Addendum 13,222-S Laboratory Wastewater Stream-Specific Report

Effluent Characteristics/Constituents of Interest (cont.)

- Chemical constituents detected in effluent:

Acetone
2-Acetothiophene(1)
Ammonia
1,2-Dimethylbutane(1)
Ethanol(1)
Ethylbenzene(1)
Methylcyclopentane(1)
Hexone
Trichloromethane

(1) Indicates one analytical result
* Indicates constituent that exceeds WAC 173-200-040, Groundwater Quality Criteria List (WWQS)

Reference: WHC-EP-0342, Addendum 13,222-S Laboratory Wastewater Stream-Specific Report

Effluent Characteristics/Constituents of Interest (cont.)

- Radiological constituents detected in effluent:

Gross Alpha	Radium Total(1)
Gross Beta	^{90}Sr(1)
^{241}Am	^{234}U
^{14}C(1)	^{238}U
^{3}H(1)	
^{238}Pu	
$^{239,240}Pu$	

(1) Indicates one analytical result

* Indicates constituent that exceeds 1/25 Derived Concentration Guideline (1/25 DCG)

Reference: WHC-EP-0342, Addendum 13,222-S Laboratory Wastewater Stream-Specific Report

Constituents that Exceeded WWQS Standard

	Effluent		Groundwater				
Constituent	Iron	Aluminum	Chloroform	Nitrate	Selenium	Gross Alpha	Tritium
Units	ppb	ppb	ppb	ppb	ppb	pCi/L	pCi/L
WWQS	300	50	7	45,000	10	15	20,000
Average	115	1,360	10	40,415	40	7	57,000
Maximum	630	5,840	14	128,000	54	16	637,000
Minimum	45	162	6	4	21	2	108
Standard Deviation	124	2,500	1	42,301	13	2	12,400

Impact of Adjacent Facilities and Past-practice Operations

Crib or Trench	Years of Service	Description	Vol. Received
216-S-7 Crib	1956-1965 Inactive	Received cell drainage from the D-1 Receiver Tank, process condensate from the D-2 Receiver Tank, and condensate from the H-6 Condenser.	3.9E+8 L
216-S-9 Crib	1965-1969 Inactive	Received process condensate from the D-2 Receiver Tank in the 202-S Building. Waste is radioactive and acidic.	5.03E+7 L
216-S-13 Crib	1952-1972 Inactive	Liquid waste from 203-S Decontaminated Metal Storage Facility, 204-S Uranyl Nitrate Hexahydrate lag Storage Facility, 276-S Organic Solvent Make-up Facility, and 204-S Uranyl Nitrate Hexahydrate Facility. Waste is low-salt and neutral/basic.	5.0E+6 L
216-S-20 Crib	1952-1973 Inactive	Liquid waste from 222-S via the 219-S Retention Building, 207-SL Retention Basin, 219-S Retention Basin, and 300 Area lab waste.	1.35E+8 L

Impact of Adjacent Facilities and Past-practice Operations (cont.)

Crib or Trench	Years of Service	Description	Vol. Received
216-S-22 Crib	1957-1967 Inactive	Liquid waste from the acid recovery facility in the 293-S Building	9.8E+4 L
216-S-12 Trench	1954-1975 Inactive	Flush waste containing ammonium nitrate from the 291-S Stack	7.6E+4 L
216-S-14 Trench	1951-1952 Inactive	Received contaminated uranyl nitrate hexahydrate from the initial test runs in the 202-S Building	7.6E+4 L
216-S-19 Pond	1952-1984 Inactive	Liquid waste from 222-S via the 219-S Retention Building, 207-SL Retention Basin, 219-S Retention Basin	>1.35E+8 L

Regulatory Requirements and Status

- Liquid Effluent Consent Order

- TPA M-17-00A Complete Liquid Effluent Treatment Facilities/ upgrades for all Phase I Streams

  Interim Milestones

  - Impact Assessment Methodology (M-17-13 and M-17-13A)
  - (SAP) for liquid effluent streams
  - Treatment system design and construction commitments
  - Interim flow restrictions
  - Cease discharge dates

- TPA M-17-13A Groundwater impact assessment implementation schedule 30 days after methodology approval

  - Present Assessment Plan - June 1993
  - Submit Groundwater Impact Assessment Report - Nov. 1993

Regulatory Requirements and Status (cont.)

- CERCLA Operable Units (the 216-S-26 Crib is within the CERCLA 200-RO-3 and 200-UP-1 Operable Units)

  - 200-RO-3 Source Area Operable Unit (S-Plant Aggregate Area)
  - 200-UP-1 Groundwater Operable Unit

- TPA M-17-08B Implement BAT/AKART - Discharge to "200 Area Treated Effluent Disposal Facilities" (Project W-049H) June 1995

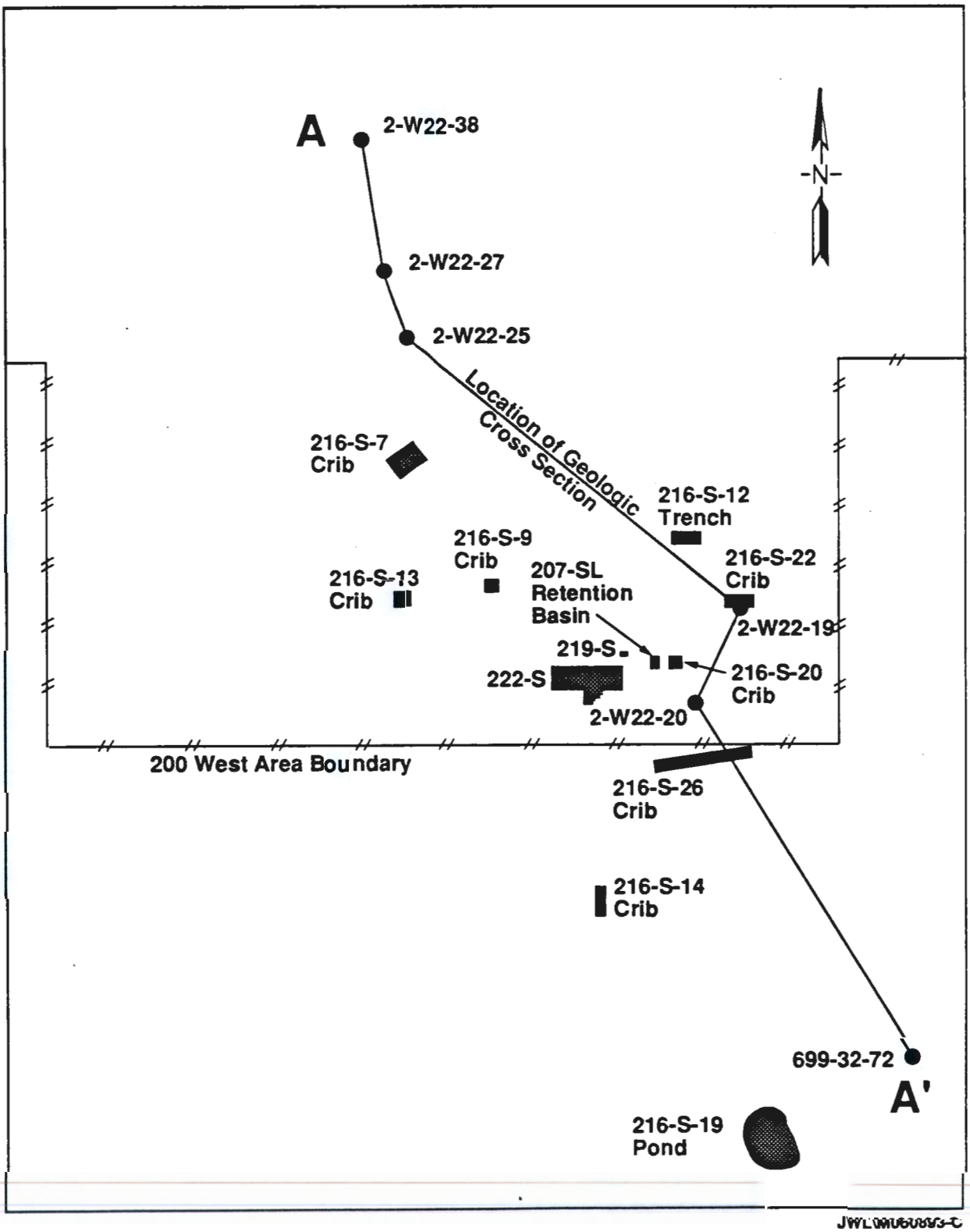
- TPA M-17-39 Cease all discharges to 216-S-26 Crib by June 1995 (Project W-049H)

- TPA M-17-39A Submit SAP by January 1992 - Complete

Preliminary Conceptual Model

- Geology
- Groundwater Hydrology
- Groundwater Monitoring Data
- Unit Gradient Model

Location of Geologic Section and Near by Facilities



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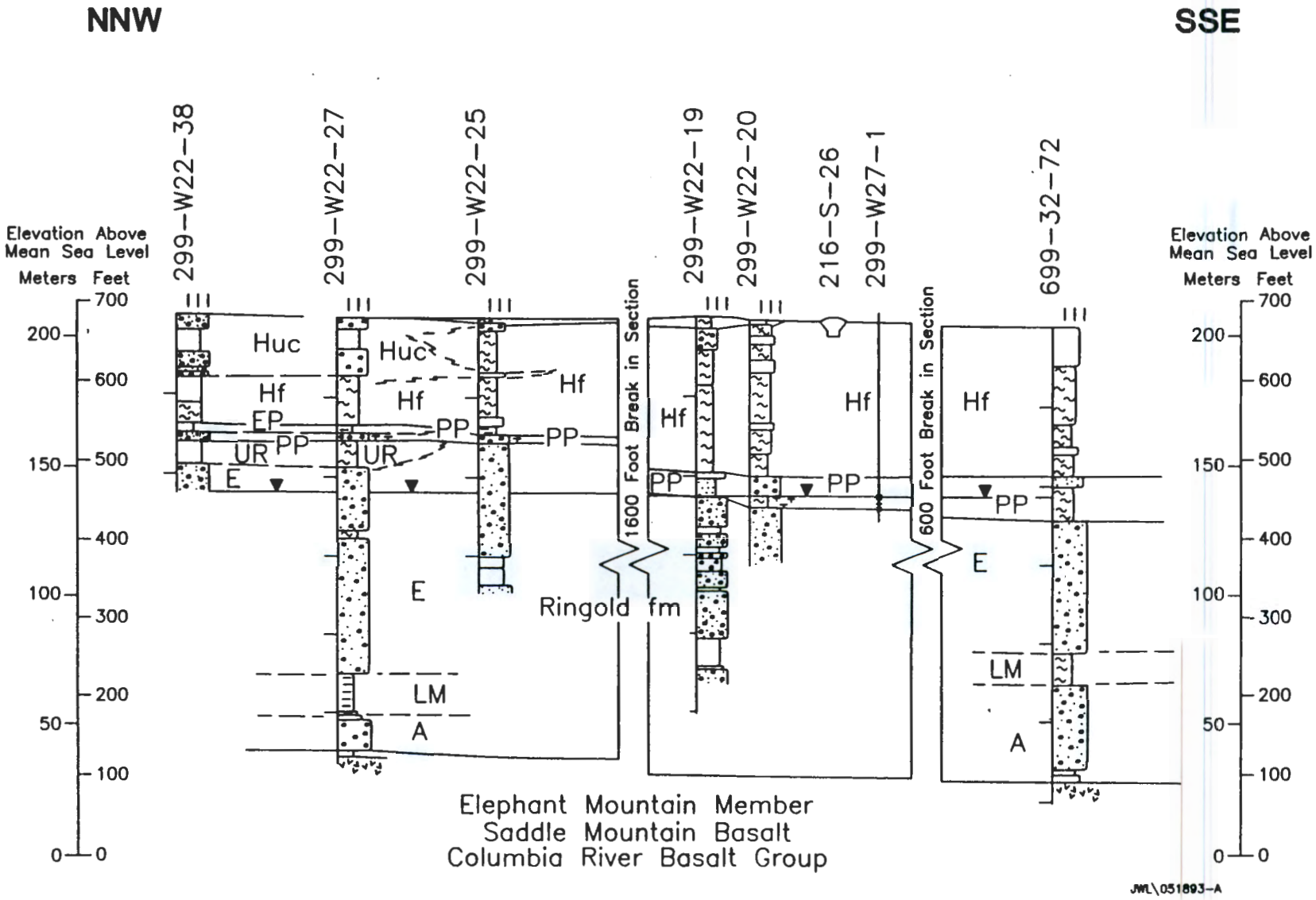
NNW
SSE
299-W22-38
299-W22-27
299-W22-25
299-W22-19
299-W22-20
216-S-26
299-W27-1
699-32-72
Elevation Above Mean Sea Level
Meters Feet
700
600
500
400
300
200
100
0
200
150
100
50
0
Huc
Hf
EP
PP
UR
E
LM
A
1600 Foot Break in Section
600 Foot Break in Section
Ringold fm
Elephant Mountain Member
Saddle Mountain Basalt
Columbia River Basalt Group
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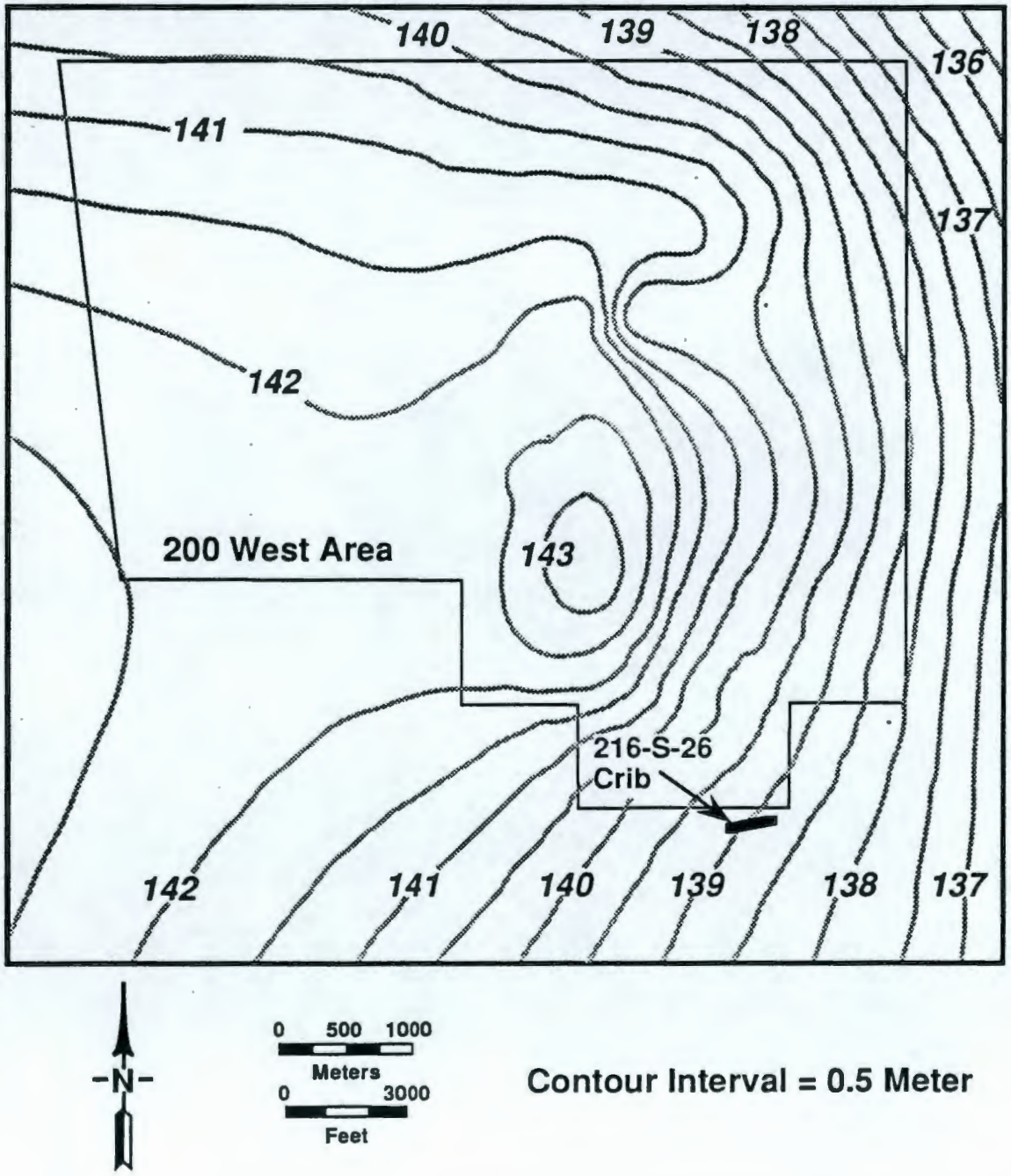
June 1991, Water Table Map
200 West Area



Contour Interval = 0.5 Meter

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Preliminary Conceptual Model (cont.)

Groundwater Monitoring Data

- 299-W27-1 is the only monitoring well for the crib
- Groundwater constituents detected during the history of the well include:

Barium	Magnesium	Sulfate
Cadmium	Manganese	TOC
Calcium	Natural Uranium	Total Carbon
Chloride	Nitrate*	Strontium
Chloroform*	Potassium	TOX
Chromium	Selenium*	Vanadium
Fluoride	Sodium	Zinc
Iron	Total Organic Halogen	

* Indicates constituent that exceeds the WAC 173-200-040, Groundwater Quality Criteria List (WWQS)
Underline indicates constituent average exceeds natural background WHC Provisional Threshold Values (95% CI) WHC-EP-0595 Appendix A

Reference: Data obtained from GEODAT database

Groundwater Monitoring Data (cont.)

^{137}Cs	^{90}Sr
^{60}Co	Tritium*
Gross Alpha*	^{234}U
Gross Beta	^{238}U

* Indicates constituent that exceeds WAC 173-200-040, Groundwater Quality Criteria List (WWQS) or 1/25 Derived Concentration Guideline (1/25 DCG)

Reference: Data obtained from GEODAT database

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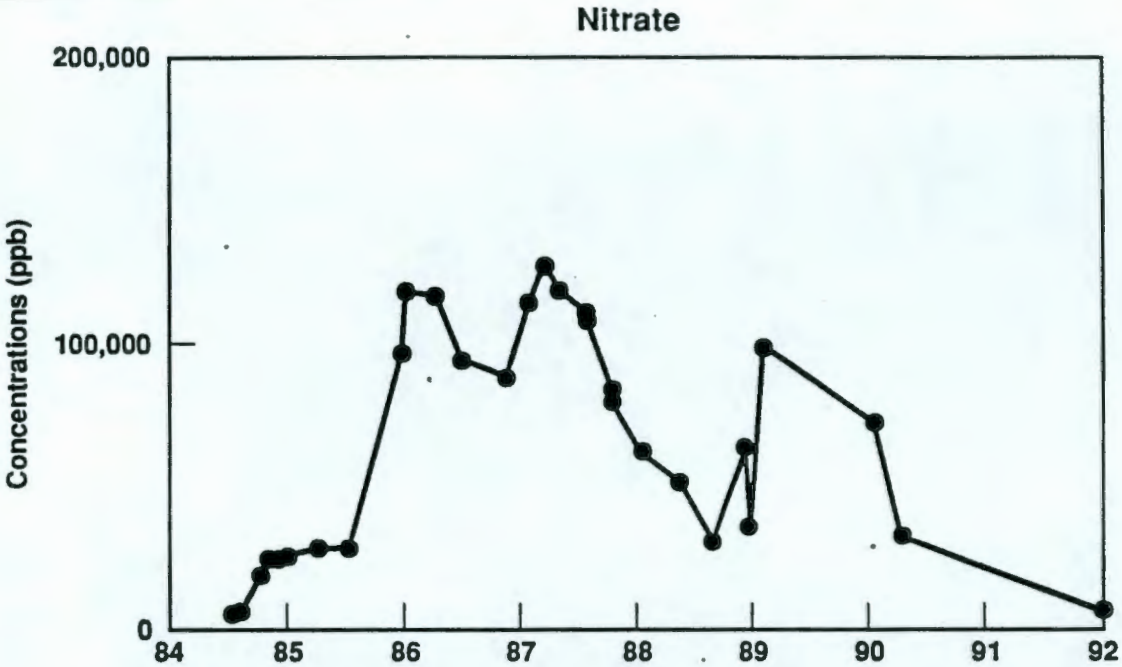
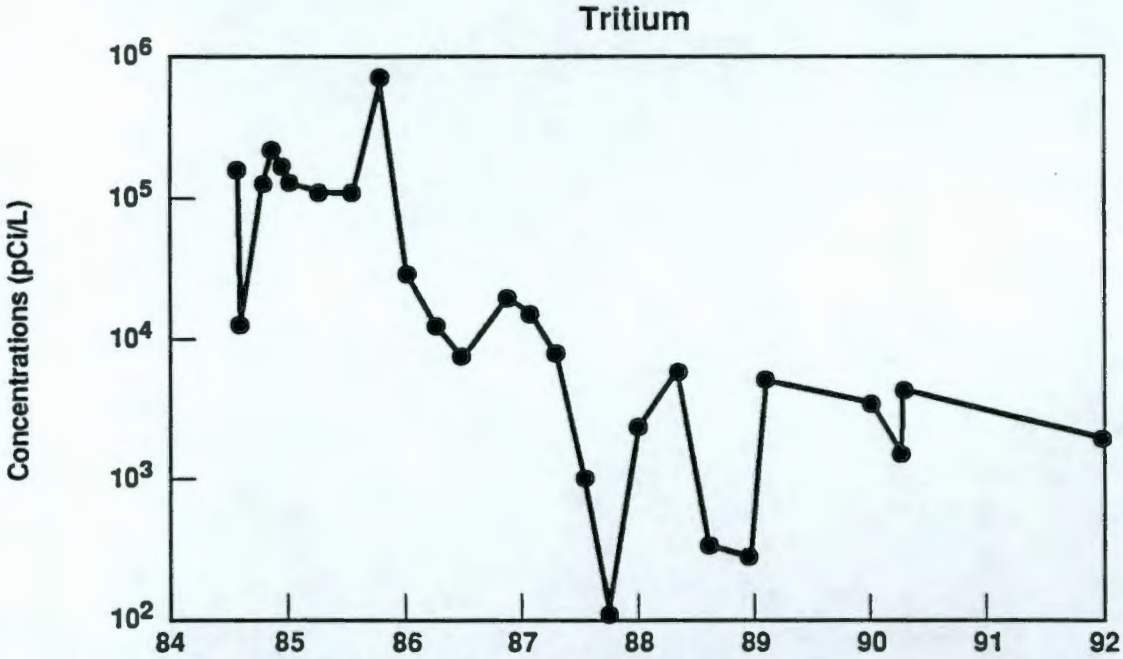
Nitrate and Tritium versus Time at the 216-S-26 Crib (Well 2-W27-1)





Reference: WHC-EP-0595 WHC Operational Groundwater Status Report 1990-1992

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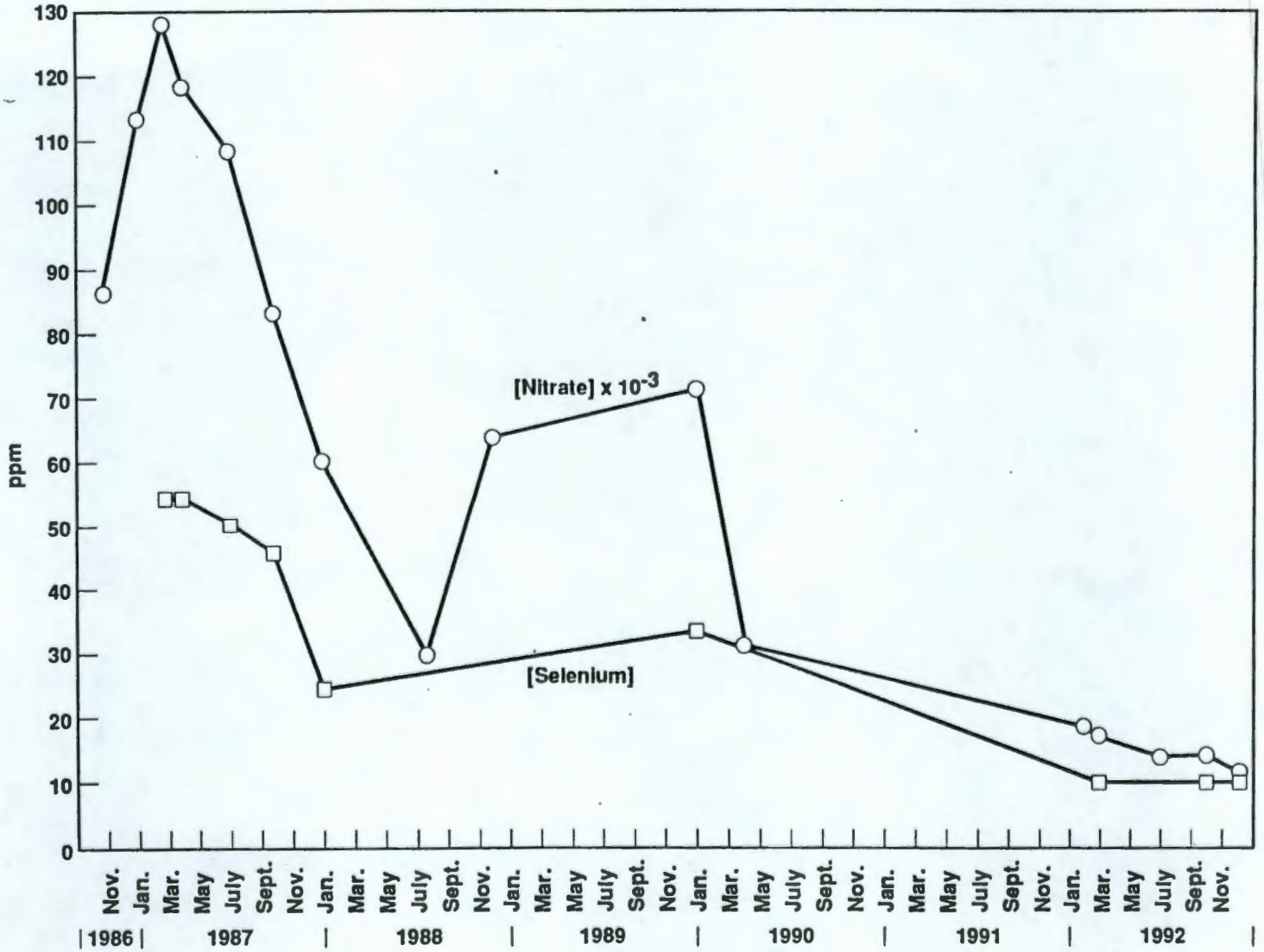
Nitrate and Selenium Concentrations in Groundwater at Well 299-W27-1



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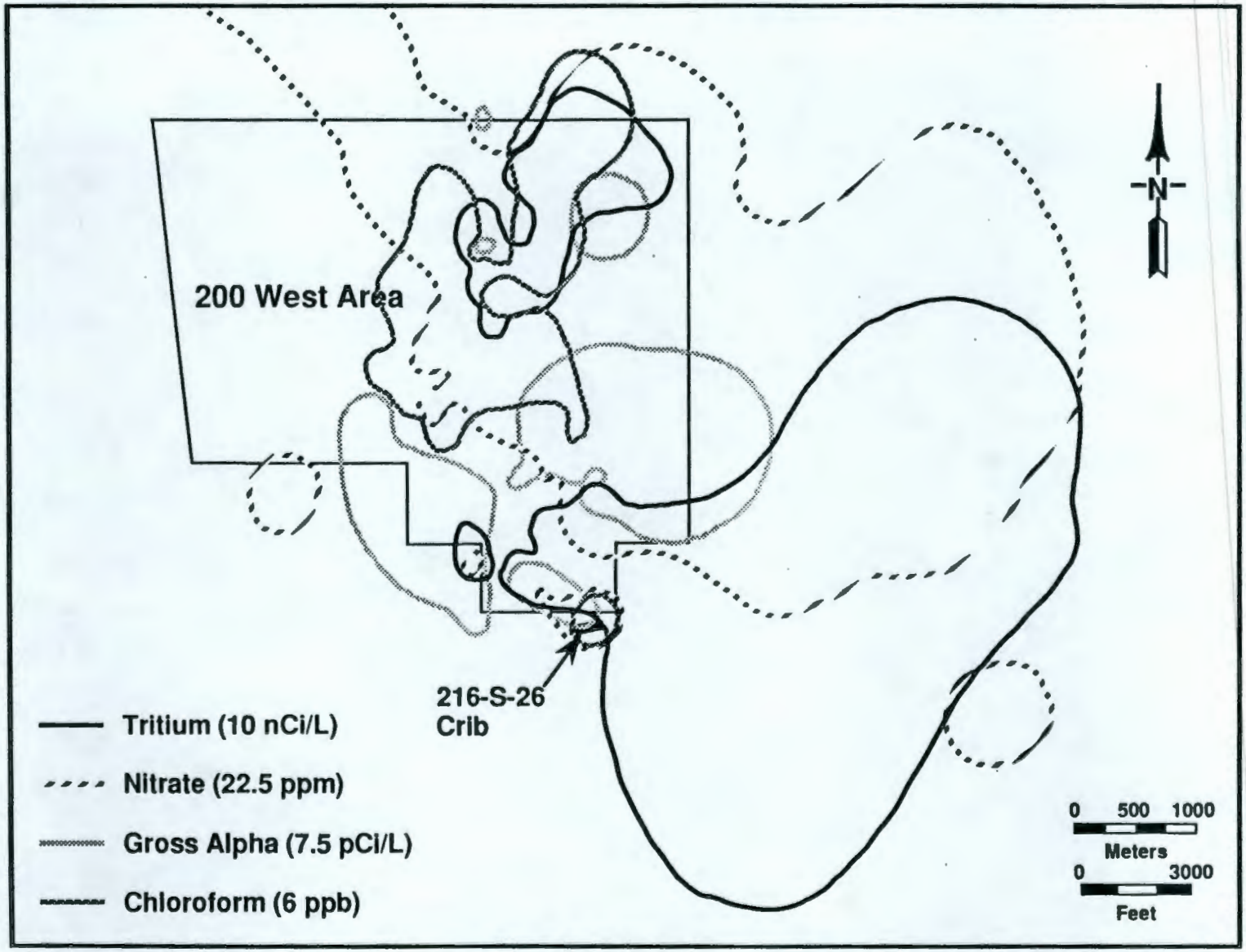
June 1991, Water Table Map
200 West Area



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Preliminary Conceptual Model (cont.)

Unit Gradient Model

- Previous results of modeling

  - Calculated travel time for wastewater to reach water table is 168 days
  - Long travel times for key constituents indicate only minor additional movement should occur with continued interim use of the crib
  - Shortest travel time, uranium at 4.6 yr
  - Longest travel time, americium-241 at 460 yr

- Geologic and hydrologic parameters considered conservative, but adequate

- Key constituents used are appropriate based on previous sampling data. However, they will be compared with data collected under the SAP (not available yet).

- Previous model runs were adequate to characterize system. Additional modeling not necessary unless new data suggest different constituents or higher concentrations.

Preliminary Conceptual Model (cont.)

Summary

- Effluent discharged to soil column via crib.
- Soil column is composed of multiple layers of interfingering sand, silty sand, and gravelly sand.
- Effluent moisture moves downward and spreads laterally, especially at sediment layer contacts.
- Water table (or the piezometric surface) is situated within the partially cemented Plio-Pleistocene unit.
- In effluent, only iron and aluminum exceeded standards.
  - Neither constitutes a health based risk
  - Neither are very mobile in soil column under expected pH and eH conditions
- Upgradient contaminant sources influence groundwater quality beneath the crib.
- Conceptual model appears consistent with previous unit gradient model (WHC-EP-0367) results.

Technical Issues/Data Needs Summary

- Groundwater contaminants come from upgradient sources.
- In general, present sampling and analysis of waste stream and groundwater are adequate.
- Continue waste stream and groundwater sampling and analysis. Data cutoff date is August 1993.
- Detection limit not low enough on some analyses (e.g., selenium). The SAP should be modified to lower the detection limit on these analyses.
- What is the impact of well completion (at 2-W27-1) on constituents sampled? Monitoring well construction needs to be examined more closely to determine whether well water is from the unconfined aquifer, a perched zone, or a semi-confined aquifer. Potential dilution from lower aquifer needs to be considered.

Project and Schedule

- Facility Effluent Sampling and Analysis Program (as stated in SAP)
- Operational Groundwater Monitoring Program (Sampling 2-W27-1)
- Groundwater Impact Assessment Report - November 1993

CORRESPONDENCE DISTRIBUTION COVERSHEET

Author	Addressee	Correspondence No.
J. M. Hennig, RL	G. C. Hofer, EPA R. F. Stanley, Ecology	Incoming: 9305506

Subject: PRESENTATION OF 216-S-26 CRIB GROUNDWATER IMPACT ASSESSMENT PLAN

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		H. E. McGuire, Level 1	B3-63	
		S. R. Moreno	B3-06	
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		D. K. Tyler	H6-06	
		T. B. Veneziano, Assignee	L4-96	X
		G. J. Warwick	T6-12	
		EDMC	H6-08	X

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