

Meeting Minutes Transmittal and Approval  
RCRA Groundwater Monitoring Program  
450 Hills Street, Room 47, Richland, Washington  
January 31, 1991

1213955

From/ Appvl: *K. M. Thompson*  
K. M. Thompson, U.S. Department of  
Energy-Richland Operations Office

Date: 3/18/91

Appvl: *K. Kowalik*  
K. Kowalik, Washington Department of  
Ecology

Date: 4/9/91

Attendees

U.S. Department of Energy-Richland  
Operations Office

K. M. Thompson A5-19

Washington State Department of Ecology

K. Kowalik

Westinghouse Hanford Company

W. R. Brown B2-19  
K. R. Fecht H4-56  
S. F. Harris H4-56  
M. J. Hartman H4-56  
R. L. Jackson H4-56  
G. L. Kasza H4-56  
A. J. Knepp H4-56  
R. B. Mercer H4-56  
R. R. Thompson R1-10  
D. K. Tyler H4-56  
B. A. Williams H4-56

Distribution

Attendees

M. R. Adams	H4-55
L. C. Brown	H4-51
M. J. Furman	A5-21
C. J. Geier	H4-57
D. G. Horton	H4-56
J. F. Keller	R3-27
M. Marratt	H4-56
L. L. Powers	B2-35
W. H. Price	N3-05
D. S. Takasumi	R3-27
ADMINISTRATIVE RECORD	H4-22

Meeting Minutes are attached. Meeting minutes are comprised of the following:

Attachment 0 - Summary Meeting Minutes

Attachment 1 - Agenda

Attachment 2 - RCRA Groundwater Monitoring Project

Attachment 3 - Tri-Party Agreement Commitments

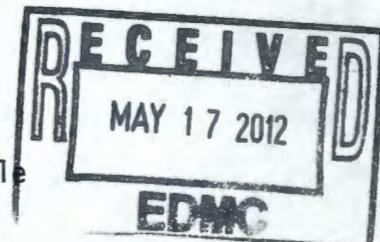
Attachment 4 - Groundwater Monitoring Plan Review Schedule

Attachment 5 - CY 1991 RCRA Drilling Schedule

Attachment 6 - Deterministic Approach to Well Placement

Attachment 7 - Groundwater Monitoring Program at 216-A-26 Ditch

Attachment 8 - Groundwater Monitoring Program at 200 Areas Low Level Burial  
Ground



**SUMMARY MEETING MINUTES**

1. **Agenda** - Attachment 1. This meeting was held as an information meeting for Ms. K. Kowalik, who replaced Mr. W. R. Brown as the Washington State Department of Ecology (Ecology) Resource Conservation and Recovery Act (RCRA) monitor, and to establish a schedule for reviewing groundwater monitoring plans which requires Ecology's approval prior to drilling.
2. **RCRA Groundwater Monitoring Project** - Mr. R. L. Jackson summarized the RCRA groundwater monitoring program (see Attachment 2). Ms. Kowalik noted that Ecology is planning to provide an on-site geologist to monitor RCRA drilling and associated activities.
3. **Tri-Part Agreement (TPA) Commitments** - Mr. R. R. Thompson summarized the TPA commitments for calendar year (CY) 1990 and 1991 (see Attachment 3). Six of the seven RCRA drilling TPA milestones (M-24-00) were completed in CY 1990. RCRA CY 1990 drilling milestones that were completed included: M-24-05 (one well at Grout Treatment Facility), M-24-06 (six wells at Low Level Burial Grounds (LLBG)), M-24-08 (four wells at 216-B-63 Trench), M-24-09 (three wells at 216-S-10 Ditch and Pond), M-24-10 (four wells at 216-U-12 Crib), and M-24-11 (one well at 216-B-Pond).

Milestone M-24-07 (eleven wells at Single Shell Tanks (SST)) was missed due to funding delays, delays to review the SST drilling issues, adverse weather conditions, and unexpected subsurface conditions. Three wells at the SSTs were completed by the end of CY 1991. Seven wells were essentially completed by end of January 1991. The remaining four wells will be completed in CY 1991. The U.S. Department of Energy-Richland Operations Office (DOE-RL) has submitted change requests to Ecology to reflect changes in TPA Milestones M-24-07 and M-24-00.

Mr. K. M. Thompson suggested that updates to the TPA action plan for RCRA drilling should include several to-be-determined (TBD) wells. This approach would allow for any unplanned drilling that may be negotiated between DOE-RL and Ecology during the CY.

4. **CY 1991 Drilling Schedule** - The baseline drilling schedule of 50 RCRA wells for CY 1991 is shown in Attachment 5. Based on this schedule, Environmental Projects plans to procure an off-site drilling contractor to assist in meeting the TPA RCRA drilling milestones. Once planning has been completed, Environmental Projects will update the drilling schedule.
5. **CY 1991 Groundwater Monitoring Plans** - A tentative groundwater monitoring plan schedule, based on Attachment 5, is shown in Attachment 4. The DOE-RL pointed out the need to work closely with Ecology to ensure that their reviews and any associated concerns are dealt with in a timely matter. Attachment 5 will be revised and transmitted to Ecology once the new drilling schedule is prepared.

Ms. K. Kowalik indicated that the approval of groundwater monitoring plans is by the project manager, who is assigned to write the permit document for a specific facility. She will act as an advisor to the project manager in regard to the technical adequacy of the plan.

Mr. K. M. Thompson agreed that he had no problem with Westinghouse Hanford Company (WHC) Geosciences Group dealing directly with Ecology on technical matters. However, WHC cannot make any commitments that affect cost and schedule without DOE-RL's approval.

6. **Deterministic Approach to Well Placement (MEMO)** - Mr. R. L. Jackson discussed approach to designing monitoring networks using the Monitoring Efficiency Model (see Attachment 6). The method simulates the migration of hypothetical contaminant plumes from the site and quantifies the detection efficiency of the well network. Maps showing areas where releases would and would not be detected are produced, providing insight into the benefits of each well location and guiding the optimization process.
7. **Groundwater Monitoring Program at 216-A-29 Ditch** - Mr. G. L. Kasza discussed the groundwater monitoring program for the 216-A-29 Ditch (see Attachment 7). Four additional RCRA wells were justified on the basis of MEMO. With these additional wells, the monitoring efficiency for the 216-A-29 Ditch is over 90 percent (e.g. ability to detect a leak for the facility). Completion of these four wells will satisfy TPA Milestone M-24-18.
8. **Groundwater Monitoring Program at 200 Areas LLBG** - Mr. R. B. Mercer summarized the groundwater monitoring program for the 200 Areas LLBG (see Attachment 8). Eighteen additional RCRA wells are planned around the LLBG waste management areas as justified by the MEMO. Completion of these 18 wells will satisfy TPA Milestone M-24-12. Ms. Kowalik commented that more hydrogeologic cross sections are needed to depict subsurface conditions beneath the facility.
9. **Technical Issues** - Ms. Kowalik agreed that longer screen interval may be required in areas where the groundwater mound exceeds pre-Hanford water table conditions by more than 15 ft. However, the change in screen length must be technically justified and approved by Ecology.
10. **Action Items**
  - o DOE-RL will submit a change request to M-24-00 to allow for TBD wells in CY 1991 (assigned to Mr. R. R. Thompson).
  - o The Geosciences Group will provide the Engineering Change Notice (ECN) to DOE-RL on February 8, 1991. The ECN identifies and justifies additional RCRA wells at the 216-S-10 Ditch and the 200 Areas LLBG. The DOE-RL will in turn transmit ECN's to Ecology for rapid review so that the drilling schedule will not be impacted (see Attachment 4) (assigned to R. L. Jackson).

- o DOE-RL has action to provide a revised drilling schedule to Ecology (assigned to Mr. R. R. Thompson).
  - o The Geosciences Group will provide a copy of Pacific Northwest Laboratory report entitled "Evaluation of Hanford site Water-Table Changes, 1980 to 1990", PNL-7498. (assigned to R. L. Jackson)
11. **Next Meeting and Agenda** - DOE-RL will establish the date and agenda of the next meeting with Ecology by February 15, 1991.

AGENDA

U. S. Department of Energy-Richland Operations Office  
Washington State Department of Ecology  
Westinghouse Hanford Company

January 31, 1991  
08:00 AM  
Room 47, 450 Hills St

- o INTRODUCTION-K. M. Thompson/R. R. Thompson/Krystyna Kowalik
  - Opening Remarks
  - Purpose
- o RCRA GROUNDWATER MONITORING PROGRAM-R. L. Jackson
- o RCRA GROUNDWATER WELL CONSTRUCTION PROJECT-R. R. Thompson/R. L. Jackson
  - Status of CY 91 Drilling Milestone
  - Drilling Schedule
  - Groundwater Monitoring Plan Schedule for Ecology's Review
  - Well Location Approach
- o GROUNDWATER MONITORING PROGRAM AT 216-A-29 DITCH-G. L. Kasza
- o GROUNDWATER MONITORING PROGRAM AT LOW-LEVEL BURIAL GROUNDS-R. S. Mercer
- o Tracking of Technical Issues
  - Screen Length Over 15 feet
- o Action Items-K. M. Thompson
- o Schedule/Agenda for Next Meeting-K. M. Thompson

**RCRA GROUNDWATER MONITORING PROJECT**

**GEOSCIENCES GROUP**

**WESTINGHOUSE HANFORD COMPANY**

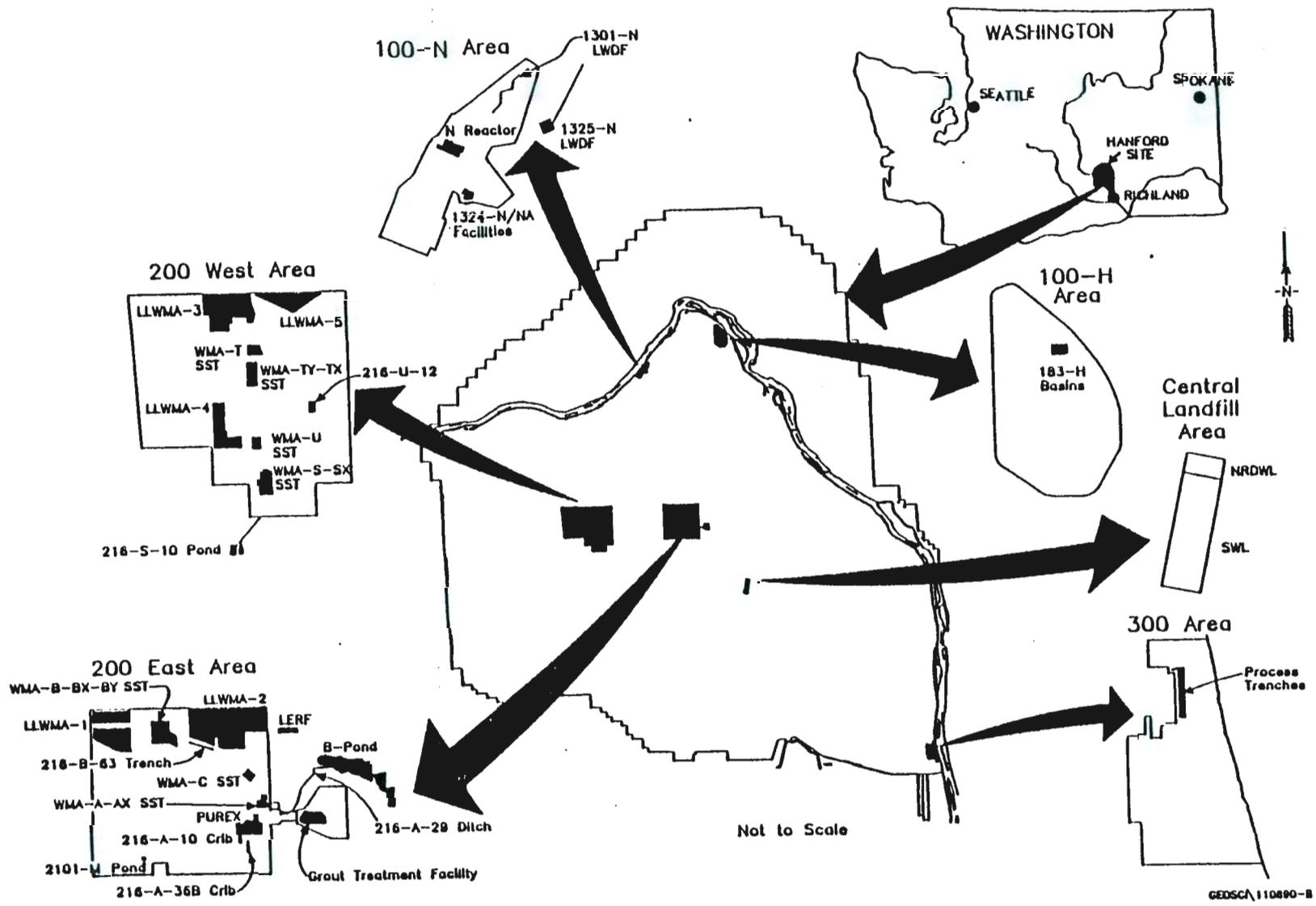
*Attachment 2*

**OBJECTIVE OF RCRA GROUNDWATER MONITORING PROGRAM**

- o **DETERMINE THE IMPACT OF TSD FACILITIES ON THE QUALITY OF GROUNDWATER IN THE UPPERMOST AQUIFER**

## **BACKGROUND**

- o Interim - status groundwater monitoring program started in 1986**
  - Detection monitoring**
  - Assessment monitoring**
  
- o 19 RCRA facilities in 100, 200, 300 and 600 Areas**
  - Low Level Burial Grounds divided into 5 Waste Management Areas**
  - Single Shell Tanks divided into 6 Waste Management Areas**
  
- o Of the 19 RCRA facilities, 7 facilities are under Assessment Monitoring**
  
- o Since 1986, approximately 250 RCRA compliant wells have been drilled**
  
- o Schedule for drilling RCRA wells based on TPA Action Plan:**
  - 1989 - 20 wells**
  - 1990 - 30 wells**
  - 1991 - 50 wells**



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**STATUS OF HANFORD SITE INTERIM STATUS GROUNDWATER  
MONITORING PROJECT**

<b>Facility</b>	<b>Background Monitoring</b>	<b>Indicator Parameter Evaluation</b>	<b>Groundwater Quality Assessment</b>	
100D Pond	No Wells			
183H Basin			X (Compliance Order)	
1301-N LWDF			X (Spec. Cond.)	
1324-N/N Pond			X (Spec. Cond.)	
1325-N LWDF			X	
Grout Treatment F			X	
B-3 Pond				X (TOX)
A-29 Ditch				X (Spec. Cond.)
A-36B Crib			X	
A-10 Crib			X	
B-63 Trench	Sample Ready			
S-10 Pond/Ditch				
U-12 Crib				
LERF				
2101 Pond			X	
LLBG				
WMA-1				X (Spec. Cond.)
WMA-2			X	
WMA-3				X (TOX)
WMA-4			X	
WMA-5	No Wells			
SST				
WMA-B/BX/BY		X		
WMA-C		X		
WMA-SX		Drilling		
WMA-A-AX		Drilling		
WMA-T		X		
WMA-TX/TY		Drilling		
WMA-U		Drilling		
300 Process Trench				X (Compliance Order)
NRDWL		X		

## **RCRA GROUNDWATER MONITORING CONSTITUENTS**

- o INTERIM PRIMARY DRINKING WATER STANDARDS**
- o GROUNDWATER QUALITY PARAMETERS**
- o GROUNDWATER CONTAMINATION INDICATOR PARAMETERS**
- o SITE SPECIFIC PARAMETERS**

## GROUNDWATER SAMPLING PARAMETERS

### Interim Primary Drinking Water Standards

Arsenic  
Barium  
Cadmium  
Chromium  
Fluoride  
Lead  
Mercury  
Nitrate (as NO<sub>3</sub>)  
Selenium  
Silver  
Endrin  
Lindane  
Methoxychlor  
Toxaphene  
2,4,D  
2,4,5-TP Silvex  
  
Radium  
Gross alpha  
Gross beta  
Coliform bacteria

### Groundwater Quality Parameters

Chloride  
Iron  
Manganese  
Phenols  
Sodium  
Sulfate

### Groundwater Contamination Indicator Parameters

pH  
Specific conductance  
Total organic carbon  
Total organic halogen

### Site Specific Constituents

Depends on Facility

## **RCRA GROUNDWATER MONITORING FREQUENCY**

- o **QUARTERLY SAMPLING**

  - DETECTION MONITORING - FIRST YEAR**
  - ASSESSMENT MONITORING**

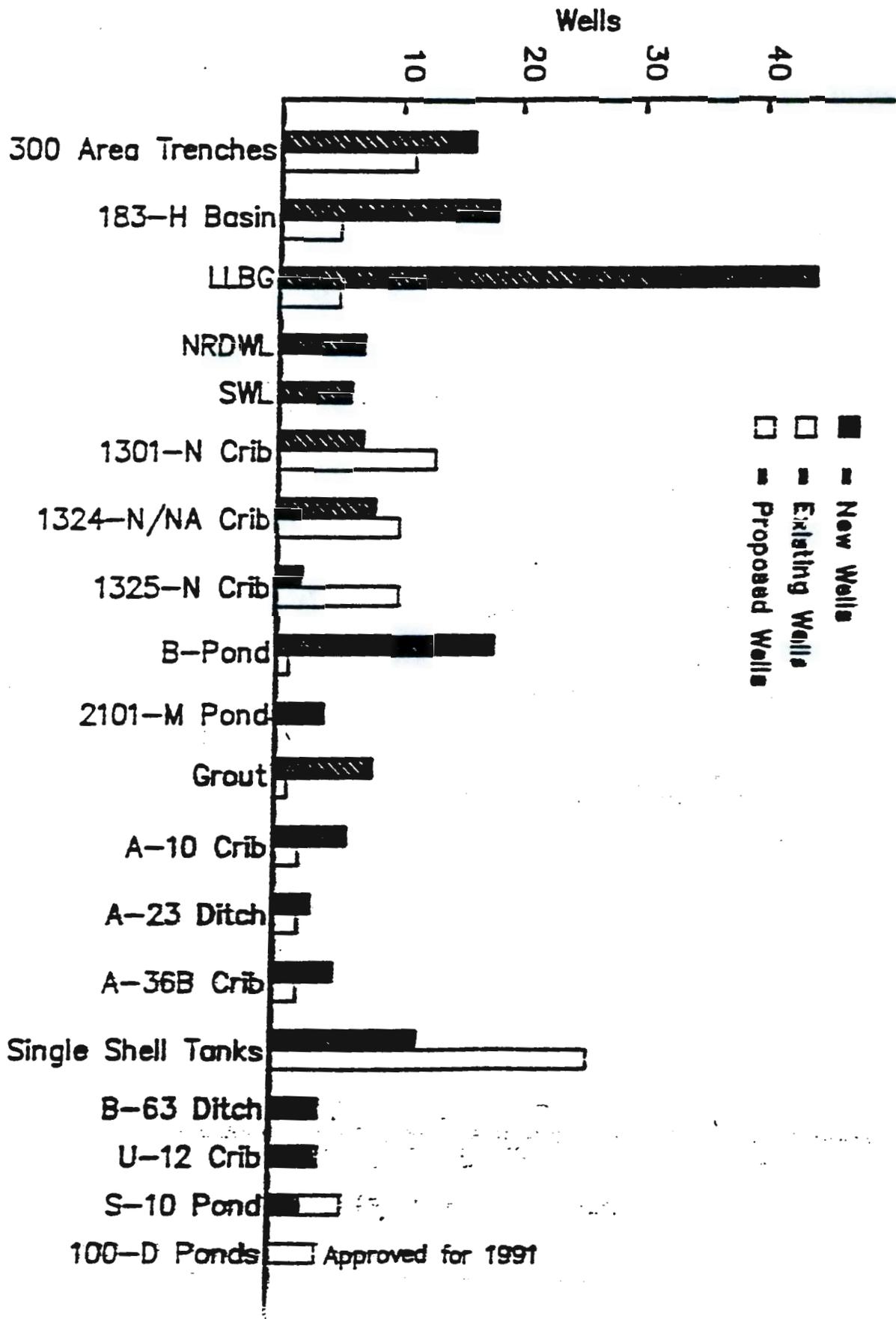
- o **SEMI-ANNUAL SAMPLING**

  - DETECTION MONITORING AFTER FIRST YEAR**

- o **WATER-LEVEL MEASUREMENTS**

  - TAKEN EACH SAMPLING EVENT (AT A MINIMUM)**

hl



Groundwater Wells at Hanford RCRA Facilities

■ New Wells  
▨ Existing Wells  
□ Proposed Wells

Approved for 1991

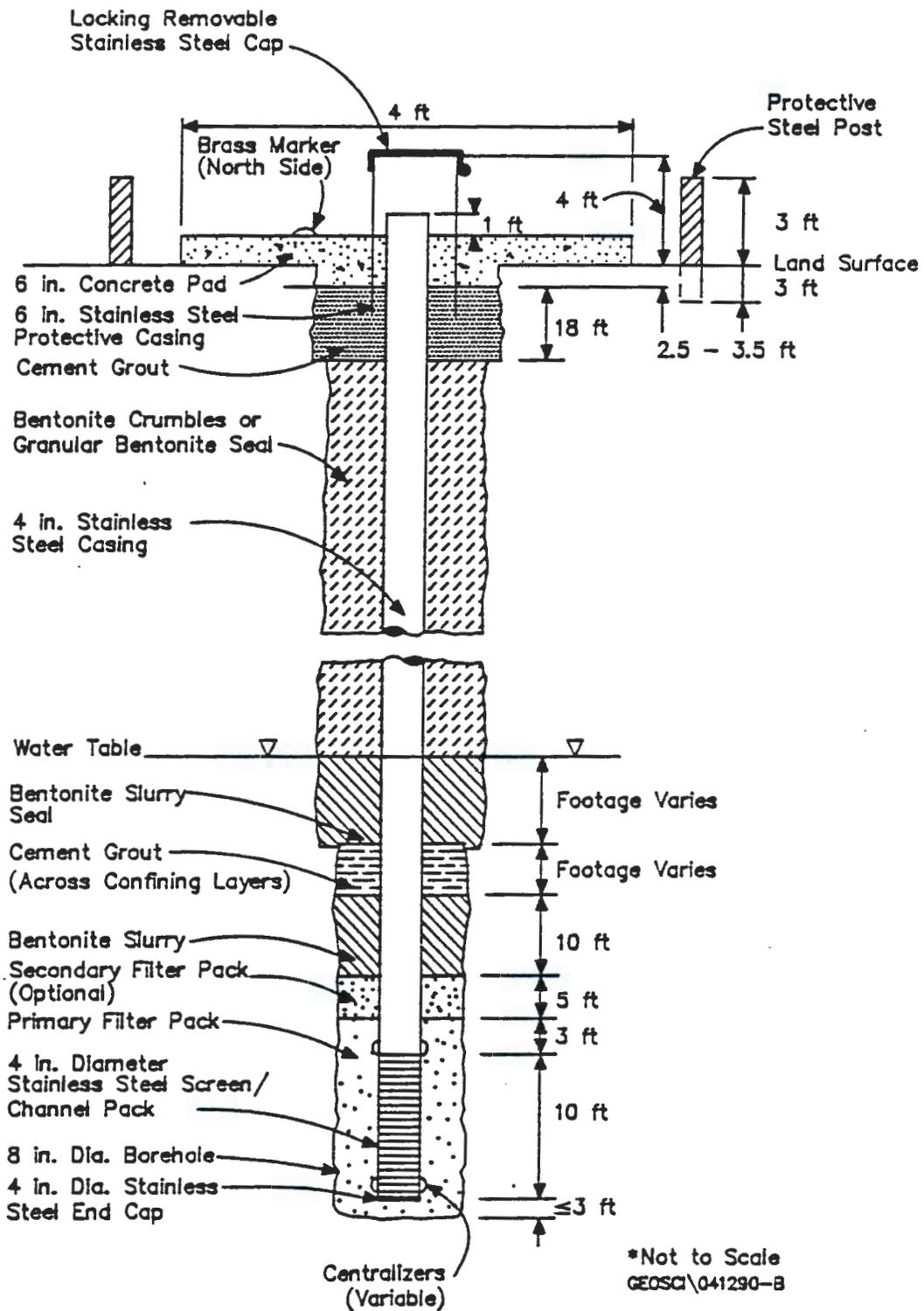


Figure 2. Schematic Diagram of a Typical Deep Groundwater Monitoring Well Completion.

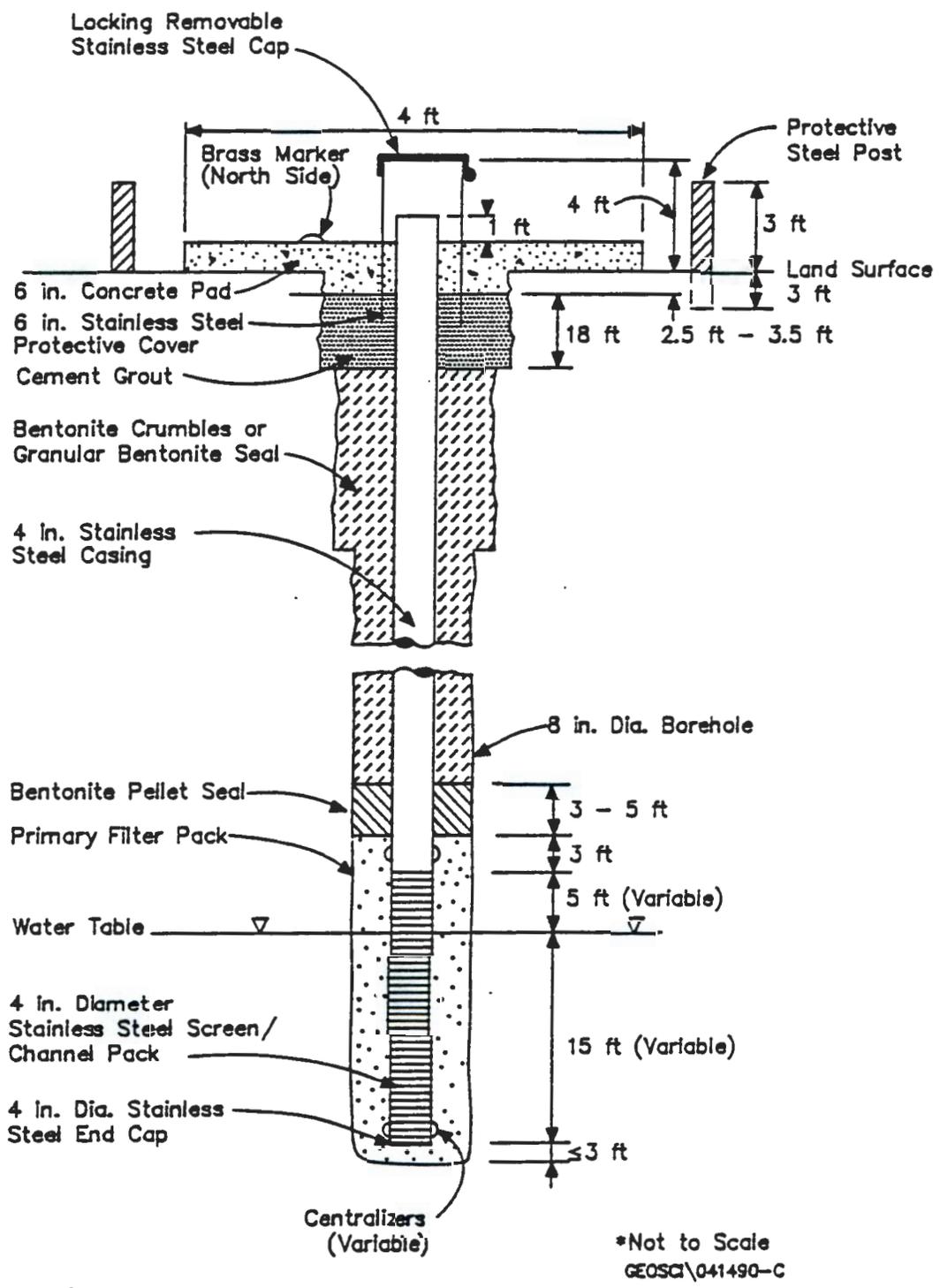


Figure 1. Schematic Diagram of a Typical Shallow Groundwater Monitoring Well Completion

## **REPORTING**

**Quarterly Reports**  
**Water-level data**  
**Chemistry data**

**Annual Report**  
**Evaluation**

**Borehole Completion Data Reports**



## \* SCHEDULED ECOLOGY MEETING

SITE	MILESTONE	PRIORITY	PROJ SCIENTIST	GWMP/ECN TO ECOLOGY MEETING	ECOLOGY MEETING	DATA SHEETS	FINAL GWMP/ECN	PROJECT START DATE
S-10	M-24-13	1(3 WELLS)	WILLIAMS	COMPLETE	1/31/91*	DONE	2/11/91	2/11/91
LLBG	M-24-12	2(18 WELLS)	MERCER	COMPLETE	1/31/91*	DONE	2/11/91	2/11/91
A-29	M-24-18	3(4 WELLS)	KASZA	1/31/91*	3/25/91	3/25/91	4/8/91	4/8/91
100N	M-24-17	4(4 WELLS)	HARTMAN	1/31/91*	4/22/91	4/22/91	5/6/91	5/6/91
B-POND	M-24-16	5(7 WELLS)	HARRIS	3/18/91	5/20/91	5/20/91	6/3/91	6/3/91
SST	M-24-15	6(10 WELLS)	CAGGIANO	4/15/91	6/17/91	6/17/91	7/1/91	7/1/91
100D	M-24-14	7(4 WELLS)	HARTMAN	7/8/91	9/9/91	9/9/91	9/23/91	<del>9/23/91</del>

*Data Si.  
Comp 2/25/91*



**DETERMINISTIC APPROACH TO WELL PLACEMENT**

**K. R. FECHT/R. L. JACKSON**

**GEOSCIENCES GROUP**

**JUNE 26, 1990**

## **RCRA GROUNDWATER MONITORING NETWORKS**

- o **18 RCRA FACILITIES**
  - **DETECTION PHASE - 11 SITES**
  - **ASSESSMENT PHASE - 7 SITES**
- o **DESIGNED TO MEET MINIMUM REGULATORY REQUIREMENTS**
- o **WELL PLACEMENT (PHASED APPROACH)**
  - **INITIAL - PROFESSIONAL JUDGEMENT**
  - **DETERMINISTIC MODELING IN PROGRESS**

## **INITIAL APPROACH: PROFESSIONAL JUDGEMENT**

- **APPLIES TO INITIAL DETECTION AND ASSESSMENT PHASES**
- **LOCATION BASED ON EVALUATION OF EXISTING DATA**
  - **HYDROCHEMISTRY**
  - **HYDRAULIC HEADS/GRADIENT**
  - **SUBSURFACE HYDROGEOLOGY**
- **NORMALLY RESULTS IN MINIMUM NUMBER OF MONITORING WELLS TO MEET REGULATORY REQUIREMENTS (e.g., 1 UP GRADIENT AND 3 DOWN GRADIENT)**
- **WELL LOCATIONS JUSTIFIED IN GROUNDWATER MONITORING PLAN**

## **DETERMINISTIC APPROACH**

**OBJECTIVES: TO OPTIMIZE MONITORING WELL LOCATIONS FOR GROUNDWATER MONITORING NETWORKS BASED ON WELL MONITORING EFFICIENCY.**

**TO QUANTIFY THE EFFECTIVENESS OF A MONITORING WELL NETWORK DESIGN**

**TO REVIEW ADEQUACY OF CURRENT MONITORING NETWORKS UNDER EXPECTED FUTURE GROUNDWATER FLOW CONDITIONS.**

## **DETERMINISTIC APPROACH (CONTINUED)**

### **CONSIDERATIONS IN SELECTING DETERMINISTIC MODEL**

- o MUST BE SIMPLE AND EASILY TO UNDERSTAND**
- o PROVIDE TECHNICAL BASIS FOR WELL SPACING**
- o ACCEPTED APPLICATION**

## **MONITORING EFFICIENCY MODEL (MEMO)**

- o SIMPLE ANALYTICAL SOLUTIONS**
- o GENERATES PLUME GEOMETRIES FOR VARIOUS LEAK SOURCES**
- o PUBLISHED BY DOMENICO AND ROBBINS IN 1985**
- o APPLIED AT OTHER RCRA SITES IN REGION X**
- o PRESENTED TO ECOLOGY IN LOW-LEVEL BURIAL GROUNDS AND GROUT FACILITY PART B APPLICATIONS**

## **DETERMINISTIC APPROACH (CONTINUED)**

- o 2-D ANALYTICAL TRANSPORT MODEL**
- o INPUT PARAMETERS**
  - SOURCE CHARACTERIZATION**
  - DEFINITION OF DETECTABLE CONCENTRATIONS**
  - TRANSPORT PARAMETERS**
  - HYDRAULIC PARAMETERS**
  - WASTE MANAGEMENT GEOMETRY**
  - BUFFER ZONES**
- o OUTPUT PARAMETERS**
  - WELL MONITORING EFFICIENCY**
  - GRAPHICAL OUTPUT**

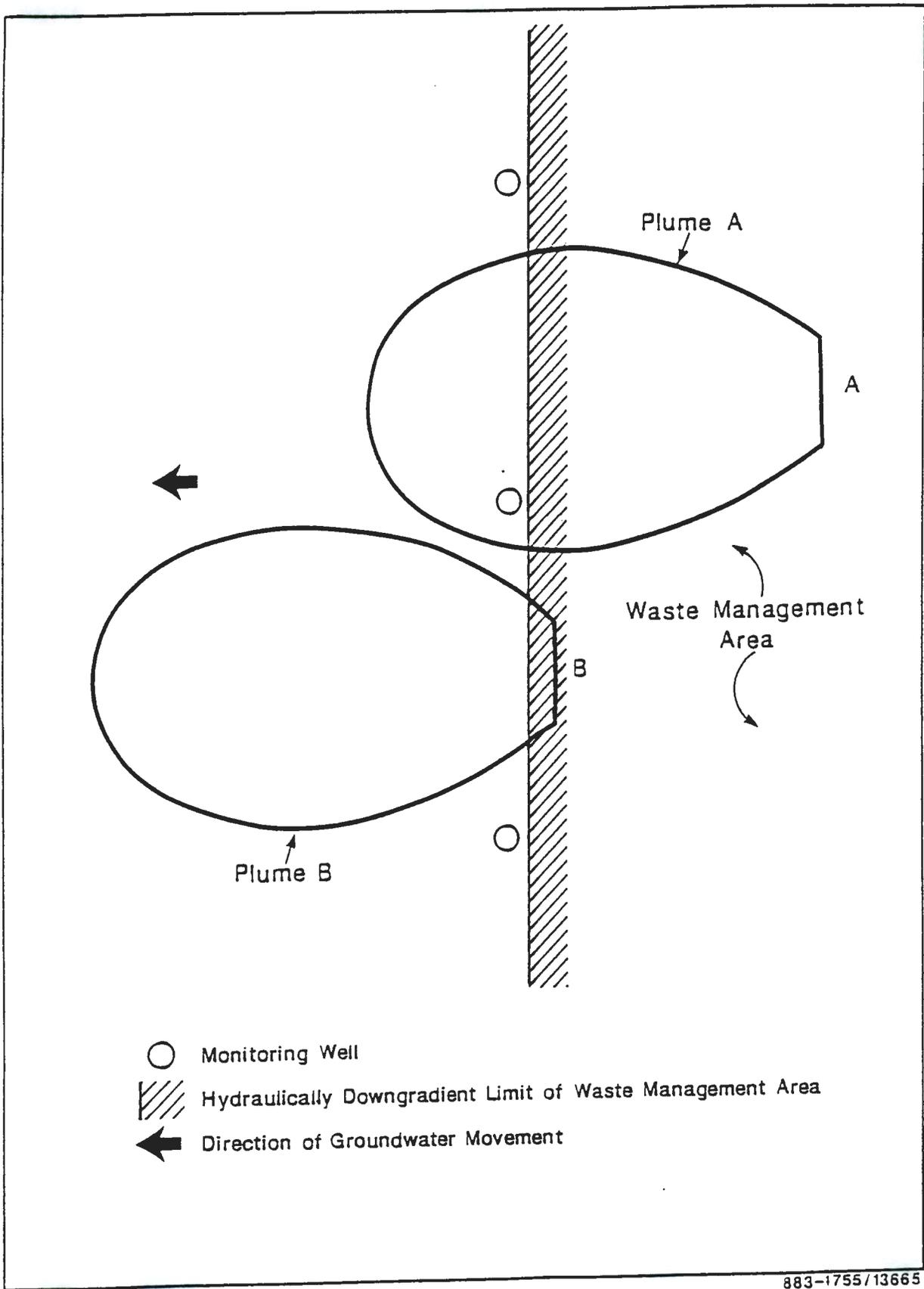
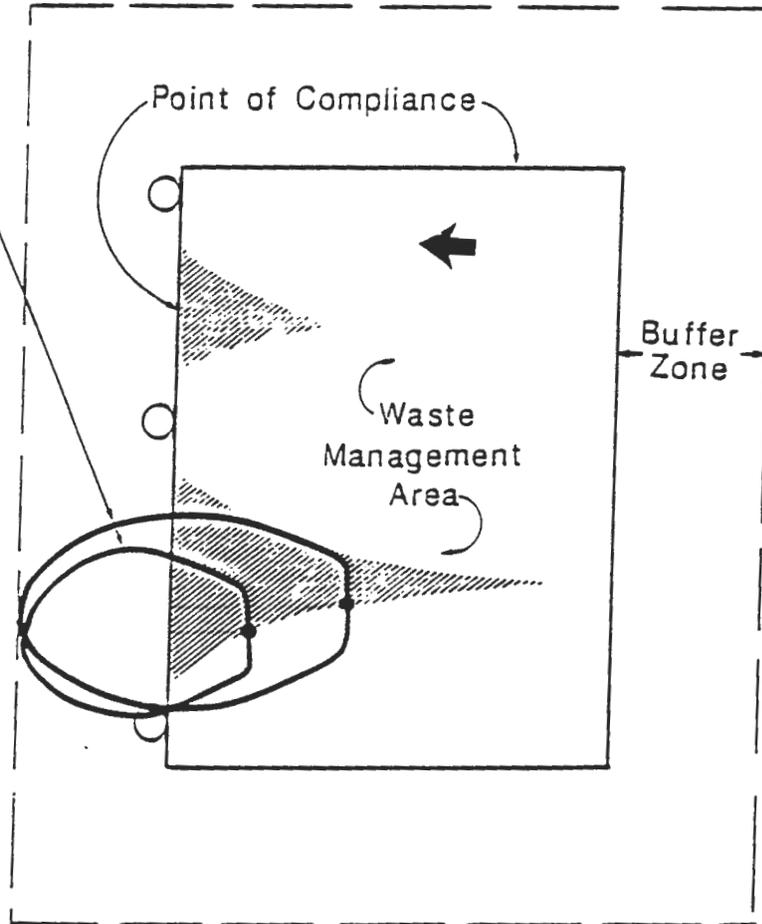


Figure 1. Illustrations of Plume Detection by Monitoring Wells

Example Members of Family of Plumes  
Used to Determine Monitoring Efficiency

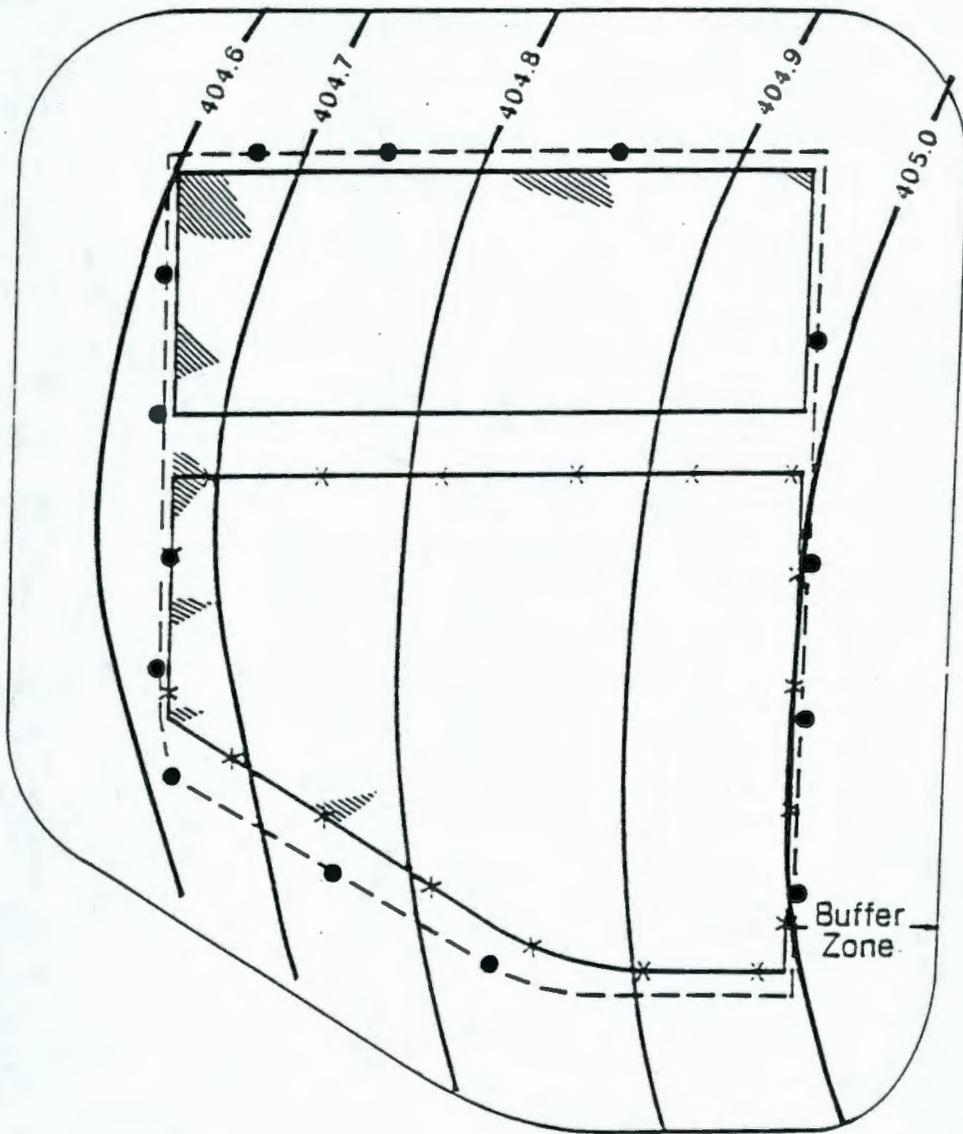


- Monitoring Well
- ▨ Area Where Leak is Less Likely to be Detected
- ← Direction of Groundwater Movement

Monitoring Efficiency: 87%

883-1755/13666

Figure 2. Illustration of MEMO Model Results



\* — \* Fence Line

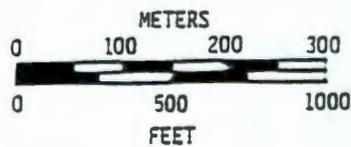
● Proposed Shallow Monitoring Well

▨ Area Where A Leak Would Be Less Likely To Be Detected Under Present Water Flow Conditions

— Water Table Contour (water levels in feet)

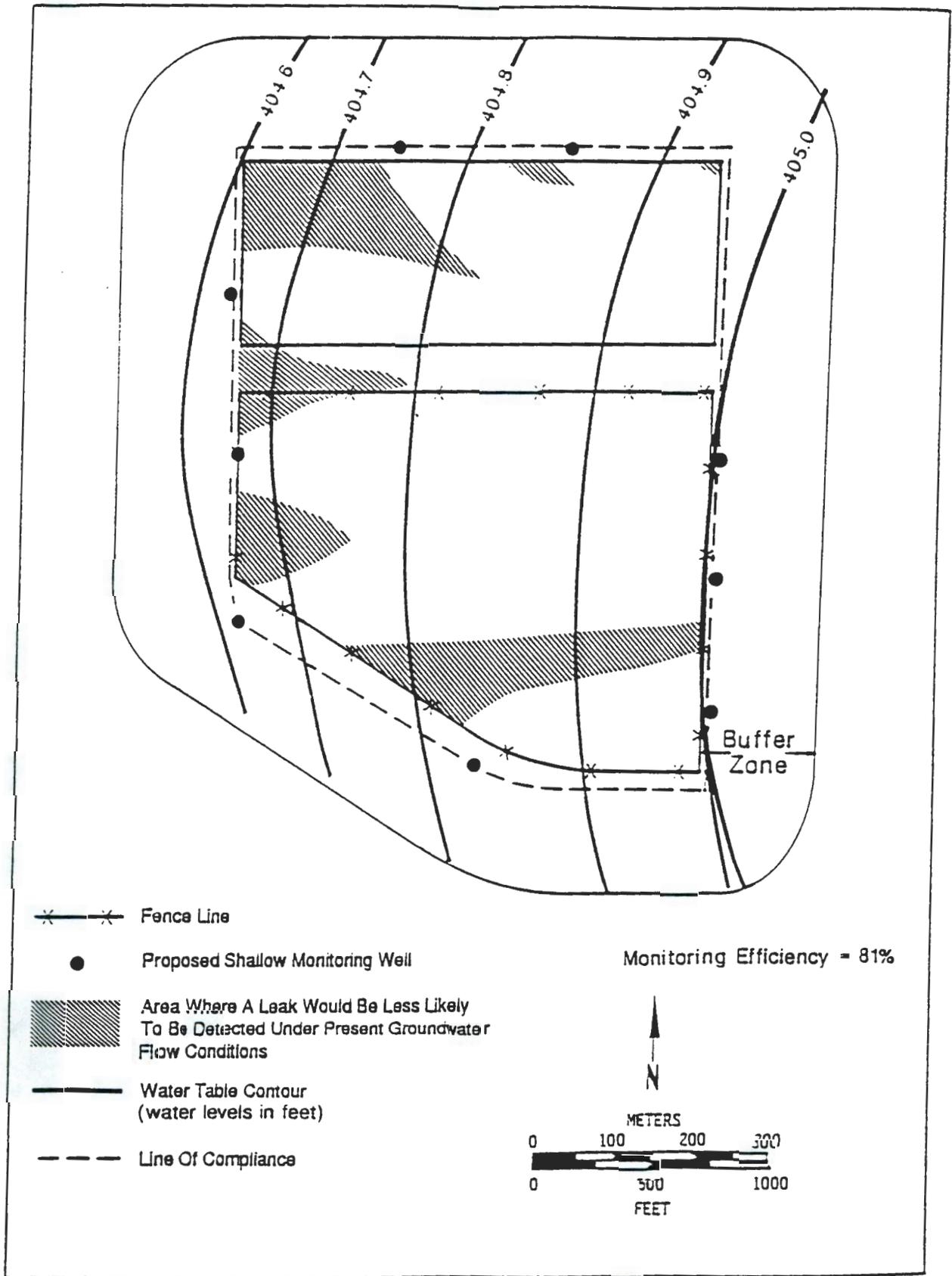
- - - Line Of Compliance

Monitoring Efficiency = 98%



883-1755/13668

Figure 5. Example application, second well network



883-1755/13669

Figure 4. Example application, first well network

**GROUNDWATER MONITORING PROGRAM**

**AT**

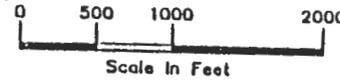
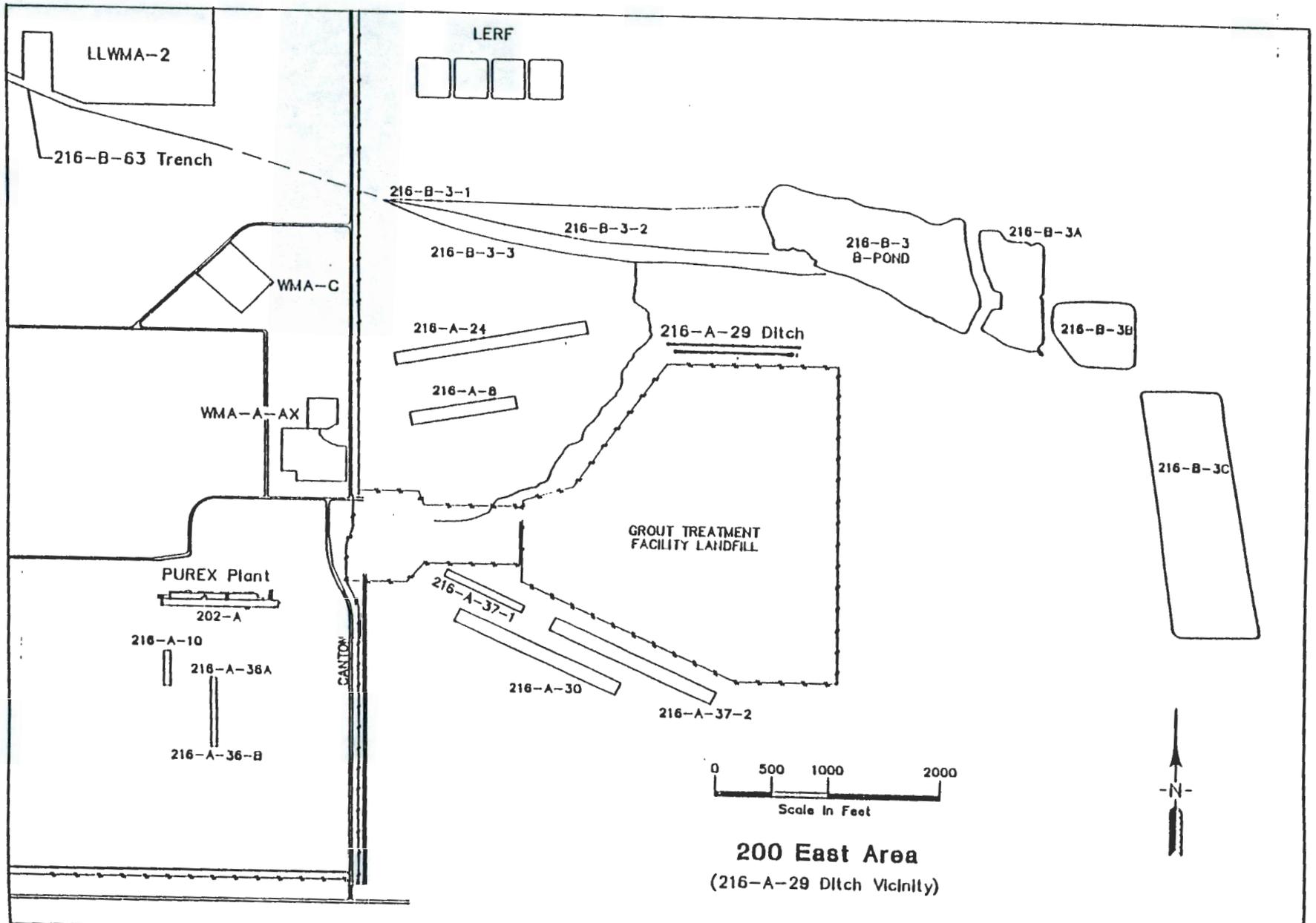
**216-A-29 DITCH**

**G. L. Kasza**

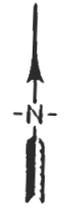
32

Attachment 7

33



200 East Area  
(216-A-29 Ditch Vicinity)



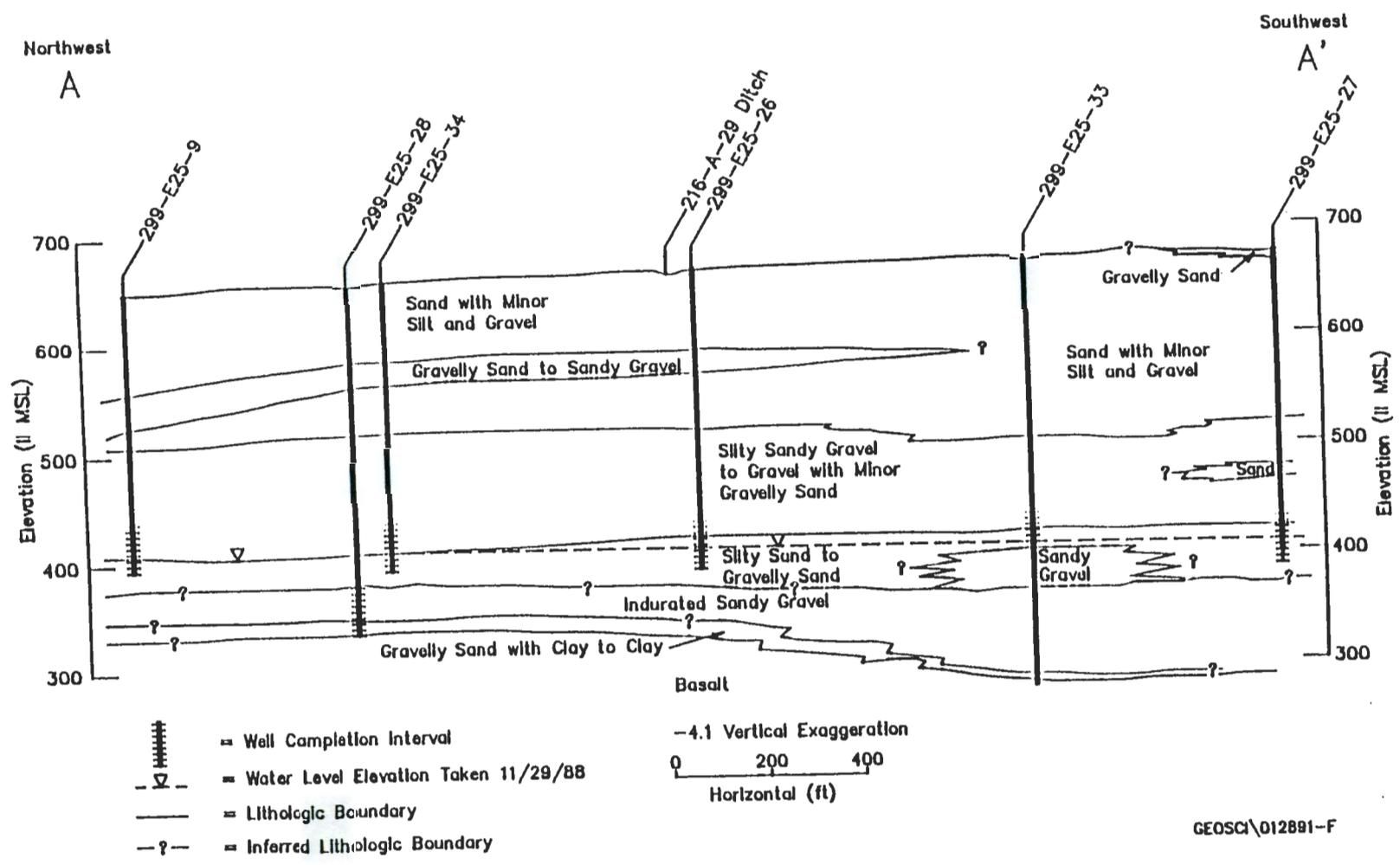
## A-29 CHRONOLOGY

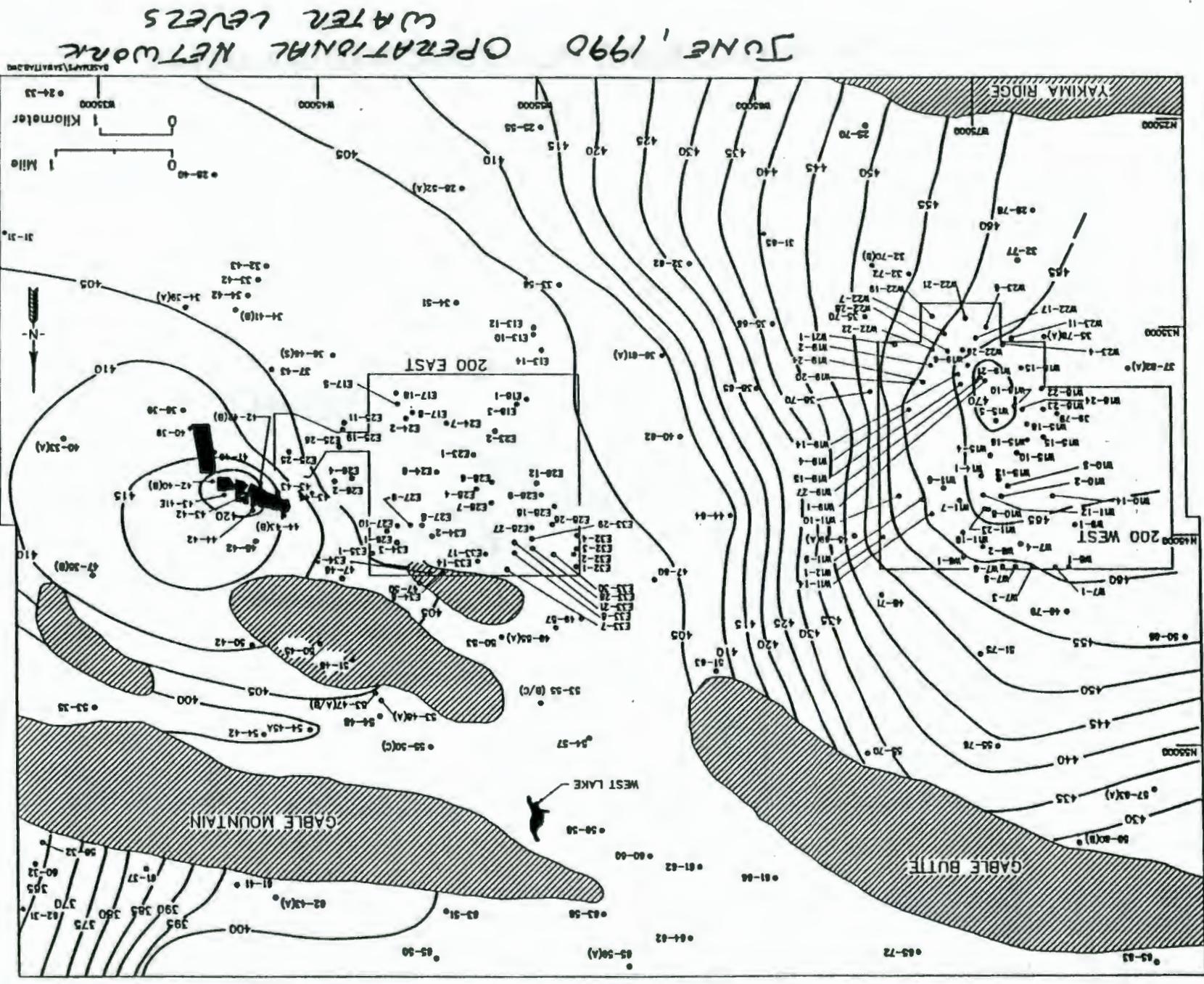
- o November 1955 - Ditch placed into service
- o 1984 - Administrative and physical pollution controls installed
- o 1987 - RCRA interim status proposed by DOE
- o November 1988 - Monitoring well network completed
- o Late 1989 - Four quarters background monitoring completed
- o Early 1990 - A-29 into groundwater quality assessment monitoring
- o Late 1990 - January 1991 - Groundwater monitoring plan revision

### A-29 SCHEDULED ACTIVITIES

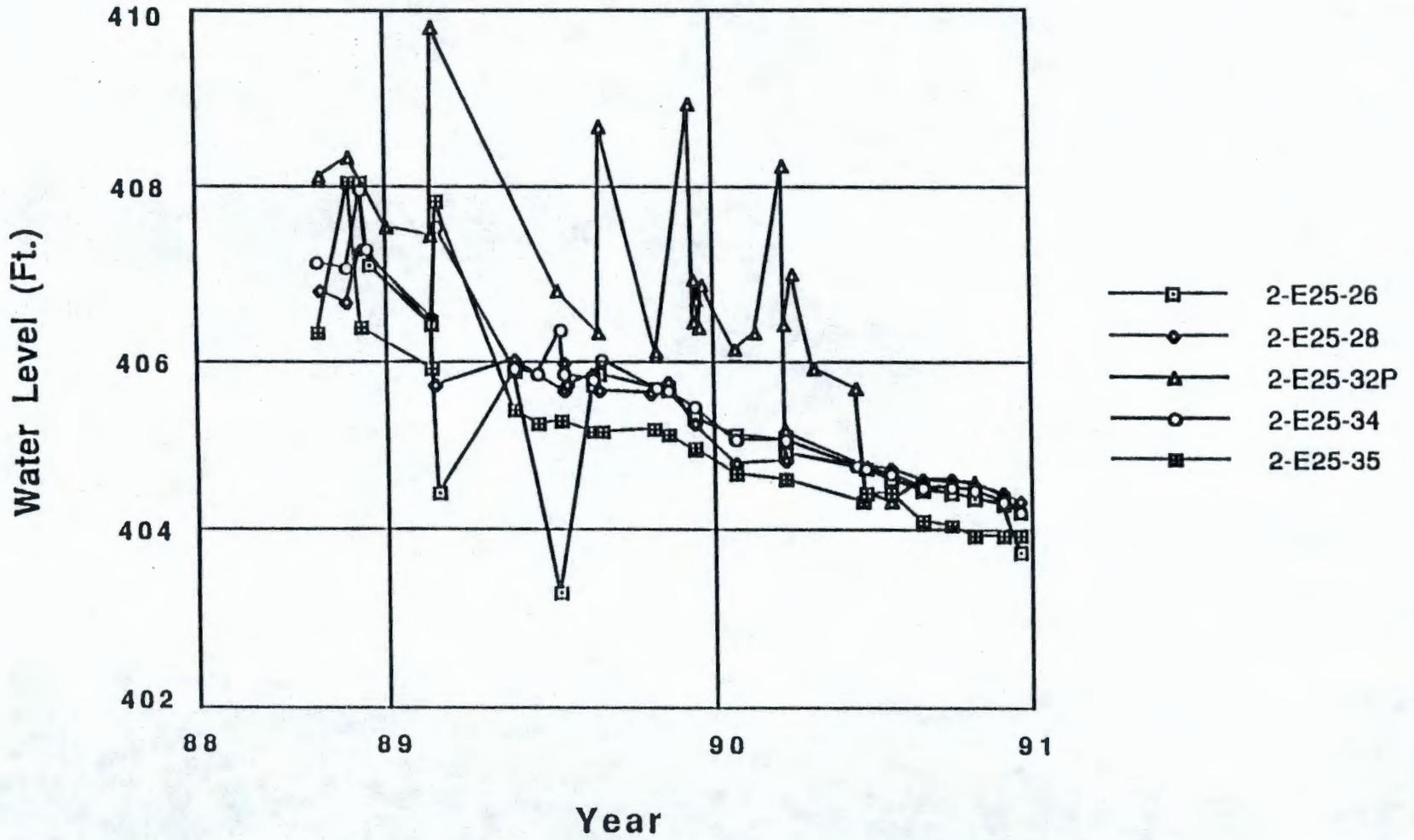
MARCH 1991	Issue revised groundwater monitoring plan
APRIL 8, 1991	Start 1991 drilling at A-29
FALL 1991	Ditch effluent rerouted to pipeline and facility interim stabilized
MARCH 1996	A-29 closure/post closure plan submittal (M-20-36)
NOT ANNOUNCED	Submittal of 200-PO-5 workplan

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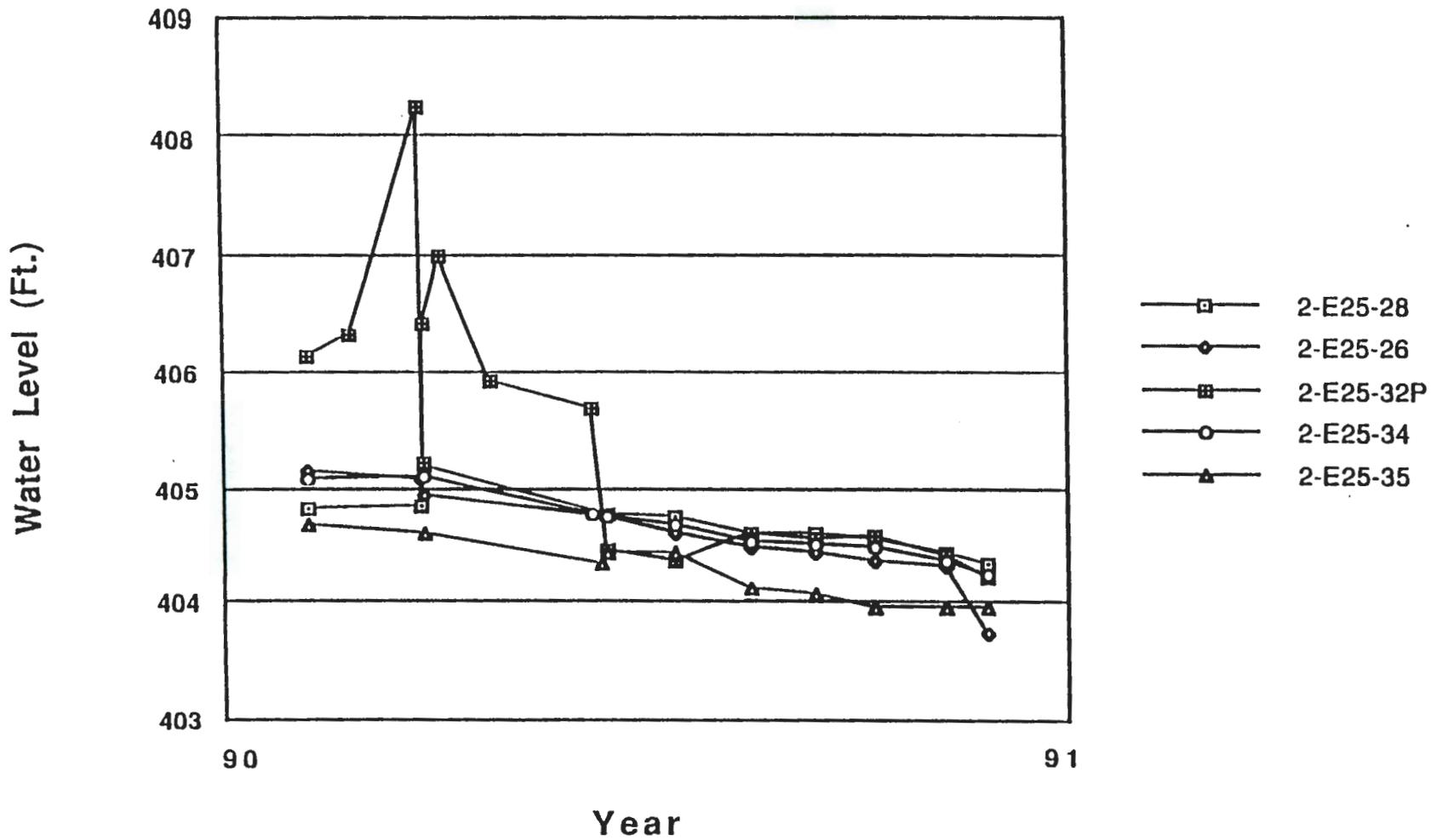




JUNE, 1990 OPERATIONAL NETWORK WATER LEVELS



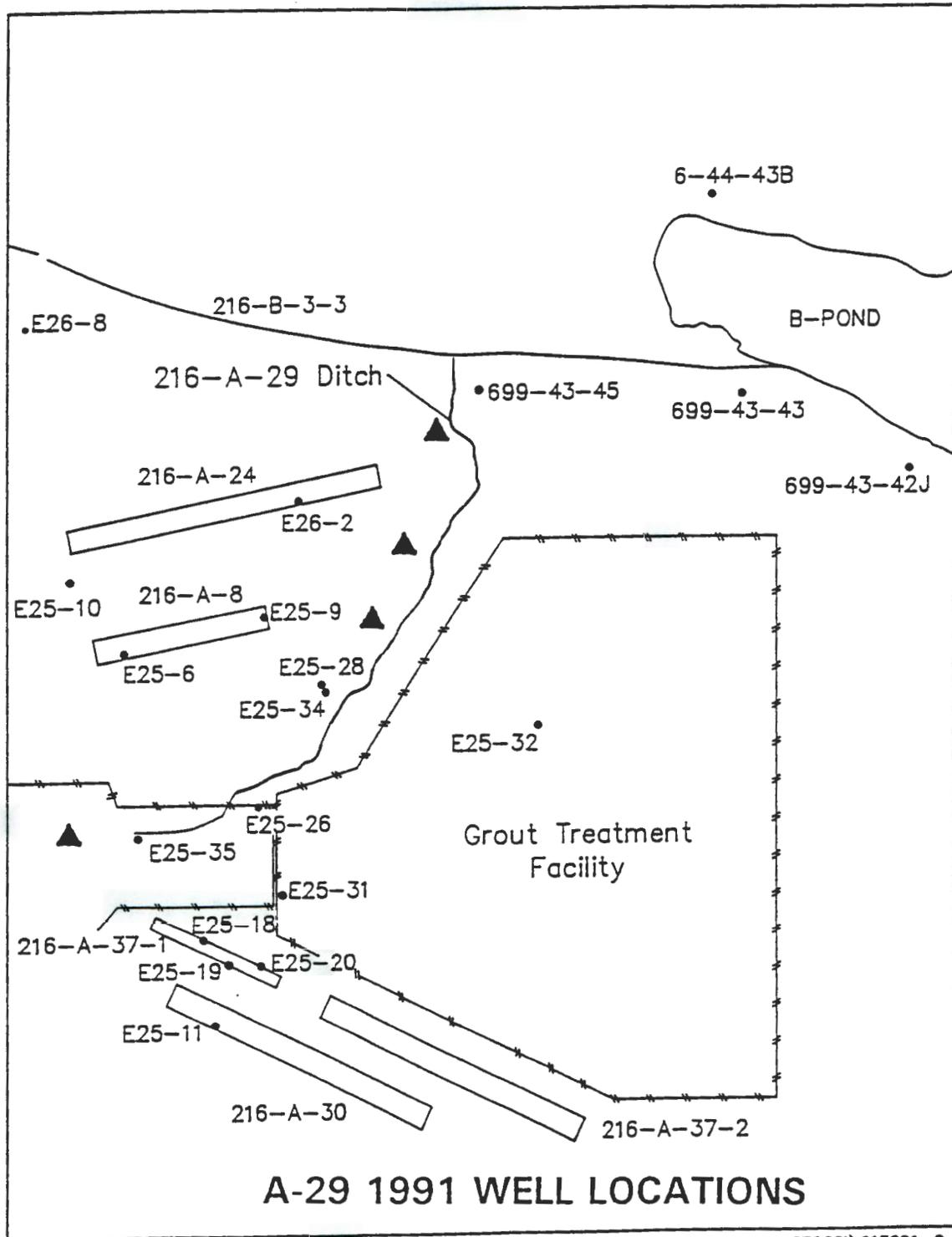
A-29 MONITORING NETWORK HYDROGRAPH



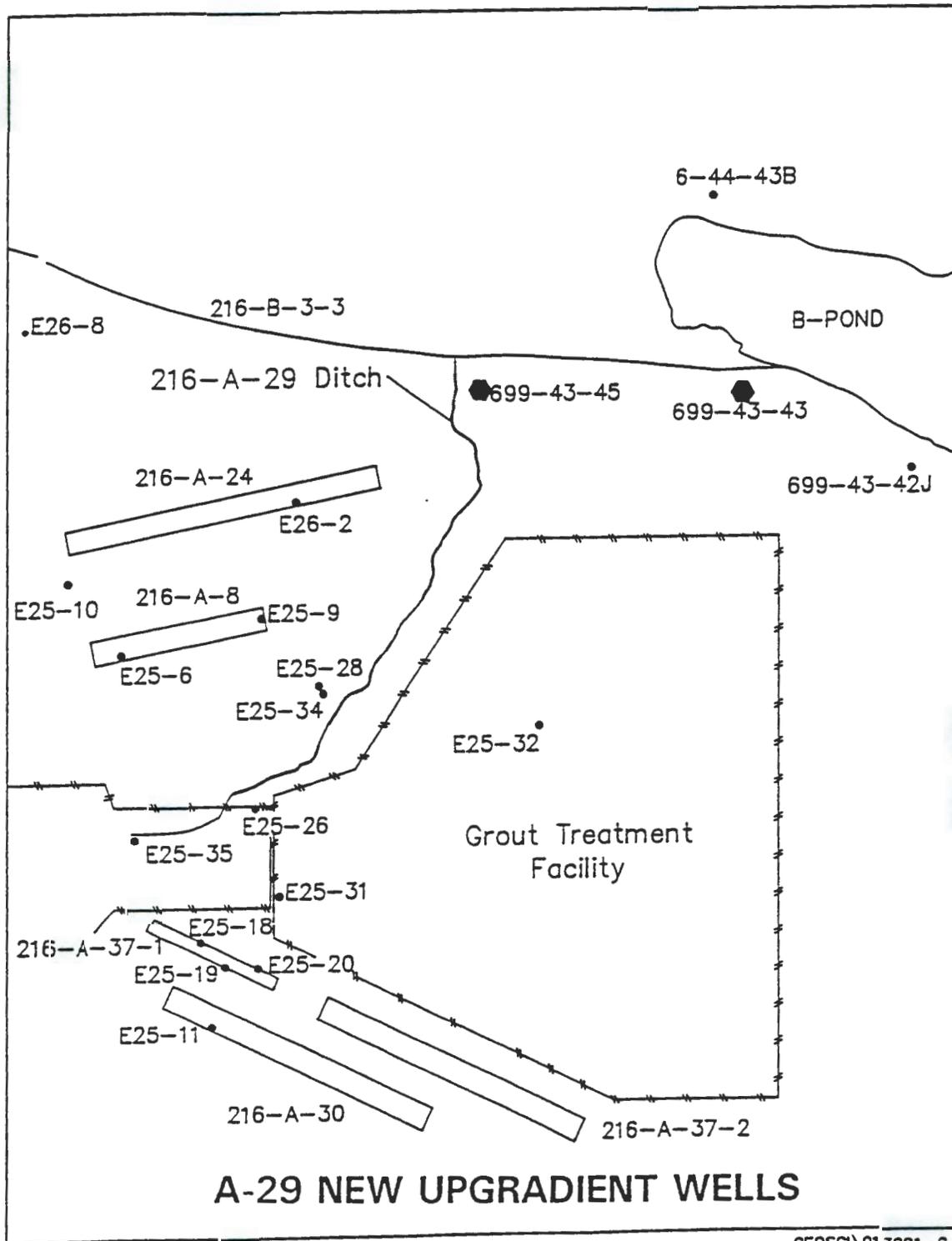
A-29 MONITORING NETWORK HYDROGRAPH

**REVISION TO A-29 GROUNDWATER MONITORING PROGRAM**

- o Establish upgradient wells for network**
- o Locate and justify 4 wells for 1991 TPA milestone**

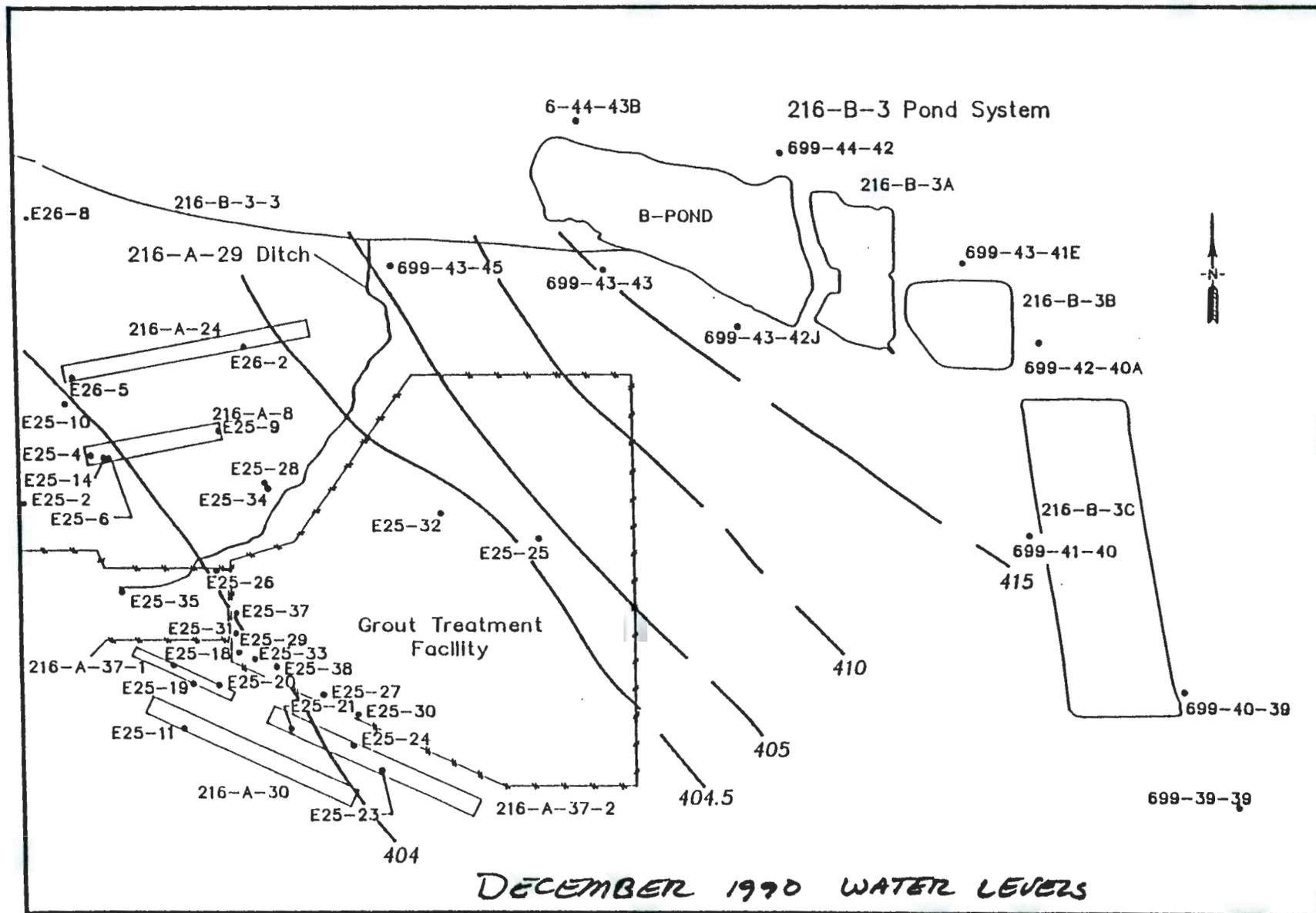


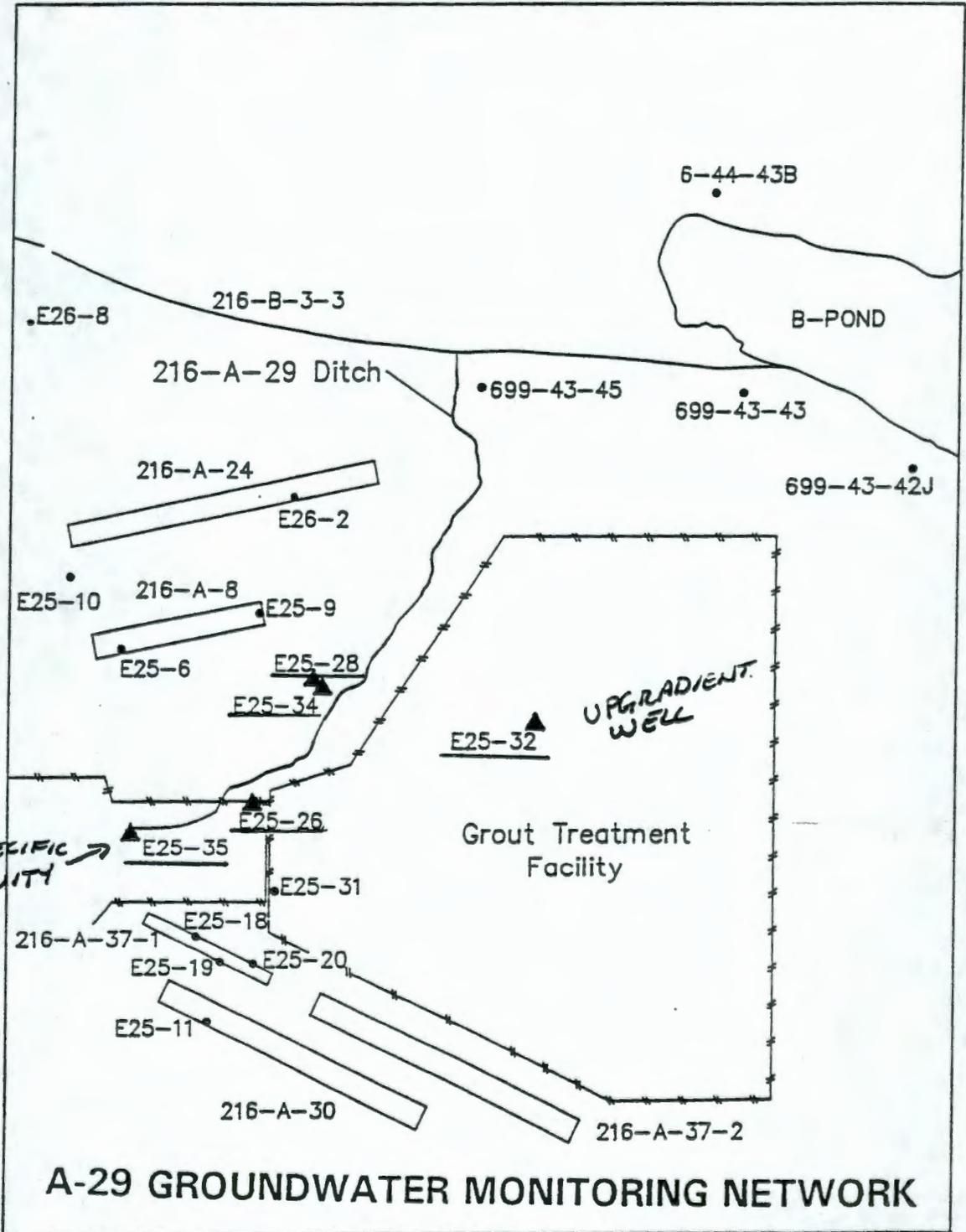
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GEOSCI\013097-6

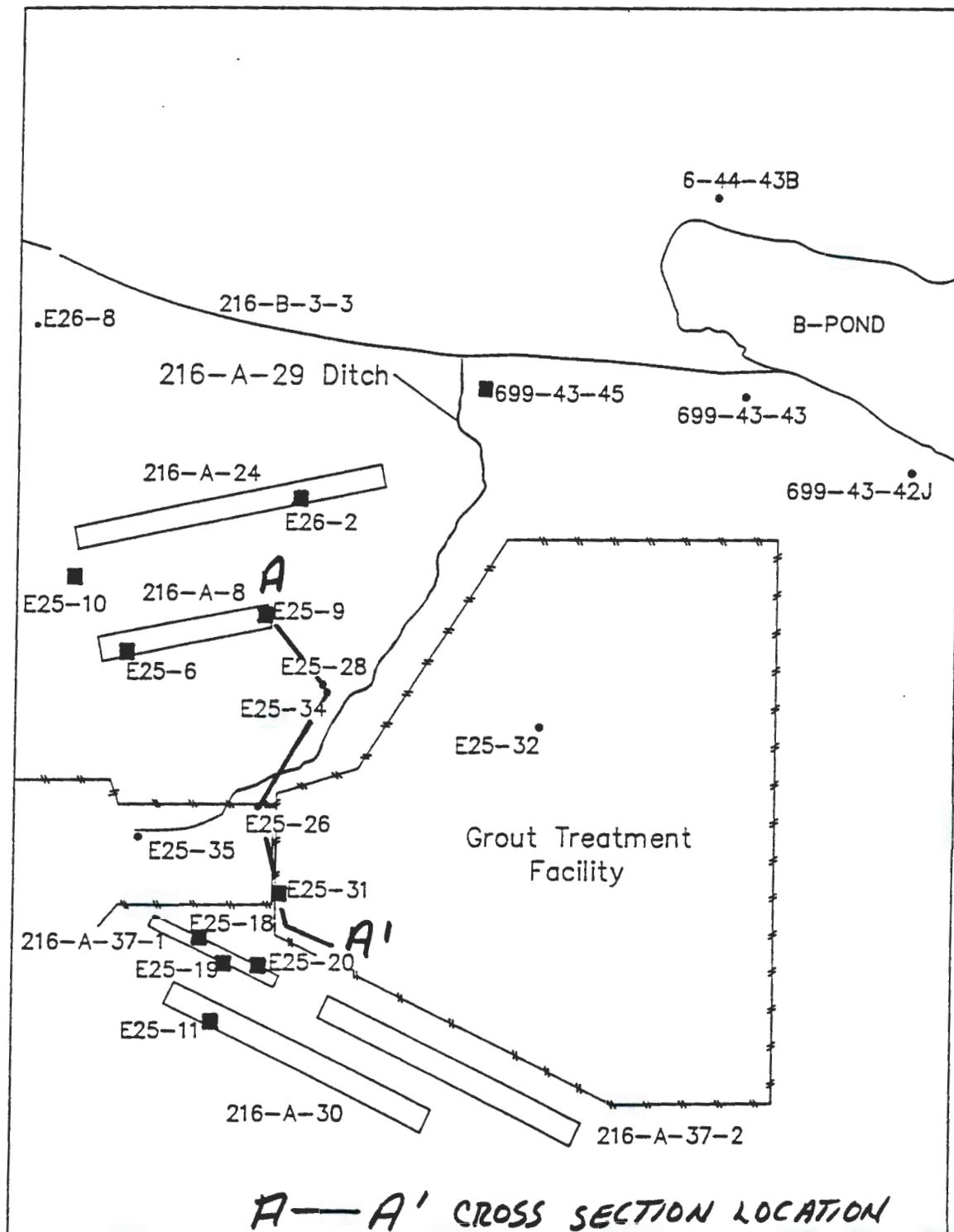
43





**A-29 GROUNDWATER MONITORING NETWORK**

GEOSCI\013091-C



**A-29 GROUNDWATER QUALITY ASSESSMENT NETWORK**

A-29 Ditch  
01/07/91 14:03:16 MEMO ver 1.1  
Monitoring Efficiency = 53.7 %

# CURRENT NETWORK

97

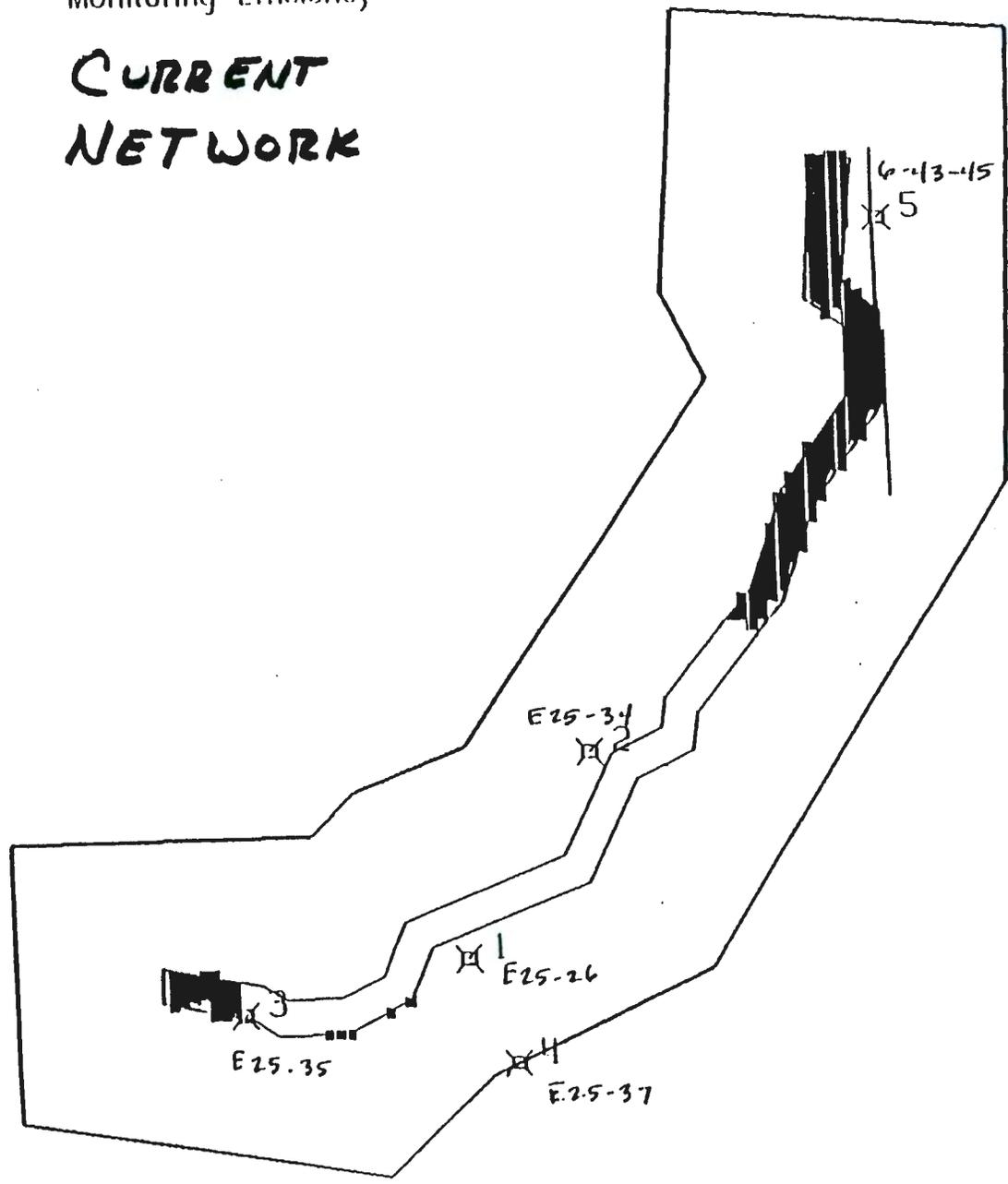


FIGURE 13

A-29 Ditch  
01/08/91 09:24.20 MEMO ver 1.1  
Monitoring Efficiency = 91.0 %

# NEW 1991 WELLS S60° W GRADIENT

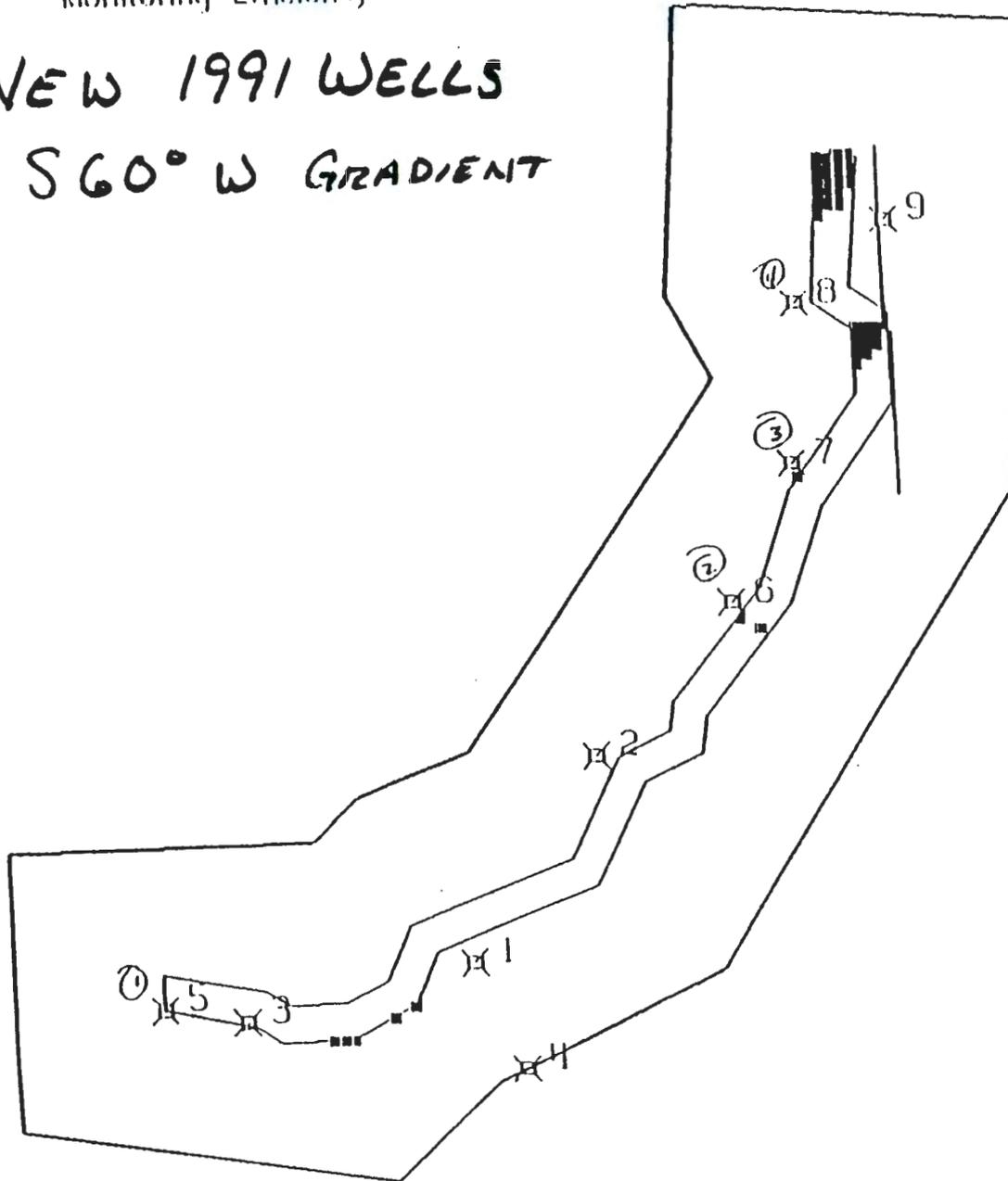
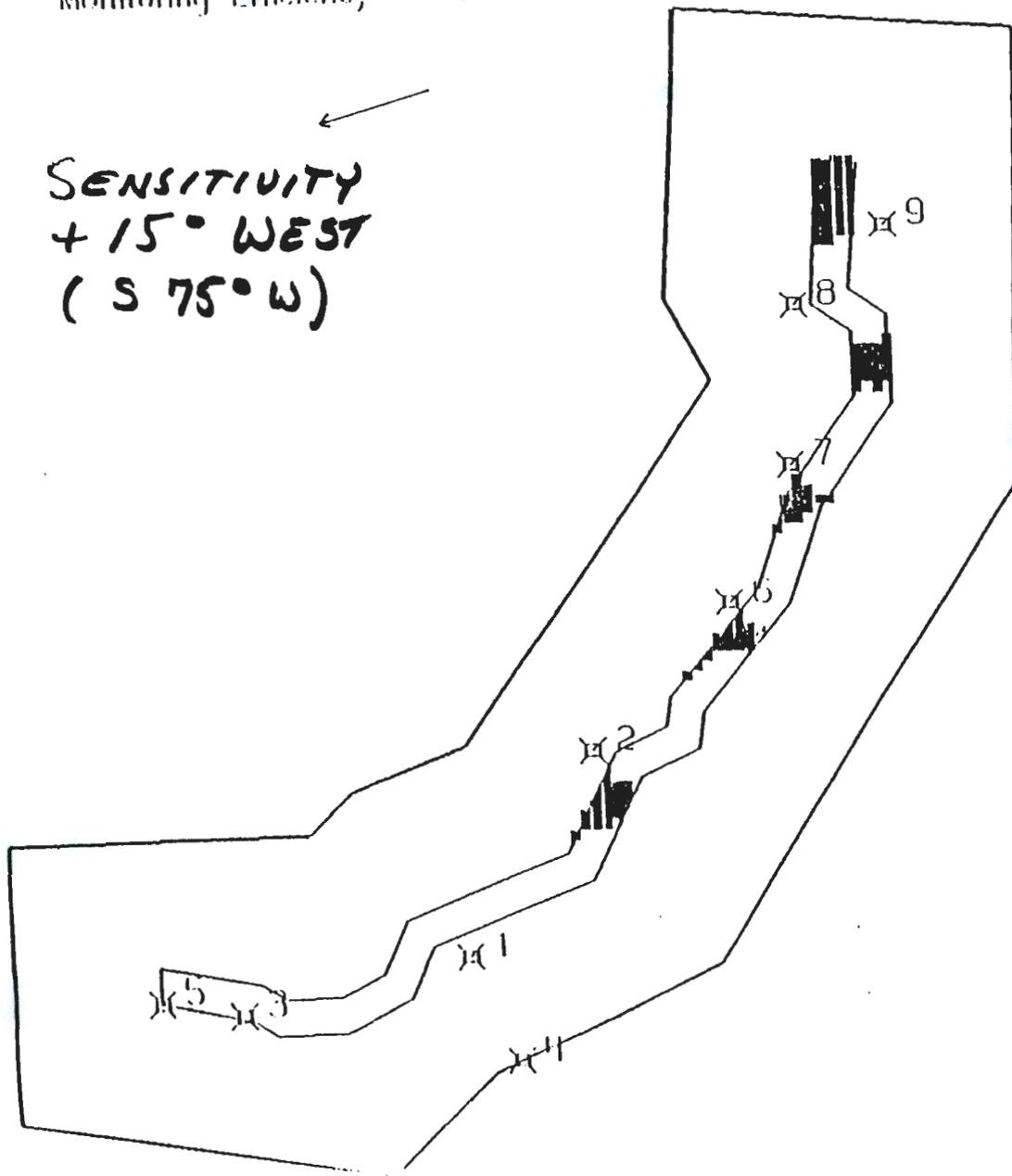


FIGURE 14

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A--29 Ditch  
01/08/91 09:39.55 MEMO ver 1.1  
Monitoring Efficiency = 79.0 %

←  
SENSITIVITY  
+ 15° WEST  
( S 75° W )



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Figure 14

A-29 Ditch  
01/08/91 09:54:12 MFM ver 1.1  
Monitoring Efficiency = 84.9 %

SENSITIVITY  
+15° SOUTH  
(S 45° W)

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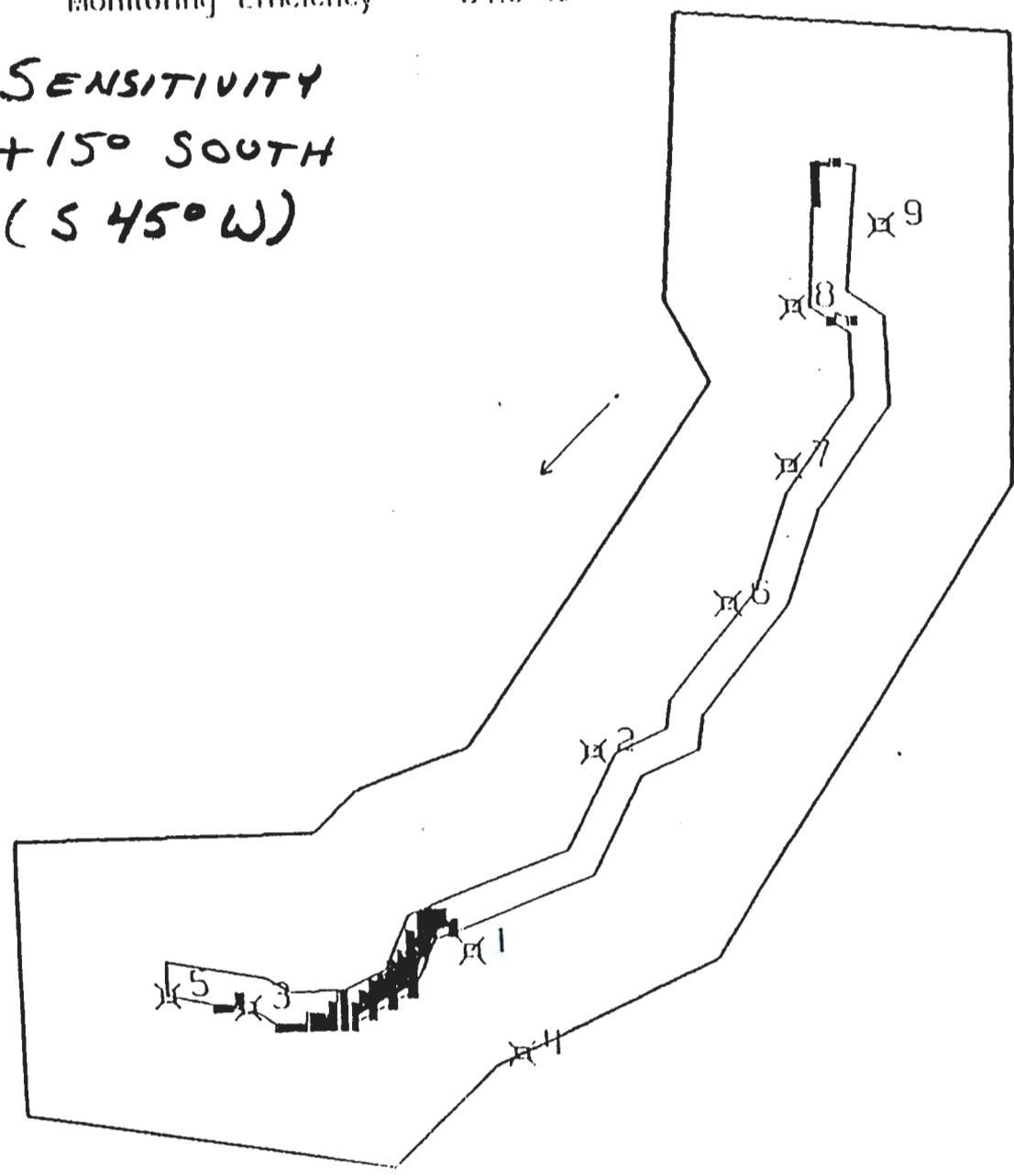


Figure 15

**GROUNDWATER MONITORING PROGRAM REVISION SCHEDULE**

- o To Ecology February 1991**
- o Comments requested March 25, 1991**
- o Start to drill April 8, 1991**

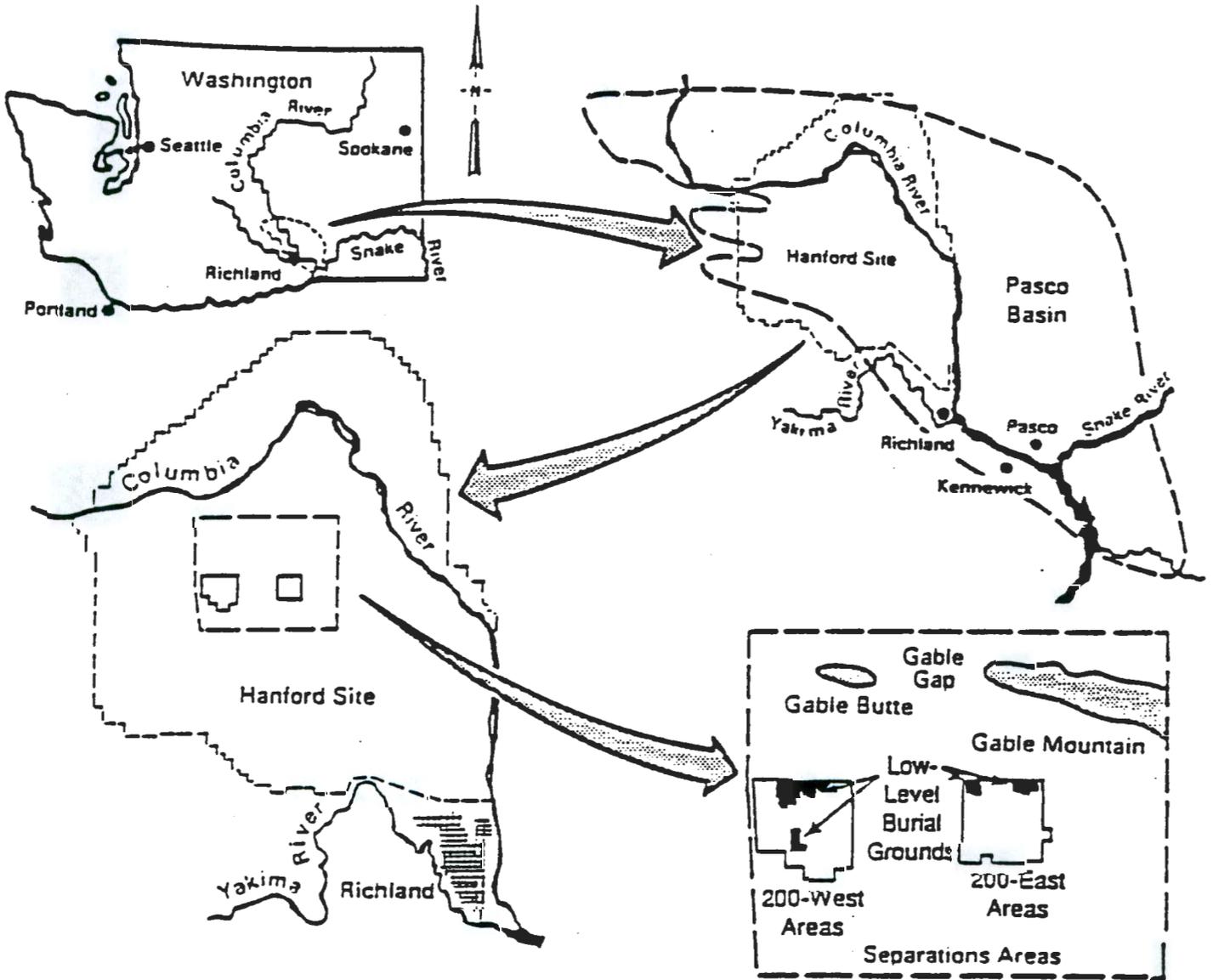
## A-29 NEAR-TERM ACTIVITIES

- o Well construction report
- o Groundwater sampling and reporting to resume
- o Evaluation of groundwater quality assessment plan
- o Soil sampling and water level monitoring after ditch shut-down
- o Evaluate monitoring network and make recommendations for 1992 drilling, if needed

# **200 Areas Low-Level Burial Grounds**

**R. B. Mercer**

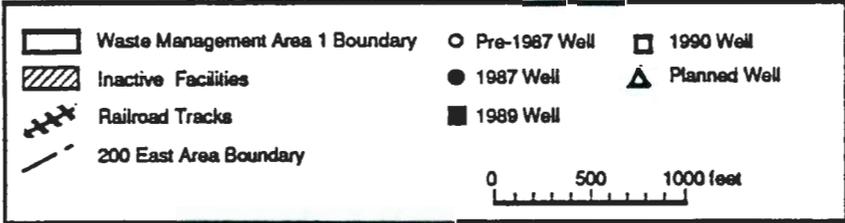
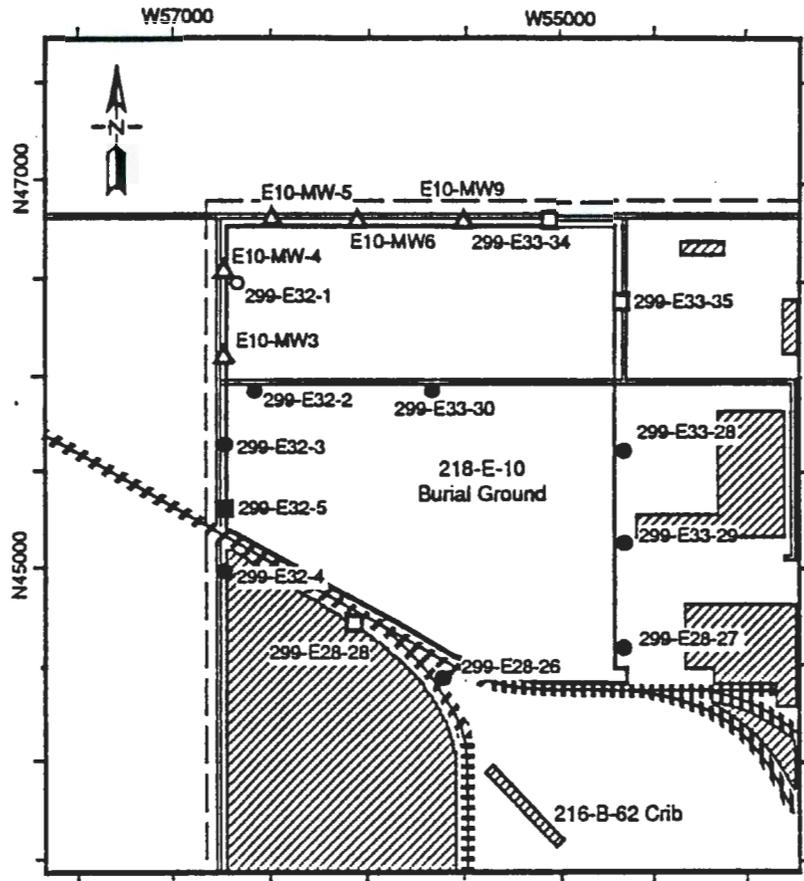
**Westinghouse Hanford  
Company**



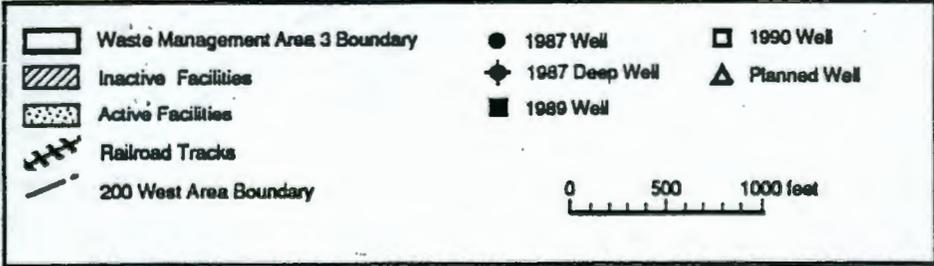
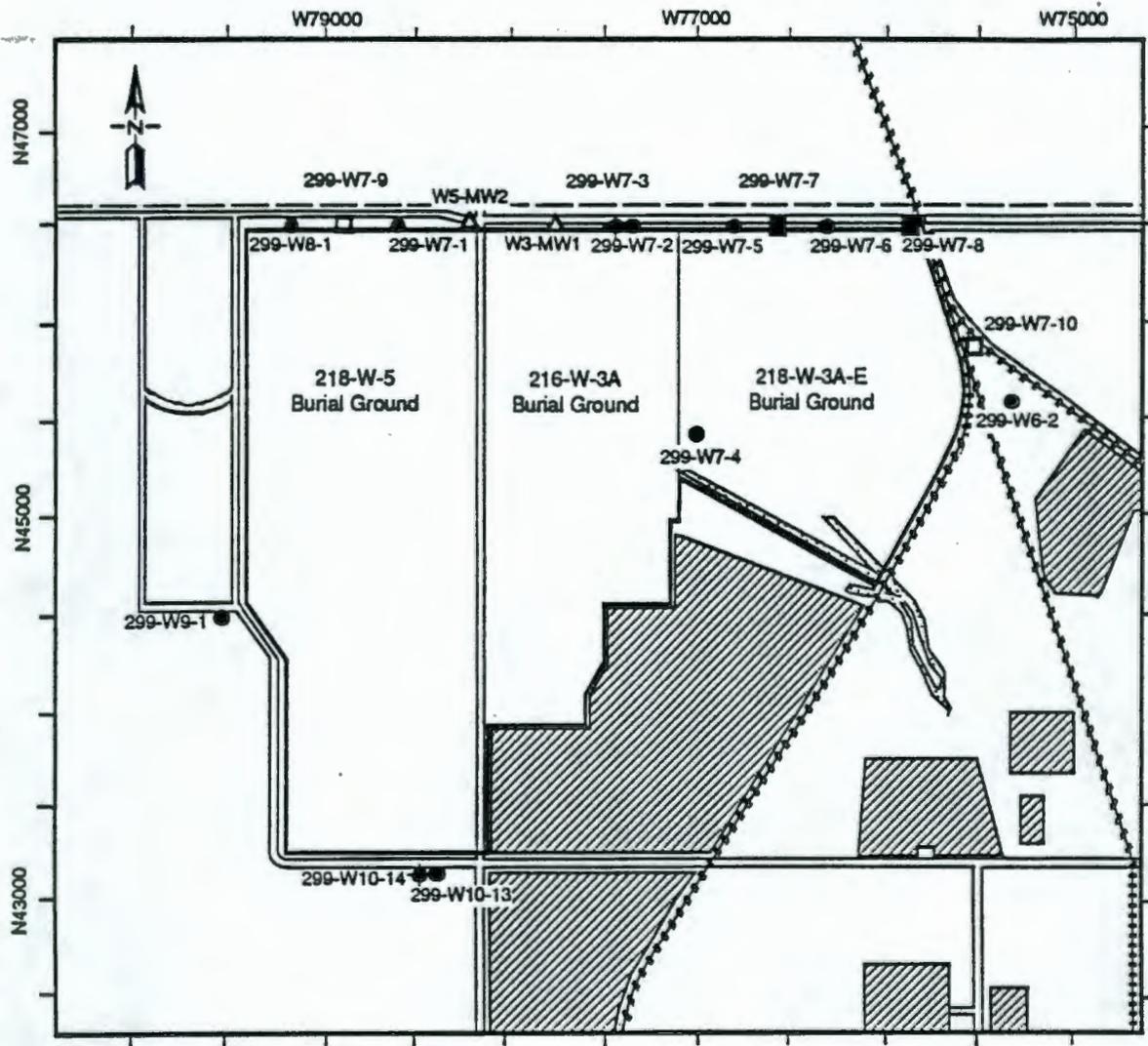
## Low-Level Burial Ground Agerage

	Burial Ground	Acres
LLWMA-1	218-E-10	56.7
	Unused	37.7
	Total	94.4
LLWMA-2	218-E-12B	173.1
	Total	173.1
LLWMA-3	218-W-3A	50.3
	218-W-3AE	49.4
	218-W-5	84.0
	Total	183.7
LLWMA-4	218-W-4B	8.6
	218-W-4C	51.7
	Total	60.3
LLWMA-5	218-W-6	44.5
	Total	44.5
Grand Total		556.0

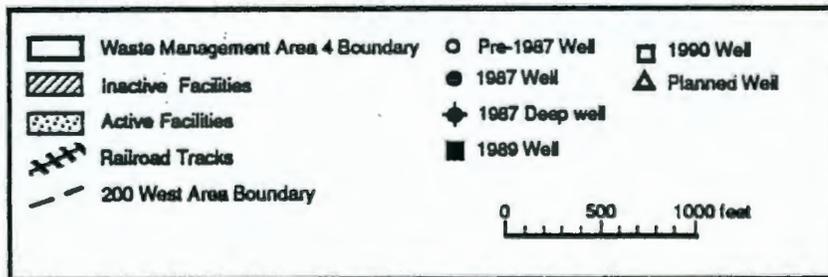
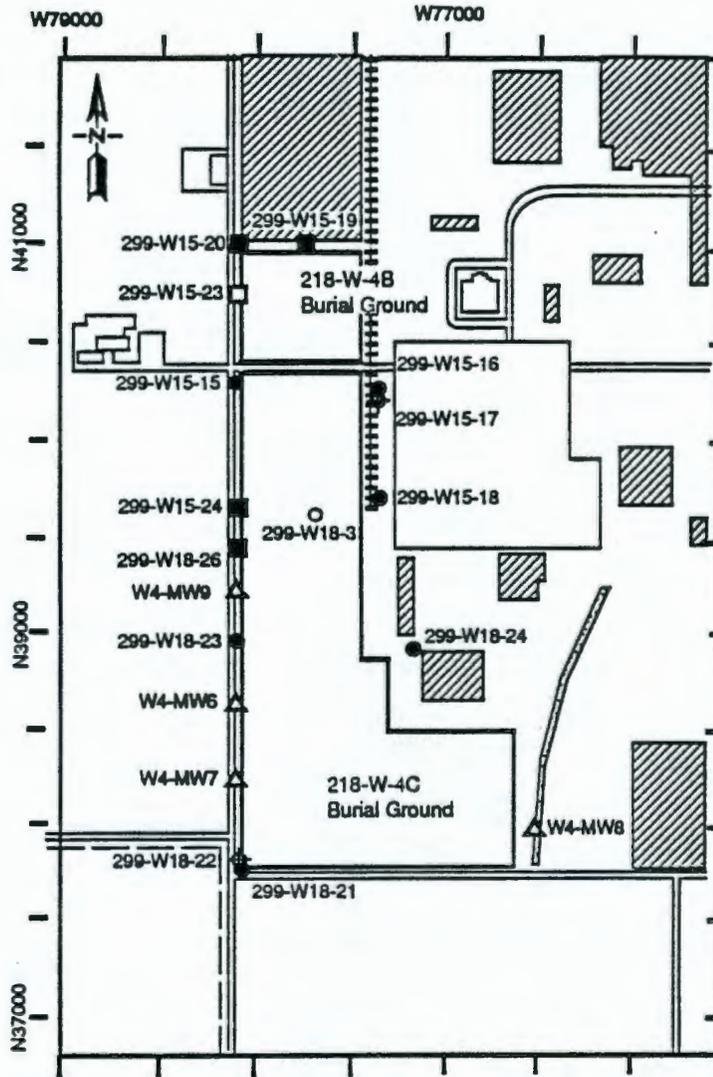
<b>Low-Level Burial Grounds</b>			
	<b>Burial Ground</b>	<b>First Use</b>	<b>Contents</b>
LLWMA-1	218-E-10	1960	Drag-off material Failed equipment Mixed wastes
LLWMA-2	218-E-12B	1968	Miscellaneous dry waste Transuranic wastes Submarine reactor compartments
LLWMA-3	218-W-3A	1970	Ion-exchange resins Failed equipment
	218-W-3AE	1981	Low-level wastes Low-level mixed wastes
	218-W-5	1986	Low-level wastes Low-level mixed wastes
LLWMA-4	218-W-4B	1968	Mixed waste Retrievable transuranic waste
	218-W-4C	1978	Transuranic wastes Mixed wastes Low-level wastes
LLWMA-5	218-W-6	NA	None to date



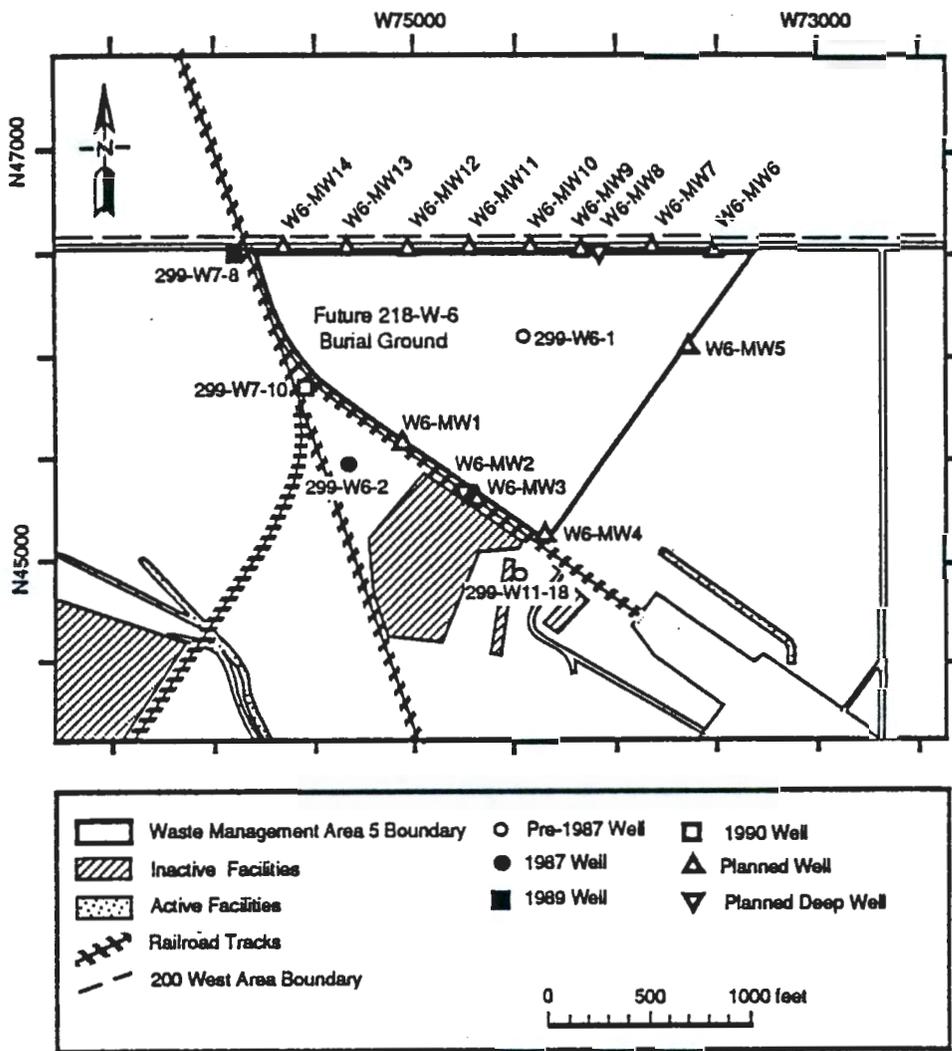
LOW-LEVEL WASTE MANAGEMENT AREA 1



LOW-LEVEL WASTE MANAGEMENT AREA 3



LOW-LEVEL WASTE MANAGEMENT AREA 4



LOW-LEVEL WASTE MANAGEMENT AREA 5

## Low-Level Burial Ground Monitoring Wells

	LLWMA-1	LLWMA-2	LLWMA-3	LLWMA-4	LLWMA-5
1	299-E28-26 <sup>87</sup>	299-E27-8 <sup>87</sup>	299-W6-2 <sup>87m</sup>	299-W15-15 <sup>87</sup>	299-W6-2 <sup>87a</sup>
2	299-E28-27 <sup>87</sup>	299-E27-9 <sup>87</sup>	299-W7-1 <sup>87</sup>	299-W15-16 <sup>87</sup>	299-W7-10 <sup>90m</sup>
3	299-E28-28 <sup>90</sup>	299-E27-10 <sup>87</sup>	299-W7-2 <sup>87</sup>	299-W15-17 <sup>87d</sup>	W6-MW1 <sup>92</sup>
4	299-E32-2 <sup>87</sup>	299-E27-11 <sup>89</sup>	299-W7-3 <sup>87d</sup>	299-W15-18 <sup>87</sup>	W6-MW2 <sup>91d</sup>
5	299-E32-3 <sup>87</sup>	299-E34-2 <sup>87</sup>	299-W7-4 <sup>87</sup>	299-W15-19 <sup>89</sup>	W6-MW3 <sup>91</sup>
6	299-E32-4 <sup>87</sup>	299-E34-3 <sup>87</sup>	299-W7-5 <sup>87</sup>	299-W15-20 <sup>89</sup>	W6-MW4 <sup>92</sup>
7	299-E32-5 <sup>89</sup>	299-E34-4 <sup>87</sup>	299-W7-6 <sup>87</sup>	299-W15-23 <sup>90</sup>	W6-MW5 <sup>92</sup>
8	299-E33-28 <sup>87</sup>	299-E34-5 <sup>87</sup>	299-W7-7 <sup>89</sup>	299-W15-24 <sup>89</sup>	W6-MW6 <sup>91</sup>
9	299-E33-29 <sup>87</sup>	299-E34-6 <sup>87</sup>	299-W7-8 <sup>89</sup>	299-W18-21 <sup>87</sup>	W6-MW7 <sup>92</sup>
10	299-E33-30 <sup>87</sup>	299-E34-7 <sup>89</sup>	299-W7-9 <sup>90</sup>	299-W18-22 <sup>87d</sup>	W6-MW8 <sup>91d</sup>
11	299-E33-34 <sup>90</sup>	299-E35-1 <sup>89</sup>	299-W7-10 <sup>90m</sup>	299-W18-23 <sup>87</sup>	W6-MW9 <sup>91</sup>
12	299-E33-35 <sup>90</sup>	E12-MW1 <sup>92</sup>	299-W8-1 <sup>87</sup>	299-W18-24 <sup>87</sup>	W6-MW10 <sup>92</sup>
13	E10-MW3 <sup>91</sup>	E12-MW2 <sup>92</sup>	299-W9-1 <sup>87</sup>	299-W18-26 <sup>89</sup>	W6-MW11 <sup>92</sup>
14	E10-MW4 <sup>91</sup>	E12-MW3 <sup>91</sup>	299-W10-13 <sup>87</sup>	W4-MW6 <sup>91</sup>	W6-MW12 <sup>91</sup>
15	E10-MW5 <sup>91</sup>	E12-MW4 <sup>92</sup>	299-W10-14 <sup>87d</sup>	W4-MW7 <sup>91</sup>	W6-MW13 <sup>92</sup>
16	E10-MW6 <sup>91</sup>	E12-MW5 <sup>91</sup>	W3-MW1 <sup>91</sup>	W4-MW8 <sup>91</sup>	W6-MW14 <sup>92</sup>
17	E10-MW9 <sup>92</sup>	E12-MW6 <sup>92</sup>	W5-MW2 <sup>91</sup>	W4-MW9 <sup>92</sup>	
18		E12-MW7 <sup>91</sup>			
19					
20					

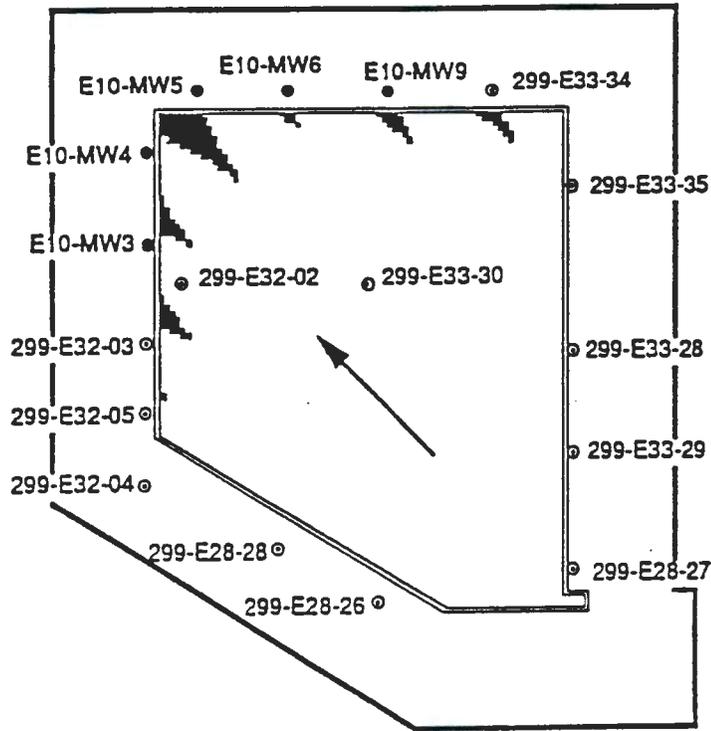
Superscript following well number denotes the year of installation.

Wells with numbers beginning with E or W are proposed.

Shading denotes upgradient wells.

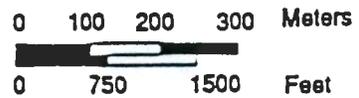
<sup>d</sup> Deep Well.

<sup>m</sup> Well monitors multiple LLWMAs.

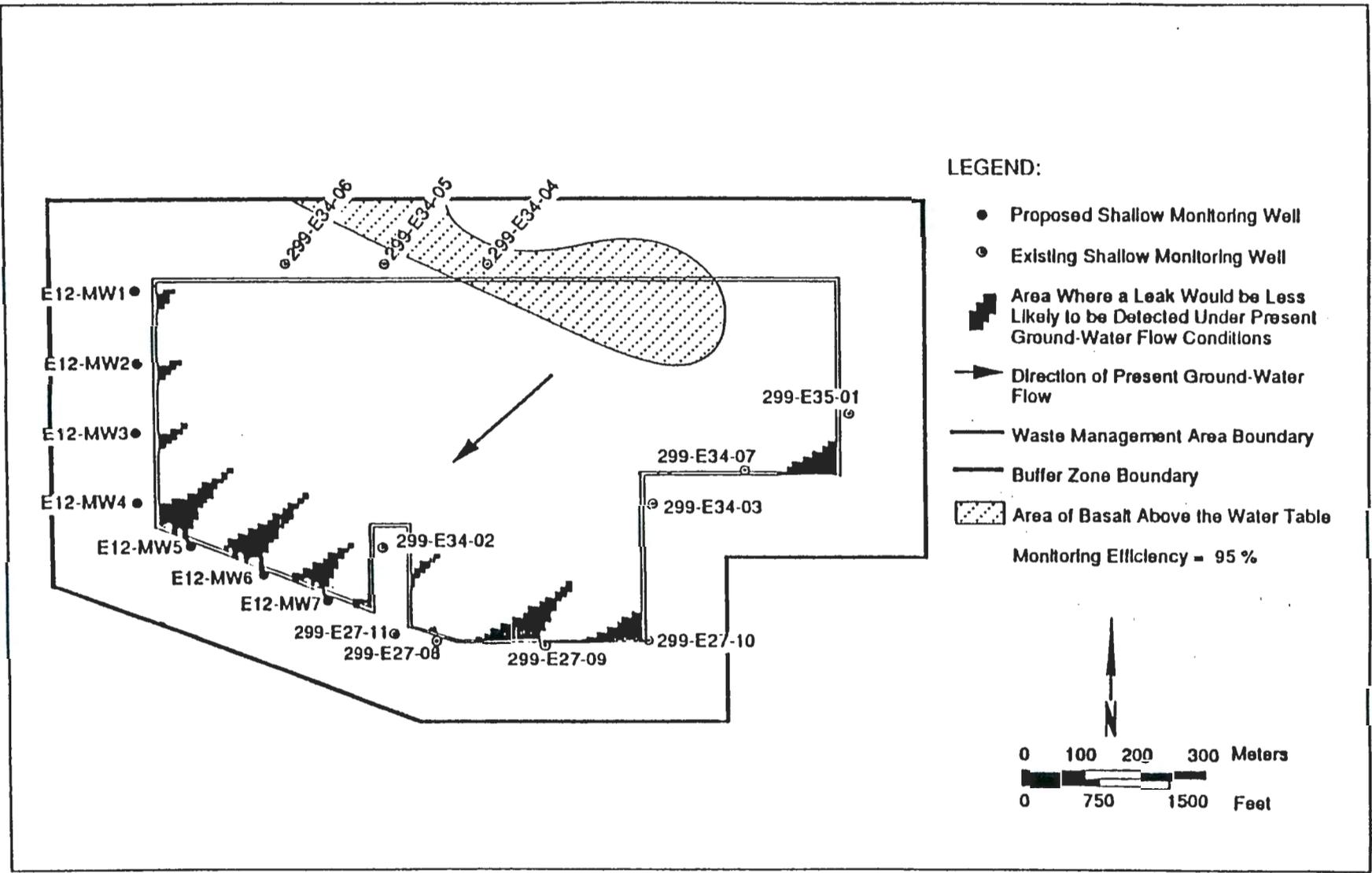


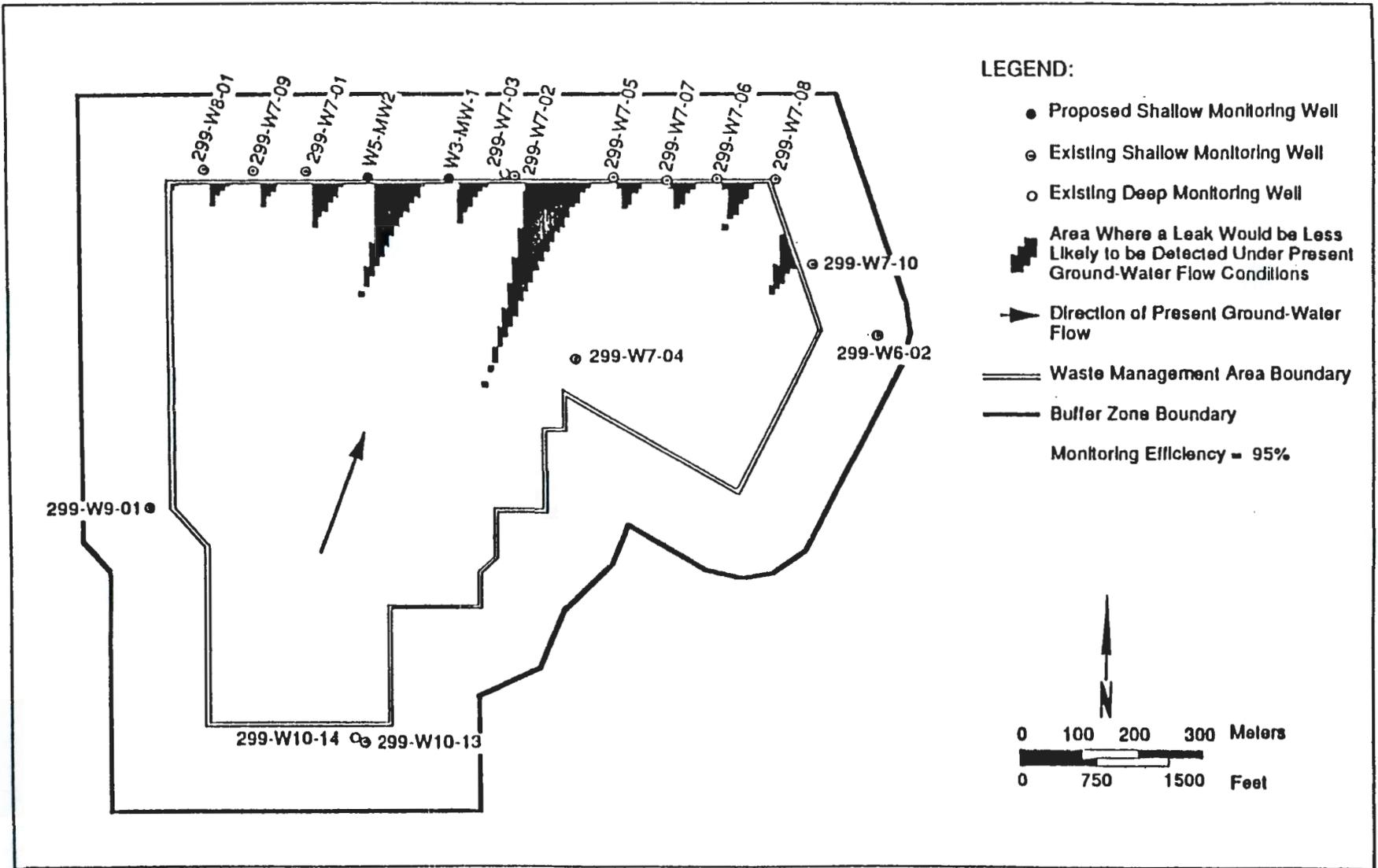
**LEGEND:**

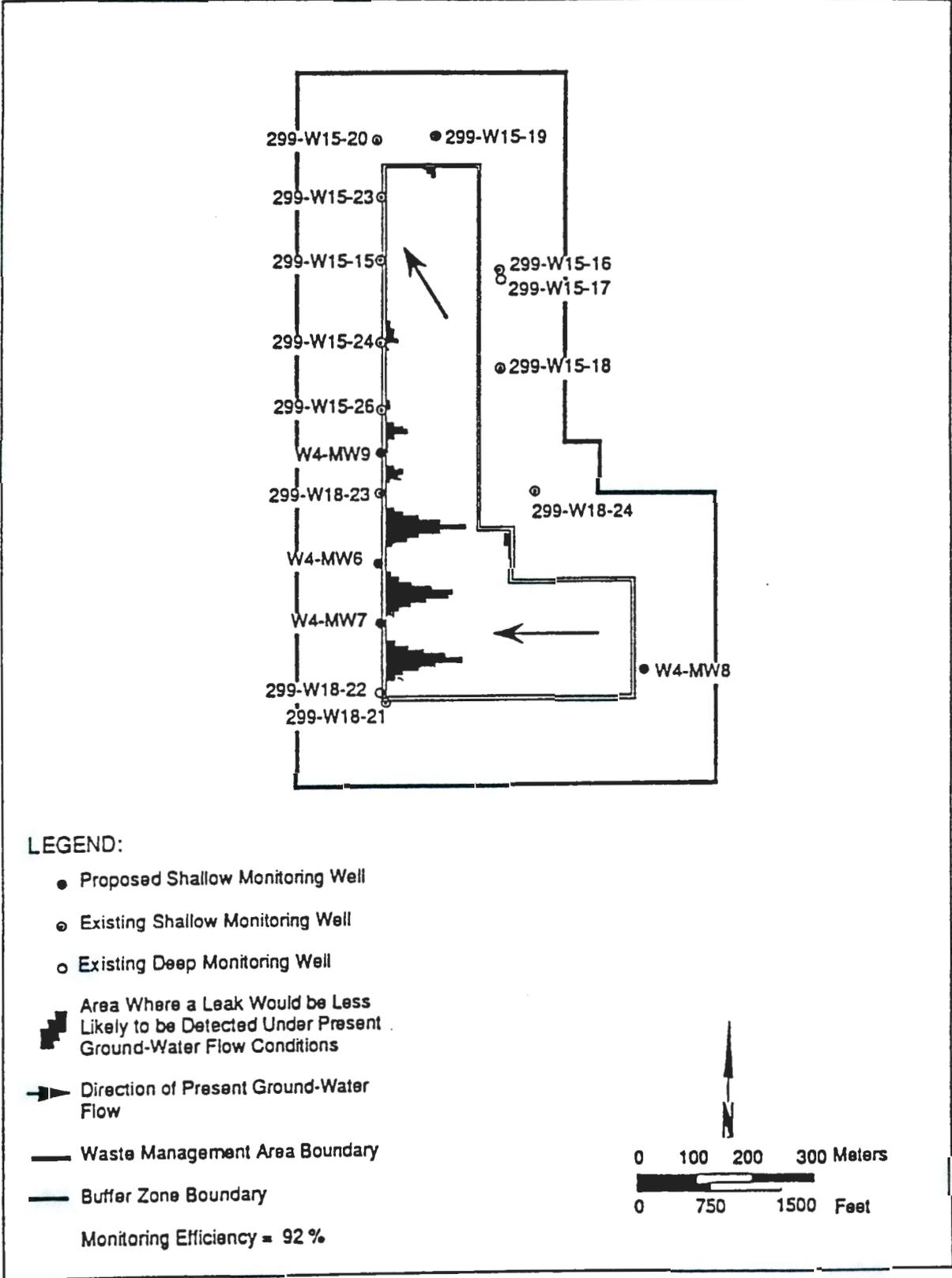
- Proposed Shallow Monitoring Well
  - ⊙ Existing Shallow Monitoring Well
  - Area Where a Leak Would be Less Likely to be Detected Under Present Ground-Water Flow Conditions
  - ➔ Direction of Present Ground-Water Flow
  - ══ Waste Management Area Boundary
  - Buffer Zone Boundary
- Monitoring Efficiency = 97 %

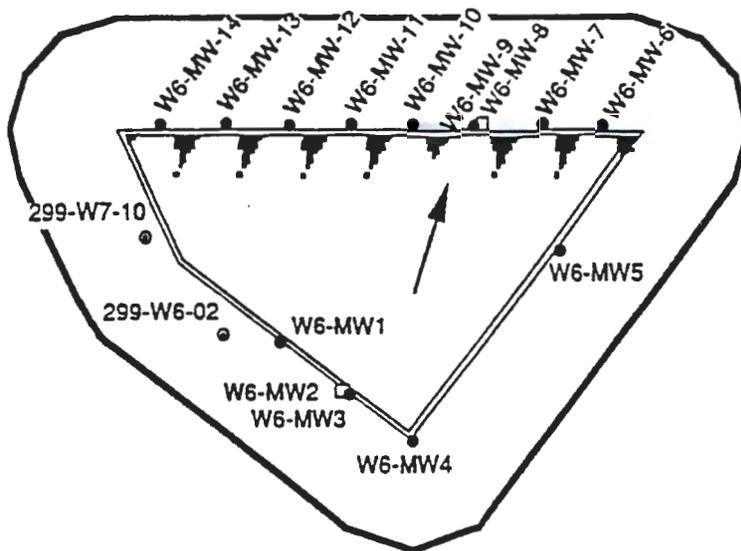


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**LEGEND:**

- Proposed Shallow Monitoring Well
  - Existing Shallow Monitoring Well
  - Proposed Deep Monitoring Well
  - Area Where a Leak Would be Less Likely to be Detected Under Present Ground-Water Flow Conditions
  - ➔ Direction of Present Ground-Water Flow
  - Waste Management Area Boundary
  - - - Buffer Zone Boundary
- Monitoring Efficiency = 95%

