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Distribution

Unit Managers' Meeting: 100 Areas Remedial Action Unit/Source Operable Units

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Dale Jackson........DOE-RL, RP (A4-52)
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Hector Rodriguez........DOE-RL, RP (A5-15)
Chris Smith........DOE-RL, RP (A3-04)
Mike Thompson........DOE-RL, RP (A6-38)
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Kent Westover........DOE-RL, RP (A3-04)

Lisa Treichel........DOE-HQ (EM-442)

John Price........WDOE (Kennewick) (B5-18)
Noel Smith-Jackson........WDOE (Kennewick) (B5-18)
Jean Vanni........WDOE (Kennewick) (B5-18)
Wayne Soper........WDOE (Kennewick) (B5-18)

Dennis Faulk........EPA (B5-01)

Randy Acselrod........Washington Dept. of Health
Richard Jaquish........Washington Dept. of Health
Debora McBaugh........Washington Dept. of Health

Eileen Murphy-Fitch........FD (A4-25)

John April........BHI (T8-02)
Jane Borghese........FH (E6-35)
Rich Carlson........BHI (X0-17)
Frank Corpuz........BHI (X0-17)
Rick Donahoe........BHI (X5-60)
Jon Fancher........CHI (X0-17)
Ella Feist........CHI (X0-17)
Kim Koegler........BHI (X9-08)
Rex Miller........BHI (X3-40)
Debbie Roskelley........BHI (X0-17)
Annie Smet........BHI (X0-17)
Dean Strom........CHI (X3-40)
Jill Thomson........CHI (H9-01)
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Administrative Record........BHI (H0-09) 2 copies

Please inform Debbie Roskelley (376-9850) – BHI (X0-17)
of deletions or additions to the distribution list.

110816

Meeting Minutes Transmittal/Approval
Unit Managers' Meeting
100 Area Remedial Action and Waste Disposal Unit/Source Operable Unit
3350 George Washington Way, Richland, Washington
December 4, 2003

APPROVAL: ______________________ Date 1/22/04
Chris Smith/Jamie Zeisloft, 100 Area Unit Managers, RL (A3-04)

APPROVAL: Arlene Tortoso Date 1/22/04
Michael Thompson/ Arlene Tortoso, Waste Management Division, RL (A6-38)

APPROVAL: John B. Price Date 1/22/04
John Price, 100 Aggregated Area Unit Manager, Ecology (B5-18)

APPROVAL: Larry Gadbois Date 1/22/04
for Dennis Faulk, 100 Aggregate Area Unit Manager, EPA (B5-01)

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

Attachment 1	--	Attendance Sheet
Attachment 2	--	Agenda
Attachment 3	--	100 Area Meeting Minutes
Attachment 4	--	Markup of proposed revision to 100 Area Burial Grounds SAP
Attachment 5	--	WIDS Site CVP Closeout Summary Table
Attachment 6	--	Map showing waste staging pile location
Attachment 7	--	Groundwater status handout
Attachment 8	--	In Situ Redox Manipulation – Status of the Barrier Presentation
Attachment 9	--	Sampling and Analysis Instruction for Aquifer Sampling Tubes Sampling and Installation Fall 2003, WMP-18051, Rev. 0
Attachment 10	--	Increased Concentration of Tritium in Groundwater near the KE and KW Complexes Synopsis

Prepared by: Debbie Roskelley Date 1/14/04
Debbie Roskelley (X0-17)

Concurrence by: Vern R. Dronen Date 1/15/04
Vern Dronen, Project Manager
BHI Remedial Action Project (X0-17)

Remedial Action and Waste Disposal Unit Managers' Meeting
Official Attendance Record – 100 Area
December 4, 2003

Please print clearly and use black ink

PRINTED NAME	ORGANIZATION	O.U. ROLE	TELEPHONE
Barry Vedder	BHI		372-9444
Bob Peterson	PNNL	GW KR4	373-9020
Mary Hartman	PNNL	GW	373-0028
Steve Clark	CHI	CVPs	372-9531
Ella Foist	CHI	RA Support	372-9140
Scott Parnell	CHI	RA	521-0958
Jon Fancher	CHI	RA	531-0700
Mike Schwab	BHI	CVP	372-9407
Jeff Leech	CHI	RA	373-5904
Stacey Callison	CHI	CVPs	372-9601
J Thomson	CHI	CVPs	372-9697
M. Buckmaster	BHI	Grp 4	521-2089
D.N. Strom	CHI	100-BC	3-5519
A.M. NAZARALI	BHI	CVP	373-1915
J.W. Golden	BHI	D&D	373-0089
John Fruchter	PNNL	GW Monitoring	376-3931
Scott Petersen	FH	GW	372-9126
Bob Raidl	FH/Geosciences	GW	373-3904
Hal Downey	BHI	RA	373-9744
JOHN MORSE	DOE-RL	PROGRAM	376-0057
Larry Gadbois	EPA	Unit Mgr	376-9884

Attachment 1

Remedial Action and Waste Disposal Unit Managers' Meeting
Official Attendance Record – 100 Area
December 4, 2003

Please print clearly and use black ink

PRINTED NAME	ORGANIZATION	O.U. ROLE	TELEPHONE
Jane V. Borghese	FH GPP	GW	373-3804
Arlene Tortoso	DOE	GW	373-9631
Jamie Zeisloft	ERD	100-K	372-0188
Dennis Faulk	EPA		
Van Johnson	FH GPP	100 GW	
KENT R. WESTOVER	DOE-RL	100-NR-1	376-3967
Chris Smith	DOE-RL	100 Area	372-1544
John Price	Ecology	Proj. Mgr.	736-3029
Beth Rochette	Ecology	100 area common	736-3020
JAck Donnelly	~~Ecology~~ BHI	Proj. Env. lead	372-9565
John Sands	DOE	RCBRA	372-2282

100 AREA
UNIT MANAGERS MEETING AGENDA

3350 George Washington Way
December 4, 2003

1:00 – 3:00 p.m. 3350 GWW (Room 1B45)

Administrative

- Meeting minutes status
- Review and approve last UMM minutes

Remedial Action

100 Area Common

- Remaining Sites ESD Status
- Remaining Sites Sampling Efforts Status
  - Proposed matrix evaluation of pipeline contaminants
  - Proposed Long, narrow shape for RESRAD direct exposure evaluation
  - Proposed 'length parallel to groundwater = pipe diameter' for RESRAD input parameter
- Burial Ground SAP revision
- 100 Area RDR & SAP comments
- CVP status
- River Corridor Risk Assessment
- B/C Pilot
- N Eco Study

100 F, K, and Group 4

- 100 F General Status
- 100 K General Status

100 N

- New Project Engineer
- Procurement update
- Overburden Sampling
- Area of Contamination
- RCRA Permit Modifications

100 B/C

- Backfill north of B Ave.
- Remediation of 4 Burial Grounds
- Cr+6 Leachate Study results
- CVP status

D&D

- Project Status

General Crossover Items

-

Review Open Action Items Log

100-NR-2 Groundwater OU

- Remediation treatment status

100-KR-4 Groundwater OU

- Remediation treatment status
- 100 K Burial Ground Soil Gas Investigation

100-HR-3 Groundwater OU

- Remediation treatment status

100-FR-3 Groundwater OU

-

100-BC-5 Groundwater OU

-

Groundwater

- 100 Area Open Action Items
- 100-Area Open forum and discussion
- Recent change in tritium concentration near KE Fuel Storage Basin
- Status of aquifer tube installation project planning

Other

UNIT MANAGERS MEETING MINUTES

3350 George Washington Way, 1B45
December 4, 2003

1:00 – 3:00 p.m. **100 Area** **3350 GWW, 1B45**

Administrative

- Meeting Minute Status – September and October meeting minutes were approved and signed by those in attendance.

- The next 100 Area Unit Managers Meeting will be held on January 22, 2004, at 3350 GWW room 1B45 beginning at 1:00 p.m.

- Action Item Update:

  June 2003 item "Dennis Faulk (EPA) asked Chris Smith (DOE) to bring revegetation of 100-F backfilled areas above the FY04 funding line in the DWP" was dropped.

  October 2003 item "Jack Donnelly (BHI) to schedule a meeting to discuss implementation of August 2001, WAC 173-340 Method B cleanup levels into the 100 Area RDR and SAP" has been completed.

  October 2003 item "Jane Borghese will prepare presentation on actions that are being taken to evaluate possible causes of the breakthrough in a few wells at the ISRM barrier" has been completed.

Remedial Action

100 Area Common

Remaining Sites ESD – The regulators have another week or two to review and comment on the Remaining Sites ESD. John Price, Ecology, plans to give a briefing to the Ecology Program Manager around December 22, after which approval is expected on the ESD. RL and Ecology Legal Counsels advise that it is OK to use the ESD to incorporate the new Ecology WAC 173-340 [Model Toxics Control Act (MTCA)] citations into the 100 Area Remaining Sites Record of Decision. The wording for the citation will be incorporated into the ESD and this revised ESD will be sent to both Ecology and EPA for another review to incorporate the new WAC 173-340 cleanup standards. Dennis Faulk, EPA, stated that Andy Boyd, EPA Region 10 Legal Counsel, is still reviewing Ecology's comment that a ROD amendment may be required to change the use of balancing factors as outlined in this ESD. This EPA decision was expected within the next week.

- Remaining Sites Sampling Efforts Status – The Tri-Parties agreed to the following:

- Revised lookup value for antimony - The revised soil cleanup level protective of groundwater (lookup value) for antimony is 5.4 mg/kg per calculation using the new WAC 173-340-747(4) fixed parameter three-phase partitioning model. Ecology agreed to allow this standard now for all waste sites undergoing remediation before the issuance of the ESD. ***[Note: The value of 5.4 mg/kg for the antimony soil cleanup level protective of groundwater is based on the drinking water MCL of 6.0 ug/L.]***

- Matrix evaluation of pipeline contaminants - When soil contamination surrounding pipelines meets the cleanup criteria but the inside of the pipeline is contaminated, the remedial action decision for the pipeline will be evaluated by volume-averaging the analytical results for the scale using the entire mass of the pipe. This approach is consistent with US DOE and US Nuclear Regulatory Commission requirements that are ARARs or To Be Considered criteria under CERCLA. EPA and Ecology concurred with this approach. When soil contamination surrounding the pipeline does not meet the cleanup criteria, the pipeline would be remediated with the soil. This approach shall be discussed in Revision 6 of the RDR.

- Long, narrow waste site shape for RESRAD direct exposure evaluation - Normal RESRAD evaluation of dose and risk from residual radioactivity assumes the waste site is circular. However, this approach needs modification for contamination inside pipelines. Contaminated pipelines will be modeled using the option in the RESRAD model for non-circular shapes. Example calculations will be discussed with Dick Jaquish of the Washington State Department of Health when they become available. EPA requested an example be run to see the differences. The example results and the discussions with Dick Jaquish will be presented at a future UMM for concurrence by EPA and Ecology. The agreed-upon approach shall be documented in Revision 6 of the RDR.

- Length parallel to groundwater for RESRAD input parameter - Length of waste sites parallel to groundwater flow is an important input parameter for determination of protection of groundwater in RESRAD modeling. RESRAD modeling of pipelines will include a discussion of the orientation of the pipelines relative to groundwater flow direction.

Dennis Faulk, EPA, stated he must perform a walk down of the 128-F-1 burn pit site before considering it for waste site reclassification.

Ella Feist, CHI, gave Dennis Faulk, EPA, MP-14 forms and summary reports for 116-B-15 and 116-C-6 for his signature.

- Burial Ground SAP Revisions – John Price, Ecology, gave feedback to Pam Doctor, BHI. He has not heard back from DOE or BHI.

Action: Rich Carlson, BHI, meet with John Price, Ecology, to resolve one comment in the Burial Ground SAP.

Jack Donnelly, BHI, stated that the 100 Area Burial Grounds SAP does not cover sampling under staging piles. Jack provided Attachment 4 to EPA and Ecology for approval, which shows the revision proposed to the SAP. The soil beneath staging piles will be sampled as separate decision units depending on the size as outlined in Attachment 4, after the staging piles are removed. This is consistent with what was done at the 300 Area Burial Grounds. John Price, Ecology, needs to discuss this internally at Ecology, and will get back to Pam Doctor with feedback.

Action: John Price, Ecology, to discuss internally at Ecology and report back at next UMM.

- 100 Area RDR and SAP Comments – Chris Smith, RL, stated that RL is ready to transmit the "response to comments" letter to the regulators. It will take about a week to get it through the signature process. He is waiting to see if the MTCA language will be included.

- CVP Status – Alex Nazarali, BHI reported that some approved CVPs have been received from EPA. The pipelines CVP was given to Dennis Faulk, EPA, for review. The CVP Summary Table is attached as Attachment 5.

- River Corridor Risk Assessment – Dennis Faulk, EPA, received a copy of the conceptual model, but does not know why he received it, and stated that DOE needs to explain the purpose of the document. John Sands, DOE, stated the document was about to be shared with stakeholders. Dennis Faulk, EPA, stated DOE should not provide to the stakeholders until they review and understand the process.

  Action: John Sands, RL, will call back the document and set up a meeting to discuss the purpose of the document.

- B/C Pilot – No discussion

- N Eco Study – Interview with the regulators were held by Jane Borghese. Tribal and HAB interviews are next.

100-F, -K, and Group 4

- 100-K General Status – 116-KW-3 sample data is in and meets cleanup values for the CVP.

  116-K-1 Crib – Sampling of all plumes has been completed. About one third of the data is in.

  116-KE-4 Retention Basin – Work is underway, they are making good progress on the pipelines, and work is currently ahead of schedule.

Work on five small sites in the 100-K Area has been accelerated (100-K-29 Sandblast Area, 128-K-1 Burn Pit, and three sulfuric acid tank sites).

116-KE-1 and 116-KW-1 Condensate Cribs – Interface work with Flour Hanford is complete. Plan to start excavating 116-KW-1 during the week of December 8. After work is completed at 116-KW-1 work will begin at 116-KE-1. Work on the cribs is expected to be complete in January. Jack Donnelly, BHI, stated they received EPA's approval of the addendum to the 100-K CERCLA Air Monitoring Plan for adding these two sites.

- 100-F General Status – Revegetation work on the borrow site was started. Jack Donnelly, BHI, stated DOE is transmitting the 100-F burial grounds and remaining sites Air Monitoring Plan. Jack further stated the air monitoring plan is based on incorporating both EPA and Washington State Department of Health comments.

100-N

- New Project Engineer - Jon Fancher, CHI, introduced new 100-N Project Engineer, Scott Parnell, CHI.

- Procurement update - Scott Parnell, CHI, noted there is a RFP out for a new remediation subcontractor, and bids are due on December 9.

- Overburden Sampling - Jon Fancher, CHI, indicated sampling was completed Monday, December 1, and sample splits were obtained for Ecology. Jon has been talking with Noe'l Smith-Jackson, Ecology, regarding split samples for Ecology, a map has been provided for Ecology's use. Noe'l will get back to Jon with which samples Ecology wants for splits.

- Area of Contamination - Jon Fancher, CHI, indicated some revisions were necessary to the AOC and the current plan was to make changes and incorporate in the next revision to the 100-N Area RDR. Ecology concurred with the process.

- RCRA Permit Modifications – Jack Donnelly, BHI, requested the status of Ecology's approval on the certification of closure for the 1324-N and 1324-NA TSDs. John Price, Ecology, stated no issues remained and he would look at it. Jack stated it would be nice for efficiency to have the approval before submittal of the renewal application of the Hanford Sitewide Permit.

100-B/C

- Dean Strom, CHI, reported that the backfill operation associated with the 100-BC Pipelines north of B Avenue has begun and three overburden piles have been moved.

- Four burial grounds are in various stages of remediation. Burial ground 118-B-4 contains multiple caissons with lead-cadmium poison pieces and aluminum spacers, 118-B-5 is a construction debris burial ground, burial ground 118-B-10 was supposed to be a vault but no vault was found, only boron balls buried in soil, and the 118-C-2 burial ground was a vault that contained boron balls. Jack Donnelly, BHI, provided maps (Attachment 6) to EPA for the waste staging pile locations at each of these four burial grounds. EPA already approved the staging pile locations.

- CVP status – The CVP for the Pipelines North of B Avenue was given to Dennis Faulk, EPA, for review. The CVP for Pipelines South of B Avenue is in progress, backfill is expected to begin at the first of the year.

  Fence post disposal – The 100-BC Pipeline Remediation Project, DOE, and EPA agreed that the disposal of galvanized steel fence posts with concrete will be documented in the CVP for the Pipelines South of B Avenue. The fence posts with concrete bases from old chain link fences are located in the excavation for the 100-B-5 waste site that was closed-out earlier this year.

D&D

- Jim Golden, BHI, is the new D&D representative. The 105-DR CVP is being finalized, and the 117-DR CVP is in draft. Two decontamination areas in 100-F are being sampled. The Waste Characterization SAP received an approval letter from Ecology. H basin fuel will be shipped next week.

Groundwater

Attachment 7 was distributed which gives the status of the 100-NR-2, 100-KR-4, and 100-HR-3 groundwater activities.

- 100-NR-2 Groundwater OU – The pump and treat system operated normally during November.

- 100-KR-4 Groundwater OU – The pump and treat system operated normally during November. Planning for characterization of the northeastern extent of the KR-4 plume continued. New aquifer tubes will be installed in January.

- 100-HR-3 Groundwater OU – Scott Peterson, FH, gave a presentation (Attachment 8) titled "In Situ Redox Manipulation: Status of the Barrier"

  After a summary of the history of the ISRM barrier, Scott presented data on the barrier (treated) wells in which chromium has been detected. These wells are 199-D4-25, -26, -31, -37, and -41. Chromium concentrations in all of these are higher than they were during the same time period last year. Chromium in well D4-40 was detected for the first time in November 2003; this well will be added to the monthly sampling. Based on field and laboratory tests, it was originally projected that the ISRM barrier would last about 20 years; chromium was detected in the wells listed above a little more than 2 years after they were injected.

Possible causes of this loss of reductive capacity in some of the wells are:

- heterogeneity (high-velocity flow zones would accelerated oxygenation of the barrier)
- fluctuating water table
- variability in reduced iron content
- formation disturbance and/or trapped air from rotary drilling
- oxygenation of reduced zone during air rotary drilling

Three investigations have recently been carried out to try and determine the cause of premature reoxygenation. In 2002 cores of soil were collected from the treatability test area and analyzed in the laboratory by PNNL. The results showed that average reductive capacity was essentially the same as when the last samples were collected in 1999, but there was a severely lowered reductive capacity around 91' below ground surface. Two studies were done to try and quantify variations in permeability and groundwater flow, one using an electromagnetic borehole flowmeter and the other using a colloidal borescope. The two techniques provided indications of areas with higher flows, but they did not agree with each other in 2 of the 3 wells that both were deployed in.

Future actions for identifying the causes of reductive loss and methods/technologies to ameliorate the situation include convening a panel of technical experts and possibly funding investigations suggested by them. The Groundwater Protection Program is also preparing a sampling and analysis plan and long-term monitoring plan. A new in situ chromium analyzer is also planned to be installed somewhere in the 100-D area.

- 100-FR-3 Groundwater OU – Nothing to report.

- 100-BC-5 Groundwater OU – Sampling is planned for the first of the New Year. The new SAPs are being implemented. Aquifer tube installation has started in the 300 Area. The plan is to complete work in the 300 Area then move to 100-K and 100-D. There may be an issue concerning Fish and Wildlife fears about the effect of driving aquifer tubes on bull trout in the 100 Area. Bob Raidl, FH, stated he has received regulator approval on the *Sampling and Analysis Instruction for Aquifer Sampling Tubes Sampling and Installation Fall 2003,* WMP-19051, Rev. 0 and requested a copy of the document be submitted to the administrative record (Attachment 9).

  Bob Peterson, PNNL, distributed "Update #2 on Increased Concentrations of Tritium in Groundwater near the KE and KW Reactor Complexes" (Attachment 10).

Outstanding 100 Area Unit Manager's Meeting Action Items

August 2003 Actions

- John Price (Ecology) will get back to Rich Carlson (BHI) by Tuesday, September 2, 2003 on the status of the MP-14 for 128-D-1 review.

November 2003 Actions

- **Action:** Rich Carlson, BHI, meet with John Price, Ecology, to resolve one comment in the Burial Ground SAP.
- **Action:** John Price, Ecology, to discuss proposed approach to sampling under staging piles internally at Ecology and report back at next UMM.
- **Action:** John Sands, RL, will call back the document and set up a meeting to discuss the purpose of the document.

Attachment 8

In Situ Redox Manipulation

Status of the Barrier

Scott Petersen

December 4, 2003

WIDS Site CVP Closeout Summary Table

WIDS Site Closeout	CVP Doc. No. documenting WIDS site closeout	EPA/ Ecology WIDS Signoff	Issue Rev. 0 CVP
100 B/C Area			
116-B-13	CVP-1999-00002	7/22/99	7/1999
116-B-14	CVP-1999-00003	7/22/99	7/1999
116-C-1	CVP-1998-00006	1/21/99	1/1999
116-B-1	CVP-1999-00012	12/8/1999	12/1999
116-B-11	CVP-1999-00001	12/8/1999	12/1999
116-C-5	CVP-1999-00004	12/8/1999	12/1999
116-B-4	CVP-1999-00014	2/24/2000	3/3/2000
116-B-6B	CVP-1999-00017	2/24/2000	3/3/2000
116-B-9	CVP-1999-00009	2/24/2000	3/3/2000
116-B-2	CVP-1999-00015	2/24/2000	3/3/2000
116-B-3	CVP-1999-00013	2/24/2000	3/3/2000
116-B-10	CVP-1999-00010	2/24/2000	3/3/2000
116-B-12	CVP-1999-00008	2/24/2000	3/3/2000
116-C-2A 116-C-2B 116-C-2C	CVP-1999-00019	3/15/2000	3/28/1999
116-B-6A 116-B-16	CVP-1999-00011	5/17/2000	5/26/2000
116-B-7 132-B-6 132-C-2	CVP-2002-00003	7/25/2002	8/6/2002
BC Pipeline (North)	CVP-2002-00012	12/4/2003	
BC Pipeline (South)	CVP-2003-00022		
100-B-5	CVP-2003-00014	6/18/2003	9/11/2003
1607-B7	CVP-2003-00004	5/27/2003	7/29/2003
1607-B8	CVP-2003-00005	5/27/2003	7/29/2003
1607-B9	CVP-2003-00006	6/19/2003	8/28/2003
1607-B10	CVP-2003-00007	5/27/2003	7/29/2003
1607-B11	CVP-2003-00008	5/27/2003	7/29/2003
100-C-3	CVP-2003-00009	5/27/2003	7/28/2003
118-C-4	CVP-2003-00015	6/25/2003	9/11/2003
100 D Area			
100-D-4 (107D5)	CVP-98-00004	3/25/1999	3/1999
100-D-20 (107D3)	CVP-98-00003	3/25/1999	3/1999
100-D-21(107D2)	CVP-98-00002	3/25/1999	3/1999
100-D-22 (107D1)	CVP-98-00001	3/25/1999	3/1999
1607-D2		closed	
1607-D2:1 Tile Field	CVP-98-00005	3/25/1999	3/1999
Septic Pipelines	CVP-2000-0004	9/26/2000	9/2000
Septic Tank	CVP-99-00005	11/23/1999	12/1999
116-DR-9 100-D-25	CVP-99-00006	1/6/2000	1/2000
116-D-7	CVP-99-00007	8/15/2000	8/2000
100-D-18 (107D4)	CVP-2000-00001	9/26/2000	10/2/2000
116-DR-1 116-DR-2	CVP-2000-00002	9/26/2000	9/27/2000
100-D-48		closed	
100-D-48:1 (Grp 2 North Pipelines)	CVP-2000-00003	3/14/2001	3/2001
100-D-48:2 (Grp 2 West Pipelines)	CVP-2000-00005	9/26/2000	10/2/2000
100-D-48:3 (Grp 3 Large Pipelines)	CVP-2000-00034	4/20/2001	4/20/2001
100-D-48:4 (Grp 3 Small Pipelines)	CVP-2000-00033	4/17/2001	4/20/2001
100-D-19 UPR-100-D-4	CVP-2000-00003	3/14/2001	3/2001
100-D-49		closed	
100-D-49:1 (Grp 2 North Pipelines)	CVP-2000-00003	3/14/2001	3/2001
100-D-49:2 (Grp 2 East Pipelines)	CVP-2000-00005	9/26/2000	10/2/2000

WIDS Site CVP Closeout Summary Table

WIDS Site Closeout	CVP Doc. No. documenting WIDS site closeout	EPA/ Ecology WIDS Signoff	Issue Rev. 0 CVP
100 F Area			
116-F-4	CVP-2001-00006	11/8/2001	11/15/2001
116-F-5	CVP-2001-00007	8/16/2001	8/23/2001
1607-F6	CVP-2001-00010	11/8/2001	11/15/2001
UPR-100-F2	CVP-2001-00011	4/22/2002	5/7/2002
100-F-19:1 100-F-19:3 100-F-34 116-F-12	CVP-2001-00002	5/21/2002	6/10/2002
100-F-40	site closed (No CVP)	2/15/2002	2/15/2002
116-F-14	CVP-2001-00009	7/11/2002	7/18/2002
100-F-2	CVP-2001-00001	7/25/2002	8/5/2002
100-F-15 100-F-4 100-F-11 100-F-16	CVP-2002-00001	7/25/2002	8/6/2002
116-F-9	CVP- 2001-00008	10/16/2002	10/22/2002
116-F-2	CVP- 2001-00005	1/13/2003	3/11/2003
126-F-1	CVP- 2002-00002	1/13/2003	TBD
100-F-35	CVP-2002-00007	4/15/2003	6/16/2003
116-F-1	CVP-2002-00009	5/22/2003	11/3/2003
116-F-3	CVP-2002-00008	4/15/2003	6/16/2003
116-F-6	CVP-2002-00010	5/19/2003	11/3/2003
116-F-10	CVP-2002-00006	4/15/2003	6/16/2003
1607-F2	CVP-2002-00005	1/13/2003	3/11/2003
100-F-19:2 116-F-11 UPR-100-F-1 100-F-29	CVP-2001-00003	5/27/2003	9/15/2003
UPR-100-F-3 100-F-25	CVP-2003-10	6/9/2003	8/14/2003
100-F-23	CVP-2003-11	6/9/2003	8/14/2003
100-F-24	CVP-2003-12	6/9/2003	8/14/2003
100 K Area			
116-K-1 Crib	CVP-2003-24	(In Progress 2/29/04)	
116-KW-3 Retention Basin	CVP-2003-23	(In Progress 2/26/04)	

100 Area UMM – November 2003:
Groundwater Remedial Actions

Groundwater operations and related highlights for the period of 20 October through 16 November are summarized as follows:

100-HR-3

- Except for some minor electrical repairs, and seasonally low water levels in three extraction wells, the pump and treat system operated normally for the report period. The average flow rate was 203 gpm. Run times were: 96.4 % for the report period, 97.9% for the year to date and 92.3 % since inception.

- ISRM: Elevated hexavalent chromium continues to be observed in five of the 66 injection wells (D4-25, D4-26, D4-31, D4-37 and D4-40). Concentrations in filtered samples collected on 11/03/03 ranged from 260 ug/L to 920 ug/L (D-4-37). A technical assistance request was submitted to DOE-HQ to evaluate causes and to develop mitigation options.

- Hexavalent chromium concentrations in the corridor between the northeast end of the ISRM and the extraction well network capture zone remain elevated. Three new wells located in the corridor of increasing chromium concentrations were drilled and completed in November. Hydrologic testing and sample pump installation activities are planned for completion in December. Efforts to locate driving forces, source areas, and evaluation of groundwater treatment options continued; weekly status meetings are being held to track progress.

100-KR-4

- Except for a short shutdown to correct leakage discovered during resin changeout, the pump and treat system operated normally during the report period.

- The average flow rate was 276 gpm. Run times were: 99.5% for the report period, 99.5% for the year to date, and 94.7% since inception.

- Planning for characterization of the northeastern extent of the KR-4 plume continued. A plan and manpower loaded schedule will be completed in December. New aquifer tubes to supplement existing tubes and monitoring wells will be installed in January.

- The hexavalent chromium concentration in well K-130 was 73 ug/L for the November sampling event as compared to 86 ug/L in October.

100-NR-2

- The pump and treat system operated normally during the report period. Average flow rate was 63 gpm. Run times were: 98.8% for the report period, 99.3% for the year to date and 93.1% since inception.

- Draft test plans for the laboratory phases of alternative treatment options (phytoremediation and apatite passive barrier) for strontium-90 were prepared by PNNL.

- The initial phase of the DQO to determine additional data needs for determining aquatic and riparian impacts was begun. Interviews with Ecology and DOE-RL leads were held. Tribal and HAB interviews are next. Ecology is summarizing stakeholder and tribal input on assessment endpoints.

Attachment 8

In Situ Redox Manipulation

Status of the Barrier

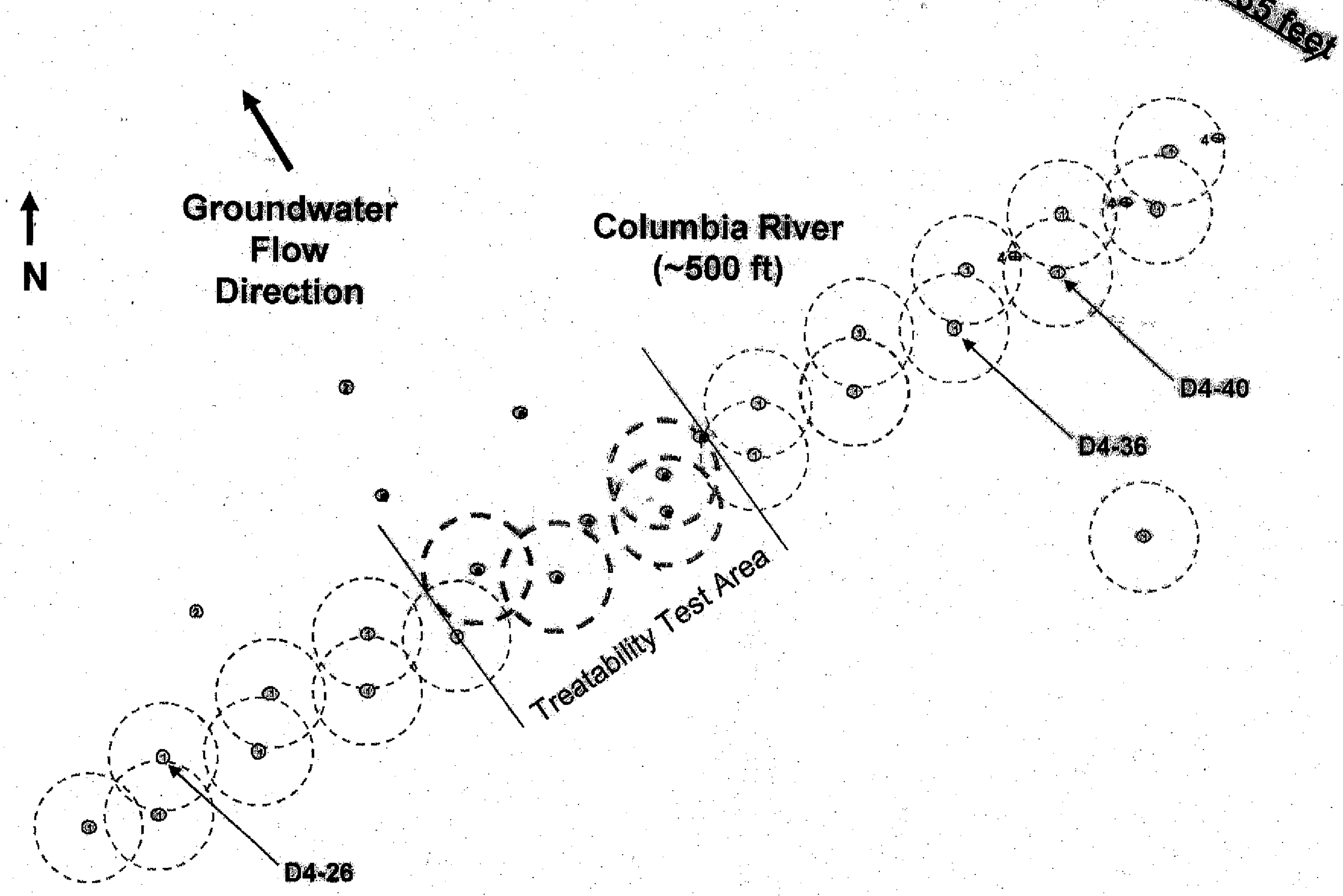
Scott Petersen

December 4, 2003

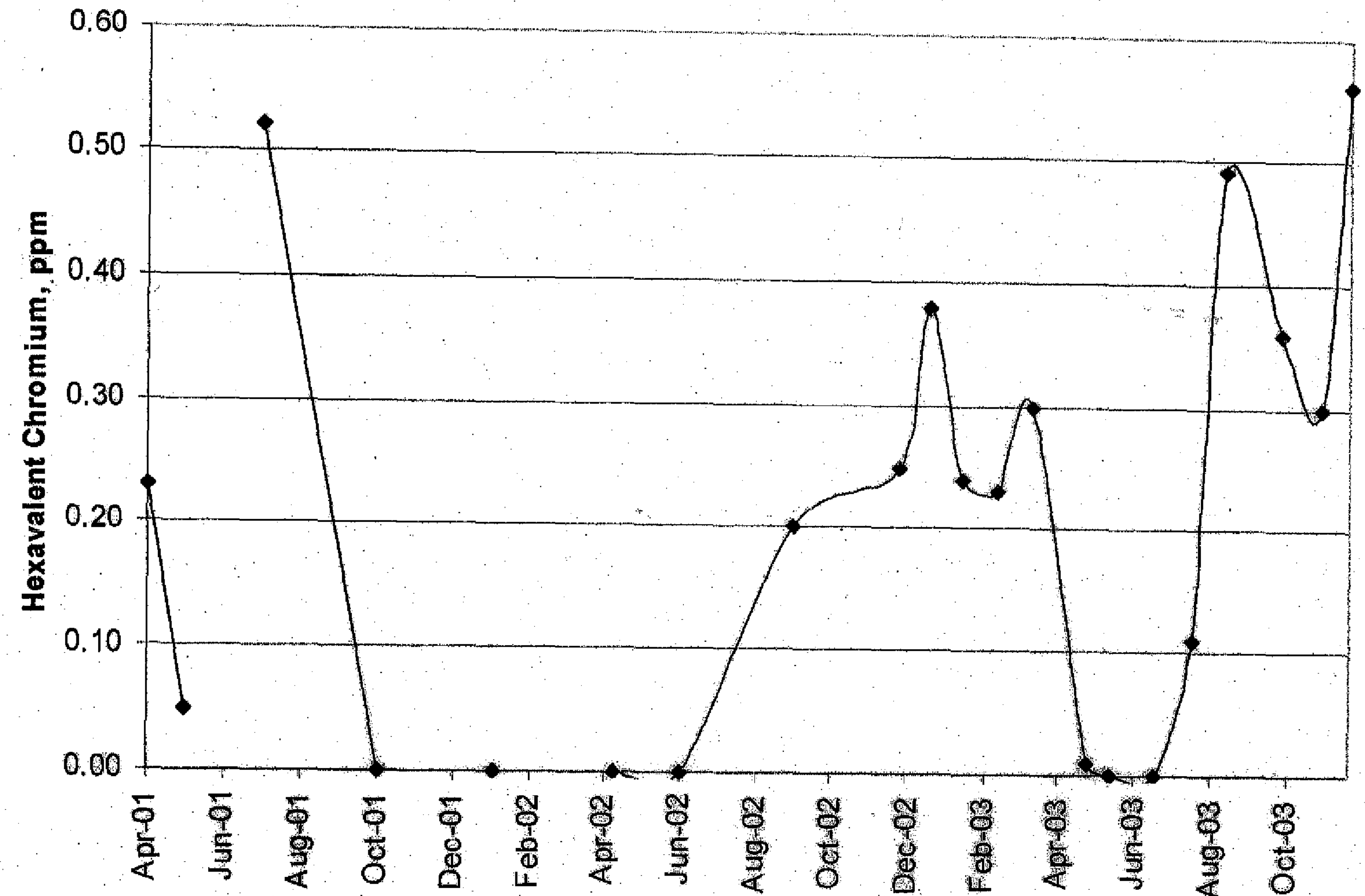
Summary of Barrier Performance

- The initial treatability test wells, injected in 1997 & 1998, showed signs of breakdown after about 2 years
- Other wells that have begun to lose their reductive capacity:
  - D4-36, ~60 m to the east of the test wells
  - D4-26, ~60 m to the west of the test wells

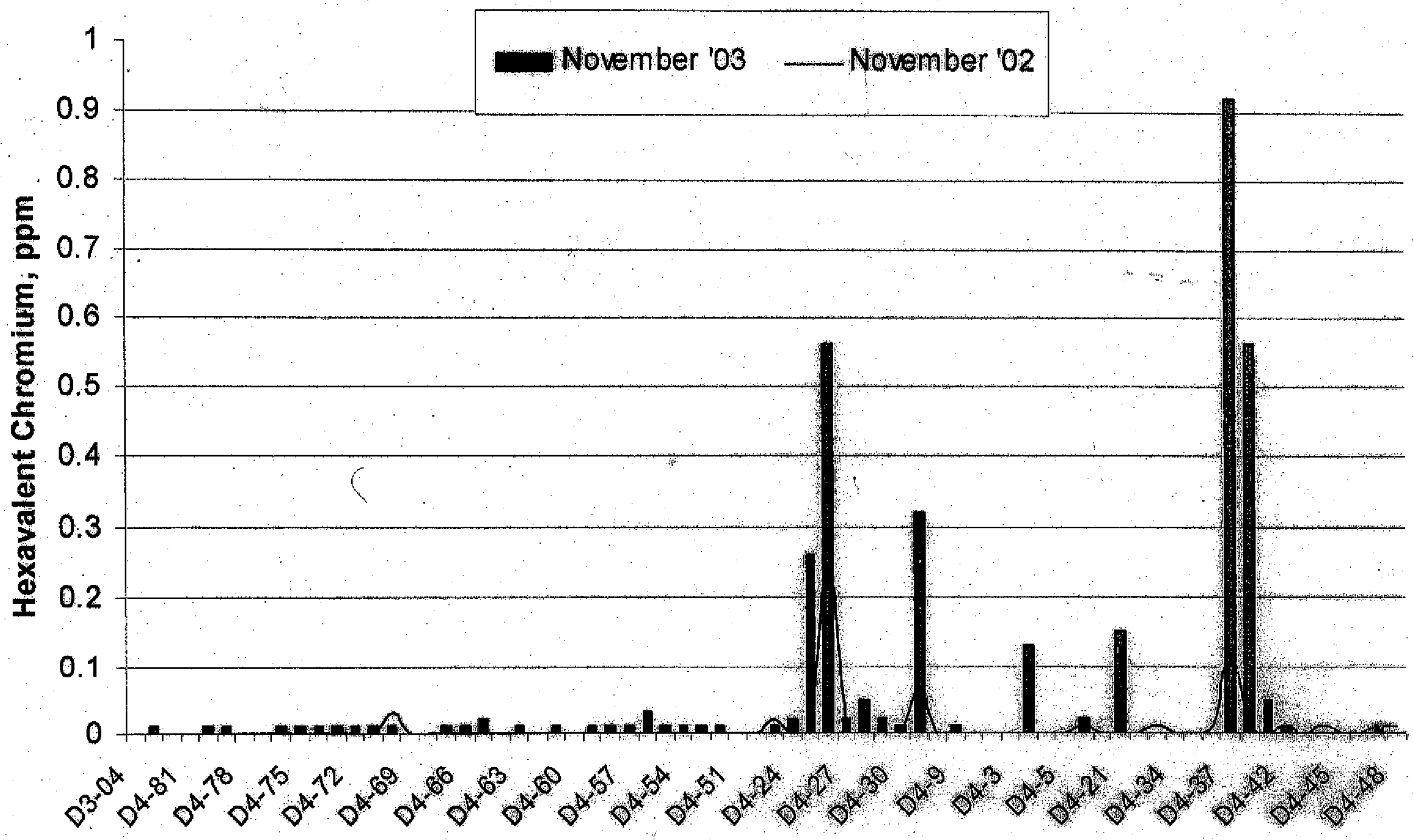
Northeastern ISRM Wells



ISRM Well D4-26



Comparison of Two Wells in November



Possible Causes of Breakdown

- Heterogeneity
  - Would allow rapid re-oxygenation of high-flow velocity zones
- Fluctuating water table
  - oxygenation from water level decline
- Variability in reduced iron content and other geochemical indicators
- Formation disturbance (fracturing) / trapped air from air rotary drilling
- Re-oxygenation of reduced zone during Air Rotary Drilling
- Natural re-oxygenation rates (dissolved oxygen content in the natural groundwater)

Investigations Conducted

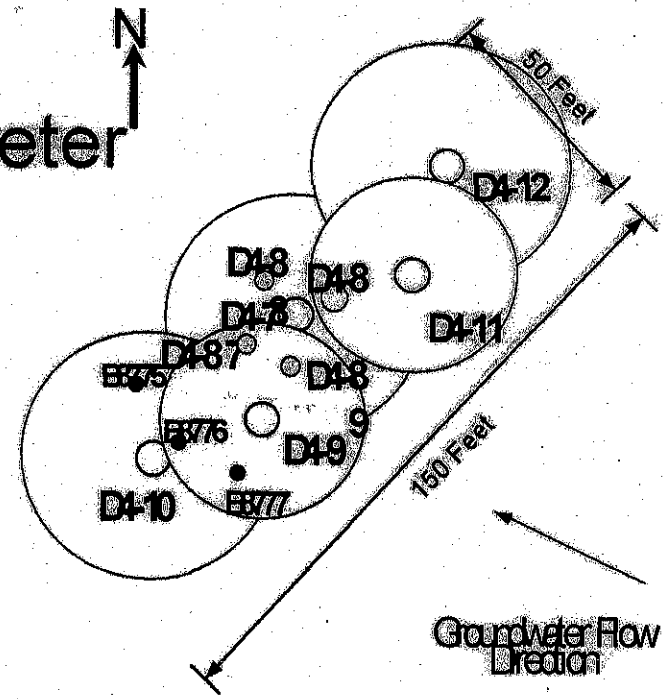
- Collected and analyzed core in treatability test area
- Used Electromagnetic Borehole Flowmeter to evaluate in situ permeability
- Deployed the colloidal borescope to determine in situ changes in flow rate

Core Collection and Analysis

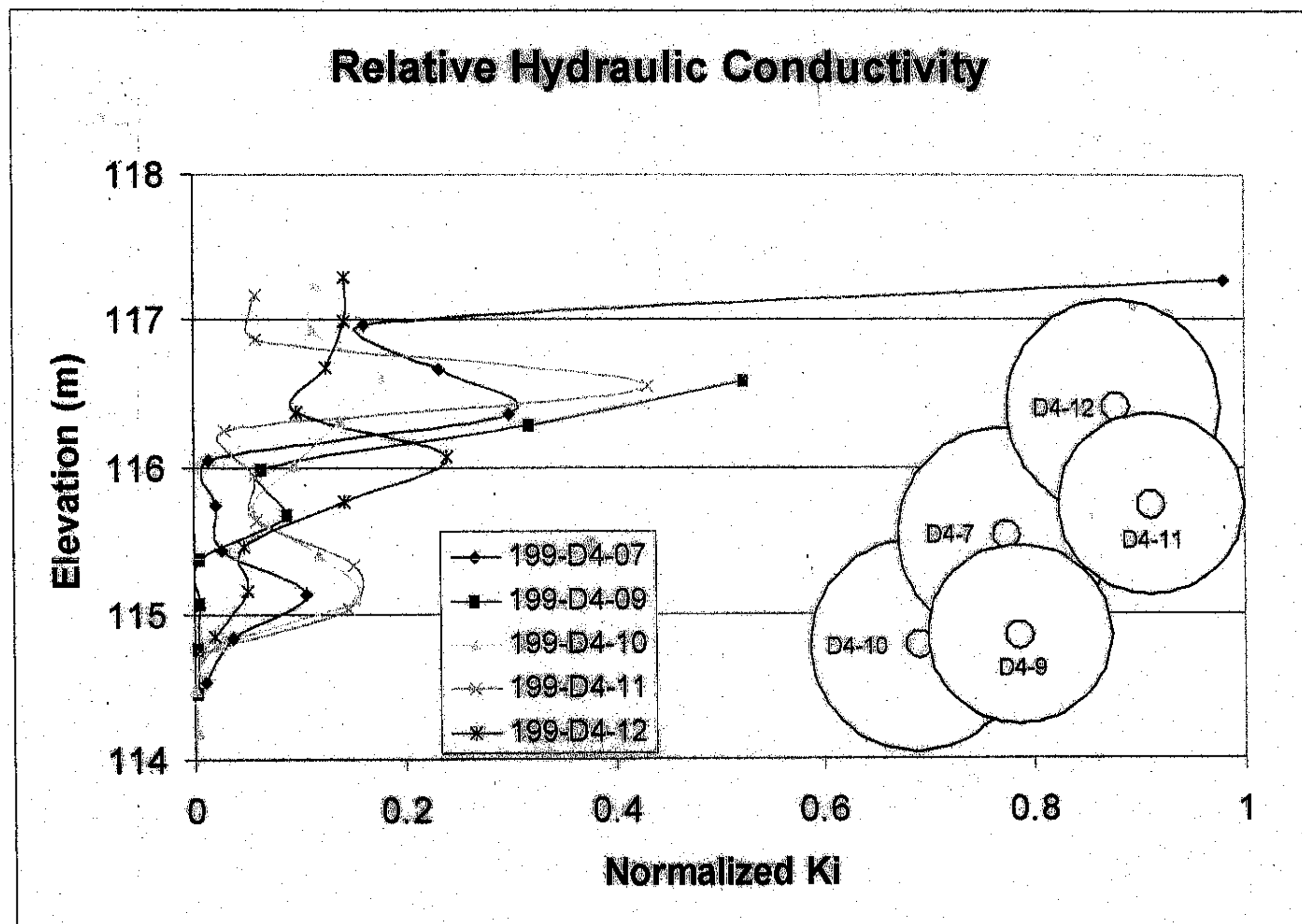
- Sixteen samples were collected from the treatability test area (before reinjection)
  - total and reduced iron contents
  - color, as an indication of oxidation
- Results
  - average reductive capacity same as 1999
  - interval ~91 ft bgs had low reductive capacity in 2 wells
  - no correlation between amount of reduced iron and porosity (correlated with permeability)

In Situ Flow Measurements

- Electromagnetic Borehole Flowmeter deployed in 12 wells in 2002
  - Demonstrated vertical heterogeneity
  - Poor correlation between wells
- Colloidal Borescope deployed in 5 wells in 2003
  - Significant vertical variation
  - Poor correlation with EBF (3 wells compared)
  - Significant vertical flow in all wells
  - No correlation between flow profiles of adjacent wells

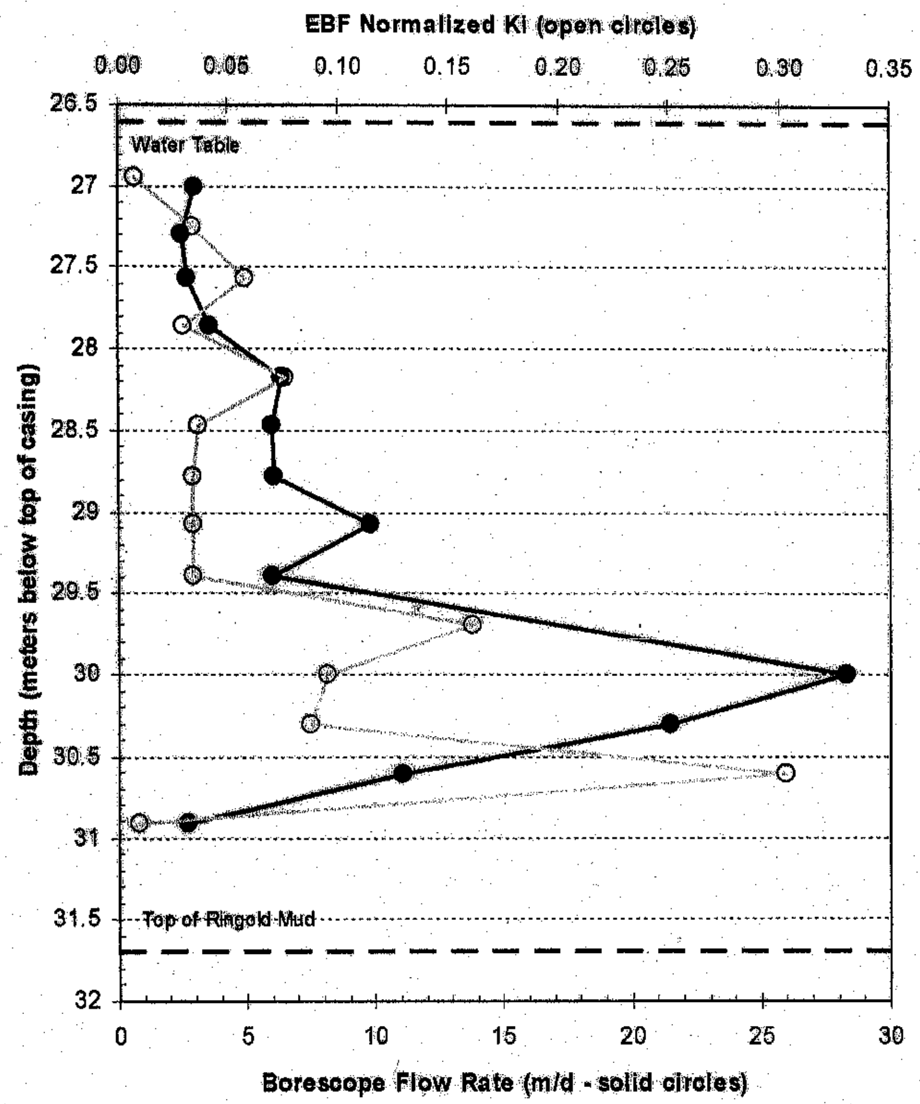


EBF Results



Relative Hydraulic Conductivity
118
117
116
115
114
Elevation (m)
0
0.2
0.4
0.6
0.8
1
Normalized Ki
199-D4-07
199-D4-09
199-D4-10
199-D4-11
199-D4-12
D4-12
D4-7
D4-11
D4-10
D4-9

Colloidal Borescope Results



Upcoming Actions

- Requested a Technical Assistance grant from DOE-HQ
  - Scheduled for January-February conference, report to follow
  - Additional actions contingent on expert panel recommendations
    - May include experimental studies
- Preparing SAP and Long-Term Monitoring Plan
- Testing new monitoring technology
  - In situ chromium analyzer

WMP-18051
Revision 0

Sampling and Analysis Instruction for Aquifer Sampling Tubes Sampling and Installation Fall 2003

Prepared for the U.S. Department of Energy
Assistant Secretary for Environmental Management

Fluor Hanford
P.O. Box 1000
Richland, Washington

Contractor for the U.S. Department of Energy
Richland Operations Office under Contract DE-AC06-96RL13200

Fiscal Year 2004 Aquifer Sampling Tube Installation and Sampling DOE/RL and 100 Area Unit Manager's Approval

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Arlene Tortoso, DOE/RL (A6-38)

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Dennis A. Faulk, EPA (B5-01)

Approval: Laurence E Gadbois — Date: 11-17-03
Laurence E. Gadbois, EPA (B5-01)

Approval: [signature] — Date: 11/14/03
Michael L. Goldstein, EPA (B5-01)

Approval: [signature] — Date: 11/17/03
for Wayne W. Soper, WDOE (B5-18)

WMP-18051
Revision 0

Sampling and Analysis Instruction for Aquifer Sampling Tubes Sampling and Installation Fall 2003

R. F. Raidl, FH

September 2003

Prepared for the U.S. Department of Energy
Assistant Secretary for Environmental Management

Fluor Hanford
P.O. Box 1000
Richland, Washington

Contractor for the U.S. Department of Energy
Richland Operations Office under Contract DE-AC06-96RL13200

Chris Willingham 11/6/03 N/A
Clearance Approval | Date | Release Approval (stamp)

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APPROVAL PAGE

Title: Sampling and Analysis Instruction for Aquifer Sampling Tubes Sampling and Installation Fall 2003

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Groundwater Protection Program, Task Lead

V. G. Johnson — 10-28-03

Signature — Date

TABLE OF CONTENTS

TABLES

APPENDICES

ACRONYMS

BHI	Bechtel Hanford, Inc.
CERCLA	*Comprehensive Environmental Response, Compensation, and Liability Act of 1980*
COC	contaminant of concern
DQO	data quality objective
ERC	Environmental Restoration Contractor
FH	Fluor Hanford
FY	fiscal year
HASQARD	*Hanford Analytical Services Quality Assurance Requirements Document*
HEIS	Hanford Environmental Information System
HSRCM	*Hanford Site Radiological Control Manual*
ICP	inductively coupled plasma
ISRM	In Situ Redox Manipulation
OU	operable unit
QA	quality assurance
QC	quality control
RL	U.S. Department of Energy, Richland Operations Office
SAF	sample authorization form
SAI	sampling and analysis instruction
SAP	sampling and analysis plan
Tri-Party Agreement	*Hanford Federal Facility Agreement and Consent Order*

METRIC CONVERSION CHART

Into Metric Units

If You Know	*Multiply By*	*To Get*
Length		
inches	25.4	millimeters
inches	2.54	centimeters
feet	0.305	meters
yards	0.914	meters
miles	1.609	kilometers
Area		
sq. inches	6.452	sq. centimeters
sq. feet	0.093	sq. meters
sq. yards	0.0836	sq. meters
sq. miles	2.6	sq. kilometers
acres	0.405	hectares
Mass (weight)		
ounces	28.35	grams
pounds	0.454	kilograms
ton	0.907	metric ton
Volume		
teaspoons	5	milliliters
tablespoons	15	milliliters
fluid ounces	30	milliliters
cups	0.24	liters
pints	0.47	liters
quarts	0.95	liters
gallons	3.8	liters
cubic feet	0.028	cubic meters
cubic yards	0.765	cubic meters
Temperature		
Fahrenheit	subtract 32, then multiply by 5/9	Celsius
Radioactivity		
picocuries	37	millibecquerel

Out of Metric Units

If You Know	*Multiply By*	*To Get*
Length		
millimeters	0.039	inches
centimeters	0.394	inches
meters	3.281	feet
meters	1.094	yards
kilometers	0.621	miles
Area		
sq. centimeters	0.155	sq. inches
sq. meters	10.76	sq. feet
sq. meters	1.196	sq. yards
sq. kilometers	0.4	sq. miles
hectares	2.47	acres
Mass (weight)		
grams	0.035	ounces
kilograms	2.205	pounds
metric ton	1.102	ton
Volume		
milliliters	0.033	fluid ounces
liters	2.1	pints
liters	1.057	quarts
liters	0.264	gallons
cubic meters	35.315	cubic feet
cubic meters	1.308	cubic yards
Temperature		
Celsius	multiply by 9/5, then add 32	Fahrenheit
Radioactivity		
millibecquerel	0.027	picocuries

1.0 INTRODUCTION

1.1 OBJECTIVES

Aquifer sampling tubes have been sampled annually in the fall since 1997 to provide contaminant concentrations where known plumes have reached the groundwater – Columbia River mixing zone. In addition, aquifer sampling tubes provide additional control between groundwater monitoring wells. Generalized field sampling and quality assurance requirements are discussed in "Sampling and Analysis Plan for Aquifer Sampling Tubes" DOE/RL-2000-59.

Additional aquifer sampling tubes have been proposed in the 100B/C, 100-K, 100-D/DR, 100-H, and 100-F reactor areas to replace destroyed or non-operating tubes or to fill in gaps in coverage along the shoreline. Also new sites have been proposed along the 300 Area shoreline.

This document provides instructions for collecting samples from both existing aquifer sampling tubes and new FY 2004 installations.

Results of aquifer tube sampling are used for the following:

- Verifying the presence or absence of contaminants of concern (COCs) at locations along the Columbia River shoreline
- Increasing knowledge of the nature, concentration, and extent of chemical and radiological indicators and the COCs in the groundwater at locations adjacent to the river
- Increasing understanding of the vertical distribution of contamination in the aquifer adjacent to the Columbia River
- Supplying data for risk assessments
- Supporting final action decisions for interim remedial actions that are underway at the 100-H, 100-K, and 100-D Areas
- Supporting monitoring efforts for other Hanford Site projects in the 100-BC-5, 100-FR-3 and 300-FF-5 operable units.

The following section provides background information about the project, a summary of the results from any previous investigations, a list of the contaminants of concern (COCs), and a definition of the problem.

1.2 BACKGROUND

The Hanford Site became a Federal facility in 1943 when the U.S. Government took possession of the land to produce nuclear materials for defense purposes. The Hanford Site's production mission continued until the late 1980s, when the mission changed from producing nuclear materials to cleaning up the radioactive and hazardous wastes that had been generated over the previous 45 years.

Aquifer sampling tubes are small-diameter polyethylene tubes that have a screen at the lower end. The tubes are implanted into the aquifer by driving a temporary steel casing into the ground and inserting a tube into the casing. The end of each tube is fitted with a screened section that acts as the sampling port. The temporary steel casing is driven by either a hydraulic ram attached to a vehicle or by a hand-carried pneumatic air hammer. The steel casing is then backpulled, leaving the tube (and the stainless-steel drive point) in place. Water is withdrawn from the tube using a peristaltic pump. The tubing exposed at the ground surface is of minimal length (several feet) and is protected from wildlife and the elements by polyvinyl chloride conduit.

1.3 PREVIOUS INVESTIGATIONS

After completion of initial porewater studies, installation and sampling of the first 14 aquifer sampling tubes occurred in October and November 1995 along the 100-D/DR Area shoreline. Aquifer sampling tube DD-39, located adjacent to the high hexavalent chromium (632 pc/L) porewater sampling site, reported up to 839 pc/L of hexavalent chromium. The result of this effort was documented by *Chromium in River Substrate Pore Water and Adjacent Groundwater: 100-D/DR Area, Hanford Site, Washington* (Hope and Peterson 1996) and led to the discovery of the chromium plume located west of the D and D/R Reactors. The high survivability of the tubes installed in the fall of 1995 resulted in follow-up sampling and installation of additional tubes.

Tubes were installed and sampled at 70 of the planned 89 additional locations in September through November 1997. Aquifer tube locations and sampling methodology were developed in a series of workshops held by Environmental Restoration Contractor (ERC) personnel with DOE/RL, the U.S. Environmental Protection Agency, the Washington Department of Health, and the Washington State Department of Ecology on September 15, 1997 (Peterson et al. 1997). Each location was equipped with one to three tubes, for a total of 178 new aquifer sampling tubes. Water was withdrawn from each installed tube, and the sample with the highest specific conductivity greater than 200 µS/cm (judged to be most representative of groundwater) was selected for additional onsite and offsite analysis.

The results of this effort are presented in *Aquifer Sampling Tube Completion Report: 100 Area and Hanford Townsite Shorelines* (Borghese et al. 1998). The tubes were sampled in October through November 1998 (Lee and Raidl 2000). Highlights of the results from this sampling include elevated hexavalent chromium in the 100-K, 100-D/DR, and 100-H Areas; elevated gross beta in the 100-B/C and 100-H Areas; and elevated tritium in the 100-B/C Area.

Additional sampling events took place in the 100-B/C, 100-K, 100-D/DR, 100-H, and 100-F Areas in the fall of 1999, 2000, and 2001 using the same screening techniques used the 1998 sampling effort. The last sampling event occurred from November 2002 into January 2003.

Sampling results were reported in the following:

- "Aquifer Sampling Tubes at the 100 Area and Hanford Townsite Shoreline," BHI, 2000
- "Aquifer Sampling Tubes Data Summary," BHI, 2001
- "Aquifer Sampling Tubes Data Summary, Fall 2001," BHI, 2002

The reporting of sampling results for the November 2002 January 2003 event is in progress.

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2.0 PROJECT MANAGEMENT

The following section identifies the individuals or organizations participating in the project and discusses specific roles and responsibilities of the individuals/organizations. This section also discusses the quality objectives for measurement data, and discusses the special training requirements for the staff performing the work.

2.1 PROJECT/TASK ORGANIZATION

The aquifer sampling tube project will be managed through the Groundwater Remediation Project , managed by Jane Borghese. Field support services will provide field management, and the field superintendent will be Russ Fabre. Samplers will be from PNNL and the geosciences support organization managed by Craig Swanson. A plan of the day meeting will be conducted on a daily basis to discuss safety and sampling objectives, and to provide personnel accountability. Rich Mahood will be the daily facilitator for the plan of the day meetings for the installation crews.

2.2 QUALITY REQUIREMENT FOR ANALYTICAL DATA

The required detection limits and precision and accuracy requirements for each of the analyses to be performed are summarized in Table 2-1.

Table 2-1 - Contaminants of Concern Analytical Requirements for Aquifer Tube Samples (2 Pages)

COCs	CAS #	MCL [c] GW[a]	Name/ Analytical Technical	Target Required Quantitation Limits	Precision Water	Accuracy Water
Radionuclides		**pCi/L**		**pCi/L**		
Gross alpha	12587-46-1	15	GPC	3	+-20%	70-130%
Gross beta	12587-46-2	50	GPC	4	+-20%	70-130%
Carbon-14	14762-75-5	2,000	Chemical sep. - liquid scintillation	200	+-20%	70-130%
Hydrogen-3 (tritium)	10028-17-8	20,000	Tritium - liquid scintillation	400	+-20%	70-130%
Total radioactive strontium	Sr-rad	8[c]	Total radioactive strontium - GPC	2	+-20%	70-130%
Chemicals						
Anions		**mg/L**		**mg/L**		
Chloride	16887-48-8	250	Anions - 9056 - IC	0.2	d	d
Fluoride	16984-48-8	4	Anions - 9056 - IC	0.5	d	d
Nitrate (as NO_3)	14797-55-8	45	Reflectometer-*MS100 and MS310*	5 mg/L		

Table 2-1 - Contaminants of Concern Analytical Requirements for Aquifer Tube Samples (2 Pages)

COCs	CAS #	MCL [c] GW[a]	Name/ Analytical Technical	Target Required Quantitation Limits	Precision Water	Accuracy Water
Nitrite(as NO_2)	14797-65-0	3.3	Anions - 9056 - IC	0.25	d	d
Phosphate	14265-44-2	None	Anions - 9056 - IC	0.5	d	d
Sulfate	14808-79-8	250	Anions - 9056 - IC	0.5	d	d
Sulfide	18496-25-8	2	Sulfide - 9030	0.5	d	d
Metals (Inorganics)		**mg/L**		**mg/L**		
Chromium VI	18540-29-9	0.1	Chromium (hexavalent) - 7196 - colorimetric	0.01	d	d

[a] Unless otherwise noted, radionuclide values were calculated from National Bureau of Standard maximum permissible concentrations (per Handbook 69 [NBS 1963]); chemical values based on maximum contaminant level (40 CFR 141).
[b] Water values for sampling QC (e.g., equipment blanks or rinses) or drainable liquids (if recovered).
[c] Maximum contaminant level (40 CFR 141).
[d] Precision and accuracy requirements as defined for the referenced U.S. Environmental Protection Agency procedures.
AEA = alpha energy analysis
CFR = *Code of Federal Regulations*
GPC = gas proportional counting
GW = groundwater
IC = ion chromatography
ICPMS = inductively coupled plasma/mass spectrometry
TBD = to be determined

2.3 SPECIAL TRAINING REQUIREMENTS

Fluor Hanford personnel training or certification requirements are described in CP-PRO-013, *Employee Training,* and *CP-MP-005*, *Central Plateau Remediation Project Training Plan.* Field personnel shall have completed the following mandatory training before starting work:

- Occupational Safety and Health Administration 40-Hour Hazardous Waste Worker Training
- Radiation Worker Training
- Hanford General Employee Training

Training will be required for use of field screening instruments and onsite analytical equipment including procedure:

- CP-GPP-EE-05, Procedure 1.17, "Determination of Hexavalent Chromium in Water, Wastewater, and Soils Utilizing the HachDR/2000 and DR/2010 Spectrophotometers," Revision 0.

PNNL will be responsible for assuring that project staff meet the Hanford site training requirements.

3.0 MEASUREMENT/DATA ACQUISITION

The following section presents the sampling process design, along with the requirements for sample collection, sample handling, custody, preservation, containers, and holding times. This section also addresses the requirements for field and laboratory quality control (QC), instrument calibration and maintenance, and field documentation.

3.1 SITE SELECTION

Aquifer sampling tube sampling during the fall of 2003 will consist of sample existing tube sites by Pacific Northwest Nuclear Laboratory staff and field screening of newly installed tubes by Fluor Hanford Geosciences Support staff. Existing and proposed aquifer sampling tube sites are displayed in Appendix A through F.

Existing aquifer sampling tube sites (see Table 3-1) were selected for the fall 2003 sampling round based on meeting one or more of the following criteria:

- A contaminant identified previously in a sample collected from the tube was present in concentrations above MCLs or the pump and treat action level for Cr VI (22 ug/L)
- The aquifer tube site is adjacent to an active surface source remediation that could impact downgradient water quality
- The aquifer tube site would provide coverage to fill in holes between groundwater monitoring wells.
- The aquifer tube site would provide a background sample.

New locations were selected to fill in coverage gaps or to replace destroyed or non functioning aquifer sampling tubes.

Table 3-1 - Sampling Locations and Required Analytes for Existing Sites

Tube #	Analyte Hexavalent Chromium	Anions	Field Parameters	Strontium 90	Tritium	Carbon-14
			100-BC-5 (PNNL)			
04/S/M/D	X	X	X	X	X	
05-S/M/D	X	X	X	X	X	
06-S/M/D	X	X	X	X	X	
07-M/D	X	X	X	X	X	
			100-KR-4 (FH)			
15-M	X	X	X	X	X	
17-M/D	X	X	X	X	X	X
21-S/M	X	X	X	X	X	
22-M/D	X	X	X	X	X	
14-D	X	X	X	X	X	

19D	X	X	X	X	X	X
25D	X	X	X			
26-S/M/D	X	X	X			
DK-04	X	X	X			
			100 D/DR			
DD-12-4	X	X				
DD-15-3	X	X				
DD-17-2	X	X				
DD-39-1/2	X	X				
DD-41-2/3	X	X				
DD-42-4	X	X				
DD-44-3/4	X	X			X	
DD-49-3/4	X	X				
DD-50-1/2	X	X			X	
35-S/M	X	X				
36/S/M/D	X	X				
37-S	X	X				
38-H/D	X	X				
			ISRM Porewater Tubes			
Redox-2	X	X				
Redox-3		X				
			100-H			
46-D	X	X				
47-M/D	X	X				
48-S/M	X	X				
49-S/M/D	X	X				
50-S/M	X	X				
51-S/M/D	X	X				
62-H/D	X	X				
			100-FR-3 (PNNL)			
64-D	X	X	X	X	X	
65-S/	X	X	X	X	X	
66S/M/D	X	X	X	X	X	

Notes:

1. All tubes in cluster will be sampled, and analyzed for hexavalent chromium. The sample with the highest conductivity will be analyzed for the other constituents, unless specified otherwise.

S=Shallow M=Mid Depth D=Deep

New FY 2004 aquifer sampling tubes will be pumped shortly after installation by the FH crew that installed them. The FH crew will record field parameters and perform a HACH® analysis for hexavalent chromium. The PNNL crew will follow up later and collect samples for the analyses shown in Table 3-2.

3.2 SAMPLING METHODS REQUIREMENTS

All aquifer sampling tube samples will be collected using a peristaltic pump. Analyte suite, QC samples, and analytical method requirements (specified in Table 2-1) will dictate sample volumes. Final sample volumes and containers are specified in the Fluor Hanford Sampling Authorization Form (SAF) or PNNL equivalent.

The aquifer sampling tube sampling process for new FY 2004 aquifer tubes is described below:

1. Confirm that selected tubes remain.
2. Re-label, if necessary.
3. Collect a water sample from each tube, measuring specific conductance.
4. If highest specific conductance is >160 µS/cm, continue with sampling. Some tube samples will be analyzed for hexavalent chromium even if the specific conductance is less than 160 µS/cm.
5. Measure field parameters (i.e., temperature, pH, specific conductance, turbidity, and dissolved oxygen).
6. Collect samples in accordance with the analyte list for the tube site as specified on Table 3-2.
7. If the tube with highest specific conductance does not produce an adequate amount of water for sampling, proceed to tube with next highest specific conductance and attempt to collect samples.
8. If none of the tubes at a site produce an adequate amount of water for sampling, select the tube with the highest specific conductance and collect samples in accordance with the following priorities.
9. Measure conductivity (field parameter) of river water.
10. After sampling is completed, re-measure field parameters.
11. Document all measurements and field sampling observations in a field logbook in accordance with HNF-PRO-10863, *Notebooks & Logbooks*.
12. Place the tubes back into the PVC.
13. Move to the next site.

Table 3.2 - Fiscal Year 2004 Aquifer Tube Installations and Proposed Analyses

Temporary Site Name	Operable Unit	Anions_300_	Fld_CR6F	Fld_Parameters[1]	Fld-REDOX	ICPF_6010A_RCRA	SR8990_SR90	Trit_906_0	Uran	VOA_8260A_RCRA	C-14
AT-B-1	100-BC-5	x		x	x	x		x			
AT-B-2	100-BC-5	x		x	x						
AT-B-3	100-BC-5	x	x	x	x	x	x	x			
AT-B-4	100-BC-5	x		x	x	x	x	x			
AT-B-5	100-BC-5	x		x	x	x	x	x			
AT-B-6	100-BC-5	x		x	x	x	x	x			
AT-K-1	100-KR-4	x	x	x			x	x			x
AT-K-2	100-KR-4	x	x	x			x	x			x
AT-K-3	100-KR-4	x	x	x			x	x			
AT-K-4	100-KR-4	x	x	x			x				
AT-K-5	100-KR-4	x	x	x			x				
AT-K-6	100-KR-4	x	x	x			x				
AT-D-1	100-HR-3(D)	x	x	x							
AT-D-2	100-HR-3(D)	x	x	x							
AT-D-3	100-HR-3(D)	x	x	x							
AT-D-4	100-HR-3(D)	x	x	x							
AT-D-5	100-HR-3(D)	x	x	x							
AT-H-1	100-HR-3(H)	x	x	x							
AT-H-2	100-HR-3(H)	x	x	x							
AT-H-3	100-HR-3(H)	x	x	x							
AT-F-1	100-FR-3	x		x	x						
AT-F-2	100-FR-3	x		x	x	x	x	x			
AT-F-3	100-FR-3	x		x	x	x	x	x			
AT-F-4	100-FR-3	x		x	x						
AT-3-1	300-FF-5	x		x	x				x	x	
AT-3-2	300-FF-5	x		x	x	x			x	x	
AT-3-3	300-FF-5	x		x	x	x			x	x	
AT-3-4	300-FF-5	x		x	x	x			x	x	
AT-3-5	300-FF-5	x		x	x	x			x	x	
AT-3-6	300-FF-5	x		x	x	x			x	x	
AT-3-7	300-FF-5	x		x	x	x			x	x	
AT-3-8	300-FF-5	x		x	x	x			x	x	

Notes:

1. Field parameters include temperature, pH, turbidity, dissolved oxygen and conductivity.

FH samplers will perform field screening analysis in accordance with CP-GPP-EE-01 and CP-GPP-EE-05. PNNL staff will collect samples from the sites listed on Table 3-1 and post screening samples listed on Table 3-2 in accordance with PNNL procedures equivalent to those in CP-GPP-EE-01.

Field pH, conductivity, turbidity, dissolved oxygen, and temperature measurements will be performed in accordance with the manufacturer's instructions for the instrument.

3.3 SAMPLE HANDLING, SHIPPING, AND CUSTODY REQUIREMENTS

All sample handling, shipping, and custody should be performed in a accordance with CP-GPP-EE-01, Procedure 3.1, "Sample Packaging and Shipping;" Procedure 3.0, "Chain of Custody"; and Procedure 4.2, "Sample Storage and Shipping Facility," or the PNNL equivalent.

3.4 SAMPLE PRESERVATION, CONTAINERS, AND HOLDING TIMES

The sample preservation, container, and holding time requirements for the analyses to be performed are summarized in Table 3-2.

Table 3-3 - Radionuclides							
STLRL	RAD	906.0_H3_LSC	6 months	P	1	1,000	mL
TMA	RAD	906.0_H3_LSC	6 months	P	1	1,000	mL
STLRL	RAD	ALPHA_GPC	6 months	G/P	1	600	mL
STLRL	RAD	ALPHA_GPC	6 months	G/P	1	1,000	mL
TMA	RAD	ALPHA_GPC	6 months	G/P	2	1,000	mL
WSCF	RAD	ALPHA_GPC	6 months	G/P	1	1,000	mL
STLRL	RAD	BETA_GPC	6 months	G/P	1	600	mL
STLRL	RAD	BETA_GPC	6 months	G/P	1	1,000	mL
TMA	RAD	BETA_GPC	6 months	G/P	2	1,000	mL
WSCF	RAD	BETA_GPC	6 months	G/P	1	1,000	mL
STLRL	RAD	C14_LSC	6 months	G/P	1	1,500	mL
TMA	RAD	C14_LSC	6 months	G/P	1	1,000	mL
222-S	RAD	GAMMA_GS	6 months	G/P	1	1,000	mL
STLRL	RAD	GAMMA_GS	6 months	G/P	1	2,250	mL
TMA	RAD	GAMMA_GS	6 months	G/P	1	1,000	mL
WSCF	RAD	GAMMA_GS	6 months	G/P	1	1,000	mL
222-S	RAD	SRTOT_SEP_PRECIP_GPC	6 months	G/P	1	1,000	mL
STLRL	RAD	SRTOT_SEP_PRECIP_GPC	6 months	G/P	3	1,000	mL
TMA	RAD	SRTOT_SEP_PRECIP_GPC	6 months	G/P	2	1,000	mL
WSCF	RAD	SRTOT_SEP_PRECIP_GPC	6 months	G/P	1	1,000	mL
Sulfate							
222-S	GENCHEM	9056_ANIONS_IC	28 days/48 hours	G/P	1	60	mL

TMA	GENCHEM	9056_ANIONS_IC	28 days/48 hours	G/P	1	250	mL
TMA	GENCHEM	9056_ANIONS_IC	28 days/48 hours	G/P	1	300	mL

Specific field analyses requirements include the following:

- Chrome 6-Hach: If water samples cannot be analyzed within 4 hours, samples should be stored at 4°C (±2°C) for up to 24 hours. All water samples shall be analyzed within 24 hours of sample collection.

3.5 QUALITY CONTROL REQUIREMENTS

The minimum number of QC samples required for the analytical laboratory are to be conducted in accordance with established laboratory contracts and are summarized below:

- One laboratory method blank for every 20 samples (5% of all samples), analytical batch, or sample delivery group (whichever is most frequent) will be carried through the complete sample preparation and analytical procedure. The method blank will be used to document contamination resulting from the analytical process.

- A matrix spike sample will be prepared and analyzed for every 20 samples (as applicable to the method used) of the same matrix or sample preparation batch, whichever is most frequent. The matrix spike results are used to document the bias of an analytical process in a given matrix.

- Laboratory duplicates or matrix spike duplicates will be used to assess precision and will be analyzed at the same frequency as the matrix spikes.

The field QC sample requirements are as follows:

- Field duplicate samples will be collected at a minimum frequency of 1 per 20 samples. Field duplicates are analyzed independently and provide information concerning the homogeneity of the matrix, as well as an evaluation of the precision of the sampling and analysis process.

- Split samples will be collected at a minimum frequency of 1 per 20 samples. Field split samples are two uniquely numbered samples produced through homogenizing a field sample and separating the sample material into two separate aliquots. Field split samples will be routed to separate laboratories for independent analysis, generally for the purposes of auditing the performance of the primary laboratory relative to a particular sample matrix and analytical method. Split samples may also be collected by regulatory agencies at any time deemed appropriate by the agencies.

3.6 INSTRUMENT CALIBRATION AND MAINTENANCE

All field screening and analytical instruments shall be calibrated and maintained in accordance CP-A-QA-03-5.2, "Onsite Measurements Quality Assurance Program." The results from all instrument calibration and maintenance activities shall be recorded in a bound logbook in accordance with procedures outlined in HNF-PRO-10868, Notebooks and Logbooks." Tags will be attached to all field screening and onsite analytical instruments noting the date when the instrument was last calibrated and the calibration expiration date.

3.7 FIELD DOCUMENTATION

Field documentation shall be kept in accordance with the following procedures:

- HNF-PRO-10863, *Notebooks and Logbooks*
- HNF-RD-15332, *Environmental Protection Requirements*, Revision 0
- HNF-PRO-15333, *Environmental Protection Process*, Revision 0
- CP-GPP-EE-01, Procedure 3.0, *Chain of Custody, Revision 0*
- Or PNNL equivalent

4.0 ASSESSMENTS AND RESPONSE ACTIONS

The Fluor Hanford Compliance and Quality Programs group may conduct random surveillance and assessments in accordance with HNF-PRO-246, "Management Assessments," to verify compliance with the requirements outlined in this sampling and analysis instruction, project work packages, the Fluor Hanford Inc (FH) quality management plan, and FH procedures and regulatory requirements.

Deficiencies identified by one of these assessments shall be reported in accordance with HNF-PRO-246, "Management Assessments." When appropriate, corrective actions will be taken by the Project Engineer in accordance with the *Hanford Analytical Services Quality Assurance Requirements Document* (HASQARD), Volume 1, Section 4.0 (DOE-RL 1996a), to minimize recurrence.

5.0 DATA VERIFICATION AND VALIDATION REQUIREMENTS

Data validation and verification are not required by this project. Other programs for aquifer tube samples (e.g., ISRM compliance sampling) may require project-specific data validation and verification. In those cases, verification and validation will be carried out using program-specific data validation procedures.

6.0 WASTE MANAGEMENT

Waste, including purgewater that is generated by sampling activities will be managed in accordance with existing regulator-approved waste management plans or waste control plans. For the aquifer sampling tubes, the approved plans are as follows:

- *Interim Action Waste Management Plan for the 100 HR-3 and 100-KR-4 Operable Units* (DOE-RL 1997, Rev. 4)
- *100-BC-5 Operable Unit Waste Control Plan* (Woolard 2000a)
- *100-FR-3 Operable Unit Waste Control Plan* (Furman, 2001).
- Waste Management Plan for the 300-FF-5 Operable Unit (DOE/RL-2000-56, Rev 1)

7.0 HEALTH AND SAFETY

All FH field operations will be performed in accordance with FH health and safety requirements, which are outlined in HNF-PRO-079 and CP-MD-001, and the requirements of the *Hanford Site Radiological Control Manual* (HSRCM) (DOE-RL 1996b). In addition, a work control package will be prepared to include an automated job hazard, site-specific health and safety plan, and applicable radiological work permits.

The sampling procedures and associated activities will consider exposure reduction and contamination control techniques that will minimize the radiation exposure to the sampling team as required by HNF-MP-599, "Quality Assurance Program Description," and HNF-PRO-079, "Job Hazard Analysis."

8.0 REFERENCES

Bechtel Hanford Inc., *Aquifer Sampling Tubes at the 100 Area and Hanford Townsite Shoreline*, 2000, Richland, Washington.

Bechtel Hanford Inc., *Aquifer Sampling Tues Data Summary*, 2001, Richland, Washington.

Bechtel Hanford Inc., *Aquifer Sampling Tubes Data Summary, Fall 2001*, 2002, Richland, Washington.

GP-GPP-EE-01, Procedure 3.0, *Chain of Custody*, Revision 0, March 26, 2003, Fluor Hanford, Inc., Richland, Washington.

GP-GPP-EE-01, Procedure 3.1, *Sample Packaging and Shipping*, Revision 0, June 25, 2003, Fluor Hanford, Inc., Richland, Washington.

GP-GPP-EE-01, Procedure 4.2, *Sample Storage and Shipping Facility*, Revision 0, March 31, 2003, Fluor Hanford, Inc., Richland, Washington.

CP-GPP-EE-05, Procedure 1.17, *Determination of Hexavalent Chromium in Water, Wastewater, and Solids Utilizing the HachDR/2000 and DR/2010 Spectrophotometers*, Revision 0, March 27, 2003, Fluor Hanford, Inc., Richland, Washington.

CP-MD-001, *Central Plateau Remediation Project Roles and Responsibilities*, Revision 2, April 2, 2003, Fluor Hanford, Inc., Richland, Washington.

CP-MP-005, *Central Plateau Remediation Project Training Plan*, Revision 1, February 27, 2003, Fluor Hanford, Inc., Richland, Washington.

CP-PRO-013, *Employee Training*, Revision 1, February 27, 2003, Fluor Hanford, Inc., Richland, Washington.

HNF-MP-599, *Quality Assurance Program Description*, Revision 11, January 22, 2003, Fluor Hanford, Inc., Richland, Washington.

HNF-PRO-079, *Job Hazard Analysis*, Revision 6, November 21, 2002, Fluor Hanford, Inc., Richland, Washington.

HNF-PRO-246, *Management Assessments*, Revision 7, May 2, 2003, Fluor Hanford, Inc., Richland, Washington.

HNF-PRO-10863, *Notebooks & Logbooks*, Revision 0, June 24, 2002, Fluor Hanford, Inc., Richland, Washington.

HNF-PRO-15333, *Environmental Protection Process*, Revision 0, August 8, 2003, Fluor Hanford, Inc., Richland, Washington.

HNF-RD-15332, *Environmental Protection Requirements*, Revision 0, August 8, 2003, Fluor Hanford, Inc., Richland, Washington.

DOE/RL, 1996b, *Hanford Site Radiological Control Manual* (HSRCM), DOE/RL-96-109, Rev. 0, U.S. Department of Energy, Richland Operations Office, Richland, Washington.

DOE/RL 1997, *Interim Action Waste Management Plan for the 100 HR-3 and 100-KR-4 Operable Units*, Revision 4, U.S. Department of Energy, Richland Operations Office, Richland, Washington.

Fuman, 100-FR-3 *Operable Unit Waste Control Plan*, 2001.

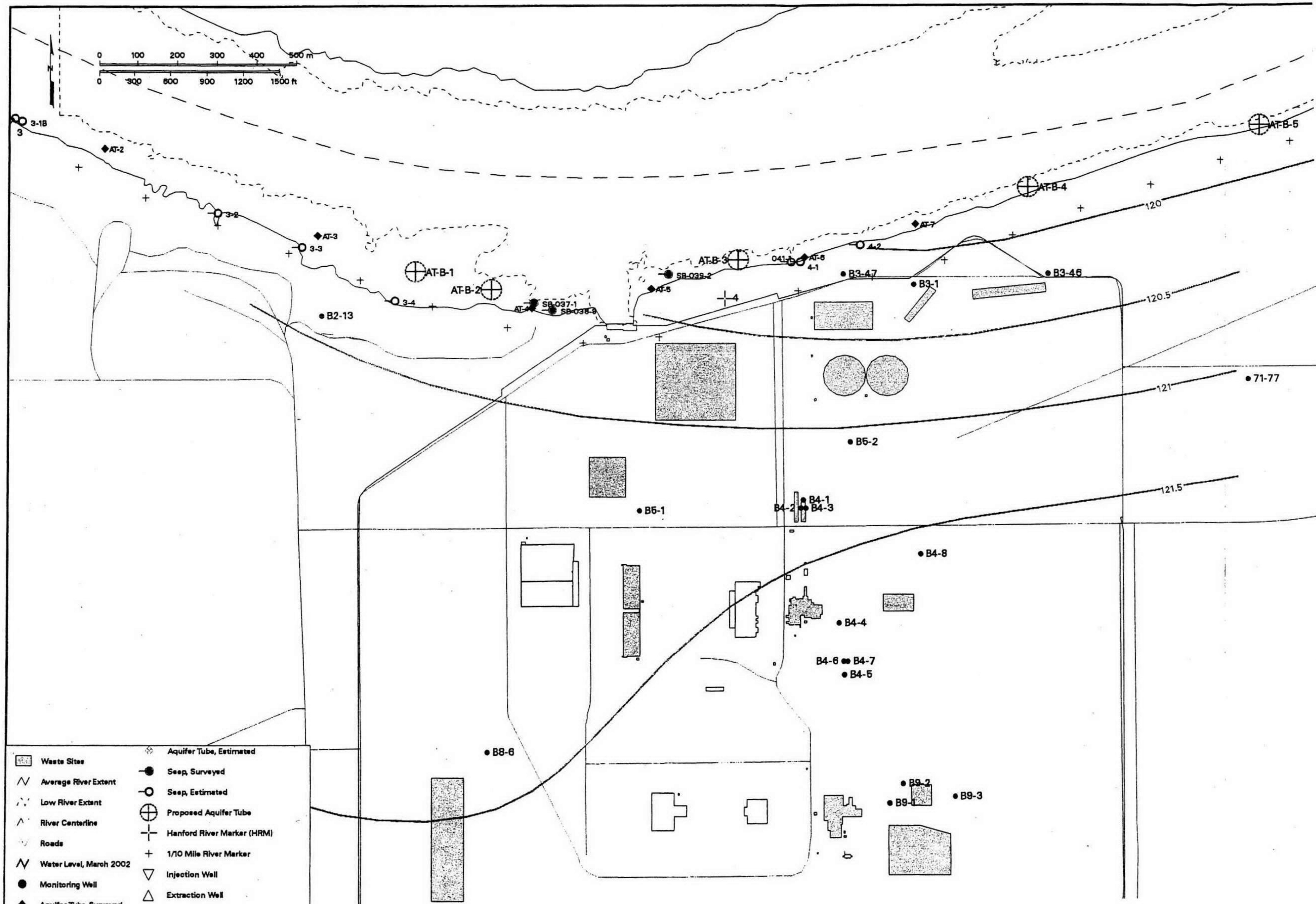
Hope and Peterson, "Chromium in River Substrate Pore Water and Adjacent Groundwater; 100-D/DR Area, Hanford Site," 1996.

J. V. Borghese, et.al., "Aquifer Sampling Tube Completion Report: 100Area and Hanford Townsite Shorelines," 1998.

Woolard 2000a, *100-BC-5 Operable Unit Waste Control Plan*.

APPENDIX A

Aquifer Sampling Tubes – 100 B/C Area



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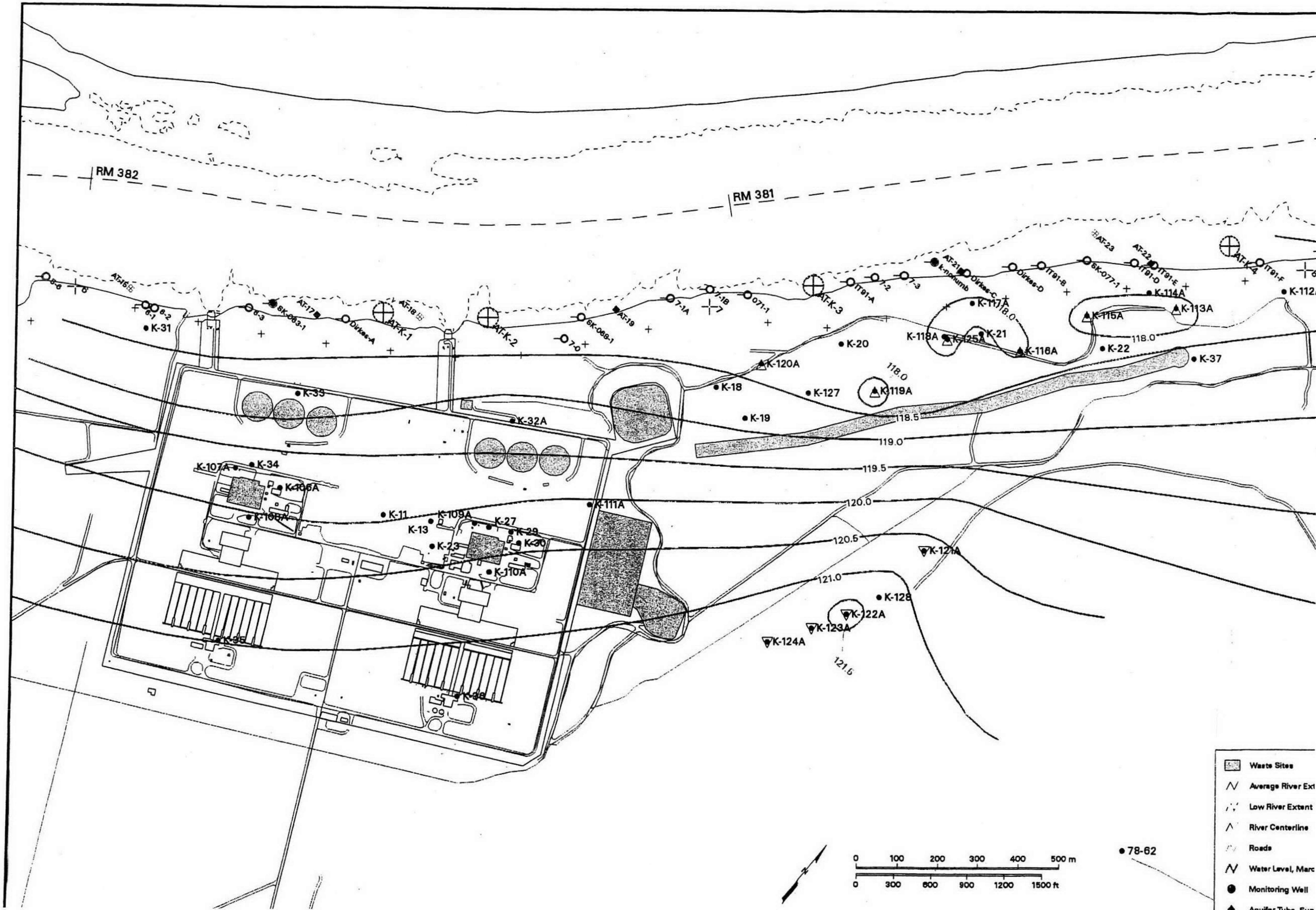
3-1B
3
AT-2
3-2
AT-3
3-3
AT-B-1
AT-B-2
3-4
AT-4
SB-037-1
SB-038-9
B2-13
SB-039-2
AT-5
AT-B-3
4
041-1
AT-6
4-1
4-2
AT-7
B3-47
B3-1
B3-46
AT-B-4
AT-B-5
120
120.5
121
121.5
71-77
B5-2
B5-1
B4-1
B4-2
B4-3
B4-8
B4-4
B4-6
B4-7
B4-5
B8-6
B9-2
B9-1
B9-3
Waste Sites
Average River Extent
Low River Extent
River Centerline
Roads
Water Level, March 2002
Monitoring Well
Aquifer Tube, Estimated
Seep, Surveyed
Seep, Estimated
Proposed Aquifer Tube
Hanford River Marker (HRM)
1/10 Mile River Marker
Injection Well
Extraction Well

APPENDIX B

Aquifer Sampling Tubes – 100 K Area



RM 382
RM 381
K-31
K-33
K-32A
K-34
K-107A
K-106A
K-108A
K-11
K-13
K-109A
K-27
K-29
K-30
K-23
K-110A
K-111A
K-18
K-19
K-20
K-127
K-120A
K-119A
K-118A
K-125A
K-21
K-117A
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K-115A
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K-113A
K-22
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K-122A
K-123A
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AT-K-2
AT-K-3
AT-K-4
Dirkes-A
Dirkes-C
Dirkes-D
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118.5
119.0
119.5
120.0
120.5
121.0
121.5
78-62
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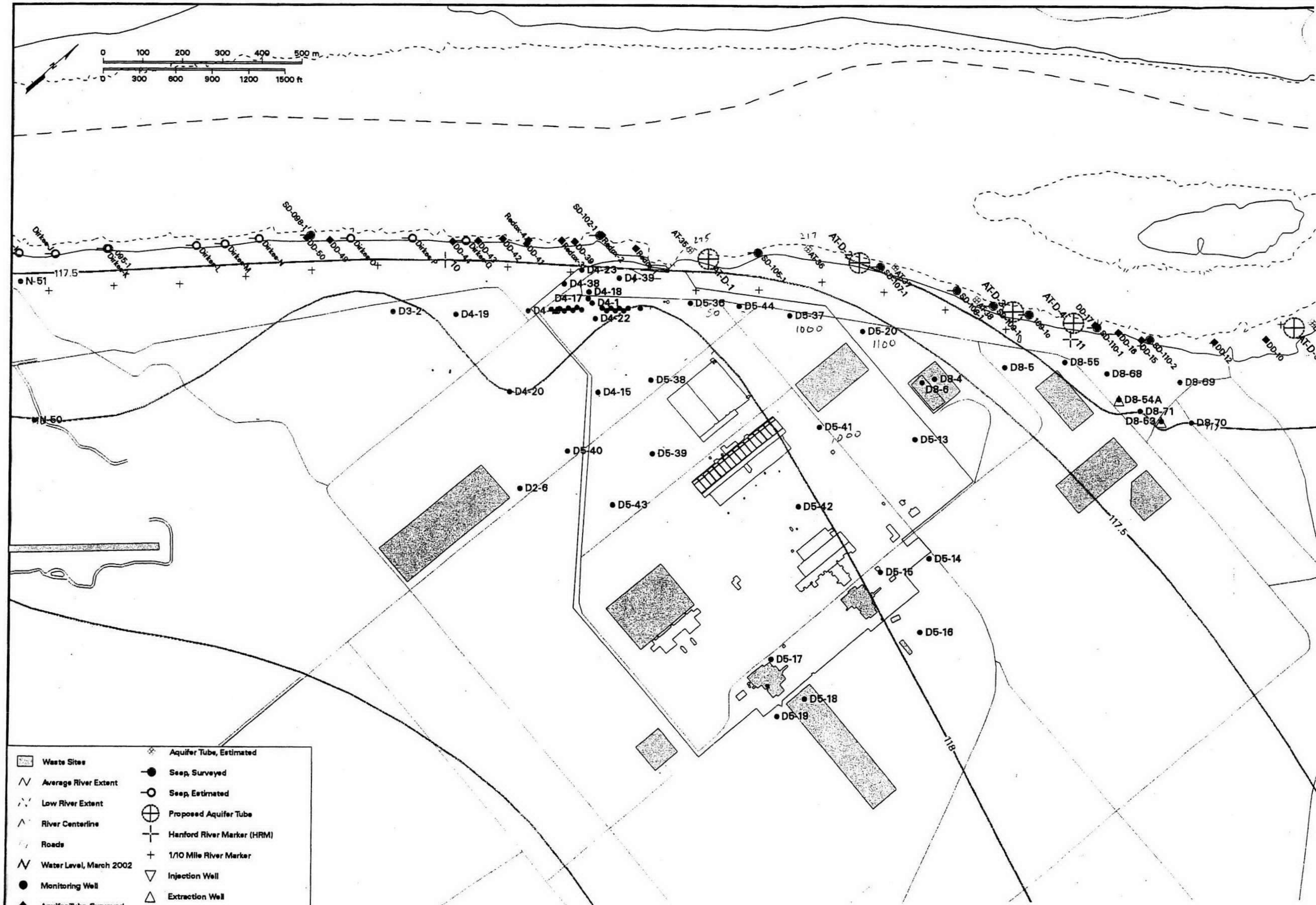
Waste Sites
Low River Extent
River Centerline
Roads
Monitoring Well

APPENDIX C

Aquifer Sampling Tubes – 100 D/DR Area



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117.5
118
N-51
N-50
D3-2
D4-19
D4-20
D4-15
D4-23
D4-38
D4-39
D4-18
D4-17
D4-1
D4-22
D4
D5-36
D5-44
D5-37
D5-20
D5-38
D5-41
D5-13
D5-40
D5-39
D2-6
D5-43
D5-42
D5-14
D5-15
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D5-17
D5-18
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D8-4
D8-6
D8-55
D8-68
D8-69
D8-54A
D8-71
D8-63
D8-70
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SD-102-1
SD-105-1
SD-107-1
SD-108-1
SD-109-1
SD-110-1
SD-110-2
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DD-49
DD-44
DD-42
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DD-39
DD-17
DD-18
DD-15
DD-12
DD-10
AT-D-1
AT-D-2
AT-D-3
AT-D-4
AT-36
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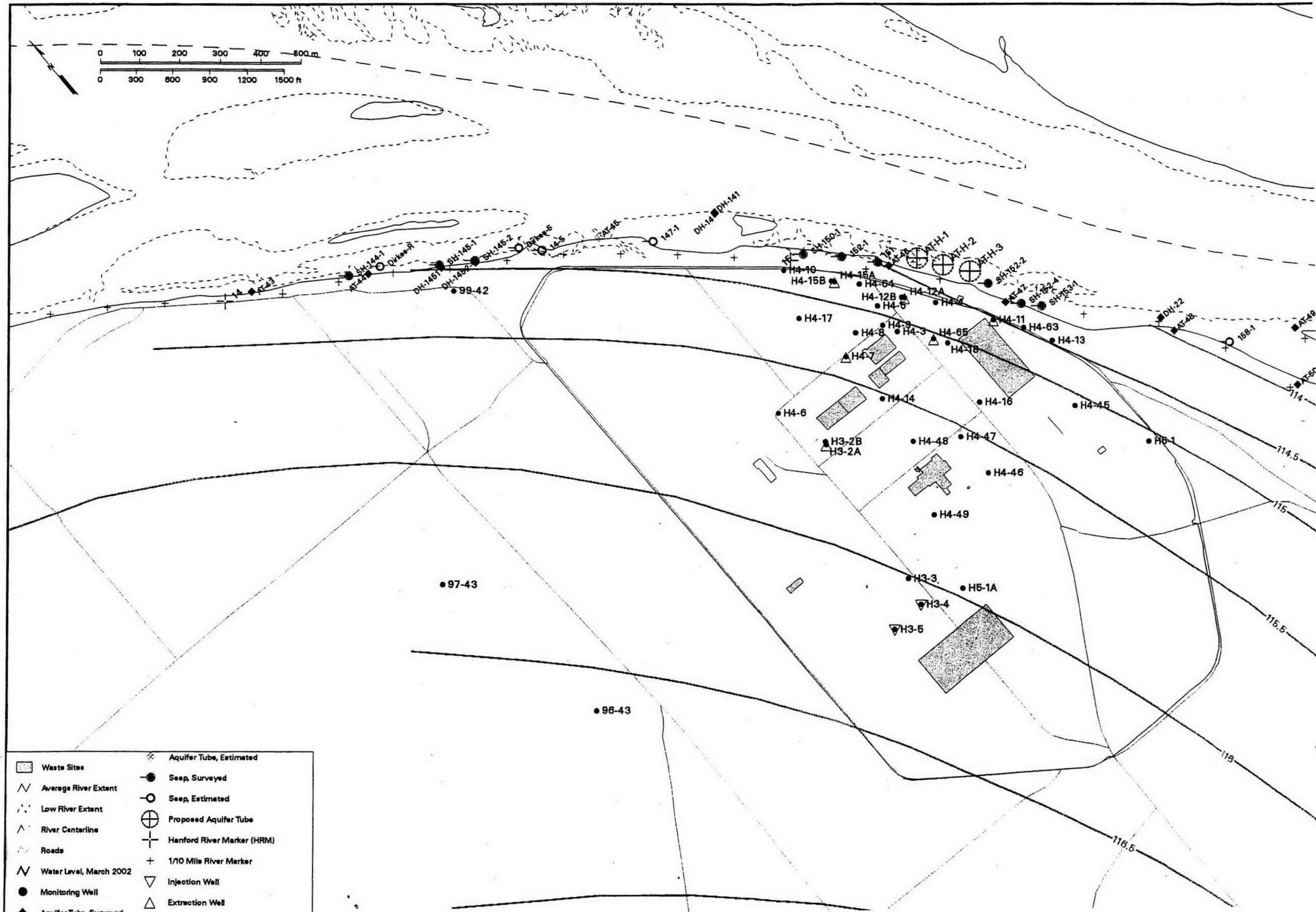
Monitoring Well
Aquifer Tube, Estimated
Seep, Surveyed
Seep, Estimated
Proposed Aquifer Tube
Hanford River Marker (HRM)
1/10 Mile River Marker
Injection Well
Extraction Well

APPENDIX D

Aquifer Sampling Tubes – 100-H Area



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1200
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AT-43
14
SH-145-1
SH-145-2
DH-1451
DH-1452
99-42
Dirkes-S
14-5
AT-45
147-1
DH-14
DH-141
SH-150-1
152-1
AT-46
AT-H-1
AT-H-2
AT-H-3
SH-152-2
AT-47
SH-152-4
SH-153-1
H4-10
H4-15A
H4-15B
H4-64
H4-12B
H4-12A
H4-5
H4-4
H4-17
H4-11
H4-63
H4-9
H4-8
H4-3
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H4-18
H4-13
H4-7
DH-22
AT-48
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H4-6
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H4-48
H4-47
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H4-49
97-43
H3-3
H5-1A
H3-4
H3-5
96-43
114
114.5
115
115.5
116
116.5
Waste Sites
Average River Extent
Low River Extent
River Centerline
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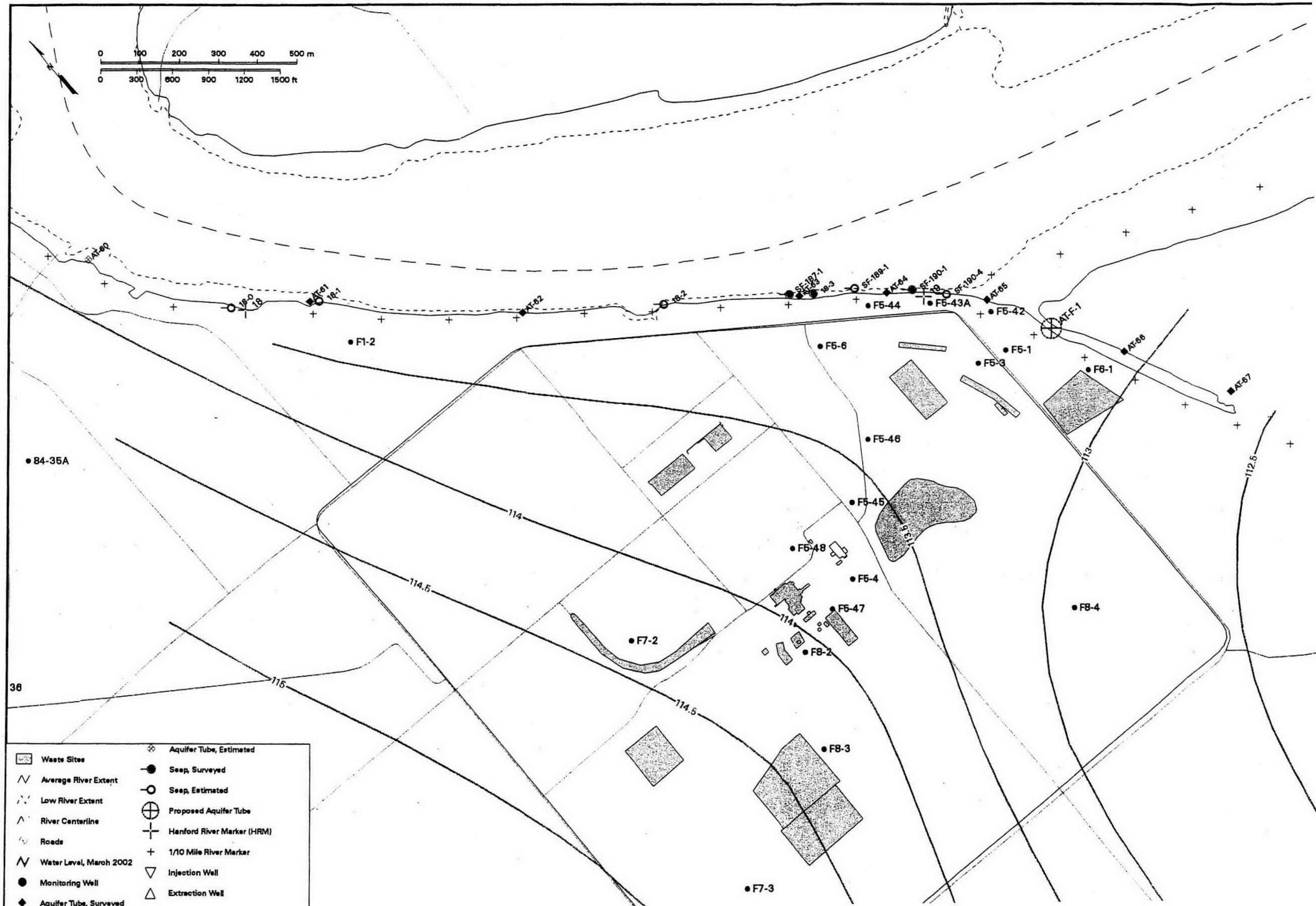
Monitoring Well
Aquifer Tube, Estimated
Seep, Surveyed
Seep, Estimated
Proposed Aquifer Tube
Hanford River Marker (HRM)
1/10 Mile River Marker
Injection Well
Extraction Well

APPENDIX E

Aquifer Sampling Tubes – 100-F Area (2 Pages)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F5-42
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AT-66
AT-67
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F5-1
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112.5
114
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F8-4
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F7-2
F8-2
36
115
114.5
F8-3
F7-3
Waste Sites
Average River Extent
Low River Extent
River Centerline
Roads
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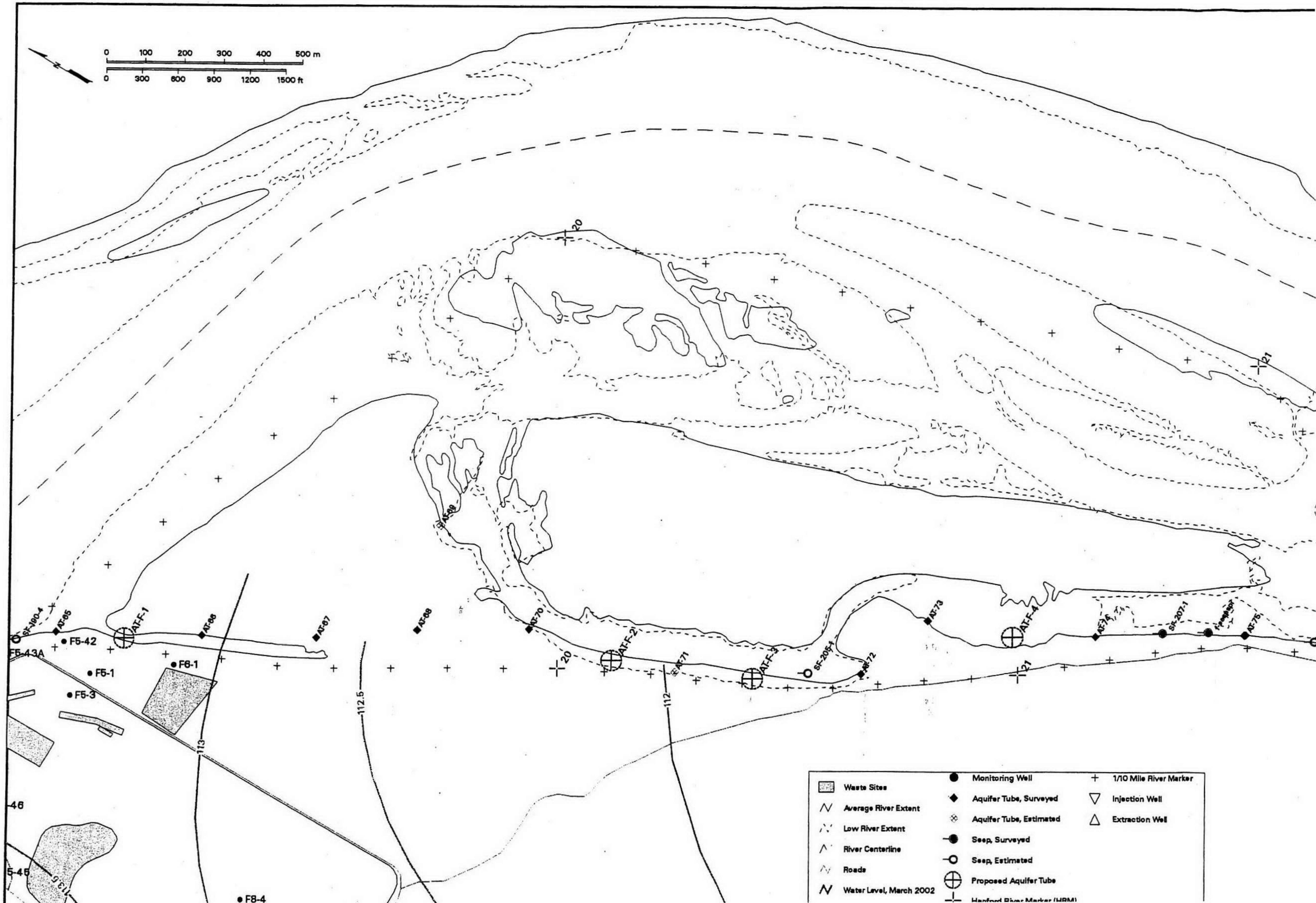
Monitoring Well
Aquifer Tube, Surveyed
Aquifer Tube, Estimated
Seep, Surveyed
Seep, Estimated
Proposed Aquifer Tube
Hanford River Marker (HRM)
1/10 Mile River Marker
Injection Well
Extraction Well



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F5-42
F5-43A
F5-1
F5-3
F6-1
F8-4
113
112.5
112
Waste Sites
Average River Extent
Low River Extent
River Centerline
Roads
Water Level, March 2002
Monitoring Well
Aquifer Tube, Surveyed
Aquifer Tube, Estimated
Seep, Surveyed
Seep, Estimated
Proposed Aquifer Tube
1/10 Mile River Marker
Injection Well
Extraction Well

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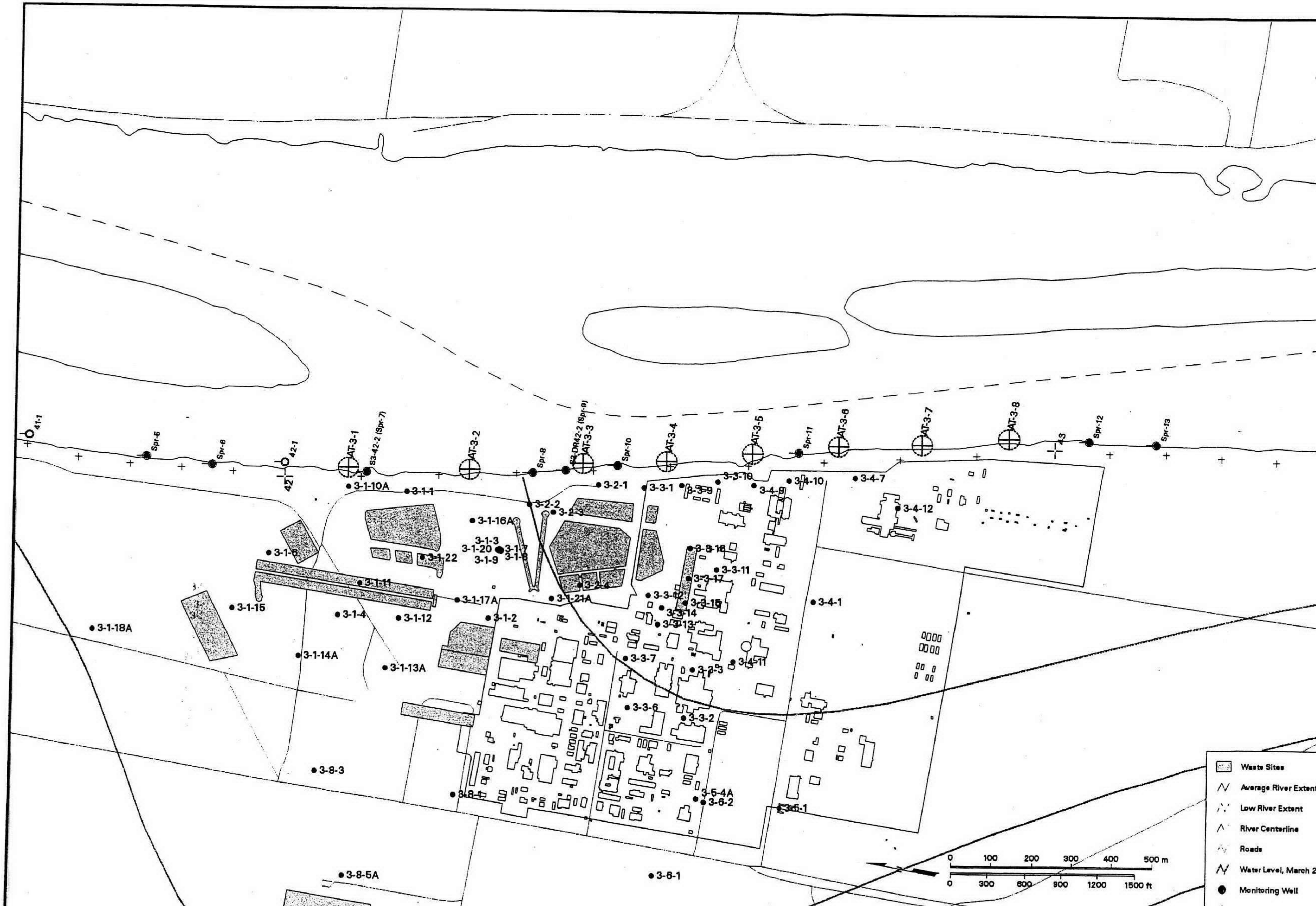
APPENDIX F

Aquifer Sampling Tubes – 300-Area



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Spr-6
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AT-3-1
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Spr-8
AT-3-3
Spr-10
AT-3-4
AT-3-5
Spr-11
AT-3-6
AT-3-7
AT-3-8
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Spr-12
Spr-13
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3-2-1
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3-6-4A
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0 300 600 900 1200 1500 ft
Waste Sites
Average River Extent
Low River Extent
River Centerline
Roads
Water Level, March 2
Monitoring Well

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Update #2 on Increased Concentrations of Tritium in Groundwater Near the KE and KW Reactor Complexes

Bob Peterson, PNNL, 373-9020
(December 4, 2003; 100-K Site Visit)

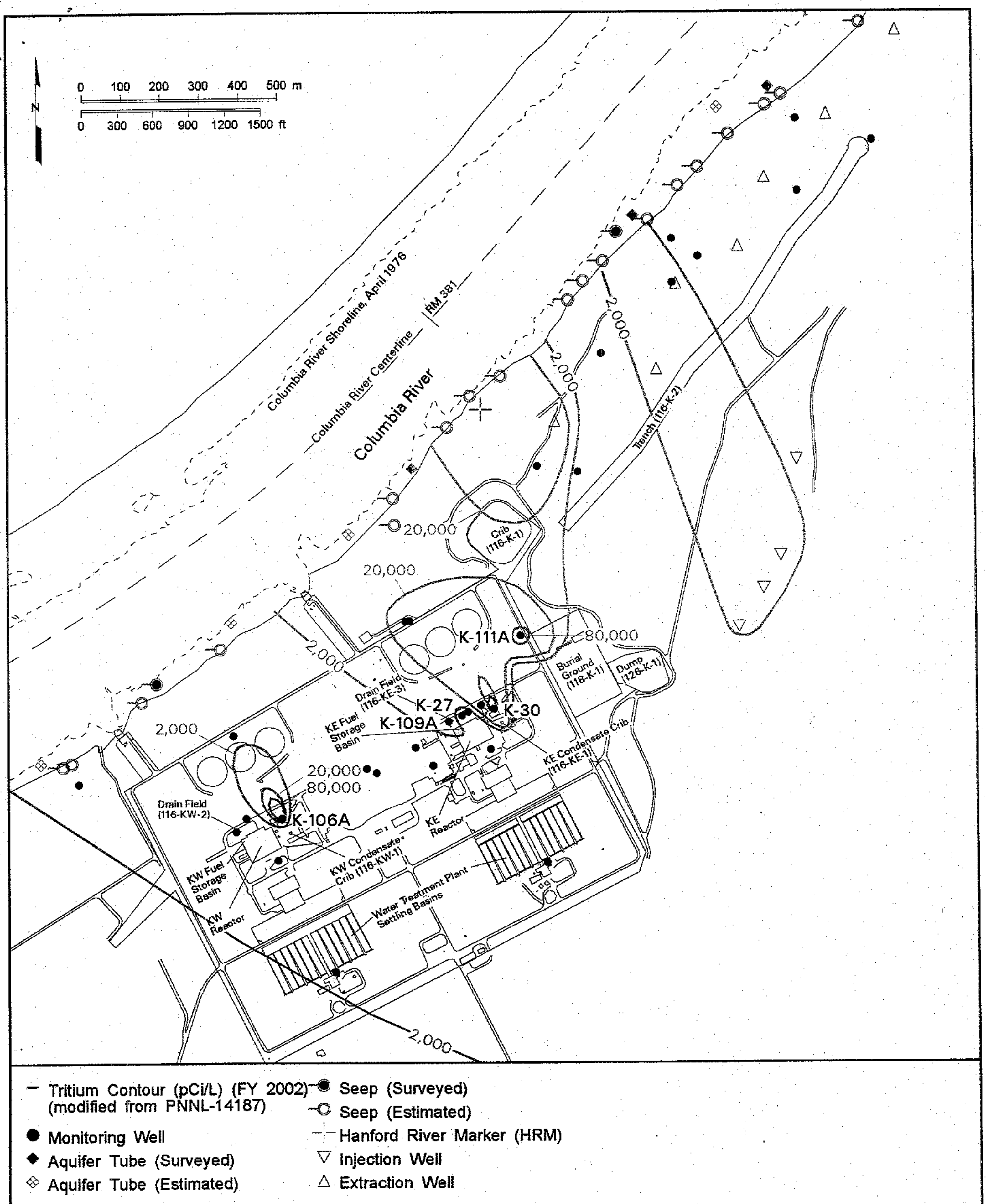
SYNOPSIS

The K-Basins groundwater monitoring task is tracking three recent changes in groundwater conditions near the KE and KW reactor complexes:

- Unexpected increases in tritium concentrations in two wells adjacent to the KE Basin (wells 199-K-27 and 199-K-109A):
    - A tritium plume created by 1993 leakage from the KE Basin was detected at 199-K-27 previously.
    - Increases in tritium and strontium-90 were observed at 199-K-109A as a result of leaking fire hydrants driving past-practices contaminants from the vadose zone.
    - Multiple potential sources for tritium in this area, including past-practices drain field and piping, and potential current loss from storage basin.

- Unexpected increase in tritium concentrations near the KW reactor (well 199-K-106A):
    - Well is located immediately downgradient of a past-practices disposal site that received liquid effluent containing tritium and carbon-14.
    - Coincident increases in groundwater temperature, and in nitrate.
    - Technetium-99, which is present in shielding water, was detected in recent samples.

- Elevated tritium concentrations in groundwater near the 100-K Burial Ground (well 199-K-111A):
    - Abrupt increase in tritium concentrations started in mid-2000; tritium previously undetected at well.
    - Special investigation identified several possible causes; circumstantial evidence indicates a previously unmapped tritium plume beneath the burial ground as a strong candidate (PNNL-14031).
    - Soil gas investigation confirms presence of excess helium-3 in vadose zone, suggesting presence of nearby vadose zone source of tritium and/or underlying groundwater plume.



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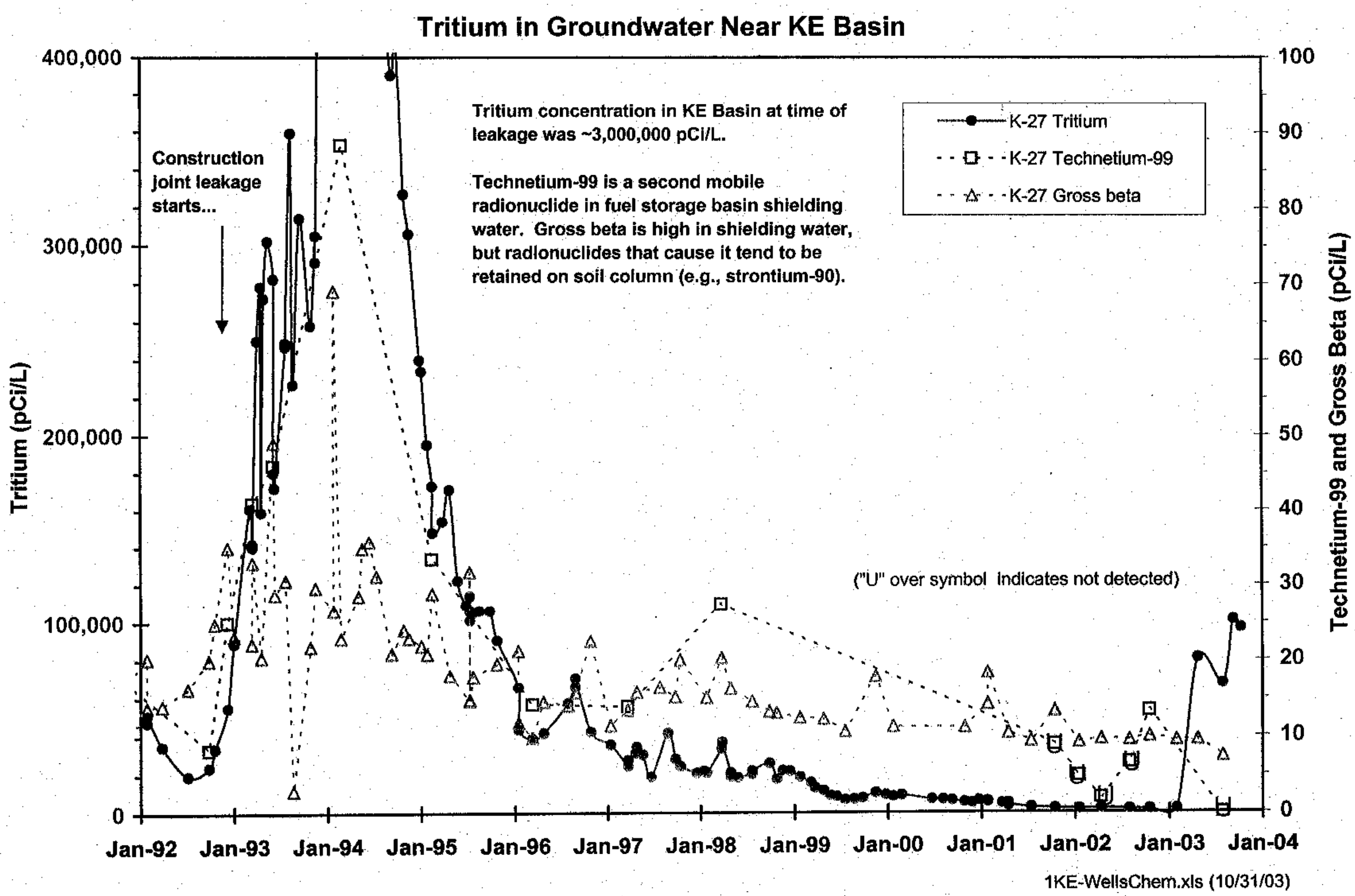
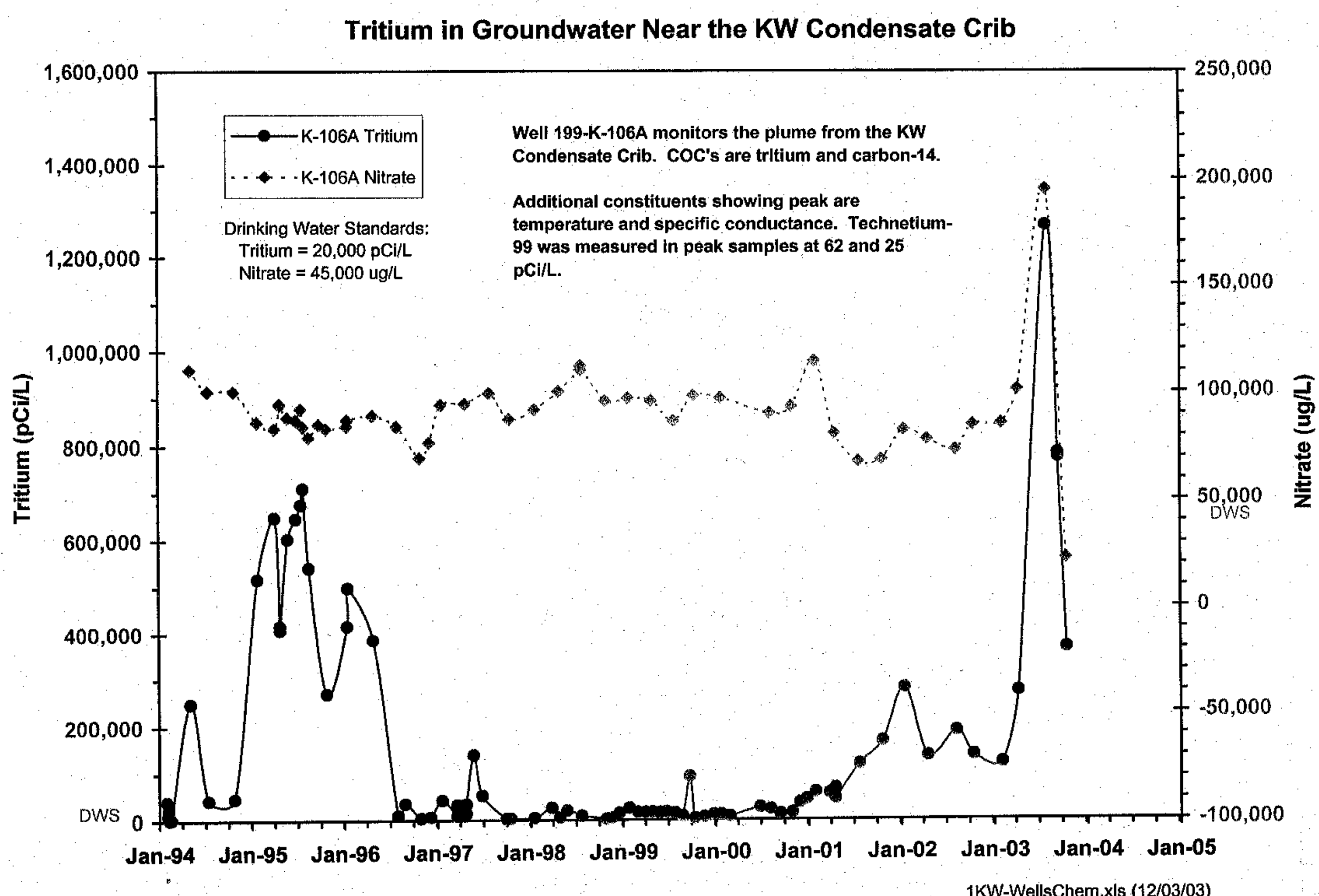
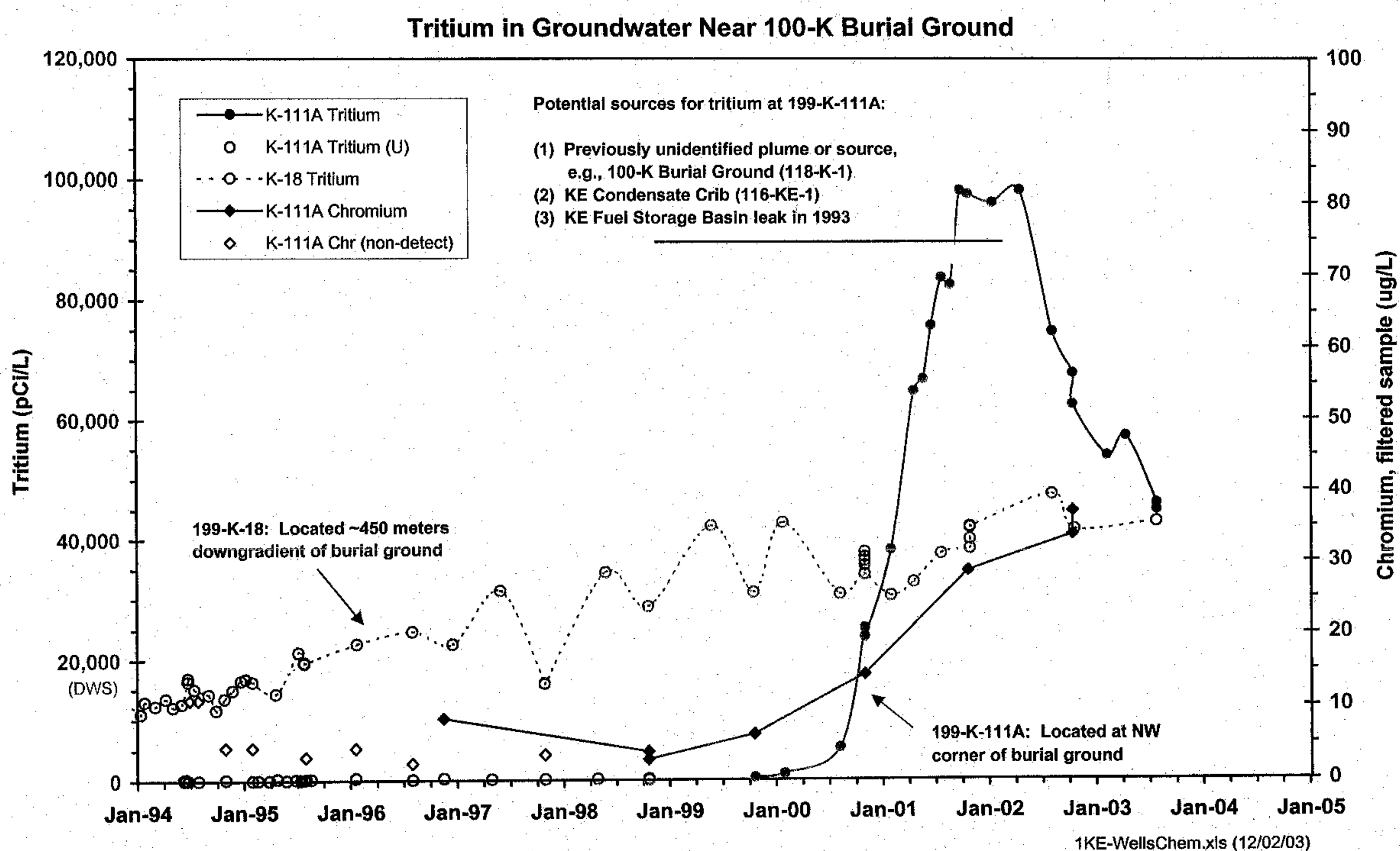


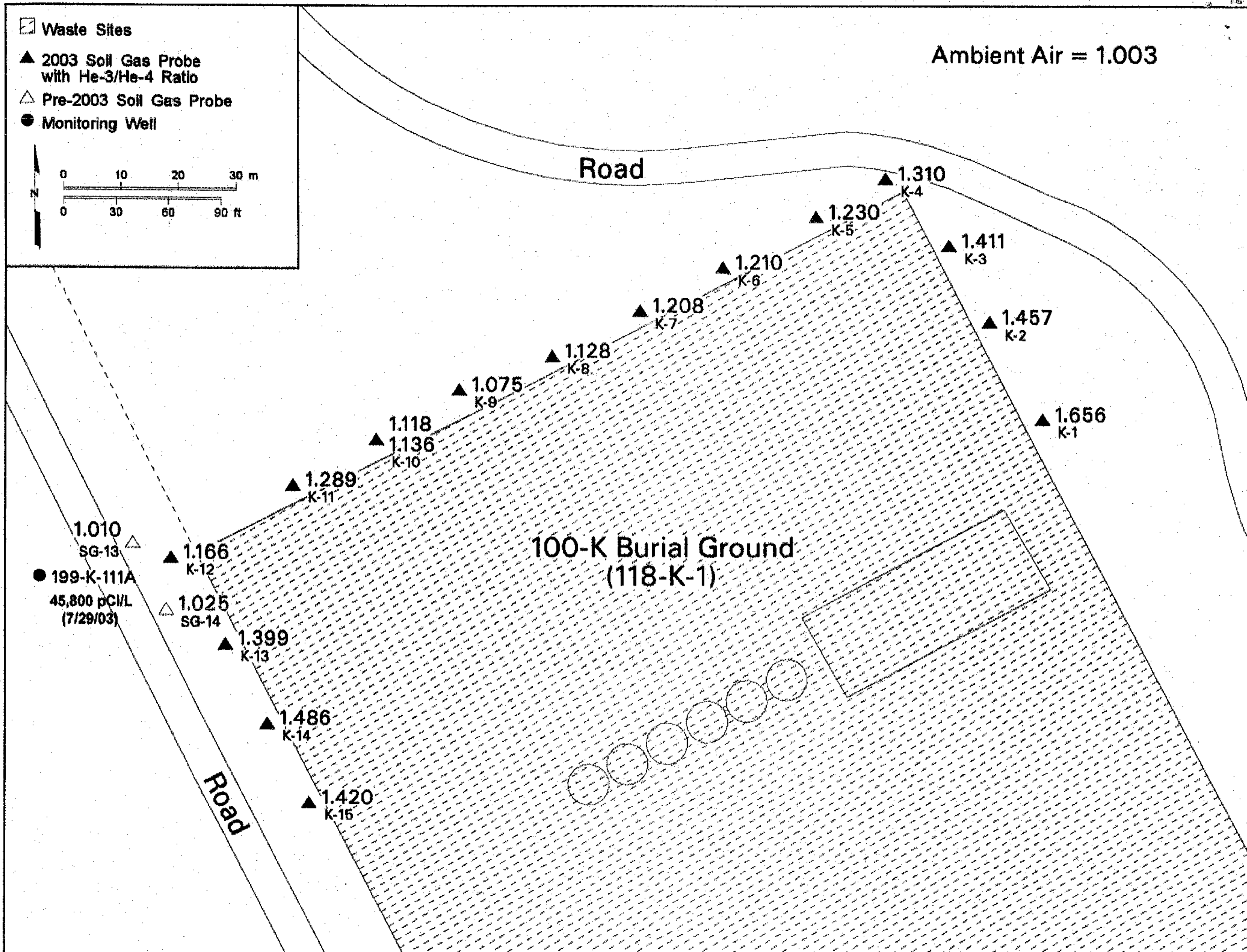
Tritium in Groundwater Near KE Basin
Tritium (pCi/L)
Technetium-99 and Gross Beta (pCi/L)
400,000
300,000
200,000
100,000
0
100
90
80
70
60
50
40
30
20
10
0
Construction joint leakage starts...
Tritium concentration in KE Basin at time of leakage was ~3,000,000 pCi/L.
Technetium-99 is a second mobile radionuclide in fuel storage basin shielding water. Gross beta is high in shielding water, but radionuclides that cause it tend to be retained on soil column (e.g., strontium-90).
K-27 Tritium
K-27 Technetium-99
K-27 Gross beta
("U" over symbol indicates not detected)
Jan-92
Jan-93
Jan-94
Jan-95
Jan-96
Jan-97
Jan-98
Jan-99
Jan-00
Jan-01
Jan-02
Jan-03
Jan-04
1KE-WellsChem.xls (10/31/03)



Tritium in Groundwater Near the KW Condensate Crib
K-106A Tritium
K-106A Nitrate
Drinking Water Standards:
Tritium = 20,000 pCi/L
Nitrate = 45,000 ug/L
Well 199-K-106A monitors the plume from the KW Condensate Crib. COC's are tritium and carbon-14.
Additional constituents showing peak are temperature and specific conductance. Technetium-99 was measured in peak samples at 62 and 25 pCi/L.
Tritium (pCi/L)
Nitrate (ug/L)
1,600,000
1,400,000
1,200,000
1,000,000
800,000
600,000
400,000
200,000
0
DWS
250,000
200,000
150,000
100,000
50,000
DWS
0
-50,000
-100,000
Jan-94
Jan-95
Jan-96
Jan-97
Jan-98
Jan-99
Jan-00
Jan-01
Jan-02
Jan-03
Jan-04
Jan-05
1KW-WellsChem.xls (12/03/03)



Tritium in Groundwater Near 100-K Burial Ground
120,000
100,000
80,000
60,000
40,000
20,000
(DWS)
0
Tritium (pCi/L)
100
90
80
70
60
50
40
30
20
10
0
Chromium, filtered sample (ug/L)
K-111A Tritium
K-111A Tritium (U)
K-18 Tritium
K-111A Chromium
K-111A Chr (non-detect)
Potential sources for tritium at 199-K-111A:
(1) Previously unidentified plume or source, e.g., 100-K Burial Ground (118-K-1)
(2) KE Condensate Crib (116-KE-1)
(3) KE Fuel Storage Basin leak in 1993
199-K-18: Located ~450 meters downgradient of burial ground
199-K-111A: Located at NW corner of burial ground
Jan-94
Jan-95
Jan-96
Jan-97
Jan-98
Jan-99
Jan-00
Jan-01
Jan-02
Jan-03
Jan-04
Jan-05
1KE-WellsChem.xls (12/02/03)



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