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Meeting Minutes Transmittal

Unit Managers' Meeting
216-B-3 Expansion Ponds
2440 Stevens Center, Room 2200
Richland, Washington

November 30, 1994
2:00 p.m. - 3:00 p.m.

The undersigned indicate by their signatures that these meeting minutes reflect the actual occurrences of the above dated Unit Managers Meeting.

Bryan L. Foley Date: 1/4/95
Bryan L. Foley, Unit Manager, DOE-RL

Not Present Date:
Daniel L. Duncan, RCRA Program Manager, EPA Region 10

Jeanne J. Wallace Date: 1/4/95
Jeanne J. Wallace, Unit Manager, Washington State Department of Ecology

216-B-3 Expansion Ponds Closure Plan, WHC Concurrence

Fred A. Ruck III Date: 1/4/95
Fred A. Ruck III, Contractor Representative, WHC

Purpose: Discuss Closure Activities

Meeting Minutes are attached. The minutes are comprised of the following:
Attachment 1 - Agenda
Attachment 2 - Summary of Discussion and Commitments/Agreements
Attachment 3 - Attendance List
Attachment 4 - Action Items
Attachment 5 - The 216-B-3 Expansion Ponds Closure Plan Notice of Deficiency Response Table Addendum 1
Attachment 6 - Page Changes to the Closure Plan

Attachment 1

Unit Managers' Meeting
216-B-3 Expansion Ponds/Main Pond
2440 Stevens Center, Room 2200
Richland, Washington

November 30, 1994
2:00 p.m. - 3:00 p.m.

Agenda

1. Approval of Past UMM Minutes

2. Status Closure Activities

   - Revision 2 Closure Plan
     - Document Transmitted
     - Status of Additional NOD Comments
   - Hanford Facility RCRA Permit Modification
     - Ecology Letter
   - Public Involvement

3. Status Action Items
   - No action items

4. New Business

5. Set Next Meeting Date

3. **Status Action Items**

There were no past action items to status. One new action item was generated for WHC to draft a letter for RL outlining the schedule of TSDs to be incorporated into the next Hanford Facility Permit modification.

4. **New Business**

Ms. Wallace stated that she received a print-out of the adminstrative record through October 31, 1994, for the main pond and the expansion ponds, and she noted that they have not been separated in the administrative record. Mr. B. Foley (RL) suggested that Ms. Wallace note which documents need to be included in the administrative record, and he added that RL/WHC will inquire about the status of the administrative record.

5. **Set Next Meeting Date**

The next Unit Managers Meeting was scheduled for January 4, 1995, at 2:00 p.m.

Attachment #3

Unit Managers' Meeting
216-B-3 Expansion Ponds
2440 Stevens Center, Room 2200
Richland, Washington

November 30, 1994
2:00 p.m. - 3:00 p.m.

Attendance List

A stenographer is present to take detailed notes on the proceeding of this meeting. These notes will be used for the sole purpose of preparing the unit manager meeting minutes. After these unit manager meeting minutes are finalized the detailed notes will be discarded.

Name	Organization	Phone #
[illegible]	WHC/RCRA Closures	376-1057
Bryan L. Foley	DOE-RL	376-7087
Donna Wanek	RL	376-5778
Fred A Ruck III	WHC/RCRA Closure	376-9876
Rhett Tranbarger	ERC	372-1258
Joanne Wallace	Ecology	736-3019
Jake R Laws	IT	376-7508
Ellen Mattlin	DOE-RL	376-2385
Kathy Knox	WHC	372-3596
Joan K. Bartz	GSSC	372-2008
Zachery C. Kraus	RCRA Closures/WHC	372-1597

Attachment #4

Unit Managers' Meeting
216-B-3 Expansion Ponds/Main Pond
2440 Stevens Center, Room 2200
Richland, Washington

November 30, 1994
2:00 p.m. - 3:00 p.m.

Action Items

Action Item #	Description
11-30-94:1	WHC will draft a letter for RL to send to Ecology outlining the schedule of activities for the TSDs, including B-Pond, to be incorporated into the next Hanford Facility Permit modification. ACTION: F. Ruck (WHC) **OPEN**

Attachment #5

Unit Managers' Meeting
216-B-3 Expansion Ponds/Main Pond
2440 Stevens Center, Room 2200
Richland, Washington

November 30, 1994
2:00 p.m. - 3:00 p.m.

THE 216-B-3 EXPANSION PONDS CLOSURE PLAN NOTICE OF DEFICIENCY RESPONSE TABLE
ADDENDUM 1

No.	Comments/Response	Concurrence
Note:	This addendum is in response to the Ecology letter dated November 11, 1994. The Ecology letter listed nine NOD comments from the initial NOD response table submitted by DOE-RL and WHC on October 31, 1994 that required further action. This table responds to the comments generated on those nine NOD comments: 37, 259, 260, 261, 269, 271, 279, 280, and 283. In responding to those comments additional information is provided for comments 281 and 282.	
37.	**Comment:** 3-2, 35-37 The criteria for determining which materials were within "proper specifications for disposal to the environment" must be incorporated into the closure plan. The analysis described in line 44, page 3-2 is inadequate to determine if a material designates as a dangerous waste per the Dangerous Waste Regulations, WAC 173-303. **DOE-RL/WHC Response:** Accept. Process knowledge and extensive sampling of the Chemical Sewer Line in accordance with WAC 173-303-090 Dangerous Waste Criteria, form the basis for the proper specifications. **Ecology Comment 2 (November 11, 1994 letter):** The DOE-RL/WHC response contains an incorrect citation to the Washington Administrative Code (WAC) chapter 173-303-090. The text of the closure plan correctly cites WAC 173-303-070. Amend the response table to reflect disposition of this comment. [page 3-3, line 18 of closure] **DOE-RL/WHC Response 2:** Accept. The citation should have been WAC 173-303-070 as stated. No change to text.	

No.	Comments/Response	Concurrence
259.	**Comment:** 5-1, 21 Dividing the B Pond system into two TSDs will not allow clean closure of the Expansion Ponds. Having separate Part A, Form 3's will make clean closure a viable option to be pursued for the Expansion Ponds. Separating the TSD into two units has little impact on integration of the TSD and the past-practice unit. Modify text accordingly. **DOE-RL/WHC Response:** Agreed--Text modified. This change was made so clean closure was an option for the expansion ponds. Changes to text as follows: line 20 and 21, add "application" after permit and add "permit application" after form 3. add "'s" to 3 and delete "applications" after form 3. Line 24 after option and before period add "for the expansion ponds" **Ecology Comment 2 (November 11, 1994 letter):** The revised text is not consistent with the response table. It will be necessary to conduct a line and/or page change to the closure plan to bring it into agreement with the language of the NOD response table. [page 5-1, line 23 of closure] **DOE-RL/WHC Response 2:** Agreed, 5-1, 23, After Form 3 insert "permit application". Line 24, delete " 's " from 3's and insert "permit applications"	

No.	Comments/Response	Concurrence
260.	**Comment:** 5-1, 25 The term "clean" is not descriptive. Stipulate if the vadose zone analytical data verify that dangerous waste or dangerous waste constituents or residues do not exceed levels specified in WAC 173-303-610(2)(b)(i) and (ii). Changes to text as follows: Line 26 change "analyses" to "Analytical"; Line 28 add new sentence to make the regulation callout less confusing. Place a period after (ii), delete the comma. Add "The analytical results are presented in more detail in Chapter 7, Closure Activities, Section 7.1.5 and in Appendix C, Phase 1, Sampling Results." The section callout is still the same. **DOE-RL/WHC Response:** Agreed--Text Modified **Ecology Comment 2 (November 11, 1994 letter):** A sentence to be added to the text of the closure plan was omitted in revision. From the DOE-RL/WHC response, add "The analytical results are presented in more detail in Chapter 7, Closure Activities, Section 7.1.5 and in Appendix C, Phase 1 Sampling Results." A line and/or page change to the closure plan will be necessary to make it consistent with the language agreed to in the response table. [page 5-1, line 29 of closure] **DOE-RL/WHC Response 2:** Agreed, however reference should be to section 7.1.4 and Appendix E. Both of these discuss the vadose zone sampling investigation performed during Phase 3 sampling. Page 5-1, line 29; delete the callout, after (ii). Replace comma with period after (ii). Add sentence, "The analytical results are presented in more detail in Chapter 7, Closure Activities, Section 7.1.4 and in Appendix E, Phase 3 Sampling Results."	

No.	Comments/Response	Concurrence
261.	**Comment:** 5-1, 26-32 This section of the closure plan describes the TPA designation of the groundwater operable units located under the B Pond system. The following information must be addressed in the closure plan in regard to the contaminated groundwater plume. The TPA. section 5.5, states "past-practice authority may provide the most efficient means for addressing mixed-waste groundwater contamination plumes originating from a combination of TSD and past-practice units. However, in order to ensure that TSD units within the operable units are brought into compliance with RCRA and state hazardous waste regulations, Ecology intends, subject to part four of the Agreement, that all remedial or corrective actions... will be conducted in a manner which ensures compliance with the technical requirements of the HWMA (Chapter 70. 105 RCW and its implementation regulations). In any case, the parties agree that CERCLA remedial actions, and as appropriate HSWA corrective actions will comply with ARAR" The TPA, section 6.3.1, states "any demonstration for clean closure of a disposal unit... must include documentation that groundwater and soils have not been adversely impacted by that TSD group/unit, as described in 173-303-645 WAC The TPA, section 6.3.2, states 'the radionuclide component of the waste will be addressed as part of the closure action.' Therefore, the tritium plume shall be addressed in this unit or the Main Pond closure plans. For this unit to be considered for clean closure, there must be an explicit commitment in the closure plan that the groundwater will be addressed in a timely manner by all applicable regulations (i.e., WAC 173-303, 40 CFR 270.1).	

No.	Comments/Response	Concurrence
	DOE-RL/WHC Response: Agreed section will be rewritten. Changes: Line 30, add after Milestone "M-" to 13-06A; Line 42 after likely add "stream"; Line 43, after administrative add "controls"; Line 45, after Administrative add "controls" after engineering add "barriers" delete controls; Line 47, delete "sewered" replace with discharged; Delete from line 32, to line 39, starting with "Technology development" on line 32.	
	Ecology Comment 2 (November 11, 1994 letter): The word "stream" was omitted from the revised text. A line and/or page change to the closure plan will be necessary to make it consistent with the language agreed to in the response table. [page 5-1 of the closure]	
	DOE-RL/WHC Response 2: Agreed; Page 5-1, Line 38; Add "stream" after "likely" this was omitted from the last text change and is in the concurred with response.	

No.	Comments/Response	Concurrence
269.	**Comment:** Title 40 Code of Federal Regulations (CFR) Part 265.93 require a groundwater monitoring program capable of determining; whether hazardous waste or hazardous waste constituents have entered the groundwater, the rate and extent of migration, and the concentration of 5-6, 340 contaminants in the groundwater. Sampling and analysis for 40 CFR 264, Appendix IX, and WAC 173-303-9905 lists must be conducted prior to closure of the TSD unit and must be conduct at a frequency which will allow statistical evaluation of the results. In addition, the Annual Groundwater Report states that all wells in the network have now been sampled for Appendix IX constituents at least once, including the wells shared with W-049 TEDB. The report makes no reference to WAC 173-3039905 constituents. Verify the analyte list and revise the closure plan accordingly. Determine if any wells have been, or are planned to be, resampled and analyzed for Appendix IX constituents. Summarize any contaminants detected from this analysis.	

No.	Comments/Response	Concurrence
	DOE-RL/WHC Response: Unable to confirm that the list in WAC 173-303-9905 must be sought in groundwater sampling for RCRA facilities. The statement to that effect should be amended to include only the Appendix IX list. Changes have occurred (and are still occurring} in the sampling and analysis schedule since the writing of this document began. The entire paragraph in question should be rewritten as follows: INSERT 6: "Groundwater samples are analyzed for parameters required by 40 CFR 265.92 (EPA 1989b}, volatile organic compounds, semi-volatile organic compounds, and tritium. Hydrazine and ammonium were also sought until recently, but several years of analyses have indicated these compounds are not present in groundwater at the 216-B-3 Expansion Ponds. Subsequently, analyses for hydrazine and ammonium were discontinued. If Appendix IX list constituents were confirmed in groundwater samples, these were added to the regular list of constituents for quarterly sampling of all downgradient wells in the network. Thus far, only one compound from this list, tris-2-chloroethyl phosphate (a semi-volatile organic compound), has been discovered to occur in groundwater at the site of 216-B-3 Pond. This compound appears to occur regularly in certain wells, but at low concentrations (see Section 5.1.3.2)." INSERT 7:Tris-2-chloroethyl phosphate has been detected in five wells at the 216-B-3 Expansion Ponds (see Table 5-8), but the origin of this compound in the groundwater is unknown at present. [well 699-43-41E should be removed from this table--the result shown (178 ppb) was rejected]	

No.	Comments/Response	Concurrence
	Ecology Comment 2 (November 11, 1994 letter): The text incorrectly cites "(DOE 88)" in place of "(EPA 89b)". To correct this error, and maintain consistency with other text, delete reference to issuing agency while maintaining cite to regulation. [page 5-6, line 29 of closure] **DOE-RL/WHC Response 2:** Agreed, Page 5-6, Line 29; delete the "(DOE 1988)" callout.	
271.	**Comment:** 5-7, 7 The closure plan states that Appendix IX and WAC 173-303-9905 constituents have been sampled and analyzed. The Annual Groundwater Report states that all wells in the network have now been sampled for Appendix IX constituents at least once, including the wells shared with W-049 TEDB. The report makes no reference to WAC 173-303-9905 constituents. Verify analyte list and/or revise the closure plan accordingly. **DOE-RL/WHC Response:** Constituents of the WAC 173-303-9905 were not sought--text is in error. Text is modified accordingly, where necessary. **Ecology Comment 2 (November 11, 1994 letter):** A citation to WAC 173-303-645(8) has been inserted into the revised text in several places. This change was not addressed in the response table. Response number 271 which addresses the deletion of an incorrect citation to WAC 173-303-9905 should be modified to explain insertion of WAC 173-303-645(8). [page 5-7, line 44 of closure]	

No.	Comments/Response	Concurrence
	DOE-RL/WHC Response 2: Throughout the closure plan the 173-303-9905 callout was replaced by 173-303-645 callout; this is correct and is being clarified here in the NOD response table. WAC 173-303-645(8) describes the general ground water monitoring requirements. According to 173-303-645(8), in detection and compliance monitoring, data on each dangerous constituent will be collected from background wells and wells at the compliance points. The owner or operator will determine appropriate sampling procedure and methods and sampling interval for each constituent. The reference to WAC was included to ensure that both federal and state requirements were addressed in the closure plan. No change to text.	
279.	**Comment:** Well 699-43-32K is not located in Figure 5-4. Please verify its location and modify figure 5-4 to incorporate, or modify text to explain why it is not included in Figure 5-4.	

No.	Comments/Response	Concurrence
	DOE-RL/WHC Response: Text is modified. It is not feasible to show the piezometer (well 699-43-32K) in the figure.	
	Ecology Comment 2 (November 11, 1994 letter): Apparently, revision 1 of the closure plan contained a typographical error for which a NOD comment was produced. Well 699-43-32K was commented on and responded to without knowledge of the error. Through discussions with WHC staff it was determined that well 699-43-32K should be well 699-43-42K. Revision 2 correctly addresses the well title. Amend the response table to fully address the NOD comment.	
	DOE-RL/WHC Response 2: The NOD comment and response incorrectly designated the well as 699-43-32K. The correct designation for this well is 699-43-42K. The closure plan text is correct. The scale used in Figure 5-4 doesn't allow the well to be shown. The symbol for it would have been placed directly on top of well number 699-43-42J. This concern was addressed in the text by referring to is as "... an adjacent piezometer (not shown in figure 5-4)..." The well is not referenced by well number in the text. No change to text.	

No.	Comments/Response	Concurrence
280.	**Comment:** 5-27, 33 This paragraph addresses the tritium plume associated with the separations area. There is no discussion of the Expansion Ponds contribution to the contamination. This leaves one to speculate if Expansion Ponds contributed or not. Modify the closure to address the Expansion Ponds contribution to the tritium plume. In addition, if it is presented that the Expansion Ponds did not contribute to the plume, explain the presence of the plume in the aquifer under the Expansion Ponds and the continued detection of tritium in the monitoring wells surrounding the Expansion Ponds (see ground water report p. 4.5-11 Note: The TPA, section 6,3.2, states "the radionuclide component of the waste will be addressed as part of the closure action.' Therefore, the tritium plume will be addressed. **DOE-RL/WHC Response:** This comment is addressed in the response to comment 18. **Ecology Comment 2 (November 11, 1994 letter):** The response refers to response number 18 for resolution. Apparently during consolidation of the response table prior to submittal, the numbering sequence was disrupted. Number 18 referred to in the DOE-RL/WHC response should be 274. Amend the response table to reflect disposition of this comment **DOE-RL/WHC Response 2:** Accept. Comment number 18 referred to in the DOE-RL/WHC response should be number 274. No change to text.	
281.	**Comment:** 5-28, 5 Well 699-42-40C is not located in Figure 5-4. Please verify its location and modify Figure 5-4 to incorporate, or modify text to explain its location and why it is not included in Figure 5-4.	

No.	Comments/Response	Concurrence
	DOE-RL/WHC Response: Text is modified to explain absence of the well.	
	DOE-RL/WHC Response Additional: Page 5-30, Line 16; Delete text "immediately adjacent to" replace text starting after "deep well" with ",approximately 25 feet to the Southeast of". This change had been concurred with previously but had not been incorporated into the text.	
282.	**Comment:** 5-28, 15 In addition to the text provided, address the tritium plume located under the Expansion Ponds.	
	DOE-RL/WHC Response: This issue is adequately addressed by discussions in earlier sections (as discussed in comments 18 and 19). Reference will be inserted to draw readers attention to these discussions.	
	<u>New References</u>	
	Kasza, G.L., 1994, "216-A-36B Crib" in *Annual Report for RCRA Groundwater Monitoring Projects at Hanford Site Facilities for 1993*, DOE/RL-93-88, Rev. 0, U.S. Department of Energy, Richland Field Office, Richland, Washington.	
	DOE-RL/WHC Additional: In responding to comments in Ecology's November 11, 1994 letter it was noted that there was an error in the referencing of previous comments made in this response. The references back to comments 18 and 19 should have been to comments 274 and 275. No change to text.	
283.	**Comment:** In addition to the text provided, address the tritium and other contaminants detected under the Expansion Ponds.	
	DOE-RL/WHC Response: Same as 282.	

No.	Comments/Response	Concurrence
	Ecology Comment 2 (November 11, 1994 letter): The response refers to response number 18 and 19 for resolution of this NOD. Apparently, during consolidation of the response table prior to submittal the numbering sequence was disrupted. Number 18 referred to in the response should be number 274 and number 19 should be 275. Amend the response table to reflect disposition of this comment. **DOE-RL/WHC Response 2:** Accept. See DOE-RL/WHC Additional response to comment 282. No change to text.	

Attachment #6

Unit Managers' Meeting
216-B-3 Expansion Ponds/Main Pond
2440 Stevens Center, Room 2200
Richland, Washington

November 30, 1994
2:00 p.m. - 3:00 p.m.

PAGE CHANGES TO THE CLOSURE PLAN

B-Pond
11-20-94
#6

5.0 GROUNDWATER MONITORING

This chapter describes the groundwater monitoring program for the 216-B-3 Expansion Ponds, including well installation and design, hydrogeologic characterization, data collection, and a summary of groundwater quality information. Current knowledge of regional and site hydrogeology is summarized.

The Expansion Ponds are part of the B Pond System and are located in the eastern part of the Separations Area (Figure 5-1). The Separations Area includes the 200 East and West Areas and all of the associated liquid waste disposal facilities. The B Pond System consists of two RCRA TSD units, which consists of four earthen, unlined, interconnected ponds and the 216-B-3-3 Ditch. The ponds are designated as the 216-B-3 Main Pond, 216-B-3A, 216-B-3B, and 216-B-3C. The 216-B-3A Pond became active in October 1983. The 216-B-3B Pond initially received water in January 1984 due to a dike failure between it and the adjacent 216-B-3A Pond, and became fully operational in June 1984. The 216-B-3C Pond became operational in 1985.

The RCRA groundwater monitoring wells discussed in this section monitor the groundwater beneath the entire B Pond System. Formerly, the entire B Pond System was included in one Part A, Form 3 permit application. In 1993, the B Pond System was split into two separate TSD units by submission of two Part A, Form 3 permit applications: one for the 216-B-3 Main Pond (216-B-3 Pond) and the 216-B-3-3 Ditch, and another for the 216-B-3 Expansion Ponds (216-B-3A, 216-B-3B, and 216-B-3C). This change was made so clean closure was an option for the Expansion Ponds.

Analytical results of samples collected from the vadose zone beneath the Expansion Ponds did not show any evidence of contamination above the levels of WAC 173-303-610(2)(b)(i) and (ii). The analytical results are presented in more detail in Chapter 7.0, Closure Activities, Section 7.1.4 and in Appendix E, Phase 3 Sampling Results. The groundwater operable unit for the north part of the B Pond System is 200-BP-5, which falls under the Tri-Party Agreement Milestone M-13-06A. The groundwater operable unit for the south part of the B Pond System is 200-PO-1, which falls under Tri-Party Agreement Milestone M-13-81.

Of all the waste streams that have discharged to the Expansion Ponds, the PUREX chemical sewer was the most likely stream to have contained dangerous wastes (Section 4.0). Numerous administrative controls and engineered barriers have been implemented to prevent and/or mitigate dangerous waste from being disposed to the Expansion Ponds. Administrative controls and engineered barriers for the PUREX chemical sewer are discussed in Section 3.1.1. Table 4-3 is a listing of discharged chemicals and accidental spills into the PUREX chemical sewer from mid-1983 to 1987. Since 1987, there has been only one known reportable chemical spill to the PUREX chemical sewer (Section 4.1.1 and Table 4-3). The most frequent dangerous waste discharge to the PUREX chemical sewer occurred during the regeneration of the PUREX demineralizers. During regeneration with sulfuric acid and sodium hydroxide, the pH of the effluents routinely dropped below 2 and exceeded 12.5. These corrosive discharges continued frequently until co-regeneration practices were instituted in February 1986 (Section 4.1.1). Co-regenerative practices successfully reduced, but did not eliminate, the potential of discharging corrosive effluents to the PUREX chemical sewer. In September 1989, a catch tank was placed in service to hold the regeneration effluents. This catch tank allows the regeneration effluents to be neutralized as necessary before release to the PUREX chemical sewer. Before co-regeneration practices, some neutralization would have occurred prior to and upon reaching the pond as a result of the successive discharge of acidic and caustic waste. Residual acidic waste would have been neutralized by the calcareous nature of the soil. The PUREX deionizers have been permanently shut down.

Therefore, because of the administrative controls and engineered barriers that were implemented, it is unlikely that the Expansion Ponds received effluent that contained dangerous waste except for the discharges listed in Table 4-3. These discharges were primarily related to demineralizer effluent.

A timeline of activities associated with the 216-B-3 Pond System (including the 216-B-3 Expansion Ponds) is presented in Figure 5-2. This timeline indicates periods of operation for the units that comprised the 216-B-3 Pond System.

5.1 INTERIM-STATUS PERIOD GROUNDWATER MONITORING

Installation of groundwater monitoring wells is required for compliance with interim-status regulations (40 CFR 265, Subpart F). This section describes the interim-status groundwater monitoring network for the Expansion Ponds, hydrogeologic characterization methods, and results of groundwater monitoring to date.

The objectives of interim-status groundwater monitoring for the Expansion Ponds (Luttrell et al. 1989) are as follows.

- Characterize the stratigraphy and the horizontal and vertical groundwater flow directions and rates beneath the ponds, with focus on the uppermost aquifer.

- Determine if any statistically significant amounts of dangerous waste constituents originating from the ponds are detectable in the groundwater.

A network of groundwater monitoring wells has been established around the Expansion Ponds to measure water levels, obtain groundwater samples, and evaluate aquifer properties. Results of groundwater analyses from downgradient wells are compared to results from wells outside of the influence of the Expansion Ponds ('background' wells) to determine whether contaminants are present in the groundwater. These results are discussed in Section 5.1.3.

RCRA groundwater monitoring at the Expansion Ponds was initiated in 1988 as a contamination indicator evaluation program for an interim-status unit. In accordance with 40 CFR 265.93(d)(2), assessment-level monitoring was

5.1.2 Sampling and Analysis Plan

Hydrogeologic characterization studies have been conducted to define the geologic and hydrogeologic conditions and properties that control contaminant flow paths. Data collection and interpretation focuses on geology, geochemistry, hydrogeology, hydrochemistry, and groundwater monitoring. Characterization is summarized in the following sections and described more fully in Luttrell et al. (1989) and Hartman (1990). The groundwater sampling and analysis plan for B Pond (Luttrell et al. 1989, Appendix D) describes sample collection, field chemical measurements, analytical methods, preservation techniques, chain-of-custody control, and quality control (QC). Laboratory methods are per SW-846 (EPA 1986b). The procedures for groundwater sample collection, water-level measurements, field chemical measurements and other field data collection activities are contained in Pacific Northwest Laboratory (PNL) (1993) and/or the Westinghouse Hanford EII Manual (WHC-CM-7-7).

5.1.2.1 Geologic Sampling. Geologic samples were collected generally at 5-foot intervals or at changes in lithology during drilling. The samples were described in the field and archived for possible additional analyses (e.g., hydraulic conductivity tests), if necessary. The permanent archive facility for geologic samples is the 2101-M core repository in the 200 East Area of the Hanford Site. Geologic logs can be found in the following documents: Fruland et al. (1989a, b); Smith et al. (1989b); Hartman (1990); and Delaney (1992, 1993). Site geology is discussed in more detail in Section 5.2.5.1. Well construction diagrams, including geologic information, are provided in Appendix A for each of the wells in the monitoring network.

5.1.2.2 Sediment Sample Analyses. Laboratory analyses of sediment samples included the following:

- Sieve analysis
- Moisture content
- Calcium carbonate content
- Hydrometer analyses of zones that contain much silt or clay
- Saturated hydraulic conductivity
- Chemical analyses of contamination indicator parameters.

Results for the previously listed parameters can be found in Fruland et al. (1989a, b); Smith et al. (1989b); Hartman (1990); and Delaney (1992, 1993). Analyses procedures can be found in PNL (1993).

5.1.2.3 Borehole Logging. Gamma geophysical logs are generally run in all new boreholes, however, occasionally neutron and density logs also may be run. Copies of such logs are included in one of the following documents: Fruland et al. (1989a, b); Smith et al. (1989b); Hartman (1990); and Delaney (1992, 1993). Analyses procedures can be found in PNL (1993).

5.1.2.4 Borehole Development and Aquifer Testing. Well development generally was conducted in two stages: initial development that, in some cases, included aquifer testing and final well development after the final well materials were installed. The purpose of borehole development is to remove drilling fluids from the well and fine-grained materials from around the well screens. Initial development also can provide information for determining the optimum pumping rates for subsequent aquifer tests.

The purpose of aquifer testing is to determine estimates of transmissivity, hydraulic conductivity, and, if possible, storativity of the uppermost aquifer beneath the Expansion Ponds. Estimates of transmissivity and hydraulic conductivity have been determined from data collected from constant-discharge tests, recovery tests, and slug injection and/or withdrawal tests. The intent was to determine storativity, if possible, from data collected from constant-discharge or recovery multiple-well tests.

Aquifer tests performed have included constant-discharge aquifer pumping tests and slug injection and/or withdrawal tests. Results of these tests are summarized in Table 5-2 and discussed in Section 5.2.5.

Information on well development and aquifer testing can be found in the borehole completion data packages (Delaney 1992, 1993).

5.1.2.5 Determination of Groundwater Flow Paths. Water levels are measured monthly in the monitoring wells and in several other nearby wells to determine hydraulic head distribution. Water-level data are discussed in Section 5.1.3.

5.1.2.6 Groundwater Sampling and Analysis. Groundwater samples are currently collected on a quarterly basis from all 25 wells in the 216-B-3 Pond monitoring network.

Groundwater samples are analyzed for parameters required by 40 CFR 265.92 and WAC 173-303-645(8), volatile organic compounds, semi-volatile organic compounds, and tritium. Hydrazine and ammonium also were included until recently, but several years of analyses have indicated that these compounds are not present in groundwater at the 216-B-3 Pond System. Subsequently, analyses for hydrazine and ammonium have been discontinued. Site-specific parameters were initially selected from lists of past waste streams. If Appendix IX list constituents were confirmed in groundwater samples, these were added to the site-specific list of constituents for quarterly sampling of all downgradient wells in the network. Thus far, only one compound from this list, tris-2-chloroethyl phosphate (a semi-volatile organic compound), has been found in groundwater at the site of 216-B-3 Pond System. This compound appears to occur regularly in certain wells, but at low concentrations (Section 5.1.3.2).

Results of chemical analyses of groundwater samples are discussed in Section 5.1.3.

5.1.2.7 Statistical Evaluation. Groundwater monitoring for the Expansion Ponds began in November 1988. Four quarters of background data have been collected, and statistical analyses have been performed to determine average concentrations of indicator parameters, as required by 40 CFR 265.93(b) and WAC 173-303-645(8). Statistical methods to determine mean background groundwater quality, variance, and coefficient of variation were based on the

The confining unit between the Rattlesnake Ridge aquifer and the unconfined aquifer is composed of the dense interiors of the Elephant Mountain Member. At well 699-42-40C, the thickness of the Elephant Mountain Member is about 100 feet (Graham et al. 1984). The thickness of the Elephant Mountain Member to the southeast of the Expansion Ponds is unknown because of a lack of wells penetrating the basalts.

Aquifer tests of the basalt aquifer system have been conducted in the past. Results of some of the tests conducted near the Expansion Ponds are summarized in the following paragraphs.

Elephant Mountain Member--A constant-discharge test at well 699-42-40C in 1982 (Graham et al. 1984) was conducted over an interval open to the Elephant Mountain Interflow Zone. Results of the test yielded a transmissivity of approximately 8 square feet per day.

Rattlesnake Ridge Aquifer--The two constant-discharge tests, two recovery tests, and two slug tests performed in well 699-42-40C in 1982 (Graham et al. 1984) were conducted in the sediments of the Rattlesnake Ridge confined aquifer. Results of the constant-discharge tests yielded transmissivity values of 300 and 310 square feet per day, and the recovery tests yielded transmissivity values of 170 and 260 square feet per day.

The slug test included both an injection and withdrawal test. The slug injection test results yielded a transmissivity value of 910 square feet per day, and the slug withdrawal test results yielded a transmissivity value of 130 square feet per day.

Hydraulic conductivities of the Columbia River basalts flow interiors are extremely low, ranging from 3×10^{-6} to 3×10^{-8} feet per day (DOE 1988).

5.2.5.3 Direction and Rate of Groundwater Movement. Water table maps of the Separations Area indicate that groundwater flows radially outward from a groundwater high beneath the B Pond System. Flow is interrupted by basalt that extends above the water table to the north and northeast (Figure 5-15). Groundwater flow in the 200 East Area is not well defined. The groundwater gradient in this area is very small; differences in water levels between wells are often within the margin of measurement uncertainty. Groundwater converges in the 200 East Area from the west and east, then diverges with a component flowing northward between Gable Mountain and Gable Butte, and another component flowing southeast toward the Columbia River.

Direction of groundwater flow over time also can be inferred by examining the patterns of groundwater chemistry. A tritium plume associated with the Separations Area is illustrated in Figure 5-6. Concentration gradients around the B Pond System show a pattern similar to the groundwater gradient.

There is also a downward vertical hydraulic gradient within the uppermost aquifer system beneath the B Pond System. This is evident from a comparison of potentiometric levels between wells 699-42-42B and 699-43-42J. Well 699-43-42J is completed in the upper portion of the uppermost aquifer (open interval of 156.9 to 177.4 feet below land surface), and well 699-42-42B is completed in the lower portion of the uppermost aquifer (open interval of 192.9 to 203.2 feet below land surface). The potentiometric levels measured in these wells on May 24, 1989, were 419.64 and 417.58 feet above mean sea level, respectively. This downward gradient of approximately 0.1 is caused by the mounding and recharge resulting from discharges to the B Pond System.

The B Pond System also has created a downward gradient from the suprabasalt aquifer to the underlying Rattlesnake Ridge interbed in the immediate vicinity of the mound (Figure 5-17; Kasza and Schatz 1989). This is a reversal of the natural gradient between these hydrologic units.

Groundwater chemistry on the Rattlesnake Ridge aquifer has been studied to assess whether there is interconnection with unconfined groundwaters (Graham et al. 1984). Tritium is present in the Rattlesnake Ridge aquifer, with the highest concentrations associated with the 200 East Area. Well 699-42-40C, a deep well, approximately 25 feet to the southeast of well 699-42-40A, but not shown in Figure 5-4, showed low levels of tritium in the Rattlesnake Ridge aquifer; these levels may have been induced during construction of the well. Tritium concentrations decreased from 39 to 12.2 picocuries per liter during an aquifer test of this well, indicating that the contamination was very local. Well 699-42-40C does not monitor conditions in the uppermost aquifer, and is not used in the RCRA groundwater monitoring network for the 216-B-3 Pond System. Other Rattlesnake Ridge wells contained tritium less than or equal to 1.4 picocuries per liter. Apparently, groundwater flow is minimal from the unconfined to the confined aquifer beneath the B Pond System. Any contamination in the Rattlesnake Ridge aquifer eventually will discharge back to the unconfined aquifer (Graham et al. 1984).

The movement of the tritium plume provides a means of tracing groundwater flow through time and for estimating its velocity over a larger area from the B Pond System to the southeast (Wilbur et al. 1983). The configuration of the plume in 1964 indicates that groundwater flowed at an average rate of 1.5 kilometers per year (14 feet per day) since PUREX began operations. Data from 1972 indicate a tritium migration of 11.3 miles in 16 years, or an average of 0.7 miles per year (10 feet per day). These estimates could represent groundwater flow in the more permeable, upper portion of the unconfined aquifer. Few wells are completed in the less permeable strata, so no estimates of flow rate have been made for these layers also (Sections 5.1.3.2 and 5.1.4).

As discussed previously, the vertical hydraulic gradient is estimated to be two orders of magnitude greater than the horizontal gradient, so the downward flow of groundwater beneath the Expansion Ponds is significant. This water may enter underlying aquifers in the basalt and interflow aquifer system. There are insufficient data to estimate vertical groundwater velocity in the suprabasalt aquifer.

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ADMINISTRATIVE RECORD: 216-B-3 Pond System Closure/Postclosure Plan, D-2-5, [Care of EDMC, WHC (H6-08)]

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