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93-RPS-165

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APR 07 1993

Mr. Paul T. Day
Hanford Project Manager
U.S. Environmental Protection Agency
Region 10
712 Swift Boulevard, Suite 5
Richland, Washington 99352

Mr. Roger F. Stanley
Tri-Party Agreement Implementation
Nuclear Mixed Waste Management Program
State of Washington
Department of Ecology
P.O. Box 47600
Olympia, Washington 98504-7600

APR 1993 RECEIVED EDMC

Dear Messrs. Day and Stanley:

RESPONSE TO THE LOW-LEVEL BURIAL GROUNDS DANGEROUS WASTE PERMIT APPLICATION, REVISION 0, NOTICE OF DEFICIENCY (TSD: D-2-9)

Enclosed is a notice of deficiency (NOD) response table for the Low-Level Burial Grounds Dangerous Waste Permit Application. The Low-Level Burial Grounds Dangerous Waste Permit Application, Revision 0, was submitted to the State of Washington Department of Ecology (Ecology) and the U.S. Environmental Protection Agency (EPA) for review on December 21, 1989, in accordance with Hanford Federal Facility Agreement and Consent Order (Tri-Party Agreement) Milestone M-20-06. This permit application is currently in the fourth NOD review cycle. Of the 389 original NOD comments, only 47 remain unresolved. The response table has been prepared to address Ecology's 47 unresolved review comments transmitted in a letter from Mr. R. E. Cordts, Ecology, to Mr. C. E. Clark, U.S. Department of Energy, Richland Operations Office (RL), dated January 8, 1993. The referenced letter requested a response by April 9, 1993.

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Should you have any questions, please contact Mr. C. E. Clark, RL, on (509) 376-9333 or Ms. S. M. Price of the Westinghouse Hanford Company on (509) 376-1653.

Sincerely,

James D Bauer

James D. Bauer, Program Manager
Office of Environmental Assurance,
Permits, and Policy
DOE Richland Operations Office

RE Lerch

R. E. Lerch, Deputy Director
Restoration and Remediation
Westinghouse Hanford Company

EAP:CEC

Enclosure:
Low-Level Burial Grounds Dangerous
Waste Permit Application, Revision 0,
NOD Response Table

cc: Administrative Records, w/encl.
R. Bowman, WHC, w/o encl.
R. E. Cordts, Ecology, w/encl
D. Duncan, EPA, w/encl.
G. Jackson, WHC, w/o encl.
T. Michelena, Ecology, w/encl.
D. Nylander, Ecology, w/ encl.
S. Price, WHC, w/o encl.

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No.	Comment/Response	Ecology Concurrence
1.	Chapter 2.0 (2-1). In several sections of Chapter 2.0 (page 2-14, Table 2-1, and page 2-21) it is documented that mixed waste is currently being disposed of in unlined trenches at the (Low-Level Burial Grounds (LLBG). On page 2-21, it is stated that this disposal is allowed under the existing portion exemption. There is no reference, within the document, that the Applicant has applied for or received from Washington State Department of Ecology (Ecology) an existing portion exemption in accordance with Washington Administrative Code (WAC) 173-303-665(2)(b). Ecology Recommendation. The Applicant should submit with this permit application all information in support of it's request for an exemption for mixed wastes currently being disposed of in unlined trenches. **DOE-RL/WHC Response: It is our understanding from the reading of the Environmental Protection Agency (EPA) regulations [40 CFR 264.301(a)] and Ecology regulations [WAC 173-303-806(4)(h)(ii)(A)] that the existing portion is exempt from liner leachate requirements by regulation; therefore, no application for exemption in accordance with WAC 173-303-665(2)(b) is required. Mixed waste is disposed in the existing portion of the trenches based on criteria described in Section 4.6.2.1 and after notifying Ecology.**	4-26-91
2.	Page 2-14 (2-2). It is noted in the first paragraph that the permit application will not be revised to include all changes to the volume forecasts. Ecology Recommendation. In accordance with WAC 173-303-830(3)(a)(i), any modifications in the projected volume of waste should be noted in a revised permit application and submitted to Ecology. **DOE-RL/WHC Response: As stated in the text, the annual waste forecast was used for the preparation of Table 2-1. The forecast is for a period of 30 years and is necessarily only a rough estimate in the later years. Any waste receipts greater than the amounts forecasted in the Part A of the permit application would of course result in a revision to the permit. The paragraph will be rewritten to clarify why Table 2-1 will not be revised.**	4-26-91

No.	Comment/Response	Ecology Concurrence
3.	Page 2-14, Section 2.1.2.2.1 (2-3). In the third paragraph, mention is made of drag-off boxes being transported to a trench by a flatbed railroad and remotely skidded off into the trench. Ecology Recommendation. It is not clear if the boxes are arranged after they are remotely skidded into the trench. Detailed procedures should be provided. **DOE-RL/WHC Response: Text will be added discussing that the waste is covered with soil as soon as it is placed and a description of procedures will be provided.**	4-26-91
4.	Page 2-23, lines 10 and 11 (2-4). Section 2.5.1 states "The LLBG are located in a semiarid climate with an average annual rainfall of about 6.3 inches." There is no cite given for this conclusion. Ecology Recommendation. Include the reference cite for this conclusion. **DOE-RL/WHC Response: Reference to Pacific Northwest Laboratory (PNL) PNL-4622, Climatological Summary for the Hanford Area, Washington State, Stone et. al., June 1983 will be added to the text.**	4-26-91
5.	Page 2-57 (2-5). Section 2.7.2.3 states that due to the remote location of the LLBG that discharges occurring on property not owned by the U.S. Government are unlikely and, therefore, a description of the actions to restore the impacted area is not required. There is no cite given for this conclusion. Ecology Recommendation. Include the reference cite for this conclusion. **DOE-RL/WHC Response No. 1: Reference to the site map, which shows the LLBG location well within the site boundaries, will be added.** Ecology Response No. 1 Comment: Section 2.7, Spills and Discharges, Page 2-57 Edit Section 2.7.2.3 to read "actions taken to restore an off-site impacted area and to replenish off-site resources is not required".	2-18-92

No.	Comment/Response	Ecology Concurrence

DOE-RL/WHC Response No. 2: The last sentence of 2.7.3.3 will be revised to read "Therefore a description of the actions taken to restore an offsite impacted area and to replenish offsite resources is not required."

6. Page 3-1, lines 11 through 13 (3-1). This section states, inter alia, that, "The generators are responsible for identifying and providing waste designations in accordance with WAC 173-303 (Ecology 1989)." A complete cite is required when referencing any statutes or regulations. — 4-26-91

Ecology Recommendation. Include the complete cite (i.e., WAC 173-303-070).

DOE-RL/WHC Response: A complete cite to WAC 173-303-070(1)(b) will be included in the text.

7. Page 3-2, lines 10 through 12 (3-2). Section 3-1 discusses mixed wastes and states that "such waste also is categorized as toxic ... under WAC 173-303 (Ecology 1989)." A complete cite is required. — 2-18-92

Ecology Recommendation. Include the complete cite (i.e., WAC 173-303-070).

DOE-RL/WHC Response No. 1: A complete cite to WAC 173-303-070 will be included in the text.

Deficiency: Section 3.1, Chem, Bio and Physical Analysis, Page 3-2

Although the correct reference has been provided in the response, the Extraction Procedure Toxicity test is no longer accepted.

Requirement: All references to future toxicity testing must reference the Toxicity Characteristic Leaching Procedure (TCLP). WAC 173-303-090(8) (October 16, 1990)

DOE-RL/WHC Response No. 2: The text will be revised to remove Extraction Procedure requirements and insert Toxicity Characteristic Leaching Procedure in its place.

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No.	Comment/Response	Ecology Concurrence
8.	Page 3-3, line 20 (3-3). Section 3.1.1.3 states that "small quantities" of mercury are disposed at the Hanford Site. Ecology Recommendation. The term "small quantities" should be refined (e.g., less than 5 pounds per year). **DOE-RL/WHC Response: The term "small quantities" will be refined to read 'less than 10 pounds per year.'**	4-26-91
9.	Page 3-4, lines 35 through 37 (3-4). Section 3.1.3 states that operation of the LLBG does not involve storage of waste in tank systems and, therefore, the requirements of "this section" are not applicable to the LLBG. It is unclear what "section" is referenced. Ecology Recommendation. Explain which "section" and its requirements that are not applicable to the LLBG. **DOE-RL/WHC Response: The text will be changed to "... the requirements of WAC-173-303-640 are not applicable to...".**	4-26-91
10.	Page 3-4, lines 42 and 43 (3-5). Section 3.1.4 states that operation of the LLBG does not involve the placement of waste in piles and, therefore, the requirements of "this section" are not applicable to the LLBG. It is unclear what "section" is referenced. Ecology Recommendation. Explain which "section" and its requirements that are not applicable to the LLBG. **DOE-RL/WHC Response: The text will be changed to "... the requirements of WAC 173-303-660 are not applicable to...".**	4-26-91

No.	Comment/Response	Ecology Concurrence
11.	Page 3-5, lines 8 through 10 (3-6). Section 3.1.6 states that operation of the LLBG does not involve the incineration of waste and waste used in performance tests and, therefore, the requirements of "this section" are not applicable to the LLBG." Ecology Recommendation. Explain which "section" and its requirements that are not applicable to the LLBG. **DOE-RL/WHC Response: The text will be changed to "...the requirements of WAC 173-303-807 are not applicable to...".**	4-26-91
12.	Page 3-5, lines 15-16 (3-7). Section 3.1.7 states that operation of the LLBG does not involve the land treatment of waste and, therefore, the requirements of "this section" are not applicable to the LLBG. It is unclear what "section" is referenced. Ecology Recommendation. Explain which "section" and its requirements that are not applicable to the LLBG. **DOE-RL/WHC Response: The text will be changed to read "... the requirements of WAC 173-303-655 are not applicable to...".**	4-26-91
13.	Page 3-5, lines 39 through 41 (3-8). Section 3.2 states that "...the waste must be completely and accurately characterized in accordance with Ecology regulations before approval for storage or disposal is granted." No cite for the referenced regulations is given. Ecology Recommendation. Include the complete cite for the referenced regulations. **DOE-RL/WHC Response: "...Ecology regulations..." will be changed to "...WAC 173-303-070...".**	4-26-91

No.	Comment/Response	Ecology Concurrence

14. Page 4-3, Section 4.1.2.1 (4-1). It is noted that testing for free liquids is not performed because testing would increase the potential for radiation exposure of personnel.

Ecology Recommendation. The reason for not testing for liquids seems reasonable. However, there is no means of verifying whether or not free liquids actually exist in a particular waste. Alternative methods to test for free liquids should be explored and discussed here.

DOE-RL/WHC Response No. 1: Text will be revised.

Comment: Section 4.1.2.1, Test for Free Liquids, Page 4-3

The alternate methods of testing for free liquids should be presented in the next NOD Response Table. This discussion must also justify the equivalency of any alternate method to the Paint Filter Method.

DOE-RL/WHC Response No. 2: The proposed alternative method for determining the presence of free liquids is real time radiography. This is the approved method for determining the presence of free liquids in transuranic waste to be shipped to the WIPP site, and has been proven very effective in locating small quantities of free liquids where lead shielding isn't used. This will be done in accordance with a sampling plan to be developed in support of the Hanford Facility Dangerous Waste Permit Application.

Comment: Section 4.1.2.1, Test for Free Liquids, Page 4-3

The response indicates that the presence of free liquids is determined by real time radiography. The response also indicates that this method is not effective in shipments where lead shielding is used. The information in Appendix 4A indicates that a large percentage of shipments received at the Low-Level Burial Grounds have contained lead. Provide an estimate of the percentage of shipments which will contain lead and therefore cannot be accurately assessed for the presence of liquids. Estimate the percentage of shipments which will be assessed by real time radiography.

DOE-RL/WHC Response No. 3: After a review of waste received since November 1987, it has been determined that RTR is not a viable free-liquid test option because of the of lead in the containers. All of the mixed waste received since November 1987, except a portion of the 183H basin waste, has been high dose rate waste in bulky packages. This makes physical

No.	Comment/Response	Ecology Concurrence

sampling not viable due to ALARA concerns and RTR not viable due to material form and package size. Each submarine reactor compartment (SRC) is estimated to have up to 230 gallons of liquids. A request for exception for the SRC is being prepared.

Hanford still believes that lead used for shielding is part of the container and thus not part of the designatable portion of the waste, however as directed by Ecology we are including all lead under a waste category.

Comment: Section 4.1.2.1, Test for Free Liquids, Page 4-3

The response indicates that the presence of free liquids will not be verified by real time radiography. However, no alternative method is presented. Are there any other methods which are available? As stated in our original comment, alternate methods to test for free liquids should be explored and discussed here.

RL/WHC Response No. 4: A new, state-of-the-art portable high energy radiography unit is to be designed and built by Bioimaging Research, Inc. A one year contact was awarded to BIR, Inc. by DOE-HQ in early 1993. Current plans are to fully test the unit during the first quarter of calendar year 1994. This unit may be able to provide sufficient penetration and resolution to verify the absence of free liquid in heavily shielded containers. If this new system is proven to be effective for our needs, consideration will be given to purchasing or leasing a unit for use at the Hanford Site.

For current operations the Hanford Site Solid Waste Acceptance Criteria (WHC-EP-0063-3) prohibits the presence of free liquids in waste to be disposed of at the LLBG except for the submarine reactor compartments (SRC). A petition to exempt the SRC from the land disposal restrictions regarding free liquids has been submitted to Ecology. (Request for Exemption from Lined Trench Requirements and from Land Disposal Restrictions for Residual Liquid at 218-E-12B Burial Ground Trench 94, DOE/RL-88-20 Supplement 1, Rev. 1). The absence of free liquid is verified according to the procedures described in the waste analysis plan and the generator oversight and certification program, Chapter 3, Section 3.2. This approach is consistent with the draft EPA guidance "Clarification of RCRA Hazardous Waste Testing Requirements for Mixed Waste", March 1992, the ALARA principles of the Atomic Energy Act, and § 1006 of the Solid Waste Disposal Act.

No.	Comment/Response	Ecology Concurrence

15. Page 4-4, Section 4.6.1 (4-2). Appendix 4B indicates the waste type, age, and status of the trenches in the 200 West and 200 East Areas burial grounds. Based on information presented in Appendix 4B tables, some trenches are presently accepting mixed waste.

Ecology Recommendation. The Applicant should identify the specific areas of the existing unlined trenches in the LLBG that have received these mixed wastes, identify the mixed waste characteristics, and present a plan for dealing with these mixed wastes.

DOE-RL/WHC Response No. 1: Trenches receiving mixed waste are existing portion trenches which are exempt from liner and leachate collection requirements [WAC 173-303-806(4)(h)(ii)(A)]. A listing of the mixed waste placed since November 23, 1987, will be added to the text. The plan for dealing with these wastes is the same as for other remote-handled waste. The waste will be covered with 8 feet of soil and will receive a RCRA compliant cover upon closure as described in Chapter 11.0.

Comment: Section 4.6.1, List of Wastes, Page 4-4

Concurrence with this response will be based upon the additional information to be submitted. This information should be provided as soon as possible to facilitate our evaluation. In addition, the trench locations where liquids have been disposed must also be identified.

DOE-RL/WHC Response No. 2: Trenches receiving mixed waste and trenches containing liquid waste will be identified to Ecology, and in the list of waste. This information already is listed in Appendix 4A.

Deficiency: Section 4.6.1, List of Wastes, Page 4-4

The response indicates that the requested information is "already listed in Appendix 4A". However, Ecology has requested the following information which is not found in Appendix 4A: 1) a list of mixed waste received after November 23, 1987, 2) the "specific areas of the existing unlined trenches" which have received mixed waste, and 3) identification of the trench locations where liquids have been disposed.

Requirement: As noted in the last NOD, concurrence with this response will be based upon the additional information to be submitted. This information should be provided as soon as possible to facilitate our evaluation. In addition, information similar to that provided in

No.	Comment/Response	Ecology Concurrence

Appendix 4A should be provided on all waste received after November 23, 1987, not just the waste that Energy/WHC consider to be mixed waste. Also note that comment 15 was erroneously listed in the last NOD as having Ecology concurrence. Concurrence is now withdrawn pending submittal and review of the requested information.

DOE-RL/WHC Response No. 3: The mixed waste received since November 23, 1987, excluding 183-H Basin waste, is listed below. The location of the mixed waste in individual trenches is shown on the colored maps provided to Ecology at a Unit Managers Meeting on January 22, 1992. All 183-H basin waste in Trench 24 has been moved to the Central Waste Complex. The PNL waste from Building 324 in Burial Ground 218-W-4C Trench 1 will moved to Central Waste Complex. The Building 324 waste that was placed before November 23, 1987 will also be moved. No liquid waste was placed in the LLBG since November 23, 1987. The location of liquids placed in the LLBG prior to November 23, 1987 is identified in The Low-Level Burial Grounds Data Base (WHC-MR-008). All other items on the list were placed in the LLBG on a case by case basis as described in the Hanford Solid Radioactive Mixed Waste Storage Strategy (included in Appendix 4D of the permit application), with the exception of the submarine reactor compartments (SRC). The SRC were classified as mixed waste after 8 SRCs were already in the LLBG, and therefore prior notification was not possible. A list of all waste disposed in the LLBG since November 23, 1987 is in preparation. The list of all waste will be an expansion of WHC-MR-008 and is estimated to contain 110,000 new containers. Preparation of this list will take approximately 180 days from the decision to prepare the document.

DOE-RL/WHC's intent has always been not to dispose of Contact Handled Mixed Waste in the LLBG, but rather to put such waste in compliant storage while waiting for the availability of treatment and disposal facilities. However, there is a continuing need to bury remote handled waste, including some remote handled mixed wastes, in the LLBG (this is the intent of the 1988 strategy letter to Ecology). Remote handled waste must be shielded for protection of health in accordance with ALARA principles. This is the reason for continuing use of the existing portion of the trenches.

SOLID RADIOACTIVE MIXED WASTE FROM 11/23/87 TO 12/31/91

ORIGIN	COMPANY	TOXIC NAME	RECORD NUMBER	WASTE TYPE

218-W-04C Trench 01 First & Last Date Used-04/12/90 to 05/29/90

No.	Comment/Response	Ecology Concurrence

The following waste is remote handled because of its high intensity radioactivity. Lead containers are necessary to provide shielding for this waste. It is DOE-RL/WHC's position that when used for shielding purposes, lead containers are not considered part of the waste. However, as directed by Ecology, the lead is identified as a waste category.

324	PNL	LEAD SHIELDING LANL-S/N-067	NON-TRU
324	PNL	LEAD SHIELDING LANL-S/N-068	NON-TRU
324	PNL	LEAD SHIELDING LANL-S/N-070	NON-TRU
324	PNL	LEAD SHIELDING LANL-S/N-058	NON-TRU
324	PNL	LEAD SHIELDING LANL-S/N-069	NON-TRU
324	PNL	LEAD SHIELDING LANL-S/N-062	NON-TRU
324	PNL	LEAD SHIELDING LANL-S/N-63	NON-TRU
324	PNL	LEAD SHIELDING LANL-S/N-052	NON-TRU
324	PNL	LEAD SHIELDING LANL-S/N-060	NON-TRU
324	PNL	LEAD SHIELDING LANL-S/N-053	NON-TRU
324	PNL	LEAD SHIELDING LANL-S/N-055	NON-TRU
324	PNL	LEAD SHIELDING LANL-S/N-054	NON-TRU
324	PNL	LEAD SHIELDING LANL-S/N-051	NON-TRU
324	PNL	LEAD SHIELDING LANL-S/N-059	NON-TRU
324	PNL	LEAD SHIELDING LANL-S/N-061	NON-TRU
324	PNL	LEAD SHIELDING LANL-S/N-066	NON-TRU

218-E-12B Trench 94 First & Last Date Used-11/02/89 to 10/30/90
The following waste is contact handled because of its low intensity radioactivity and consists of defueled submarine reactor compartments. Lead containers are necessary to provide shielding for this waste. It is DOE-RL/WHC's position that when used for shielding purposes, lead containers are not considered part of the waste. However, as directed by Ecology, the lead is identified as a waste category.

BETTS	PSN	ASBESTOS	9003-5	NON-TRU
BETTS	PSN	LEAD SHIELDING	9003-5	NON-TRU
BETTS	PSN	PCB	9003-5	NON-TRU
BETTS	PSN	ASBESTOS	9190-1	NON-TRU
BETTS	PSN	LEAD SHIELDING	9190-1	NON-TRU
BETTS	PSN	PCB	9190-1	NON-TRU
BETTS	PSN	ASBESTOS	9190-2	NON-TRU

No.	Comment/Response	Ecology Concurrence

BETTS	PSN	LEAD SHIELDING	9190-2	NON-TRU
BETTS	PSN	PCB	9190-2	NON-TRU
BETTS	PSN	ASBESTOS	9190-3	NON-TRU
BETTS	PSN	LEAD SHIELDING	9190-3	NON-TRU
BETTS	PSN	PCB	9190-3	NON-TRU
BETTS	PSN	ASBESTOS	9003-1	NON-TRU
BETTS	PSN	LEAD SHIELDING	9003-1	NON-TRU
BETTS	PSN	PCB	9003-1	NON-TRU
BETTS	PSN	ASBESTOS	9003-2	NON-TRU
BETTS	PSN	LEAD SHIELDING	9003-2	NON-TRU
BETTS	PSN	PCB	9003-2	NON-TRU
BETTS	PSN	ASBESTOS	9003-3	NON-TRU
BETTS	PSN	LEAD SHIELDING	9003-3	NON-TRU
BETTS	PSN	PCB	9003-3	NON-TRU
BETTS	PSN	ASBESTOS	9003-4	NON-TRU
BETTS	PSN	LEAD SHIELDING	9003-4	NON-TRU
BETTS	PSN	PCB	9003-4	NON-TRU

218-W-04C Trench 58 First & Last Date Used-5/18/88
The following waste is remote handled because of its high intensity radioactivity. Lead containers are necessary to provide shielding for this waste. It is DOE-RL/WHC's position that when used for shielding purposes, lead containers are not considered part of the waste. However, as directed by Ecology, the lead is identified as a waste category.

324	PNL	LEAD SHIELDING	324-88-0010S	NON-TRU

218-W-04C Trench 14 First & Last Date Used-04/15/89
The following waste is contact handled because of its low intensity radioactivity and consists of the defueled Shipingport reactor. Lead containers are necessary to provide shielding for this waste. It is DOE-RL/WHC's position that when used for shielding purposes, lead containers are not considered part of the waste. However, as directed by Ecology, the lead is identified as a waste category.

SPAP	SPA	LEAD	8901-02-1	NON-TRU

No.	Comment/Response	Ecology Concurrence

Comment: Section 4.6.1, List of Wastes, Page 4-4

Ecology is currently reviewing the additional information provided in the response as well as in the colored drawings. The results of this review will be discussed in the next NOD.

RL/WHC Response No. 4: No response is required at this time.

16. Page 4-5, Section 4.6.2.1 (4-3). A request for an exemption for mixed wastes (specifically categorized as remote-handled waste) placed in unlined trenches subsequent to November 23, 1987, is reported here. The Applicant states that this element of the radioactive mixed waste management strategy was summarized in Applicant's January 26, 1988, letter to Ecology.

Ecology Recommendation. The Applicant should identify the specific areas of the existing unlined trenches in the LLBG that have received these mixed wastes, identify the mixed waste characteristics, and present a plan for dealing with these mixed wastes.

DOE-RL/WHC Response No. 1: Trenches receiving mixed waste are existing portion trenches which are exempt from liner and leachate collection requirements [WAC 173-303-806(4)(h)(ii)(A)]. A listing of the mixed waste placed since November 23, 1987, will be added to the text. The plan for dealing with these wastes is the same as for other remote-handled waste. The waste will be covered with 8 feet of soil and will receive a RCRA compliant cover upon closure as described in Chapter 11.0.

Deficiency: Section 4.6.2.1, Exemption Based on Existing, Pg 4-5

Although trenches which were operational and received mixed waste prior to November 23, 1987 are exempt from the double-liner requirements of HSWA, the portion of these trenches which did not receive wastes must still meet the single liner with leachate collection system required prior to HSWA.

Requirement: The additional information to be provided should also specify what portions of each trench did not contain wastes on November 23, 1987. In addition, the term "notification of" on line 21 must be replaced with "approval from."

No.	Comment/Response	Ecology Concurrence

DOE-RL/WHC Response No. 2: There is no question that the mixed waste is subject to the Hazardous and Solid Waste Amendments (HSWA); however, HSWA did not change the definition of the existing portion of a landfill. Mixed waste has been accepted, with prior notification of Ecology by DOE, in the open trenches beyond that which was there on November 23, 1987; therefore, the definition of the existing portion of the landfill has had implicit concurrence by Ecology.

Deficiency: Section 4.6.2.1, Exemption Based on Existing, Pg 4-5

The response fails to address Ecology's requirements. These requirements are: 1) specify the portions of each trench which did not contain waste on November 23, 1987, and 2) edit the term "notification of" to "approval from".

Requirement: The requested information must be provided and a commitment made to make the specified text corrections. It should also be noted that Federal Register language addressing HSWA defined differences between existing, new, replacement, and lateral expansion units (see July 15, 1985 Federal Register).

DOE-RL/WHC Response No. 3: The location of the mixed waste in the LLBG is shown on the new colored maps that were provided to Ecology at the unit managers meeting on January 22, 1992. The extent of the waste in each trench on November 1987 is shown in the permit application drawings listed below. The drawings are revised annually; however, for mixed waste they show the extent of mixed waste on November 23, 1987.

Burial Ground	Drawing
218-W-3A	H-2-34880
218-W-3AE	H-2-75351
218-W-4B	H-2-33055
218-W-4C	H-2-37437
218-W-5	H-2-94677
218-W-6	H-2-99933
218-E-10	H-2-92004
218-E-12B	H-2-33276

As stated in response No. 2, DOE-RL/WHC does believes additional approval is not necessary for disposal in the exempt portions of the open trenches. DOE-RL/WHC's intent has always

No.	Comment/Response	Ecology Concurrence

been not to dispose of Contact Handled Mixed Waste in the LLBG, but rather to put such waste in compliant storage while waiting for the availability of treatment and disposal facilities. However, there is a continuing need to bury remote handled waste, including some remote handled mixed wastes, in the LLBG (this is the intent of the 1988 strategy letter to Ecology). Remote handled waste must be shielded for protection of health in accordance with ALARA principles. This is the reason for continuing use of the existing portion of the trenches.

Comment: Section 4.6.2.1, Exemption Based on Existing, Page 4-5

Ecology is in the process of reviewing the 1988 strategy letter as well as new DOE proposals for disposal of mixed waste in existing trenches. The results of this review will be discussed in the next NOD.

RL/WHC Response No. 4: No response is required at this time.

17. Page 4-5, lines 26 through 33 (4-4). The Applicant states that a liner system exemption request for trench 94 in burial ground 218-W-12B will be submitted in a separate submittal. — 4-26-91

Ecology Recommendation. It is recommended that the Applicant submit the application for exemption in accordance with WAC 173-303-665(2)(b) with sufficient information demonstrating equivalent protection for the hazardous wastes to be included in the reactor compartments.

DOE-RL/WHC Response: An application for exemption in accordance with WAC 173-303-665(2)(b) was prepared and submitted to Ecology on July 25, 1990.

18. Page 4-12, Section 4.6.3.3.1 (4-5). Placing the asphalt in nondrag-off landfills using heavy machinery will be difficult and if not done with proper care, could damage the underlying liner. — 2-18-92

Ecology Recommendation. It is recommended that the use of light vehicles be investigated for use over the liner to lay asphalt as a way to avoid heavy loading on the liner during construction. Detailed procedures for ensuring liner and leachate collection system integrity must be developed during final design but should be provided at the conceptual level in the permit application.

No.	Comment/Response	Ecology Concurrence

DOE-RL/WHC Response No. 1: The construction of an asphalt pad is not included in the definitive design that will be submitted to Ecology for review. The permit application will be revised to agree with the definitive design.

Comment: Section 4.6.3.3.1, Liner System Description, Page 4-12

Until the definitive design is complete, Ecology will not issue a dangerous waste permit for the dragoff mixed waste trench. If this trench is not scheduled for design and construction in the near future (within the next 12 months), all references to this trench should be eliminated from the Part A and the Part B applications. A permit modification can be used if and when the dragoff trench becomes a reality.

DOE-RL/WHC Response No. 2: Design and Construction of the dragoff mixed waste trench will not be completed in the next 12 months. The project was replaced with the non-dragoff mixed waste trench. The reference to the dragoff trench will be removed from the Part A and Part B permit application.

19. Page 4-13, lines 5 and 6 (4-6). There is high potential for significant shear when boxes loaded with wastes are pulled into place in the drag-off trenches. The Applicant has proposed to evaluate the effects on the liner by use of a test pad. — 2-18-92

Ecology Recommendation. As noted by the Applicant, there is a high degree of uncertainty associated with quantifying the shear stresses associated with movement of the drag-off trenches on the liner. Applicant should provide a detailed review of the alternative procedures proposed for testing of the liner damage.

DOE-RL/WHC Response No. 1: The mixed waste trench to be constructed in burial ground 218-W-5 is designed for nondrag-off packages. This section will be revised to address only burial ground 218-W-5.

Deficiency: Section 4.6.3.3.2, Stresses from Equipment, Page 4-13

The response is unclear. If burial ground 218-W-5 is a nondrag-off burial ground, why would it be the only burial ground addressed in a permit section discussing the effects of dragging boxes? Furthermore, the text appears to indicate that the sole purpose of the test pad is to

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evaluate operational stresses on the liner. The test pad must also be constructed to determine the acceptability of the soil liner construction and design specifications. Section 4.6.5.5.1 discusses some field tests for the liner, but does not indicate whether these tests are for both the dragoff and non-dragoff trenches, nor if these will be performed on a test pad or the installed liner.

Requirement: Please clarify the response and provide more detail for the dragoff test pad if the dragoff trench is to be included in the application (see comment 18).

DOE-RL/WHC Response No. 2: Burial Ground 218-W-5 is a non-dragoff mixed waste trench. The portion of section 4.6.3.3.2 that pertains to the dragoff trench will be removed from the permit. The field test mentioned in section 4.6.5.5.1 applies to the non-dragoff landfill. A test fill (also known as a test pad) will be performed for the admix liner material to document the adequacy of the materials, design, equipment, and construction procedures proposed for the admix liner [see the recently submitted Construction Quality Assurance Plan (WHC-SD-W025-PLN-001), Sections 4.3.2 and 4.4.1]. Furthermore, samples of the liner material will be collected and tested upon delivery and preparation to document that the material properties are within the range stated in the specifications (WHC-S-045, Section 02275). As noted in WHC-SD-W025-FDR-001, section 5.3.3., Page 19 of 197, a two-foot operations layer will be placed over the entire landfill, including the slopes, during construction to protect the liners from equipment damage during operations and to act as an insulating layer.

20. Page 4-14, lines 26 through 29 (4-7). The anchor trenches are intended to hold the liners in place while the liner is extended up the side slopes to the ground surface. 2-18-92

Ecology Recommendation. Details of the anchor trench construction and overlying weight specifications should be provided in the detailed design. The Applicant should provide conceptual information in the permit application sufficient to demonstrate that the anchor trenches will be of adequate design to hold the liners in place during construction and operation periods.

DOE-RL/WHC Response No. 1: The information requested will be provided in the definitive design that will be submitted to Ecology for review. The permit application will be revised to agree with the definitive design.

Comment: Section 4.6.3.4, Liner System Coverage, Page 4-14

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This comment will be addressed in a subsequent NOD to be issued for the definitive design document.

DOE-RL/WHC Response No. 2: The anchor trench design is shown on Drawing H-2-131579. Pullout resistance for this system is analyzed in Appendix C.11 of the Design Report and demonstrated to be substantially greater than required.

21. Page 4-14, lines 31 through 33 (4-8). The Applicant states that the portion of the liner system on the upper side slopes will be exposed to the weather for several years.

Ecology Recommendation. The Applicant has not demonstrated with test data that the integrity of the liner will remain after an extended period of exposure to the elements. Although some liner materials are less effected by exposure than others, Ecology knows of no liner materials which would be unaffected by prolonged exposure over several years. Alternative approaches to limit the period of exposure of a particular liner section, such as covering the liner and phased cell construction, should be evaluated.

DOE-RL/WHC Response No. 1: The liner will be covered with soils to protect it from the environment as described in the definitive design that will be submitted to Ecology for review. The permit application will be revised to agree with the definitive design.

Deficiency: Section 4.6.3.5, Liner Exposure Prevention, Page 4-14 — 1-8-93

Comment 20 also applies here.

DOE-RL/WHC Response No. 2: The stresses caused by thermal contraction can be seen in the Definitive Design Report WHC-SD-W025-FDR-001, Appendix C.10, Pages 275-279 of 397 and on Page 19 of 397, Sections 5.3.3, 5.4.1. A two foot operations layer will be placed over the entire landfill, including the slopes, during construction to act as an insulating layer and to prevent exposure of the geosynthetics to ultraviolet (UV) radiation, the most serious cause of deterioration. Carbon black will be added to the FML and will prevent deterioration during reasonably expected storage times even if the geomembrane is exposed to UV light. Any deterioration would be identified by conformance testing as described in Section 4.4.1.2 of the CQA Plan.

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Comment: Section 4.6.3.4, Liner Exposure Prevention, Page 4-14

Although covering the side slopes with an earthen cover should be adequate for short term protection, the erosional forces present on the Hanford Reservation will most likely thin this layer over a period of time. Precipitation and wind erosion will distribute this cover material to the toe of the slope. Discuss or reference the text which address the methods for determining the extent of such erosion over time.

DOE-RL/WHC Response No. 3: It is planned to increase the thickness of the operations layer to 3 feet, which will provide additional protection. The types of erosion which will cause liner exposure by removing 3 feet of relatively coarse-grained material, such as gullying after large storms, are expected to be easily detected during visual inspection of the landfill sideslopes, as part of normal operations. The operations layer will be repaired if such damage is observed. Visual inspection as part of normal landfill operations will be added to the text in Section 4.6.3.4.

22. Page 4-26, lines 3 through 5 (4-9). Indicates an absence of hydraulic conductivity test data. — 2-18-92

Ecology Recommendation. Hydraulic conductivity test data would be useful as part of the permit review process. The Applicant should provide the test results.

DOE-RL/WHC Response No. 1: Hydraulic conductivity test data are not required for the definitive design. There are no plans to conduct additional testing as part of this project.

Deficiency: Section 4.6.4.3.4, Hydraulic Conductivity, Page 4-26

Line 4 and 5 indicate that some hydraulic conductivity test results from the unsaturated zone were not available at the time of preparing the permit application. These results should be available now.

Requirement: A summary of these test results should be provided in the application.

DOE-RL/WHC Response No. 2: The requested hydraulic conductivity test results have been incorporated into the revised Chapter 4.0.

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23.	Page 4-31, Section 4.6.4.4.5 (4-10). As part of the preliminary design, there are no provisions for monitoring the potential landfill gas. Ecology Recommendation. Although significant amounts of landfill gas are not expected to be generated in the LLBG, it is possible that radioactive gases, such as tritium, could be produced in the LLBG cells. The Applicant should provide an assessment of the potential for gas production and an evaluation of alternative gas monitoring alternatives. **DOE-RL/WHC Response: Section 4.6.4.4.5 is discussing the potential for gas pressure in the subgrade beneath the liner of the landfill and not generation of gas by the waste placed in the lined trench and above the liner. The discussion as written is correct for the subject of this section as defined by the Ecology permit application outline. Generation of gas by the waste is discussed in Section 11.1.4.3.**	4-26-91
24.	Pages 4-34 and 4-35, Section 4.6.5.2 (4-11). According to the testing protocol, separate samples will be subjected to primary leachate, secondary leachate, and radiation levels to provide the total expected design-life dose in a period of about 30 days. Ecology Recommendation. The test protocol as proposed may not be adequate. In order to simulate the cumulative effect of all three forms of contaminants, some of the liner samples should be exposed concurrently to combinations of the strongest leachate form and radiation. Extended period testing should also be considered in parallel with permitting and design activities to increase information available on the basis for liner selection. **DOE-RL/WHC Response: A "Liner/Leachate Compatibility Test Plan" has been submitted to Ecology for review. The proposed leachate and radiation testing protocols are described in more detail in the test plan. The permit application will be revised to agree with the test plan.**	4-26-91
25.	Page 4-36, lines 14 and 15 (4-12). The Applicant refers to "substantial modification" of the conceptual design. Ecology Recommendation. Some additional clarification with regard to the term "substantial modification" is needed. A change in the conceptual design requires a modification of the permit application, per WAC 173-303-610(3)(b).	4-26-91

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DOE-RL/WHC Response: The definitive design will be submitted for review and will be the basis for modifying the permit application.

26. Page 4-37, Section 4.6.5.3.4 (4-13). The thermal expansion of the liner due to temperature variations will be accommodated by installing the flexible membrane liner with a small amount of slack in the side slopes of the trenches. 2-18-92

Ecology Recommendation. Given the extreme temperature variations at the Hanford Site, providing slack might not be sufficient to prevent damage due to thermal stresses and other effects of prolonged exposure. The exposed portion of the liner on the side slope portions of the trenches should be covered with ultra-violet protection material until the side slopes are covered with waste. See comment number 22.

DOE-RL/WHC Response No. 1: Thermal expansion is described in more detail in the definitive design that will be submitted to Ecology for review. The permit application will be revised to agree with the definitive design.

Deficiency: Section 4.6.5.3.4, Thermal Stresses, Page 4-37

Comment 20 also applies here.

DOE-RL/WHC Response No. 2: The stresses caused by thermal contraction are described in the Definitive Design Report WHC-SD-W025-FDR-001, Page 19 of 397, Section 5.4.1. and in Appendix C.10, Pages 275-279 of 397. This analysis shows that thermal stresses and strains in the FML were well within acceptable limits even when extreme temperature conditions and no slack were assumed. Also, once the operations layer is in place, thermal fluctuations will be relatively minor compared to the extreme conditions assumed for the analysis.

27. Page 4-41, Section 4.6.5.5.2 (4-14). Soil liner compatibility test procedures. 4-26-91

Ecology Recommendation. Similar to the synthetic liner testing protocol, some means of testing the cumulative effects of the contaminant types should be included.

DOE-RL/WHC Response: This information will be provided in the Liner/Leachate Compatibility Test Plan. The permit application will be revised to agree with the test plan.

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28.	Page 4-44, Section 4.6.6.1.1 (4-15). The locations of the sumps in the primary system are not specified. Ecology Recommendation. Specify the location of sumps in the primary system. **DOE-RL/WHC Response No. 1: The locations of the sumps will be provided in the definitive design documents that will be submitted to Ecology for review. The permit application will be revised to agree with the definitive design.** Comment: Section 4.6.6.1.1, Primary System Page 4-44 Comment 20 also applies here. **DOE-RL/WHC Response No. 2: See the Definitive Design Report WHC-SD-W025-FDR-001, Page 29 of 397, Section 6.4.1.1, "Primary System." The sump locations are shown on the design drawings and on Figure 4-7 of the revised Chapter 4.**	2-18-92
29.	Page 4-46, Section 4.6.6.1.2 (4-16). The locations of the sumps in the secondary system are not shown. Ecology Recommendation. Specify the locations of the sumps in the secondary system. **DOE-RL/WHC Response No. 1: The locations of the sumps will be provided in the definitive design documents that will be submitted to Ecology for review. The permit application will be revised to agree with the definitive design.** Comment: Section 4.6.6.1.2, secondary System, Page 4-46. Comment 20 also applies here. **DOE-RL/WHC Responses No. 2: See the Definitive Design Report WHC-SD-W025-FDR-001, Page 30 of 397, Section 6.4.1.2, "Secondary System Pumps." The sump locations are shown on the design drawings and on Figure 4-7 of the revised Chapter 4.**	2-18-92
30.	Page 4-47, Section 4.6.6.5 (4-17). The Applicant cites references to other sources for information on components within the waste stream.	2-18-92

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Ecology Recommendation. Test results for compatibility of components within the waste stream handling system (pumps, holding tanks, and drain pipes) with radioactive and dangerous wastes should be provided here or appended by reference.

DOE-RL/WHC Response No. 1: Items that are replaceable, such as pumps and tanks, will not be subjected to Method 9090 testing. The high-density polyethylene pipe used for drainage and transfer of leachate from the sump area into the aboveground holding tank will be tested. The design attempts to minimize the components that would not be accessible for maintenance.

Comment: Section 4.6.6.5, System Compatibility, Page 4-47

Comment 20 also applies here.

DOE-RL/WHC Responses No. 2: When the 9090 test report is completed, it will be submitted to Ecology and will provide the information applicable to this comment.

31. Pages 4-36 through 4-48, Sections 4.6.5.3.2 and 4.6.6.6.1 (4-18). Both sections discuss the stresses on the liner and geonet from the overlying load.

Ecology Recommendation. The weight of the overlying material on the geonet after the landfill is closed has a tendency to impinge the geonet and impair the function of the geonet resulting in clogging of the drainage layer. Laboratory tests should be performed on a geonet layer sandwiched between flexible membrane liners and geotextile and supplying the weight of the waste and final cover to demonstrate that the geonet will perform in the field. Such tests should include bearing weights of asphalt or other base courses provided as storage flooring overlying the liner system. These test results should be provided for Ecology review. Factors of safety for compression and clogging (particles, mineral deposits, and biological growth) also should be provided for Ecology review.

DOE-RL/WHC Response No. 1: This concern is addressed in the definitive design specifications which will be submitted to Ecology for review. In the specifications, the transmissivity value is specified under normal load of about one-half the ultimate waste cover. Manufacture's test data and results of planned conformance tests will be submitted to Ecology if requested.

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Comment: Sections 4.6.5.3.2 and 4.6.6.6.1, Weight of Overlying Material and Stability of Drainage Layers, Pages 4-36 and 4-47

Transmissivity tests should indicate adequate performance (i.e., transmissivity greater than 5×10^{-4} m^2/sec) at 1.5 times the maximum expected load which the geonet will experience. Furthermore, the manufacturer's test data and results must be submitted to Ecology. Comment 20 also applies here.

DOE-RL/WHC Response No. 2: Manufacturer's transmissivity data for the proposed geonet is shown on the attached Figure PN-3000. With respect to performance, we believe that the section tested by Fluid Systems, Inc. is similar to the critical section in the Project W-025 Landfill (operations layer over geocomposite). It can be seen that at loads up to 10,000 psf, the transmissivity of this system exceeds 5×10^{-4} m^2/sec in all cases. Conservatively assuming a unit weight of 110 pcf for materials above the liner, a load of 10,000 psf corresponds to 90 feet of waste and soil cover. This is 2 to 3 times the expected thickness, so the geocomposite has an acceptable margin of capacity.

With respect to test data, formal manufacturer's submittals and conformance testing results are required, not only for the geocomposite but for most other materials, as established in the CQA Plan and the Specifications. This information will be made available to Ecology as requested.

Comment: Sections 4.6.5.3.3 and 4.6.6.6.1, Weight of Overlying Material and Stability of Drainage Layers, Pages 4-36 and 4-47

It is unclear if the last line of text in this response means that material test results will be submitted to Ecology "as requested" in the future or "as requested" in the NOD comment. It should be noted that all "Certified Material Test Reports" and similar material documents must be provided to Ecology. This is a permit requirement which must automatically be met without future requests from Ecology staff.

DOE-RL/WHC Response No. 3: Copies of all construction media (e.g., Certified Material Test Reports, drawings, inspection reports, etc.) will be available to Ecology at the project site during construction. The CQA Manager will provide on site office space for the Ecology representative. Inspection hold and witness points will be scheduled and conducted in

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accordance with the approved CQA Plan. In addition, at the end of construction, the CQA Manager will prepare a final report containing all construction records. See response to comment 354.

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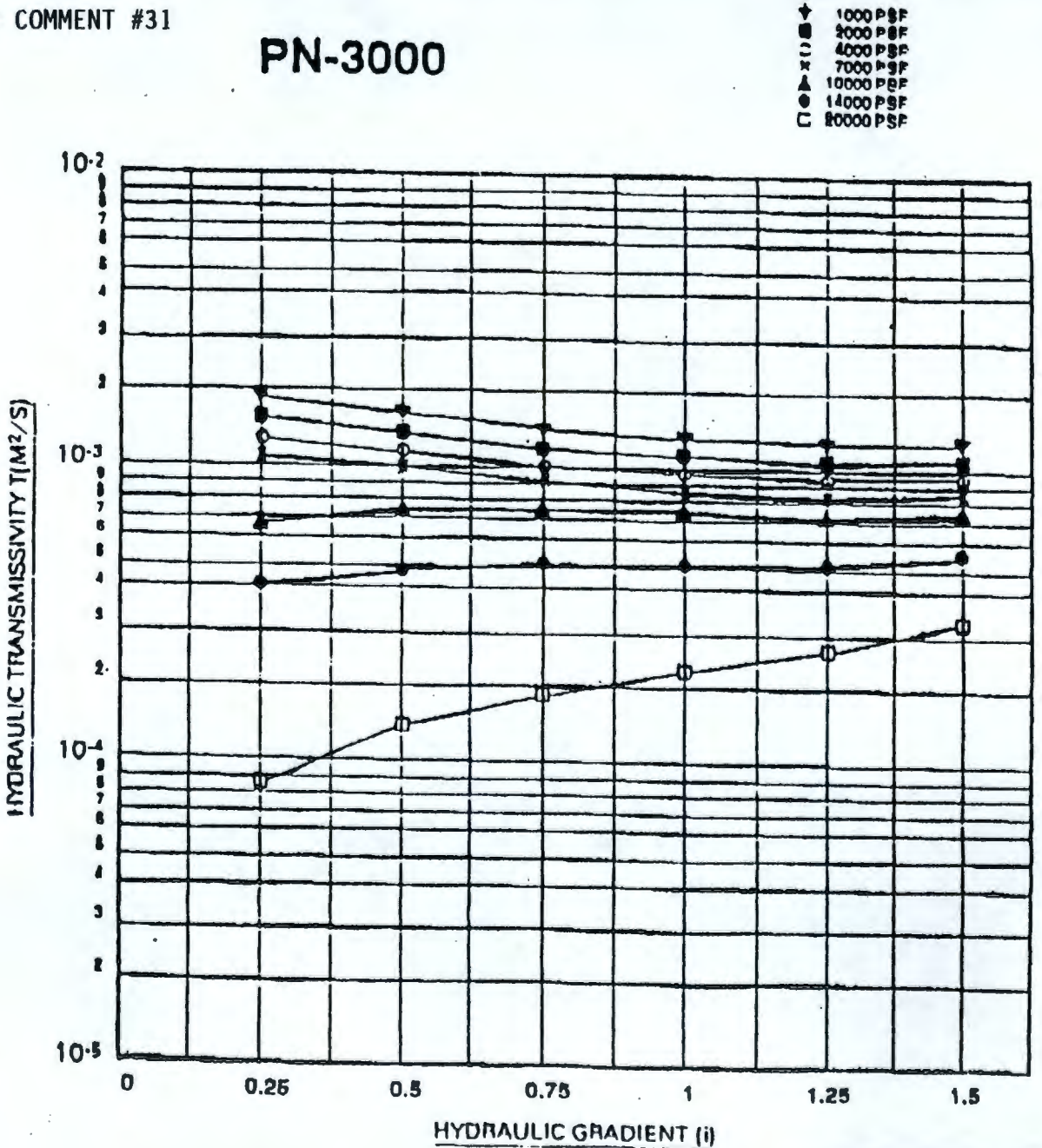
FIGURE FOR COMMENT #31



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Deficiency: Section 4.6.5.3.3 and 4.6.6.6.1, Weight of Overlying Material and Stability of Drainage Layers, Page 4-36 and 4-47.

The response fails to acknowledge Ecology's requirement to be provided with this documentation.

Requirement: The submittals noted in the response must be provided to Ecology's construction inspector or unit manager prior to use of the material.

RL/WHC Response No. 4: The handling of construction inspection and other interfaces with Ecology regarding construction are being addressed as part of Hanford Facility Permit discussions.

32. Page 5-1, lines 18-21 (5-1). This section states that because a waiver from the groundwater monitoring requirements under WAC 173-303-645 is not requested by this plan, "therefore, the requirements of this section of the Washington Administrative Code are not applicable to the LLBG." This is not correct. This section of the Code (173-303-645) states, inter alia, "(a) Except as provided in (b) of this subsection, the regulations in this section apply to owners and operators of facilities that treat, store, or dispose of dangerous waste in surface impoundments, waste piles, land treatment units, or landfills. The owner or operator must satisfy the requirements of this section for all wastes (or constituents thereof) contained in any such waste management unit at the facility that is a "regulated unit" [as defined in WAC 173-303-040(75)]." Thus, subsection -645 applies although application of specific provisions of this subsection (i.e., those relating to exemption from groundwater monitoring) are not requested. — 4-26-91

Ecology Recommendation. Rewrite this section to state that WAC 173-303-645 applies and that exemption from this subsection of the code is not requested.

DOE-RL/WHC Response: The sentence "Therefore, the requirements of this section ... are not applicable to the LLBG." will be deleted.

33. Page 5-2, lines 25 through 35 (5-2). Section 5.2.1 discusses what the Interim Status Groundwater Monitoring Approach was supposed to do to meet the 1986 compliance order. To what degree these requirements were carried out is not detailed. — 4-26-91

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Ecology Recommendation. Outline to what degree requirements, goals, and objectives were met.

DOE-RL/WHC Response: The text will be expanded to indicate that the initial network of 35 monitoring wells was installed as planned, and that the goals of the network in providing hydrogeologic property information and background water quality data were met.

34. Page 5-3, lines 4 and 5 (5-3). The basis for establishing the compliance boundaries is not explained. Is the compliance boundary the same as the low-level waste management area (LLWMA) boundary shown in Figures 5-1 and 5-2? — 4-26-91

Ecology Recommendation. Describe the basis for establishing compliance boundaries and delineate the compliance boundary in figures.

DOE-RL/WHC Response: The compliance boundary is defined by a line that connects the monitoring wells spaced around the perimeter of the waste management area. If no well is located at a corner of a waste management area the compliance line is continued along both sides of the waste management area until they meet. The lines on Figures 5-1 and 5-2 that delineate the 'low-level waste management area' are the compliance boundaries. Both text and figures will be altered to specifically define these boundaries.

35. Page 5-6, line 51 (5-4). Bierschenk initials turned around in reference section. — 4-26-91

DOE-RL/WHC Response: The order of Bierschenk's initials will be corrected in the references.

36. Page 5-7, line 8 (5-5). Deju (1975) citation omitted in reference section. — 2-26-91

DOE-RL/WHC Response: The Deju (1975) citation is not correct. The citation in the text will be corrected to Ledgerwood and Deju (1975).

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37.	Page 5-7, lines 30-42 (5-6). Section 5.2.2.2 discusses the interim status monitoring well network and states that four of the 35 wells, completed in 1987, are screened over the lowermost 20 feet of the uppermost aquifer. The remaining 31 wells are completed in the upper 20 feet of the uppermost aquifer. No explanation is given why four wells were completed in the deep section of the aquifer. Ecology Recommendation. Provide an explanation on the number of wells chosen for monitoring the deeper section of the aquifer. This discussion should focus on explaining why a small number of wells were completed in the deeper section of the aquifer relative to the larger number of wells for the upper part of the aquifer. **DOE-RL/WHC Response: There is considered to be virtually no likelihood of dense non-aqueous phase liquids reaching the groundwater from the wastes in the LLBG. However, four wells were selected as deep wells for verification. This concept is supported by the types and quantities of waste described in Chapter 3.0, the methods of disposal, and the mechanisms available for mobilization and transport to the groundwater. Furthermore, the results of the first year of monitoring have been found to be consistent with this concept. The text will be revised to explain the number of wells chosen to monitor the deeper section of the aquifer.**	4-26-91
38.	Page 5-9, lines 25 and 26 (5-7). A detailed explanation on casing and screen inspection was not provided. Was decontamination performed prior to placement? If so, what solutions/solvents were used? Ecology Recommendation. Provide a detailed explanation on casing and screen inspection. **DOE-RL/WHC Response: The casing and screen were factory-cleaned and delivered to the well site in clean plastic bags where they were visually inspected prior to installation. No additional cleaning was found to be required at the well site. A detailed description of the cleaning, inspection, and handling process will be added to the text.**	4-26-91
39.	Page 5-9, line 30 (5-8). What size and type of silica sand? **DOE-RL/WHC Response: The size and type of silica sand will be specified in the text.**	4-26-91

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40.	Page 5-9, line 38 (5-9). What proportion of grout is Volclay vs. concrete? **DOE-RL/WHC Response: Volclay does not contain concrete. A detailed description of Volclay will be added to the text.**	4-26-91
41.	Pages 5-10 and 5-13 (5-10). Well 299-W7-2 has been left out of well listing. Ecology Response. Include Well 299-W7-2 to the well listing. **DOE-RL/WHC Response: Well 299-W7-2 will be added to the well listing.**	4-26-91
42.	Page 5-13, lines 12-17 (5-11). Text says that the data do not "clearly indicate" whether upgradient contamination is a problem. Is there 'some' indication that upgradient contamination is a problem? Ecology Recommendation. Elaborate on the potential for upgradient contamination and how it should be addressed in the monitoring program. **DOE-RL/WHC Response: Upgradient contamination is a potential problem at the site. A description of this upgradient contamination is provided in Section 5.4. An approach for treating the statistical complications resulting from the presence of upgradient contamination is outlined in Section 5.5.4.7. References to these sections will be added to Section 5.2.2.4.**	4-26-91
43.	Page 5-13, lines 26 through 35 (5-12). Section 5.2.2.5 lists analysis performed on sediments. Were the grab samples used for analysis? If so, were they hard drive slurry or drive barrel samples? Ecology Recommendation. Elaborate and clarify the sampling methods employed and the type of samples tests were performed on. Subsequent sections' discussion on heterogeneity of material types, hydraulic conductivity, etc., could raise question on quality of lithologic evaluation. **DOE-RL/WHC Response: A more detailed description of the sediment sampling techniques and the testing performed on each type of soil sample will be added to the text. Sediment was collected as split barrel continuous core, hard tool slurry, and drive barrel samples.**	4-26-91

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44.	Page 5-13, line 47 (5-13). How was contaminated purge water disposed of? **DOE-RL/WHC Response: A more detailed discussion of purge water disposal will be presented in the new Section 5.2.3.1.8, and a reference to that section will be added to the text.**	4-26-91
45.	Page 5-14, lines 37 through 44 (5-14). What decontamination techniques were used to decontaminate water-level measuring equipment between wells? **DOE-RL/WHC Response: The water-level measuring equipment is decontaminated between wells by rinsing with distilled water. A description of the decontamination techniques will be added to the text.**	4-26-91
46.	Page 5-15, lines 2 through 4 (5-15). For low-yielding wells, at least two volumes should be evacuated to purge annular space water in contact with casing volume water. **DOE-RL/WHC Response: The LLBG monitoring networks contain no low-yielding wells at present, and at least three well volumes have been removed from all interim status wells before each sampling event. The discussion of reduced purging of low-yielding wells will be removed from the text.**	4-26-91
47.	Page 5-15, lines 7 and 8, Section 5.2.3.1.3 (5-16). Specify pump flow rate during VOA collection. **DOE-RL/WHC Response: The flow rate during collection of VOA samples is generally 1 gallon per minute. A discussion of this flow rate will be added to the text.**	4-26-91
48.	Page 5-15, line 34 (5-17). Semivolatiles were not specified in above sampling order (Section 5.2.3.1.3, lines 16 and 17). When was this fraction sampled? Ecology Recommendation. Specify semivolatiles in the sampling order. Identify when this fraction was sampled. **DOE-RL/WHC Response: The sampling order, including semivolatiles, will be more clearly described in the text.**	4-26-91

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49.	Page 5-15, lines 43 through 45 (5-18). Semivolatiles require a volume of only 75 percent container. **DOE-RL/WHC Response: All sample bottles, other than those for VOA's, are filled to the top, although a small amount of air space (less than 5 percent) may remain in the bottle. The VOA vials are filled slightly more than full so that no air space remains in the bottle. The text will be modified to clarify the extent of filling and specify sample bottle types.**	4-26-91
50.	Page 5-15, lines 40 through 43 (5-19). Specify sample bottle types - size, clear glass, amber glass, polyethylene, etc. **DOE-RL/WHC Response: The text will be revised to specify sample bottle types.**	4-26-91
51.	Page 5-15, line 48 (5-20). What methods were used to monitor the 4°C temperature? Ecology Recommendation. Specify methods used to monitor the 4°C temperature. **DOE-RL/WHC Response: A description of the methods will be included in the permit application.**	4-26-91
52.	Page 5-16, lines 29 through 37 (5-21). What preparation procedures were used for field and trip blanks? What kind of water is used - distilled, deionized, or carbon-free? Where are trip blanks prepared? **DOE-RL/WHC Response: A more complete description of the preparation procedures for blank samples will be added to the text.**	4-26-91
53.	Page 5-16 (5-22). Section 5.2.3.1.7 does not indicate whether samples were collected as a check on matrix homogeneity (duplicates, replicates). Ecology Recommendation. Applicant should elaborate on this and specify frequency. In addition, state whether or not any unsates on ancillary equipment (water-level measurement tapes, probes) were taken to evaluate the effectiveness of the decontamination process. **DOE-RL/WHC Response: Duplicate sampling frequency and a discussion of equipment blanks will be added to the text.**	4-26-91

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54.	Page 5-25, lines 10 and 11 (5-23). What was done with the water from Well 299-E28-26? **DOE-RL/WHC Response: Well 299-E28-26 was not pump tested. Purge water from this well was treated the same as other purge water, as described in Section 5.2.3.1.8. The text will be modified to clarify water handling from this well.**	4-26-91
55.	Pages 5-25 through 5-27, Section 5.2.3.2.3 (5-24). What was done with unacceptable purge water during quarterly monitoring? **DOE-RL/WHC Response: A description of disposal procedures for all purge water will be outlined in the new Section 5.2.3.1.8. A reference to this section will be added to the text.**	4-26-91
56.	Page 5-39, line 34 (5-25). Refer to Section 5.3.3 which does not discuss transmissivity. Ecology recommendation. Delete reference or clarify. **DOE-RL/WHC Response: The reference to Section 5.3.3 will be changed to Section 5.3.5.1.5.**	4-26-91
57.	Page 5-41, Table 5-3 (5-26). This table identifies the major ion chemistry of the unconfined aquifer on the Hanford Site. No source for this data is noted. Ecology Recommendation. Include the citation for this data at the bottom of Table 5-3. **DOE-RL/WHC Response: The source of the data will be added to Table 5-3.**	4-26-91

No.	Comment/Response	Ecology Concurrence
58.	Pages 5-42 through 5-59, Section 5.3.5 (5-27). There is a considerable amount of ambiguity with respect to hydraulic conductivities. It is understood that a considerable degree of heterogeneity in site materials results in great variations in hydraulic conductivity. However, evaluation and analysis should focus more attention on this critical parameter because it does play such a critical role in the efficiency modeling, potential plume dispersion, and ultimately the location of monitoring wells. **DOE-RL/WHC Response: Although discussion of hydraulic conductivities will be clarified in the text, this parameter does not affect dispersion, the efficiency modeling, or the location of monitoring wells. Efficiency modeling depends upon the plume shape when plumes reach the boundary of the buffer zone. As described in Section 5.5.2.1.4, dispersion in porous media is the sum of molecular diffusion and mechanical dispersion. Mechanical dispersion, which equals velocity times a dispersivity coefficient, dominates molecular diffusion except at very low flow rates. Assuming a diffusion coefficient of 1×10^{-6} square feet per day, and a low transverse dispersivity of 1 foot, molecular diffusion may be neglected at flow rates greater than 1×10^{-4} feet per day, which is several orders of magnitude smaller than the estimated flow rates beneath the LLBG. For nonreactive transport dominated by mechanical dispersion, the shape of a plume of a given size is independent of groundwater velocity and, therefore, also independent of hydraulic conductivity. This velocity independence is evident upon careful inspection of the equation in Section 5.5.2.1.4. This will be described in greater detail in the text.**	4-26-91
59.	Page 5-48, lines 33 through 38 (5-28). Section 5.3.5.1.5 suggests a comparison of hydraulic conductivity in feet per day for basalt to transmissivity in square feet per day of Hanford and Ringold Formations. Ecology Recommendation. Convert transmissivity to average hydraulic conductivity so units will allow direct comparison. **DOE-RL/WHC Response: Transmissivity values will be converted to hydraulic conductivity values.**	4-26-91

No.	Comment/Response	Ecology Concurrence
60.	Page 5-59, lines 12 through 16 (5-29). Section 5.3.5.2.5 discusses groundwater flow velocities beneath the low-level waste management areas and indicates that Darcian flow is assumed to be valid. No explanation is given why this assumption should not be considered valid. Ecology Recommendation. Provide an explanation why Darcian flow should be considered valid for groundwater flow beneath these management areas. **DOE-RL/WHC Response: Darcy's law is considered valid for all flow through granular media except in fine-grained materials of very low permeability (Freeze and Cherry, 1979, pp. 72-73). Sediments in the Hanford and Ringold Formations are relatively coarse grained with moderate to high permeability. The text will be modified to eliminate the suggestion that Darcy's law may not be valid.**	4-26-91
61.	Page 5-60, line 44, Section 5.3.6 (5-30). What is (I)? **DOE-RL/WHC Response: 'I' refers to the upper member of the Elephant Mountain Basalt. The text will be changed to be consistent with the usage of 'upper' throughout.**	4-26-91
62.	Page 5-62, lines 3 through 5 (5-31). Section 5.4 states that, "Ecology regulations require a description and delineation of any groundwater contaminant plume that, based on interim status monitoring data, is suspected of originating from one of the LLBG-regulated units." The specific Ecology regulations must be cited. Ecology Recommendation. Cite the specific Ecology regulations referenced. **DOE-RL/WHC Response: The specific Ecology regulation will be added to the text.**	4-26-91
63.	Page 5-62, line 5 (5-32). The, "on" should be "of". **DOE-RL/WHC Response: This sentence will be replaced as part of revising Chapter 5.**	4-26-91

No.	Comment/Response	Ecology Concurrence
64.	Pages 5-77, lines 22 and 23 (5-33). Text implies drinking water standard for nitrate is 45 parts per million as NO_3, but should specifically state. **DOE-RL/WHC Response: The text will be changed to specifically state that the water standard for nitrate is expressed in terms of nitrate.**	4-26-91
65.	Pages 5-77 through 5-148, Section 5.5 (5-34). General monitoring program design should consider contingency for monitoring aquifer below uppermost aquifer if uppermost aquifer becomes contaminated. **DOE-RL/WHC Response: The text will be changed to indicate that monitoring the aquifer below the uppermost aquifer may be necessary should the bottom of the uppermost aquifer become contaminated from waste in the LLBG.**	4-26-91
66.	Page 5-85, Section 5.5.2.1.3 (5-35). The monitoring efficiency model appears to be an ideal approach to the design of monitoring systems. However, even if the model is valid, it should be in addition to conventional hydrogeologic analysis, particularly, the preparation of detailed planer and cross-sectional flow nets for each of the sites. There may not be sufficient data for the preparation of detailed flow nets, specifically for LLWMA-2, -4, and -5. If this is the case, and representative flow net construction is not possible, this may indicate that data are insufficient for a valid interpretation of the hydrogeology and the proper design of a monitoring system, including application of the efficiency model. Ecology Recommendation. Provide detailed planer and cross-sectional flow nets for each site or provide a detailed explanation why construction of these nets is not possible. **DOE-RL/WHC Response: Equipotential maps of the groundwater surface have been prepared for three consecutive years for all low-level waste management areas to supplement the efficiency model results and will be added to the text. These maps have contour intervals of 1 foot or less and are based upon data from the immediate vicinity of the low-level waste management areas and from the surrounding area. The consistency of the equipotentials with time and the level of detail provided by the small contour intervals are considered to provide sufficient information on the hydrogeology to support monitoring network design. Planer flow nets have been prepared at 1 foot contour intervals or less for all low-level waste management areas**	4-26-91

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for the most recent data set. Companion cross-sectional flow nets have also been prepared at 1-foot contour intervals or less for the low-level waste management areas in the 200 West Area, where the thickness of the uppermost aquifer is about 200 feet and deep monitoring wells have been installed. All flow nets will be added to the text and will be used with the MEMO Model results in monitoring network design.

67. Page 5-90, lines 1 through 52 (5-36). The original Domenico and Robbins (1985) article on the two-dimensional analytical transport model could not be obtained for review within the time available. Until the original article and other documentation can be reviewed, specific comments on the applicability of this particular model must be deferred. — 4-26-91

DOE-RL/WHC Response: Additional comments on the applicability of the Domenico and Robbins plume generation model have not been received from Ecology, and it is assumed that this model was found to be acceptable.

68. Page 5-91, lines 1 through 9 (5-37). The report states the model is valid for lower density contaminants which would not exhibit vertical mixing. A potential problem could exist with heavier contaminants that would show vertical mixing and that would then invalidate the two-dimensional assumption of the Domenico and Robbins model. Deeper monitoring wells and some type of three-dimensional model may be warranted. — 4-26-91

DOE-RL/WHC Response: The text will be modified to include a discussion of potential sources of dense non-aqueous phase liquids and metal salts at the low-level waste management areas that, if present, could invalidate the application of the two-dimensional formulation of the Domenico and Robbins model. In brief, based on the quantities and disposal methods of metal salts and dense non-aqueous phase liquids, no significant potential for density driven transport is considered to exist at the low-level waste management areas.

69. Page 5-92, lines 29 through 32 (5-38). The assumption of a 20-foot long source length through a 200-foot deep vadose zone is not adequately substantiated. This factor could greatly effect the model results as it would effect the generation of the plume family curves used. — 4-26-91

Ecology Recommendation. Backup data for the assumption of 20-foot long source length through a 200-foot deep vadose zone would be helpful. Golder Associates (i.e., Charles Wilson)

No.	Comment/Response	Ecology Concurrence

stated that the figure came from the literature. A source reference was not cited, but should be.

DOE-RL/WHC Response: The text will be modified to include an expanded discussion (Section 5.5.2.1.5.3) of line source width. The magnitude of this width was determined based upon site specific conditions and was not taken from the literature. A review of Hanford Site data on tank and crib leaks and the associated spreading of the plume through the vadose zone will be presented. Modeling results of the T-106 point source leak and of an aerially distributed leak scenario will be summarized. In addition, a detailed analysis of model sensitivity to source width will be included. Because monitoring efficiencies decrease at a decreasing rate as source width declines, and changes little below about 40 feet, the selection of source width is not critical to model results.

70. Page 5-93, lines 1 through 36 (5-39). Discussion states: 4-26-91

a) Smaller dispersitivities are more conservative.

b) Longitudinal dispersivity (Dx) for Ringold like material is 49 feet over distance of 260 feet (scale of interest).

c) Scale of interest at 200 Areas is 300 to 1,000 feet.

d) Selected 'conservative' longitudinal dispersivity is 70 feet.

Dx=70 feet may be conservative for a scale of interest of 1,000 feet. However, it is not very conservative for a scale of interest of 300 feet which is closer to what the Ringold like material was evaluated at..

For monitoring well placement, proper selection of a representative transverse dispersivity is even more critical. Hydraulic conductivity influences the dispersivity ratio and the data indicate low and high extremes in hydraulic conductivity for the low-level waste management areas. A single transverse dispersivity for all cases does not seem appropriate, particularly in the case of the Hanford formation where hydraulic conductivities are on the order of 10 feet per minute. In such a case, a transverse dispersivity of 3 to 5 feet might be more appropriate.

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Ecology Recommendation. Re-evaluate dispersivities. If necessary use more than one dispersivity value for modeling runs to reflect variations in site conditions. Due to the extreme sensitivity the model results would have on the selection of both lateral and transverse dispersivity, some type of tracer test should be run to further validate the model assumptions for typical sites around the project.

DOE-RL/WHC Response: Dispersivity values presented in the literature and estimated from existing plumes at the Hanford Site were re-evaluated, and detailed sensitivity studies were performed on both longitudinal and transverse dispersivities using the MEMO Model. The results of these studies will be added to the text. The monitoring efficiency was found to be sensitive to transverse dispersivity but relatively insensitive to longitudinal dispersivity. The data were evaluated at a scale of about 1,000 feet, which is considered appropriate because of the need to model plumes extending across the 500 feet wide buffer zone and well back into the low-level waste management area. The dispersivity data show wide ranges, from which conservative values were selected for use in the model. Emphasis was given to transverse dispersivities because of the demonstrated sensitivity to that parameter.

While the process of dispersion is velocity dependent, the dispersivity coefficients are material properties that depend only upon the heterogeneity of the material, and not upon the absolute magnitude of the hydraulic conductivity; see, for example, "Three-Dimensional Stochastic Analysis of Macrodispersion in Aquifers" by L. W. Gelhar and C. L. Axness (Water Resources Research, Vol. 19 No. 1, 1983), and "A Natural Gradient Experiment on Solute Transport in a Sand Aquifer, Spatial Variability of Hydraulic Conductivity and Its Role in *the Dispersion Process*" by E. A. Sudicky (Water Resources Research, Vol. 22 No. 13, 1986). While the geology of the 200 East and West Areas are somewhat different, there is no reason to believe that the heterogeneity of the areas differs significantly. As a result, because the scale of interest is the same for all of the low-level waste management areas, the same values for dispersivity coefficients were used for all sites.

No.	Comment/Response	Ecology Concurrence

Several existing plumes on the Hanford Site have been analyzed to estimate dispersivities, and the results will be summarized in the text. Performing a field tracer test to further validate the model assumptions is suggested in the comments but is not believed to be warranted for the purpose of supporting network design. A single test could not be demonstrated to be representative of all sites; several tests would need to be run to overcome this difficulty. Further, tracer testing is not a routine practice in the same sense as permeability testing, but is of a somewhat experimental nature. It is proposed instead to base the monitoring network design upon conservatively selected dispersivities from the literature and from analysis of existing plumes at the Hanford Site.

71. Page 5-94, lines 1 through 8 (5-40). The need for a buffer zone in the model is well explained but selection of a 500 foot width appears somewhat arbitrary. 4-26-91

Discussions with Golder Associates (Charles Wilson) indicate that there were no guidelines for buffer zone width designation. Guidelines they did see pertained mostly to urbanized areas. The remote location of the sites appears to have strongly influenced the selection of 500 feet as the zone width. Are there any objective criteria which can be used? What would a small buffer zone be? What would a large buffer zone be?

Ecology Recommendation. Elaborate on selection of a specific buffer zone width. Some backup references concerning this are in order, even if they pertain mostly to urban areas. This would at least give some feel for the numbers used at other sites. If objective criteria cannot be established, describe the benefit of using 500 foot width over larger or smaller widths (i.e., sensitivity analysis presented on page 5-98, lines 16 through 24, cost differences, etc.).

DOE-RL/WHC Response: The discussion of buffer zone width will be expanded in the text. Regulatory guidelines relating to the buffer zone concept have been discussed, and references to those guidelines have been included. In addition, several objective criteria are suggested for determining buffer zone widths, although not all may apply to any one site. A sensitivity analysis of monitoring efficiency to buffer zone width was conducted, and the results will be described in the text. The results indicate that the efficiency is not highly sensitive to buffer zone width.

No.	Comment/Response	Ecology Concurrence
72.	Page 5-97, lines 21 through 25 (5-41). Northern wells are spaced farther apart because of angle of incidence. Because hydraulic conductivity is also highest in the north, transverse dispersivity will consequently be less, yielding a narrower plume. Ecology Recommendation. Reconsider wider spacing of monitoring wells on the northern margin of LLWMA-1. **DOE-RL/WHC Response: Transverse dispersivity is a material property that is independent of the magnitude of hydraulic conductivity and groundwater flow velocity (see response to comment number 69). However, the process of dispersion, which governs lateral spreading in the Domenico and Robbins model (ignoring molecular diffusion) is dependent upon the magnitude of hydraulic conductivity and groundwater flow velocity. This process is adequately represented in the MEMO Model. The width of the plume and the spacing of the northern wells of LLWMA-1 are, therefore, entirely appropriate.**	4-26-91
73.	Page 5-98, lines 26 through 36 (5-42). Larger transverse dispersivity is less conservative given fixed well locations as in design presented. Sensitivity to changes in transverse dispersivity is reported low for high-efficiency levels and high for low-efficiency levels. How low is low? Ecology Recommendation. Perform sensitivity analysis using a transverse dispersivity of 3 to 5 feet which would be representative of high hydraulic conductivities and result in lower efficiencies, indicating a given well spacing is less conservative. **DOE-RL/WHC Response: A sensitivity analysis of monitoring efficiency to transverse dispersivity will be conducted over the range of 1.75 to 17.5 feet, and a discussion of the results will be added to the text.**	4-26-91
74.	Page 5-100, lines 18 through 20 (5-43). The text states that the lower hydraulic gradient in the west-central part of the area suggests that the groundwater is crossing a band of lower conductivity material. Typically (everything else being equal), a lower hydraulic gradient is indicative of a higher hydraulic conductivity. Therefore, the text is confusing or erroneous. Which data supports the use of the efficiency model, the hydraulic gradient or the hydraulic conductivities?	4-26-91

No.	Comment/Response	Ecology Concurrence

Ecology Recommendation. Clarify or correct and relate to model application.

DOE-RL/WHC Response: This section of the text will be clarified. The original text erroneously referred to a lower, rather than a higher, hydraulic gradient in the central part of the low-level waste management area.

The MEMO Model depends only on the direction, and not the magnitude, of the hydraulic gradient, and does not depend upon the magnitude of hydraulic conductivity (see response to comment number 69).

75. Page 5-104, lines 20 through 24 (5-44). A hydraulic conductivity of 0.6 feet per day (4 x 10-4 feet per minute) is not consistent with the sandy gravel depicted in Figure 5-19. This order of magnitude for hydraulic conductivity is characteristic of a very fine sand or silt. — 4-26-91

Ecology Recommendation. Re-evaluate hydraulic conductivity for LLWMA-3, basic data or interpretation of aquifer tests may be in error or original lithologic descriptions may be in error.

DOE-RL/WHC Response: The values of hydraulic conductivity reported in the text were obtained from Last et al. (1989), in which hydraulic conductivity was estimated by dividing the transmissivity by the total saturated thickness of the aquifer. This was incorrect, since in most cases the wells were not screened over the total saturated thickness of the aquifer. Hydraulic conductivities have been recalculated by dividing the transmissivity obtained from the well tests by the total screen length of 10 feet. These new values will be reported in Sections 5.3.5.1.5 and 5.3.5.2.5. In some cases, the new values of hydraulic conductivity are more than two orders of magnitude larger than originally reported.

76. Pages 5-107 and 5-108, Figure 5-39 (5-45). Figure labeled incorrectly. Should be Area-3. — 4-26-91

DOE-RL/WHC Response: The figure heading will be corrected.

77. Page 5-112, Section 5.5.2.1.9 (5-46). With the data and discussion presented, it is not possible to evaluate the adequacy of the base of aquifer monitoring program (deep wells). — 4-26-91

No.	Comment/Response	Ecology Concurrence

Ecology Recommendation. Provide cross-sectional flow nets parallel to groundwater flow for each site and relationship of deep wells.

DOE-RL/WHC Response: Cross-sectional flow nets have been prepared at 1 foot contour intervals or less for the low-level waste management areas in the 200 West Area, where the thickness of the uppermost aquifer is about 200 feet and deep monitoring wells have been installed. These flow nets will be added to the text and are used with the MEMO Model results in monitoring network design. The thickness of the uppermost aquifer in the 200 East Area is sufficiently small that many monitoring wells penetrate the entire aquifer, and vertical flow nets for that area have not been prepared.

78. Page 5-112, lines 40-43 (5-47). Section 5.5.2.1.9 discusses the need to monitor the deeper portion of the uppermost aquifer due to possible migration of dense contaminants to the bottom of the aquifer. It is stated that, "in view of these considerations, deep wells will be installed at each low-level waste management area to provide samples for upgradient and downgradient water quality analysis, but will not be configured to establish networks equivalent to those described for the shallow wells." This explanation regarding the network density for wells monitoring the deeper portion of the aquifer relative to wells monitoring the shallow portion of the aquifer is inadequate. 4-26-91

Ecology Recommendation. Provide a detailed explanation regarding the rationale for the network of wells monitoring the shallow portion of the aquifer and wells monitoring the deeper portion of the aquifer.

DOE-RL/WHC Response: Based on the quantities and disposal methods of metal salts and dense non-aqueous phase liquids, no significant potential for density driven transport exists at the low-level waste management areas. As a result, the number of deep wells is smaller than the number of shallow wells (see response to comment number 68). The text will be revised to explain the number of wells chosen to monitor the shallow and deeper sections of the aquifer.

79. Page 5-115, line 47 (5-48). Well Construction Standard citation not included in references. 4-26-91

DOE-RL/WHC Response: The WAC 173-160 Well Construction Standard will be added to the reference list.

No.	Comment/Response	Ecology Concurrence
80.	Page 5-129, line 26 (5-49). Implements should be steamed cleaned after 6 and before 7. **DOE-RL/WHC Response: The type of groundwater sampling equipment addressed in this paragraph is usually not steam cleaned. The text will be changed to clarify that this discussion applies only to laboratory decontamination of groundwater sampling equipment.**	4-26-91
81.	Page 5-130, lines 44 through 51 (5-50). Section 5.5.3.2.1 states that, "For low-level waste management areas in which regulated units presently contain buried waste, background water quality conditions will be determined from monitoring wells located immediately hydraulically upgradient and within 100 feet of the boundary of the respective low-level waste management area." No explanation is given why 100 feet was chosen as the maximum distance an upgradient well will be situated at the monitored burial ground. Ecology Recommendation. Provide a detailed explanation regarding the spacing of upgradient monitoring wells from the burial grounds. **DOE-RL/WHC Response: The text will be modified to clarify the rationale for locating upgradient wells. Generally, it will be necessary to locate upgradient wells relatively near the low-level waste management areas because of the close proximity of other potential sources of contamination. Such locations are also desirable in areas where groundwater flow directions are projected to change because of mound decay, and some upgradient wells may become downgradient wells. However, the text was not intended to imply that 100 feet is a limit that will be applied to all future upgradient wells. The text will be revised accordingly.**	4-26-91
82.	Page 5-134, line 35 (5-51). Section 5.5.3.2.3 should include a discussion of quality control sample types and frequency. **DOE-RL/WHC Response: A discussion of quality control sample types and frequency will be added to the text.**	4-26-91
83.	Page 5-135 (5-52). Section 5.5.4.1.1 should discuss procedures used for decontamination of measurement devices between wells. **DOE-RL/WHC Response: A discussion of decontamination of water-level measurement devices between wells will be added to the text.**	4-26-91

No.	Comment/Response	Ecology Concurrence
84.	Page 5-136, lines 14 through 45 (5-53). Pump type selection is critical and should be detailed. Ecology Recommendation. Describe pump type, manufacturer, and reason for selection. **DOE-RL/WHC Response: A discussion of the reasons for selecting the Hydrostar pump will be added to the text. The pump type and manufacturer have also been added to the text.**	4-26-91
85.	Page 5-136, lines 21 through 24 (5-54). What is sampling procedure if stabilization of parameters does not occur after evacuation of two well volumes? **DOE-RL/WHC Response: A description of the procedure to follow, should parameters not stabilize after evacuation of two well volumes, will be added to the text.**	4-26-91
86.	Page 5-136, lines 33 through 34 (5-55). At least two volumes should be removed to evacuate annular space water in contact with casing volume. **DOE-RL/WHC Response: A description of the methods will be included in the Hanford Dangerous Waste Permit. The LLBG will cross reference the site-wide permit.**	1-8-93
	DOE-RL/WHC Revised Response: The comment response is contingent upon resolution of the draft Hanford Facility Dangerous Waste comments by DOE-RL, WHC, and PNL that were submitted to Ecology on March 16, 1992.	
87.	Page 5-138, lines 1 through 18 (5-56). Pump type selection is critical and should be detailed. Ecology Recommendation. Describe pump type, manufacturer, and reason for selection. **DOE-RL/WHC Response: The criteria for selection of the pump type will be explained in Section 5.5.4.1.3. The pump type and manufacturer will also be added to the text. A reference to that section will be added to the text.**	4-26-91
88.	Page 5-138, line 46 (5-57). What methods will be used to monitor the 4°C temperature?	4-26-91

No.	Comment/Response	Ecology Concurrence

DOE-RL/WHC Response: A description of the methods will be included in the permit application.

89. Page 5-140, lines 32 and 33 (5-58). How will trip blanks be prepared? What media will be used for field and trip blanks - distilled, deionized, or carbon-free? 4-26-91

DOE-RL/WHC Response: A description of procedures for field-related quality control blank and duplicate samples will be provided in Section 5.5.3.2.3. This description will be modified to indicate the type of media to be used. A reference to that section will be added to the text.

90. Page 5-140, line 31 (5-59). Analysis of another sample from the original sample volume is a replicate, not a duplicate. 1-8-93

DOE-RL/WHC Response: A description of the methods will be included in the Hanford Dangerous Waste Permit. The LLBG will cross reference the site-wide permit.

DOE-RL/WHC Revised Response: The comment response is contingent upon resolution of the draft Hanford Facility Dangerous Waste comments by DOE-RL, WHC, and PNL that were submitted to Ecology on March 16, 1992.

91. Page 5-148, lines 8 through 15 (5-60). This section outlines the DOE-RL actions in the event of determining a statistically significant increase in one or more parameters. However, the discussion omits immediate resampling as required under WAC 173-303-645(9)(h)(ii). 4-26-91

Ecology Recommendation. Include immediate resampling as the DOE-RL action or explain why resampling will not be performed.

DOE-RL/WHC Response: Immediate resampling will be added to the text as a required action if a statistically significant increase is detected.

92. Page 5-148, line 36 (5-61). Typo, "started" should be "stated". 4-26-91

DOE-RL/WHC Response: Typo will be corrected.

No.	Comment/Response	Ecology Concurrence
93.	Page 5-151, lines 38 and 39 (5-62). Section 5.7 states that, "Characterization will provide concentrations of each constituent listed in WAC 173-303-9905 (Ecology 1989)..." Characterization should be conducted in compliance with 40 CFR 264, Appendix IX (EPA 1988). Ecology Recommendation. Replace WAC 173-303-9905 with 40 CFR 264, Appendix IX (EPA 1988) in the above quoted sentence. **DOE-RL/WHC Response: The citation will be changed in the text as suggested.**	4-26-91
94.	Page APP 7A-1 through 7A-4 (7-1). Appendix 7A is a sample procedure for "clean up/recover radioactive material spills emergency procedures--low-level burial grounds. Submission of a sample procedure is inappropriate for this application. Ecology Recommendation. The Applicant is required to submit an actual sampling procedure for clean up/recover radioactive spills emergency procedure for the low-level burial grounds permit application. **DOE-RL/WHC Response No. 1: A description of operations will be provided as required by WAC 173-303-806(4)(a)(viii). All 'sample' procedures and references to such will be removed from the permit application. This approach is consistent with that being used to finalize the 616 NRDWSF permit application.** Comment: Appendix 7A, Sample Procedure, Page 7A-1 In addition to the description of operations which will be provided, a statement must be made indicating the locations of the actual procedures. **DOE-RL/WHC Response No. 2: Controlled copies of the procedures are kept in Building 272WA and in vehicles so that they are available at the work location. A statement will be included noting that these procedures will be available for on-site inspection by the regulators.**	2-18-92

No.	Comment/Response	Ecology Concurrence
95.	Page 8-9, Table 8-1, line 15 (8-1). This table indicates that Basic Crane and Rigging Training is not a required course for crane operators. Is this correct? If so, please provide an explanation why crane operators are not required to complete the course. **DOE-RL/WHC Response: The Basic Crane and Rigging Training is required for crane operators. Table 8-1 will be corrected to show that the training is required.**	4-26-91
96.	Page 9-12, lines 39 through 41 (9-1). Section 9.2.2.2 states, inter alia, that because of low precipitation, flat topography, and the lack of nearby surface water bodies, the risk of human exposure to LLBG waste through the surface water pathway is very low. Emphasis added. Characterizing any risk to human health as low without further quantification is not appropriate for a document of this type. Ecology Recommendation. Quantify the risk to human health of exposure to LLBG waste through the surface water pathway. **DOE-RL/WHC Response: The EPA guidelines for preparing the Exposure Information Report state that the "EPA does not expect applicants to develop major, extensive new pieces of information..." Quantification of the risk to human health of exposure to LLBG waste would require developing new information that is beyond the scope of the EPA guidelines; therefore, the text will remain unmodified.**	4-26-91
97.	Page 9-14, lines 37 and 38 (9-2). The same comment applies to the characterization of the risk to human health via the air pathway as for the surface water pathway. Ecology Recommendation. Quantify the risk to human health of exposure to LLBG waste through the air pathway. **DOE-RL/WHC Response: The EPA guidelines for preparing the Exposure Information Report state that the "EPA does not expect applicants to develop major, extensive new pieces of information..." Quantification of the risk to human health of exposure to LLBG waste would require developing new information that is beyond the scope of the EPA guidelines; therefore, the text will remain unmodified.**	4-26-91
98.	Page 9-14, lines 1 and 2 (9-3). The same comment applies to the characterization of the risk to human health via soils as for the air and surface water pathways.	4-26-91

No.	Comment/Response	Ecology Concurrence

Ecology Recommendation. Quantify the risk to human health of exposure to LLBG waste through soils.

DOE-RL/WHC Response: The EPA guidelines for preparing the Exposure Information Report state that the "EPA does not expect applicants to develop major, extensive new pieces of information..." Quantification of the risk to human health of exposure to LLBG waste would require developing new information that is beyond the scope of the EPA guidelines; therefore, the text will remain unmodified.

99. Page 9-17, lines 26 through 28 (9-4). The same comment applies to the characterization of the risk to human health via transportation-related releases as for air, surface water, and soil pathways. — 4-26-91

Ecology Recommendation. Quantify the risk to human health of exposure to LLBG waste via transportation-related releases.

DOE-RL/WHC Response: The EPA guidelines for preparing the Exposure Information Report state that the "EPA does not expect applicants to develop major, extensive new pieces of information..." Quantification of the risk to human health of exposure to LLBG waste would require developing new information that is beyond the scope of the EPA guidelines; therefore, the text will remain unmodified.

No.	Comment/Response	Ecology Concurrence
100.	Page 11-2, Section 11.1 (11-1). The fourth paragraph indicates burial ground 218-E-12B is to be a RCRA compliant facility. Ecology Recommendation. Until an exemption is approved with regard to lining of particular trenches within the LLBG, the LLBG is not considered a RCRA compliant facility. **DOE-RL/WHC Response: The purpose of the application is to receive a Part B permit for the Low-Level Burial Grounds as a RCRA disposal facility. When this permit and any necessary exemptions are granted, the Low-Level Burial Grounds will indeed be a RCRA compliant facility. The statement is made in this context.** **In light of this, the text in lines 27 and 28 of page 11-2 will be modified with the following or similar text:** **"Landfills for future disposal of low-level mixed waste are required to comply with RCRA standards and are proposed in burial grounds 218-W-5 (lined landfill) and 218-E-12B (trench 94 extension)".**	4-26-91
101.	Pages 11-15 and 11-16, Figure 11-7 (11-2). The identification of trench numbers 20, 24, and 29 is not shown on the legend. Ecology Recommendation. The figure should be revised as appropriate. **DOE-RL/WHC Response: These trenches are identified in the legend, but the identification appears to be misleading because only the outline of the trench bottom is black instead of the entire bottom. This will be changed to make the identification of this type trench in the figure clearer.**	4-26-91
102.	Page 11-22, Section 11.1.2 (11-3). This paragraph states that following retrieval of the transuranic and radioactive organic liquid waste, native soils lying beneath the existing unlined trenches that may have been contaminated by waste or waste residues will be left in place. It is proposed that the trenches will be closed in compliance with the closure requirements of WAC 173-303. After retrieval of the transuranic and radioactive organic liquid waste and closure under WAC 173-303, it is possible that the trenches will be reused for the burial of stabilized low-level waste.	1-8-93

No.	Comment/Response	Ecology Concurrence

Ecology Recommendation. Following retrieval of wastes that are regulated by Ecology, the trenches may have to be certified closed before reuse for the disposal of low-level waste or any other waste. The closure performance standards required that all contaminated soils be cleaned to background levels [WAC 173-303-610(2)(b)(i)]. The conditions under which the trenches may be reused should be more clearly defined.

DOE-RL/WHC Response No. 1: It seems that Ecology's interpretation of the closure of a trench and the closure of a landfill is two separate issues. Individual trenches remain part of the LLBG regardless of whether the waste in those trenches has been moved, retrieved, or replaced. Closure requirements for the LLBG are defined in WAC 173-303-665(6)(b), "a landfill must comply with all postclosure requirements contained in WAC 173-303-610(7), (8), (9), and (10)". There are no requirements in these sections which discuss cleanup levels for soils. Therefore, there are no closure performance standards for a landfill which require that contaminated soils be cleaned to background levels or to designated limits. The WAC 173-303-610(2)(b)(i) and (ii), do not apply to the closure of a landfill.

To assist in clarifying the WAC requirements which must be met for closure of the LLBG, the text will be modified to cite closure under WAC 173-303-665.

Deficiency: Section 11.1.1.2, Removal or Decontamination, Page 11-22

After the waste is retrieved from a trench, any further use of that trench would be considered replacement and would therefore be subject to double liner requirements. Furthermore, it would not be prudent to leave uncontainerized, contaminated soil in place when it can easily be identified and removed. The identification of soil contamination, if any, would also provide valuable insight into the potential extent of contamination beneath other trenches as well as other disposal sites at the Hanford Reservation.

Requirement: After waste retrieval, soil sampling must be conducted. The results of this sampling will determine any further actions to be taken and future use of the trench. The permit application must contain a generalized sampling plan for this situation. A detailed sampling plan need not be developed until the soil beneath the retrievable waste is visually inspected.

DOE-RL/WHC Response No. 2: The text will be modified to present a general soil sampling plan for extremely hazardous waste (EHW) in trenches where such waste has been retrieved. Details

No.	Comment/Response	Ecology Concurrence

of the sampling program, such as depth, locations, and methods, will depend on a number of factors, including trench geometry, age of the waste, and type of waste. Detailed sampling plans for a particular trench or portion thereof will be prepared after the waste has been retrieved and the constituents verified. On the basis of sampling and testing results, further requirements (if any) for reusing the trench will be identified.

Deficiency: Section 11.1.1.2, Removal or Decontamination, Page 11-22

It is unsatisfactory to only address extremely hazardous waste (EHW) in this soil sampling plan. The plan should address all likely dangerous/hazardous constituents.

Requirement: Replace the phrase "extremely hazardous waste (EHW)" with "hazardous constituents".

DOE-RL/WHC Response No. 3: The phrase "extremely hazardous waste (EHW)" will be replaced with "dangerous waste".

103. Page 11-25, Section 11.1.4.1 (11-4). It is noted that in the third and fourth storage configurations (containing retrievable transuranic waste) have not been covered since 1987 and will continue to be that way for the next 10 years. It appears that the containers are left exposed to ambient atmospheric conditions for long periods making them more susceptible to degradation and eventual leakage. 1-8-93

Ecology Recommendation. The Applicant should provide some discussion of measures that have been taken to protect the containers from the weather. If measures have not been taken to date, the possibility of a temporary cover that will serve to protect the waste containers for the next 10 years should be explored and discussed.

DOE-RL/WHC Response No. 1: In a desert climate, such as is present on the Hanford Site, the relative humidity is low and metal surfaces do not corrode rapidly in the open atmosphere. The text will be revised to include a discussion of this 'as is' option as well as soil covering or temporary cover options. The text will provide supporting rationale for the preferred option.

Deficiency: Section 11.1.4.1, Retrievably Stored TRU Waste, Page 11-25

No.	Comment/Response	Ecology Concurrence

The response is erroneous. The Central Waste Complex has experienced the corrosion of drums stored on exposed pads for periods far less than 10 years. Furthermore, it is not acceptable to only state that the text will be revised.

Requirement: Either retract the first sentence of the response or expand the response to discuss the reality of storing containerized dangerous waste in a semiarid climate. In addition, provide the revised test as part of this response.

DOE-RL/WHC Response No. 2: The reviewer's understanding of the 183-H Basin waste problem is incorrect. The drums corroded from the inside out due to improper packaging methods. Many of the presently uncovered waste containers will be retrieved, repackaged, and transferred to a permitted storage facility in the Central Waste Complex within a year's time period. The concept of providing weather protection for the remaining uncovered mixed-waste containers in the trenches is being discussed. Alternatives under consideration include some type of roof cover and a plastic tarp covered with soil as was used previously. Because this waste is to be retrieved in the future, the method of protection should not unduly hinder the retrieval operation. Current plans call for transferring the uncovered containers of transuranic waste from the trenches to a permitted storage building when space becomes available. It is anticipated that this transfer will be initiated within two years. In addition, an engineering evaluation will be performed during FY 1992 to determine if a cover should be placed over the uncovered waste in the interim. The last sentence of the fourth paragraph will be deleted and replaced with the following statements: "Uncovered waste will be transferred to a permitted storage building at the Central Waste Complex or the 224T Transuranic Waste Storage and Assay Facility when space becomes available."

Comment: Section 11.1.4.1, Retrievably Stored TRU Waste, Page 11-25

The report "Corrosion in Waste Drums from the 183-H Solar Evaporation Basin Cleanout Project" (WHC-IP-0716) states that "A significant accelerating factor was the high ambient temperature and direct sun exposure of the failed drums." and "...the cyclic temperatures experienced could lead to condensation of moisture inside the drums, lowering the pH and accelerating corrosion." Although Ecology recognizes that the climate alone did not result in the breached drums, it is evident that the unprotected storage of dangerous waste drums in the Hanford environment should not be taken for granted. No further comment is necessary.

No.	Comment/Response	Ecology Concurrence

DOE-RL/WHC Response No. 3: No further comment. As a matter of record, the 183-H wastes were removed from the trenches and placed into storage modules at the Central Waste Complex.

104. Page 11-27, lines 39 through 43 (11-4). Section 11.1.4.5 states that decontaminated equipment and structures will be disposed of in accordance with requirements of the U.S. Department of Energy and WAC 173-303 (Ecology 1989). The cite to the Washington Administrative Code is incomplete. — 4-26-91

Ecology Recommendation. Include the complete cite to WAC 173-303 for disposal of decontaminated structures and equipment.

DOE-RL/WHC Response: The text will be modified to cite WAC 173-303-665.

105. Page 11-28, Section 11.1.4.5 (11-5). The last paragraph indicates that contaminated native soils, if any, lying beneath the retrievable trenches will not be removed as part of closure operations. — **2-18-92**

Ecology Recommendation. The Applicant should provide some discussion of measures that have been taken to protect the containers from the weather. If measures have not been taken to date, the possibility of a temporary cover that will serve to protect the waste containers for the next 10 years should be explored and discussed.

DOE-RL/WHC Response No. 1: It seems that Ecology's interpretation of the closure of a trench and the closure of a landfill is two separate issues. Individual trenches remain part of the LLBG regardless of whether the waste in those trenches has been moved, retrieved, or replaced. Closure requirements for the LLBG are defined in WAC 173-303-665(6)(b), "a landfill must comply with all postclosure requirements contained in WAC 173-303-610(7), (8), (9), and (10)". There are no requirements in these sections which discuss cleanup levels for soils. Therefore, there are no closure performance standards for a landfill which require that contaminated soils be cleaned to background levels or to designated limits. The WAC 173-303-610(2)(b)(i) and (ii), do not apply to the closure of a landfill.

No.	Comment/Response	Ecology Concurrence

To assist in clarifying the WAC requirements which must be met for closure of the LLBG, the text will be modified to cite closure under WAC 173-303-665.

Comment: Section 11.1.4.5, Decon and Disposal Procedures, Page 11-28

Ecology's concern in this comment is not so much whether soil sampling should occur as discussed in comment 102, but a reiteration of the concern raised in comment 103. In other words, what steps have and will be taken to prevent the soil contamination in the first place? The response to this comment need only note that this section will reflect any text changes resulting from the resolution of comments 102 and 103.

DOE-RL/WHC Response No. 2: As noted in the response to comment 103, the uncovered transuranic waste is to be transferred to a permitted storage building when space becomes available. In addition, an engineering evaluation will be performed in 1992 to determine the feasibility of putting a temporary cover over the waste during the interim.

106. Page 11-29, Section 11.1.5.2.1 (11-6). The cover will be sloped at a grade of 1.5 percent. This proposed slope is below the 3 percent slope recommended in the EPA technical guidance document entitled, "Final Covers on Hazardous Waste Landfills" (EPA/530-SW-89-047). 1-8-93

Ecology Recommendation. The Applicant should demonstrate that the proposed slope is sufficient to drain the surface water flows and accommodate projected subsidence.

DOE-RL/WHC Response No. 1: The necessary calculations have already been performed to evaluate the covers ability to adequately handle precipitation and other surface water flows. Ecology is directed to Appendices 11-A, B, C, and D. Further demonstration of design adequacy is presented in the response to comment 109.

Subsidence is not considered to be an issue of concern at the LLBG. Ecology is directed to Section 11.2.1.3 for a discussion on subsidence.

Deficiency: Section 11.1.5.2.1, General Description, Page 11-29

Although the calculations support the use of a 1.5% slope, a 3.0% slope would provide for unanticipated settlement/subsidence as well as meet the recommended guidance.

No.	Comment/Response	Ecology Concurrence

Requirement: All final cover slopes must be no shallower than 3.0%. This grade must not vary more than 1/10 of a foot in 16 feet.

DOE-RL/WHC Response No. 2: Final covers will be sloped at a minimum grade of 3%.

Comment: Section 11.1.5.2.1, General Description, Page 11-29

Although the response does not address the grade requirement specified in this comment, Ecology has located and concurs with the grade requirement found elsewhere in the application. No further comment is required.

DOE-RL/WHC Response No. 3: No further comment.

107. Page 11-48, Section 11.1.5.2.2 (11-7). The third paragraph of this section indicates that the grade layer will be placed in 18- to 24-inch-thick lifts in most areas of the LLBG to a compaction of 95 percent or as high as is reasonably achievable. 2-18-92

Ecology Recommendation. The proposed lift of 18- to 24-inch-thick lifts appear to be too thick to achieve the compaction limits of 95 percent density. Loose lifts of up to 12 inches should be used in order to achieve a more uniform compaction throughout the depth of the grade layer.

DOE-RL/WHC Response No. 1: Observations indicate that some of the potential grade layer material is quite coarse, containing a large fraction of cobbles. Experience indicates that this type of material can be placed in relatively thick lifts and compacted satisfactorily. However, it may be premature to specify a lift thickness at this time, even if only as an example. The text will be modified to delete reference to specific lift thickness and will note that the optimum lift thickness will be determined by constructing a test pad.

No.	Comment/Response	Ecology Concurrence

Deficiency: Section 11.1.5.2.2.1, Native Soil Grade Layer, Page 11-48

It is typical construction practice to place soil in 6 - 8 inch lifts when compaction or permeability are critical factors. Evaluating lift depths of up to 2 feet would only encumber the test pad evaluation.

Requirement: All soil and soil mixtures must be placed per the accepted practice of 6 - 8 inch lifts.

DOE-RL/WHC Response No. 2: The soil available for the grade layer may have coarse material up to 12 inches in dimension. Placing such material in thin lifts would be counterproductive, as the roller would ride on the larger material and not effectively compact the finer grained matrix. Were this a normal fine-grained fill, lift thicknesses of 6 to 8 inches would be appropriate. While permeability is not a design consideration for the grade layer, we agree that compaction is important. Evaluation of compaction as part of the test pad construction may be slightly cumbersome, but is required and will be performed.

108. Page 11-48, Section 11.1.5.2.2 (11-8). It is proposed that the compaction of the grade layer will be accomplished with a 20-ton dead weight or drum vibratory roller. — 4-26-91

Ecology Recommendation. The bearing capacities of the underlying cover material and waste containers should be determined to ensure that they can withstand the loads imposed by the 20-ton or greater weight drums vibratory roller and prevent any damage to the waste containers or the liner and leachate collection systems. The use of lifts of lesser thickness may allow adequate completion to be accomplished with lower weight roller sand limit the potential for such damage.

DOE-RL/WHC Response: This is a valid concern for structures with geosynthetics and should be addressed prior to closure when the waste characteristics and geometry are known. Text on page 11-48 will be modified to address this concern.

109. Page 11-52, Section 11.1.5.2.2.6 (11-9). No mention is made of the slope of the drainage layer. — 1-8-93

Ecology Recommendation. The EPA RCRA cover technical guidance document recommends a drainage layer with a minimum slope of 3 percent after settlement and subsidence.

No.	Comment/Response	Ecology Concurrence

DOE-RL/WHC Response No. 1: The drainage layer will be sloped at 1.5 percent, the same as the other layers. However, the issue primarily relates to the performance of the drainage layer with the use of a 1.5 percent slope. The EPA technical guidance at the time of the LLBG cover design (EPA, 1982) recommended final slopes of 3 to 5 percent. However, slopes outside of this range have been approved for other hazardous waste facilities if adequate performance could be demonstrated. It appears that the EPA implicitly recognizes this in their latest guidance document for closure covers (EPA, 1989), which states:

"In arid regions...it may be possible to construct a top layer that will absorb most, if not all, of the precipitation that infiltrates into that layer, eliminating the need for a drainage layer."

Consequently, if the drainage layer is not required, then its slope is no longer a significant issue.

To investigate this design approach, a series of supplemental HELP (Hydrological Evaluation of Landfill Performance) analyses were performed. The same parameters as in Appendix 11A of the application were used, except that the slope angle and drainage path length were varied.

HELP version 2.04 was used instead of version 2.02, which was used for the original analysis. Daily precipitation data from 1979 through 1988 from the Hanford Meteorological Station were used in all cases. The results are summarized in the attached Table 1.

Case 1 is the analysis presently contained in Appendix 11A, which was performed using version 2.02. Case 2 uses the same parameters with version 2.04. It may be seen that version 2.04 predicts slightly less evapotranspiration and slightly more flow through the drainage layer than does version 2.02. The difference is not considered significant. Cases 3 through 5 show the effect of increasing the cover slope from 0 to 5 percent. Case 6 shows the effect of a reduced drainage path length.

It may be seen that the amount of lateral drainage increases with steeper cover slopes and reduced path length, as might be intuitively expected. However, the amount of percolation through the cover into the waste remains the same in all cases. This supports the EPA approach in that the contribution of the drainage layer to cover performance appears to be negligible at an arid site. This analysis indicates that a flat cover and a 5 percent sloped cover would perform equally well at the Hanford Site.

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The advantages of a flatter cover relate primarily to (1) less water erosion, which is a major consideration on such large covers, and (2) less material required for the grade layer, which will reduce the cost.

This type of study should of course be repeated during final cover design, and should incorporate both the current EPA guidance and specific parameters for the cover soils and other components.

Table 1. Supplemental HELP Model Results.

Parameter	Case 1	Case 2	Case 3	Case 4	Case 5	Case 6
HELP Version	2.02	2.04	2.04	2.04	2.04	2.04
Drainage layer slope %	1.5	1.5	0	3	5	1.5
Length of layer, ft	725	725	725	725	725	200
Average Annual: (inches)						
Precipitation	7.08	7.08	7.08	7.08	7.08	7.08
Run-off	0.002	0.002	0.002	0.002	0.002	0.002
Evapotranspiration	6.782	6.684	6.684	6.684	6.684	6.684
Lateral drainage	0.3785	0.4174	0.1041	0.4291	0.4309	0.4311
Percolation	0.0011	0.0011	0.0011	0.0011	0.0011	0.0011
Change in storage	-0.079	-0.020	0.293	-0.032	-0.034	-0.034

The text will be changed to identify the slope of the drainage layer.

References:

EPA, 1982, *RCRA (Resource Conservation and Recovery Act) Guidance Document: Landfill Design, Liner Systems and Final Cover*, PB87-157657, National Technical Information Service, Springfield, Virginia.

EPA, 1989, *Technical Guidance Document: Final Covers on Hazardous Waste Landfills and Surface Impoundments*, EPA/530-SW-89-047, Office of Solid Waste and Emergency Response, Washington, D.C., July

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Comment: Section 11.1.5.2.2.6, Drainage Layer, Page 11-52

Comment 106 also applies here.

DOE-RL/WHC Response No. 2: The drainage layer will be sloped at 3%, the same as the other layers. See response to Comment 106.

Comment: Section 11.1.5.2.2.6, Drainage Layer, Page 11-52

Comment 106 also applies here.

DOE-RL/WHC Response No. 3: No further comment.

110. Page 11-64, Section 11.1.5.5.5 (11-10). The results of wind erosion analysis indicates a net loss of 3.5 tons of cover soil per year. This amount of soil is greater than the EPA recommended value of 2 tons per year. 4-26-91

Ecology Recommendation. Discussion of alternative measures to reduce the total erosion due to wind and surface water should be provided here and specifically addressed in the detailed design.

DOE-RL/WHC Response: The need to revise the cover wind erosion section (Appendix 11F), due to subsequent work done in this area on cover designs for the Hanford Site, is recognized. The revised text will address such information as specific McGee Ranch soil physical property analysis that was not available at the time of submitting the permit application and information on the crusting properties of soil. If this additional information does not indicate a reduction of the erosion levels to EPA guidance levels, then a more in depth discussion will be added to the text that will explain why the erosion levels are not a point of concern and/or discussion of alternative measures proposed to achieve this level.

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111. Page 11-64, Section 11.1.5.5.5 (11-11). The total erosion (sum of net cover water and wind erosion) is 4.3 tons of cover soil per acre per year. This exceeds the EPA recommended limit of 2 tons per acre per year. 4-26-91

Ecology Recommendation. Discussion of alternative measures to reduce the total erosion due to wind and surface water should be provided here and specifically addressed in the detailed design.

DOE-RL/WHC Response: The main contribution to total erosion is wind erosion. As stated in response 110, this section will be revised. The concern that Ecology raises here will be dealt with in the revised text described in the response to Comment 110.

112. Page 11-66, Section 11.1.5.6 (11-12). Two of the techniques proposed for correction of existing subsidence problems in inactive trenches prior to placement of final cover are mass impact (pounding of the ground using a weight of up to 30 tons dropped from a height of 65 feet) and dynamic consolidation (hammering or vibrating a beam or pile into the ground). 4-26-91

Ecology Recommendation. Both methods have the potential for producing or increasing damage to previously disposed of wastes or waste containers and thereby increasing the potential for leakage or leaching. The bearing capacities of underlying waste containers, cover, and other materials should be determined to ensure that they can withstand the stresses due to mass impact and dynamic consolidation and prevent any supplemental damage that might increase the potential for emissions. Alternative approaches for providing the necessary ground improvement to support the final cover loads and minimize cover settlement should be considered, or more adequate assessment of the potential for increased leakage or leaching provided.

DOE-RL/WHC Response: This NOD suggests that dynamic consolidation will damage waste or waste containers, and thereby increase the potential for leakage or leaching. Furthermore, the NOD suggests that the purpose of dynamic consolidation is for support of static loads imparted by the surface (at grade) cover and for minimization of cover settlement.

The initial premise of unintentional damaging of waste and waste containers, relative to solid waste burial grounds may not be correct. Solid waste typically consists of contaminated miscellaneous metallic, cellulose based, or mineralogic materials transported and discharged to burial trenches in bulk transport packaging, Little, if any, intent was

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given to disposal of waste materials in high integrity containers or equivalent packages. Additionally, most waste transport packages used have a nominal expected integrity when buried. Hence, one may assume that most packages and containers, will have presently degraded, or will degrade within a few decades.

Structural collapse of waste materials and containers has occurred at most burial grounds as manifested by moderate to large subsidence features. This provides evidence as to the present failure of waste and waste containers under ambient conditions. It is indeed the intent of dynamic consolidation to cause "damage" to waste and waste containers. Dynamic consolidation causes compaction of waste under controlled conditions. Past field demonstration activities have shown that greater than 90 percent of potential waste volume reduction can be imparted by dynamic consolidating in situ with negligible health and safety concerns. Without dynamic consolidation, or equivalent in situ treatment, structural failure of surface engineered barriers overlying buried solid waste trenches is probable and could prove to be compromising to the life of the cover system.

The text will be modified to clarify the purpose of the waste consolidation efforts.

113. Page 12-14, lines 44 through 46 (12-1). Section 12.4.1.8.2 states, "(c) The future use of the above described land is restricted under terms of 40 CFR 264.117(c) and WAC 173-303-61-(7)(d). The reference to the Washington Administrative Code is a misprint. The correct cite is WAC 173-303-610(7)(d). — 4-26-91

DOE-RL/WHC Response: The citation will be corrected.

114. Pages APP 4A-17 through 4A-44 (Volume 5). Under the "Toxic Name" column on each of these pages are listed the various constituents placed in the trenches. In the T50 trench lead, oil, beryllium, zirconium, and "carcinogens" are listed. In the T10 trench, as noted on page APP 4A-44, lead, lead shielding, lead pipes, oil, "carcinogens", mercury, and charcoal are listed. The use of the term "carcinogens" is too vague. — 2-18-92

No.	Comment/Response	Ecology Concurrence

Ecology Recommendation. Replace "carcinogens" with the specific form of carcinogen (e.g., asbestos insulation).

DOE-RL/WHC Response No. 1: A better description of "carcinogens" is not available because it was not recorded on the old records. The best information available has been provided in the permit application and in the "LLBG Database" (WHC-MR-0008).

Comment: Appendix 4A, List of Mixed Waste

The fact that "carcinogens" cannot be more specifically defined should be stated in the Chapter 4 text where this appendix is referenced.

DOE-RL/WHC Response No. 2: The following statement will be added to 4.6.1: "Some older type waste was not well characterized at the time it was emplaced (e.g., waste listed as 'carcinogens'). This waste is identified to the extent possible with the available information."

115. Deficiency: Part A Permit Application, Page Part A-iii — 2-18-92

It is inappropriate to dismiss a dangerous waste designation simply because certain tests have not been conducted. Unless toxicity testing proves otherwise, all elemental lead (whether used as shielding or not) must be designated as D008 as well as WT01. Designation of elemental lead as D008 is recognized in the liner exemption request (page 2-3).

Requirement: Any lead disposed of at the LLBG or elsewhere on the reservation must be designated as WT01 and D008. This correction needs to be made throughout the text. Furthermore, TCLP testing should be cited instead of EP Toxicity testing.

DOE-RL/WHC Response: Revision 5 of the LLBG Part A permit application, which was included with the Part B permit application (Revision 0), did not include the D008 designation for all waste lead. Revision 6 of the LLBG Part A permit application now designates all waste lead as D008. The text in the Part A will be revised to designate waste containing radioactive elemental lead waste solids as 'WT01 and D008'. The text will also be revised to indicate that the Toxicity Characteristic Leaching Procedure (TCLP) has replaced the Extraction Procedure (EP) toxicity test for determining the characteristics of toxicity.

No.	Comment/Response	Ecology Concurrence
116.	Deficiency: Part A Permit Application The drawings provided in the Part A application, duplicated from Figures 2-7 through 2-14 of the Part B application, are illegible and therefore unacceptable. Furthermore, these drawings do not identify which trenches contain mixed waste. Requirement: Legible drawings must be provided and must identify which trenches contain mixed waste. **DOE-RL/WHC Response: Legible drawings that identify the mixed waste trenches will be provided.**	2-18-92
117.	Deficiency: Section 2.1.1, Hanford Site, Page 2-3 It is not clear what is meant by "Heads of field documents" as used on lines 47 and 48. Requirement: Please clarify the text. **DOE-RL/WHC Response: The text will be replaced with "Heads of Field Elements" to agree with DOE Order 5820.2A.**	2-18-92
118.	Deficiency: Section 2.1.1, Hanford Site, Page 2-4 The definition of mixed wastes on lines 6-8 is inadequate because it does not include radioactive waste containing dangerous constituents not regulated by RCRA. Requirement: Although DOE Order 5820.2A may not take into account state laws and regulations, the text must be edited to indicate that mixed waste at the Hanford Reservation includes waste containing both radioactive and hazardous components as defined by the Atomic Energy Act and the Hazardous Waste Management Act. RCW 70.105.109 **DOE-RL/WHC Response: The text will be changed to define mixed waste as: "Waste containing both radioactive components as defined by the *Atomic Energy Act*, and hazardous components as defined by RCRA, including state implementation of RCRA."**	2-18-92

No.	Comment/Response	Ecology Concurrence

119. Comment: Section 2.1.1, Hanford Site, Page 2-4

The regulation of radionuclides will be addressed in the facility wide permit. Delete the sentence beginning on line 12.

DOE-RL/WHC Response No.1: Radionuclides are not regulated under RCW 70.105.109 because the Federal Government has not delegated this authority to the State; therefore this statement is correct.

Comment: Section 2.1.1, Hanford Site, Page 2-4

Ecology is aware of DOE-RL's position on the regulation of radionuclides. However, our response to this position and further discussion on this issue will be addressed on a site-wide basis and not in this permit. Delete the sentence beginning on line 12.

DOE-RL/WHC Response No. 2: DOE-RL/WHC believe these statements reflect the current status of the law and should not be removed. A detailed discussion of the lack of jurisdiction over the radioactive component of mixed waste is presented in the March 16, 1992, DOE/WHC/PNL comment submittal to Ecology on the draft Hanford Facility Permit.

Comment: Section 2.1.1, Hanford Site, Page 2-4

Ecology is aware of DOE-RL's position on the regulation of radionuclides. Unless the regulation of radionuclides is resolved in the Facility Wide Permit or some other forum outside of this permit application, the sentence beginning on line 12 will not be incorporated into the dangerous waste permit for the Low-Level Burial Grounds.

RL/WHC Response No. 3: No response is required at this time.

120. Deficiency: Section 2.1.2.1, Past Practices, Page 2-6 — 1-8-93

It is not clear in the last paragraph of this page and the first paragraph of page 2-11 if liquid waste (whether mixed waste or not) with a dose rate greater than 200 millirem per hour is still being placed in the trenches. Liquid dangerous/mixed waste can no longer be land disposed per WAC 173-303-140.

No.	Comment/Response	Ecology Concurrence

Requirement: The discussion must indicate what type of liquid wastes, if any, have been or continue to be disposed of or stored in the trenches since November 23, 1987.

DOE-RL/WHC Response No. 1: The following sentence will be added on page 2-6, line 51: "Liquid mixed waste is no longer accepted for storage."

Comment: Section 2.1.2.1, Past Practices, Page 2-6

In lieu of the proposed text addition, the text proposed in the response to comment 126 should be used here.

DOE-RL/WHC Response No. 2: The following statement will be added on page 2-6 at line 51: "No liquid waste has been placed in the trenches since November 23, 1987."

121. Deficiency: Section 2.1.2.1, Past Practices, Page 2-11 — 2-18-92

The fire retardant that was used on the plywood may contain dangerous constituents which could eventually leach out of the burial ground. The text does not indicate if this possibility has been considered.

Requirement: The text should specify what type of fire retardant was and currently is used on the plywood within the burial grounds. A discussion should also be presented on the leaching potential of this material.

DOE-RL/WHC Response: The fire retardant type is being investigated and will be fully explained in the text.

122. Deficiency: Section 2.1.2.1, Past Practices, Page 2-11

Although trenches which received mixed waste and discontinued operation prior to November 23, 1987 are not subject to permitting under WAC 173-303, they are subject to the Hazardous and Solid Waste Amendments (HSWA) to RCRA.

Requirement: The application must incorporate the above text. In addition, the term "were backfilled" on line 31 should be replaced with "discontinued operation."

No.	Comment/Response	Ecology Concurrence

DOE-RL/WHC Response No. 1: There is no question the mixed waste is subject to the Hazardous and Solid Waste Amendments (HSWA); however, HSWA did not change the definition of the existing portion of a landfill. Mixed waste has been accepted, with Ecology's notification, in the open trenches beyond that which was there on November 23, 1987; therefore, the definition of the existing portion of the landfill has had implicit concurrence by Ecology. The text in section 2.1.2.1 on page 2-11, beginning on line 31, will be changed as follows: "Trenches that received mixed waste and were backfilled before the effective date of regulation of mixed waste are not subject to regulation as permitted treatment, storage, and/or disposal units under WAC 173-303 (Ecology 1991), although the requirements of the (HSWA) to RCRA will apply."

Deficiency: Section 2.1.2.1, Past Practices, Page 2-11

The fact that the trenches were backfilled before the effective date of mixed waste regulations has no bearing on how the trenches are regulated. The relevant fact is whether the trench continued accepting mixed waste.

Requirement: Delete the term "received mixed waste and were backfilled before" and insert "discontinued receiving mixed waste prior to".

DOE-RL/WHC Response No. 2: The following sentence will be inserted on page 2-11, line 44, "Open Trenches that were partially filled with mixed waste prior to November 23, 1987 will not receive mixed waste after the LLBG permit is issued unless authorized by the permit." It is DOE-RL/WHC's intent to continue limited use of existing trench portions for remote handled waste when deemed necessary for ALARA and health related reasons. Currently, mixed waste treatment and disposal projects are underway to manage this waste, but temporary placement in LLBG is needed until these project are completed and operational.

Deficiency: Section 2.1.2.1, Past Practices, Page 2-11

The continued use of existing trenches for mixed waste is currently being evaluated by Ecology (See comment 16). Until this review is complete, Ecology will not accept the proposed text. Furthermore, the text change required by our last NOD should still be incorporated to at least address trenches which have been out of service, and will remain so, since November 23, 1987. Our point of contention only lies with trenches which DOE has used or plans to use since this date.

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Requirement: Delete the term "received mixed waste and were backfilled before" and insert "discontinued receiving mixed waste prior to".

RL/WHC Response No. 3: Additional response will be provided when Ecology completes its evaluation of the existing trenches.

123. Deficiency: Section 2.1.2.1, Past Practices, Page 2-11 — 2-18-92

Trenches which were constructed prior to November 23, 1987 but did not receive mixed waste until after November 23, 1987 are not considered existing units and therefore are not exempt from the liner requirements. Therefore, some "unfilled" trenches may be subject to the liner requirements.

Requirement: Edit the last sentence of this section to read "The existing units include trenches which received mixed waste and were constructed prior to November 23, 1987."

DOE-RL/WHC Response: The last sentence in section 2.1.2.1 will be changed as follows: "The existing units include trenches which received mixed waste and were constructed before November 23, 1987."

124. Deficiency: Section 2.1.2.3, Closure, Page 2-22

The distinctions drawn between the types of trenches are important to determine the applicable regulations. Although Appendix 4B aids in the identification of how each trench is classified, there is no visual aid to illustrate the locational relationship of each type of trench.

Requirement: New figures should be provided or Figures 2-7 through 2-14 should be elaborated to distinguish the types of trenches within each burial ground (see comment 116).

DOE-RL/WHC Response No.1: New figures will be provided that indicate which trenches contain mixed waste.

Comment: Section 2.1.2.3, Closure, Page 2-22

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This comment will not be concurred with until after receipt of the revised drawings. These drawings should be provided as soon as possible because the overall permitting and closure strategy will be based upon this information.

DOE-RL/WHC Response No. 2: The revised figures were delivered to Ecology at the unit managers meeting held on January 22, 1992.

Comment: Section 2.1.2.3, Closure, Page 2-22

Ecology is in receipt of the drawings and will provide additional comment in the next NOD.

RL/WHC Response No. 3: No response is required at this time.

125. Comment: Figure 2-7, Burial Ground, Page 2-25/2-26 — 2-18-92

Typo. The proper identification number for this burial ground is "218-W-3A", not "218-2-3A". Please correct.

DOE-RL/WHC Response: The number will be corrected.

126. Deficiency: Section 2.5.1, Measures to Prevent Degradation, Page 2-53 — 2-18-92

It is not clear if the discussion in this section on liquids in the trenches refers only to mixed waste placed prior to November 23., 1987. See comment 120.

Requirement: The text should be clarified to indicate what, if any, liquid waste has been disposed in the trenches after November 23, 1987.

DOE-RL/WHC Response: The following statement will be added to second paragraph: "No liquid waste has been placed in the trenches since November 23, 1987."

127. Comment: Section 3.1, Chem, Biol and Phys Analysis, Page 3-2 — 2-18-92

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Waste analysis procedures for the Hanford Site are under development through the facility wide permit negotiations. The specific requirements for waste verification prior to disposal at the LLBG will be addressed upon resolution of this issue.

DOE-RL/WHC Response: The following paragraph will be added to section 3.0, beginning on line 20: "Unit particular waste analysis plans are being developed through the Hanford Facility Permit negotiations. As part of this effort, specific sampling and analysis strategies will be prepared for any waste received for disposal or storage."

128. Deficiency: Section 3.1.2, Containerized Waste, Page 3-4 — 1-8-93

The text states that the mixed waste disposed at the LLBG is packaged "to ensure isolation from the environment for 20 years". It is unacceptable to only design for 20 year isolation.

Requirement: It is Ecology's understanding that USDOE policy requires mixed waste disposal practices to isolate mixed waste for much greater periods of time, in some cases up to 10,000 years. Provide additional discussion in the application defending the 20 year time period in relation to both USDOE policy and dangerous waste closure performance standards.

DOE-RL/WHC Response No. 1: Most waste drums have a design life of 10 years; the drums used on site have a higher design standard of 20 years. This requirement is consistent with the intent to retrieve waste from the LLBG within this time period (Section 3.1, page 3-2, line 19). The DOE requirements for long term isolation will not depend upon waste container design life. Other barriers are to be employed to prevent intrusion and exposure, such as the construction of thick, impervious covers over the trenches. The precise specifications for these barriers have not yet been finalized; however, the requirements of DOE Order 5820.2A, and the soon to be completed performance assessment, will be used to establish these criteria. The date for completion of the Performance assessment is not yet determined.

To clarify these issues the text in section 3.1.2 will be revised as follows:

"Under current operating conditions, mixed wastes stored at the LLBG is packaged to maintain containment and retrieval capability of the waste for up to 20 years. The mixed waste stored in open trenches will be moved into permitted storage buildings at the Central Waste Complex when space becomes available. Buried mixed waste in retrievable storage will be retrieved for

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subsequent processing at the proposed Waste Receiving and Processing Facility. Chapter 4.0, Section 4.1.1 provides details of the waste container system.

Comment: Section 3.1.2, Containerized Waste, Page 3-4

The Performance Assessment must be provided to Ecology when available.

DOE-RL/WHC Response No. 2: The performance assessment will be provided when it is completed. It is expected that a final report will be completed in 1994.

129. Deficiency: Section 3.1.5, Landfilled Wastes, Page 3-5 — 2-18-92

The definition of free liquid given on lines 1 and 2 is not consistent with the dangerous waste regulations.

Requirement: The definition of free liquids should reference the Paint Filter Liquids Test as described in SW-846. WAC 173-303-140(4)(b)

DOE-RL/WHC Response: Consistent with 40 CFR 260.10 and WAC 173-303-140, the definition of free liquid will be revised as follows: "liquids which readily separate from the solid portion of a waste under ambient temperature and pressure. For containerized or bulk waste, the absence or presence of free liquids is demonstrated by the Paint Filter Liquids Test."

130. Comment: Section 3.2, Waste Analysis Plan, Page 3-6 — 2-18-92

Comment 127 also applies here.

DOE-RL/WHC Response: The issues will be addressed by adding to Section 3.0 the new paragraph shown in the response to comment 127.

131. Comment: Section 3.2.3, Waste Shipment, Inspection, Page 3-7 — 2-18-92

Comment 127 also applies here.

DOE-RL/WHC Response: The issues will be addressed by adding to Section 3.0 the new paragraph shown in the response to comment 127.

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132. Comment: Section 3.2.4, Generator Oversight, Page 3-8 — 2-18-92

How long has the generator assessment program been used? How many noncompliant waste packages have been identified through this program? The application should describe who the "waste certification review committee" is, how often they meet, what criteria they use, etc.

DOE-RL/WHC Response: The assessment program has been replaced by a full audit and surveillance program for non-naval reactor (NR) generators. The audit program has been in effect for three years. The exact number of noncompliant waste packages identified through the program is estimated to be less than 800.

As a result of these changes to the audit program, the waste certification review committee has been replaced by the audit team. The audit team will consist of at least two engineers from Solid Waste and one engineer from Quality Assurance. A description of the revised program will be incorporated into Chapter 3.

Public Law 98-525 Section 1634 gives NR special considerations regarding disposal of their components. NR has exercised their authority in regard to this law and DOE-RL has been directed to use an information exchange program in lieu of an audit. The information exchanges will be performed by the same personnel as audits and will complete the same audit checklist. Generators who are not satisfactory, as measured by the checklist, will not be authorized to ship to Hanford. A description of the program will be incorporated into Chapter 3. The end result is that all generators will be treated the same in fact, if not in format.

133. Comment: Section 3.2.4, Generator Oversight, Page 3-8 — 2-18-92

The overall planning efforts of the assessment team should not be directed toward "minimizing impacts to generator operations", but to ensuring environmentally safe packaging and adequate waste analysis.

DOE-RL/WHC Response: The sentence in question refers to the assessment procedure itself; the intent of the planning effort is to assure minimal impact to operations during the actual assessment. The objective of the assessment is to provide assurance that waste generators are in compliance with the Hanford Site solid waste acceptance criteria. This statement is made in the first sentence of Section 3.2.4.

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134. Deficiency: Figure 3-1, Sample Assessment Checklist, Page 3-9 — 2-18-92

It is unclear what is meant in item 4 of this checklist which asks "Are radioactive waste analyzed for dangerous constituents and their constituents?"

Requirement: Correct or clarify item 4 on this checklist.

DOE-RL/WHC Response: The checklist will be replaced with an updated version.

135. Comment: Table 3-1, Mandatory Waste Characterization, Page 3-14 — 2-18-92

Item 7 must be corrected to indicate the TCLP test.

DOE-RL/WHC Response: Item 7 on page 3-14, lines 45 and 46 will be changed to "Toxicity Characteristic" which is consistent with the terminology used in WAC 173-303-090.

136. Deficiency: Section 3.2.7, Sampling Methods, Page 3-16 — 2-18-92

Composite sampling should only be conducted when it is reasonable to assume the constituent concentrations are evenly distributed. Otherwise, samples should always be taken from the location where the highest chemical concentrations are expected. Furthermore, if a phase separation exists, each portion must be sampled and analyzed.

Requirement: The text in the last paragraph of this section must be modified per the above discussion.

DOE-RL/WHC Response: The text in the last paragraph in section 3.2.7 on page 3-16 will be changed as follows: "Composite sampling is conducted when it is reasonably assumed the constituent concentrations are evenly distributed and is performed by obtaining random samples in random locations. Otherwise, samples will be taken from the location where the highest chemical concentrations are expected. Furthermore, if multiple phases or media exist, each different phase or media will be individually sampled and analyzed.

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137. Comment: Table 3-2, Analytical Methodology, Page 3-17 — 1-8-93

The reference to EP Toxicity testing should be changed to TCLP testing. In addition, the procedure for determining the Ph of a solid outlined in Ecology's Chemical Testing Methods, WDOE 83-13, should be referenced for corrosivity testing. WAC 173-303-090(8) (October 16, 1990)

DOE-RL/WHC Response No. 1: The text on line 11, page 3-17 will be changed from "extraction procedure toxicity, reference 1310," to "toxicity characteristic leaching procedure, reference 1311." The following reference will be put after 9041, line 10, page 3-17: "9045," which is the ASTM testing method used for determining the Ph of soils and semi-solid materials.

Comment: Table 3-2, Analytical Methodology, Page 3-17

There is no "9045" ASTM procedure. However there is an SW-846 Method 9045 which is considered equivalent to Ecology's procedure for determining the pH of a solid Reference to SW-846 Method 9045 is an acceptable text change.

DOE-RL/WHC Response No. 2: The text will be changed to reference the SW-846 Method 9045 for determining the pH of solids.

138. Comment: Section 3.2.9, Additional Requirements, Page 3-20

Are offsite generators subject to the generator assessment program discussed in Section 3.2.4? If not, how is offsite waste verified? Offsite waste should be more vigorously assessed than onsite waste. Common practice dictates 10% of offsite generated waste should be verified prior to acceptance.

DOE-RL/WHC Response No. 1: Except for special cases (naval reactor (NR) generators subject to Public Law 98-525, Section 1634), off-site generators are subject to the same auditing and surveillance program as the on-site generators. The schedule for conducting audits is a minimum of one per year. Surveillances are conducted on a more frequent basis. The same information is gathered from NR generators, but a different format is used. (See comment 132)

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Deficiency: Section 3.2.9, Additional Requirements, Page 3-20

Annual audits of each generator are insufficient for waste verification of off-site generators.

Requirement: The waste verification program must include the physical/chemical verification of 10% of the waste received in each shipment transported to the site from non-Hanford generators.

DOE-RL/WHC Response No. 2: The unit will comply with the requirements of WAC 173-303-300 with the exception of special cases [eg., naval reactor (NR) generators subject to Public Law 98-525, Section 1634].

Deficiency: Section 3.2.9, Additional Requirements, Page 3-20

The response fails to address the requirement of the last NOD. At this time, the Facility Wide permit will require the 616 Dangerous Waste Storage facility to chemically analyze 5% of incoming waste generated at the Hanford Site. Waste coming from off-site is less controlled by DOE-RL and therefore should be subject to more verification standards than on-site generated waste.

Requirement: The waste verification program must include the chemical/physical verification of 10% of the waste received in each shipment transported to the site from non-Hanford generators. This requirement is waived for the disposal of the submarine reactor compartments from Bremerton Naval Shipyard.

RL/WHC Response No. 3: The waste analysis program will be revised to agree with the Hanford Facility Permit when it is finalized.

139. Deficiency: Section 4.1.1, Containers with Free Liquids, Page 4-1 — 2-18-92

The text on line 28 indicates that the containers with free liquids are lab packs. Lab packs are specifically defined in WAC 173-303-161. Section 4.1.1.1 describes containers containing liquids which may not meet the regulatory definition of lab packs.

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Requirement: Wac 173-303-161 and the federal regulations referenced therein should be reviewed to determine if all containers with liquids are indeed lab packs. If some containers are not lab packs, the text should be edited to identify the other type of free liquid containers which are located in the trenches.

DOE-RL/WHC Response: The containers with free liquid consist of an inner container of no more than 15 gallons of liquid surrounded with an amount of absorbent which can absorb at least twice the amount of liquid present; this is packaged in 55-gallon steel drums. As discussed in section 4.1.1, these containers do meet the WAC-303-161 definition of a lab pack. To avoid further confusion, the above description of the containers will be added to the text in section 4.1.1 and will follow the first sentence which starts on line 28. Also the term lab pack will be deleted from the text. The revised text will be as follows: "Containers with free liquid are discussed in the following sections. The containers with free liquid consist of an inner container of no more than 15 gallons of liquid surrounded with an amount of absorbent which can absorb at least twice the amount of liquid present; this is packaged in 55-gallon steel drums.

These sections describe past practices in the LLBG that were discontinued before November 23, 1987. Currently, mixed waste is received and stored at the new Central Waste Complex, which will be covered under a separate Part B permit application."

140. Deficiency: Section 4.1.1.2, Container Management Practices, Page 4-2 — 2-18-92

It is not appropriate to treat buried containers of waste as storage units because none of the container storage regulations can be applied.

Requirement: The retrievable storage units must be considered landfills.

DOE-RL/WHC Response: It is agreed the reference to storage units is inaccurate. However, it is necessary to differentiate the management of waste considered to be retrievable from that considered to be disposed. Therefore, retrievable waste in trenches will be referenced as such in the text. The phrase "retrievable storage units" will be replaced with "retrievable waste in the LLBG trenches." The buried containers were placed in storage prior to coming under Ecology regulation and the storage unit being classified as a landfill. The waste is to be retrieved when the Central Waste Complex is capable of receiving it.

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141. Deficiency: Section 4.1.2.4, Container Storage Area Drainage, Page 4-3 — 2-18-92

Precipitation that comes into contact with exposed waste containers could leach chemical and/or radiological contamination. There is no description of how the drainage liquid (run-off) is chemically or radiologically assessed and managed.

Requirement: The application should discuss the potential for precipitation to leach contaminants from exposed waste containers and how the run-off is assessed to verify the absence of such contamination.

DOE-RL/WHC Response: The following text will be added to Section 4.1.2.4: "The Waste is packaged in polyethylene (either double bagged, or bagged and placed in 90 mil polyethylene liners inside 55 gallon DOT 17C or 17H drums containing absorbent material that would absorb any potential leachable waste). The packaging combined with the dry desert climate preclude the leaching of hazardous constituents from the waste. Weekly inspections are performed on waste stored in open trenches to check for evidence of any leakage from drums. Routine radiation surveys are conducted in the burial grounds to check for soil contamination. These checks are more sensitive than hazardous waste tests for verifying that waste drums are not leaking."

142. Comment: Section 4.6.2.2, Exemption Based on Design, Page 4-5 — 2-18-92

Comment 115 also applies here.

DOE-RL/WHC Response: The sentence on Page 4-5 line 31 will be revised to say, "Each compartment weighs approximately 1,000 tons and contains waste lead designated as WT01 and D008." The paragraph beginning on Page 4-6 line 7 will be replaced with the following: "Of the hazardous constituents listed previously, only waste lead is present in quantities requiring regulation under WAC 173-303. This lead is designated as WT01 and D008."

143. Deficiency: Section 4.6.2.2, Exemption Based on Design, Page 4-5 — 1-8-93

Based upon discussions with U.S. Navy personnel, it is our understanding that the reactor compartments will be encased in steel hulls with a minimum thickness of 3/4 inch, not 3/8 inch. Furthermore, it is now expected that as much as 230 gallons of liquid may remain in the compartments. Therefore, all free liquids have not been drained.

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Requirement: Please verify the text. Also, provide a reference for stating "the compartments should probably last longer than 500 years".

DOE-RL/WHC Response No. 1: Ecology comments 143, 256, 261, and 262 require further technical evaluation.

Comment: Section 4.6.2.2, Exemption Based on Design, Page 4-5

This comment must be addressed in the next NOD Response Table.

DOE-RL/WHC Response No. 2: The thickness of the SRC packages will be revised to state that the lead is isolated from the environment by the SRC steel hull which is a minimum of 1 inch, and bulkheads which are a minimum of 3/4 inch (in some cases combinations of plates). Also, each SRC has approximately 10 penetrations covered by 1/2 inch welded steel plate. None of these covers are in the immediate vicinity of lead shielding. The maximum diameter of penetrations covered is 6 inches and total area protected is less than five hundredths of one percent (0.05%) of the surface area of the package.

A discussion of the containment lifetime of the SRC will be included in the revised exemption request. The discussion will be based on the recently completed study "Prediction of Pitting Corrosion Performance of Submarine Reactor Compartments After Burial at Trench 94, Hanford, Washington" (March 1992).

A request for exemption to the land disposal restrictions (WAC 173-303-140) for leaving the residual liquid remaining in the SRCs will be included in the "Request for Exemption from the Lined Trench Requirements for Submarine Reactor Compartments."

144. Deficiency: Section 4.6.3, Liner System, General Items, Page 4-6 — 1-8-93

The duration of postclosure has not been defined. Therefore, the term "30-year postclosure period" may not be accurate.

Requirement: Delete the term "30-year".

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DOE-RL/WHC Response No. 1: The "30-year postclosure period" is defined in WAC 173-303-610(7)(a). No text change is required.

Deficiency: Section 4.6.3, Liner System, General Items, Page 4-6

WAC 173-303-610(7)(b) allows Ecology to set postclosure durations of any length based upon site conditions. Although a 30-year timeframe can be used to estimate future requirements, Ecology cannot specify the postclosure duration at this time.

Requirement: Delete the term "30-year".

DOE-RL/WHC Response No. 2: The term "30 year" will be deleted from the first paragraph. It will be retained further down in the list of requirements specified by the Functional Design Criteria.

145. Deficiency: Figure 4-1, RCRA Compliant Liner System, Page 4-7/8 — 1-8-93

This figure and several other references indicate a layer of "asphalt". Taken literally, this means that a layer of viscous petroleum residues will be applied over the sand layer. It is unclear if this or asphaltic concrete will be used.

Requirement: Please verify the composition of this layer. Edit the text to specify the composition and purpose of this layer.

DOE-RL/WHC Response No. 1: The only asphalt that will be used on the non-dragoff trench will be asphaltic concrete similar to that used elsewhere in the 200 Areas. The asphaltic concrete will provide pavement for the truck unloading area. Please see the Construction Quality Assurance Plan (CQAP), WHC-SD-W025-PLN-001, Page 23, Section 4.3.6, and the design drawings in WHC-SD-W025-FDR-001 on Page 105 of 397.

Comment: Figure 4-1, RCRA Compliant Liner System, Page 4-7/8

Appropriate text changes need to be made within the permit application to specify asphaltic concrete. Are the truck staging and unloading areas within the line part of the landfill? If so, what type of compatibility testing has been done on this material?

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DOE-RL/WHC Response No. 2: The permit application has been revised to contain an accurate description of the present design, including the truck unloading area. The truck unloading area drains into the landfill; the truck staging area does not. Compatibility testing with the asphalt concrete has not been done and is not considered necessary given the low concentrations expected for any leachable components.

146. Deficiency: Section 4.6.3.1.2, Primary Liner System, Page 4-11 **1-8-93**

All landfill slopes must be no steeper than 4 horizontal: 1 vertical. This applies to both the lined trench slope and the final cover slope.

Requirement: Edit line 47 to read "4H:1V".

DOE-RL/WHC Response No. 1: The basis for Ecology's requirement of 4H:1V slopes is not clear. Slope stability is discussed in Section 5.1 of FDR-001. Details of these analyses are presented in Appendices C.8, C.9, and C.12 of the Design Report, and indicate acceptably high factors of safety under all design conditions. With respect to constructability, 3H:1V side slopes are routinely constructed without difficulties at several major hazardous waste disposal facilities (one facility even has side slopes as steep as 2H:1V). Operations layer material is also typically spread on these 3H:1V slopes.
The Design Report includes a filling plan (Section 6.6) which suggests that the landfill be filled in horizontal lifts. This approach will avoid any unbalanced forces acting downward along the slopes and will thus serve to maximize stability (also see response to comment 150).

The final cover has not yet been designed, so slope of the cover has not been determined.

Deficiency: Section 4.6.3.1.2, Primary Liner System, Page 4-11

Ecology's basis for requiring 4H:1V slopes is to reduce the possibility of potential failures. This could be done by requiring higher factors of safety (FS) for slope stability analysis. However, requiring flatter slopes provides additional assurance against failure which are not an input to the theoretical calculations used to produce the FS. As an example an FS could be increased for a slope by flattening the slope or by using a material with a higher friction angle. Although each parameter could be adjusted to yield the same FS

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flattening the slope actually produces a system less likely to fail because the flatter slope is easier to install from both a soil and synthetic liner point of view.

It should also abe noted that one of biggest problems with multi-layer liner systems is the complexity and cost of repairing failures. Should a slope failure of such a system occur, the possibility exists that the entire liner system may have to be replaced. In addition, breach of the liner may result in a release of hazardous constituents to the environment. Therefore, Ecology considers it critical to design multi-layer systems with a higher factor of safety (measurable or not) than for a non-barrier or readily replaceable component.

The definitive design report (Section 5.1) states "a static factor of safety of 1.5 and a dynamic factor of safety of 1.1 is considered adequate". Not only does Ecology disagree with these values, Ecology also finds disagreement in using a separate FS for static versus dynamic conditions. It is our opinion that an FS of 2.0 is appropriate for both conditions. The reported FS values for the critical interface (geotextile-sand) are 1.75 (static) and 1.25 (dynamic). Neither values meet our proposed standard and are uncomfortably close to the design document standards. There appears to be little room for error during installation, product manufacture, and unforseen/unusual combinations of failure mechanisms. The FS determination is based upon data generated under pristine laboratory conditions on a small fraction of the material to be used. The liner system will not be installed in a similar environment. Furthermore, it is not evident if the laboratory tests which produced the shear strength parameters were based upon the actual materials to be used for this project. This has been the cause of failure in other, similar systems where these parameters were taken from a text resource or based on "similar", not actual materials.

Requirement: It is Ecology's understanding that part of the reluctance to change the trench side slopes is the added cost to re-design this facility. Although we appreciate that concern, it cannot interfere with Ecology's responsibility to ensure protection of human health and the environment. However, given the fact that these slopes are not permanent, that this project is a landfill (as opposed to a surface impoundment), and will be filled (loaded) in a manner which minimizes additional stress, Ecology may allow the use of 3H:1V trench slopes if: 1) a dynamic and static factor of safety equal to or greater than 2 can be achieved or an acceptable justification for using a static FS of 1.5 and a dynamic FS of 1.1 is provided (such justification should include the reasons for using a different FS for static versus dynamic), 2) an evaluation is provided of the materials used for testing versus those to be installed, and 4) a statement is added to the text stating Ecology's preference

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for an FS-2 and a 4H:1V slope along with Energy's recognition that a slope failure may prohibit further use of the landfill if Ecology does not accept the repair work of a failed slope.

DOE-RL/WHC Response No. 2: This comment raises a number of issues. We are also concerned with safety, but believe that 3H:1V sideslopes will perform satisfactorily. The following thoughts are offered to support this conclusion.

The assumed strength properties and corresponding factors of safety used for the W-025 design are summarized in the attached table titled "Summary of Slope Stability Design Values". These values are based on laboratory testing and are residual strength values, a conservative approach. It may be seen that the factors of safety for the soil/geotextile interface are below Ecology's proposed value of 2. However, the apparent cohesion (see attached test data sheet, "Sandy Soil vs Texnet Geocomposite") was ignored in this analysis to be conservative. If the cohesion is included, the static and dynamic factors of safety increase to 4.3 and 3.1, respectively. It should be noted that failure along this interface means that the operations layer would slide; this would not affect the liner system and consequently would have no impact on landfill performance. As discussed in more detail below, the buttressing effect of the toe of the operations layer and of the waste itself was not considered, again a conservative approach. For these reasons, the strength of this interface is considered adequate.

The other factor of safety in the Design Values table that is less than 2 is the dynamic factor of safety for the subgrade, which is 1.7. As discussed in more detail below, a factor of safety of 1.1 is considered adequate for dynamic loading conditions. Also discussed below, a dynamic factor of safety lower than the static factor of safety is appropriate.

Additional stability analyses have been performed that do include the buttressing effects of the toe of the slope. These analyses and results are described in the attached "Supplement 1." This analysis confirms and extends the results of the original W-025 design analyses, and again indicates that relatively high factors of safety, both static and dynamic, can be achieved using reasonably expected material strengths.

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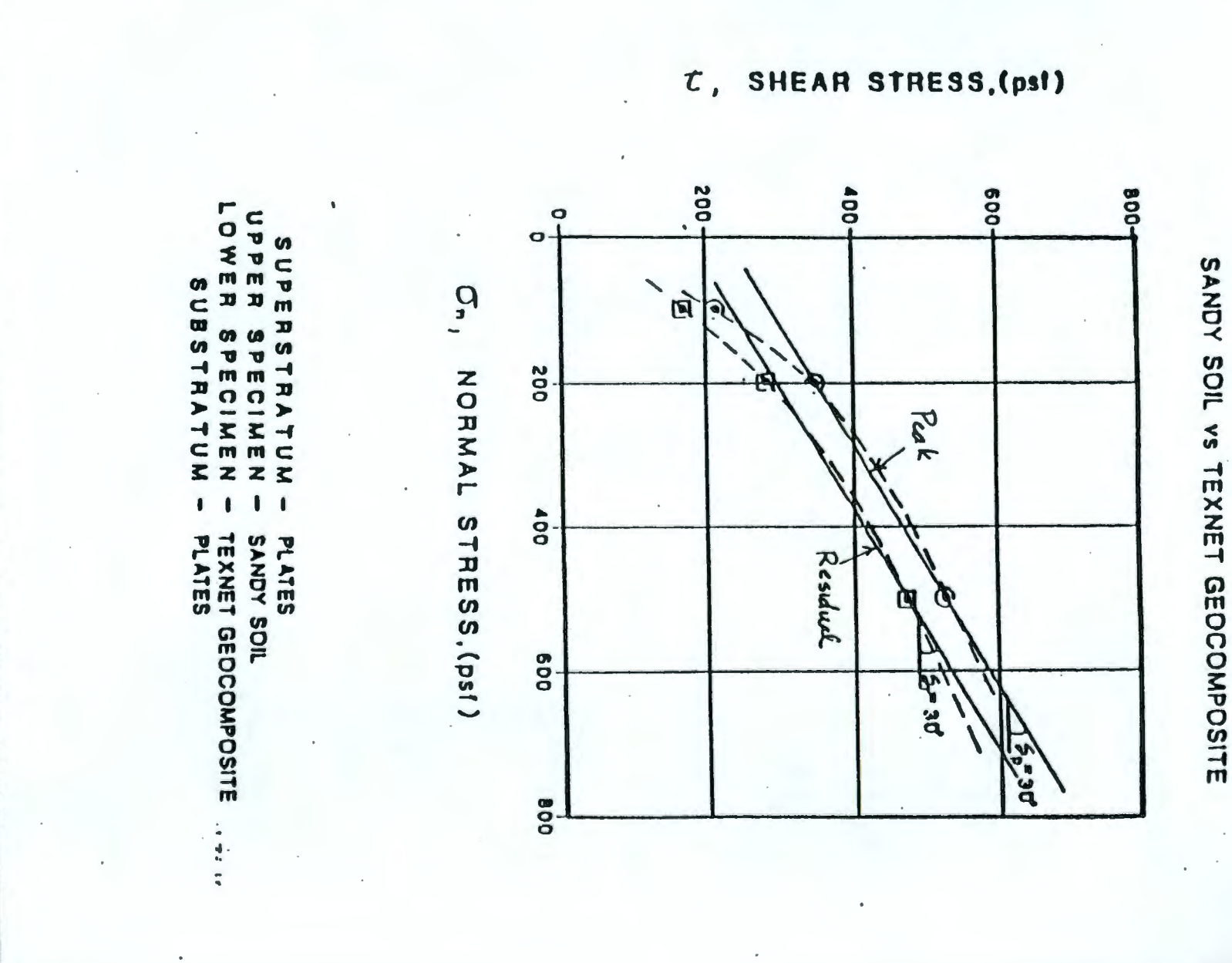
FIRST FIGURE FOR COMMENT 146, TEST DATA SHEET, SANDY SOIL VS TEXNET GEOCOMPOSITE



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The following paragraphs discuss the question of slope stability in more detail.

1. Potential Failure Mechanisms. Two main types of failures could occur at the W-025 Landfill. The first involves deep-seated failure through the soils that form the subgrade beneath the sideslopes of the landfill. Such a failure could damage the entire liner system at the location of the failure. However, the toe of such of failure would most likely be above the waste, rather than through it, for two reasons. First, the soils at depth (sandy gravels) are typically stronger than the surficial soils (silty sands), so there is no weak zone that might cause a failure at depth. Second, the landfill will be filled in horizontal lifts and the waste will act to buttress the slope. Thus, even if a failure occurred, it is likely that the liner under the waste would remain intact and no environmental contamination would occur. In any case, such a large failure would be easily detected, and waste could be readily transferred from the damaged area to another location in this relatively small landfill. The landfill could then be repaired.

The factor of safety against a subgrade failure is essentially determined by the strength of the soils. As noted in the W-025 Design Report, a friction angle of 38 degrees (no cohesion) was measured for the Eolian sand, which produced a static factor of safety of 2.4 for static loading conditions and 1.7 for dynamic conditions. As discussed in more detail below, these factors of safety are considered adequate. Because strength is an intrinsic property of the soil, there are no practical ways to increase the stability of these slopes.

Evidence for the stability of 3H:1V slopes in the subgrade is provided by trenches in the Low-Level Burial Grounds and by Trench 94, where side slopes have been cut at 1.5H:1V or steeper. These slopes, which are twice as steep as the proposed W-025 slopes, have performed well for a number of years with no failures or other signs of instability.

The second type of failure involves sliding of the operations layer along one of the underlying interfaces. As with the deep-seated failure, it would most likely occur in the sideslopes above the waste, and thus landfill integrity would not be compromised. This type of failure would be easily identified by visual inspection, and repair could be readily accomplished. As for a deep-seated failure, however, it is not the lack of serious consequences, but rather the adequacy of design methods and the successful construction and

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operation of existing landfills that forms the basis for using 3H:1V slopes in the W-025 Landfill.

2. Precedent for 3H:1V sideslopes. A number of commercial hazardous waste landfills have been designed, permitted, and constructed with sideslopes of 3H:1V or steeper. These facilities have been successfully operating for a number of years. Consequently, the design approach used for the W-025 Landfill is consistent with industry practice and has been accepted by other state and regulatory agencies and has proven adequate. A selected list of these landfills is shown in the attached table titled "Landfill Summary Data".

Goldman et al. (1988) reviewed a number of hazardous waste containment facilities and found that sideslopes varied from 4H:1V to vertical. Maximum sideslopes of 2H:1V were recommended where granular drainage layers would be installed or where highly plastic soil liners would be installed. For admixed bentonite liners, maximum sideslopes of 3H:1V were "generally preferred", because this is the steepest slope upon which compaction equipment can operate, rather than for reasons of stability. The EPA guidance which recommends maximum sideslopes of 3H:1V (EPA, 1985) is also based on adequate compaction, not stability considerations.

3. Selection of Factors of Safety. Several of the designs in the Landfill Summary table used factors of safety of 1.5 for static loading and 1.1 for dynamic loading. The use of a static factor of safety of 1.5 is consistent with industry practice and standards for geotechnical engineering. Goldman et al. (1988) note that "temporary slopes are often designed for factors of safety of 1.2 to 1.5". Richardson and Koerner (1987) provide a sample analysis of sliding of the soil cover over a geomembrane (the second failure type described in item 1 above) with a recommended factor of safety of 1.2. Koerner (1990) notes that a factor of safety of 1.5 "is often a targeted value" for soil failure beneath a liner (first failure type described in item 1 above). In a later example, he considers a factor of safety of 1.37 adequate for failure of a geomembrane in a composite sideslope liner system (second failure type described in item 1 above). The U.S. Navy in their design manuals recommends the following factors of safety for slopes: "no less than 1.5 for permanent or sustained loading conditions.....For temporary loading conditions...safety factors may be reduced to 1.3 or 1.25.....For transient loads, such as earthquake, safety factors as low as 1.2 or 1.15 may be tolerated" (Navy, 1982). Finally, the Washington State Department of Ecology (Ecology, 1987) in its Solid Waste Landfill Design Manual recommends that "final slope design should include a factor of safety of 1.4-1.5" when stability analyses are performed. This requirement is based in turn on EPA guidance (EPA, 1983).

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4. Case Study of Failure. A recent failure of the liner system in one landfill at the Kettleman Hills Facility (KHF) in California may be a source of concern. However, there are several significant differences in the design and operation between this landfill and the W-025 Landfill:

a. The KHF landfill had a sideslope of 2H:1V, while the W-025 Landfill will have sideslopes of only 3H:1V.

b. At the time the KHF landfill was constructed, textured HDPE and geocomposite drainage layers were not available. The shear strengths across some of the interfaces may have been as low as 8 degrees, based on lab testing after the failure. In contrast, the interface friction values for the W-025 Landfill will be considerably higher because textured HDPE and geocomposite drainage layers will be used; typical laboratory results are shown in the attached table of Design Values. The exact friction values have not been determined because the geosynthetics have not yet been selected. However, minimum required values will be explicitly specified to provide adequate factors of safety.

c. The KHF landfill was constructed in phases, so that it could not be filled in horizontal lifts across the entire landfill floor. Hence, the resisting block of waste on the floor was not large enough to support the driving block on the 2H:1V slope. The W-025 Landfill, on the other hand, will be completely constructed prior to waste placement, and waste will be placed in horizontal lifts across the entire floor area. Thus, unbalanced forces of the type at the KHF landfill will not exist.

5. Minimum Interface Friction Requirements. The Specifications and CQA Plan will be revised to include minimum interface friction requirements so that the assumptions used in the design stability analyses are satisfied. See responses to comments 265, 324, 325, and 326.

6. Dynamic vs. Static Factor of Safety. Because of the transient nature of earthquake loading, use of the factor of safety concept is problematical. Static loads are present essentially permanently, and a factor of safety sufficiently in excess of unity must be provided to prevent excessive displacements and failure. Peak dynamic loadings are applied for such a short period of time, that even if the static strength is temporarily exceeded, this does not imply that significant permanent displacements will occur.

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A more rational way of viewing the earthquake slope stability problem is that attributed to Newmark (1965), wherein the effect of earthquake loading is assessed in terms of the permanent displacements induced during seismic shaking. The approach of Newmark consisted of applying a large number of earthquake time histories, each scaled to a range of peak ground accelerations, and calculating the permanent displacements that would be experienced by systems with different static factors of safety. The degree of static stability was expressed in terms of a yield acceleration, in each case, which is the acceleration required to bring the factor of safety to unity and initiate sliding. Therefore, structures with an initial low static factor of safety (and low yield acceleration), subjected to time histories with large peak ground accelerations, would tend to accumulate large permanent displacements during the earthquake shaking. Conversely, structures with an initial high static factor of safety (yield acceleration), subjected to time histories with a low peak ground accelerations, would experience small to negligible permanent displacements. With respect to the W-025 liner, smaller permanent deformations would be less likely to damage the liner system.

Newmark summarized his information in terms of a plot of permanent displacement versus the ratio of the yield to the peak applied acceleration. For yield to applied acceleration ratios as low as unity (i.e., dynamic factor of safety of unity), no permanent displacements were generated as the applied acceleration never exceeded the yield acceleration, i.e., the dynamic factor of safety was always at or above unity. Even for yield to peak applied accelerations (or dynamic factor of safety) as low as 0.8, permanent displacements were generally very small because the period of time that the applied acceleration exceeded the yield acceleration during the earthquake was also very small. As the acceleration ratio or dynamic factor of safety was further reduced, permanent displacements became more significant. Hence the work of Newmark indicated that dynamic factors of safety (which included the peak ground acceleration as a pseudostatic load) could pass below unity without causing any significant permanent displacements and damage to facilities such as slopes and embankments. The applied peak ground acceleration of 0.12g used in the current analyses is representative of a design seismic event with a return period of 1000 years (Kennedy et al., 1988), or an event with a less than two percent chance of being exceeded during a design life of 20 years.

Prior to the work of Newmark, the conventional approach to seismic design of earth embankments and slopes was the largely empirical pseudostatic seismic coefficient. The seismic coefficient was specific to the location, with higher coefficients used in

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seismically more active areas, and was generally less than corresponding peak ground acceleration discussed above. Using this method, the seismic coefficient is applied as an equivalent static force acting on the slope. The recommended seismic coefficient for the Hanford Site is 0.1 (COE, 1983), compared to the 1000 year return period peak ground acceleration of 0.12g. The pseudostatic seismic coefficient method required a calculated dynamic factor of safety of 1.0 (COE, 1971), and has been used to good advantage for many years. Newmark demonstrated, in general, that the use of lower seismic coefficients with a higher factor of safety was generally consistent with his conclusions relating to limited deformations in structures with dynamic factors of safety of less than unity when the actual peak ground acceleration was used as a pseudostatic loading.

Therefore, experience indicates that if the peak ground acceleration is applied as a pseudostatic loading, calculated factors of safety on the order of unity (or even somewhat less than unity) will be consistent with the development of negligible permanent displacements during seismic shaking. For the present design, the calculated dynamic factors of safety for a seismic loading of 0.12g are well in excess of these requirements. There is no basis in theory or practical experience for requiring an equivalency between static and dynamic factors of safety for design purposes.

COE, 1971, Engineering and Design: Stability of Earth and Rock-Fill Dams, EM 1110-2-1902, U.S. Army Corps of Engineers, Washington, D.C.

COE, 1983, Earthquake Design and Analysis for Corps of Engineers Projects, ER 1110-2-1806, U.S. Army Corps of Engineers, Washington, D.C.

Ecology, 1987, Solid Waste Landfill Design Manual, Publication 87-13, Washington State Department of Ecology, Grants Section, Olympia, Washington.

EPA, 1983, Lining of Waste Impoundment and Disposal Facilities, SW-870, U.S. Environmental Protection Agency, Cincinnati, Ohio.

EPA, 1985, Draft Technology Guidance Document on Double Liner Systems and Surface Impoundments -- Design, Construction, and Operation, EPA/530-SW-85-014, U.S. Environmental Protection Agency, Office of Solid Waste and Emergency Response, Washington, D.C.

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Goldman, L.J., L.I. Greenfield, A.S. Damle, G.L. Kingbury, C.M. Northeim, and R.S. Truesdale, 1988, Design, Construction, and Evaluation of Clay Liners for Waste Management Facilities, EPA/530/SW-86/007F, U.S. Environmental Protection Agency, Office of Solid Waste and Emergency Response, Washington. D.C.

Kennedy, R.P., S.A. Short, J.R. McDonald, M.W. McCann, and R.C. Murray, 1988, Design and Evaluation Guidelines for Department of Energy Facilities Subjected to Natural Phenomena Hazards, UCRL-15910, Office of Nuclear Safety, U.S. Department of Energy, Washington, D.C.

Koerner, R.M., 1990, Designing with Geosynthetics, Prentice-Hall Inc., Englewood Cliffs, New Jersey.

Navy, 1982, Soil Mechanics, NAVFAC DM-7.1, U.S. Department of the Navy, Naval Facilities Engineering Command, Alexandria, Virginia.

Newmark, N.M., "Effects of Earthquakes on Dams and Embankments", Fifth Rankine Lecture, Geotechnique, Vol XV, No.2, The Institute of Civil Engineers, London, England.

Richardson, G.N., and R.M. Koerner, 1987, Geosynthetic Design Guidance for Hazardous Waste Landfill Cells and Surface Impoundments, EPA/600/2-87/097, U.S. Environmental Protection Agency, Office of Research and Development, Cincinnati, Ohio.

Summary of Slope Stability Design Values - W025 Landfill					
File: NDOSTRNG.WK1					
	Cohesion,	Friction	Static	Dynamic	
Interface	psf	Angle, Deg	F.S.	F.S.	Comments
Design Values					

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Soil/Geotextile	0	30	1.8	1.3	Residual strength,
					ignores apparent
					cohesion
Geocomp/Text HDPE	188	22	3.9	2.8	Wet interface, values
					at 2 inches displ.
Text HDPE/Admix	320	36	6.8	4.9	Residual strength
					at 2 inches displ.
Subgrade	0	38	2.4	1.7	Strength at 3% strain,
					Eolian Sand
Alternative Values					
Soil/Geotextile	175	30	4.3	3.1	Residual strength,
					includes apparent
					cohesion

LOW-LEVEL BURIAL GROUNDS
NOTICE-OF-DEFICIENCY RESPONSE TABLE

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Landfill Summary Data						
Golder Associates Inc.						
1-9-92						
	Location		Area,	Depth,	Side	Construction
Landfill	State	Type	acres	feet	Slopes	Date
Adams Center	IN	Haz	30	30	2H:1V	1988
Arden	PA	Mun	65		3H:1V	1991
Arlington L-13	OR	Haz	16	50	3H:1V	1987
Beatty Trench II	NV	Haz	20	100	0.5H:1V	1989 (add. in 1990, 1991)
Bolton Road	GA	Mun	20	20	3H:1V	1991 - 1992
Clear View	MS	Mun	20	10	3H:1V	1991
Columbia Ridge	OR	Mun	35/cell	60	3H:1V	1989 (+1 cell/yr)

LOW-LEVEL BURIAL GROUNDS
NOTICE-OF-DEFICIENCY RESPONSE TABLE

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CWM -Kansas	KS	Haz	5	30	3H:1V	1989
Emelle	AL	Haz	60	120	2.5H:1V	1985 - Present
Greater Wenatchee	WA	Mun	7	60	3H:1V	1989
High Plains	MT	Mun	3	40	3H:1V	1991
Kettleman B-19	CA	Haz	22	90	2H:1V	1987
Kettleman B-18	CA	Haz	23	100	2H:1V	1992
Lake Charles	LA	Haz	60	30	2.5H:1V	1986 - Present
Marsh Canyon	CA	Mun	290	350	2H:1V	1992
Model City	NY	Haz	60	40	3H:1V	1986 - 1991
North Mountain	WV	Mun	12	60	3H:1V	1990 - 1991
Piedmont	NC	Mun	65	140	3H:1V	1989 - 1990
Vickery PCB Cell	OH	Haz	30	15	3H:1V	1989 - 1990

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Woodside	LA	Mun	70	25	3H:1V	1989 - Present

Haz = Hazardous

Mun = Municipal

Supplement 1
Summary of Additional Stability Analyses

1. The failure mode considered involved the sliding of some thickness of the landfill liner system, along the 3H:1V sideslope, at the time the landfill liner is fully constructed but before any waste is emplaced. As waste is emplaced, the length of the liner susceptible to sliding will decrease and its stability will be correspondingly increased. The liner was assumed to consist of two feet of granular operations layer overlying a primary geocomposite and textured HDPE geomembrane, a secondary geocomposite and textured HDPE membrane, and three feet of secondary liner admix. The geometry used for this analysis is shown on Figure S-1.

2. The following slip surfaces were considered:

- within the granular operations layer.
- within the synthetic liner system at a depth of two feet, along the weakest of the various interfaces (i.e., granular operations layer/geocomposite; geocomposite/textured HDPE geomembrane; textured HDPE geomembrane/admix).
- within the secondary liner admix (from depths of two to five feet).
- within the subgrade.

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FIGURE FOR COMMENT # 146

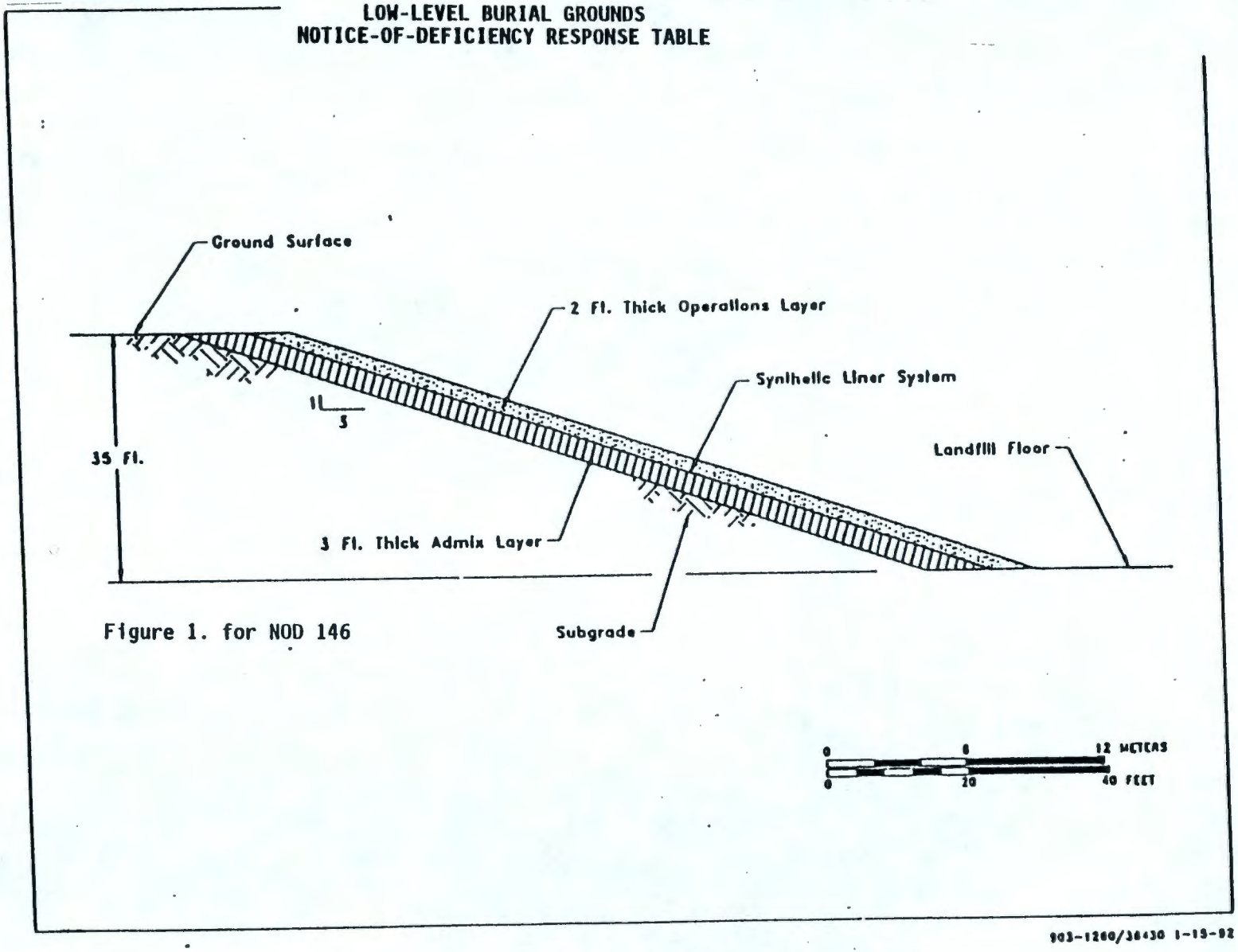

Figure S-1. Geometry Analyzed for Additional Stability Analysis.

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3. The following strength data have been measured for the various materials and interfaces:

Granular operations layer: phi=38 degrees.

Synthetic liner system: lowest residual strength of all interfaces at the normal stress levels of interest correspond to c=188 psf and phi=22 degrees (corresponding to the geocomposite/textured HDPE interface).

Admix: Triaxial testing of the admix indicated effective strength parameters of phi=36 degrees. Normal stress levels for this testing were significantly higher than will exist within the admix liner prior to waste emplacement. Direct shear testing of the admix/textured HDPE interface at low normal stress levels to 500 psf indicated a residual strength corresponding to c=320 psf and phi=36 degrees. It is reasonable to assume that the admix in the vicinity of the interface also exhibited at least these strength parameters and that at the low normal stress levels relevant to the stability analyses considered herein, the admix exhibits a small effective cohesive component of strength in addition to its frictional component. Stability analyses for failure modes through the admix were therefore conducted for two conditions; 1) c=320 psf and phi=36 degrees (most representative) and 2) phi=36 degrees (lower bound).

Subgrade: phi=38 degrees.

4. Factors of safety were calculated for two conditions corresponding to the static loading case and for a pseudostatic seismic loading of 0.12g. The following results were obtained:

Failure Mode	FS(static)	FS(dynamic)
Operations layer (2 ft depth)	2.4	1.7
Synthetic interface (2 ft depth)	3.9	2.8
Admix (2 ft depth - c=320 phi=36)	6.6	4.8
(2 ft depth - phi=36)	2.3	1.6
Admix (5 ft depth - c=320 phi=36)	4.4	3.1
(5 ft depth - phi=36)	2.4	1.7
Subgrade (5 ft depth)	2.8	2.0
(Circular Failure)	2.7	1.9

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5. Discussion of results

The static factor of safety for slip within the operations layer (i.e., above any synthetic components of the liner system) is a substantial 2.4. For an applied seismic coefficient of 0.12, the pseudostatic factor of safety for sliding within the operations layer is 1.7, indicating no chance of permanent displacements related to sliding within the operations layer for such levels of seismic loading.

For failure modes involving disruption of the liner synthetics, lowest factors of safety are developed for sliding within the subgrade, with a static factor of safety of 2.8 and a pseudostatic seismic factor of safety of 2.0. For failure modes involving sliding within the admix, somewhat lower factors of safety are calculated for a lower bound characterization of the admix strength (i.e., phi=36 degrees), although the existence of even modest effective cohesion components of strength has a relatively dramatic influence on the calculated factors of safety. The test data indicate that small effective cohesion components of strength are relevant for compacted clay liners at low normal stress levels.

Similarly, for the types of synthetic materials to be used in construction of the landfill liner system, high static and dynamic factors of safety are indicated as a result of the relatively significant cohesive strength components at the low expected levels of normal stress.

The dynamic factor of safety is typically less than the static factor for several reasons. First, the probability of earthquake loading is low, while static loading will certainly be experienced throughout much of the operating life of the landfill. In a true risk-based analysis, the probability of exceedance for certain acceleration levels would be considered in the overall determination of acceptable risk, and, at a site like Hanford with relatively low seismic activity, would reduce the risk substantially. In practice, this formal type of detailed risk analysis is rarely performed; instead, the dynamic factor of safety is reduced to consider this question implicitly.

The second reason involves the duration of the loading. For static loads, which are continuously experienced, long-term processes such as creep, deformation, stress relief, and others can reduce the effective strength of the loaded materials. This is particularly true for geosynthetics. Hence, a higher factor of safety is assigned to static conditions to account for these processes. On the other hand, earthquake loads are transient and short-term, and the effective strength of the materials is not reduced via the processes noted above.

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The third reason is that although design accelerations may be exceeded, resulting displacements can be sufficiently small so that no damage occurs. Hence, the dynamic factor of safety can actually be less than 1 and still be acceptable. In simple terms, this results from the wave-like nature of seismic events, resulting in only a very small time during which the design acceleration is exceeded (i.e., the wave is above a certain amplitude). This process is discussed by Newmark (1965).

Finally, the pseudostatic loading condition assumed for the W-025 analyses, where the seismic acceleration is in effect continuously applied, is a more severe condition than actually encountered in reality, and hence is conservative. The assumed pseudostatic accelerations are referred to as "seismic coefficients". Values for these coefficients were developed empirically before more sophisticated analytical methods were available and were found to provide adequate performance. In general, the seismic coefficient for a given locality is lower than the actual peak ground acceleration. For example, the seismic coefficient for southern California used by the U.S. Army Corps of Engineers for design purposes is 0.2 (COE, 1983), while actual peak ground accelerations may be 0.43 g (e.g., at the KHF) or higher. (The COE seismic coefficient for the Hanford Site is 0.1, slightly less than the value of 0.12 used for the W-025 analysis.) The reason that low seismic coefficients used in a pseudostatic analysis give an indication of performance comparable to results using peak ground accelerations in a more sophisticated analysis relates to the short time that peak accelerations are actually experienced, as described above. Thus, the pseudostatic method contains a large measure of conservatism, and use of a lower factor of safety is appropriate.

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147. Comment: Section 4.6.4.4.4, Stability of Slopes, Page 4-30 — 1-8-93

It is not just conjectural that sand will not stay on this slope, it is a certainty. There have been a number of reported slope failures at grades of 3H:1V. As far as mitigating this problem, option 1 is undesirable since it maximizes exposure of the geosynthetics, the solution in option 2 is obscure and needs expansion, and option 3 may not work due to crushing under the load of the backfill. Comments 20 and 146 also apply here.

DOE-RL/WHC Response No. 1: See the Definitive Design Report WHC-SD-WO25-FDR-001, Page 14 of 397, Section 5.1.1. and Appendix C.9, Page 264 of 397. The response to Number 146 also applies here.

Comment: Section 4.6.4.4.4, Stability of Slopes, Page 4-30

This issue will be addressed in comment 146. No further response is necessary.

DOE-RL/WHC Response No. 2: No further response.

148. Comment: Section 4.6.5.1.1, Geotextiles, Page 4-32 — 2-18-92

Typo. Line 52 should reference Section 4.6.5.2., not Section 4.6.5.1.1. This correction also needs to be made on line 45 of page 4-33 and line 10 of page 4-34.

DOE-RL/WHC Responses: The references will be revised as suggested.

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149. Deficiency: Section 4.6.5.1.2, Geonet, Page 4-33

The "important consideration" when selecting a geonet is transmissivity, not permeability.

Requirement: The term "permeability" on line 32 should be replaced with "transmissivity". In addition, the appropriate ASTM test to determine transmissivity should be specified in the text.

DOE-RL/WHC Response No. 1: The transmissivity is the most important consideration when selecting a geonet. See the Definitive Design Report WHC-SD-W025-FDR-001, Page 21 of 397, Section 5.5.2. and Appendix C.3, Page 209 of 397. It specifically states that the "primary selection criteria for the geonet was the transmissivity." Also note that the specifications require conformance testing for transmissivity (see WHC-S-045, Section 02275 and the CQAP Appendix A).

Deficiency: This comment previously received Ecology concurrence. However, after further review, it has been noted that the response does not acknowledge the NOD's requirement to change the word "permeability" to "transmissivity".

Comment: The text change should be made.

RL/WHC Response No. 2: The text will be changed to say "transmissivity" in the next revision of this chapter of the permit.

150. Deficiency: Section 4.6.5.3.3, Operational stresses, Page 4-37 — 2-18-92

It is not clear how the waste will be backfilled.

Requirement: Provide a discussion on backfilling waste, i.e., immediately after placement, after the trench is filled, in lifts, etc.

DOE-RL/WHC Response: The landfill filling plan is in the Definitive Design Report WHC-SD-W025-FDR-001, Page 35 of 397, and Section 6.6., Waste Stability 5.1.4, Page 15 of 397. Also see Page 112 of 397, Drawing H-2-131588. Golder Associates is currently evaluating alternative materials to be used as backfill and will prepare a report with these findings. Therefore, the approach described in FDR-001 may be modified.

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151. Comment: Section 4.6.5.5, Soil Liners, Page 4-39

Installation of soil/bentonite liners is underway at the LERF site. A number of refinements are being made to the process. Activities involving the development and installation of the admixed liner should be coordinated with the LERF project to ensure consistency in technical and regulatory matters (See Ecology letter to Wisness from Nord dated January 30, 1991 titled: Standardized Soil-Bentonite Project).

DOE-RL/WHC Response No. 1: The LERF team has provided lessons learned on problems encountered during their project. Soil/Bentonite plans can be seen in the Definitive Design Report WHC-SD-W025-FDR-001, Section 4.2.1, 4.3.1, and 5.3. The Design Report, Specifications, and CQA Plan provide a great deal of latitude for the Contractor (or Construction Manager) to determine the most suitable types of equipment and procedures for preparing and placing the admix liner. The Specifications require a submittal to the Westinghouse Hanford Company Project Engineer and the CQA Engineer describing these activities. With this approach, the pertinent experience from the LERF Project will be incorporated as appropriate when the Project W-025 Landfill is constructed (see response to comment 19 in regards to an individual test fill).

Deficiency: Section 4.6.5.5, Soil Liners, Page 4-39

It is Ecology's experience that "the great deal of latitude for the Contractor (or Construction Manager) to determine the most suitable types of equipment and procedures for preparing and placing the admix liner" has been a key problem at the LERF site. Another problem has been the sampling and field test procedures utilized at LERF.

Requirement: Ecology highly recommends that the Contractor's flexibility be limited wherever possible. If Energy, WHC, or Kaiser are aware of a successful procedure or piece of equipment, it should be specified to the Contractor. If not, the requirement for the Contractor to submit a description of these activities should be augmented by a requirement to have the submittal approved by the WHC Project Engineer and the CQA Engineer. These submittals must also be approved by Ecology's construction inspector or unit manager.

DOE-RL/WHC Response No. 2: The W-025 Specifications will be revised to require use of a pugmill for preparing the soil/bentonite admix, thus incorporating some of the most important LERF experience. Submittals are listed in detail in Section 01300 of the Specifications,

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presently being prepared by Kaiser Engineers Hanford. Submittals "requiring review and approval" are explicitly noted, and include most of the key activities. Approvals will be by the WHC Project Engineer and the KEH Construction Manager. The section further states that "submittals requiring review and approval are to receive approval before procurement, fabrication, or construction is started." (see response 354).

Deficiency: Section 4.6.5.5, Soil Liners, Page 4-39

The response fails to acknowledge Ecology's requirement to review contractor submittals before implementation of proposed activities.

Requirement: The submittals noted in the response must also be provided to Ecology's construction inspector or unit manager prior to implementation.

RL/WHC Response No. 3: The handling of construction inspection and other interfaces with Ecology regarding construction are being addressed as part of Hanford Facility Permit discussions.

152. Comment: Section 4.6.5.5.1, Material Testing Data, Page 4-40 — 2-18-92

Fines content testing (ASTM D 1140) should also be specified.

DOE-RL/WHC Response: The CQA Plan requires sieve and hydrometer testing on Eolian sand and admix at the rate of 1 test per 1,000 cubic yards of material. The specified method is ASTM D422, which is much more comprehensive than ASTM D1140 (see WHC-S-045, Section 02224, Paragraph 2-3).

153. Deficiency: Section 4.6.5.5.1, Material Testing Data, Page 4-41 — 2-18-92

It is not sufficient to only use a nuclear densimeter when measuring density. A minimum number of sand cone tests, ASTM D1556-82, should be performed to provide calibration and backup for the nuclear densimeter.

Requirement: The frequency of performing sand cone tests must be specified.

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DOE-RL/WHC Response: The CQA Plan (Section 4.3.2) requires that nuclear gage density measurements be verified with either sand cone (ASTM D1556) or rubber balloon (D2167) tests. At least 1 of these tests is required for each 2 lifts of admix placed, or 1 per day, whichever is greater.

154. Deficiency: Section 4.6.5.5.2, Soil Liner Compatibility, Page 4-41 — 2-18-92

A permeability of 1 X 10^{-7} centimeters per second is a maximum value, not a minimum value as indicated on line 42.

Requirement: Edit the word "minimum" to read "maximum".

DOE-RL/WHC Response: The Design Report WHC-SD-W025-FDR-001, Page 18 of 397, Section 5.3.2 has the correct terminology. The word has been changed to a "maximum value" in the revised Chapter 4.0 permit application.

155. Comment: Section 4.6.5.5.5, Engineering Report, Page 4-43. — 2-18-92

If this report is complete, it must be more specifically referenced and provided to Ecology. If it is not, provide an estimate for when it will be completed and modify the text to note that a copy will be provided to Ecology for review and approval.

DOE-RL/WHC Response: The Engineering Report has been provided to Ecology for review (see the Design Report WHC-SD-W025-FDR-001, DOE-RL-88-20, Supplement 2, Volume 1 of 2., Chapter 4).

156. Deficiency: Section 4.6.6.1.1, Primary System, Page 4-44 — 2-18-92

The text here states that the primary drainage layer will be composed of gravel. This contradicts Figure 4-1 which specifies sand.

Requirement: Clarify this contradiction and edit the application as necessary.

DOE-RL/WHC Response: The Primary Drainage Layers will be gravel (see the Design Report WHC-SD-W025-FDR-001, DOE-RL-88-20, Supplement 2, Volume 1 of 2, Chapter 4, Page 20 of 397, Section 5.5.1 and the design drawings). Figure 4.2 in the revised Chapter 4 has this revision.

9 3 1 2 8 8 1 8 3 8

No.	Comment/Response	Ecology Concurrence
157.	Deficiency: Section 4.6.6.1.1, Primary System, Page 4-44 EPA guidance has changed since the publishing of the document referenced on line 8. The EPA currently recommends a granular drainage layer hydraulic conductivity of 1 cm/sec and a synthetic drainage layer transmissivity of 5 X 10^{-4} m^2/sec. Requirement: The above specifications must be used for the LLBG's. **DOE-RL/WHC Response No. 1: EPA guidance allows use of either granular or synthetic drainage layer materials. The Project W-025 Landfill design includes both. As noted in the response to comment 31, the transmissivity of the geocomposite exceeds the EPA proposed requirement, and thus would be adequate by itself. However, the drainage gravel has been added for redundancy. Hence, the design provides high flow capacity and substantially exceeds the proposed EPA requirements.** Comment: Section 4.6.6.1, Primary System, Page 4-44 The text should be edited to reflect the response. **DOE-RL/WHC Response No. 2: The text in the Part B Permit Application will be edited during the next revision.**	1-8-93
158.	Deficiency: Section 4.6.6.1.1, Primary System, Page 4-45 The text describes the possibility of an asphaltic operations layer. However, no evaluation is provided describing the potential impacts of this layer on the bottom liners and associated components. Requirement: An evaluation should be provided which addresses the possibility of both waste leachate and precipitation leaching materials from the asphaltic layer into the LDCRS. Effects such as accelerated degradation and clogging should be considered. **DOE-RL/WHC Response: The words "asphalt operation layer" will be replaced with the following words "two foot operations layer of general fill." See the Design Report WHC-SD-W025-FDR-001, Page 8 of 397, Section 2.2 and design drawings.**	2-18-92

No.	Comment/Response	Ecology Concurrence
159.	Deficiency: Section 4.6.6.1.1, Primary System, Page 4-45 It is insufficient to say the primary sumps will be monitored "regularly". Requirement: The monitoring frequency should be specified as weekly. **DOE-RL/WHC Responses: See the Design Report WHC-SD-W025-FDR-001, Page 37 of 397, Section 7.2. Periodic (daily) readings of the leachate levels in the primary and secondary sumps will be obtained and recorded.**	2-18-92
160.	Deficiency: Section 4.6.6.1.2, Secondary System, Page 4-46 There is no reference to a Response Action Plan (RAP) which is required by EPA's minimum technology requirements for landfills. The RAP addresses the handling of liquids which enter the leachate detection, collection and removal system (LCDRS) and the actions to be taken in response to liquids in the LDCRS. Requirement: A RAP must be written and included in this application. Refer to the Grout Processing Facility RAP for guidance. **DOE-RL/WHC Response: A Response Action Plan will be included in the permit application prior to operation of the landfill.**	2-18-92
161.	Deficiency: Section 4.6.6.5, System Compatibility, Page 4-47 There is no mention here or throughout the text on fingerprinting FML's. Requirement: Fingerprinting must be conducted for all synthetic liners. A discussion of the fingerprinting program must be presented in the text. Furthermore, the reference to "Farnsworth et al. 1988" should be corrected to read "Farnsworth et al. 1989". **DOE-RL/WHC Response No. 1: Fingerprinting will be conducted (see the Design Report WHC-SD-W025-FDR-001, Page 27 of 397, Section 6.3.1. and the 9090 Test Report to be submitted to Ecology). The reference to Farnsworth et al. is no longer cited in the revised Chapter 4.0.**	

No.	Comment/Response	Ecology Concurrence

Deficiency: Section 4.6.6.5, System Compatibility, Page 4-47

There is insufficient data in the two references listed in the response to assess the fingerprinting program.

Requirement: A discussion of the fingerprinting program must be presented in the text. It should include a list of the parameters for each synthetic material which have been analyzed, the reported values, and tolerances for acceptance of future shipments of synthetic material to be used for this project.

DOE-RL/WHC Response No. 2: FML composition will be verified by melt index and specific gravity testing, which are considered "fingerprinting" tests. Acceptance criteria are included in the Specifications (Section 02275). Other "fingerprinting" parameters and acceptance criteria will be added to the Specifications to demonstrate that the supplied material meets chemical compatibility requirements. In addition, the FML Manufacturer is required to submit quality control certificates, manufacturing information, and test results on the polymer resin. The CQA Plan requires that the Manufacturer test each batch of resin and that if for any reason, the Specifications are not entirely satisfied, that batch of resin will not be used in FML manufacture. This type of discussion will be included in Section 4.6.6.5 during the next revision.

Comment: Section 4.6.6.5, System Compatibility, Page 4-47

What are the "other 'fingerprinting' parameters" which will be added to the specifications?

RL/WHC Response No. 3: See page 02275-3 of WHC-S-045, Rev 1. Differential Scanning Calorimetry (DSC) has been added as a fingerprinting test. This test indicates the degree of crystallinity of the HDPE material and is a useful discriminator between batches of resin. Other fingerprinting tests were reviewed but were not included because they lacked sensitivity for this application.

162.	Deficiency: Section 4.6.7.3, Construction Quality Control, Page 4-49	2-18-92

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Although Appendix 4F provides some construction quality control information for the liner system, the EPA requires a comprehensive construction quality assurance (CQA) plan for the entire facility in the Hazardous and Solid Waste Amendments to RCRA.

Requirement: A CQA plan must be provided as part of the application for the LLBG which addresses the EPA's, as well as Ecology's, concerns.

DOE-RL/WHC Response: The CQA Plan has been submitted to Ecology.

163. Comment: Section 4.6.8.1.1, Design and Performance, Page 4-50 — 2-18-92

What factor of safety does a 0.3 foot freeboard provide?

DOE-RL/WHC Response: See the Design Report WHC-SD-W025-FDR-001, Page 122 of 397, for surface water hydrology calculations. Drainage ditch design is presented in Appendix C.1 of the Design Report. Because the total cross sectional area of the ditch is 3 times the area of flow for the peak 25-year storm, the factor of safety is 3.

164. Deficiency: Section 4.6.8.5, Maintenance, Page 4-52 — 2-18-92

Given the sandy and windy conditions of the Hanford site, as well as the problems associated with tumbleweeds, it would seem maintenance may be a greater problem than projected.

Requirement: Discuss the effect of wind, sand and tumbleweeds on drainage ditch maintenance.

DOE-RL/WHC Response: See the Design Report WHC-SD-W025-FDR-001, Page 37 of 397, Section 7.2. Surface drainage ditches surrounding the landfill should be cleaned out and graded in the fall of each year prior to start of the rainy season (see Section 4.6.8.5. of the revised Chapter 4.0).

165. Comment: Chapter 5, Groundwater — 1-8-93

Although Ecology concurs with the previous NOD responses made on this chapter, a number of new comments on this chapter are presented and may address similar concerns. It is our understanding that this chapter has been extensively revised since this application's submittal. Therefore, although the specific Chapter 5 comments which follow may no longer be

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applicable, the following general requirements should be addressed in the revised text. Chapter 5 should address the following: 1) all stages of monitoring well installation and well sampling should be coordinated with Ecology; 2) all lab result reports must be provided to Ecology; 3) all well completion reports must be provided to Ecology; 4) the revised chapter should utilize post 1987 data as well as prior data; and 5) provide supporting descriptions for the well location model.

DOE-RL/WHC Response No. 1: (1) DOE/RL will continue to inform Ecology in advance of monitoring well installation and sampling plans. Advance information on each year's drilling program for installing new monitoring wells is provided in quarterly groundwater monitoring reports or in letter reports to Ecology. Advance information on well sampling is provided in the Part B permit application for both Interim Status and the proposed Final Status programs. This procedure provides Ecology with the opportunity to comment upon and discuss well installation and sampling plans at any time.

(2) Ecology will continue to be provided with validated laboratory data from the LLBG monitoring wells in quarterly groundwater monitoring reports. Because of their volume, raw and unvalidated data are not automatically distributed; however, laboratory result reports will be provided to Ecology along with the validated laboratory data upon request.

(3) Well Completion Reports for the LLBG monitoring wells will be provided to Ecology.

(4) Post-1987 data will be incorporated into the revised Chapter 5.

(5) The description of the Monitoring Efficiency Model used to locate monitoring wells will be expanded and clarified in response to Ecology comments. Further, references will be provided to technical reports describing the model that have been prepared since the first draft of Chapter 5 was submitted to Ecology.

Comment: Chapter 5, Groundwater

All laboratory results submitted to Ecology must be accompanied by a qualitative report which discusses the findings and draws conclusions. The revised Chapter 5 must include: 1) updates of all maps, including the plume migration maps, 2) new cross-sections based on information from 1990-91 well reports, and 3) a commitment to prepare an annual data evaluation report

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(with validated data) of water quality for 1991, 1992, and 1993, and 4) the criteria to be used in assessing compliance based upon the reports in item 3.

DOE-RL/WHC Response 2: Laboratory results and evaluations will continue to be reported in accordance with 40 CFR 265.95, Record Keeping and Reporting. The required reports are a quarterly report containing laboratory results and an annual report evaluating the chemistry data and the adequacy of the monitoring network. The annual report includes a qualitative evaluation of the data and draws conclusions. The quarterly report is just a data report. The data do not change sufficiently during a quarter to justify a qualitative evaluation of the data, and therefore including a qualitative evaluation would not be productive.

The revised Chapter 5 will include the requested information as described below:

(1) Maps, including plume migration maps, will be updated with the most current information available.

(2) Additional information gained from 1990-1991 monitoring well installations will be included in updated cross-sections.

(3) The annual report required by 40 CFR 265.95, Record Keeping and Reporting contains an evaluation of water quality that will continue to be prepared.

(4) Please clarify what criteria you are requesting that are in addition to the requirements of the regulations.

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166. Deficiency: Section 5.2.1, Interim Status Groundwater, Page 5-2 — 2-18-92

According to the text, the monitoring system should accomplish the following: 1) define the specific waste management areas for the LLBG, 2) establish an initial ground water monitoring well network, and 3) characterize the hydrogeologic properties of the upper most aquifer beneath the LLBG. Item 3 was not fully accomplished nor completely presented in the application.

Requirement: Based upon the most current data, item 3 must be completed according to the premise in the application.

DOE-RL/WHC Response: The third objective of the interim status program was clarified in response to Ecology Comment 33, to indicate that the first 35 wells were intended to provide preliminary hydrogeologic properties of the uppermost aquifer system beneath the LLBG using data collected from the monitoring well network and from previously collected or published data. These data are being supplemented by additional data collected while installing new monitoring wells, and by monitoring data collected from the entire existing network. Chapter 5 will be revised to discuss these new data and will either present them or describe how they may be obtained. Characterization of the hydrogeologic properties of the uppermost aquifer is sufficient to support this Part B permit application.

167. Deficiency: Section 5.2.3.2.1, Groundwater Elevations, Page 5-18 — 2-18-92

Although the text states "Hydrographs for the interim status wells are given in Last et al. (1989)", no comments related to the hydrographs or any interpretations of the conclusion are given.

Requirement: The information from the cited reference should be provided along with the conclusions drawn from this information.

DOE-RL/WHC Response: The water level changes shown in the hydrographs are summarized in the paragraph containing the Last et al. citation, and the preceding paragraph of the text. The hydrographs are too short (covering a period of only about 8 months) to draw meaningful conclusions regarding long-term trends. The revised Chapter 5 will address the longer period of record now available, and present interpretations of that record.

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168.	Deficiency: Figure 5-6, Water Table Beneath LLWMA 1 and 2, Page 5-19 A single contour line does not illustrate the flow direction of ground water. Requirement: The report cited on page 5-18, Last el al. (1989), indicates that the details of ground water movement in the vicinity of Waste Management Area 1 and 2 are difficult to discern. An explanation of why only one contour line is shown should be provided on the figure or in the text. If other data is available to better characterize the flow, it should be provided and the figure updated. In addition, the interpretation of reasons for ground water movement in the waste management area should be given. **DOE-RL/WHC Response: In a homogeneous, isotropic system the direction of groundwater movement is perpendicular to the equipotential contour lines, and in heterogeneous, anisotropic systems the equipotential contour lines still provide an indication of the direction of flow (see Freeze and Cherry, 1979, Chapter 5). Thus a single contour line does provide information on the flow direction of groundwater. There are two equipotential contour lines shown on Figure 5-6, which provide an indication of hydraulic gradient as well as the direction of groundwater flow. The difficulties referred to by Last et al. resulted from low hydraulic gradients and a lack of data points to support additional contours. Additional data have since been obtained and Chapter 5 will be revised to present three sets of water table contours beneath LLWMA 1 and 2 covering a period of three consecutive years. Groundwater movement at this location is believed to be strongly influenced by the B-Pond groundwater mound, as stated in the text on page 5-18.**	2-18-92
169.	Deficiency: Section 5.2.3.2.3, Results of Water Quality, Page 5-26 The text states "The concentration of dissolved chromium exceeded drinking water standards...." However, the origin of the contamination and possible remedial actions are not discussed. Requirement: The text must discuss the origin of this contamination as well as remedial actions which could be immediately undertaken to address this contamination. This comment also applies to any other constituents which were above drinking water standards. **DOE-RL/WHC Response No. 1: The origin of the high concentrations of chromium found in several of the wells is thought to be the well construction practices. This is so stated in**	1-8-93

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the paragraphs immediately preceding the cited paragraph, and the text will be revised to clarify that this same potential source applies to all of the newly installed wells. Such contamination is thought to be highly localized around the well, is expected to dissipate with time, and does not result from a chemical release from a burial ground. A discussion of remedial actions for chromium contamination will be added to the text. The text will also be revised to address the origins of any other constituents found to exceed the drinking water standards listed in WAC 173-303-645(5) Table 1. Should any such constituents be indicated to have originated from the low-level burial grounds, the text will be revised to discuss remedial actions.

Deficiency: Section 5.2.3.2.3, Results of Water Quality, Page 5-26

The statement that elevated chromium concentrations are due to well construction practices is not supported by evidence currently under review by Ecology.

Requirement: The conclusion drawn in the response must be supported by sampling results which indicate that chromium and other elevated constituent concentrations have dissipated within a year of well installation.

DOE-RL/WHC Response 2: Results of additional sampling will be discussed and, if appropriate graphs will be included to support conclusions regarding elevated levels of chromium. As stated above, the sources of other constituents found to exceed drinking water standards will be addressed.

170. Comment: Section 5.3.3.2.1, Seismicity, Page 5-37 — 2-18-92

The Department of Natural Resources may have some pertinent information to these discussions from their state geological mapping efforts. Ecology recommends that the DNR be contacted for more information.

DOE-RL/WHC Response: The Department of Natural Resources will be contacted regarding seismicity, and the text will be revised to incorporate any pertinent new information.

171. Deficiency: Section 5.3.4, Regional Hydrogeology, Page 5-38 — 1-8-93

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The text notes that "The base of the aquifer is the basalt surface, but semiconfining silts and clays are present above the basalt in some areas." However, the locations of these semiconfining layers is not presented.

Requirement: The locations of the semiconfining layers should be specified as well as a description of how these layers influence ground water flow and the entrapment of pollutants.

DOE-RL/WHC Response No. 1: The text will be clarified to indicate that the semi-confining silts and clays are found in the lower fine-grained basal Ringold. This unit is shown in section in Figures 5-19 and 5-20. It is present beneath the 200-West Area where its lateral extent and thickness is shown in Figure 5-21. It is not present beneath the 200-East Area. The influence of this unit on groundwater flow and contaminant migration is discussed in Sections 5.3.5.2 and 5.5.2.1.9.

Deficiency: Section 5.3.4, Regional Hydrogeology, Page 5-38

It is insufficient to only provide text discussion concerning the semiconfining silts and clays.

Requirement: The locations of the semiconfining layers must be shown on cross-sectional maps and include information gained through 1991 drillings.

DOE-RL/WHC Response 2: A map showing the extent of the semi confining layer beneath the 200 West Area will be included. This map will be based on data obtained from additional monitoring well installations in the area and will include the 1991 data.

172. Comment: Section 5.3.4, Regional Hydrogeology, Page 5-39 — 1-8-93

The "actual amount of recharge" needs to be revised based upon the new data that is now available.

DOE-RL/WHC Response No. 1: The text will be revised based upon the more recent studies of Gee and others, to indicate that the actual net recharge is not known, but is thought to vary

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locally from near zero to about 4 inches per year, depending upon the local soil and vegetative characteristics.

Comment: Section 5.3.4, Regional Hydrogeology, Page 5-39

Recharge rate variation within the 200 Areas must be plotted on a map.

DOE-RL/WHC Response 2: Natural recharge rates are not known for the 200 Areas; therefore a map portraying these data would be highly speculative and convey an indication that more information is known than is in fact the case.

Artificial recharge has been addressed in several existing WHC documents; "Hanford Site Stream Specific Reports" (WHC-EP-0342), "Liquid Effluent Study Final Project Report" (WHC-EP-0367), and the "Liquid Effluent Study: Groundwater Characterization Data" (WHC-EP-0366). The final status of liquid effluents on the Hanford Site is discussed in Consent Order No. DE 91NM-177 between Ecology and RL, signed on December 23, 1991.

173. Comment: Section 5.3.4, Regional Hydrogeology, Page 5-39 — 2-18-92

The paragraph beginning on line 23 is unclear. Please clarify how the difference between high and low transmissivities effect the monitoring network.

DOE-RL/WHC Response: A higher and larger mound developed in the 200-West Area because a greater hydraulic gradient and aquifer thickness were required to move the same volume of water through a less transmissive medium. The effects of varying hydraulic properties on the monitoring network are discussed in Section 5.5.2 rather than in this section. The transmissivity may be a factor in determining an appropriate buffer zone width, and will affect the modeling results if the hypothetical plume moves so slowly that it does not reach a monitoring well. At the Hanford Site, the plumes would be expected to move with sufficient velocity that the network design developed with the help of the Monitoring Efficiency Model is not affected by the transmissivity. The discussions of this and other characteristics and assumptions of the model will be expanded and clarified in Section 5.5.2.

174. Comment: Section 5.3.4, Regional Hydrogeology, Page 5-39 — 2-18-92

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The quoted ranges of hydraulic conductivity and the information provided in Tables 5-3 and 5-4 are not relevant because they are provided as estimated ranges. Additional discussion should be presented to indicate the impact of this variability on the design of the monitoring system.

DOE-RL/WHC Response: The general ranges of hydraulic conductivity are relevant to the discussion on page 5-39 in Section 5.3.4 because that section addresses regional hydrogeology. The general water quality data presented in Tables 5-3 and 5-4 are also relevant to the discussion of regional hydrogeology in Section 5.3.4. More detailed discussions of hydraulic properties at the LLBG begin in Section 5.3.5 where the results of aquifer tests performed in the LLBG monitoring wells and other nearby wells are presented. An expanded discussion of the effects of the variability in hydraulic conductivity on the design of the monitoring system will be provided in Section 5.5.2.

175. Comment: Section 5.3.5, Uppermost Aquifer, Page 5-42 — 2-18-92

The thickness of the sediments must be specified. This information can be found in Last (1989).

DOE-RL/WHC Response: The total thicknesses of the sediments beneath each of the LLBG will be added to the text in Sections 5.3.5.1.1 (for those in the 200-East Area) and 5.3.5.2.1 (for those in the 200-West Area).

176. Deficiency: Section 5.3.5.1.4, Vadose Zone, Page 5-46 — 2-18-92

There is no data provided from recent drilling.

Requirement: The information from the most recent drilling program must be provided.

DOE-RL/WHC Response: The text will be revised to provide additional data on the vadose zone obtained from recent drilling.

177. Deficiency: Section 5.3.5.1.5, Aquifer Properties, Page 5-48 — 2-18-92

The porosity was not tested, but estimated. This is not acceptable because these values should have been obtained after analyzing samples from recent drilling.

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Requirement: The analysis of soil samples should include determining porosity from undisturbed samples obtained during recent drilling.

DOE-RL/WHC Response: The text will be revised to provide available information on porosity determined from samples taken in the aquifer during recent drilling.

178. Comment: Section 5.3.5.1.5, Aquifer Properties, Page 5-49 — 2-18-92

The text states that "The impact of the mound reduction on the local hydraulic gradient and velocity may be significant." Please elaborate on this comment.

DOE-RL/WHC Response: The text in Section 5.3.5.1.5 will be revised to further explain the potential effects of mound reduction on local hydraulic gradients and flow velocities. In general, hydraulic gradients would be expected to decrease in the vicinity of the mounds, groundwater flow directions may change, and groundwater flow velocities may decrease.

179. Comment: Section 5.3.5.2.4, Vadose Zone, Page 5-57

The text indicates the presence of an 8-15 foot thick section of unconsolidated loess. Was this section analyzed for its effect on pollutant migration? The applicable data supporting this effect, or the absence of an effect, must be provided.

DOE-RL/WHC Response No. 1: The various stratigraphic horizons within the vadose zone in the 200 West Area, including the loess, sandy gravels, sands, and cemented calcium carbonate units, were considered in estimating the size of the source in the Monitoring Efficiency Model. Because the model assumes constant, steady state releases, retardation within the vadose zone was not considered. The horizons with smaller pore sizes such as the loess would tend to spread a release over a wider area because of lower hydraulic conductivities and stronger lateral capillary effects. However, with wider lateral spreading the contaminant flux per unit surface area of the aquifer decreases, reducing the contaminant concentration in the aquifer. Sensitivity studies that will be presented in the revised text have shown that the two effects of lateral spreading and reduced concentration offset each other, resulting in a low net sensitivity to lateral spreading for the final network design. The network design was not found to be sensitive to the presence of the loess, and a detailed evaluation of its properties was not considered necessary.

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Deficiency: Section 5.3.5.2.4, Vadose Zone, Page 5-57

The Monitoring Efficiency Model only models efficiency and is therefore not adequate for representing the vertical distribution of contaminants in various stratigraphic units.

Requirement: The computer models PORFLO-3 and VAM-2D should be used to make the assessment of pollution migration. A characterization of the vadose zone should be completed prior to developing a vadose zone monitoring plan. This vadose zone monitoring plan must be part of the permit application.

DOE-RL/WHC Response 2: Although some assumptions about the distribution of possible contamination in the unsaturated zone must be made in order to run the Monitoring Efficiency Model, this model was never intended to represent the vertical distribution of contamination in the vadose zone. Since neither a detailed characterization with extensive modeling of the vadose zone nor a vadose zone monitoring plan is required by the regulations for a permit application, these items will not be part of the document.

Comment: Section 5.3.5.2.4, Vadose Zone, Page 5-57

This comment is still under review by Ecology. The results of this review will be discussed in the next NOD.

RL/WHC Response No. 3: No response is required at this time.

180. Deficiency: Section 5.3.5.2.4, Vadose Zone, Page 5-58 — 2-18-92

The text indicates that the sediment thickness varies from 80-150 feet and the moisture content varies from 2-18.7%. This is not an adequate description of the unsaturated zone.

Requirement: The results of soil sampling and analysis from new wells should be used for the description of the unsaturated zone. The changes of moisture content should be then mapped more precisely.

DOE-RL/WHC Response: The text will be revised to provide an expanded discussion of the properties of the vadose zone. This will include additional details on changes of moisture content and new data that have become available from recent drilling.

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181. Comment: Section 5.3.6, Underlying Aquifer, Page 5-60 — 2-18-92

The aquifer description should include how the new wells respond to monitoring. In addition, new data obtained during drilling and monitoring should be included.

DOE-RL/WHC Response: Several new wells not associated with this permit application have been drilled into the underlying Rattlesnake Ridge aquifer since the 1989 text was prepared. Although none of the wells in the Rattlesnake Ridge aquifer are part of the monitoring network for the LLBG, the text will be revised to incorporate more recent data that may be relevant.

182. Deficiency: Section 5.4, Contaminant Plume Description, Page 5-62 — 2-18-92

The text states "Presently, water quality information is available for only the first quarter sampling event (October 1988)." New data is now available.

Requirement: The new data should be presented.

DOE-RL/WHC Response: Additional water quality data are now available and statistical analysis of the interim status indicator parameters has been completed. The text will be revised in Section 5.2.3 to present the new water quality data that has become available from the LLBG monitoring wells, and will be revised in Section 5.4 to present any new information regarding any contamination that may have entered the groundwater from one of the regulated units.

183. Deficiency: Section 5.4.1.3, Vadose Zone, Page 5-63 — 2-18-92

The vadose zone description does not include any site specific information, nor soil testing results from the 36 new LLBG boreholes.

Requirement: The new information should be provided.

DOE-RL/WHC Response: The text will be revised to incorporate available site-specific information relating to plume travel times in the vadose zone, including results from the new LLBG boreholes.

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184. Deficiency: Section 5.4.1.3.2, Measured Contaminant Plumes, Page 5-65 — 2-18-92

There is no supporting evidence for the example given in the text. Therefore, the conclusions are premature.

Requirement: The data which supports this example must be provided.

DOE-RL/WHC Response: The text will be revised to provide additional supporting information (plan and cross-section views of the extent of contamination) and to cite a recent modeling study of the 241-T-106 tank leak prepared by Pacific Northwest Laboratory that provides an analysis of the leak.

185. Deficiency: Section 5.4.2, Travel Time, Page 5-70 — 1-8-93

The estimated travel times given here are not substantiated because aquifer parameters and flow paths are not presently known.

Requirement: New travel times should be specified based on more accurate calculations.

DOE-RL/WHC Response No. 1: Travel times based upon actual plume migration rates at the Hanford Site on the scale of interest are more accurate than the results of calculations based upon averaged aquifer parameters and flow paths inferred from those plumes. Further, travel times based upon theoretical considerations can only be substantiated if actual plume data are available at a burial ground site on the same scale of interest. Thus it is preferable, where possible, to base travel time estimates upon actual plume migration rates rather than upon aquifer parameter and flow path data. The regional travel times given in the text are based upon actual large-scale plume migration rates for the Hanford Site in the uppermost aquifer. Their accuracy should be equal to or greater than that for travel times computed for similar flowpath lengths at other (not at Hanford) landfill sites, and is considered acceptable. Because these estimates are based upon actual plume migration rates, any new aquifer parameter or flowpath data that estimate significantly different rates would be of questionable validity.

Comment: Sections 5.4.2 and 5.4.4, Travel Time From 200 West and Summary of Travel, Page 5-70

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Aquifer tests must be completed and the results compared to travel times given in the text.

DOE-RL/WHC Response 2: Aquifer testing has been conducted at the time of well construction at many of the monitoring wells at the LLBG. Twenty eight wells have pumping test data and another 28 have been slug tested. These results will be presented in the next revision. Travel times calculated from these tests will be compared to travel times estimated from plume migration information. The travel times based on plume migration data are still considered to be more reliable because data from a single well tests may not truly represent the larger scale characteristics of an aquifer

186. Comment: Section 5.4.4, Summary of travel, Page 5-70 — 2-18-92

See above comment.

DOE-RL/WHC Response: See response to Comment 185.

187. Deficiency: Figures 5-28, 5-29 and 5-30, Pages 5-71 through 5-76 — 2-18-92

These figures provide no interpretation of plume behavior in different lithological formations.

Requirement: The modeling should include the behavior of the plume in different lithologies using field obtained parameters.

DOE-RL/WHC Response: The text will be revised to provide an interpretation of plume behavior in different lithological formations. The discussion and application of the model in Section 5.5.2 will be revised to incorporate dispersivity values obtained from Hanford Site plumes, and to evaluate the effects of changing lithologies and hydrologic parameters on the model results.

188. Comment: Section 5.4.6, Conclusions, Page 5-77 — 2-18-92

The conclusions are unclear and need to be substantiated with new data.

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DOE-RL/WHC Response: The text will be revised to clarify and update the conclusions, based upon the new data that have become available.

189. Comment: Section 5.5.1, Indicator Parameters, Page 5-80 — 2-18-92

Were any volatile organic compounds or supplemental parameters present in the soil or water during the more recent drilling? Provide the justification for choosing these "indicator" parameters.

DOE-RL/WHC Response: The text will be revised to present groundwater monitoring data obtained since the 1989 draft was prepared. The indicator parameters will be reevaluated based on these new data and on a reanalysis of the quantity and chemical form of each parameter in the waste. The justification for developing the indicator parameter list will be presented.

190. Deficiency: Section 5.5.2, Groundwater Monitoring Program, Page 5-82 — 2-18-92

This section does not address the interim status monitoring program.

Requirement: The groundwater monitoring program should be based on the results of interim monitoring and incorporate all improvements necessary for the final detection system.

DOE-RL/WHC Response: The text will be revised to explain how the results of the interim status monitoring program are used to design the final detection system. Emphasis will be placed upon the use of the expanded groundwater level data to refine the directions of groundwater flow, and the use of the aquifer test data to assess the influence of permeability variations on monitoring network design.

191. Deficiency: Section 5.5.2.1.1, Background, Page 5-84 — 1-8-93

There is a need for monitoring the middle portion of the aquifer. The lithology between some "deep" and "shallow" portions might be such that it will retain pollutants.

Requirement: A portion of the monitoring wells must be screened to monitor the middle section of the aquifer if the aquifer thickness exceeds 40 feet.

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DOE-RL/WHC Response No. 1: Retention of pollutants in the middle section of the aquifer would require (1) the presence of lithologic layers that could retain and laterally divert contaminants that would otherwise reach the bottom of the aquifer, and (2) the presence of contaminants in the middle section of the aquifer. The stratigraphy of the saturated zone is discussed in Sections 5.3.5.1.3 (for the 200-East Area) and 5.3.5.2.3 (for the 200-West Area), and illustrated in Figures 5-16 and 5-19. In both cases the sediments in the middle of the aquifer are sands, gravelly sands, and sandy gravels with no laterally extensive fine-grained silts or clays. There is therefore no evidence that a lithologic layer that could retain and laterally divert contaminants is present. The presence of contaminants in the middle section of the aquifer beneath the LLBG is also unlikely, for the reasons stated in the accepted DOE-RL/WHC response to Comments 68 and 78. In view of the lack of identified lithologic layers that could cause retention and lateral diversion of contaminants, and the small likelihood that contaminants could reach the middle section of the aquifer, monitoring wells completed in the middle section of the aquifer are not considered to be needed.

Deficiency: Section 5.5.2.1.1, Background, Page 5-84

New data from RCRA-compliant wells is absent. Furthermore, pollutants classified as "sinkers" may be present for long periods of time in the middle of the aquifer as they migrate downwards from the upper part of the aquifer.

Requirement: The new data regarding the lithology of Waste Management Areas 3, 4, and 5 must be included to provide updated evidence of pollutant distribution in the soil column. In addition, a portion of the monitoring wells must be screened to monitor the middle section of the aquifer and soil testing must be conducted to establish if pollutants are distributed throughout the saturated zone.

DOE-RL/WHC Response 2: New information from more recent monitoring well installation in waste management areas 3, 4, and 5 will be included in the revised permit application. Soils samples were not analyzed for dangerous constituents during drilling of the monitoring wells now in place because field analysis did not indicate the presence of volatile organics or radioactive materials. In view of the very limited amounts of dense non-aqueous phase liquid contaminants, the probability that these contaminants could reach the groundwater in amounts necessary to warrant an extensive monitoring network for the middle of the aquifer is remote. Therefore monitoring wells in the middle of the aquifer would not significantly improve the detection level monitoring network and are considered unnecessary.

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192. Comment: Section 5.5.2.1.1, Background, Page 5-84 — 2-18-92

The ranges of hydraulic conductivity should be based on the soils sampling from new wells. The aquifer properties should be described in greater detail after obtaining the new samples and lab analysis results. This will allow the calculation of transmissivity for each change of lithology within the Hanford or Ringold formation.

DOE-RL/WHC Response: Identification of hydraulic conductivity on the basis of sedimentary facies rather than geologic formations is being studied at the Hanford Site (see, for example, Poeter and Gaylord, Groundwater, Vol. 28 No. 6, 1990). These studies will be reviewed and the correlations adapted, where pertinent, to the LLBG. Both new and old soil sampling data at the LLBG will be used in this correlation.

193. Deficiency: Section 5.5.2.1.2, Monitoring Design Approach, Page 5-84 — 2-18-92

The assumptions about hydraulic conductivities can be misleading. As a consequence, some constituents can be missed in the monitoring wells.

Requirement: The text here must provide support for the assumptions.

DOE-RL/WHC Response: The text will be revised to more fully explain the monitoring design approach, which is based upon more factors than the hydraulic conductivity and depth considerations discussed here.

194. Comment: Section 5.5.2.1.3, Monitoring Efficiency, Page 5-87 — 2-18-92

The monitoring efficiency model is being reevaluated since a presentation to Ecology by the model's author.

DOE-RL/WHC Response: No additional comments on the Monitoring Efficiency Model have been received.

195. Comment: Section 5.5.2.1.9, Monitoring Design, Page 5-112 — 2-18-92

It is not appropriate to assume the shallow wells will be the most indicative of contamination. Deep wells need to be used in the monitoring system as extensively as shallow

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monitoring wells. This will depend upon what constituents will be detected in the first deep well that is drilled.

DOE-RL/WHC Response: The basis for the proposed relative density of shallow and deep wells was addressed in accepted Comments 68 and 78, and the text will be revised as stated in the responses to those comments to more fully support the design basis. The text will also be revised to present the monitoring results from the deep wells, and to evaluate the implications of those results on the adequacy of the deep well network.

196. Comment: Section 5.5.2.1.9.1, Deep Well Locations, Page 5-113 — 2-18-92

Lines 40-48 are unclear and not defensible. Please clarify.

DOE-RL/WHC Response: The text will be clarified by rewording, providing additional supporting information on groundwater flow directions, and referring to Figure 5-20 as well as Figure 5-21. The direction of groundwater movement will be indicated on Figure 5-20. Both of these figures illustrate the extent of the lower Ringold sediments beneath LLWMA-3 and LLWMA-4.

197. Deficiency: Section 5.5.2.1.9.2, Deep Well Locations, Page 5-114 — 2-18-92

Two deep wells were constructed for the interim monitoring network, but no results from these wells are presented to support these conclusions. Deep wells might be extremely important in total network efficiency. If there are differences in the predicted distribution of aquifers, the results from sampling deep wells will also confirm or negate changes in transmissivities.

Requirement: The results from the deep wells must be presented.

DOE-RL/WHC Response: There are actually four deep LLBG monitoring wells, two at upgradient and two at downgradient locations. The text will be revised to present the monitoring results from the deep wells, and to evaluate the implications of those results on the adequacy of the total monitoring well network.

198. Comment: Section 5.5.2.1.11, Well Installation Staging, Page 5-125 — 2-18-92

No.	Comment/Response	Ecology Concurrence
	The text indicates that the monitoring system will consist of 69 shallow wells and 6 deep wells. Of these, 42 new shallow wells and 2 new deep wells will be installed. This means that 27 shallow wells and 4 deep wells were installed for the interim monitoring system. However, page 5-1 indicates that thirty-five wells were in the interim monitoring system. Please correct this discrepancy.	

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DOE-RL/WHC Response: The monitoring system is explained in the following tabulation.

	Shallow	Deep	Total
Number of Interim Status Wells Installed in 1987	31	4	35
Number of Additional Wells to be Installed	42	2	44
Number of Wells within Final Line of Compliance to be Removed from System at Closure	(4)	(0)	(4)
Final Number of Wells in Monitoring System	69	6	75

The text will be revised to more clearly explain the number of wells in the final system. Please note that the number of wells may change as a result of network reevaluations in response to the comments received.

199. Comment: Table 5-12, Well Installation Priority, Page 5-127 1-8-93

The preliminary results from drilling the priority 1 wells should serve as a base for drilling wells in the priority 2 list. Staging of wells should depend upon the results obtained during previous drilling.

DOE-RL/WHC Response No. 1: The priority of installation of monitoring wells that have not yet been drilled will be reviewed based upon the results obtained from the previous wells to determine if any changes should be made in the schedule.

Comment: Table 5-12, Well Installation Priority, Page 5-127

Ecology will give final approval of the monitoring network after the revised plan is reviewed.

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DOE-RL/WHC Response 2: No response necessary.

200. Comment: Section 5.5.2.3, Representative Samples, Page 5-129 — 2-18-92

Sampling may be subject to revision depending upon results from the past two years of monitoring, 1991 monitoring, and one additional year for monitoring all the wells in the network.

DOE-RL/WHC Response: The sampling procedure will be reviewed for adequacy based upon the results obtained from previous monitoring. The text will be modified to provide for continuing review and evaluation of the representativeness of the samples based upon past monitoring results.

201. Comment: Section 6.2.2.6.2, Leak Detection System, Page 6-4 — 2-18-92

The text here indicates that the leak detection system design was scheduled for completion in February 1990. If complete, it must be included in the revised text. If not complete, provide the new date for completion. This also applies to the LCRS referred to in Section 6.2.2.6.4.

DOE-RL/WHC Response: The information requested was provided to Ecology in September 1990 as the Supplement to the Permit Application for the LLBG, "Low Level Burial Waste Dangerous Waste Permit Application Design Documents, DOE/RL 88-20, Supplement 2."

202. Comment: Section 6.3.1.3, Emergency Equipment, Page 6-5 — 2-18-92

List any emergency equipment located at each trench or burial ground, i.e., spill control material, fire suppressants, first aid. If there is none, this should be justified.

DOE-RL/WHC Response: The following text will be added to Section 6.3.1.3: "Emergency equipment is not located at burial ground trenches. Portable fire extinguishers are carried on all LLBG operations vehicles. The 200 Area fire station with trained fire fighting and emergency medical personnel and equipment is located within five minutes of any location

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within the LLBG. Spill cleanup materials are readily available from the 272WA building and the Central Waste Complex staging area (overpack drums, protective clothing, handling and cleanup equipment). The Building Emergency Plan (Contingency Plan) lists the emergency equipment."

203. Comment: Section 7.2, Emergency Coordinators, Page 7-2 — 2-18-92

The identification of emergency coordinators is under development through the facility wide permit negotiations. The need to identify these individuals along with their addresses and phone numbers will be addressed upon resolution of this issue. WAC 173-303-350(3)(d)

DOE-RL/WHC Response: The names of Building Emergency Directors and Building Wardens are maintained by the Hanford Patrol Operations Center and the Hanford Occurrence Notification Center (ONC) on a twenty four hour basis. These names may accessed by calling the ONC.

204. Deficiency: Section 7.4.1.3, Notification of Authorities, Page 7-19

The discussion in the first paragraph on this page does not address Ecology's Nuclear and Mixed Waste Program Policy for spill reporting. Also, WAC 173-303-082 is an incorrect citation for spill reporting.

Requirement: The above referenced policy, to be outlined in a forthcoming letter from Ecology, must be incorporated into the text. The correct regulatory citation is WAC 173-303-145.

DOE-RL/WHC Response No. 1: The citation will be corrected as requested. DOE-RL will comply with the applicable provisions of the regulations cited in WAC 173-303-145.

Deficiency: Section 7.4.1.3, Notification of Authorities, Page 7-19

Ecology previously concurred with this response. However, after further review, it has been noted that the response does not address Ecology's requirement.

Requirement: The text in the first paragraph of this page must be edited to require that spill reporting will be consistent with that required in the in the Facility Wide Permit.

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RL/WHC Response No. 2: The text will be revised to agree with the Hanford Facility Permit when it is finalized.

205. Comment: Section 7.4.1.3, Notification of Authorities, Page 7-19 — 2-18-92

Spill reports should be submitted to Ecology's Kennewick office:

Washington State Department of Ecology
7601 West Clearwater
Suite 102
Kennewick, WA 99336
Phone: (509) 546-2990

Please note that the proper zip code for Ecology's Olympia Office is 98504-8711, not 98501-8711.

DOE-RL/WHC Response: The address will be changed to identify the Kennewick office for reporting.

206. Comment: Section 7.4.6, Treatment, Storage, or Disposal, Page 7-32 — 1-8-93

The text should indicate that releases of dangerous wastes or materials which, upon release, would be considered a dangerous waste, must be handled in accordance with WAC 173-303.

DOE-RL/WHC Response No. 1: The text will be revised to comply with the revised regulations in WAC 173-303-340.

Deficiency: Section 7.4.6, Treatment, Storage, or Disposal, Page 7-32

Ecology's concern in this comment is the handling of spill or emergency related residue material. WAC 173-303-340 does not fully address this issue.

Requirement: The text must be revised to indicate that WAC 173-303 requirements will be met in handling releases and release residues.

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DOE-RL/WHC Response No. 1: Chapter 7 will be replaced by the "Low-level Burial Grounds Building Emergency Plan" (WHC-IP-0263-LLBG). The plan will become Appendix 7A of the revised permit application. This plan will comply with the requirements of WAC 173-303 regarding handling dangerous waste releases and release residues.

207. Deficiency: Section 9.2.1.2.2, Migration Through the Vadose, Page 9-8 — 2-18-92

Based upon discussions in Section 2.1.2.1 regarding past practices, the statement that "no liquid waste is disposed of in the LLBG" is incorrect.

Requirement: Delete or edit the sentence containing this phrase on line 34 and 35.

DOE-RL/WHC Response: The sentence will be edited as follows: "A leak of this magnitude is unlikely because free liquid currently in containers within the LLBG is to be retrieved. Since November 23, 1987, no free liquid has been accepted in the LLBG."

208. Deficiency: Section 11.1.4.3, Gas Sampling, Page 11-27 — 1-8-93

Hydrogen gas generation recently created concerns in the tank farms and grout vaults. Therefore, it may not have been prudent to discontinue gas sampling.

Requirement: In light of the recent hydrogen gas concerns, justification should be provided for not taking gas samples until immediately before retrieval.

DOE-RL/WHC Response No. 1: Unlike the tank farms, it is expected that radiogenic hydrogen will escape into the atmosphere through the relatively permeable soils and that dangerously high concentrations are unlikely. However, this issue will be addressed in the health and safety plan for waste retrieval, described in Section 11.1.4.6. The word "immediately" will be deleted from Section 11.1.4.3.

Deficiency: Section 11.1.4.3, Gas Sampling, Page 11-27

Because the gas sampling tubes are already in place, monitoring of the emissions, or lack of emissions, from these sampling points should continue.

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Requirement: An ambient air sampling monitoring plan should be developed and indicate points of monitoring, constituents to be assessed, sampling protocols to be used and the frequency of monitoring.

DOE-RL/WHC Response No. 2: The purpose of the gas sampling tubes was to measure radiogenic hydrogen production. Early results indicated that this was negligible and posed no hazard. Continued hydrogen sampling would provide no environmental protection or health and safety benefits. However, since the gas samples were taken, the pipes have been broken and are no longer are suitable for collecting gas samples. Pre-retrieval sampling will serve as a final verification of radiogenic hydrogen production.

209. Comment: Section 11.1.5.2, Cover Design, Page 11-29 — 2-18-92

There is a reference on line 33 and throughout this application citing a 1982 EPA guidance document on landfill design. The EPA has published numerous technical guidance documents on this subject since that document was issued. In addition, a substantial amount of regulatory changes concerning dangerous waste landfills have occurred since that time. The LLBG permit application will be evaluated against the more recent documents. It is therefore recommended that past and future work be assessed against the most current guidance.

DOE-RL/WHC Response: The cover design in the permit application is conceptual and was prepared in accordance with regulatory guidance existing at the time of writing (1988). Actual (detailed) cover design has yet to be done and will be performed in accordance with the most current regulations and guidance. The text in Section 11.1.5.2 will be modified to include this discussion.

210. Comment: Section 11.1.5.2.1, General Description, Page 11-30

Comment 146 also applies here.

DOE-RL/WHC Response No. 1: 3H:1V slopes have been included around the margins of the covers because of limited horizontal distance between the waste trenches and the boundaries of the burial grounds. As shown on Figure 11-9, this slope is only about 5 feet high, so toe support is substantial and stability will not be a problem. In addition, this slope will be

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covered with a 2-foot-thick riprap layer to prevent gullying and animal intrusion. Hence, these slopes are considered adequate as designed.

Comment: Section 11.1.5.2.1, General Description, Page 11-30

The extent of each landfill cover is still under consideration by Ecology and will be based, in part, on the new drawings to be provided in response to comment 124. Ecology requires 4H:1V slopes and a factor of safety of 2.0 for the cover. (See comment 146)

DOE-RL/WHC Response No. 2: Response to this comment will be deferred until agreement has been reached regarding comments 124 and 146. However, a 4H:1V slope may not be feasible when two burial grounds are adjacent to each other, and when one is regulated under CERCLA and the other is regulated under RCRA. Surface water runoff facilities and maintenance roads will probably require a more flexible approach to designing a functional cover. Resolution to this comment should be deferred until review of the definitive cover design for each burial ground.

Comment: Section 11.1.5.2.1, General Description, Page 11-30

The extent of each landfill cover is still under review by Ecology and will be based, in part, on the new drawings to be provided in response to comment 124. Where physically possible, Ecology will still require 4H:1V slopes for the cover. The results of our review will be discussed in the next NOD.

RL/WHC Response No. 3: No response is required at this time.

211. Comment: Figures 11-15 and 11-16, Pages 11-43/44 and 11/45/46 — 2-18-92

Typos. The burial ground in Figure 11-15 should be "218-W-5", not "218-E-5". The burial ground in Figure 11-16 should be "218-W-6", not "218-E-6".

DOE-RL/WHC Response: Corrections will be made as requested.

212. Comment: Section 11.1.5.2.2.1, Native Soil Grade Layer, Page 11-48

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A statement should be made that Ecology will be notified and provided a copy of the construction test pad plan for review and approval prior to initiating construction of this pad.

DOE-RL/WHC Response No. 1: Ecology will be provided with a copy of the test pad plan for review prior to construction. This also applies to a number of other plans and designs, many of which have not been completed or even identified at this time. On this basis, it is not appropriate to attempt to identify such submittals in the permit application. EPA guidance suggests preparation of a CQA Plan for landfill and closure cover construction, and such a plan will therefore be prepared for the LLBGs. As an example, Ecology is referred to the CQA Plan for the non-dragoff landfill, which was recently submitted for review and includes detailed plans for a test fill.

Deficiency: Section 11.1.5.2.2.1, Native Soil Grade Layer, Page 11-48

The response fails to address the comment's requirement for Ecology approval on the test pad plan.

Requirement: The text must indicate that this plan must receive Ecology approval before construction of the pad can commence.

DOE-RL/WHC Response No. 2: The design of the pad used in construction of the cover will be submitted to Ecology for review in the same manner as has been done for the design of the mixed waste trench (Project W-025).

Comment: Section 11.1.5.2.2.1, Native Soil Grade Layer, Page 11-48

Ecology agrees with your response, however, it should be noted that construction documents need to be provided to Ecology with a reasonable amount of time for review prior to construction. No further response is necessary.

RL/WHC Response No. 3: No response is required at this time.

213. Deficiency: Section 11.1.5.2.2.3, Soil/Bentonite Layer, Page 11-49 — 1-8-93

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The disking method described for the soil/bentonite layer has been used with mixed results. The method of spreading bentonite on the ground and tilling it into the soil is fraught with inexactness. Soil/bentonite mixing can only be provided for with any certainty by processing in a pugmill. This method is being used for the LERF project and will also be used at the grout facility.

Requirement: The soil/bentonite material must be mixed in a pugmill in accordance with current practice.

DOE-RL/WHC Response No. 1: At this time, material sources for the LLBG covers have not been identified and therefore the applicability of the LERF experience cannot be assessed. The disking method has been successfully used at commercial hazardous waste facilities in the western U.S. and should not be excluded at this time. The text will be revised to state "...(e.g., by disking or mixing in a pugmill)...".

The design, Specifications, and CQA Plan for the LLBG will provide a great deal of latitude for the Contractor (or Construction Manager) to determine the most suitable types of equipment and procedures for preparing and placing the admix liner. The Specifications will require a submittal to the WHC Project Engineer describing these activities. With this approach, the pertinent experience from the LERF Project will be incorporated as appropriate when the LLBG covers are constructed.

Deficiency: Section 11.1.5.2.2.3, Soil/Bentonite Layer, Page 11-49

It is not possible for on-site disking to allow the precise degree of control of bentonite and moisture percentage that pugmilling will afford. Furthermore, disking on the side slopes will be difficult with currently available tractor-harrow combinations. This is a critical liner which needs as much control as possible. Choosing to disk the admix would also require additional test pads to prove this method is equivalent to the pugmill method.

Requirement: The soil/bentonite material must be mixed in a pugmill. In addition, Ecology's remarks on contractor flexibility in comment 151 should be noted here.

DOE-RL/WHC Response No. 2: Similar methods and specifications as described for NOD 151 will be used in design and construction of the landfill cover. These details will be included in the definitive design documents for the landfill cover.

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214. Deficiency: Section 11.1.5.2.2.4, FML, Page 11-51 — 2-18-92

The EPA currently recommends a 45-mil flexible membrane liner in situations where the liner will be exposed to weathering. Furthermore, standard practice dictates that a 60-mil liner be used even if not exposed (see Grout and LERF designs).

Requirement: This geomembrane must be 60-mil thick.

DOE-RL/WHC Response: EPA's recommendation for 45 mils is for bottom liners, not cover geomembranes. In addition, the cover geomembrane will not be exposed to weathering, as a landfill liner with no soil cover or a pond liner would be. The most recent (1989) EPA guidance for covers recommends a 20-mil FML for covers, which has been doubled for the LLBG. Use of a 40-mil FML is standard practice at RCRA hazardous waste landfills in arid regions of the western U.S.

215. Comment: Section 11.1.5.2.2.6, Drainage Layer, Page 11-52 — 2-18-92

Comment 157 also applies here.

DOE-RL/WHC Response: The cover design in the permit application is conceptual and was prepared in accordance with regulatory guidance existing at the time of writing (1988). Actual (detailed) cover design has yet to be done and will be performed in accordance with the most current regulations and guidance. The text in Section 11.1.5.2 will be modified to include this discussion.

216. Comment: Section 11.1.5.2.2.9, Vegetative Cover, Page 11-54 — 1-8-93

The justification for vegetative specie selection should be provided or a document referenced which, at a minimum, discusses other vegetative varieties which were considered and the reasons for there dismissal.

DOE-RL/WHC Response No. 1: The selection of wheat grasses was based on successful past practice at the Hanford Site. Formal documentation of these practices has not been identified, but a comprehensive search will be conducted. In addition to the existing discussion in the permit application, the text will be modified to note that Russian wheat grasses develop a much higher root density than native wheat grasses and thus more rapidly

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extract water from the soil profile (Cadwell et al., 1983). The text will also be modified to note that other grasses, if proven more suitable, may be substituted if reseeding is required during the postclosure period.

Cadwell, M.M, Dean, T.J., Nowak, R.S., Dzurec, R.S., and Richards, J.H., 1983, "Bunchgrass Architecture, Light Interception, and Water Use Efficiency: Assessment by Fiber Optic Point Quadrants and Gas Exchange", Oecologia, Vol 59, pp. 178-184.

Comment: Section 11.1.5.2.2.9, Vegetative Cover, Page 11-54

Concurrence will be based upon the results of the comprehensive search.

DOE-RL/WHC Response No. 2: The comprehensive search will be submitted with the definitive cover design.

217. Comment: Section 11.1.5.2.2.10, Riprap Bedding Layer, Page 11-55 — 2-18-92

The bedding layers should also be designed as a filter. Otherwise the storm water runoff and wind will remove fines from beneath the riprap and eventually cause undermining of the riprap and failure.

DOE-RL/WHC Response: A geotextile layer will be placed between the bedding layer and the riprap to serve as a filter. Figure 11-9 and the text in Section 11.1.5.2.2.10 will be modified accordingly.

218. Comment: Section 11.1.5.3, Minimization of Liquid, Page 11-56 — 2-18-92

The term "leakance factor" should be edited to read "leakage fraction".

DOE-RL/WHC Response: The correction will be made as requested.

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219. Comment: Section 11.1.5.3, Minimization of Liquid, Page 11-57

2-18-92

Although the regulations require the use of 24-hour, 25-year design storms, the text here specifies a 30-year storm event to match the design life of the covers. Although this makes sense, how does the 30-year design life compare to DOE's requirements for constructing mixed waste disposal facilities? (see comment 128). In addition, would it not be more conservative to design for a shorter duration storm (e.g. 6-hour duration as specified in DOE Order 6430.1A) as it is probably more indicative of the most intense storms received by the Reservation?

DOE-RL/WHC Response: With respect to DOE's long-term performance objectives for mixed waste facilities, the permit application does not attempt to address compliance with these requirements. Section 11.1.1.1 states that "compliance with these objectives will be demonstrated through a radiological performance assessment as specified by the Department of Energy" and discusses this issue in more detail.

For the purposes of HELP modelling discussed in Section 11.1.5.3, the 24-hour storm is more conservative than the 6-hour storm because it applies a greater total volume of precipitation to the cover (see Table 11.D.1). The intensity of the 24-hour storm is less than that of the 6-hour storm, but this consideration is not relevant to the proposed analysis.

220. Comment: Section 11.1.5.4.3, Deep-Rooted Plants, Page 11-58

2-18-92

Roots will not penetrate a coarse, clean, dry, uniformly graded gravel layer. Such a layer, one foot thick and placed above the drainage layer, should be considered. This layer could be keyed into the riprap bedding layer to provide a biotic barrier across the entire cover.

DOE-RL/WHC Response: This type of barrier will be evaluated during detailed cover design. The text in Section 11.1.5.4.3 will be modified accordingly.

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221. Requirement: Section 11.1.5.4.4, Burrowing Animals, Page 11-59 — 2-18-92

The biotic barrier discussed in comment 220 would also address the burrowing animal concern. In addition, the HPDE liner should be designed with the following criteria to reduce the potential for attack by burrowing animals: 1) underground installation of free edges should be avoided, 2) angles of 90 degrees and less should be avoided, and 3) any radius of curvature should be greater than 60mm.

DOE-RL/WHC Response: See response to Comment 220. With respect to the suggestions about HDPE liner design, the conceptual design incorporates all of these features, and it is expected that the detailed design will as well.

222. Deficiency: Section 11.1.5.5.1, Cover Drainage, Page 11-60 — 1-8-93

The text does not identify where the cover drainage goes. In addition, a means must be provided to monitor the amount of liquid collected from the cover.

Requirement: Define where the cover drainage will go and how the amount of cover drainage will be measured.

DOE-RL/WHC Response No. 1: Cover drainage is shown on Figures 11-10 through 11-16. Drainage patterns were designed to conform to the extent possible with existing topography and to discharge into natural channels presently draining the cover areas. More comprehensive surface water management plans will be prepared as part of detailed cover design.

Measurement of drainage from the covers could be performed using standard methods (weirs, flowmeters, gaging, and similar techniques) in the discharge pipes. However, the usefulness of doing this needs to be established.

Comment: Section 11.1.5.5.1, Cover Drainage, Page 11-60

Measuring the amount of cover drainage can be easily accomplished and may provide data which supports or refutes use of the HELP model and the cover design. This issue was discussed and agreed to for the design of the 183-H Basins final cover. No permit limits will be set nor chemical analysis required for the runoff.

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DOE-RL/WHC Response No. 2: No response is needed.

223. Comment: Section 11.1.5.4.3, Page 11-61 — 2-18-92

In regards to the choice of storm duration, comment 219 also applies here.

DOE-RL/WHC Response: The type of storm depends on the type of analysis and the model being used. In Appendix 11, appropriately conservative storms were always selected; for example, the 50-year, 20 minute rainfall for sheet erosion (Appendix 11.D) where intensity is critical. Also see response to Comment 219.

224. Comment: Section 11.1.5.6, Settlement and Subsidence, Page 11-67 — 2-18-92

Comment 107 also applies here.

DOE-RL/WHC Response: Lift thickness for the grade layer will be selected so that the compaction specification can be satisfied. The compaction specification of 95% of modified Proctor density was selected as the maximum potentially achievable with conventional methods, and has been found to effectively minimize settlements under structures far less tolerant than the closure cover. Increasing the cover slope from 1.5% to 3%, as discussed above, will also lessen the impact of any areal settlements.

225. Deficiency: Section 11.1.6, Schedule for Closure, Page 11-68

It is unacceptable to defer closure of trenches containing mixed waste for extended periods of time in order to fill low-level waste trenches near the mixed waste trench. Overall, the current closure schedule does not provide for the timely isolation of the mixed waste trenches.

Requirement: The configuration of proposed trenches must be reevaluated to reduce the amount of time the trenches will remain open. In addition, acceleration of the retrieval schedule must be assessed to shorten the time mixed waste trenches are uncovered.

DOE-RL/WHC Response No. 1: The schedule for LLBG closure is in review. A revised schedule may be forthcoming after the impact of acceleration has been completely evaluated.

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Deficiency: Section 11.1.6, Schedule for Closure, Page 11-68

Concurrence will be assessed after Ecology reviews the outcome of this evaluation.

DOE-RL/WHC Response No. 2: The schedule for closure is in review. In addition to accelerating the retrieval schedule, the feasibility of constructing interim covers for the mixed waste trenches is being studied.

Comment: Section 11.1.6, Schedule for Closure, Page 11-68

Ecology is also reviewing the closure schedule and anticipates further discussions with DOE based upon the results of the on-going studies.

RL/WHC Response No. 3: No response is required at this time.

226. Deficiency: Section 11.2.1.2, Erosion Damage, Page 11-77 — 1-8-93

There is insufficient detail provided on the surveying to be conducted.

Requirement: A drawing of the final cover should be provided indicating where each monument will be located. A drawing or additional text should also be added detailing the design and installation of the monuments. In addition, surveying should be conducted quarterly for at least the first two years and then reduced to annually if no significant changes are noted.

DOE-RL/WHC Response No. 1: As noted in Section 11.2.1.2, surveying monuments will generally be installed on a 100-foot grid. More exact locations cannot be specified until the final cover designs are completed. The design and installation of survey monuments will also be addressed during final cover design. Quarterly surveying is not considered necessary given the long periods of time during the year when there is little or no precipitation at the Hanford Site.

Deficiency: Section 11.2.1.2, Erosion Damage, Page 11-77

Precipitation is not the only cause of settlement.

No.	Comment/Response	Ecology Concurrence

Requirement: Surveying must initially be conducted quarterly. If early results show no significant settlement, annual surveys will be sufficient with Ecology concurrence.

DOE-RL/WHC Response No. 2: Surveying will be conducted quarterly as requested.

227. Comment: Section 11.2.1.4, Vegetative Cover Condition, Page 11-77 — 2-18-92

The means to determine adequate vegetative cover must be discussed. Two possible methods are identified in the 183-H Basins Closure Plan.

DOE-RL/WHC Response: Methods for assessing the vegetative cover as described in the 183-H Basins closure plan will be incorporated as appropriate in the LLBG Permit Application.

228. Deficiency: Section 11.2.1.9, Benchmark Integrity, Page 11-78 — 2-18-92

It is insufficient to rely solely on visual inspections when determining benchmark integrity.

Requirement: Each benchmark should be surveyed to ascertain its integrity.

DOE-RL/WHC Response: Benchmark integrity refers to the absence of physical deterioration, for example spalling from frost action. Visual inspections are necessary to determine if changes in survey data are actually ground displacements or the result of other physical processes affecting the monument itself. The survey monuments will be designed to be robust and weather resistant to the extent practical.

229. Comment: Section 11.3, Notice in Deed, Page 11-83 — 2-18-92

This section should be rewritten in accordance with the language found in the 183-H Basins Closure Plan (Rev. 3).

DOE-RL/WHC Response: The notice in deed section from the 183-H Basins closure plan will be incorporated in the LLBG Permit Application.

230. Deficiency: Section 11.5, Closure Cost Estimates, Page 11-84

No.	Comment/Response	Ecology Concurrence

Closure cost estimates must be provided as agreed to for the facility wide permit.

Requirement: A statement to this effect must be provided in the text.

DOE-RL/WHC Response No. 1: The permit application will be revised to indicate that closure cost information will be provided as part of the annual reporting requirements of WAC 173-303-390. The schedule for initial submittal of projections of anticipated costs for closure will be established as part of discussions associated with the development of the Hanford Facility Permit. The text on page 11-84, Section 11.5 will be changed to the following: "It is DOE-RL's understanding that federal facilities are not required to comply with WAC 173-303-620. However, projections of anticipated costs for closure will be provided annually during closure activities."

DOE-RL/WHC Revised Response No. 1: The Permittee shall be exempt from the requirements of WAC 173-303-620. The permittee agrees to submit an annual report updating projections of anticipated costs for closure and postclosure for final status TSD units. This report will be submitted annually, by October 31, to the Department.

Comment: Section 11.5, Closure Cost Estimates, Page 11-84

The text should also note that these estimates will be provided annually, by October 31, beginning in 1993.

RL/WHC Response No. 2: Text will be added to say that closure projections of anticipated costs will be provided annually in a separate report by October 31 of the year after the Hanford Facility Permit becomes final.

No.	Comment/Response	Ecology Concurrence

231. Comment: Section 11.7, Post-Closure Cost Estimate, Page 11-84

Comment 230 also applies to post-closure cost estimates.

DOE-RL/WHC Response No. 1: The permit application will be revised to indicate that closure cost information will be provided as part of the annual reporting requirements of WAC 173-303-390. The schedule for initial submittal of projections of anticipated costs for closure will be establjshed as part of discussions associated with the development of the Hanford Facility Permit. The text in Section 11.7 on page 11-84 will be changed to the following: "It is DOE-RL's understanding that federal facilities are not required to comply with WAC 173-303-620. However, projections of anticipated costs for closure will be provided annually during closure activities."

DOE-RL/WHC Revised Response No. 1: The Permittee shall be exempt from the requirements of WAC 173-303-620. The permittee agrees to submit an annual report updating projections of anticipated costs for closure and postclosure for final status TSD units. This report will be submitted annually, by October 31, to the Department.

Comment: Section 11.7, Post-closure Cost Estimate, Page 11-84

The text should also note that these estimates will be provided annually, by October 31, beginning in 1993.

RL/WHC Response No. 2: Text will be added to say that post-closure projections of anticipated costs will be provided annually in a separate report by October 31 of the year after the Hanford Facility Permit becomes final.

No.	Comment/Response	Ecology Concurrence

232. Comment: Section 12.3, Transporter Requirements, Page 12-6

Although transporter requirements are not required per WAC 173-303-260 and -270 at the Hanford Reservation, these requirements must still be fulfilled as requirements under WAC 173-303-395. This statement must be incorporated into the text.

DOE-RL/WHC Response No. 1: The requirements to comply with other environmental protection laws and regulations as stated in WAC 173-303-395(2) pertain to receiving, storing, handling, treating, processing, and disposing of waste at a TSD facility; requirements for transport of waste are not specified. Additional clarification is requested.

Comment: Section 12.3, Transporter Requirements, Page 12-6

Details of transportation requirements required by Ecology can be found in the facility-wide permit application.

DOE-RL/WHC Response No. 2: The response to this comment will be prepared when comments are resolved for the facility-wide permit.

Comment: Section 12.3, Transporter Requirements, Page 12-6

The text should state that transporter requirements will be defined in the Facility Wide Permit.

RL/WHC Response No. 3: The text will be revised to agree with the Hanford Facility Permit when it becomes finalized.

233. Comment: Section 12.4.1.5.1, Immediate Notification, Page 12-11 — 2-18-92

Comment 204 is also applicable to this section and section 12.4.1.6.1.

DOE-RL/WHC Response: The text will be revised as required to respond to the forthcoming letter that defines Ecology's Nuclear and Mixed Waste Program Policy and WAC 173-303-145.

No.	Comment/Response	Ecology Concurrence

234. Comment: Section 12.4.2.3.3., Closure and Post-Closure, Page 12-18

Comment 230 also applies.

DOE-RL/WHC Response No. 1: The permit application will be revised to indicate that closure cost information will be provided as part of the annual reporting requirements of WAC 173-303-390. The schedule for initial submittal of projections of anticipated costs for closure will be established as part of discussions associated with the development of the Hanford Facility Permit. The text in Section 12.4.2.3.3 will be changed to the following: "It is DOE-RL's understanding that federal facilities are not required to comply with WAC 173-303-620. However, projections of anticipated costs for closure will be provided annually during closure activities."

DOE-RL/WHC Revised Response No. 1: The Permittee shall be exempt from the requirements of WAC 173-303-620. The permittee agrees to submit an annual report updating projections of anticipated costs for closure and postclosure for final status TSD units. This report will be submitted annually, by October 31, to the Department.

Comment: Section 12.4.2.3.3, Closure and Post-closure, Page 12-18

The text should also note that these estimates will be provided annually, by October 31, beginning in 1993.

RL/WHC Response No. 2: Text will be added to say that closure and post-closure projections of anticipated costs will be provided annually in a separate report by October 31 of the year after the Hanford Facility Permit becomes final.

No.	Comment/Response	Ecology Concurrence

235. Comment: Appendix 4A, List of Mixed Waste, Page 4A-ii — 2-18-92

It is unclear what the term "UNSEG" means. Does this term identify trenches which could have any type of waste including TRU, mixed, etc.? Please clarify.

DOE-RL/WHC Response: The following definition will be added to Appendix 4B: "Unseg is an abbreviation of unsegregated. The term arises from the description of waste buried prior to 1970 which did not have the transuranic waste component segregated from the low level component of the waste matrix."

236. Comment: Appendix 4A, List of Mixed Waste, Page 4A-18, 38, 44 — 1-8-93

Trenches CU1 and TV7 are not identifiable on Figure 2-9. These trenches should be identified on the figure or the proper identification numbers provided in this appendix. In addition, trenches T05 and T10 are listed in this appendix but only trenches T05E and T10E exist on Figure 2-8. The text or the figure should be clarified.

DOE-RL/WHC Response No. 1: "Trench CU1" is not a standard trench, but is a caisson that contains low level waste. This number 1 caisson is located in the area where trench 14 of burial ground 218-W-4B would be located as shown in Figure 2-9. Appendix 4B, page APP 4B-9 provides additional information. "Trench TV7" is a concrete portion of trench 7 in burial ground 218-W-4B as shown in Figure 2-9. The "E" will be removed from Figure 2-8.

Deficiency: Appendix 4A, List of Mixed Waste, Pages 4A-18, 38, 44

Figure 2-9 must be edited to support the response. In addition, the report "Corrosion in Waste Drums from the 183-H Solar Evaporation Basin Cleanout Project" (WHC-IP-0716) indicates that 3,230 drums were sent to Trench 24 in Burial Ground 218-W-04C and 1, 990 drums were sent to Trench 5 in Burial Ground 218-W-3AE. These drums are not all listed in this appendix, nor does the Toxic Name assigned to the drums appear accurate.

Requirement: The response must indicate where these 5220 drums are located and justify the Toxic Name assigned to the drums.

DOE-RL/WHC Response No. 2: Caisson unit #1 is shown on Figure 2-9 in trench area 14 as "#1". A note will be added to Figure 2-9 explaining the designation of "TV7". The 3230 drums sent

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to Burial Ground 218-W-4C Trench 24 from the 183-H Basin Waste project have been relocated to the Central Waste Complex. The 1,990 drums in Trench 5C of 218-W-3AE will remain, as this trench was closed prior to November 23, 1987. The information in appendix 4A is accurate. Some of the record numbers listed in the appendix are shipment numbers that contained up to 72 drums per shipment.

237. Comment: Appendix 4B, Trench Classifications, Page 4B-3 — 2-18-92

Trenches 1D and 16 in burial ground 218-E-12B should be classified as LL-MW (low-level mixed waste) based upon information provided on page 4A-1. In addition, if trench 28 is closed, why is part of its classification "*" (trench will be dug)? Please clarify or correct.

DOE-RL/WHC Response: Trench 1D and 16 will be revised and classified as UG-MW which means unsegregated mixed waste. Trench 28 classification will be revised to be LL-MW and appropriate dates added.

238. Comment: Appendix 4B, Trench Classifications, Page 4B-9 — 2-18-92

Based upon information provided in Appendix 4A, trenches 3, 4, 8, 9, 10, 12, and 13 should also be classified as LL-MW (low-level mixed waste). Please correct or clarify.

DOE-RL/WHC Response: Trenches 3, 4, 6, 8, 9, 10, 12, and 13 will be redesignated UG-MW in the table.

239. Comment: Appendix 4F, Liner Material Specifications, Page 4F-1 — 1-8-93

The specific gravity of the liner must be no less than 0.94 and the maximum melt flow index must be no more than 0.3 grams per 10 minutes.

DOE-RL/WHC Response No. 1: A detailed set of Specifications has been prepared for the Project W-025 Landfill. These specifications require that the specific gravity of the FML resin be greater than 0.94. Melt index is required to be within the range of 0.1 to 1.1 g/10 min, based on typical values reported by geomembrane manufacturers.

Comment: Appendix 4F, Liner Material Specifications, Page 4F-1

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Ecology is aware of at least two geomembrane manufacturer's who supply HDPE products with melt flow indices (MFI) of much less than 1.1 grams per 10 minutes. A technical document supplied by one of the manufacturer's listed a MFI of 0.22 grams per 10 minutes as a "typically good" product. A compilation of "typical values reported by geomembrane manufacturers" must be provided.

DOE-RL/WHC Response No. 2: Appendix 4F has been deleted and is replaced by the Specifications (WHC-S-045). These Specifications require a melt flow index of 0.1 to 1.1 grams per 10 minutes. The specifications also include a complete and comprehensive listing of required material properties.

240. Comment: Appendix 4F, Liner Material Specifications, Page 4F-2 — 1-8-93

The geosynthetic quality assurance consultant must not only verify the specifications identified, or to be identified, in Table 4F-1, but also every fingerprinting parameter (see comment 161).

DOE-RL/WHC Response No. 1: Melt index and specific gravity are considered "fingerprinting" tests and will be required submittals from the FML manufacturer as discussed in the Specifications (Section 02275) and the CQA Plan (Section 4.4.1.1). Other 'fingerprinting' tests such as thermogravimetric analysis and differential scanning calorimetry will be performed as part of the 9090 testing program for evaluating chemical changes in the FML. These tests are also required for each lot of geomembrane as noted in Appendix A of the CQA Plan.

Comment: Appendix 4F, Liner Material Specifications will be used in lieu of this appendix? If so, this appendix should be removed from the next revision of this document. If not, the text must be revised to address Ecology's original comment.

DOE-RL/WHC Response No. 2: Appendix 4F has been deleted and is replaced by the Specifications (WHC-S-045). This revision will be reflected in the next version of the document.

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241. Comment: Appendix 4F, Liner Material Specifications, Table 4F-1 — 1-8-93

Why are four identical values given for some parameters? The fingerprinting parameters must also be listed, with limits, on this table.

DOE-RL/WHC Response No. 1: The Specifications prepared for the Project W-025 Landfill now contain only information pertinent to the geosynthetics actually used in the design. With respect to "fingerprinting" parameters, see responses to comments 239 and 240.

Comment: Appendix 4F, Liner Material specifications, Table 4F-1

Does the response imply that the specifications will be used in lieu of this appendix? If so, this appendix should be removed from the next revision of this document. If not, the text must be revised to address Ecology's original comment. This comment applies to all the original comments addressing this appendix.

DOE-RL/WHC Response No. 2: See response to comment 240.

242. Comment: Appendix 4F, Liner Material Specifications, Page 4F-8 — 2-18-92

One factor of the geomembrane layout which could be "detrimental to the project" is excessive seam footage. To reduce this problem, a minimum liner roll width should be specified. A list of other possible detrimental aspects should be listed.

DOE-RL/WHC Response: This discussion has been eliminated in the revised Specifications. As described in Section 02275, the Geosynthetics Installer will be required to submit a panel layout plan for approval prior to construction, and general requirements for panel layout are explicitly stated. The specified geomembrane is supplied in 34-ft-wide rolls, among the widest in the industry.

243. Comment: Appendix 4F, Liner Material Specifications, Page 4F-9 — 2-18-92

The preferred method of seaming is double hot wedge welding. Any other method of welding will have to be justified over this method.

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DOE-RL/WHC Response: The 'best' seaming method for geomembranes is still an open issue, particularly for textured FMLs. It also depends on factors other than equipment, such as crew experience. Any seaming method used at the Project W-025 Landfill will be demonstrated and proved satisfactory by test seams, as well as by ongoing destructive and non-destructive tests of actual seams. These requirements are in Section 02275 of the Specifications and Section 4.4 of the CQA Plan.

244. Comment: Appendix 4F, Liner Material Specifications, Page 4F-10 — 2-18-92

The specifications must include extreme temperatures (absolute maximum and minimum ambient temperatures) beyond which no seaming will occur. In addition, the methods must be specified which will be used during temperatures between the optimal range and the extreme range.

DOE-RL/WHC Response: Construction Specification WHC-S-045, Section 02275, page 20, specifies the absolute maximum and minimum ambient temperatures for seaming and specifies methods that the installer must satisfactorily demonstrate for use during weather conditions between the optimal range and this extreme range.

245. Comment: Appendix 4F, Liner Material Specifications, Page 4F-20 — 1-8-93

Comment 213 also applies here. In addition, moisture adjustments cannot be made at the borrow site, but must be made at the pugmill.

DOE-RL/WHC Response No. 1: The Design Report, Specifications, and CQA Plan provide a great deal of latitude for the Contractor (or Construction Manager) to determine the most suitable types of equipment and procedures for preparing and placing the admix liner. The Specifications require a submittal to the WHC Project Engineer and the CQA Engineer describing these activities. With this approach, the pertinent experience from the LERF Project will be incorporated as appropriate when the Project W-025 Landfill is constructed (see response to comment 19 in regards to an individual test fill).

Comment: Appendix 4F, Liner Material Specifications, Page 4F-20

Previous comments address these same issues. No further comment necessary.

DOE-RL/WHC Response No. 2: No further comment.

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246. Comment: Appendix 4F, Liner Material Specifications, Page 4F-21 — 2-18-92

In-situ permeability testing must be done with a sealed double ring infiltrometer.

DOE-RL/WHC Response: A Sealed Double Ring Infiltrometer (SDRI) test will be performed on the test fill (see response to comment number 19).

247. Comment: Appendix 4F, Liner Material Specifications, Page 4F-22 — 2-18-92

Comment 157 also applies here and to Table 4F-7.

DOE-RL/WHC Response: EPA guidance allows use of either granular or synthetic drainage layer materials. The Project W-025 Landfill design includes both. As noted in the response to comment 31, the transmissivity of the geocomposite exceeds the EPA proposed requirement, and thus would be adequate by itself. However, the drainage gravel has been added for redundancy. Hence, the design provides high flow capacity and substantially exceeds the proposed EPA requirements.

248. Comment: Appendix 4F, Liner Material Specification, Page 4F-23 — 2-18-92

Transmissivity should be measured with the geonet sandwiched between the actual boundary materials, not steel plates. Explain why the condition in footnote "a" must be met. Comments 239 and 240 also apply here.

DOE-RL/WHC Response: This is a manufacturer's test method and is intended as a conformance test, not a simulation test. In other words, if the geonet has this transmissivity under these conditions, it is an acceptable product. With respect to Note (a), it has been found that a higher specific gravity produces a harder HDPE. To avoid the geonet embedding into the FML under load and thereby restricting flow, the geonet specific gravity is specified to be less than that of the FML. Responses to comments 239 and 240 apply here as well.

249. Comment: Appendix 4F, Liner Material Specifications, Page 4F-25 — 2-18-92

The drainage net must be stored above ground in a dust-proof wrapper.

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DOE-RL/WHC Response: This requirement has been included in the Specifications (Section 02275).

250. Comment: Appendix 4F, Liner Material Specifications, Page 4F-27 — 2-18-92

Frozen material will be removed from the fill and reprocessed through the pugmill or discarded.

DOE-RL/WHC Response: The CQA Plan discusses restrictions on construction activity during freezing weather and establishes the requirement to protect the completed admix layer from freezing. See also response to comment 151.

251. Comment: Appendix 4F, Liner Material Specifications, Page 4F-29 — 2-18-92

The list of actual specifications to avoid desiccation cracking should be provided.

DOE-RL/WHC Response: Measures to minimize desiccation as well as repair criteria are described in the CQA Plan (Section 4.3.2) and Specifications (Section 02224).

252. Comment: Appendix 4F, Liner Material Specifications, Page 4F-44 — 1-8-93

Ecology shall be notified of the date, time, and place of resolution meetings. If Ecology plans to attend, the meeting must be delayed a reasonable length of time to allow their attendance. This is also applicable to the preconstruction meeting and problem/work deficiency meetings. This requirement must be reflected in the application.

DOE-RL/WHC Response No. 1: The application will include that Ecology will be notified within a reasonable amount of time of the date, time, and place of resolution meetings, so that their non-attendance will not result in a delay of the meeting.

Deficiency: Appendix 4F, Liner Material Specifications, Page 4F-44

The response does not address preconstruction meetings and problem/work meetings.

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Requirement: These two meetings must also be included in the response for Ecology notification requirements. This comment also applies to the meetings listed in Section 2.2 of the CQA Plan.

DOE-RL/WHC Response No. 2: The discussion of meetings in this appendix has been superseded by the CQA Plan. All meeting minutes will be documented in accordance with the project Quality Assurance Program Plan (WHC-SD-WO25-QAPP-001) and will be distributed to all parties including Ecology. Ecology's on site representative will be notified of all project meetings by the DOE site representative.

253. Comment: Appendix 4F, Liner Material Specifications, Page 4F-49

The facility design and specifications will be part of the dangerous waste permit. Therefore, any changes to or deviations from the design or specifications must be approved by Ecology. Ecology will treat these changes as Class I permit modifications requiring pre-approval. Ecology assumes that these changes and deviations will be handled through the Engineer Change Notice (ECN) process and Nonconformance Report (NCR) process such as used for the Grout project. If this is true, Ecology must be provided a copy of the draft ECN/NCR to allow response, if necessary, prior to implementing the change or dispositioning the nonconformant condition. This requirement may be fulfilled by either 1) hand delivering the draft ECN/NCR to Ecology's on-site construction inspector, if one is present, or 2) sending a facsimile copy (fax) to Ecology's LLBG unit manager. Ecology will notify DOE-RL if the modification should be upgraded to a Class II or III modification. This method of handling modifications is limited to design and specification changes which occur during construction. All other changes must be handled in accordance with WAC 173-303-830. A statement reflecting this discussion must be made in the application.

DOE-RL/WHC Response No. 1: ECN/NCRs will be provided to the on-site inspector prior to implementation by the construction contractor. If the on-site inspector is unavailable, the ECN/NCR will be faxed to the Ecology office in Lacy, Washington for their immediate review. The turnaround time for this review is expected to be within 8 hrs.

Comment: Appendix 4F, Liner Material Specifications, Page 4F-49

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It should be noted that Ecology, in most cases, can concur with ECN/NCR's within 8 hours. However, there will be changes and deviations which require a detailed review and cannot be turned around in 8 hours. If Ecology expects a longer review, the appropriate individuals will be informed as such. The DOE-RL/WHC response should be incorporated into the permit application.

DOE-RL/WHC Response No. 2: ECNs and NCRs will be provided to the on site Ecology representative.

Comment: Appendix 4F, Liner Material Specifications, Page 4F-49

The handling of ECNs and NCRs will be described in the Facility Wide Permit. The text should state that the ECNs and NCRs will be handled in accordance with the requirements of the Facility Wide Permit.

RL/WHC Response No. 3: The text will be revised to agree with the Hanford Facility Permit when it becomes finalized.

254. Comment: Appendix 4F, Liner Material Specifications, Page 4F-51 — 2-18-92

Comment 246 also applies here.

DOE-RL/WHC Response: A Sealed Double Ring Infiltrometer (SDRI) test will be performed on the test fill (see response to comment number 19).

255. Comment: Appendix 4G, Construction Procedures, Page 4G-1 — 2-18-92

These procedures must be approved by Ecology before construction begins.

DOE-RL/WHC Response: Construction procedures are described in both the CQA Plan and the Specifications. Ecology will be provided with an opportunity to examine these procedures before construction begins.

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The following comments refer to Supplement 1 of the LLBG permit application, Request for Exemption from Lined Trench Requirements.
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256. Deficiency: Section 2.3.2, Long-Term Migration, Page 2-8 in the Request for Exemption from Lined Trench Requirements for Submarine Reactor Compartments, Revision 0.

This section discusses the reasons for requiring liner systems at dangerous waste land-based units. In addition to the reasons provided, the bottom liner system provides the function of detecting leachate. This liner system is, in fact called the leachate detection, collection and removal system (LDCRS). Although Ecology agrees that the SRC's are designed such that we can be reasonably sure liquids will not leach from/through the SRC's, the most prudent practice in this case is to provide a means to verify that the SRC system performs as asserted in this document.

Requirement: A means to monitor the amount of liquids, if any, that could pass from/through an SRC needs to be included in the disposal design. Ecology recommends that a catch basin similar to those beneath the grout vaults be installed beneath one of the SRC's as a demonstration project. The basin would need to be capable of collecting liquids as well as provide a means to measure the quantity and assess the composition of any liquids which could reach the basin.

DOE-RL/WHC Response No. 1: Ecology comments 143, 256, 261, and 262 require further technical evaluation.

Comment: Section 2.3.2, Long-Term Migration, Page 2-8

This comment must be addressed in the next NOD Response Table.

DOE-RL/WHC Response No. 2: The SRC package will last significantly longer than the estimated life of a catch basin. Therefore, during the life of a catch basin, there is no reason to expect any liquid to come or pass through the SRC package. Thus, there is no technical reason to install a catch basin. A discussion of the containment life of the SRC package will be included in the revised exemption request. The discussion will be based on the

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recently completed study "Prediction of Pitting Corrosion Performance of Submarine Reactor Compartments After Burial at Trench 94, Hanford, Washington" (March 1992).

Comment: General

Since receipt of the NOD response table, it is our understanding that USDOE is now willing to establish a performance demonstration project for the SRCs. The details of a performance demonstration have yet to be developed. Until these details are developed, and the mechanism for incorporating the performance demonstration into an enforceable document are established, no further response to this comment is required.

RL/WHC Response No. 3: No response is required at this time.

257. Comment: Section 3.1, General Description, Page 3-1 in the Request for Exemption from Lined Trench Requirements for Submarine Reactor Compartments, Revision 0. — 2-18-92

Typo. "U.S. Ecology" should be edited to read "US Ecology".

DOE-RL/WHC Response: The text will be corrected to read US Ecology.

258. Comment: Section 4.1, Waste Characteristics, Page 4-1 in the Request for Exemption from Lined Trench Requirements for Submarine Reactor Compartments, Revision 0. — 1-8-93

Are the bulkheads which are added at Bremerton Navy Yard welded with the same specifications and performance standards utilized in welding the original hull? Describe any differences between the specifications and standards used for the original hull and those used on the bulkheads welded for disposal purposes.

DOE-RL/WHC Response No. 1: The new welding to install shipyard fabricated disposal bulkheads is also accomplished using Navy shipbuilding and repair welding processes and electrodes to produce the same high-integrity welding as found on original ship construction.

Since the initial construction of nuclear powered submarines, the Navy has established the highest standards for critical welds, including submarine hull welds and reactor plant welds. In general, these Navy welding standards are more rigorous than private sector critical welding standards.

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The strength of the Navy standards lies not only in the proper selection and qualification of materials and welding parameters, but also in the rigorous personnel training and qualification process, nondestructive testing (NDT) and audit and surveillance programs. Most importantly, official records for each of these areas are maintained as objective quality evidence that welding and NDT were completed satisfactorily.

All weld materials are tested and maintained to ensure the materials meet specified standards. Welding procedures are formally developed and qualified in accordance with Navy requirements. The personnel performing the welds must be qualified, and periodically requalified, to demonstrate the ability to perform the welding in accordance with the weld procedure. Finally, nondestructive testing is performed by personnel who are qualified, and periodically requalified on the use of nondestructive test equipment. In addition, in-process surveillances are conducted by independent quality assurance personnel to evaluate work performance and to verify welding is being performed in accordance with specifications.

The original welding of the SRC hull was accomplished to Navy standards designed to ensure the integrity of deep diving hull structures, which must resist submergence pressures and potential battle shock while protecting human life and the operating reactor plant. The only significant difference between original hull welding and new welding is that since the new welds will not be subjected to the cyclic stresses experienced by deep diving hulls, they do not require the radiographic inspection used on original hull welds. It should be noted that all containment boundary welds (both original and new) are subjected to a package air test to verify their integrity.

Comment: Section 4.1, Waste Characteristics, Page 4-1

The response should be incorporated into the text.

DOE-RL/WHC Response No. 2: The response will be added to the text as requested.

259. Comment: Section 5.1.1, Integrity of the SRC, Page 5-2 in the Request for Exemption from Lined Trench Requirements for Submarine Reactor Compartments, Revision 0. 2-18-92

This section should include a discussion regarding: 1) the effects of radiation on corrosion rates; and, 2) the corrosion potential of original hull and new bulkhead welds.

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DOE-RL/WHC Response: The text will include:

a. "The corrosion rate of the hull, containment bulkheads, and containment bulkhead welds is not affected since these materials are basically non-irradiated."

b. "There is no difference in corrosion potential between the ship's original welds and new welds accomplished in preparing the SRC package for disposal."

260. Comment: Section 5.1.2.1, Lead, Page 5-5 in the Request for Exemption from Lined Trench Requirements for Submarine Reactor Compartments, Revision 0. — 2-18-92

Typo. The word "At" in line 6 should be edited to read "As".

DOE-RL/WHC Response: The text will be changed to "As".

261. Comment: Appendix 5A, Conceptual Design of Cathodic Protection, Page 5A-1 in the Request for Exemption from Lined Trench Requirements for Submarine Reactor Compartments, Revision 0. — 1-8-93

The specifications for the epoxy-polyamide paint should be provided to include a discussion of the durability of this paint under the handling, transportation and disposal scenarios expected.

DOE-RL/WHC Response No. 1: Ecology comments 143, 256, 261, and 262 require further technical evaluation.

Comment: App 5A, Conceptual Design of Cathodic Protection, Page 5A-1

This comment must be addressed in the next NOD Response Table.

DOE-RL/WHC Response No. 2: The request for exemption will be revised to present the technical basis for stating that no additional environmental protection beyond what the SRCs themselves provide would be gained by installing a cathodic protection system. Although the paint currently being used has good strength and abrasion resistance, and may provide some short term burial protection, this will not be taken into account in evaluating the containment lifetime of the SRC. Therefore, the specification of this paint is not relevant

No.	Comment/Response	Ecology Concurrence

to the request for exemption. It is noted that the paint will be maintained prior to burial.

262. Comment: Appendix 5A, Conceptual Design of Cathodic Protection in the Request for Exemption from Lined Trench Requirements for Submarine Reactor Compartments, Revision 0. 1-8-93

The report states that if the passive cathodic protection fails, an impressed current can be substituted. If the conductors fail, how will an impressed current work? If the sacrificial anodes fail, why not replace them?

DOE-RL/WHC Response No. 1: Ecology comments 143, 256, 261, and 262 require further technical evaluation.

Comment: App 5A, Conceptual Design of Cathodic Protection

This comment must be addressed in the next NOD Response Table.

DOE-RL/WHC Response No. 2: The request for exemption will be revised to present the technical basis for stating that no additional environmental protection beyond what the SRCs themselves provide would be gained by installing a cathodic protection system. Therefore, the design of the impressed current system will no longer be relevant to the request for exemption.

No.	Comment/Response	Ecology Concurrence

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The following comments refer to documents located in Supplement 2 of the LLBG Permit Application, Design Documents.
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263. Deficiency: Section 4, Field Exploration, Page 4, Site Investigation Report

Only one geotechnical boring for the investigation appears to have been drilled near the landfill, this boring is located approximately 60 feet north of the proposed limit of the landfill. In addition, only 5 of the 12 test pits were excavated within the footprint of the landfill. Maximum test pit excavation depths were 17 feet. With the landfill excavation being about 30 feet, the sufficiency of field exploration cannot be adequately made.

Requirement: A supplemental field exploration plan must be developed and submitted to Ecology for approval. Upon approval, this plan must be executed to provide the information needed to assess the proposed landfill geology.

DOE-RL/WHC Response No. 1: Geologic information required for designing the W-025 Landfill is relatively simple and was adequately determined by the field exploration program. No additional geologic data needs were determined either by the designer during the design process or by Ecology during their review of Chapter 4 of the Part B Permit Application. Therefore, there is no clear purpose for additional field exploration.

The borehole in the original field exploration program was intentionally drilled just beyond the landfill footprint to avoid forming a potential hydraulic pathway immediately beneath the landfill.

Comment: Section 4, Field Exploration, Page 4

Ecology believes that in order to adequately determine the soil properties of the proposed site, additional soil testing needs to be conducted in the area of the landfill at the depth to which excavation will occur. The additional sampling and testing should include the same tests as done during the shallow trenching investigation and can be completed at the time of actual trench excavation. The results should be compared to the data obtained during the shallow trenching to ensure the deeper soils provide a satisfactory setting for construction of the landfill.

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No.	Comment/Response	Ecology Concurrence

RL/WHC Response No. 2: The CQA Plan (WHC-SD-W025-PLN-001 Rev. 2) already requires that CQA personnel observe excavated material and foundation conditions during excavation. The CQA Plan will be modified during the next revision to require: (1) geologic mapping of the excavation; (2) that any change in materials from those assumed during design will be brought to the attention of the COTR and Design Engineer; and (3) that samples will be collected for testing as required.

264. Comment: Section 4.2, Laboratory Testing, Page 7 of Definitive Design Report — 1-8-93

Testing did not include any analyses of in situ soil strength parameters. The calculations use in situ soil strength. Without this information, the appropriateness of the values used cannot be adequately made. (See comment 263)

DOE-RL/WHC Response: Test results for the Eolian sand are presented in the Site Investigation Report, as noted in Section 4.2 of the Design Report. This testing included strength measurements on recompacted samples (expected to give conservative results), and indicated a friction angle of 38° with no cohesion. Strength testing on the admix is presented in Appendix A-1 of the Design Report, and shows a residual friction angle of 36°.

No.	Comment/Response	Ecology Concurrence
265.	Deficiency: Section 4.2.2, Geosynthetics Interface Testing, Page 8 of Definitive Design Report Textured HDPE for geosynthetic interface testing was supplied by Gundle Lining Systems, Inc. The specified geosynthetic will be supplied by SLT. The texturing of these two materials is produced by different manufacturing methods. Their interface friction angles with adjacent materials are not necessarily equal. Requirement: Additional interface friction testing should be performed for all the interfaces using the exact materials, both geosynthetic and soil, specified in the construction documents. **DOE-RL/WHC Response: The CQA Plan requires interface friction testing between the geomembrane and soil liner (CQA Plan Section 4.4.1.2) and between the geocomposite and geomembrane (CQA Plan Section 4.5.2.2). Acceptance criteria will be added to the Specifications (see responses to comments 324, 325, and 326).**	1-8-93

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No.	Comment/Response	Ecology Concurrence

266. Comment: Section 5.3.3, Desiccation Cracks, Page 14 of Definitive Design Report

As stated in EPA's *Requirements for Hazardous Waste Landfill Design, Construction, and Closure*, the composite secondary liner system should out perform either geomembranes or soil based liners alone. When a geomembrane is placed directly on top of a soil based liner and sealed up against its upper surface, leachate moving down through a hole or defect in the geomembrane does not spread out between the geomembrane and soil based liner.

The geomembrane must be placed on top of the admix liner such that leachate does not spread along the interface of the geomembrane and admix liner and move downward through the entire area of the admix liner. A geomembrane placed on highly permeable portions of the admix liner (areas with 1-inch deep, 1/4-inch wide desiccation cracks), would allow leachate to move through a defect in the geomembrane, spread over a large area of the admix liner and percolate down as if the geomembrane was not there.

Requirement: The design report and specifications must require that the admix surface is wetted just prior to geomembrane placement to minimize the amount of desiccation cracks. This would be a more appropriate response to providing the best possible seal between the admix liner and geomembrane than adding an additional 1-inch of thickness to the admix liner.

DOE-RL/WHC Response No. 1: The CQA Plan (CQA Plan Sections 4.3.2 and 4.4.1.5) requires the admix surface to be free of desiccation cracks prior to geomembrane placement and explicitly requires that it be protected from drying and cracking by installation of a temporary plastic cover or keeping the surface wet. However, even with the most careful approach, it is difficult to avoid a few cracks. This is the basis for the requirement to repair any crack greater than 1 inch in depth and 0.25 inch in width. Limited field testing suggests that smaller cracks will heal once the geomembrane is placed.

Deficiency: Section 5.3.3, Desiccation Cracks, Page 14

The performance of the temporary plastic cover at LERF was unsatisfactory. It acted as a solar still creating moisture which accumulated on the floor of the basins thus over-wetting the admix layer. Furthermore, it is not possible to check the admix layer to see if cracks have self-healed once the HDPE is in place. Visible cracks must be repaired; the depth and width of a crack are used to determine how to repair the crack: When the depth is less than two inches and the width less than one quarter inch, hand or manual repair is adequate.

No.	Comment/Response	Ecology Concurrence

Cracks greater than two inches deep or greater than one-quarter inch in width are to be repaired by mechanical methods (rotto-tiller).

Requirement: The design report and specifications must require that the admix surface is tilled, wetted, and rolled just before membrane installation should any cracks greater than two inches deep or greater than one-quarter inch in width be present. Smaller cracks may be repaired by hand.

RL/WHC Response No. 2: Based on conversations with Kaiser Engineers Hanford personnel involved in the LERF project, it was determined that the over-wetted admix on the floor of the basins was not due to the solar still phenomenon discussed above. Rather, after placing the admix, a concrete wall had to be built on which to anchor the geomembrane before it could be installed. Several months were required to install these concrete walls. During this time, the admix layer was covered with a temporary plastic liner. Precipitation accumulated in the floor of the basins on top of the temporary plastic liner. Since the plastic was only temporary, it was not tightly sealed, and the water seeped through and over-wetted the admix.

In Project W-025, there are no concrete anchor walls. Anchor trenches are used instead. These will be excavated after placing the admix layer, and the secondary liner will then be installed. The time between installation of these two liner components will be much shorter (for example, 2 or 3 weeks) than at LERF.

The Contractor is required in the Specifications to maintain the liner until geomembrane installation. In addition, the Specifications (WHC-S-045 Rev. 1, page 02275-14) require that no standing water or excessive moisture be allowed to accumulate on the admix surface prior to geomembrane installation. Also, the CQA Engineer is required to confirm that there is no area excessively softened by water prior to geomembrane installation. At any time during geomembrane installation, the Installer and CQA Engineer are required to report any adverse conditions in the admix layer surface so that they can be repaired. With these requirements, the problems encountered at LERF will be avoided.

The statement regarding smaller cracks healing once the geomembrane is placed is based on experience at other landfills, where field testing has shown that these cracks tend to heal. However, we agree that minimizing cracks in the first place is the preferred alternative.

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No.	Comment/Response	Ecology Concurrence
267.	Deficiency: Section 5.5.1, Geotextile Selection Analyses, Page 15 of Definitive Design Report As stated in Appendix C, gradient ratio testing should be performed for all soil-to-geotextile interfaces where the geotextile will act as a filter. This includes the operations layer over geotextile, drainage layer over geotextile and admixed layer over geotextile interfaces. This test is to confirm that the actual soil material with the actual geotextile selected for the job will perform as modeled in the calculations. Requirement: Perform gradient ratio testing for the three soil/geotextile interfaces shown in the construction drawings. **DOE-RL/WHC Response: A gradient ratio test will be performed when the operations layer material and geotextile have been identified. Because the drainage gravels are specified to contain negligible amounts of fine soil, no clogging tests are required. The interface between admix and geotextile is for separation, not drainage, and therefore need not be tested.**	1-8-93

No.	Comment/Response	Ecology Concurrence
268.	Deficiency: Section 5.6.2, Earth Loading - Primary Slope Riser Pipe, Page 17 of Definitive Design Report The primary and secondary slope's riser pipes are inferred as being the same for calculating purposes. The secondary slopes riser pipe is perforated and therefore may deflect more than the primary slope riser pipe. Requirement: A separate calculation should be provided for the expected deflection of the secondary slope riser pipe. **DOE-RL/WHC Response: The perforations consist of 8 holes each ¼" in diameter, located radially in single planes, spaced at 3 inches. Therefore these perforations slightly reduce the load carrying capacity of ¼" in every 3 inches of pipe. This small zone of lower effective modulus is not expected to cause a significant increase in deflection. In addition, the limiting deflection should not be a problem because the design is based on the assumption of a pipe with continuous fill above. In reality, the fill over the perforated section will include the vertical riser foundation slab, which will limit local differential settlement and load transfer, thereby limiting deflection.**	1-8-93

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No.	Comment/Response	Ecology Concurrence
269.	Deficiency: Section 6.4.1, Leachate Removal Pumps, Pages 23-25 of Definitive Design Report	1-8-93

No discussion was found relative to the possibility of flammable gas generation in this disposal facility. It is unclear how likely this possibility may be and whether the proposed design is reasonable without special provisions for the pumps (e.g. intrinsically safe controls).

Requirement: Provide information to support proposed pump design regarding flammable gas potential.

DOE-RL/WHC Response: The W-025 Landfill will comply with waste acceptance criteria for RCRA facilities and consequently, organic materials are not expected to be present in the waste after processing. Without organic materials, the potential for flammable gas (e.g., methane) generation is extremely limited.

Radiolytically-generated hydrogen is not expected to be a problem because (1) the concentrations of radionuclides in the waste will be relatively low (DOE Class 1), and (2) hydrogen will diffuse relatively rapidly upward through the soil cover rather than accumulating in the sumps.

No.	Comment/Response	Ecology Concurrence
270.	Deficiency: Section 6.4.1.1.1, Low Capacity Submersible Pump, Page 24 of Definitive Design Report Based on a telephone conversation with the Grundfos pump manufacturer, the selected pump model (5N03-9) is not available. For similar leachate pump flow/head conditions, the manufacturer's application engineer recommended pump model 5E5. This model has 304 stainless steel and teflon coated internal parts instead of 316 stainless steel construction. It was stated that "the foot valve on this pump will be removed so that leachate in the riser pipe can drain back into the sump and will not be subject to freezing." The term foot valve is not applicable to a submersible pump. There is an internal check valve in the pump which prevents the discharge line from draining back through the pump. In conversation with the pump manufacturer, all submersible pumps would have this check valve (it is not optional). Efforts to defeat this check valve are certainly not recommended by the manufacturer, would void pump warranty and may cause pump damage if operated without this check valve. It is normal design practice to maintain a full discharge line from a pump such that the pump starts up against an elevation head. No information was found in the design calculations to indicate that operation of this pump under startup conditions (no head) or running condition (5 gpm +/-, 50 feet of head +/-) was reasonable. Requirement: Select a pump which meets the intended design operating conditions and which is available. Consider alternate freeze protection of the discharge line and maintain a full discharge line or evaluate alternate means of draining the discharge line. **DOE-RL/WHC Response: Conversations with Grundfos in late November 1991 indicated that the model 5N03-9 was available, but has a 12 to 16 week delivery time.** **While the comment concerning back-pressure at pump start-up is valid for large, high capacity or high head hydraulic machinery, the same does not hold true for small pumps and motors. The pump in question is 1/3 HP with a TDH of 50 ft and a nominal capacity of about 5 gpm. Issues of cavitation and hydraulic transients are not a concern in systems of this size, especially when they are operated only intermittently. For this reason, it is recommended that the pump check valve (foot valve) be removed as initially intended. It is recognized that this will automatically void the warranty on the pump, according to the manufacturer, because it involves opening the pump. However, this is a standard policy of the**	1-8-93

No.	Comment/Response	Ecology Concurrence

manufacturer, not a statement regarding the likelihood of cavitation or damage. These pumps are manufactured for a variety of applications, some of which require check valves. The check valve is not considered to be required for this application. It is suggested that the effects of potential future damage, however slight, be mitigated by purchasing spare pumps. See response to comment 340.

271. Comment: Section 6.4.1.2, Secondary System Pump, Page 24 of Definitive Design Report — 1-8-93

See comment 270.

DOE-RL/WHC Response: See comment 270.

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No.	Comment/Response	Ecology Concurrence

272. Deficiency: Section 6.4.4.2 Tank Design, Page 27 of Definitive Design Report

No discussion was provided on the construction inspection, leak testing or certifying of the tank and components as required in WAC 173-303-640.

Requirement: Discuss or reference the section within the permit application which addresses compliance with WAC 173-303-640.

DOE-RL/WHC Response No.1: The tank fabricator will provide a submittal which will include a fabrication drawing, showing the details of the proposed tank and supports. The tank will be shop fabricated, pressure tested, and ASME Code stamped. Details regarding the epoxy coating and foundation design are provided in the Design Report. The CQA Plan requires verification that the tank was fabricated and installed according to the design intent. In our view, these documents together will meet the requirements of WAC 173-303-640. The intent of the design and CQA Plan is to comply with the requirements of WAC 173-303-640.

Deficiency: Section 6.4.4.2, Tank Design, Page 27

WAC 173-303-640(3)(e) requires that tanks and ancillary equipment must be tested for tightness after installation prior to being covered, enclosed, or placed in use. The response does not address this requirement.

Requirement: Discuss or reference the section within the permit application which addresses compliance with WAC 173-303-640(3)(e).

RL/WHC Response No. 2: WAC 173-303-640 (3)(e), states "All new tanks and ancillary equipment must be tested for tightness prior to being covered, enclosed, or placed in use."

As described in the Specifications (WHC-S-045, Rev 1, Section 13205), the tank will be ASME code stamped for a rated pressure of 25 psig. This involves a pressure test to 25 psig, which is quite conservative because the tank will be unpressurized in actual operation. The Specifications also required that "all welding of tank, including the connections and details for electrical or pipe support, insulation and cladding shall be completed prior to ASME pressure test". This requires a *system* test to the extent possible at the time of fabrication.

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No.	Comment/Response	Ecology Concurrence

Section 15060 of the Specifications requires that the Contractor pressure test all piping and valves. The details described in this section indicate that the piping must be tested as a system.

In the CQA Plan (WHC-SD-W025-PLN-001, Rev. 2), CQA personnel are required to review the "certifications and shop drawings submitted by the tank fabricator to confirm that the tank and associated equipment are designed in accordance with design requirements and the specifications" (page 44). They are also required to "document the pressure test of the piping as described in the CQA Plan" (page 47, Section 4.9).

These requirements of Specifications and the CQA Plan satisfy the requirements of WAC-173-303-640(3)(e) that the tank and ancillary systems be tested prior to use.

273. Deficiency: Section 6.4.4.4, Tank Leak Containment System, Page 28 of Definitive Design Report — 1-8-93

No discussion was provided concerning the requirement that the tank secondary leak containment system will be pumped dry within 24 hours whenever water accumulates (WAC 173-303-640(4)(c)(iv)).

Requirement: The text must be edited or the appropriate citation given to demonstrate compliance with this regulation.

DOE-RL/WHC Response: The Operations and Maintenance (O&M) manual will describe the procedures for evacuation of the tank sump, which will be performed within 24 hours whenever water accumulates.

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No.	Comment/Response	Ecology Concurrence
274.	Deficiency: Section 6.4.5.2, Control, Operation and Maintenance, Page 29 of Definitive Design Report A response action plan (RAP) will have to be prepared for the landfill. The RAP will have a section that contains criteria on what is a rapid and large leak (RLL) and the action leakage rate (ALR) for the leak detection layer. A discussion on the requirements for RAPs is contained in EPA report *Requirements for Hazardous Waste Landfill Design, Construction, and Closure*, 1989 Chapter 10. With no separate flow measuring device for the secondary leak detection layer, the quantity of leachate removed cannot be assessed with the pump in the "auto" mode of operation. This will not allow determination of compliance with the RAP. Requirement: A Response Action Plan must be included with the permit application. The secondary pumps must be operated manually with the primary pumps shut down so the quantity of leachate removed can be recorded or provide a separate flow meter for the secondary leak detection layer. **DOE-RL/WHC Response: A RAP is presently being prepared and will be submitted to Ecology when completed.** **The O&M manual will include instructions on operating the secondary pump in the manual mode. This will allow monitoring of all leakage volumes. If the pump operation becomes too frequent, the operator will be advised to switch operation to AUTO mode and to install a recorder on the secondary sump level control. This will also allow monitoring of secondary leachate volumes.**	1-8-93

No.	Comment/Response	Ecology Concurrence

275. Comment: Section 6.6, Facility Filling Plan, Page 30 of Definitive Design Report

The facility filling plan calls for three single layers of barrels with each layer covered with a 1- or 2-foot soil layer. Questions concerning this filling plan are presented below.

- Will the soil layer and drums support equipment driven over them?
- Will the barrels be driven down into the operations layer?
- What is an irregularly shaped burial box?
- When driven on will this irregular shaped box be driven down into the operations layer or crushed?
- How will the operations layer be placed to prevent consolidation and slumping of the overlying 1- to 2-foot soil layer?

The description of how waste will be disposed of should be described in greater detail to assess whether or not waste placement may cause a failure of the primary liner and leachate collection system.

DOE-RL/WHC Response No. 1: Alternative methods of backfilling around waste are being considered and are described in the report Alternative Operational Backfill Material Study for W-025 Landfill, Hanford, Washington. In addition, the thickness of the operations layer will be increased from the existing 2 feet to a total of 3 feet, in part to decrease the risk of operational damage. This change is described in more detail in the report Liner Performance Operating Life Study, Project W-025 Landfill, Hanford Site, Washington.

With respect to the questions above,

a) Based on experience at commercial hazardous waste landfills, the bearing capacity of the soil layer and drums are expected to support the weight of the equipment driven over them. Testing is planned to verify this.

No.	Comment/Response	Ecology Concurrence

b) Based on experience at commercial hazardous waste landfills and the relatively high strength of the proposed operations layer material, the operations layer will have sufficient bearing capacity to support the drums.

c) Irregularly shaped burial boxes are generally steel boxes containing mechanical equipment classified as mixed waste that is not amenable to decontamination.

d) The bearing capacity of the operations layer is expected to adequately support the burial boxes. Voids in the boxes will be filled with stabilizing material to prevent crushing or collapse.

e) The operations layer will be placed and compacted during landfill construction. The 1- to 2-foot-thick overlying soil layer will be placed later during operations. This soil will be compacted if appropriate to minimize settlement.

Comment: Section 6.6, Facility Filling Plan, Page 30

The two reports referenced in the response should be provided to Ecology.

RL/WHC Response No. 2: WHC-SD-W025-PD-001, Liner Performance Operating Life Study, Project W-025 Landfill and WHC-SD-W025-ER-001, Alternative Operational Backfill Material Study For W-025 Landfill will be provided to Ecology in the future for informational purposes only.

No.	Comment/Response	Ecology Concurrence
276.	Deficiency: Section 6.7, Electrical Service and Lighting, Page 31 of Definitive Design Report There is no mention of the reliability of the electrical system which will supply power to the leachate removal pumps. Lengthy electrical service interruption may result in more than 12 inches of leachate on the liner and flooding of the high capacity pump. Requirement: Provide information to indicate that electrical supply system reliability is high [data on the frequency and duration of power outages (last 10 years) for the power supply system in proximity to the proposed facility (State of Washington Department of Ecology, *Criteria for Sewage Works Design*, 1985, pg. 44 and 255]. Subject to this information, an on-site emergency power supply for the pumping system (including alarms and level controls) may be necessary. **DOE-RL/WHC Response: As noted in Section 5.8.2 of the Design Report, the 12-inch limit on the primary liner may be exceeded for a few days following the design flood event. This approach is acceptable under EPA's minimum technology guidance. The design drawings indicate that the base of the high capacity pump is located about 9.5 feet above the bottom of the secondary sump. As shown on Figure 5 in the Design Report, this elevation corresponds to about 200,000 gallons total storage capacity. Since the sum of the 4 wettest days shown on Figure 4 in the Design Report is about 185,000 gallons, the high capacity pump is not expected to flood even under these relatively severe conditions.** **Power for the W-025 landfill facilities will be obtained from the main Hanford grid, which is highly reliable.**	1-8-93

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No.	Comment/Response	Ecology Concurrence

277. Comment: Section 7.1, Period of Operations, Page 32 of Definitive Design Report — 1-8-93

The 30-year post-closure monitoring time frame is the only post-closure time mentioned in the regulations. However, the EPA notes that if the waste in the landfill is still hazardous after 30 years monitoring will continue. Post-closure monitoring may continue at low level radioactive landfills for 100 years or more (EPA, *Requirements for Hazardous Waste Landfill Design, Construction, and Closure*, 1989, page 113). See comment 144.

DOE-RL/WHC Response: The sentence stating that the post closure period is 30 years will be removed from Section 7.1.

278. Deficiency: C.1, Surface Water Hydrology/HELP Model, Pages 150 through 196 of Definitive Design Report — 1-8-93

No calculation was provided to show that the drainage layer permeability is 1 cm/sec. If the drainage layer permeability changes then flow through the drainage layer and maximum head on the primary liner could be different.

Requirement: Provide calculations that support the input value used.

DOE-RL/WHC Response: Using data from Appendix C.26, page 3 (30 cm x 0.2 cm/sec = 6 cm^2/sec) and Appendix C.3, page 9 (0.5 cm x 25 cm/sec = 12.5 cm^2/sec), a combined transmissivity of 18.5 cm^2/sec is calculated. For a 30.5-cm-thick drainage layer, the equivalent permeability is 0.61 cm/sec, which is rounded to 1 cm/sec. Appendix C.1 (page 26) notes that use of 1 x 10^{-2} cm/sec or 1 cm/sec for the drainage layer permeability had little effect on the results, indicating that this is in fact not a sensitive parameter.

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No.	Comment/Response	Ecology Concurrence
279.	Deficiency: C.3, Primary Leachate Collection System, Page 214 of Definitive Design Report The leachate collection pipe at the toe of the 3H:1V slope most likely will not collect all the leachate that passes by the pipe because of the trench design. Leachate will flow through the geonet under the pipe and the 1/4-inch holes at 12 inches on-center most likely will not collect all the leachate in the drainage material. Requirement: Calculate flow passing by the leachate collection pipes at the toe of the slope and verify that less than 12 inches of head will be on the liner. **DOE-RL/WHC Response: The purpose of the drain pipes is to provide the capacity required for extreme precipitation events. For lower precipitation events, essentially all leachate will bypass the pipes and flow to the sump through the geonet. Because the drainage pipes are located at the base of the drainage gravel (see construction drawings in Design Report), they will begin to carry significant flow when the head on the primary liner is only a few inches. The calculations in Appendix C.3 in the Design Report analyze pipe capacity in detail and indicate that the three drainage pipes can accommodate the design storm event. Therefore, head on the primary liner will be limited to less than 12 inches.** **The drain pipe is placed at the toe of the slope because the theoretical flow capacity of the geonet decreases as at the break in slope. The drain pipe is intended to relieve any hydrostatic pressure which might develop at the toe due to this reduced capacity.**	1-8-93

No.	Comment/Response	Ecology Concurrence
280.	Deficiency: C.4, Tank Secondary Containment System Concrete Structural Design, Page 223 of Definitive Design Report No extra surcharge load was added to active earth pressure acting on the wall. Maintenance trucks and possible leachate tanker trucks will park along side the concrete wall. Requirement: Add surcharge load from trucks to active earth pressure and then reexamine reinforcing. **DOE-RL/WHC Response: The design load includes full hydrostatic pressure on the wall, even though no such load is expected to occur due to the highly permeable soils at the site. This loading was included in order to provide a very conservative design which would accommodate possible future loads such as the truck surcharge. The design will be reviewed to determine if a truck surcharge loading increases the design load above those already used. The wall thickness or reinforcing steel will be increased if appropriate.**	1-8-93
281.	Deficiency: C.4, Tank Secondary Containment System/Concrete Structural Design, Page 224 of Definitive Design Report No reinforcing for the tank footing was selected. Requirement: Select reinforcing for tank footing. **DOE-RL/WHC Response: The tank footing is an extension of the floor slab, which is reinforced. In addition, anchor bolts are provided for the tank, which will serve to reinforce the footing. No additional reinforcement is necessary.**	1-8-93

No.	Comment/Response	Ecology Concurrence
282.	Deficiency: C.4, Tank Secondary Containment System/Concrete Structural Design, Page 224 of Definitive Design Report The lap splice length of 12 inches for the vertical reinforcing into the horizontal slab was not calculated. Based on our calculations, the lap splice should be longer. Requirement: The lap splice length calculations must be provided. **DOE-RL/WHC Response: The lap length shown in the calculations is not specified on the drawings. Detailed reinforcing drawings with bar schedules and detailed lengths such as lap lengths will be provided by the Contractor in a submittal pursuant to the requirements of Section 03210, 1-2B of the Specifications. The detailed shop drawings must be in accordance with ACI 318 and CRSI Manual of Standard Practice, as described in the Specifications.**	1-8-93

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No.	Comment/Response	Ecology Concurrence

283. Deficiency: C.4, Tank Secondary Containment System/Concrete Structural Design, Page 225 of Definitive Design Report

The discussion indicates that cracking of the secondary containment systems concrete should occur. External liners are to be free of cracks and gaps (WAC 173-303-640(4)(e)(i)(C)).

Requirement: The design of the concrete slab under the tank footings should be reexamined to ensure that cracking of secondary containment system is minimized. In addition, the maximum width of allowable cracks must be specified.

DOE-RL/WHC Response No. 1: The tank secondary containment system will be redesigned to include an FML on the floor and extending up the interior walls. This FML will be fabricated from HDPE, which will provide a water-tight seal even if the underlying concrete cracks at some locations.

Deficiency: C.4, Tank Secondary Containment System/Concrete Structural Design, Page 225 of 397

The use of an HDPE liner to cover the concrete does not relieve the requirement to meet the regulations concerning the concrete itself. Furthermore, it has proven difficult to fit a square-cornered box with plastic sheeting and conduct seam testing on the same.

Requirement: As originally stated, the design of the concrete slab under the tank footings should be reexamined to ensure that cracking of secondary containment system is minimized. In addition, the maximum width of allowable cracks must be specified.

RL/WHC Response No. 2: The HDPE liner is now considered the external liner in this system; no credit is taken for the concrete, which will only provide mechanical support. Drawing H-2-131585 Rev. 1, Note 7 requires the installation of a water tight HDPE liner on the floor and walls of the concrete containment areas. The liner will be 80 mils thick. A requirement will be added to the Specifications and CQA Plan to perform a test to confirm that a water tight seal exists. This test will involve filling the lined basin with water and monitoring the water level for 48 hours. If leaks are detected, the liner will be replaced or repaired at the contractor's expense and retested until satisfactory. This approach was used for the lysimeter basins in the Hanford Site Solid Waste Landfill Permit Application (DOE/RL-90-38) and was accepted by Ecology. This test exceeds the requirements of the test described in

No.	Comment/Response	Ecology Concurrence
	Ecology's "Technical Information Memorandum No. 89-1, Vadose Zone Monitoring" for lysimiter construction. **Liner geometries that are difficult to construct in the field can be prefabricated under controlled conditions and tested by the geomembrane manufacturer. For example, Gundle routinely offers this service for pipe penetrations. Thus, the proposed approach is feasible and readily available.**	
284.	Deficiency: C.6, Vertical Riser Pipe Foundation-Structural Design, 242 of Definitive Design Report The load the vertical riser pipe places on its 6-foot-square foundation with a 32-inch-diameter hole in the middle is calculated to be 6.85 kips. This exceeds the allowable bearing capacity of the sand layer for rectangular footings of 6.4 kips in calculation C.14 Bearing Capacity of Liner Soils. Requirement: Redesign footing so that less than 6.4 kips is applied to sand layer. **DOE-RL/WHC Response: The value calculated in Appendix C.6 of the Design Report is a perimeter load of 6.85 kips/ft, used in the reinforcement analysis. For bearing capacity analysis, it is appropriate to consider the total load of 150 kips distributed over the net area of the slab, 30.4 square feet. This produces a bearing pressure of 4.9 ksf, well below the allowable of 6.4 ksf.**	1-8-93

No.	Comment/Response	Ecology Concurrence

285. Deficiency: C.7, Sump Design, Page 248 of Definitive Design Report

No calculation was provided concerning clogging potential of 3/4-inch diameter holes in the leachate collection well by the sump gravel. Refer to Bass, Jeffery, et. al., *Avoid Failures of Leachate Collection and Cap Drainage Systems*, Pollution Technology Review No. 138, for design guidance.

Requirement: Provide the calculations justifying design.

DOE-RL/WHC Response No. 1: As shown on page 4 of Design Report Appendix C.26, the sump gravel is a relatively clean, coarse material. Therefore, the concern is not clogging, but rather preventing excessive amounts of the finer fraction from entering the collection well. As noted on the Design Report construction drawings, this will be accomplished by wrapping the well in 2 layers of geonet over the area of the holes.

Comment: C.7, Sump Design, Page 248 of 397

In approaching a similar design question at the LERF project, a test run of the sump was conducted with water. This test assured all parties that the leachate collection system would operate as intended. A similar test should be conducted for the W-025 project as well. A test is required to be run as the leachate sump level sensor needs to be calibrated for the "pump-on" and "pump-off" levels.

RL/WHC Response No. 2: An Acceptance Test Procedure (WHC-SD-W025-ATP-001) has been prepared that requires the type of test suggested by Ecology. This procedure also includes requirements for setting "pump-on" and "pump-off" levels. A copy of this procedure will be provided to Ecology for informational purposes only.

No.	Comment/Response	Ecology Concurrence
286.	Deficiency: C.21, Earth Loading Primary Slope Riser Pipe, 334 of Definitive Design Report The calculations do not consider the effects of the 2-inch HDPE pipes under the haunches of the 8-inch HDPE slope riser pipes. Requirement: Revise calculations to take into account the 2-inch HDPE pipes under the haunches of the 8-inch HDPE slope riser pipes or relocate the 2-inch HDPE pipes. **DOE-RL/WHC Response: The effects of the 2-inch-diameter pipes are considered by use of a very low soil modulus value, 300 psi (hand-tamped to 65% maximum density). See Design Report, Appendix C.21, page 3.**	1-8-93
287.	Deficiency: C.25, Geotextile Selection, Page 368 of Definitive Design Report The maximum height which the soil containing 4-inch rock can be dropped onto the geotextile without damaging the geotextile is a concern. Requirement: Provide calculations that state the allowable height that each of the soil layers overlying geotextiles can be dropped without damaging the geotextiles and describe placement method. **DOE-RL/WHC Response: The Specifications (Section 02275, Part 3-2 (C) (4)) require that "the Installer shall place all soil materials located on top of a geotextile in such a manner as to ensure...no damage of the geotextile...". The 4-inch rock is required to be in soil matrix (see Section 02228 of the Specifications).**	1-8-93

No.	Comment/Response	Ecology Concurrence
288.	Deficiency: H-2-131577, Operations Layer Contours of Definitive Design Report The leachate truck loading area should be defined and the method of controlling spills detailed (WAC 173-303-665(2)(a)(i)(C)). A system similar to the truck unloading area would be appropriate. Requirement: Locate the leachate truck loading area and provide spill control details as appropriate. **DOE-RL/WHC Response: All valves, pumps, and connection points for leachate transfer are already located within the concrete containment area under the leachate tank (see Dwg. H-2-131585). These are the locations most likely to experience minor accidental spills.**	1-8-93
289.	Deficiency: H-2-131577, Operations Layer Contours of Definitive Design Report The "D" pipe (leachate collection piping) system needs a way to be cleaned out. Requirement: Show locations and details of "D" drain pipe system cleanouts. **DOE-RL/WHC Response: Cleanout locations will be added to the drawings.**	1-8-93

No.	Comment/Response	Ecology Concurrence

290. Deficiency: H-2-131577, Operations Layer Contours of Definitive Design Report

Control for the location of the "D" drain pipe at the toe of the slope is not provided. There are no dimensions in the details of control points provided.

Requirement: The drawing must illustrate these items.

DOE-RL/WHC Response No. 1: The location of the drain pipes is not sufficiently critical to require control points. The location is adequately shown on Detail 4 of Dwg H-2-131579.

Deficiency: H-2-131577, Operations Layer Contours

Standard engineering practice dictates that the drawings be dimensioned. Criticality is not necessarily an issue when dimensioning.

Requirement: The drawing must be dimensioned to illustrate these items.

RL/WHC Response No. 2: Each admix and gravel layer of the liner system has a grading tolerance, as shown on Drawing H-2-131579, Rev. 1. Due to the uncertainty reflected in each of these tolerances, the exact positions of the drain pipes cannot be accurately predicted. The locations of these pipes are based on other features of the design, e.g., directly above the primary geocomposite and along the toe of all slopes. Attempting to dimension the drawings would only produce unnecessary costs and requirements for changes during construction.

Part of the problem may be related to an error on one of the drawings. Detail 4 on Drawing H-2-31579, Rev. 1, is intended to show that the 4-inch-diameter drainage pipe is located directly on top of geotextile overlying the primary geocomposite at the toe of the slope. Drainage gravel is mistakenly shown inside the pipe. This detail will be corrected either by an Engineering Change Notice (ECN) or a drawing revision.

9 3 1 2 8 8 1 9 2 0

No.	Comment/Response	Ecology Concurrence

291. Comment: H-2-131579, Liner System Details, Detail 5 of Definitive Design Report — 1-8-93

The limits of the general fill and the operations layer is not clear. The drawing should be revised.

DOE-RL/WHC Response: The Specifications (Section 02228, Part 2-1) define operations layer as the same as general backfill, except operations layer on the slopes shall have a maximum particle size of 1 inch (rather than 4 inches). This effectively defines the boundary between the two materials as the crest of the slope. However, should the Contractor for practical reasons wish to place the 1-inch-maximum material beyond this limit, the function would be identical to using standard general fill. Thus, it is unduly restrictive to define an exact limit for the operations layer.

292. Comment: H-2-131581, Sump Cross-Sections, Section H of Definitive Design Report — 1-8-93

The excavated trench for the secondary slope riser pipe is shown to have vertical side walls with 90 degree corners at the bottom and top which the geomembrane must bend around. The 60 mil HDPE geomembrane is not sufficiently flexible to bend at the corners. When the sand backfill is placed around the pipe, the pressure will force the HDPE into the bottom corners, thereby placing additional stress on the HDPE liner material at the bottom and top corners. This is not necessary and could be resolved by cutting the trench sidewalls back to a maximum slope of 1H:1V. A means to alleviate this problem must be provided.

DOE-RL/WHC Response: The 90 degree corners shown on the drawing are idealized. In practice, they end up rounded from the excavation process. HDPE generally has the flexibility to accommodate the surface roughness that is unavoidable with practical excavation methods, regardless of trench configuration. A note will be added to the drawing to "round all trench corners." A vertical-sided trench reduces earth loading on the riser pipe, relative to a sloping-sided trench.

No.	Comment/Response	Ecology Concurrence

293. Deficiency: H-2-131581, Sump Cross-Sections, Section H of Definitive Design Report — 1-8-93

The sensor pipes under the haunches of the slope riser pipes will not allow for proper compaction under the haunches of either pipe, which could result in over 5 percent deflection of the pipes.

Requirement: The sensor pipes should be repositioned so they are not under the haunches of the slope riser pipes would allow for good compaction and reduce deflection. See comment 286.

DOE-RL/WHC Response: Adequate compaction will be achieved to satisfy design assumptions. See comments 286 and 292. The sensor pipes in the sump must be under the haunches in order to accurately measure leachate levels.

294. Comment: H-2-131582, Sump Leachate Collection Pipes, Detail 8 of Definitive Design Report — 1-8-93

A detail is needed to show what is required at the end of the primary slope riser pipe and primary leachate collection pipes. Provide connection details to the leachate collection well and pump location information.

The top of the vertical riser pipe is at elevation 686.9 feet in this detail. Drawing H-2-131588 indicates that top of waste contours will be an elevation 691 feet, 4 feet above the top of the vertical riser pipe. The plan for the extension of the vertical riser pipe should be described in the Definitive Design Report and included in the O & M.

DOE-RL/WHC Response: Note 1 on Dwg. H-2-131582 indicates that the slope riser and leachate collection pipes will be tack welded to the collection well. Pump location information similar to Note 5 on Drawing H-2-131583 will be added for the primary riser pipe.

The vertical riser pipe is described in Part 02727 of the Specifications. It will be precast manhole sections, which automatically determines the joint configuration and the method of joining (i.e., stacking). The final elevation of the vertical riser cannot be determined because the closure cover (and the ultimate waste elevation) has not yet been designed.

No.	Comment/Response	Ecology Concurrence
295.	Comment: H-2-131582, Sump Leachate Collection Pipes, Detail 8 of Definitive Design Report It would seem prudent to add a bentonite mat under the primary liner in the sump area. This is a critical location as over 12 inches of leachate can pond there at times. This would be relatively low cost and may prevent a small defect in the primary liner from adding significant quantities of leachate to the leak detection layer. **DOE-RL/WHC Response: As a result of the Design Life Study, an 18-inch-thick admix layer will be placed under the primary liner across the floor of the landfill, including the sump.**	1-8-93
296.	Comment: H-2-131582, Sump Leachate Collection Pipes, Detail 8 of Definitive Design Report Intake velocity is typically about 3.5 fps to avoid problems with head loss and cavitation. The design intake velocity is 15 fps. A larger intake (4 inches) is recommended to reduce intake velocity. **DOE-RL/WHC Response No. 1: The sump leachate collection pipes all have velocities which will be very low (<<3.5 fps) under all but the most extreme conditions. Cavitation is therefore not a problem. The only velocity which is near 15 fps is the intake velocity on the high capacity, self priming sump pump. The intake is 2 inches in diameter, and the capacity is nominally 150 gpm, producing an intake velocity of 15 fps. The 2 inch dimension originates with the pump intake, as determined by the manufacturer. Cavitation in the pump is therefore not a concern. Head losses in the elbows of the intake piping may total 2 or 3 feet; however, the pump will operate only rarely. The difficulties associated with handling larger diameter pipe under the pump were a consideration against increasing the intake pipe diameter.** Comment: H-2-131582, Sump Leachate Collection Pipes, Detail 8 See comment 285. **RL/WHC Response No. 2: See response to Comment No. 285.**	

No.	Comment/Response	Ecology Concurrence

297. Comment: H-2-131582, Sump Leachate Collection Pipes, Detail 11 of Definitive Design Report — 1-8-93

The 3 x 3 x 3/8 inch angle should be as a radius angle. A description similar to the call out on the Primary Leachate Self Priming Pump Plan View on drawing H-2-131586 would be useful.

DOE-RL/WHC Response: The angle is not curved, nor are the plates to which it is welded. All are standard shapes. The drawing will be clarified.

298. Deficiency: H-2-131583, Side Slope and Vertical Riser Pipes, Detail 15 of Definitive Design Report — 1-8-93

The reinforcing should have a 3-inch clearance from bottom of footing and 1-1/2-inch clearance from top of footing according to the UBC. See comment 284.

Requirement: Revise detail to meet the requirements of the UBC.

DOE-RL/WHC Response: Codes such as UBC and ACI require concrete cover on rebar which is greater on the surfaces against the ground because of the potential for corrosion of the rebar caused by groundwater or soil water. This situation is not applicable to the riser base. The dimensions and clear cover shown on the drawing were selected for several reasons:

1) There will generally be no groundwater (leachate) against the slab since the sump lies below it.

2) The concrete slab will have a protective coating on all outside surfaces.

3) The rebar will be epoxy coated, substantially reducing the potential for corrosion.

4) The slab must be kept as light and easy to handle as possible since it will be placed by crane and must be manually positioned.

These reasons justify modifying the dimensions prescribed by the UBC while satisfying the intent of the UBC provisions.

No.	Comment/Response	Ecology Concurrence
299.	Deficiency: H-2-131584, Truck Staging Area and Access Ramp, Detail 16 of Definitive Design Report The truck staging area grading plan (southwest corner) will allow water to runoff onto unlined areas. All areas exposed or that could be exposed to waste should be lined (WAC 173-303-665(2)(a)). Requirement: Revise grading plan or use other methods to control runoff. **DOE-RL/WHC Response: The truck staging area is simply a waiting area. No waste handling operations will be performed here. As such, it is functionally the same as the paved site roads over which the waste is transported.**	1-8-93
300.	Deficiency: H-2-131584, Truck Staging Area and Access Ramp, Detail 35 of Definitive Design Report The drain line under the staging area should have a way to be cleaned out (WAC 173-303-665(3)). Requirement: Provide the location and details for the drain line cleanout. **DOE-RL/WHC Response: Cleanout access will be shown on the drawing.**	1-8-93

No.	Comment/Response	Ecology Concurrence
301.	Comment: H-2-131584, Truck Staging Area and Access Ramp, Section C of Definitive Design Report There is no design justification of the 2-foot drop of the geosynthetics on the uphill side of the ramp. Comment 292 also applies. Provide justification or re-design. **DOE-RL/WHC Response: The drop of the geosynthetics functions as a wide anchor trench. It is necessary to anchor the geosynthetics on the ramp to avoid bridging at the toe of the upper slope, which in turn may overstress and damage the geosynthetics. Even with textured geomembrane, thermal expansion and contraction can cause bridging. Use of an anchor trench near the toe of the upper slope is an approach used successfully by the designer at other hazardous waste landfills. The large width of this anchor trench in the W-025 design is to accommodate the width of construction equipment.**	1-8-93
302.	Deficiency: H-2-131585, Leachate Collection and Tank Piping, Section J of Definitive Design Report The 3-inch line from the high capacity pump does not have secondary containment from the edge of the liner to the temporary leachate storage tanks secondary containment system, as required by WAC 173-303-640(4)(C). Requirement: Provide secondary containment of the 3-inch line. **DOE-RL/WHC Response: The design will be changed to include a 6-inch-diameter HDPE sleeve which will provide secondary containment between the edge of the liner and the penetration of the concrete slab. The sleeve will be 5 to 10 feet long.**	1-8-93

No.	Comment/Response	Ecology Concurrence
303.	Comment: H-2-131585, Leachate Collection and Tank Piping, Section J of Definitive Design Report The width of the tank footing must be called out. **DOE-RL/WHC Response: The length (9 feet) and thickness (6 inches) of the footing are provided in Section K on this drawing. The width (1.5 feet) is shown on the Tank and Piping Plan.**	1-8-93
304.	Deficiency: H-2-131585, Leachate Collection and Tank Piping, Section K of Definitive Design Report The drawings show the tank being supported on 2 legs. Calculation C.4 used a continuous strip for analyzing the load applied to the footing. Requirement: Redesign tank support to apply a continuous load to the tank footing or analyze and design reinforcement for point loads from the temporary leachate storage tank. **DOE-RL/WHC Response: The tank supports shown on the drawings are idealized. Tank support details are usually determined by the preferences of the tank fabricator. The tank fabricator will submit a shop drawing providing details of the support saddles which he intends to use. The Specifications will be modified to explicitly require this information. The anchor bolt layout and footing design will be reviewed for compatibility at that time.**	1-8-93
305.	Deficiency: H-2-131585, Leachate Collection and Tank Piping, Section K of Definitive Design Report No detail was provided on how the tank footing is to be attached to the slab. Requirement: Provide detail on how the tank footing will be attached to the slab. **DOE-RL/WHC Response: See response to comment 304.**	1-8-93

No.	Comment/Response	Ecology Concurrence
306.	Deficiency: H-2-131585, Leachate Collection and Tank Piping, Detail 23 of Definitive Design Report No corner bar detail was provided for the horizontal reinforcement. Requirement: Provide horizontal corner bar detail. **DOE-RL/WHC Response: Detailed drawings of rebar will be submitted by the Contractor. See response to comment 282.**	1-8-93
307.	Comment: H-2-131585, Leachate Collection and Tank Piping, Detail 23 of Definitive Design Report The cleaning of the horizontal slab construction joints prior to pouring the vertical wall was not discussed. This cleaning will help to ensure a good bond between the vertical wall and horizontal slab. **DOE-RL/WHC Response: The Specifications Section 03310, 3-3 will be modified to explicitly include previously poured concrete surfaces in the cleaning requirements.**	1-8-93
308.	Comment: H-2-131586, Sump Pump Details, Section L of Definitive Design Report The spacing of the expansion anchors must be called out. **DOE-RL/WHC Response: Exact location of anchor bolts is not available at this time. It will be the contractor's responsibility to install the pump, including the proper placement of the expansion anchors.**	1-8-93

9 3 1 2 8 8 1 9 2 8

No.	Comment/Response	Ecology Concurrence

309. Deficiency: H-2-131586, Sump Pump Details, Section L of Definitive Design Report — 1-8-93

No specification was provided or called out on the drawings for the grating that the self priming pump is attached to.

Requirement: Provide grating specification or call out selected grating on the drawings.

DOE-RL/WHC Response: The grating is covered as a submittal under Section 05500 of the Specifications (Metal Fabrications).

310. Comment: H-2-131586, Sump Pump Details, Detail 33 of Definitive Design Report

An enclosure should be provided over the opening for the high capacity discharge pipe in the cover pipe in the cover plate to prevent debris from entering the pump station.

DOE-RL/WHC Response No. 1: A tight sealing cover over the vertical riser pipe was considered and rejected during the design process. The likelihood of debris entering the riser was considered small.

Comment: H-2-131586, Sump Pump Details, Detail 33

An enclosure should be provided over the opening for the high capacity discharge pipe in the cover plate to prevent debris from entering the pump station. The likelihood of debris entering the riser is difficult to predict and can easily be prevented by adding a cover.

RL/WHC Response No. 2: The cover (see Drawing H-2-131586 Rev. 1) has been modified so that the gap between the discharge pipe and the cover is reduced to 1/4 inch. This will prevent any significantly large debris from entering the vertical riser, while at the same time minimizing the risk of damage to the discharge pipe when the cover is removed. A small gap is necessary to ensure that the cover can be removed to allow pump maintenance when necessary. In addition, the top of the vertical riser will be several feet (9 feet initially) above the surface of the waste at all times. Therefore it is unlikely that debris will enter the vertical riser through the small gap in the cover.

9 3 1 2 8 8 1 9 2 9

No.	Comment/Response	Ecology Concurrence
311.	Comment: Section 01300, Geosynthetics Submittal, Part 1-11, C, Page 01300-9 of Construction Specifications Interface friction testing, gradient ratio testing, drainage layer and sump gravel permeability, geonet testing and geocomposite testing should be included with the quality control certificates required. All the geosynthetic testing noted above except gradient ratio testing will be performed as part of the CQA activities. Gradient ratio testing should still be performed, especially on the admix liner to geotextile interface. **DOE-RL/WHC Response: See response to comment 267.**	1-8-93
312.	Comment: Section 02220, General Excavation and Backfill, Part 2-1A, Page 02220-2 of Construction Specifications The requirements for general fill are too broad. The section should be modified to say "...and as approved by the Owner or CQA Engineer." **DOE-RL/WHC Response: The range of materials that will function adequately as general fill is fairly broad. On-site sources shall be identified by the landfill owner and approved by the contracting office technical representative and the Owner.**	1-8-93

No.	Comment/Response	Ecology Concurrence

313. Comment: Section 02220, General Excavation and Backfill, Part 3-6.F. Page 02220-5 of Construction Specifications

There is no discussion about proofrolling and testing in Part 3-1, Clearing and Grubbing. Such a discussion should be provided.

DOE-RL/WHC Response No. 1: Part 3-6.F is covered elsewhere and will be removed.

Comment: Section 02220, General Excavation and Backfill, Part 3-6.F, Page 02220-5

The response fails to address the comment. Is there a discussion of proofrolling elsewhere in the specifications?

RL/WHC Response No. 2: Although the term "proofrolling" is not used, Parts 3-2.A.2 and 3-5 of Section 02220 of the Specifications (WHC-S-045 Rev. 1) describe preparation of the excavation subgrade and natural soil subgrade under areas to receive fill. The Specifications require scarifying the top 6 to 8 inches of the surface, moisture conditioning, and compacting to 90 percent of Modified Proctor Density (ASTM D1557). This achieves the same goal as the less specific term "proofrolling".

314. Comment: Section 02220, General Excavation and Backfill, Part 3-7, Page 02220-5 of Construction Specifications — 1-8-93

See comment 313.

DOE-RL/WHC Response: Text will be clarified.

No.	Comment/Response	Ecology Concurrence
315.	Deficiency: Section 02222, Trenching and Backfilling, Part 2-5, Page 02222-2 of Construction Specifications Secondary side slope trench compaction requirements should be at least hand compacted to assure there are no voids under the slope riser pipe. Requirement: Revise the table to require at least hand compaction of soil under riser pipe. **DOE-RL/WHC Response: Table will be revised as requested.**	1-8-93
316.	Comment: Section 02224, Admix Production, Placement, Compaction, and Trimming, Part 3-3, Test Fill, Page 02224-4 of Construction Specifications The following should be added to the last sentence in paragraph C, "and placement/compaction is equal to that used on the test fill." **DOE-RL/WHC Response: This is already required by the CQA Plan (Section 4.3.2). All admix is required to meet the specifications as described in Section 02224, 3-5, regardless of source.**	1-8-93
317.	Comment: Section 02224, Placement and Compaction, Part 3-5.B, Page 02224-4 of Construction Specifications This section requires that the admix be compacted at a moisture content of 1 to 5 percent over optimum. Part 3-2 says the admix should be prepared at 0 to 5 percent over optimum. These requirements must be made consistent. **DOE-RL/WHC Response: This section will be revised to require mixing with a pugmill, and a single moisture content range will be specified.**	1-8-93

No.	Comment/Response	Ecology Concurrence
318.	Comment: Section 02224, Admix Production, Placement, Compaction, and Trimming, Part 3-5.H, Placement and Compaction, Page 02224-4 of Construction Specifications Paragraph H should be amended to require fully penetrating pads for the pegfoot or padfoot roller compactor in all lifts above the first lift of admix material. After compaction of the horizontal lifts, a disk harrow should be used to rough the face prior to placing the next lift. This will allow the interface between lifts to be fully mixed which would reduce the possibility of leachate travelling horizontally at lift interfaces. **DOE-RL/WHC Response: The requirement for fully penetrating compactor feet will be added to the Specifications. Use of a disk harrow will be added to the Specifications.**	1-8-93
319.	Comment: Section 02224, Admix Production Placement, Compaction, and Trimming, Page 02224-4 of Construction Specifications Comment 266 also applies here. **DOE-RL/WHC Response No. 1: See response to comment 266.** Comment: Page 02224, Admix Production Placement, Compaction, and Trimming, Page 02224-4 Comment 266 also applies here. **RL/WHC Response No. 2: See response to Comment No. 266**	

No.	Comment/Response	Ecology Concurrence

320. Comment: Section 02226, Granular Drainage Layers, Part 2-1, Page 02226-1 of Construction Specifications

The specifications require mechanically stable and chemically inert material. If this is a critical item, performance testing should be added to the specifications.

DOE-RL/WHC Response No. 1: The Contractor is required to submit gravel samples for testing by the CQA Engineer (Section 02226, Part 1-2). Qualitative evaluation will be done at this time.

Comment: Section 02226, Granular Drainage Layers, Part 2-1, Page 02226-1

The CQA plan is an inappropriate place to specify any material, even if the plan has some status in the contract. Furthermore, the CQA plan does not specify strength or chemical resistance testing. Such tests should be required in the specifications.

RL/WHC Response No. 2: Requirements will be added to the Specifications and the CQA Plan for testing of drainage and sump gravels. The test will be a Slake Durability test in simulated leachate, which will test both the strength and chemical resistance simultaneously. These conditions will provide a rigorous evaluation of aggregate suitability.

No.	Comment/Response	Ecology Concurrence
321.	Deficiency: Section 02226, Granular Drainage Layers, Parts 2-1 and 2-2, Page 02226-2 of Construction Specifications Page B to the drainage layer gravel and sump gravel sections require that the "material shall exhibit a permeability of 1 x 10^{-2} cm/sec or greater." Calculation C.26, Estimated Permeabilities of Drainage Gravels used a formula to determine permeability that is not applicable to the specified gravel and further recommends laboratory permeability testing for verification. Requirement: Permeability testing of the drainage layer and sump gravel must be performed. This requirement should also be added to Section 01300. **DOE-RL/WHC Response: Permeability testing of drainage and sump gravels using ASTM D2434 (rigid wall permeameter) is required in the CQA Plan, Section 4.3.3 and Appendix A. This requirement will be added to Section 01300 of the specifications. See also response to comment 320.**	1-8-93
322.	Deficiency: Section 02226, Granular Drainage Layers, Part 3-1, Page 02226-3 of Construction Specifications The proposed compaction methods to be used around the leachate collection pipes in the pipe strength calculations (C.22) were not incorporated into the placement section. Requirement: Add a section on placement and compaction of drainage layer gravel around the leachate collection piping consistent with design assumptions. **DOE-RL/WHC Response: Will add text as requested.**	1-8-93

No.	Comment/Response	Ecology Concurrence
		1-8-93
323.	Deficiency: Section 02228, Operations Layer, Part 2-1, Operations Layer material, Page 02228-1 of Construction Specifications The materials specification does not assure that the assumptions for the operations layer grain size distribution analyses used in design calculation for the Type A geotextile are met. See calculation C.25, Geotextile Selection. Requirement: A requirement for the operations layer grain size should be specified which is consistent with the grain size assumed in the calculations. Gradient ratio testing should also be required for the actual materials submitted for the project as stated in the design calculations. **DOE-RL/WHC Response: As noted in the response to comment 267, a gradient ratio test will be performed to verify design assumptions. Other design assumptions are consistent with a "maximum particle size of 4 inches, provided large particles are in soil matrix", or else produce such low strength requirements that a 4-inch particle would not cause problems.**	
324.	Deficiency: Section 02275, Geosynthetics, Part 2-1, Geomembrane Liner, Page 02275-4 of Construction Specifications The table containing the geomembrane properties required does not contain requirements for the interface friction angle of the geomembranes with the adjacent soil or geosynthetic materials. Requirement: Add interface friction requirements to the properties specified. **DOE-RL/WHC Response: The acceptance criteria for interface friction testing will be added to the Specifications.**	1-8-93

No.	Comment/Response	Ecology Concurrence
325.	Deficiency: Section 02275, Geosynthetics, Part 2-1.C.4, Conformance Testing, Page 02275-7 of Construction Specifications Interface friction testing should be added to the list of tests to be performed on the geomembrane in Section a and the test procedure indicated in Section b. Requirement: Include the appropriate interface friction testing information. **DOE-RL/WHC Response: This information will be added to the Specifications.**	1-8-93
326.	Deficiency: Section 02275, Geosynthetics, Part 2-2.c, Conformance Testing, Page 02275-11 of Construction Specifications Specific geocomposite tests are identified but no minimum requirements are provided in the specifications. Requirement: Include the required physical properties of the geocomposite in the appropriate section of these specifications. **DOE-RL/WHC Response: The acceptance criteria for interface friction testing will be added to the Specifications. Other acceptance criteria are given in the tables for the individual geonet and geotextile components that form the geocomposite.**	1-8-93

No.	Comment/Response	Ecology Concurrence
327.	Comment: Section 02275, Geosynthetics, Part 2-2.C, Conformance Testing, Page 02275-11 of Construction Specifications The transmissivity testing of the geonet and geocomposite should be run at the gradients used in the landfill and at the expected overburden pressure. The gradients at the landfill are 0.33 for the side slopes and 0.025 for the bottom slope. The overburden pressure is 120 pounds per cubic foot times 35-feet-thick for a pressure of 29 psi on the geonet. We recommend considering using a slightly higher overburden pressure to be conservative. **DOE-RL/WHC Response: The test requirements are intended to confirm that the geonet has at least the transmissivity of the material assumed for design purposes. They are not intended to simulate field conditions, only to demonstrate that the correct material has been received.**	1-8-93
328.	Comment: Section 02275, Geosynthetics, Part 2-2.D, Transportation, Handling and Storage, Page 02275-12 of Construction Specifications Based on a telephone conversation with the geonet manufacturer, the nominal transmissivity of 7.2 gallons per minute per foot can not be met at the hydraulic gradient and compressive stress called out in the table. The appropriate specification should be determined and the impacted calculations must be re-run. **DOE-RL/WHC Response: The requirement for 7.2 gpm/ft at 14.5 psi is equivalent to 1.5×10^{-3} m^2/sec at a normal load of 2100 psf. Per the attached chart from the manufacturer, PN-3000 is expected to have higher capacity than this value. Note also that the chart is based on tests between 2 sheets of HDPE; tests between steel plates would probably show higher transmissivity.** **If the manufacturer can no longer meet this requirement, then an approved equal product will be used.**	1-8-93

No.	Comment/Response	Ecology Concurrence
329.	Comment: Section 02275, Geosynthetics, Part 2-2.B, Transportation, Handling and Storage, Page 02275-13 of Construction Specifications The apparent opening size (AOS) for geotextiles Type A and B in the table does not agree with the manufacturer's literature. AOS is typically called out in U.S. Standard sieve or millimeters. Please comment. **DOE-RL/WHC Response: The correct AOS values will be listed in millimeters..**	1-8-93
330.	Comment: Section 02275, Geosynthetics, Part 3-1.C, Geomembrane Liners, Page 02275-15 of Construction Specifications The third paragraph in section C states that the geosynthetic layer shall be anchored with a maximum 6-inch thick lift of compacted soil in the anchor trench. The plans indicate that this is a 6-inch minimum requirement. it is not clear if the 6-inch dimension is a minimum or maximum requirement. Please clarify. **DOE-RL/WHC Response: The Specifications will be changed to read "minimum".**	1-8-93
331.	Comment: Section 02275, Geosynthetics, Part 3-1.B.9, Nondestructive Seam Continuity Testing, Page 02275-22 of Construction Specifications The word "fabricator" should be replaced with the word "installer" in the first sentence of section a). A fabricator is not necessary with HDPE geomembrane installation. The installer is usually the onsite entity responsible for NDT. Also, the last sentence in section a) allows rewelding of seams that do not pass nondestructive testing. Rewelding of seams amy increase the possibility of stress cracking and is not recommended. Industry standard is to typically patch areas that do not pass nondestructive testing. **DOE-RL/WHC Response: "Fabricator" will be changed to "Installer". See also response to comment 332.**	1-8-93

No.	Comment/Response	Ecology Concurrence
332.	Comment: Section 02275, Geosynthetics, Part 3-1.B.13, Repair Procedures, Page 02275-28 of Construction Specifications Repair procedures allow grinding and rewelding of small sections of extruded seams which need repair. Rewelding of seams is not recommended due to the increased potential for stress cracking. **DOE-RL/WHC Response: The intent is to limit this method to seam lengths of no more than a few inches, where it is feasible. The text will be modified accordingly.**	1-8-93
333.	Deficiency: Section 02275, Geosynthetics, Part F-1, Granular materials, Page 02275-30 of Construction Specifications Motor graders are rubber tired vehicles, can weigh as much as 60,000 pounds and have tire pressures in excess of 60 psi. A D-3 tractor weighs about 17,000 pounds and applies about 5 psi ground pressure. Requirement: Specify what is an allowable motor grader weight and tire pressure and supply calculations supporting your conclusion or allow motor graders to operate on no less than 3 feet of material over any geosynthetic layer. **DOE-RL/WHC Response No.1: The weight of the grader will be limited to less than the weight of a Caterpillar 12G or lighter. Designer's construction experience indicates that this equipment will perform satisfactorily.** Comment: Section 02275, Geosynthetics, Part F-1, Granular Materials, Page 02275-30 The motor grader limit provided in the response should also appear in the specifications. **RL/WHC Response No. 2: This change has been made in the latest revision of the Specifications (WHC-S-045 Rev. 1). See Page 51, Section 02275-30, Part F-1(c).**	

No.	Comment/Response	Ecology Concurrence

334. Deficiency: Section 02275, Geosynthetics, Part 3-2.C.4, Placement of Soil Materials, Page 02275-35 of Construction Specifications

See comment number 287.

Requirement: The maximum height which the overlying soil can be dropped on the geotextiles without damaging or a placement method must be specified.

DOE-RL/WHC Response No. 1: The Specification is appropriate as written. The state-of-the-art in geotextile design does not allow calculations to cover every contingency. Hence, it is appropriate to leave the responsibility for damage with the Installer.

Comment: Section 02275, Geosynthetics, Part 3-2.C.4, Placement of Soil Materials, Page 02275-35

The method of installation should be specified by the installer and provided before site work begins. This submittal should be approved by the CQA officer.

RL/WHC Response No. 2: Prior to any site work, the method for placing soil materials over geosynthetic layers will be submitted by the Contractor and approved by the Construction Manager as part of the Earthworks Operation Plan. This Plan is required in Sections 02226 (Granular Drainage Layers) and 02228 (Operations Layer), Parts 1-2, Submittals. These are the sections that specify all materials that will be placed directly over geosynthetics; no materials will be placed that are not discussed in the Plan. The Earthworks Operation Plan will also be reviewed by the CQA Engineer as required in Division 1 (Section 01300) of the Specifications. Division 1 of the Specifications is part of the bid package included in the contract documents.

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No.	Comment/Response	Ecology Concurrence
335.	Deficiency: Section 02511, Truck Unloading Area Surfacing, Parts 2 and 3, Pages 02511-2 of Construction Specifications No top course material specification is provided as called out in Section 02220-2.2 Requirement: Provide top course material specification. **DOE-RL/WHC Response: Top course specification has been added to Section 02220.**	1-8-93
336.	Comment: Section 02511, Truck Unloading Area Surfacing, Parts 2 and 3, Pages 02511-2 and 3 of Construction Specifications No references to sub-base appear on the construction drawings. In Part 2-4, a reference to Section 02200 is confusing since no Section 02200 exists. Part 3 has two separate and different subsections on sub-base execution. **DOE-RL/WHC Response: Section 02511 will be revised to eliminate these problems.**	1-8-93
337.	Comment: Section 02720, Drainage Facilities Part 3-1, Page 02720-1 of Construction Specifications Referenced work for 23rd Street drainage ditch improvements was not found on the drawings. Please provide. **DOE-RL/WHC Response: Since the Project W-025 design was originally prepared, the area to the west of the landfill site has been extensively excavated as a borrow source for Project W-105 liner material. This excavation will intercept any surface water draining from the west, and as a result, drainage ditch improvements for 23rd Street are no longer necessary. Reference to this work will be deleted from the Specifications.**	1-8-93

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No.	Comment/Response	Ecology Concurrence
338.	Comment: Section 02727, Vertical Riser Pipe, Part 2-1.B, Page 02727-1 of Construction Specifications The reference to "coating for the lower portion of the riser pipe as shown on the drawings" is not consistent with other references. The drawings relate coating requirements for the entire riser pipe to Section 09900. Section 09900, part 3-4.A.2a, requires "all concrete within the landfill" be coated. This should be clarified. **DOE-RL/WHC Response: Section 02727, Part 2-1.B will be modified to indicate that the entire riser pipe is to be coated.**	1-8-93
339.	Deficiency: Section 03310, Structural Concrete, Part 3-5.E, Inspection and Testing, Page 03310-7 of Construction Specifications WAC 173-303-640(4)(e)(i)(C) required that external liners be free of cracks and gaps. Requirement: Concrete for the secondary containment should be inspected for cracks and gaps after placement and after filling of the temporary leachate storage tank. A repair procedure should be specified. **DOE-RL/WHC Response No. 1: The tank secondary containment sump will be lined with an FML. See response to comment 283.** Comment: Section 03310, Structural Concrete, Part 3-5.E, Inspection and Testing, Page 03310-7 Comment 283 also applies here. **RL/WHC Response No. 2: See response to Comment No. 283.**	

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No.	Comment/Response	Ecology Concurrence

340. Comment: Section 11210 of Construction Specifications, Leachate Pumps, General — 1-8-93

There is no indication that spare pumps will be obtained for this facility. It is highly recommended that at least one spare pump of each type be provided and available for O & M personnel. Thus, immediate replacement of a failed pump can be performed to maintain satisfactory and timely leachate removal in accordance with stated design requirements.

DOE-RL/WHC Response: The Specifications will be changed to require that the contractor provide a spare for each leachate pump. This will result in 3 spare pumps: 1 submersible, 1 self priming, and 1 transfer pump.

341. Comment: Section 11210, Leachate Pumps, Part 2-1, Submersible Sump Pumps, Page 11210-1 of Construction Specifications — 1-8-93

The Grundos pump manufacturer recommended that a "flow inducer sleeve" be provided on each submersible pump installed in a horizontal position to ensure adequate cooling of the motor and avoid premature motor failure. The manufacturer should be consulted to establish specific sleeve requirements. Comment 270 also applies here.

DOE-RL/WHC Response: Further discussions with the manufacturer indicated that for a small pump and motor, such as proposed here, the normal flow passing over the motor and into the pump is expected to provide adequate cooling. Also, see responses to comments 343 and 344.

No.	Comment/Response	Ecology Concurrence

342. Deficiency: Section 13205, Leachate Temporary Storage Tank, Part 3-2, Inspection, Page 13205-2 of Construction Specifications

WAC 173-303-640 requires that tank and ancillary equipment be tested after installation and certified.

Requirement: Provide in specifications and CQA Plan a method to test, inspect and certify the tank after installation.

DOE-RL/WHC Response No. 1: The tank and ancillary systems will be certified at different stages in the design. Once it is fabricated, the tank will be pressure tested and ASME Code stamped, which is a certification of its adequacy to withstand pressure. Once the installation is complete, the CQA engineer will verify that the installation was done in accordance with the design. The transfer pump will be tested by the contractor during construction as described in Section 11210 of the Specifications. See response to comment 272.

Comment: Section 13205, Leachate Temporary Storage Tank, Part 3-2, Inspection, Page 13205-2

Comment 272 also applies here.

RL/WHC Response No. 2: See response to Comment No. 272.

No.	Comment/Response	Ecology Concurrence

343. Comment: Section 13340 of Construction Specifications, Pump Controls, General

There is no indication as to how "pump on" and "pump off" levels will be set for the submersible primary and secondary leachate removal pumps. The "pump off" level will need to be set above these pumps to avoid a run-dry condition (re: potential motor overheating/burnout and airlock problems). Possible design changes may be needed to accommodate the above while still satisfying the Definitive Design Report criteria stated in Section 6.4.1.

It is recommended that a "high water" alarm condition be sensed in the primary leachate collection system because of the potential flooding of the high capacity pump (State of Washington, Department of Ecology, *Criteria For Sewage Works Design*, 1985, P. 39).

Unless an emergency power source is provided, it is recommended that a "power failure" alarm also be provided since all leachate removal depends on electrically operated pumps.

DOE-RL/WHC Response No. 1: Pump on and off levels will be addressed in the O&M manual. The pump off levels will be set so that pumps do not run dry, nor cycle on and off. In general, the leachate will be pumped to the lowest levels possible without causing pump damage. No design changes are anticipated as being necessary.

The only significant source of leachate at the site is precipitation and snowmelt. The O&M manual will address the need to frequently monitor the sump during and immediately following these periods. In any event, the sump leachate levels will be monitored daily. Under normal conditions it will take many days for the leachate to accumulate to significant depths. For this reason, a high water alarm was considered unnecessary.

A power failure alarm is not considered necessary, because the daily maintenance inspection will immediately identify lack of power at the control panels.

Comment: Section 13340, Pump Controls, General

The pump on and off levels should be addressed in the specifications. A power failure alarm is necessary for unexpected circumstances.

No.	Comment/Response	Ecology Concurrence

RL/WHC Response No. 2: Pump on and off levels are defined, and the leachate removal system will be calibrated and tested as described in the Acceptance Test Procedure, WHC-SD-W025-ATP-001 (see Comment No. 285). This testing will be conducted by the Contractor under the direction of the Construction Manager prior to operation of the landfill. Acceptance of the test results by WHC Operations & Projects, the CQA Engineer, and the KEH Construction Manager will be required before the Contractor is released.

Due to the high reliability of the main Hanford grid system (See Comment No. 276), and the fact that site-wide loss of power will be obvious and quickly repaired, an overall power failure alarm at the landfill is not considered necessary. Of greater concern is undetected failure of one or more pumps. To minimize this possibility, a pump failure alarm will be installed on the roof of the control building (see Specifications Section 13340 and Drawing H-2-131587 Rev. 1, sheets 1, 2, and 4). This alarm will activate for any pump failure.

344. Deficiency: Section 13340, Pump Controls, Part 3-4, Float Switches, Page 13340-9 of Construction Specifications — 1-8-93

The pump off float switch in the leachate collection well is specified to be set such that the pump turns off when the leachate level is 1-inch deep. This conflicts with the drawings which show the bottom of the pump suction 2 inches above the floor of the collection well.

Requirement: The pump off level should be set to eliminate (or minimize) any pump cavitation in accordance with manufacturer recommendations. Minimum depth for correct float operation should be considered.

DOE-RL/WHC Response: The referenced section of the Specifications will be altered to such that the pump off level is 1 inch above the pump intake. The pump switching levels will be addressed further in the O&M manual (see response to comment 343). The location of the float switch shown on the drawings is diagrammatic only and is not dimensioned. It will be determined based on specific pump geometry and the considerations discussed previously.

No.	Comment/Response	Ecology Concurrence
345.	Deficiency: Section 15060, Pipe and Pipe Fittings, Part 3-1, Acceptance, Page 15060-4 of Construction Specifications The test procedure outlined does not stat the duration of the pressure testing, whether makeup water for hydrostatic pressure testing is allowed, and total allowable test time at the test pressure. Requirement: A more complete specification for pressure testing the soiled wall HDPE pipe should be provided. **DOE-RL/WHC Response: The Specifications will be amended to include test durations. The tests will be one hour in duration. Makeup water will be permitted to maintain the test pressure, but the volume must be measured and documented. The total allowable test time is not necessary.**	1-8-93

No.	Comment/Response	Ecology Concurrence

346. Comment: Liner/Leachate Compatibility Test Plan, General — 1-8-93

Ecology has recently been provided a copy of a new compatibility test plan (WHC-SD-W025-TRP-001). Does the new plan completely replace the plan provided as Document 7 to Supplement 2 for the LLBG Permit Application or will it be added as an additional document to the application? The following comments are based upon the first compatibility test plan. However, they should also assessed against the new report. It is Ecology's understanding that a polypropylene geotextile will be used instead of a polyester geotextile and that the compatibility test results from the Grout project to support a polypropylene geotextile will be used. This change must be noted in the permit application. In addition, fingerprint data of the Grout-tested geotextile must be compared with the geotextile to be used at the LLBG to ensure the Grout Method 9090 results are transferrable.

DOE-RL/WHC Response: WHC-SD-W025-TRP-001 documents the results of the 9090 testing preformed on geosynthetics for the W-025 Landfill. It is not a test plan and does not replace the liner/leachate compatibility test plan. It will be added to the permit application. The geosynthetics proposed for the liner system in the W-025 Landfill were tested to evaluate their chemical resistance to expected leachate. In the W-025 tests, polyethylene and polyester (PET) were tested. In the Grout project work, polyethylene and polypropylene were tested. In both instances, polyethylene performed satisfactorily. Polypropylene performed well in the Grout test. Because of the less severe environment in the W-025 tests compared to Grout, it is anticipated that polypropylene will perform satisfactorily in the W-025 landfill.

Available fingerprint data for the polypropylene used in the Grout work will be obtained from Battelle Pacific Northwest Laboratory files and from the vendor. These data will be used to select and qualify the polypropylene for the W-025 landfill.

No.	Comment/Response	Ecology Concurrence

347. Deficiency: Leachate, Page 6 of Liner/Leachate Compatibility Test Plan — 1-8-93

Appendix B of the Plan lists the constituents found in mixed waste within the time frame of November 1986 to September 1989. This list is used to formulate the synthetic leachate. The Plan states that only components present at levels greater than or equal to 0.01% will be used to produce the synthetic leachate. Only including compounds present at a level greater 0.01% seems inappropriate.

Requirement: Provide a discussion of the reasons for choosing 0.01% as the cut-off level.

DOE-RL/WHC Response: In reviewing the list of potential chemicals that could enter the W-025 landfill, the elimination of components whose concentration is <0.01% is somewhat moot. Most of these components are organics that will not be allowed in the site above EPA-defined limits. The remainder of the components present in concentrations of less than 0.01% will be (1) neutralized by other compounds present, (2) neutralized to the EPA limits or stabilized as part of waste treatment, or (3) are innocuous to the geosynthetics. Of the components not otherwise neutralized, but still innocuous to the geosynthetics, most are the same or similar to other components present in larger quantities in the starting mixture for making the synthetic leachate.

348. Comment: Leachate, Page 7 of Liner/Leachate Compatibility Test Plan — 1-8-93

"The source leachate . . . will be . . . analyzed using standard approved organic[2] and inorganic[3,4] analytical procedures . . . ." The footnotes list the analytical procedures using a numbering system contained in a Pacific Northwest Laboratory document (Vol 7 of PLNL-MS-597).

Requirement: The EPA method number corresponding to the PNL number must be provided.

DOE-RL/WHC Response: The listed PNL procedures correspond to and are based on equivalent EPA methods given in SW-846, Test Methods for Evaluating Solid Waste, Physical/Chemical Methods.

No.	Comment/Response	Ecology Concurrence
349.	Comment: Sample Immersion Tests, Page 13 of Liner/Leachate Compatibility Test Plan The size of the stainless steel tanks should be provided in the report. **DOE-RL/WHC Response: The tanks are commercial stainless steel vessels for use in the photography industry and are about 12" wide, 15" high, and 8" deep. Each is provided with a close-fitting stainless steel cover.**	1-8-93
350.	Deficiency: Sample Immersion Tests, Page 13 of Liner/Leachate Compatibility Test Plan "The containers will be fitted with loose-fitting lids to prevent over pressurization during heating and still minimize evaporation." Method 9090 calls for a sealed lid to prevent evaporation. In addition, the pressure inside and outside the tank must be the same. These two requirements necessitate a sealed lid combined with a condenser. **DOE-RL/WHC Response: TM 9090 calls for sealed, atmospheric pressure vessels in an attempt to ensure that no volatiles escape. In the W-025 test, no volatile components were present except for the water in the tanks. The water level was checked periodically and refilled as necessary; the small concentration changes were insignificant and no salts precipitated. Though loose, the lids were sufficiently tight-fitting that evaporation was minimal and the intent of TM 9090 was met.**	1-8-93
351.	Comment: Sample Immersion Tests, Page 13 of Liner/Leachate Compatibility Test Plan The Plan does not state that the leachate in the tank will be stirred. This is a requirement of method 9090. **DOE-RL/WHC Response: TM 9090 requires stirring to ensure a uniform mixing of the components and to ensure any component that settles out will be resuspended. All components in this test were soluble and stirring was therefore unnecessary. Nevertheless, when the liquid level was checked on a weekly basis, the test materials were agitated to ensure no gas bubbles were collecting on the surface that would isolate the geosynthetic from the solution.**	1-8-93

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No.	Comment/Response	Ecology Concurrence

352. Comment: Radiation Testing, Page 14 of Liner/Leachate Compatibility Test Plan — 1-8-93

Information regarding typical radionuclides and activities in the waste is not included. This data should be included with the list of chemicals in Appendix B.

DOE-RL/WHC Response: No information on the specific radionuclide content was available when designing the experiment. Therefore it was assumed that the allowable upper limits for Types A, B, and C wastes would be present.

353. Comment: Sample handling, Page 15 of Liner/Leachate Compatibility Test Plan — 1-8-93

The Plan does not discuss the procedure for storing the samples once they are removed from the exposure cells.

DOE-RL/WHC Response: After removal from the immersion test, the samples either were immediately measured and returned to the test or placed while still moist in Zip-Loc™ bags. The bagged samples are stored at ambient conditions, 23±2°C, until they were tested. The samples were tested within 24 hours, as required by the Plan and TM 9090. After testing, the scrap material was returned to the bags, sealed, and stored at ambient temperature.

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The following comments refer to the Construction Quality Assurance Plan for LLBG Non-Drag-Off Mixed Waste Trench (WHC-SD-W025-PLN-001).

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354. Comment: General regarding Construction Quality Assurance Plan (WHC-SD-W025-PLN-001)

Ecology's construction oversight of this project is outlined in the Construction Inspection Policy found in Enclosure 3 of this NOD. Although the policy itself will not be part of the permit but will be instead by referenced in the permit. The application must contain a statement that the requirements of Ecology's CIP will be met. It should also be noted that Ecology may require videotaped footage or may tape their own footage of certain construction activities.

No.	Comment/Response	Ecology Concurrence

DOE-RL/WHC Response No. 1: Ecology may choose to manage the oversite of this project as outlined in the Construction Inspection Policy (CIP). The CIP is an internal policy for Ecology and has no standing under the regulations; therefore RL will not make a statement that the requirements of Ecology's CIP will be met.

Comment: General

Although a Construction Inspection Plan (CIP), formerly called a Construction Inspection Policy, is not specifically identified in regulations, its requirements are derived from the regulations and the CQA plan for this project. The CIP does not represent additional QA work to be completed, but instead provides Energy with Ecology's expectations for involvement and oversight during construction. Ecology believes that the CIP is necessary to ensure the approved plans, specifications and applicable regulations are followed.

RL/WHC Response No. 2: Ecology may choose to manage the oversite of this project as outlined in the Construction Inspection Policy (CIP). The CIP is an internal policy for Ecology and has no standing under the regulations; therefore RL will not make a statement that the requirements of Ecology's CIP will be met.

355. Comment: Section 1.1, Purpose, Page 5 of 112 in Construction Quality Assurance Plan (WHC-SD-W025-PLN-001)

Please provide Ecology with a copy of the Quality Assurance Program Plan (QAPP) that was prepared for this project.

DOE-RL/WHC Response No. 1: WHC-SD-W025-QAPP-001, Quality Assurance Program Plan for Project W-025, Radioactive Mixed Waste Facility, Non-Drag-Off, will be released to Ecology in the near future.

Comment: Section 1.1, Purpose, Page 5 of 112

Ecology will further address this comment upon receipt of a copy of the Quality Assurance Program Plan (QAPP).

RL/WHC Response No. 2: The QAPP was sent to Ecology.

No.	Comment/Response	Ecology Concurrence
356.	Deficiency: Section 2.1.5.6, Consultants/Subcontractor, Page 9 of 112 in Construction Quality Assurance Plan (WHC-SD-W025-PLN-001) The condition for the CQA personnel to coordinate with the surveyor to measure the depth and slope of various landfill components proved to be an unsuccessful means for the LERF project in verifying the design requirements are met. Requirement: CQA personnel should use a level to check for themselves that depth and slope requirements are met. In addition, a survey report should be prepared to document the thickness and grade of each lift. **DOE-RL/WHC Response: The most recent version of the CQA Plan states (Section 2.1.5.6) that "CQA surveying ... will be subcontracted by GAI." GAI will be the CQA Engineer. This allows complete independence from the Contractor and satisfies Ecology's requirement. In Section 5.7, it is noted that "the as-built drawings, which will be generated by a licensed land surveyor, shall include scale drawing depicting depths, plan dimensions, elevations, and soil component thicknesses."**	1-8-93
357.	Comment: Section 2.2.1, Pre-Construction Meeting, Page 10 of 112 in Construction Quality Assurance Plan (WHC-SD-W025-PLN-001) An additional topic to be added to this list is the overall project schedule. **DOE-RL/WHC Response: The overall project schedule is a required submittal from the Contractor and will, in part, be dictated by the results of the pre-construction meeting. A bullet to note "Reviewing the proposed project schedule" will be added to this section of the CQA Plan.**	1-8-93

No.	Comment/Response	Ecology Concurrence
358.	Comment: Section 4.3.1. Excavation, Backfilling, and Grading, Page 17 of 112 in Construction Quality Assurance Plan (WHC-SD-W025-PLN-001) Comment 356 also applies here. **DOE-RL/WHC Response: See response to comment 356.**	1-8-93
359.	Comment: Section 4.3.2, Admix Soil Liner, Page 18 of 112 in Construction Quality Assurance Plan (WHC-SD-W025-PLN-001) According to the Definitive Design Report and specifications, the admix liner soil is coming from on-site and will be amended with bentonite. Unless there has been a change in admix liner criteria, it would be beneficial to rewrite these paragraphs to directly reflect the use of on-site materials. In addition, bentonite swell testing should be conducted on the raw bentonite materials. A description of the swell test to be used must also be provided. **DOE-RL/WHC Response No. 1: Although it is planned to obtain admix liner soil from on-site sources, the CQA Plan has been written to allow off-site sources if required. This eliminates the need for revising the CQA Plan should an unforseen contingency arise.** **The tests listed in the CQA Plan are considered those necessary to establish the quality of the bentonite and reflect the requirements of API Specification 13A, Section 4 (see Specifications Section 02224). The swell test is not required for this purpose.** Comment: Section 4.3.2, Admix Soil Liner, Page 18 of 112 The free swell test is required for the bentonite to be used. This test must be run before mixing. **RL/WHC Response No. 2: The free swell test will be added to the Specifications and CQA Plan during the next revision or via the ECN process.**	

No.	Comment/Response	Ecology Concurrence
360.	Comment: Section 4.3.2, Admix Soil Liner, Page 18 of 112 in Construction Quality Assurance Plan (WHC-SD-W025-PLN-001) As discussed in other comments, the admix must be prepared in a pugmill. Therefore, the Material Inspection program must require moisture content and soil/bentonite percentage tests to be carried out during the mixing operation to separate rejected material. **DOE-RL/WHC Response: The Specifications and CQA Plan will be revised to reflect use of a pugmill and will include testing as requested above.**	1-8-93
361.	Comment: Section 4.3.2, Admix Soil Liner, Test Fill, Pages 19, 20 and 21 of 112 in Construction Quality Assurance Plan (WHC-SD-W025-PLN-001) It appears that only one test fill (pad) will be constructed for the Non-Drag-Off facility. But there will be two different slopes at the facility, at 2.5 percent bottom slope and 3H:1V side slope. The contractor is given a choice on how to construct the side slope either parallel to the slope or horizontal to the slope. The test fill should be done in a similar manner as full-scale construction. If the contractor elects to build the side slopes in horizontal lifts then one test fill which is fairly flat would be appropriate. If the contractor elects to build the side slopes in lifts parallel to the slope, then another test fill must be built at a 3H:1V side slope. This will allow the contractor and CQA Engineer to determine if different construction methods and criteria are needed for the different slopes at the landfill. The test fill section should be amended to note that if the contractor elects to build the admix liner parallel to the side slopes, a second test fill will be required. The second test fill should be tested, monitored and inspected the same as the first test fill. How will repaired liner sections be tested to ensure repaired sections equal or exceed the performance of other liner sections? What method(s) will be used to collect undisturbed samples?	1-8-93

No.	Comment/Response	Ecology Concurrence

DOE-RL/WHC Response: The Specifications (Section 02224, Part 3-5.J) require the Contractor, if placing admix parallel to the slopes, to avoid spinning the wheels of the compaction equipment or disturbing the previously placed lifts in any other way. This requirement is included specifically so that the liner on the slopes and floor will be essentially the same. The contractor's equipment and methods will be developed with the horizontal test fill. The first section of admix placed on the slopes will be visually inspected and will be required to satisfy moisture, compaction, and permeability requirements as defined in the CQA Plan. Unsatisfactory placement techniques will be detected at this time (i.e., the first admix section serves as a test fill). Therefore, a second test fill is not required.

In addition, laboratory testing of admix samples from the floor and sideslopes of landfills generally indicates similar permeability. Thus, the use of one test fill is appropriate.

Repaired liner sections will be tested in the same way as other parts of the liner, i.e., density and moisture content.

Undisturbed samples will be obtained with Shelby tubes (thin-walled sampling tubes).

362. Comment: Section 4.3.2, Admix Soil Liner, Page 21 of 112 in Construction Quality Assurance Plan (WHC-SD-W025-PLN-001) — 1-8-93

The number and frequency of field and laboratory tests to be conducted during the test fill must be changed as follows: fields in-place density (rubber balloon) - 1 for every lift (minimum); laboratory permeability test - 1 for every lift (minimum); field in-place permeability test (sealed double-ring infiltrometer) - 1 after completion. The other tests listed here should remain the same. The procedures for conducting the sealed double-ring infiltrometer test must be added to the text.

DOE-RL/WHC Response: The above changes will be included in the CQA Plan. A description of the procedures will be included.

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363.	Comment: Section 4.3.2, Admix Soil Liner, Page 21 of 112 in Construction Quality Assurance Plan (WHC-SD-W025-PLN-001) The fourth bullet in the Construction section should be edited to read "...are discarded or reduced in size;" The last bullet on this page should be removed as it is applicable to in-place mixing. The admix for this project will be mixed in a pugmill. **DOE-RL/WHC Response: First change will be made as requested. The CQA Plan will be revised to reflect use of a pugmill only.**	1-8-93
364.	Deficiency: Section 4.3.2, Admix Soil Liner, Page 22 of 112 in Construction Quality Assurance Plan (WHC-SD-W025-PLN-001) Desiccation cracking is caused by drying below optimum moisture. Smooth rolling this material is treating the symptom, not the cause. Rolling the surface will not be acceptable. Requirement: Water must be applied to the surface if desiccation cracking is evident. See comment 266. **DOE-RL/WHC Response No. 1: See response to comment 266. Reference to smooth-drum rolling will be deleted.** Comment: Section 4.3.2, Admix Soil Liner, Page 22 of 112 Comment 266 also applies here. **RL/WHC Response No. 2: See response to Comment No. 266.**	

No.	Comment/Response	Ecology Concurrence
365.	Deficiency: Section 4.3.2, Admix Soil Liner, Page 22 of 112 in Construction Quality Assurance Plan (WHC-SD-W025-PLN-001) A sheepsfoot roller cannot be used to scarify the surface of each lift since the lift should be compacted to the point the sheepsfoot roller walks out of the soil. Therefore, this roller will not scarify the face. Requirement: A disk harrow must be used to scarify the surface. **DOE-RL/WHC Response: "Disk harrow" will be substituted for "sheepsfoot roller" in the text.**	1-8-93
366.	Comment: Section 4.3.2, Admix Soil Liner, Construction, Page 22 of 112 in Construction Quality Assurance Plan (WHC-SD-W025-PLN-001) When the undisturbed soil liner samples are collected, it is recommended that at least one should be from the side slope and one should be from a corner. These are the areas that are most likely to fail due to the difficulties of operating compaction equipment. If a nuclear gauge is not used for field density testing, what method will be used and what will be the backup method? **DOE-RL/WHC Response: Because the majority of the area of the W-025 Landfill is sideslope, the existing sampling requirements ensure that a number of samples will be taken from the sideslopes. At least one sample will be taken from a corner area. The locations will be at the direction of the CQA Engineer.** **As shown in Appendix A of Rev 1 of the CQA Plan, density will be taken using the sand cone or rubber balloon methods if a nuclear gage is not used.**	1-8-93

No.	Comment/Response	Ecology Concurrence
367.	Deficiency: Section 4.3.2, Admix Soil Liner, Page 23 of 112 in Construction Quality Assurance Plan (WHC-SD-W025-PLN-001) It is not practical to remedy incorrect moisture content through scarifying, moisture conditioning and recompaction in the hot, dry climate at the Hanford Reservation. Requirement: The soil must be removed, moisture adjusted, and then replaced and recompacted. **DOE-RL/WHC Response: The admix must satisfy moisture and density specifications. The text will be changed to read "...and recompacted or otherwise reworked and retested until moisture and density specifications are achieved."**	1-8-93
368.	Comment: Section 4.3.2, Admix Soil Liner, Page 24 of 112 in Construction Quality Assurance Plan (WHC-SD-W025-PLN-001) Comment 356 also applies here and to the first paragraphs of page 25 of 112 and page 27 of 112. **DOE-RL/WHC Response: See response to comment 356.**	1-8-93
369.	Comment: Section 4.3.3, Gravel Drainage Layers Construction, Page 24 of 112 in Construction Quality Assurance Plan (WHC-SD-W025-PLN-001) The CQA inspector should also observe the placement and compaction of gravel drainage materials around piping and the leachate collection sump. **DOE-RL/WHC Response: Will add this requirement to text.**	1-8-93

No.	Comment/Response	Ecology Concurrence
370.	Comment: Section 4.3.5, Anchor Trench/Side Slope Riser Pipe Trench, Page 26 of 112 in Construction Quality Assurance Plan (WHC-SD-W025-PLN-001) There is no mention of the side slope riser pipe trench in this section other than in the title. Since soil placement and compaction around piping is different than for an anchor trench, CQA requirements should be identified for the side slope riser pipe trench also. **DOE-RL/WHC Response: Requirements for placement and compaction of soil in the sideslope riser trench will be added to this section.**	1-8-93
371.	Comment: Section 4.3.6, Asphalt, Page 27 of 112 in Construction Quality Assurance Plan (WHC-SD-W025-PLN-001) Insert "stockpiling and" after the word "during" in the second bullet of this section. Insert "mixing and " after the word "concrete" in the third bullet of this section. The text should also indicate that sub-base grading, layout and compaction must be verified prior to placement of the asphalt concrete. **DOE-RL/WHC Response: As noted in Appendix A of Rev 1 of the CQA Plan, top course material will be tested (gradation, compaction, and density) before and during construction. Also, the Contractor is required to submit mix design, placement, and compaction methods. Asphalt concrete samples will be taken and tested during construction. Testing requirements always imply acceptance by the CQA Engineer.**	1-8-93
372.	Comment: Section 4.3.7, Concrete, Page 27 of 112 in Construction Quality Assurance Plan (WHC-SD-W025-PLN-001) Insert "and reinforcing steel" after the word "formwork" in the second bullet of this section. **DOE-RL/WHC Response: Will modify text as requested.**	1-8-93

No.	Comment/Response	Ecology Concurrence

373. Comment: Section 4.3.7, Concrete, Pages 27 and 28 of 112 in Construction Quality Assurance Plan (WHC-SD-W025-PLN-001)

Where the concrete will be utilized as a liner, there is no mention of inspection for cracks and gaps as required in the regulations. See comments 283 and 339.

DOE-RL/WHC Response No. 1: The tank containment sump will be lined with an HDPE FML. See responses to comments 283 and 339.

Comment: Section 4.3.7, Concrete, Page 27 and 28 of 112

Comment 283 also applies here.

RL/WHC Response No. 2: See response to Comment No. 283.

374. Comment: Section 4.4.1.1, HDPE Manufacture, Page 29 of 112 in Construction Quality Assurance Plan (WHC-SD-W025-PLN-001) — 1-8-93

The manufacturer should also provide recommended repair procedures.

DOE-RL/WHC Response: Extensive repair procedures are contained in the Specifications (Section 02275 Part 3-1.E). These include typical manufacturer's recommendations, Installer's recommendations, and much field experience as to which methods are appropriate for various conditions.

375. Comment: Section 4.4.1.2, Receiving, Inspection, and Conformance Testing, Page 30 of 112 in Construction Quality Assurance Plan (WHC-SD-W025-PLN-001) — 1-8-93

Paragraph 5 on this page must be edited to read "Rolls of geomembrane which do not meet or exceed..."

DOE-RL/WHC Response: Will modify text as requested.

No.	Comment/Response	Ecology Concurrence
376.	Comment: Section 4.4.1.2, Receiving, Inspection and Conformance Testing, Page 32 of 112 in Construction Quality Assurance Plan (WHC-SD-W025-PLN-001) The Geomembrane Contractor should be defined (manufacturer, fabricator, installer, etc.). **DOE-RL/WHC Response: The term "Geomembrane Installer" will be used consistently throughout the text.**	1-8-93
377.	Comment: Section 4.4.1.5, Bedding Layer, Page 32 of 112 in Construction Quality Assurance Plan (WHC-SD-W025-PLN-001) The geomembrane bedding layer is not to have sharp changes in grade but design drawings have some trenches with vertical walls and 90 degree corners. We agree that sharp changes in grade should be avoided. See comment 292. This section reads a little differently than the specification. For clarity, the specification and CQA Plan should read the same, otherwise the contractor and CQA personnel could be confused as to which requirement is to be followed. **DOE-RL/WHC Response: See response to comment 292. The requirements in the Specifications and CQA Plan will be made consistent.**	1-8-93

No.	Comment/Response	Ecology Concurrence
378.	Comment: Section 4.4.2.2, Field Seaming of Geosynthetics, Pages 33 through 36 of 112 in Construction Quality Assurance Plan (WHC-SD-W025-PLN-001) The specifications and CQA Plan description on when the "master seamer" is to be present do not agree. The specification and CQA Plan should read the same to avoid confusion. The CQA Plan gives the Project Manager the right not to accept seaming personnel to work at the site if their qualifications are insufficient. The specification does not contain this requirement. The specification and CQA Plan should read the same to avoid confusion. The test seam the CQA Plan requires is at least two-feet-long by one-foot-wide. The specification test seam is at least three-feet-long by one-foot-wide. The specification and CQA Plan should read the same to avoid confusion. **DOE-RL/WHC Response: The Specifications and CQA Plan will be made consistent, although each document, because of their different purposes, may not contain the same details. The test seam will be two-feet-long in both documents.**	1-8-93
379.	Comment: Section 4.4.2.5, Repairs, Pages 37 and 40 of 112 in Construction Quality Assurance Plan (WHC-SD-W025-PLN-001) The section contains information different from the specification. To avoid conflicting information, the CQA Plan and the specification should read the same to avoid confusion. See comments 331 and 332. **DOE-RL/WHC Response: The Specifications and CQA Plan will be made consistent.**	1-8-93

No.	Comment/Response	Ecology Concurrence
380.	Comment: Section 4.4.2.6, Materials in Contact with Geomembrane, Page 40 of 112 in Construction Quality Assurance Plan (WHC-SD-W025-PLN-001) This section contains information that is not the same as the specification. The CQA Plan and the specification should read the same to avoid confusion. See comment 333. **DOE-RL/WHC Response: The Specifications and CQA Plan will be made consistent. See response to comment 333.**	1-8-93
381.	Comment: Section 4.5.1, Pre-Construction, Page 42 of 112 in Construction Quality Assurance Plan (WHC-SD-W025-PLN-001) Who is the CQA consultant? This individual or organization was not described in the personnel requirements section. In addition, the manufacturer should submit their recommended installation, repair, and testing procedures. **DOE-RL/WHC Response: The CQA Consultant will be defined in Section 2.1.5 of the CQA Plan. Extensive installation, repair, and testing procedures are contained in the Specifications (Section 02275 Part 3-1.E). These include typical manufacturer's recommendations, Installer's recommendations, and much field experience as to which methods are appropriate for various conditions.**	1-8-93

No.	Comment/Response	Ecology Concurrence
382.	Comment: Section 4.5.2.2, Geotextile, Geocomposite, and Geonet, Page 45 of 112 in Construction Quality Assurance Plan (WHC-SD-W025-PLN-001) Wide strip (width) tensile test on the geotextiles was not included in the specifications. Wide strip tensile test should be included in the specification and the minimum physical property requirement specified. Transmissivity testing of the geonet was not included in the list. This item should be included since it will be tested for according to the specification. Mass per unit area testing on the geonet was not included in the specification but should be along with the minimum physical property requirement. **DOE-RL/WHC Response: With respect to conformance testing, the wide strip tensile test will not provide any additional information beyond what is obtained from other strength tests. Therefore, it will not be required and will be deleted from the CQA Plan. Geonet transmissivity will be added to the CQA Plan. Geonet mass per unit area will be added to the Specifications.**	1-8-93

No.	Comment/Response	Ecology Concurrence

383. Deficiency: Section 4.6, Temporary Leachate Collection Tank and Associated Features, Page 48 in Construction Quality Assurance Plan (WHC-SD-W025-PLN-001) of 112

No discussion was provided on the construction inspection, leak testing or certifying of the tank and components as required in WAC 173-303-640. See comments 272 and 342.

Requirement: Provide a more complete discussion on construction inspection, leak testing and certifying of the temporary leachate collection tank and associated features to meet the requirements of the regulations. In addition, the requirement for the manufacturer to submit certifications and shop drawings should be noted in this plan.

DOE-RL/WHC Response No. 1: See responses to comments 272 and 342.

Comment: Section 4.6, Temporary Leachate Collection Tank and Associated Features, Page 48 of 112

Comment 272 also applies here.

RL/WHC Response No. 2: See response to Comment No. 272.

384. Comment: Section 4.8, Electrical System and Pump controls, Page 50 of 112 in Construction Quality Assurance Plan (WHC-SD-W025-PLN-001) — 1-8-93

The qualifications and experience records of the installer's key personnel must be submitted by the installer.

DOE-RL/WHC Response: Unlike the geosynthetics, the pump and control system can and will be tested completely prior to acceptance. Hence, the installer's qualifications, although relevant to the efficiency of construction, are not pertinent to the final installation.

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385. Comment: Appendix A, Section 02224, Admix Production, Placement, Compaction and Trimming, Page 63 and 64 of 112 in Construction Quality Assurance Plan (WHC-SD-W025-PLN-001)

The specifications require that the Eolian sand for admix production have no rocks larger than 1-inch-diameter. The table says there is no acceptance criteria applicable for grain size distribution. The table should be amended to refer the CQA inspector to the correct section in the specifications.

Bentonite yield in the specification requires a bentonite with a minimum yield of 125 barrels. The CQA Plan requires a minimum yield of 91 barrels. The proper bentonite yield should be selected and the CQA Plan or specification amended.

Equipment types, speed of equipment, number of passes, and special construction methods should be added to the Pre-Placement Mixing section, Test Fill Construction section, and Soil Liner Construction section. These are important items and by adding them will remind the CQA inspectors and contractor to document and use this information.

DOE-RL/WHC Response No. 1: The requirement for 1-inch maximum particle size will be added to the table. The Specifications will be changed to require a minimum yield of 91 barrels. The equipment and construction methods are implicit in the requirement for visual inspection; these are Hold points for both the test fill and initial liner placement, so will not be forgotten.

Comment: Appendix A, Section 02224, Admix Production, Placement, Compaction and Trimming, Page 63 and 64 of 112

Equipment types, speed of equipment, number of passes, and special construction methods should be specified for the contractor to follow. The purpose of the test fill is to establish these parameters to be able to place them in the specifications. Specifying these requirements is standard engineering practice.

RL/WHC Response No. 2: Equipment types, speed, number of passes, special construction methods, and other parameters will be specified prior to placing the admix liner, in accordance with the intent of Ecology's comment. The basis for these specifications will be the results of the Test Fill (see Specifications WHC-S-045 Rev. 1 Section 02224). Once these

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requirements are established, the Contractor will not be allowed to depart from them without repeating the test fill process.

The Specifications for admix placement do provide some general guidance on compaction equipment where necessary. However, in accordance with Federal procurement laws, the construction specifications cannot be written so stringently as to limit competition. This would clearly be the case if particular types of equipment, which may be owned by one contractor but not another, are required.

It is important to note that the Specifications establish the performance requirement that the admix liner have a permeability no greater than 1×10^{-7} cm/sec. The CQA Plan requires extensive testing to demonstrate that this requirement is met. If the Specifications were to establish equipment and construction methods at the present time, without the benefit of the test fill, it is conceivable that these requirements would not meet the performance objective. The result would likely be contradictory specifications, cost overruns, schedule delays, and a less effective admix liner.

386. Comment: Appendix A, Section 02226, Granular Drainage Layers, Page 66 of 112 in Construction Quality Assurance Plan (WHC-SD-W025-PLN-001) — 1-8-93

According to the specifications and design drawings, these layers are to be surveyed and should be included as an item in the table.

DOE-RL/WHC Response: Surveying of the sump and drainage gravel layers has been included in the table in Appendix A of Rev 1 of the CQA Plan.

387. Comment: Appendix A Section 02228, Operations Layer, Page 68 of 112 in Construction Quality Assurance Plan (WHC-SD-W025-PLN-001) — 1-8-93

According to the specifications and design drawings, the operations layer is surveyed and should be included as an item in the table.

DOE-RL/WHC Response: Surveying of the operations layer has been included in the table in Appendix A of Rev 1 of the CQA Plan.

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388.	Comment: Appendix A Section 02275, Geosynthetics, Page 69 and 73 of 112 in Construction Quality Assurance Plan (WHC-SD-W025-PLN-001) Thickness testing, ASTM D 1593, was called out differently than in the specification. The specification used ASTM D 750. The method shown on the manufacturer's data sheet is ASTM D 1593. Review the thickness test methods called out and select the appropriate method for this job. Then amend the specification or CQA Plan to list the correct test method. Geotextile conformance testing did not include mass per unit area ASTM D 3766 and wide strip (width) tensile test ASTM D 4595. These tests should be included in the list. See comment 382. Geonet conformance testing did not include mass per unit area ASTM D 3776C. This test should be included in the list. See comment 382. **DOE-RL/WHC Response: The Specifications will be revised to require ASTM D1593. ASTM D3776 will be added to the table for both geotextiles and geonets; see response to comment 382.**	1-8-93
389.	Comment: Appendix A, Sections 03100, 03210, 03310, Concrete Formwork, Reinforcing Steel, Structural concrete, Page 78 of 112 in Construction Quality Assurance Plan (WHC-SD-W025-PLN-001) Checking for cracks and gaps in the temporary leachate collection tanks concrete liner should be added. See comments 283, 339, and 383. **DOE-RL/WHC Response No. 1: See responses to comments 283, 339, and 383.** Comment: Appendix A, Sections 03100, 03210, 03310, Concrete Formwork, Reinforcing Steel, Structural Concrete, Page 78 of 112 Comment 283 also applies here. **RL/WHC Response No. 2: See response to Comment No. 283.**	

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21945

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