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APR 10 1986

Mr. O. L. Olson
Director
Basalt Waste Isolation Division
U. S. Department of Energy
Richland Operations Office
P. O. Box 550
Richland, WA 99352

Dear Mr. Olson:

By this letter, the U. S. Nuclear Regulatory Commission (NRC) is transmitting the staff's review of the document entitled "Test Plan for Multiple-Well Hydraulic Testing of Selected Hydrogeologic Units at the RRL-2 Site, Basalt Waste Isolation Project (BWIP), Reference Repository Location" (SD-BWI-TP-040). The staff's observations resulting from the December 9-10, 1985 meeting have been integrated into these comments.

Based on the staff's review of the document prior to the December 1985 meeting, it was initially determined that the proposed testing strategy was consistent with that presented in the NRC's BWIP Site Technical Position (STP) 1.1. The test plan indicated that testing would begin with a repository scale, multiple-well pump test of the Rocky Coulee flow top. Additionally, testing would occur only after baseline hydraulic heads had been established and would continue until sufficient data were collected to allow identification and evaluation of hydrologic boundaries and hydraulic continuity of the hydrogeologic units surrounding the RRL.

Discussions during the meeting, however, indicated that the BWIP's present strategy deviates significantly from the strategy presented in STP 1.1 in two key areas. First, initial testing will not be on a repository scale, and thus, will not adequately evaluate the hydrologic and hydraulic properties of the Columbia River Basalts within the Cold Creek Syncline. This reduced scale of testing will not support development and calibration of repository performance models. Although the test plan indicated that repository scale testing would be performed, the BWIP refused, during the December meeting, to commit to performing such a test. Second, BWIP indicated during the meeting that baseline hydraulic heads, with respect to characterization of the pre-emplacement ground water flow system, will not be established prior to initiating the testing. Stage 1 of the strategy presented in STP 1.1 calls for a technical consensus that piezometric baseline, which is adequate for use in developing defensible assessments with respect to 10 CFR 60, has been established prior to initiating testing. The primary NRC concern is that perturbations on the system may be of such a magnitude that baseline determination may be delayed for a long period of time or be impossible to

obtain within DOE's schedule for repository development. As the BWIP has stated in the past, other site activities, such as exploratory shaft construction and testing, may also significantly perturb hydraulic heads around the RRL further delaying establishment of baseline. This premise is substantiated by the hydraulic head perturbations evidenced in wells DC-19, 20, and 22 caused by removal of bridge plugs from RRL-14 and the drilling of DC-23, thus delaying the establishment of an LHS test baseline by several months. If such small-scale activities can create significant perturbations, it is conceivable that perturbations caused by exploratory shaft construction could delay the establishment of hydrologic baseline, with respect to characterization of the pre-emplacement groundwater flow system, for a period of several years. Such perturbations, should they occur while LHS testing is being performed, could also limit the DOE's ability to interpret LHS test data. The DOE's hydrologic testing strategy should allow for sequencing of site activities so that effects of one activity will not compromise the ability to perform others. Hydrologic baseline should be established to the extent possible with existing wells prior to performing any hydrologic testing. The DOE should be conservative with respect to baseline establishment, as this may be the only opportunity to collect necessary information in this area. Should the DOE determine that a testing program that significantly deviates from the agreed to strategy in STP 1.1 is more appropriate for characterizing the hydrologic regime at the BWIP, the DOE should provide to the NRC their rationale for deviating from STP 1.1 and explain how the proposed plan will provide a better hydrologic characterization of the site.

It became apparent during the December 1985 meeting that the BWIP's proposed plans for hydrologic site characterization were not sufficiently developed to allow commencement of testing in February 1986, as proposed. A sound technical rationale for the purpose and timing of the proposed testing was not presented nor was documentation provided to the NRC at the meeting. In addition, testing procedures and quality assurance plans had not yet been finalized, and the BWIP could not satisfactorily demonstrate how the testing strategy was being integrated with other site characterization activities.

It is our understanding, based on several telephone conversations between our staffs, that the BWIP is currently reevaluating their strategy and plan for hydrologic testing. In accordance with NRC/DOE agreements on pre-licensing consultations, it is requested that NRC/DOE consultations take place during the development of any new testing strategy so that the NRC can provide timely guidance that can be considered during your planning stages and thereby avoid unnecessary schedule delays. Additionally, the staff also requests early involvement in the readiness review process to provide the DOE guidance in this area prior to issuance of the Draft Readiness Review Plan.

*See previous concurrence

OFC	:WMRP:mkb	:WMGT	:WMGT	:WMGT	:WMRP	:	:
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Prior to initiating any hydrologic test work, the DOE should also develop a comprehensive quality assurance plan that is consistent with the criteria of Appendix B of 10 CFR 50. Backfitting of QA procedures after the fact is not acceptable.

Although most of the attached comments were discussed during the December 1985 meeting, few were resolved to the satisfaction of the NRC staff. Many of our comments required analyses that the BWIP had either not performed or was not prepared to present at the meeting. When revising the test plan document, the DOE should reincorporate the consultation review steps as agreed at the May 1985 Hydrology meeting. Additionally, the attached detailed comments together with the observations and agreements in the signed meeting minutes resulting from the December 1985 meeting should be addressed. The NRC considers resolution of these comments necessary prior to initiating hydrologic testing or exploratory shaft construction. The next appropriate forum for resolving these comments is the NRC/DOE workshop tentatively planned for July or August of this year.

Should you have any questions, please contact Paul Hildenbrand of my staff at FTS 427-4672 or Michael Weber at FTS 427-4746.

Sincerely,

John J. Linehan, Section Leader
Repository Projects Branch
Division of Waste Management
Office of Nuclear Material Safety
and Safeguards

Enclosure:
NRC Review Comments

cc: R. Stein, DOE-HQ

*See previous concurrence

OFC	:WMRP:mkb	:WMGT	:WMGT	:WMGT MK	:WMRP RB	:	:
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NRC'S DETAILED COMMENTS ON
"TEST PLAN FOR MULTIPLE-WELL HYDRAULIC TESTING OF
SELECTED HYDROGEOLOGIC UNITS AT THE RRL-2 SITE,
BWIP, RRL" SD-BWI-TP-040

The following comments have been classified into several categories as they pertain to BWIP's proposed large-scale hydraulic stress (LHS) testing at RRL-2.

Monitoring Facilities

1. Monitoring Locations and Frequencies

Because of the uneven distribution of monitoring facilities around the pumping well (RRL-2B), BWIP's ability to characterize and interpret hydraulic responses to pumping stress in three dimensions is limited. As planned, water levels will not be monitored between radial distances of 152 m (RRL-2A) and 2250 m (RRL-14). Without water level information at intermediate scales between RRL-2A and RRL-14, results from LHS testing of the Grande Ronde Basalts at RRL-2 may yield considerable uncertainty in interpretations drawn from the test results. For example, deviations from expected drawdown responses may be caused by distributed leakage through flow interiors or discrete features, or by interference by hydrogeologic boundaries. It appears that current monitoring facilities at the Hanford Site are inadequate to achieve the objectives of LHS testing because of their locations and limited number.

The inadequacy of present monitoring facilities is especially acute for the third planned LHS test, which will stress the Grande Ronde 5 flow top. Of the three proposed tests, the LHS test of the Grande Ronde 5 flow top has the greatest potential to be a repository-scale test because of the unit's apparent high transmissivity in the vicinity of the RRL-2 cluster. However, only two facilities presently monitor the Grande Ronde 5 flow top: RRL-2C at 76 m from RRL-2B and RRL-14 at 2250 m. The limited number and locations of these facilities appear to be inadequate to characterize hydrologic boundaries and hydraulic continuity, and the spatial distribution of hydraulic properties. BWIP should install additional monitoring facilities or substantially modify existing facilties prior to conducting the proposed LHS test in the Grande Ronde Number 5 flow top.

Prior to conducting LHS testing, BWIP needs to demonstrate how proposed monitoring facilities will provide necessary hydraulic head and response data for site characterization. BWIP should assess the limitations of the present monitoring network at the Hanford Site and improve the network to accomplish the objectives of LHS testing and site characterization. Potential improvements to the network range from increasing the frequency and location of head measurements at existing facilities to installing new monitoring

facilities. A more comprehensive piezometer network (both in frequency of measurement and location) would support characterization of the groundwater flow system in the Pasco Basin and provide a potentiometric baseline against which BWIP could compare effects of drilling, well development, testing, and other activities (e.g., exploratory shaft construction, off-site perturbations, wastewater disposal activities).

2. Cement Effects

During the drilling of RRL-2A and -6, the Rocky Coulee flow top was cemented to reduce mud loss. This cementing may adversely complicate the interpretation of water level responses and tracer breakthrough during the first LHS test. Such complications in RRL-2A could be especially important because of the sensitivity of test interpretations to water level responses at this location and because cement may inhibit tracer injection into the Rocky Coulee flow top.

During the meeting, BWIP asserted that cement does not significantly interfere with hydraulic communication between RRL-2A and the Rocky Coulee flow top. This position was based on evaluation of dynamic temperature logs and comparisons of hydraulic test data. Dynamic temperature logging indicated that the Rocky Coulee flow top still contributes flow to the well. BWIP also compared the transmissivity value determined from a hydraulic test of the combined Grande Ronde 2 flow and the Rocky Coulee flow top in RRL-2A with the transmissivity value determined from a pulse test in RRL-2B. BWIP concluded that the two transmissivity values compared favorably, thus indicating that cement does not inhibit hydraulic communication between the borehole and the Rocky Coulee flow top.

Although BWIP provided a verbal basis for its assertion that cement in RRL-2A and -6 does not signficantly inhibit hydraulic communication with the Rocky Coulee flow top, BWIP did not provide any documentation of the conclusions nor supporting assessments. BWIP should document the basis for its assertion and then provide it to NRC for review and comment.

3. Borehole Interflow

Subsequent to the first LHS test in the Rocky Coulee flow top and removal of bridgeplugs, interformational flow via open boreholes between flow tops and other producing zones may occur within observation wells RRL-2A, DC-4, RRL-6, and the McGee Well. The bridgeplugs were originally installed to minimize borehole interflow, which could interfere with interpretations of LHS test results by perturbing water levels. BWIP indicated during the meeting that borehole interflow would not significantly perturb water levels, yet did not provide any rationale for this conclusion. BWIP should carefully analyze whether borehole interflow subsequent to bridgeplug removal will significantly

affect interpretations of LHS test results. This analysis should then be presented to NRC for review.

4. Monitoring Facilities for the Ratio Test

BWIP proposes to analyze LHS test results using the Neuman-Witherspoon ratio method to derive estimates of vertical hydraulic conductivity of the flow interiors near RRL-2B. The utility of the first ratio test in the Rocky Coulee flow top is limited, however, because limitations of present monitoring facilities preclude determination of diffusivity for the flow interior above the Rocky Coulee flow. In addition, ratio testing could result in low, non-conservative estimates of hydraulic diffusivity for the Rocky Coulee flow interior because of piezometer compliance, which is the non-ideal response of piezometers caused by small-scale deformation of piezometer components.

The Neuman-Witherspoon (1972) ratio method requires head response data from within confining beds adjacent to the pumped aquifer (e.g., Rocky Coulee flow top in the first planned LHS test). These data are interpreted along with response data from within the pumped aquifer to estimate the hydraulic diffusivity of the confining units, where diffusivity equals the ratio of the confining unit's vertical hydraulic conductivity and its specific storage. Although response data can be collected from the piezometer completed within the Rocky Coulee flow interior at RRL-2C, response data cannot be collected within the flow interior above the Rocky Coulee flow top because BWIP has not completed a piezometer within the interior of Grande Ronde flow number 2. Thus, the first LHS test will not estimate the diffusivity of the flow interior above the Rocky Coulee flow top. Because of this limitation, the first LHS test will not serve as a good example of applying the ratio test to characterize vertical hydraulic conductivities of the Columbia River Basalts. In comparison, testing the Cohassett flow top may provide a better demonstration of ratio testing since flow interiors above and below the flow top will be monitored.

In addition, the utility of the first ratio test may also be limited because piezometer compliance could delay head responses in piezometers completed in the flow interiors. This delay could bias analyses of test results by underestimating the hydraulic diffusivity of the interiors, thus underestimating values of vertical hydraulic conductivity which would be nonconservative with respect to repository performance. BWIP should assess the significance of time-lag due to compliance of piezometers in the RRL-2C cluster that will be used for the ratio test. For example, BWIP could measure piezometer compliance prior to LHS testing by conducting pulse tests in appropriate piezometers. After the LHS test is completed and the results needed for the ratio test have been collected, BWIP could then compare the lag time determined in pulse tests with the time difference between the start of the test and initial response detected in the piezometers completed in the flow

interiors. If the piezometer lag time is comparable with the initial response time, then BWIP may need to correct the response data to characterize hydraulic diffusivities.

5. Grout Permeabilities

During the meeting, BWIP indicated that the permeabilities of grouts used in the clustered piezometer installations (i.e. DC-19/20/22) had recently been estimated using permeameter testing. The contrast between the grout permeability in the cluster installations and that of the basalts is important to reliable performance of the piezometers. In addition, the effectiveness of the bond between the grout and basalt also affects the reliability of piezometer responses. Isolation of monitoring intervals using grout is especially important to reliable performance of piezometers completed within flow interiors because of the similarity of hydraulic conductivities between the grout and basalt. BWIP should present its analyses of grout permeability and integrity to NRC to demonstrate reliable performance of the piezometers.

6. Westbay Installation

Based on discussions during the meeting and the subsequent site visit by NRC consultants (12/11/85), the trial installation of a Westbay device in RRL-14 appears to be providing useful information about the device's utility within the Hanford site monitoring network. BWIP indicated during the meeting that the travelling pressure probe in the Westbay device will be used to monitor several horizons at RRL-14 during the LHS test. This does not appear feasible, however, because approximately 8 hours are required to complete a profile of all ports. The probe cannot be moved back and forth from one portal to another, thus it may not be useful to monitor several horizons during the LHS test because of the time consumed in moving the probe. BWIP should evaluate whether the configuration of the Westbay device can be effectively modified to monitor several flow horizons during LHS testing.

Despite their apparent limitations for near-field multi-level monitoring of LHS tests, Westbay devices may satisfy the need for additional far-field monitoring facilities at the Hanford Site (cf. USGS letter from Rollo to Olson, October 21, 1985). Additional facilities are needed to characterize the regional groundwater flow system in terms of both horizontal and vertical hydraulic gradients. For example, monitoring of such facilities outside of the Cold Creek Syncline may provide DOE with the ability to characterize vertical pressure profiles in areas where site activities are not expected to cause significant transient hydrologic responses. This type of additional information could significantly contribute to BWIP's understanding of the groundwater flow system at the Hanford Site. Based on experience gained with the Westbay device at RRL-14, BWIP should consider installing similar types of

devices in boreholes distant from the RRL to characterize the regional groundwater flow system.

Testing Procedures

7. LHS Testing Focus

The test plan states on page 41 that the "real focus of large-scale hydraulic testing in the Grande Ronde Basalt at the RRL-2 site is the Cohassett flow interior." This statement appears to be inconsistent with both the objectives of LHS testing stated earlier in the plan and BWIP's approach to repository performance assessment. As described in other sections of the test plan and NRC's BWIP Site Technical Position 1.1, the primary objective of LHS testing at BWIP is to provide repository-scale hydraulic data to support licensing assessments of repository performance. This includes characterization of hydraulic parameters, identification of hydrologic boundaries, evaluation of far-field hydraulic continuity, and formulation of defensible conceptual models of the groundwater flow system. To accomplish these objectives, LHS testing should develop a far-field perturbation in response to controlled stress, which can best be done in the units with the highest transmissivities. Of the three units identified in the test plan for LHS testing, the Cohassett flow appears to have the lowest transmissivities. Therefore, BWIP's focus on the Cohassett flow may decrease the potential for fulfilling the primary objective of LHS testing.

The focus on the Cohassett flow interior also appears inconsistent with BWIP's current approach to repository performance assessment. As stated on page 2-9 of the Exploratory Shaft Test Plan [SD-BWI-TP-007], "BWIP is following a logic which does not take credit for [groundwater] travel time [in] the preferred horizon dense interior." Since the goal of LHS testing is to develop information necessary for demonstrating compliance with licensing requirements, it would appear that BWIP should focus testing on hydrogeologic units that it plans to take credit for in the compliance demonstration.

In addition, if BWIP's proposed testing plan focuses on the Cohassett flow interior, the plan should be modified to include a long-term pumping test of the Cohassett flow top. The test plan implies that LHS testing will not be considered in the Cohassett flow top because of its assumed low transmissivity relative to other flow tops. However, long-term testing of the flow top may yield valuable information about the vertical hydraulic conductivity of the Cohassett and Rocky Coulee flow interiors. Uncertainty in estimates of vertical leakage can be reduced by pumping a lower transmissivity unit such as the Cohassett flow top because uncertainty in leaky aquifer analyses is reduced in LHS tests where aquifer response deviates substantially from the theoretical Theis response, and this deviation increases as the ratio in conductivities between the aquifer and confining units decreases. Thus, LHS testing of low

transmissivity flow tops may provide more information about vertical hydraulic conductivity than tests in higher transmissivity units.

BWIP should determine the appropriate focus of LHS testing at RRL-2 with respect to its approach for performance assessment and the objectives for LHS testing. As discussed during the meeting, BWIP should also evaluate LHS testing of the Cohassett flow top based on preliminary estimates of the unit's transmissivity at RRL-2B that will be determined through pulse tests and well development.

8. Pump Selection

The test plan states that the first LHS test in the Rocky Coulee flow top will use a positive displacement (sucker rod) pump. Positive displacement pumps, however, do not produce a continuous and constant rate of discharge. Fluctuations in pressure at the pumping well caused by pump cycling may complicate interpretation of early-time drawdown data if the fluctuations cause oscillations in water levels at observation wells RRL-2C and -2A. In addition, changes in pumping rate may be difficult to accomplish during the early part of the test because of the operation of the pump. It appears BWIP would have to turn the pump off to alter the pump discharge rate, which may unnecessarily complicate interpretation of the LHS test results. If the production capability of RRL-2B in the Rocky Coulee flow top is greater than anticipated, the sucker rod pump may not be able to pump at sufficiently high rates to optimize the performance of the LHS test.

When the selection of the sucker rod pump was discussed during the meeting, BWIP indicated the selection was based on the need to minimize the effects of wellbore storage. Although this is an advantage of using the sucker rod pump, other pumping schemes such as submersible pumping may also acheive this advantage while providing relatively constant discharge rates.

BWIP should attempt to keep the discharge rate relatively constant, as appropriate, during the pumping test to minimize complications in interpreting the test results. In addition, BWIP should document its rationale for selecting the sucker rod pump and evaluate potential adverse effects of sucker rod pumping on interpretation of water level data from the pumping well and RRL-2C and -2A.

9. Criteria for LHS Testing

The LHS test plan describes a nominal 30-day period of pumping during the first test from the Rocky Coulee flow top. The plan recognizes satisfactory tracer recovery and indications of hydraulic boundary conditions as criteria to determine when pumping should be terminated. Premature termination of the pumping, however, may limit the ability of the test to fulfill its objectives.

During the meeting, BWIP elaborated on the termination criteria which included accomplishment of test objectives and jeopardization of synchronous head measurements. In their present form, however, both of these criteria are subjective and need to be defined in greater detail to develop objective criteria for determining when pumping should be terminated. BWIP should also develop criteria for determining when transient responses caused by LHS testing have sufficiently subsided to allow subsequent LHS tests to begin.

Similar criteria should be developed to determine when pressure trends have been reestablished after the first tracer has been injected during the first LHS test, but before the transducer is pulled out of the second piezometer prior to tracer injection. During the meeting, BWIP indicated that both transducers in RRL-2A and -2C in the Rocky Coulee flow top could be out of the piezometers at the same time, which would eliminate BWIP's capability of monitoring drawdown if measurable perturbations from the first test do not reach more distant monitoring facilities beyond 2250 m. Thus, BWIP would not be able to detect hydrogeologic boundaries. Further, the removal of the tracer injection apparatus may also perturb pressures in the flow top, which could not be characterized unless at least one transducer remained in a piezometer in the flow top. Once developed, these criteria should be incorporated into LHS and tracer testing procedures.

10. Development of RRL-2B

The LHS test plan does not discuss how the the pumping well, RRL-2B, has been or will be developed prior to the first LHS test in the Rocky Coulee flow top, or how the well will be developed prior to subsequent tests. Drill cuttings and drilling fluids remaining in the Rocky Coulee flow top may inhibit flow to the well, thus decreasing well efficiency and potential pumping rates. The purpose of well development is to remove cuttings and drilling fluids from the formation. The drilling and completion specifications document for RRL-2B and -2C [SD-BWI-TC-023] mentions that RRL-2C will be developed prior to installation of the piezometers, but does not discuss well development activities for RRL-2B. In addition to improving well efficiency, controlled development of RRL-2B using air-lift pumping or other suitable techniques may provide valuable pre-LHS testing transmissivity estimates allowing selection of optimal pumping rates from the Rocky Coulee flow top. Use of well development as a pre-test would require that BWIP monitor water levels and/or pressures, discharge rates, and hydraulic responses to the development stress. Controlled well development of RRL-2B may provide more accurate estimates of aquifer transmissivity and a more defensible basis for selection of optimal pumping rates than the proposed pulse testing, particularly in higher transmissivity units. Hydrochemical sampling during well development could also be used to evaluate whether the bulk of drilling fluids injected during drilling have been removed. BWIP should carefully document the development procedures used in RRL-2B. If the well has not been developed, BWIP should evaluate alternative

development techniques and develop RRL-2B, as appropriate, prior to initiation of LHS testing.

11. Mechanical Effects

Based on pre-test analyses described in the test plan, BWIP expects that pumping from RRL-2B will develop significant drawdowns (e.g., 263 meters) in the vicinity of the pumping well during the first LHS test. Such large drawdowns may stimulate discontinuous deformation of the basalt flows by decreasing pore pressures and changing fracture apertures. Although stresses caused by changes in pore pressure may be insignificant compared with in-situ stresses, BWIP should recognize that changes in fracture apertures in close proximity to the pumping well may cause anomalous head responses during LHS testing.

12. Vesicular Zone Testing

As agreed in the meeting, BWIP needs to consider performing LHS tests of the vesicular zone in the Cohasset flow interior. BWIP's decision to conduct testing of the vesicular zone should be consistent with the test plan and be based on preliminary testing of the vesicular zone after the pumping well has been drilled through the zone.

13. Convergent Tracer Test

The test plan proposes integration of convergent well tracer testing with LHS testing of the Rocky Coulee flow top. The NRC is concerned that the tracer test may complicate the interpretation of LHS testing results. Injection of tracer solution and chase water under 250 m of head into RRL-2A and -2C, may result in pressure perturbations that could interfere with aquifer responses to pumping stress, especially within the flow interiors. Although such perturbations may not last long within flow tops (e.g., several hours to days), the pressure pulses in flow interiors may be on the order of meters and persist for periods up to tens of days. As discussed in comment number 9, conduct of the tracer test may also prevent continuous collection of pressure data at RRL-2A and -2C because the pressure transducers will be removed to inject the tracers.

In addition, the test plan does not provide a detailed rationale for how information derived from the convergent well tracer test will be utilized in evaluations of site performance. For example, the two-well recirculating tracer test conducted previously at the BWIP was not designed to provide repository-scale estimates of dispersivity (Leonhart et al., 1984). This same limitation also applies to the dispersivity values determined in the convergent well tests at RRL-2. The test plan's description of proposed tests does not evaluate whether lateral dispersion will be significant with respect to

longitudinal dispersion, or whether the hydraulic gradients imposed during the test will result in tracer behavior that is fundamentally different from tracer behavior under ambient conditions. This difference may be especially significant if flow through fractured basalt is assumed to represent an equivalent porous medium. Further, the plan does not discuss uncertainties about the representativeness of effective porosity and dispersivity values for portions of the Rocky Coulee flow top distant from RRL-2 and other basalt flow tops.

The NRC agrees that the DOE needs to characterize effective porosity and dispersivity at the BWIP site, but this information should be collected in a manner that does not compromise the primary objective of the LHS testing, i.e. to characterize the groundwater flow system including hydrologic boundaries, hydraulic continuity, and hydraulic parameters. BWIP should assess potential complications of conducting the convergent tracer tests in conjunction with the LHS test and concurrent ratio test, particularly with respect to monitoring water level responses within the flow interiors. This assessment should also document the rationale for the tracer tests including a discussion of the limitations and uncertainties that will be associated with the tracer test results.

REFERENCE: Leonhart, L. R., R. Jackson, D. Graham, L. Gelhar, G. Thompson, B. Kauchoro, and C. Wilson, 1984, "Analysis and Interpretation of a Recirculating Tracer Experiment Performed in a Deep Basalt Flow Top," RHO-BW-SA-300 P, Rockwell Hanford Operations.

Hydrologic Baseline

14. Perturbations to Hydrologic Baseline

Based on reviews of recent water level data submitted by BWIP, NRC observes that trends in hydraulic heads appeared to have been sufficiently established for LHS testing in the Rocky Coulee flow top in May and June of 1985. Since that time, concurrent site preparation activities (e.g., drilling bridgeplugs at RRL-14 and drilling DC-23) have perturbed the groundwater system causing significant deviations to pre-test trends. During the meeting, BWIP acknowledged that more time is now required to reestablish pre-test trends before LHS testing can begin. These recent perturbations demonstrated that hydraulic stresses can be propagated across the Reference Repository Location, thus adding credence to the feasibility of conducting repository-scale LHS testing. The perturbations also indicate that future combinations of drilling, construction, and testing may perturb hydraulic heads to the extent that characterization of the pre-emplacement groundwater flow system and LHS testing would be delayed for a significant amount of time.

In developing strategies and schedules for site activities, BWIP should consider potential complications and delays of site activities caused by perturbations to the hydrologic system. For example, BWIP indicated that a multi-year period of reduced site activity might be required to establish hydrologic baseline if it cannot be established prior to LHS testing and Exploratory Shaft construction. BWIP's strategy for site characterization should consider the practicality of these contingencies in light of the ambitious project schedules.

15. Hydrochemical Sampling

The test plan lists constituents that will be analyzed in groundwater samples collected during pumping (cf. Table 13). Although the list appears comprehensive, the test plan does not discuss the objectives for collecting the hydrochemical data or provide a rationale supporting the list. Based on NRC's understanding of BWIP's current strategy for site characterization, these data will be used to characterize baseline hydrochemistry of the Hanford Site to confirm conceptual groundwater flow models and to support predictions of post-emplacement hydrochemical environments along potential radionuclide pathways. BWIP should amend the test plan to discuss the objectives and rationale for the hydrochemical sampling.

In addition, BWIP has omitted carbonate and bicarbonate species from the list of constituents that will be analyzed. Bicarbonate and carbonate species may significantly affect radionuclide transport by a variety of processes, such as complexing, pH buffering, and precipitation. In addition, concentrations of these two species are essential for calculating ion balances. The NRC recognizes that the concentrations of these two species may be calculated based on pH, alkalinity, and concentrations of other constituents (Stumm and Morgan, 1970). However, it would be prudent for BWIP to analyze for carbonate and bicarbonate as a more direct and precise method of determining their concentrations than through calculations. BWIP should include carbonate and bicarbonate in the list of constituents to be analyzed or amend the test plan to describe how their concentrations will be determined in lieu of analysis.

REFERENCE: Stumm, W. and J. J. Morgan, 1970, "Aquatic Chemistry: An Introduction Emphasizing Chemical Equalibria in Natural Waters," (New York, New York: Wiley-Interscience).

16. Data Release

Until several days before the meeting, the most recent water level information available to the NRC staff and contractors had been collected six months earlier (May/June 1985). NRC has not received pressure data from the BWIP site for the last 10 months. If NRC is to provide constructive comments to DOE on the adequacy of hydrologic data and interpretations, BWIP needs to release

essential information such as the water level data on a more-timely basis. The meeting may have been postponed if the NRC had been informed about the perturbations caused by drilling activities prior to the meeting. BWIP should release tabulated and time profile data including down-hole pressures, water levels, and environmental heads in accordance with the Site Specific Agreement, which specifies a 45-day release time frame from the time of data acquisition to the time the data are provided to the NRC.