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from: R. Cook sac

Mr. O. L. Olson
Project Manager, Basalt Waste
Isolation Project Office
U.S. Department of Energy
P.O. Box 550
Richland, Washington 99352

Dear Mr. Olson:

On August 27-28, 1985, we reviewed several of the activities of the Basalt Waste Isolation Project (BWIP) to characterize the hydrology of the proposed waste repository site as you had requested. All participating members of the BWIP team were again free and open in their presentations and discussions. We greatly appreciate this cooperation in discussing the large-scale hydrologic tests, the associated tracer tests, the forthcoming drilling program to obtain additional data on head distribution in the Wanapum and Grand Ronde basalts in the Cold Creek syncline, the drilling and testing schedule, modeling efforts, and geochemical data, among other topics. We had complete and sometimes lively discussions on all topics. The extent of discussion of some topics may have been out of proportion with their true significance, and we will not further belabor those points here. We will elaborate on a few topics on which a consensus was not reached during the discussions or which we wish to emphasize.

One topic concerns the proposed baseline monitoring priorities, which involves drilling new holes and installing separate piezometer nests in the Wanapum and Grand Ronde basalts in the vicinity of the reference repository location (RRL). We wholeheartedly concur with the need for and objectives of the planned enhancement of the baseline monitoring activities and feel that additional piezometers are essential to define adequately the areal hydrology and geochemistry. However, we do have some concerns related to the drilling sequence and locations of some of the proposed nests. We feel that too much weight has been given to the near field issues and too little to the dictates of the hydrologic system itself. We strongly endorse the installations beyond the suspected barriers to the north of the extended Umtanum Ridge anticline, to the south of the extended Yakima Ridge anticline, and to the west of the Cold Creek flow barrier, recognizing that perhaps something can be done to collect such information from the McGee well, say by installing a Westbay packer system. Our main concern is that some of the proposed wells within the Cold Creek Syncline flow system are planned too near existing wells to provide optimal information necessary to define the overall flow system.

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We are concerned with the proposed location for nests DC-24 and DC-25. These proposed locations seem to us to be too close to nests DC-19, 20, and 22 to provide substantial new information, either on hydrology or on geochemistry, particularly when the small horizontal and vertical hydraulic gradients at the existing nests are considered. We feel that it would be much more valuable hydrologically if one new nest were to be located near the Cold Creek Syncline axis about midway between DC-19 and DC-15. We feel that this location has several advantages over the current proposed location, including a large enough distance from existing wells to provide meaningful new head data; major benefits in supporting or rejecting current hypotheses on geochemistry; and a much smaller chance of interfering with the planned large-scale hydrologic stress tests at RRL-2. We also recommend that the nest now proposed to be installed just east of the RRL actually be located much further east, perhaps about halfway between the repository location and the river on the south side of the extended Umtanum Ridge anticline. In making the above recommendations, we recognize that other than strictly hydrologic considerations may have to be addressed in locating the nests. However, we believe that the scientific merits of extending the zone of consideration to the east and southeast are quite compelling.

We believe a strategy which involves drilling DC-24 and DC-25 at the locations proposed in the preceding paragraphs has the following advantages:

1. Will create a minimum of interference during the period in which you will be running the first one or two large-scale pumping tests.

2. Enables quicker development of a conceptual model of the entire ground-water flow system in the Cold Creek syncline than is likely if current locations are retained.

3. Piezometers at DC-24 and DC-25, as proposed, can continue equilibration during shaft drilling because of the large distance from drilling disturbance.

4. Near field wells can be drilled later because the near-field region will already be disturbed.

Once the Cold Creek syncline hydrology is more clearly defined, decisions on the locations for additional near repository observation points can be made and the wells drilled during shaft sinking.

Considerable discussion was devoted to the projections made of water levels and our concern over using linear equations to make such projections. Notwithstanding our objections to this type of projection for future water levels, we do believe that sufficient water level data is available to begin a large-scale hydrologic stress test at the RRL.

We did agree that the heads in several zones have not yet reached environmental equilibrium. Therefore you must recognize that the stress testing will disrupt the effort to obtain undisturbed water levels, possibly for a period as long or longer than the present equilibration period observed at DC-19, 20, and 22. The true distribution of head in the Cold Creek Syncline will not be known until such equilibration is accomplished. But as we have indicated in our discussion of your new observation wells, there will be several disturbances of head in the near term, and after these disturbances, water levels can be allowed to recover to a state of dynamic equilibrium.

We see no way to avoid these disturbances and no way to overcome the need to obtain heads in equilibrium in order to understand the hydrologic flow system in the Cold Creek syncline. The only way such data can be obtained will ultimately be to allow the water levels sufficient time to reach equilibrium.

We discussed the desirability of an areal modeling effort by BWIP staff. We believe that there was a consensus among BWIP staff, the DOE representative, and the USGS that such an activity is desirable. We merely wish to amplify on those thoughts here. We believe that the BWIP should develop a model encompassing a larger area than the one presently used to analyze the potential effects of the hydrologic tests, but smaller than that modeled by the IMG (Interagency Modeling Group). Such a model might be bounded to the north and east by the Columbia River, on the south by Rattlesnake Ridge and the lower Yakima River, and on the west at existing topographic and ground-water divides. It probably is desirable to retain the same six layers used by the IMG and to do some calibration to roughly match predevelopment conditions. Care should be exercised, however, to avoid detailed calibration that might become an end of itself.

We feel that this roughly calibrated model will be useful to test a number of concepts concerning the hydrology of the Cold Creek Syncline and its environments. A partial listing of items that might be tested, in no particular order, is presented below.

1. Effects of barriers and geologic structures.

2. Effects of various hypothetical ratios and directions of horizontal anisotropy on flow directions and gradients.

3. Effects of various magnitudes of vertical permeability on the flow system.

4. Temporal and long-term effects of the recharge mound in the Hanford Reservation due to waste-disposal activities on flow rates and directions in the Grand Ronde basalts.

5. Effects of stage changes in the Columbia River due to the creation of Lake Waulula on flow rates and directions.

6. Effects of ground-water pumpage for irrigation in the upper part of the syncline.

7. Effects of changes in river stage due to releases from Priest Rapids Dam on water levels in various wells in the area.

8. General distribution and nature of discharge from Grand Ronde basalts to Columbia River.

9. Test the validity of flow directions and discharge rates derived from geochemical interpretations.

We recognize that the current schedule calls for testing the Rocky Coulee flow top before shaft construction begins. Recognizing the vagaries of such schedules, we reiterate our recommendation that the Rocky Coulee test be completed before the shaft drilling begins because of the unknown impact such drilling may have on the water levels in the horizons of interest.

We would also like to offer again the assistance of Don Thorstenson and perhaps other geochemists from our staff, to assist your geochemical staff members in analyzing the available data and to help define future program direction. Should you desire such assistance, please feel free to contact me at your convenience, and we will work to arrive at a mutually acceptable date for a visit.

We appreciate the efforts and cooperation of the BWIP staff which were reflected in their thorough presentations and the manner in which they addressed our questions.

James R. Rollo
Deputy Assistant Director
for Engineering Geology

Copy to: D. Dahlem