Lawrence Berkeley Laboratory

University of California
Berkeley, California 94720
Telephone: (415) 486-6433
FTS: 451-6433

Earth Sciences Division

February 25, 1982

Ms. Linda Lehman
Nuclear Material Standard Safeguards
U.S. Nuclear Regulatory Commission
Mail Stop 1130 - SS
Washington, D.C. 20555

Dear Linda:

I was pleased to review your draft report "Geochemical Interpretations of Groundwater Flow Systems in the Central Columbia Plateau" and have enclosed a copy of it with my detailed comments. I enjoyed reading the draft very much and feel that you have uncovered an important piece of evidence for understanding the regional groundwater flow system. The evidence for upwelling of the deeper waters of sedimentary origin within the Pasco Basin appears to be good, considering the high factor scores presented on Figure 2. This evidence of upwelling is supported as you note by regional groundwater budget studies which indicate a net discharge of groundwater to the Columbia River within the Pasco Basin. Your theories of structural control of rivers and groundwater movement in the flood basalts are also reasonable in view of similar observations which can be made in other parts of the Columbia Plateau.

Overall I feel that your observations have considerable merit and should be presented to the technical community. I have made a number of specific comments on possible ways to improve your draft text which are noted on the copy of the text I have returned to you. I have only a few general comments which might be of value to you. First, I believe that the factor analysis approach which you use to study the hydrochemical data is not sufficiently known within the technical community and will require a more thorough explanation in your paper. Specifically, it would be worthwhile to present more details of the underlying theory of factor analysis and a more complete definition of terms.

A second general point is that your results are based on sparse data and a reasonably large number of assumptions and inferences have been made in arriving at your conclusions. These extend both to the interpretation of the hydrochemical data and to the inferences drawn from geological studies made in other parts of the Columbia Plateau. While I generally agree with the reasonableness of your conclusions I feel that your discussions in the text should be qualified in many places so that the reader understands that your results may not be totally clear-cut and that other possible [illegible] also be made from the same data base. My third [illegible] that additional data exists which could be used to verify [illegible] your assumptions, particularly with reference to the [illegible] should be obtained, analyzed and included in [illegible] it would be desirable, for example, to

obtain more hydrochemical data on the shallow wells, to obtain a more precise control on the hydrochemical variations with depth, and to compare your concepts of upwelling groundwater with measured vertical hydraulic gradients. I believe that your conclusions are correct in broad terms, but that the actual situation in the Pasco Basin is more complex than you indicate.

I hope that these general comments and the specific comments noted on your draft paper will be of value to you. If you have any questions or any problems reading my hand written notes, some of which were done in the van on the way home, I would be happy to discuss this with you at any time. I am quite impressed by the detective work you have done in this analysis and feel that it provides a valuable contribution to our understanding of groundwater movement within the Pasco Basin.

Sincerely yours,

Charlie

Charles R. Wilson

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Enclosure

cc: R. Wright/USNRC