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Task 10: Support to the regional model

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SUPPORT TO THE REGIONAL MODEL

TASK 10

Final Report

Dr. Irene Farnham

**Harry Reid Center for Environmental Studies
University of Nevada, Las Vegas**

October 3, 2003

SUPPORT TO THE REGIONAL MODEL

Final Report

Dr. Irene Farnham, Harry Reid Center for Environmental Studies, UNLV

The Harry Reid Center for Environmental Studies (HRC) at the University of Nevada, Las Vegas (UNLV) has analyzed approximately 200 groundwater samples for over 60 trace elements and major solutes over the past ten years. These samples represent groundwaters from the Nevada Test Site, Amargosa Valley, the Spring Mountains, Death Valley, Ash Meadows, Pahranaagat Valley, and Oasis Valley. The preparation of a data base containing all of these data is near completion and will be submitted to DOE upon its completion. Data verification is in progress. In addition, many multivariate analyses were performed to characterize the trace element compositions in these groundwaters. The techniques of principal components analysis, correspondence analysis, Q-mode factor analysis, k-means cluster analysis, and hierarchical cluster analysis were applied to these data in order to determine the variations within the trace element chemistry of these waters. A geographical information system was also employed to find spatial trends within the study area. Several journal articles and presentations describing these analyses were completed or brought to near completion.

Several significant tasks caused the priority of efforts of the Principal Investigator to be shifted to other projects of the UCCSN cooperative agreement. For instance, the analyses of the samples for the alluvial tracer complex tracer testing (Task 8) and the Alcove 8 / Niche 3 tracer testing (Task 9 and 35) demanded a significant amount of time. The Quality Assurance associated with these tasks was also quite significant. These tasks were given the highest priority. Geochemical evaluation of the groundwaters of the Nye County Early Warning Drilling Program was also performed under Task 8 and a "Q" report was submitted to the DOE. This report, "Preliminary Geochemical Evaluation of Groundwaters from Wells of the Nye County Early Warning Drilling Program (TR-02-004)." was submitted to the US DOE in September 2002. In addition, the Harry Reid Center sponsored the 2003 Devils Hole Conference (Task 38). Student's from the University of Nevada, Las Vegas' Geoscience Department and the Department of Mathematics were provided the opportunity to present results of their analyses of the Harry Reid Center trace element chemistry data. Because the level of effort was placed on other tasks, the Harry Reid Center returned a total balance of \$102,610 to the DOE following the ending date of Task 10.

A list of the journal articles and presentations resulting from this task are listed below. An additional journal article describing the multivariate statistical analyses of the Harry Reid Center Groundwater chemistry data, along with the database containing these data, will be provided to the DOE in the future.

Journal Articles

Farnham, I.M., Singh, A.K., Stetzenbach, K.J., and Johannesson, K.H. (2002) 'Treatment of Nondetects in Multivariate Analysis of Groundwater Geochemistry Data' *Chemom. and Intelligent Lab. Sys.*, 60, 265-281.

Zhou, X., Stetzenbach, K.J., and Johannesson, K.H., and Farnham, I.M., (2000) 'Major Ion Geochemistry of Groundwaters from Southern Nevada and Eastern California, USA' Chinese Journal of Geochemistry, 19:1, 1-22.

Presentations

Farnham, I.M., Zhou, X., Stetzenbach, K. J., Singh, A. K., and Johannesson, K.H. 'Multivariate Statistical Analysis of Groundwater Trace Element Data To Evaluate Groundwater Flow in South-Central Nevada' Geological Society of America Summit 2000', Reno, NV, Nov., 2000.

Stanek, T., Singh, A.K., Farnham, I.M. (2003). Multivariate Population Partitioning of Groundwater Geochemistry Data, Joint Statistical Meetings in San Francisco (JSM 2003) Aug., 2003.

Singh, A.K., Farnham, I.M., Gewali, L.P., Hansen, D. (2003) 'A Computational Geometric Approach for Comparing Stiff Diagrams of Chemical Compositions of Groundwaters' Joint Statistical Meetings in San Francisco (JSM 2003) Aug., 2003.

Koonce, J., Farnham, I, Singh, A.K. and Yu, Z. (2003) 'Groundwater Flow Interpretation in the Southern Great Basin Using Hydrogeochemical Data and Multivariate Statistics', Devils Hole Workshop, Furnace Creek, CA, May, 2003.

Stanek, T, Farnham, I and Singh A.K. (2003) 'Multivariate Population Partitioning of Trace Element Geochemistry Data for the Southern Nevada region', Devils Hole Workshop, Furnace Creek, CA, May, 2003.

Hanson, D., Gewali, L., Farnham, I. and Singh, A.K. 'Evaluating Similarity in Major Ion Chemistry of Groundwaters of the Nye County Wells via a Shape Similarity Index of Stiff Diagrams', Devils Hole Workshop, Furnace Creek, CA, May, 2003.