Statement of Work
Dr. Charles B. Connor
June 5, 2001

Dr. Connor will assist CNWRA staff in Technical and Programmatic support to the NRC's High Level Waste Program. Technical work will include assisting in both probability and consequence tasks. Programmatic support may include review of DOE documents and attending appropriate NRC supported meetings. Dr Connor may also be called on to assist in a variety of work for other tasks.

Scope of Work for Charles B. Connor
Project: 01402.461
Period of Performance: July 10, 2002 to December 30, 2002

Charles B. Connor and Laura Connor have written a computer code to model magnetic field data efficiently using standard forward calculation and optimization methods based on the simplex optimization method. The code is written in ANSI C and uses the message passing interface (MPI). The code runs in parallel to use any number of processors to estimate magnetic anomalies rapidly. Specifically, this code:

a) Calculates the magnetic anomaly due to a set of vertical sided prisms using the forward solution proposed by Rao and Babu (1991, *Geophysics*).

b) Solves for the forward solution at many grid points using parallel programming techniques and the Message Passing Interface.

c) Compares observed and calculated magnetic anomalies using standard goodness-of-fit measures (i.e., chi-squared)

d) Alters parameters (depth to top of prisms, depth to base of prisms, magnetization) using the downhill simplex method in multiple dimensions (Nelder and Meade, 1965, *Computer Journal*, 7: 308). The simplex method is modified to incorporate rule sets specific to magnetic data modeling.

e) Outputs a best-fit model together with calculated solution at each grid point, which may be subsequently visualized using generic mapping tools or similar software.

Following modification of the code by Laura Connor, as outlined in a concurrent statement of work for Laura Connor, Charles Connor will:

1) Assist Laura Connor in documenting the modeling code and testing the forward models using CNWRA QA procedures. Experience with PVHA codes indicates that at least 1.5 weeks needs to be allocated for this step to meet TOP-18 requirements.

2) Assist Laura Connor in delivering the complete modeling code to the CNWRA and installing this code on a CNWRA system on or about Sept 5–6, 2002. This task will include a complete source code with documentation, and a version of the code compiled to run on a LINUX computer cluster containing MPI software. He also will meet with CNWRA staff for training on the use of the code and to discuss possible modifications related to GUI development and visualization of output.

3) While at the CNWRA, Charles Connor will work with CNWRA staff to model magnetic data collected in the Yucca Mountain region, using geologically reasonable model assumptions.

Charles Connor also agrees that:

i) Charles and Laura Connor hold the copyright on parts of the code that already exist.
ii) The new parts of the code to be developed under contract to CNWRA will be owned by CNWRA. Charles and Laura Connor retrain the right to publish model results using the new code.
iii) Charles and Laura Connor retain the right to model magnetic data for clients independent of CNWRA using magnetic modeling codes not developed under contract with CNWRA.
iv) Charles and Laura Connor retain the right to pursue academic grants (e.g., National Science Foundation, NASA) using magnetic modeling codes developed independent of the CNWRA.

This work will be completed by September 6, 2002. At completion, it is anticipated that the team will be able to evaluate the strengths and weakness of the application for modeling complex anomalies resulting from 3D geologic bodies.

Projected Costs

Personnel:

Task 1: 16 hr @
Task 2: 8 hr @
Task 3: 16 hr @

Total Personnel Costs.

Direct Expenses:

To be billed at cost. Estimated expenses are currently:

Travel to San Antonio:

Roundtrip airfare Tampa to San Antonio:
Car Rental:
Hotel: 2 nights at
Meals: 2 days @

Total Direct Expenses:

Total Cost: