# NUCLEAR WASTE CONSULTANTS INC.

8341 So. Sangre de Cristo Rd., Suite 14
Littleton, Colorado 80127
(303) 973-7495

WM DOCKET CONTROL
CENTER

August 11, 1987
'87 AUG 19 A9:52

009/PM/NWC.016
RS-NMS-85-009
Communication No. 188

WM-RES
WM Record File
D1021
NWCI

Communication No. 188   WM Project
Docket No.
PDR
X LPDR (B,WS)

Distribution:
Pohle
(Return to WM, 623-SS)

U.S. Nuclear Regulatory Commission
Division of Waste Management
Geotechnical Branch
MS 623-SS
Washington, DC   20555

Attention:  **Mr. Jeff Pohle, Project Officer**
            **Technical Assistance in Hydrogeology - Project B (RS-NMS-85-009)**

Re:  Trip Report - "Modeling of Fluid Flow and Contaminant Transport in
     Fractured or Granular Porous Media" July 27-31, 1987

Dear Mr. Pohle:

This letter transmits the trip reports of Nuclear Waste Consultants' (NWC)
subcontractor modelers who attended the Holcomb Research Institute Short
Course "Modeling of Fluid Flow and Contaminant Transport in Fractured or
Granular Porous Media" July 27-31, 1987.  Nuclear Waste Consultants was
represented by Drs. Catherine Kraeger-Rovey (Terra Therma) and Jeffrie Minier
(Daniel B. Stephens and Associates).  Because the short course dealt with
methods for assessing flow and transport, NWC considers the short course
accountable under Subtasks 2.5 and 3.5; the material dealt exclusively with
saturated media, and consequently NWC and the NRC Project Officer authorized
personnel from the BWIP and Salt teams only.

It appears to NWC that two useful results are apparent from the trip reports.
First, the material presented by Dr. Sudicky confirms the often-repeated
position of NWC that considerable progress can be made in addressing the
significance of even very complex phenomena by the use of closed-form
analytical methods.  Second, based on both trip reports, it seems likely that
for a range of applications the two-dimensional finite-element flow and
transport code TRAFRAP may be a very useful substitute for the much more
complex (and apparently less user-friendly) SWIFT.  With respect to the NRC's
needs, the principal limitations of TRAFRAP appear to be:

1.  It is two-dimensional instead of three-dimensional model;

2.  It is an isothermal model;

3.  It has not been verified and benchmarked using the NRC's approach and
    test sets.

Particularly at this stage in the HLW program, none of these is necessarily an insurmountable problem. With respect to dimensionality, it has long been understood by the Staff that because of the enormous computing requirements of SWIFT (or essentially any other 3-D code), the use of 3-D simulations will almost always be limited to a (probably small) number of confirmatory runs with relatively large grid-spacing; most of the applications of SWIFT or any other model/code at this time, and probabaly well into if not throughout licensing, will be in a 2-D mode along pathways that can be identified in some independent fashion. Secondly, both fundamental analytical considerations and numerical modeling to date have shown that heat transfer at the scale of repository performance in the saturated systems under consideration is dominated by conduction. This would allow modelers to formally decouple the heat transfer from the fluid flow equations and offers a vast simplification in computational approach. Finally, since the NRC's approach to verification and benchmarking has been formally established, it would be possible for the Staff or contractors to undertake the testing necessary to establish the computational and conceptual reliability of TRAFRAP. In the meantime, TRAFRAP could join a host of other tools (analytical as well as numerical) that can be used to assess the importance of certain conceptual problems and to test for data needs in selected areas.

Before Drs. Kraeger-Rovey and Minier attended the short course, the NWC Project Manager agreed with the NRC Project Officer that copies of software that were provided as part of the course would be transfered to the HLTR Staff in some suitable format. For a description and discussion of the software, please see Dr. Kraeger-Rovey's trip report. NWC is prepared to transmit to the Staff copies of the analytical software provided by Dr. Sudicky as part of the course; please advise us of the format in which you would like the material transmitted. As you will note, both Dr. Minier and Dr. Kraeger-Rovey point out that the TRAFRAP code was not routinely provided to participants. However, it is available to participants at a special, reduced rate of $95.00. If the NRC Project Officer authorizes the expense, NWC will order a copy of the code and provide for its copying and transfer to the NRC. However, please note the code is currently available only in mainframe versions. Pending direction from the NRC Project Officer, NWC will not authorize Dr. Kraeger-Rovey to attempt to produce a PC version from the FORTRAN source code at the expense of the current contract.

**Nuclear Waste Consultants, Inc.**

If you have any questions about this trip report, please contact me immediately.

Respectfully submitted,
NUCLEAR WASTE CONSULTANTS, INC.
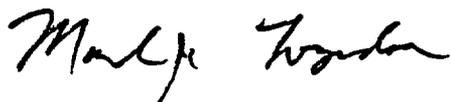
Mark J. Logsdon, Project Manager

Att: Trips reports to NWC from Kraeger-Rovey and Minier


cc:  US NRC - Director, NMSS (ATTN PSB)
            HLWM(ATTN Division Director)
            Mary Little, Contract Administrator
            HLTR (ATTN Branch Chief)
            D. Chery, HLTR

cc:  M. Galloway, TTI
     L. Davis, WWL
     J. Minier, DBS