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A Division of Southwest Research Institute
6220 Culebra Road • San Antonio, Texas, U.S.A. 78228-5166
(210) 522-5160 • Fax (210) 522-5155

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U.S. Nuclear Regulatory Commission
ATTN: Dr. Bret W. Leslie
Division of Waste Management
Two White Flint North
Mail Stop 7F-17
Washington, DC 20555

Subject: Transmittal of "MULTIFLO Version 1.2—Letter Report" (IM 20.01402.561.010)

Dear Dr. Leslie:

This letter transmits the deliverable "MULTIFLO Version 1.2—Letter Report" under the title "MULTIFLO User's Manual, MULTIFLO Version 1.2, Two-phase Nonisothermal Coupled Thermal-Hydrologic-Chemical Flow Simulator."

The computer code MULTIFLO has been developed to provide NRC staff with a tool for independent evaluation of DOE models of perturbations that may occur in the natural and engineered systems as a result of emplacement of high-level nuclear waste in a geologic repository. Such changes result from complex couplings among a variety of thermal-hydrologic-chemical (THC) processes. These interactions are not well-understood and significant uncertainties remain regarding DOE assumptions

MULTIFLO is used to support issue resolution activities in several Key Technical Issues (e.g., Evolution of the Near-Field Environment, Thermal Effects on Flow, Unsaturated and Saturated Flow Under Isothermal Conditions, and Container Life and Source Term). Among other applications, MULTIFLO is used to test the appropriateness of DOE "bounding" environmental parameters, to evaluate the validity of DOE models for changes to flow in the near-field, and to probe DOE assumptions about far-field flow. MULTIFLO is also an important part of several review methods to be included in the Yucca Mountain Review Plan.

MULTIFLO Version 1.2 has significant new capabilities compared with the previous Version 1.0. Most notably, Version 1.2 has dual permeability capabilities for modeling fractured rock systems and is based on an integrated finite volume methodology that allows for arbitrarily shaped computational elements. These features are essential capabilities for any THC model used in evaluations of the proposed repository at Yucca Mountain. The new controlled Version 1.2 replaces the testing "beta" version, which has been available since June 1998. In going from 1.2 β to 1.2, important improvements in accuracy, stability, and ease-of-use were achieved as a result of a systematic testing and benchmarking program.

Although a significant improvement over Version 1.0, MULTIFLO Version 1.2 is not able to model some processes that must be evaluated as part of issue resolution activities. For example, Version 1.2 is not able to model ventilation or other processes that occur within an open emplacement tunnel. Also, the fracture-to-matrix



Washington Office • Twinbrook Metro Plaza #210
12300 Twinbrook Parkway • Rockville, Maryland 20852-1606

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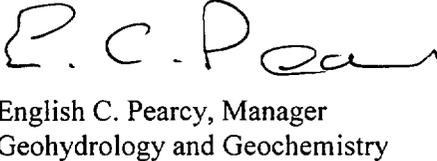
coupling model used in MULTIFLO Version 1.2 does not incorporate current understanding of unsaturated fractured rock systems, which has evolved rapidly over the past two years. Enhancements to address these and other limitations are planned for Version 2.0.

The MULTIFLO Version 1.2 code will be provided to NRC staff as requested. As noted above, the code has wide applicability and additional users are likely to improve the code.

The DOE has consistently demonstrated a high interest in obtaining and using MULTIFLO. In the past, NRC has provided DOE with copies of MULTIFLO for its use in support of NWPA activities. We encourage NRC management to convey this improved version of MULTIFLO to DOE as soon as it is practicable.

If you have any questions regarding this deliverable, please call me at (210) 522-5540 or Dr. Scott Painter at (210) 522-3348.

Sincerely yours,


English C. Percy, Manager
Geohydrology and Geochemistry

/ph

Enclosure

cc:	J. Linehan	W. Reamer	S. Painter	W. Patrick
	D. DeMarco	K. Stablein	R. Pabalan	B. Sagar
	B. Stiltenspole	D. Esh	D. Hughson	CNWRA Directors w/o enclosure
	B. Meehan	R. Codell	L. Browning	CNWRA Element Mgrs w/o enclosure
	J. Greaves	T. McCartin	G. Ofoegbu	T. Nagy (SwRI Contracts)
	D. Brooks	H. Arlt	R. Chen	P. Maldonado
	J. Holonich		R. Green	M. Seth
			M. Hill	