



**GEOSCIENCES AND ENGINEERING DIVISION  
DOCUMENT REVIEW REQUEST AND TRANSMITTAL CONTROL (REF. QAP-002)**

**I. DOCUMENT INFORMATION**

a. TITLE: Fiscal Year 2012 Summary of Grout Monolith Manuscript Preparation

**b. DOCUMENT TYPE**

<input checked="" type="checkbox"/> Technical Report, Trip Report	<input type="checkbox"/> CQAM, QAPs, APs	<input type="checkbox"/> Abstracts*	<input type="checkbox"/> Posters*
<input type="checkbox"/> Guidance Documents	<input type="checkbox"/> TOPs	<input type="checkbox"/> Conference Papers*	<input type="checkbox"/> Presentations*
<input type="checkbox"/> Operations Plans, Proposals	<input type="checkbox"/> Project, Test, Validation Plans	<input type="checkbox"/> Journal Articles*	*Peer Reviewed Y <input type="checkbox"/> N <input type="checkbox"/>

\*Conference/Journal Title NA  
Date/Location/Publisher/City, State: \_\_\_\_\_

Copyright Permission Required and Obtained: Y  N

c. DOCUMENT CLASSIFICATION: Classified: Y  N  Sensitive Unclassified: Y  N  Export Controlled: Y  N

Special Markings (specify): NA

**d. PROJECT INFORMATION**

Project No.: 20.14003.01.071 Milestone No.: \_\_\_\_\_ AI No.: 20.14003.01.071.220

CNwRA DOCUMENT NO.: Y  N  Assigned No.: CNwRA 2000X-XXX

e. SCHEDULE Today's Date: 11/27/2012 Scheduled Transmittal Date: 11/29/2012

Author: C. Dinwiddie Manager: R. Lenhard Assigned Secretary: L. Selvey

**II. REVIEW (See QAP-002 Table 1 for applicable review types.)**

Approvals of

<u>Robert Lenhard</u> (Manager Signature)	<u>11/27/2012</u> (Date)
<u>John Stamatakos</u> (Director Signature)	<u>11/27/2012</u> (Date)

		Req'd Date	Initials/Date Completed
	TECHNICAL (Attached Form QAP-12.) Reviewer(s): <b>NA: No technical content</b>		
X	EDITORIAL Reviewer: <b>R. Lenhard</b>	11/28/2012	<i>RJL 11/28/2012</i>
	QUALITY ASSURANCE Reviewer:		
X	PROGRAMMATIC/COPYRIGHT PERMISSION VERIFIED Reviewer: <b>R. Lenhard</b>	11/28/2012	RJL 11/28/2012
X	FORMAT Reviewer: <b>B. Street</b>	11/28/2012	BS 11/28/2012

GED calculations and analyses supporting this report are documented in Scientific Notebook(s): (If none, state "None") None

Verification of Compliance with QAP-002, Records Management Staff \_\_\_\_\_

**IV. TRANSMITTAL**

TO: M. George FROM: R. Lenhard

COPIES TO: \_\_\_\_\_



**A center of excellence in earth sciences and engineering®**

Geosciences and Engineering Division  
6220 Culebra Road • San Antonio, Texas, U.S.A. 78238-5166  
(210) 522-5160 • Fax (210) 522-5155

November 29, 2012  
Contract No. NRC-02-07-006  
J5562: PROJ0734; PROJ0735  
Account No. 20.14003.01.071

ATTN: Document Control Desk  
U.S. Nuclear Regulatory Commission  
Mr. Mathews George  
Division of Waste Management and Environmental Protection  
Two White Flint North; Mail Stop T7-J8  
11555 Rockville Pike  
Rockville, MD 20555

Subject: Fiscal Year 2012 Summary of Grout Monolith Manuscript Preparation

Dear Mr. George:

This letter transmits a description of Task 7, Subtask 1 accomplishments during the fiscal year 2012 contract extension period (1 October–30 November 2012), as part of the Center for Nuclear Waste Regulatory Analyses (CNWRA) technical assistance for evaluating non-high-level waste determinations for U.S. Department of Energy (DOE) facilities in accordance with the National Defense Authorization Act (NDAA) of 2005. During this interval, a draft manuscript was developed to support the U.S. Nuclear Regulatory Commission (NRC) in its consulting and monitoring role with respect to NDAA reviews of DOE waste determinations and related waste tank closure activities.

This short symposia manuscript, titled "Performance Impact of Fast Flow Paths Through Grout Monoliths Used for Radioactive Waste Disposal," summarizes the experimental methods used and results obtained from the first four years of NRC's cementitious grout monolith experimental test bed project. Empty high-level radioactive waste handling and storage tanks at Savannah River Site and Idaho National Laboratory are being stabilized during closure operations with cementitious grout. CNWRA developed physical analogs of cementitious grout monoliths in tanks to investigate their potential to form fast flow pathways such as macrocracks, separations between grout lifts, and annuli around pipes, supports, and along tank walls. These experiments demonstrated that the maximum temperatures attained during hydration and the fast flow pathways that develop are proportional to the scale of the specimen, and that annular apertures and bulk grout permeability generally increased with time post-placement. Cracks developed rapidly in the largest specimen and more slowly in smaller specimens. Plastic and drying shrinkage commonly led to poor bonding of grout to tank walls or to adjacent lifts of grout, and cracks, annular gaps, and grout seams transmitted fluids during injection testing. A key outcome of the experiments is the recognition that fast flow pathways that develop in grout monoliths may compromise performance of grouted tanks.



Washington Office  
1801 Rockville Pike, Suite 105 • Rockville, Maryland 20852-1633

Mr. Mathews George  
November 29, 2012  
Page 2

The manuscript contains data about physical model construction, inspection methods, and grout performance behavior that provide important insights useful to a broad cementitious barrier community. The manuscript was developed because DOE staff expressed their interest to NRC staff that the results of this project be presented at a waste-incident-to-reprocessing session at the 2013 Waste Management Symposia (WM2013) in Phoenix, Arizona in February 2013. NRC staff approved submission of the draft manuscript November 9, 2012. The manuscript was then transmitted to the organizers of WM2013, who have initiated an abbreviated external review process. The review comments from the symposia organizers are expected by month's end. The corresponding presentation at WM2013, to be developed under the new contract, would enable staff to present insights gained from recent analyses conducted under the NRC program, and conference interactions will enhance CNWRA staff support for that program.

In summary, results obtained to date from NRC's cementitious grout monolith experimental test beds help NRC and CNWRA staffs evaluate the credit DOE takes for their engineered waste containment system and are incorporated into NRC's regulatory reviews and monitoring plans. Project reports and status updates have served to communicate interim results and insights to NRC, and to other stakeholders when made public, but only recently have staff begun to synthesize and interpret the collective results of four years of work in a manner suitable for public presentation.

If you have any questions regarding this summary of accomplishments, please contact Cynthia Dinwiddie at (210) 522-6085 or me at (210) 522-6418.

Sincerely,



Robert Lenhard, Ph.D.  
Program Manager  
Environmental Protection and Waste  
Management for Non-High Level  
Radioactive Waste

CD/RL/ls  
cc:

D. DeMarco  
R. Jackson  
V. Whipple  
D. Skeen  
G. Suber  
C. Barr  
C. McKenney  
N. Devaser  
J. Shaffner

W. Patrick  
B. Sagar  
GED Directors/Managers  
L. Howard  
R. Pabalan  
C. Dinwiddie  
M. Padilla

Record Copy B—IQS