



Department of Energy

Office of Civilian Radioactive Waste Management
Office of Repository Development
P.O. Box 364629
North Las Vegas, NV 89036-8629

QA: QA

JUL 10 2003

N. H. Williams
Bechtel SAIC Company, LLC
1180 Town Center Drive, M/S 423
Las Vegas, NV 89144

ISSUANCE OF DEFICIENCY REPORTS (DR) BSC(O)-03-D-172 THROUGH BSC(O)-03-D-179 RELATED TO SOFTWARE MANAGEMENT

Enclosed are DRs BSC(O)-03-D-172 through BSC(O)-03-D-179 generated as a result of Office of Quality Assurance Audit OQAP-BSC-03-07.

Please provide responses that meet the applicable requirements of Administrative Procedure (AP)-16.1Q, *Management of Conditions Adverse to Quality*. Send the original of your responses to Deborah G. Opielowski, Navarro Quality Services, P.O. Box 364629, Mail Stop 455, North Las Vegas, Nevada 89036-8629.

Responses to the DRs are due thirty calendar days from the date of this letter. Please notify the U. S. Department of Energy when all actions are complete.

If you have any questions, please contact either William J. Boyle at (702) 794-5506 for technical questions or Kerry M. Grooms at (702) 794-1367 for quality related questions.

William J. Boyle, Division Director
Postclosure & License Acquisition Division
Office of License Application & Strategy

OLA&S:WJB-1472

Enclosures:

1. DRs BSC(O)-03-D-172 through BSC(O)-03-D-179
2. Condition Report Response Form
3. Condition Report Response Instructions

Contract Number: DE-AC28-01RW12101

WM11
NM5507

JUL 10 2003

cc w/encs:

N. K. Stablein, NRC, Rockville, MD
Robert Latta, NRC, Las Vegas, NV (2 cys)
S. W. Lynch, State of Nevada, Carson City, NV
L. W. Bradshaw, Nye County, Pahrump, NV
G. K. Beall, BSC, Las Vegas, NV
M. J. Mason, BSC, Las Vegas, NV
S. E. Archuleta, NQS, Las Vegas, NV
J. R. Doyle, NQS, Las Vegas, NV
B. D. Foster, NQS, Las Vegas, NV
W. J. Glasser, NQS, Las Vegas, NV
M. L. Horseman, NQS, Las Vegas, NV
D. G. Opielowski, NQS, Las Vegas, NV
C. M. Palay, NQS, Las Vegas, NV
W. J. Boyle, DOE/ORD (RW-40W), Las Vegas, NV
E. R. Cooper, DOE/ORD (RW-40W), Las Vegas, NV
C. M. Newbury, DOE/ORD (RW-40W), Las Vegas, NV
B. M. Terrell, DOE/ORD (RW-40W), Las Vegas, NV
J. D. Ziegler, DOE/ORD (RW-40W), Las Vegas, NV
Records Processing Center = "26"

OCRWM	ORIGINAL CONDITION REPORT	1. <input checked="" type="checkbox"/> DR <input type="checkbox"/> CAR
		CR NO.: BSC(O)-03-D-172 Page 1 of QA: QA

2. Controlling Document (Document Identifier and Rev. or Effective Date): See Attached	3. Related Report No.: See Attached
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4. Responsible Organization: See Attached	5. Discussed With: See Attached
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6. Requirement: See Attached

7. Description of Condition: See Attached	7a. <input type="checkbox"/> Corrected During Activity (Describe all actions taken to close in Block 7.)
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8. Initiator: See Attached	9. Responsible Manager: (Required if 7a checked and <u>not</u> from QA verification activity) N/A
Printed Name Signature Date	Printed Name Signature Date

10. QA Review: JOHN R. DOYLE <i>John R Doyle</i> 7/6/03	11. Does a stop work condition exist? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
QAR Printed Name Signature Date	13. For a DR, check if Response must have: <input checked="" type="checkbox"/> Impact <input checked="" type="checkbox"/> Cause <input checked="" type="checkbox"/> Action to Prevent Recurrence

12. Issuing Organization: (if applicable) William J. Boyle <i>William Boyle</i> 7/10/03	14. Due Date: 30 calendar days after issue (Issue Date: <u>7/10/03</u>)
Issuing Org Printed Name Signature Date	

15. Issuing Organization Closure Review: (if applicable)	16. QA Corrective Action Verification/Closure:
Issuing Org Printed Name Signature Date	Printed Name Signature Date

17. Trend Data: ____ / ____ ____ / ____ ____ / ____ ____ / ____ ____ / ____
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**OFFICE OF CIVILIAN
RADIOACTIVE WASTE MANAGEMENT
U.S. DEPARTMENT OF ENERGY
WASHINGTON, D.C.**

8. ☒ DEFICIENCY REPORT
☐ CORRECTIVE ACTION
REPORT

NO. BSC(O)-03-D-172

PAGE 1 OF

QA: QA

DEFICIENCY REPORT/CORRECTIVE ACTION REPORT

1. Controlling Document: (Document ID and Revision or Date)

AP-SI.1Q, Revision 5, ICN 0, *Software Management*

2. Related Report No.:

OQAP-BSC-03-07

3. Responsible Organization:

Bechtel SAIC Company, LLC (BSC)

4. Discussed With:

John Pelletier, Jeff Mason, Steve Splawn

5. Requirement:

AP-SI.1Q, Section 5.7, "Status Accounting" states:

- a) "Establish and maintain centralized software baseline and status accounting records containing unique software identifiers, a brief chronology of the software items, and a description of the changes made between versions of the software items."
- b) "Inform management and users, upon request, of the software baseline status including proposed in-process, or approved changes, through the various SCM reports that comprise Status Accounting."

6. Description of Condition:

The requirements of AP-SI.1Q, Section 5.7 a) and b) were not met. a) The status accounting of users and locations is not current and is not up-to-date. b) Therefore, management information is incorrect. Examples include:

Five of the six Total System Performance Assessment-License Application codes were reviewed. Four of the five were not found on the identified user's platform. The Software User Request identified users, but no software was installed. In addition, FEHM V2.20, SEEPAGE.dll V2, ASHPLUME V14LV, and SZ_CONVOLUTE V2.2 were authorized and indicated as installed on the User Listing for Larry Rickertsen and Jeffrey Matties. These codes have not been installed on their CPUs.

Also:

1. GoldSim V7.50.100, authorized and indicated as installed for John Pelletier is installed, but not on the CPU indicated on the User Listing.
2. The software defect notification for SEEPAGE.dll V2 was not distributed to all current users due to the incorrect status.

Has work been stopped? ☐ Yes ☒ No

7. Initiator:

John R. Doyle

Printed Name

Signature

7/62/03.
Date

9. Does a stop work condition exist?

☐ Yes ☒ No ☐ N/A

If Yes, Check One:

☐ A

☐ B

☐ C

☐ D

10. Recommended Actions:

SCM should conduct physical configuration authentication audits to verify installations on a period basis.

11. QA Review:

John R. Doyle

Printed Name

Signature

7/08/03
Date

12. Response Due Date:

Working Days after Issuance

13. QAM Issuance Approval:

Printed Name

Signature

Date

14. Corrective Actions Verified/Closure:

QAR Printed Name

Signature

Date

15. QAM Closure Approval:

Printed Name

Signature

Date

OCRWM	ORIGINAL CONDITION REPORT	1. <input checked="" type="checkbox"/> DR <input type="checkbox"/> CAR CR NO.: BSC(O)-03-D-173 Page 1 of <div style="text-align: right;">QA: QA</div>
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2. Controlling Document (Document Identifier and Rev. or Effective Date): See Attached			3. Related Report No.: See Attached		
4. Responsible Organization: See Attached			5. Discussed With: See Attached		
6. Requirement: See Attached					
7. Description of Condition: See Attached			7a. <input type="checkbox"/> Corrected During Activity (Describe all actions taken to close in Block 7.)		
8. Initiator:			9. Responsible Manager: (Required if 7a checked and <u>not</u> from QA verification activity)		
Bruce Foster <i>Bruce Foster</i> 6/30/03 Printed Name Signature Date			N/A Printed Name Signature Date		
10. QA Review:			11. Does a stop work condition exist? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No		
Bruce Foster <i>Bruce Foster</i> 7/14/03 QAR Printed Name Signature Date			13. For a DR, check if Response must have:		
			<input checked="" type="checkbox"/> Impact <input checked="" type="checkbox"/> Cause <input checked="" type="checkbox"/> Action to Prevent Recurrence		
12. Issuing Organization: (if applicable)			14. Due Date: 30 calendar days after issue		
William J. Boyle <i>William J. Boyle</i> 7/19/03 Issuing Org Printed Name Signature Date			(Issue Date: <u>7/10/03</u>)		
15. Issuing Organization Closure Review: (if applicable)			16. QA Corrective Action Verification/Closure:		
Issuing Org Printed Name Signature Date			Printed Name Signature Date		
17. Trend Data:					
____ / ____ ____ / ____ ____ / ____ ____ / ____ ____ / ____					

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8. ☒ DEFICIENCY REPORT
☐ CORRECTIVE ACTION REPORT
NO. BSC(O)-03-D-173
PAGE 1 OF
QA: QA

DEFICIENCY REPORT/CORRECTIVE ACTION REPORT

1. Controlling Document: (Document ID and Revision or Date)
QARD (DOE/RW-0333P), Rev. 13 , AP-SI.1Q, Rev. 5, AP-SI.2Q, Rev. 1, ICN 0

2. Related Report No.:
OQAP-BSC-03-07

3. Responsible Organization:
Bechtel SAIC (BSC) LLC

4. Discussed With:
Steve Splawn, John Pelletier

5. Requirement:

1. QARD Section 2.2.10 states, in part, that "... documents that specify quality or technical requirements shall be reviewed ..."
- QARD Section 2.2.10A states that "Review criteria shall be established before performing the review. The criteria shall consider applicability, correctness, technical adequacy, completeness, accuracy, and compliance with established requirements."
- QARD Section 2.2.10C states "the review shall be performed by individuals other than the preparer."
- QARD Section 2.2.10D states that "Reviewers shall be technically competent for the subject area of the document being reviewed."
- (See attached continuation sheet)

6. Description of Condition:

1. Verification activities did not meet QARD requirements regarding document reviews. Based on a sample of 25 software qualification packages, the following conditions were noted:
- a. The verification reviews performed under AP-SI.1Q, Rev. 5, Section 5.3.1 and AP-SI.2Q, Rev. 1, Sections 5.1 and 5.2 did not specifically include reviews for technical adequacy.
- b. SCCRs were reviewed for categorization determinations by the same individual as the preparer for the following software packages: repository_percolation_calculator ver. 1.0, heatgen_ventTable_emplace ver. 1.0.
- c. No evidence was provided showing that one Software Coordinator was technically competent in the subject area of the software documentation being reviewed.
- (see attached continuation sheet)

Has work been stopped? ☐ Yes ☒ No

7. Initiator:

Bruce Foster

Printed Name Signature Date

9. Does a stop work condition exist?

☐ Yes ☐ No ☐ N/A

If Yes, Check One: ☐ A ☐ B ☐ C ☐ D

10. Recommended Actions:

None

11. QA Review:

Bruce Foster

Printed Name Signature Date

12. Response Due Date:

10 Working Days after Issuance

13. QAM Issuance Approval:

Printed Name Signature Date

14. Corrective Actions Verified/Closure:

QAR Printed Name Signature Date

15. QAM Closure Approval:

Printed Name Signature Date

Submittal Page 2 of 2

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☐ SWO

NO. BSC(O)-03-D-173

PAGE 2 OF

QA: QA

CONDITION ADVERSE TO QUALITY CONTINUATION PAGE

Block 5 continued:

2. AP-SI.2Q, sections 5.1.1.4 and 5.2.1.4 require that verification reviews of RDs and DDs be performed, documented, and resolved.

Block 6 continued:

2. The qualification package for sz_convolute ver. 3.0 did not include evidence of RD and DD review comments and resolution for document identifiers 10207-RD-3.0-00 and 10207-DD-3.0-00.

OCRWM	ORIGINAL REGISTERED STAMP CONDITION REPORT	1. <input checked="" type="checkbox"/> DR <input type="checkbox"/> CAR CR NO.: BSC(O)-03-D-174 Page 1 of	QA: QA

2. Controlling Document (Document Identifier and Rev. or Effective Date): See Attached	3. Related Report No.: See Attached
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4. Responsible Organization: See Attached	5. Discussed With: See Attached
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6. Requirement: See Attached

7. Description of Condition: See Attached	7a. <input type="checkbox"/> Corrected During Activity (Describe all actions taken to close in Block 7.)
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8. Initiator: Bruce Foster [Signature] 6/30/03 Printed Name Signature Date	9. Responsible Manager: (Required if 7a checked and <u>not</u> from QA verification activity) N/A Printed Name Signature Date
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10. QA Review: Bruce Foster [Signature] 6/30/03 QAR Printed Name Signature Date	11. Does a stop work condition exist? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No 13. For a DR, check if Response must have: <input checked="" type="checkbox"/> Impact <input checked="" type="checkbox"/> Cause <input checked="" type="checkbox"/> Action to Prevent Recurrence
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12. Issuing Organization: (if applicable) William J. Boyle [Signature] 7/10/03 Issuing Org Printed Name Signature Date	14. Due Date: 30 calendar days after issue (Issue Date: <u>7/10/03</u>)
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15. Issuing Organization Closure Review: (if applicable)	16. QA Corrective Action Verification/Closure:
Issuing Org Printed Name Signature Date	Printed Name Signature Date

17. Trend Data:
____ / ____ ____ / ____ ____ / ____ ____ / ____ ____ / ____

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8. ☒ DEFICIENCY REPORT
☐ CORRECTIVE ACTION REPORT
NO. BSC (O)-03-D-174
PAGE 1 OF
QA: QA

DEFICIENCY REPORT/CORRECTIVE ACTION REPORT

1. Controlling Document: (Document ID and Revision or Date) AP-SI.1Q, Rev. 4; note: Rev. 5 supercedes Rev. 4; conditions identified under Rev. 4		2. Related Report No.: OQAP-BSC-03-07	
3. Responsible Organization: Bechtel SAIC (BSC) LLC		4. Discussed With: Steve Splawn, Jeff Mason, John Pelletier	
5. Requirement: 1. Section 5.2 of AP-SI.1Q states "the RM shall categorize software in order to determine the appropriate level of required controls, validation, and verification based on the nature, function, and complexity of the software." Section 5.2.1.1 requires the software user to "initiate an SCCR and complete the Software Description and Category Justification blocks..." Section 5.2.1.2 requires the RM to a) "Review the SCCR," b) "Resolve issues with the Software User," and 3) "Assign the appropriate category level... sign and date in the appropriate approval blocks for the RM..." (see continuation sheet)			
6. Description of Condition: Based on a sample of 14 reviewed SCCRs: 1a. The SCCR category justification block did not support the category assignment for the following codes reviewed: boundary_conditions ver. 1.0, heatgen_ventTable_emplace ver. 1.0, repository_percolation_calculator ver. 1.0, YMESH ver. 1.54, and Streltsova-Adams.vi ver. 1. The category justifications for boundary_conditions ver. 1.0, heatgen_ventTable_emplace ver. 1.0, repository_percolation_calculator ver. 1.0, and YMESH ver. 1.54 states that the software applications are needed to continue the development of the Multiscale Thermohydrologic Model to address questions and issues related to the License Application. This justification indicates the software is critical to support the License Application and therefore, does not provide an adequate basis for a software Category B assignment. The category justification for Streltsova-Adams.vi ver. 1 states that the software provides a curve-fitting application to develop hydrologic parameters. This justification does not sufficiently describe the software nature, function, and complexity to justify the Category B assignment. 1b. No justification for category assignment was provided for the following codes reviewed: PREINFIL ver. 1.20 and GENMESH ver 6.08. (see continuation sheet) Has work been stopped? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No			
7. Initiator: Bruce Foster Printed Name _____ Signature _____ Date _____		9. Does a stop work condition exist? <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A If Yes, Check One: <input type="checkbox"/> A <input type="checkbox"/> B <input type="checkbox"/> C <input type="checkbox"/> D	
10. Recommended Actions: None			
11. QA Review: Bruce Foster Printed Name _____ Signature _____ Date _____		12. Response Due Date: 10 Working Days after Issuance	
13. QAM Issuance Approval: Printed Name _____ Signature _____ Date _____			
14. Corrective Actions Verified/Closure: QAR Printed Name _____ Signature _____ Date _____		15. QAM Closure Approval: Printed Name _____ Signature _____ Date _____	

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☐ SWO

NO. BSC(O)-03-D-174

PAGE 2 OF

QA: QA

CONDITION ADVERSE TO QUALITY CONTINUATION PAGE

Block 5 Continuation

2. Attachment 4, Instructions for Completing the SCCR, step 18 states: "SEL/DOCUMENT – Mark the documents that will be submitted for the software."

Block 6 Continuation

- 1c. The SCCR form for CWD v. 2.0 was signed off by the responsible manager (2/25/03) prior to signoff by the preparer (4/17/03).
2. The "SEL" column of SCCR forms, page 2, is inconsistently marked for the designated categorization level. Form instructions imply that the full suite of documents required in the qualification package be identified. This was not done for the following software packages reviewed: Streltsova-Adams.vi ver. 1, T2FEHM ver 4.0, flow-con ver. 1.0, Injection_Pumpback.vi Ver. 1, heatgen_ventTable_emplace ver. 1.0, AcuSolve ver. 1.4, STRAT2AVS ver. 1.0, repository_percolation_calculator ver. 1.0, and PREINFIL ver. 1.20.

OCRWM

ORIGINAL CONDITION REPORT

- 1.
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- ☐
- CAR

CR NO.: BSC(O)-03-D-175

Page 1 of

QA: QA

2. Controlling Document (Document Identifier and Rev. or Effective Date):

See Attached

3. Related Report No.:

See Attached

4. Responsible Organization:

See Attached

5. Discussed With:

See Attached

6. Requirement:

See Attached

7. Description of Condition:

See Attached

7a. ☐ Corrected During Activity

(Describe all actions taken to close in Block 7.)

8. Initiator:

See Attached

Printed Name

Signature

Date

9. Responsible Manager: (Required if 7a checked and not from QA verification activity)

N/A

Printed Name

Signature

Date

10. QA Review:

Christian Palay, Chris Palay 7/10/03

QAR Printed Name

Signature

Date

11. Does a stop work condition exist? ☐ Yes ☒ No

13. For a DR, check if Response must have:

☒ Impact ☒ Cause ☒ Action to Prevent Recurrence

12. Issuing Organization: (if applicable)

William J. Boyle

William Boyle 7/10/03

Issuing Org

Printed Name

Signature

Date

14. Due Date: 30 calendar days after issue

(Issue Date: 7/10/03)

15. Issuing Organization Closure Review: (if applicable)

16. QA Corrective Action Verification/Closure:

Issuing Org

Printed Name

Signature

Date

Printed Name

Signature

Date

17. Trend Data:

____ / ____ ____ / ____ ____ / ____ ____ / ____ ____ / ____

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U.S. DEPARTMENT OF ENERGY
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8. ☒ DEFICIENCY REPORT
☐ CORRECTIVE ACTION
REPORT

NO. BSC(O)-03-D-175

PAGE 1 OF

QA: QA

DEFICIENCY REPORT/CORRECTIVE ACTION REPORT

1. Controlling Document: (Document ID and Revision or Date)

AP-SI.1Q, Revision 3, ICN 3 and Revision 3, ICN 4

2. Related Report No.:

OQAP-BSC-03-07

3. Responsible Organization:

Bechtel SAIC (BSC) LLC

4. Discussed With:

Steve Splawn, Douglas Weaver, Grace Su, Mark Kurzmack

5. Requirement:

Section 5.12.2 requires the submission of the in-use test documentation to the RPC in accordance with Section 6.0 of this procedure as individual records.

6. Description of Condition:

Based on an audit sample of four data acquisition/process control software systems, there was no objective evidence that the in-use test results were submitted to RPC for the following three continuous operation software:

1. TRW Yucca Mountain Data Collection System V.1, base-lined on 6/28/02 under revision 3 ICN 4
2. Auto pinch valve box.vi V.1.0, base-lined 3/13/02 under revision 3 ICN 3
3. HDAS2 V2.110, base-lined 5/2/02 under revision 3 ICN 3

Has work been stopped? ☐ Yes ☒ No

7. Initiator:

Christian Palay
Printed Name

Christian Palay
Signature

6/27/2003
Date

9. Does a stop work condition exist?

☐ Yes ☒ No ☐ N/A

If Yes, Check One: ☐ A ☐ B ☐ C ☐ D

10. Recommended Actions:

None.

11. QA Review:

Christian Palay
Printed Name

Christian Palay
Signature

6/27/2003
Date

12. Response Due Date:

10 Working Days after Issuance

13. QAM Issuance Approval:

Printed Name

Signature

Date

14. Corrective Actions Verified/Closure:

QAR Printed Name

Signature

Date

15. QAM Closure Approval:

Printed Name

Signature

Date

OCRWM

ORIGINAL CONDITION REPORT

1. ☒ DR
☐ CAR

CR NO.: BSC(O)-03-D-176

Page 1 of

QA: QA

2. Controlling Document (Document Identifier and Rev. or Effective Date):

See Attached

3. Related Report No.:

See Attached

4. Responsible Organization:

See Attached

5. Discussed With:

See Attached

6. Requirement:

See Attached

7. Description of Condition:

See Attached

7a. ☐ Corrected During Activity

(Describe all actions taken to close in Block 7.)

8. Initiator:

See Attached

Printed Name

Signature

Date

9. Responsible Manager: (Required if 7a checked and not from QA verification activity)

N/A

Printed Name

Signature

Date

10. QA Review:

John R. Doyle John R. Doyle 07/02/03

QAR Printed Name

Signature

Date

11. Does a stop work condition exist? ☐ Yes ☒ No

13. For a DR, check if Response must have:

☒ Impact ☒ Cause ☒ Action to Prevent Recurrence

12. Issuing Organization: (if applicable)

William J. Boyle William J. Boyle 7/10/03

Issuing Org

Printed Name

Signature

Date

14. Due Date: 30 calendar days after issue

(Issue Date: 7/10/03)

15. Issuing Organization Closure Review: (if applicable)

16. QA Corrective Action Verification/Closure:

Issuing Org Printed Name Signature Date

Printed Name Signature Date

17. Trend Data:

OFFICE OF CIVILIAN RADIOACTIVE WASTE MANAGEMENT
U.S. DEPARTMENT OF ENERGY
WASHINGTON, D.C

8. ☒ Deficiency Report
☐ Corrective Action Report

No. BSC(O)-03-D-176

Page 1 of ____

QA: QA

DEFICIENCY REPORT/CORRECTIVE ACTION REPORT

1. Controlling Document: (Document ID and Revision or Date)

AP-SI.1Q, Revision 4, ICN 0, *Software Management*

2. Related Report No.:

OQAP-BSC-03-07

3. Responsible Organization:

Bechtel SAIC Company, LLC (BSC)

4. Discussed With:

I. McClung, J. Gebhart, J. Mason

5. Requirement:

AP-SI.1Q. Attachment 4, "Instructions for Completing the Office of Civilian Radioactive Waste Management Software Configuration Control Request."

6. Description of Condition:

The records copy of SCCR, MOL.20030425.0228, page 3, is incomplete for FLOW_CON V1.0. The same condition has also been identified for T2FEHM V4.0 and GridReader V1.0.

Note: During the audit, it was found that the correct and completed Software Configuration Control Request was on file at Lawrence Berkeley National Laboratory.

Has work been stopped? ☐ Yes ☒ No

7. Initiator:

John R. Doyle

9 Does a stop work condition exist?

☐ Yes ☒ No ☐ N/A

Printed Name

Signature

Date

If Yes, Check One:

☐ A

☐ B

☐ C

☐ D

10. Recommended Actions:

None.

11. QAR Review:

John R. Doyle

12 Response Due Date:

10 Working days after issuance.

Printed Name

Signature

Date

13. QAM Issuance Approval:

R. Dennis Brown

Printed Name

Signature

Date

14. Corrective Actions Verified/Closure:

15. QAM Closure Approval:

QAR Printed Name

Signature

Date

Printed Name

Signature

Date

OCRWM	ORIGINAL CONDITION REPORT	1. <input checked="" type="checkbox"/> DR <input type="checkbox"/> CAR CR NO.: BSC(O)-03-D-177 Page 1 of <div style="text-align: right;">QA: QA</div>
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2. Controlling Document (Document Identifier and Rev. or Effective Date): See Attached			3. Related Report No.: See Attached		
4. Responsible Organization: See Attached			5. Discussed With: See Attached		
6. Requirement: See Attached					
7. Description of Condition: See Attached				7a. <input type="checkbox"/> Corrected During Activity (Describe all actions taken to close in Block 7.)	
8. Initiator: <i>Marlin Hovsman</i> <i>Marlin Hovsman/For Sam Archuleta</i> <i>6-30-03</i> Printed Name Signature Date			9. Responsible Manager: (Required if 7a checked and <u>not</u> from QA verification activity) <div style="text-align: center;">N/A</div> Printed Name Signature Date		
10. QA Review: <i>Marlin Hovsman</i> <i>Marlin Hovsman/For Sam Archuleta</i> <i>7-02-03</i> QAR Printed Name Signature Date			11. Does a stop work condition exist? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No 13. For a DR, check if Response must have: <input checked="" type="checkbox"/> Impact <input checked="" type="checkbox"/> Cause <input checked="" type="checkbox"/> Action to Prevent Recurrence		
12. Issuing Organization: (if applicable) <div style="text-align: center;"> <i>William J. Boyle</i> <i>William Boyle</i> <i>6/7/03</i> William J. Boyle Printed Name Signature Date </div>			14. Due Date: 30 calendar days after issue (Issue Date: <u>7/10/03</u>)		
15. Issuing Organization Closure Review: (if applicable)			16. QA Corrective Action Verification/Closure:		
Issuing Org Printed Name Signature Date			Printed Name Signature Date		
17. Trend Data: ____ / ____ ____ / ____ ____ / ____ ____ / ____					

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8. ☒ DEFICIENCY REPORT
☐ CORRECTIVE ACTION REPORT

NO. BSC(O)-03-D-177

PAGE 1 OF

QA: QA

DEFICIENCY REPORT/CORRECTIVE ACTION REPORT

1. Controlling Document: (Document ID and Revision or Date)
RW/DOE-0333P, Rev 13, Quality Assurance Requirements and Description;
AP-SI.1Q, Revision 5, and AP-SI.2Q, Revision 1

2. Related Report No.:

OQAP-BSC-03-07

3. Responsible Organization:

Bechtel SAIC (BSC) LLC

4. Discussed With:

J. Mason, W. Watson, J. Ralston, J. Pelletier, S. Splawn, B. Bullard, L. Griswald, J. Esposito, B. Robinson, L. Southworth, Z. Dash

5. Requirement:

Applicable requirement documents: (see Continuation Page for specific requirements related to deficiencies)

RW/DOE-0333P, Rev 13, Quality Assurance Requirements and Description (QARD); AP-SI.1Q, Rev 5 and AP-SI.2Q/Rev 1

6. Description of Condition:

Five deficiencies, related to procedural adequacy, were noted during the review of fourteen software development packages, and are noted below:

- a. AP-SI.1Q does not adequately address the QARD requirements. The evaluation determined that SMRs for several Level B codes did not define the relationships between design elements and system requirements to a consistent level of detail. These codes included iTough2, PPPTRK, STRAT2AVS, PREINFIL, CWD, Streltsova-Adams, and FLOW-CON. The current procedures do not clearly define the level of design elements that should be specified for Level B codes.
- b. AP-SI.1Q does not adequately address the QARD requirements. A review of FEHM and MVIEW also determined that the current design documentation for legacy software does not clearly specify the relationships between design elements and system requirements. A review of design documentation determined that the theoretical basis (e.g. algorithms, derivation of equations, etc.) is adequately documented for most codes. However, several calculations for CWD were incomplete in the record copy. Further investigation determined that the equations were complete in the electronic form, but the review process had missed the error in the color master used to produce the record copy.

Has work been stopped? ☐ Yes ☒ No

7. Initiator:

Sam E. Archuleta

Printed Name

Signature

Date

9. Does a stop work condition exist?

☐ Yes ☐ No ☐ N/A

If Yes, Check One:

☐ A

☐ B

☐ C

☐ D

10. Recommended Actions:

Recommend that procedures pertaining to documentation of design be revised to provide the level and extent of guidance necessary to produce the proper design documentation for code implementation.

11. QA Review:

Sam E. Archuleta

Printed Name

Signature

Date

12. Response Due Date:

10 Working Days after Issuance

13. QAM Issuance Approval:

Printed Name

Signature

Date

14. Corrective Actions Verified/Closure:

QAR Printed Name

Signature

Date

15. QAM Closure Approval:

Printed Name

Signature

Date

**OFFICE OF CIVILIAN
RADIOACTIVE WASTE MANAGEMENT
U.S. DEPARTMENT OF ENERGY
WASHINGTON, D.C.**

☒ DR/CAR/QO

☐ SWO

NO. BSC(O)-03-D-177

PAGE 2 OF

QA: QA

CONDITION ADVERSE TO QUALITY CONTINUATION PAGE

5. Requirement:

- a. QARD Section I.2.3 B 2.; AP-SI.1Q, Revision 5, ICN 0, 5.3.1 b)2); and AP-SI.2Q, Revision 1, ICN 0, 5.2.1.1 4): The software design documentation shall provide a description of the allowable test results, including acceptance criteria and validation results.
- b. QARD Section I.2.3 B 2.; AP-SI.1Q, Revision 5, ICN 0, 5.3.1b)2); and AP-SI.2Q, Revision 1, ICN 0, 5.2.1.1.3): Documentation and Testing shall provide design description and equations of mathematical models, algorithms, and numerical solution techniques as related to requirements.
- c. QARD Section I.2.3 B 2 and AP-SI.2Q, Revision 1, ICN 0, 5.2.1.1 5): - The design shall be described in a manner that can be translated into code.
- d. QARD Section I.2.3.B.2f - The documentation shall specify the technical description with respect to the theoretical basis.
- e. QARD Section I.2.3.B.2a - The design documentation shall specify the major components of the software design as related to the software requirements.

6. Description of Condition: (Continued from Page 1)

- c. AP-SI.1Q does not adequately address the QARD requirements. No design documentation was available for iTough2 V4.0, PPPTK V1.0, STRAT2AVS V1.0, PREINFIL V1.2, CWD V2.0, Streltsova-Adams.vi V 1.4 and FLOW-CON V1.0 either as a separate baseline document, or as part of the Software Management Reports (SMR). PREINFIL contained over 43 subroutines, however no architectural design was specified to define the transformation of inputs required to produce the desired output. The Qualification Report for TOUGH2 v1.3 was reviewed to determine how software requirements were transformed into the architectural design for modified modules. However, the baseline for TOUGH2 V1.11 was not available in the Project baseline. The transformation of software requirements was distributed in five different baselines (V1.11, V1.2, V1.3, V1.4 and V1.6) making traceability very difficult to confirm.
- d. AP-SI.1Q does not adequately address the QARD requirements. The SMRs for iTough2, PPPTK, STRAT2AVS, PREINFIL, CWD, Streltsova-Adams.vi and FLOW-CON clearly specified the theoretical basis. However the SMRs did not provide a description of control flow, data flow or control logic. A review of NUFT V3.0S, mView V2.20 and FEHM V2.20 qualification packages demonstrated that the documentation did specify the algorithms used by each design entity. However, the documentation did not provide a description of control flow, data flow, or control logic for NUFT, mView or FEHM.
- e. AP-SI.1Q does not adequately address the QARD requirements. No design documentation was available for iTough2, PPPTK, STRAT2AVS, PREINFIL, CWD, Streltsova-Adams.vi and FLOW-CON either as a separate baseline document, or as part of the Software Management Reports (SMR). A review of FEHM V2.20 and MVIEW V2.20 also determined that the current design documentation for legacy software does not clearly specify the major components of the system design as they relate to software requirements. PREINFIL documentation did not clearly describe all of the resources external to the design that are needed for each design entity to perform its function. Interviews with the developer of PREINFIL determined that the information needed to understand the input data sets and input ranges was not clearly described or referenced in the PREINFIL documentation. The information required was only available by access to the developer who was intimately familiar with the FEHM code.

OCRWM

CONDITION REPORT

1. ☒ DR
☐ CAR

CR NO.: BSC(O)-03-D-178

Page 1 of

QA: QA

2. Controlling Document (Document Identifier and Rev. or Effective Date):

See Attached

3. Related Report No.:

See Attached

4. Responsible Organization:

See Attached

5. Discussed With:

See Attached

6. Requirement:

See Attached

7. Description of Condition:

See Attached

7a. ☐ Corrected During Activity

(Describe all actions taken to close in Block 7.)

8. Initiator:

Marlin Horsemann

For

Sam Archuleta

Marlin Horsemann

6-30-03

Printed Name

Signature

Date

9. Responsible Manager: (Required if 7a checked and not from QA verification activity)

N/A

Printed Name

Signature

Date

10. QA Review:

Marlin Horsemann

Marlin Horsemann / For Sam Archuleta

7-02-03

QAR Printed Name

Signature

Date

11. Does a stop work condition exist? ☐ Yes ☒ No

13. For a DR, check if Response must have:

☒ Impact ☒ Cause ☒ Action to Prevent Recurrence

12. Issuing Organization: (if applicable)

William J. Boyle

William Boyle 7/10/03

Issuing Org

Printed Name

Signature

Date

14. Due Date: 30 calendar days after issue

(Issue Date: 7/10/03)

15. Issuing Organization Closure Review: (if applicable)

16. QA Corrective Action Verification/Closure:

Issuing Org

Printed Name

Signature

Date

Printed Name

Signature

Date

17. Trend Data:

____ / ____ ____ / ____ ____ / ____ ____ / ____ ____ / ____

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THIS IS A RED COPY

OFFICE OF CIVILIAN
RADIOACTIVE WASTE MANAGEMENT
U.S. DEPARTMENT OF ENERGY
WASHINGTON, D.C.

8. ☒ DEFICIENCY REPORT
☐ CORRECTIVE ACTION
REPORT

NO. BSC(O)-03-D-178

PAGE 1 OF

QA: QA

DEFICIENCY REPORT/CORRECTIVE ACTION REPORT

1. Controlling Document: (Document ID and Revision or Date)

RW/DOE-0333P, Rev 13, Quality Assurance Requirements and Description

2. Related Report No.:

OQAP-BSC-03-07

3. Responsible Organization:

Bechtel SAIC (BSC) LLC

4. Discussed With:

J. Mason, W. Watson, J. Ralston, J. Pelletier, S. Splawn, B. Bullard, L. Griswald, J. Esposito, B. Robinson, L. Southworth, Z. Dash

5. Requirement:

RW/DOE-0333P, Rev 13, Quality Assurance Requirements and Description:

I.2.3.A.3: Software requirements shall be traceable throughout the remaining stages of the software lifecycle

I.2.3.B.1: The software design shall be developed, documented and reviewed based on requirements

I.2.3.B.2.a: A description of the major components of the software design as they relate to software requirements shall be specified.

I.2.3.B.2.d: The design shall be described in a manner that can be translated into code

I.2.3.C.2: The source code and resulting executables shall adhere to the design specification

These requirements apply to all three conditions described below.

6. Description of Condition:

Several codes did not have a Traceability Matrix and a clear organization of the coding information. In these cases, verification of the code traceability is not an effective or efficient process for determining the adequacy of documentation for the implementation phase. As a result, the following three conditions were noted during the review of fourteen software development packages.

- Implementation documentation for software reviewed was limited to source code. There was no clear description of how component-level code is integrated or how explicit connections and dependencies within modules were provided in the source code for PREINFIL V1.2, FLOW_CON V1.0 or SZ_CONVOLUTE V3.0. No restrictions of syntax and semantics have been specified in coding standards. Implementation coding did not provide sufficient reference to design or requirement elements.
- The methods for integrating module-level code, synchronization of parallel processes, and interfaces between design entities have not been identified or formally established.
- Coding standards for PREINFIL, FLOW_CON, PPTRK, STRAT2AVS, STRELTSOVA-ADAMS.vi and SZ_CONVOLUTE were limited to identifying the required programming language (e.g., Fortran 90). The Software Activity Plan for SZ_CONVOLUTE and software management reports for PREINFIL and FLOW_CON did not specify internal coding conventions, techniques, or coding methods. As a result, subroutine arguments, local variables, application specific variables, dimensional parameters, and input/output files were not clearly identified.

Has work been stopped? ☐ Yes ☒ No

7. Initiator:

Sam E. Archuleta

Printed Name

Signature

Date

9. Does a stop work condition exist?

☐ Yes ☐ No ☒ N/A

If Yes, Check One:

☐ A

☐ B

☐ C

☐ D

10. Recommended Actions:

Recommend that procedures pertaining to documentation of implementation activities be revised to provide the level and extent of guidance necessary to produce implementation documentation that is in accordance with the QARD in order to make the software defensible (traceable), and to facilitate maintenance and modification of the code when necessary.

11. QA Review:

Sam E. Archuleta

Printed Name

Signature

Date

12. Response Due Date:

10 Working Days after Issuance

13. QAM Issuance Approval:

Printed Name

Signature

Date

14. Corrective Actions Verified/Closure:

QAR Printed Name

Signature

Date

15. QAM Closure Approval:

Printed Name

Signature

Date

OCRWM	CONDITION REPORT	1. <input checked="" type="checkbox"/> DR <input type="checkbox"/> CAR CR NO.: BSC(O)-03-D-179 Page 1 of QA: QA
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2. Controlling Document (Document Identifier and Rev. or Effective Date): See Attached	3. Related Report No.: See Attached
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4. Responsible Organization: See Attached	5. Discussed With: See Attached
--	------------------------------------

6. Requirement: See Attached

7. Description of Condition: See Attached	7a. <input type="checkbox"/> Corrected During Activity (Describe all actions taken to close in Block 7.)
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8. Initiator: <i>Marlin Horseyman</i> <i>Marlin Horseyman / For Sam Archuleta Mahilman 6-30-03</i>	9. Responsible Manager: (Required if 7a checked and <u>not</u> from QA verification activity) N/A
Printed Name Signature Date	Printed Name Signature Date

10. QA Review: <i>Marlin Horseyman</i> <i>Marlin Horseyman / For Sam Archuleta</i> <i>7-02-03</i>	11. Does a stop work condition exist? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
QAR Printed Name Signature Date	13. For a DR, check if Response must have: <input checked="" type="checkbox"/> Impact <input checked="" type="checkbox"/> Cause <input checked="" type="checkbox"/> Action to Prevent Recurrence

12. Issuing Organization: (if applicable) William J. Boyle <i>William Boyle</i> <i>7/10/03</i>	14. Due Date: 30 calendar days after issue (Issue Date: <i>7/10/03</i>)
Issuing Org Printed Name Signature Date	

15. Issuing Organization Closure Review: (if applicable)	16. QA Corrective Action Verification/Closure:
Issuing Org Printed Name Signature Date	Printed Name Signature Date

17. Trend Data: ____ / ____ ____ / ____ ____ / ____ ____ / ____ ____ / ____
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RADIOACTIVE WASTE MANAGEMENT
U.S. DEPARTMENT OF ENERGY
WASHINGTON, D.C.

8. ☒ DEFICIENCY REPORT
☐ CORRECTIVE ACTION
REPORT

NO. BSC(O)-03-D-179

PAGE 1 OF

QA: QA

DEFICIENCY REPORT/CORRECTIVE ACTION REPORT

1. Controlling Document: (Document ID and Revision or Date)

RW/DOE-0333P, Rev 13, Quality Assurance Requirements and Description
AP-SI.1Q/Rev 5, Software Management and AP-SI.2Q/Rev 1, Qualification of Level A
Software

2. Related Report No.:

OQAP-BSC-03-07

3. Responsible Organization:

Bechtel SAIC (BSC) LLC

4. Discussed With:

J. Mason, W. Watson, J. Ralston, J. Pelletier, S. Splawn, B. Bullard, L.
Griswald, J. Esposito, B. Robinson, L. Southworth, Z. Dash

5. Requirement:

AP-SI.1Q/Rev 5, Software Management and AP-SI.2Q/Rev 1, Qualification of Level A Software

- a. AP-SI.1Q/Rev 5, Sec. 5.3.1b)2), ninth bullet and AP-SI.2Q/Rev 1, Sec. 5.2.1.1.4) both require description of the input and output parameter values.
- b. AP-SI.1Q/Rev 5, Sec. 5.3.1b)2), eighth bullet and AP-SI.2Q/Rev 1, Sec. 5.2.2.1.b)2) both require description of acceptance criteria.

Requirements are continued on page 2.

6. Description of Condition:

Deficiencies, as described below, were identified in software packages reviewed from a sample size of fourteen codes:

- a. Test documentation for CWD V2.0, STRELTSOVA_ADAMS V1.4, and TOUGH 2 V1.6 did not clearly define the operational range of the software (e.g., "intended use"). As a result, test cases for these codes were limited to a partial set of input ranges. For example, a review of the source code for CWD demonstrated that the software was originally designed to handle a range of weld thicknesses from 6 to 63mm, although a single weld thickness input was tested (25mm). Although developers interviewed indicated that a wide range of testing was performed, this testing was not documented and the criteria for the required level of documentation was not understood. In addition, no input or output ranges were specified in the SMRs for PREINFL, CWD and Streltsova-Adams.vi
- b. Test documentation did not establish quantitative acceptance criteria for GT STRUDEL V26, PREINFIL V1.2, STRAT2avs V1.0, STRELTSOVA-ADAMS V1.4, PPTRK V1.0, or SEEPAGEDLL V1.0. The acceptance criteria specified for these codes were limited to the comparison of test output files with reference data sets. All other codes reviewed established clear tolerances for the specified acceptance criteria (e.g., 4 significant figures, 1%, 5%, etc.).

Has work been stopped? ☐ Yes ☒ No

7. Initiator:

Sam E. Archuleta

Printed Name

Signature

Date

9. Does a stop work condition exist?

☐ Yes ☐ No ☒ N/A

If Yes, Check One:

☐ A

☐ B

☐ C

☐ D

10. Recommended Actions:

Recommend that procedures pertaining to documentation of testing be revised to provide the level and extent of guidance necessary to produce the proper testing documentation in order to make the software defensible and to demonstrate that all requirements have been adequately tested.

11. QA Review:

Sam E. Archuleta

Printed Name

Signature

Date

12. Response Due Date:

10 Working Days after Issuance

13. QAM Issuance Approval:

Printed Name

Signature

Date

14. Corrective Actions Verified/Closure:

QAR Printed Name

Signature

Date

15. QAM Closure Approval:

Printed Name

Signature

Date

**OFFICE OF CIVILIAN
RADIOACTIVE WASTE MANAGEMENT
U.S. DEPARTMENT OF ENERGY
WASHINGTON, D.C.**

☒ DR/CAR/QO☐ SWO

NO. BSC(O)-03-D-179

PAGE 2 OF

QA: QA

CONDITION ADVERSE TO QUALITY CONTINUATION PAGE

Block 5: Requirements (Continued)...

- c. AP-SI.1Q/Rev 5, Sec. 5.3.1b)2), first bullet and AP-SI.2Q/Rev 1, Sec. 5.4.2 both require description of software and hardware.
- d. AP-SI.1Q/Rev 5, Sec. 5.3.1b)2), seventh bullet and AP-SI.2Q/Rev 1, Sec.5.2.2.1b) both require mapping of test cases to requirements.
- e. AP-SI.1Q/Rev 5, Sec. 5.3.1b)2), ninth bullet, requires description of range of input and output parameters for which results were validated. AP-SI.2Q/Rev 1, Sec. 5.5.1b)6) requires description of any failure conditions.
- f. AP-SI.2Q/Rev 1, Sec. 5.2.2.1b)3) requires regression testing on modified software.
- g. AP-SI.2Q/Rev 1, Sec. 5.2.2.1b) requires development of a VTP that reflects the requirements of the RD and the design elements of the DD for developed software.
- h. AP-SI.2Q/Rev 1, Sec. 5.2.2 requires that appropriate tests for each requirement and/or design element be developed.
- i. AP-SI.1Q/Rev 5, Sec. 5.10.3a) requires that the Responsible Manager conduct and document an impact evaluation when SDNs (or problem reports) are initiated.

Block 6: Description of Condition (Continued)

- c. The Test documentation did not consistently identify the hardware and software configuration for WAPDEG V2.10, FEHM V2.10, TOUGH2 V1.6, and STRELTSOVA_ADAMS V1.4. The VTR for WAPDEG indicated that testing was performed on a Windows NT platform, although the VTP indicated that testing was to be performed on a Windows 2000 platform. The VTP for FEHM specified that testing would be performed on a UNIX, Windows 2000 and NT platform, although the test documentation only identified testing on a Windows 2000 and UNIX platform. The VTP for TOUGH2 specified that testing would be performed on Windows 95, Windows 98, DEC-Alpha, and SUN platforms. The VTR results for TOUGH2 included a single set of output results which did not specify the platform. Test documentation for STRELTSOVA_ADAMS did not identify the test platform. Also, TOUGH2, V1.6, ASHPLUME V1.4 and FEHM V2.20 did not identify tests for each platform and operating system on the baseline.
- d. Test documentation did not consistently document the traceability of test cases to requirements for ACUSOLVE V1.4. The test case log for ACUSOLVE did not identify test cases that addressed modeling head transport by pure conduction (FR9), radiation transfer (FR10), and fluid flow (FR11). Although the test cases for WAPDEG V2.10 referenced the software requirement, there was no forward traceability from the requirement to the test case. As a result, it would require a review of all 27 test cases to determine if a critical relative humidity requirement was addressed in testing, for example.
- e. Review of the VTR for ACUSOLVE determined that six out of approximately 150 test points exceeded the acceptance criteria specified for the test. Test results in the VTR (STN 10635-1.4-00) stated that results were "well within acceptance band at all points" (see pages 9-10). Test results did not adequately justify the resolution of the test exceptions. Validation testing acceptance criteria for TOUGH2 V1.6 was stated quantitatively (0.1%), however the testing was evaluated qualitatively (visual inspection). There was no objective evidence that the specified acceptance criteria was met.
- f. There was no evidence of regression testing for TOUGH2 V1.6. Testing for Version 1.6 appeared to be limited to the changes that were made to the current version of the software. Test cases performed did not evaluate major functions identified in Version 1.4 of the software (Requirement 1: modified Corey Relative Permeability, and Requirement 6: Active Fracture Concept), nor was there documentation to indicate whether those features are not being used. Thus, the conclusion that regression testing was not complete.
- g. The VTP and VTR for NUFT V3.0s contain instructions that are confusing and difficult to follow without recourse to the technical expert. Other test parameters are specified but not used.
- h. Test results for ARC/INFO V7.2.1 do not adequately demonstrate that all system requirements were tested as specified in the VTP. Test documentation did not clearly demonstrate that GEOSPATIAL analysis functions were tested.
- i. Contrary to error reporting requirements, SDNs were written for SZ-CONVOLUTE and SEEPAGEDLL. There was no objective evidence that the required impact evaluation by the Responsible Manager was conducted and documented.

OCRWM	2. Submittal Page of	1. CR NO.:
	<input type="checkbox"/> Amended	Page of
CONDITION REPORT RESPONSE		QA: QA

3. Extent of Condition: Significant: ☐ Yes ☐ No (Complete significance for a DR.)

4. Impact: (Provide an impact statement relative to waste isolation and safety, and impact to other work, if any.)

5. Remedial Actions Required:

6. ☐ Root Cause (For a significant CAQ, attach results of formal root cause determination prepared in accordance with AP-16.4Q.)
☐ Apparent Cause

7. Action to Preclude Recurrence: (Address those actions necessary to prevent the identified cause from recurring.)

8. Due Date for Completion of Corrective Action:	9. Responsible Manager:		
	Printed Name	Signature	Date

10. Issuing Organization: (if applicable)	11. QA Review:
<input type="checkbox"/> Accept <input type="checkbox"/> Reject	<input type="checkbox"/> Accept <input type="checkbox"/> Reject <input type="checkbox"/> Re-evaluated for significance

Printed Name	Signature	Date	QAR Printed Name	Signature	Date
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CR RESPONSE INSTRUCTIONS

The numbered steps represent the numbered blocks on the CR Response. Complete only the applicable information. Mark blocks that are not applicable "N/A." Use the CR Continuation Page or reference attachments if additional space is required.

RM:

If a CAQ does not seem to exist, provide a response on a continuation page and justify the basis for not considering the issue to be a CAQ.

1. Enter the applicable CR number. Do not place page numbers in this block.
2. If deemed necessary to number the submittal pages, enter the submittal page count in the upper section of this block. If the specific submittal is an amended response, check this box.
3. Document the extent of condition investigation activities and include a detailed listing of those items or documents that are found to be part of the extent of condition. If an extent of condition investigation is not warranted, provide justification. For a DR, check the appropriate significance box to represent the RM's assessment.
4. Identify the impact relative to waste isolation, safety, and/or to other work, if any. If there is no impact, then provide justification or rationale as to why there is no impact. Otherwise, mark block N/A if impact statement is not required.
5.
 - a) Provide specific remedial actions that have been or will be taken to address each specific type of condition noted in Block 3.
 - b) Include the immediate corrective action taken if not reported on the description of condition to allow work to continue or to mitigate the consequences of the CAQ.
 - c) List specific actions in a concise bulleted or numbered format. Actions stated must be verifiable.
 - d) Provide names of specific individuals responsible for completing each action and the expected completion date, to facilitate closure verification activities.
 - e) If remedial actions are deemed unnecessary or cannot be taken, then provide a clear justification or rationale as to why no actions were taken.
 - f) Include, as a remedial action, an appropriate requirement to cross-reference this CR to all affected records identified in the extent of condition (required for all CR Responses).
 - g) If the CR documents a significant design deficiency because of an incorrect design, then require a review of the design process, design verification methods, and implementing documents.
6. For a significant CAQ, perform a root cause determination in accordance with AP-16.4Q, and attach it to the response. Provide the apparent cause if the "Cause" box of Block 13 of the CR is checked.
7. Identify those actions to be taken to preclude recurrence of the specific causes identified in Block 6. Actions planned should stem directly from the cause statements. These actions must be verifiable prior to closure of the CR. (This is required if the "Action to Prevent Recurrence" box of Block 13 of the CR is checked, or for a CAR.)
8. Provide the due date for completion of all the corrective actions outlined in the response.
9. Print name, sign, and date.