9/15/2000

85/145

CENTER FOR NUCLEAR WASTE REGULATORY ANALYSES

CORRECTIVE ACTION REQUEST

CAR No: 2000-03

Associated AR, SR, NCR No: Audit 2000-1

PART A: DESCRIPTION OF CONDITION ADVERSE TO QUALITY: Documentation/Verification of Calculations

The QAP-014, 3.2 requirements that 10% of calculations be verified and the verification documented in, referenced in, or attached to the review documentation has not been consistently complied with. The journal article (Q199911140001) for Container Life, Source Term did not receive a calculation check.

2 Bem 7/11/2000

Initiated by: D.W. Dunavant DWD

Date: 06/30/00

PART B: PROPOSED ACTION

See attached sheets

Responsible Individual: B. SAGAR

Response Due: 7/31/2000

1) Extent of Condition:

2) Root Cause:

3) Remedial Action:

Proposed Completion Date: 8/30/2000

4) Corrective Action to Preclude Recurrence:

Proposed Completion Date: 8/30/2000

Element Manager: Patrick C. Martin for B. Sagar

Date: 7/31/2000

PART C: APPROVAL

Comments/Instructions

DW Dunavant 8/02/00

Director of QA: [signature]

Date: 7/31/2000

PART D: VERIFICATION OF CORRECTIVE ACTION IMPLEMENTATION

Reviewed attached table of 86 CNWRA Reports that were evaluated and the results documented. Also reviewed attached copy of revised QAP-014 (Revision 2) that addresses instructions for calculation reviews and how to document it. Electronic training has been provided to appropriate CNWRA staff on 8/31/2000.

Verified by: [signature]

Date: 9/15/2000

Distribution:
Original-CNWRA/QA DIRECTOR QA Records
ORIGINATOR
PRINCIPAL INVESTIGATORS
ELEMENT MANAGERS
TECHNICAL DIRECTOR & DIRECTORS
CNWRA PRESIDENT
M. Ehnstrom/30
T. Mayes/30

CAR No. 2000-03

1) Extent of Condition

A significant portion of review records of CNWRA deliverables for FY 2000 were examined to determine the extent of condition. A total of 86 deliverables was examined. Out of these, 48 deliverables were found to contain some form of calculations. The calculations ranged from very complex (use of computer codes such as MULTIFLO) to very simple [e.g., manipulation of laboratory data (take logarithms) for plotting]. Twelve of the 48 were marked for QAP-014 checking. All 12 had statements on the Comment Resolution Record form regarding checks. Not all these statements indicated the specific calculations, percentage of calculations, or the location of calculations (e.g., scientific notebooks) checked. Two types of non-conformance were found,

(i) responsible managers (Element Manager and Technical Director) not asking for QAP-014 check

(ii) reviewer not providing sufficient record of the QAP-014 checking.

Based on above data, the condition is considered to be wide spread.

2) Root Cause

Selected Element Managers and technical staff members were interviewed to determine the root cause.

Regarding (i) above, it was determined that the Element Managers and the Technical Director believed that they were to judge whether a QAP-014 check was required for a deliverable, even if it contained calculations. Their decision on whether to ask for such a check was based on the importance of calculations in a specific paper or report to issue closure or a future licensing action, whether or not a controlled software was used for calculations, whether the calculations were too simple, and whether the calculations were from a previous report or published paper. However, QAP-014 requires that any CNWRA report/paper containing a calculation should undergo a QAP-014 check.

Regarding (ii) above, after talking to the reviewers, it was determined that when the proper box was checked on the AP-6 form, the reviewers did check the calculations as required by QAP-014, but the lack of training of the reviewers with respect to what is required as documentation of this check left the documentation uneven.

3) Remedial Action

In view of the corrective action suggested in 4) below, the remedial action will be to have the cognizant Element Managers evaluate the 36 CNWRA reports that were not identified for calculation checks and determine if QAP-014 should be applied. Those so identified will receive such a documented review. Those that do not need a QAP-014 review will be so documented with the initials and date of the cognizant Element Manager. Actions are recommended below for future reports.

4) Corrective Actions to Preclude Recurrence.

The following corrective actions are recommended to preclude recurrence.

(i) The present practice of allowing the author, the Element Manager, and the Technical Director to determine which deliverables should undergo QAP-014 checks should be continued. QAP-014 should be modified accordingly. However, on the AP-6 form for reports containing calculations, a brief rationale for omitting this review should be recorded. Complete by August 23, 2000.

(ii) The 10% criteria in QAP - 014 should be revised. No numerical limit should be mentioned. Instead, the extent of check should be based on the nature of calculations being checked. For computer codes and spread sheets, checking of the formula and a single calculation is sufficient. For non repetitive calculations, more than 10% may need to be checked. Complete by August 23, 2000.

(iii) QAP- 014 should be revised to provide specific suggested language for reviewers to use for recording reviews of the calculations. This language should constitute "objective" proof of the review. Complete by August 23, 2000.

(iv) The decision to conduct a QAP-014 review and the choice of the review should be made as early as possible in the process of developing a deliverable/paper. To the extent feasible and desirable, the reviewers for those reports should perform required checks as calculations proceed. This is an implementation detail and will be monitored throughout the coming year. Supporting changes will also be considered in the revision to QAP-014.

(v) The Element Managers, the Technical Director, and the reviewers should be provided refresher training on requirements of the modified QAP-014. Complete by August 30, 2000.

CENTER FOR NUCLEAR WASTE REGULATORY ANALYSES

December 14, 2000

MEMORANDUM

TO: Corrective Action Folder for Audit 2000-1

FROM: Bruce Mabrito, Director of Quality Assurance

SUBJECT: Evaluation of Proposed Corrective Action Responses

A review was performed on responses originally composed in July 2000 on the Corrective Actions Requests (CARs) which resulted from the annual CNWRA audit performed in June of the same year. During the review it became apparent that as further evaluation and work was performed in closing out the CARs, some of the originally described actions were no longer appropriate or applicable. It is the goal of this memorandum to explain some of the changes which occurred between what was originally planned and what actions were performed to close out the CARs. These changes are in line with CNWRA business practices and, in a sense, more in line with the performance-based quality program we at the CNWRA are implementing.

Most of the differences occur on the CARs in the areas identified as "Remedial Action" and/or in the area identified as "Corrective Action to Preclude Recurrence." We will discuss the differences between what was originally agreed to and what was actually performed in more detail below.

CAR 2000-01 Subject: Procurement Controls identified in NQA-1, 1986 were not addressed in QAP-016, and have not been followed.

In the 5th paragraph under Corrective Action to Prevent Recurrence a statement is made to "implement adequate formal training for all affected CNWRA staff and, if required, consultants and subcontractors on the provisions of 10 CFR 50, Appendix B, Criterion VII and, if necessary, those related to ANSI/ASME NQA-1, Element 7 concerning the acquisition of items and services." The statement goes on to state that this training can be part of the regular QA indoctrination for CNWRA staff members and, if appropriate, consultants and subcontractors. It also requires that the training will be documented on attendance/participation records.

Upon further evaluation it was recognized that consultants and subcontractors do not purchase items and materials effecting quality for the CNWRA, so therefore, training on critical procurement requirements is not appropriate or warranted. CNWRA staff were issued a revised QAP-016 procedure with a transmittal and receipt form in August 2000. The transmittal and receipt form provides documentation that CNWRA staff have read and understand the procedure containing the more recent procurement requirements. Although formal attendance records were originally required, the strategy of using transmittal and receipt records

provides documented objective evidence that CNWRA staff had received and read the required procedure and understand the procedure contents.

CAR 2000-02 Subject: Scientific Notebooks were not compliant to the requirements of QAP-001.

Corrective Action to Preclude Recurrence state that Element Managers (EMs) are to do occasional informal checking of the Scientific Notebooks; QA will follow-up when Scientific Notebooks are issued to new employees, consultants, and subcontractors; and that EMs and the Director of QA will review scientific notebooks in the process of being archived at approximately six month intervals as they are submitted to QA records.

It will be difficult to produce objective evidence documentation showing that all these activities are being completed. As part of their managerial activities, EMs should be informally reviewing scientific notebooks of staff who work in areas for which they are responsible. During the extensive review of CNWRA scientific notebooks completed after the June 2000 audit, a heightened sense of ownership and responsibility was shown by CNWRA staff personnel for scientific notebooks and compliance to QAP-001. This commitment was also transferred to consultants and subcontractors who maintained notebooks for work being performed by them for the CNWRA Principal Investigators and EMs. CNWRA QA staff will continue to evaluate scientific notebooks during the periodic surveillances which are routinely performed in accordance with the CNWRA Surveillance Schedule. During the next 6 month recall of scientific notebooks, EMs and the Director of QA will continue their close review of scientific notebooks that are in the process of being archived.

CAR 2000-03 Subject: Documentation/Verification of Calculations

Corrective Actions to Preclude Recurrence contained five distinct recommendations of which two will be discussed here. The first area for discussion is contained in paragraph (iv) and states the requirements for performing a QAP-014, Documentation and Verification of Scientific and Engineering Calculations, should be made as early as possible. The recommendation also states that the required checks should be performed as "calculations proceed." Paragraph (v) of the recommendations states that EMs , the Technical Director, and the reviewers should be provided refresher training on the revised QAP-014.

Calculation verification reviews are performed when required as identified on the QAP-12-4 Form, Instructions To Technical Reviewers, which is signed by the cognizant EM. This form is initiated at the beginning of the review process and is just about as early as anyone would want to review calculations used to support data and/or conclusions contained in a deliverable document. Performing calculation reviews prior to work being completed on a deliverable product would be unproductive. The revised QAP-014 (dated 8/30/2000) was sent to appropriate CNWRA technical staff to replace their earlier version and to other CNWRA staff needing the procedure. Electronic training was sent out to technical staff to inform them of the changes to QAP-014. Again, formal CNWRA transmittal and receipt forms were used to document that staff personnel have received, read and understand the revised procedure.

CAR 2000-05 Subject: Training Issues

The only change concerning this CAR is that the remedial action required copies of an e-mail from EMs to the Director of QA documenting the results of an assessment by the EMs be placed in each consultant's file. The EMs performed their assessment and informed the Director of QA but these e-mails, one e-mail from each EM, will be placed in the training file and not in each consultant's file.

CAR 2000-06 Subject: Ineffective Corrective Action

Since the 2000 audit in June, no corrective actions have been written and therefore it is too early to determine compliance with the responses described in the CAR. Some of the actions to preclude recurrence will have to be evaluated during the 2001 audit. A significant number of procedures have been revised to prevent recurrence of the unsatisfactory findings.

CAR 2000-07 Subject: Quality Planning

The Director of CNWRA QA, by attending the weekly management meetings and by making presentations at quarterly staff meetings, is continually keeping the staff aware of their individual responsibilities within the CNWRA quality assurance system. This individual responsibility is first presented to each employee during their Indoctrination to the Quality System as part of their new employee training.

In summary, significant changes have occurred within the quality assurance system, including the revision 4 to the CNWRA QA Manual (CQAM). These changes primarily addressed the modification of work routines and parts of the quality system which were not adequately described in the CQAM. Revisions to some of the most commonly used procedures at the CNWRA have also been made. With these and other changes implemented, it is our belief that the quality system is stronger, and more flexible, in the areas that were found deficient during the 2000 audit and the actions taken should prevent similar deficiencies from occurring again.

cc: QA Memos Folder
Each QA Audit 2000 CAR

Subject: CAR typo
Date: Tue, 11 Jul 2000 13:14:54 -0500 (CDT)
From: DDunavant@swri.edu
To: bmabrito@swri.edu

Please correct the reference in CAR 2000-03 to Q199911240001 instead of Q199911740001. Some people still don't recognize my european style 7s.

Don Dunavant
Manager, Quality Systems Technology
Institute Quality Assurance
Southwest Research Institute
(210) 522-2942

CENTER FOR NUCLEAR WASTE REGULATORY ANALYSES

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MEMORANDUM

September 15, 2000

TO: QA Records Corrective Action Request 2000-03 Folder

FROM: Budhi Sagar, Technical Director for B. Sagar

SUBJECT: Closure of Corrective Action Request (CAR) 2000-03

REFERENCE: CAR 2000-03, Annual 2000 CNWRA QA Audit

This memorandum to the CAR 2000-03 folder is to document closure of CAR 2000-03, which deals primarily with calculations and the checking of such calculations in final CNWRA reports. Of the total 86 deliverables examined, 48 contained some form of calculation. Twelve of the 48 reports had already received a QAP-014 (Documentation and Verification of Engineering and Scientific Calculations) review. The CNWRA technical staff performed a QAP-014 calculation check on those 12, plus the 36 additional CNWRA reports. In the 48 individual cases, the QA Records folder now contains evidence of the calculation reviews that were documented on the AP-6 form or the Instructions to Technical Reviewers or on a separate page(s). CNWRA QA has verified the documentation of the calculation review. No errors were found during the calculation review activities that would change the values in the final CNWRA report.

Background Information: CAR 2000-03 was initiated June 30, 2000 at the conclusion of the annual CNWRA QA Audit. The CAR identified that the 10% of calculations to be verified and the verification documented in, referenced in, or attached to the review documentation has not been consistently complied with. One of the remedial actions was to review a significant portion of CNWRA deliverables for FY2000. That review was accomplished and certain CNWRA deliverables were identified as needing to be either checked or rechecked. The checking process has been ongoing for about four weeks and now 100 percent of the deliverables in the original survey have gone through the QAP-014 check. The CAR 2000-03 proposed completion date was initially August 30, 2000, and it was extended to September 8, 2000 and then to September 15, 2000 because key CNWRA technical staff were on travel and did not have the time to perform the independent reviews.

The objective evidence of the calculation review is present in each of the report's QA Records folder. QAP-014 has been revised so that a rationale is required for omitting a QAP-014 review; the 10% criterion has now been replaced with options based on the nature of the calculations, and the objective proof of a review is to be documented, e.g., the source of data is to be reviewed. QAP-014 training has been provided to CNWRA staff members via e-mail and will be followed up by informal Element Manager and QA staff training.

cc: W. Patrick
CNWRA Directors/Element Managers
M. Ehnstrom

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QA Records
Training
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Subject: TRAINING: DOCUMENTATION & VERIFICATION OF S&E CALCS
Date: Thu, 31 Aug 2000 22:06:44 -0500
From: Bruce Mabrito <bmabrito@gargol.cnwra.swri.edu>
Organization: CNWRA
To: STAFF_GROUP <STAFF_GROUP@gargol.cnwra.swri.edu>

The CNWRA procedure on Documentation and Verification of Scientific and Engineering Calculations, QAP-014 Revision 2/Change 0, has been revised and distributed. Copies have been sent out to CNWRA management and others who previously held a copy. If you believe you need a controlled copy of this procedure to perform your work, contact your Element Manager and they will arrange to have a copy sent to you from QA. You will be required to sign and date that you received it and read the document.

This Documentation and Verification of Scientific and Engineering Calculations procedure has been revised and shortened to be more clear and understandable, and, it removes the arbitrary "10%" rule under which we previously operated. QAP-014 provides requirements for calculations to be documented if they are calculations performed using controlled software, calculations performed using uncontrolled software, calculations performed using commercial off-the-shelf software, and other calculations.

The procedure also addresses the verification of calculations, which was an issue in the CNWRA 2000 audit. The procedure now states that "In consultation with the author(s), the EM will determine whether a CNWRA product contains calculations and the extent to which these calculations require verification. The EM will make this decision based on (i) potential importance of the calculations with respect to their intended use, (ii) extent of prior verification in related reports or papers, and (iii) complexity of calculation and potential for errors."

The methods of documenting the calculation checks are also clearly identified. You should be able to provide clear objective evidence that you accomplished these actions in your scientific notebook, in the comment and resolution sheets, or in other ways that provides a lasting record.

If you have questions regarding this procedure, contact your Element Manager.

Bruce Mabrito

Corrective Action Request 2000-03 (QAP-014)
List of Reports Reviewed in QA Records
January 1, 2000 - July 22, 2000

Project Number	Title	Calculations in Report[1]	QAP-014 Required	Remarks
20-OH	EFFECTS OF SURFACTANT MODIFICATION ON THE NATURAL ZEOLITES...	Yes	No	
0751.004	FRACTURE PATTERN CHARACTERIZATION OF ACOUSTIC...	Yes	No	
01136.006	Models for Evaluating Corrosion Under Disbonded Coating on Steel Piping	Yes	No	p. 2 - 7
01402.158.060	CNWRA COMPUTER REQUIREMENTS FOR FY2001-LETTER REPORT	None	N/A	
01402.331.010	OBSERVATION REPORT ON DOE YM ISM AUDIT	None	N/A	
01402.331.011	OBSERVATION REPORT ON WASTE PACKAGE DOE YM AUDIT (11/8-12/99)	None	N/A	
01402.331.012	INPUT TO OBSERVATION AUDIT REPORT ON BIOSPHERE 11/15-19/99	None	N/A	
01402.331.013	INPUT TO OBSERVATION AUDIT REPORT ON UNSATURATED ZONE FLOW AND TRANSPORT (1/24-28/00)	None	N/A	
01402.331.014	INPUT TO OBSERVATION AUDIT REPORT ON WASTE FORM DEGRADATION (1/31-2/4/00)	None	N/A	
01402.331.015	INPUT TO OBSERVATION AUDIT REPORT ON EBS DEGRADATION FLOW AND TRANSPORT (2/7-11/00)	None	N/A	
01402.461.045	ABSTRACT -- SUCCESSFUL ERUPTION FORECASTING BEFORE UNREST AT CERRO NEGRO VOLCANO, NICARAGUA	None	N/A	
01402.461.050	PHVIEW USERS GUIDE AND CODE-LETTER REPORT	None	N/A	
01402.461.070	ESTIMATION OF VOLCANIC HAZARDS RELATED TO TEPHRA FALLOUT	Yes	Yes	Statement added to Form TOP-3 No % calculations checked provided
01402.471.020	STRAIN DISTRIBUTION AND THE TECTONIC SETTING OF YUCCA MOUNTAIN AND CRATER FLAT-JOURNAL ARTICLE	Yes	No	
01402.471.021	REVIEW OF MANUSCRIPT "PRESNT DAY MOTION...	Yes	No	

Project Number	Title	Calculations in Report	QAP-014 Required	Remarks
01402.471.040	RESOLVE SELECTIVE FIELD RELATIONSHIPS FOR THREE-DIMENSIONAL STRUCTURAL MODEL OF AMARGOSA DESERT FOR INPUT TO USFIC-CNWRA REPORT	Yes	No	See p. vi
01402.471.050	CONSTRAIN MODELS OF FAULTS AND FRACTURES AT DIFFERENT SCALES IN ANALYSIS AND EVALUATION OF FRACTURE DATA-JOURNAL ARTICLE	Yes	Yes	Statement added to Form TOP-3- "calculations checked" No % calculations checked provided No location of calculation checked provided
01402.561	NATURAL ANALOGS AND PERFORMANCE	Yes	No	
01402.561.000	FEPS DATABASE ANALYSIS	Yes	No	p. xi
01402.561.010	MULTIFLO VERSION 1.2-LETTER REPORT	None	N/A	
01402.561.020	EFFECTS OF DESIGN ON COUPLED THERMAL-HYDROLOGIC-CHEMICAL EFFECTS ON SEEPAGE AND FLOW-LETTER REPORT	None	N/A	
01402.561.030	EFFECTS OF DESIGN ON COUPLED THERMAL-HYDROLOGIC-CHEMICAL EFFECTS ON WASTE PACKAGE CHEMICAL ENVIRONMENT-LETTER REPORT	None	N/A	
01402.561.040	EFFECTS OF DESIGN ON COUPLED THERMAL-HYDROLOGIC-CHEMICAL EFFECTS ON ENVIRONMENT FOR RADIONUCLIDE RELEASE-LETTER REPORT	None	N/A	
01402.561.050	EFFECTS OF DESIGN ON COUPLED THERMAL-HYDROLOGIC-CHEMICAL EFFECTS ON RADIONUCLIDE TRANSPORT-LETTER REPORT	None	N/A	
01402.571	PASSIVE DISSOLUTION AND LOCALIZED CORROSION...	Yes	No	
01402.571	EFFECTS OF ENVIRONMENTAL FACTORS AND POTENTIAL...	Yes	No	
01402.571	AN ARCHEOLOGIAL SITE AT AKROTIRI...	Yes	No	
01402.571	A FRACTURE MECHANICS-BASED MODEL FOR...	Yes	No	

Corrective Action Request 2000-03 (QAP-014)

Project Number	Title	Calculations in Report[1]	QAP-014 Required	Remarks
01402.571	EFFECTS OFIRON CHLORIDES...	Yes	Yes	Statement added to Form TOP-3- "verified propagation through equations" No % calculations checked provided
01402.571	EFFECTS OF ENVIRONMENTAL ELECTROCHEMICAL...	Yes	No	P. 5/18
01402.571.005	INPUT TO SAFETY EVALUATION REPORT ON DISPOSAL CRITICALITY ANALYSIS METHODOLOGY TOPICAL REPORT	None	N/A	
01402.571.010	LOCALIZED AND UNIFORM PASSIVE CORROSION OF TI-GRADE 7 DRIP SHIELD UNDER SIMULATED REPOSITORY CONDITIONS-JOURNAL ARTICLE	Yes	No	p. 5, 18, 19
01402.571.020	ENVIRONMENTAL AND ELECTROCHEMICAL FACTORS ON LOCALIZED CORROSION OF ZIRCALOY 4 CLADDING-PAPER TO BE SUBMITTED TOCORROSION	Yes	No	
01402.571.040	INPUT TO CLST IRSR, REVISION 3-LETTER REPORT	None	N/A	
01402.661.010	MOUNTAIN-SCALE THERMAL-HYDROLOGIC ANALYSES-STATUS REPORT	Yes	No	Statement added to Form TOP-3- Only one type of calculation checked?
01402.661.030	INPUT TO TEF IRSR, REVISION 3-LETTER REPORT	None	N/A	
01402.661.940	THERMALLY DRIVEN REFLUX...	Yes	No	P. 15/16
01402.671	INSTITUTIONAL REVIEW OF CENTER FOR NUCLEAR WAISTE...	Yes	No	
01402.671	AN INDICATOR OF MICROFAILURE OF ROCK ACOUSTIC EMMISSION	Yes	No	
01402.671	MODELING DRIFT STABILITY IN FRACTURED...	Yes	Yes	No statement on TOP-3 form
01402.671.040	THERMAL-MECHANICAL EFFECT ON REPOSITORY DESIGN/PERFORMANCE: CONTINUUM MODEL-CONFERENCE PAPER OR JOURNAL ARTICLE	Yes	Yes	No statement on TOP-3 form
01402.671.060	PROCESS-LEVEL ROCKFALL STUDY FOR INPUT TO SEISMO MODULE OF TPA CODE-CONFERENCE PAPER OR JOURNAL ARTICLE	Yes	Yes	No statement on TOP-3 form

Corrective Action Request 2000-03 (QAP-014)

Project Number	Title	Calculations in Report[1]	QAP-014 Required	Remarks
01402.671.071	ASSESSMENT OF MECHANICAL RESPONSE...	Yes	Yes	Statement added to Form TOP-3 No % calculations checked provided No location of calculation checked provided
01402.761	CDF SENSITIVITY ANALYSIS TECHNIQUES FOR RANKING INFLUENTIAL PARAMETERS...	Yes	No	
01402.761	SENSITIVITY ANALYSIS OF A COMPLEX GEOLOGIC WASTE...	Yes	Yes	Statement added to Form TOP-3 No % calculations checked provided
01402.761.010	AN APPROACH TO ASSESS. OF HLW CONTAINMENT I: WP DEG.	None	N/A	
01402.761.010	INPUT TO TSPAI IRSR, REVISION 2-LETTER REPORT	Yes	Yes	No statement on TOP-3 form
01402.761.011	AN APPROACH TO ASSESS. OF HLW CONTAINMENT II: RAD REL FROM ENGINEERING BARRIER SYSTEM	Yes	No	p. 5
01402.761.014	QA TASK FORCE OBSERVATIONS TRIP TO LLNL	None	N/A	
01402.761.015	MRS PAPER: PREDICTION OF WP LIFETIME	Yes	No	
01402.761.016	MRS PAPER: "RADIOACTIVE RELEASE RATES..."	No	No	
01402.761.018	SRD for TPA VERSION 4.0	Yes	No	
01402.761.080	EXTERNAL REVIEW OF TPA 3.2 CODE-LETTER REPORT	None	N/A	
01402.771.030	ANALYSES SUPPORTING RESPONSE TO PUBLIC COMMENTS ON DRAFT HLW RULEMAKING	Yes	Yes	Statement on TOP-3 form, "Approximately 20% of calculations..." No location of calculation checked provided
01402.861	DRIPPING INTO SUBTERANEAN CAVITIES...	Yes	No	
01402.861	A DISCRETE-FACTURED BOUNDARY INTEGRAL...	Yes	No	
01402.861.000	HYDRAULIC CONDUCTIVITY AND PERMEABILITY AT YUCCA MOUNTAIN--LETTER REPORT	None	N/A	
01402.861.010	ANALYSIS OF NICHE STUDIES AND DEVELOPMENT OF BASES FOR TOTAL-SYSTEM PERFORMANCE ASSESSMENT SEEPAGE PARAMETERS	Yes	No	p. ix

Project Number	Title	Calculations in Report[1]	QAP-014 Required	Remarks
01402.861.020	POROSITY AT YUCCA MOUNTAIN--LETTER REPORT	None	N/A	
01402.861.040	INPUT TO USIFC IRSR, REVISION 3 - LETTER REPORT	None	N/A	
01402.861.050	COMPARISON OF NUMERICAL AND ANALYTICAL MODELS OF UNSATURATED FLOW AROUND UNDERGROUND OPENINGS CONSIDERATIONS FOR PERFORMANCE ASSESSMENTS OF YUCCA MOUNTAIN, NEVADA, AS A HIGH-LEVEL NUCLEAR WASTE REPOSITORY	Yes	No	
01402.861.060	THE EFFECT OF CAVITY WALL IRREGULARITIES ON SEEPAGE EXCLUSION FROM HORIZONTAL CYLINDRICAL UNDERGROUND OPENING	Yes	Yes	Statement added to Form TOP-3 "Sample Mathamatica run..." No % calculations checked provided No location of calculation checked provided
01402.871	Thermodynamic Modeling of the Adsorption of radionuclides in Selected minerals I: Cations	Yes	No	p. 13, 16
01402.871	Thermodynamic Modeling of the Adsorption of radionuclides in Selected minerals II: Anions	Yes	No	p. 20 - 25
01402.871	Cation Exchange Properties of Natural Zeolites	Yes	No	
01402.871.000	EFFECT OF REDUCING CHEMISTRY ON TECHNETIUM TRANSPORT-MATERIALS RESEARCH SOCIETY MANUSCRIPT	Yes	No	
01402.871.010	STOCHASTIC ANALYSIS OF NEPTUNIUM TRANSPORT IN THE VICINITY OF YUCCA MOUNTAIN-JOURNAL PAPER	Yes	No	
01402.871.020	INPUT TO RT IRSR, REVISION 2 - LETTER REPORT	Yes	No	p. x, used Excel, 5.0
01402.931.010	DRAFT ENVIRONMENTAL IMPACT STATEMENT EVALUATIVE REVIEW COMMENTS	No	No	
01403.102.001	SOLIDIFICATION REPORT AS NUREG/CR	None	N/A	
01403.106	PRETRAT A GRAPHICAL ...MICROSOFT EXCEL SPREADSHEET MODEL	Yes	No	

Project Number	Title	Calculations in Report[1]	QAP-014 Required	Remarks
01403.201.011	CNWRA RESPONSE TO BNFL INC. COMMENTS ON THE CNWRA "COMPLIANCE WITH RISK GOALS AND PROJECT RELIABILITY DATABASE"	None	No	
01403.201.202	RESPONSE TO BNFL INC. COMMENTS ON CNWRA 99-001 REV. 1 REPORT	None	N/A	
01405.021.010	DRY TRANSFER SYSTEM SAFETY EVALUATION REPORT-DRAFT LETTER REPORT (DTS)	None	N/A	
01405.021.020	DRY TRANSFER SYSTEM SAFETY EVALUATION REPORT-FINAL LETTER REPORT	None	N/A	
01405.031.010	HI-STAR/HI-STORM HIGH SEISMIC TOPICAL REPORT SECOND ROUND REQUEST FOR ADDITIONAL INFORMATION-LETTER REPORT	None	N/A	
01405.031.020	HOLTEC HI-STAR/HI-STORM HIGH SEISMIC TOPICAL REPORT REVIEW SUMMARY--LETTER REPORT	Yes	No	p. 2-1
01405.041.010	DRAFT PFSF SER INPUT--LETTER REPORT	Yes	Yes	
01405.081.020	FIRST ROUND REQUEST FOR ADDITIONAL INFORMATION, AND PRELIMINARY SAFETY EVALUATION REPORT, INEEL ISFSI-N--FINAL LETTER REPORT	None	N/A	
01408.001.001	PRELIMINARY QUESTIONS ON SKB SR-97	None	N/A	
08801.006.007	ADEQUACY OF DECONTAMINATION AND DISMANTLEMENT FOR WASHINGTON SITE	None	N/A	
08801.006.008	WASHINGTON FACILITY STATUS REPORT	None	N/A	
08801.006.009	WASHINGTON FINAL RADIATION SURVEY PLAN REVIEW REPORT	None	N/A	
08801.006.010	ADEQUACY OF WASHINGTON SITE FUNDING PLAN REPORT	None	N/A	
08801.006.011	ALARA REVIEW REPORT FOR WASHINGTON SITE	None	N/A	
18.03345.01.002	FAILURE ANALYSIS OF TYPE 316L...	Yes	No	

1. Either noted presence of calculation OP formulas/tables/graphs that indicated a strong possibility of calculations

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Subject: **Corrective Actions on CAR 2000-03**
Date: Tue, 22 Aug 2000 16:57:45 -0500
From: Bruce Mabrito <bmabrito@gargol.cnwra.swri.edu>
Organization: CNWRA
To: "Vijay Jain (vjain)" <vjain@gargol.cnwra.swri.edu>,
Gordon Wittmeyer <gwitt@gargol.cnwra.swri.edu>,
"English Pearcy (epearcy)" <epearcy@gargol.cnwra.swri.edu>,
"Asadul Chowdhury (achowdhury)" <achowdhury@gargol.cnwra.swri.edu>

All,

More information on the CAR 2000-03 response action.

The Description of the Condition: "The QAP-014, para. 3.2 requirements that 10% of calculations be verified and the verification documented, referenced in, or attached to the review documentation has not been consistently complied with."

The Remedial Action to this CAR states: "In view of the correction suggested below (Actions to Preclude Recurrence), the remedial action will be to have the cognizant Element Managers evaluate the 36 CNWRA reports that were not identified for calculation checks and determine if QAP-014 should be applied. Those so identified will receive such a documented review. Those that do not need a QAP-014 review will be so documented with the initials and date of the cognizant Element Manager."

QAP-014 currently states the following: "3.2.4 Verifications shall be documented on the report comment resolution sheets, identifying the location of the calculation by Scientific Notebook number and page. Any duplicate calculations [see paragraph 3.2.3(i)] shall be documented on or attached to the comment resolution sheet." We should meet this requirement with a statement in the QA Folder with our corrective actions.

I will ask the EMs for a statement (via e-mail) after all reviews are complete, telling QA that each of identified/assigned documents has been reviewed and the QAP-014 calculation checks have been completed. Please note the requirement above to state the scientific notebook number and page in your reviews. We must be able to show ("objective evidence") that the CNWRA has fully complied with QAP-014. Thanks for your help in this matter. Bruce

Subject: **CAR 2000-03 (QAP-014/Calculations) Actions**
Date: Tue, 22 Aug 2000 10:30:07 -0500
From: Bruce Mabrito <bmabrito@gargol.cnwra.swri.edu>
Organization: CNWRA
To: DIRS-MGRS_GROUP <DIRS-MGRS_GROUP@gargol.cnwra.swri.edu>, "Vijay Jain (vjain)" <vjain@gargol.cnwra.swri.edu>

EMs:

1. We are issuing out QA Records for your review (your staff members' review) re CAR 2000-03. Please return the folders to QA before the end of the work day so they can be kept safely in the fire protected room.

2. As you review the QA documents, think about the checks that will be made in the future to verify that you looked at the document. Please note on the document that you reviewed it and sign and date the fact on the AP-6 form (those done so far have been using the bottom of the AP-6 form). If extra paperwork is generated, put that in the folder also for a complete record.

3. If you have questions regarding this CAR resolution, call me at x 5149.

Thanks. Bruce

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Subject: **CAR 2000-03 on QAP-014 Reviews**
Date: Tue, 22 Aug 2000 09:01:18 -0500
From: Gordon William Wittmeyer <gwittmeyer@gargol.cnwra.swri.edu>
Organization: CNWRA
To: "Sean Brossia (sbrossia)" <sbrossia@gargol.cnwra.swri.edu>,
"David Pickett (dpickett)" <dpickett@gargol.cnwra.swri.edu>,
"Osvaldo Pensado (opensado)" <opensado@gargol.cnwra.swri.edu>
CC: Maria Padilla <mjpadilla@gargol.cnwra.swri.edu>,
"Budhi Sagar (bsagar)" <bsagar@gargol.cnwra.swri.edu>,
"Bruce Mabrito (bmabrito)" <bmabrito@gargol.cnwra.swri.edu>

Sean, David, and Osvaldo:

To complete the response to Corrective Action Request (CAR) 2000-03, I am asking each of you to complete a QAP-014 review of the PA reports that you previously reviewed (Osvaldo is asked to substitute for Yichi Lu). When you originally reviewed the deliverable, I failed to check the box on the QAP-12-4 form to require a verification of calculations. Checking or not checking is only an option for the EM if NO calculations are documented, and we must now correct the review. Please request the appropriate Scientific Notebooks from the authors and record the results of your QAP-014 review on the original TOP-003 form. Please complete your review by Thursday, August 24, 2000 and return to me.

The Director of QA has asked that conduct your re-review in Building 189 since you are working with the official QA record. Please pick up the appropriate QA record from M. Padilla in the library. Please also return the QA record to Maria by 5:00 PM each evening.

Thanks,
Gordon

CENTER FOR NUCLEAR WASTE REGULATORY ANALYSES QUALITY ASSURANCE PROCEDURE	Proc. QAP-014 Revision 2 Chg 0 Page 1 of 4

Title QAP-014 DOCUMENTATION AND VERIFICATION OF SCIENTIFIC AND ENGINEERING CALCULATIONS

EFFECTIVITY AND APPROVAL

Revision 2 of this procedure became effective on 8/30/2000. This procedure consists of the pages and changes listed below.

Page No.	Change	Date Effective
All	0	8/30/2000

Supersedes Procedure No. QAP-014, Rev. 1, Chg 0 dated 10/14/96.

Approvals

Written By	Date	Concurrence Review	Date
Budhi Sagar	8/30/2000	English Pearcy	6/30/2000
Quality Assurance	**Date**	**Cognizant Director**	**Date**
Bruce Mabrito	8/30/2000	Henry Garcia	8/30/00

QAP-014 DOCUMENTATION AND VERIFICATION OF SCIENTIFIC AND ENGINEERING CALCULATIONS

1. PURPOSE

The purpose of this procedure is to specify the methods for documenting and verifying scientific and engineering calculations. This procedure applies to calculations performed by hand, hand calculator, and by computer software.

2. RESPONSIBILITIES

2.1 The investigator is responsible for documenting calculations in an appropriate Scientific Notebook as specified in this procedure.

2.2 Technical reviewers are responsible for verifying samples of calculations as specified in this procedure.

3. PROCEDURE

3.1 Documentation of Calculations

Calculations shall be documented in appropriate Scientific Notebooks sufficiently so that the calculation can be duplicated.

3.1.1 Data inputs and computational methods shall be documented as follows:

(i) Calculations Performed Using Controlled Software – The name and version number of the controlled software and the input files will be documented and submitted as a part of the QA records.

(ii) Calculations Performed Using Uncontrolled Software – A source code and/or an executable copy of the uncontrolled software together with the input file will be documented and submitted as a part of the QA records.

(iii) Calculations Performed Using Commercial-off-the-Shelf Software – The name and version number of the commercial-off-the-shelf software (e.g., spreadsheets, Mathematica, Mathcad) source code of any macros or formulae or script, and the input data will be documented and submitted as a part of the QA records.

(iv) Other Calculations – A description of the calculation method in detail sufficient for reapplication and the data used will be documented and submitted as a part of the QA records.

3.1.2 Output data from calculations shall be documented in the appropriate Scientific Notebook. If the output data consist of large files, the files may be copied to a disk and attached to the Scientific Notebook, or the Scientific Notebook may reference a file location. Electronic output files should identify the software name and version and date of the calculation. When complete input files are included in the QA records, it will be sufficient to document only a sample of the output files.

3.2 Verification of Calculations

The objective of the verification of calculations is to assure their arithmetic correctness. In consultation with the author(s), the Element Manager will determine whether a CNWRA product contains calculations and the extent to which these calculations require verification. The Element Manager will make this decision based on (i) potential importance of the calculations with respect to their intended use, (ii) extent of prior verification in related reports or papers, and (iii) complexity of calculation and potential for errors. For calculations performed using controlled software, verification of input data is generally sufficient. For calculations performed using uncontrolled software, a check of output using alternate software or hand calculations of a subset of the analysis will generally also be required. For calculations performed using commercial-off-the-shelf software (e.g., spread sheets, Mathematica, Mathcad), verification of a suitable number of formulae will generally be required in addition to the foregoing checks of input and output. The Element Manager will note on the QAP-002 review form (CNWRA Form TOP-3) the extent and type of verification required and obtain concurrence of the Technical Director for the same.

In verifying calculations, the assigned reviewer will obtain access to relevant scientific notebooks and records of input and output data files, as appropriate. The reviewer may require access to the software, if any, and exercise it as a part of the verification process.

3.2.1 The reviewer shall verify that the input data have been documented as required in paragraph 3.1.1.

3.2.2 The reviewer shall verify that the calculation methods have been documented as required in paragraph 3.1.2., sections (i), (ii), or (iii) as appropriate.

3.2.3 The reviewer shall verify the calculations to the extent determined by the Element Manager as follows.

(i) Calculations Performed Using Controlled Software – Check a sample of the input data to determine that data is correctly entered and that the input data are potentially free of errors (e.g., incorrect units, misplaced decimal, incorrect exponent, value in the wrong field, etc.). Check a sample of the output for reasonableness.

(ii) Calculations Performed Using Uncontrolled Software – In addition to checks in (i), verify sample results by alternate calculations either by hand or using alternate software, if available, or reviewing the basic logic of the uncontrolled software. The reviewer may ask the assistance of the author(s) to accomplish alternate calculations.

(iii) Calculations Performed Using Commercial-off-the-Shelf Software – Check a sample of the formulae employed , the correctness of a sample of the input data, and the reasonableness of a sample of the output.

(iv) Other Calculations – Check correctness of a sample of the input data and verify sample results by alternate calculations.

3.2.4 Verification of calculations will be documented as part of the reviewer comments on the CNWRA TOP-3 Form. The reviewer shall indicate how the sample verification was accomplished and the conclusions regarding the correctness of calculations. For example, the reviewer may state that the report or paper under review used xxx software(s), which is controlled /uncontrolled, a sample of the input data recorded within the report or in Scientific Notebook No. yyy was checked, and an alternate calculation was/was not performed. The check determined that the calculations were/were not performed correctly.

3.2.5 In case errors are found, the author(s) must obtain resolution with the reviewer before the product can be released.

4. RECORDS

Technical review comment resolution sheets shall be retained as QA records in accordance with QAP-012, Quality Records Control.

Subject: TRAINING: DOCUMENTATION & VERIFICATION OF S&E CALCS
Date: Thu, 31 Aug 2000 22:06:44 -0500
From: Bruce Mabrito <bmabrito@gargol.cnwra.swri.edu>
Organization: CNWRA
To: STAFF_GROUP <STAFF_GROUP@gargol.cnwra.swri.edu>

The CNWRA procedure on Documentation and Verification of Scientific and Engineering Calculations, QAP-014 Revision 2/Change 0, has been revised and distributed. Copies have been sent out to CNWRA management and others who previously held a copy. If you believe you need a controlled copy of this procedure to perform your work, contact your Element Manager and they will arrange to have a copy sent to you from QA. You will be required to sign and date that you received it and read the document.

This Documentation and Verification of Scientific and Engineering Calculations procedure has been revised and shortened to be more clear and understandable, and, it removes the arbitrary "10%" rule under which we previously operated. QAP-014 provides requirements for calculations to be documented if they are calculations performed using controlled software, calculations performed using uncontrolled software, calculations performed using commercial off-the-shelf software, and other calculations.

The procedure also addresses the verification of calculations, which was an issue in the CNWRA 2000 audit. The procedure now states that "In consultation with the author(s), the EM will determine whether a CNWRA product contains calculations and the extent to which these calculations require verification. The EM will make this decision based on (i) potential importance of the calculations with respect to their intended use, (ii) extent of prior verification in related reports or papers, and (iii) complexity of calculation and potential for errors."

The methods of documenting the calculation checks are also clearly identified. You should be able to provide clear objective evidence that you accomplished these actions in your scientific notebook, in the comment and resolution sheets, or in other ways that provides a lasting record.

If you have questions regarding this procedure, contact your Element Manager.

Bruce Mabrito

CENTER FOR NUCLEAR WASTE REGULATORY ANALYSES

103/149

MEMORANDUM

August 30, 2000

TO: QA Records Corrective Action Request 2000-03 Folder

FROM: Bruce Mabrito, Director of Quality Assurance

SUBJECT: Closure of Corrective Action Request (CAR) 2000-03

REFERENCE: CAR 2000-03, Annual 2000 CNWRA QA Audit

This memorandum to the CAR 2000-03 folder is to document progress and estimate closure of CAR 2000-03, which deals primarily with calculations and the checking of such calculations in final CNWRA reports.

CAR 2000-03 was initiated June 30, 2000 at the conclusion of the 2000 annual CNWRA QA Audit. One of the remedial actions was to have a review accomplished to identify FY2000 deliverables that should have had a calculation check in accordance with Quality Assurance Procedure-014, Documentation and Verification of Engineering and Scientific Calculations. That review was accomplished and certain CNWRA deliverables were identified as needing to be either checked or rechecked. That checking process has been ongoing for about two weeks and about 95 percent of the deliverables have gone through that process with appropriate objective evidence. However, there are a couple of QA Record packages yet to be processed and it was agreed between the CNWRA Technical Director and the Director of Quality Assurance to delay the target date for completing the work and closing out the CAR until September 8, 2000.

The labor intensive checking process is continuing and will be followed up on by key CNWRA management until it is completed. Also, QAP-014 has been revised and it was issued to appropriate CNWRA August 30, 2000.

Objective evidence of this work will be maintained in each CNWRA QA Records folder showing the work on the deliverable.

Other information can be obtained from the CNWRA Technical Director or the CNWRA Director of Quality Assurance.

CENTER FOR NUCLEAR WASTE REGULATORY ANALYSES

MEMORANDUM

September 8, 2000

TO: QA Records Corrective Action Request 2000-03 Folder

FROM: Bruce Mabrito, Director of Quality Assurance

SUBJECT: Closure of Corrective Action Request (CAR) 2000-03

REFERENCE: CAR 2000-03, Annual 2000 CNWRA QA Audit

This memorandum to the CAR 2000-03 folder is to document progress and estimate closure of CAR 2000-03, which deals primarily with calculations and the checking of such calculations in final CNWRA reports.

CAR 2000-03 was initiated June 30, 2000 at the conclusion of the 2000 annual CNWRA QA Audit. One of the remedial actions was to have a review accomplished to identify FY2000 deliverables that should have had a calculation check in accordance with Quality Assurance Procedure-014, Documentation and Verification of Engineering and Scientific Calculations. That review was accomplished and certain CNWRA deliverables were identified as needing to be either checked or rechecked. That checking process has been ongoing for about three weeks and about 95 percent of the deliverables have gone through that process with appropriate objective evidence. However, there are a couple of QA Record packages yet to be processed (because of NRC-directed travel on the part of James Weldy) and it was agreed between the CNWRA Technical Director and the Director of Quality Assurance to delay the target date for completing the work and closing out the CAR until September 15, 2000.

The labor intensive checking process is continuing and will be followed up on by key CNWRA management until it is completed. Also, QAP-014 has been revised and it was issued to appropriate CNWRA August 30, 2000.

Objective evidence of this work will be maintained in each CNWRA QA Records folder showing the work on the deliverable.

Other information can be obtained from the CNWRA Technical Director or the CNWRA Director of Quality Assurance.