Department of Energy
Yucca Mountain Site Characterization
Project Office
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CLOSURE OF STANDARD DEFICIENCY REPORT (SDR) 222, REVISION 0, RESULTING FROM
YUCCA MOUNTAIN QUALITY ASSURANCE DIVISION AUDIT 88-08 OF LOS ALAMOS NATIONAL
LABORATORY

SDR 222, Revision 0, has been closed based on satisfactory verification of
completed corrective actions. A copy of the SDR is enclosed for your files.

If you have any questions, please contact either Catherine E. Hampton at
(702) 794-7973 or FTS 544-7973, or Neil D. Cox of Science Applications
International Corporation at (702) 794-7236 or FTS 544-7236.

Donald G. Horton, Director
Yucca Mountain Quality Assurance Division

YMQAD:CEH-1426

Enclosure:
SDR 222, Revision 0

cc w/encl:
K. R. Hooks, NRC, Washington, DC
S. W. Zimmerman, NWPO, Carson City, NV
J. L. Day, LATA, Los Alamos, NM
H. P. Nunes, LANL, Los Alamos, NM
N. J. Brogan, SAIC, Las Vegas, NV, 517/T-08

cc w/o encl:
J. H. Hines, OQD, AL
A. R. Chernoff, MSD, AL
H. E. Valencia, LAAO
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FULL TEXT ASCII SCAN

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WMPO STANDARD DEFICIENCY REPORT

N-QA-038
3/87

1 Date 10/6/88	2 Severity Level ☒ 1 ☐ 2 ☐ 3		Page 1 of 6
3 Discovered During Audit 88-08	3a Identified By K. Schwartztrauber	3b Branch Chief Concurrence Date	4 SDR No. 222 Rev. 0
5 Organization LANL	6 Person(s) Contacted M. McGowan/K. Eggert		7 Response Due Date is 20 Working Days from Date of Transmittal

8 Requirement (Audit Checklist Reference, if Applicable)
LANL QAPP, R2 Sections 5.1 and 3.3.1 state that activities and software used to support a license application are documented and controlled according to LANL implementing procedures.

9 Deficiency
Contrary to the above requirement, the quality of software development documentation activities prior to the implementation of LANL procedure TWS-QAS-QP-3.1, RO, dated 21-Sept-88 cannot be assured. The following

10 Recommended Action(s): ☒ Remedial ☒ Investigative ☒ Corrective

1. Modify LANL procedure TWS-MSTQA-QP-14 or TWS-QAS-QP-3.1 to include criteria

11 QAE/Lead Auditor Date	12 Branch Manager Date	13 Project Quality Mgr. Date
William H. Camp 11/4/88	HA Caldwell 4 Nov 88	James Blaylock 11/15/88

14 Remedial/Investigative Action(s)

15 Effective Date 2/28/89

Refer to Page 5 of 6

16 Cause of the Condition & Corrective Action to Prevent Recurrence

17 Effective Date 3/31/89

Refer to Page 6 of 6

18 Signature/Date OP Nunes 12/21/88

HNBm 03/10/89

19 Response	☐ Accept ☒ Amended ☐ Reject Response	QAE/Lead Auditor/Date W.H. Camp 3-9-89	Branch Manager/Date HA Caldwell 9 Mar 89
20 Amended Response	☒ Accept ☐ Reject	QAE/Lead Auditor/Date William H. Camp 4-21-89	Branch Manager/Date HA Caldwell 21 Apr 89
21 Verification	☒ Satisfactory ☐ Unsatisfactory	QAE/Lead Auditor/Date Neil D. Cox 12/20/90	Branch Manager/Date 12/21/90

22 Remarks
1. TELECON; N.D. COX TO H. NUNES EXTENSION REQUEST TO BE PREPARED JAN 2-12, 1990. DATE: 12/22/89
2. TELECON; N.D. COX TO H. NUNES, JAN. 18 1990, REPORTED EXTENSION REQUEST DATED 11 JAN. 90, LETTER NO. TWS-13 01 9096, HERBST TO HORTON.
3. Letter HERBST TO HORTON, dated 1/11/90, No. TWS-13-01-90-066, REQUESTED CLOSURE. (RC'D 1/23/90)
4. Letter HORTON TO HERBST, dated 2/7/90, YMP: RBC-1916, REQUEST DENIED, NEW COMPLETION DATE REQUESTED.

CONTINUED ON PAGE 4

23 QA CLOSURE	QAE/Lead Auditor/Date Neil D. Cox 12/20/90	Branch Manager/Date N/A	PQM/Date Hampton 12/21/90

ENCLOSURE

8 Requirement (continued)

The LANL NNWSI QAPP, R2, Sections 5.1 and 5.2 require that activities affecting
quality be performed in accordance with documented procedure⁹(i.e., QP's or DPs).
Section 3.3.1 of the QAPP also states that computer software used to support a
license application is documented and controlled according to LANL implementing
procedures. Section 3.1.6 of the LANL NNWSI QAPP, R2 also requires that LANL
establish procedures for review, approval and release of documents transmitting
(software) information or items across scientific investigation interfaces.

LANL NNWSI QAPP, R2 states that, LANL will institute a software configuration
management program through implementing procedures and will provide documentation of
this program to the Records Management System (RMS).

9 Deficiency (continued)

objective evidence was examined to support this finding:

o LANL procedures do not specify appropriate quantitative or qualitative
   criteria for determining satisfactory work performance and compliance
   with QA requirements for scientific notebook documentation of software
development activities.

o CAR 045 does not specify that a determination be made of the impact on
   quality resulting from the software development work performed prior to
   the date LANL procedural guidance was in effect.

o CAR 045 does not specify the action necessary to preclude the issuance
   of LANL reports and or publications containing data/results generated
   from computer codes which are not baselined, controlled and fully
   verified and validated as defined by NUREG-0856.

o LANL procedure TWS-QAS-QP-3.1, RO and LANL NNWSI QAPP, R2 does not state
   that computer programs developed and/or modified for the YMP shall be
   documented and controlled in accordance with the applicable elements of
   NUREG-0856.

o LANL procedure TWS-QAS-QP-3.2, RO does not state that the minimum
   requirements for software configuration mangement include a chronology of
   versions and description of changes made between versions.

o LANL procedure TWS-QAS-QP-3.1, RO does not specify how software
   verification, test and validation interface controls are coordinated
   among project participants. However, LANL is participating in Computer
   Code Verification Efforts (called COVE) with SNL, USGS, LLNL, LBL and PNL
   under Subtask D, titled "Computer Code Benchmarking Activities", of LANL

9 Deficiency (continued)

     SIP 87/4.1.7, RO (WBS 2.3.4.1.7/A) without interface procedural control.
Software interface controls are not addressed in LANL CAR 045.

DISCUSSION

LANL is developing Quality Assurance Level I scientific and engineering software and
has been involved in this activity for several years to support the Yucca
Mountain/NNWSI Project. LANL failed to issue procedural guidance to control software
development documentation and to institute a software configuration management
program as required by Section 3.3 of the LANL QAPP. LANL has recognized this
deficiency in CAR 045, "Software Control", dated 19-Sept-88. On 21-Sept-88 LANL
issued procedure TWS-QAS-QP-3.1, RO. The audit team did not have the benefit of
reviewing this procedure prior to the audit, however, this procedure contained
programmatic deficiencies, as described above, which were discovered during the
conduct of the audit.

10 Recommended Actions (continued)

     for satisfactory compliance with QA requirements for scientific notebook
documentation of software development activities; include model
development, mathematical methods, numerical techniques, source code
listing references and changes.

2. Determine the impact on quality of software development work performed
prior to the effective date of TWS-QAS-QP-3.1, RO. Investigate whether or
not all LANL YMP software development documentation is being consistently
prepared, reviewed, verified and validated

3. Document by Nonconformance Report all publications and reports containing
data/results generated from computer codes which were not baselined,
controlled, and fully verified and validated according to LANL procedures.
Determine the impact on quality of publication of results based on the use
of unqualified data and unverified and unvalidated computer codes. Develop
measures to assure the LANL reports and publications are not released which
contain data generated by uncontrolled computer codes unless appropriate
disclaimers are included.

4. Modify LANL procedure TWS-QAS-QP-3.1 so that a commitment to the documenta-
tion requirements of NRUEG-0856 is stated.

5. Modify LANL procedures TWS-QAS-QP-3.1 so that the minimum requirements for
configuration management are included.

10 Recommended Actions (continued)

6. Modify LANL PROCEDURE TWS-QAS-WP-3.1 or other appropriate procedures to
    ensure that software interfaces are controlled, coordinated and documented.
    Document by Nonconformance Report all COVE and other interface information
    generated from computer codes without appropriate disclaimers stating that
    the data/results are not based on controlled and fully verified and
    validated computer codes. Determine the impact on quality of potential use
    of results based on the use of unqualified data and unverified and unvali-
    dated computer codes. Develop measures to assure that future COVE bench-
    marking activities are conducted in accordance with LANL interface control
    procedures.

21. REMARKS (CONTINUED)

- REQUEST FOR EXTENSION RECEIVED 2/26/90, LETTER: HERBST
  TO HORTON, "TWS-EES -13-02-90-048, DATED 2/20/90. EXTENSION
  REQUESTED DUE DATE: 4/1/90

- EXTENSION REQUEST GRANTED TO 5/21/90 BY LETTER
  HORTON TO HERBST, YMP: RBC-2327, DATED 3/9/90, LONGER
  TIME CONSIDERED NECESSARY FOR COMPLETION OF CORR. ACTION.

- Accept Extension 5/23/90 - YMP: ACW- 3391

- UNREQUESTED EXTENSION GRANTED TO AUG. 31, 1990, LTR HORTON TO HERAST,
  DATED 5/23/90; YMP-ACW-3391 (DUPLICATE OF ITEM JUST ABOVE)

  Extension Request 8/28/90 - TWS-EES-13-08-90-100
  Extension Evaluation 9/26/90 - QA: CEH-5085

- VERIFICATION
  THE LANL SOFTWARE QA PLAN AND ITS ASSOCIATED
  IMPLEMENTING PROCEDURES WERE APPROVED BY THE
  PROJECT OFFICE BY LETTER, HORTON TO HERBST, YMQAD: ACW-1257,
  DATED DEC. 19, 1990. THE PLAN AND IMPLEMENTING PROCEDURES
  CORRECT THE DEFICIENCIES IN THE SDR.

14.   Remedial/Investigative Action(s)

Revisions to Procedures TWS-QAS-QP-03.1, R0 (LANL Computer Software Control) and QP-14 (Research and Development Experimental Procedure) (to be issued as TWS-QAS-QP-03.5, R0) are now in progress, with issuance scheduled for January 1989. These and other procedures, as well as actions already initiated, will address the noted deficiencies as detailed below.

- Criteria for determining satisfactory work performance will be in the revised QP-03.1. QA requirements for notebooks will be in QP-03.5.

- As part of obtaining a fully qualified QA program, Project personnel have been directed to identify computer codes used after June 1984 to generate data used in LANL reports. This information will be used to assess any effects on quality of codes developed before implementation of QP-03.1. At present, it is LANL's intention to use no computer-generated data developed before implementation of the qualified QA plan in pursuing its scope of work.

- QP-03.1 and revisions to that procedure specify that reports using codes that have not been verified must include a disclaimer to that effect. Criteria for reviewing reports, as contained in the technical review procedure (TWS-QAS-QP-03.2), will address this requirement.

- The methods described in QP-03.1 are consistent with, or go beyond, NUREG-0856. LANL procedures reference only the LANL QAPP. The QAPP, in turn, references external source documents. The LANL QAPP, Rev. 4, now in preparation, is expected to cite NUREG-0856 as one of the external reference documents for guidance of software QA control.

- The requirements for a chronology of codes and description of changes between versions occurs in the LANL QAPP, Rev. 2. The software control procedure requires development of that information. The chronology of code version is documented on the Software Summary Form. The procedure requires reissuance of the summary form and all supporting documentation to document changes between versions of a code.

- An interface control procedure (TWS-QAS-QP-01.2) will govern all organizational interface activities, including software related activities.

16. Cause of Condition and Corrective Action to Prevent Recurrence

Cause: Inadequate procedural direction. NUREG-0856 was referenced in the YMP QA Plan as a document for guidance, not as a specific implementing requirement.

Corrective Action: As noted in Section 14. All corrective actions and required training will be completed by 3/31/89.

14.   Remedial/Investigative Action(s)

Revisions to Procedures TWS-QAS-QP-03.1, R0 (LANL Computer Software Control) and QP-14 (Research and Development Experimental Procedure) (to be issued as TWS-QAS-QP-03.5, R0) are now in progress, with issuance scheduled for January 1989. These and other procedures, as well as actions already initiated, will address the noted deficiencies as detailed below.

1.   Criteria for determining satisfactory work performance will be in the revised QP-03.1. QA requirements for notebooks will be in QP-03.5.

2.   The QAPP, R4.3, requires that any computer software and computer-generated data used for licensing must be documented in compliance with methods described in the LANL software quality administrative procedures. This documentation is currently described in QP-03.1. Codes developed before implementation of QP-03.1 will be documented as necessary, consistent with QP-03.1, before they are used for generating licensing information. Data generated by computer software that has not been documented and verified in accordance with the QA methods described in QP-03.1 are unacceptable for use in the licensing process.

As part of developing a fully qualified QA program, Project personnel at LANL have been directed to identify computer codes used after June 1984 to generate data appearing in LANL reports. Any of these data that may be required for licensing will be regenerated after the code and associated documentation have been shown to be in compliance with QP-03.1 or subsequent implementing procedures for software QA. The regeneration of these data will ensure that there is no effect on quality resulting from software developed before implementation of QP-03.1.

Control of computer software and computer-generated data is achieved through the application of the procedure governing the technical review of technical information products (reports), QP-03.2. The procedure stipulates that a quality assurance review be performed of all computer software described in or used to generate data appearing in the report. A disclaimer is

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to be inserted in the report identifying any software that is not in full compliance with QA requirements.

Surveys and audits will be used to verify that LANL software is being developed and documented in accordance with QA requirements. All LANL groups currently using or developing computer software will be audited against the applicable software QA requirements.

3. QP-03.1 and revisions to that procedure specify that reports using codes that have not been verified must include a disclaimer to that effect. Criteria for reviewing reports, as contained in the technical review procedure (TWS-QAS-QP-03.2), will address this requirement.

4. The methods described in QP-03.1 are consistent with NUREG-0856. LANL procedures reference only the LANL QAPP. The QAPP, in turn, references external source documents. The LANL QAPP, Rev. 4.3, issued 3/30/89, cites NUREG-0856 as one of the external reference documents for guidance of software QA documentation.

5. The requirements for a chronology of codes and description of changes between versions occurs in the LANL QAPP, Rev. 4.3. The software control procedure explains the development of that information. The chronology of code version is documented on the Software Summary Form. The procedure requires reissuance of the summary form and all supporting documentation to document changes between versions of a code.

6. An interface control procedure (TWS-QAS-QP-01.2) will govern all organizational interface activities, including software related activities.

16. Cause of Condition and Corrective Action to Prevent Recurrence

Cause: Inadequate procedural direction. NUREG-0856 was referenced in the YMP QA Plan as a document for guidance, not as a specific implementing requirement.

Corrective Action: As noted in Section 14. All corrective actions and required training will be completed by 4/30/89.