

U.S. DEPARTMENT OF ENERGY
OFFICE OF CIVILIAN RADIOACTIVE WASTE MANAGEMENT
OFFICE OF QUALITY ASSURANCE

AUDIT REPORT
OF
UNITED STATES GEOLOGICAL SURVEY

AUDIT NO. YMP-91-05

MAY 20 THROUGH MAY 24, 1991

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Approved by: James Blaylock for Date: 6/11/91
Donald G. Horton, Director
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EXECUTIVE SUMMARY

Overall, it was determined that the United States Geological Survey (USGS) is satisfactorily implementing an effective Quality Assurance Program in accordance with the USGS Quality Assurance Program Plan and implementing procedures. No program elements or procedures were found to be ineffective; however, effectiveness of management assessments, control of data, and issuance of stop work orders could not be determined because of the lack of activity in these areas since the previous audit of USGS. In addition, evaluation of control of measuring and test equipment could not be completed at the Denver facility and will be concluded during surveillance(s) at the Nevada Test Site and, if necessary, at other field locations.

The Yucca Mountain Quality Assurance Division Audit Team identified 15 deficiencies during the audit. All but four of these deficient conditions were resolved prior to the post-audit conference. Unresolved deficiencies were documented on Corrective Action Requests as detailed in Section 6.1 and Enclosure 5 of this report.

1.0 INTRODUCTION

This report contains the results of the Office of Civilian Radioactive Waste Management (OCRWM) Quality Assurance (QA) Audit YMP 91-05 of the United States Geological Survey (USGS) conducted at Denver, Colorado May 20 through 24, 1991. The audit was conducted by an audit team from the Yucca Mountain Quality Assurance Division (YMQAD) of the Office of Quality Assurance (OQA) in accordance with the approved Audit Plan (reference: correspondence OQA: JB-3405, dated 4/24/91).

2.0 AUDIT SCOPE

This audit evaluated the effectiveness of the USGS QA Program in meeting the requirements and commitments imposed by OCRWM. Specifically, the audit evaluated the effectiveness of QA requirements specified in the USGS Quality Assurance Program Plan and implementing procedures.

A representative sample of discrepancies identified during the previous QA Audit No. 90-03 were included in the scope of this audit to determine effectiveness of USGS corrective actions.

The programmatic elements and technical activities audited are identified below:

Programmatic Elements

- 1.0 Organization
- 2.0 Quality Assurance Program
- 3.0 Scientific Investigation and Design Control
- 4.0 Procurement Document Control
- 5.0 Instructions, Procedures, Plans and Drawings
- 6.0 Document Control
- 7.0 Control of Purchased Items and Services
- 8.0 Identification and Control of Items, Samples and Data
- 12.0 Control of Measuring and Test Equipment
- 13.0 Handling, Shipping and Storage
- 15.0 Control of Nonconforming Items
- 16.0 Corrective Action
- 17.0 Quality Assurance Records
- 18.0 Audits

In addition, Computer Software QA was also audited.

The audit did not address programmatic elements 9, 10, 11, and 14 since USGS is performing no activities to which these elements are applicable.

Technical Activities

Technical Specialists reviewed and evaluated the following technical activities listed by SCP/Activity Number and Title.

SCP Number	Title
8.3.1.2.2.7	Unsaturated Zone Hydrochemistry
Activity (.1)	Gaseous Phase Chemical Investigations
Activity (.2)	Aqueous Phase Chemical Investigations
8.3.1.2.3.1	Site Saturated Zone Ground-Water Flow System
Activity (.2)	Site Potentiometric-Level Evaluation
Activity (.3)	Analysis of Single- and Multiple-Well Hydraulic-Stress Tests
Activity (.4)	Multiple-Well Interfacing Testing
8.3.1.5.2.1	Quaternary Regional Hydrology
Activity (.3)	Evaluation of Past Discharge Areas
Activity (.4)	Analog-Recharge Studies
Activity (.5)	Studies of Calcite and Opaline Silica Vein Deposits
8.3.1.17.4.1	Historical and Current Seismicity
Activity (.1)	Compile Historical Earthquake Record
Activity (.2)	Monitor Current Seismicity
Activity (.3)	Evaluate Potential for Induced Seismicity at the Site

As a minimum, the evaluation determined adequacy of the following:

1. Technical qualifications of scientific personnel.
2. Understanding of procedural requirements as they pertain to scientific investigation activities.
3. Adequacy of technical procedures.
4. Development of study plans, work supporting the Site Characterization Plan, and any related work.

3.0 AUDIT TEAM AND OBSERVERS

Audit team members and observers are listed in Enclosure 1.

4.0 SUMMARY OF RESULTS

4.1 Program Effectiveness

Overall, the USGS is satisfactorily implementing an effective QA Program in accordance with the USGS Quality Assurance Program Plan (QAPP) and implementing procedures. No program elements or procedures were found to be ineffective; however, evaluation of one USGS program element (Control of Measuring and Test Equipment) could not be completed due to the relatively small amount of measuring and test equipment in use at the Denver facility. Completion of the evaluation of this program element will be performed by surveillance(s) at the Nevada Test Site (NTS) and, if necessary, at other field locations. In addition, the effectiveness of management assessments, control of data, and issuance of stop work orders could not be determined because of a lack of activity in these areas since the previous audit of USGS.

4.2 Programmatic Audit Activities

Details of programmatic audit activities are documented in Enclosure 2.

4.3 Technical Activities

The scope of technical audit included activities that are described in four Study Plans:

1. 8.3.1.2.2.7 Hydrochemical Characterization of the Unsaturated Zone.

Both gaseous-phase (Activity .1) and aqueous-phase (Activity .2) chemical investigations were examined.

2. 8.3.1.5.2.1 Characterization of the Yucca Mountain Quaternary Regional Hydrology

Emphasis was given to investigation of calcite and opaline-silica vein deposits (Activity .5) with passing attention to evaluation of past-discharge areas (Activity .3) and analog recharge studies (Activity .4).

3. 8.3.1.2.3.1 Characterization of the Site Saturated Zone Ground-Water Flow System

The evaluation of the site potentiometric-level investigation (Activity .2) was the only activities examined for this study plan.

4. 8.3.1.17.4.1 Historical and Current Seismicity

The monitoring of seismic activity in the Yucca Mountain region (Activity .2) was examined for this Study Plan.

In all cases the work was found to be satisfactory. Teams composed of at least one technical specialist and one programmatic auditor evaluated both the compliance to programmatic and procedural requirements and the degree to which the technical activity carried out the investigation outlined in the Study Plan. The technical specialists considered the qualifications of the personnel involved in the activity, the approach taken to the work, the soundness of technical procedures, the manner in which the work was (being) performed, and the techniques of data reduction and its analysis. The preceding were evaluated on the basis of objective evidence obtained from direct observation, interviews, procedures, QA Records, and other supporting documentation.

During the review of activities for Study Plan 8.3.1.17.4.1, the audit team was informed that analysis, reporting and publication of seismic data for the project was on hold at USGS until April 12, 1991. This hold was in effect because of QA program deficiencies identified by the Yucca Mountain Project Office in 1988 for which a Project Office Stop Work Order was issued. The subject Stop Work Order was lifted in 1989 and control of resolution of deficiencies was turned over to the USGS QA organization. During the hold period, data recording for seismic activity in the Yucca Mountain region continued to be performed. This performance was evaluated by a technical specialist during the audit.

4.4 Summary of Deficiencies

The YMQAD Audit Team identified 15 deficiencies during the audit. All but four of these deficient conditions were resolved prior to the post-audit conference. The unresolved deficiencies identified qualification of a technical reviewer not in compliance with QAPP or procedural requirements; documentation for developed/modified software that does not meet minimum procedural requirements; an inconsistency between the QAPP and procedures in the area of records storage; and missing calibration documentation for two USGS mass spectrometers. These unresolved deficiencies were documented on Corrective Action Requests (CARs) YM-91-050, -051, -052, and -053 respectively. A synopsis of the CARs and of the 11 deficiencies corrected during the audit is presented in Section 6.0 of this report. An information copy of each CAR may be found in Enclosure 5.

5.0 AUDIT MEETINGS AND PERSONNEL CONTACTED

The pre-audit conference was held at USGS on May 20, 1991. Daily meetings were held with USGS management and staff to discuss audit results from the previous day. Daily meetings were also held with the audit team and observers to discuss audit activities

and findings. The audit concluded with a post-audit conference held at USGS on May 24, 1991. Enclosure 1 identifies audit team members and observers. Enclosure 3 identifies personnel contacted during the audit and those who attended the pre- and post-audit conferences.

6.0 SYNOPSIS OF CORRECTIVE ACTION REQUESTS AND DEFICIENCIES CORRECTED DURING THE AUDIT

6.1 Corrective Action Requests

- YM-91-050 Contrary to USGS QAPP and procedural requirements, one technical reviewer of USGS procedures was qualified without the appropriate minimum requirements being established for the reviewer's qualification.
- YM-91-051 Contrary to procedural requirements, USGS has baselined and released USGS developed and modified software products for which less than the procedurally required Software QA documents have been written.
- YM-91-052 Contrary to USGS QAPP requirements which specify the use of two hour fire rated containers for records storage, USGS procedures permit the use of one-hour fire-rated containers.
- YM-91-053 Contrary to USGS procedural requirements, documentation of calibration for two mass spectrometers was not accomplished.

6.2 Deficiencies Corrected During the Audit

The following deficiencies considered isolated occurrences, and requiring only remedial action were corrected during the audit:

1. YMP-USGS-QMP-2.07, Revision 1 did not meet all requirements stated in paragraph 2.5.3 of YMP-USGS-QAPP-01, Revision 5. This paragraph of the QAPP requires personnel to be indoctrinated to specific project documents. Modification M2 to YMP-USGS-QMP-2.07 was issued during the audit to require personnel indoctrination to include all documents stated in YMP-USGS-QAPP-01.
2. YMP-USGS-QMP-3.13, Revision 1, paragraph 5.4, requires that documentation for design input indicate whether the input is new or revised. Contrary to this requirement, one records package examined during the audit did not indicate this information. This deficient condition was corrected in the records package and verified.

3. YMP-USGS-QMP-5.03, Revision 5 requires that records associated with the procedure be submitted to the USGS Records Center in accordance with QMP 17.01 requirements. Contrary to these requirements, one records package reviewed (HP-190, Revision 0), which documented technical procedures in scientific notebook form, did not include required information such as numbering notebook page reproductions, dating pages (entries), and including initial entries (typically the scientific notebook plan). Prior to the start of the audit these deficient conditions had been documented on draft USGS Audit Finding Report (AFR) 9112-04. During the audit this AFR was issued to officially document and require resolution of these deficient conditions.
4. YMP-QMP-5.01, Revision 4 requires that range and accuracy for measuring and test equipment be stated in technical procedures that address calibration. Contrary to this requirement, technical procedure NWM-USGS-HP-198, Revision 0, did not list accuracy requirements for anemometers calibrated under this procedure. This deficiency was corrected during the audit by issuance of Modification M1 to the procedure to include accuracy requirements.
5. YMP-USGS-QMP-15.01, Revision 4, paragraph 5.5.7 required that repair or use-as-is dispositions for Nonconformance Reports (NCRs) be approved by the Yucca Mountain Project Office (YMPO) prior to implementation. Contrary to this requirement, NCRs with repair or use-as-is dispositions were not being approved by YMPO prior to implementation. Since YMPO no longer requires approval of NCR dispositions, this condition was permitted to be corrected during the audit by issuance of Interim Change Notice 3 to YMPO-USGS-QAPP-01 and Modification M2 to YMP-USGS-QMP-15.01 deleting the requirement.
6. YMP-USGS-QMP-17.01, Revision 4 and YMP-USGS-QMP-17.03, Revision 0 did not meet the requirements for record legibility stated in YMP-USGS-QAPP-01, Revision 5, paragraph 17.3.2. This deficiency was corrected during the audit by issuance of Modifications M4 to QMP-17.01 and M1 to QMP-17.03 to clarify legibility requirements.
7. YMP-USGS-QMP-17.03, Revision 0 did not meet the receipt acknowledgement requirements for records stated in YMP-USGS-QAPP-01, Revision 5. This deficient condition was corrected during the audit by issuance of Modification M1 to QMP-17.03 to clarify record receipt acknowledgement requirements.
8. YMP-USGS-QMP-18.01, Revision 6, paragraph 5.1.3, required that triennial audits be performed for suppliers on the USGS Approved Vendors List. Contrary to this requirement, one supplier was not scheduled for audit until after the allowable three year time limit had expired. This condition was corrected during the audit by issuance of Modification M1 to QMP-18.01 which provided more flexibility to the Triennial requirement.

9. YMP-USGS-QMP-18.01, Revision 6, paragraphs 5.4.2 and 5.4.3, require that specific information be included in USGS Audit Checklists. Contrary to these requirements, checklists for USGS Audit 91-05 did not include all specified information. The deficient audit checklists were corrected and found acceptable prior to completion of the audit.
10. YMP-USGS-QMP-18.01, Revision 6, paragraphs 5.5.1 and 5.5.6, require specific information be entered in pre-audit and post-audit documentation. Contrary to these requirements, it was found that USGS pre and post audit documentation did not contain all required information. USGS Audit Finding 9110-09 which was in the process of being issued when the audit began identified similar discrepancies with audit documentation and was expanded to document all identified conditions prior to being issued.
11. YMP-USGS-QMP-2.05, Revision 3, paragraph 5.2, requires that USGS QA Lead Auditor Qualification Records indicate that the Lead Auditor was evaluated for communication skills and received necessary training prior to being certified. Contrary to these requirements, the qualification record for one Lead Auditor did not indicate evaluation for communication skills or that training was received. This deficient condition was corrected during the audit by correcting the Lead Auditor Qualification Record and issuing a memo to file to provide the justification for the correction.

7.0 REQUIRED ACTIONS

Responses to the CARs listed in Section 6.1 of this report are required by June 28, 1991, as stated in Block 10 of each CAR and detailed in the CAR transmittal letter. Upon receipt of acceptable responses and satisfactory verification of all corrective actions, the CARs will be closed and USGS will be notified in writing of closure.

8.0 LIST OF ENCLOSURES

- Enclosure 1: Audit Team Members And Observers
- Enclosure 2: Audit Details
- Enclosure 3: Personnel Contacted During The Audit
- Enclosure 4: Objective Evidence Reviewed During The Audit
- Enclosure 5: Information Copies of CARs

AUDIT TEAM MEMBERS AND OBSERVERS

Responsibility	Individual
Audit Manager	James Blaylock
Audit Team Leader	Charles Warren
Lead Technical Specialist	Thomas Higgins
Auditors	Robert Constable
	Stephen Dana
	John Martin
	Kenneth McFall
	Terry Noland
	Richard Weeks
Technical Specialists	Bruce Hurley
	Keith Kersch
	Forrest Peters
	Tung, Chao-Hsiung
Observers	Tilak Verma (NRC)
	John Gilray (NRC)
	Abou-Bakr Ibrahim (NRC)
	Bruce Mabrito (NRC)
	Phillip Niedzielski-Eichner (Nye County, Nevada)
	Susan Zimmerman (State of Nevada)
	Joseph Caldwell (OQA)

AUDIT DETAILS

The following is a summary of programmatic activities evaluated during the audit. A list of objective evidence reviewed is indicated in Enclosure 4. This list includes the full document identification number, revision number, and title for the plans and procedures referenced below.

1.0 Organization

The evaluation of Organization was conducted to determine compliance to Section 1 of the USGS QAPP and QMP 1.01. The evaluation included questioning of key USGS personnel assigned to the Yucca Mountain Project (YMP) to determine their degree of awareness and understanding of the organizational structure, lines of communication, authority, duties, and responsibilities. It was found that personnel had a clear understanding of both the requirements for the USGS YMP organization and how those requirements are being implemented. The following USGS personnel were interviewed:

Technical Project Officer
Quality Assurance Manager
Three Quality Assurance Staff Personnel

2.0 Quality Assurance Program

The Following aspects of the USGS Quality Assurance Program were evaluated during the audit:

Performance of Management Assessments in accordance with QMP 2.01

Indoctrination/Orientation/Training of personnel in accordance with QMP-2.07

Qualification of personnel in accordance with QMP 2.02 and 2.08

It was intended that an evaluation of Management Assessments would include a review of documentation for performance of assessments since the last USGS audit. However, it was found that no Management Assessments were performed during this period and that USGS CAR 91-06 had been issued to document this deficient condition.

Evaluation of indoctrination, orientation, training, and qualification of personnel was performed by review of personnel records to verify compliance to QMP requirements. A total of 35 USGS personnel files were reviewed. Results of the evaluation for indoctrination, orientation, and training was that procedures are effectively implemented.

Results of the evaluation for qualification of personnel was that procedures were effectively implemented although recently issued USGS Audit Finding Report 9110-02 documented a lack of compliance to QMPs 2.02 and 2.08 and a deficiency was identified by the audit team concerning procedural requirements for qualification of technical reviewers.

3.0 Scientific Investigation and Design Control

Evaluation of scientific investigation activities included an examination of four study plans to verify compliance to QMPs 3.04, 3.05, and 3.07. All study plans examined were found to comply with the requirements of QMPs for planning, review, and approval. In addition, publications, criteria letters, and technical procedures associated with study plans were reviewed and found to be in compliance with appropriate QMPs. Finally, Principal Investigators (PIs) for each study plan were interviewed to determine their understanding of quality requirements for the project. All PIs interviewed had a clear understanding of quality requirements and appeared determined to insure that investigations conducted for the project were done in accordance with these requirements. It should be noted that the following QMPs associated with scientific investigations had not been implemented since the last audit of USGS.

QMP 3.02
QMP 3.06
QMP 3.10
QMP 3.11

Evaluation of design control activities included a review of design inputs to determine compliance to QMP 3.13 and a review of grading packages to verify compliance to AP 5.28Q. It was found that only one design input has been submitted by USGS. All requirements of QMP 3.13 were met for this input except for the requirement to indicate if the input was new or revised. This deficient condition was corrected by USGS. Two grading packages were examined and found to be in compliance with the requirements of AP-5.28Q.

4.0 Procurement Document Control

Evaluation of procurement document control activities was performed to determine compliance to QMPs 4.01 and 4.02. A total of 10 purchase requisition packages were examined and found to be reviewed, approved, and issued in accordance with QMP requirements.

5.0 Instructions, Procedures, Plans and Drawings

The evaluation of this program activity consisted of a review of nine technical procedures, one sketch, five QMPs, the QAPP and four scientific notebooks for compliance to QMPs 5.01, 5.02, 5.03, 5.04, and 5.05. With exception of a deficiency identified for not entering the appropriate information in one scientific notebook, activities were found to be effectively implemented in accordance with QMPs. This deficient condition was corrected by USGS during the audit.

6.0 Document Control

The evaluation of document control was conducted to determine compliance of document control activities to the requirements of QMP 6.01. Controlled documents such as QMPs, technical procedures, the Software Quality Assurance Plan, and Quality Assurance Level Assignments were reviewed to assure identification and distribution of documents was performed as required. Activities were found to be in full compliance with QMP requirements.

7.0 Control of Purchased Items and Services

Establishment and maintenance of the Qualified Suppliers List, Solicitation Evaluation Forms and related documentation for qualification of suppliers was reviewed for compliance to QMP 7.01. In addition, documentation for acceptance of items from four purchase order packages was reviewed for compliance to the QMP. Procedural requirements were found to be fully implemented for controls of purchased items and services.

8.0 Identification and Control of Items, Samples and Data

The evaluation of this program element included a review of sample control activities for compliance to QMP 8.01 and control of data for compliance to QMP 8.03. Identification and traceability for five samples was verified to be in compliance with QMP 8.01 requirements. In evaluating control of data, it was found that USGS had not implemented QMP 8.03 since the last audit and that control of data was being accomplished in accordance with AP 5.1Q. A total of six Technical Data Information Forms were reviewed and their completion was found to be in compliance with AP requirements.

12.0 Control of Measuring and Test Equipment

Evaluation of control of measuring and test equipment was performed by review of the M&TE Equipment Register, calibration procedure requirements, records of calibration, records of standards used, and identification of calibrated equipment. A sample of 10 instruments requiring calibration under the USGS program were selected for this evaluation to determine compliance to QMP 12.01 requirements. During the evaluation, one instance of missing calibration records for mass spectrometers was identified by the audit team and documented on a CAR. In addition, one instance of a procedure not including accuracy information for an instrument was identified and corrected by USGS during the Audit. Because of the deficiencies identified and the small amount of measuring and test equipment at the Denver facility, evaluation of control of measuring and test equipment will be continued by surveillance(s) at remote USGS locations.

13.0 Handling, Shipping, and Storage

The evaluation of handling shipping and storage was limited to reviewing development of detailed procedures as required by QMP 13.01. At present, USGS is handling/storing/shipping no equipment to which controls would be applicable.

15.0 Control of Nonconforming Items

A Sample of 11 of 42 NCRs issued since the last USGS audit were reviewed to determine degree of compliance to QMP 15.01. The evaluation included identification, segregation, disposition, verification of corrective action, closure, and trending/tracking of nonconforming items. With the exception of one minor deficiency concerning Project Office approval of repair and use-as-is dispositions, all aspects of control of nonconforming items was found to be in compliance with QMP 15.01.

16.0 Corrective Action

All of the 10 CARs issued by the USGS since the last audit were examined during the evaluation of corrective action. Car issuance, tracking, response evaluation, corrective action completion and verification, closure, and trending were reviewed to determine compliance to the requirements of QMP 16.01. All activities were found to be in full compliance with QMP 16.01.

17.0 Quality Assurance Records

A total of 12 records packages were reviewed during the evaluation of quality assurance records to determine compliance of records sources to QMP 17.01. This evaluation included entering required information, completeness, legibility, authentication, and transmittal. In addition, an evaluation of records center activities was performed to determine degree of compliance to QMP 17.01 and 17.03. This evaluation consisted of a check of record retrievability, access control, records storage, verification/acceptance activities, and records processing. With exception of one deficiency in the area of records storage documented on a CAR by the audit team and two minor deficiencies involving records legibility and receipt acknowledgement corrected during the audit, USGS was found to be in compliance with QMP 17.01 and 17.03.

18.0 Audits

The evaluation of audits included a review of documentation for nine audit reports issued since the last audit of USGS. Specifically, the evaluation included review of audit schedules, audit plans, checklists, findings, responses to findings, closeout, and record keeping for compliance to QMP 18.01. In addition, five of eighteen surveillance reports issued since the last audit of USGS were reviewed to determine compliance to QMP 18.02. This review included scheduling activities, planning, checklists, documentation of results, deficiency reporting and follow-up, and records keeping. With exception of minor deficiencies regarding scheduling of supplier audits, information to be included in checklists, and information required on pre and post audit documentation, audit and surveillance activities were determined to be in compliance with QMP 18.01 and 18.02. These minor deficiencies were corrected during the audit.

An evaluation of auditor, lead auditor and surveillance personnel qualifications was also performed to QMP 2.05. The evaluation included a review of auditor qualification records of four auditors, four lead auditors, and three surveillance personnel. With exception of deficiencies identified by the audit team regarding one lead auditor qualification which was corrected during the audit, compliance to QMP 2.05 was verified.

19.0 Software Quality Assurance

The evaluation of software quality assurance was performed by reviewing software classification, software lifecycle methodology, software quality assurance, and the software configuration management system for compliance to the requirements of QMP 3.03 and QMP 3.14. With exception of deficiencies identified by the audit team regarding noncompliance with procedures in documenting software products, USGS was found to be in compliance with QMP requirements. Identified deficiencies were documented on a CAR.

PERSONNEL CONTACTED DURING THE AUDIT

NAME	ORGANIZATION/ LOCATION	PRE-AUDIT MEETING	DURING AUDIT	POST-AUDIT MEETING
V. Abeyta	USGS/Denver		X	
D. Appel	USGS/Denver	X	X	X
J. Barth	USGS/Denver	X		X
M. Bennington	SAIC/Golden	X	X	X
M. Bouche	USGS/Denver	X	X	
J. Brooks	USGS/Denver		X	
K. Burgess-Kohn	SAIC/Golden	X		X
T. Chaney	USGS/Denver	X	X	X
M. Ciesnik	USGS/Denver	X		
P. Covington	SAIC/Golden	X	X	X
L. Ducret	USGS/Denver	X		X
D. Erdmann	USGS/Denver	X		X
S. Frans	USGS/Denver	X		
J. Frearese	USGS/Denver		X	
K. Futa	USGS/Denver		X	
J. Gemmell	USGS/Denver	X		
V. Glanzman	USGS/Golden	X		X
J. Gomberg	USGS/Golden		X	
E. Gutentag	USGS/Denver	X		
L. Hall	SAIC/Golden		X	
A. Handy	USGS/Denver	X	X	X
S. Harmsen	USGS/Golden		X	
L. Hayes	USGS/Denver	X	X	X
J. Henderson	USGS/Denver		X	
B. Hersh	SAIC/Golden	X		
R. Holliday	SAIC/Golden			X
N. Karas	SAIC/Golden	X	X	
J. Lamonica	USGS/Denver		X	
W. Langer	USGS/Denver	X		X
K. Larsen	SAIC/Golden		X	
M. LaRue	SAIC/Golden		X	
D. Lobmeyer	USGS/Denver	X		
R. Luckey	USGS/Denver	X	X	X

NAME	ORGANIZATION/ LOCATION	PRE-AUDIT MEETING	DURING AUDIT	POST-AUDIT MEETING
A. Lykins	USGS/Denver	X	X	X
S. Mahan	USGS/Denver		X	
P. McKinley	USGS/Denver	X	X	X
T. Mendez-Vigo	SAIC/Golden	X	X	X
M. Murray	SAIC/Golden		X	
M. Mustard	USGS/Denver	X	X	X
G. O'Brien	USGS/Denver	X		
D. Overturf	USGS/Golden		X	
M. Pabst	USGS/Las Vegas	X		
G. Patterson	USGS/Denver	X		
C. Peters	USGS/Denver	X		X
D. Porter	SAIC/Golden	X	X	X
P. Reilly	SAIC/Golden	X	X	X
R. Ritchey	USGS/Denver			X
W. Rodman	USGS/Denver	X	X	X
A. Rogers	USGS/Golden		X	
M. Salamon	USGS/Denver	X	X	X
J. Shaler	SAIC/Golden	X		X
K. Shedlock	USGS/Golden		X	
G. Shideler	USGS/Golden	X		X
W. Smith	USGS/Denver		X	X
P. Stiffer	USGS/Denver		X	
J. Stuckless	USGS/Denver	X	X	X
M. Trotter	USGS/Denver		X	
L. Ulmer	SAIC/Golden		X	
M. Umari	USGS/Denver	X		X
D. Valega	SAIC/Golden	X	X	X
M. Wallendorf	SAIC/Golden	X		X
P. Warner	SAIC/Golden	X	X	X
L. Watt	SAIC/Golden	X		X
A. Whiteside	SAIC/Golden	X	X	X
J. Woolverton	USGS/Denver	X	X	X
J. Ziemba	SAIC/Golden	X	X	X

OBJECTIVE EVIDENCE REVIEWED DURING THE AUDIT

Plans

YMP-USGS-QAPP-01 USGS Quality Assurance Program Plan
Revision 5, and
ICN 1, 2 & 3,

YMP-USGS-SQAP-01, Software Quality Assurance Plan
Revision 0

Quality Management Procedures

YMP-USGS-QMP-1.01, R3	Organization Procedure
QMP-2.01, R2	Management Assessment of the YMP-USGS Quality Assurance Program
QMP-2.02, R5	USGS Personnel Qualification
QMP-2.05, R3	Qualification of Audit and Surveillance Personnel
QMP-2.07, R1 QMP-2.07, R1-M1 QMP-2.076, R1-M2	YMP-USGS Instruction Modification to QMP-2.07, R1 Modification to QMP-2.07, R1
QMP-2.08, R1	Non-Federal Contractor Personnel Qualification
QMP-3.02, R1	USGS QA Levels Assignment (QALA)
QMP-3.03, R2 QMP-3.03, R2-M1	Software Quality Assurance Modification to QMP-3.03, R2
QMP-3.04, R3	Technical Review, Approval, and Distribution of YMP- USGS Publications
QMP-3.04, R3-M1	Modification to QMP-3.04, R3
QMP-3.05, R2	Work Request for NTS Contractor Services (Criteria Letter)
QMP-3.06, R1	Scientific Investigation Plan

QMP-3.07, R3-M1 QMP-4.01, R3-M1	YMP-USGS Review Procedure Modification to QMP-3.14, R3
QMP-40.1, R3 QMP-4.01, R3-M1	Procurement Document Control Modification to QMP-4.01, R3
QMP-4.02, R2	Control of Intra-USGS Acquisitions
QMP-5.01, R4	Preparation of Technical Procedures
QMP-5.02, R3	Development and Maintenance of Quality Management Procedures
QMP-5.04, R3	Preparation and Control of the YMP-USGS Quality Assurance Program Plan
QMP-5.05, R2	Scientific Notebook System
QMP-6.01, R5	Document Control
QMP-7.01, R4 QMP-7.01, R4-M1 QMP-7.01, R4-M2	Control of Purchased Items and Services Modification to QMP-7.01, R4 Modification to QMP-7.01, R4
QMP-8.01, R2	Identification and Control of Samples
QMP-8.03, R3	Identification, Control, and Transmittal of Technical Data
QMP-12.01, R5 QMP-12.01, R5-M1	Instrument Calibration Modification to QMP-12.01, R5
QMP-13.01, R1	Handling, Storage, and Shipping of Instruments
QMP-15.01, R4 QMP-15.01, R4-M1 QMP-15.01, R4-M2	Control of Nonformance Items Modification to QMP-15.01, R4 Modification to QMP-15.01, R4
QMP-16.01, R3 QMP-16.01, R3-M1	Control of Corrective Action Reports Modification to QMP-16.01, R3
QMP-16.02, R0	Control of Stop Work Orders
QMP-16.03, R2 QMP-16.03, R2 QMP-16.03, R2-M2	Trend Analysis Modification to QMP-16.03, R2 Modification to QMP-16.03, R2

QMP-17.01, R4
QMP-17.01, R4-M1
QMP-17.01, R4-M2
QMP-17.01, R4-M3
QMP-17.01, R4-M4

YMP-USGS Records Management
Modification to QMP-17.01, R4
Modification to QMP-17.01, R4
Modification to QMP-17.01, R4
Modification to QMP-17.01, R4

QMP-17.03, R0
QMP-17.03, R0-M1

YMP-USGS Local Records Center
Modification to QMP-17.03, R0

QMP-18.01, R6
QMP-18.01, R6-M1

Audits
Modification to QMP-18.01, R6

QMP-18.02, R2

Surveillances

YMP Administrative Procedures

AP-5.1Q, Revision 1

Control and Transfer of Technical Data on the Yucca
Mountain Project

AP-5.28Q, Revision 2

Quality Assurance Grading

Study Plans

8.3.1.2.2.7
8.3.1.2.3.1
8.3.1.5.2.1
8.3.1.17.4.1

Unsaturated Zone Hydrochemistry
Site Saturated Zone Ground-Water Flow System
Quaternary Regional Hydrology
Historical and Current Seismicity

Technical Procedures

NWM-USGS-GCP-02, R2

Labeling, Identification, and Control of Samples for
Geochemistry and Isotope Geology

NWM-USGS-GCP-09, R1

Preparation of Spike Solutions

NWM-USGS-GCP-12, R3

Rb-Sr Isotope Geochemistry

NWM-USGS-GCP-13, R2

U-Th-Pb Isotope Geochemistry

NWM-USGS-GCP-15, R2

Oxygen Isotope Analysis of Opaline Silica, Chalcedony,
and Quartz

NWM-USGS-GCP-16, R3	Carbonate Carbon and Oxygen Isotope Analyses
NWM-USGS-GCP-21, R1	Sm-Nd Isotope Geochemistry
NWM-USGS-GP-01, R1	Geologic Mapping
NWM-USGS-GP-17, R1	Describing and Sampling Soils in the Field
NWM-USGS-GP-22, R2	Dust Trap Sampling and Mineralogical Analysis of Dust Samples
NWM-USGS-GP-27, R2	Trench Wall and Natural Outcrop Sampling for Coordinated Studies
NWM-USGS-GPP-01, R2	Gravity Methods
NWM-USGS-HP-09, R1	Construction of Piezometer in Unconsolidated Sediments
NWM-USGS-HP-12, R3	Method for Collection, Processing, and Handling of Drill Cuttings and core from Unsaturated-Zone Boreholes at the Well-Site, NTS
NWM-USGS-HP-56, R2	Gas and Vapor Sampling from Unsaturated-Zone Test Holes
NWM-USGS-HP-60, R1	Method for Monitoring Water-Level Changes Using Pressure Transducers
NWM-USGS-HP-62-R5	Method for Measuring Sub-Surface Moisture Content Using a Neutron Moisture Meter
NWM-USGS-HP-76, R1	Diatom Enumeration Studies
NWM-USGS-HP-86, R1	Method for Degassing CO ₂ and H ₂ O Vapor Samples from Unsaturated Zone Test Holes
NWM-USGS-HP-95, R0	Measurement of Wind Direction Using a Met-1 Model 025A Wind Direction Sensor
NWM-USGS-160-R1	Methods for Analysis of Samples for Gas Composition by Gas Chromatography
NWM-USGS-HP-170-R	Method for Measuring Temperature Using a Campbell Scientific, Inc. 107 Temperature Probe

NWM-USGS-HP-190T, R0

Silica Gen Dewatering

NWM-USGS-HP-198, R0

Measurement of Wind Speed and Wind Director using the
05031 R.M. Young Wind Monitor

Publications

Isotopic Discontinuities in Ground-Water Beneath Yucca Mountain,
Nevada, J. Stuckless, et al.

Strontium Isotopes in Carbonate Deposits at Crater Flat, Nevada,
B. Marshall et al.

Drilling and Geohydrologic Data for Test Hole, USW-UZ1, Yucca Mountain
Nye County, Nevada

Water Levels in Periodically Measured Wells in the Yucca Mountain area,
Nevada, 1988.

Purchase Orders

134065-90

140061-91

134078-90

140162-91

140022-91

140166-91

140041-91

140179-91

140050-91

140196-91

Criteria Letters

USGS-YMP-3331G-01, R0

USGS-YMP-123233G-01-C2, R0

Grading Packages

G1233127 - for Study Plan 8.3.1.2.2.7

G1232841 - for Study Plan 8.3.1.17.4.1

Quality Assurance Level Assignments

USGS-3342G-01-01, R0	USGS-3370G-01-08, R0
USGS-3343G-01-10, R0	USGS-6922G-01-09, R0
USGS-3360G-01-02, R0	

Samples

HD 513 # HD 532
HD 514 # HD 539
HD 517

Instruments

Gravity Meter	# G-177
Datalogger	# 21X-3021
Balance Electronic	# 3312097
Flowmeter # 1	
Anemometer	# 5913
Temp Probe	# 5914
Thermometer	# TB-1
Mas Spectrometer	# 1-6
Mas Spectrometer	# 2-6

Nonconformance Reports

90-29	91-10
90-33	91-12
90-37	91-17
91-02	91-22
91-05	91-23
91-09	91-33

Corrective Action Requests

90-02	91-02
90-03	91-03
90-04	91-04
90-05	91-05
91-01	91-06
91-02	

Audit Reports

90-12 91-05
90-13 91-06
91-01 91-09
91-02 91-10
91-03

Surveillance Reports

90-533 90-506
90-537 90-512
91-501 91-514

Miscellaneous Records

Qualification Files for 35 USGS Personnel
Letter USGS-91-514
Quality Integration Group memo
Delegation of Authority for CAR Board
Signature Authority for Procurement Documents
Preliminary, Pre Title II, Test Planning Information
Selection of Manager of Resources Management
QA Records List
Authorized Personnel List (Records)
Requisition 1-9950-7414
M&TE Register
Qualified Suppliers List
Six Technical Data Information Forms for SCP 8.3.1.5.2.1.5

Audit Report
No. YMP-91-05
Enclosure 5

**INFORMATION COPIES OF
CORRECTIVE ACTION REQUESTS**

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

14CAR NO.: YM-91-50
 DATE: 5/30/91
 SHEET: 1 OF 2
 QA
 WBS No.: 1.2.9.3

CORRECTIVE ACTION REQUEST

1 Controlling Document YMP-USGS-QAPP-01, R5, YMP-USGS-QMP-5.01, R4	2 Related Report No. Audit No. YMP 91-05
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3 Responsible Organization USGS	4 Discussed With T. H. Chaney/L. R. Hayes
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10 Response Due 6/28/91	11 Responsibility for Corrective Action L. R. Hayes, USGS TPO	12 Stop Work Order Y or N N
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5 Requirement:

(1) Para. 2.5: The USGS shall establish requirements for the selection, indoctrination, and training of personnel performing or verifying activities that affect quality The requirements shall establish position descriptions, set forth minimum personnel qualifications . . . prior to initiation of activities that affect quality." (2) YMP-USGS-QMP-5.01, R4, Para. 5.4, "A technical review of the technical procedure and its revisions shall be performed by a subject matter expert"

6 Adverse Condition:

A review of USGS procedure SP-06, R2, was performed by C. Langer. In accordance with USGS-QMP-3.07, a "Technical Reviewer Selection Form" was completed. The basis of qualifications for the reviewer was familiarity with the subject. The basis of qualification does not establish the minimum qualifications required, nor does it establish a basis to support that the individual is a subject matter expert.

7 Recommended Action(s):

Identify the remedial action(s) to be taken to correct the deficiencies noted in Block 6. Investigate the program process, activities or documentation to determine the extent and depth of similar deficient conditions on the CAR. Identify these deficiencies and provide

8 Initiator S. Dana	Date: 5/30/91	9 Severity Level - 1 <input type="checkbox"/> 2 <input checked="" type="checkbox"/> 3 <input type="checkbox"/>	13 Approved By: OQA <i>Catherine H. [Signature]</i>	Date: 5-30-91
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15 Verification of Corrective Action:

16 Corrective Action Completed and Accepted: OAR _____ Date _____	17 Closure Approved By: OQA _____
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**OFFICE OF CIVILIAN
RADIOACTIVE WASTE MANAGEMENT
U.S. DEPARTMENT OF ENERGY
WASHINGTON, D.C.**

CAR NO.: YM-91-50
DATE: 5/30/91
SHEET: 2 OF 2

**CORRECTIVE ACTION REQUEST
(continuation sheet)**

7 Recommended Action(s) (continued)
the measures required to correct them. Identify the cause of the condition and the planned
corrective action to prevent recurrence.

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

14CAR NO.: YM-91-51
 DATE: 5/30/91
 SHEET: 1 OF 2
 QA
 WBS No.: 1.2.9.3

CORRECTIVE ACTION REQUEST

1 Controlling Document YMP-USGS-QMP-3.03, R2	2 Related Report No. Audit No. YMP 91-05
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3 Responsible Organization USGS	4 Discussed With T. H. Chaney
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10 Response Due 6/28/91	11 Responsibility for Corrective Action L. R. Hayes, USGS TPO	12 Stop Work Order Y or N N
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5 Requirement:
 YMP-USGS-QMP 3.03, R2, Section 5.3.2.1, requires that all phases of the Software Lifecycle Methodology shall apply to all critical and ancillary Software products developed by or under direction of USGS personnel. Section 5.3.2.2 makes the same requirements for the modification of all Ancillary or Critical Software. Section 5.3.3 states that each phase of the Lifecycle Methodology shall be documented by preparing a specified SQA document for that phase.

6 Adverse Condition:
 Contrary to the above requirements, USGS has baselined and released USGS-developed and modified Software products that are classified as Critical and Ancillary and for which less than the procedurally required minimum set of SQA documents have been written.

7 Recommended Action(s):
 Identify the remedial action(s) to be taken to correct the deficiencies noted in Block 6. Investigate the program process, activities or documentation to determine the extent and depth of similar deficient conditions to the CAR. Identify these deficiencies and provide

8 Initiator T. J. Higgins	Date: 5/30/91	9 Severity Level - 1 <input type="checkbox"/> 2 <input checked="" type="checkbox"/> 3 <input type="checkbox"/>	13 Approved By: OQA <i>Catharine Hays</i>	Date: 5-30-91
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15 Verification of Corrective Action:

16 Corrective Action Completed and Accepted: OAR _____ Date _____	17 Closure Approved By: OQA _____
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**OFFICE OF CIVILIAN
RADIOACTIVE WASTE MANAGEMENT
U.S. DEPARTMENT OF ENERGY
WASHINGTON, D.C.**

CAR NO.: YM-91-51
DATE: 5/30/91
SHEET: 2 OF 2

**CORRECTIVE ACTION REQUEST
(continuation sheet)**

7 Recommended Action(s) (continued)

the measures required to correct them. Identify the cause of the condition and the planned corrective action to prevent recurrence.

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

14 CAR NO.: YM-91-52
 DATE: 5/30/91
 SHEET: 1 OF 2
 QA
 WBS No.: 1.2.9.3

CORRECTIVE ACTION REQUEST

1 Controlling Document YMP-USGS-QAPP-01, R5		2 Related Report No. Audit No. YMP 91-05	
3 Responsible Organization USGS		4 Discussed With Feggy Warner	
10 Response Due 6/28/91	11 Responsibility for Corrective Action L. R. Hayes, USGS TPO	12 Stop Work Order Y or N N	
5 Requirement: YMP-USGS-QAPP-01, R5, Criteria 17, Quality Assurance Records, Para. 17.4.1.2, states in part; Alternative Single Facilities: The following are acceptable alternatives to the criteria for a single facility: <ul style="list-style-type: none"> o Two-hour fire-rated vault that meets National Fire Protection Association (NFPA) 232-1975. o Two-hour fire-rated Class B file containers that meet the requirements of NFPA 232-1975. 			
6 Adverse Condition: Contrary to the above requirements, YMP-USGS-QMP-17.01, R4, Para. 5.5.1, allows the utilization of a one-hour fire rated container.			
7 Recommended Action(s): Identify the remedial action(s) to be taken to correct the deficiencies noted in Block 6. Investigate the program process, activities or documentation to determine the extent and depth of similar deficient conditions on the CAR. Identify these deficiencies and provide			
8 Initiator J. S. Martin	Date: 5/30/91	9 Severity Level - 1 <input type="checkbox"/> 2 <input checked="" type="checkbox"/> 3 <input type="checkbox"/>	13 Approved By: OQA <i>Catherine Harper</i> 5/30/91
15 Verification of Corrective Action:			
16 Corrective Action Completed and Accepted: QAR _____ Date _____		17 Closure Approved By: OQA _____	

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

CAR NO.: YM-91-52
DATE: 5/30/91
SHEET: 2 OF 2

**CORRECTIVE ACTION REQUEST
(continuation sheet)**

7 Recommended Action(s) (continued)

the measures required to correct them. Identify the cause of the condition and the planned corrective action to prevent recurrence.

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

14CAR NO.: YM-91-53
 DATE: 5/30/91
 SHEET: 1 OF 2
 QA
 WBS No.: 1.2.9.3

CORRECTIVE ACTION REQUEST

1 Controlling Document YMP-USGS-QMP-12.01, R5	2 Related Report No. Audit No. YMP 91-05
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3 Responsible Organization USGS	4 Discussed With Wayne Rodman
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10 Response Due 6/28/91	11 Responsibility for Corrective Action L. R. Hayes, USGS TPO	12 Stop Work Order Y or N N
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5 Requirement:
 YMP-USGS-QMP-12.01, R5, Para. 5.2.1, states in part, "calibrations performed by YMP-USGS or contractor personnel are to be recorded"

6 Adverse Condition:
 Documentation of calibration for mass spectrometer No. 1-6 and 2-6 has not been accomplished as procedurally mandated.

7 Recommended Action(s):
 Identify the remedial action(s) to be taken to correct the deficiencies noted in Block 6. Investigate the program process, activities or documentation to determine the extent and depth of similar deficient conditions on the CAR. Identify these deficiencies and

8 Initiator J. S. Martin	Date: 5/30/91	9 Severity Level - 1 <input type="checkbox"/> 2 <input checked="" type="checkbox"/> 3 <input type="checkbox"/>	13 Approved By: OQA <i>Robert Hayden</i>	Date: 5/30/91
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15 Verification of Corrective Action:

16 Corrective Action Completed and Accepted: OAR _____ Date _____	17 Closure Approved By: OQA _____
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**OFFICE OF CIVILIAN
RADIOACTIVE WASTE MANAGEMENT
U.S. DEPARTMENT OF ENERGY
WASHINGTON, D.C.**

CAR NO.: YM-91-53
DATE: 5/30/91
SHEET: 2 OF 2

**CORRECTIVE ACTION REQUEST
(continuation sheet)**

7 Recommended Action(s) (continued)

provide the measures required to correct them. Identify the cause of the condition and the planned corrective action to prevent recurrence.