

Root Cause Analysis Report  
In Response to Condition Report 5223  
Regarding Emails Suggesting Noncompliance with  
Quality Assurance Requirements



**U.S. Department of Energy**  
**Office of Civilian Radioactive Waste Management**

Submitted by:

A handwritten signature in black ink, appearing to read "D. M. Howell", written over a horizontal line.

David M. Howell  
Lead, Root Cause Analysis Team

Approved by:

A handwritten signature in black ink, appearing to read "Gene E. Runkle", written over a horizontal line.

Gene E. Runkle  
Program Manager

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This document consists of the following:

*Root Cause Analysis Report in Response to Condition Report 5223 Regarding Emails Suggesting Noncompliance with Quality Assurance Requirements, and*

*Corrective Action Plan for CR 5223*

Appendices to the *Root Cause Analysis Report* are included in this document as a CD attached to the inside back cover.

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## List of Acronyms

AMR	-	Analysis and Model Report
BSC	-	Bechtel SAIC Company
CAP	-	Corrective Action Program
CIRS	-	Condition/Issue Identification and Reporting/Resolution System
CR	-	Condition Report
DOE	-	Department of Energy
GAO	-	Government Accountability Office
IG	-	Inspector General
ITTSP	-	Infiltration Technical Team Special Project
LSN	-	Licensing Support Network
M&O	-	Management and Operating
NRC	-	Nuclear Regulatory Commission
OCRWM	-	Office of Civilian Radioactive Waste Management
PVAR	-	Process Validation and Re-engineering
QERs	-	Quality Engineering Representatives
RIT	-	Regulatory Integration Team
SCWE	-	Safety Conscious Work Environment
TSPA	-	Total System Performance Assessment
USGS	-	United States Geological Survey

## Executive Summary

The U.S. Department of Energy (DOE), Office of Civilian Radioactive Waste Management (OCRWM) conducted this root cause analysis in response to Condition Report (CR) 5223 associated with the Yucca Mountain Project. CR 5223 reports the discovery of emails written by a small number of employees of the U.S. Geological Survey (USGS) suggesting that the technical product output, software, and information related to the infiltration Analysis and Model Report (AMR) prepared by the USGS may not have met applicable quality assurance requirements. The USGS is an agency within the U.S. Department of the Interior and has been involved with the study of water infiltration and related model development at Yucca Mountain in support of DOE since the mid-1980s.

### ***What is a Condition Report (CR)?***

A CR is a document used to report adverse conditions related to work activities, what caused the conditions, and corrective actions taken to resolve the conditions.

In November 2004, a number of USGS emails were discovered during a review of legacy emails for inclusion in the Licensing Support Network (LSN). The LSN is an electronic database of documents and records which OCRWM is required to make available prior to submittal of the license application to the Nuclear Regulatory Commission (NRC) for the Yucca Mountain repository. These emails were reported to DOE in March 2005.

OCRWM established a Root Cause Analysis Team (Team) to determine the root cause(s) associated with the USGS emails and the extent of condition. The Team was also tasked to determine: a) whether the attitudes and behaviors exhibited by the small group of people responsible for the subject emails were seen in other parts of the OCRWM program; b) whether the infiltration AMR, developed by USGS and referenced in the subject emails, met applicable requirements; and c) whether opportunities were missed to identify and act on conditions adverse to quality associated with the infiltration modeling products.

In the extent of condition review, over 900,000 emails were key word searched, and more than 50,000 LSN-relevant and non-relevant emails from 14 million email records in the OCRWM email warehouse were physically reviewed. Additionally, over 7,000 documents related to the Corrective Action Program (CAP) and 1,138 records from the employee concerns programs were reviewed. In performing the root cause analysis and extent of condition determination, the Team reviewed documents and data spanning a 24-year period, from 1982 to 2006, and also conducted interviews with project staff and management. The Team's conclusions are summarized below.

## Conclusions

### USGS Emails

- The USGS emails suggesting noncompliance with quality assurance requirements were written over a six-year period, between 1998 and 2004, and the authors were limited to a small group of USGS employees.
- The emails appeared to represent frustration with work pressures including quality assurance requirements, competition with the national laboratories and the management and operating (M&O) contractor for Yucca Mountain work, funding and schedule constraints, and competing work priorities with other USGS assignments.
- The authors of the USGS emails expressed a negative attitude about the quality assurance program and suggested noncompliance with quality assurance requirements through

actions such as backdating documents, making up dates of task completions, and misrepresenting information.

- Some USGS managers were aware of the negative attitudes toward quality assurance expressed by the USGS employees responsible for the infiltration model. The Team found no indication that this situation was addressed prior to the issuance of CR 5223 in March 2005.
- Some of the USGS emails in question were also sent to staff at Bechtel SAIC Company, LLC (BSC), the current M&O contractor for the Yucca Mountain Project, and to staff at Sandia National Laboratories and Los Alamos National Laboratory who were working on the Yucca Mountain Project. There is no indication that the individuals who received these emails initiated a CR.
- The Team examined modeling software, model reports, and scientific notebooks associated with the USGS work but found no evidence that the referenced information was falsified or modified as suggested in the emails.
- The Team determined that the negative attitudes toward quality assurance requirements expressed in the USGS emails were limited to a small number of USGS employees who exchanged the emails and were not pervasive throughout OCRWM or its contractors.

#### Infiltration and Other AMRs

- The infiltration AMRs prepared by the USGS and by BSC did not meet the traceability and transparency requirements specified in the Quality Assurance Requirements and Description (QARD) and the implementing procedures. Initial attempts to replicate the output of the infiltration model were not successful. However, after consultation with the USGS in March 2006, OCRWM was able to reproduce all of the infiltration model results.
- During the development of the infiltration AMRs, quality assurance processes were not always effective. After the infiltration products developed by the USGS had been reviewed, delivered, and accepted in accordance with OCRWM procedures, 35 separate CRs were written to address infiltration product quality.
- Five other AMRs, developed by the national laboratories and BSC, were assessed by a separate OCRWM team to determine if results could be reproduced. The independent assessment team was able to reproduce AMR results for three of the AMRs but experienced difficulty with two of the AMRs. However, after correcting the identified deficiencies, the assessment team was able to reproduce the output from these two remaining AMRs.
- The reviews of previous CRs, audits, and surveillances related to other AMRs identified some issues with traceability and transparency, records packages, and work product verification, but these issues were minor and none of them affected the validity of model outputs and results.

#### Programmatic Issues

- Reporting of the USGS emails as a condition adverse to quality was not performed in a timely manner. In November 2004, a BSC employee discovered the initial 18 emails and reported the emails to BSC management who, in turn, reported the information to BSC legal counsel. Four months elapsed before BSC notified DOE management and generated CR 5223 in March 2005.

- Of the issues identified in the extent of condition review, none are comparable in significance or duration to those associated with the USGS emails that are the subject of CR 5223 as discussed in this report.
- The issues identified in the CRs written on the infiltration AMR and associated infiltration reports were consistent with issues that had been previously identified in other CRs and root cause analysis reports.
- Prior corrective actions were not completely effective in preventing recurrence, as evidenced by repeated issues associated with infiltration model software, electronic data sets, scientific notebooks, and technical errors.
- Trending was not effective in identifying recurring and systemic issues with the infiltration products. Corrective actions were generally aimed at individual conditions without necessarily addressing the underlying causes or process weaknesses.
- OCRWM has procedures for software and modeling product development, review, and acceptance. Procedures are also in place for corrective actions, root cause analyses, and trending. The Team found that, in general, these procedures were followed but the implementation of these procedures was not always effective as evidenced by the technical issues, audit findings, and CRs related to the infiltration and other work products that were identified subsequent to product acceptance by OCRWM.
- OCRWM was not completely effective in managing the application of quality assurance requirements to the infiltration work performed by the USGS. There was a lack of accountability in the preparation of some technical products prepared by the USGS infiltration team. The Team also found that audits and assessments of the infiltration work products identified issues but the corrective actions were not always effective. These circumstances contributed to poor work practices and indicated weaknesses in the implementation of quality assurance by the USGS infiltration group.

### **Root Cause and Contributing Causes**

The Team identified the following root cause issue:

OCRWM senior management failed to establish and hold the OCRWM organization accountable for meeting quality expectations with regard to the infiltration products.

The Team identified the following contributing causes:

- OCRWM failed to fully implement an effective nuclear culture within those groups responsible for preparing infiltration products.
- OCRWM failed to hold individuals accountable for infiltration product quality.
- OCRWM did not fully implement quality assurance requirements with line management accepting ownership and accountability for the infiltration products.

## 1.0 Introduction

This root cause analysis has been conducted in response to Condition Report (CR) 5223. CR 5223 reports the discovery of emails written by a small number of employees of the U.S. Geological Survey (USGS) suggesting that some of the technical product output, software, and information related to the infiltration Analysis and Model Report (AMR) prepared by the USGS may not have met applicable quality assurance requirements.

The charter for the Root Cause Analysis Team (Team) was issued on July 18, 2005, by the Deputy Director, U.S. Department of Energy (DOE) Office of Civilian Radioactive Waste Management (OCRWM), Office of Repository Development, and was amended on December 1, 2005. The Team charters and list of Team members are provided in Appendix A1.

The charter directed the Team to consider, evaluate, and determine the root cause(s) and extent of condition regarding the USGS emails. In addition, the Team was tasked to determine the following:

- Whether the infiltration AMR met applicable requirements,
- Whether the attitudes and behaviors exhibited by the small group of USGS employees who wrote the subject emails were seen in other parts of the project, and
- Whether opportunities were missed by OCRWM personnel and organizations to identify and act on conditions adverse to quality associated with the infiltration AMR.

This root cause analysis report presents background information and a description of the conditions identified in CR 5223, analysis of conditions, conclusions regarding causes, extent of condition/cause, and recommendations for corrective actions to preclude recurrence of the identified conditions. Appendices supporting this root cause analysis are provided on a compact disk that accompanies this report.

## 2.0 Background

DOE is the Federal agency responsible for the management and disposal of spent nuclear fuel and high-level radioactive waste. In 1982, Congress enacted the *Nuclear Waste Policy Act* that established the high-level waste disposal program for the United States, and directed that a general plan be prepared for characterizing a candidate repository site for permanent disposal of the nation's high-level radioactive waste and spent nuclear fuel. Various locations and geologic formations across the United States were reviewed for their potential to support a deep geologic repository. Between 1982 and 1987, technical investigations and evaluations of potential sites were conducted. In 1987, the *Nuclear Waste Policy Act of 1982* was amended, directing DOE to characterize only the Yucca Mountain site in Nevada.

In 2002, the Secretary of Energy recommended the Yucca Mountain site to the President for use as a high-level radioactive waste repository. This recommendation initiated a formal approval process that included passage of a joint resolution by Congress and signature by the President.

As required by the *Nuclear Waste Policy Act of 1982* (as amended), the proposed geologic repository is to be licensed and regulated by the Nuclear Regulatory Commission (NRC). In preparation for becoming a licensee, OCRWM established programs and procedures to address the NRC's requirements and guidance. OCRWM developed the *Quality Assurance*

*Requirements and Description* (QARD) document (DOE 2006a) that describes the overarching quality assurance requirements for the program.

Among the procedures that implement the QARD is procedure AP-16.1Q, *Condition Reporting and Resolution*, which establishes a process to ensure that adverse conditions related to work activities are identified and resolved. CRs, classified as Level A, B, C, or D depending on significance, are used to document issues and corrective actions. Level A represents the highest significance level and requires a root cause analysis, extent of condition determination, and actions to preclude recurrence. For each CR, a responsible manager is assigned to investigate the circumstances of the CR and develop and implement corrective actions. Corrective actions are tracked to completion through the CR process. Effectiveness reviews are performed for all Level A CRs to ensure that the implemented corrective actions are effective in mitigating the identified issues.

NRC regulations require that, prior to submitting the license application, DOE make available its “documentary materials” using an electronic system known as the Licensing Support Network (LSN). As part of the efforts to identify records for inclusion in the LSN, OCRWM contractors conducted a review of emails in inactive accounts, including some USGS accounts. The USGS has been involved with the study of water infiltration and model development at Yucca Mountain in support of DOE since the mid-1980s. During the email review process, a reviewer discovered a number of USGS emails that suggested disregard for and noncompliance with OCRWM quality assurance requirements (see Appendix A2). Subsequent searches revealed additional emails containing similar content written by the same USGS employees who authored the initial emails. Some additional representative emails are provided in Appendix A3.

## **2.1 Chronology of Events and Interim Actions Following Discovery of the USGS Emails**

The USGS emails were identified in November 2004 by a Bechtel SAIC Company, LLC (BSC) screener who was reviewing emails from individuals with inactive email accounts. BSC is the current management and operating (M&O) contractor for OCRWM. Some of the events that ensued upon discovery of the emails are listed below.

- November 2004. The project manager of the email review team was apprised of the existence of the emails and provided them to BSC legal counsel sometime before the Thanksgiving holiday.
- December 2004. BSC legal counsel prepared a document indicating that the USGS emails could have programmatic impacts and outlining possible actions. BSC legal counsel conducted a conference call with representatives of DOE's Office of General Counsel (GC) and GC's outside counsel, but did not discuss the substance of the subject emails. The suggestion of noncompliance with quality assurance requirements was not discussed during this conversation.
- March 9, 2005. During a briefing with BSC legal counsel, the BSC Employee Concerns Program Manager was informed of the emails. Upon learning of the emails, the BSC Employee Concerns Program Manager obtained copies of the emails and immediately notified the OCRWM Concerns Program Manager.
- March 10, 2005. The Deputy Director of OCRWM, Office of Repository Development, was informed of the existence and content of the USGS emails and notified the OCRWM Acting Director and the DOE Office of Inspector General (IG) regional office.

- March 11, 2005. Senior DOE managers in Headquarters were subsequently notified.
- March 16, 2005. The Secretary of Energy announced that a DOE IG investigation into potential criminal misconduct would be conducted, and the Department of the Interior IG also initiated an investigation. OCRWM initiated an evaluation to identify any circumstances similar to the USGS emails. This evaluation included conducting a large sample search of emails for key words and phrases and also reviewing records from DOE and BSC systems, including the OCRWM Concerns Program, the BSC Employee Concerns Program, and the OCRWM Corrective Action Program. Concurrently, OCRWM initiated a study of the technical impact of the USGS emails on the infiltration modeling work and results.
- March 28, 2005. CR 5223 was issued by BSC identifying the potential noncompliance with quality assurance requirements. The CR was designated as a Level B condition.
- June 20, 2005. CR 5223 was transferred to DOE from BSC and elevated to a Level A condition, which requires a root cause analysis and extent of condition determination.
- June 20, 2005. In order to evaluate transparency and traceability, OCRWM initiated the first of two independent assessments (DOE 2005) to determine if the results of an AMR – the Biosphere Model Report – could be reproduced without recourse to the originator, using information only available from the existing quality assurance records and information management systems. These independent assessments were part of the initial actions to support the extent of condition review of the infiltration AMR.
- July 18, 2005. OCRWM issued the charter for the Team, and this root cause analysis and extent of condition determination for CR 5223 was initiated.
- July 25, 2005. OCRWM initiated a second independent assessment (DOE 2006b) to determine if the results of four additional AMRs could be reproduced without recourse to the originator, thus evaluating the transparency and traceability of the AMRs.
- October 13, 2005. OCRWM issued a letter to the USGS requesting that the USGS develop and implement a process to certify the scientific work completed for OCRWM (Golan, P. 2005) (see Appendix A4.1).
- December 1, 2005. OCRWM revised the charter for the Team to clarify the problem statements that were to be evaluated and to update Team membership.
- February 17, 2006. OCRWM published the technical evaluation regarding the impact of the USGS emails. This document, DOE/RW-0583, was entitled *Evaluation of the Technical Impact on the Yucca Mountain Project Technical Basis Resulting from Issues Raised by Emails of Former Project Participants* (DOE 2006c). OCRWM concluded that the net infiltration rate estimates developed by the USGS employees were independently corroborated by the results of several studies conducted by other organizations regarding water infiltration and recharge rates in the southwestern U.S., where the Yucca Mountain repository site is located.
- April 25, 2006. The DOE IG reported in Memorandum 2006-04-25 (DOE IG 2006) that its investigation was complete, with no findings of criminal misconduct.
- May 4, 2006. The Department of the Interior IG issued a report on the results of its investigation (DOI IG 2006) which found that “the substance of several questionable e-mails, and the related conduct discussed, either did not occur or could not be substantiated.”

- July 27, 2006. The USGS Acting Director submitted a response to the OCRWM letter dated October 13, 2005, describing the USGS process for certifying the scientific work completed for OCRWM, including the USGS's product review and approval policy and steps being taken to ensure product quality (see Appendix A4.2).

## 2.2 Technical Evolution of the Infiltration Model and Significance of Email Content

The USGS emails that suggest noncompliance with quality assurance requirements were associated with the conceptual and numerical models that provide estimates of infiltration expected under present-day and future climate conditions. Net infiltration is that portion of precipitation that works its way below the root zone and cannot readily be evaporated or transpired by plants back into the atmosphere.

**What is an Analysis and Model Report (AMR)?** An AMR is a report that summarizes a particular body of scientific work and provides conclusions, output from numerical simulations, or in some cases, both. AMRs document the spectrum of scientific activities that support Yucca Mountain post-closure performance assessment.

The primary technical work in question is the AMR, *Simulation of Net Infiltration Under Modern and Expected Future Climate Conditions* (USGS 2000), developed by the USGS employees who exchanged the emails. The AMR, issued in June 2000 as a scientific analysis, presents infiltration maps calculated using this model. Due to procedural changes, the June 2000 AMR was superseded and reissued in November 2004 as a scientific model, *Simulation of Net Infiltration Under Present-Day and Expected Future Climate Conditions* (BSC 2004). The 2004 model,

prepared by the M&O contractor, also relies upon the work of the USGS employees who exchanged the emails.

## 3.0 Methodology

This root cause analysis was conducted in accordance with procedure AP-16.1Q, *Condition Reporting and Resolution*. The Team conducted a wide-ranging analysis to determine the causation of the USGS emails, to assess the extent to which this condition may have occurred elsewhere in the OCRWM program, and to address the other three areas of the Team's charter related to the quality of technical products produced by the OCRWM program. Appendix A provides background information and evidence used by the Team in conducting the root cause analysis. A glossary of terms is also included in Appendix A.

The Team reviewed several types of information, as shown in Table 1, as the foundation for its analysis. As part of its investigation, the Team also conducted a series of interviews with past and present OCRWM personnel who had been involved with the development of the infiltration model and associated activities. The interviews were used to supplement the Team's examination of emails, CRs, audits, and other materials.

The individuals interviewed comprised a cross-section of OCRWM employees and contractors including management, technical leads/principal investigators, BSC legal counsel, and specialists in quality assurance, corrective actions, regulatory and public affairs, records/data, employee concerns, safety, and performance assessment. The selection of the interviewees was based upon the Team's assessment of what type of information was necessary to address specific root cause issues. Interviewees were selected who had direct contact and experience

with the individuals responsible for the infiltration model or had participated in its development and/or approval in some capacity. Questions posed to the interviewees were designed to elicit information from relevant personal experiences and/or confirm or clarify findings developed by the Team. Questions were specific to each interviewee's area of expertise and relevant experience with the root cause issues.

The Team did not contact any current USGS employees and specifically, the authors of the subject emails and their supervisors, so as not to conflict with investigations being conducted by the DOE IG and Department of the Interior IG. Internal records and email systems maintained by the USGS also were not accessible during this effort, with the exception of copies of a number of emails that the USGS had submitted to the House of Representatives Government Reform Committee, Subcommittee on the Federal Workforce and Agency Organization, and that were obtained directly from the Department of the Interior. The Team interviewed other (non-USGS) project personnel with direct experience relevant to the root cause analysis and reviewed documentation available in the public domain or within the OCRWM records system.

**Table 1. Sources of Information Used in the Root Cause Analysis**

Information Source	Evaluation
USGS emails	Reviewed the original 18 USGS emails identified during the 2004 email review and additional USGS-related emails found during subsequent search activities. (Appendices A2 and A3)
Interviews of current and former project personnel	Interviewed over 40 current and former project personnel.
Letters regarding USGS certification of scientific work	Reviewed OCRWM letter requesting USGS certification of scientific work performed for the Yucca Mountain Project and USGS response. (Appendices A4.1 and A4.2)
OCRWM emails	Reviewed the results of keyword searches and physical reviews, conducted by a separate OCRWM team, of emails drawn from across OCRWM. (Appendix A5)
CRs	Reviewed the results of an examination of CRs conducted by a separate OCRWM team. (Appendix A5)
Employee concerns	Reviewed the results of an examination of all OCRWM Employee Concerns (1991 through November 2005) and BSC Employee Concerns (2002 through November 2005) conducted by a separate OCRWM team. (Appendix A5)
USGS letter signed by 17 USGS employees	Reviewed USGS letter dated August 17, 1988, regarding quality assurance concerns. (Appendix A6)
USGS memorandum concerning the infiltration report	Reviewed an internal USGS memorandum dated March 29, 2000 from the Senior Reports Advisor, USGS, concerning problems with an infiltration report used by the USGS in the development of the 2000 version of the infiltration AMR. (Appendix A7)
Regulatory Integration Team (RIT) Decision Summary	Reviewed RIT Decision Summary which documented the rationale for deferring further work on infiltration modeling products until after submittal of the license application. (Appendix A8)
CRs related to AMRs	Reviewed selected CRs from 2000 to 2006 to identify issues with the infiltration model and associated reports. (Appendix A9.1)
Audit and surveillance reports	Reviewed audit and surveillance reports related to USGS issued from 1982 to 2005. (Appendix A9.2)

**Table 1, Continued. Sources of Information Used in the Root Cause Analysis**

Information Source	Evaluation
Quality assurance procedures and change history	Reviewed quality assurance procedures applicable to modeling and analysis to provide input into the Team's assessment of the quality assurance program. (Appendix A9.2)
Prior lessons learned, root causes, and other evaluations	Reviewed prior lessons learned, root causes, and other evaluations from 2000 to 2005 to determine their applicability to this root cause analysis and extent of condition determination. (Appendix A10)
Impact assessments of AMRs	Reviewed the findings of an evaluation of five AMRs conducted by individuals outside the Team to assess transparency and reproducibility of model results. (DOE 2005 and DOE 2006b)
Technical assessment of infiltration AMR	Reviewed the findings of an assessment of the infiltration AMR conducted by the Infiltration Technical Team Special Project and documented in CR 6334.
CR 6334	Reviewed CR 6334, which documents approximately 100 traceability and transparency issues associated with the electronic data sets, software codes, and output results of the infiltration AMR. (Appendix A11)
Trending reports	Reviewed trending reports issued November 2003 through February 2006.
Internal evaluations/surveys	Reviewed documentation from the Safety Conscious Work Environment (SCWE) surveys and Corrective Action Program.

### 3.1 Root Cause Analysis Approach

The Team used a recognized root cause analysis methodology, the Phoenix Approach<sup>®</sup>, and other problem-solving tools to determine the root cause of the condition revealed in the USGS emails. This approach includes evaluation of the consequences and significance of the event and an identification of the factors that affected it. The Team used a series of analytical tools including Eight Questions, Comparative TimeLine<sup>®</sup>, Factor Trees, Barrier Analysis Matrix, and Missed Opportunities Matrix to structure and document its analysis (see Appendix B). The results obtained from each tool were factored into the overall determination of the root and contributing causes.

### 3.2 Extent of Condition Approach

The Team looked at a variety of indicators to determine the extent of condition. For example, trend reports, corrective action reports, and the analysis of five AMRs were reviewed to determine whether deficiencies similar to those found in the infiltration model were identified in other work. To determine whether the attitudes and behaviors suggested in the USGS emails existed across the OCRWM program, sources such as emails, employee concerns, and CRs were reviewed.

The results of the reviews focused on attitudes and behaviors were compiled in a report provided to the Team (Appendix A5). The OCRWM reviews examined:

- More than 7,000 CRs, Deficiency Reports, and Corrective Action Reports,
- More than 1,138 employee concern reports, and
- A large sampling of emails from across the OCRWM program.

Different search techniques were used in the sampling of the emails to suit the size of the data set and to ensure representative results. These included:

- A keyword search of over 900,000 emails from the population of emails considered relevant for inclusion in the LSN, resulting in a physical review of over 20,000 email records,
- A physical review of an additional 9,000 emails deemed relevant for inclusion in the LSN, and over 5,000 non-relevant emails, and
- Statistical sampling of the 14 million records in the OCRWM email warehouse, resulting in a physical review of 25,055 LSN-relevant and non-relevant emails.

These reviews looked specifically for two characteristics evident in the USGS emails: a negative attitude toward quality assurance, and indications of willful misconduct or noncompliance with quality assurance requirements. Where such characteristics were found, reviewers also attempted to determine whether there was supervisory knowledge of the behavior or attitude, whether it had been reported, and the longevity of the condition. Additionally, reviewers identified any emails that gave indications of potential conditions adverse to quality so that those conditions, even if not relevant to the extent of condition review, could be analyzed, trended, and addressed as appropriate.

Reviewers forwarded any suspect records to subject matter experts for further analysis. Subject matter experts researched the suspect records by consulting relevant documentation and gathering background information from knowledgeable staff, as appropriate. In some cases where the author was still a current employee, that employee was asked to provide further perspective on the subject email and to explain how the issue discussed in the email was handled. For emails that indicated the author was aware of a quality issue, an important part of the analysis was to determine whether action had been taken to initiate a CR or otherwise appropriately address the issue. In the majority of cases, analysis of additional contextual information revealed that emails were part of normal work discussions, or that appropriate follow-up of issues had occurred. The results of the email review and analysis process were provided to the Team for evaluation and use in the extent of condition reviews.

#### **4.0 USGS Emails**

##### **Issue To Be Addressed:**

*Emails were discovered suggesting violations of the Quality Assurance Program.*

#### **4.1 Investigation**

The Team reviewed USGS emails and also conducted an extent of condition review to determine whether the attitudes and behaviors suggested in the USGS emails were evident elsewhere in the OCRWM program. Findings from this analysis are presented below.

#### **4.2 Findings Regarding USGS Emails**

- Eighteen emails written between 1998 and 2000 by employees of the USGS contain several examples of what appeared to be a negative attitude and disdain regarding quality assurance requirements. Subsequent to the discovery of the 18 emails, OCRWM identified

additional USGS emails, expressing similar attitudes, written through 2004 and associated with the same individuals who authored the initial emails. Some USGS management personnel were recipients of these emails.

- While most of the infiltration modeling work was performed between 1998 and 2001, the USGS employees who developed the infiltration model were intermittently involved in documentation and validation activities through April 2005. The emails of concern occurred over a six-year period, from 1998 to 2004. The individuals principally involved in the email exchange no longer work on the Yucca Mountain Project (effective April 2005).
- Some of the USGS emails suggested the potential for deliberate misconduct, such as backdating documents, making up dates of task completions, and misrepresenting information. From the investigation of the modeling software, model reports, and scientific notebooks associated with the USGS work, the Team found no evidence that the referenced information was falsified or modified as suggested in these emails. In addition, during the June 29, 2005 hearing of the Federal Workforce and Agency Organization Subcommittee of the House Government Reform Committee, one of the USGS employees who authored some of the emails testified under oath, “I have never falsified any documents related to Yucca Mountain or any other project” (U.S. Congress 2005).
- The USGS emails contain indications of poor quality assurance practices related to the infiltration work products. For example, the emails suggest that codes and data sets were not managed properly and were not submitted as required to the Technical Data Management System. This resulted in the apparent loss of some data sets and the failure of efforts in 2004 and 2005 to assemble the necessary files to re-run the infiltration model. The USGS employees responsible for the infiltration model made draft versions available to OCRWM but did not complete the work required to incorporate USGS review comments and secure the USGS Director’s approval. Other examples involved deferral of certain quality assurance and technical tasks (such as cleaning up software code) due to perceived time and funding pressures.
- There were a few members of the USGS infiltration team who demonstrated a negative attitude and disdain toward quality assurance requirements. Although the USGS was experienced in performing scientific investigations, the USGS employees supporting the OCRWM program had limited prior experience with work subject to NRC regulations and the associated quality assurance requirements.
- Interviews conducted by the Team provided confirmatory statements that the USGS employees who exchanged the emails displayed a negative attitude toward quality assurance and openly discussed potential methods for circumventing quality assurance requirements. An early indication of these attitudes was a 1988 letter addressed to OCRWM by 17 USGS employees (including one of the employees who worked on the infiltration model) expressing concerns about quality assurance requirements (see Appendix A6).
- Some USGS managers were aware of the apparent negative attitudes toward quality assurance expressed by some of the USGS employees responsible for the infiltration model. The Team found no indication that this situation was addressed prior to the issuance of CR 5223 regarding the emails in March 2005.

- Some of the USGS emails expressing negative attitudes about quality assurance and possible misrepresentation of data and modeling work were also sent to individuals at BSC, Sandia National Laboratories, and Los Alamos National Laboratory who were working on the Yucca Mountain Project. There is no indication that the individuals who received these emails initiated a CR.
- Reporting of the USGS emails as a condition adverse to quality was not performed in a timely manner. The screener who discovered the USGS emails provided them to BSC management who in turn provided the information to BSC legal counsel in November 2004. A CR was not initiated at that time. In December 2004, BSC legal counsel prepared a document that identified potential negative program impacts and included a plan outlining possible actions. On December 12, 2004, BSC legal counsel informed a counterpart in DOE GC and the GC's legal support contractor of the existence of the emails but did not provide specific information on the content. Again, a CR was not initiated. Only when the BSC Employee Concerns Program Manager obtained copies of the emails (in March 2005) was OCRWM management informed of the emails, nearly four months after their discovery. CR 5223 was issued on March 28, 2005 to address this issue.

### **4.3 Extent of Condition**

The activities supporting the extent of condition review involved focused keyword searches of more than 900,000 emails and a full physical review of more than 50,000 emails from the LSN-relevant and non-relevant email populations. Additionally, over 7,000 documents related to the Corrective Action Program and 1,138 records from the employee concerns programs were reviewed.

The extent of condition review identified additional emails written by the same individuals who wrote the initial 18 USGS emails. The review also identified emails that raised five additional issues, including three issues associated with USGS employees, one issue associated with an OCRWM construction contractor, and one issue associated with a BSC employee, as described below.

- Additional USGS emails were found, written by the same individuals as the original 18 USGS emails, and suggesting similar attitudes and behaviors. From the email reviews conducted between May 2005 and January 2006, 77 additional USGS emails of concern were added to CR 5223. These emails were written between 1998 and 2004.
- One email involving one of the authors of the original 18 emails was identified that concerned potential irregularities in the dates of infiltration software documentation. This issue was documented in CR 7413 and is being resolved through the efforts already underway to replace infiltration modeling software and to verify or replace modeling results as necessary.
- Two USGS emails were identified that raised concerns regarding potential backdating of documents by USGS employees. In one of these instances, documented in CR 7422, the investigation substantiated that backdating of an administrative entry into a scientific notebook did occur in 2000. There was, however, no technical impact due to the nature of the entry. In the second instance, documented in CR 7414, backdating of a training record in 1998 by another USGS employee was determined as likely to have occurred. Both of these instances involved USGS employees other than the individuals who exchanged the original 18 USGS emails. Additionally, the review identified two more instances in which

USGS employees suggested, but apparently did not perform, backdating. Although the impact of these instances was minimal, the recurrence of USGS “backdating” emails suggests a disregard for quality assurance requirements on the part of the USGS employees who wrote and received these emails.

- One email, written in 2001 by an employee (now deceased) of a former Yucca Mountain construction contractor, contained a disparaging remark regarding the Condition/Issue Identification and Reporting/Resolution System (CIRS). CIRS is a system for correcting worker safety and operational conditions. An investigation found that there was no noncompliance with quality assurance requirements.
- One issue considered in the extent of condition review involved BSC and a previously closed CR which was made available to the Team. This CR addressed an improper signature on the cover page of a document, and there were indications that the CR may have been closed prematurely. A new CR (CR 7584) was initiated to investigate the closure of the CR. A handwriting expert, hired by BSC, examined the document in question but was unable to determine who had signed the document. The matter was referred to the DOE IG, but after review and verification that the signed document was not quality impacting, the DOE IG decided not to pursue the matter. CR 7584 was then closed.

#### **4.4 Conclusion**

The Team concluded that the USGS emails appeared to be associated with a small number of USGS employees who demonstrated a negative attitude toward quality assurance requirements and engaged in poor quality assurance practices from 1998 to 2004. An extent of condition review found five other isolated instances suggesting similar attitudes and behaviors, three of which involved USGS employees. The Team did not find a widespread or pervasive pattern across OCRWM of a negative attitude toward quality assurance or willful noncompliance with quality assurance requirements. None of the instances identified through the extent of condition review is comparable in significance or duration to those associated with the USGS emails that are the subject of CR 5223 as discussed in this report.

#### **5.0 Infiltration AMR**

##### **Issue To Be Addressed:**

*Determine whether the infiltration analysis/model reports met applicable requirements.*

#### **5.1 Investigation**

The Team reviewed the history of the infiltration AMR development, the CRs related to the infiltration AMR and associated infiltration reports, and the results obtained from re-running the infiltration model to determine if the model output could be reproduced.

The infiltration AMR has undergone several phases of development over the years. It was originally developed under the requirements and provisions of AP-3.10Q, *Analyses and Models*. This procedure required the AMR to be checked, prior to document approval, by a technically competent individual (other than the originator) to confirm the adequacy, accuracy, and completeness of the documentation. USGS employees completed the required evaluation and

issued the infiltration AMR as a scientific analysis in June 2000. This AMR was subsequently accepted by the M&O contractor and OCRWM.

Issues with the infiltration AMR were initially identified in a January 2000 quality assurance performance-based audit (DOE 2000) which evaluated a draft version of the AMR. This audit identified issues associated with software, traceability and transparency, and the lack of a scientific notebook to record model development.

In early 2006, OCRWM was provided a copy of an internal USGS memorandum dated March 29, 2000 (see Appendix A7) that indicated issues with a report entitled, *Conceptual and Numerical Models of Infiltration for the Yucca Mountain Areas, Nevada*, which was written by the USGS employees who exchanged the emails. In this memorandum, the Senior Reports Advisor at USGS indicated that this infiltration report would not be approved for release by the USGS Director and was being returned to the authors for additional work and explanation. The issues identified in the March 29, 2000 memorandum included unresolved review comments on terminology, model calibration, water storage and drainage estimates, and estimates of soil and rooting depths, as well as the use of many citations that referred to reports that were incomplete or not approved. A CR was not initiated to address these issues, and the Director's approval was not obtained. OCRWM did not require the USGS Director's approval of work products. The referenced infiltration report was used by the USGS in the development of the 2000 version of the infiltration AMR (USGS 2000).

During the early stages of assembling and reviewing material that would support the license application, a Regulatory Integration Team (RIT) was formed in April 2004 to address regulatory compliance and technical issues associated with AMRs. The RIT review of the infiltration AMR identified 17 issues, of which 13 were resolved and corrective actions were completed during the RIT process. Four issues were carried forward, including a recommendation to re-run the model to ensure that model results could be reproduced. Due to OCRWM's attempt to submit a license application by December 2004, the decision was made to defer taking action on these four issues. The basis for this decision was documented in the RIT Decision Summary (see Appendix A8). The RIT did not initiate a CR to document the technical issues when they were identified. A CR was, however, initiated to address these issues one year later.

The infiltration AMR was revised and reissued in November 2004 (BSC 2004) as required by LP-SIII.10Q-BSC, *Models*. This revision process required a thorough checking of the document before approval. Investigations associated with CR 6334 identified that only a partial check of the November 2004 version of the AMR was performed.

Since the issuance of the infiltration AMRs in 2000 and 2004, at least 35 CRs have been written pertaining to the AMRs and associated infiltration reports (some with multiple issues). A summary of these CRs is provided in Appendix A9.1. Table 2 lists the general types of issues identified in the 35 CRs.

**Table 2. CRs Related to Quality Issues in the Infiltration AMRs and Associated Infiltration Reports**

Type of Issues by Category	Number of CRs	CRs
<b>Technical</b>	12	0138, 0160, 0662, 2842, 3551, 5356, 5698, 5907, 6312, 6334, 7587, 7729
<b>Electronic Data Sets</b>	8	5071, 5222, 6678, 7246, 7487, 7589, 7593, 7627
<b>Reviews/Checking</b>	3	1821, 6938, 8154
<b>Corrective Action</b>	2	5320, 6460
<b>Records</b>	5	0763, 1554, 7629, 8352, 8712
<b>Other</b>	5	1862, 4507, 5223, 7184, 7413,
<b>Total</b>	35	
<b>Category Definitions</b>		
<b>Technical</b>	Conditions related to the infiltration AMR of a technical or scientific nature including issues with software	
<b>Electronic Data Sets</b>	Conditions that reflect incorrect electronic data sets or traceability in the infiltration AMR	
<b>Reviews/Checking</b>	Conditions that have to do with the formal checking process, the assigned checkers, the review by RIT, or similar conditions related to the infiltration AMR	
<b>Corrective Action</b>	Conditions that are related to the corrective action timeliness, the Corrective Action Program (CAP) system, the trending process and results, and other similar conditions related to the infiltration AMR	
<b>Records</b>	Conditions related to infiltration quality assurance records and the submittal of records to the Records Processing Center	
<b>Other</b>	Miscellaneous CRs, for example related to emails, procedures, or other uncategorized areas	

Some of the identified CRs are discussed below.

- CR 5071 (Level B) was written in February 2005 and documented the fact that several computer control files necessary to reproduce the infiltration maps (the principal output of the infiltration AMR) were missing. Without the necessary links to the original data sets and software, the model results could not be reproduced and did not provide full traceability and transparency. Subsequently, with the assistance of the AMR originator (one of the USGS email authors) all but one of the missing control files were discovered or rebuilt; however, without the missing file, one of the infiltration maps could not be reproduced, even with the assistance of the AMR originator. In 2006, after further consultation with the USGS, OCRWM was able to reproduce all of the infiltration model results.
- CR 5223 (Level A, the subject of this root cause analysis) was initiated in March 2005 to investigate potential noncompliance with quality assurance requirements pertaining to the infiltration AMR as suggested in the USGS emails.
- CR 6334 (Level B) was initiated to address review findings from the Infiltration Technical Team Special Project (ITTSP) (see Appendix A11). The ITTSP was established in August 2005 to perform a detailed technical review of the software, electronic data sets, and technical adequacy of the current version of the infiltration AMR (BSC 2004). CR 6334

documents approximately 100 traceability and transparency issues associated with the electronic data sets, the software codes, and the infiltration AMR as identified by the ITTSP review. Some of these issues were originally discovered in April 2005, but were not reported in a CR until August 2005. CR 6334 further identified that only a partial check of the AMR was performed. Corrective actions for the infiltration AMR and the associated electronic data sets were developed and are being implemented.

## 5.2 Findings Regarding Infiltration AMR

- The infiltration AMR (June 2000 and November 2004 versions) did not meet the traceability and transparency requirements of the QARD and the implementing procedures. A number of CRs has been initiated to address issues with the infiltration model. These issues generally fall into the following categories:
  - Improper or inadequate assumptions,
  - Issues related to software documentation and use,
  - Missing, incomplete, or inaccurate electronic data sets,
  - Inconsistencies in electronic data sets, tables, figures, and text,
  - Errors in equations, algorithms, and formulas,
  - Incorrect references,
  - Incomplete scientific notebooks, and
  - Errors in checking.

Initial attempts to replicate the output of the November 2004 infiltration model were not successful. However, after consultation with the USGS in March 2006, OCRWM was able to reproduce all of the infiltration model results.

- Self-checking by originators of work products should occur during product development to ensure product quality rather than relying on end-of-cycle checking. Of the 35 CRs listed in Table 2, 34 were Levels A, B, and C, indicating conditions adverse to quality, which should have been recognized and addressed during product development. There was an over-reliance on checking and other barriers to catch issues.
- In 2004, the infiltration AMR was considered by the M&O contractor to be an acceptable technical product that could be relied on in the preparation of a license application. However, in 2005 and 2006, technical errors associated with the infiltration software products, electronic data sets, and the AMR itself were still being identified, even after two cycles of review and checking had been conducted.

## 5.3 Conclusion

Based on its review, the Team found that quality assurance processes were not always followed in the development of the infiltration AMRs. However, OCRWM's technical evaluation regarding the impact of the USGS emails (DOE 2006b) determined that the net infiltration rate estimates developed by the USGS employees were independently corroborated by the results of several studies regarding water infiltration and recharge rates conducted by other organizations. To ensure full compliance with quality assurance requirements, OCRWM has directed Sandia National Laboratories to develop new infiltration rate estimates and maps and verify the electronic data sets used in the new infiltration AMR.

## 6.0 Other AMRs

In addition to the infiltration AMRs, the Team also looked at other AMRs as part of its evaluation.

### 6.1 Investigation

The Team reviewed the results of an independent assessment of five AMRs conducted by a separate OCRWM team (DOE 2005 and DOE 2006b) to determine if model output from the five AMRs could be reproduced. The five selected AMRs were:

- Biosphere Model Report,
- Atmospheric Dispersal and Deposition of Tephra from a Potential Volcanic Eruption at Yucca Mountain,
- Saturated Zone Flow and Transport Abstraction,
- Abstraction of Drift Seepage, and
- Particle Tracking Model and Abstraction of Transport Processes

The independent assessment group selected these five models because they represented a variety of features, events, and processes; were produced by different organizations (i.e., Lawrence Livermore National Laboratory, Sandia National Laboratories, Los Alamos National Laboratory, and BSC); and the model outputs could be produced within the timeframe of the independent assessment.

The Team also reviewed 145 CRs related to other AMRs (2002 to 2006).

### 6.2 Findings Regarding Other AMRs

- The independent assessment group was able to reproduce results for three of the AMRs (Biosphere Model Report, Saturated Zone Flow and Transport Abstraction, and Particle Tracking Model and Abstraction of Transport Processes) but experienced a difficulty with the other two AMRs. One involved an error in which data values were incorrectly rounded when transcribed and the other involved an issue with an electronic data set that required the group to contact the AMR originator to resolve. After correcting these issues, the group was able to reproduce results from these two AMRs. The technical issues with these two AMRs were documented in CR 6729 (Atmospheric Dispersal and Deposition of Tephra from a Potential Volcanic Eruption at Yucca Mountain) and CR 7819 (Abstraction of Drift Seepage).
- The review of 145 CRs related to other AMRs identified a number of issues. A summary of these CRs is provided in Appendix A9.1. Examples include the following:
  - CR 2608 (Level B) documented the review of 33 record packages for three models and identified seven record packages that did not contain the required records. These issues were subsequently addressed and CR 2608 was closed.
  - CR 6011 (Level B) described a BSC self-assessment review of over 150 CRs to determine procedural adherence. Thirty-one CRs identified failures in the checking process which impacted over 10 percent of the AMRs supporting the Total System Performance Assessment (TSPA). CR 6011 did not present any final conclusions and was transferred for closure to CR 5559.

- CR 5559 (Level B) documented issues associated with the checking and review of technical work products. These issues included procedural nonconformances, incomplete documentation and record packages, and insufficient time to complete the checking process. This CR identified 3,940 issues, most of which were considered minor. All the issues were addressed and there was no impact on the results or conclusions of the technical work products. CR 5559 was subsequently closed.
- CR 6334 (Level B) also identified some minor issues with other AMRs as part of the extent of condition review associated with the infiltration AMR. However, none of the issues identified changed the results or conclusions of these AMRs.

### 6.3 Conclusion

The reviews of previous CRs, audits, and surveillances related to other AMRs identified some issues with traceability and transparency, records packages, and work product verification, but none of these issues affected the validity of model outputs and results.

### 7.0 Culture

#### Issue To Be Addressed:

*Determine whether the attitudes and behaviors exhibited by the small group of USGS employees who wrote the subject emails were seen in other parts of the OCRWM program.*

### 7.1 Investigation

Since the Yucca Mountain repository will be a nuclear facility licensed by the NRC, the Team compared OCRWM culture against recognized general attributes of a good nuclear culture in assessing the information collected from interviews and documents reviewed. The term “nuclear culture” includes organizational, quality, and nuclear safety principles, values, and behaviors.

A good nuclear culture is a work environment that reflects a rigorous attention to safety and quality, where behavior is focused on doing work right the first time, a questioning attitude, self-assessment and early identification of issues, and prompt and complete actions to resolve issues and prevent recurrence. Self-identification of issues and prompt corrective actions are important to nuclear culture.

Although many good practices were noted, the Team also found examples of a lack of attention to detail, ineffective quality assurance program implementation, and a lack of accountability related to the infiltration products.

### 7.2 Findings Regarding Culture

The Team found that the USGS employees involved in developing the infiltration products did not always exhibit behaviors consistent with a good nuclear culture. Although the infiltration model results were corroborated by regional data from the southwest U.S., they were not always developed in accordance with established quality assurance requirements. Cultural aspects that contributed to this condition include the following:

- The application of quality assurance requirements to infiltration work products was not always managed effectively.
  - In the early years of the scientific site characterization of Yucca Mountain, the national laboratories, USGS, M&O contractor, and other organizations participating in Yucca Mountain studies followed their own procedures for conducting, documenting, and verifying scientific work. In order to develop a single approach to quality assurance that would be responsive to NRC requirements, OCRWM imposed a set of uniform quality assurance requirements applicable to all entities conducting Yucca Mountain Project work. In order to meet the traceability and transparency requirements of the NRC, OCRWM established more rigorous quality assurance requirements than those generally found in scientific and research endeavors. This led to resistance by some scientists, as exemplified by the 1988 letter signed by 17 USGS personnel including one of the authors of the infiltration model (USGS Hydrologists and Hydrologic Technicians 1988).
  - The OCRWM QARD was issued in 1992 to provide uniform quality assurance requirements across the OCRWM program to meet NRC expectations. Since that time, OCRWM has faced challenges in effectively implementing the QARD and making the transition to a design and engineering mission. Since 1992, the QARD has undergone 18 revisions. Numerous changes have also occurred in the implementing procedures. These frequent changes have resulted from efforts to improve the quality assurance program and build a good nuclear culture, but have also contributed to some frustrations and difficulties related to QARD implementation.
  - The Interagency Agreement between the DOE and USGS includes general statements of the work to be performed but does not include specific requirements and expectations for the work products, such as approval by the USGS Director.
- There were indications that schedule demands and funding limitations influenced some infiltration work products. Examples include the following:
  - The subject USGS emails made reference to meeting schedules, lack of funding, and ignoring quality assurance requirements (see Appendix A2). A broader search of USGS emails identified similar references (see Appendix A3).
  - Two of the 35 CRs related to the infiltration AMRs (0138 and 8154) and 13 of the 145 CRs on other AMRs (2551, 2562, 2794, 3235, 3347, 3732, 3890, 4231, 4304, 4943, 5384, 5438, and 5559) cited schedule pressures, conflicts with other work, and funding issues as the causes for poor quality work (see Appendix A9.1).
  - During the interviews conducted by the Team, technical checking (per LP-SIII.10Q-BSC, *Models*) was mentioned as one of the areas where sufficient time was not allotted to perform required actions. Five AMR-related CRs (2551, 3235, 3347, 4304, 5559) identified this as an issue.
  - In 2001, a root cause analysis involving a TSPA model was performed based upon NRC technical concerns. The report, *Root Cause Analysis Report for Yucca Mountain Project Technical Document Deficiencies* (BSC 2001a), was issued August 17, 2001. The report identified the “generic cause” as – “DOE and the M&O believed meeting the timeline window (schedule) was more critical to project success than producing error-free documents at this time in the life of the Project. Consequently, the M&O and the DOE managed accordingly, resulting in the documents being issued with deficiencies.”

- OCRWM assessments and CRs have identified recurring conditions adverse to quality, and some corrective actions have not been completely effective with regard to the infiltration work products.
  - Assessments and CRs identified deficiencies in AMRs that were similar or identical to deficiencies previously reported and corrected, indicating a corrective action process that was not completely effective. For example, there were at least 53 audits and surveillances of USGS products and activities from 1995 to 2004, five of which resulted in unsatisfactory ratings. Of these five, four specifically addressed modeling of the unsaturated zone, scientific notebook issues, and technical inadequacies of the infiltration AMR and software.
  - Despite reviews and checking that were required by OCRWM procedures, as well as subsequent audits and surveillances, two versions of the infiltration AMR were formally approved and accepted by OCRWM in June 2000 and in November 2004. Following product acceptance, issues with transparency, traceability, and overall quality were discovered and documented in CRs.
- Line management was not held accountable for the quality of infiltration products and this lack of ownership and accountability for infiltration work products contributed to an over-reliance on the reviews, audits, and assessments.

### 7.3 Conclusion

The Team concluded that OCRWM was not completely effective in managing the application of quality assurance requirements to the infiltration work performed by the USGS. The Team found that assessments of the infiltration work products identified issues but the corrective actions were not always effective. The Team noted instances where there was a lack of ownership and accountability for work products and an over-reliance on reviews, checking, and assessments to assure infiltration work product quality. These circumstances contributed to poor work practices and indicated weaknesses in the implementation of quality assurance by the USGS infiltration group.

### 8.0 Missed Opportunities

**Issue To Be Addressed:**

*Assess whether opportunities were missed by OCRWM personnel and organizations to identify and act on conditions adverse to quality associated with the infiltration AMRs.*

#### 8.1 Investigation

Using the Missed Opportunity Matrix tool in Appendix B5, the Team evaluated information obtained during the root cause analysis to identify and document missed opportunities.

#### 8.2 Findings Regarding Missed Opportunities

There were missed opportunities to identify and act on conditions adverse to quality specific to the infiltration products. These missed opportunities are summarized below:

- Quality Assurance Program – Although the OCRWM quality assurance program was in place at the time the infiltration products were developed, that program was not consistently and effectively implemented by line management with regard to these products. The USGS infiltration team did not take full responsibility for the quality of its work and did not recognize the importance of quality assurance to the licensing process.
- Corrective Actions –The USGS infiltration team and the RIT could have, but did not correct known conditions adverse to quality associated with the infiltration products. Although numerous CRs were written and corrective actions were taken, the same issues continued to occur.
- Trending – Although the trending process was in place at the time, that process did not identify recurring and systemic issues associated with the development of the infiltration products. Trending could have been used to identify issues earlier and mitigate the consequences. Many CRs were categorized as isolated conditions despite their direct relationship to other existing CRs. For example, 35 CRs (1 Level A, 8 Level Bs, 25 Level Cs, and 1 Level D) have been identified that pertain to the infiltration AMR, but these issues were not identified in a formal trending report as an emerging adverse trend.
- Checking and Review Process – Many of the technical issues that have been identified with the infiltration products should have been identified during the numerous checks and reviews required by procedures.
- Process Improvements – OCRWM management undertook several process improvement initiatives since 1999 to improve organizational performance, regulatory compliance, quality, accountability, technical work products and work processes, and to further define roles and responsibilities. These initiatives included:
  - Process Validation and Re-engineering (PVAR) in 1999,
  - Management Improvement Initiative (DOE 2002a) in 2002, and
  - RIT in 2004.

Although these initiatives met some of their intended objectives, they were not fully effective in implementing accountability and technical work product improvements and therefore represented missed opportunities to identify and correct issues associated with the preparation of infiltration products.

## 9.0 Causes/Extent of Causes

### 9.1 Root Cause and Contributing Causes

The Team has determined that the previously discussed issues are a direct result of the following root cause issue:

OCRWM senior management failed to establish and hold the OCRWM organization accountable for meeting quality expectations with regard to the infiltration products.

The Team identified the following contributing causes:

1. OCRWM failed to fully implement an effective nuclear culture within those groups responsible for preparing infiltration products.
2. OCRWM failed to hold individuals accountable for infiltration product quality.
3. OCRWM did not fully implement quality assurance requirements with line management accepting ownership and accountability for the infiltration products.

Table 3 expands on the identified causes.

## 9.2 Extent of Causes

The Team reviewed previous root cause analyses, CRs, audits/surveillances, interviews, and external assessments. Causes similar to those identified in this root cause analysis were identified in the following:

- 1998 – CARs LVMO-98-C-006, which later became LVMO-00-C-001 (software) and LVMO-98-C-010 (models);
- 2000 – Nuclear Energy Institute evaluation of the Yucca Mountain Project, *Yucca Mountain Project Independent Quality Review* (NEI 2000);
- 2001 – BSC evaluation of the root causes of technical deficiencies (*Root Cause Analysis Report for Yucca Mountain Project Technical Document Deficiencies*) (BSC 2001a);
- 2001 – *Root Cause Analysis Report for CAR BSC-01-C-001 and CAR BSC-01-C-002, Revision 1* (BSC 2001b);
- 2002 – Management Improvement Initiative (DOE 2002a) (procedure and process improvements);
- 2002 – Evaluation of Lessons Learned Report OCRWM-LL-2002-026, *Yucca Mountain Project Evaluates Past Initiatives to Help Ensure Future Success* (DOE 2002b);
- 2003 – CR 3235 (inadequate technical products and ineffective corrective actions);
- 2004 – Government Accountability Office (GAO) report, *Yucca Mountain: Persistent Quality Assurance Problems Could Delay Repository Licensing and Operation* (GAO 2004);
- 2005 – CR 5071 (missing infiltration files);
- 2005 – CR 5559 (ineffective product checking);
- 2005 – CR 6334 (infiltration errors and technical inconsistencies);
- 2005 – Inspector General Report (DOE IG 2005) *Quality Assurance Weaknesses in the Review of Yucca Mountain Electronic Mail for Relevancy to the Licensing Process*; and
- 2006 – GAO report, *Yucca Mountain: Quality Assurance at DOE's Planned Nuclear Waste Repository Needs Increased Management Attention* (GAO 2006).

Many of these same causes have been previously identified and the corrective actions have not been fully effective in preventing recurrence.

**Table 3. Root Cause and Contributing Causes**

<b>Root Cause:</b>		
<ul style="list-style-type: none"> <li>■ OCRWM senior management failed to establish and hold the OCRWM organization accountable for meeting quality expectations with regard to the infiltration products.</li> </ul>		
<b>Contributing Causes:</b>		
<b>1. OCRWM failed to fully implement an effective nuclear culture within those groups responsible for preparing infiltration products.</b>		
<ul style="list-style-type: none"> <li>■ OCRWM has not previously constructed and operated a repository and did not effectively manage the transition from a science-oriented mission to the NRC licensing process in connection with the infiltration products.</li> </ul>		
<i>Indicators</i>	<i>Examples</i>	
<ul style="list-style-type: none"> <li>➢ OCRWM does not yet have experience as an NRC licensee and there is limited training on NRC requirements and expectations.</li> <li>➢ OCRWM has not fully implemented a culture that emphasizes conservative decision-making, exceeding minimum requirements, and integration of quality with respect to the infiltration work products.</li> </ul>	<ul style="list-style-type: none"> <li>➢ <i>The RIT management decided to defer some corrections to infiltration models as documented in its Decision Summary.</i></li> <li>➢ <i>The RIT Decision Summary included estimated levels of effort for work product corrections. Interviews indicated that decisions were made not to pursue some of the technical corrections to the infiltration models due to schedule and budget constraints.</i></li> </ul>	
	<ul style="list-style-type: none"> <li>➢ <i>OCRWM does not have a comprehensive training program on NUREG 1804 (NRC 2003), which communicates NRC licensing expectations.</i></li> <li>➢ <i>There are no formal requirements to re-run models as part of the checking and review process for AMRs.</i></li> <li>➢ <i>The USGS employees supporting the OCRWM program had limited experience with nuclear work subject to NRC regulations and the associated quality assurance requirements.</i></li> </ul>	

**Table 3. Root Cause and Contributing Causes**

<p><b>2. OCRWM failed to hold individuals accountable for infiltration product quality.</b></p>		
<p>▪ OCRWM senior management did not effectively manage program changes, including changes in schedule, organizations, processes, and program direction in connection with the infiltration products.</p>		
<p><b>Indicators</b></p>	<p><b>Examples</b></p>	
<ul style="list-style-type: none"> <li>➤ Inconsistent year-to-year funding and allocation precluded effective multi-year planning.</li> <li>➤ Frequent changes have occurred in program direction, management, organizational structure, participants, requirements, processes, and contracting arrangements.</li> <li>➤ OCRWM has not always effectively managed schedules to ensure quality infiltration work products.</li> <li>➤ With emphasis on meeting cost, schedule, and programmatic commitments, OCRWM management did not always effectively sustain and enforce consistent quality assurance expectations for the infiltration products.</li> <li>➤ The Interagency Agreement between DOE and USGS has a general statement of work but does not include specific performance requirements and expectations for work products.</li> </ul>	<ul style="list-style-type: none"> <li>➤ <i>Emails from USGS employees responsible for infiltration mentioned concerns with funding of work in order to meet schedule.</i></li> <li>➤ <i>USGS emails expressed issues with organizational restructuring, including uncertainty as to who was providing direction.</i></li> <li>➤ <i>USGS emails indicate employees responsible for infiltration had quality concerns but rushed products to meet schedule.</i></li> <li>➤ <i>The RIT was designed to complete its task in accordance with the license application schedule. Interviews indicated that decisions were made to defer some of the technical corrections due to schedule and budget constraints and negligible technical impacts.</i></li> </ul>	
	<ul style="list-style-type: none"> <li>➤ <i>Eighteen revisions of the QARD have been prepared, and only Revision 18 addressed 10 CFR Part 63 requirements.</i></li> <li>➤ <i>The model and analysis procedures (e.g., LP-SIII.9Q-BSC and LP-SIII.10Q-BSC) each changed 21 times in 7 years (see Appendix B4.1, Oversight Barrier Analysis).</i></li> </ul>	

**Table 3. Root Cause and Contributing Causes**

<p>▪ OCRWM did not have an effective product development and review process to ensure quality of the infiltration products.</p>		
<b>Indicators</b>	<b>Examples</b>	
<ul style="list-style-type: none"> <li>➤ In some instances, project management processes were ineffective in producing quality infiltration work products.</li> <li>➤ Quality was not always integrated into infiltration work plans, processes, and products.</li> <li>➤ Multiple check points including work planning, self-assessment, quality assurance audits, and external assessments were relied upon for infiltration product quality.</li> <li>➤ Authors, checkers, and managers were not always held accountable for poor quality infiltration work products.</li> <li>➤ Work was sometimes initiated prior to approval of infiltration work plans.</li> <li>➤ Checking and review for quality of infiltration work products was not always rigorous.</li> </ul>	<ul style="list-style-type: none"> <li>➤ 35 separate CRs were written to address infiltration product quality.</li> <li>➤ OCRWM has accepted deliverables that do not meet expectations, such as the infiltration model which resulted in re-work activities.</li> <li>➤ The infiltration analysis was reclassified as a model, which would have required additional support for conclusions and validation; however, this additional effort was not performed. This resulted in CR 6334.</li> <li>➤ CR 6334 indicates that the infiltration AMR had over 100 nonconformances even though it had gone through formal checking, review, and acceptance.</li> <li>➤ Corrective actions specified in two Corrective Action Reports (CAR 1 and CAR 2) required extensive efforts over three years (2001 to 2004) to resolve the described modeling and software issues with AMRs, including the infiltration AMR, yet issues persisted even after corrective actions were completed.</li> </ul>	
	<ul style="list-style-type: none"> <li>➤ Authors' names did not appear on the document, and authors typically only focused on their own sections of a product.</li> <li>➤ Many procedures were revised multiple times in a single year and the QARD changed four times in one year.</li> <li>➤ The model and analysis procedures (e.g., LP-SIII.9Q-BSC and LP-SIII.10Q-BSC) each changed 21 times in 7 years (see Appendix B4.1, Oversight Barrier Analysis).</li> <li>➤ Audits identified conditions adverse to quality that should have been corrected by work product management, owners, checkers, and reviewers.</li> <li>➤ OCRWM product acceptance process was not rigorous and was often schedule driven thus not allowing adequate time for product review.</li> </ul>	

**Table 3. Root Cause and Contributing Causes**

<p>▪ OCRWM did not always work as an integrated organization to ensure accountability with regard to the infiltration products.</p>		
<b>Indicators</b>	<b>Examples</b>	
<ul style="list-style-type: none"> <li>➤ Some organizations within OCRWM failed to work as a team and did not always work to common goals and objectives.</li> <li>➤ There were instances of a lack of ownership and accountability for infiltration work products.</li> <li>➤ Participants sometimes competed for work scope and funding.</li> <li>➤ Integration of Quality Engineering Representatives (QERs) into the line organizations was not fully effective.</li> <li>➤ There were instances of a lack of accountability for quality in delivered infiltration products and in product acceptance, leading to corrective actions and rework.</li> </ul>	<ul style="list-style-type: none"> <li>➤ <i>According to the USGS emails, USGS employees considered themselves separate from and in competition with other Yucca Mountain Project organizations (i.e., the national laboratories and the M&amp;O contractor).</i></li> <li>➤ <i>Sometimes allocation of work between national laboratories required discussion to resolve issues.</i></li> <li>➤ <i>Interviews conducted by the Team and emails indicated that the QERs for the original USGS infiltration work eventually gave up trying to help resolve the quality issues.</i></li> <li>➤ <i>USGS management failed to hold infiltration employees accountable for quality of the infiltration work.</i></li> </ul>	
	<ul style="list-style-type: none"> <li>➤ <i>Based on interviews and review of CRs and root cause analyses, the value of the quality assurance organization was not fully embraced by line management.</i></li> <li>➤ <i>A common theme in the email reviews and interviews was a lack of communication of primary goals, objectives, schedules, requirements and expectations between the organizations including national laboratories, USGS, M&amp;O contractor, and DOE.</i></li> <li>➤ <i>Emails and interviews described competition between the national laboratories, USGS, M&amp;O contractor, and MTS (OCRWM technical support contractor) for work scope, associated funding, and professional recognition.</i></li> <li>➤ <i>QERs had been integrated into the line organization for some time, including during RIT activities, yet quality work product issues persisted as shown by CRs, audit issues, and external evaluations.</i></li> </ul>	

**Table 3. Root Cause and Contributing Causes**

**3. OCRWM did not fully implement quality assurance requirements with line management accepting ownership and accountability for the infiltration products.**

- OCRWM did not transition its quality assurance program from a scientific, research-oriented mission to a design and engineering mission in connection with the infiltration products.

<i>Indicators</i>	<i>Examples</i>
<ul style="list-style-type: none"> <li>➤ OCRWM attempted to impose a quality assurance program more suited to a design and engineering mission on an organization performing a scientific, research-oriented mission.</li> <li>➤ OCRWM line management did not always take ownership of quality in infiltration product development; oversight did not identify this lack of ownership.</li> <li>➤ Quality was frequently audited into the infiltration work products and not integrated into the development process.</li> <li>➤ Organizations, management, and staff were not always held accountable for quality of the infiltration work products.</li> <li>➤ Quality assurance requirements were not always effectively implemented throughout the organizations and work processes related to infiltration.</li> <li>➤ Some individuals saw little value in quality assurance requirements as related to the infiltration work products.</li> <li>➤ Performance-based audits were not routinely performed.</li> <li>➤ Checking and verification to ensure the quality of work products was in some instances influenced by schedule pressures.</li> </ul>	<ul style="list-style-type: none"> <li>➤ <i>The M&amp;O contractor considered the infiltration AMR (MDL-NBS-HS-000023) to be acceptable for inclusion in the draft materials used in the preparation of a license application even though the project later learned there were deficiencies. 35 CRs on the infiltration AMR have been generated since 2004.</i></li> <li>➤ <i>OCRWM accepted the infiltration AMR as a deliverable.</i></li> <li>➤ <i>RIT items were not fully addressed and issues were left open on the infiltration AMR (MDL-NBS-HS-000023) and were not initially managed through the Corrective Action Program. After one year a CR was initiated to address the issues.</i></li> <li>➤ <i>Subsequently, CRs on the infiltration AMR have identified issues after the formal reviews and checking required by procedures were complete.</i></li> <li>➤ <i>The USGS emails expressed disdain for quality assurance.</i></li> <li>➤ <i>18 OCRWM quality assurance audits were performed of USGS activities during the period of 1995 through 2004, of these 9 were compliance-based and 9 were performance based; all of the compliance audits determined that USGS activities were “Satisfactory”, while 4 (44%) of the performance-based audits indicated an overall “Unsatisfactory” rating.</i></li> <li>➤ <i>USGS scientists wrote a letter to DOE in 1988 expressing concerns about quality assurance requirements.</i></li> <li>➤ <i>Conditions adverse to quality were considered to be isolated conditions although many were repetitive. This precluded an effective corrective action effort.</i></li> <li>➤ <i>Early identification of issues with the infiltration products (e.g., scientific notebooks, traceability issues) did not result in actions to preclude recurrence.</i></li> <li>➤ <i>Management, program and procedural changes, and quality assurance practices have not always been effective in preventing conditions adverse to quality.</i></li> </ul>

**Table 3. Root Cause and Contributing Causes**

<p>▪ OCRWM did not implement an effective Corrective Action Program with regard to the infiltration products.</p>		
<b>Indicators</b>	<b>Examples</b>	
<ul style="list-style-type: none"> <li>➤ In some instances, there was a lack of management oversight to ensure the effectiveness of corrective actions related to the infiltration work products.</li> <li>➤ Recurring conditions were identified as isolated, leading to correction of specific issues rather than the causes and the underlying processes.</li> <li>➤ Self-assessment processes were not always effective in finding issues related to the infiltration work products.</li> <li>➤ There was reluctance to initiate Level A and Level B CRs to avoid the required evaluation efforts.</li> <li>➤ Difficulties in using CAP software in some cases created reluctance to use the system.</li> <li>➤ There were multiple issue tracking systems which limited the effectiveness of trending.</li> </ul>	<ul style="list-style-type: none"> <li>➤ 35 CRs identified issues with the infiltration AMR including multiple recurring issues.</li> <li>➤ In addition to the infiltration AMR, numerous CRs have been written on AMRs in general.</li> <li>➤ Rework of the infiltration products and issues identified in CRs reflect a weakness in the self-assessment program.</li> </ul>	<ul style="list-style-type: none"> <li>➤ Interviews revealed that there was reluctance to initiate Level A and Level B CRs to avoid the required evaluation efforts.</li> <li>➤ The 2006 CAP self-assessment indicated inconsistencies in cause codes and CR levels.</li> <li>➤ The 2006 CAP self-assessment, SCWE survey, and interviews identified that difficulties in using CAP software resulted in reluctance to use the system.</li> </ul>

## 10.0 Recommendations

The following are recommendations for corrective actions to address the causes identified in Table 3. Progress should be actively monitored to ensure timely and successful execution of the planned actions and achievement of the desired end state.

The following corrective actions should be considered:

- Ensure that the USGS completes its planned actions for USGS Director approval of work performed by the USGS and that such work conforms to OCRWM's quality assurance requirements.
- Review the Interagency Agreement between DOE and USGS and add specific requirements and expectations for work products, as needed.
- Complete the rework of the infiltration AMR and the associated CRs.
  - OCRWM has directed Sandia National Laboratories to develop new infiltration rate estimates and maps and verify and validate the electronic data sets used in the new infiltration AMR.
- Implement lessons learned from the infiltration work to strengthen the technical product development process and acceptance criteria for AMRs. Specific activities could include the following:
  - Use a risk-based process to evaluate the adequacy of existing AMRs,
  - Require an independent confirmation of model output and re-running of codes,
  - Emphasize quality assurance requirements in planning and implementation activities,
  - Ensure that quality is built in at every step of the process,
  - Initiate quality objectives early in the product planning process (requirements and design reviews),
  - Identify measurable acceptance criteria including requirements for transparency and traceability,
  - Provide adequate time for detailed checking and review,
  - Specify in-process milestones or hold points to ensure that quality requirements are implemented as products are developed,
  - Continue performance-based quality assurance audits to ensure technical adequacy,
  - Hold managers, authors, checkers, and reviewers accountable for product quality,
  - Incorporate product acceptance criteria into performance-based contract incentives, and
  - Hold organizations and individuals accountable for quality work products.
- Identify and implement actions to further enhance OCRWM performance as an NRC licensee and improve change management processes to effectively plan for and manage programmatic, organizational, and resource changes. The resulting actions should address the following:
  - Training,
  - Coaching,
  - Mentoring,
  - NRC interactions,
  - NRC expectations, and
  - Nuclear culture.

## End State – Measures of Success

Following are attributes of the desired end state by which OCRWM should measure the success of its corrective actions associated with the infiltration work products resulting from this root cause analysis:

- The infiltration work products are accurate, transparent, and traceable.
- Routine performance-based audits recognize the infiltration work products as complete and technically sound. These audits also find as a noteworthy practice that line management fully owns product quality throughout the product lifecycle.
- Assessments indicate that a change management process is in place for the infiltration work products and management is effective in managing organizational, programmatic, and cost and schedule changes to deliver quality products.

## 11.0 Lessons Learned/Generic Implications

Many of the lessons to be learned from the current investigation are the same or similar to those provided during previous attempts to improve mission, organizational, and individual objectives and results. In addition, reviews completed by external organizations (such as the GAO and the DOE IG) have also pointed to some of the same recurring issues. OCRWM management should review and implement the lessons learned from this root cause analysis to prevent a recurrence of the circumstances associated with CR 5223. The OCRWM program must continue to embrace the concept of utilizing past experiences to prevent issues from recurring and to learn from successes that enhance program activities and the ability to meet program objectives.

## 12.0 References

### 12.1 Documents Cited

BSC (Bechtel SAIC Company) 2001a. *Root Cause Analysis Report for Yucca Mountain Project Technical Document Deficiencies*. Las Vegas, Nevada: Bechtel SAIC Company. ACC: MOL.20011023.0449.

BSC 2001b. *Root Cause Analysis Report for CAR BSC-01-C-001 and CAR BSC-01-C-002, Revision 1*. Las Vegas, Nevada: Bechtel SAIC Company. ACC: MOL.20011023.0447.

BSC 2004. *Simulation of Net Infiltration for Present-Day and Potential Future Climates*. MDL-NBS-HS-000023 REV 00. Las Vegas, Nevada: Bechtel SAIC Company. ACC: DOC.20041109.0004.

DOE (U.S. Department of Energy) 2000. *Office of Quality Assurance Audit Report M&O-ARP-00-004 of the Civilian Radioactive Waste Management System Management and Operating Contractor, Lawrence Berkeley National Laboratory, and U.S. Geological Survey, at Berkeley, CA, January 24-28, 2000*. Washington, D.C.: U.S. Department of Energy, Office of Civilian Radioactive Waste Management. ACC: MOL.2000.5040853.

DOE 2002a. *Management Improvement Initiatives*, PLN-CRW-AD-000009, Rev. 0. Washington, D.C.: U.S. Department of Energy, Office of Civilian Radioactive Waste Management. ACC: MOL.20020729.0388.

DOE 2002b. *Yucca Mountain Project Evaluates Past Initiatives to Help Ensure Future Success*. OCRWM-LL-2002-026. Washington, D.C.: U.S. Department of Energy, Office of Civilian Radioactive Waste Management. ACC: MOL.20020927.0027.

DOE 2005. *Independent Assessment of the Biosphere Model Output Reproducibility*. *Independent Assessment IA-OLAS-2005-001*. Washington, D.C.: U.S. Department of Energy, Office of Civilian Radioactive Waste Management Office of Repository Development. ACC: MOL.20050629.0163.

DOE 2006a. *Quality Assurance Requirements and Description*. DOE/RW-0333P, Rev. 18. Washington, D.C.: U.S. Department of Energy, Office of Civilian Radioactive Waste Management. ACC: DOC.20060602.0001.

DOE 2006b. *Independent Assessment Plan and Report: Reproducibility of Four Model Reports*. *Independent Assessment IA-OLAS-2005-002*. Washington, D.C.: U.S. Department of Energy, Office of Civilian Radioactive Waste Management Office of Repository Development. ACC: MOL.20060524.0098.

DOE 2006c. *Evaluation of Technical Impact on the Yucca Mountain Project Technical Basis Resulting from Issues Raised by Emails of Former Project Participants*. DOE/RW-0583. Washington, D.C.: U.S. Department of Energy, Office of Civilian Radioactive Waste Management. ACC: MOL.20060309.0482.

DOE IG (Department of Energy Office of Inspector General) 2005. *Quality Assurance Weaknesses in the Review of Yucca Mountain Electronic Mail for Relevancy to the Licensing Process*. IG-0708. ACC: MOL.20060821.0139.

DOE IG 2006. *Investigation of Allegations Involving False Statements and False Claims at the Yucca Mountain Project (OIG Case No. I05LV002)*. ACC: MOL.20060504.0161.

DOI IG (Department of Interior Office of the Inspector General) 2006. *Investigative Report - On Allegations that U.S. Geological Survey Employees Assigned To Conduct Research on the Yucca Mountain Project May Have Falsified Scientific Data and Quality Assurance Records*. URL: <http://www.doiig.gov/upload/Yucca%20Mountain11BESTRedacted1.pdf> (Readily available).

GAO (Government Accountability Office) 2004. *Yucca Mountain: Persistent Quality Assurance Problems Could Delay Repository Licensing and Operation*. GAO-04-460. Washington, D.C.: URL: <http://www.gao.gov/new.items/d04460.pdf> (Readily available).

GAO 2006. *Yucca Mountain, Quality Assurance at DOE's Planned Nuclear Waste Repository Needs Increased Management Attention*. GAO-06-313. Washington, D.C.: U.S. Government Accountability Office. URL: <http://www.gao.gov/new.items/d06313.pdf> (Readily available).

Golan, P. 2005. "OCRWM Letter Requesting USGS Certification of Scientific Work." Letter from P. Golan (Office of Civilian Radioactive Nuclear Waste) to R.M. Hirsch (USGS), October 13, 2005.

NEI (Nuclear Energy Institute) 2000, *Yucca Mountain Project Independent Quality Review*, August 2000. Washington, D.C.: Nuclear Energy Institute. ACC: MOL.20050611.0037.

NRC (U.S. Nuclear Regulatory Commission) 2003. *Yucca Mountain Review Plan, Final Report*. NUREG-1804, Rev. 2. Washington, D.C.: U.S. Nuclear Regulatory Commission, Office of Nuclear Material Safety and Safeguards. TIC: 254568.

U.S. Congress 2005. House Government Reform Committee, Subcommittee on Federal Workforce and Agency Organization Hearing, "Yucca Mountain Data Falsification." URL: <http://reform.house.gov/FWAO/Hearings/EventSingle.aspx?EventID=40214> (Readily available).

USGS (U.S. Geological Survey) 2000. *Simulation of Net Infiltration for Modern and Potential Future Climates*. ANL-NBS-HS-000032 REV 00. Denver, Colorado: U.S. Geological Survey. ACC: MOL.20000801.0004.

USGS Hydrologists and Hydrologic Technicians 1988. "USGS Role in Yucca Mountain Site Characterization Effort." Letter from Hydrologists and Hydrologic Technicians (Nuclear Hydrology Program, Nevada Nuclear Waste Investigations, USGS, WRD, Lakewood, CO and Mercury, NV) to V. Schneider (USGS, WRD), August 17, 1988. ACC: HQX881221.0002

## **12.2 Regulations and Procedures Cited**

AP-3.10Q, Rev. 2, ICN 2. *Analyses and Models*. Washington, D.C.: U.S. Department of Energy, Office of Civilian Radioactive Waste Management. ACC: MOL.20000619.0576.

AP-16.1Q, Rev. 9, ICN 0. *Condition Reporting and Resolution*. Washington, D.C.: U.S. Department of Energy, Office of Civilian Radioactive Waste Management. ACC: DOC.20060619.0001.

LP-SIII.9Q-BSC, Rev 1, ICN 0. *Scientific Analyses*. Washington, D.C.: U.S. Department of Energy, Office of Civilian Radioactive Waste Management. ACC: DOC.20060518.0006.

LP-SIII.10Q-BSC, Rev. 1, ICN 0. *Models*. Washington, D.C.: U.S. Department of Energy, Office of Civilian Radioactive Waste Management. ACC: DOC.20060518.0004.

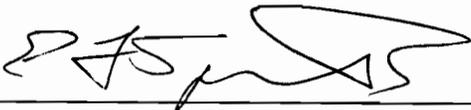
Nuclear Waste Policy Act of 1982. Public Law No. 97-425, 96 Stat. 2001 (Readily available).

**Corrective Action Plan for CR 5223  
Regarding Emails Suggesting Noncompliance  
with Quality Assurance Requirements**

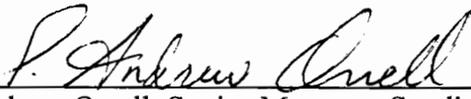
**March 2007**

**Corrective Action Plan for CR 5223**

**E-Mails Suggesting Non-Compliance with Quality Assurance requirements**

Approved:   
Edward F. Sproat, Director, OCRWM, DOE

Approved:   
Ted C. Feigenbaum, President, Bechtel SAIC Co. LLC

Approved:   
S. Andrew Orrell, Senior Manager, Sandia National Laboratories

Approved:   
Kenneth J. Skipper, Chief, Yucca Mountain Project Branch, USGS

**Corrective Actions for Condition Report 5223**  
**E-mails Suggesting Noncompliance with Quality Assurance Requirements**

The investigation and Extent of Condition report that has been generated in response to CR 5223 identified as a root cause: “OCRWM senior management failed to establish and hold the OCRWM organization accountable for meeting quality expectations with regard to the infiltration products”. There were also several contributing factors noted in the Extent of Condition report including the failure of OCRWM to fully implement an effective nuclear culture within those groups responsible for preparing infiltration products; Failure of OCRWM to hold individuals accountable for infiltration product quality; and failure of OCRWM senior management to fully implement quality assurance requirements in their organizations with line management ownership and accountability.

The corrective actions required to address the root cause and the contributing causes associated with the USGS e-mail issue are listed below and form the corrective action plan for CR 5223. These corrective actions address not only the technical adequacy of the USGS infiltration work in question, but also the role and expectations of DOE and USGS management in the adequate implementation of the Yucca Mountain Quality Assurance program. With this approach, the Yucca Mountain program will fix the problems identified in the past and prevent them from reoccurring. The Extent of Condition investigation looked elsewhere in the program for problems similar to the ones cited in the USGS emails but did not find evidence of a similar lack of respect for quality assurance requirements in other organizations; therefore, the corrective actions contained herein are primarily focused on the USGS implementation of the OCRWM quality assurance program. The Director – OCRWM has, however, determined that several broader corrective actions are required so that senior DOE management expectations for quality and accountability are clearly communicated and enforced across the Program.

## **Corrective Action Plan**

**Root Cause:** OCRWM senior management failed to establish and hold the OCRWM organization accountable for meeting quality expectations with regard to the infiltration products.

### **Technical Corrective Actions:**

1. Evaluate the results produced by the USGS infiltration model and determine its adequacy against other independent benchmarks. (Completed)
2. Generate a new infiltration model and rate estimates to be used in the License Application technical basis using the OCRWM Lead Laboratory (Sandia National Laboratories) to increase transparency and traceability by June 30, 2008.

### **Management Corrective Actions:**

1. OCRWM Director to communicate in person quality and accountability expectations to program management at DOE, BSC, Sandia and USGS by June 30, 2007.
2. OCRWM Director to institute monthly project review meetings with all program senior management to review quality and safety performance and reinforce quality performance expectations. (Completed)
3. Each organization to establish Quality performance indicators for DOE, BSC, Sandia and USGS associated with Yucca Mountain work no later than June 30, 2007.
4. USGS to institute USGS Bureau approval of USGS Yucca Mountain work products starting October 18, 2006 (Completed).
5. DOE and USGS to review and revise the Interagency Agreement between DOE and USGS to include specific quality requirements by June 30, 2007.
6. The Director-OCRWM will transmit this corrective action plan along with his expectations for management actions, including the discussion of this event with their teams, to all Program managers. Team discussions are to be completed by June 30, 2007.
7. Perform an effectiveness review of the corrective actions for this event in September 2008.

**Contributing Cause #1:** OCRWM failed to fully implement an effective nuclear culture within those groups responsible for preparing infiltration products.

**Corrective Actions:**

1. The USGS individuals involved who exhibited disregard for Quality Assurance requirements have been removed from the program. (Completed)
2. USGS senior management has reinforced their expectations for quality assurance program compliance with all USGS personnel working on Yucca Mountain by conducting a Quality Assurance and ethical conduct Focus Day (Completed).
3. USGS employees to complete additional classroom training on appropriate electronic mail use regarding quality issues. (Complete)
4. USGS to complete the extent of condition review of USGS Yucca Mountain Project Branch actions by July 2, 2007.
5. USGS to conduct training on the overall Quality Assurance program implementation by the USGS Yucca Mountain Project Branch by June 30, 2007.

**Contributing Cause #2:** OCRWM failed to hold individuals accountable for infiltration product quality.

**Corrective Actions:**

1. The individuals involved have been removed from working on the program.(Completed)
2. Quality performance expectations will be added to the performance plans or added as written expectations for all individuals working on the Program by June 30, 2007.
3. The Management Corrective Action #1 noted in the root cause above will also specifically address this contributing cause.

**Contributing Cause #3:** OCRWM senior management did not effectively manage Program changes, including changes in schedule, organizations, processes, and Program direction in connection with the infiltration products.

**Corrective Actions:**

1. The Director – OCRWM will promulgate a Program-wide policy regarding the management of major programmatic, process or organizational changes by June 30, 2007.

**Contributing Cause #4:** OCRWM did not have an effective product development and review process to ensure quality of the infiltration work product.

**Corrective Actions:**

1. USGS is now utilizing the USGS Bureau approval process for all Yucca Mountain Project work products produced by the USGS. (Completed)
2. The USGS approval process for work products has been revised and strengthened. (Completed)
3. USGS senior management has reinforced the requirement for all USGS employees to adhere to Fundamental Science Practices. (Completed)

**Contributing Cause #5:** OCRWM did not always work as an integrated organization to ensure accountability with regard to the infiltration work products.

**Corrective Action:**

1. The monthly management project review meeting attended by senior management of the major program organizations was instituted in 2006 to address this issue. (Completed)

**Contributing Cause #6:** OCRWM did not fully implement Quality Assurance requirements with line management accepting ownership and accountability for the infiltration products.

**Corrective Actions:**

1. USGS management conducted a Quality Assurance and Ethical Focus Day for all employees working on the Yucca Mountain Project. (Completed)
2. Management Corrective Action #1 relating to the root cause above will also address this contributing cause.

**Contributing Cause #7:** OCRWM did not transition its quality assurance program from a scientific, research-oriented mission to a design and engineering mission in connection with the infiltration products.

**Corrective Actions:**

1. The Director – OCRWM has ordered an independent review of the QA program and its implementation across the program to be completed by June 30, 2007.
2. USGS instituted a new Quality Assurance program effective October 18, 2006 which is aligned with the Lead Laboratory's Quality Assurance program and is specifically designed to support the current OCRWM design and engineering environment. (Completed)

**Contributing Cause # 8:** OCRWM did not implement an effective corrective action program with regard to the infiltration products.

**Corrective Actions:**

1. CR 9774 has been written as a Level A condition report to investigate and determine the corrective actions required to address the ineffectiveness of previous attempts to improve the implementation of the corrective action program by all Program participants. Those corrective actions will address this contributing cause.

Root Cause Analysis Report  
In Response to Condition Report 5223  
Regarding Emails Suggesting Noncompliance with  
Quality Assurance Requirements

Appendices A1 – A11  
And B1 – B5



U.S. Department of Energy  
Office of Civilian Radioactive Waste Management

March 2007

# **Appendix A-GL**

## **Glossary**

*For terms with a specific meaning within OCRWM, sources are provided in parentheses.*

**Acceptance** – The documented determination by the receiving organization that work is suitable for the intended purpose. (QARD)

**Analysis and Model Report (AMR)** – An AMR is either an analysis or a modeling report that summarizes a particular body of related scientific or engineering studies. Information contained in AMRs can include conceptual model development, data gathering activities, data analysis, output from numerical simulations, conclusions, and model validation.

**Approval** – The documented determination by a responsible organization that work is suitable for the intended purpose and shall be used as required. (QARD)

**Audit** – A planned and documented quality assurance program verification performed to determine by investigation of objective evidence the adequacy of and compliance with established implementing documents and the effectiveness of implementation. (QARD)

**Barrier** – Anything that tends to protect the target or reduce the likelihood or severity of the threat. Barriers, in this context, are positive entities that include any physical structure, device, configuration, process, control, or measure that can detect, delay or prevent the effect of a threat on a target. In the context of the infiltration work, barriers included reviews, checking, work control processes, assessments, audits, and final project acceptance.

**Cause Analysis** – A cause determination based on the evaluator's judgment and experience involving an effort to determine why the problem occurred. This might include fact finding, interviewing, benchmarking, reviewing data, or maintenance history, or other analysis methods, as appropriate. Typical analysis methods include Change Analysis, Barrier Analysis, and Event and Causal Factor Charting. (AP-16.4Q)

**Cause Code** – Codes used to identify and categorize the causal factor(s) associated with the problem. The cause code characterizes the CR by its relationship to human performance and other causal factors. Cause codes are not causes and should not be confused with the cause of the CR. Again, they simply allow the conversion of text to alpha-numeric for binning and sorting data. (Trend Evaluation and Analysis Handbook)

**Condition Adverse to Quality** – An all inclusive term used in reference to any of the following: failures, deficiencies, defective items, and nonconformances. (QARD)

A state of noncompliance with QA program requirements. A condition adverse to quality exists when a QARD requirement, an Augmented Quality Assurance Program requirement, or a QA program implementing document requirement is not met. (AP-16.1Q)

**Condition** – An inclusive term used to define a situation that may require management attention.

**Conservative Decision-making** – A fundamental practice in nuclear safety culture that stresses the use of defense-in-depth principles in establishing adequate safety margins and effective ways to account for uncertainties in conceptual and process models, equipment, and human performance.

**Contributing Cause** – Causes that by themselves would not create the problem but are important enough to be recognized as needing corrective action. Sometimes referred to as causal factors. (AP-16.4Q)

**Corrective Action** – Measures taken to rectify conditions adverse to quality and, where necessary, to preclude repetition. (QARD)

Measures taken to rectify conditions, and where necessary to preclude recurrence. (AP-16.1Q)

**Employee Concerns Program** – A program established to allow employees to report conditions they feel are adverse to nuclear safety practices. An employee concern is a good faith expression by an employee that a policy or practice of the OCRWM or of one of its contractors or subcontractors should be improved, modified, or terminated because it is unsafe, unlawful, fraudulent, or wasteful. Concerns can address issues such as health, safety, the environment, personnel or management practices, fraud, waste, or reprisal for whistleblower activities.

**Extent of Cause** – The extent to which the root cause(s) of an identified problem have impacted other processes, equipment, or human performance. (AP-16.4Q)

**Extent of Condition** – The extent to which the actual condition exists with other processes, equipment, or human performance. (AP-16.4Q)

**Independent Assessment** – An assessment, conducted by a group or organization having authority and freedom from the line organization, to evaluate the scope, status, adequacy, programmatic implementation, or effectiveness of a program or process.

**Issue** – An inclusive term used to define a problem requiring management attention. (synonymous with the term "Adverse Condition" used in AP-16.1Q) (AP-16.4Q)

**Licensing Support Network** – An electronic, Internet-based system established by the Nuclear Regulatory Commission to facilitate discovery. When fully implemented, it will contain the DOE's documents related to the licensing proceeding, as well as documents of the Commission and other parties to the proceeding.

**Line Organization** – The organization directly responsible for task products and services.

**Management and Operating (M&O) Contractor** – The company or corporation which the DOE contracts for the operation, maintenance, or support of Government-controlled research, development, special production, or testing devoted to major programs. M&O contractors for the Yucca Mountain Project during the period of interest have included TRW and Bechtel-SAIC Company, LCC (current).

**Model** – A representation of a system, process, or phenomenon, along with any hypotheses required to describe the process or system or explain the phenomenon, often mathematically. Model development typically progresses from conceptual to mathematical models. Mathematical model development typically progresses from process, to abstraction, and to system models.

**Nonconformance** – A deficiency in characteristic or record that renders the quality of an item or sample unacceptable or indeterminate. (QARD)

**NUREG 1804** – The Yucca Mountain Review Plan. An NRC document that describes those items and activities and the acceptance criteria for items and activities important to safety and/or important to waste isolation. It is the document that the NRC will use to determine if OCRWM is meeting NRC requirements.

**Procedure** – A document that specifies or describes how an activity is to be performed. The term "procedure" may also include instructions and drawings.

**Process** – A series of actions that achieves an end result or accomplishes work. (QARD)

**Quality** – The condition achieved when an item, service, or process meets or exceeds the user's requirements and expectations.

**Quality Assurance** – All those planned and systematic actions necessary to provide adequate confidence that an item will perform satisfactorily in service. (QARD)

**Quality Assurance Program** - The sum total of the quality requirement documents and the associated implementing procedures that comprise the planned and systematic actions necessary to provide adequate confidence that products will fulfill their intended purpose. This includes:

- the identification of requirements,
- the necessary planning, training and communications,
- the control and implementation of procedures, required inspections, and tests,
- the identification and implementation of needed corrective actions, and
- the assessment and self-assessment activities related to verifications.

**QARD** – The Quality Assurance Requirements and Description document (DOE/RW-0333P). This document describes the OCRWM Quality Assurance Program for those

items that are important to safety and/or important to waste isolation and the associated activities.

**Root Cause** – The cause of the adverse condition that, if corrected, will preclude recurrence or greatly reduce the probability of recurrence of the same or similar adverse condition(s). The root cause does not apply to the identified condition only, but has generic implications to a broad group of possible occurrences and is the most fundamental aspect of the cause that logically can be identified and corrected. (AP–16.4Q)

**Scientific Notebook** – A record of the methodology and results of scientific investigations that is used when the work involves a high degree of professional judgment or trial and error methods or both. (QARD)

**Self-Assessment** – An assessment performed by all levels of management and personnel directly involved/responsible for the process being assessed. The process of actively identifying opportunities for improvement, in addition to self-identifying conditions and deficiencies and, in some cases, event precursors, to prevent performance shortfalls. (LP–PM–001–OCRWM)

**Software** – Computer programs, procedures, rules, and associated documentation pertaining to the operation of a computer system. (QARD)

**Subject Emails** – The original 18 emails written by the USGS employees which suggested a negative attitude toward and intentional noncompliance with quality assurance requirements. These emails were discovered during the review of email correspondence in inactive accounts (legacy emails).

**Surveillance** – The act of observing real-time activities and/or reviewing documentation to verify conformance with specified requirements and to evaluate their adequacy and effectiveness. (QARD)

**Traceability** – The ability to trace the history, applications, and location of an item or data. (QARD)

**Transparent** – A document is transparent if it is sufficiently detailed as to purpose, method, assumptions, inputs, conclusions, references and units such that a person technically qualified in the subject can understand the document and ensure its adequacy without recourse to the originator. (QARD)

**Trending** – Evaluating records of previous deficiencies and corrective actions for type, frequency, and importance to determine if further evaluation is needed to preclude future problems.

**Validation** – An activity that demonstrates or confirms that a process, item, data set, or service satisfies the requirements defined by the user.

# **Appendix A1**

## **Root Cause Analysis Team Charter and Members**

# **Appendix A1.1**

## **July 18, 2005, Charter**



**Department of Energy**  
Office of Civilian Radioactive Waste Management  
Office of Repository Development  
1551 Hillshire Drive  
Las Vegas, NV 89134-6321

QA: N/A

JUL 18 2005

MEMORANDUM FOR: David M. Howell (RW-66)

FROM: W. John Arthur, III   
Deputy Director

SUBJECT: Charter for Root Cause Analysis (RCA) for the Apparent Noncompliance with Qualification Requirements as Detailed in Condition Report (CR) 5223

I am directing you to serve as the lead in performing an RCA for the subject CR in accordance with administrative procedure 16.4Q, *Causal Analysis and Corrective Action Plan Development*.

The Office of Repository Development (ORD); Booz Allen Hamilton, Inc. (MTS); Navarro Research and Engineering, Inc. (NQS); and Bechtel SAIC Company, LLC (BSC); have contributed team members as follows:

David M. Howell, ORD, Lead  
Michael L. Ulshafer, ORD, Team Member  
James B. Harper, MTS, Team Member  
Tish Morgan, MTS, Team Member  
Ronald M. Linden, MTS, Team Member  
Warren J. Dorman, NQS, Team Member  
Gerald H. Nieder-Westermann, BSC, Team Member

The team shall consider, evaluate, and determine the root cause(s) of the following problem statements:

E-mails were discovered suggesting violations of the Quality Assurance (QA) Program.

- Did the technical product output and/or the software and data related to the infiltration analysis/model report meet applicable qualification requirements?
- Did a culture exist at the time the e-mails were generated which promoted and/or ignored noncompliance with the QA Program?
- Did QA miss an opportunity to identify conditions adverse to quality?

The scope of this analysis should fully cover the three questions presented above but the team may find it necessary to expand the scope once the analysis is underway.

The documentation in the RCA report should include: an executive summary, a description of the related conditions/events/culture/etc., lessons to be learned, the causal factors, generic implications/extent of condition, newly identified conditions adverse to quality (if any), prior similar events, quality and safety impact, and recommended corrective actions. The report is to reflect adherence to the considerations provided in section 5.4 of AP-16.4Q.

I am requesting a briefing to senior management on your preliminary results within two weeks of the kick-off meeting. The kick-off meeting should occur no later than July 22, 2005. The root cause analysis report is expected to be completed one month after the management briefing.

By copy of this charter, I am requesting full support from individuals who may be asked to assist in the RCA through interviews, data gathering, or providing historical information. Catherine E. Hampton will be my day-to-day representative to assist the team in obtaining necessary resources. Any actions identified during the course of this analysis which require immediate attention should be brought to me for disposition.

If you have any questions in this regard, please contact Catherine E. Hampton of my staff at 794-1387.

OFO:CEH-1523

cc:

Donald Beckman, BSC, Las Vegas, NV  
G. H. Nieder-Westermann, BSC, Las Vegas, NV  
J. L. Donnell, MTS, Las Vegas, NV  
J. B. Harper, MTS, Las Vegas, NV  
R. M. Linden, MTS, Las Vegas, NV  
Tish Morgan, MTS, Las Vegas, NV  
Richard Toft, MTS, Las Vegas, NV  
W. J. Dorman, NQS, Las Vegas, NV  
R. D. Brown, DOE/ORD (RW-61), Las Vegas, NV  
C. E. Hampton, DOE/ORD (RW-64), Las Vegas, NV  
R. E. Spence, DOE/ORD (RW-66), Las Vegas, NV  
M. L. Ulshafer, DOE/ORD (RW-61), Las Vegas, NV  
OFO Records Coordinator, Las Vegas, NV  
Records Processing Center = "4"

## **Appendix A1.2**

### **December 1, 2005, Charter Revision**



**Department of Energy**  
Office of Civilian Radioactive Waste Management  
Office of Repository Development  
1551 Hillshire Drive  
Las Vegas, NV 89134-6321

MOL.20060112.0090

QA: N/A

**DEC 01 2005**

MEMORANDUM FOR: David M. Howell (RW-66)  
FROM: *J. Kenneth W. Paven*  
W. John Arthur, III, Deputy Director  
SUBJECT: Root Cause Analysis (RCA) and Extent of Condition for the  
Apparent Noncompliance with Qualification Requirements as  
Detailed in Condition Report (CR) 5223

Reference: Memo, Arthur to Howell, dtd 7/18/05 (DOE Ltr No. OFO:CEH-1523)

The above-referenced memorandum appointed you to lead a RCA team for CR 5223 using the procedure described in AP 16.4Q, *Causal Analysis and Corrective Action Plan Development*. This memorandum clarifies and updates your responsibilities in this area.

1. **Scope of assignment:** Since CR 5223 is a Level A, your charter includes both the RCA as well as the determination of the extent of condition. The team shall consider, evaluate, and determine the root cause(s) and extent of condition of the following problem statement: *E-mails were discovered suggesting violations of the Quality Assurance Program.*

The RCA should fully determine:

- Whether the infiltration analysis/model reports met applicable requirements.
- Whether a culture existed that resulted in a failure to produce products that would perform satisfactorily in service and be suitable for their intended purposes.
- Whether opportunities were missed by Office of Civilian Radioactive Waste Management (OCRWM) personnel and organizations to identify and act on conditions adverse to quality associated with the infiltration analysis/model reports.

The extent of condition analysis should determine whether conditions similar to or associated with the conditions identified in the RCA exist within the Program. The scope of the analyses should fully cover the issues presented above, and

DEC 01 2005

recommendations for corrective action should be provided. The team may find it necessary to expand on the scope described above once the analysis is underway.

2. **Team members:** The following is the current list of team members for the RCA and extent of condition review activity.
  - David M. Howell, Office of Repository Development (ORD), Lead
  - Marlin L. Horseman, Navarro Quality Services (NQS), Team Member
  - Warren J. Dorman, NQS, Team Member
  - Tish Morgan, Management and Technical Support Services (MTS), Team Member
  - Ronald M. Linden, MTS, Team Member
  - Michael S. Russell, Bechtel SAIC Company, LLC (BSC), Team Member
  - Ahmed Monib, BSC Team Member
  - William Corcoran, Senior Advisor to the Team
3. **Timeframe:** The subject memo stated that the RCA report should be completed one month after a briefing to management on preliminary results. Based on the new scope and current status of this project, I expect the team to work diligently toward delivering a quality final product when your technical analysis is completed.
4. **Incorporation of additional Condition Reports:** I have asked that CRs 6679, 6680, 6681, and 6682 be reassigned to you. It is my understanding that you are in the process of integrating them into the analysis for CR 5223.
5. **Inputs to extent of condition review:** It is my understanding that your additional activities for the extent of condition review include a review of the INFIL model and associated analysis/model report that BSC is currently working. Additionally, there are several activities being performed by others that will provide input to the extent of condition review. These include:
  - Assessment of the results of previous review processes that include:
    - Statistical sampling of relevant e-mails (Harry C. White, Jr., ORD)
    - Word searching of relevant e-mails (Maureen M. Mendez, BSC)
    - Statistical sampling of non-relevant e-mails from 237 staff likely to produce relevant information (Diane E. Vigue, ORD)
    - Corrective action reports and deficiency reports (Albert C. Williams, Office of Quality Assurance, and Hubert M. Carmichael, BSC)

DEC 01 2005

- Updates to the previous review processes to include the period from May/June 2005 through November 1, 2005.
- Additional, comprehensive review of the OCRWM Concerns Program (OCP) and BSC's Employee Concerns Program (ECP) files (Nancy Cunningham, OCP, and Richard F. Phares, ECP).
- Review of a statistical sample (approximately 25,000 out of 14 million) of relevant and non-relevant OCRWM e-mail (Joseph Atchue, MTS, and Harry C. White, Jr., ORD).

Mr. Gene Runkle will be coordinating these activities and will provide updates and full documentation of the results to you for integration into your extent of condition evaluation.

I appreciate your efforts and continued leadership throughout this process.

OPM&I:DMH-0228

cc:

Gene Runkle, DOE/HQ (RW-1), FORS  
M. L. Ulshafer, DOE/OQA (RW-3), Las Vegas, NV  
Donald Beckman, BSC, Las Vegas, NV  
Ahmed Monib, BSC, Las Vegas, NV  
M. S. Russell, BSC, Las Vegas, NV  
J. L. Donnell, MTS, Las Vegas, NV  
R. M. Linden, MTS, Las Vegas, NV  
Tish Morgan, MTS, Las Vegas, NV  
R. L. Toft, MTS, Las Vegas, NV  
W. J. Dorman, NQS, Las Vegas, NV  
M. L. Horseman, NQS, Las Vegas, NV  
C. E. Hampton, DOE/ORD (RW-64), Las Vegas, NV  
R. E. Spence, DOE/ORD (RW-66), Las Vegas, NV  
H. C. White, Jr., DOE/ORD (RW-66), Las Vegas, NV  
Records Processing Center = "6"

## **Appendix A1.3**

### **Root Cause Analysis Team Members**

## Root Cause Analysis Team Members

As of the date of publication, the Root Cause Analysis Team members are as follows:

Name	Organization
D. M. Howell, Team Lead	DOE OCRWM
M. L. Horseman	OCRWM Office of Quality Assurance/Navarro Quality Services
R. M. Linden	Management and Technical Services/Golder Associates, Inc.
M. S. Russell	Bechtel SAIC Company, LLC/Beckman and Associates
T. L. Vincent	Bechtel SAIC Company, LLC
W. R. Corcoran, Senior Advisor	Nuclear Safety Review Concepts Corporation

## **Appendix A2**

### **Subject USGS Emails (Redacted)**

This appendix presents the 18 subject emails written by USGS employees. They have been retyped and reformatted and the names of individuals have been removed, but the content is otherwise exactly as written by the USGS employees.

**Categorization of the Emails:** Based upon the content and context, the emails have been grouped into the following three general categories:

- **Technical Issues:** This category includes emails concerning technical issues pertaining to AMRs, model development, electronic data sets, software, transparency and traceability, and overall defensibility.
- **Nuclear/Quality Culture:** This category includes emails that pertain to aspects of nuclear/quality culture including CAP, QA, audits/surveillances, SCWE, personnel attitudes, and expected behaviors.
- **Budget and Schedule:** This category includes emails regarding the influence of budget and schedule on project activities including topics such as funding, schedule, planning, integration, program direction, and workloads.

The following table displays the 18 subject emails and their associated categories:

**Table A2.1 – Email Categorization**

Email Number	Date of Email	Category		
		Technical Issues	Quality/Culture	Budget/Schedule
1	5/11/98	X	X	
2	6/18/98		X	X
3	10/27/98		X	X
4	10/29/98	X	X	
5	11/22/98	X		X
6	12/18/98	X	X	X
7	3/15/99		X	X
8	3/26/99	X	X	X
9	4/22/99	X	X	
10	4/22/99	X	X	
11	8/5/99		X	
12	11/15/99	X	X	
13	1/6/00	X	X	
14	2/17/00		X	
15	3/6/00	X	X	
16	3/7/00		X	
17	3/9/00	X	X	
18	3/30/00		X	

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**#1**

Date: 05/11/1998

Subject: UZ Flow (+climate+infiltration) section for TSPA-VA document

Body:

FYI. Still don't know quite how to handle the air temp glitch. I'm continuing to keep mum about this, but, from a scientific integrity standpoint, it is tempting to let the end users know exactly what was provided to them in terms of effectively cooler future climate simulations. Problem is, I don't know how to do this without looking bad. If we can let it all pass without trying to attach DTN numbers to these results (the preferred choice), then I can forget about it and just concentrate on getting results out for the new model. If they (DOE) force us to put DTNs on these things; I would rather the truth come out sooner than later.

Don't need to respond to this, we can talk about it later.

**#2**

Date: 06/18/1998

Subject: Re:

Body:

I'm finishing up the infil report (concentrating only on those items \_\_\_\_\_ originally requested me to look at ... talked this over with \_\_\_\_\_ yesterday). I've been meaning to send you a program that will convert the 6 regional strips you have back to the original \*.inp file format, but I got sidetracked a little with the planning stuff. Let me finish infil and I will get you the code (I'm close to finishing it). I wanted to have these simulations running this week. But I also wanted you and \_\_\_\_\_ to look at what I'm using for effective permeabilities. I'm trying to clean up a worksheet I have so that you and \_\_\_\_\_ can understand it.

As far as FY99 modeling goes, there are several areas that we can always use help in; programming, GIS, and anyone capable of getting a simulation going, compiling the results, creating maps and graphs of the output, and helping me compile and update the climate database, streamflow records (along with any other calibration data), and the future climate stuff. You and I may be the only ones developing the model code, but even some part-time help from someone with programming skills would be tremendous boost to keep things going (the small re-formatting program above is a great example), and to have software QA keep in step with model improvements. I don't know who this person would be, and there we have a dilemma. At least we are making an effort to improve out GIS expertise.

As far as the Fortymile Wash stuff and the regional stuff goes; 1. We never seem to be certain about the funding level from \_\_\_\_\_ until the planning is over and done with..... I wanted to have a backup to keep the regional effort going. 2. We are doing the same amount of work on the regional scale whether we get the money for Fortymile Wash or not, so why not try to get the money? All we have to do is a few extra simulations for Fortymile Wash. Its like we'll get paid twice for the same work (and I don't feel bad about this considering how little we're getting paid for the work this year.... in my mind it will all even out in the end). 3. I'm still not convinced that

there will not be another round of planning where we have to try to cut 50% of the funding we are asking for now. Then we can just get rid of the Fortymile Wash WP.

Geeze... I spent too much time on this email...gotta go!

**#3**

Date: 10/27/1998

Subject: Re: Jury Summons

Body:

Hey yeah. If its not registered than it can't be important. I think \_\_\_\_\_ scared me (something about a \$5,000 fine). So back to my usual strategy. But does this mean that our nation's juries are filled with people who have nothing better to do (or who hate their jobs)? Some college grad sociology – law – statistics major should do a study on this.

Date: 10/27/1998

Subject: Re: Jury Summons

Body:

That's odd , I have never gotten one. My kid's must have lost it when they got the mail and since it wasn't registered mail there is no way to know that I actually got it. Even if I did get one and my kids lost it I have never heard back from them that I in fact ever got one so they must not care terribly much if my kids get the mail and loose the summons. I just don't know what to do with my kids someday when terrible lose of mail occurs. Oh well, I guess if anybody really wanted me they would send me a registered form. You know how the mail is these days. You just can't count on anyone getting the mail to you, especially little kids.

Date: 10/27/1998

Subject: Re: Jury Summons

Body:

I've been summoned for Jury duty. I can't do this. My wife tells me this is not something I can just ignore (my usual strategy). The instructions on the summons tell me to show the summons to my employer prior to calling the court. Should I send a fax to you? How does one proceed if one cannot at this time be a juror?

Date: 03/17/1999

Subject: Re: Jury Summons

Body:

They want me to go down on April 19th. I've been putting together the new future climate input sets; I need to be running simulations while I'm writing reports. I'm also putting together a real simple snow cover model for now; the degree-day approach. I've been working on programs

that pull in the earhinfo export files (precip, max temp, min temp), combine the files into one, check for gaps, estimate missing values, and generate output that is usable for infil modeling or the next step in climate modeling; spatial interpolation of daily input. I think when I'm done this will be applicable to the Mojave study. I think we can generate one file that will contain a precip map for each day for a 100-year record.

This work also needs to get done for a level 4 milestone coming up end of April for 22001. Basically I have two weeks left to get this done so \_\_\_\_\_ can start the technical reviews of the developed data 1<sup>st</sup> part of April. Also, I need to get it out of the way so we can have some leeway for putting the SCAS stuff together, and so I can get back to writing.

Either the regional modeling or the site scale modeling will get into trouble if I'm the only one working in it. The 176k for 22001 assumed about .5 FTE beyond my time for things like model calibration, QA, model development, and up-dating input files. At this point the regional modeling is suffering because I've focused everything on 22001. You and I are the only ones that seem to know FORTRAN programming so that puts us in a bind. On the other hand, it wouldn't take that much time to show someone like \_\_\_\_\_ or \_\_\_\_\_ how to run the model for calibration (only worksheet skills are needed here, although Transform skills are also very helpful). I'm hoping to have a final FY99 site-scale model together by the time I come out to Sacramento (1st or 2nd week of April) so we can go into full-time calibration run mode.

What resources beyond our own group could I be tapping to solve the 22001 FTE problem? For example, I've thought about: 1. UNLV student help (administrative hassle factor may be high), 2. PWT (administrative hassle factor high), 3. Sandia support (\_\_\_\_\_ is ready to help us out with the uncertainty analysis.... I think we can make some headway without handing over the source code, which has been my biggest worry), 4. Student help from either Sacramento or Tuscon, 5. YMP USGS (\_\_\_\_\_??.....)

Gotta go...I've spent way too much time on this email

Date: 03/16/1999

Subject: Re: Jury Summons

Body:

I think you're stuck. You get USGS pay and they, supposedly, get the money. I think you should just go in and do the jury duty. Chances are there will be 50 people of whom 12 will be picked. If you are picked it will likely be for only a day. Sorry.

Date: 03/16/1999

Subject: Re: Jury Summons

Body:

I've just received my 2nd notice for a summons to the 8th judicial district court jury duty in LV (I ignored the 1st one back in October 98). This one warns me that I could go to jail if I continue to ignore this. I called the court today and they want me to find out how the USGS handles pay for this leave situation.

Is there a way to have the USGS over-ride this summons? I cannot afford to stop working on what I'm working on now to go sit in a Jury (unless the trial doesn't last longer than have a day), and it has nothing to do with money.

At any rate, I don't think I can just say the dog ate it.

**#4**

Date: 10/29/1998

Subject: RE: Design Features 23/24 – Period of Effectiveness

Body:

Enjoyed the ranting and raving. We're trying to work with the engineers because that's where the funding's going. Leveling the top of the mountain seemed humorous but it gave me the chance to make some more cool figures. This little task is history now. Wait till they figure out that nothing I've provided them in QA. If they really want the stuff they'll have to pay to do it right.

**#5**

Date: 11/22/1998

Subject: beaten to death

Body:

\_\_\_\_\_,  
This was \_\_\_\_\_ own response to my response to his question (which I tried to be as honest as possible about), without any intentional provocation on my part. In some ways this is getting bizarre; one never knows how far along an old memo will get passed, or even what context it will end up in (for example, \_\_\_\_\_ has no idea that his memo to \_\_\_\_\_ got pasted into this thing, so I'm cc'ing him on this). As I understood from your last memo, there is a point at which we run the risk of beating something to death, and I'm in full agreement on that. Please be assured that I've placed myself in a "wait and see" mode for now. I'm paranoid enough now that I almost couldn't send this.

Date: 11/20/1998

Subject: FW: QA'd models

Body:

\_\_\_\_\_,  
Can you please check with \_\_\_\_\_ and \_\_\_\_\_ to better understand the level of effort that the USGS will put forth to have infiltration information submitted to the TDMS this FY? (see e-mail below from \_\_\_\_\_) Based on the response to the memo that you sent out earlier, I thought that \_\_\_\_\_ had agreed that the most up to date infiltration maps, including the FY96, FY97, and FY98 models, would be submitted (perhaps sequentially) to the TDMS by the end of this FY (see attached memo). If this is not the case, then LBNL will have to re-evaluate their intended use of the FY98 infiltration maps in their new UZ flow models if the maps may not be qualified in time for SR.

Date: 11/19/1998

Subject: RE: QA'd models

Body:

The 96 model report has been re-submitted for USGS Director's approval.

\_\_\_\_\_ has been the main force behind dealing with the latest round of editorial reviews and pushing the report forward. When Director's approval is granted, I am assuming the FY96 model will be in the TDMS, although we may be required to submit additional supporting information (we are still in the process of finding this out). There is also a chance that the report will not be approved, and will require additional work and/or modifications. Unfortunately, the process of Director's approval is largely beyond our control. Past experience has shown that it is always best to assume additional work and/or modifications will be needed. At any rate we are still hoping for end of December on this, but cannot make any guarantees. If additional QA work is needed, it may become a problem because at present we are not in a good position to do this. I'd say a 50% probability of completion.

The 96 model includes only the current climate base-case net infiltration map, and a wet and dry year current climate simulation. We still need until April to get the 97 future climate 100-year simulations into the TDMS. Again, no guarantees, especially in light of major uncertainties that continue to exist, and thus I can only give a 50% probability of completion.

Bottom line is, our position for making any FY99 commitments at all is still poor to nonexistent.

Date: 11/19/1998

Subject: Re: funding woes

Body:

\_\_\_\_\_,  
What is the status of the FY96 model being submitted to the TDMS? I thought you said that the FY96 infiltration maps could probably be submitted to the TDMS by December.

Date: 11/18/1998

Subject: Re: funding woes

Body:

FYI: another example of an apparent disconnect between 1.2.5 and 1.2.3. What is your source in regards to the 1M provided to the USGS? If this is true then the funds seem to be getting funneled in the wrong direction.

Date: 11/20/1998

Subject: Re: Discussion with \_\_\_\_\_ (Document link not converted)

Body:

As far as I know there is no funded milestone for December. The milestone we tried to get was not a milestone but an attempted to get the FY96 map in the TDMS. There is no funding. Perhaps DOE should be honest with the NRC and tell them they are not funding an infiltration map this year.

**#6**

Date: 12/18/1998

Subject: Re: AP 3.10Q

Body:

Wow! Thanks for this very thoughtful and philosophy charged wealth of advice. I here exactly what you say. YMP is looking for the fall guys, and we are high on the list. I got a strong feeling at the PA meeting that high level folks are starting to pay very close attention to who they will come after when things hit the fan. Who got how much funding at what time will all be long forgotten when the lawyers start challenging credibility of results. It was made clear that this will be like the OJ trial, where results are completely thrown out because of minor procedural flaws or personal attacks on credibility. As \_\_\_\_\_ told the lawyer who was there, YMP doesn't stand a snowball's chance in hell of making this work if that is the approach.

As far as the 98 and 99 modeling, I'm starting the write-ups now. Much of this is already being covered in the NLPs and Aps so I can kill 2 birds with the same stone. I much as I think Sandia may help us out with some things, I am going to be very careful that Sandia doesn't end up taking credit for our work.

\_\_\_\_\_

Date: 12/17/1998

Subject: Re: AP 3.10Q

Body:

I agree with your analysis. We only win if we get the final product out. I have to think through this carefully but where I'm headed is this. \_\_\_\_\_ and I will make sure we get the 96 report done (you need to call \_\_\_\_\_ ASAP, just in case she needs input from you on Friday). You, on the other hand, need to start the FY99 report, assuming the FY96 gets approved. You need to lay out the changes you've made to the model, how you've tested or calibrated those changes (stream gage, neutron (I've already started working on a new neutron hole analysis which I had hoped to finish this vacation but won't be done until later I'm sure)), what the results are, and what difference it makes. Do this for the site scale as your basis for the change to the model and as the basis of the report. Then start another report, which uses the first report, to lay out the regional model. Both report will address past and future climates. That's where I'm heading but I'm not there yet. We can discuss tomorrow.

\_\_\_\_\_

The bottom line is forget about the money, we need a product or we're screwed and will take the blame. EVERYBODY will say they told us to go ahead without a plan or budget in place (even though \_\_\_\_\_ said no hires). This is now CYA and we had better be good at it. I seem to have let this one slip a little to much in an attempt to cover all our work (and get us the hell out of the long term problem and Yucca Mountain) but now it's clear that we have little to no choice. In all honestly I've never felt well managed or helped by the USGS YMP folks, in fact, as you know, I've often felt abandoned. This time it's no different, or worse, and we have to work together to get out of this one. I'm still overwhelmed trying to protect the rest of the program from the ravages of what's happening in Denver (funding, which we seem to be blamed for because we got funding) and the current HDP fiascoes in the ESF. That is to say we're not working on our own as we have for the past 12 year, now were being threatened (and carefully watched) by the people who us to simply ignore us. These are very dangerous time, both funding wise and professionally. Mark my words on this one, it will not be lone before our technical credibility with be challenged in an attempt to discredit us and redirect funding!

Oh, by the way, you did a great job in response to \_\_\_\_\_ request. Bravo!!

(keep my last paragraph private or among friends, if you know who they are)

\_\_\_\_\_ \_\_\_\_\_

Date: 12/17/1998

Subject: Re: AP 3.10Q

Body:

FYI: The work plan PA has put together as a result of the meeting this week includes model hand-offs (TBVs documented using NLP 3-15s) which will all eventually be QA'd using AP 3.10Q (see attachment below). \_\_\_\_\_ is going to be the PA lead on the AP 3.10Q for the FY98 model. We're not sure how smoothly this is going to go but this is the approach. Like you've said all along, YMP has now reached a point where they need to have certain items work no matter what, and the infiltration maps are on that list. IF USGS can't find a way to make it work, Sandia will (but for now they are definitely counting on us to the job). PA totally supports paying for a USGS report on the FY98 model, but they fully realize the problems we're having the Director's approval thing.

I've had no response from \_\_\_\_\_ concerning my response to his request for an FY99 work plan using the close-out funds. PA has indicated that I can charge all my time this year to 10506 account. There was also good indication this week that PA is willing to support us in FY00 to continue on with model validation and uncertainty work, and to deal with FEPs addressing the infiltration maps. The 110k provided to USGS was in direct response to the telecom and was specifically intended for infiltration modeling work. I can no longer wait for USGS to figure this out; I'm moving ahead according to the PA/Sandia work plan we put together this week.

What I really need now are some warm bodies to review the work I've been doing.

Like \_\_\_\_\_ said, "Live by the sword, die by the sword!"

Date: 12/17/1998

Subject: Re: AP 3.10Q

Body:  
\_\_\_\_\_

Thanks much! Yes, I very much need to take a close look at this. I was about to request this when I saw your note.

**#7**

Date: 03/15/1999

Subject: Re: Tiger Team Hell

Body:  
\_\_\_\_\_

\_\_\_\_\_ and I have been trying to figure out what's really coming at us with the tiger team effort. So far we've learned that they don't have a solid plan of action yet. I've formulated a "potential impact list" that is prioritized according to what work gets impacted 1<sup>st</sup>; 1. FY99 support to PA (includes all the workshop stuff), 2. regional recharge report, 3. site-scale infiltration modeling report. Some of the work the tt effort call for was scheduled under 22001 QA anyway, but we started hearing rumors of things like re-doing all the QA work for the neutron logging data, which will stop us dead in the water.

Now I'm going to give you the inside scoop: I'm going to continue the regional modeling, even if it means ignoring direct orders from YMP management. I'm also going to be working on reports, even if it means ignoring direct order from YMP management. \_\_\_\_\_ and I have a pretty clear vision of the type of work that needs to be done to stay alive for the long-haul, and it very definitely involves getting product out there for the users and the public to see. The Death Valley regional modeling work fits that bill. Screwing around with tiger teams does not. In the end, it's going to be the reports that move everything else forward. Tiger team efforts will just be vaporized.

So, the work may be slowed, but I will not let it stop. At this point, I am still working to the plan that we've all spent a significant amount of time on to make things happen for FY99. That's the insider scoop. The position we will take for the M&O planners may be much different. So delete this memo after you've read it.

\_\_\_\_\_

Date: 03/15/1999

Subject: Re: Tiger Team Hell

Body:

I understand you're going to be sucked into the Tiger Team for UZ site infiltration. Any idea how that will impact timing of your regional recharge model product for the year's end. Or are you just working every weekend and waking moment like all the rest of us?

\_\_\_\_\_

**#8**

Date: 03/26/1999

Subject: Status of LADS phase 1 calc. Report - USGS

Body:

Between you and me, I put my 6k effort in six months ago. My work gets charged to 11016 and 22001. This is where we invested our time and energy in promoting, planning, and actually doing the work. I'll admit that I have not devoted a full-time effort towards LADS. I've been working on the daily climate data-base, the new future climate simulations, the regional modeling, and the backlog of reports. Yes the LADS work is now behind schedule but so is everything else because I'm the only one doing this work, and I'll be damned if I drop everything else and work on nothing but LADS. I'd be very happy to just had the work over to someone else at this point. It seems I do not have this option, thus all I can say is that the work will get done, but not by sacrificing everything else that's going on. I do not need to be developing M&O hoop jumping skills. The skills I am interested in developing are ones that will benefit the CA district and our careers.

I'm not directing this at you. This is just to let you know where I stand at this point in time.

I guess this is another one of those memos that need to be destroyed.

\_\_\_\_\_

Date: 03/26/1999

Subject: Status of LADS phase 1 calc. Report - USGS

Body:

\_\_\_\_\_

On Feb. 19 I requested the following steps from USGS staff, to complete the calculation report for LADS DF23A and B (formerly designated DF 23 and 24):

1. Train \_\_\_\_\_ and a checker to QAP 3-15. Train \_\_\_\_\_ to YAP SIII.3Q. Also, train \_\_\_\_\_ to APSI.1Q, for classification of software as "software routines."
2. Assign a DTN, and prepare a TDIF with input/output files (i.e. implement YAPSIII.3Q). Typically this means that all input/output files, and code listings, are put on a CD-ROM. The originating organization should be NEPO, to avoid complications from USGS policies.
3. Designate all software used in this calculation as "software routines." This means software does not have to be qualified. The calc. report should include source code listings, description of routines and how they fit together, exact specification of compiler and CPU (with S/Ns), and a test case that exercises all the routines.

4. Revise 3-15 calc. Report with DTN, and software routine documentation. Note that the report should state whether all input data are "Q." If not, then the calculation results should be clearly indicated as "TBV."
5. Printout first draft (Rev. 00A). Originator signs calc. cover sheet. All pages will have the DI number, including the correct Rev. number. Page numbering will comply with QAP 3-15.
6. Perform internal review of report. This can be informal, or as a NEPO review implementing QAP SIII-2. Make revisions as required (a revised copy will have the text draft number, i.e. Rev. 00B, etc.)
7. Printout checking draft (increment draft number using Rev. 00B, Rev. 00C, etc.). All pages will be marked "Checking Draft in addition to the DI number, etc.
8. Perform checking function, coordinating with the checking group (\_\_\_\_\_\_). A technically qualified checker (as determined by the Responsible Manager), who has received the checking indoctrination training and knows how to use the checklists, needs to be identified from within NEPO.
9. Revise document, backcheck per QAP 3-15, and get Originator and Checker signoffs on calc. cover page. Get Lead Engineer's signoff (\_\_\_\_\_\_ or \_\_\_\_\_).
10. Submit final document with cover sheet, all drafts, markups, and review paperwork, to your representative from Engineering Document Control. Request that they close out any TBVs on the original 3-12 Design Input Request, and prepare and submit the Record Package to RPC IAW AP 17.Q.

I requested that steps 1-4 be completed by March 15th, and all steps by 4/15. Steps 1-4 are not complete, so this activity is behind schedule.

Please help expedite this effort.

\_\_\_\_\_

Date: 03/26/1999

Subject: Status of LADS phase 1 calc. Report - USGS

Body:

\_\_\_\_\_

I have appended your memo to indicate the status of this work (see red text below).

\_\_\_\_\_

\_\_\_\_\_

On Feb. 19 I requested the following steps from USGS staff, to complete the calculation report for LADS DF23A and B (formerly designated DF 23 and 24):

1. Train \_\_\_\_\_ and a checker to QAP 3-15. Train \_\_\_\_\_ to YAP SIII.3Q. Also, train \_\_\_\_\_ to APSI.1Q, for classification of software as "software routines." **Done**
2. Assign a DTN, and prepare a TDIF with input/output files (i.e. implement YAP SIII.3Q). Typically this means that all input/output files, and code listings, are put on a CD-ROM. The originating organization should be NEPO, to avoid complications from USGS policies. **I have**

been working on this, but will need help from QA to expedite. QA is waiting for the CD-ROM, and this will be completed on 3/30/99. Remainder should be complete by 4/2/99, unless there are hidden requirements for large input and output files (for example, these files are approximately 21 MB each (ASCII format), and do not include headers. The files are fully explained in report. Inclusion of header lines will cause further delay)

3. Designate all software used in this calculation as "software routines." This means software does not have to be qualified. The calc. report should include source code listings, description of routines and how they fit together, exact specification of compiler and CPU (with S/Ns), and a test case that exercises all the routines. **There has been progress here modifying the report to contain all necessary information and developing the test cases. This task is 50% completed. The work has gone slower than anticipated because there are several steps involved in this engineering calculation and thus a set of tests is needed. Remainder should be complete by 4/2/99.**
4. Revise 3-15 calc. Report with DTN, and software routine documentation. Note that the report should state whether all input data are "Q." If not, then the calculation results should be clearly indicated as "TBV." **Report being modified to contain needed information. All input data has been identified as either Q or TBV. This should be complete by 4/2/99.**
5. Printout first draft (Rev. 00A). Originator signs calc. cover sheet. All pages will have the DI number, including the correct Rev. number. Page numbering will comply with QAP 3-15. **This task is complete.**
6. Perform internal review of report. This can be informal, or as a NEPO review implementing QAP SIII-2. Make revisions as required (a revised copy will have the text draft number, i.e. Rev. 00B, etc.) **An informal review has been conducted by \_\_\_\_\_, and all suggested modifications (including those listed above) are being incorporated. This task is 75% complete. Need help from QA to expedite.**
7. Printout checking draft (increment draft number using Rev. 00B, Rev. 00C, etc.). All pages will be marked "Checking Draft in addition to the DI number, etc. **0% complete. Need help from QA to expedite.**
8. Perform checking function, coordinating with the checking group (\_\_\_\_\_\_). A technically qualified checker (as determined by the Responsible Manager), who has received the checking indoctrination training and knows how to use the checklists, needs to be identified from within NEPO. **\_\_\_\_\_ has volunteered to be the checker, and is waiting for us to provide the official version of the finished draft (Rev 00A). Both \_\_\_\_\_ and \_\_\_\_\_ have been providing valuable assistance in terms of interpreting procedures and providing examples throughout this process.**
9. Revise document, backcheck per QAP 3-15, and get Originator and Checker signoffs on calc. cover page. Get Lead Engineer's signoff (\_\_\_\_\_\_ or \_\_\_\_\_). **0% complete.**
10. Submit final document with cover sheet, all drafts, markups, and review paperwork, to your representative from Engineering Document Control. Request that they close out any TBVs on the original 3-12 Design Input Request, and prepare and submit the Record Package to RPC IAW AP 17.Q. **0% complete. Will need help from QA or administrative staff to expedite.**

I requested that steps 1-4 be completed by March 15th , and all steps by 4/15. Steps 1-4 are not complete, so this activity is behind schedule. **Developing test cases, organizing all input/output and software codes onto CD-ROM, and completing required modifications to original document is taking longer than anticipated. I am planning to have steps 1-4 complete by 4/2/99. Although this phase is approximately 2 weeks behind schedule, there is still hope of meeting the 4/15 deadline for all steps. I am estimating potential worst-case delay of 4/22/99.**

Please help expedite this effort.

\_\_\_\_\_

**#9**

Date: 04/22/1999

Subject: Re: QA

Body:

Not a bad idea. I am now considering it. Ideally, one would assume that the more information you provide QA, the better the QA. In reality, it seems that the opposite is true. At any rate, its a damn shame to be wasting time with this sort of thing.

\_\_\_\_\_

Date: 04/22/1999

Subject: Re: QA

Body:What if you just download the raw files from Earthinfo and say you used those? Do they need to know any more than that? You don't really need to do an analysis just say this is the data I used. Maybe that would work.

\_\_\_\_\_

Date: 04/22/1999

Subject: Re: QA

Body:

The QA bullshit grows deeper. I may need to say that I did everything by hand for the data package I am submitting that You and \_\_\_\_\_ reviewed. The program I wrote is not in the system and QA will be all over it like flies on &%#\$\$. All references to \_\_\_\_\_ are being deleted.

Here's my question: When we go to start QA'ing the site-scale modeling work, will I get taken to the cleaners because I am not referencing either a tech procedure or a scientific notebook? In other words, would it be cost-effective to create a SN for the site-scale work and back-date the whole thing??

Can't wait to be far-far away from here!

---

**#10**

Date: 04/22/1999

Subject: status of new climate net-infiltration modeling

Body:

I thought I'd give you a "heads up" on the progress of work I've been doing with the results you've provided. Model simulations have been in progress but about 3 weeks ago I found a small error in the model input that was generated using the Earthinfo data. The error was minor but would have created a QA nightmare so this was fixed and the simulations are being re-done (I'll send you a summary of the results when I get to this point).

I am to submit a "developed datapackage" milestone consisting of the climate input files (7 files for the 7 sites to you identified) that are being used by the net-infiltration model. The input files are basically re-formatted Earthinfo export files with a minor amount of parameter estimation occurring to fill small gaps in the record (even for the high ranking sites, there are gaps all over the place).

Here's the weird news; to get this milestone through QA, I must state that I have arbitrarily selected the analog sites. At first, I was going to include your email as supporting information in the data package, and discuss the work we did using the worksheets consisting of candidate sites, but since there is no DTN for your results the message I am getting from QA is that I can't use or refer to those results. In other words, I was trying to give you credit for your part in all this, as well as provide all info possible for the traceability of the analog climates, but this seems to create problems rather than solving them.

So for the record, the seven analog sites have been arbitrarily (randomly) selected. Hopefully these sites will by coincidence match the site you have identified.

---

P.S. please destroy this memo

**#11**

Date: 08/05/1999

Subject: RE: SN-0116

Body:

Still planning to meet the Aug 31 deadline with 1st draft into tech review, so I'll be charging full-time to 4b this month (and probably next)..... I think 4b (is it 11018???) is running a surplus right now, but Alan may also be charging to this. \_\_\_\_\_ and \_\_\_\_\_ are helping me with the 1st draft as we speak. I've been boggled down with the Yucca Mt. site-scale AMR stuff which includes all the software QA. \_\_\_\_\_ has put a high priority on the deliverables for both the site

and regional work so I'm burning the candle at both ends. The good news is that I'll be a lot more productive in Sacramento. The bad news is that my productivity has been real bad the past month or two with all this moving and house buying crap. Life has been crazy ever since the gathering at the Longstreet Inn. But it feels real good to be working out of the CA district Office in the middle of CSUS.

Hopefully the proposals for the NTS work (the stuff we sent \_\_\_\_\_) will go thru and then we'll be doing some serious leveraging of resources for FY00. I also need to get serious about getting together with \_\_\_\_\_ for the UCDOE stuff.....

got to go

\_\_\_\_\_

Date: 08/05/1999

Subject: RE: SN-0116

Body:

Piss on QA, how's your recharge report (due Aug 31, 1999) coming. By the way INyo COunty may want to fund the transient recharge work!!!! Perfect for all you CA district types!

Date: 08/05/1999

Subject: RE: SN-0116

Body:

\_\_\_\_\_ and \_\_\_\_\_ have responded to the recent issues concerning SN-0116. We believe we've fixed all of the problems identified so that a stop work order should be averted. A copy of the fixed notebook was forwarded to \_\_\_\_\_. We have not yet heard anything back from QA.

\_\_\_\_\_

**#12**

Date: 11/15/1999

Subject: Thanks for the cool refs

Body:

These references are pretty cool. Thanks for leaving them, it looks like usable stuff. Why can't I do this? What's my problem?

Well, maybe its that I'm just now getting the stupid data package off to the correct person. I re-sent it to \_\_\_\_\_, who responded from a laptop in Miami that I should just re-send it to \_\_\_\_\_, which I just did. Pretty soon the QA experts will want to know where the 4ja and Area 12 Mesa precip files came from.

Here they are: 4ja.txt Area12.txt Don't look at the last 4 lines. Those lines are a mystery that I believe somehow relate to the work \_\_\_\_\_ was doing in entering the 1994 data. These lines are not used by MARKOV (we stop at 9/30/94). I've deleted the lines from the "official" QA version of the files (which do have headers). In the end I keep track of 2 sets of files, the ones that will keep QA happy and the ones that were actually used.

The files are the output from the Paradox database that \_\_\_\_\_ and I had put together, which I still have but haven't looked at since 1996. So either the NTS data package has to look a lot like those files or I'm going to have start talking about the Paradox database when the QA questions start. My guess is that we do not want to deal with the Paradox database.

Here it is almost 2000, and I am still struggling with work done in 1995 and 1996.

\_\_\_\_\_

P.S. Let's make QA read those references too. Better yet, let's set aside a day for watershed training.

### **#13**

Date: 01/06/2000

Subject: Re: AMR U0010

Body:

\_\_\_\_\_ called. Yes, this is really happening. \_\_\_\_\_ and \_\_\_\_\_ will help but it seems I am stuck going to LBNL on the 26th (\_\_\_\_\_ and \_\_\_\_\_ will also go for moral support). Responses to the LBNL comments are due on the 21st.

There is, of course, no scientific notebook for this work. All work is in the form of electronic files. I can show auditors input, output, and program files, but it is not clear to me how to show documentation of work in progress. They may be expecting to see something that at least looks like a scientific notebook documenting work in progress. I can start making something up but then the CA projects will need to go on hold.

If I continue placing \_\_\_\_\_ tasks as 1st priority for January, I will be ill prepared for the audit, and will likely get hammered. That's fine by me. I am far more concerned about the CA projects than I am about the AMR. But BC will be rather unhappy, and I will need help trying to figure out a good excuse why 100% of my time did not go into the audit without revealing the CA projects.

I am open for suggestions.

### **#14**

Date: 02/17/2000

Subject: finally the darn coordinates

Body:

I finally took the time to process your request. This required the use of TRANSFORM to look at the corners of the DEM, then a coordinate transformation using CORPSCON. Here are the results:

Dem-box.utm my picks using TRANSFORM

Dem-box.geo results obtained from CORPSCON

Please do not tell anyone how this was done because then we will need to get this whole thing through software QA!

\_\_\_\_\_

**#15**

Date: 03/06/2000

Subject: Re: USGS AMRs

Body:

What a circus (see emails below).....

I re-wrote blockr7 to use the following ARCINFO ASCII.grid files as input:

30melev.asc: the composite DEM created by \_\_\_\_\_

30mlat.asc: latitude (decimal degrees) for each grid cell calculated by ARCINFO

30mlong.asc: longitude....calculated by ARCINFO

30mslop.asc: slope calculated by ARCINFO

30masp.asc: aspect calculated by ARCINFO

30msoil.asc: the soil type map, rasterized by ARCINFO

30mdpth.asc: the depth class map, rasterized by ARCINFO

30mrock.asc: the rock type map (\_\_\_\_\_ & \_\_\_\_\_ and \_\_\_\_\_ & \_\_\_\_\_ only), rasterized by ARCINFO

30mtopo.asc: the topographic ID (I must assume that this was produced in ARCINFO by \_\_\_\_\_ using the DEM. Because it is only a place holder and not actually used by the model it doesn't matter but the parameter has been carried through the pre-processing and is in all the \*.w20 files used as input for INFIL v2.0)

So once the DEMs, the geology, the soil type, and the soil depth class maps make it into the TDMS, BLOCKR7 will provide a link to 30msite.inp, which is the file I started with in 1996. The link between the source data in the TDMS and the ASCII grid files above are all standard ARCINFO operations (except for maybe the topo ID stuff) so this should get us to full traceability.

I checked the blocking ridge calculations using BLOCKR7 and they do not match what is in 30msite.inp. The skyview map produced by the new version of BLOCKR7 looks reasonable. I have not yet incorporated \_\_\_\_\_ latest fixes to BLOCKR7 for the improved version. I am just trying to re-produce the blocking ridge values in 30msite.inp back in 1996, and I have not yet been able to do this. Again, the original calculation was not done by me and at this point I have no direct trace of the the blocking ridge values in 30msite.inp to the actual calculation. I do have a copy of FREGRIDGE provided to me by \_\_\_\_\_ and I am now using this to check the BLOCKR7 calculations. \_\_\_\_\_, do you have the original BASIC program that was used to create the values in 30msite.inp? Also, could you send me a copy of the improved version so that we can start with the better numbers for the regional modeling?

I can fudge the attachment for BLOCKR7 for now but eventually someone may want to run BLOCKR7 to see what numbers come out and at that point there will be problems, although it is my belief for now that an impact analysis would reveal that the differences are not critical to the end result.

**#16**

Date: 03/07/2000

Subject: developed daily precip record

Body:

Mod3-ppt.dat believe it or not, this file is now 3.5 years old, but it is what was used. This developed record stops day 274, 1995. The only real good thing about this file is we seem to be very close to getting it into TDMS (the data was developed in a LOTUS turned to EXCEL worksheet that may now be required to go through qualification as software routine, so things have yet again stalled.) Someday I hope to have the time to update this to include an improved pre-1987 interpolation and all the new data after 1995, which includes some interesting events..... back to QA.

P.S. Hope this email doesn't trigger a 3.15 input request. I'll probably get fired.

**#17**

Date: 03/09/2000

Subject: Re: vegcov01

Body:

\_\_\_\_\_,

Vegcov01 has a user option which when set to 0 the vegtypes in the file vegtyp1.xyz (created by the damn routine vegtyp01) are ignored and a veg-cover term of 30 is just assumed. The real stupid thing is that this value is never used because veg cover stuff (root-zone parameters) all get defined in the control file. The veg-type and veg-cover columns are just dummy place holders that are not even used by INFIL v2.0 (remember all those great ideas about correlating something, anything, to vegetation.....). But because vegcov01 is where the bedrock ks is adjusted I have to drag the routine into the AMR. Damn it!

The main stupid thing is that as a 1st step I ran vegcov01 with the user option set 2 to create 30mgrd02.sr1 from 30mgrd01, the output from sortgrd01. This setting causes a veg cover estimate to be made based on vegtyp01, which are the vegtypes defined for the regional model (data from \_\_\_\_\_ and \_\_\_\_\_). I was desperately trying to bring vegetation into the picture (still wasn't getting what I needed from the bugs and bunny crowd) but it didn't match up as well as I had hoped, I ran out of time, and it fizzled.

Now here is the majorly stupid part. To create 30mgrd04.sr1, which is used as input to CHNNET16, I re-ran VEGCOV01 using 30mgrd02.sr1 as input and set the option to 0. So the regional vegtypes made it into all the watershed files that were used in the AMR. Now I can't just re-write the routine to leave out vegtyp01 because the output will never match what ended up becoming the watershed files. Had I re-run vegcov01 using 30mgrd01.sr1, I could now re-write the code in 5 minutes, get rid of vegtype01.xyz all together, and all would be cool.

So I would like to keep vegcov01 as is, tell the story just as it happened, and than explain that we don't have to trace vegtyp01 because it was not used (we cannot bring vegtyp01 into the picture because then we have to deal with the input file which is the geospatial input file for the Death valley region!). In fact we can just not even talk about the vegtype and vegcover stuff and just say those are dummy place holders that are never used so they don't need to be traced.

On second thought ... do whatever you want. At this point I cannot re-produce the blocking ridge numbers using BLOCKR7 and I have yet to re-visit the elevation stuff \_\_\_\_\_ was finding

and who knows what will happen if we tried to run ARCTOOLS on any of the source data going into the TDMS. There is a bug in the top layer of the cascading bucket model, the soil ks conversion is off by a factor of 10, and even if I can re-produce the blocking ridges they're still wrong. Then there are those strange non-integer values that I saw for the 1st time in the Day and others input file during my testing of GEOMAP7. What is rock-type 1.33??? Oh yeah, the NTS data....Jesus! I'm going nuts again! I'm going home now!

**#18**

Date: 03/30/2000

Subject: Installations

Body:

---

The programs, of course, are all already installed otherwise the AMR would not exist. I don't have a clue when these programs were installed. So I've made up the dates and names (see red edits below). This is as good as its going to get. If they need more proof I will be happy to make up more stuff, as long as its not a video recording of the software being installed.

---

## **Appendix A3**

### **Other USGS-Related Emails (Redacted)**

**Introduction:** This appendix contains additional USGS-related emails that provide insight and information relevant to the conclusions of the root cause analysis. The emails include communications among OCRWM personnel on a range of topics and issues.

The emails have been retyped and reformatted and personal information and specific names have been redacted, but the content is otherwise exactly as written by the author. The emails are listed in chronological sequence and each email has been assigned a sequential email number and subject category. The categorization of these emails is summarized in Table A3.1, and the redacted text of these emails is provided following the table.

**Categorization of the Emails:** Based upon the content and context, the emails have been grouped into the following three general categories:

- **Technical Issues:** This category includes emails concerning technical issues pertaining to AMRs, model development, electronic data sets, software, transparency and traceability, and overall defensibility.
- **Nuclear/Quality Culture:** This category includes emails that pertain to aspects of nuclear/quality culture including CAP, QA, audits/surveillances, SCWE, personnel attitudes, and expected behaviors.
- **Budget and Schedule:** This category includes emails regarding the influence of budget and schedule on project activities including topics such as funding, schedule, planning, integration, program direction, and workloads.

**Table A3.1 – Email Categorization**

Email Number	Date of Email	Technical Issues	Quality Culture	Budget/ Schedule
1	03/03/97		X	
2	06/25/97		X	
3	06/26/97		X	
4	07/03/97		X	
5	07/15/97		X	
6	07/15/97		X	
7	07/28/97		X	
8	09/29/97	X	X	
9	10/02/97		X	
10	02/23/98		X	
11	06/17/98		X	X
12	06/17/98		X	X
13	07/08/98		X	
14	10/14/98		X	
15	10/20/98	X	X	
16	11/13/98			X
17	11/18/98	X		
18	11/18/98	X		X
19	11/19/98	X	X	X
20	11/19/98	X		X

Email Number	Date of Email	Technical Issues	Quality Culture	Budget/Schedule
21	11/20/98			X
22	12/08/98		X	X
23	12/10/98			X
24	12/22/98			X
25	12/24/98	X		X
26	12/24/98	X		X
27	01/06/99		X	
28	01/26/99	X		
29	01/26/99		X	X
30	02/23/99		X	
31	03/15/99		X	
32	03/22/99	X	X	
33	03/26/99		X	X
34	04/04/99	X	X	
35	04/23/99	X	X	
36	04/28/99	X	X	X
37	04/28/99	X	X	X
38	04/28/99		X	
39	04/28/99	X	X	
40	04/28/99			X
41	05/14/99		X	X
42	08/20/99	X	X	
43	08/23/99	X		X
44	08/23/99	X		X
45	09/17/99	X		X
46	11/05/99		X	X
47	11/05/99		X	X
48	12/23/99	X		X
49	01/04/00	X		X
50	01/04/00	X	X	
51	01/20/00	X	X	X
52	01/31/00		X	
53	02/03/00	X	X	
54	03/29/00		X	
55	04/05/00		X	X
56	05/26/00	X	X	
57	07/05/00		X	
58	07/12/00	X	X	
59	08/08/00	X	X	
60	09/05/00			X
61	09/08/00			X
62	09/27/00		X	
63	10/27/00		X	X
64	12/06/00		X	X
65	12/20/00		X	X
66	12/20/00		X	
67	01/16/01	X	X	

Email Number	Date of Email	Technical Issues	Quality Culture	Budget/Schedule
68	01/16/01	X	X	
69	01/18/01		X	
70	01/19/01		X	
71	01/26/01		X	
72	02/14/01	X	X	
73	02/15/01			X
74	02/20/01		X	
75	02/20/01		X	
76	02/27/01		X	
77	03/06/01	X	X	
78	03/06/01		X	
79	03/06/01		X	
80	03/06/01		X	
81	03/06/01	X	X	
82	03/06/01	X	X	
83	03/05/01	X	X	
84	04/06/01		X	
85	05/08/01		X	X
86	07/12/01	X		X
87	07/30/01	X		
88	08/29/02	X	X	
89	09/04/02		X	
90	04/16/03	X	X	
91	06/17/03	X	X	
92	06/17/03	X	X	
93	06/17/03	X		
94	06/18/03	X	X	
95	08/17/03	X		
96	08/18/03	X	X	
97	06/16/04	X	X	
98	06/24/04	X	X	
99	06/25/04	X		
100	06/25/04	X	X	
101	06/29/04	X	X	
102	07/06/04	X	X	
103	07/06/04	X	X	
104	07/07/04	X		
105	07/08/04	X		
106	07/08/04	X		
107	07/12/04	X		
108	07/16/04	X	X	X
109	07/16/04	X	X	
110	07/17/04	X	X	
111	09/08/04	X		
112	09/08/04	X		X

Email Number	Date of Email	Technical Issues	Quality Culture	Budget/Schedule
113	10/13/04	X		X
114	10/13/94		X	
115	02/11/05	X		
116	02/14/05	X		
117	02/14/05	X	X	
118	02/14/05	X	X	
119	03/15/05	X		
120	03/17/05		X	
121	03/17/05		X	
122	03/23/05	X		
123	03/23/05	X		
124	03/23/05	X		
125	03/23/05	X		
126	04/06/05	X	X	

**Emails Categorized in Table A3.1**  
(Text retyped, reformatted, and redacted)

**# 1**

Date: 03/03/1997  
Subject:

In addressing your review comments, which I find to be accurate and thorough, I became somewhat amused by the comment addressing frozen precip. Of course, we all know this to be a problem, but how did the non-heated Sierra-Misco data make it through QA. How do we know that a lizard wasn't hopping around on the buckets? Shouldn't we have hired someone to stand at each tipping bucket gage the whole time they were out in the field to document what really happened out there? How does QA know that the Yucca Mountain project isn't just a bad dream that someone is having?

**# 2**

Date: 06/25/1997  
Subject: QA

I missed the NWTRB thing because I'm trying to deal with QA. First I told them what I did. Then I was told that I had over-simplified things, and QA needed more information. So I put the time and effort into sending QA everything I had, and explaining everything I did. Now I'm being told that I'm providing too much information, and QA doesn't have the time to deal with it. I should have gone to the NWTRB thing.

Tomorrow I'm in stupid GET training all morning. I couldn't get around it by the annual refresher test (I'm 3 years overdue). I was told by training that the test is bogus anyway because you can keep making selections until you get the right answer. Its another one of those illogical YMP things.

I placed the new regional DEM on your C-drive. The 6 bad data values are not yet corrected, but at least it's a rectangular grid.

**# 3**

Date: 06/26/1997  
Subject: Re: Just one more thing

I got fed up with the QA stuff too. It seems stupid to be able to not mention stuff to go around the rules. I am pushing for the next update to state the reformatting is exempt without having to be submitted to be exempted. I guess the reason this milestone is getting so much attention is that its written as a synthesis milestone so it has to have all supporting data already submitted.

I'm not sure what the data point problem is. Let me know if you want me to send it again. The DEM is just every third point, so if you want an even bigger file with every point I could get you that when I get back or the 250 K DEMs are all on the internet now.

Lotts of luck, talk to you in a couple of weeks. We are suppose to be in Las Vegas on July 21-23, so maybe I'll see you then.

**# 4**

Date: 07/03/1997  
Subject: Re: Appropriate Use of Government Phones Form

I don't have the form. However, as a Federal employee of the U.S. Geological Survey, I filled out and filed this form with the USGS Personnel Office when I was hired. As a fed, I am well aware of the policy on appropriate use of government phones and I do not feel that it is necessary nor appropriate to file an additional form with a contractor. I will not file this form with the M&O until and unless I am directed to do so by the USGS branch chief, \_\_\_\_.

**# 5**

Date: 07/15/1997  
Subject: Re: Area 12 results

I agree. If I can't break the problem up into 4 parts, then it takes about 40 days to do a 100-year simulation, plus the additional time needed for flow routing. We probably shouldn't jump into that until we've finished and tested all the modifications to the model. Which brings me to a silly question. Will we be needing to redo software QA on this thing? I don't think I accounted for software QA in any of the planning documents I worked on. However, it may not be too much of a headache because I could draw on the experienced I have with software QA.

P.S. If you look closely at the figure I spent, you'll notice that the lower left and lower right quads, which contain the greatest percentage of deep alluvium, tend to fall below the Maxey-Eakin curve. I am hypothesizing that the runoff routing modification will cause a relatively greater increase in infiltration values for these quads as compared to the upper 2 quads.

**# 6**

Date: 07/15/1997  
Subject: Re: Area 12 results

I don't think QA is worth the worry. We can redo it just the same way we did the original, or simply compare the new version to the old. The area with more alluvium probably has the same number of channels as the other area. My guess is the more alluvium, the lower the infiltration, the lower the elevation and the lower the rainfall. So I'm guessing the routing will not make as much of a difference, there just aren't enough channels.

**# 7**

Date: 07/28/1997  
Subject: \_\_\_\_\_

Thanks for stopping by my cubicle. This is my reminder to you about \_\_\_\_\_. I appreciate your empathy for my situation. My perspective is that they (DOE-M&O/YMP) do not really care about the quality of work we produce if they're willing to sacrifice their human resources by putting us into cubicles. On the other hand, this may be the way of the future, and we'd all better get used to it. The winners will be those who figure out how to be productive in the confines of a cubicle.

**# 8**

Date: 9/29/1997  
Subject: \_\_\_\_\_'s Paper

The last time I sent email to \_\_\_\_\_ was 6/6/97. The address I used was \_\_\_\_\_. The latest version I have of \_\_\_\_\_'s paper is the final draft (Dec 09, 1996) which was sent to American Meteorological Society, titled \_\_\_\_\_ by \_\_\_\_\_, \_\_\_\_\_, \_\_\_\_\_, and \_\_\_\_\_. I have yet to see the actual publication. I have a copy of the copyright info the publisher needed (I believe this includes the name of the journal), but this is at home. I have an email which I sent to \_\_\_\_\_, and I will try to get more detailed info using this source. I also have \_\_\_\_\_'s email address buried somewhere. The data presented in this report are in error due to the error identified in the raingage calibration program. Although this affects all of the results, I believe this seriously affects only one graph (the comparison of corrected and non-corrected rates for a 1991 summer storm measured at Yucca Mt.) and discussions related to this graph. I'm actually praying that if the report does get published, no one looks at it too closely.

\_\_\_\_\_

**# 9**

Date: 10/02/1997  
Subject: Re: cc list

\_\_\_\_\_ is a contractor to DOE and works for \_\_\_\_\_. It's better to send it to her and she can pass it on to \_\_\_\_\_ (even though he has an unofficial copy. I like \_\_\_\_\_'s idea of just doing it and charging time to another account. I really think we need to fix the model. Again we can make the climate change stuff easy. Increases in ppt lead to increases in ground cover, which is dealt with when we separate E from T. The Alpha coefficient goes back to 1.26 but only applies to vegetation with a correct beta coefficient. The reduction in ET comes from lost interception of Rn. This is all easy to fix but requires some calibration/comparison runs. Easy to do. I will be in Vegas Friday and Monday, and at the NTS on Tuesday so we can meet Friday and Monday. I'll be in Davis on Saturday and Sunday. Prepare to give me a good copy of the model that we want to go forward with so that I can start to work on the E and T portions based on advice given me by \_\_\_\_\_. Make sure all you little flags are explained so I can follow things. Talk later.

Modellingly,

\_\_\_\_\_

**# 10**

Date: 02/23/1998  
Subject: Re: stuff

\_\_\_\_\_, you are just starting to wake up to what the hell is going on in the Yucca Mountain project. \*I can't teach it to you. I've learned, and that's why I'm in California. I would have liked to bring more people with me but nobody ever figured it out as much as I tried to tell you. I couldn't do it directly because you have to learn by experience. Once you learn, you learn. There is more to

it than you think, that's why I'm still on the project. They won't get rid of me. You are on the verge of figuring this shit out. Good luck.

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**# 11**

Date: 06/17/98  
Subject: Re: mod to z12332247uj2

Thats OK. I was waiting for input on this. Basically, I only have 2 goals:

1. To keep our modeling efforts going full swing so that we come out with a final product that we will be proud of and one that will be an important contribution to the project 2. Continue developing expertise and knowledge in this area (watershed scale unsaturated zone modeling) which will enable us to grow well beyond Yucca Mountain.

As for as committing FTEs, I guess my position these days is to get as much money as possible and then once that's close to being finalized (which I don't think is the case yet) we'll have the luxury of deciding whether we're getting too much money. As you know, I don't have all the information in front of me at the moment; whether this money cuts into underground work (I am assuming it doesn't), who in the Survey is lacking funding at the moment (we could have \_\_\_\_\_ help us with GIS, I could have \_\_\_\_\_ and/or \_\_\_\_\_ help out with the modeling, .... I'm not sure about \_\_\_\_\_ at the moment)

I know what you're saying but I'm just trying to cover the 3 basics; funding, doing the work, publishing. In addition, I have a genuine concern that if we don't get funding for modeling, my funding will come from the underground work, and then \_\_\_\_\_ will be trying to tell me what to do. I know he's been working hard with the budgets and he's doing a good job but I don't want him to have control over what I do.

Finally, I don't think we're as overcommitted in this as it may seem. We have a lot of irons in the fire and I've convinced myself that we are on the verge of putting out a series of slick, high profile products. Yeah I'm asking for more money than what might be needed given how all the modeling efforts are inter-related but I've had some bad experiences where it seems like I wasn't asking for enough money (the 50% cut last year comes to mind).

Did you get both overnights I sent (you should be getting a JAZ disk today). How are your meetings going this week? I just had the huge \_\_\_\_\_ report land in my lap for technical review. I could use the extra money to pay someone else to do the modeling while I do the technical review.

**# 12**

Date: 06/17/1998  
Subject: Re: mod to z12332247uj2

I wasn't suggesting you ask for less money. I am suggesting we do the best work we can, get all the money we can, and commit to the least amount of product we can. The money is not taking money from another source. That money is extra. There may be an overriding goal by management to cut our staff. If that's the case then the modeling money will help lower the expectations for underground work. It may be in somebody's mind that there is not enough money for the GS people in all project but enough for all our (my) GS and the PWT people. If that happens then "they" will make us get rid of PWT people, take our money and give it to other GS people (how do \_\_\_\_\_ and \_\_\_\_\_ get there money anyway?). I'm actually more

paranoid than you. When you talk about not being over committed I'm not sure you are accounting for perhaps 0.5 FTE here in California next year. Also don't forget \_\_\_\_\_ has you funded (if his money comes through) for 0.5 FTE next years. So right now you and I, if all the money comes through, have about 4 FTE for modeling. What modeling do you really thing \_\_\_\_\_ and \_\_\_\_\_ could do? \_\_\_\_\_ has been responsible for the 40 Mile Wash study for years and hasn't modeled anything. What modeling has \_\_\_\_\_ (either \_\_\_\_\_) ever done? I've worked with everybody in the group and as far as getting a good model you and I are it. I've work with \_\_\_\_\_ and his perspective is more difficult to deal with for me. Ground truth, that's what we'll need next year, especially when we do the entire Mojave (654,000,000 grid cells). On getting papers out you only made 16 pages in over a week, that was just review. You're tract record on getting out papers has me more nervous. I know you're trying to cover the 3 basics but promising then is another question. Check your track record on papers and then try to reassure me you can do the modeling, turn in data, finish the QA, finish two USGS WRIR's that you've started, help write the Invited paper, finish the Conceptual model paper (16 pages out of 59! so far) and then promise a Journal article. I know it's stressful (I know stress). You can also do more than is promised but you can never do less. We can talk more later.

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**# 13**

Date: 07/08/1998  
Subject: don't be jeolous

You may be jeolous about a one-day event I had, but I'm sure as hell jeolous about the office you get to work in 5 days out of 7. I don't know how much longer I can take this cube shit. There are days when I seriously ponder the thought of quitting.

**#14**

Date: 10/14/1998  
Subject: Re: Welcome Back

OK just saw this. I can create my own footprint real easy.

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Subject: Re: Welcome Back

Also, I don't have the foot print but we need to make up a larger area than that. Look at some maps and just guess. They want the data fast enough to not be picky.

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**# 15**

Date: 10/20/1998  
Subject: Re: Additions to DRAFT--- DOE Requests for Possible FY99 Additions

This is a gamble but I'll take the OK and make them eat shit in the long run. They WILL NOT go into a license scenario with the model we have now, and particularly with PA demanding changes. Don't sell out.

**# 16**

Date: 11/13/98  
Subject: RE: FW: '98 vs. '96

\_\_\_\_\_, I thought that the USGS just receive over \$1M in new money, partly because of all the hooplah surrounding the lack of infiltration maps. Are you sure you're not going to see any of that new money? Maybe you should ask \_\_\_\_\_.

\_\_\_\_\_

**# 17**

Date: 11/18/98  
Subject: infiltration

I thought we were assured by \_\_\_\_\_ that the 1998 infiltration maps would be submitted by the end of FY99. It seems that \_\_\_\_\_ has some other thoughts. \_\_\_\_\_, can you pursue this with \_\_\_\_\_?

\_\_\_\_\_

**# 18**

Date: 11/18/1998  
Subject: RE: FW: '98 vs. '96

Hi \_\_\_\_\_,

I did ask \_\_\_\_ and I'm waiting for an answer, although it seems to me the funds you are referring to have been distributed elsewhere. At this point, once my 6 weeks worth of available funding for TSPA support is gone, there will be no more funding, site-scale infiltration modeling will be shut down, and the 97 and 98 modeling results will not be QA'd. Even the 20k promised as an outcome of the 10/21 telecon has not yet materialized, so the UZ model may be left without a single QA'd infiltration map. In effect, I have yet to see any concrete developments coming out of the 10/21 meeting. A lot of time seems to have been wasted on emails and meetings.

I'm looking forward to the TSPA workshop you've put together. I'm hoping to contribute to discussions and the development of work plans for SR/LA but if NEPO/USGS doesn't provide me with an account to charge to soon it will become somewhat difficult to commit to any type of SR/LA work plan for FY99-00.

\_\_\_\_\_

**#19**

Date: 11/19/98  
Subject: Re: infiltration FY99

The infiltration issues are flaring and we are currently caught between two groups. One group believes that it is possible and necessary to complete all pending technical work and QA so that they can use the 98 infiltration map for SR. This group is proceeding accordingly to create QA workarounds. The second group is convinced that no money will be available for any work in FY99 and that there may not be any QA infiltration data sets for the UZ model in the SR. Email is circulating this week that supports each group's position. Now senior managers are getting involved and concerned about the various potential outcomes. I want to get this issue settled before it gets any bigger.

We need to decide which of the following scopes of work will be completed in FY99:

1. QA / TDB of 1996 infiltration model, interpretative report, and resulting data set.
2. QA / TDB of 1997 infiltration work performed for and used by TSPA.
3. QA / TDB of 1998 infiltration model, interpretive report, and the resulting data set for use in FY99.
4. Completion and QA / TDB of the technical aspects that \_\_\_\_\_ and \_\_\_\_\_ believe are necessary for SR defensibility.

Obviously the funding circus has been the major problem in all of our planning this year. The UZ budget has risen and fallen more than the stock market this year and is still unresolved. With the new funds available to the USGS for close out, most of us assumed that as a minimum, item 1 would be funded and as much of the rest as determined necessary by the USGS. We all agree that finishing all of the scope above sooner than later is the best option.

The issue of using preliminary data would make this an even bigger tangle than it is now. I believe we should assume that as long as it is legal now, we should proceed with planning based on the assumption that we can use the existing QA processes. Given the ultra importance of the infiltration model and data sets to the entire UZ and TSPA modeling, I doubt that the project will decide to pack up and go home rather than work this issue such that we will have a usable product for SR.

What we collectively need are: determination by the USGS how much of the above scope they are willing to fund in FY99 and communication of this information to the respective USGS, DOE, PA, MTS, and NEPO staff to settle the issue.

How can I help? How can I get out of the way? Do I need to be more patient while ongoing processes are completed?

How do we jointly wrap this up?

## #20

Date: 11/19/1998  
Subject: infiltration

\_\_\_\_\_, this is fyi, but I thought you had said that there were sufficient funds to generate the appropriate Q controls and submission of infiltration maps to the TDMS? In fact, I do not know how NEPO creates a UZ flow model with traceable data without that occurring. Am I missing something? \_\_\_\_

**#21**

Date: 11/20/98  
Subject: Re: infiltration FY99

By no means should get out of the way or, necessarily, be particularly more patient. Keep pushing, otherwise we risk that nothing will happen, or just as bad, we won't be able to make the schedule for the model. Thanks!

**#22**

Date: 12/08/98  
Subject: Close out

I'm tired of waiting for the M&O to pursue the issue, therefore we'll make up the rules as we go.

I need a schedule and deliverables for funded (maybe funded) close out activities. Specifically, as follows:

Work Package 81916105U3, Activity Group 5 -

Cost Account #	Title	Funding Target
4889-83609	Tectonic Close-out Activities others.	Estimated at \$326K by Parks &
4889-23009	Surface Based Testing Close-out	Estimated at \$465K by Kurzmack
4889-22001	Coupled Infiltration Surface Water	Estimate = \$176K Flow Model
4889-30917	Climate Close-out Activities	Funded at \$315K

SBT is in a state of flux (so to speak) - assume shutdown of SD-12 and UZ-7a - until you hear otherwise, assume that UZ-4, Uz-5 and NRG-7a remain in operation with line power. How much money is required and what schedule/deliverables result?

We currently have \$1,113 K for close out and I believe another roughly \$800 K coming. We need to put the plans together (schedule & deliverables) post haste. I would like the information to me by next Monday morning.

ALSO - I had input for other close out activities - remainder of Environmental Science Team - \$313 K worth of work - Strat data submittal 120 k, Submittal of Fracture related information - \$64 K plus other minor amounts of work/money. Now is the time to firm the work up!!!

**#23**

Date: 12/10/1998  
Subject: Re: Close out

Yes, when I wrote them and sent them to you told me to be generous with the output and I was. As I noted in reply to this message to \_\_\_\_\_ however the tasks listed and sent to you are not the ones I'm doing, I'm doing WDLA, SDrevl etc and so the scheduled work is getting pushed aside. \_\_\_\_\_

\_\_\_\_\_: I know we have some verbage on work scope but do we have a schedule and deliverables for Climate?

**#24**

Date: 12/22/98  
Subject: account 4889-10506

Hello \_\_\_\_\_,

1<sup>st</sup>, Have a Merry Christmas and a Happy New Year,

2<sup>nd</sup>,

Recently I attended a TSPA meeting at Sandia and was instructed to charge all site scale infiltration modeling work which PA needs performed in FY99 to 4889-10506. On indicating that it was my impression that there was only 6 weeks worth of funding for me in that account (1.2.5 folks still insist the 110k for 10506 was intended for infiltration modeling), I was further instructed to keep charging to the account beyond the 6 weeks (bottom line is to just do the work that needs to be done). \_\_\_\_\_ and I are already heavily involved in this work in an effort to meet FY99 schedules. Please provide me with an update of the funding status for this account, and any information you may have received from the 1.2.5 folks recently.

**#25**

Date: 12/24/1998  
Subject: Re: account 4889-10506

\_\_\_\_\_,

I don't understand this either. Here's what I know thus far:

1. The 176K (22001) is for "close-out" of the infiltration modeling work. This work is still following the original work package that I put into the system more than 6 months ago (in response to a PA-USGS-DOE meeting in April or May 1998 on climate and infiltration issues), but which never received funding. I've charged 1 pay-period to this account, following my response to \_\_\_\_\_'s request of work-plans for FY99 close-out funds. Currently I have no information as to the exact status of the 22001 work package and its funding, although \_\_\_\_\_ has indicated to me to plan on doing as much infiltration modeling work as possible in FY99.
2. We notified PA about 5 months ago that 1. The FY99 infiltration modeling work package was not getting funded, 2. additional work was needed to get the new model results into the TDB, 3. the new requirements for data used by models required the data to be in the TDB (and the

USGS requirement for placing model output into the TDB is that an interpretive report is needed to support the results..... I am supporting this requirement, but also support the use of the TBV status to allow PA modelers access to results under the imposed schedule), 4. Additional work was needed to incorporate the Day and others 1:24,000 scale geologic map (only the 1:6000 scale map was available in time for the FY98 model), a snow cover module, and a quantitative evaluation of model uncertainty to ensure that a fully defensible model was in place for LA & SR. A meeting was held in October to discuss these issues. Upper management was made aware of the issues, but from my perspective nothing had been resolved (I did not have an account to charge the work to).

3. The 4998-10506 account materialized, with 6-weeks worth of funding for infiltration modeling. This is allowing the work to limp along, but will not be adequate to provide PA with what it needs. Scheduling of FY99 work has already been seriously affected, and we are falling critically short of the original work plan I tried to put in place during the summer.

4. Following a recent TSPA workshop (12/14-16) which \_\_\_\_\_ and myself attended, critical issues regarding needed climate and infiltration modeling work to support SR & LA were discussed, with emphasis on the need to have modeling results in the TDB. The latest (FY98) version of the model addresses many (but not all) of the issues identified as critical during the workshop, and which largely reflect technical reviews of the TSPA-VA by NRC, NWTRB, and others. I again indicated that this was largely a resource problem (climate has the funding to do the work, infiltration modeling does not), and that from my perspective nothing had really been resolved following the October meeting. PA indicated to me during the workshop that: 1. the 110k provided to the 4998-10506 account was intended for the infiltration modeling work, 2. there is still a critical need to complete the work in FY99, 3. the work needs to be supported in FY99 (continued evaluation of model uncertainty), and 4. that the funds to do the needed work should be available in 10506.

Thus, as of the 12/14-16 workshop, I have been going ahead with a modified version of the original FY99 work plan, although no it will be even more difficult to meet PA's FY99 modeling schedules (I'm basically following the 22001 "close-out" package, which now reflects a tighter 9-month schedule). I have received no information on the status of the 22001 account, so at this point in time I am planning to do the needed work under 10506, and I will continue to do so until I receive further direction from you or \_\_\_\_\_.

#### **#26**

Date: 12/24/98  
Subject: Re: account 4889-10506

\_\_\_\_\_ - I have had no recent communications from anyone for the PA work. The hours I am carrying are still the ones which reflect 240 hours for you and 80 hours for \_\_\_\_\_ as well as some hours for other staff for the \$110K. I believe that \_\_\_\_\_ thinks all of the money is for infiltration but there are other needs for PA other than the area that \_\_\_\_\_ is heading up. Is the \$176K for infiltration that we set up in 1.2.3 totally different than what you are doing for PA? I will have to defer to \_\_\_\_\_ on how you should charge. It's true you should charge where you are working but I'm not sure I understand the separation between 1.2.3 and 1.2.5.

#### **#27**

Date: 01/06/1999

Subject: SN-0118

Hi \_\_\_\_\_,

Could you do us favor and review the attached initial entry for SN-0118 (\_\_\_\_\_ is the PI). Please sign and date as of October 15, 1998. We are little bit late!!!!

Fax # is:

Thanks  
have a happy new year

**# 28**

Date: 01/26/1999  
Subject: Re: Work plans

I'll talk to you about this more after I get back from SN raining. I've re-scheduled my trip for Monday & Tuesday next week (arrive Sunday night).

\_\_\_\_\_

**# 29**

Date: 01/26/99  
Subject: Re: Work plans

Just a caution. \_\_\_\_\_ doesn't know about \_\_\_\_\_'s worksheet, at least not the one we're using. She disapproves of our methods and if she finds out she'll give us shit about it. What we do is take the money and balance out the hours to match. What she wants if for us to tell her how many hours it will take to do the work and only ask for that amount of money. If we have to much money for the FTE she want's us to give back the money. We don't agree but can't tell her that so we do an end run with the worksheet. She is a stickler for the rules (her rules) but I'm a stickler for the science. I need the leeway for bringing on additional FTE, when I need them. As things heat up so will demand for our time, especially with the Tiger Team. You should like you already have a plan on how to deal with it. That's good. I know you believe that we should only do what we're paid to do and you're right, we're not paid to write journal articles, give professional talks, or write proposals for future funding. I'm sure our managers will take care of us in the future, so I'll leave that decision and that belief to you. I have other things I need to do in life.

\_\_\_\_\_

**# 30**

Date: 02/23/1999  
Subject: Re: NCR YMSCO-99-0002, ECRB-SYS-CS1900

Sure it's supposed to make you feel better! I gave a presentation to a small group of professional women at the local chapter of the Assoc. of Women Geoscientists a couple of weeks ago and the consensus was that I had by far the best job and they were all jealous. We do SCIENCE! And we analyze data and even do some cool esoteric stuff and get to think about hydrologic processes while we drink beer. This QA tracking crap is only half our lives, remember. The other half we actually do some cool stuff. Right? Right? Talk to a consultant and you'll get a new perspective. (I just deleted, (yes, just pushed the delete key!) the email

from \_\_\_\_\_ on some stupid software QA package I was supposed to submit for a stupid modeling analysis I did in 1995. Yeah, just try to get me to do it.) Go out and have some fun today, \_\_\_\_\_, I miss you!

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**# 31**

Date: 03/15/1999  
Subject: Re: Tiger Team Hell

This memo actually hits the nail on the head. You are exactly right: One, yes, we will do the work, Two, yes, screw the tiger team (I don't know how yet but I'll figure it out), Three, yes, destroy this memo!

---

**# 32**

Date: 03/22/1999  
Subject: Re: Just Checking In

1. Software QA for the latest version of the model is coming along crappy. This is because there are some 11<sup>th</sup> hour changes taking place. The fall-back position is that the new models will be used only as supporting info for the developed data packages supporting the FY99 milestone report (we will use the 96 version of the infil code, which has been QA'd, to generate the final FY99 result.... This is mostly what \_\_\_\_\_ wants anyway).
  2. Here's the minimum input data being used (both 96 and 99 version of model), which has for the most part already been QA'd:
    1. Digital elevation data (data already QA'd)\*
    2. Geologic classification GIS map (already QA'd)\*
    3. Vegetation classification GIS map (already QA'd)\*
    4. Stream channel GIS map (already QA'd????)\*
    5. Daily precipitation data (already QA'd for 96 version of infil model.... I need to double check this. There's some important data from NTS precipitation stations in here that have always been a QA gray zone)
    6. Soil property data (already QA'd)
    7. Bedrock permeability (mostly already QA'd or available... I think)
- \* I'm trying to complete the northward expansion to match the new are of the SZ model. I'm not sure what the QA status is for the new GIS coverages for data sets 1-5.  
Here's what I'm hoping to add to this, if all goes well;
1. USGS stream flow data: this is all available data... no QA needed. (This is used for calibration)
  2. NCDC (Earth-Info) daily climate data (precip, air temp, snow cover): also available data, no QA needed
  3. Better soils data. If we use the STATSGO data, I don't think it needs to be QA'd
  4. I've had my AP3.10Q training (doesn't mean I know what I'm supposed to do, but I have hard copies of everything).
  5. Scientific notebook OK (not perfect, but I'm getting help from \_\_\_\_\_ in this department).

6. For now, I'm hiding out from all tiger teams, like some outlaw in a Spaghetti Western. We're heading underground with the real work. Tell \_\_\_\_\_ he was supposed to destroy that memo.

**# 33**

Date: 03/26/1999  
Subject: Status of LADS phase 1 calc. report - USGS

Between you and me, I put my 6K effort in months ago. My work gets charged to 11016 and 22001. This is where we invested our time and energy in promoting, planning, and actually doing the work. I'll admit that I have not devoted a full-time effort towards LADS. I've been working on the daily climate data-base, the new future climate simulations, the regional modeling, and the backlog of reports. Yes the LADS work is now behind schedule but so is everything else because I'm the only one doing this work, and I'll be damned if I drop everything else and work on nothing but LADS. I'd be very happy to just hand the work over to someone else at this point. It seems I do not have this option, thus all I can say is that the work will get done, but not by sacrificing everything else that's going on. I do not need to be developing M&O hoop jumping skills. The skills I am interested in developing are ones that will benefit the CA district and our careers.

I'm not directing this at you. This is just to let you know where I stand at this point in time.

I guess this is another one of those memos that need to be destroyed.

\_\_\_\_\_

**# 34**

Date: 04/04/1999  
Subject: Re: Precipitation estimates in VA

Here's my perspective:

Have you looked at the latest EOS? The article on nuke waste and Yucca Mt. states that the amount of water that will be contacting waste canisters is still the key issue for repository performance. The primary factor controlling flux thru the UZ is the infiltration rate. Some nights I have a hard time going to sleep because I realize the importance of trying to get the right answer, and I know how many serious unknowns are still out there, and how many quick fixes are still holding things together. I'm just trying the best I can with 3 equations and 15 unknowns. It seems so odd that we've had to push so hard just to get even a little support for this work, and at the same time we end up being the ones most responsible for whether the PA predictions are right or wrong. I'm looking forward to putting the YMP nonsense far behind me.

I ran you're sublimation model and the entire snowpack sublimated. I have a 3<sup>rd</sup> model now which just uses a lower percentage of PET. Sublimation using this model comes to about 20% of the total annual snow fall, but the term includes sublimation above freezing, which thus includes evaporation from the snow pack, in addition to melting. I found out our PET calculation goes negative when air temp drops below about -20 deg C, which happens once in while using the Spokane climate, so this just gets set to zero for now. It causes PET to go from about 805 mm/year to 805.5 mm/year, so this was not a significant problem.

I'm driving out to Sacramento on Monday with the family (next time we'll fly, but we couldn't get our act together with air travel for the coming week). We'll be staying on the east side of Sacramento. \_\_\_\_\_ will start checking out the area while I go to work at the SAC office. I'm bringing the lap-top and lots of JAZ disks. I need to start a number of models running on the SAC DEC Alpha. I plan to work Tues - Thurs at the SAC office, then take Friday off and spend time with \_\_\_\_\_ looking around, and drive back Saturday. \_\_\_\_\_ is on Spring break now so we wanted to take advantage of this. The LADS stuff will fall a little further behind but that's too bad because the move has now become my highest priority.

We've contacted a Realtor and everything is already in full swing at this end. We have 2 For-sale signs out in the yard, and our house is officially "listed".

Happy Easter! I'll see everyone 1<sup>st</sup> thing Tuesday morning. \_\_\_\_\_

**# 35**

Date: 04/23/1999  
Subject: PA help

I have to run this by you because I promised \_\_\_\_\_ and \_\_\_\_\_ that I would get back to them with a game plan next week: PA (\_\_\_\_\_ and \_\_\_\_\_) are pushing me to get the QA work in place for the products they need from me and are suggesting that they can help me out with software QA issues and all the grunt work required to just do the modeling runs so that needed products can be finished for the modelers to use. They realize that I am somewhat overloaded with this task so they are willing to provide us resources in terms of computing power and warm bodies doing QA and running the code. The catch for us is that the Infil code will be on Sandia DEC Alphas (they can dedicate 3 DEC alphas do the number crunching....they will give us accounts so that we can Telnet to these machines). I have been given a verbal promise that we will not lose control of the code, and the goal is to get the job done, not to take over our work. The Sandia personnel would in essence be working for us, not the other way around.

I am thinking that if I want to remain viable team player on YMP (which may translate to continued funding), I need to show that we can get the job done and provide the modelers with the results they need. This is not going to happen if I rely solely on USGS YMP resources. For example, Sandia can dedicate a person to do all of our software configuration management stuff and help us out with input parameter QA issues. This strategy sounds much more appealing to me now because I'm getting the impression that unlike USGS QA, the labs have the QA resources to actually get in there and do the work, instead of just creating more work for the PI to do.

The other option would be to stall, and then when I'm in SAC I will just ignore all this, and we can let the site scale modeling go down the tubes. Dealing with this QA bullshit is really starting to make me sick.

**# 36**

Date: 04/28/99  
Subject: USGS Participation in AP3.10Qs

The schedule for AP3.10Qs is being revised to place additional constraints on information handoffs. The completion dates and links by the climate model and infiltration model to the UZ model may need to be revised. In the frenzy of reorganizing the FY99 replan I am concerned that the Climate model and Infiltration model PIs have not been kept up to date. The current plan (with dates supplied by ??) calls for the Climate AP3.10Q to be in draft form by April 20. The final report is scheduled to through checking review on June 1. The Infiltration model is scheduled to be in draft form on by April 19 and through checking review by June 1. I doubt that these dates are even close to reality. I am requesting that the Climate and Infiltration PIs confer within their organizations provide realistic dates for completion of the AP3.10Qs. Although there is an absolute completion deadline of December 1 for all AP3.10Qs that feed the TSPA, this cannot be the deadline for Climate and Infiltration. These must be completed and submitted as a version 00A documents before any downstream AP3.10Qs can pass through a checking review. The absolute latest date for completion of Climate and Infiltration version 00A documents is August 15 according to the current schedule requirements. However I may not be allowed to use the August 15 date because it will require all AP3.10Q to be stacked up behind it waiting for check reviews (and break other rules).

I eagerly await your responses. \_\_\_\_\_

**#37**

Date: 04/28/99  
Subject: Re: USGS Participation in AP3.10Qs (Document link not converted)

I'm confused. I seem to have three different deadlines for the same thing. I guess I'm out of date. What is a "Tiger Team", what is a "Wiring Diagram", what is "draft form", what (who) is in charge and why do I get requests for different things from different people that all seem to be related, if not the same thing? When do the "Tiger Teams" go into effect? When is the FY99 planning and reallocation of money to fund the "Tiger Teams" going to be finished? Are any milestones going to be delayed to meet new AP3.10Q requirements? Will the ICD's vanish, will the AP-3.10Q originator vanish? Who is a PAO? What's going on? What's the April 20<sup>th</sup> deadline? I thought I was only late for the April 23<sup>rd</sup> deadline. I guess I just don't have the PMR concept embedded properly. Did I get anything right? Just curious, \_\_\_\_\_

**# 38**

Date: 04/28/1999  
Subject: [Fwd: USGS Participation in AP3.10Qs]

\_\_\_\_\_ forgive me for my lack of familiarity with what you are talking about. I for one, and it probably applies to \_\_\_\_\_ as well, am phasing out of the YM program. I am now in Geologic Division and am contracted by the YM branch. I am in the process of trying to tie up lose ends before I leave the project completely, probably after next fiscal year, during which I only expect to be halftime.

I m sorry to say I dont have a clue about what you are talking about with regard to the AP3.10Q needs. Yes I took the class, but don't know what you need. I have submitted climate input parameters for PA and the infiltration model as a milestone done in February. I am in the process of writing an open file describing the basis for the input values. The methods I used to get at the input terms have been approved by the NRC, but they are entirely new, no one has

ever done this before. Because they are entirely new preparing the open file will take time as each step in the process needs to be documented in detail, so that readers can see the complete nature of the method. Im hoping the open file will be ready for review some time during the summer, but can make no guarantees. Is this open file the sort of thing you are talking about? \_\_\_\_\_

**# 39**

Date: 04/28/99

Subject:

You are a lot more than curious. You are right on target. There seem to be lots of plans that call for completion of products without any notification of the person being expected to produce work. Let me tell you what I know thus far in the continuing saga.

Tiger Team - a QA and technical team that digs down through references to the original data in project notebooks. Your situation may be different but Labs are suppose to be working to the concept in anticipation of authorization under the new CR (maybe by mid-May)?

Wire Diagram - a flow chart of information passed among the AP3.10Q reports that lead to a PMR.

Milestone - a date committed to by the M&O and/or the DOE this does not change no matter what.

Draft form - as per AP3.10Q, ready for check review, information must be in this form to pass to the next AP3.10Q.

PAO - Performance Assessment Operations (come on now, you had to have known about that one)

PMR Lead - \_\_\_\_\_ (he sets the UZ internal deliverable dates)

Your April 20 deadline - that's one that I am not up on, is it related to the infiltration model?

What's going on - detailed planning with more and more constraints and still somehow meet the deadline.

The purpose of my memo was to 1) alert you that you may see plans concerning your work for which you were not previously aware, and 2) determine when the AP3.10Qs for Climate and Infiltration will actually be completed. I need the deliverable information before big nasty guys in dark suits take me into the back room and began a medieval interrogation session related to the UZ schedule. You are willing to save my skin aren't you??

**# 40**

Date: 04/28/99

Subject: Re: USGS Participation in AP3.10Qs

I am not suprised that you were in the dark about the current state of planning. The M&O has changed the project a lot since January. The purpose of my meno was 1) to alert you that your

work will need to be placed into the format of an AP3.10q and 2) learn when the work may be completed. The mid summer date will work if we label the reference with a "TBV".

**#41**

Date: 05/14/1999  
Subject: Re: Recharge

\_\_\_\_\_,  
We do not have the 1990-95 recharge map yet. The final simulation will be started week after next and will be our best answer for FY99.

The regional recharge modeling has been delayed the last 2 months due to priorities being placed on meeting PA's FY99 schedules for the site-scale modeling (I'm finishing up the new site-scale net infiltration maps) and additional work required for the new QA procedures. If I could get out of this I would but YMP has placed this work on par with a level 3 milestone (even though funding didn't actually come through until mid-January 1999). Part of the problem now is computing power. I've just ordered a single CPU Gateway and am setting up a dual processor Xeon Gateway which will need to be a PO and thus will be slower. I will also be switching the site-scale modeling to Sandia DEC Alphas soon (possibly next week) so this will free-up our machines to do the regional modeling.

I wanted to ask you about setting up the Gateway order thru your district office (I will also talk Alan about setting it up thru SAC). If I go thru Joyce its YMP funds. If I charge to 11016 its still YMP funds. I was hoping to find a way of not having this come from YMP because we are trying to get out of YMP but either way I'm starting the order on Monday.

I will also give \_\_\_\_\_ a call to see if there are any free sub-district.

\_\_\_\_\_

**# 42**

Date: 08/20/99  
Subject: Re: FW: infiltration maps

\_\_\_\_\_,  
The catch-22 is that I've been busy trying to finish up the AMR and thus haven't up-dated myself on the status of the AP-3.14Q. I recall discussions between myself and LBNL regarding a formal data transmittal, but I'm not sure if an AP-3.14Q was called out (I'll need to double check my records) because the official data release date was 5/21/99 (check the file dates) and transpired as an official memorandum from \_\_\_\_\_ to LBNL. If we need to retrofit this transmittal with AP-3.14Q then we'll do it, but I've assumed the completion of the AMR has highest priority. I'm also assuming that until the AMR is complete the AP-3.14Q can only be submitted as TBV. Along these lines...there's been discussion of whether it is best to have a single encompassing DTN for all the FY99 net infiltration modeling results or separate DTNs for each of the 9 files distributed. We may need to just go with whatever is most efficient with QA resources, although there are advantages to having the separate DTNs for end users (this was my original intent), especially in terms of distinguishing between the modern climate and potential future climate results.

**#43**

Date: 08/23/99  
Subject: Re: FW: infiltration maps

\_\_\_\_\_,  
Both the climate and infiltration AMRs are now late for checking by 10 days. As you know the PMR lead is held responsible for all such "bad" activities. Please provide me with a reasonable estimate of when I can expect to receive these AMRs for LBNL checking. Thanks. \_\_\_\_

**# 44**

Date: 08/23/1999  
Subject: Re: FW: infiltration maps

Just an example of the Hub-bub I was talking about. I spent the whole weekend working on the AMR. Probably I will need to cut way back on my original visions of what the final product should look like (of course in my mind the infiltration modeling should be its own PMR). Its too bad because I wanted to truly document how the infiltration modeling is done (\_\_\_\_ is actually counting on this so he can cut and past into the new SD). Its still shit on time isn't it.

**# 45**

Date: 09/17/99  
Subject:

\_\_\_\_\_,  
I have to say that I am disappointed in this progress report. Both of the USGS AMRs for the UZ PMR are months late, and I cannot accept that you do not have the key scientists working full time on them. Both the climate and infiltration AMRs are key products for the UZ PMR and we are proceeding with considerable risk. I need from you a firm date of commitment for completion of rev00 for both of these AMRs, and please try to make these dates before November 30, 1999. If you need I will be glad to help with checking of both AMRs and anything else I or my organization can do. Thank you! \_\_\_\_

**# 46**

Date: 11/05/99  
Subject: Re: PMR/AMR Issues

You know, we sat in that meeting on Wed. in \_\_\_\_'s office and \_\_\_\_ repeatedly said that "we" made mistakes and "management" didn't figure things out in time. I lay this responsibility completely in his lap. I (we) have not been made aware of the scope of this AMR mess and my (our) TPO should've done so quite some time ago. Then it wouldn't have been shit on time (almost) because his people in the trenches would've understood the scope and schedule in enough time to focus resources properly. How can we deal with a problem when we don't know what it is? All we can do now is clean up the mess as well as we can and save his butt. Can we meet sometime today? How about lunch?

**# 47**

Date: 11/05/1999  
Subject: Re: PMR/AMR Issues

Another reply to this: I've shunned the whole PVAR process so I can be blamed for that. All I want to do is get a report out that documents what we've done and what we've learned. I just wish that \_\_\_\_\_ was a little closer to the work we do because I think then he would have a better feel of what resources will be required for a given set of M&O procedures. Probably this just isn't possible at his level. But at Wednesday's afternoon meeting I sure had a sense that upper management, PVAR, and the M&O were on one planet, while the USGS folks in the trenches were on another.

\_\_\_\_\_

**# 48**

Date: 12/23/99

Subject: Re: Reviews of Infiltration and Climate AMRs

I think some of the questions are fair and some are not as fair as I don't believe the reviewers have taken into account the project under which we work. We have argued, unsuccessfully, to get the funding to support real modeling. \_\_\_\_\_ and \_\_\_\_\_ have never been real supportive or successful in getting supporting our efforts. Can you imagine what the UZ Flow model would look like if you got \$150K every other year? Don't forget milestones. Basically the infiltration model is what it was in 1996 except for the runoff component. It is a one or two person effort and that is all the project would ever support. We will pay the price but if we have done an inadequate job we have to share the blame. There are many reasons why the model is written the way it was and we justify most of them. As painful as it would be I would suggest that the best way to resolve these issues in to have a face to face meeting with the reviewers, myself, \_\_\_\_\_ and you. I would believe your presence would help to get past the sticky issues and come to a resolution rather than debate modeling methodology. We have matched all the data available with a simple model. We don't have data available to justify more complex modeling, such as Richard's equation, which is very time consuming on a site basis. We did write, and ran, a Richard's equation based model and got similar results so we stayed with the current model. Also, for the most part, what the reviewers are suggesting our errors to be would cause the flux to go up considerably beyond what it is now.

\_\_\_\_\_

**# 49**

Date: 01/04/2000

Subject: Re: Reviews of Infiltration and Climate AMRs

\_\_\_\_\_

The following is a long-winded but I'm hoping this gives you an understanding of the general position I am taking in defense of the net infiltration AMR. I am not referring to any specific comment here but I feel I need to provide some insight on the position I will likely take on the tough issues (I thought I saw at least one or two of these). If my position seems problematic to you and the reviewers then I agree that a "face to face" meeting is a very good idea. I think \_\_\_\_\_ and \_\_\_\_\_ will share most of my views but they have not seen any of this so I cannot at the moment speak for them.

I am in the process of formulating written responses to the two sets of review comments. I believe \_\_\_\_\_ is committed to being on travel for the next 2 weeks so most of the responses will

likely come from me but I will make sure \_\_\_\_\_ has a chance to provide as much input as his schedule allows (and as much help as I may need). My plan is to ask \_\_\_\_\_ and \_\_\_\_\_ for a review of my written responses prior to sending these back to you (which I believe means I sent the complete review comment sheets back to \_\_\_\_\_ who will then forward them through \_\_\_\_\_ to LBNL... someone please correct me if I'm wrong). In general, I can tell even from my brief scan that both reviews involve a careful digestion of the material and have well thought-out comments, and I am sure these will help improve the final product. I believe that many if not most of the issues can be resolved with only minor modifications to the AMR (addition of information, rewording to clarify terms, definitions, etc).

I will try to address the more difficult issues as best as I can but there is a likelihood that some comments will not be resolved by simply a written response along with document modifications. Some of the comments seem to address issues which in most cases I will fully support as being important to consider but which I believe go beyond the intended scope of AMR U0010. One example, through probably not the best, indicates that simply stating that vapor flow is assumed insignificant and is thus not included in the model is insufficient. Some proof within the AMR itself is needed to validate the assumption. My problem here is that the modeling of vapor flow has never been included in any of the finalized worksopes that the new model was developed within, so I do not believe that the AMR is required at this point in time to prove that the assumption is valid. In this case we might also solve the problem easily by providing a reference or showing a calculation but in other cases it will be much more difficult to prove the validity of the assumptions being made within the AMR. These are valid comments but involve technical issues that, although we may be in full agreement on regarding their potential importance as well as the means of resolving the problem, have previously been determined by YMP as not being cost-effective to resolve under the given time and resource constraints. )I am referring to an entire history of struggling with severely limited work scopes following the initial 1996 version of the model).

I know the review comments are purely assessments of scientific and technical merit regardless of project history and management decisions, and in that respect they have been successfully executed. But in scanning them I cannot help in becoming increasingly concerned that the AMRs and PMRs may end up becoming the battlefields were PIs start paying the price of issues which have been left unresolved because of management decisions (I'm not saying "bab" decisions, just "management" decisions). It is my opinion that this should not be the case, at least not at the AMR level). In my original interpretation, I perceived the purpose of the AMR to be primarily a documentation of the process of obtaining a given result through a series of analysis and or modeling steps, containing everything needed to reproduce the result and ensure full traceability for end users, including identification of all assumptions and limitations. So if something real bad happens to me YMP still has everything needed to march forward towards SR and LA. In my view, the results provided by a given AMR need only be defended scientifically in the context of the work scope in which the analysis/modeling was performed, because the work scope determines the assumptions and limitations, and as long as these are fully addressed in the AMR (along with QA of course), then the results should be defensible to the degree that the procedures used are defensible and within the context of the intended use or criteria defined in the work scope.

In my original interpretation of AP-3.10Q, I did not believe that the intent of the AMR is to provide the best result possible, to provide the most complete or accurate mathematical formulation of the process being modeled, or to have an answer to all possible aspects of the problem being addressed. In face the whole concept of PVAR only makes sense to me if AMRs and PMRs are interpreted not as scientific studies but more as contracts documenting the

products that we all agreed needed to be completed in proper sequence to satisfy the needs of ISPA-SR. A scientific study can have a negative result and still be a successful product but this does work with AMRs. What I am leading to with this reasoning in terms of the reviews (and I've tried to justify my reasoning) is that my only response to a particular comment may end up being a reference to the limitations and assumptions which I have tried to provide a thorough accounting for (but not prove the validity of) in the AMR (I will gladly add any limitations or assumptions if I've left them out), and which are in turn defined by the level of work that was supported by management decisions and determined by end users as adequate for their needs. This may in some cases upset folks because scientific issues may be left unresolved, but I hope everyone will agree with me that the results of the AMR need only be defensible in the context of the criteria and requirements assumed during the planning process, and this does not include any new insights gained once the work scopes were finalized or issues that were not considered important during the planning process. In other words, my comment to any issue that is outside the intended scope of the AMR will hopefully be a nice way of stating that we are now facing the consequences of a history of project decisions made following the initial evaluations of the 1996 model, and YMP is no longer in a position to resolve issues that may have re-surfaced and are being assed by end users as being more important than originally thought when the work scopes got hammered out. We will certainly address all technical issues relevant to net infiltration either directly in the AMR or indirectly by references. However, it is unclear to me at the moment how to address any outstanding, unresolved technical issues (other than my approach above of referring to assumptions and limitations) which at this point become identified as being potentially problematic for end users or SR in general because to my knowledge there is no current work scope that I am aware of for major model changes requiring up-dated model inputs, source code modifications, improved model calibration, field verifications, or any technical work unless this is what is meant by "impact analysis" Resolving net infiltration issues are usually not quick fixes and thus may require re-allocation of limited resources, which does not seem likely. The only technical work still in progress that is likely to be included in time for a March 30th Rev 00 milestone is the net infiltration uncertainty analysis work that is now being completed (sorry, I am not recalling the AMR # at the moment, but \_\_\_\_\_ is the originator on this once). Scheduled work being conducted to finalize Rev 00 (I think the current version is still Rev 00A), involves removing the current TBVs (software QA, acquired data approvals, completion of all data package submittals) and document modifications in response to all the reviews being done.

Of course you know that we have been aware of the many issues concerning net infiltration but the general problem of net infiltration was not landing very high on YMPs priority lists so we had to be very selective in identifying the aspects of the model we would improve on. My own opinion is that net infiltration and surface boundary processes are important and complicated enough to warrant a separate PMR for packaging the climate-biosphere-surface hydrology-shallow subsurface hydrology processes, with separate AMRs for each of the components. I think this would have provided a much better integration of the various inputs for end users. In relative terms, this structuring would have provided the proper level of support needed to have thoroughly addressed all the scientific issues I am seeing coming out of this technical reviews as well as more general criticisms of the models and results currently in place. If relying on the logic I defined above to address the more difficult issues satisfies the reviewers, the end users, yourself, and is good enough for SR, than this should all proceed rather smoothly and quickly. If my thinking on all of this seems flawed, then I am open to advise and would welcome an informal meeting with open discussion on how best to proceed. In fact, if YMP really does need to resolve all the issues, the work plans are already written and as long as we started the work right away, we could still have the answers in time for LA (I think I'm only joking). On the other hand, letting the chloride data define our understanding of the upper boundary condition seems

to be getting increasing support these days as an easier solution to be defending for SR, whereas many sources of uncertainty continue to exist in modeling net infiltration. I believe the chloride data does provide a very important perspective on the problem, but my gut feeling as a hydrologist is that it will not be possible to survive SR and LA without being able to show some type of deterministic accounting and understanding of climate, the biosphere, surface hydrology, and shallow subsurface hydrology, and how all of these components combine and interact with the UZ.

If you have actually made it down to this point, thanks for taking the time and reading all of this. Let me know what you decide about the heads up.

**# 50**

Date: 01/04/2000

Subject: Re: Reviews of Infiltration and Climate AMRs

\_\_\_\_\_,  
If you send another letter like this you must provide me with 1 month funding to read it. Just kidding. I am not sure I understand your points clearly. If you are suggesting that you respond to the comments other than technically by discussing them in terms of management decisions/AMR type documents/lack of funding, etc, I don't agree with you. We, especially you, are going to have to be able to defend all parts of your model with technical arguments. I actually think your strongest argument is the chloride data, and that these data support the average conclusions of the model. I think you should respond to all comments the best way you can.

Any other opinions?

\_\_\_\_\_

**#51**

Date: 01/20/2000

Subject: Re: EarthInfo

\_\_\_\_\_, we really need some methods (make up something 1 or 2 lines) and beginning and ending data collection date for the whole package. ASAP to be able to prepare the TDIF.

Subject: Re: EarthInfo

Hi \_\_\_\_\_,

The data collection period was different for each station. The complete record, updated through 12/31/97, was used for each station. The methods used to collect the data are different depending on the date of collection, and may also vary between stations. This information is not provided by the database, therefore I cannot provide it. However, if this becomes a problem, let me know and I will make something up.

Subject: EarthInfo

\_\_\_\_\_, please provide us with the beginning and end of the data collection period and the methods used to collect the data. I need these info. To prepare the TDIF.

ASAP.....you like that Ha!

-----

Date: 01/21/2000  
Subject: Re: EarthInfo

Ok here it is:

Methods: measure daily precipitation amount using a precipitation gage (either simple storage, tipping bucket, or weighing gage type). Measure maximum and minimum air temperature using a thermometer. Measure snow fall accumulation using either a heating rain gage (tipping bucket), simple storage gage, or a weighing gage.

period of record: 01/01/1900 to 12/31/1997

used up all my time so I hope this does it!

—

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Subject: Re: EarthInfo

\_\_\_\_, we really need some methods (make up something 1 or 2 lines) and beginning and ending data collection date for the whole package. ASAP to be able to prepare the TDIF.

-----

Subject: RE: EarthInfo

Hi \_\_\_\_\_,

The data collection period was different for each station. The complete record, updated through 12/31/97, was used for each station. The methods used to collect the data are different depending on the date of collection, and may also vary between stations. This information is not provided by the database, therefore I cannot provide it. However, if this becomes a problem, let me know and I will make something up.

—

-----

Subject: EarthInfo

\_\_\_\_, please provide us with the beginning and end of the data collection period and the methods used to collect the data. I need these info. to prepare the TDIF.

ASAP.....you like that Ha!

**# 52**

Date: 01/31/2000  
Subject: Re: January report for 4b

\_\_\_\_\_,

No progress on completion of recharge report due to prioritization by upper management of non-scheduled work needed for completion of YMP AMR U0010 under a continually evolving and expanding QA and regulatory environment (they call it PVAR, I call it FUBAR).

**#53**

Date: 02/03/2000  
Subject: Re: DEM Accepted Data

Hi \_\_\_\_\_,

There is no lat/long associated with the source, or beginning and ending dates. I'm not sure how these rules apply. I could give you the date of the file but I've never actually seen the file so even this is a problem.

Of course I could make something up. My guess for a date is 3/31/60. I can calculate the lat/long for the corners of the dem. Will that work?

\_\_\_\_\_

Subject: DEM Accepted Data

\_\_\_\_\_, please send the ASCII file for the DEM that includes the lat/long. with beginning and ending dates and something for methods to be able to prepare TDIF and submit the package.

THANKS

**# 54**

Date: 03/29/2000  
Subject: Installations

Good afternoon \_\_\_\_\_:

I am following up on our conversation today about the installations I have pending.

The installations are for Unqualified Software Codes under section 5.11 of AP-SI.1Q.

SURFER V6.04 \_\_\_\_\_ (1/1/1998)  
TRANSFORM V3.3 \_\_\_\_\_ (1/1/1998)  
ARCINFO V6.1.2 \_\_\_\_\_ (1/1/1995)

All three code are for \_\_\_\_\_ and \_\_\_\_\_. The first two codes are for CPU# SM321276, ARCINFO is for CPU SN 249F2296.

The information I need to have these codes already been installed to initiate the 5.11 process, or do they still need to be installed: If they have been installed I need to know the name of the individual that installed the codes and the date. I will also need you permission to make the entries onto the User Request forms to bring them up to date.

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**# 55**

Date: 04/05/2000  
Subject: Notes from April 4 Denver staff meeting

Please read very last line of meeting notes. I have stopped working on the AMR and I am now just working on reports: 1. the unfinished maxey-eakin report, 2. regional net infil model for Frank, 3. re-calibration of watershed model in Pagany Wash using both streamflow and neutron logging data (and a fixed model). \_\_\_\_\_ and I have been working on the precip-input problem today. Eventually this will lead to another report. Add all the Mojave/Joshua tree stuff and there is no time to do AMR work anymore. If Gary can do this sort of thing why can't we: Oh yeah, and I refuse to take any further training until I take the training course "How to publish reports in the USGS". After all, isn't that the bottom line. What good is QA if there is no data or analysis to QA: Do we just QA the QA?  
Ok I'll shut up now.

**# 56**

Date: 05/26/2000  
Subject: Re: Infiltration AMR Table 7-1 changes

\_\_\_\_\_,  
It has always been my belief that in an ideal world, all input and output files used to develop the final results for U0010 should be archived in the TDMS. But, as I mentioned in previous emails to.... (can't remember, I think it may have been \_\_\_\_\_ et al), since there as many as about 1,000 files involved, we do not have the resources to even think about this. Eventually this may create problems. For example, the NRC is already putting in a request for the geospatial data, the merged DEMs, and the daily climate inputs (including the stochastic simulation input files, Area12.s01 and 4ja.s01). In the case of the uncertainty analysis AMR, originally we were processing 17 watershed modeling domains as data packages because this is what was provided as input to that AMR. This data is now only accessible as the all-inclusive "geospatial input parameters" data package. The data are the same, but the exact input files that were used will need to be re-generated by other users. The uncertainty analysis AMR also used the 4ja.s01 file directly as input. Its OK (I think) that this file or the developed data is not in the TDMS, but other users will need to realize that the developed data will need to be re-generated by going back to the raw data and running the qualified programs MARKOV and PPTSIM (so they will need to request the software from the SCM). At any rate, I hope that YMP realizes that even when this AMR is completed, all of the intermediate data will not be readily available to other users through the TDMS.

---

**# 57**

Date: 07/05/2000  
Subject: Re: Deficiency Report #34

Well hello there!

I'm not really dealing with it yet.....just intercepting emails and faxes. I guess we'll chat tomorrow, but I'll try to have a deeper understanding of what the issues are (I left a copy of \_\_\_\_\_ fax on you desk). It looks like it has to do with being a little too vague and general with some of the model inputs, such ET and root-zone parameter. Other items have to do with stupid DIRS stuff I think.

\_\_\_\_\_ was looking for you about other stupid QA stuff, I think.

I'm almost done with the new TSPA-SR models. I have to get these results out this week. San Gorgonio needs to be done next week. I haven't even though about the DTN plan we we are supposed to have done by Friday.....

**# 58**

Date: 07/12/2000  
Subject: Re: Request for USGS Data Files

Mod3-ppt.dat = the file referenced by DTN GS000208311221.001. The title, per table 7-1 in AMR U0010, is "Yucca Mountain 1980-1995 Developed Daily Precipitation Record". Here is the file: (See attached file: Mod3-ppt.dat). The date for this file is 8/23/96. It was used to support the 1996 milestone for INFIL v1.0. I have no idea if its made it into TDMS, but we've been trying for 4 years now!

IF I could I would throw this file out and start over. The file is too old and out-dated, based on what we now know to be true with the updated NTS data, the now available SAIC data, and data collected after 1995. Since support for net infiltration modeling waned after 1995 and especially 1996, we've been stuck with this file.

**# 59**

Date: 08/08/2000  
Subject: preliminary data

I have reviewed two packages for preliminary data, DTNs, GS000308311221.004 and GS000308311221.00. Both appear to be typical Technical Product Output (TPO) from the AMR, ANL-NBS-HS-000032 (Infiltration). The Project has adopted a policy for treating TPO's as qualified since this will be their status when the AMR has been completed with 100% qualification of inputs and software.

Unfortunately, there is an input to this AMR from pre-PVAR modeling. This is DTN GS960108312111.00, Geostatistical Model for Estimating Precipitation and Recharge. . . . . Qualifying the results of pre-PVAR modeling essentially requires the entire scope of work of an AMR which is beyond the charter of the data qualification group.

This AMR also has several other unqualified data inputs and software. It will be necessary to qualify all of the inputs and software in order for the preliminary data DTNs to become qualified. The data and software qualification group can help qualify all of these items except for DTN GS960108312111.000. The qualification of DTN GS960108312111.000 might be accomplished by incorporating that work into the AMR in order to bring it up to PVAR specifications.

Probably the first step towards resolving issues concerning DTN GS960108312111.000 would be to organize a meeting between the AMR author and key participants and data and software qualification personnel to discuss alternatives within the constraints of PVAR. . It should be noted that the intent and requirement of PVAR was that all previous work be brought up to conformance with PVAR standards.

Regards

\_\_\_\_\_

**# 60**

Date: 09/05/2000  
Subject: Re: UZ KTI action assignments

assigned to personnel by \_\_\_\_\_ or \_\_\_\_\_ so please contact them regarding any discussions in the future

I would like to state it differently - there is no funding other than that to be used for software qualification to fund the Infiltration AMR related work. It's not that I decided to not fund \_\_\_\_, \_\_\_\_\_, or you - it's the work and funding is not there! I will not be assigning someone else to conduct the work - there will not be any other work.

I've campaigned for a long time to maintain funding such that expertise is available when needed. People that are no longer administratively under my control may not be available later in the FY (in this case, FY 2001) once they have made other commitments, no mater what funding may become available.

**# 61**

Date: 09/08/2000  
Subject: Re: Infiltration Support

It is my understanding from \_\_\_\_ that if funding were available then \_\_\_\_ and I would be involved but DOE has not made any funding available for FY01 for infiltration work. Therefore it is not a question of who will replace \_\_\_\_ or I but who would fund the project. \_\_\_\_ will not likely reassign personnel because they would not be funded either. The bottom line is this problem is a funding problem and not a manpower problem. The second bottom line is that if a funding decision is not made before too much longer then it will become a manpower problem. And no, I'm not whining for money I'm just pointing out the reality.

**#62 (note: e-mails from same originator, different dates and topics)**

Date: 9/27/2000  
Subject: geospatial data package-fixed

Why did you convert the ASCII file to EXCEL? Is this corrected data exactly the same data used in the AMR? If it is not the same, is there any impact on the AMR?

Thanks \_\_\_\_\_, we will update the data summary according to your response.

-----  
Subject: Re: geospatial data package-fixed

\_\_\_\_\_,'

Here is the fixed data summary: (See attached file: GeospatialSummary-new-\_\_\_\_ response to request.doc)

I have inserted the following paragraph:

Statement of Explanation for Supersession to the previous data package which contained errors.

A previous data package was submitted containing errors. The errors were caused by importing the original ASCII text files (column formatted) into EXCEL and submitting the EXCEL files as the data package. Several columns that existed in the original data files were deleted in the EXCEL files. This data package consists of the original data files that were imported into EXCEL. No columns have been deleted. The data have not been changed.

\_\_\_\_\_

Date: 09/27/2000  
Subject: Re: geospatial data package

\_\_\_\_\_, we have new data added to the data files; that requires a supersession to the old data. Please add a statement to the data summary sheet explaining the reason for changing the data.

I am ready to send this package for a Review/Check to Denver, so please send me the updated data summary ASAP.

Thanks

-----  
Date 9/27/2000  
Subject: geospatial data package

\_\_\_\_\_

I just left you a voice mail message explaining that the 10 watershed files submitted with the preliminary data package had errors in them due to transferring the data to excel. We are resubmitted those files as ascii files to preclude this from happening again. Hope this doesn't cause problems.

(See attached file: GeospatialSummary-new.doc)

GeospatialSummary-new-\_\_\_\_ response to request.doc  
GeospatialSummary-new.doc

Date: 03/08/1999  
 Subject: Davidodo

Water potential data for samples from borehole USW UZ-14. Values of -0.1 bars indicates -0.1 or higher.

This data received technical review with the original data package. Errors occurred when the data was printed out in final form for submission to QA review and the original data was misrepresented when put into the TDB.

### Water Potential

Borehole	Depth, ft	(-bars)					
UZ14	39.9	0.1		UZ14-	39.9	12.16	
	2.17	0.117					
UZ14	42.5	0.1		UZ14-	42.5	12.95	
	2.06	0.168					
UZ14	46.7	0.1		UZ14-	46.7	14.23	
	2.04	0.176					
UZ14	50.3	0.1		UZ14-	50.3	15.33	
	2.05	0.174					
UZ14	52.8	0.1		UZ14-	52.8	16.09	
	2.07	0.166					
UZ14	56.5	0.1		UZ14-	56.5	17.22	
	2.07	0.166					
UZ14	60.6	0.1		UZ14-	60.6	18.47	2
	0.191						
UZ14	65	0.1		UZ14-	65	19.81	
	1.81	0.186					
UZ14	67	0.1		UZ14-	67	20.42	
	1.75	0.21					
UZ14	70.4	0.1		UZ14-	70.4	21.46	
	1.53	0.308					
UZ14	72.4	0.1		UZ14-	72.4	22.07	
	1.49	0.328					
UZ14	76.7	0.1		UZ14-	76.7	23.38	
	1.43	0.279					

Date: 05/04/1999  
 Subject: Re: matrix date

Sorry \_\_\_\_, I know you other things to work on, but \_\_\_\_\_ send me some more info. on the WRIR data.

Date: 05/04/1999  
Subject: Re: matrix data

Looks like \_\_\_\_ changed his mind. Oh well. I imagine we're going to have problems. The corrected data will have to be reviewed. Dang.

Subject: Re: matrix data

\_\_\_\_\_

I did use the corrected data to estimate a global handling error, so I need it to be in the spreadsheets. Also, I think as part some sensitivity studies we will run later this year, we are going to look at the effect of using the composite curves. I assume that the corrected data is better for producing the composite curves. I hope this doesn't complicate things too much.

\_\_\_\_\_

-----

I don't have the DTN's yet. I think I'll bypass the QA problems and remove the corrected data from the spreadsheets. If you think this is the wrong approach let me know.

\*\*\*\*\*

\_\_\_\_\_  
Earth Sciences Division  
Lawrence Berkeley National Laboratory

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Date: 05/07/1999  
Subject: Re: Help

FYI

\_\_\_\_\_

Date: 05/06/1999  
Subject: Re: Help

I haven't a clue why wet bulk density was included in any data packages. Why on earth do we have to redo a package that was submitted in 1995???????????????????? If the records

managements folks were doing their jobs properly they should have all the information you need, as that is how we submitted it. The output files from the permeameter should've also been included in the review package as supporting information. I have none of this data, but I hope \_\_\_\_\_ kept all the files he generated during the reviews. What's going on here? Hey \_\_\_\_\_, want to come to work for the district?

-----  
Subject: Help

I need any data, or calibration information that you can find for the following data package:  
FY95 Water permeability of core from borehole SD-9, 23 Feb 95 to 17 Apr 95.  
GS950608312231.006

In particular, since I have to make an entirely new data package (under the new rules) I will need the output files from the low pressure permeameter not the output files from the untracked software output files from \_\_\_\_\_'s prog. The current plan is to make an entirely new data package following the current format. What da hell is wet bulk density anyway!!! since is not defined in HP-229 and no body uses it for anything. DO WE NEED TO SUBMIT THIS????? (Sure you recognized \_\_\_\_\_'s writing style in this para)

P.S. Do we now need a statement explaining why the data summary was modified?

-----  
**# 63**

Date: 10/27/2000  
Subject: RE: INFIL2 software QA

To all,

As \_\_\_\_\_ stated in a previous email, if we do not parallel process we will not finish software QA until the end of FY01. From the onset, the QA procedure could not be followed because the work had been performed prior to the procedure being written. All we are now doing is making pretty documents for lawyers. If we had followed the PVAR procedure we would probably just now be getting ready to run the model, and this would be 1.5 years too late according to the TSPA-SR schedule, so there would be no point in doing any of the work, and there would be even fewer reasons for the USGS to be associated with YMP.

**# 64**

Date: 12/06/2000  
Subject: Re:Signature pages

We didn't deal with it because there was no time to deal with it, and there is even less time now. Since I would have to go to \_\_\_\_\_ to get the answers, and he is no longer on YMP, my decision is to not talk about the subroutine at all. So please axe it from all flow charts, and proof all documents to make sure it is not mentioned. I will do the same.

Here is the ITP: ITP DRAFT INFILv2.doc Do you need the program files too?

How should we handle \_\_\_\_\_ review of the VTP? Should I send you the document she reviewed and we send this version to CP1, or should I send you the newer versions that incorporated \_\_\_\_\_ comments and some of my own revisions (I found some mistakes)?

**# 65**

Date: 12/20/2000  
Subject: Re: my address

Thanks for the address. How are things back east? Did you hear, \_\_\_\_\_ is going to work for UNLV? The position for \_\_\_\_\_ has fallen through. LBNL got tired of waiting. I don't know if they will become a sub to BSC or not. We still don't know anything here. Total chaos. People are starting to get edgy. I talked to Carlsbad. If the positions get funded under a new CR, I am still in the running. If they make an offer I am out of here. \_\_\_\_\_ is going to the other side as an engineer for U1A. Good move for him. \_\_\_\_\_ is retiring tomorrow. USGS here is out of control. \_\_\_\_\_ said they are only going to submit raw data and nothing else. \_\_\_\_\_ is still trying to work under LBNL notebooks. Tunnel work is slowly restarting. They are compiling a major CR that sucks money from everyone to rewicker the project. TCO was hit for 600k. \_\_\_\_\_ is fighting that battle. I think they are looking for around 15m. Where are you for X-mas? When are you going to sell the house? If you are back here give us a call. Otherwise it is still the same ole Wally World. Have a good holiday season if I don't talk to you. Tell \_\_\_\_\_ hi for us. Talk to ya later.

**# 66**

Date: 12/20/2000  
Subject: Re: my address

Greetings from cold, snowy Dover. We got our first snow (about 2 inches) last night. I forgot what a pain it is to scrape windows etc.. Other than that things are going fine. I am coming up to speed on the project and figuring out what we have and have not been doing. I talked with \_\_\_\_\_ on Monday and heard she was moving to UNLV. This is probably the best move because it will let her work on her master's at the same time. I hope you hear good things from Carlsbad. I see no future for anyone at YMP. What is just turning out raw data? Has \_\_\_\_\_ laid anyone off or are they hoping for money later in the year? All I can hope is that \_\_\_\_\_ keeps making a bigger mess and gets stuck cleaning it up. Hopefully he will have to clean up all of \_\_\_\_\_ old messes. He really deserves whatever he gets stuck with.

I am flying into Las Vegas tomorrow night. I will stop by the offices on Friday but I believe you will be out of there. Would you like to meet for lunch? I have plans in the evening but would love to get together if possible. During the holiday I will be fixing a few final items at the house and getting a For Sale sign in the front yard. Hopefully we will move the house by Feb.

Where are you today?

Talk with you soon and say hi to \_\_\_\_\_ fro me.

\_\_\_\_\_

**# 67**

Date: 01/16/01

Subject: INVIL V2.0, VTR

I have started reviewing the VTR. Two things immediately came to my attention. First is that you reference an ITP and VTR qualified and submitted by the OCRWM M&O, and indicate your VTR describes the results of re-execution of these plans which you acquired in accordance with section 5.9.3.1. This is incorrect. You used INFIL v2.0 under Section 5.11 of the software procedure. The process to follow is that you do all the qualification for INFIL v2.0, compare output of the unqualified version with this newer, better, qualified version, and document this comparison in the SAP. The M&O has not qualified INFIL V2.0 and I find nothing in the data base (software configuration management baseline) to indicate otherwise. I'll be changing the language to reflect use of 5.11.

The other important issue is that you are supposed to have been the tester and \_\_\_\_\_ was to do the technical review. I thought that is what we agreed would be in print. However, in the first paragraph under the section titled "Validation Test Plan", and in another place, you indicate \_\_\_\_\_ is the tester. If this is the case, that's fine as long as you let me know who reviewed the test so that I can change the signature page to correctly identify the people who are involved in this work.

Information required per the Control Point 2 checklist that must be incorporated in the VTR includes:

- 1) Special tools and equipment (type, nomenclature, model numbers, serial numbers.  
If these items do not apply, one needs to say as much to prove the item was considered (I think this is probably the case.)
- 2) The files you attached that are in fortran or some other language: I'm not sure what to do about getting these into the SCM. I can't download the files – at least not without help. In the best case scenario, the SCM won't want these; however, I seriously doubt that is the case. I will check this. I will see if we can forward the email you sent with these files to the ITSMA and then to the SCM, with the condition that it is upon them to get the media downloaded. I'm not real sure they will buy off on this. If we must submit them, I may be asking you to copy these files to a disk that you can forward to \_\_\_\_\_ or to me so that we can get this to the SCM.

Other than the two (maybe 3) glitches noted above, this looks like a great job. I'll be taking a closer look tomorrow, to be sure I haven't missed anything within the actual results text.

\_\_\_\_\_

**# 68**

Date: 01/16/2001

Subject: Re: INFIL V2.0, VTR

\_\_\_\_\_,  
I cannot continue providing support to this activity. I have given you the results of the comparison test, along with the tables I compiled. I have conducted an exhaustive software validation test, and \_\_\_\_\_ has reviewed this. I have promised some attempt at a UM by 2/28/01, if all goes well. Right now all is not going well so the UM is getting pushed out 2

more months. There is no other action I am going to take. Someone (not me) needs to review all the CP1 documents. If mistakes are found, someone (not me) will need to fix them. Someone (not me) will need to take on the responsibility of responding to your email below. This is no longer my problem.

**# 69**

Date: 01/18/2001

Subject: Re: INFIL VTP

Good catch. XX is place holder. Change to "section 7.0 of ITP". I expected more errors would surface, so I'm glad to hear you had the chance to double check everything before sending to CP1.

Do I now print out the signatures pages with the new dates, sign these, and overnight to \_\_\_\_\_?

Sounds like you need to lie to ITSMA about when the comparison test was performed, because I am not going to redo this. Someone will need to change all the file dates. Or I email you all the inputs and you can redo the test. Of course then you need to show what CPU was used on all the documents, and run the ITP.

**# 70**

Date: 01/19/2001

Subject: INFIL CP1 documents

It makes me a little nervous to talk about lying to the ITSMA in a DOE-available email so I'm using the USGS lotus notes instead. Now there's an interesting thought – me doing the testing. I'd like to have the opportunity but I don't see much chance as there would be the learning curve period and of course I'd want a help person/tutor – you available. Once I got the email from \_\_\_\_\_ regarding the timing of the comparison, I discussed the timing for the test with Bill. I knew quite some time ago that it was not clear how this should be done. I asked for guidance (you may remember this) and was counseled to proceed as we have been doing ...

The file dates needing to be changed might be a problem; however, I have opened a couple of the files (dwl-ym1.v23 and one other) for the Q-d software run of one of the comparisons, and there are no visible printer-output dates. I have the files in two sets of folders, one for Comparison 1 and one for Comparison 2, and then have sub-folders for Q-d run files and Non-Q-d run files. Soon I will go through each of the Q-d files to check for dates to make sure there is nothing to prevent submittal of these when the time comes. Would you take a look at the lists below to make sure I have currently indexed these files?  
(See attached file: COMPARISON 1 LIST of FILES.doc) (See attached file: COMPARISON2 FILE LIST.doc)

In answer to the question about signatures, I changed the headers and footers on the CP1 documents to correlate with the signature page dates we already have (4 December 2000 for all but the SAP, which has the 5 Dec date). The dates that show within the cover and signature pages) not the header and footer), but the date within the titles) can be different (earlier) because each document was initially drafted before the finalized document was issued. This is one of those details that is cumbersome but has to be right, and another good reason for having a checker to look things over.

**# 71**

Date: 01/26/2001

Subject: Re: Questions

\_\_\_\_\_,  
1. please fix you email  
2. see cut and paste below (from VTP)  
3. my advise is to sit down with all material before you now, read everything carefully (including AMR and the source code), and figure this stuff out. Or just submit to CP1 as is. This is your responsibility now. I understand your questions, but why were't you asking these questions 3 months ago? I thought you were ready to send everything to CP1 in December. My schedule is full and I advise you not to count on further input from me.

**#72**

Date: 02/14/2001

Subject: none

Let's be sure that it's not written in the past tense! We can be just a little creative, but be careful.

THANKS!!!

Subject: Scientific Notebook

Hi \_\_\_\_\_,

please open a new SN for the low-temp TSPA net infiltration exercise. The notebook should begin:

1. AMR U0010 was followed as a procedure to extract 6 new watershed modeling domains for development of a southern extension to the FY99 net infiltration model area documented in the AMR.
2. All source data is identical to source data documented in AMR U0010.
3. All routines and model codes are the same as those documented in AMR U0010.

I will add a 1-page write up to this. That should be all you need. When ready, send me the notebook for signatures, then we'll send it back so you can close it.

\_\_\_\_\_

-----  
Subject: Scientific Notebook

\_\_\_\_ strongly suggested and I agree, we need to track this exercise with a scientific notebook. Please contact \_\_\_\_\_ to open a new one for just this exercise. Thanks!

-----  
Subject: Re: Scientific Notebook

This email is currently marked "Not Relevant"

\_\_\_ is focused on sci.notebooks. I would suggest talking to \_\_\_\_\_ about the QAIS support.

-----  
Subject: Re: Scientific Notebook

\_\_\_ and I discussed this and think this is the best way to open the scientific notebook and not have to have many details. We will identify where the data comes from by reference to the AMR. When we send the final data to LBNL we can close the notebook. We appreciate the help in having a full time YMP person keeping us honest and following all the rules. Should we assume that \_\_\_ has been assigned the responsibility for keeping us in full QA compliance? Also, we may want to backdate the notebook to when we started putting things together, if practicable.

\_\_\_\_\_  
Date: 02/13/2001  
Subject: Scientific Notebook

\_\_\_\_\_  
Below is the cook-book procedure being followed to develop the low-temp TSPA results. All we need to do is paste this into the SN and we are close to being done.

- 1) Define Watersheds using the modeled drainage network (modeled drainage network is documented in AMR)
- 2) Extract watersheds and compile and analyze area coverage (I can include the selected pour points and a map showing the watersheds overlain by the new UZ model boundary)
- 3) Define model control files (I can send you the files)
- 4) Perform model runs based on climate inputs and root zone parameters defined in the AMR (A total of 10 simulations for each watershed).
  - A) Modern climate
    - 1) 1980-1995 record (Yucca Mountain)
    - 2) 4JA 100-year stochastic simulation
    - 3) Area 12 100-year stochastic simulation
  - B) Monsoon Climate
    - 1) Nogales (AZ) upper bound #1
    - 2) Hobbs (NM) upper bound #2
  - C) Glacial Transition Climate
    - 1) Rosalia (WA) upper bound #1
    - 2) Spokane (WA) upper bound #2
    - 3) St. John (WA) upper bound #3

- 4) Beowawe (NV) lower bound #1
- 5) Delta (UT) lower bound #2
- 5) Compile individual model runs by post-processing using the routine MAPADD20
  - A) Modern climate
    - 1) lower bound would be the driest of:
      - 1980-1995 record (Yucca Mountain)
      - 4JA 100-year stochastic simulation
      - Area 12 100-year stochastic simulation
    - 2) mean would be the average of:
      - 1980-1995 record (Yucca Mountain)
      - 4JA 100-year stochastic simulation
    - 3) upper bound would be the average of:
      - 1980-1995 record (Yucca Mountain)
      - 4JA 100-year stochastic simulation
  - B) Monsoon Climate
    - 1) lower bound would be the modern mean, A2 above.
    - 2) the mean would be the average of B1 and B3
    - 3) the upper bound four be the average of
      - Nogales (AZ) upper bound #1
      - Hobbs (NM) upper bound #2
  - C) Glacial Transition Climate
    - 1) lower bound would be the average of:
      - Beowawe (NV) lower bound #1
      - Delta (UT) lower bound #2
    - 2) the mean would be the average of C1 and C3
    - 3) upper bound would be the mean of:
      - Rosalia (WA) upper bound #1
      - Spokane (WA) upper bound #2
      - St. John (WA) upper bound #3
- 6) if needed analyze results (this part still not crystal clear, but I am planning on developing 1 Arcview map for each net infiltration result (net infiltration only).
  - A) develop summary statistics (optional)
  - B) display spatial distributions (ARC/View maps and figures)
  - C) Compiles statistics for new repository area and new UZ model area (optional)

-----

Date: 02/13/2001  
 Subject: Scientific Notebook

Hi \_\_\_\_,  
 please open a new SN for the low-temp TSPA net infiltration exercise. The notebook should begin:

1. AMR U0010 was followed as a procedure to extract 6 new watershed modeling domains for development of a southern extension to the FY99 net infiltration model area documented in the AMR.
2. All source data is identical to source data documented in AMR U0010.
3. All routines and model codes are the same as those documented in AMR U0010.

I will add a 1-page write up to this. That should be all you need. When ready, send me the notebook for signatures, then we'll send it back so you can close it.

\_\_\_\_\_  
-----  
Date: 02/13/2001  
Subject: Scientific Notebook

\_\_\_\_ strongly suggested and I agree, we need to track this exercise with a scientific notebook. Please contact \_\_\_\_ to open a new one for just this exercise. Thanks!

**# 73**

Date: 02/15/2001  
Subject: Re: \_\_\_\_\_/\_\_\_\_\_ effort for Infiltration for the Low-Temperature TSPA

\_\_\_\_\_,  
When do you plan on having the revised plan approved? Do you know that the DI number will be. As you know we can initiate a Scientific Notebook and point to the plan but we cannot actually start work without an approved plan. Should time be an issue one potential option might be to have Berkley provide actual written "guidance" to initiate work but that guidance must include the specific planning information that would eventually be included in the plan. Obviously what we do and when we initiate work on this activity is in LBNL control. Please let us know what you have decided.

**# 74**

Date: 02/20/2001  
Subject: Re: \_\_\_\_\_/\_\_\_\_\_ effort for Infiltration for the Low-Temperature TSPA

\_\_\_\_\_,  
Just checking on the status of the question I asked below. We will not be able to open the Scientific notebook (i.e., initial entry and initial compliance review) without answer from yo as to what you want us to do. Unfortunately, according to procedure we cannot start work without the SN in place. I have a placeholder in the system to get the SN number and we have started drafting the initial entry, but without guidance from you we can progress no further. Sorry to such a pain in the \_\_\_\_\_.

**# 75**

Date: 02/20/2001  
Subject: Re: \_\_\_\_\_/\_\_\_\_\_ effort for Infiltration for the Low-Temperature TSPA

I talked with \_\_\_\_ on the phone today. I told him we could be ready to send out 1<sup>st</sup> batch of results by the 26<sup>th</sup>, but not if this would look screwy because USGS can't start work until SN is in place. \_\_\_\_\_ strongly implied to me that he wants to stick by the rules, and we should not be conducting work until the SN is in place. But we can't finish the SN until \_\_\_\_\_ responds to \_\_\_\_\_' questions. I will need to make the apparent schedule slip unless they can figure out the

YMP-QA stupidities by COB today. If we don't let the schedule slip, they will catch on that it takes much less time to get the results out than what we say it takes.

**# 76**

Date: 02/27/2001

Subject: INFIL V2.0 media

Hello \_\_\_\_,  
Perhaps you are out of town, as you have not responded to my last phone calls, so I am emailing you.

With help from \_\_\_\_\_, I am working on revising the Installation Test Plan (first submittal of the plan was rejected by the project SCM). In addition to this, I am working on the User's Manual (with help from \_\_\_\_\_) and then looking at the Validation Test Report you drafter, for the purpose of editing/enhancing if necessary. Along with these items, the USGS-YMP must submit a copy of the media for the qualified version of INFIL V2.0. Would you please send a copy of the source and executable code to me, so that we have this for submittal with the CP2 documents.

Although I had asked for the pre-Q version of the code from you, the SCM located the pre-Q version of the source and executable program code you sent to them last year, and they are sending a copy of that to me so that I don't need this from you anymore.

Hope all is well,  
\_\_\_\_\_

**# 77**

Date: 3/06/01

Subject: INFIL v2

I don't know if this was resolved yesterday, but I received a phone message from \_\_\_\_\_ and \_\_\_\_\_ that explains that the zip directory that was sent to YMP that included the fortran code for infil v2 was to the same as the code/files used to produce the executable file. Either all the files were not there to run it or the code was actually different. Anyhow, \_\_\_\_\_ could not get the file to run.

**# 78**

Date: 03/06/01

Subject: Re: INFIL v2

I have no clue what YMP did. So far, YMP has had a history of screwing up everything I've sent them. Their records system is useless.

**# 79**

Date: 03/06/01

Subject: Re: INFIL V2.0 media

Hi \_\_\_\_\_,

The code SCM is sending you is the correct code. If anyone wants to locate the correct version, it is much easier to go back into email as opposed to looking around in my office (I've distributed the code to all a number of times). It is also located on the Gateway D drive. A file search of "INFILv2" will turn up at least 50 copies. I am including a copy here: (See attached file: Infilv2.for) Note that this code has not changed since 3/2/00.

**# 80**

Date: 03/06/01

Subject: Take a look

See the email below the following draft. I decided to write \_\_\_ first.

\_\_\_\_\_,  
Hello. thanks for getting back to me on this. Unless there is something \_\_\_\_\_ needs to be (via DOE email) before any questions have been ironed out, please use this USGS address. It does work now – finally.

I thought the before and after AMR (Q vs non-Q) code was supposed to be the same. However, we need to make sure the timeframe for changes correlates. You indicate the last changes were made in March 2000. Is it correct to say that the code was not changed between the time all program output included for the AMR work was documented as existing, and the time the AMR was first submitted?

right now, we have one issue that \_\_\_\_\_ found while working with me to enhance the ITP to meet the information requirements. This is that the code shown in the fortran file (.for) does not entirely match the compiled executable code. This became apparent while comparing the file names for the precipitation and geospatial input files. When the program is run, the precipitation input file is named mod3-ppt.dat file, and the geospatial input file is named t1.w20. The fortran file calls these the pptfile and the iinfile. We tried running the program using the names shown in the fortran printout, thinking (hoping) that this might just be cosmetics. However, the program would not run with the files names differently. Ergo, it looks like the fortran printout is not for the executable code. We need to this to be cleared up as soon as possible.

**# 81**

Date: 03/06/2001

Subject: Re: Take a look

Hi \_\_\_\_\_,

Not sure what the problem is. I ran the ITP several times and everything went well. I used the 3/2/00 version of the code, which is the exact version submitted to SCM on 3/9/00. I do not have these materials at my fingertips anymore, but I did archive everything, so I'm sure I can help out, but no time at the moment. If you look back in email you should find the ITP attachments.

Please keep in mind that there was no time to "clean up" INFILv2. This code is a work in progress. The version being QA'd was intended for a one-time application only. It is not

intended for general use. Many of the debugging options are obsolete and should simply be ignored. This includes the "vwfile" option, which was put in place back in 1998 when \_\_\_\_\_ and I were running the code in the BOA building and we had a hard time completing a 15 year model run without a power failure, so I added a program-crash-restart option. This option was not used for the AMR. I did not have time to take all unused options out of the code back in 1999. So there are some parts of INFILv2 that will never make sense (in terms of the AMR), no matter how much QA is thrown at it. The code was tested to ensure that it was adequate for the intended application, and that is all QA needs to show.

**# 82**

Date: 03/06/01

Subject: Re: Take a look

\_\_\_\_\_,  
Thanks for getting back. As it turns out, although you are required to have a copy of the source code on file, the software procedure only requires a copy of the executable code be submitted to the SCM. It would seem better to have the two items correlate, but if a copy of the fortran code doesn't have to be submitted, so be it. Thinking we need to submit the source code is my mistake. I can't help but worry that you don't have this filed away somewhere, as you are required to do so. If someone looks at the initial media submittal (Under Section 5.11 – Interium Use) and compares that media which includes the .for file, reads the .for file and runs the program and finds the discrepancy, you might be asked to explain what's going on. Especially if the media that will be submitted as the final copy, is executed and found to compare to the initial executable.

I understand that your infiltration modeling is going to be extended. Is this true? If so, will you be using a different software program that is disassociated with the procedural requirements? If you are tinkering with the source code now, are there any files you could send to me that might have the source code that matches the current executable?

LOTS of what'ifs and I don't really know if the poential problem will come about; I just want to fly it by you because it is a possibility. I would have to say that of course the source code is somewhere in your office. I apologize for nagging, but I'll not ask about this particular issue anymore if I don't have to.

With regards to submitting the final media version, will you please cut a CD that does not include the .for file and send it to me?

**# 83**

Date: 03/05/2001

Subject: Re: Take a look

\_\_\_\_\_,  
Here is a description of what I found was wrong. It could be used as a substitute for your last paragraph, or as the body of a follow-up note to \_\_\_\_\_/\_\_\_\_\_ with more information on exactly where the conflict is, if resolution is not forthcoming. It doesn't flow as well as your paragraph. You decide.

For the INFIL 2 program, please consider this a "heads up" for a larger ITSMA problem in the future, as well as a problem for completing the ITP and user's manual currently. The zipped

directory we obtained from Las Vegas contains a fortran source code that does not match the compiled executable for INFIL 2 that is also in the zipped directory. The six files in the directory are infilv2.for, infilv2.exe, infilv2.ctr, mod3-ppt.dat, t1.w20, and t1-4ex.v23. Then the program runs, the initial output indicates that mod3-ppt.dat and t1.w20 were the input files, along with Mod3-ppt.dat is only mentioned in a comment field under the "read precipitation file" section of the source code, near statement 8021, and the following read statement reads from unit 11, which was opened with file=pptfile. The input files opened in the source code are named infilv2.ctl, infile (for the geospatial data), and pptfile (for the precip data). An additional file, vcvfile, was added at some point for inputting finalvwc from previous simulations as initial conditions for a next simulation. An example of this file can not be identified among the files in the zipped directory. It looks like testing was run on the code with (probably?) successive test data sets named in the source code with names designed to keep them separately identified from each other. The executable code zipped up with the test data sets in the zipped directory is simply the last one that had all of the bugs fixed (Yes?, No?). This is sure to raise questions in the mind of any ITSMA reviewer as to whether the source code is that which was used to compile the executable program.

Is there a version of the source code with all the debugging included that has the more generic input file name forms in it? Could that be recompiled and zipped with source code, executable and test input sets that could be used for program verification? The user's manual can be written to instruct users to change the names of test input data files to the generic file names before running the program. The same is true for the ITP. Alternatively, it does not really matter what file names are used (though actual last fortran code that was used to create the current executable code, the user's manual and ITP could direct users to change input data set file names to the ones that are designated in the initial output from the program runs. Whichever, the source code and output from the program runs will have to agree on file names before the code will get through ITSMA review, and it is easier to write the ITP and user's manual with the actual source code that was/is compiled. Later on, an example for vvcfile to be used when ivwcfgl is set to one will probably be necessary also.

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**# 84**

Date: 04/06/2001

Subject: Re: Validation Test Report for INFIL v2.0

Hello,

Thanks for writing back; however, if I understand your reply, this is not the concern I addressed in my previous email to you. We are working to get the technical review for the VTR completed. The several copies of the VTP show that \_\_\_\_\_ reviewed these and we sent the VTP forward to reflect this; if has been baselined (qualified). However, \_\_\_\_\_ now is to complete the VTR review task to complete the baseline requirements for INFIL V2.0. For this, he needs the disks I mentioned in the earlier email, as soon as possible. Please get these to him at your earliest convenience. If you have any questions, please give \_\_\_\_\_ or me a phone call. Any other QA issues needed to qualify the work done for AMR comes next.

thanks again, \_\_\_\_\_

**# 85**

Date: 05/08/2001

Subject: Infiltration work

We now have the scientific notebook and can begin the work on infiltration. Which means we can get paid. As you would imagine \_\_\_ and I have already done much of the work in pulling all the data together. \_\_\_ and I have charged to California accounts. To get that money back if would be extremely helpful if you could have \_\_\_\_\_ SV the money to our Death Valley account (4706-56321) then we can recoup all our salary expenses. We can still charge time YMP account but I'd rather do it with an SV if possible.

Thanks.

**# 86**

Date: 07/12/2001

Subject: Re: More NRC question on infiltration

\_\_\_\_\_,  
Here are my responses: (See attached file: NRC-Responses071101.doc)  
Also, I think you should be aware that the USBS is unable to qualify INFILv2, and does not have the resources to continue working on this. I must confide that this means the USGS cannot support the results in the infiltration AMR, and will not be conducting any further work with this code, such as the net infiltration estimates for the southern extension area.

**# 87**

Date: 07/30/2001

Subject: RE: Fy 2002 Infiltration Work

P.S. \_\_\_\_\_'s email concerning the VTR (I think I cc'd you) hit a real sore spot with me because, believe it or not, I agree with \_\_\_'s concerns, and I've become frustrated because I feel that too much time and effort has gone into band-aid approaches in the defense of the 1996-1999 modeling work, as opposed to really trying to increase our understanding of this very difficult problem and come up with better answers. I cannot keep defending the AMR results as something I would go into LA wih, when my hope all along has been that DOE would support the development of improved models, as has been the case with the UZ and SZ.

**# 88**

Date: 08/29/2002

Subject: USGS Publication of 1996 YM Infiltration Report

\_\_\_\_\_:

I probably should have forwarded to you earlier, but I just didn't think of it. The copy of the e-mail below was a direct outcome of the telecom I told you about with \_\_\_\_\_ (DOE-YMP) and \_\_\_\_\_ of the NRC staff. In that meeting, I was asked to get answers to the two questions. After discussing the matter with \_\_\_\_\_, I sent \_\_\_\_\_ this e-mail,

which he probably shared with \_\_\_\_\_. My intent here, obviously, was to tell them that we would try one more time to get the 1996 report approved by the Director. I also felt it appropriate to explain why it hadn't been approved over the last 5 years or so. I felt it would have been highly inappropriate to say what I'm hearing this week from \_\_\_\_\_: "It's a bad report and a bad model and should never be published". My sense is that this kind of characterization would cause the USGS and the DOE a very serious problem if it got back to the N.

**# 89**

Date: 09/04/2002  
Subject: \_\_\_\_\_ and tons of property on record

\_\_\_\_\_,

The \_\_\_\_\_ seem to be a property problem for all aspects of YMP. \_\_\_\_\_ (pre- me) attempted several times, to clean up the \_\_\_\_\_/YMP property situation – with out success. Requesting a list of property that they have etc.

They seem to be unresponsive. I have not attempted to work with them personally/aggressively for there are so many other problems that are much easier to work first.

We (USGS) have 14 items over \$5000 and over 300 items under \$5000 assigned to the \_\_\_\_\_ still on the books.

Yup – there is a problem.

SO.....

"bang head here!"

\_\_\_\_\_

**# 90**

Date: 04/16/2003  
Subject: Re: Request to change the status of DTN: MO0212GWLSSPAX.000 (161271) to be changed from "unqualified" to "qualified" – correspondence Log # 0415036913

\_\_\_\_\_,

We need to discuss \_\_\_\_\_ proposed action. I do not concur with the action and need to escalate the issue. Perhaps we need to talk with \_\_\_\_\_ about it. Fact is, a mistake was made and there is an attempt to minimize the impact of the propagation of that error which from my perspective does not invoke accountability nor responsibility.

We have a DTN with known errors that has been qualified for intended use within an AMR. He wants to mark the original DTN as qualified per said AMR even though he acknowledges that there are errors in the data. Problem is, a portion of the DTN has errors, the rest is good to go. My position is that the use of this DTN should be approached with caution...keep it UQ and everyone who uses it must qualify it for use in their product. If we accept Joe's request, we

have a DTN with known errors marked Q in our database and persons who use it downline will not be alerted to the fact that they need to address those errors if they use it in their AMR. Another case of an attempt to cover up a blunder....I have issues with that.

Date: 04/15/2003  
Subject: Re: Request to change the status of DTN: MO0212GWLSSPAX.000 (161271) to be changed from "unqualified" to "qualified" – correspondence Log # 0415036913

\_\_\_\_\_

\_\_\_\_\_ and I talked with \_\_\_\_\_ about this change request because it seems strange to have a DTN in ATDT listed as qualified that, per the notes that they want added to the comments field of the TDIF, has known errors. Maybe I am being picky but I want qualified data to be error-free – call me crazy!

Anyway, you might hold off on doing anything on this one for right now and if when we get further guidance from Matt, we will let you know.

Thanks.

\_\_\_\_\_

**# 91**  
Date: 06/17/2003  
Subject: Re: Template Files for

\_\_\_\_\_

I have not yet located the files you need, but I will keep looking. The files contain the input parameters to run INFIL.

Without looking at the hard copy, I believe that most of the parameters in these two files are the same as in the file I sent you earlier. So if you have a hard copy, why not just make the changes in this file and the use it?

**# 92**  
Date: 06/17/2003  
Subject: Re: Template Files

I need an electronic copy of the whole data set for your DTN to submit to TDMS, so other users may have access to the electronic files from a controlled source. Right now there is only the hard copy in records which is not usable as input when performing analyses because it's not electronic.

\_\_\_\_\_

**# 93**

Date: 06/17/2003  
Subject: Re: Template Files for Uncertainty Analysis

What about scanning the files? I cannot guarantee that I can find the files. If I can't find the files, how will you solve the problems?

**# 94**

Date: 06/18/2003  
Subject: Re: Template Files for Uncertainty Analysis

If you cannot find the files, let me know and the problem will continue to be a problem for anyone wanting to use the data as input in their analyses, etc. We have tried converting the .pdf file to a text file, but it doesn't convert well, and scanning doesn't work either because the file in the RPC is a scanned copy and it doesn't convert well to text, etc.

I tried every angle and avenue I could think of before calling you because I did not want to bother you with this request. But we were at the end of our options for obtaining the electronic files for these data.

If you cannot find them, then USGS may have to make do with a partial submittal to TDMS of the one file that you did send me, and the other 2 will remain in hard copy only, but it would be preferable to submit the entire dataset for that DTN.

Thanks,

\_\_\_\_\_

**# 95**

Date: 08/17/2003  
Subject: Ksat values

\_\_\_\_\_, the saga continues.

They want me to revise the ranges one more time.

I have a question: why are the values for bulk bedrock Ksat w/filled 250-um fractures in Table 2 of \_\_\_\_\_, \_\_\_\_\_, \_\_\_\_\_, 1996 (conceptual and numerical model of infiltration for the YM area, NV) different from those in u0010, Table IV-3?

Please help. Thanks.

**# 96**

Date: 08/18/2003  
Subject: Re: ksat values

Hi \_\_\_\_\_,

I don't remember, but I think we may have taken weighted averages of different columns in the 1996 report. I noticed the difference at a point in time when it was too late to change things, and we dealt with this issue before, but I can't remember how to answer your question.

**# 97**

Date: 06/16/2004  
Subject: Re: 14 Q Legacy Code Re-Testing, INFIL v2.0, SPR023120040614, STN: 10307-2.0-00

Hi \_\_\_\_\_,

\_\_\_\_\_, \_\_\_\_\_, and I are still moving ahead with the work. The Sandia version of INFIL was QA'd by \_\_\_\_\_ and the Sandia QA team. We've assumed that the code is still good to go until someone tells us otherwise. I just set things up in Sacramento, \_\_\_\_\_ does the actual model runs.

One thing we are doing for validation is regenerating the upper bound modern climate result in AMR U0010, so we'll have some double-checking in place.

As for the USGS version, I am using this for testing, and its working fine, but this stuff doesn't have to be part of the final results, so for now it doesn't seem to be as critical to solve the software QA glitch. But I'm still real curious as to what the heck is going on.

We do need to run the post-processing code MAPADD20 that is included in the AMR attachments. This code was not QA'd by Sandia. If QA decides to put their efforts into disqualifying this code, they may find a way to do it.

**# 98**

Date: 06/24/2004  
Subject: Re: ESTIMATED ANNUAL SHALLOW INFILTRATION AT 84 NEUTRON ACCESS BOREHOLES

Great response to \_\_\_\_\_. Sorry, I seem to be 1 email behind everyone else!

This is a great dataset, because the sensitivity to the selected filter size can be directly included in any application of the data. I feared all this stuff would have to be recreated, and I was telling everyone there was no time to do this. So this data package is saving our butts.

Its a bit strange doing this work. Yeah, I went for the stupid funding. But I doubt now that this will lead into anything for FY05. Even worse, a part of me feels that all I'm doing is handing over our work to \_\_\_\_\_ and crowd so that they can do it all and our chances of future funding is actually decreasing by my jumping into this "put-the-fire-out-yet-again-so-that-BSC-can-get-their bonuses" 3 week effort.

Am I doing more harm than good (helping others undercut us)?

**# 99**

Date: 06/25/2004

Subject: RE: new model runs

I've been rerunning the Pagany Wash calibration runs with the corrected bedrock ksat and 1.6 x PET. The results haven't changed that much from the Wednesday results (I've attached the control file). Based on these results I'm expecting an approx 3-fold increase in net infiltration, with minor runoff generation. The runoff amount is better than zero, but still not enough to generate significant streamflow, so we are not in good shape for calibrating to the streamflow records.

I think we need the bedrock ksat in the 1 to 2 mm/day range (for at least part of the watershed area) in order to start generating enough runoff to match streamflow records. Usually I tweek bedrock ksat during the calibration process. If we decide that we cannot tweek bedrock ksat beyond the alcove 1 log-scaling, getting the model to calibrate may be real difficult.

**# 100**

Date: 06/25/2004  
Subject: RE: new model runs

We can do bad science and force net infil to be within 2x to 0.5x range. Looks like we're supposed to stay within the limits of the climate bounds??? More bad science: we're mixing apples and oranges. Now you can see why things are the way they are at ymp. The real answer is that we simply need a better model (this is what the model is trying to tell us).

To be successful, we will likely need to force another parameter into the unreasonable range. I am going to look at storm duration first, then soil ksat, then flow-area, then soil thickness again. If none of those work, I'll need to start looking at the root zone parameters.

I hope we don't need to reduce soil ksat by 0.1x in order to get enough runoff. Then we may have a model where soil ksat is roughly equal to bedrock ksat. Are you willing to defend this?

Also, we may end up with a model that does not allow saturated conditions at the soil/bedrock interface (all runoff will be generated as precip rate > soil ksat), and this will contradict the field data and the conceptual model. Are you ready to defend such a model?

**# 101**

Date: 06/29/2004  
Subject: RE: new model runs, 1980-95: dh1

\_\_\_\_\_ seems like you're making great progress with the runs. So I'm thinking we can leave the hourly time step to 1 hour?

When the 4ja runs are finished, we can do the direct comparison against the baseline modern climate. This will be a big moment!

I must admit that even though we're saying that we're calibrating using the neutron data and maybe the streamflow data, and the modern climate comparison is being done to validate the u0010 result, in reality the exact opposite is happening. I've selected a model that I'm hoping

will provide a close match to the u0010 result, but still provides a good comparison to the neutron logs and streamflow records.

**# 102**

Date: 07/06/2004  
Subject: RE: FW: Web FTP Sites

I won't worry about \_\_\_\_, but I think the more we show that the original input ranges are wrong, the more we open up the need to redo u0095 (which makes sense). So I think \_\_\_\_'s just worried about opening up that can of worms.

**# 103**

Date: July 06, 2004  
Subject: RE: FW: Web FTP Sites

\_\_\_\_ and \_\_\_\_,

after talking to \_\_\_\_ on Friday, I also realized that he'll want to see that we followed the calibration/validation procedure correctly. I told \_\_\_\_ that I'm calibrating using the subset of np boreholes in the streamflow calibration watersheds and also in WT2 wash (this gives me about 4.1 boreholes). We will validate against the remaining boreholes (I'll identify these soon, so you guys can start on the validation part).

I have also been using the streamflow records for calibration/validation. Not sure whether these should be calibration only, validation only, or some combo.

But we're also validating against the base case run (or its the other way around). I'm not sure how to discuss this, since the reality is that we're using it to calibrate/validate the new model, but then in the write up I think we're supposed to say that its the other way around (we validate the base case against the new calibrated and validated model)?

**# 104**

Date: 7/7/2004  
Subject: RE: telecom

\_\_\_\_, \_\_\_\_

Perhaps we will need to talk with \_\_\_\_ and try to persuade him regarding the pet multiplier and/or the rkpor values relative to the uncertainty analysis. Heck it looks like (according to \_\_\_\_?) that the new model is much more sensitive to rkpor. Doesn't that already call into question the results of the uncertainty analysis? If so then it's almost a moot point that we use values outside the range of the uncertainty analysis input (except it's less obvious I guess). Maybe the case could be made that increasing the high range of the pet multiplier would make the uncertainty results less conservative (the upper-bound would make the climate weighting factor would decrease relative to the mean)?

**# 105**

Date: 7/8/2004  
Subject: one more model

Silly me, I was killing myself trying to find a good model (within 2x basecase) with rkpor = 0.02. But when I used 0.024, everything went much easier. This degree of sensitivity to rkpor is a little scary.

brsdepth and rkpor are related (dependent) because the 2 are multiplied to get the root zone storage capacity for water available for ET. I decided to leave this at 2 because this is now the neutron probe flux calculations are defined, and I didn't want to start mixing apples and oranges.

anyway, I've found a model (h104) that is within all the u0095 input ranges, calibrates OK (though not as good as e66 or e75), and should be within 2x of the basecase (though it will be wetter than basecase). I'll send the model you're way in the morning, and I can start running the mod3 runs with this model if you want. I guess I was hell bent on finding at least one model that worked and yet did not violate the input distributions. But I don't think I've found an optimum model yet. Its just too hard with trial and error.

Anyway, I'm done with testing models. Its time to go with what we've got, but I think it will work out good. If there's time, we may want to rerun the models using the 1.6 PET multiplier (and 1.26) and use the 1.4, 1.46 combo instead.

**# 106**

Date: 7/8/2004  
Subject: just a thought

You know, I'm starting to wonder if the model results aren't trying to tell us that maybe the u0010 basecase result is a little on the dry (low) side, and that's why the calibration/validation has been a little tricky. Certainly the neutron borehole data suggest that for the 1980-95 period, u0010 is on the low side. But the borehole data itself also has a high degree of uncertainty.

So, now I'm real curious how well these models stack up against the other validation results (CMB, temperature modeling, etc).

**# 107**

Date: 07/12/2004  
Subject: model h104 control file

I'm starting to see that the starting model (a00) may provide a better calibration than h104 to the flux data (both models are better than U0010 basecase). So my huge calibration effort may be all for naught.

However, a00 doesn't produce streamflow, and is about 4x greater than basecase so it can't work. This means that our success in validating u0010 is hinged on the argument that we need to account for measured streamflow. In other words, its absolutely essential that we bring the streamflow records into the calibration.

I've attached the h104 control file for wt2 wash

**# 108**

Date: 07/16/2004  
Subject: I've simmered down a bit.

Do you suppose that 10 years from now someone from YMP will have to go dig up a Windows NT machine from some landfill in order to rerun the 1999 version of INFIL?

On the other hand, most of my frustrations with QA at the moment are there simply because I don't have the time. Eventually, QA catches up with everything and does become important. For example, if \_\_\_\_\_ - \_\_\_\_\_ hadn't taken care of the software QA problem (I did absolutely to help her out), we might have been caught dead in the water. Its just hard to deal with all these issues given our schedule. As you can tell it was starting to get to me.

Before moving over to the CA district on my way out of YMP, I remember the KTI meetings and how the lawyers had started to show up and talk about the OJ Simpson case. Their main concern was credibility and traceability, not the science. The science doesn't seem to matter, because YMP will get attacked on whether procedures were followed, instruments were calibrated, workers were qualified, and codes were QA'd. I know this, but I guess it doesn't mean I'll ever stop complaining about it. I'm not anti-QA. I'd just like to solve the scientific issues first, then worry about QA. At the moment, QA seems to be taking too many resources away from the scientific uses.

I'll never forget a famous quote by the great Ed Weeks: Good science without good QA is just good science.

**# 109**

Date: 7/16/2004  
Subject: Re: another question from \_\_\_\_\_

\_\_\_\_\_,  
you're making me laugh! HA HA HA HA

I'm ignoring your email for now.

But I will take the time to say this: it requires code modification. I've decided I don't want YMP work bad enough to go there. Remember what I said: these guys are trying to put bandaids on a road kill. THEY DON'T GET IT!!!!!!!

The more they start digging, the more dangerous it starts to get. There many skeletons in the closet.

**# 110**

Date: 07/17/2004  
Subject: Re: saturation & software

Thats funny, because 1/2 of the results in the AMR were run on an Alpha machine.

And I told the QA folks that that was the case.

Remember, good QA without good science is just good science.

**# 111**

Date: 09/08/2004

Subject: V24 files from 1999 runs

\_\_\_\_, thanks for responding to my emails. That helps much.

One more thing that is very important:

Do you have the \*.V24 output files for all 9 climates from 1999 model runs: We need to submit them to TDMS since mapadd20 isn't Q.

Thanks \_\_\_\_.

-\_\_\_\_

**# 112**

Date: 09/08/2004

Subject: Re: V24 files from 1999 runs

I have all the original files. After 5 years of waiting, you are the first to make this request.

I will pull the files together, zip them, and place them on the SANDIA ftp site. But I may not have to the time to do this until October. I will do the best I can, but I cannot promise anything during Sept 04.

**# 113**

Date: Wednesday, October 13, 2004  
Subject: RE: update

\_\_\_\_\_,  
Could you do me a favor and notify \_\_\_\_ \_\_\_\_\_ that support from me is still needed to help deal with the lingering AMR issues. I need to make sure that I can charge 16 hours of time to the YMP account (I need 2 days time to find/compile/archive/zip the INFILv2 files and return the modern climate lower bound post-processing).

Thanks,  
\_\_\_\_\_  
\_\_\_\_\_

**# 114**

Date: 10/13/2004  
Subject: RE: update

We don't have any funds from BSC in support his work in FY 2005. I'd like to make them sweat a bit.

**# 115**

Date: 02/11/2005  
Subject: RE: V24 files from 1999 runs

\_\_\_\_\_,  
I don't have the files well organized anymore. Here's some stuff I've come across:

I'm not remembering what the last versions of the model runs were (I have my own coding for this). To make sure I get you the right files will take a little bit of time. I'm real busy at the moment.

\_\_\_\_\_  
\_\_\_\_\_

**# 116**

Date: 02/14/2005  
Subject: RE: V24 files from 1999 runs

\_\_\_\_\_,  
the file I sent may not be for the right model. I did not have time to look thru the amr and see what filenames I needed. Also, are you looking at results for the average-climate, or the individual runs?

I think what would help a lot is if you can send me a list of the files you need. Then I'll know what files I'm looking for. I'm not at the office now (I'll be in and out all week).

\_\_\_\_\_

**# 117**

Date: Mon 2/14/2005  
Subject:

—'

The only control file I got from tdms is the one you supplied me for the uncertainly analysis (glacial transition)  
I have looked through the documentation for dtms for any other control files without success. Are the control files in tdms? If so where would we find them?  
We've had not had a problem with the code not running; we just can't get your results for any future climates.  
Attached is the control file for the uncertainty analysis.

**# 118**

Date: Mon 2/14/2005  
Subject: RE: V24 files from 1999 runs

—'

the file you attached is the climate input. I've grabbed this and will double check it. please send the control file, the watershed file, and the summary output file.

Here's the deal: At the moment I'm swamped. I have a presentation to stakeholders on Thursday that I need to get ready for. After that I'm on annual leave until first week of March. At that point I think I can be more helpful with this.

In can't believe you guys are still running that model! Why not just fix it????

**# 119**

Date: 03/15/2005  
Subject: RE: YMP support

—'

Did you get some funding to help us?

If so, the first thing is that we cannot reproduce your results from the 1999 AMR. The control files are not in TDMS. Please dig through your files and try to find the control files that generated all 9 of the 1999 maps and see if you can reproduce your results in the AMR.

We're very glad to get your help.

**# 120**

Date: 03/17/2005  
Subject: All Employee Email (All – Questions about USGS studies at Yucca Mountain Project)

It's about 25 pages of emails that suggest that falsification of records occurred. It concerns the modeling process and such things as when software was installed on a computer, etc. They are mainly from one individual to another individual running of at the mouth through his fingers. DOE has taken a worst case position so they don't have to latter say it's worse than they thought. It is as we've been told many times in the Yucca Mt Project – **all** email gets captured in the DOE system even if you attempt to erase a received or sent email. The individual(s) involved are still with the USGS, but no longer in YMPB.

**# 121**

Date: 03/17/2005  
Subject: RE: Are you OK?

I'm fine. \_\_\_ sent some emails to me and other people that used extremely poor wording. Nothing was falsified and the documents were in place that support that. \_\_\_ just used email improperly to complain about things. Every problem was fixed by me or someone else, or by \_\_\_ in many cases. We still have to go through several investigations but the truth will come out that everything we did is good honest science.

**# 122**

Date: 03/23/2005  
Subject: control files questions

\_\_\_  
I finally looked at the control files you sent on 3/16 for UpperGT (Rosalia), and on 3/17 for lower GT (Beowawe).

I thought we only changed vegcover from 0.4 to 0.6, and bedrock rooting depth from 2.5 to 3 m when going from lower to upper GT climate.

Instead I see that many parameters change including:  
ROOTF1, ROOTF2, ROOTF3, ROOTF4  
MAXWGT1, MAXWGT2, MAXWGT3, MAXWGT4  
RDEPTH1, RDEPTH2, RDEPTH3, RDEPTHF  
FLAREA  
Vcwfact  
Ndaymap  
and the soil and bedrock values of alpha and beta.

By the way, what are vwcfact and ndaymap?

Also, I see that RDEPTH3 changes from 2.5 to 3.0. Is this parameter the same as bedrock rooting depth? Why isn't it RDEPTHF?

We really need your help \_\_\_\_.  
Can you call me or email me with more info?

- \_\_\_\_

**# 123**

Date: 03/23/05  
Subject: RE: control file questions

\_\_\_\_\_,  
I'll explain everything better in just a bit. I'm in the middle of something at the moment. Here's a start:

Vwcfact = multiplier used with wilting point water content to set assumed initial water contents.

This is assumed to be wetter climates.

Ndaymap = output option (number of daily map files)

rdepth3 = assumed bedrock root zone layer thickness (meters)

flarea = assumed effective wetter area parameter (as fraction of grid cell area) for grid cells defined as being in active or well-defined channels (this should be based on the number of upstream cells). The higher the value, the wider the effective channel, and the higher the channel losses. The other parameters define assumed root densities. I think the basic assumption is that there are more roots and deeper roots for wetter climates.

**# 124**

Date: 03/23/2005  
Subject: RE: control file questions

I'm trying to remember if there might be a detailed discussion of input parameters in the now defunct USGS software QA documentation for INFILv2. I do remember putting a huge amount of time and effort into the software QA for the INFILv2 (set up about 20 test cases to show that the program was working as intended). There might be someone with the USGS in Denver or Las Vegas who would still have this documentation.

**# 125**

Date: 3/23/2005  
Subject: RE: control file questions

\_\_\_\_ and \_\_\_\_\_,

don't forget that the comments in the control files are not always correct, so be careful when using the control files to decipher variable names and uses. These control files are the files that were actually used) not cleaned up versions). The correct variable names in the software documentation \_\_\_\_\_ just sent are the names used in the FORTRAN code, so please refer to this when interpreting the control files.

**# 126**

Date: 04/06/2005  
Subject: Re: .ctl files

This email will serve to confirm the voice mail message I left for you today at approximately 1:55 pm PDT notifying you that you are to cease working in support of the resolution of Condition Report CR 507. This is effective immediately. Your authorization to charge up to 40 hours against YMPB 4568-90001 is revoked with the understanding that any time worked in support of the resolution of the condition report up to and including today may be appropriately charged as per my email of March 15, 2005. If you have any questions you may contact me at \_\_\_\_\_.

## **Appendix A4**

# **Request for USGS Certification of Scientific Work**

## **Appendix A4.1**

# **OCRWM Letter Requesting USGS Certification of Scientific Work**



Department of Energy

Washington, DC 20585

October 13, 2005

Received  
OCT 17 2005  
Chief Hydrologist

Mr. Robert M. Hirsch  
Associate Director for Water  
U.S. Geological Survey  
409 National Center  
Reston, VA 20192-0002

Dear Mr. Hirsch:

Thank you for your October 5, 2005, letter regarding Fiscal Year 2006 funding for U.S. Geological Survey (USGS) work in support of Yucca Mountain. In the past, the Department of Energy has provided funding to USGS on a level-of-effort support approach. Our commitment for funding for FY06 will be consistent with the approved work plan between the Department and USGS. The general work areas will be Seismic, Igneous, Geotechnical, Geochemistry, Hydrology, Data Submittals and Publications, and Performance Confirmation tasks.

The Office of Civilian Radioactive Waste Management (OCRWM) Contracting Officer will be providing specific work packages and task descriptions within two weeks. I would expect that you will develop a task plan for the work packages and submit it to the Department as soon as practicable so that we can move on with the execution of FY06 required work. The task plan should include key research and products the USGS will provide to the Department.

Regarding the quality of the technical work and your "commitment to producing work of the highest caliber," I applaud that commitment and would ask that the USGS develop and implement a process to certify the scientific work that it has completed for the Department's Yucca Mountain Project. I would also ask that the certification process that the USGS develops be transparent, traceable, and in accordance with the OCRWM governing documents and quality assurance requirements. I would further ask that the USGS develop and transmit a schedule for completing this certification.

If you have any questions or would like to discuss these issues, please contact either Eric Knox or me at (202) 586-6850.

Sincerely,

Paul M. Golan  
Principal Deputy Director  
Office of Civilian Radioactive  
Waste Management

## **Appendix A4.2**

# **USGS Response to OCRWM Letter Requesting USGS Certification of Scientific Work**



# United States Department of the Interior

U.S. GEOLOGICAL SURVEY  
Office of the Director  
Reston, Virginia 20192

In Reply Refer To:  
Mail Stop 409  
#2006467-DO

**JUL 27 2006**

Mr. Edward F. Sproat III, Director  
Office of Civilian Radioactive Waste Management  
Department of Energy  
1000 Independence Avenue SW  
Washington, D.C. 20585

Dear Mr. Sproat:

This letter is in response to the letter of October 13, 2005, from Paul Golan to Robert Hirsch, which requested that the U.S. Geological Survey (USGS) develop and implement a process to certify the scientific work completed for the U.S. Department of Energy's (DOE) Yucca Mountain Project (YMP). The USGS has reviewed our existing process; we describe that process and an approach for improved implementation herein.

Work by the USGS YMP Branch is conducted under the auspices of the DOE Office of Civilian Radioactive Waste Management (OCRWM) and subject to applicable OCRWM procedures. In addition, the work is subject to the USGS internal review and approval process for products to be published or released to the public.

Over the years, the USGS has delivered Earth-science products to the YMP in many forms including technical reports, maps, and data packages. The majority of the USGS work has been performed under an approved Quality Assurance (QA) Program implementing OCRWM's Quality Assurance Requirements and Description (DOE/RW-0333P). The USGS maintained an approved QA Program prior to 1997, subsequently has worked to OCRWM's QA Program for YMP work, and currently maintains an approved USGS QA Program as an approved vendor for the OCRWM Office of the Chief Scientist. USGS work not conducted under an approved QA Program is of a supporting or scoping nature and is not used directly to support the OCRWM License Application. USGS work has been subject to numerous QA audits, both compliance audits and technical audits.

Most USGS products also received bureau approval in accordance with the USGS product review and approval policy. The policy requires that products undergo technical, editorial, and policy review prior to publication or public release. The objective of the USGS review and approval process is quality and consistency of Earth-science products comparable to that achieved through journal peer review.

USGS Earth-science products developed for the YMP are currently available in the following OCRWM systems:

**Record Information System (RIS):** The RIS is the most comprehensive database for USGS products developed specifically for the YMP. It contains a copy of the actual data or report and the supporting information as required by the specific governing procedure. Additionally, OCRWM's Management and Operations Records Management and Document Control Manager has included some USGS reports in the Technical Information Center.

**Technical Data Management System (TDMS):** The USGS has submitted about 2,300 data sets to the TDMS. Each data set is identified by a unique Data Tracking Number and is accompanied by a Technical Data Information Form (TDIF). The TDIF contains fields that indicate whether the data are preliminary (not reviewed) or final (reviewed); qualified (collected under an approved QA Program) or non-qualified; whether they are subject to verification; and whether they have USGS bureau approval (found in the comments section). As a result of project-wide corrective action reports, project data collected under an approved QA Program prior to June 1999 are flagged as subject to verification. If these data are used as direct sources for quality-affecting products, they must be verified first. Data submitted to the TDMS are linked to the record package containing supporting information.

The USGS also has contributed to YMP products not directly attributable to the USGS, such as YMP Analysis and Model Reports. These reports are developed according to project procedures under the OCRWM QA Program, including multiple check and review phases.

Our review of past and current practices of approving USGS products for OCRWM-sponsored work leads us to conclude additional emphasis should be placed on attaining USGS bureau approval for our work as citable literature. Considerable interpretive work has been published as USGS approved interpretive reports. However, not all work has been published in this manner in order to focus on expeditious transfer of work products to others on the OCRWM team for their use. The USGS believes in the value of providing reports in the citable literature (e.g., journal articles, meeting proceedings, abstracts, and USGS publications). Although it may involve more time and expense, citable literature is generally more concise and accessible to the scientific community. We have determined it is important to implement the USGS review and approval policy for all products being provided to the OCRWM, and to publish the results in the citable literature to the extent possible. In fiscal year 2006, deliverables to the YMP were planned and scheduled with this policy in mind.

The USGS acknowledges the seriousness of the discovery of USGS e-mails that suggest noncompliance with software quality-assurance procedures during work related to infiltration modeling. We have intensified communication with the USGS YMP staff to reinforce the importance of quality assurance and address issues and consequences arising from the e-mails, including a recent 2-day stand-down with all Federal and contract USGS YMP staff and senior USGS management to focus on QA and ethical standards. In addition, the USGS has issued a

solicitation for an extent-of-condition investigation. We will provide the results when they become available.

The USGS, in an October 4, 2001, letter to DOE Under Secretary Robert G. Card, concluded "that the scientific work performed to-date supports a decision to recommend Yucca Mountain for development as a nuclear waste repository." This decision was the result of a careful evaluation based on a variety of input and was not dependent upon any specific scientific result or report. Rather, the overall body of work performed by the USGS, coupled with knowledge and review of the work of others, led to the determination cited above. The USGS endorsement reflects confidence in the scientific method as applied at Yucca Mountain, including multiple working hypotheses, multiple lines of evidence, peer review of key studies, and open discussion of results. The endorsement is only within the scope of USGS Earth-science expertise, and as part of a stepwise, decisionmaking process and phased implementation of the repository program.

In summary, USGS technical work provided to the DOE uses DOE procedures appropriate for the intended use. Quality pedigree is noted in accompanying records and is further verified by a number of audits. The USGS is placing renewed emphasis on applying our internal approval process to ensure the excellence of products and make them available in the citable literature. Furthermore, the USGS approval process provides an analogous process to certification. As stated in Chapter SM 502.4 of the U.S. Geological Survey Manual, "Bureau Approval (previously referred to as 'Director's Approval') validates the scientific excellence of the information product. Bureau Approval ensures that all appropriate reviews have been conducted and that the product is consistent with all pertinent USGS and Departmental policies."

If you have further questions or requests, please direct them to Dr. Robert M. Hirsch, Associate Director for Water, at 703-648-5215 or rhirsch@usgs.gov. If I can be of further assistance, I can be reached at 703-648-7411 or pleahy@usgs.gov.

Sincerely,



P. Patrick Leahy  
Acting Director

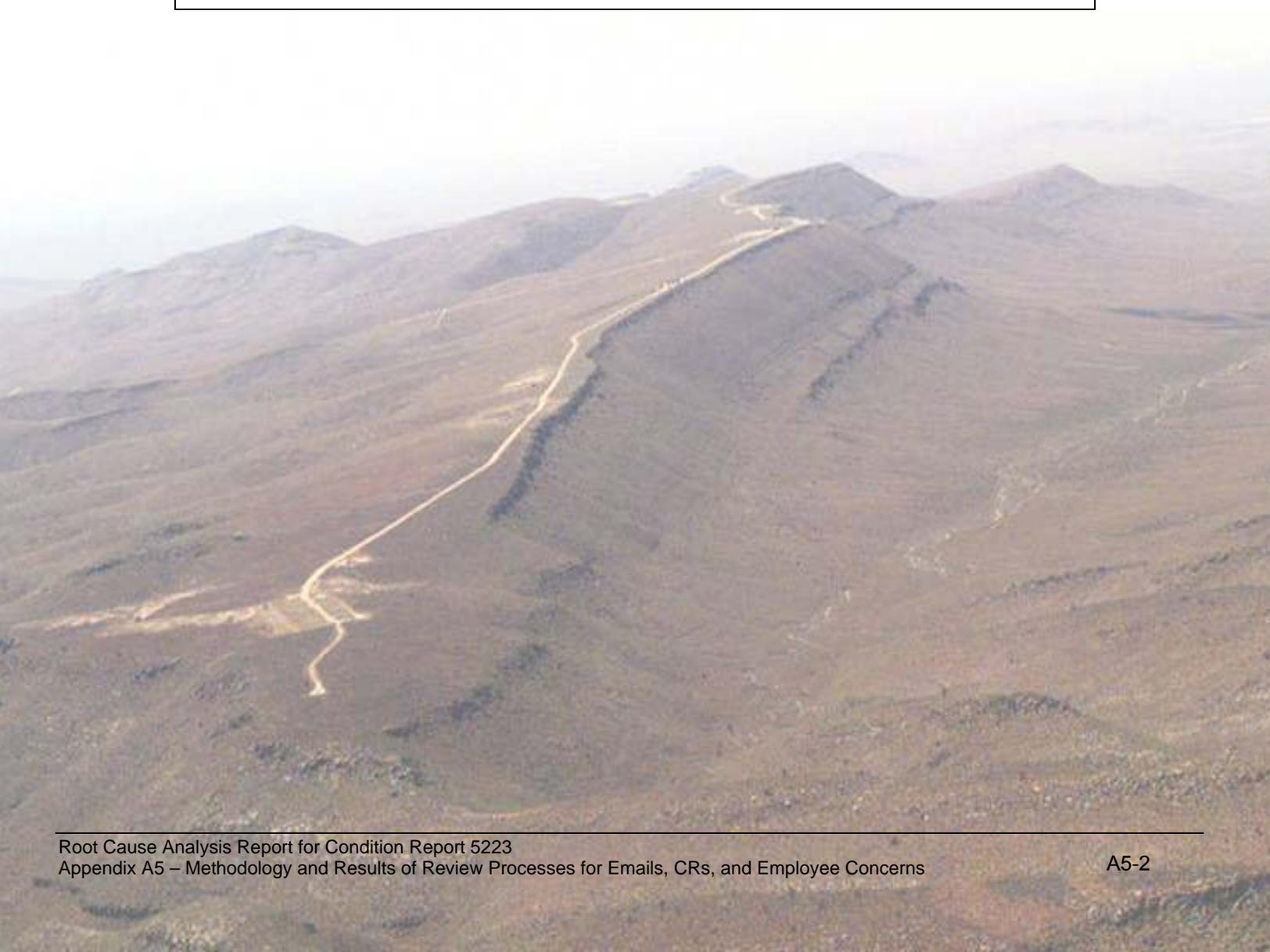
Copy to:  
P. Golan, DOE  
G. Runkle, DOE

## **Appendix A5**

# **Methodology and Results of Review Processes for Emails, Condition Reports, and Employee Concerns**

**Methodology and Results of Review Processes for Emails,  
Condition Reports, and Employee Concerns**

October 2006, Published March 2007



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## Attachments

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Attachment F	Disposition of Non-Relevant Email Records
Attachment G	Disposition of the Email Records of Concern from the 25,055 Sampled
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Attachment I	DOE Office of the Inspector General Email Review

## 1.0 INTRODUCTION

### 1.1 Background

In the Nuclear Waste Policy Act of 1982, as amended, Congress assigned the Office of Civilian Radioactive Waste Management (OCRWM) responsibility for licensing, constructing, and operating a geological repository for disposal of spent nuclear fuel and high-level radioactive waste. OCRWM is preparing an application for a license, to be submitted to the Nuclear Regulatory Commission (NRC), to construct a repository at Yucca Mountain in Nevada.

As part of the licensing process, NRC requires that the Department of Energy (DOE) make available documentary material, as defined by NRC regulations, that could be used in the licensing process. This documentary material will be made available in an electronic format known as the Licensing Support Network (LSN).

In November 2004, OCRWM's management and operating contractor personnel who were reviewing archived emails for possible inclusion in the LSN discovered some emails that suggested a lack of compliance with quality assurance (QA) requirements in work associated with the modeling of water infiltration at Yucca Mountain. These emails were exchanged by employees of the U.S. Geological Survey (USGS) between 1998 and 2001. Subsequent searches found additional emails of concern dating through 2004.

When the discovery of the emails came to the attention of OCRWM in March 2005, several response actions were initiated:

- **Technical evaluation:** OCRWM initiated an evaluation of the technical issues raised by the emails. The OCRWM report on the technical impact of the emails was issued on February 17, 2006.<sup>1</sup> This report stated that the net infiltration rate estimates developed by USGS personnel were corroborated by independent estimates of recharge and infiltration for semi-arid sites in Nevada and elsewhere in the southwestern United States.
- **Programmatic evaluation:** OCRWM also initiated an evaluation of the programmatic (i.e., cultural and QA-related) aspects of the issue. This report supports the analysis of programmatic issues. When the USGS emails were brought to the attention of DOE in March 2005, OCRWM initiated Condition Report (CR) 5223 to address the apparent QA issue. Between March and July 2005, OCRWM federal and contractor staff conducted an investigation into the nature and the extent to which the problems suggested in the USGS emails are present throughout OCRWM. The results of this investigation were documented in a draft *Preliminary Extent of Condition Review*, in September 2005, and submitted to OCRWM management. Contractor staff were subsequently directed to revise the preliminary draft to add specificity about the review processes and results and to bring the review processes up to a consistent baseline date of November 1, 2005.

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<sup>1</sup> OCRWM, 2006. *Evaluation of Technical Impact on the Yucca Mountain Project Technical Basis Resulting From Issues Raised by E-mails of Former Project Participants*, DOE/RW-0583.

On June 20, 2005, CR 5223 was changed to a Level A CR (requiring a root cause analysis and extent of condition determination), and the ownership of CR 5223 was transferred from Bechtel SAIC Company, LLC (BSC) to DOE. This report provides detailed information on the review processes that were conducted for CR 5223 and was used by the team as input into the extent of condition review<sup>2</sup>.

- **Office of Inspector General investigations:** The DOE Office of Inspector General and the Department of Interior (parent agency of USGS) Office of Inspector General initiated investigations into potential misconduct by the USGS employees who exchanged the emails. At a congressional hearing on April 25, 2006, the DOE Inspector General announced that the U.S. Attorney for Nevada had decided not to prosecute the individuals involved in the matter. The DOE Inspector General also publicly released an Investigation Memorandum sent to the Secretary of Energy; the memorandum documented the investigation and identified three “internal control deficiencies” where management attention is needed.

## 1.2 Approach

As a basis for determining the extent to which the attitudes and behaviors suggested in the USGS emails exist within OCRWM, several review processes were designed and implemented. Three types of records were considered relevant to this analysis:

- Emails that were deemed relevant for inclusion in LSN and were available in the Automated Document Image Indexing System (ADIIS), and a subset of Non-Relevant emails
- Employee concerns files maintained by the OCRWM Concerns Program and BSC Employee Concerns Program
- Corrective Action Reports (CARs), Deficiency Reports (DRs), and Condition Reports (CRs)

The volume and types of records to be analyzed drove the methodologies for the different review processes. Reviews were conducted in two phases: initial reviews completed prior to September 2005, and follow-on reviews completed between October 2005 and January 2006. These approaches are summarized in the following subsections, and the methodologies and results of the reviews are described in detail in Section 3.0 of this report.

### 1.2.1 Initial Review Activities for CR 5223

The federal and contractor staff who performed initial reviews developed an approach to look for indications of the attitudes and expressions suggested in the USGS emails. These conditions were identified as:

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<sup>2</sup> A preliminary draft of this report was originally provided to the team in May 2006. Updates on the issues identified through the reviews were incorporated in October 2006, and this revised report was provided to the team at that time. Additional updates were added to this report as disposition of the emails was completed and the report was published in March 2007.

- Negative attitude toward QA requirements
- Expressions of willful misconduct or noncompliance
- Supervisory knowledge of the above, with no action taken
- Longevity of misconduct.

**Emails:** For emails, the following reviews were conducted:

- *Statistical Review of LSN-Relevant Emails in ADIIS* - Emails that were deemed relevant for inclusion in LSN and were available in ADIIS as of May 31, 2005, were addressed through a random sampling approach that resulted in the physical review of 4,500 email records.
- *Word-Search Review of LSN-Relevant Emails in ADIIS* - A word search review was applied to the total volume of LSN-Relevant emails available on ADIIS as of June 22, 2005.
- *Review of Non-Relevant Emails* - Another email review assessed emails that were deemed not LSN-Relevant as of May 31, 2005. A subset of 695 email records, randomly selected out of 332,447 Non-Relevant email records generated by staff who were participants in the license application development process, were subjected to a focused review in the May-June 2005 timeframe.

**Corrective Actions:** CARs, DRs, and CRs documenting indications of willful misconduct or deliberate noncompliance with QA requirements were reviewed using a variety of word searches to identify records potentially indicative of the attitudes and behaviors suggested in the USGS emails. As an additional check, 10% of all CARs and DRs, and 25% of the CARs and DRs generated by USGS, were randomly selected and reviewed in full.

**Employee Concerns:** Staff also reviewed employee concerns documentation maintained by the OCRWM Concerns Program and BSC Employee Concerns Program. For OCRWM employee concerns files, staff reviewed header information and identified a number of reports for more detailed review on the basis of that information. For BSC employee concerns files, staff excluded a number of files clearly not relevant to this inquiry, then reviewed in detail each of the remaining files.

### **1.2.2 Follow-On Review Activities for CR 5223**

In October through December 2005, the OCRWM Project Manager for actions related to the USGS email situation evaluated the initial review approaches for completeness and initiated additional review work to ensure that an appropriate dataset was considered and reviews were sufficiently rigorous. At a minimum, the initial review processes were updated to bring all reviews up to a baseline date of November 1, 2005. The follow-on review activities are indicated below.

## **Emails:**

- Review of an additional 4,500 LSN-Relevant email records from ADIIS, supplementing the prior dataset of 4,500 LSN-Relevant emails
- Review of an additional 4,500 Non-Relevant emails, randomly sampled from the emails generated by a larger group of participants in the license application development process
- A new email review encompassing a larger body of both LSN-Relevant and Non-Relevant Yucca Mountain Project emails: a statistical sample of 25,055 emails was randomly selected from the 14 million email records available in the Yucca Mountain Project Email Warehouse and reviewed.

**Corrective Actions:** Updating the review to the baseline date of November 1, 2005 and inclusion of all Level D CRs as part of the review

**Employee Concerns:** Review of the full text of OCRWM Employee Concerns files

### **1.2.3 Other Reviews**

The email and document reviews conducted in support of the extent of condition review for CR 5223 provide an exceptional level of rigor and a topical focus on the conditions suggested in the USGS emails. In addition to these focused reviews, several other review processes have been conducted, prior to or separately from the extent of condition review, that provided additional opportunities for QA issues to be identified. These include:

- **Reviews of Employees' Own Documents and Emails:** In identifying documentary materials for inclusion in the LSN, employees with active email accounts reviewed all of their email, as well as paper and electronic documents in their possession, for relevancy to licensing. This review is an ongoing requirement imposed on all federal and contractor employees associated with the Yucca Mountain Project. Categorization of emails also includes designating whether an email is a federal record. The email categorization includes an independent "checking" function: emails that are designated by the originator as "not a record" are subject to review by records management personnel to ensure that important issues or relevant information are not being excluded from LSN or federal records management.
- **Review of Inactive and External Users' Emails:** Email generated by individuals who worked on the Yucca Mountain Project in the past but no longer have an active email account, as well as emails sent from external sources to OCRWM email account-holders, have been reviewed. In August 2004, there were approximately 4 million emails in this category, all of which were subjected to review as part of actions necessary for DOE's LSN certification.<sup>3</sup> Trained reviewers read the email in specific individuals' email

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<sup>3</sup> DOE had originally certified that its documentary materials were made available through LSN on June 30, 2004; however, NRC rejected that certification on August 31, 2004, in part because emails of inactive and external users had not been reviewed.

accounts, gaining an insight into the individual's work context and the back-and-forth of email exchanges. The original USGS emails of concern, which resulted in CR 5223, were found through this process.

- **Email Review Related to Office of Inspector General Report:** In conjunction with the investigation into potential misconduct by the USGS employees who exchanged the emails of concern, the DOE Office of Inspector General evaluated the adequacy of the review process for the (at the time) approximately 10 million emails contained in OCRWM archives. In the report, *Quality Assurance Weaknesses in the Review of Yucca Mountain Electronic Mail for Relevancy to the Licensing Process* (DOE/IG-0708), the Office of Inspector General determined that the LSN relevancy review process did not ensure that records indicating “conditions adverse to quality” (i.e., a state of noncompliance with a Quality Assurance Program requirement) were identified. CR 7036 was opened and corrective actions were implemented in early 2006, including a change to the email template requiring senders to indicate whether or not each email sent relates to a condition adverse to quality. Early in the implementation of this change, it was found that senders were being overly conservative by, for example, applying the condition adverse to quality indicator to emails related to existing CRs. Mandatory training was conducted, after which employees generally identified emails containing conditions adverse to quality appropriately.

Audits and surveillances, investigations related to employee concerns and the Corrective Action Program, management assessments, and analyses by external parties are other means by which quality-related issues can be identified. The email and documentation review processes for CR 5223 supplemented this array of other reviews and provided a focus specifically on identifying the attitudes and behaviors suggested in the USGS emails.

## **2.0 METHODOLOGY OF THIS REPORT**

The OCRWM Project Manager with responsibility for the actions resulting from the USGS email situation, with support from staff from OCRWM's Management and Technical Support (MTS) contractor, conducted interviews and a review of data and reports to evaluate the initial review approaches that had been used prior to September 2005. Staff involved in those reviews were interviewed in October - November 2005, either by video-teleconference, conference call, or in person at the Department of Energy's Yucca Mountain Project facilities in Las Vegas, Nevada. Attachment A is a list of the organizations represented in interviews.

Because much of the review processes for emails revolved around statistical sampling, an external consultant was identified to provide guidance and review regarding the determination of the sample sizes for the various efforts. Dr. Christopher Morrell, the Chair of the Mathematics Department of Loyola College in Maryland, was identified for this position. He prepared a report that discussed the sampling methodologies and sample sizes used in the review process and also provided the estimates and confidence intervals for various findings. His report is provided in Attachment B.

Email records identified as potentially indicating the attitudes and behaviors suggested in the USGS emails were dispositioned through a structured process led by the OCRWM Office of Performance Management and Improvement. As records were dispositioned, the MTS contractor received information and incorporated it into the "results" portions of this report.

### **3.0 REVIEW PROCESSES, FOLLOW-ON ACTIONS, AND RESULTS**

This section documents the processes used to review the different types of information provided as input to the extent of condition review for CR 5223. This section also describes the follow-on actions taken to investigate records of concern, and documents the results of each review process.

To understand the processes described in the following sections, it is important to recognize that CRs/DRs/CARs were reviewed by personnel from the Corrective Action Program, and employee concerns were reviewed by managers and staff of the OCRWM Concerns Program and BSC Employee Concerns Program. These reviewers were cognizant of the content, context, and disposition of these files.

In contrast, the email reviews described in this report were performed by teams of personnel drawn from various areas of the OCRWM program. They reviewed emails written by others and made initial judgments about each email on its face, without the benefit of contextual information that would be available if emails from a particular sender or on a particular topic were reviewed together. The reviewers were trained to err on the side of being overly inclusive and to forward any potentially suspect records for further review. This process resulted in initial identification of large numbers of emails (e.g., 179 from the relevant email search and 111 from the review of email records from the Email Warehouse). The “topical summary” table provided in each subsection summarizes the potential areas of concern in the initial identification of emails for further review. Upon review by personnel knowledgeable of the topics discussed in the emails, the result sets initially identified were reduced to much smaller sets, as reflected in the ultimate disposition summarized in the “disposition” tables and detailed in Attachments D through G. Finally, the results were analyzed to determine which issues constitute indicators of an Extent of Condition, as distinct from work process issues with no relevancy to the Extent of Condition. This aspect of the review is discussed in detail in the conclusion of this report. Ultimately, the reviews and secondary analysis and investigation identified a small number of emails that appeared to exhibit the attitudes and behaviors suggested in the USGS emails.

#### **3.1 Email Record Reviews**

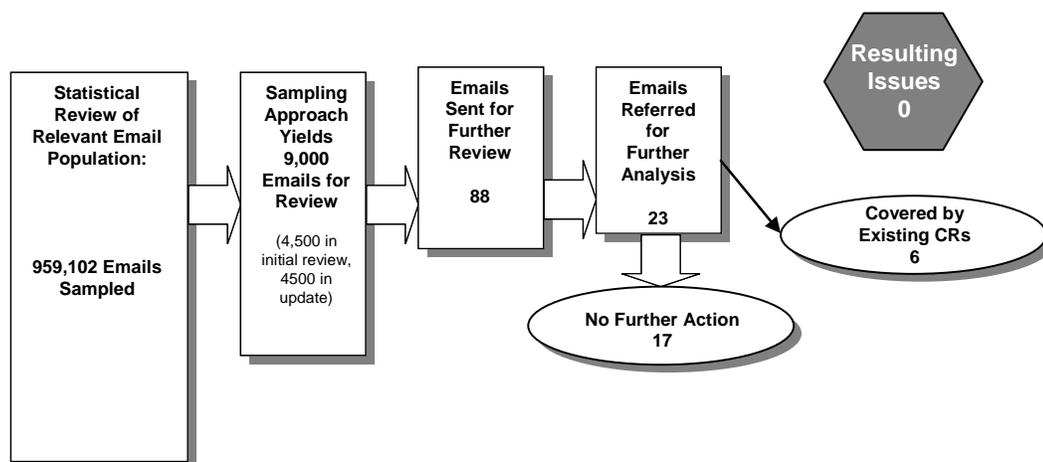
Four distinct reviews were completed to search emails for the attitudes and behaviors suggested in the USGS emails. The reviews included a statistical review of LSN-Relevant emails in the ADIIS, a word-search review of LSN-Relevant emails in ADIIS, a review of Non-Relevant emails, and a review of an additional 25,000 relevant and Non-Relevant emails.

The methodology used in each of the reviews and the results are discussed individually below.

##### **3.1.1 Statistical Review of LSN-Relevant Email Records in ADIIS**

The Office of Performance Management and Improvement undertook the statistical review of LSN-Relevant emails stored in ADIIS. This process is depicted in Figure 1.

**Figure 1. Statistical Review Process for Relevant Emails**



*Process*

The statistical review of the ADIIS emails took place in two phases. The first phase occurred in June and July 2005. This process used a statistical sampling approach to determine whether the attitudes and behaviors suggested in the USGS emails were widespread. After discussions with an MTS statistician, it was determined that a sampling approach using a Poisson distribution was appropriate. Such an approach allowed some degree of precision in stating whether or not the issues associated with CR 5223 were widespread based on the numbers of additional emails detected in a random sample.

Using these assumptions, a standard sampling calculator was used to estimate the minimum number of samples required to achieve a 99 percent confidence level with a 2 percent variance. The calculator required an estimate of the variance using a proportion, and indicated that a minimum of 4,147 samples needed to be taken. A similar sampling calculator, previously used by the Department of Defense, indicated a value of 4,268 using the same parameters and assumptions. The final number of samples selected was 4,500. Emails were selected randomly by staff from CACI (OCRWM’s information technology support contractor for the LSN) using a random number generator.

A subsequent phase, intended to update the review to a baseline date of November 1, 2005, began in December 2005 and was completed in January 2006. An additional 4,500 emails were reviewed in this step; again, emails were selected randomly by staff from CACI using a random number generator.

The process of reviewing the 9,000 total emails was carried out by several DOE and contractor staff, including individuals from:

- OCRWM Concerns Program
- OCRWM Office of Quality Assurance
- OCRWM Office of Performance Management and Improvement

- MTS
- BSC.

*Results*

Table 1 summarizes the potential topics identified in the 23 email records that warranted further review. The records were provided to the OCRWM Office of Performance Management and Improvement for evaluation and disposition.

**Table 1. Topical Summary: Attachment C- LSN-Relevant Email Review**

<b>Topic</b>	<b>Occurrence</b>
<b>Technical</b>	<b>9</b>
- Data qualification/corroboration	5
- Scientific interpretation	2
- Data use	2
<b>QA</b>	<b>9</b>
- Document preparation	4
- QA requirements	2
- CR process	3
<b>Software</b>	<b>2</b>
<b>Management</b>	<b>2</b>
- Supervision/direction	2
<b>Personnel</b>	<b>1</b>
- Whistleblower	1
<b>TOTAL</b>	<b>23</b>

Table 2 summarizes this disposition of these records. Results are documented in detail in Attachment C. Through the disposition process, research and analysis by subject-matter experts and other knowledgeable staff found no substantiated evidence of QA issues similar to those documented in CR 5223. The emails flagged by reviewers were found to represent innocuous communications (e.g., personal opinions or in-process working discussions), discussion of matters not covered by quality assurance (e.g., discrepancies in reference citation format), or issues that had previously been handled appropriately (e.g., through initiation of a CR).

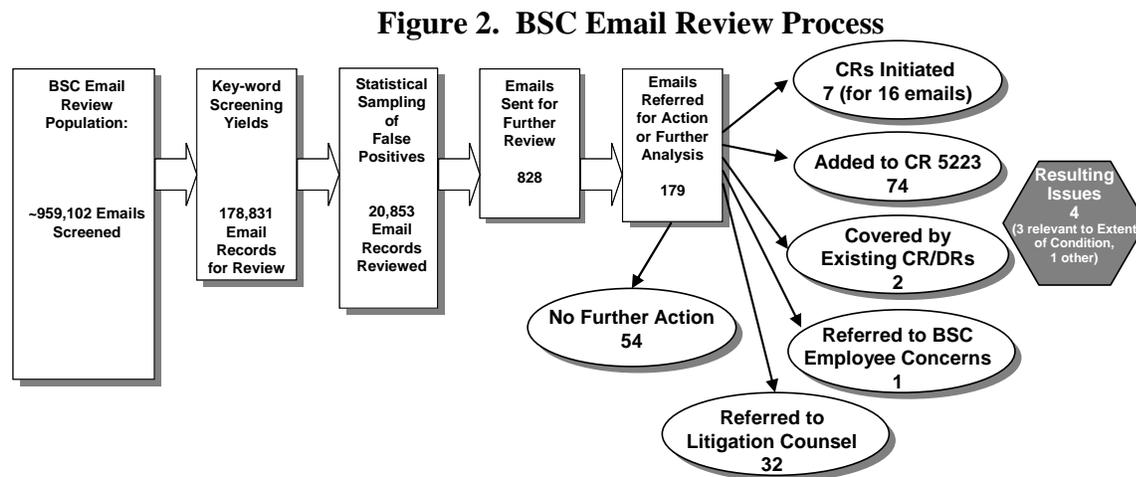
**Table 2. Disposition of the 23 Email Records Identified for Referral**

<b>Disposition</b>	<b>Number of Email Records</b>
Resolved -- No Further Action	<b>17</b>
Covered by existing CRs <sup>4</sup>	<b>6</b>
<b>TOTAL</b>	<b>23</b>

<sup>4</sup> Throughout this report, the statement that a record was covered under an “existing CR” denotes a CR that was not initiated as a result of the CR 5223 review process. In some cases such a CR may have been created at approximately the same time as the CR 5223 review, but the need for the CR was identified independently.

### 3.1.2 Word-Search Review of LSN-Relevant Email Records in ADIIS

The word-search review process conducted by BSC on the LSN-Relevant emails in ADIIS is depicted in Figure 2.



#### *Process*

BSC conducted an initial review in June through August 2005 of LSN-Relevant ADIIS emails using a word search methodology.

BSC developed a list of 70 search terms drawn from a number of sources, including the original USGS emails, input from BSC personnel, and final tailoring by the managers of the task. An additional 13 terms were added as the review progressed, based on observations of terms thought to be more likely to identify the attitudes and behaviors suggested in the USGS emails. The terms were divided into two groups:

- Terms unlikely to be found in the course of scientific and professional communication.
- Terms likely to be found in the course of scientific and professional communication.

Attachment D is the BSC report which lists the search terms used and describes how they were applied during searches. Electronic searches were performed of 959,102 emails to identify those emails that contained the keywords. Reviewers, who were determined by their managers to meet a skills profile established by the email review team management, were trained in use of the ADIIS database and briefed on the purpose of the review. Emails potentially of concern were forwarded to the task manager for subsequent review.

A second phase of this review by BSC, using the same methodology, took place in November and December 2005 to update the review to the baseline date of November 1, 2005. Results from the two phases have been aggregated.

*Results*

A total of 178,831 emails were identified using the word search technique. For 11 of the search terms, it was determined after initial review that there were large numbers of false positives. For those cases, a statistical sampling methodology was used to determine the minimum number of emails requiring review. As a result of applying this additional screen, 20,853 emails were individually reviewed. From this review, 828 email records were found to warrant further review, and from that number 179 were referred for action or further analysis by subject-matter experts. Table 3 summarizes the potential topics identified in these 179 email records.

**Table 3. Topical Summary: Attachment E – Keyword Search**

<b>Topic</b>	<b>Occurrence</b>
<b>Technical</b>	<b>37</b>
- Modeling	10
- INFIL	7
- DTNs	6
- Scientific interpretation	6
- Records management	4
- Testing processes	4
<b>QA</b>	<b>38</b>
- Computer account control	15
- QARD process	12
- Records management	7
- Data qualification/corroboratorion	2
- Scientific notebooks	1
- Procedure review	1
<b>Software</b>	<b>11</b>
<b>Management</b>	<b>18</b>
- Supervision/direction	10
- Budget	5
- Planning	3
<b>Personnel</b>	<b>62</b>
- Unfair treatment/harassment	24
- Job performance	8
- Other Litigation	7
- Grievance	6
- Counseling	4
- EEO complaint	4
- SCWE	4
- Whistleblower	2
- Training	1
- Unknown	2
<b>Backdating</b>	<b>7</b>
<b>Not Related to Yucca Mountain</b>	<b>6</b>
<b>TOTAL</b>	<b>179</b>

After review, the 179 records were dispositioned as detailed in Attachment E and summarized in Table 4.

**Table 4. Disposition of the 179 Email Records Identified for Referral**

<b>Disposition</b>	<b>Number of Email Records</b>
Resolved - No Further Action	<b>54</b>
Referred to Litigation Counsel as Part of Ongoing Litigation	<b>32</b>
CR Initiated (7 new CRs)	<b>16</b>
CR 7148 Initiated <sup>5</sup>	1
CR 7176 Initiated	15
Added to Existing CR 5223 <sup>6</sup> <i>Subsequently broken out as new CRs:</i>	<b>74</b>
CR 7413	2
CR 7414	1
CR 7415	1
CR 7419	1
CR 7422	2
Already Included Under Existing CR (or USGS DR):	<b>2</b>
Covered Under DR (USGS-99-D-041)	1
Covered Under CR 6228	1
Referred to BSC Employee Concerns Program	<b>1</b>
<b>TOTAL</b>	<b>179</b>

Of the 179 emails, 74 were added to CR 5223. Two others had been included under an existing CR and USGS DR.

Ultimately, three new potential issues relevant to the extent of condition review for CR 5223 were identified in the review. (Multiple emails can correspond to a single issue.)

- Two emails from January 2001 suggested noncompliance with software documentation requirements. The author of these emails is one of the authors of the USGS emails that led to CR 5223. The two emails suggested that there was an attempt to synchronize dates

<sup>5</sup> CR 7148 was determined, after investigation, to be a non-issue. It will not be cited further in this report.

<sup>6</sup> Four CRs (6679, 6680, 6681, and 6682) were opened at the time of this email review to document negative attitudes toward QA requirements or noncompliance with such requirements on the part of the USGS employees who authored the emails that are the subject of CR 5223. These four CRs were then closed to CR 5223 so that they could be addressed in the context of the USGS email issue, rather than in isolation. Because of their temporary nature, CRs 6679-6682 will not be cited further in this report. Subsequently, five new CRs were created to address the matters addressed in CR 6681 (for which 7413 was opened) and 6682 (for which 7414, 7415, 7419, and 7422 were opened). Three of these, CRs 7413, 7414, and 7422, were found to represent issues, as detailed above and in the conclusion of this report. CRs 7415 and 7419 were determined to be non-issues and will not be cited further in this report.

for documents and computer files to conform to a December 2000 approval of the INFIL software documentation package. Corrective action includes removing the INFIL software from the software baseline report. CR 7413, Level C, was initiated, and is now closed.

- A December 1998 email discussed startup of geologic mapping activities prior to staff completing the required training. This email was written by a USGS employee, though not one of the employees involved in the original email exchange that led to CR 5223. The email mentioned backdating of training documentation or initiating a deficiency report as two options and indicated that the author understood the situation was a condition adverse to quality. Because no deficiency report was found, backdating was considered likely. CR 7414 was initiated, and is now closed.
- Two June 2000 emails suggested backdating a scientific notebook. These emails were written by USGS employees, though not the employees involved in the original email exchange that led to CR 5223. Investigation found that backdating did occur, but the administrative nature of the notebook entry meant that there was no technical impact. CR 7422 was initiated, and is now closed.

CRs 7415 and 7419 both involved USGS staff who suggested backdating as an option to resolve documentation inconsistencies. Investigations were conducted which found that backdating had not occurred in either case, so these CRs are not listed among the issues identified from the review.

In addition to the results summarized above, this email review led to identification of a work process issue that is not relevant for the Extent of Condition determination. CR 7176 was initiated to address the inadvertent miscategorization of 15 linked emails containing sensitive unclassified computer account information.

BSC's observations and conclusions from the review of LSN-Relevant email records were that:

- Staff did not appear to have systematically withheld from LSN emails not supportive of either the management, technical, or quality-related aspects of the Yucca Mountain Project.
- There was no indication of systematic, willful noncompliance with QA requirements or a negative attitude toward quality assurance across OCRWM.

### **3.1.3 Review of Non-Relevant Email Records**

Staff from the OCRWM Office of Performance Management and Improvement performed the initial review activity, which focused on 695 Non-Relevant email records; a follow-on random-sample review of 4,500 records was completed by MTS contractor staff.

Process

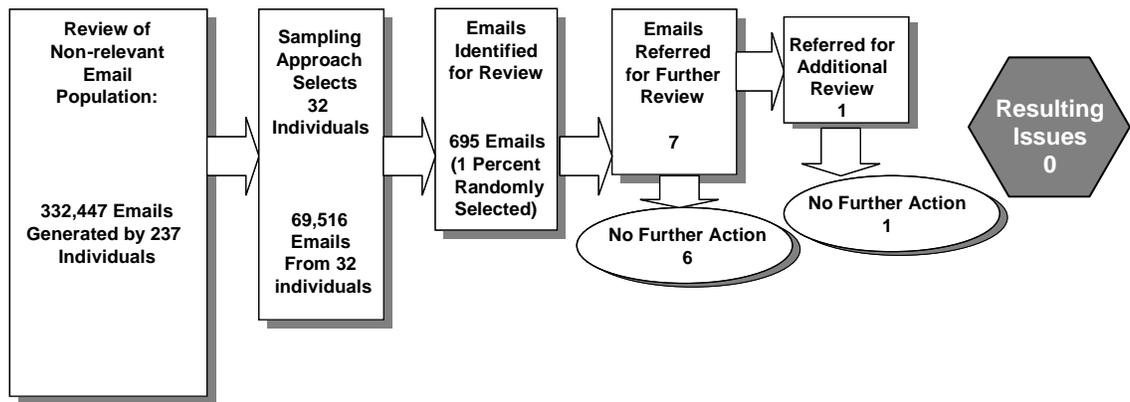
**Focused Review:** At the time of the initial review, there were more than 12 million emails judged to be Non-Relevant for inclusion in LSN. A small sample of these emails was reviewed as a check on whether the attitudes and behaviors suggested in the USGS emails were indicated in emails contained in the Non-Relevant email universe.

Senior managers determined that the sample set would include emails from staff that held positions that might influence the license application and who did technical work on the application. Previously, as part of the LSN checking process, a list of 237 individuals meeting these criteria had previously been developed; that list was a starting point for the selection of emails for review as part of the extent of condition review process. A senior member of the technical staff then selected a subset of 32 individuals for evaluation. The total number of Non-Relevant emails from these 32 individuals was 69,516. A one percent sample of each individual’s emails was obtained, for a total sample size of 695 emails. The random sample of 695 was generated using software from the U.S. Army Audit Agency.

A single individual reviewed all 695 emails, using her extensive Office of Inspector General and Government Accountability Office experience to identify potential problems. The reviewer looked for terms unlikely to appear in appropriate technical or professional communications to identify potential instances of the attitudes and behaviors suggested in the USGS emails.

The process for the focused review of Non-Relevant emails is depicted in Figure 3.

**Figure 3. Focused Review Process for Non-Relevant Email Records**

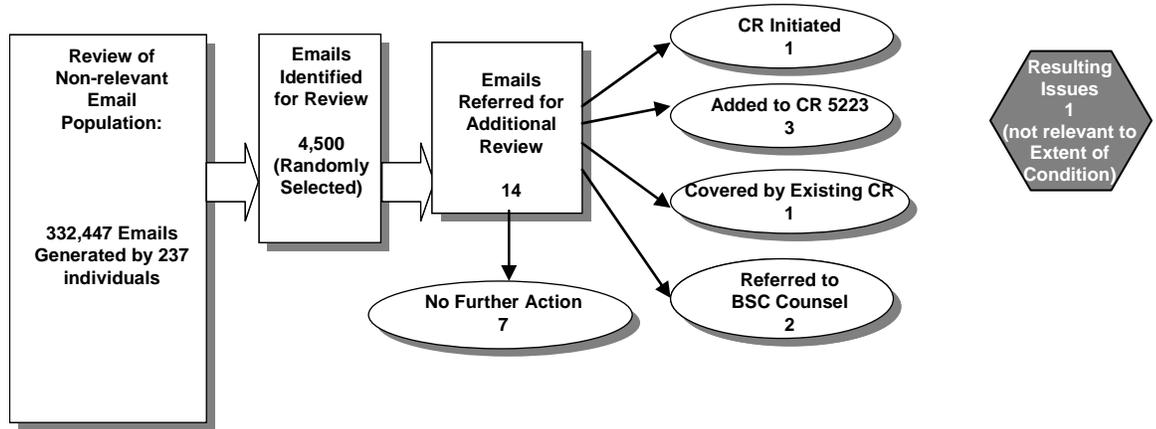


**Expanded Random Sample Review:** In November 2005, the Project Manager for actions related to the USGS emails decided to expand the review of emails from the initial 32 technical personnel to include all 237 technical personnel,<sup>7</sup> yielding a population of 332,447 emails from which a sample of 4,500 was selected for review and disposition as appropriate. This expansion

<sup>7</sup> Email from the 32 individuals who were the focus of the initial review was again sampled during this second review.

of the review was done in order to make its results comparable with those of the other random-sample reviews. Figure 4 depicts the process used for the random-sample review of Non-Relevant emails.

**Figure 4. Random-Sample Review Process for Non-Relevant Email Records**



### Results

The initial focused review of 695 email records identified a total of seven emails of potential concern. These documents were passed sequentially to the OCRWM Office of Quality Assurance, and OCRWM Office of Technical and Regulatory Programs. The Office of Quality Assurance stated that none of the seven emails were of concern but should have a further review by technical staff. Technical staff from the Office of Technical and Regulatory Programs indicated that information in a single email required follow-up to determine if the Seismic Design Basis Report reviews discussed in the email were completed. This email was referred to the OCRWM Office of License Application and Strategy. The staff person who responded from that office stated that the email in question did not indicate noncompliance with QA requirements; it was part of a discussion on the status of deliverables between two Federal employees, and the report reviews discussed in the email had been completed.

The later random-sample review of 4,500 email records resulted in 14 additional records of concern. These emails were provided to OCRWM Office of Repository Development (ORD) staff for additional review.

Table 5 summarizes the topics identified in email records of concern from both phases of the review.

**Table 5. Topical Summary: Attachment F – Non-Relevant Email**

<b>Topic</b>	<b>Occurrence</b>
<b>Technical</b>	<b>13</b>
- Data qualification	5
- Document preparation	3
- Data use	2
- Modeling	2
- Unknown	1
<b>QA</b>	<b>3</b>
- QA process	1
- QA requirements	1
- QARD process	1
<b>Management</b>	<b>5</b>
- Supervision/direction	3
- Planning	2
<b>TOTAL</b>	<b>21</b>

Attachment F provides the dispositions of the records considered to be of concern from both the focused review and larger random-sample review. After review by subject-matter experts, these records were dispositioned as shown in Table 6.

**Table 6. Disposition of the 20 Email Records Identified for Referral**

<b>Disposition</b>	<b>Number of Email Records</b>
Resolved -- No Further Action	<b>14</b>
Referred to BSC Litigation Counsel As Part of Ongoing Litigation	<b>2</b>
CR Initiated (1 New CR)	<b>1</b>
Added to CR 5223	<b>3</b>
Already Included Under Existing CR (CR 0016)	<b>1</b>
<b>TOTAL</b>	<b>21</b>

Of the 21 email records, three have been added to CR 5223. One email record had previously been identified through means unrelated to this email review and had resulted in CR 0016. An additional two email records, related to health and safety concerns, have been submitted to BSC litigation counsel for consideration with regard to ongoing litigation.

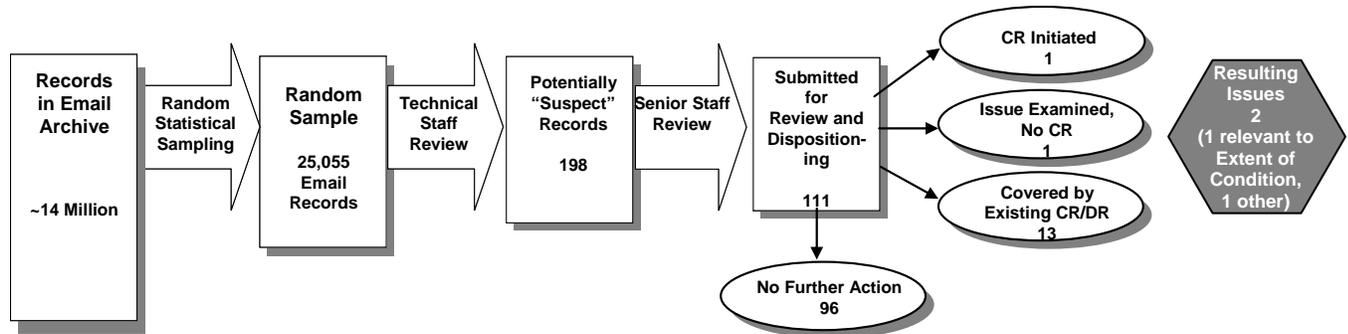
No new issues were identified. This review process did identify one work process issue that was documented and resolved through a CR. Email record LN-019 referred to a technical document that was submitted before all editorial comments were incorporated. CR 8157, Level D, was initiated, and corrective action included development of a style manual identifying editorial work process steps. This CR is now closed.

### 3.1.4 Review of an Additional 25,055 Relevant and Non-Relevant Email Records

The Email Warehouse is a database that resides on a Lotus Notes server, storing all emails sent or received by staff with OCRWM email accounts. In December 2005, OCRWM information technology staff estimated that approximately 14 million unique email records were housed in the Email Warehouse. Because of the large volume of email records, a broad search of the Email Warehouse was deemed necessary to provide a degree of confidence in the email reviews, and a statistical sampling approach was decided upon. Based on consultation with statistician Dr. Christopher Morrell, the Project Manager determined that sampling 25,000 records provided a robust estimate.

In December 2005, two sets of 25,000 randomly selected email records, both LSN-Relevant and Non-Relevant, were extracted from the Email Warehouse. One set was the primary set for review, while the second was a backup: where records in the primary set were unreadable (due to encryption or other technical issues), additional records were randomly pulled from the backup set to replace them, resulting in the total selection of 25,055 email records for review. The review process is depicted in Figure 5.

**Figure 5. MTS Review Process for the 25,055 Randomly Selected Email Records**



#### *Process*

Training material for the review was developed by two MTS staff. One individual was knowledgeable of the issues surrounding the USGS email extent of condition review and also had extensive experience from email relevancy reviews performed in 2004 and 2005. The second staff member was a QA professional, qualified under NQA-1, with more than 20 years of experience on a wide variety of QA activities.

A total of 21 reviewers with prior experience working on various aspects of the Yucca Mountain Project were assigned to perform the review. Potentially “suspect” emails were first reviewed by two senior reviewers and then emails of concern were forwarded to the OCRWM Office of Performance Management and Improvement staff.

For efficiency, the staffing, training, and information technology infrastructure that were put in place for the review supporting the extent of condition review for CR 5223 were leveraged to

also support a review focused on identifying conditions adverse to quality, as part of OCRWM's actions in response to the DOE Office of Inspector General report, *Quality Assurance Weaknesses in the Review of Yucca Mountain Electronic Mail for Relevancy to the Licensing Process* (DOE/IG-0708). CR 7036 was opened to track specific actions associated with this report. One action was to provide additional attention to the total population of emails in the Yucca Mountain Email Warehouse. While the purpose of this review is unrelated to the USGS email issue and the search criteria are different, the results provide additional insight into QA issues.

Because both of these reviews focused on identifying quality-related issues and some degree of overlap could be expected, they were conducted simultaneously, using the same dataset of 25,055 email records. Reviewers were instructed to identify attitudes and behaviors similar to those suggested in the USGS emails, and indications of conditions adverse to quality. Where the reviewers found indications of a negative attitude towards QA or a willful misconduct or non-compliance with the QA Program, they would also look for supervisory knowledge of the attitudes or behaviors, with no action taken, and the longevity of misconduct.

### *Results*

Because the set of 25,055 email records was reviewed both for willful misconduct/non-compliance and negative attitude toward quality assurance (in support of CR 5223) and for conditions adverse to quality (in response to Office of the Inspector General report DOE/IG-0708), the results differ slightly from those of other reviews. Reviewers identified 71 email records as potential indicators of the attitudes and behaviors suggested in CR 5223; however, because the distinction between these characteristics and conditions adverse to quality (as defined in AP-16.1Q) is sometimes nonexistent or difficult to ascertain, all emails identified as records of potential concern were referred for further review. Additionally, the broad focus on quality led reviewers to flag some emails that did not meet the criteria for either CR 5223 or conditions adverse to quality but seemed to have some relevance to QA; these were also included in the set forwarded for further review. These "other" records represent the lowest level of concern regarding QA issues.

Review and dispositioning was performed by the OCRWM Office of Performance Management and Improvement using technical experts and employee concerns staff to assess the emails and provide recommended actions. Results of the dispositioning process are documented in a database.

Table 7 summarizes the topics identified in 111 potential email records of concern.

**Table 7. Topical Summary: Attachment G – Review of 25,055 Emails**

<b>Topic</b>	<b>Non-CAQ</b>
<b>Technical</b>	<b>54</b>
- Records management	25
- DTN	10
- Modeling	8
- Other	6
- Requirements	5
<b>QA</b>	<b>40</b>
- QA process	23
- Records management	10
- Scientific notebook	4
- Calibration	2
- Analysis and model reports	1
<b>Software</b>	<b>6</b>
<b>Management</b>	<b>5</b>
- Security	3
- Supervision/direction	2
<b>Personnel</b>	<b>5</b>
- Job performance	3
- SCWE	2
<b>Not Related to Yucca Mountain</b>	<b>1</b>
<b>TOTAL</b>	<b>111</b>

Appendix G provides details on the email records identified during the review and the dispositions of each one. Further review by subject matter experts dispositioned these records as shown in Table 8.

**Table 8. Disposition of the 111 Email Records Identified for Referral**

<b>Disposition</b>	<b>Number of Email Records</b>
Resolved - No Further Action	<b>96</b>
CR Initiated	<b>1</b>
Issue Identified But CR Not Initiated	<b>1</b>
Already Included Under Existing CR or DR (see Appendix G for Specific CRs/DRs)	<b>13</b>
<b>TOTAL</b>	<b>111</b>

Thirteen email records were identified that, upon analysis as part of the disposition process, were found to be covered under existing CRs or DRs. The email review process also resulted in the identification of two potential issues that were investigated but ultimately determined to have minimal significance for the Extent of Condition review:

- One potential issue was identified through the disposition process but was not substantiated by investigation. Email record 94-195 suggested potential use of unqualified data in an analysis and model report despite a warning that the dataset was not qualified. CR 8152 was initiated as a Level B. Based on information from individuals involved in the work, it was determined that the condition suggested by the email existed in Revision 1 of the report but had been corrected prior to issuance of Revision 2, and the use of data complied with applicable procedures. CR 8152 was downgraded to a Level D and is now closed; however, the broader issue of data traceability is being handled through CR 8396, which was initiated independently of the CR 5223 email review.
- A second potential issue involved an employee, now deceased, of a construction firm that was formerly under contract to OCRWM. The employee, when informed of a tasking to manage two items under the Condition Identification/Investigation and Reporting/Resolution System (CIRS)<sup>8</sup>, responded with a short statement of disdain for the CIRS Team. While this appears to be an instance of negative attitude toward safety-related requirements and behavior contrary to nuclear culture, research indicated that the two CIRS items assigned to the employee were appropriately completed and closed out, and a manager knowledgeable of the employee's activities stated that there had been no issues of concern in the employee's behavior or performance. Due to the historical nature of this isolated instance and the fact that the tasking in question did not involve scientific or technical work under the quality assurance program, no CR was initiated.

### **3.2 Reviews of Corrective Action Reports, Deficiency Reports, and Condition Reports**

Within the Yucca Mountain Project, CARs, DRs, and CRs are key documents providing indicators of quality assurance concerns. The review of these reports was carried out by two separate groups, focusing respectively on CARs and DRs generated from 1989 to September 2003 (at which time a new Corrective Action Program, managed by BSC, was put in place), and on all subsequent reports, known as CRs, through November 1, 2005. Staff from the OCRWM Office of Quality Assurance who are familiar with the system that was in place until September 2003 ran the search of legacy reports. BSC staff familiar with the current system performed the search of CRs. The methodologies and results of each review are discussed below.

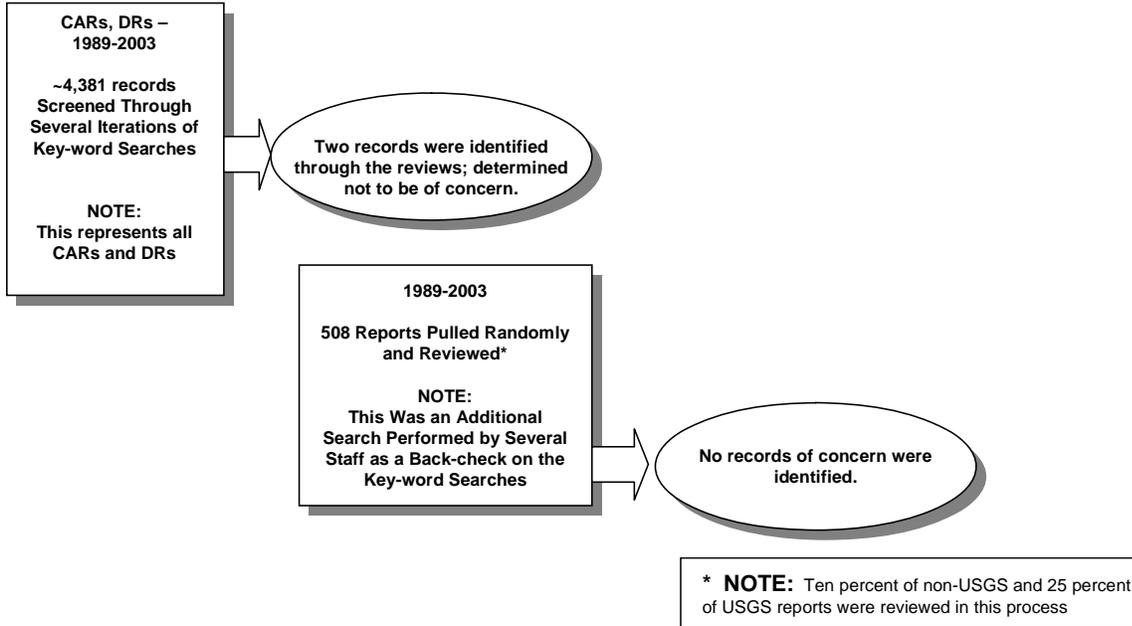
#### **3.2.1 Deficiency Reports and Corrective Action Reports From 1989 Through September 2003**

Staff from the OCRWM Office of Quality Assurance performed a keyword search of documentation generated prior to the beginning of the OCRWM Corrective Action Program (i.e., CARs and DRs). The process for this review is depicted in Figure 6.

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<sup>8</sup> CIRS was a condition reporting system supporting safety in physical operations such as Exploratory Studies Facility construction and maintenance.

**Figure 6. Review Process for DRs and CARs, 1989-2003**



*Process*

Four keyword searches were run on 4,381 records. After a preliminary search returned a large number of hits on terms such as “QA” and “concerns,” the OCRWM Office of Quality Assurance reviewer managing the process eventually developed three separate lists of terms, presented in Table 9, for use in the keyword searches.

**Table 9. Keyword Lists Used in Searching DRs and CARs**

<b>Keyword List 1</b>	<b>Keyword List 2</b>	<b>Keyword List 3</b>
Willful Falsification Circumvent Fabrication Malicious Bogus Waste of Cover up	Back and date Back date Cover and up Delete Fake False <i>(plus other forms of root word)</i>	Misconduct Illegal Deliberate Fraudulent

An additional random-sample review of the DRs and CARs was performed to validate the keyword search. From the total population of CARs and DRs, a total of 10 percent of non-USGS and 25 percent of USGS CARs and DRs were randomly pulled for a separate evaluation. A total of 508 records were reviewed in this process.

## Results

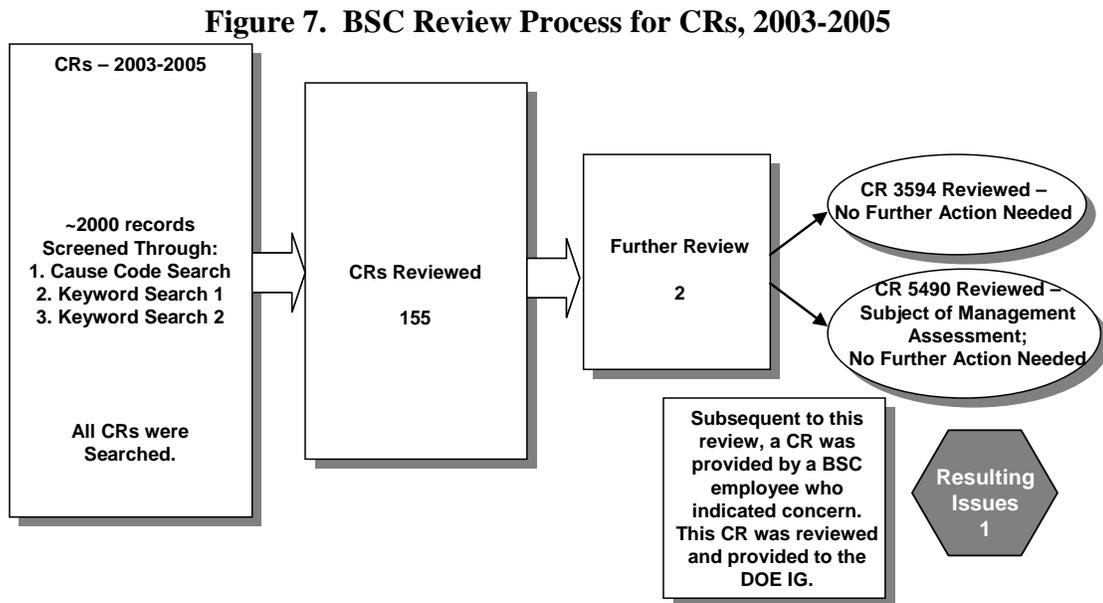
A total of two items of concern were found through the keyword search and subjected to further review:

- USGS-QDR-950004 dealt with an issue regarding the storage of magnetic tape at a USGS facility; this was determined to be not a quality assurance issue since it arose from a procedural change which required different management of the tapes.
- BSC(O)-03-C-097 dealt with BSC failing to effectively implement the AP-5.1Q process (preparation of procedures) during the preparation, review, and approval of the procedure. This item was closed satisfactorily on August 14, 2003.

### 3.2.2 Condition Reports From October 2003 Through May 31, 2005

In October 2003, a single Corrective Action Program, managed by BSC, took effect. The process for documentation of quality conditions changed, with CRs taking the place of CARs and DRs.

BSC staff reviewed CRs in support of the Review for CR 5223. This review process is depicted in Figure 7.



## Process

The focus of the CR review was to determine whether there were any instances of willful misconduct or deliberate violations of the QA program recorded in the Corrective Action Program documentation. Three independent searches were undertaken of the Corrective Action

Program Database for this activity. All CRs that were identified as Level A, B, or C were searched. The parameters for the three searches were:

- Search 1: A search on the cause code A3B4 (Human Performance Error – Work Practices LTA).
- Search 2: A full keyword search for words or combinations of words comprising the following: misconduct, illegal, falsification, falsify, fraud, fraudulent, willful violation, willful, intentional, misconduct, and deliberate.
- Search 3: A final keyword search that included words used in the parallel search done by the OCRWM Office of Quality Assurance staff (see Table 9). It used words or combinations of words comprising the following: circumvent, fabrication, malicious, bogus, waste of, cover up, back date, fake, and false.

### *Results*

Each search returned different records. Each CR that was identified through the three search processes was reviewed by the BSC Corrective Action Program Manager.

**Search 1:** The cause code search identified 57 CRs potentially of concern. After review, none of the CRs in the first search were found to indicate the attitudes and behaviors suggested in the USGS emails.

**Search 2:** The first keyword search identified 44 CRs potentially of concern. This search produced CR 5223 as part of its output. After review, CR 5223 was the only CR found to include indications of the attitudes and behaviors suggested in the USGS emails.

**Search 3:** The second keyword search identified 54 CRs potentially of concern. After review, only CR 3594 was determined to involve potential misconduct. The Corrective Action Program Manager conducted a detailed review of the CR, which described individuals being insensitive to requirements to submit non-Q records, and determined that the issue was lack of awareness of the requirements, not willful misconduct. The reviewer noted that there was only one other case of willful misconduct in the CAP database, and that matter was not relevant to the QA issue, as it dealt with a lockout/tagout issue.

One additional CR that identified potential misconduct was identified as a result of the additional review. CR 5490 (which was a level D CR) was generated as a result of a self assessment in the Total System Performance Assessment area. It expresses the opinion that managers use formal processes only when it meets their needs or supports production goals. At the time of issuance, senior management recognized the potential significance of the issue in the CR and chartered a team to conduct a management self-assessment to determine whether there was any validity to the statements in the CR. The self-assessment (MSA-2005-018) has been completed and there was no substantiation of the issue identified in the CR.

Subsequent to the CR keyword searches, a copy of CR 2891 and documentation of an associated BSC internal audit were provided by a BSC employee to the team working on the extent of condition review for CR 5223. The CR documented an instance of improper signature of a cover

sheet. A full review of the language in the CR indicated that it would not have been identified through a keyword search. CR 7584 was opened to further address this issue and, due to the subject matter, was formally provided to the DOE Office of Inspector General, which reviewed initial information and decided to take no further action. CR 7584 is now closed.

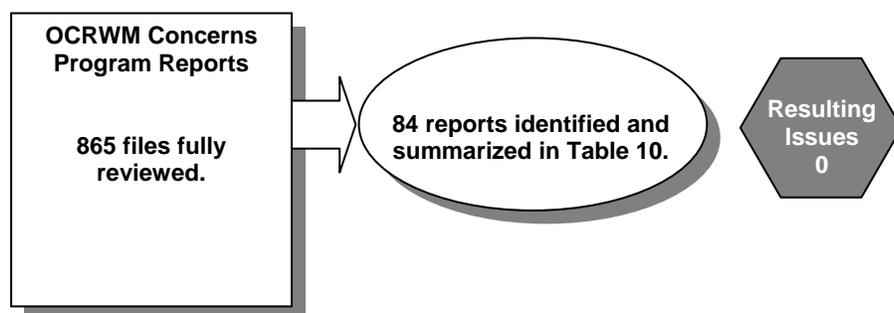
### 3.3 Reviews of Employee Concerns Reports

Employee concerns reports from both the OCRWM Concerns Program (OCRWM Concerns Program) and BSC Employee Concerns Program (Employee Concerns Program) were reviewed. The OCRWM Concerns Program has been in place since 1991, while the BSC Employee Concerns Program has been operating since 2002. Records dating from the inception of each program to November 1, 2005, were included in the scope of the review.

#### 3.3.1 Review of the OCRWM Concerns Program Information

The review of employee concern records related to the OCRWM Concerns Program was carried out by OCRWM Concerns Program staff. The process for the review is depicted in Figure 8.

**Figure 8. Review Process for OCRWM Concerns Program Reports**



#### *Process*

The review of OCRWM Concerns Program records encompassed the following activities:

- Review of concern summary statements contained in annual logs of the OCRWM Concerns Program, and subsequent direct review of suspect records
- Electronic search of records of the OCRWM Concerns Program for terms that could indicate the attitudes and behaviors suggested in the USGS emails
- Review of emails provided by the email review team and associated employee concerns.

The first two of these activities looked at records with the objective of identifying any employee concerns where (a) potential attitudes and behaviors suggested in the USGS emails existed and (b) corrective actions were not adequate to resolve the concern and implement steps to prevent recurrence of the condition.

Since the OCRWM Concerns Program began in January 1991, 865 concerns had been received and documented through June 2005 (when the review activities were performed). The OCRWM Concerns Program Manager deemed physical review of the documentation associated with all 865 concerns to be infeasible. Instead, the OCRWM Concerns Program staff reviewed the concern summary statements contained in logs that list the concerns filed in each calendar year. These statements are brief, one-line indicators of the content of each file. OCRWM Concerns Program staff exercised their judgment based on experience to select the summary statements that potentially indicated the attitudes and behaviors suggested in the USGS emails. For these selected summary statements, the associated concerns files were subjected to full physical review.

The review of concern summary statements was complemented by an electronic search of all OCRWM Concerns Program records for terms, such as “falsification,” “wrongdoing,” “lying,” and “misrepresentation,” that are likely to appear in documentation of concerns related to the attitudes and behaviors suggested in the USGS emails. For any hits from the electronic search, the associated concerns files were subjected to full physical review.

Subsequently, it was determined that the review of summary statements related to records of the OCRWM Concerns Program did not provide adequate confidence that no issues of concern were identified, and a full review of the actual files was needed. OCRWM Concerns Program staff initiated a full review of the remaining 753 files that had not been read during the initial review process. The OCRWM Concerns Program follow-on review also included records generated since the initial review through November 1, 2005, consistent with the updating of other review processes. From this review, one-page summary sheets on each OCRWM Concerns Program concern were developed and reviewed.

### *Results*

Together, the review of concerns summary statements, the electronic search of the concerns files, and the full reading of all of the concerns files over the 14-year period of the OCRWM Concerns Program identified 85 potentially relevant concerns that had been dispositioned by the OCRWM Concerns Program under a confidential process. Employee concerns that are indicators of quality issues have historically led to initiation of actions under the Corrective Action Program; CAR-001 and CAR-002, two of the most significant OCRWM quality issues, originated in this way. However, as a matter of practice CRs are not retrospectively tied back to the concerns filed with the OCRWM Concerns Program; therefore, during the review, correlation between concerns and CRs was established in some but not all cases. Table 10 provides a summary of the concerns, and Appendix H contains additional detail on the concerns.

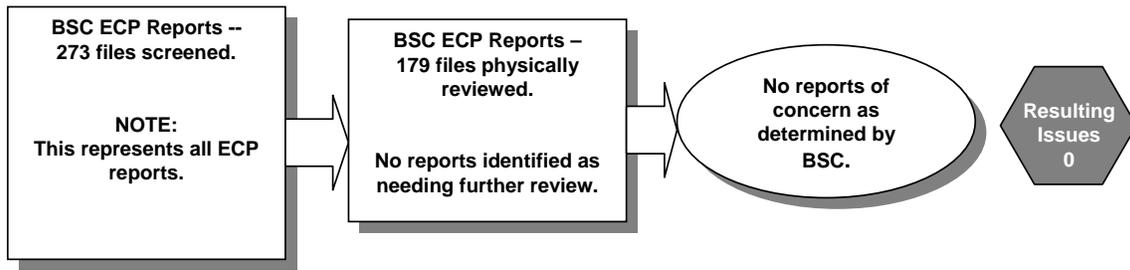
**Table 10. OCRWM Concerns Program Concerns Summary**

<b>Years</b>	<b>Concerns</b>
1991-1993	No potentially relevant concerns.
1994	1 potentially relevant concern that addresses USGS handling of borehole data.
1995	1 potentially relevant concern that addresses USGS budget cuts.
1996	No potentially relevant concerns.
1997	1 potentially relevant concern that addresses ineffective USGS QA program and the hiring of inexperienced personnel.
1998	No potentially relevant concerns.
1999	1 potentially relevant concern that addresses inconsistent application of QARD requirements.
2000	6 potentially relevant concerns that address QA affecting program issues in general (4), a data issue (1), and attempted circumvention of QA procedures (1).
2001	41 potentially relevant concerns. The concerns address software validation issues (19), excessive/complex QA requirements (5), BSC's process validation and reengineering process (2), and the remaining 15 concerns address non-specific QA program/management issues. (The software concerns resulted in CAR 001 and 002.)
2002	2 potentially relevant concerns that address software validation (1) and QA program violations (1).
2003	5 potentially relevant concerns that address QA personnel issues (3) and QA program violations (2).
2004	6 potentially relevant concerns that address QA management issues (3), an attempt to alter a QA record (1), the QARD not keeping pace with NRC rulemaking (1), and safety conscious work environment non-compliance (1).
2005	21 potentially relevant concerns. The concerns address QA management and personnel issues (12) (including 3 concerning the OCRWM management), problems with the draft license application and safety analysis report (5), falsification of documents (1), lack of a formal design change control process (1), improper email categorization (1), and incomplete CR packages (1).

### 3.3.2 Review of the BSC Employee Concerns Program Information

The review of records related to the Employee Concerns Program was carried out by BSC's Employee Concerns Program staff. The process for the review is depicted in Figure 9.

**Figure 9. BSC Review Process for Employee Concerns Program Reports**



### *Process*

The BSC Employee Concerns Program staff performed two review activities in support of the evaluation:

- Initial screening of 273 concerns (the complete universe of concerns at BSC) by a knowledgeable individual, and subsequent physical review of documentation related to 179 concerns
- Review of a set of emails provided by BSC staff working on the extent of condition review, and associated employee concerns.

As with the review of OCRWM Concerns Program records, the objective of the review of BSC Employee Concerns Program records was to identify any employee concerns where (a) potential attitudes and behaviors suggested in the USGS emails existed and (b) corrective actions were not adequate to resolve the concern and implement steps to prevent recurrence of the condition.

Since the BSC Employee Concerns Program began in October 2002, 273 concerns had been received and documented through June 2005 (when the review activities were performed). The BSC Concerns Program Manager, who has been with the program since its inception, reviewed the concerns log to perform an initial screen to exclude concerns where he was personally familiar with the subject matter and could state with certainty that the concern clearly did not involve the attitudes and behaviors suggested in the USGS emails. Ninety-four concerns were excluded in this way. For each of the remaining 179 concerns, BSC Employee Concerns Program staff pulled the concerns folders and performed a physical review of the concerns summary statements and also the content of the documentation.

### *Results*

The physical review of 179 concerns identified only a concern related to the USGS email issue, which the BSC Employee Concerns Program had referred to the OCRWM Concerns Program. As newly filed employee concerns are received, the BSC Employee Concerns Program staff has continued to evaluate them to detect potential attitudes and behaviors suggested in the USGS emails. Therefore, a separate update step was not needed to bring the review of the BSC Concerns Program up to the baseline date of November 1, 2005.

In reviewing the set of emails provided by BSC staff working on the extent of condition review, BSC Employee Concerns Program staff looked at associated employee concerns to identify QA-related issues. Some of the emails were determined to be the subject of ongoing litigation. For other emails in this group, the Employee Concerns staff determined that the isolated emails (without the context of the email string) were inconclusive. Upon review of the complete email exchanges, none of these emails was found to represent QA issues.

With one exception, BSC Employee Concerns Program staff found that QA-related issues discussed in emails had also been reported to the BSC Employee Concerns program. The exception is an email exchange that occurred in the early 1990s in which an employee expressed concern about a materially false statement that another employee may have made. The statements or work alluded to in the email cannot be determined on the basis of the email alone, and a principal participant in the email discussion is now deceased. Nonetheless, the BSC Concerns Program staff investigated the circumstances related to this exchange by contacting other employees who might be cognizant of the topic and researching work records of the participants. This review concluded that no additional actions could be taken due to the principal person with knowledge being deceased and no other staff having specific knowledge or facts that could be pursued. The formal Employee Concerns Program report documents these results.

## 4.0 CONCLUSION

The reviews conducted to support the extent of condition review for CR 5223 evaluated various types of information to identify records or documents potentially revealing the attitudes and behaviors suggested in the USGS emails. Using a combination of approaches including keyword searches, random sampling, and examination of records, the reviews examined:

- 959,102 relevant emails from ADIIS (29,853 individually reviewed)
- Over 5,000 Non-Relevant emails individually reviewed
- A statistical sample of 25,055 of the 14 million email records from the OCRWM Email Warehouse individually reviewed
- More than 7,000 DRs/CARs/CRs
- More than 1,138 employee concern reports.

Reviewers identified 334 emails as records of potential concern. Table 11 shows the areas of potential concern that prompted reviewers to forward these emails for review by subject-matter experts or personnel knowledgeable of the topics discussed in the emails. When in doubt, the reviewers erred on the side of referring emails for further review. After review and investigation, most of the referred records were determined to be not of concern.

**Table 11. Email Topical Summary Table**

<b>Topic</b>	<b>Occurrence</b>
<b>Technical</b>	<b>113</b>
- Data qualification/corroboration	10
- Data use	4
- Document preparation	3
- DTN	16
- INFIL	7
- Modeling	20
- Other	6
- Records management	29
- Requirements	5
- Scientific interpretation	8
- Testing processes	4
- Unknown	1
<b>QA</b>	<b>90</b>
- Analysis model reports	1
- Calibration	2
- Computer account control (CR 7176)	15
- CR process	3
- Data qualification/corroboration	2
- Document preparation	4
- Procedure review	1
- QA process	24

**Table 11. Email Topical Summary Table, continued**

<b>Topic</b>	<b>Occurrence</b>
<b>QA (continued from previous page)</b>	
- QA requirements	3
- QARD process	13
- Records management	17
- Scientific notebook	5
<b>Software</b>	<b>19</b>
<b>Management</b>	<b>30</b>
- Budget	5
- Planning	5
- Security	3
- Supervision/direction	17
<b>Personnel</b>	<b>68</b>
- Counseling	4
- Equal employment opportunity complaint	4
- Grievance	6
- Job performance	11
- Other litigation	7
- SCWE	6
- Training	1
- Unfair treatment/harassment	24
- Unknown	2
- Whistleblower	3
<b>Backdating</b>	<b>7</b>
<b>Not Related to Yucca Mountain</b>	<b>7</b>
<b>TOTAL</b>	<b>334</b>

Tables 12 and 13 provide similar detail for DRs/CARs/CRs and employee concerns records identified by the reviewers as potential concerns and submitted for further review.

**Table 12. DR/CAR/CR Topical Summary Table**

<b>Topic</b>	<b>Occurrence</b>
<b>QA program issues</b>	<b>4</b>

**Table 13. Concerns Program Records Topical Summary Table**

<i>OCRWM Concerns Program</i>	
<b>Topic</b>	<b>Occurrence</b>
<b>QARD/NRC requirements, QA procedures</b>	<b>8</b>
<b>Program Issues</b>	<b>22</b>
<b>Software/data issues</b>	<b>21</b>
<b>Process validation and reengineering</b>	<b>3</b>
<b>License application/safety analysis report</b>	<b>5</b>
<b>Management/management and personnel</b>	<b>15</b>
<b>Other</b>	<b>10</b>
<b>TOTAL – OCRWM Concerns Program</b>	<b>84</b>
<i>BSC Employee Concerns Program</i>	
<b>Potentially false statement</b>	<b>1</b>

Key questions in evaluating the Extent of Condition for CR 5223 are addressed below.

***How many of the review records considered potentially problematic were previously known and addressed?***

After review and dispositioning, 77 email records, written by the USGS personnel who exchanged the original 18 emails, were added to CR 5223. The quantity of potentially problematic emails from the same USGS authors reinforces the significance of the USGS email issue.

The email review provided a good check on whether employees who discuss problems in email also document those problems in CRs. Aside from the records added to CR 5223, reviewers identified emails of concern that are directly related to ten previously created CRs and six DRs. In addition, many of the email records flagged as potential concerns were found, upon review, to relate to employees’ actions to highlight and resolve questions and minor problems on a day-to-day basis. Particularly during the Email Warehouse review, reviewers flagged emails that appeared to show any quality concern, not just those directly parallel to the USGS email situation. These findings provide confidence that the email reviewers were able to recognize potential issues of concern, and the results of subsequent analyses and investigations show many instances where employees have been proactive in addressing issues and initiating corrective actions.

***How many previously unknown issues were discovered during the reviews? That is, how many new issues were identified as a result of these reviews? Are these issues comparable in nature and significance to the issues seen in the USGS emails?***

Table 14 summarizes the issues<sup>9</sup> discovered during the reviews. After analysis and dispositioning of the records suggesting potential attitudes and behaviors similar to those suggested in the USGS emails, the reviews resulted in the identification of five issues

<sup>9</sup> Multiple emails can correspond to a single issue.

representing substantiated or likely instances of negative attitude toward quality assurance or noncompliance with quality assurance requirements. Three Level C and one Level D CRs were initiated for these issues (one issue involving negative attitude, due to its isolated and historical nature, did not lead to a CR). As reflected in the CR levels, these issues when viewed individually were not considered egregious. It is important to note, however, that three of the five issues involve USGS personnel. Two of the USGS-related issues involve substantiated or likely backdating; additionally, the review identified two more instances in which USGS personnel suggested, but apparently did not perform, backdating.

In addition to the issues that represent inputs to the Extent of Condition determination, the reviews identified three issues that, while not of the same nature as the USGS emails and therefore not relevant to the extent of condition, provided an opportunity for OCRWM to document conditions related to work processes and implement improvements. Details of the issues and associated CRs are provided in Table 15.

While the issues identified during the reviews are important for OCRWM to resolve, none is comparable in nature and significance to CR 5223. There is no evidence of a pattern of sustained, willful misconduct or deliberate disregard of quality assurance requirements across OCRWM.

#### ***How does the population of reviewed records relate to the universe of OCRWM records?***

The review activities supporting the extent of condition review for CR 5223 encompassed keyword searches of over 900,000 emails and full review of more than 50,000 emails from the LSN-Relevant and Non-Relevant populations. Additionally, over 7,000 documents related to the Corrective Action Program and 1,138 employee concerns program records were reviewed. The breadth of these reviews provides confidence that OCRWM has taken a good cross-section of documentation and emails and has conducted a rigorous review of those materials to determine whether issues similar to those addressed in CR 5223 exist across OCRWM.

In summary, the reviews conducted in support of the extent of condition review for CR 5223 provided a valuable check on key types of records where expressions of negative attitude toward quality assurance, willful misconduct, or noncompliance with quality assurance requirements are most likely to be found if they exist. The reviews have provided value by confirming the significance of the USGS email situation, by leading to the creation of seven new CRs, and by giving insight into how employees raise issues and the effectiveness of the Corrective Action Program. Reviewers forwarded a total of 334 records to a rigorous disposition process involving documentation research, consultation with knowledgeable parties, and significance determination by multiple individuals. When these records were investigated and analyzed, the characteristics of the USGS email situation – negative attitude and indications of potential noncompliance with quality assurance requirements over a long period of time, with supervisory knowledge – were not evident across OCRWM.

**Table 14. Issues Relevant to Extent of Condition**

Issue	Description	Status	Documented In
<p><b>1. Noncompliant Documentation for Software QA</b></p>	<p>Two emails from January 2001 suggested non-compliance with software documentation requirements, indicating there may have been an attempt to synchronize dates for documents and computer files in order to conform to a December 2000 approval of the INFIL software CP-1 documentation package.</p>	<p>Investigation identified emails from March 2001 suggesting that technical activities continued after the documentation had been signed, as well as suggesting other irregularities. The corrective action for this CR was to remove INFIL Version 2.0 from the Software Baseline Report and reference the records package for the software qualification documentation.</p>	<p>CR 7413 – Level C – closed</p>
<p><b>2. Backdating of Training Records</b></p>	<p>An email from December 1998 discussed startup of geologic mapping activities prior to staff completing required reading assignments for the USGS Procedure YMP-USGS-GP-01, Geologic Mapping. The email indicates the author understood that this was a condition adverse to quality, and the author considered backdating training documentation or writing a deficiency report.</p>	<p>Investigation found that a deficiency report was not written, and concluded that it is likely that backdating of the training records occurred. An additional investigation of field notebooks, map products, and training records followed, as well as a determination of the impact of not having taken the required training. It was concluded that a qualified person could have appropriately performed the work if they had not read the procedure prior to work.</p>	<p>CR 7414 – Level C – closed</p>

**Table 14. Issues Relevant to Extent of Condition, continued**

Issue	Description	Status	Documented In
<b>3. Backdating of Scientific Notebook Documentation</b>	Two emails from June 2000 suggested backdating in scientific notebook SN-USGS-SCI-123-V1 approximately two weeks prior to the emails' dates.	Investigation confirms that backdating did occur. There was no technical impact because the backdated material was administrative, not technical.	CR 7422 – Level C -- closed
<b>4. Improper Signature</b>	CR 2891, which documented an instance of improper signature of a cover sheet, was provided to the manager of the reviews supporting CR 5223. The CR was generated because the individual whose name appeared on the cover sheet stated that it was not his signature.	It was determined that CR 2891 had not been fully investigated before closure. An external handwriting expert examined relevant documentation but was not able to determine who had signed the cover sheet. BSC made a presentation to managers regarding signature and dates on documents, management expectations, and reinforcing appropriate behavior. Because this CR concerns an improper signature, it was also provided to the Office of Inspector General, which decided not to take further action.	CR 7584 – Level D – closed

**Table 14. Issues Relevant to Extent of Condition, continued**

Issue	Description	Status	Documented In
<p><b>5. Negative Attitude Toward Worker Safety</b></p>	<p>An employee of a construction firm no longer associated with OCRWM made a disparaging remark about the Condition Identification/Investigation and Reporting/Resolution System (CIRS) Team when informed of two assignments under CIRS. This appears to be an instance of negative attitude toward safety-related requirements and behavior contrary to nuclear culture.</p>	<p>Research indicated that the two CIRS items assigned to the employee were appropriately completed and closed out, and a manager knowledgeable of the employee’s activities stated that there had been no issues of concern in the employee’s behavior or performance.</p>	<p>Due to the historical nature of this isolated instance and the fact that the tasking in question did not involve scientific or technical work under the quality assurance program, no CR was initiated.</p>

**Table 15. Work Process Issues Not Relevant to Extent of Condition**

Issue	Description	Status	Documented In
<b>1. Miscategorization of Emails</b>	15 linked emails containing sensitive unclassified computer account information were miscategorized.	Miscategorization of the first email was repeated as the email was replied to and forwarded. Because business-sensitive information could have been obtainable, cyber security staff conducted a presentation on sensitive email classification to prevent recurrence.	CR 7176 – Level C – closed
<b>2. Incorporation of Editorial Comments</b>	A technical document was submitted before all editorial comments were incorporated.	BSC is developing a style manual, which will include work process steps for editors and word processors and will replace the existing OCRWM Style Guide, which does not contain the work process steps identified in the CR. Required training sessions will be conducted on the approved manual.	CR 8157 – Level C – closed
<b>3. Potential Use of Unqualified Data</b>	An email suggested potential use of unqualified data in an analysis and model report despite a warning that the dataset was not qualified.	Based on information from individuals involved in the work, it was determined that the condition suggested by the email existed in Revision 1 of the report but had been corrected prior to issuance of Revision 2, and the use of data complied with applicable procedures.	CR 8152 – Level B – closed  <u>Note:</u> Based upon findings, CR 8152 was downgraded to a Level D. The broader issue of data traceability is being handled through CR 8396, which was initiated independently.

## **ATTACHMENT A**

### **LIST OF ORGANIZATIONS REPRESENTED IN INTERVIEWS**

ATTACHMENT A - LIST OF ORGANIZATIONS REPRESENTED IN INTERVIEWS

<b>Organizations Represented in Interviews October 2005</b>	
<b>Organization</b>	<b>Task/Role</b>
BSC, L&NS	Early association with the key-word search sampling and review of LSN-relevant emails.
DOE/ORD/OQA Office of Quality Assurance	Provided input on developing key word search terms for email review primarily in the preparation of a QA History of YMP.
BSC Organizational Assurance – Corrective Action Program	Oversaw review of quality assurance reports from September 2003 through May 2005.
DOE/ORD OCRWM Concerns Program	Oversight of ECP search activities.
BSC Business Systems	Developed system for implementing and oversaw the key-word search sampling and review of ADIIS relevant emails.
BSC Employee Concerns Program	Oversight of ECP search activities.
BSC QA – Special Projects	Provided input on developing key word search terms for email review primarily in the preparation of a QA History of YMP.
DOE/ORD/OPM&I	Implemented statistical sampling and review of non-relevant emails.
BSC L&NS – Post Closure Activities	Worked on key-word search sampling and review of LSN-relevant emails.
DOE/ORD/OPM&I	Oversaw statistical sampling and review of LSN-relevant emails.
DOE/ORD/OQA	Oversaw review of quality assurance reports from 1989 through September 2003.

## **ATTACHMENT B**

# **ANALYSIS OF SAMPLING STRATEGY FOR THE EXTENT OF CONDITION REVIEW PROCESSES ASSOCIATED WITH THE USGS EMAILS**



LOYOLA COLLEGE IN MARYLAND  
1852

March 13, 2006

J.A. Atchue III, CEP, CHMM Booz Allen  
Hamilton, Inc. 555 13<sup>th</sup> Street, N.W.  
Suite 480 East  
Washington, DC 20004

Dear Mr. Atchue:

Re: Draft Pre-Decisional Work Product

Attached is my report on the sampling of emails.

This work is not a part of my duties at Loyola College but was conducted as an independent contractor for Booz, Allen, Hamilton.

Please contact me if you have any further questions.

Sincerely,

[signed copy on file]

Christopher Morrell, Ph.D.  
Chair, Mathematical Sciences Department

4501 NORTH CHARLES STREET, BALTIMORE, MARYLAND 21210-2699

410-617-2000 ' WWW.LOYOLA.EDU

## **Analysis of Sampling Strategy for the Extent of Condition Review Processes Associated with the USGS Emails**

### **Introduction**

In late 2004, OCRWM staff that were processing documents for inclusion in the Licensing Support Network discovered a number of emails that suggested noncompliance with quality assurance (QA) requirements and potential falsification of data. OCRWM is currently performing an “extent of condition” review to determine whether the behaviors and attitudes reflected in the emails are present within the OCRWM organization. One process being conducted in support of the extent of condition review is review of emails generated by Yucca Mountain Project participants, employee concerns records, and QA documentation. Statistical processes have been performed to determine the sample size for certain of these reviews.

### **Statistical Inference**

I will first comment on what statistical sampling from a population may hope to achieve before commenting on the various sampling strategies used in the report.

Statistical inference is used to make inferences about a population based on a sample from that population. In the case of OCRWM email, there are a number of populations, and each population consists of a large number of emails. The aim of the statistical sampling is to provide data that will allow one to estimate the true proportion of emails in the entire population that can be classified as exhibiting a negative attitude toward QA or a willful noncompliance with QA requirements. This is achieved by selecting a random sample from the population, determining the number of emails in the sample that exhibit negative attitude/willful non-compliance, and then applying statistical inferential procedures to obtain an estimate (and 95% confidence interval) for all emails that exhibit these characteristics. A 95% confidence interval is an interval within which we can say that we are 95% confident that the true population proportion lies. We are not certain that the true proportion for *this particular* population lies in the interval, but if we selected many random samples and constructed 95% confidence intervals for each sample, then, in the long run, 95% of these intervals would contain the true population proportion. Statistical

inference cannot identify or detect all such emails, but can only provide an estimate of the true proportion of such emails.

### **Statistical Sampling Strategies Used to Date**

OCRWM conducted several reviews in May and June 2005 to detect instances of negative attitude toward QA or willful noncompliance with QA requirements in order to estimate the extent of such occurrences within the total email population. This report discusses the statistical sampling strategies that were used to sample from various groups of emails and documents. Three separate email reviews were performed, using:

- 4,500 emails sampled from the 907,363 relevant emails available as of May 31, 2005.
- A random sample of emails generated by word searches using eleven key words that returned large numbers of false-positive results.
- A random sample of one percent of emails selected based on the author's expected impact on the License Application.

In addition to the email reviews noted above, OCRWM reviewed documents related to the QA Program – condition reports and deficiency reports – as well as records maintained by the OCRWM and contractor employee concerns programs. Because the reviews of employee concerns records did not use a sampling approach, those reviews are not discussed further in this paper.

### **Sample of 4,500 Relevant Emails**

It was decided to try to detect whether the occurrence of negative attitude/willful noncompliance with QA requirements was a rare event. It was thought that if the true population proportion – the number of emails showing negative attitude or willful noncompliance – was less than 2% of the total, then this would indeed be a rare occurrence. In order to use a more conservative approach to determine the sample size (that is, to sample a greater number of emails from the population), the threshold percentage at which negative attitude/willful noncompliance

could still be considered a rare event was decreased to a value of 1%. This led to selecting a sample size of 4500 emails.

In the first sample, no emails exhibited negative attitude or willful non-compliance. An exact 95% confidence interval for the true proportion of all emails exhibiting negative attitude or willful non-compliance in the population is from 0 to 0.000666 (or 0 to 666 per million). That is, we are 95% confident that the true proportion of emails in the population of 907,363 emails available as of May 31, 2005 that exhibit negative attitude or willful non-compliance is less than 0.0666%. This is clear evidence that emails exhibiting negative attitude or willful non-compliance are indeed rare events.

### **Random Sub-Sample of False Positives**

In another effort, BSC identified more than 90 keywords and phrases that could indicate negative attitude or willful noncompliance with QA requirements and used them as search terms to identify potential emails for review from the relevant universe. This process led to 11 keywords generating large numbers (in the thousands) of false positives. To identify a subset of the search results for these 11 keywords for review, separate samples were selected from each of the sets of emails identified by each keyword. These keyword-specific samples were combined to allow inference to be made about all emails identified by all 11 keywords. This is an application of stratified sampling, where the samples are selected “proportional to size.” This approach appears to be appropriate in this situation when one needs to ensure that emails are selected from each group of emails in the proper proportion.

### **One-Percent Sample of Relevant Mail by Key Individuals**

A sample of one percent of emails was taken from each of 39 individuals. The total number of emails reviewed in this process was 695. The number of samples taken in this effort does not allow the same level of precision to be obtained as in the sample of 4,500 taken from the larger relevant population. In order to achieve the same precision, the same sample size is needed.

## **Condition Reports and Deficiency Reports**

OCRWM staff performed sampling of legacy condition reports and deficiency reports to provide a secondary, confirmatory review after keyword searches had been run. A total of 10 percent of non-USGS and 25 percent of USGS condition reports and deficiency reports were randomly pulled for a separate evaluation. The 10 percent and 25 percent figures were not statistically derived. A total of 477 records were reviewed in this process, out of a total record population of approximately 4,100. No reports in this sample exhibited a negative attitude or willful non-compliance. This sample cannot be considered as a random sample from the respective population. However, if it was, a 95% confidence interval for the true proportion would be 0 to 0.006261 (or 0 to 0.6261%). While this confidence interval is not completely valid since the sample is not a random sample from the population, it does provide some indication of the set of possible values of the true proportion of emails exhibiting a negative attitude or willful non-compliance.

## **Conclusion: Sampling Approaches Used to Date**

With the exception of the one percent sample of relevant email by key individuals, which did not provide the same level of precision as the other reviews and is currently being redone at a higher sampling frequency, and the sampling of condition reports and deficiency reports, the sampling approaches described in this report appear to be appropriate to the situations described. The sample sizes are satisfactory to detect whether or not an event is in fact rare (given the working definition of a rare event).

### Developing a More Precise Estimate

Work is now ongoing to review a sample of emails from the total OCRWM email archive of approximately 14 million emails. A more precise estimate of the proportion of emails exhibiting negative attitude or willful non-compliance with QA requirements than the one developed is desired, requiring a larger sample. In computing the sample size, I assume that the sample will result in no emails exhibiting negative attitude/willful non-compliance and compute the resulting one-sided exact 95% confidence interval for the true proportion as a function of the sample size (see Table 1).

*Table 1. One-sided 95% upper confidence level for the true proportion as a function of the sample size assuming the sample results in no emails exhibiting negative attitude/willful noncompliance.*

Sample Size	4500	9000	10000	15000	20000	25000
Upper Confidence Level	0.000666	0.000333	0.000299	0.000200	0.000150	0.000120

**ATTACHMENT C**

**FINAL DISPOSITION OF EMAIL RECORDS RANDOMLY  
SAMPLED FROM ADIIS**

ATTACHMENT C - FINAL DISPOSITION OF EMAIL RECORDS RANDOMLY SAMPLED FROM ADIIS

Accession Number or Email Date		Topic	Subject	Copy of Email Text or Summary Statement <sup>1</sup>	Disposition
1	07/29/97	Technical/Data – data use	Data	Discussion re: data work package.	The email transmitted data and discussed future work. Not QA related. <b>Resolved - no further action needed.</b>
2	10/17/97	Management – Supervision/direction	Re: Reorg	Disagreement re: management’s handling of a work stream.	The email expressed concerns on several management actions. Not QA related. <b>Resolved - no further action needed.</b>
3	02/23/98	Management Supervision/direction	Re: individual revised talk	Disagreement re: undefined “these guys” and their inability to understand the big picture.	The email discussed perceived leadership issues. Not QA related. <b>Resolved - no further action needed.</b>
4	12/24/98	QA – CR process	Nonconformance Reporting for products	Discussion re: an unspecified document that was changed after resolution and QAP6.2 review. The author states this may be a common occurrence, and that a ‘Nonconformance Report’ should be written when this occurs. The email does not indicate whether such a report was filed. This issue is QA related.	After procedural technical and acceptance reviews had been complete, an earlier version of the report was inadvertently put into the Records System and sent to DOE for transmittal to the NRC; however, the mistake was caught and corrected prior to transmittal to the NRC. This was investigated in January 1999, and a paper was written to document the causes, conclusions, and lessons learned. <b>Resolved - no further action needed.</b>
5	07/14/99	Technical/Data – data qualification/corroboration	Re: Change of ECR numbers	Discussion re: correction of unauthorized and incorrect modification to ECR data. While the email indicates that this specific issue was corrected, it implies that there may be a larger problem. The issue is QA related.	The system was not a “Q” system, but an administrative tracking database that contained bibliographic data on each change request. The email discusses changing some Engineering Change Request (ECR) numbers from a “T” prefix to an “E” prefix, and back again. These are routine changes caused by a lack of communication before making the change. There was no “Q” process violated. This email is not an issue. <b>Resolved - no further action needed.</b>
6	05/17/00	Technical/Data – scientific interpretation	Re:	Discussion re: scientific interpretation.	The email discussed the interpretation of a 10,000 year performance assessment. Not QA related. <b>Resolved - no further action needed.</b>
7	09/11/03	Personnel- Whistle blower	That familiar eerie feeling	Discussion re: DOE’s ‘shakedown’ of SAIC as part of unspecified litigation that seems to be personnel oriented.	The email discusses potential corporate litigation issues related to SAIC and alleged corruption. The issues were previously addressed through other means. Not QA related. <b>Resolved - no further action needed.</b>

ATTACHMENT C - FINAL DISPOSITION OF EMAIL RECORDS RANDOMLY SAMPLED FROM ADIIS

Accession Number or Email Date		Topic	Subject	Copy of Email Text or Summary Statement <sup>1</sup>	Disposition
8	AD-017  ALA.2005 1017.0651	QA – QA requirements	Re: IVRT and question of independence	Discussion re: A recent QA surveillance that was performed several months ago and found the IVRT to be "independent" in terms of the procedural requirements.	The issue found in the email had been appropriately identified prior to the email review (in fact, prior to these emails being written). CR 5600 was written to document issues concerning the IVRT and qualification of data inputs to AMRs, and remains open.  <b>Resolved - no further action needed.</b>
9	AD-020  ALA.2005 0708.6874	Software	Internal Message sent via Notes Client	Discussion re: A new software procedure issued that potentially requires all COTS/exempt software to be added to a centralized list with SCM (Software Configuration Management).	Based on input from the email recipient, this is not an issue because the TSPA-LA has not been completed, and any use of the software is being tracked and will be appropriately qualified / documented prior to issuance of the document.  <b>Resolved - no further action needed.</b>
10	AD-021  ALA.2005 1007.1217	QA – document preparation	Re:CMT-062705-093311-25	Discussion re: IVRT comments on Np solubility. IVRT had numerous opportunities to comment on this work and has in fact, suggested several times that the project adopt a solubility model for Np where Np is incorporated into the secondary uranium phases based on information that is less "convincing" than using NpO <sub>2</sub> as the controlling phase.	Based upon the SME comments that the emails discuss an on-going independent technical review, the path forward for comment resolution is pending. The development of the NpO <sub>2</sub> solubility work discussed in the emails was performed in response to a DOE Technical Direction Letter. The independent review team work is in process and the TSPA is not yet complete. The issue is being addressed prior to the completion of the IVRT document as part of the FY06 work plan.  <b>Resolved - no further action needed.</b>
11	AD-023  ALB.2005 1018.0628	Technical/Data – data qualification/ corroboration	Potential Data Qualification Need	“The original was created in 1996, long before the qualified version of ArcINFO (ver. 7.2.1) was released.”	This email contains no information that would indicate that a CR is appropriate. It was responding to a query asking whether or not a dataset was indeed unqualified based on the qualification status of the software that was used to create it. There are many UQ data sets on the project and this is merely an assessment of what potential path forward would have to be taken should the use of that particular UQ dataset be necessitated in a Q document.  <b>Resolved - no further action needed.</b>

ATTACHMENT C - FINAL DISPOSITION OF EMAIL RECORDS RANDOMLY SAMPLED FROM ADIIS

Accession Number or Email Date		Topic	Subject	Copy of Email Text or Summary Statement <sup>1</sup>	Disposition
12	AD-024  ALA.2005 0815.5616	QA – QA requirements	Internal Message sent via Notes Client	Discussion re: June 14, 2005, BSC QA communication about of the lack of linkage between QARD requirements and certain design control procedures.	The issue found in the email had been appropriately identified and dealt with prior to the email review. As a result of OQA audit "OCRWM-OQA-05-10 of Procedure Compliance at BSC" dated 7/26/05, the procedures discussed in the email were reviewed. Two CRs were written, CR 6058 regarding LP-2.15Q-BSC and CR 6057 regarding LP-3.20Q-BSC. Actions addressed in the CRs have been completed and the CRs have been closed.  <b>Resolved - no further action needed.</b>
13	AD-025  ALB.2005 1018.2325	Software	Re: Software Configuration Management CR6292	Discussion re: Software Configuration Management (SCM) not following LP-SI.15Q-BSC procedure in ensuring that all documents have "unique identifiers".	The issue found in the email had been appropriately identified and dealt with prior to the email review. The email author initiated CR 6292 on the same day the email was written. Action was completed and closed on 11/29/05.  <b>Resolved - no further action needed.</b>
14	AD-026  ALA.2005 1006.4868	Technical/Data – scientific interpretation	RE: Probability of Scenarios Larger than 1	"I see the problem. Hopefully, we can get it fixed by an appropriate description of the analysis."	The issue found in the email had been appropriately identified prior to the email review (in fact, prior to these emails being written). CR 5600 was written to document issues concerning the IVRT and qualification of data inputs to AMRs, and remains open.  <b>Resolved - no further action needed.</b>
15	AD-033  ALA.2005 1017.0246	Technical/Data – data qualification/ corroboration	Re: Reference Verification Issues	"The problem: Unfortunately, records packages submitted by SCM suggest the new memos are "corrections" to the old memos which has led to some confusion. As a result, DIRS Reference Verification is refusing to verify the new references and has, in fact, placed notes in the new DIRS entries declaring them duplicates and referring users to the old DIRS numbers that point to the old pieces of correspondence containing the old procedure number. Totally unacceptable!"	The issue regarding DIRS 174193 appears to be a difference of opinion between the email author and the Reference Verification staff, as the OCRWM Style Manual is subject to opinion. The style manual is being rewritten and will provide more clear guidelines/samples of citing books in a series and reference formats. The other DIRS items regard citing references when the referenced procedure is superseded by a new procedure. Both issues remain "Author Input Needed" (AIN) in the DIRS database.  <b>Resolved - no further action needed.</b>

ATTACHMENT C - FINAL DISPOSITION OF EMAIL RECORDS RANDOMLY SAMPLED FROM ADIIS

Accession Number or Email Date		Topic	Subject	Copy of Email Text or Summary Statement <sup>1</sup>	Disposition
16	AD-034  ALA.2005 1013.0188	Technical/Data – data qualification/ corroboration	Re: ref to previous # of WPs hit	“The December DTN is uncitable, as it has been superseded by the latest Number of WPs Hit DTN. And the old distribution is not contained in the previous (Oct 2004) version of the AMR. This leaves us with no reference to the old distribution.”	Based on following input from an individual, the sender of the email in question, “Issue with use of information from # of WPs hit. The TSPA LA document has not been completed, so the status of these DTNs is irrelevant until we are ready to finish and close that document.” This is not an issue.  <b>Resolved - no further action needed.</b>
17	AD-042  ALA.2005 0815.3491	QA – document preparation	Internal Message sent via Notes Client	“The copy is dated with the today's date, to match the manager's and the QER's copy - they are getting their copies today because Friday was the day off for most people from our department.”	Contacted the individual on 2/14/06 to discuss the issue regarding the different dates for the Draft document she sent via FedEx. The individual stated she dated the document as of 6/13/05 and shipped the FedEx on 6/10/05, as the intended recipient would not receive the document until 6/13/05. The individual stated she hand carried the draft to the managers and QERs on 6/13/06. The individual stated she determined it would be best if all individuals assigned as reviewers have the draft on the same date. This issue is not a violation of procedural requirements but it is not a good business practice. No further action is required for this issue.  The supervisor will speak to the individual about dating documents in advance. No CR required.  <b>Resolved - no further action needed.</b>
18	AD-043  ALB.2005 0722.0568	QA – document preparation	Re: Web Requests Supporting NRC DOE Interactions	We need to figure out how this syncs up with the individual requirement to buck off on all papers that go public out of his organization.	This is a non-issue. The emails were written during May 2005. The non-Q procedure mentioned in the email was current, effective March 2005.  <b>Resolved - no further action needed.</b>
19	AD-057  ALA.2005 1013.0255	QA – CR process	Re: CR4196-004	“A question is whether the text in the write up for action -004 can be work-smithed ( <i>sic</i> ) or revised as necessary. The current write up says something like 20 passed, 9 acceptable, and 4 failed. The attached table shows 31 passed and 2 failed with documentation in a new CR.”	The issue found in the email had been appropriately identified prior to the email review. CR 5907 had been initiated to document issues related to exemption from software qualification of ARCINFO V6.1.2. Closure of this CR is linked to completion of new infiltration modeling that will verify or replace USGS infiltration products.  <b>Resolved - no further action needed.</b>

ATTACHMENT C - FINAL DISPOSITION OF EMAIL RECORDS RANDOMLY SAMPLED FROM ADIIS

Accession Number or Email Date		Topic	Subject	Copy of Email Text or Summary Statement <sup>1</sup>	Disposition
20	AD059  ALA.2005 0722.1078	QA – document preparation	Internal Message sent via Notes Client	“We can not simply go in and change the text.”	This is an administrative action of a correction to a customer satisfaction survey form to remove the previous contractor’s name from the form. A review of the survey form found that the contractor’s name (RSIS) has been removed. Issue has been corrected. This is not an issue.  <b>Resolved - no further action needed.</b>
21	AD-062  ALA.2005 0722.6832	Technical/Data – data qualification/ corroboration	Internal Message sent via Notes Client	“I’ve addressed the questions to you (and copied the individual) because in the past you have been the only ones who understood (or cared) about the designation of ITWI for postclosure items.”	This is an exchange of comments relating to the LA which would have been resolved prior to the final issuance of the LA.  <b>Resolved - no further action needed.</b>
22	AD-063  ALA.2005 1006.1223	QA – CR process	Re: IVRT assumptions	“The good news is that the author of CR 5600 is our QER checker. The bad news is that the author of CR 5600 is our QER checker.”	The issue found in the email had been appropriately identified prior to the email review (in fact, prior to these emails being written). CR 5600 was written to document issues concerning the IVRT and qualification of data inputs to AMRs, and remains open.  <b>Resolved - no further action needed.</b>
23	AD-065  ALA.2005 0728.0770	Technical/Data – data use	Message not sent to ERMS	“One figure in this report is bad, unfortunately it is one of the more important figures.”	Based on an explanation from the email author, “The report is non-Q. Figure referenced was just a poor repro job ....” Not an issue.  <b>Resolved - no further action needed.</b>
<p>Note 1. The information in this column is either a copy of the complete email text or a brief summary. Summaries were used in situations where the text was too long to be easily included.</p>					

## **ATTACHMENT D**

### **BSC REPORT WITH SEARCH TERMS AND DISPOSITION OF EMAILS FROM KEYWORD SEARCH**

## **Initial BSC Report**

ATTACHMENT D - BSC REPORT WITH SEARCH TERMS AND DISPOSITION OF  
EMAILS FROM KEYWORD SEARCH

To: BSC Regulatory Counsel  
From: Licensing & Compliance Staff  
Date: October 7, 2005  
Subject: Report on CR 5223 EOC Email Review

Purpose: This email review was undertaken as part of the effort to determine the extent of the condition identified in CR 5223. CR 5223 was initiated because legacy emails between a few U.S. Geological Survey (USGS) employees suggested actions had been taken to circumvent and/or misrepresent compliance with the YMP QA requirements. Among the aspects of the extent of condition to be determined was whether the conduct of potential concern had been engaged in by other employees of the USGS, by employees of the National Laboratories, or by employees of DOE, BSC, or its subcontractors.

Scope: Approximately 17,500 emails in CACI, Inc's. Automated Document Image Indexing System (ADIIS) EMAIL Database of about one million LSN relevant emails were reviewed for evidence of the type of conduct of concern. ADIIS was identified as the document source for the search because of its availability and inclusive character with respect to LSN relevant email.

Reviewers were also instructed to identify emails that indicated other conduct that could be of concern. These were evaluated by the Team Lead / and Regulatory Counsel for appropriate disposition, including referral to the concerned organization.

Methodology: Emails in the ADIIS EMAIL Database were reviewed and evaluated to determine to what degree, if any, inappropriate behaviors similar to those identified in the subject emails may have been committed by others beyond the previously identified individuals. Key words/phrases for the electronic searches of emails for evaluation were identified. Searches used CACTs email retrieval tool. Approximately 17,500 emails containing one or more of the key word/phrases were reviewed. The plan for conduct of the review (BSC Attachment 1, "the Plan") describes the scope and methodology for the effort.

Experienced program personnel conducted reviewers the reviews. Nine reviewers participated in the effort from 6/22/05 through 8/5/05. Reviewer characteristics and capabilities were established (BSC Attachment 4 of the Plan) and confirmed by the participant's immediate supervisor (BSC Attachment 2). Reviewers were trained on the ADIIS system on 6/16/05 and trained on the review methodology on 6/22-23/05 (BSC Attachment 3). Those unable to attend the scheduled training were individually instructed. A nondisclosure agreement was executed by each reviewer prior to his or her participation (BSC Attachment 4).

Search Terms: Fifty-eight targeted key word/phrases agreed to by DOE and BSC (BSC Attachment 7 of the Plan) were used as search terms for the database searches. These search terms were derived from a number of sources, including the emails sent by certain members of the USGS staff. Thirteen additional search terms identified during the review were added based on experience. Search terms were divided into two categories, likely and unlikely to appear in technical or professional exchanges. Forty-five were judged unlikely to be used in such exchanges. These included 32 terms from the agreed list and 13 terms added based on review experience. Twenty-six terms were judged likely to appear in technical or professional exchanges.

All search terms employed, including the exact search phrase, are listed in Table 1. Table 1 also indicates the number of emails reviewed for each term and whether the statistically sampling methodology was employed.

For terms yielding prevalent false positive results, a statistical sampling methodology was employed. The statistical sampling methodology was developed in consultation with a BSC expert who supports the Six Sigma project. It was determined that the statistical analysis should be based on the symmetric binomial distribution with a finite population correction factor applied (BSC Attachment 8 to the Plan). Binomial distributions have been recognized by the courts, including the U.S. Supreme Court, as a valid basis for the statistical analysis of employment and jury selection cases<sup>1</sup>.

The size of the sample was selected to achieve a 98% confidence that 98% or more (i.e., 99%  $\pm$  1%) of the subject email population would not contain messages that meet the attributes of the criteria established by DOE.

Evaluation Criteria: The database was searched for evidence of conduct that met the following criteria established by DOE.

- Longevity of misconduct
- Negative attitude towards the QA requirements
- Continued expressions of willful misconduct or noncompliance
- Supervisor knowledge of above with no action taken
- No evidence that the matter was timely reported to DOE by any parties knowledgeable of above

Search Details: All email with occurrences of the "unlikely" terms were reviewed (i.e., the occurrence of each search term within the email was considered). Also, all email with occurrence of seventeen of the twenty-six "likely" terms was reviewed (BSC Table 1). Search results for the nine of the "likely" terms presented obviously prevalent false positive results, warranting application of the *statistical* sampling methodology. In a few instances Boolean logic search term strategies were used to reduce the number of false positive results

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<sup>1</sup> See, *Castenada, Sheriff v. Partida*, 430 U.S. 482, 497, n. 17 (1977); *EEOC v. Western Electric Co.*, 713 F.2d 1011 (C.A. 4, 1983); and *Boykin v. Georgia-Pacific Corp.*, 706 F.2d 1384 (C.A. 5, 1983).

before conducting the review.

BSC Figure 1 illustrates the review process. The Team Lead assigned search terms to reviewers. Reviewers searched the ADIIS EMAIL Database for email with occurrences of the term. The resultant list of emails was sorted by date (this allowed the reviewer to return to their review upon interruption). Reviewers recorded in a spreadsheet the Participant Accession Number for email reviewed. In general, separate spreadsheets were created each day, and for each search term. Reviewers recorded pertinent observations in the spreadsheet, and highlighted observations the reviewer felt warranted further consideration.

Reviewers identified email for further consideration by the Team Lead and/or Regulatory Counsel that met review criteria by:

- Appearing related to the USGS matter currently under investigation
- Reflecting a willful noncompliance with QA requirements
- Reflecting other concerns

Daily meetings were held with reviewers to assess review status and facilitate coordination. Reviewers were regularly reminded to bring to the Team Lead's attention, any documents that they believed warranted immediate consideration.

Post-Identification Evaluation The Team Lead evaluated reviewer-highlighted items and provided feedback to the reviewers using notations in the spreadsheet. Reviewers were frequently requested to check the Team Lead feedback notations in their individual spreadsheets and notify the Team Lead if they disagreed with the assessment.

Emails which the reviewers identified as indicating conduct of potential concern were evaluated by the Team Lead and/or Regulatory Counsel for possible referral and further consideration by a knowledgeable point of contact (POC) within the BSC or DOE organization. This confirmed that the email met the review criteria and included consideration of the conduct criteria established by DOE.

Referrals were made to appropriate project organizations for evaluation and action as necessary. Evaluation results and action, if necessary, were recorded on a referral sheet. BSC Tables 2 through 5 list the referred emails by accession number and include a brief description and summary of the disposition.

Results: Of the approximately 17,500 emails reviewed, nearly 800 (5%) were identified by reviewers for evaluation by the Team Lead / Regulatory Counsel. The Team Lead / Regulatory Counsel referred one hundred fifty-two emails to other organizations of YMP for further consideration. Seventy-eight percent of these (119) were referred to DOE as related to DOE (44) or USGS matters (75).

Eighty-five of the referrals (56%) resulted from searches for terms judged to be "unlikely" terms. However it should be noted that "unlikely" terms resulted in about 18 referrals per 1000 emails reviewed while "likely" terms resulted in about 5 referrals per 1000 emails

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reviewed. This suggests it may be as much as 3 times more efficient to review email for terms that one does not expect to find in technical or professional exchanges.

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Seven of the emails warranted consideration as concerns in the area of noncompliance with QA (BSC Table 2). Two emails are related to software management, and five emails discuss four instances of possible backdating scientific materials (three related to scientific notebooks and one related to training records). All are dated between 1998 and 2001. In both groups, USGS staff connected to the circumstances underlying CR 5223 were involved. It cannot be concluded on the basis of the email content alone that requirements were actually sidestepped.

Four Condition Reports (CR-6679, CR-6680, CR-6681 and (CR-6682) were initiated to address the aspects of the seven emails reflecting, QA noncompliance (BSC Table 2). Two were directed at the attitude expressed toward QA (CRs 6679 and 6680) and two were directed at technical issues (CRs 6681 and CR 6682).

Thirty-three emails (BSC Table 3) were referred to BSC points of contact (POCs) in science/engineering (14), employee concerns (19). All of the science/engineering related matters were resolved without further escalation. They were determined to have been addressed with ongoing processes, were addressed by subsequent work or were not a substantive issue.

Eleven of the nineteen of the emails referred to the BSC ECP POC, were dispositioned without further action. Four emails were related to design and engineering records, and ECP is investigating. Three were related to an alleged radiation exposure on NTS and referred to Bechtel Nevada for investigation, having nothing to do with YMP. One email was re-evaluated and determined not to have required referral.

Sixty-eight USGS emails (BSC Table 4) were provided to DOE principally because USGS personnel connected to the circumstances underlying CR 5Z23 were involved.

Forty-four emails were referred to OCRWM concerns program (BSC Table 5).

Observations and Conclusions Based on the CR 5223 EOC Email review: The broad scope of subjects addressed in the emails evaluated suggests that

- a) YMP staff do not appear to have systematically withheld email expressing views that are not supportive of either the management, technical, or quality related aspects of the project;
- b) There is no indication of prevalent willful noncompliance with QA requirements, or attitude toward Quality Assurance. Only isolated instances of an inappropriate attitude toward QA requirements were identified;
- c) Email searches for terms that are judged "unlikely" to appear in appropriate technical or professional exchanges appeared to be as much as three times more effective than searches for "likely" terms.

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**BSC Table 1**  
**CR 5223 EOC Email Review**  
**List of Search Terms**

Category	Search Term	Emails Reviewed	Sample / Population Size
Unlikely	"delete this email" or other form		
	delete this email Not privileg% not secure FTP	30	
	delete this email Not privileged	84	
	delete this message not privileged not "electronic message" not TBM	57	
Unlikely	backdate	7	
	backdat%	14	
	back date	26	
Unlikely	bogus	231	
Unlikely	cheat%	204	
Unlikely	cover up (removed due to ADIIS search limitations)		
Unlikely	coverup	4	
Unlikely	deceit%	12	
Unlikely	deceiv%	29	
Unlikely	destroy% (re-categorized as "Likely")		
Unlikely	dread%	100	
Unlikely	fake	42	
Unlikely	fall guy%	9	
Unlikely	falsif%	257	
Unlikely	fictit%	80	
Unlikely	forget about it (removed due to ADIIS search limitations)		
Unlikely	fubar	9	
Unlikely	fudge%		
	fudg%	159	
Unlikely	glitch (re-categorized as "Likely")		
Unlikely	harrass%	50	
	haras%	389	
Unlikely	hit the fan	49	
Unlikely	hoop and jumping		
	hoop near jump%	13	
Unlikely	inside scoop		
	insid% scoop	13	
Unlikely	intimidat%	199	
Unlikely	laugh		
	laugh%	568	
Unlikely	made up (removed due to ADIIS search limitations)		
Unlikely	make up (removed due to ADIIS search limitations)		
Unlikely	mum	18	

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Category	Search Term	Emails Reviewed	Sample / Population Size
Unlikely	nervous		
	nervous%	523	
Unlikely	nightmar%	418	
Unlikely	phony	45	
Unlikely	piss	60	
Unlikely	pretend	234	
Unlikely	screw around	11	
Unlikely	screwed around	1	
Unlikely	sham	26	
Unlikely	taken to the cleaners	4	
Unlikely	whistle blow%		
	whistle near blow%	31	
Unlikely	whistleblow%	67	
<b>Sub-Total</b>		<b>4073</b>	
Likely	decept%	79	
Likely	destroy%	42	
	destroy% not "Configuration Management Notice" not "responsive material" not "Cluster Notification" not "CONFIDENTIALITY NOTICE" not "either destroying" not "Confidentiality Footer"	125	125 of 1420
	destroy% not "Configuration Management Notice" not "responsive material" not "Cluster Notification" not "CONFIDENTIALITY NOTICE" not "either destroying" not "Confidentiality Footer"	120	
	destroy% not "Configuration Management Notice" not "responsive material" not "Cluster Notification" not "CONFIDENTIALITY NOTICE" not "either destroying" not "Confidentiality Footer"	<u>438</u>	392 of 1457
Likely	distort%	486	
Likely	distract%	<u>337</u>	319 of 787
Likely	forge	115	
Likely	glitch	721	
	glitch%	<u>388</u>	385 of 1365
Likely	hide	572	
Likely	hitch	115	
Likely	improper	759	
Likely	imprudent%	66	
Likely	irrespons%	157	
Likely	misrepresent%	821	

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Category	Search Term	Emails Reviewed	Sample / Population Size
Likely	overlook%	430	
	overlook%	<u>539</u>	408 of 1701
Likely	problem%	<u>547</u>	533 of 87563
Likely	retaliat%	205	
Likely	ridicul%	439	
Likely	rig%		
	rig% not "reserved rights" not "rights reserved" not "drilling activity report" not "drilling operations summary" not "site progress report" not rightfax not "form entry" not login not "planned activity"	<u>548</u>	531 of 55514
	rig% not right not "reserved rights" not "rights reserved" not "drilling activity report" not "drilling operations summary" not "site progress report" not rightfax not "form entry" not login not "planned activity"	<u>211</u>	504 of 8525
Likely	scar%		
	scar% not scarp% not scarif% not scarl% not scarb% not scarf% not scarc% not scarab not scarr% not scarolina not scarv% not scaria not scarafett	652	
Likely	screw%	178	
	screw% & quality	14	
	screw%	<u>406</u>	396 of 1511
Likely	sidetrack%	205	
Likely	stupid	581	
Likely	suspect%	<u>726</u>	504 of 8350
Likely	suspicio%	784	
Likely	truth%	218	
	truth% and qa	302	
	truth%	<u>387</u>	376 of 1257
Likely	unbeliev%	154	
Likely	wasting time	138	
<b>Sub-Total</b>		<b>13005</b>	
Added	{swept under the rug}	8	
Added	[profanity (6 terms) searched but not listed here]%	341	
Added	hypocrit%	14	
Added	illicit%	16	
Added	liar%	40	
Added	material% false statement%	8	
Added	squash%	38	

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BSC Table 1  
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Category	Search Term	Emails Reviewed	Sample / Population Size
Added	whitewash%	18	
<b>Sub-Total</b>		<b>483</b>	

**BSC Table 2**  
**CR 5223 EOC Email Review**  
**Emails Suggesting Willful Noncompliance with QA Requirements**

Accession Number	Email Date	Description	Disposition
ALB.20050315.3152	1/19/2001	Message is discussion coordinating the ITP (Installation Test Plan) in the context of the VTP (Validation Test Plan) to support Control Point 1 of software qualification / management for INFIL v2. It is suggested that the software advisory staff lie to ITSMA (Information Technology Software Management Analyst) about the timing of the comparison. The individual acknowledges that the software advisor "can't lie to ITSMA", and provides alternatives for repeating the ITP.	CR 5223 Personnel and timeframe - Suggestion of willful noncompliance with QA. Inspection of records associated with ITP for INFIL v2.0 does not show irregularities with documentation for ITP. However, a March 2001 email (ALA.20050315.8130) indicates ITP activities were ongoing after the 2/2/01 approval of the ITP documentation. CRs6681 and 6679 initiated to address technical noncompliance and personnel negative attitude, respectively. INFIL Technical Team Special Project expected to address any appropriate technical aspects. (See ALD.20050318.2117)
ALD.20050318.2117	1/19/2001	Message is discussion coordinating the ITP (Installation Test Plan) in the context of the VTP (Validation Test Plan) to support Control Point 1 of software qualification / management for INFIL v2. It is suggested that the software advisory staff lie to ITSMA (Information Technology Software Management Analyst) about the timing of the comparison. In a subsequent message (ALB.20050315.3152) The individual acknowledges that the software advisor "can't lie to ITSMA", and provides alternatives for repeating the ITP.	CR 5223 Personnel and timeframe - Suggestion of willful noncompliance with QA. Inspection of records associated with ITP for INFIL v2.0 does not show irregularities with documentation for ITP. However, a March 2001 email (ALA.20050315.8130) indicates ITP activities were ongoing after the 2/2/01 approval of the ITP documentation. CRs 6681 and 6679 initiated to address technical noncompliance and personnel negative attitude, respectively. INFIL Technical Team Special Project expected to address any appropriate technical aspects. (See ALB.20050315.3152)

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**BSC Table 2**  
**CR 5223 EOC Email Review**  
**Emails Suggesting Willful Noncompliance with QA Requirements**

Accession Number	Email Date	Description	Disposition
ALB.20050321.5944	5/3/2000	Message suggests backdating an entry (to before 9/1/99) in Scientific Notebooks SN-USGS-SCI-001-V1, SN-USGS-SCI-001-V2, and SN-USGS-SCI-001-V3.	Negative attitude toward QA - Suggestion of willful noncompliance with QA. - Evaluation of RIS records do not indicate that SN-USGS-SCI-001-V1, SN-USGS-SCI-001-V2, and SN-USGS-SCI-001-V3 were backdated. CRs 6682 and 6680 initiated to address technical noncompliance and personnel negative attitude, respectively.
ALB.20050321.6162	6/28/2000	Message suggests backdating an initial entry in Scientific Notebook SN-USGS-SCI-123-V1.	Negative attitude toward QA - Willful noncompliance with QA requirements - Review of RIS records confirms the initial entry scientific notebook was backdated. Testing did not commence until after this occurrence and test results were recorded in separate notebooks. CRs 6682 and 6680 initiated to address backdating of QA records and personnel negative attitude. (See ALA.20050324.1808)
ALA.20050324.1808	6/29/2000	Message suggests backdating an initial entry in Scientific Notebook SN-USGS-SCI-123-V1.	Negative attitude toward QA - Willful noncompliance with QA requirements - Review of RIS records confirms the initial entry scientific notebook was backdated. Testing did not commence until after this occurrence and test results were recorded in separate notebooks. CRs 6682 and 6680 initiated to address backdating of QA records and personnel negative attitude. (See ALB.20050321.6162)

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**Emails Suggesting Willful Noncompliance with QA Requirements**

Accession Number	Email Date	Description	Disposition
ALB.20050324.4159	12/21/1998	Message related to documenting completion of GP-01 reading assignment for geologists. It is implied that the documentation be backdated, or alternatively, a deficiency (QDR) be documented.	Suggestion of willful noncompliance with QA. - Further evaluation indicates that GP-01 is Geologic Mapping procedure, apparently in place since 1983, which seems to be USGS basic training that has been proceduralized for YMP. Another email (ALC.20050214.2344) indicates a deficiency report was written (as alternative proposed to suggested backdating). CRs 6682 and 6680 initiated to address backdating of QA records and personnel negative attitude.
ALB.20050401.6925	12/14/2001	Message suggests backdating an initial entry in Scientific Notebook SN-USGS-SCI-127-V1, "if that's doable".	CR 5223 Personnel and timeframe - negative attitude toward QA - Evaluation of RIS records indicate that document was <b>not</b> backdated, also no work performed under notebook SN-USGS-SCI-127-V1. CRs 6682 and 6680 initiated to address technical noncompliance and personnel negative attitude, respectively.

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**BSC Table 3**  
**CR 5223 Extent of Condition Email Review**  
**Emails Referred to Technical / ECP POCs**

<b>Accession Number</b>	<b>Email Date</b>	<b>Description</b>	<b>Disposition</b>
ALC.20040615.7363	1/10/2000	Message is part of a fictional murder mystery. Attachment contains potentially relevant material. (See ALC.20040615.7345 ALC.20040615.7347)	Discussed with BSC ECP manager 9/1/05 - evaluated as innocuous.
ALA.20050328.7048	7/7/2003	Message concerns subcontractor staff allegedly directed to violate procedures under threat of dismissal.	Discussed with BSC ECP manager 7/6/05 - issue was previously reviewed by BSC ECP.
ALD.20050315.4424	3/12/2003	Message is related to BSC employee's USDOL complaint.	Discussed with BSC ECP manager 7/6/05 - issue was previously reviewed by BSC ECP.
ALA.20050328.8994	3/13/2003	Message is related to BSC employee's USDOL complaint.	Discussed with BSC ECP manager 7/6/05 - issue was previously reviewed by BSC ECP.
ALB.20050302.1041	9/21/1999	Message discussed issue with software configuration management documents. Author threatens use of Stop Work Authority to emphasize the importance of the issue.	Discussed with Technical POC on 7/6/05 - issue was dealt with appropriately, requiring adherence to QA procedures. Not an issue.
ALA.20050322.1456	9/1/2004	Message alleges harassment of BSC employee. (see ALA.20050322.1457)	Discussed with BSC ECP manager 7/11/05 - BSC ECP - issue previously acknowledged, addressed and resolved.
ALA.20050322.1457	9/1/2004	Message alleges harassment of BSC employee. (see ALA.20050322.1456)	Discussed with BSC ECP manager 7/11/05 - BSC ECP - issue previously acknowledged, addressed and resolved.
ALC.20040615.7345	1/6/2000	Message is part of a fictional murder mystery. Attachment contains potentially relevant material. (See ALC.20040615.7363 ALC.20040615.7347)	Discussed with BSC ECP manager 9/1/05 - evaluated as innocuous.

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<b>Accession Number</b>	<b>Email Date</b>	<b>Description</b>	<b>Disposition</b>
ALC.20040615.7347	1/6/2000	Message is part of a fictional murder mystery. Attachment contains potentially relevant material. (See ALC.20040615.7363 ALC.20040615.7345)	Discussed with BSC ECP manager 9/1/05 - evaluated as innocuous.
ALA.20050318.2471	2/27/2002	Message discusses QA status of computer codes used in SR in context of proceeding forward to LA.	Discussed with Technical POC 7/10/05 - issues were addressed and resolved before proceeding with codes.
ALO.20040617.6400	12/3/1996	Message discusses differences in interpretation of geophysical surveys between USGS and DOE scientists.	Discussed with Technical POC 7/10/05 - issue was resolved by including both interpretations in the YMSD.
ALF.20040612.9481	12/17/1996	Message describes injection of SF6 above regulatory limits in testing conducted in Alcove 6.	Discussed with Technical POC and Manager of TCO on 7/10/05 - issue addressed after occurrence and corrective actions taken.
ALO.20040617.6362	12/17/1996	Message describes injection of SF6 above regulatory limits in testing conducted in Alcove 6.	Discussed with Technical POC and Manager of TCO on 7/10/05 - issue addressed after occurrence and corrective actions taken.
ALH.20050214.2768	7/23/1996	Message includes email where individual says they have been excluded from project involvement for raising a technical concern. (see ALC.20040618.9425)	Discussed with BSC ECP manager 9/1/05 - determined there is no evidence of retaliation.

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<b>Accession Number</b>	<b>Email Date</b>	<b>Description</b>	<b>Disposition</b>
ALC.20040618.9425	7/23/1996	Message includes email where individual says they have been excluded from project involvement for raising a technical concern. (see ALH.20050214.2768)	Discussed with BSC ECP manager 9/1/05 - determined there is no evidence of retaliation.
ALI.20050302.1991	1/30/1997	Message offers opinions on issues related to Qualimetrics data.	Questions tipping bucket data package (Qualimetrics data) - email is about documented problems with following the procedure and a defense of why the data is good. It is not an additional condition that has not already been addressed. A search of RIS records finds USGS-NCR-96-0004 which addresses lack of field calibrations.
ALF.20050308.8636	9/20/1999	Message discusses possible negative influence of silica plugging of fractures on repository performance.	Discussed with Technical POC on 7/19/05 - issue addressed in experimental work at LBNL in 2001.
ALA.20050318.8821	2/27/2002	Message discusses Extent of Condition for DR-88 (TSPA Code Status).	Discussed with Technical POC 7/19/05 - issue has been addressed previously in resolution of DR - 88.
ALH.20040617.8948	4/30/2001	Message questions LBNL software configuration management activities.	Discussed with Technical POC 7/19/05 - this issue has been addressed in work subsequent to the email.
ALB.20040618.4495	9/20/1999	Message discusses possible negative influence of silica plugging of fractures on repository performance.	Discussed with Technical POC on 7/19/05 - issue addressed in experimental work at LBNL in 2001.
ALF.20040612.2215	4/21/2003	Message conveys problems with data in TDMS for various geomechanical properties.	Discussed with D&E Technical POCs on 7/21/05 - issue is one that has been previously acknowledged and addressed with several CRs. Initiation of the CRs involved the email author.

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Accession Number	Email Date	Description	Disposition
ALG.20050308.7207	2/13/2001	Message is procurement staffer complaining about management inattention prior to BSC.	Discussed with BSC ECP manager 9/1/05 - issue precedes BSC ECP program.
ALC.20050302.9374	1/26/1995	Messages express concern about designation of design and engineering records in the context of records collection. ALC.20050302.9374 specifically mentions "material false statement". (See also ALH.20050308.7618 ALA.20050317.9143 ALA.20050317.4560)	Discussed with BSC ECP manager 9/1/05 - BSC ECP to investigate.
ALH.20050308.7618	1/26/1995	Messages express concern about designation of design and engineering records in the context of records collection. (See also ALC.20050302.9374 ALA.20050317.9143 ALA.20050317.4560)	Discussed with BSC ECP manager 9/1/05 - BSC ECP to investigate.
ALA.20050317.9143	1/26/1995	Messages express concern about designation of design and engineering records in the context of records collection. (See also ALC.20050302.9374 ALH.20050308.7618 ALA.20050317.4560)	Discussed with BSC ECP manager 9/1/05 - BSC ECP to investigate.

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<b>Accession Number</b>	<b>Email Date</b>	<b>Description</b>	<b>Disposition</b>
ALA.20050317.4560	1/27/1995	Messages express concern about designation of design and engineering records in the context of records collection. (See also ALC.20050302.9374 ALH.20050308.7618 ALA.20050317.9143 )	Discussed with BSC ECP manager 9/1/05 - BSC ECP to investigate.
ALH.20050214.9543	3/13/2000	Message is about the status of a list of software used in the UZ AMRs and includes the phrase "material false statement".	Discussed with Technical POC on 7/27/05 - discussion is about apparently conflicting information in a spreadsheet and the phrase "material false statement" is used to place extremely exaggerated emphasis on needing to resolve the conflict before an individual will concur. Not an issue.
ALA.20050324.6287	5/18/2000	Message suggests problems with DTNs	Discussed with Technical POC on 7/27/05 - message addresses formatting of the data submitted. Not an issue.
ALB.20050325.0826	2/10/2000	Message suggests that information was discarded.	Discussed with Technical POC on 7/27/05 - consulted with SME on DTN GS931008312261.002 - DTN is only used as unqualified data to support YMSD.
ALD.20050214.6074	5/18/1999	Message alleges significant radiation exposure (2 Rem) in Test Cell C of NTS Area 25.	Referred to Bechtel Nevada, Bechtel Nevada Dosimetry, for investigation. Not a YM site issue.
ALC.20050220.0449	5/18/1999	Message alleges significant radiation exposure (2 Rem) in Test Cell C of NTS Area 25.	Referred to Bechtel Nevada, Bechtel Nevada Dosimetry, for investigation. Not a YM site issue.
ALA.20050315.3902	5/18/1999	Message alleges significant radiation exposure (2 Rem) in Test Cell C of NTS Area 25.	Referred to Bechtel Nevada, Bechtel Nevada Dosimetry, for investigation. Not a YM site issue.

ATTACHMENT D - BSC REPORT WITH SEARCH TERMS AND DISPOSITION OF  
EMAILS FROM KEYWORD SEARCH

**BSC Table 3**  
**CR 5223 Extent of Condition Email Review**  
**Emails Referred to Technical / ECP POCs**

<b>Accession Number</b>	<b>Email Date</b>	<b>Description</b>	<b>Disposition</b>
ALD.20050318.4600	3/10/1999	Message asserts that LANL persisted in an approach until DOE changed the QARD to accommodate it.	Discussed 9/8/05 - regardless of the author's personal characterization of the sequence of events leading to DOE's modification of the QARD, the conclusion is that LANL complied with the QARD.

ATTACHMENT D - BSC REPORT WITH SEARCH TERMS AND DISPOSITION OF  
EMAILS FROM KEYWORD SEARCH

**BSC Table 4**  
**CR 5223 EOC Email Review**  
**Emails Referred to DOE because of USGS involvement**

<b>Accession Number</b>	<b>Email Date</b>	<b>Description</b>	<b>Disposition</b>
ALD.20050208.2426	04/22/99	Message includes negative comment about QA.	CR 5223 personnel and timeframe - negative attitude toward QA
ALB.20050220.2577	04/22/99	Message includes negative comment about QA.	CR 5223 personnel and timeframe - negative attitude toward QA
ALB.20050216.8701	04/22/99	Message includes negative comment about QA.	CR 5223 personnel and timeframe - negative attitude toward QA
ALB.20050222.5721	10/20/99	Request for GIS information related to infiltration model.	CR 5223 personnel and timeframe - INFIL Technical Team Special Project to address any appropriate technical aspects.
ALC.20050220.3605	03/21/99	Transmits spreadsheet of information apparently related to infiltration model, includes negative comment about USGS QA program.	CR 5223 personnel and timeframe - negative attitude toward QA - INFIL Technical Team Special Project to address any appropriate technical aspects.
ALD.20050208.1512	02/18/98	Funding and workscope discussion, concern is expressed about transfer of funding and challenges to their modeling.	CR 5223 personnel and timeframe - INFIL Technical Team Special Project to address any appropriate technical aspects.
ALA.20050222.0159	12/24/98	Complaint about organizational conflicts and impact of funding on ability to QA work product.	CR 5223 personnel and timeframe - INFIL Technical Team Special Project to address any appropriate technical aspects.
ALA.20050315.3018	02/02/00	Exchange of technical information about INFILv2.0.	CR 5223 personnel and timeframe - INFIL Technical Team Special Project to address any appropriate technical aspects.
ALD.20050208.1820	05/11/98	Discussion of aspect of climate / infiltration aspect of VA TSPA UZ Flow section that appears unknown to authors.	CR 5223 personnel and timeframe - INFIL Technical Team Special Project to address any appropriate technical aspects.

ATTACHMENT D - BSC REPORT WITH SEARCH TERMS AND DISPOSITION OF  
EMAILS FROM KEYWORD SEARCH

**BSC Table 4**  
**CR 5223 EOC Email Review**  
**Emails Referred to DOE because of USGS involvement**

<b>Accession Number</b>	<b>Email Date</b>	<b>Description</b>	<b>Disposition</b>
ALA.20050315.7629	05/05/00	Email suggests backdating a review form from AP-2.14Q review.	Email documents that the review comments by the individual were not part of 2.14 process. Comments were made by the Responsible Manager prior to approval of the final document. Manager indicates there is no need to include them in 2.14 process. No willful noncompliance with QA.
ALD.20050208.2871	05/28/99	Response to DEIS question about infiltration impacts related to species changes.	CR 5223 personnel and timeframe - Innocuous response.
ALB.20050302.2429	03/10/00	Individual's email bemoaning conflicts between schedule, quality, and other demands in context of software validation.	CR 5223 personnel and timeframe - No willful noncompliance with QA.
ALC.20050228.5440	03/10/00	Individual's email response bemoaning conflicts between schedule, quality, and other demands in context of software validation.	CR 5223 personnel and timeframe - No willful noncompliance with QA.
ALD.20050208.5319	03/08/00	Bemoaning conflicts between schedule, quality, and other demands in context of software validation.	CR 5223 personnel and timeframe - No willful noncompliance with QA.
ALD.20050214.3592	04/15/98	Discussion of ESF water monitoring / programmatic budget impacts / ESF and ECRB tests.	CR 5223 personnel and timeframe - No willful noncompliance with QA.
ALD.20050208.5111	04/15/98	Discussion of ESF water monitoring / programmatic budget impacts / ESF and ECRB tests.	CR 5223 personnel and timeframe - No willful noncompliance with QA.

ATTACHMENT D - BSC REPORT WITH SEARCH TERMS AND DISPOSITION OF  
EMAILS FROM KEYWORD SEARCH

**BSC Table 4**  
**CR 5223 EOC Email Review**  
**Emails Referred to DOE because of USGS involvement**

<b>Accession Number</b>	<b>Email Date</b>	<b>Description</b>	<b>Disposition</b>
ALG.20040618.8044	04/15/98	Discussion of ESF water monitoring / programmatic budget impacts / ESF and ECRB tests.	CR 5223 personnel and timeframe - No willful noncompliance with QA.
ALD.20050222.9877	08/10/95	Discussion in response to DOE Management question about used of a particular stratigraphic nomenclature in the ESF.	Referred only because of pejorative description of DOE Manager. No willful noncompliance with QA.
ALA.20050321.4504	04/10/00	Discussion related to USGS QARD matrix review and approval, including USGS and DOE management interest in the same.	No willful noncompliance with QA.
ALD.20040611.0525	04/10/00	Discussion related to USGS QARD matrix review and approval, including USGS and DOE management interest in the same.	No willful noncompliance with QA.
ALB.20050325.3477	04/23/99	Description of individual's job performance.	CR 5223 personnel and timeframe - No willful noncompliance with QA.
ALD.20050208.2428	04/23/99	Message includes negative comment about QA.	CR 5223 personnel and timeframe - negative attitude toward QA - No willful noncompliance with QA.
ALB.20050220.2579	04/26/99	Response to request from USGS person for presentation materials to support funding request.	CR 5223 personnel and timeframe - No willful noncompliance with QA.
ALD.20050208.2429	04/26/99	Pejorative characterization of response to individual's inability to find reviewer for data package.	CR 5223 personnel and timeframe - No willful noncompliance with QA.

ATTACHMENT D - BSC REPORT WITH SEARCH TERMS AND DISPOSITION OF  
EMAILS FROM KEYWORD SEARCH

**BSC Table 4**  
**CR 5223 EOC Email Review**  
**Emails Referred to DOE because of USGS involvement**

<b>Accession Number</b>	<b>Email Date</b>	<b>Description</b>	<b>Disposition</b>
ALD.20050208.1208	11/12/98	Pejorative forwarded email about M&O discussions pertaining to a position on surface temperature rise.	CR 5223 personnel and timeframe - No willful noncompliance with QA.
ALD.20050208.2417	03/26/99	Negative forwarded message to individual about M&O manager's attention to activities the USGS behind schedule, including QA activities.	CR 5223 personnel and timeframe - negative attitude toward QA - No willful noncompliance with QA.
ALD.20050208.1511	12/17/98	Complaint about USGS management.	CR 5223 personnel and timeframe - No willful noncompliance with QA.
ALC.20050220.2051	02/23/99	Negative comment about QA in discussion of sample tracking and software requirements.	CR 5223 personnel and timeframe - negative attitude toward QA
ALB.20050220.3892	05/29/99	Discussion of DTN Q/Non-Q status in context of modeling.	CR 5223 personnel and timeframe - No willful noncompliance with QA. INFIL Technical Team Special Project to address any appropriate technical aspects.
ALA.20050222.6605	05/29/99	Negative comment about QA in discussion of DTN Q/Non-Q status in context of modeling.	CR 5223 personnel and timeframe - negative attitude toward QA - No willful noncompliance with QA. INFIL Technical Team Special Project to address any appropriate technical aspects.
ALA.20050315.3306	06/13/00	Discussion involving an individual about whether a DTN represents input or output data in the context of AMR involving INFIL v2.0.	CR 5223 personnel and timeframe - No willful noncompliance with QA. INFIL Technical Team Special Project to address any appropriate technical aspects.
ALB.20050423.9004	04/10/00	Discussion related to USGS QARD matrix review and approval, including USGS and DOE management interest in the same.	No willful noncompliance with QA.

ATTACHMENT D - BSC REPORT WITH SEARCH TERMS AND DISPOSITION OF  
EMAILS FROM KEYWORD SEARCH

**BSC Table 4**  
**CR 5223 EOC Email Review**  
**Emails Referred to DOE because of USGS involvement**

<b>Accession Number</b>	<b>Email Date</b>	<b>Description</b>	<b>Disposition</b>
ALE.20050308.3476	05/08/96	Message is a response engendered by former USGS staff alleging that seismic records were destroyed.	Response indicates that USGS destruction of duplicate records due to shutdown of USGS local records centers
ALD.20050302.3271	08/24/99	Discussion of QA status of corrected saturation data need to undergo qualification procedure if necessary.	CR 5223 personnel and timeframe - No willful noncompliance with QA.
ALE.20050214.1517	08/25/99	Discussion of QA status of corrected saturation data need to undergo qualification procedure if necessary.	CR 5223 personnel and timeframe - No willful noncompliance with QA.
ALE.20050214.1519	08/27/99	Discussion of QA status of corrected saturation data need to undergo qualification procedure if necessary.	CR 5223 personnel and timeframe - No willful noncompliance with QA.
ALA.20050325.5617	08/27/99	Discussion of QA status of corrected saturation data need to undergo qualification procedure if necessary.	CR 5223 personnel and timeframe - No willful noncompliance with QA.
ALC.20050423.0109	08/27/99	Discussion of QA status of corrected saturation data need to undergo qualification procedure if necessary.	CR 5223 personnel and timeframe - No willful noncompliance with QA.
ALA.20050325.5620	08/30/99	Discussion of QA status of corrected saturation data need to undergo qualification procedure if necessary.	CR 5223 personnel and timeframe - No willful noncompliance with QA.
ALD.20050208.3719	01/05/00	Questions use of infiltration AMR in support of SR.	CR 5223 personnel involved - No willful noncompliance with QA. INFIL Technical Team Special Project to address any appropriate technical aspects.

ATTACHMENT D - BSC REPORT WITH SEARCH TERMS AND DISPOSITION OF  
EMAILS FROM KEYWORD SEARCH

**BSC Table 4**  
**CR 5223 EOC Email Review**  
**Emails Referred to DOE because of USGS involvement**

<b>Accession Number</b>	<b>Email Date</b>	<b>Description</b>	<b>Disposition</b>
ALC.20050318.5730	07/12/00	Admits jumping to incorrect conclusion about content of files.	CR 5223 personnel involved - No willful noncompliance with QA. INFIL Technical Team Special Project to address any appropriate technical aspects.
ALD.20050208.2008	06/26/98	Discussion of modeling details.	CR 5223 personnel involved - No willful noncompliance with QA. INFIL Technical Team Special Project to address any appropriate technical aspects.
ALB.20050330.3397	09/12/97	Message is reaction to confused direction received on implementation of CR 97/040.	No willful noncompliance with QA.
ALG.20040618.8584	02/23/98	Comment about YMP.	CR 5223 personnel and timeframe - No willful noncompliance with QA.
ALG.20040618.8429	02/23/98	Comment about YMP.	CR 5223 personnel and timeframe - No willful noncompliance with QA.
ALD.20050208.5101	02/23/98	Comment about YMP.	CR 5223 personnel and timeframe - No willful noncompliance with QA.
ALD.20050208.5099	02/23/98	Comment about YMP.	CR 5223 personnel and timeframe - No willful noncompliance with QA.
ALB.20050216.7440	05/01/98	Subject line is pejorative about QA, no text in body of message, transmits attachment only.	CR 5223 personnel and timeframe - No willful noncompliance with QA. - attachment contains header 35341TXT.WPD August 26, 1997, with an initial heading of "3.5.3.4.1. Site Infiltration and Potential Recharge", apparently a descriptive technical document.
ALG.20040618.8103	06/17/98	Pejorative response to request to project overtime for USGS staff.	CR 5223 personnel and timeframe - No willful noncompliance with QA.
ALC.20050220.2111	06/17/98	Message forwards pejorative response to request for FY98 planning information.	CR 5223 personnel and timeframe - No willful noncompliance with QA.

ATTACHMENT D - BSC REPORT WITH SEARCH TERMS AND DISPOSITION OF  
EMAILS FROM KEYWORD SEARCH

**BSC Table 4**  
**CR 5223 EOC Email Review**  
**Emails Referred to DOE because of USGS involvement**

<b>Accession Number</b>	<b>Email Date</b>	<b>Description</b>	<b>Disposition</b>
ALD.20050208.5116	06/17/98	Pejorative response to request for FY98 planning information.	CR 5223 personnel and timeframe - No willful noncompliance with QA.
ALG.20040618.8412	06/17/98	Pejorative response to request for FY98 planning information.	CR 5223 personnel and timeframe - No willful noncompliance with QA.
ALD.20050208.2011	07/08/98	Pejorative complaint about work environment.	CR 5223 personnel and timeframe - No willful noncompliance with QA.
ALC.20050216.0124	10/20/98	Brief pejorative comment on state of model, suggesting that an individual should maintain his position, with no elaboration.	CR 5223 personnel and timeframe - No willful noncompliance with QA.
ALB.20050222.2090	01/26/99	Brief message forwarding an individual's message (with expletive) commenting on funding / staffing information.	CR 5223 personnel and timeframe - No willful noncompliance with QA.
ALD.20050208.2558	11/17/99	Series of messages with SNL personnel about infiltration modeling work.	CR 5223 personnel and timeframe - No willful noncompliance with QA.
ALA.20050308.0511	11/17/99	Series of messages with SNL personnel about infiltration modeling work.	CR 5223 personnel and timeframe - No willful noncompliance with QA.
ALB.20050220.3496	11/18/99	Series of messages with SNL personnel about infiltration modeling work.	CR 5223 personnel and timeframe - No willful noncompliance with QA.
ALD.20050302.4383	11/18/99	Series of messages with SNL personnel about infiltration modeling work.	CR 5223 personnel and timeframe - No willful noncompliance with QA.
ALD.20050208.2617	11/18/99	Series of messages with SNL personnel about infiltration modeling work.	CR 5223 personnel and timeframe - No willful noncompliance with QA.
ALJ.20050308.2315	11/18/99	Series of messages with SNL personnel about infiltration modeling work.	CR 5223 personnel and timeframe - No willful noncompliance with QA.

ATTACHMENT D - BSC REPORT WITH SEARCH TERMS AND DISPOSITION OF  
EMAILS FROM KEYWORD SEARCH

**BSC Table 4**  
**CR 5223 EOC Email Review**  
**Emails Referred to DOE because of USGS involvement**

<b>Accession Number</b>	<b>Email Date</b>	<b>Description</b>	<b>Disposition</b>
ALA.20050317.2703	11/18/99	Series of messages with SNL personnel about infiltration modeling work.	CR 5223 personnel and timeframe - No willful noncompliance with QA.
ALA.20050316.5962	11/18/99	Series of messages with SNL personnel about infiltration modeling work.	CR 5223 personnel and timeframe - No willful noncompliance with QA.
ALC.20050208.4594	04/19/99	Message from USGS staff initiating DR (USGS-99-D-041) addressing the timeliness of identifying loss of records due to flooding at DFC.	No willful noncompliance with QA.
ALB.20050423.9004	04/10/00	Discussion related to USGS QARD matrix review and approval, including USGS and DOE management interest in the same.	No response required - management interest in ensuring QA.
ALB.20050302.1965	11/09/99	Exchange of information related to differences in reported average infiltration from different sources apparently based on repository footprint configuration, as noted by SNL personnel.	CR 5223 personnel and timeframe - No willful noncompliance with QA. INFIL Technical Team Special Project to address any appropriate technical aspects.
ALB.20050222.0229	07/12/99	Exchange of information with SNL personnel related to average infiltration and repository footprint configuration in context of AMR development.	CR 5223 personnel and timeframe - No willful noncompliance with QA. INFIL Technical Team Special Project to address any appropriate technical aspects.

ATTACHMENT D - BSC REPORT WITH SEARCH TERMS AND DISPOSITION OF  
EMAILS FROM KEYWORD SEARCH

**BSC Table 4**  
**CR 5223 EOC Email Review**  
**Emails Referred to DOE because of USGS involvement**

<b>Accession Number</b>	<b>Email Date</b>	<b>Description</b>	<b>Disposition</b>
ALA.20050328.2090	11/08/99	Exchange of information related to differences in reported average infiltration from different sources apparently based on repository footprint configuration, as noted by SNL personnel.	CR 5223 personnel and timeframe - No willful noncompliance with QA. INFIL Technical Team Special Project to address any appropriate technical aspects.

ATTACHMENT D - BSC REPORT WITH SEARCH TERMS AND DISPOSITION OF  
E-MAILS FROM KEYWORD SEARCH

**BSC Table 5**  
**CR 5223 EOC Email Review**  
**Emails Referred to OCRWM Concerns Program**

<b>Accession Number</b>	<b>Email Date</b>	<b>Description</b>	<b>Disposition</b>
ALF.20050208.4497	07/13/98	DOE - personnel matter - staff alleging unjust and unfair treatment (see ALF.20050208.4498)	Referred to OCRWM Employee Concerns Program 7/5/05
ALF.20050208.4498	07/13/98	DOE - personnel matter - staff alleging unjust and unfair treatment (see ALF.20050208.4497)	Referred to OCRWM Employee Concerns Program 7/5/05
ALG.20040615.8930	02/20/03	DOE - personnel matter - staff email to himself documenting events in grievance / complaint.	Referred to OCRWM Employee Concerns Program 7/5/05
ALG.20040615.9119	02/14/01	DOE - personnel matter - staff request for reconsideration of counseling referral.	Referred to OCRWM Employee Concerns Program 7/11/05
ALF.20050208.4593	11/11/98	DOE - message mentions DOE staff in itemization of alleged intimidation.	Referred to OCRWM Employee Concerns Program 7/11/05
ALB.20040621.9108	03/26/04	DOE - message suggesting that DOE work environment has a "chilling effect".	Referred to OCRWM Employee Concerns Program 7/11/05
ALB.20050318.9867	01/15/03	DOE - factfinding statement from investigation of allegations.	Referred to OCRWM Employee Concerns Program 7/11/05
ALB.20050318.9868	01/15/03	DOE - comments on factfinding statement from investigation of allegations.	Referred to OCRWM Employee Concerns Program 7/11/05
ALC.20050318.2014	12/18/02	DOE - factfinding statement from investigation of allegations.	Referred to OCRWM Employee Concerns Program 7/11/05
ALC.20050318.2015	12/18/02	DOE - factfinding statement from investigation of allegations.	Referred to OCRWM Employee Concerns Program 7/11/05

ATTACHMENT D - BSC REPORT WITH SEARCH TERMS AND DISPOSITION OF  
E-MAILS FROM KEYWORD SEARCH

**BSC Table 5**  
**CR 5223 EOC Email Review**  
**Emails Referred to OCRWM Concerns Program**

ALC.20050318.2016	12/19/02	DOE - factfinding statement from investigation of allegations.	Referred to OCRWM Employee Concerns Program 7/11/05
ALF.20040615.7823	02/22/03	DOE - message from DOE manager advising that SCWE allegation is being followed.	Referred to OCRWM Employee Concerns Program 7/11/05
ALG.20040615.9044	11/05/03	DOE - personnel matter - staff response to request.	Referred to OCRWM Employee Concerns Program 7/11/05
ALE.20040621.3330	02/17/04	DOE - message about public disclosure of sexual harassment of contractor employee.	Referred to OCRWM Employee Concerns Program 7/11/05
ALG.20040615.9040	07/07/03	DOE - personnel matter - staff email about events in grievance.	Referred to OCRWM Employee Concerns Program 7/11/05
ALG.20040615.8951	01/27/03	DOE - personnel matter - staff email to himself documenting events in grievance / complaint.	Referred to OCRWM Employee Concerns Program 7/11/05
ALG.20040615.8768	12/18/02	DOE - personnel matter - staff email to himself documenting events in grievance / complaint.	Referred to OCRWM Employee Concerns Program 7/11/05
ALG.20040615.8780	11/21/02	DOE - personnel matter - staff email with comments on letter of counseling.	Referred to OCRWM Employee Concerns Program 7/11/05
ALG.20040615.8800	11/08/02	DOE - personnel matter - staff email to himself about letter of counseling and EEO complaint.	Referred to OCRWM Employee Concerns Program 7/11/05
ALG.20040615.8760	09/23/02	DOE - personnel matter - staff email to himself highlighting performance evaluation information.	Referred to OCRWM Employee Concerns Program 7/11/05

ATTACHMENT D - BSC REPORT WITH SEARCH TERMS AND DISPOSITION OF  
E-MAILS FROM KEYWORD SEARCH

**BSC Table 5**  
**CR 5223 EOC Email Review**  
**Emails Referred to OCRWM Concerns Program**

ALG.20040615.2002	09/19/02	DOE - personnel matter - message from DOE staff alleging harassment.	Referred to OCRWM Employee Concerns Program 7/11/05
ALG.20040615.8721	06/25/02	DOE - personnel matter - message from DOE staff, Subject: Re: Harassment.	Referred to OCRWM Employee Concerns Program 7/11/05
ALG.20040615.8720	06/25/02	DOE - personnel matter - message from DOE staff, Subject: Re: Harassment.	Referred to OCRWM Employee Concerns Program 7/11/05
ALG.20040615.8722	06/20/02	DOE - personnel matter - message from DOE staff, Subject: Re: Harassment.	Referred to OCRWM Employee Concerns Program 7/11/05
ALG.20040615.8883	02/12/02	DOE - personnel matter - message from DOE staff notice of EEO complaint.	Referred to OCRWM Employee Concerns Program 7/11/05
ALG.20040615.8881	02/12/02	DOE - personnel matter - message from DOE staff about EEO complaint.	Referred to OCRWM Employee Concerns Program 7/11/05
ALG.20040615.8823	03/09/01	DOE - personnel matter - message from DOE staff about management treatment.	Referred to OCRWM Employee Concerns Program 7/11/05
ALG.20040615.8847	02/07/01	DOE - personnel matter - message from DOE staff to DOE legal counsel about EEO complaint.	Referred to OCRWM Employee Concerns Program 7/11/05
ALG.20040615.9004	02/28/01	DOE - personnel matter - message from DOE staff about employment mediation.	Referred to OCRWM Employee Concerns Program 7/11/05
ALG.20040615.9119	02/14/01	DOE - personnel matter - staff request for reconsideration of counseling referral.	Referred to OCRWM Employee Concerns Program 7/11/05
ALG.20040615.8838	02/01/01	DOE - personnel matter - staff email to himself documenting certain events.	Referred to OCRWM Employee Concerns Program 7/11/05
ALG.20040615.9116	01/25/01	DOE - personnel matter - message documenting performance evaluation discussions	Referred to OCRWM Employee Concerns Program 7/11/05

ATTACHMENT D - BSC REPORT WITH SEARCH TERMS AND DISPOSITION OF  
E-MAILS FROM KEYWORD SEARCH

**BSC Table 5**  
**CR 5223 EOC Email Review**  
**Emails Referred to OCRWM Concerns Program**

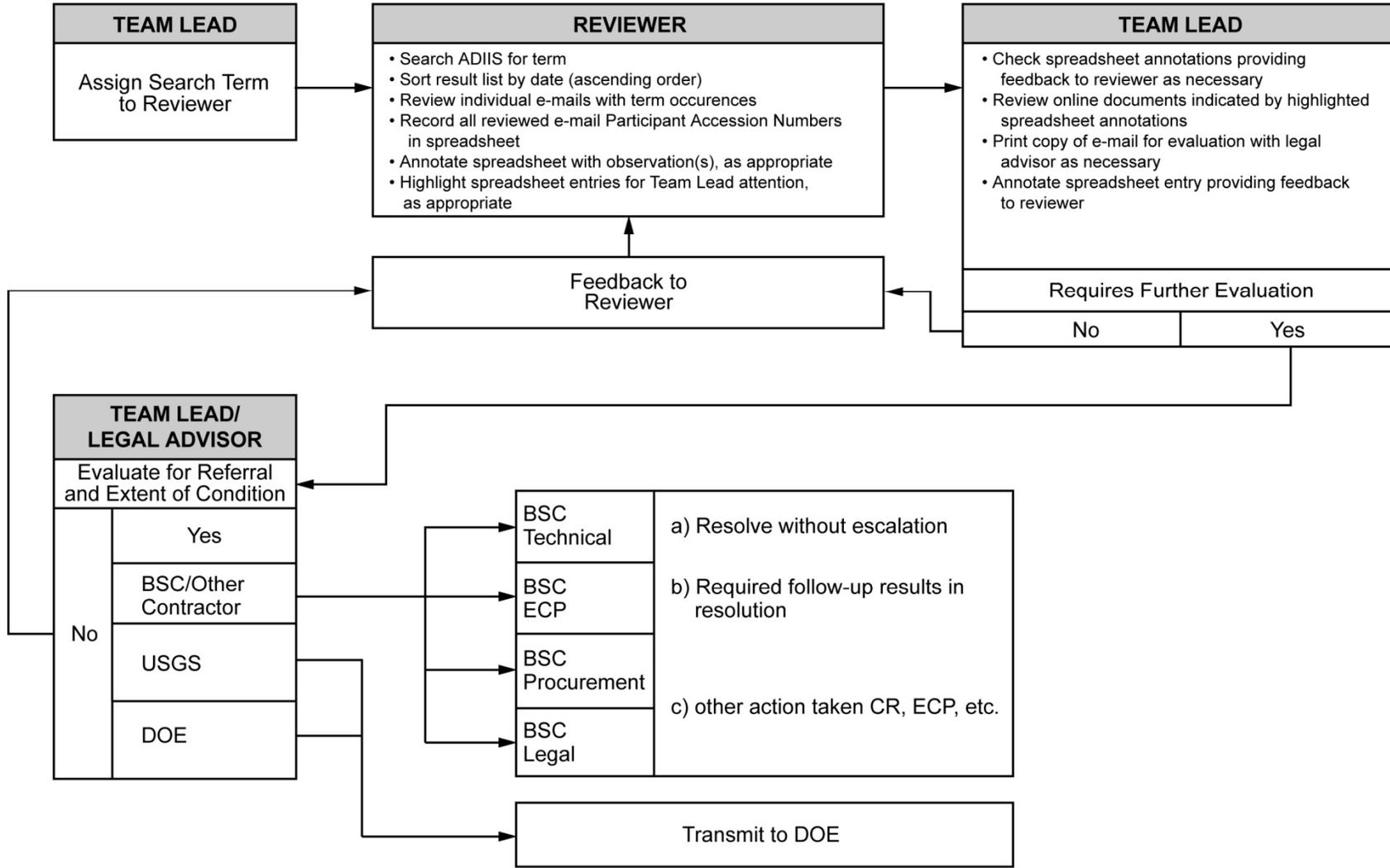
ALG.20040615.9117	12/11/00	DOE - personnel matter - message documenting concerns about role and responsibilities in organization.	Referred to OCRWM Employee Concerns Program 7/11/05
ALG.20040615.8906	12/07/00	DOE - personnel matter - message documenting concerns about role and responsibilities in organization.	Referred to OCRWM Employee Concerns Program 7/11/05
ALG.20040615.8905	12/04/00	DOE - personnel matter - message responding to denial for request for transfer within organization	Referred to OCRWM Employee Concerns Program 7/11/05
ALG.20040615.8704	02/07/01	DOE - personnel matter - staff email complaining of harassment.	Referred to OCRWM Employee Concerns Program 7/11/05
ALG.20040615.8934	02/24/03	DOE - personnel matter - staff email to himself documenting events in grievance / complaint.	Referred to OCRWM Employee Concerns Program 7/11/05
ALC.20050208.7467	10/28/99	DOE - personnel matter - message is escalation of concern beyond employee's current manager.	Referred to OCRWM Employee Concerns Program 7/20/05
ALG.20040615.8929	02/24/03	DOE - personnel matter - staff email to himself documenting events with respect to SCWE complaint.	Referred to OCRWM Employee Concerns Program 7/28/05
ALG.20040615.8934	02/24/03	DOE - personnel matter - staff email to himself documenting events with respect to SCWE complaint.	Referred to OCRWM Employee Concerns Program 7/28/05
ALG.20040615.9145	09/20/00	DOE - personnel matter - message from DOE staff about management treatment.	Referred to OCRWM Employee Concerns Program 7/28/05
ALC.20040621.1704	04/09/04	DOE - message about staff frustration with procedure review.	Referred to OCRWM Employee Concerns Program 7/28/05

ATTACHMENT D - BSC REPORT WITH SEARCH TERMS AND DISPOSITION OF  
E-MAILS FROM KEYWORD SEARCH

**BSC Table 5**  
**CR 5223 EOC Email Review**  
**Emails Referred to OCRWM Concerns Program**

ALD.20040621.4897	03/11/04	DOE - message about contractor destruction of records.	Referred to OCRWM Employee Concerns Program 8/04/05
ALD.20040612.8448	01/28/04	DOE - message implies ethical questions involving DOE staff.	Referred to OCRWM Employee Concerns Program 8/04/05

**BSC FIGURE 1 - CR 5223 EOC Email Review Process**



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ATTACHMENT D - BSC REPORT WITH SEARCH TERMS AND DISPOSITION OF  
EMAILS FROM KEYWORD SEARCH

BSC Attachment 1

Plan for CR 5223 Extent of Condition Evaluation of Email for Indications of Willful  
Circumvention or Misrepresentation of Quality Assurance Requirements Rev 2 7/29/05

Plan for CR 5223 Extent of Condition Evaluation of Email for Indications of Willful  
Circumvention or Misrepresentation of Quality Assurance Requirements

Purpose

CR 5223 was initiated as a result of evaluation of the legacy emails that determined that a few U.S. Geological Survey (USGS) employees exchanged email which contains statements indicating actions to circumvent and/or misrepresent compliance with the YMP QA requirements. The purpose of this review is to:

- a) Conduct reviews of the existing database of project email to determine to what degree, if any inappropriate behaviors similar to those identified in the subject emails may have been committed by others beyond the previously identified individuals.
- b) Define the appropriate key words/phrases to *use* in the electronic searches to identify emails for evaluation.
- c) Evaluate any identified emails to determine whether there is indication of willful actions to circumvent and/or misrepresent compliance with the YMP QA requirements.

Scope

It is suggested that less than 10,000 emails will need to be evaluated for the initial scope of the review.

Organization \ Staffing

The task is the responsibility of BSC Business Systems. The task lead reports directly to the Manager, Business Systems with direct coordination and consultation with the Licensing & Nuclear Safety 1 Postclosure Activities organization. The task lead is from the Licensing & Compliance organization. The task legal advisor is *name withheld*. Organization charts are included as BSC Attachments 1 - 3. Available BSC staff, many of whom were previously involved in email review will be used for the evaluation.

Required Reviewer characteristics are included in BSC Attachment 4. Reviewer's immediate supervisors will be requested to confirm that reviewers meet these characteristics. All reviewers will be required to execute a nondisclosure form (BSC Attachment 5) before initiating their review.

Training \ Briefings

Reviewers will use a computer database tool for their search and evaluation of email and/or email attachments. General training on use of the computer application for conducting the review will be provided.

A separate briefing on the approach for conduct of the review will also be provided to reviewers, before beginning their review. Reviewers will be briefed on the purpose, approach and process for their evaluation of the email, including advice on consultation with the Task Lead or BSC Legal Counsel, as necessary. The briefing materials (BSC Attachment 6) were developed by the Task Lead in consultation with BSC Legal Counsel.

### Search Strategy for CR 5223 EOC Email Review

The approach to the review is to search the email database collection(s) for key terms and phrases to identify a collection of email for evaluation by trained reviewers. The search terms and phrases were developed by BSC personnel, further tailored by the task management and concurred in by DOE-OGC (BSC Attachment 7 Rev 01).

The list of search terms (BSC Attachment 7 Rev 01) support a strategy for searching the archival emails for indications of willful non-compliance with, or a negative attitude towards, quality assurance requirements. An initial list was derived from a number of sources, including the emails sent by certain members of the USGS staff. The initial list of terms was revised to avoid terms that were:

- a) not obviously indicative of willful noncompliance with or a negative attitude towards QA requirements (e.g., "appealing") and
- b) commonly used terms that would not necessarily be indicative of willful noncompliance with or a negative attitude towards QA requirements (e.g., "funding").

The search strategy is designed to focus efforts on the documents that are most likely to contain the kinds of statements which indicate willful noncompliance or a negative attitude towards QA requirements. Accordingly, the search strategy is flexible and will evolve in response to the findings of the searches. The search strategy includes the following steps:

1. In cases where single words are unlikely to appear in appropriate technical or professional exchanges, such as "cover up" or "pretend", the archival emails will be searched for those specific terms and "hits" (documents with search term occurrences) individually reviewed by staff.
2. In cases where words are likely to appear in appropriate technical or professional exchanges as well as in inappropriate private communications, such words will be used in compound search terms. For example the phrases "the results are deceptive" versus "the deception won't be found" illustrate the possible results of searching using "decept%" only. The compound search terms will be phrases designed to reduce the number of false positive "hits" on documents which use such words in appropriate technical or professional exchanges. If possible, boolean search strategies excluding terms with the intent to focus the search on the area of interest maybe employed before using the statistical sampling approach. Staff will individually review "hits" except as noted in step 3 below.
3. It is recognized that there will be cases where the search using words or compound search terms from step 2 above results in an excessive number of "hits" and further reduction of false positives is not practical. In such cases, the staff review will utilize a-the statistical sampling approach. If possible, boolean search strategies excluding terms with the intent to focus the search on the area of interest may be employed before using the statistical sampling approach.

ATTACHMENT D - BSC REPORT WITH SEARCH TERMS AND DISPOSITION OF  
EMAILS FROM KEYWORD SEARCH

4. In cases where statistical samples result in new indications (previously unidentified issues) of possible willful noncompliance with or negative attitude towards QA requirements, samples sizes will be increased or search terms tailored as appropriate.
5. Although not listed, a number of profane words and phrases will also be used as search terms as an indicator of a negative attitude towards QA requirements.
6. Additional words or search strategies may be developed on the basis of experience with initial search results.

Approach for CR 5223 EOC Email Review

There are 62 search terms provided in BSC Attachment 7 Rev 01. Thirty-eight of the terms are initially thought to be unlikely to appear in appropriate communications, as described by item 1 above. These terms will be distributed first to reviewers. The remaining 24 terms are thought likely to appear in appropriate communications, and are subject to items 2-4 above. Based on experience in term searches, re-categorization of terms within the "unlikely" and "likely" categories is anticipated.

Two terms categorized as "unlikely" (destroy% and glitch) were recategorized as "likely" based on search results (07/14105).

Four terms affected by ADIIS search limitation ("cover up", "make up", "made up", and "forget about it") were removed from the list of terms on 7/15/05. ADIIS search capability does not allow searching on certain common English words, such as "about" or "up". This causes a search using the term "cover up" to only report all emails with the term "cover". Similarly, a search for "forget about it" returns all emails with the term "forget". The effect of this is that the resulting population of "hits" is not a representative sample of emails containing the specific term in question. A statistical sample obtained from such a population is not likely to provide meaningful results.

CACI software will be used to search for terms in Email only, unless something suggests that evaluation of attachments will improve the effort. Search terms will be issued by the task lead to reviewers. Reviewers will evaluate the documents with occurrences of the search terms for indications of willful non-compliance with, or a negative attitude towards, quality assurance requirements. Task Lead will monitor reviewers' the results and provide direction on proceeding.

Generally, searches yielding > 500 term occurrences in email will be reviewed with the task lead, to decide if the:

- a) search result occurrences should be reviewed without further search effort
- b) search result occurrences should be evaluated see if recategorization of the term is appropriate and whether a revised search using a compound search term would focus the search more appropriately. A decision may be made at this point to review the documents exhibiting search term occurrences.
- c) search results not amenable to reduction of false positives will be addressed using a statistical sampling approach as described in BSC Attachment 8. Where statistical sampling is employed and results indicate possible willful noncompliance with/or negative attitude towards QA requirements, samples sizes will be increased or search

terms tailored, as appropriate.

Searches for profane terms (words and phrases) as indicators of a negative attitude towards QA requirements will be conducted by the task lead, with the assistance of selected reviewer(s).

Additional words or search strategies may be developed on the basis of experience with initial search results. Reviewer recommendations for new search terms, compound search terms or revised approaches will be brought to the task lead's attention for consideration by a legal advisor and task management before implementation.

Reviewers will search for assigned terms and evaluate documents online for indications suggesting willful noncompliance or a negative attitude towards QA requirements. The Participant Accession # for each document reviewed will be recorded in an Excel spreadsheet by the reviewer, using the template provided, allowing documentation of: the progress of review assignment(s); the completion of review assignment(s); and, identification of documents requiring further evaluation.

Reviewer observations related to indications of noncompliance will be noted in the reviewer's spreadsheet and brought to the attention of the task lead. The task lead and legal advisor will assess the identified document, in consultation with the reviewer, as necessary, and decide whether it warrants escalation for management's consideration. Escalated observations will be brought to the attention of the managers of the BSC Post-Closure Activities, BSC Employee Concerns, BSC Procurement, BSC Legal or other appropriate organizations. The task lead will document the identification by reviewers and escalation of concerns about questionable email. Feedback to reviewers will be provided by the task lead on the disposition of documents identified by the reviewers as warranting further evaluation.

Reviewer identified concerns not related to willful noncompliance of QA requirements, will be assessed by the task lead and legal advisor, in consultation with the reviewer, as necessary, and escalated to the appropriate BSC manager evaluation and disposition.

A summary evaluation of the review process for incorporation into the summary report on the extent of condition investigation for CR 5223 will be developed by the task lead for transmittal to the manager of Licensing and Nuclear Safety, Business Systems, and BSC Legal Counsel.

#### Schedule

June 13 to June 22 -finalized list of search terms; finalize strategy/approach for conduct of their review; Identifying, training, and briefing reviewers; acquire access to ADIIS

June 22 to August 5 - conduct review

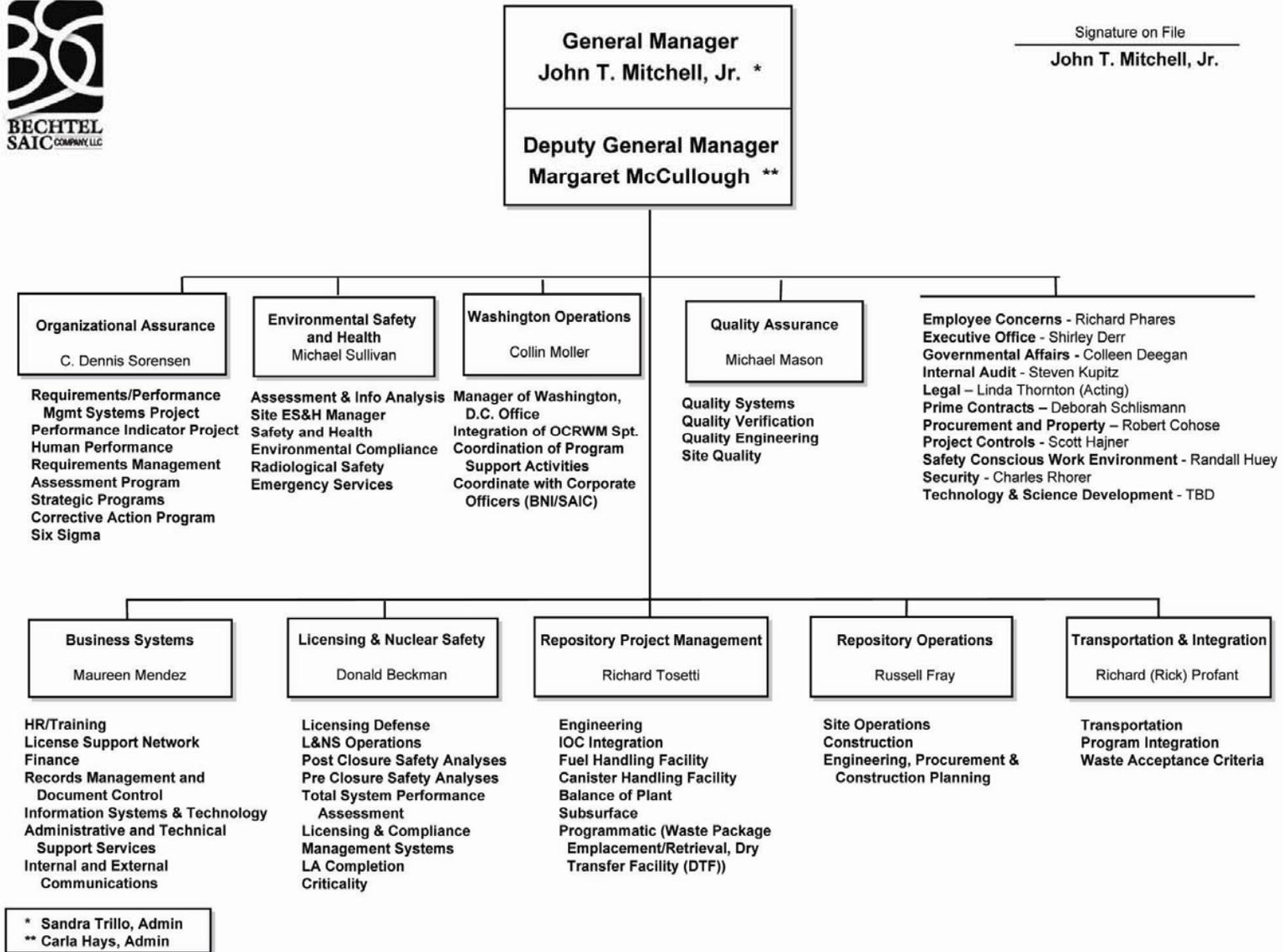
July 30-to-August 18 - develop and document summary evaluation of the review

ATTACHMENT D - BSC REPORT WITH SEARCH TERMS AND DISPOSITION OF  
EMAILS FROM KEYWORD SEARCH

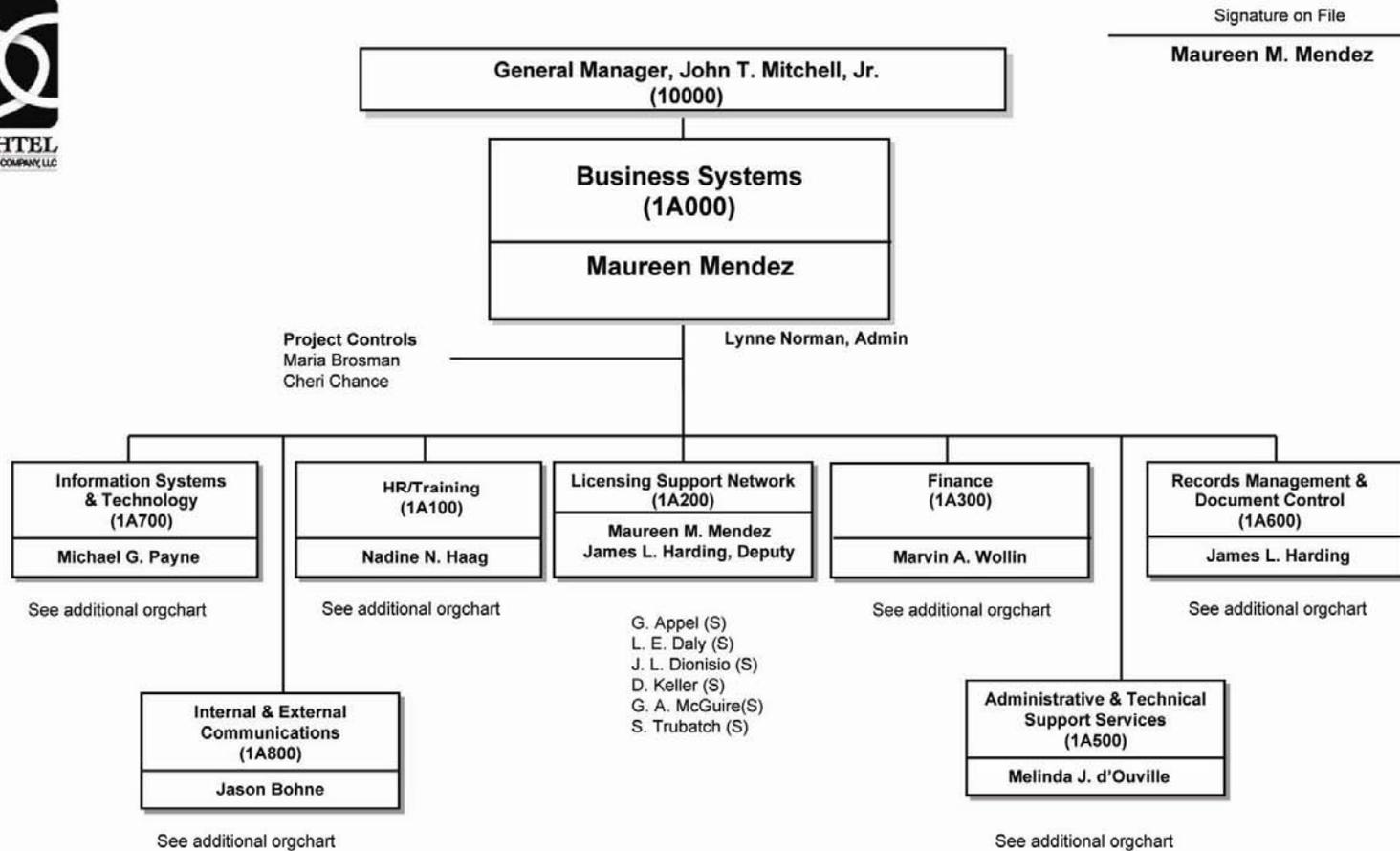
List of Attachments

- BSC Attachment 1 – Organization Chart –BSC General Manager
- BSC Attachment 2 – Organization Chart – BSC Business Systems Manager
- BSC Attachment 3 – Organization – Licensing & Nuclear Safe Manager
- BSC Attachment 4 – Reviewer Characteristics
- BSC Attachment 5 – Nondisclosure Agreement
- BSC Attachment 6 – Initial Briefing – CR 5223 Extent of Condition Email Reviews
- BSC Attachment 7 – List of Search Terms
- BSC Attachment 8 – Statistical Sampling Methodology

ATTACHMENT D - BSC REPORT WITH SEARCH TERMS AND DISPOSITION OF  
EMAILS FROM KEYWORD SEARCH



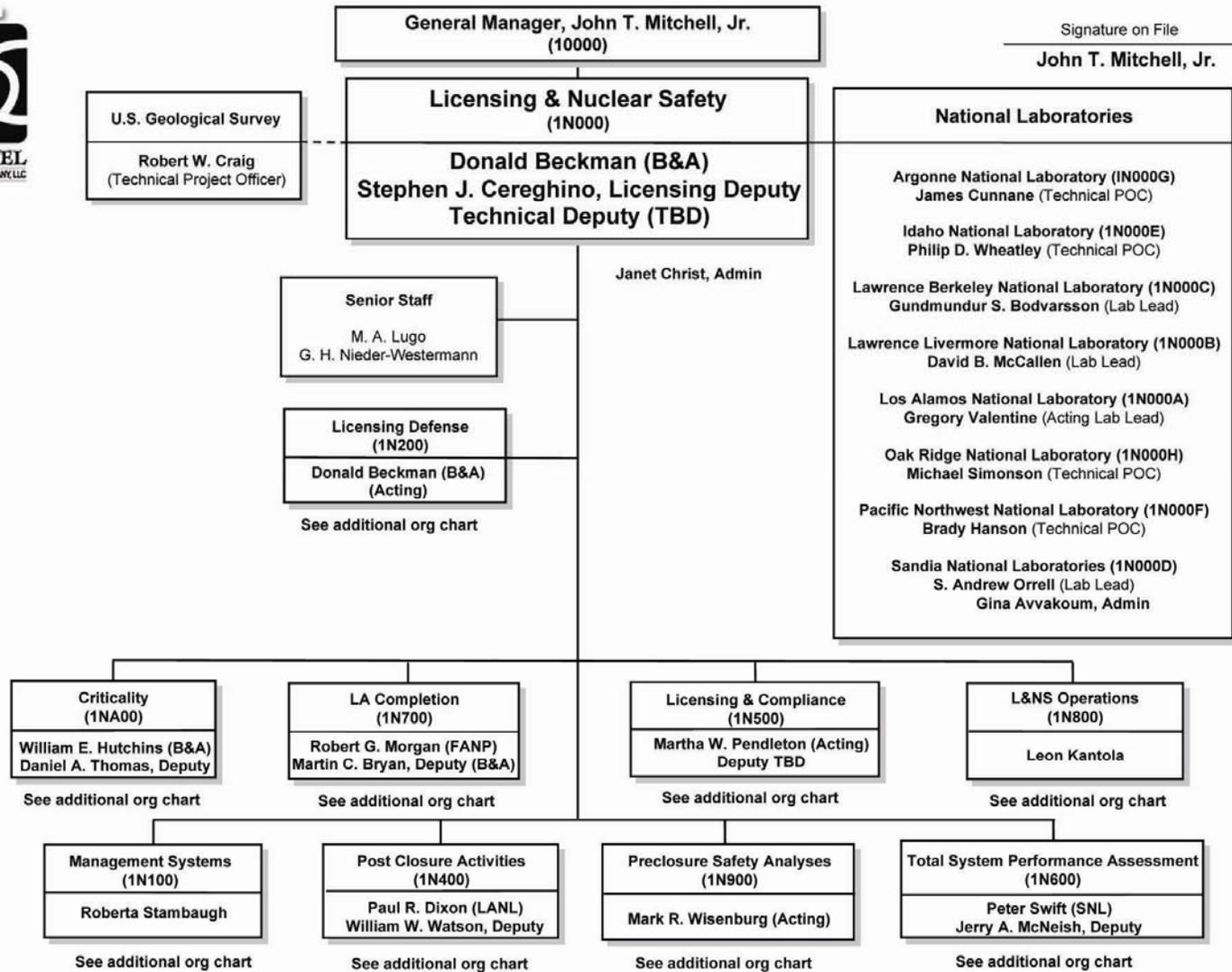
ATTACHMENT D - BSC REPORT WITH SEARCH TERMS AND DISPOSITION OF EMAILS FROM KEYWORD SEARCH



(S) = Shared

Mendez.ppt  
06.27.05

ATTACHMENT D - BSC REPORT WITH SEARCH TERMS AND DISPOSITION OF  
EMAILS FROM KEYWORD SEARCH



Beckman.ppt  
05.10.05

**BSC Attachment 4**

**CR 5223 Extent of Condition Email Reviewer Characteristics**

Scope:

Review of email generated by current and former participants on the Yucca Mountain Project for indications of willful non-compliance with quality assurance program requirements in Legacy, and Archival email collections. Review is also to screen for apparent business ethics failures and silica litigation discovery pertinent material.

Reviewers will be trained on the purpose, scope, and screening criteria for the review. Participants will be screening large volumes of email that are likely to contain technical information. All reviewers will be required to complete the required training and sign a review specific nondisclosure agreement.

Requirements:

- A minimum of one year experience working in a technical position on the Yucca Mountain Project. Examples of technical positions include engineer, scientist, and QA personnel.
- Familiarity with procedural processes for technical work, especially those related to quality assurance of technical/engineering information
- Familiarity with application of ethical standards (e.g., BSC Standards of Conduct and Business Ethics)
- Questioning attitude – willingness to seek advice of legal and subject matter experts.
- Demonstrated dependability, task oriented approach, conscientious, self-motivated work ethic.
- Ability to work for extended periods at a computer terminal.
- Attention to detail and tolerance for detailed, repetitious work.
- Discretion to not discuss or disclose sensitive, private, or privileged information that may be encountered during the review.
- Execution of nondisclosure agreement requiring the employee to maintain confidential the contents of materials reviewed.
- Work to be performed project premises.

**CONTRACTOR OWNED DOCUMENT (BSC Attachment 5)  
NOT LSN RELEVANT/DO NOT PLACE IN LSN**



**NONDISCLOSURE AGREEMENT**

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Procurement & Property  
Yucca Mountain Project

This Nondisclosure Agreement (“Agreement” herein), concerns the protection of certain information (hereinafter “Project Information”) associated with the U.S. Department of Energy (DOE) Office of Civilian Radioactive Waste Management activities, which may include information that is non-public, proprietary, privileged, personal, important to security or safeguards, or otherwise confidential.

1. \_\_\_\_\_ (Reviewer) is working as an employee, consultant, contractor, or subcontractor of Bechtel SAIC Company, LLC (BSC).
2. If Reviewer agrees to the comply with the terms of this Nondisclosure Agreement (Agreement), Project Information may be disclosed to Reviewer and/or may be processed or created by Reviewer for the purpose of evaluation and segregation according to instructions given to Reviewer (the Support Work). The Support Work is in support of a contract BSC has with the DOE. As a condition to being furnished the Project Information and participating in the Support Work, Reviewer agrees to treat Project Information in accordance with the provisions of this Agreement.
3. Reviewer agrees to use Project Information solely for the purpose of performing the Support Work as directed by BSC and DOE. The Project Information may be disclosed only to those personnel properly authorized by the BSC Manager of Business Systems, which personnel are involved in the Support Work, either as employees of DOE, BSC or their subcontractors. In the event Reviewer has any question about which personnel are so authorized, Reviewer is to contact *name withheld*.
4. Except as required to perform assigned Support Work or to respond to requests by BSC Legal Counsel, Reviewer will neither copy nor use any of the Project Information for any other purpose, and will not cause any such Project Information either to be revealed to any other party, nor to be placed in a location where unauthorized persons may have access to it, including, without limitation, in the Licensing Support Network (LSN). Additionally, Reviewer agrees to protect and not to disclose the nature of, or any description of the contents of, the Project Information. Reviewer will return all copies to BSC when the Support Work is finished.
5. Reviewer agrees to exercise all reasonable care to safeguard Project Information from unauthorized use or disclosure.
6. Reviewer understands that in the event of violation of this Agreement, he or she may be subject to discipline, including possible termination of employment. This is in addition to any rights of enforcement the DOE, other persons, or other Government entities may have related to misuse or unauthorized disclosure of information.
7. The obligations under this Agreement shall continue after the Support Work is completed, and shall remain in effect unless, and only to the extent that, BSC releases Reviewer from these obligations in writing.
8. Notwithstanding the above, nothing in this Agreement prevents a Reviewer from bringing a confidential concern to either the BSC or DOE Employee Concern Program or to the Nuclear Regulatory Commission.

I agree to the requirements and limitations stated in this document.

By:

Print Name: \_\_\_\_\_

Position: \_\_\_\_\_

Date: \_\_\_\_\_

Employer: \_\_\_\_\_

ATTACHMENT D - BSC REPORT WITH SEARCH TERMS AND DISPOSITION OF  
EMAILS FROM KEYWORD SEARCH

Attachment 6  
CR 5223 Extent of Condition E-mail Review  
Preparatory Review Briefing Agenda – General Information

Purpose of task - to evaluate the extent of condition that may exist with respect to indications of willful circumvention or misrepresentation of quality assurance requirements as reflected in program participant's e-mail.

Relationship to LSN Relevancy Review – there is no relationship.

This task is an evaluation of a condition identified in CR 5223, it is not an LSN effort.

Ergonomic factors – task work is ergonomically challenging

Call Sue Stonebraker (5-5373) for ergonomic evaluation if most recent is > 6 months

Report ergonomic injury symptoms to task team lead and/or base organization manager

Reference Material and Task Support

See - G:\ADIIS\ or G:\ADIIS\CR 5223 EOC E-mail Review

Importance of this Task

Read “Initial Investigation Into Potential Noncompliance with Quality Assurance Requirements [attachment to CR 5223 “CR 5223\_Initial\_Investigation[1].pdf” ]

Organization:

CR 5223 Owner – Licensing & Nuclear Safety

CR 5223 EOC E-mail Review task owner – Business Systems

Managing Quality and Schedule:

Maintain quality while recognizing schedule importance

Nondisclosure

All reviewers must sign nondisclosure form

Reviewers should be mindful of their work environment vis-à-vis nondisclosure requirements

Do not share information, insights, documents, electronic media with others

Reporting Willful Noncompliance Observations

Documents indicating willful noncompliance are discussed with team lead \ legal advisor

Escalation will be to Post-Closure Activities, L&NS, and QA Managers

Feedback on disposition will be provided by team lead to reviewer

Reporting other observations such as: obscene e-mail, silica or other litigation, security concerns, etc. will be reported to team lead for distribution to appropriate BSC organization (e.g., ECP, legal, security) after conferring with task legal advisor.

Feedback on disposition will be provided by team lead to reviewer

Daily Reporting

See - G:\ADIIS\ for Excel template to be completed daily and saved in reviewer folder in G:\ADIIS\CR 5223 EOC E-mail Review

**DO NOT HESITATE TO ASK QUESTIONS, at any time during this review task!**

**YOUR CONSCIENTIOUS COOPERATION IS ESSENTIAL TO OUR SUCCESS**

ATTACHMENT D - BSC REPORT WITH SEARCH TERMS AND DISPOSITION OF  
EMAILS FROM KEYWORD SEARCH

Attachment 6  
CR 5223 Extent of Condition E-mail Review  
Preparatory Review Briefing Agenda – Review Approach

Search Terms

List of 62 search terms

Initial list derived from number of sources, (including the e-mails sent by certain members of the USGS staff.)

Initial list was reviewed to avoid terms that:

- a) not obviously indicative of willful noncompliance with or a cavalier attitude towards QA requirements (e.g., “appealing”) and,
- b) commonly used terms that would not necessarily be indicative of willful noncompliance with or a cavalier attitude towards QA requirements (e.g., “funding”).

Search Approach

Focuses effort on the documents judged likely to contain indications of willful noncompliance or a cavalier attitude towards QA requirements. Note that disparaging commentary on program or aspect of project does not necessarily indicate willful noncompliance.

Search Term is issued by team lead to reviewer.

ADIIS is searched for Term in E-mail only (nominally personnel tend to be less guarded in these communications), unless otherwise indicated.

Search results yielding > 500 occurrences in e-mail will be reviewed with team lead, to decide whether:

- a) search result occurrences should be reviewed without further evaluation
- b) search result occurrences should be evaluated see whether a revised search using a compound search term would focus the search appropriately. A decision may be made at this point to review the reduced number of occurrences.
- c) search results not amenable to reduction of false positives will be addressed using a statistical sampling approach such as that in American National Standard ANSI/ASQC Z1.4-1993 (Sampling Procedures and Tables for Inspection by Attributes) as described in a revision to the task plan. Where statistical sampling is employed and results indicate possible willful noncompliance with or cavalier attitude towards QA requirements, samples sizes will be increased as described in a revision to the task plan.

Search terms consisting of profane words and phrases will also be used as an indicator of a cavalier attitude towards QA requirements.

Additional words or search strategies may be developed on the basis of experience with initial search results.

Reviewer recommendations for new search terms, compound search terms or revised approaches must be brought to the team lead’s attention for consideration by task legal advisor and management before implementation.

Review Documentation The Participant Accession # for each document reviewed will be recorded in an Excel spreadsheet by the reviewer, using the template provided, allowing: documentation of the progress of review assignment(s) documentation of the completion of review assignment(s) documentation of identification of suspect e-mail

Record # of documents with occurrences.

OCR Load Date is important field

The team lead will be responsible for documenting the identification by reviewers and escalation of concerns about questionable e-mail

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EMAILS FROM KEYWORD SEARCH

Rev 01 - 07/15/05

Attachment 7 (page 1 of 2)  
CR 5223 EOC E-mail Review  
List of Search Terms

Terms Unlikely to Appear in Appropriate Technical or Professional Communications

"delete this e-mail" or other form

backdate

bogus

cheat%

7/15/05 removed due to ADIIS search limitations

coverup

deceit%

deceiv%

7/14/05 re-categorized as "Likely" dread%

fake

fall guy%

falsif%

fictit%

7/15/05 removed due to ADIIS search limitations fubar

fudge%

7/14/05 re-categorized as "Likely"

harrass%

hit the fan

hoop and jumping

inside scoop

intimidat%

laugh

7/15/05 removed due to ADIIS search limitations

7/15/05 removed due to ADIIS search limitations

mum

nervous

nightmar%

phony

piss

pretend

screw around

screwed around

sham

taken to the cleaners

whistle blow%

whistleblow%

ATTACHMENT D - BSC REPORT WITH SEARCH TERMS AND DISPOSITION OF  
EMAILS FROM KEYWORD SEARCH

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Attachment 7 (page 2 of 2)  
CR 5223 EOC E-mail Review  
List of Search Terms

Terms Likely to Appear in Appropriate Technical or Professional Communications

decept%  
destroy% 7/14/05 re-categorized as "Likely"  
distort%  
distract%  
forge  
glitch 7/14/05 re-categorized as "Likely"  
hide  
hitch  
improper  
imprudent%  
irrespons%  
misrepresent%  
overlook%  
problem%  
retaliat%  
ridicul%  
rig%  
scar%  
screw%  
sidetrack%  
stupid  
suspect%  
suspicio%  
truth%  
unbeliev%  
wasting time

Note: % indicates a syntax whereby the search will identify the root term in combination with any other characters.

## BSC Attachment 8

### Statistical Sampling Methodology CR 5223 Extent of Condition Email Review Effort

#### Introduction

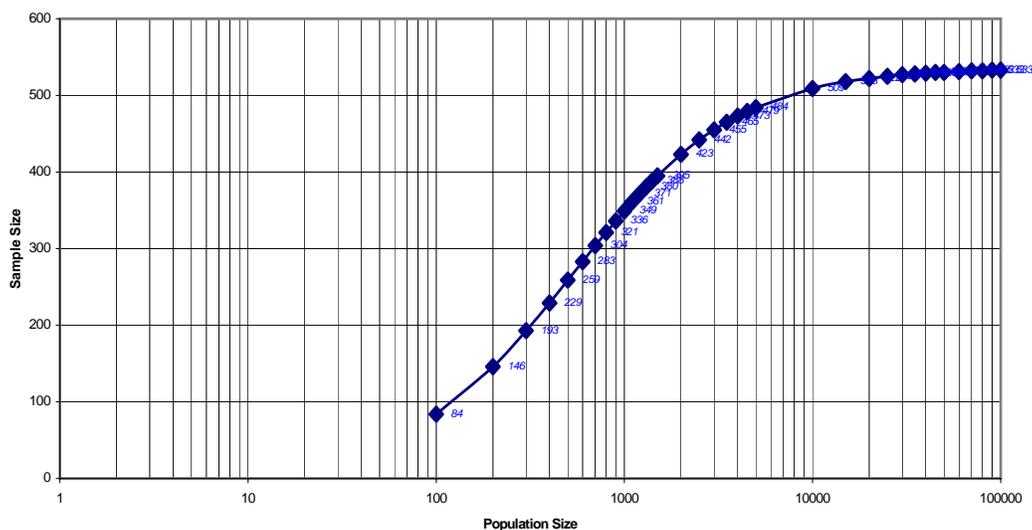
This describes the statistical sampling methodology for the search terms which resulted in too large a number of e-mails to be read individually. BSC's Search Strategy included a commitment to develop a statistical sampling methodology and to provide the statistical basis for that methodology to the Department of Energy Office of Repository Development. The details of the statistical basis for the sample selection and the process of random sampling are discussed below.

#### Statistical Sampling Methodology

The statistical sampling methodology was developed in consultation with a BSC expert who supports the Six Sigma project. Based on the population and question to be answered, it was determined that the statistical analysis should be based on the symmetric binomial distribution with a finite population correction factor applied. This method is widely accepted as an effective method of sample size estimation. (References 1 & 2).

The size of the sample was selected to achieve a 98% confidence that 98% or more (that is 99% +/- 1%) of the subject e-mail population would not contain messages which meet the attributes defined in the Search Strategy. The following graph shows the necessary sample size required for a given population (number of observations needed in a sample to infer a property of the population).

Sample Size for 98% Confidence that 99% (+/- 1%) of emails are free of the attributes of concern



## Conclusion

Based on this methodology, the sample sizes listed in the table below were determined for the “likely” search terms listed, based on the currently estimated number of search term occurrences. Technical details on how the samples were extracted are in an Appendix.

Term	Occurrences	Sample Size
destroy%	2271	434
glitch%	1365	385
truth%	1250	375
screw%	1550	398
overlook%	1696	407
suspect%	8270	503
rig%	60209	531
problem%	86711	533

## References

1. "Statistics for Managers Using Microsoft Excel", 3rd edition, written by David M. Levine, David Stephan, Timothy C. Krehbiel, Mark L. Berenson, discusses binomial distribution and probability (Section 4-6, pages 191 - 198), Sample Sizes (Section 6-4, pages 304 - 307), and Finite Population Correction Factor (Section 6-7, page 319). This text was used to teach graduate statistics in the MBA program at the University of Nevada, Las Vegas.
2. "Barron's Business Statistics", 4th edition, by Douglas Downing and Jeffrey Clark, discusses polling and sampling using the binomial distribution (Chapter 12, page 254). This text is used to teach statistics during Six Sigma Black Belt instruction.

Appendix: Details of Sample Generation

ADIIS will be searched for the term of interest using appropriate compound search terms to limit false positives. The search will use a specific ADIIS load date in order to be able to duplicate the search findings. ADIIS will return a list of e-mails in which the term occurs. The reviewer will sort the list of e-mails by e-mail date resulting in a numbered list (i.e., 1 to X where X is the number of e-mails in which the term occurs). E-mail will be selected randomly for evaluation from the date-sorted list. An Excel spreadsheet will be used to generate the requisite random numbers for selection from the sorted list as explained below.

The requisite random numbers for evaluation of the E-mail containing search term occurrences will be generated using an excel spreadsheet with 4 columns:

Column A formula - =RAND()  
Generates random decimal with value between 0 and 1

Column B formula - =INT(Ax\*N)  
Generates integer value for random decimal in row x of column A and multiplies it by N.  
N equals the number of E-mail containing search term occurrences.

About 20 % more random integers should be generated than N to account for duplicates.

Column B is copied, pasting into Column C with the commands Edit\Paste Special\Values.  
This allows sorting and comparison without recalculation

Column C is sorted using Data\Sort\Ascending  
This puts the random integers in ascending order

Column D formula - =IF(INT(C3)=INT(C2),"Duplicate","OK")  
This formula is copied into every cell adjacent to a random integer in Column C.

Press [F9] to recalculate. Note this will change the values in Columns A and B and operate the expression in Column D

The expression in Column D will indicate the location of duplicate random integers in Column C. All but one of the duplicates should be deleted. This process is continued until the requisite number of random integers is obtained.

The ordered list of random integers will be provided to the reviewer. The reviewers will again search ADIIS using the specific ADIIS load date and sort the resultant listing according to e-mail date producing a numbered list. The reviewer selects the email in the listing according to the list of random integers provided.

Note: Auto calculate feature must be turned off, using Tools/Options/Calculate/Manual to avoid continuously recalculating when formulae are entered.

## **Second BSC Report**

ATTACHMENT D - BSC REPORT WITH SEARCH TERMS AND DISPOSITION OF  
EMAILS FROM KEYWORD SEARCH

To: *Name withheld*, BSC Regulatory Counsel  
From: *Name withheld*, Licensing & Compliance Staff  
Date: December 12, 2005  
Subject: Addendum to 10/07/05 Report on CR 5223 EOC Email Review

Purpose This is an addendum to the report on the email review undertaken as part of the effort to determine the extent of the condition identified in CR 5223. The purpose of this addendum is to provide an update of the results of the additional review conducted after the initial review documented in my October 7, 2005 “Report on CR 5223 EOC Email Review”. This review was conducted for emails through November 1, 2005. The overall purpose of the review is the same as described in the October report. Details on the search terms and review scope and methodology are included in that document.

Scope of the Update About 1600 emails in CACI, Inc's. Automated Document Image Indexing System (ADIIS) EMAIL Database were reviewed. The search was designed to identify email which had been entered into ADIIS after the start of the initial review and contained the search terms.

Methodology Emails in the ADIIS EMAIL Database were reviewed and evaluated to determine to what degree, if any, inappropriate behaviors were exhibited as in the initial review. Key words/phrases used for the electronic searches of emails were the same as in the initial review.

Experienced program personnel conducted the reviews. Five reviewers participated in the effort from November 21, 2005 through December 5, 2005. Reviewers had participated in the initial review. Reviewers were briefed on November 29, 2005. One participant was unable to attend the scheduled training and was individually instructed. The nondisclosure agreement previously executed by each reviewer was still in effect.

Search Terms The search terms used were the same as in the initial review and are listed in BSC Table 1. BSC Table 1 also indicates the number of emails reviewed for each term and whether the statistically sampling methodology was employed. The statistical sampling methodology was only used for terms to which it was applied in the initial review.

The size of the sample was selected to achieve a 98% confidence that 98% or more (i.e., 99% +/- 1%) of the subject email population would not contain messages that meet the attributes of the criteria established by DOE.

Evaluation Criteria The database was searched for evidence of conduct that met criteria established by DOE, as described in the October report.

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EMAILS FROM KEYWORD SEARCH

Search Details Searches were conducted for email containing the search terms with OCR Load Dates in the range from 6/22/05 to 11/1/05. Since the initial review was begun on 6/22/05, this ensured that the search included all email entered into ADIIS, in the period following the initial review up until 11/1/05. All email with occurrences of the terms were reviewed, with the exception of three terms. Search results for the three of the terms (problem%, rig%, and suspect%) presented prevalent false positive results, warranting application of the statistical sampling methodology.

Reviewers identified email for further consideration by the Team Lead and/or Regulatory Counsel that met review criteria by:

- Appearing related to the USGS matter currently under investigation
- Reflecting a willful noncompliance with QA requirements
- Reflecting other concerns

Regular contact was maintained with reviewers to assess review status and facilitate coordination. Reviewers were reminded to bring to the Team Lead's attention, any documents that they believed warranted immediate consideration.

Post-Identification Evaluation The Team Lead evaluated reviewer-highlighted items and provided feedback to the reviewers using notations in reviewer's spreadsheets. Reviewers were requested to check the Team Lead feedback notations in their individual spreadsheets and notify the Team Lead if they disagreed with the assessment.

Emails which the reviewers identified as indicating conduct of potential concern were evaluated by the Team Lead and/or Regulatory Counsel for possible referral and consideration by a knowledgeable point of contact (POC within the BSC or DOE organization. Condition Reports (CR) in the Corrective Action Program (CAP) were initiated as appropriate.

Results Of the 1646 emails reviewed, the Team Lead / Regulatory Counsel evaluated twenty-eight (28) as appropriate for further consideration. BSC Table 2 lists emails warranting further consideration and includes a brief description and summary of the disposition.

Eight (8) emails were referred to DOE (BSC Table 2).

Two emails relating to personnel or SCWE issues were referred to BSC ECP (Table 2).

Three emails suggested technical / quality implications (BSC Table 2). Two were resolved based on discussions with technical points of contact (POC). Resolution of the third email of this group is indeterminate. While it cannot be concluded on the basis of the email content alone that requirements were actually circumvented, a condition report (CR – 7148) was initiated to address issues reflected in this email.

Fifteen emails suggesting a lack of control of sensitive unclassified computer account information were addressed by initiating CR 7176.

ATTACHMENT D - BSC REPORT WITH SEARCH TERMS AND DISPOSITION OF  
EMAILS FROM KEYWORD SEARCH

Observations and Conclusions Based on the CR 5223 EOC Email review:

The observations from the initial review, listed below were not changed by the update review:

- a) YMP staff do not appear to have systematically withheld email expressing views that are not supportive of either the management, technical, or quality related aspects of the project;
- b) There is no indication of prevalent willful noncompliance with QA requirements, or attitude toward Quality Assurance. Only isolated instances of an inappropriate attitude toward QA requirements were identified;
- c) Email searches for terms that are judged “unlikely” to appear in appropriate technical or professional exchanges appeared to be as much as three times more effective than searches for “likely” terms.

List of Tables

BSC Table 1 – List of Search Terms

BSC Table 2 – Emails Warranting Consideration

ATTACHMENT D - BSC REPORT WITH SEARCH TERMS AND DISPOSITION OF  
EMAILS FROM KEYWORD SEARCH

**BSC Table 1  
List of Search Terms**

<b>Category</b>	<b>Search Term</b>	<b>Update Emails Reviewed</b>	<b>Update Sample / Population Size</b>
Unlikely	"delete this email" or other form		
	delete this email Not privileg% not secure FTP	0	
	delete this email Not privileged	1	
	delete this message not privileged not "electronic message" not TBM	2	
Unlikely	backdate	3	
	backdat%	4	
	Back date	6	
Unlikely	bogus	19	
Unlikely	cheat%	22	
Unlikely	cover up (removed due to ADIIS search limitations)		
Unlikely	coverup	0	
Unlikely	deceit%	2	
Unlikely	deceiv%	2	
Unlikely	destroy% (re-categorized as "Likely")		
Unlikely	dread%	13	
Unlikely	fake	12	
Unlikely	fall guy%	2	
Unlikely	falsif%	32	
Unlikely	fictit%	3	
Unlikely	forget about it (removed due to ADIIS search limitations)		
Unlikely	fubar%	2	
Unlikely	fudge%		
	fudg%	4	
Unlikely	glitch (re-categorized as "Likely")		
Unlikely	harras%	3	
	haras%	9	
Unlikely	hit% the fan	3	
Unlikely	hoop and jumping		
	hoop near jump%	2	
Unlikely	inside scoop		
	insid% scoop	0	
Unlikely	intimidat%	6	
Unlikely	laugh		
	laugh%	16	
Unlikely	made up (removed due to ADIIS search limitations)		
Unlikely	make up (removed due to ADIIS search limitations)		
Unlikely	mum	2	

ATTACHMENT D - BSC REPORT WITH SEARCH TERMS AND DISPOSITION OF  
EMAILS FROM KEYWORD SEARCH

BSC Table 1  
**List of Search Terms**

Category	Search Term	Update Emails Reviewed	Update Sample / Population Size
Unlikely	nervous		
	nervous%	5	
Unlikely	nightmar%	8	
Unlikely	phony	2	
Unlikely	piss	2	
Unlikely	pretend	1	
Unlikely	screw around	0	
Unlikely	screwed around	0	
Unlikely	sham	3	
Unlikely	taken to the cleaners	2	
Unlikely	whistle blow%		
	whistle near blow%	2	
Unlikely	whistleblow%	4	
<b>Sub- Total</b>		<b>199</b>	
Likely	decept%	3	
Likely	destroy%		
	destroy% not "Configuration Management Notice" not "responsive material" not "Cluster Notification" not "CONFIDENTIALITY NOTICE" not "either destroying" not "Confidentiality Footer"	124	101 of 124
Likely	distort%	9	
Likely	distract%	9	9 of 9
Likely	forge	8	
Likely	glitch		
	glitch%	39	36 of 39
Likely	hide%	29	
Likely	hitch	4	
Likely	improper	29	
Likely	imprudent%	2	
Likely	irrespons%	2	
Likely	misrepresent%	8	
Likely	overlook%		
	overlook%	54	49 of 54
Likely	problem%	461	456 of 3048
Likely	retaliat%	14	
Likely	ridicul%	9	

ATTACHMENT D - BSC REPORT WITH SEARCH TERMS AND DISPOSITION OF  
EMAILS FROM KEYWORD SEARCH

**BSC Table 1  
List of Search Terms**

<b>Category</b>	<b>Search Term</b>	<b>Update Emails Reviewed</b>	<b>Update Sample / Population Size</b>
Likely	rig%		
	rig% not "reserved rights" not "rights reserved" not "drilling activity report" not "drilling operations summary" not "site progress report" not rightfax not "form entry" not login not "planned activity"	398	397 of 1534
Likely	scar%		
	scar% not scarp% not scarif% not scarl% not scarb% not scarf% not scarc% not scarab not scarr% not scarolina not scarv% not scaria not scarafett	6	
Likely	screw%		
	screw%	9	9 of 9
Likely	sidetrack%	4	
Likely	stupid	8	
Likely	suspect%	166	163 of 234
Likely	suspicio%	12	
Likely	truth%	26	
Likely	unbeliev%	6	
Likely	wasting time	2	
<b>Sub- Total</b>		<b>1441</b>	
Added	{swept under the rug}	0	
Added	[profanity (6 terms) searched but not listed here]%	2	
Added	hypocrit%	0	
Added	illicit%	0	
Added	liar%	0	
Added	material% false statement%	0	
Added	squash%	4	
Added	whitewash%	0	
<b>Sub- Total</b>		<b>6</b>	

ATTACHMENT D - BSC REPORT WITH SEARCH TERMS AND DISPOSITION OF  
EMAILS FROM KEYWORD SEARCH

**BSC Table 2  
CR 5223 EOC E-mail Review  
E-mails Suggesting Willful Noncompliance with QA Requirements**

	<b>Accession Number</b>	<b>Email Date</b>	<b>Issue Area</b>	<b>Description</b>	<b>Disposition</b>
1	ALA.20050721.0064	05/10/05	DOE	Apparent reduction of training requirements because refresher not available.	Referred to OCRWM Employee Concerns Program 11/21/05
2	ALB.20050722.1243	05/17/05	DOE	Self-identified attempt to mislead	Referred to OCRWM Employee Concerns Program 11/21/05
3	ALA.20051020.0647	09/19/05	DOE	Question of adequacy of review of DRs / CARs	Referred to OCRWM Management 12/09/05
4	ALA.20051018.4835	07/26/05	DOE	Employee DOL complaint - history	Referred to OCRWM Employee Concerns Program 11/21/05
5	ALA.20051018.3988	08/01/05	DOE	Employee DOL complaint - history	Referred to OCRWM Employee Concerns Program 11/21/05
6	ALA.20050815.4506	06/01/05	DOE	Assertion that whistleblower is unknown to OCP	Referred to OCRWM Employee Concerns Program 12/06/05
7	ALA.20050815.0382	06/06/05	DOE	Assertion that whistleblower is unknown to OCP	Referred to OCRWM Employee Concerns Program 12/06/05
8	ALA.20050721.2806	05/11/05	DOE	Employee recounting SCWE and ECP concerns to OCP	Referred to OCRWM Employee Concerns Program 12/06/05
9	ALA.20050721.2232	05/02/05	ECP	Employee retaliation claim	Reviewed with ECP 11/22/05 - Matter has been investigated via ECP procedures, and is pending resolution.
10	ALB.20051018.3382	08/23/05	ECP	Possible intimidation	Referred to BSC ECP 12/7/05 for investigation

ATTACHMENT D - BSC REPORT WITH SEARCH TERMS AND DISPOSITION OF  
EMAILS FROM KEYWORD SEARCH

BSC Table 2  
CR 5223 EOC E-mail Review  
E-mails Suggesting Willful Noncompliance with QA Requirements

	Accession Number	Email Date	Issue Area	Description	Disposition
11	ALC.20050214.4497	08/10/99	Tech	Possible inaccurate Scientific Notebook date information	Not an Issue - Discussed with Technical POC 12/08/05. The LotusNotes database is non-Q, and apparently had a substitute initial date (referred to as "fictitious"). The database appears to have been updated with the correct date of 6/15/98 for initiation. All seven notebooks referred to in the email are closed, with closing technical and compliance reviews completed.
12	ALB.20051018.4160.	08/26/05	Tech	Question of adequacy of database search	Not an issue - Discussed with Technical POC on 12/7/05. Author of message is pointing out that electronic search approach will not identify records, if a signature is the identifier. Concern is mooted by INFIL Technical Team Special Project examination of all infiltration related calibration records associated with the noted individuals work.

ATTACHMENT D - BSC REPORT WITH SEARCH TERMS AND DISPOSITION OF  
EMAILS FROM KEYWORD SEARCH

BSC Table 2  
**CR 5223 EOC E-mail Review**  
**E-mails Suggesting Willful Noncompliance with QA Requirements**

	<b>Accession Number</b>	<b>Email Date</b>	<b>Issue Area</b>	<b>Description</b>	<b>Disposition</b>
13	ALA.20051020.0813	09/23/05	Tech	Possible QA noncompliance for Scientific Notebook	<p>Initiated CR 7148 - Discussed with Technical POC on 12/7/05. Section 5.1.1.10 of LP-SIII.11Q-BSC states that "each entry shall be signed/initialed by the person making the entry". This email suggests that a participant was initialing for another individual after the entry was made. The initialer was not the supervisor of the other two individuals mentioned. Even though it was the participant's notebook, the person making the entry should have initialed the entry. The notebook has been submitted for records processing, and is not immediately available. Resolution of the issue may need more than examination of the notebook. Hence, the matter of noncompliance with respect to the initialing of entries is indeterminate, and CR 7148 was initiated.</p> <p>Relative to the question of lining through blank space, there is nothing in the procedure to preclude doing what is described as one makes entries. There is no noncompliance in this regard.</p>
14	ALA.20050721.1430	05/13/05	Tech	Lack of control of sensitive unclassified computer account information	Initiated CR 7176 to evaluate and address process resulting in loss of proper controls.
15	ALA.20050722.5169	05/23/05	Tech	"	"
16	ALA.20050722.5384	05/23/05	Tech	"	"
17	ALA.20050722.5604	05/23/05	Tech	"	"
18	ALA.20050722.5635	05/23/05	Tech	"	"
19	ALA.20050722.5639	05/23/05	Tech	"	"

ATTACHMENT D - BSC REPORT WITH SEARCH TERMS AND DISPOSITION OF  
EMAILS FROM KEYWORD SEARCH

BSC Table 2  
CR 5223 EOC E-mail Review  
E-mails Suggesting Willful Noncompliance with QA Requirements

	<b>Accession Number</b>	<b>Email Date</b>	<b>Issue Area</b>	<b>Description</b>	<b>Disposition</b>
20	ALA.20050722.5833	05/23/05	Tech	"	"
21	ALA.20050722.6076	05/23/05	Tech	"	"
22	ALA.20050815.5514	06/08/05	Tech	"	"
23	ALA.20050815.5513	06/08/05	Tech	"	"
24	ALA.20050815.3361	06/08/05	Tech	"	"
25	ALA.20050801.8949	06/09/05	Tech	"	"
26	ALA.20050801.3398	06/09/05	Tech	"	"
27	ALA.20050801.3981	06/14/05	Tech	"	"
28	ALA.20050801.2064	06/16/05	Tech	"	"

## **ATTACHMENT E**

### **DISPOSITION OF THE BSC-REVIEWED EMAILS FROM THE KEYWORD SEARCH OF ADIIS**

**Initial BSC Email Review (151 Emails)**

Accession Number		Email Date	Topic	Description	Disposition	Status
1	ALB.20050315.3152	1/19/2001	Software	Message is discussion coordinating the ITP (Installation Test Plan) in the context of the VTP (Validation Test Plan) to support Control Point 1 of software qualification / management for INFIL v2. It is suggested that the software advisory staff lie to ITSMA (Information Technology Software Management Analyst) about the timing of the comparison. The individual acknowledges that the software advisor "can't lie to ITSMA", and provides alternatives for repeating the ITP.	CR 5223 Personnel and timeframe - Suggestion of willful noncompliance with QA. Inspection of records associated with ITP for INFIL v2.0 does not show irregularities with documentation for ITP. However, a March 2001 email (ALA.20050315.8130) indicates ITP activities were ongoing after the 2/2/01 approval of the ITP documentation. CRs6681 and 6679 initiated to address technical noncompliance and personnel negative attitude, respectively. INFIL Technical Team Special Project expected to address any appropriate technical aspects. (See ALD.20050318.2117)	<b>Added to CR 6681 and subsequently integrated into CR 5223. In January 2006, CR 7413 was initiated for this email and one other.</b>
2	ALD.20050318.2117	1/19/2001	Software	Message is discussion coordinating the ITP (Installation Test Plan) in the context of the VTP (Validation Test Plan) to support Control Point 1 of software qualification / management for INFIL v2. It is suggested that the software advisory staff lie to ITSMA (Information Technology Software Management Analyst) about the timing of the comparison. In a subsequent message (ALB.20050315.3152) The individual acknowledges that the software advisor "can't lie to ITSMA", and provides alternatives for repeating the ITP.	CR 5223 Personnel and timeframe - Suggestion of willful noncompliance with QA. Inspection of records associated with ITP for INFIL v2.0 does not show irregularities with documentation for ITP. However, a March 2001 email (ALA.20050315.8130) indicates ITP activities were ongoing after the 2/2/01 approval of the ITP documentation. CRs 6681 and 6679 initiated to address technical noncompliance and Personnel negative attitude, respectively. INFIL Technical Team Special Project expected to address any appropriate technical aspects. (See ALB.20050315.3152)	<b>Added to CR 6679 and subsequently integrated into CR 5223. In January 2006, CR 7413 was initiated for this email and one other.</b>
3	ALB.20050321.5944	5/3/2000	Backdating	Message suggests backdating an entry (to before 9/1/99) in Scientific Notebooks SN-USGS-SCI-001-V1, SN- USGS-SCI-001-V2, and SN-USGS-SCI- 001-V3.	Negative attitude toward QA - Suggestion of willful noncompliance with QA. - Evaluation of RIS records do not indicate that SN-USGS-SCI-001-V1, SN-USGS-SCI-001-V2, and SN-USGS-SCI-001-V3 were backdated. CRs 6682 and 6680 initiated to address technical noncompliance and personnel negative attitude, respectively.	<b>Added to CR 6680/82 and subsequently integrated into CR 5223. In January 2006, CR 7415 was initiated for this email.</b>

**Initial BSC Email Review (151 Emails)**

Accession Number		Email Date	Topic	Description	Disposition	Status
4	ALB.20050321.6162	6/28/2000	Backdating	Message suggests backdating an initial entry in Scientific Notebook SN- USGS-SCI-123-V1.	Negative attitude toward QA -Willful noncompliance with QA requirements - Review of RIS records confirms the initial entry scientific notebook was backdated. Testing did not commence until after this occurrence and test results were recorded in separate notebooks. CRs 6682 and 6680 initiated to address backdating of QA records and personnel negative attitude. (See ALA.20050324.1808)	<b>Added to CR 6680/82 and subsequently integrated into CR 5223. In January 2006, CR 7422 was initiated for this email and one other.</b>
5	ALA.20050324.1808	6/29/2000	Backdating	Message suggests backdating an initial entry in Scientific Notebook SN- USGS-SCI-123-V1.	Negative attitude toward QA -Willful noncompliance with QA requirements - Review of RIS records confirms the initial entry scientific notebook was backdated. Testing did not commence until after this occurrence and test results were recorded in separate notebooks. CRs 6682 and 6680 initiated to address backdating of QA records and personnel negative attitude. (See ALB.20050321.6162)	<b>Added to CR 6680/82 and subsequently integrated into CR 5223. In January 2006, CR 7422 was initiated for this email and one other.</b>
6	ALB.20050324.4159	12/21/1998	Backdating	Message related to documenting completion of GP-01 reading assignment for geologists. It is implied that the documentation be backdated, or alternatively, a deficiency (QDR) be documented.	Suggestion of willful noncompliance with QA. – Further evaluation indicates that GP-01 is Geologic Mapping procedure, apparently in place since 1983, which seems to be USGS basic training that has been proceduralized for YMP. Another email (ALC.20050214.2344) indicates a deficiency report was written (as alternative proposed to suggested backdating). CRs 6682 and 6680 initiated to address backdating of QA records and personnel negative attitude.	<b>Added to CR 6680/82 and subsequently integrated into CR 5223. In January 2006, CR 7414 was initiated for this email.</b>

**Initial BSC Email Review (151 Emails)**

Accession Number		Email Date	Topic	Description	Disposition	Status
7	ALB.20050401.6925	12/14/2001	Backdating	Message suggests backdating an initial entry in Scientific Notebook SN- USGS-SCI-127-V1, "if that's doable".	CR 5223 Personnel and timeframe – negative attitude toward QA – Evaluation of RIS records indicate that document was not backdated, also no work performed under notebook SN- USGS-SCI-127-V1. CRs 6680 and 6682 initiated to address technical noncompliance and personnel negative attitude, respectively.	<b>Added to CR 6680/82 and subsequently integrated into CR 5223. In January 2006, CR 7419 was initiated for this email.</b>
8	ALC.20040615.7363	1/10/2000	Not related to Yucca Mountain	Message is part of a fictional murder mystery. Attachment contains potentially relevant material. (See ALC.20040615.7345)	Discussed with BSC ECP manager 9/1/05 - evaluated as innocuous.	This was non-project, non-relevant email where writers used creative writing to break some of the monotony of a task. The email was inappropriate to the work involved, and it was inappropriately categorized as relevant. <b>Resolved - no further action needed.</b>
9	ALA.20050328.7048	7/7/2003	Personnel – unfair treatment/harassment	Message concerns subcontractor <u>staff</u> allegedly directed to violate procedures under threat of dismissal.	Discussed with BSC ECP manager 7/6/05 - issue was previously reviewed by BSC ECP.	These emails dealt with an alleged claim of disability that was denied. BSC resolved the condition with the individual. <b>Resolved - no further action needed.</b>
10	ALD.20050315.4424	3/12/2003	Personnel – unfair treatment/harassment	Message is related to BSC employee's USDOL complaint.	Discussed with BSC ECP manager 7/6/05 - issue was previously reviewed by BSC ECP.	
11	ALA.20050328.8994	3/13/2003	Personnel – unfair treatment/harassment	Message is related to BSC employee's USDOL complaint.	Discussed with BSC ECP manager 7/6/05 - issue was previously reviewed by BSC ECP.	
12	ALB.20050302.1041	9/21/1999	Software	Message discussed issue with software configuration management documents. Author threatens use of Stop Work Authority to emphasize the importance of the issue.	Discussed with Technical POC on 7/6/05 - issue was dealt with appropriately, requiring adherence to QA procedures. Not an issue.	<b>Added to CR 6679/81 (now integrated into CR 5223).</b>
13	ALA.20050322.1456	9/1/2004	Personnel – unfair treatment/harassment	Message alleges harassment of BSC employee. (see ALA.20050322.1457)	Discussed with BSC ECP manager 7/11/05 - BSC ECP – issue previously acknowledged, addressed and resolved.	Corrective actions were properly taken to resolve the issue. <b>Resolved - no further action needed.</b>
14	ALA.20050322.1457	9/1/2004	Personnel – unfair treatment/harassment	Message alleges harassment of BSC employee. (see ALA.20050322.1456)	Discussed with BSC ECP manager 7/11/05 - BSC ECP – issue previously acknowledged, addressed and resolved.	

**Initial BSC Email Review (151 Emails)**

Accession Number		Email Date	Topic	Description	Disposition	Status
15	ALC.20040615.7345	1/6/2000	Not related to Yucca Mountain	Message is part of a fictional murder mystery. Attachment contains potentially relevant material. (See ALC.20040615.7363 ALC.20040615.7347)	Discussed with BSC ECP manager 9/1/05 - evaluated as innocuous.	This was non-project, non-relevant email where writers used creative writing to break some of the monotony of a task. The email was inappropriate to the work involved and it was inappropriately categorized. <b>Resolved - no further action needed.</b>
16	ALC.20040615.7347	1/6/2000	Not related to Yucca Mountain	Message is part of a fictional murder mystery. Attachment contains potentially relevant material. (See ALC.20040615.7363 ALC.20040615.7345)	Discussed with BSC ECP manager 9/1/05 - evaluated as innocuous.	See email above, ALC.20040615.7345. <b>Resolved - no further action needed.</b>
17	ALA.20050318.2471	2/27/2002	Software	Message discusses QA status of computer codes used in SR in context of proceeding forward to LA.	Discussed with Technical POC 7/10/05 - issues were addressed and resolved before proceeding with codes.	<b>Added to CR 6679/81 (now integrated into CR 5223).</b>
18	ALO.20040617.6400	12/3/1996	Technical/Data – scientific interpretation	Message discusses differences in interpretation of geophysical surveys between USGS and DOE scientists.	Discussed with Technical POC 7/10/05 - issue was resolved by including both interpretations in the YMSD.	No further action needed per the technical POC. <b>Resolved - no further action needed.</b>
19	ALF.20040612.9481	12/17/1996	Technical/Data – testing processes	Message describes injection of SF6 above regulatory limits in testing conducted in Alcove 6.	Discussed with Technical POC and Manager of TCO (Test Coordination Office) on 7/10/05 - issue addressed after occurrence and corrective actions taken.	No further action needed per the technical POC. <b>Resolved - no further action needed.</b>
20	ALO.20040617.6362	12/17/1996	Technical/Data – testing processes	Message describes injection of SF6 above regulatory limits in testing conducted in Alcove 6.	Discussed with Technical POC and Manager of TCO on 7/10/05 - issue addressed after occurrence and corrective actions taken.	No further action needed per the technical POC. <b>Resolved - no further action needed.</b>
21	ALH.20050214.2768	7/23/1996	Personnel – unfair treatment/ harassment	Message includes email where individual says they have been excluded from project involvement for raising a technical concern. (see ALC.20040618.9425)	Discussed with BSC ECP manager 9/1/05 - determined there is no evidence of retaliation.	The author is no longer available (no longer with the program). There is no evidence to support the alleged condition. <b>Resolved - no further action needed.</b>
22	ALC.20040618.9425	7/23/1996	Personnel – unfair treatment/ harassment	Message includes email where individual says they have been excluded from project involvement for raising a technical concern. (see ALH.20050214.2768)	Discussed with BSC ECP manager 9/1/05 - determined there is no evidence of retaliation.	<b>Resolved - no further action needed.</b>

**Initial BSC Email Review (151 Emails)**

Accession Number		Email Date	Topic	Description	Disposition	Status
23	ALL.20050302.1991	1/30/1997	Technical/Data – scientific interpretation	Message offers opinions on issues related to Qualimetrics data.	Questions tipping bucket data package (Qualimetrics data) - email is about documented problems with following the procedure and a defense of why the data is good. It is not an additional condition that has not already been addressed. A search of RIS records finds USGS-NCR-96-0004 which addresses lack of field calibrations.	<b>Added to CR 5223.</b>
24	ALF.20050308.8636	9/20/1999	Technical/Data – testing processes	Message discusses possible negative influence of silica plugging of fractures on repository performance.	Discussed with Technical POC on 7/19/05 - issue addressed in experimental work at LBNL in 2001.	<b>Resolved - no further action needed.</b>
25	ALA.20050318.8821	2/27/2002	Technical/Data – records management	Message discusses Extent of Condition for DR-88 (TSPA Code Status).	Discussed with Technical POC 7/19/05 - issue has been addressed previously in resolution of DR - 88.	<b>Added to CR 6679/81 (now integrated into CR 5223).</b>
26	ALH.20040617.8948	4/30/2001	Software	Message questions LBNL software configuration management activities.	Discussed with Technical POC 7/19/05 - this issue has been addressed in work subsequent to the email.	<b>Added to CR 6679/81 (now integrated into CR 5223).</b>
27	ALB.20040618.4495	9/20/1999	Technical/Data – testing processes	Message discusses possible negative influence of silica plugging of fractures on repository performance.	Discussed with Technical POC on 7/19/05 - issue addressed in experimental work at LBNL in 2001.	<b>Resolved - no further action needed.</b>
28	ALF.20040612.2215	4/21/2003	Software	Message conveys problems with data in TDMS for various geomechanical properties.	Discussed with D&E Technical POCs on 7/21/05 - issue is one that has been previously acknowledged and addressed with several CRs. Initiation of the CRs involved the email	Issues addressed in CR 6228 and several technical deliverables. <b>CR6228 had been issued independently.</b>
29	ALG.20050308.7207	2/13/2001	Management – supervision/direction	Message is procurement staffer complaining about management inattention	Discussed with BSC ECP manager 9/1/05 - issue precedes BSC ECP program.	The individual is no longer with the project. The information was insufficient to evaluate further. <b>Resolved - no further action needed.</b>

## Initial BSC Email Review (151 Emails)

Accession Number		Email Date	Topic	Description	Disposition	Status
30	ALC.20050302.9374	1/26/1995	QA – records management	Messages express concern about designation of design and engineering records in the context of records collection. ALC.20050302.9374 specifically mentions "material false statement". (See also ALH.20050308.7618 ALA.20050317.9143 ALA.20050317.4560)	Discussed with BSC ECP manager 9/1/05 - BSC ECP to investigate.	The email author is deceased and no one remembers the context of the emails. The emails reflect a discussion of thoughts by "records management" personnel and none of the involved personnel were generators of records. Therefore the emails likely did not involve substantive QA issues. ECP review concluded and documented.  <b>Resolved - no further action needed.</b>
31	ALH.20050308.7618	1/26/1995	QA – records management	Messages express concern about designation of design and engineering records in the context of records collection. (See also ALC.20050302.9374 ALA.20050317.9143 ALA.20050317.4560)	Discussed with BSC ECP manager 9/1/05 - BSC ECP to investigate.	
32	ALA.20050317.9143	1/26/1995	QA – records management	Messages express concern about designation of design and engineering records in the context of records collection. (See also ALC.20050302.9374 ALH.20050308.7618 ALA.20050317.4560)	Discussed with BSC ECP manager 9/1/05 - BSC ECP to investigate.	
33	ALA.20050317.4560	1/27/1995	QA – records management	Messages express concern about designation of design and engineering records in the context of records collection. (See also ALC.20050302.9374 ALH.20050308.7618 ALA.20050317.9143 )	Discussed with BSC ECP manager 9/1/05 - BSC ECP to investigate.	
34	ALH.20050214.9543	3/13/2000	Software	Message is about the status of a list of software used in the UZ AMRs and includes the phrase "material false statement".	Discussed with Technical POC on 7/27/05 - discussion is about apparently conflicting information in a spreadsheet and the phrase "material false statement" is used to place extremely exaggerated emphasis on needing to resolve the conflict before an individual will concur. Not an issue.	
35	ALA.20050324.6287	5/18/2000	Technical/Data – DTNs	Message suggests problems with DTNs	Discussed with Technical POC on 7/27/05 – message addresses formatting of the data submitted. Not an issue.	No further action needed per the technical POC. <b>Resolved - no further action needed.</b>

## Initial BSC Email Review (151 Emails)

Accession Number		Email Date	Topic	Description	Disposition	Status
36	ALB.20050325.0826	2/10/2000	Technical/Data – DTNs	Message suggests that information was discarded.	Discussed with Technical POC on 7/27/05 - consulted with SME on DTN GS931008312261.002 - DTN is only used as unqualified data to support YMSD.	No further action needed per the technical POC. <b>Resolved - no further action needed.</b>
37	ALD.20050214.6074	5/18/1999	Not related to Yucca Mountain	Message alleges significant radiation exposure (2 Rem) in Test Cell C of NTS Area 25.	Referred to Bechtel Nevada, Bechtel Nevada Dosimetry, for investigation. Not a YM site issue.	Issue related to NTS, not part of the Yucca Mountain project. <b>Resolved - no further action needed.</b>
38	ALC.20050220.0449	5/18/1999	Not related to Yucca Mountain	Message alleges significant radiation exposure (2 Rem) in Test Cell C of NTS Area 25.	Referred to Bechtel Nevada, Bechtel Nevada Dosimetry, for investigation. Not a YM site issue.	
39	ALA.20050315.3902	5/18/1999	Not related to Yucca Mountain	Message alleges significant radiation exposure (2 Rem) in Test Cell C of NTS Area 25.	Referred to Bechtel Nevada, Bechtel Nevada Dosimetry, for investigation. Not a YM site issue.	
40	ALD.20050318.4600	3/10/1999	QA – QARD process	Message asserts that LANL persisted in an approach until DOE changed the QARD to accommodate it.	Team Lead / Legal Counsel discuss 9/8/05 - regardless of the author's personal characterization of the sequence of events leading to DOE's modification of the QARD, the conclusion is that LANL complied with the QARD.	Email is a discussion between a DOE employee and a DOE contractor (MTS). No additional investigation was performed because LANL complied with the QARD. <b>Resolved - no further action needed.</b>
41	ALD.20050208.2426	04/22/99	QA – QARD process	Message includes negative comment about QA.	CR 5223 Personnel and timeframe - negative attitude toward QA	<b>Added to CR 5223.</b>
42	ALB.20050220.2577	04/22/99	QA – QARD process	Message includes negative comment about QA.	CR 5223 Personnel and timeframe – negative attitude toward QA	<b>Added to CR 5223.</b>
43	ALB.20050216.8701	04/22/99	Technical/Data – INFIL	Message includes negative comment about QA.	CR 5223 Personnel and timeframe - negative attitude toward QA	<b>Added to CR 5223.</b>
44	ALB.20050222.5721	10/20/99	Technical/Data – INFIL	Request for GIS information related to infiltration model.	CR 5223 Personnel and timeframe - INFIL Technical Team Special Project to address any appropriate technical aspects.	<b>Added to CR 5223.</b>
45	ALC.20050220.3605	03/21/99	Technical/Data – INFIL	Individual transmits spreadsheet of information apparently related to infiltration model, includes negative comment about USGS QA program.	CR 5223 Personnel and timeframe - negative attitude toward QA - INFIL Technical Team Special Project to address any appropriate technical aspects.	<b>Added to CR 5223.</b>
46	ALD.20050208.1512	02/18/98	Technical/Data – INFIL	Funding and workscope discussion, concern is expressed about transfer of funding and challenges to their modeling.	CR 5223 Personnel and timeframe - INFIL Technical Team Special Project to address any appropriate technical aspects.	<b>Added to CR 5223.</b>

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Accession Number		Email Date	Topic	Description	Disposition	Status
47	ALA.20050222.0159	12/24/98	Technical/Data – INFIL	Complaint about organizational conflicts and impact of funding on ability to QA work product.	CR 5223 Personnel and timeframe - INFIL Technical Team Special Project to address any appropriate technical aspects.	<b>Added to CR 5223.</b>
48	ALA.20050315.3018	02/02/00	Technical/Data – INFIL	Exchange of technical information about INFILv2.0.	CR 5223 Personnel and timeframe - INFIL Technical Team Special Project to address any appropriate technical aspects.	<b>Added to CR 5223.</b>
49	ALD.20050208.1820	05/11/98	Technical/Data – INFIL	Discussion of aspect of climate / infiltration aspect of VA TSPA UZ Flow section that appears unknown to authors.	CR 5223 Personnel and timeframe - INFIL Technical Team Special Project to address any appropriate technical aspects.	<b>Added to CR 5223.</b>
50	ALA.20050315.7629	05/05/00	Backdating	Email suggests backdating a review form from AP-2.14Q review	Email documents that the review comments by the individual were not part of 2.14 process. Comments were made by the Responsible Manager prior to approval of the final document. Manager indicates there is no need to include them in 2.14 process. No willful noncompliance with QA.	<b>Added to CR 6680/82. (now integrated into CR 5223).</b>
51	ALD.20050208.2871	05/28/99	Technical/Data – scientific interpretation	Response to DEIS question about infiltration impacts related to species changes.	CR 5223 Personnel and timeframe - Innocuous response.	<b>Added to CR 5223.</b>
52	ALB.20050302.2429	03/10/00	Software	About individual's email bemoaning conflicts between schedule, quality, and other demands in context of software validation.	CR 5223 Personnel and timeframe - No willful noncompliance with QA.	<b>Added to CR 5223.</b>
53	ALC.20050228.5440	03/10/00	Software	About individual's email response to bemoaning conflicts between schedule, quality, and other demands in context of software validation.	CR 5223 Personnel and timeframe - No willful noncompliance with QA.	<b>Added to CR 6679/81 (now integrated into CR 5223).</b>
54	ALD.20050208.5319	03/08/00	Software	Bemoaning conflicts between schedule, quality, and other demands in context of software validation.	CR 5223 Personnel and timeframe - No willful noncompliance with QA.	<b>Added to CR 6679/81 (now integrated into CR 5223).</b>
55	ALD.20050214.3592	04/15/98	Management – budget	Discussion of ESF water monitoring / programmatic budget impacts / ESF and ECRB tests.	CR 5223 Personnel and timeframe - No willful noncompliance with QA.	<b>Added to CR 5223.</b>

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Accession Number		Email Date	Topic	Description	Disposition	Status
56	ALD.20050208.5111	04/15/98	Management – budget	Discussion of ESF water monitoring / programmatic budget impacts / ESF and ECRB tests.	CR 5223 Personnel and timeframe - No willful noncompliance with QA.	<b>Added to CR 5223.</b>
57	ALG.20040618.8044	04/15/98	Management – budget	Discussion of ESF water monitoring / programmatic budget impacts / ESF and ECRB tests.	CR 5223 Personnel and timeframe - No willful noncompliance with QA.	<b>Added to CR 5223.</b>
58	ALD.20050222.9877	08/10/95	Management – supervision/direction	Discussion in response to DOE Management question about used of a particular stratigraphic nomenclature in the ESF.	Referred only because of “pejorative” description of DOE Manager. No willful noncompliance with QA.	Not a QA issue. <b>Resolved - no further action needed.</b>
59	ALA.20050321.4504	04/10/00	Personnel – other litigation	Discussion related to USGS QARD matrix review and approval, including USGS and DOE management interest in the same.	No willful noncompliance with QA.	Personnel issue in litigation, no further action (related to 0525 and 9004). <b>Referred to litigation counsel.</b>
60	ALD.20040611.0525	04/10/00	Personnel – other litigation	Discussion related to USGS QARD matrix review and approval, including USGS and DOE management interest in the same.	No willful noncompliance with QA.	Personnel issue in litigation, no further action (related to 4504 and 9004). <b>Referred to litigation counsel.</b>
61	ALB.20050325.3477	04/23/99	Personnel – job performance	Description of individual’s job performance.	CR 5223 Personnel and timeframe - No willful noncompliance with QA.	<b>Added to CR 5223.</b>
62	ALD.20050208.2428	04/23/99	QA – QARD process	M<essage includes negative comment about QA.	CR 5223 Personnel and timeframe - negative attitude toward QA - No willful noncompliance with QA.	<b>Added to CR 5223.</b>
63	ALB.20050220.2579	04/26/99	Management – budget	Response to request from USGS person for presentation materials to support funding request.	CR 5223 Personnel and timeframe - No willful noncompliance with QA.	<b>Added to CR 5223.</b>
64	ALD.20050208.2429	04/26/99	QA – data qualification/corroboration	Pejorative characterization of response to colleague’s inability to find reviewer for data package.	CR 5223 Personnel and timeframe - No willful noncompliance with QA.	<b>Added to CR 6679/81 (now integrated into CR 5223).</b>
65	ALD.20050208.1208	11/12/98	Technical/Data – scientific interpretation	Pejorative forwarded email about M&O discussions pertaining to a position on surface temperature rise.	CR 5223 Personnel and timeframe - No willful noncompliance with QA.	<b>Added to CR 5223.</b>
66	ALD.20050208.2417	3/26/99	Management – supervision/direction	Negative forwarded message about M&O manager's attention to activities the USGS behind schedule, including QA activities.	CR 5223 Personnel and timeframe - negative attitude toward QA - No willful noncompliance with QA.	<b>Added to CR 5223.</b>

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Accession Number		Email Date	Topic	Description	Disposition	Status
67	ALD.20050208.1511	12/17/98	Management – supervision/direction	Complaint about USGS management.	CR 5223 Personnel and timeframe - No willful noncompliance with QA.	<b>Added to CR 5223.</b>
68	ALC.20050220.2051	02/23/99	Software	Negative comment about QA in discussion of sample tracking and software requirements.	CR 5223 Personnel and timeframe - negative attitude toward QA	<b>Added to CR 6679/81 (now integrated into CR 5223).</b>
69	ALB.20050220.3892	05/29/99	Technical/Data – DTNs	Discussion of DTN Q/Non-Q status in context of modeling.	CR 5223 Personnel and timeframe - No willful noncompliance with QA. INFIL Technical Team Special Project to address any appropriate technical aspects.	<b>Added to CR 5223.</b>
70	ALA.20050222.6605	05/29/99	Technical/Data – DTNs	Negative comment about QA in discussion of DTN Q/Non-Q status in context of modeling.	CR 5223 Personnel and timeframe - negative attitude toward QA - No willful noncompliance with QA. NFIL Technical Team Special Project to address any appropriate technical aspects.	<b>Added to CR 5223.</b>
71	ALA.20050315.3306	06/13/00	Technical/Data – DTNs	Discussion about whether a DTN represents input or output data in the context of AMR involving INFIL v2.0.	CR 5223 Personnel and timeframe - No willful noncompliance with QA. NFIL Technical Team Special Project to address any appropriate technical aspects.	<b>Added to CR 5223.</b>
72	ALB.20050423.9004	04/10/00	QA QARD process	Discussion related to USGS QARD matrix review and approval, including USGS and DOE management interest in the same.	No willful noncompliance with QA.	Personnel issue in litigation, no further action needed (related to 0525 and 4504) Repeat # <b>Referred to litigation counsel.</b>
73	ALE.20050308.3476	05/08/96	Technical/Data – records management	Message is a response engendered by former USGS staff alleging that seismic records were destroyed.	Response indicates that USGS destruction of duplicate records due to shutdown of USGS local records centers	<b>Resolved - no further action needed.</b>
74	ALD.20050302.3271	08/24/99	QA – QARD process	Discussion of QA status of corrected saturation data need to undergo qualification procedure if necessary.	CR 5223 Personnel and timeframe - No willful noncompliance with QA.	<b>Added to CR 5223.</b>
75	ALE.20050214.1517	08/25/99	QA – QARD process	Discussion of QA status of corrected saturation data need to undergo qualification procedure if necessary.	CR 5223 Personnel and timeframe - No willful noncompliance with QA.	<b>Added to CR 5223.</b>
76	ALE.20050214.1519	08/27/99	QA – QARD process	Discussion of QA status of corrected saturation data need to undergo qualification procedure if necessary.	CR 5223 Personnel and timeframe - No willful noncompliance with QA.	<b>Added to CR 5223.</b>

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Accession Number		Email Date	Topic	Description	Disposition	Status
77	ALA.20050325.5617	08/27/99	QA – QARD process	Discussion of QA status of corrected saturation data need to undergo qualification procedure if necessary.	CR 5223 Personnel and timeframe - No willful noncompliance with QA.	<b>Added to CR 5223.</b>
78	ALC.20050423.0109	08/27/99	QA – QARD process	Discussion of QA status of corrected saturation data need to undergo qualification procedure if necessary.	CR 5223 Personnel and timeframe - No willful noncompliance with QA.	<b>Added to CR 5223.</b>
79	ALA.20050325.5620	08/30/99	QA – QARD process	Discussion of QA status of corrected saturation data need to undergo qualification procedure if necessary.	CR 5223 Personnel and timeframe - No willful noncompliance with QA.	<b>Added to CR 5223.</b>
80	ALD.20050208.3719	01/05/00	Technical/Data – modeling	Questions use of infiltration AMR in support of SR.	CR 5223 Personnel involved - No willful noncompliance with QA. INFIL Technical Team Special Project to address any appropriate technical aspects.	<b>Added to CR 5223.</b>
81	ALC.20050318.5730	07/12/00	Technical/Data – scientific interpretation	Individual admits jumping to incorrect conclusion about content of files.	CR 5223 Personnel involved - No willful noncompliance with QA. INFIL Technical Team Special Project to address any appropriate technical aspects.	<b>Added to CR 5223.</b>
82	ALD.20050208.2008	06/26/98	Technical/Data – modeling	Discussion of modeling details.	CR 5223 Personnel involved - No willful noncompliance with QA. INFIL Technical Team Special Project to address any appropriate technical aspects.	<b>Added to CR 5223.</b>
83	ALB.20050330.3397	09/12/97	QA – records management	Message is reaction to confused direction received on implementation of CR 97/040.	No willful noncompliance with QA.	<b>Added to CR 5223 and referred to USGS re: actual implementation.</b>
84	ALG.20040618.8584	02/23/98	Management – supervision/direction	Comment about YMP.	CR 5223 Personnel and timeframe - No willful noncompliance with QA.	<b>Added to CR 5223.</b>
85	ALG.20040618.8429	02/23/98	Management – supervision/direction	Comment about YMP.	CR 5223 Personnel and timeframe - No willful noncompliance with QA.	<b>Added to CR 5223.</b>
86	ALD.20050208.5101	02/23/98	Management – supervision/direction	Comment about YMP.	CR 5223 Personnel and timeframe - No willful noncompliance with QA.	<b>Added to CR 5223.</b>

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Accession Number		Email Date	Topic	Description	Disposition	Status
87	ALD.20050208.5099	02/23/98	Management – supervision/direction	Comment about YMP.	CR 5223 Personnel and timeframe - No willful noncompliance with QA.	<b>Added to CR 5223.</b>
88	ALB.20050216.7440	05/01/98	Technical/Data – records management	Subject line is pejorative about QA, no text in body of message, transmits attachment only.	CR 5223 Personnel and timeframe - No willful noncompliance with QA. - attachment contains header 35341TXT.WPD August 26, 1997, with an initial heading of "3.5.3.4.1. Site Infiltration and Potential Recharge", apparently a descriptive technical document.	<b>Added to CR 5223.</b>
89	ALG.20040618.8103	06/17/98	Management – supervision/direction	Pejorative response to request to project overtime for USGS staff	CR 5223 Personnel and timeframe - No willful noncompliance with QA.	<b>Added to CR 5223.</b>
90	ALC.20050220.2111	06/17/98	Management – planning	Message forwards pejorative response to request for FY98 planning information.	CR 5223 Personnel and timeframe - No willful noncompliance with QA.	<b>Added to CR 5223.</b>
91	ALD.20050208.5116	06/17/98	Management – planning	Pejorative response to request for FY98 planning information.	CR 5223 Personnel and timeframe - No willful noncompliance with QA.	<b>Added to CR 5223.</b>
92	ALG.20040618.8412	06/17/98	Management – planning	Pejorative response to request for FY98 planning information.	CR 5223 Personnel and timeframe - No willful noncompliance with QA.	<b>Added to CR 5223.</b>
93	ALD 20050208.2011	07/08/98	Management – supervision/direction	Pejorative complaint about work environment.	CR 5223 Personnel and timeframe - No willful noncompliance with QA.	<b>Added to CR 5223.</b>
94	ALC.20050216.0124	10/20/98	QA – data qualification/ corroboration	Brief pejorative comment on state of model, suggesting colleague should maintain his position, with no elaboration.	CR 5223 Personnel and timeframe - No willful noncompliance with QA.	<b>Added to CR 5223.</b>
95	ALB.20050220.3892	05/29/99	Technical/Data – DTNs	Discussion of DTN Q/Non-Q status in context of modeling.	CR 5223 Personnel and timeframe - No willful noncompliance with QA. INFIL Technical Team Special Project to address any appropriate technical aspects.	<b>Added to CR 5223.</b>
96	ALB.20050222.2090	01/26/99	Management – budget	Brief message forwarding a message (with expletive) commenting on funding / staffing information.	CR 5223 Personnel and timeframe - No willful noncompliance with QA.	<b>Added to CR 5223.</b>

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Accession Number		Email Date	Topic	Description	Disposition	Status
97	ALD.20050208.2558	11/17/99	Technical/Data – modeling	Series of messages with SNL Personnel about infiltration modeling work.	CR 5223 Personnel and timeframe - No willful noncompliance with QA.	<b>Added to CR 5223.</b>
98	ALA.20050308.0511	11/17/99	Technical/Data – modeling	Series of messages with SNL Personnel about infiltration modeling work.	CR 5223 Personnel and timeframe - No willful noncompliance with QA.	<b>Added to CR 5223.</b>
99	ALB.20050220.3496	11/18/99	Technical/Data – modeling	Series of messages with SNL Personnel about infiltration modeling work.	CR 5223 Personnel and timeframe - No willful noncompliance with QA.	<b>Added to CR 5223.</b>
100	ALD.20050302.4383	11/18/99	Technical/Data – modeling	Series of messages with SNL Personnel about infiltration modeling work.	CR 5223 Personnel and timeframe - No willful noncompliance with QA.	<b>Added to CR 5223.</b>
101	ALD.20050208.2617	11/18/99	Technical/Data – modeling	Series of messages with SNL Personnel about infiltration modeling work.	CR 5223 Personnel and timeframe - No willful noncompliance with QA.	<b>Added to CR 5223.</b>
102	ALJ.20050308.2315	11/18/99	Technical/Data – modeling	Series of messages with SNL Personnel about infiltration modeling work.	CR 5223 Personnel and timeframe - No willful noncompliance with QA.	<b>Added to CR 5223.</b>
103	ALA.20050317.2703	11/18/99	Technical/Data – modeling	Series of messages with SNL Personnel about infiltration modeling work.	CR 5223 Personnel and timeframe - No willful noncompliance with QA.	<b>Added to CR 5223.</b>
104	ALA.20050316.5962	11/18/99	Technical/Data – modeling	Series of messages with SNL Personnel about infiltration modeling work.	CR 5223 Personnel and timeframe - No willful noncompliance with QA.	<b>Added to CR 5223.</b>
105	ALC.20050208.4594	04/19/99	Technical/Data – records management	Message from USGS staff initiating DR (USGS-99-D-041) addressing the timeliness of identifying loss of records due to flooding at DFC.	No willful noncompliance with QA.	<b>USGS initiated a DR (USGS-99-D-041) to address the loss of records.</b>
106	ALB.20050423.9004	04/10/00	QA QARD process	Discussion related to USGS QARD matrix review and approval, including USGS and DOE management interest in the same.	No response required - management interest in ensuring QA.	Personnel issue in litigation, no further action. (Repeat #). <b>Referred to litigation counsel.</b>
107	ALB.20050302.1965	11/09/99	Technical/Data – scientific interpretation	Exchange of information related to differences in reported average infiltration from different sources apparently based on repository footprint configuration, as noted by SNL Personnel.	CR 5223 Personnel and timeframe - No willful noncompliance with QA. INFIL Technical Team Special Project to address any appropriate technical aspects.	<b>Added to CR 5223.</b>
108	ALF.20050208.4497	07/13/98	Personnel – unfair treatment/ harassment	DOE - Personnel matter - staff alleging unjust and unfair treatment (same email as ALF.20050208.4498)	DOE matter, referred to OCRWM Concerns Program 7/5/05 for disposition.	Individual who submitted the email has left the program and no longer wishes to take any action. (related to ALF.20050208.4593) <b>Resolved - no further action needed.</b>

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Accession Number		Email Date	Topic	Description	Disposition	Status
109	ALF.20050208.4498	07/13/98	Personnel – unfair treatment/ harassment	DOE - Personnel matter - staff alleging unjust and unfair treatment (same email as ALF.20050208.4497)	DOE matter, referred to OCRWM Concerns Program 7/5/05 for disposition.	Individual who submitted the email has left the program and no longer wishes to take any action. (related to ALF.20050208.4593) <b>Resolved - no further action needed.</b>
110	ALG.20040615.8930	02/20/03	Personnel – grievance	DOE - Personnel matter - staff email to himself documenting events in grievance / complaint.	DOE matter, referred to OCRWM Concerns Program 7/5/05 for disposition.	Personnel issue in litigation. <b>Referred to litigation counsel.</b>
111	ALG.20040615.9119	02/14/01	Personnel – counseling	DOE - Personnel matter - staff request for reconsideration of counseling referral.	DOE matter, referred to OCRWM Concerns Program 7/11/05 for disposition.	Personnel issue in litigation. Repeat # <b>Referred to litigation counsel.</b>
112	ALF.20050208.4593	11/11/98	Personnel – unfair treatment/ harassment	DOE - message mentions DOE staff in itemization of alleged intimidation.	DOE matter, referred to OCRWM Concerns Program 7/11/05 for disposition.	Individual who submitted the email has left the program and no longer wishes to take any action. (related to ALF.20050208.4497/4498) <b>Resolved - no further action needed.</b>
113	ALB.20040621.9108	03/26/04	Personnel – unfair treatment/ harassment	DOE - message suggesting that DOE work environment has a "chilling effect".	DOE matter, referred to OCRWM Concerns Program 7/11/05 for disposition.	Spoke with author, not a QA issue. Encouraged to report the issue to ECP. <b>Resolved - no further action needed.</b>
114	ALB.20050318.9867	01/15/03	Personnel – other litigation	DOE - factfinding statement from investigation of allegations.	DOE matter, referred to OCRWM Concerns Program 7/11/05 for disposition.	Confidential employee concern files removed from ADIIS. Investigation completed, claims not substantiated. <b>Resolved - no further action needed.</b>
115	ALB.20050318.9868	01/15/03	Personnel – other litigation	DOE - comments on factfinding statement from investigation of allegations.	DOE matter, referred to OCRWM Concerns Program 7/11/05 for disposition.	
116	ALC.20050318.2014	12/18/02	Personnel – other litigation	DOE - factfinding statement from investigation of allegations.	DOE matter, referred to OCRWM Concerns Program 7/11/05 for disposition.	
117	ALC.20050318.2015	12/18/02	Personnel – other litigation	DOE - factfinding statement from investigation of allegations.	DOE matter, referred to OCRWM Concerns Program 7/11/05 for disposition.	
118	ALC.20050318.2016	12/19/02	Personnel – other litigation	DOE - factfinding statement from investigation of allegations.	DOE matter, referred to OCRWM Concerns Program 7/11/05 for disposition.	

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Accession Number		Email Date	Topic	Description	Disposition	Status
119	ALF.20040615.7823	02/22/03	Personnel – SCWE	DOE – Message from DOE manager regarding SCWE allegation.	DOE matter, referred to OCRWM Concerns Program 7/11/05 for disposition.	<b>Resolved - no further action needed.</b>
120	ALG.20040615.9044	11/05/03	Personnel – grievance	DOE - Personnel matter - staff response to request.	DOE matter, referred to OCRWM Concerns Program 7/11/05 for disposition.	Personnel issue in litigation. <b>Referred to litigation counsel.</b>
121	ALE.20040621.3330	02/17/04	Personnel – unfair treatment/harassment	DOE - message about public disclosure of sexual harassment of contractor employee.	DOE matter, referred to OCRWM Concerns Program 7/11/05 for disposition.	IG investigation, claim not substantiated. <b>Resolved - no further action needed.</b>
122	ALG.20040615.9040	07/07/03	Personnel – grievance	DOE - Personnel matter - staff email about events in grievance.	DOE matter, referred to OCRWM Concerns Program 7/11/05 for disposition.	Personnel issue in litigation. <b>Referred to litigation counsel.</b>
123	ALG.20040615.8951	01/27/03	Personnel – grievance	DOE - Personnel matter - staff email to himself documenting events in grievance / complaint.	DOE matter, referred to OCRWM Concerns Program 7/11/05 for disposition.	Personnel issue in litigation. <b>Referred to litigation counsel.</b>
124	ALG.20040615.8768	12/18/02	Personnel – grievance	DOE - Personnel matter - staff email to himself documenting events in grievance / complaint.	DOE matter, referred to OCRWM Concerns Program 7/11/05 for disposition.	Personnel issue in litigation. <b>Referred to litigation counsel.</b>
125	ALG.20040615.8780	11/21/02	Personnel – counseling	DOE - Personnel matter - staff email with comments on letter of counseling.	DOE matter, referred to OCRWM Concerns Program 7/11/05 for disposition.	Personnel issue in litigation. <b>Referred to litigation counsel.</b>
126	ALG.20040615.8800	11/08/02	Personnel – EEO complaint	DOE - Personnel matter - staff email to himself about letter of counseling and EEO complaint.	DOE matter, referred to OCRWM Concerns Program 7/11/05 for disposition.	Personnel issue in litigation. <b>Referred to litigation counsel.</b>
127	ALG.20040615.8760	09/23/02	Personnel – job performance	DOE - Personnel matter - staff email to himself highlighting performance evaluation information.	DOE matter, referred to OCRWM Concerns Program 7/11/05 for disposition.	Personnel issue in litigation. <b>Referred to litigation counsel.</b>
128	ALG.20040615.2002	09/19/02	Personnel – unfair treatment/harassment	DOE - Personnel matter - message from DOE staff alleging harassment.	DOE matter, referred to OCRWM Concerns Program 7/11/05 for disposition.	Spoke with author, not a QA issue. Encouraged to report the issue to ECP or a CR. <b>Resolved - no further action needed.</b>

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Accession Number		Email Date	Topic	Description	Disposition	Status
129	ALG.20040615.8721	06/25/02	Personnel – unfair treatment/harassment	DOE - Personnel matter - message from DOE staff, Subject: Re: Harassment.	DOE matter, referred to OCRWM Concerns Program 7/11/05 for disposition.	Personnel issue in litigation. <b>Referred to litigation counsel.</b>
130	ALG.20040615.8720	06/25/02	Personnel – unfair treatment/harassment	DOE - Personnel matter - message from DOE staff, Subject: Re: Harassment.	DOE matter, referred to OCRWM Concerns Program 7/11/05 for disposition.	Personnel issue in litigation. <b>Referred to litigation counsel.</b>
131	ALG.20040615.8722	06/20/02	Personnel – unfair treatment/harassment	DOE - Personnel matter - message from DOE staff, Subject: Re: Harassment.	DOE matter, referred to OCRWM Concerns Program 7/11/05 for disposition.	Personnel issue in litigation. <b>Referred to litigation counsel.</b>
132	ALG.20040615.8883	02/12/02	Personnel – EEO complaint	DOE - Personnel matter - message from DOE staff notice of EEO complaint.	DOE matter, referred to OCRWM Concerns Program 7/11/05 for disposition.	Personnel issue in litigation. <b>Referred to litigation counsel.</b>
133	ALG.20040615.8881	02/12/02	Personnel – EEO complaint	DOE - Personnel matter - message from DOE staff about EEO complaint.	DOE matter, referred to OCRWM Concerns Program 7/11/05 for disposition.	Personnel issue in litigation. <b>Referred to litigation counsel.</b>
134	ALG.20040615.8823	03/09/01	Personnel – unfair treatment/harassment	DOE - Personnel matter - message from DOE staff about management treatment.	DOE matter, referred to OCRWM Concerns Program 7/11/05 for disposition.	Personnel issue in litigation. <b>Referred to litigation counsel.</b>
135	ALG.20040615.8847	02/07/01	Personnel – EEO complaint	DOE - Personnel matter - message from DOE staff to DOE legal counsel about EEO complaint.	DOE matter, referred to OCRWM Concerns Program 7/11/05 for disposition.	Personnel issue in litigation. <b>Referred to litigation counsel.</b>
136	ALG.20040615.9004	02/28/01	Personnel – counseling	DOE - Personnel matter - message from DOE staff about employment mediation.	DOE matter, referred to OCRWM Concerns Program 7/11/05 for disposition.	Personnel issue in litigation. <b>Referred to litigation counsel.</b>
137	ALG.20040615.9119	02/14/01	Personnel – counseling	DOE – Personnel matter – staff request for reconsideration of counseling referral.	DOE matter, referred to OCRWM Concerns Program 7/11/05 for disposition.	Personnel issue in litigation, (Repeat #) <b>Referred to litigation counsel.</b>

**Initial BSC Email Review (151 Emails)**

Accession Number		Email Date	Topic	Description	Disposition	Status
138	ALG.20040615.8838	02/01/01	Personnel – grievance	DOE - Personnel matter - staff email to himself documenting certain events.	DOE matter, referred to OCRWM Concerns Program 7/11/05 for disposition.	Personnel issue in litigation. <b>Referred to litigation counsel.</b>
139	ALG.20040615.9116	01/25/01	Personnel – job performance	DOE - Personnel matter – message documenting performance evaluation discussions	DOE matter, referred to OCRWM Concerns Program 7/11/05 for disposition.	Personnel issue in litigation. <b>Referred to litigation counsel.</b>
140	ALG.20040615.9117	12/11/00	Personnel – job performance	DOE - Personnel matter – message documenting concerns about role and responsibilities in organization.	DOE matter, referred to OCRWM Concerns Program 7/11/05 for disposition.	Personnel issue in litigation. <b>Referred to litigation counsel.</b>
141	ALG.20040615.8906	12/07/00	Personnel – job performance	DOE - Personnel matter – message documenting concerns about role and responsibilities in organization.	DOE matter, referred to OCRWM Concerns Program 7/11/05 for disposition.	Personnel issue in litigation. <b>Referred to litigation counsel.</b>
142	ALG.20040615.8905	12/04/00	Personnel – unfair treatment/harassment	DOE - Personnel matter – message responding to denial for request for transfer within organization	DOE matter, referred to OCRWM Concerns Program 7/11/05 for disposition.	Personnel issue in litigation. <b>Referred to litigation counsel.</b>
143	ALG.20040615.8704	02/07/01	Personnel – unfair treatment/harassment	DOE - Personnel matter - staff email complaining of harassment.	DOE matter, referred to OCRWM Concerns Program 7/11/05 for disposition.	Personnel issue in litigation. <b>Referred to litigation counsel.</b>
144	ALG.20040615.8934	02/24/03	Personnel – unfair treatment/harassment	DOE - Personnel matter - staff email to himself documenting events in grievance / complaint.	DOE matter, referred to OCRWM Concerns Program 7/11/05 for disposition.	Personnel issue in litigation. <b>Referred to litigation counsel.</b>
145	ALC.20050208.7476	10/28/99	Personnel – unfair treatment/harassment	DOE - Personnel matter - message is escalation of concern beyond employee's current manager.	DOE matter, referred to OCRWM Concerns Program 7/20/05 for disposition.	<b>Added to CR 6679/81 (now integrated into CR 5223).</b>
146	ALG.20040615.8929	02/24/03	Personnel – SCWE	DOE - Personnel matter - staff email to himself documenting events with respect to SCWE complaint.	DOE matter, referred to OCRWM Concerns Program 7/28/05 for disposition.	Personnel issue in litigation. <b>Referred to litigation counsel.</b>
147	ALG.20040615.8934	02/24/03	Personnel – SCWE	DOE - Personnel matter - staff email to himself documenting events with respect to SCWE complaint.	DOE matter, referred to OCRWM Concerns Program 7/28/05 for disposition.	Personnel issue in litigation. <b>Referred to litigation counsel.</b>

**Initial BSC Email Review (151 Emails)**

Accession Number		Email Date	Topic	Description	Disposition	Status
148	ALG.20040615.9145	09/20/00	Personnel – unfair treatment/harassment	DOE - Personnel matter - message from DOE staff about management treatment.	DOE matter, referred to OCRWM Concerns Program 7/28/05 for disposition.	Personnel issue in litigation. <b>Referred to litigation counsel.</b>
149	ALC.20040621.1704	04/09/04	QA -- process review	DOE - message about staff frustration with procedure review.	DOE matter, referred to OCRWM Concerns Program 7/28/05 for disposition.	<b>Resolved - no further action needed.</b>
150	ALD.20040621.4897	03/11/04	QA – records management	DOE - message about contractor destruction of records.	DOE matter, referred to OCRWM Concerns Program 8/4/05 for disposition.	IG investigation, claim not substantiated. <b>Resolved - no further action needed.</b>
151	ALD.20040612.8448	01/28/04	Personnel – job performance	DOE - message implies ethical questions involving DOE staff.	DOE matter, referred to OCRWM Concerns Program 8/4/05 for disposition.	<b>Resolved - no further action needed.</b>

## Second BSC Email Review (28 Emails)

Accession Number		Email Date	Issue Area	Topic	Description	Disposition	Status
1	ALA.20050721.0064	5/10/05	DOE	Personnel – training	Apparent reduction of training requirements because refresher not available	Administrative training issue, no further action required.	The email is administrative in nature and discusses the fact that a refresher course the recipients were supposed to take is not yet developed. TPD-PI-RW-001, Rev 1., effective 1/6/06, addresses this issue <b>Resolved -- no further action needed.</b>
2	ALB.20050722.1243	5/17/05	DOE	Personnel – job performance	Self-identified attempt to mislead	A humorous comment, no further action required.	The message appears to be a humorous comment about the sending of a file. A discussion with the individual who initiated the email confirmed this position. <b>Resolved -- no further action needed.</b>
3	ALA.20051020.0647	9/19/05	DOE	Personnel – job performance	Question of adequacy of review of DRs/CARs	The adequacy of the DR/CAR review was addressed by the more extensive review that was performed from August to December 2005 and is fully documented in this <i>Methodology and Results of Review Processes for Emails, Condition Reports, and Employee Concerns</i> .	The email is a discussion of the email review process as it related to the USGS emails and the CR/DAR review activities. The author complained about the volume of emails, inability to search them, and about the review missing some portion of the CRs/DARs, but indicated the situation was being remedied. No action required. This e-mail was associated with the USGS Extent of Condition review process. The e-mail discusses a process issue, but does not identify a Condition Adverse to Quality. <b>Resolved -- no further action needed.</b>
4	ALA.20051018.4835	7/26/05	DOE	Personnel – unknown	Employee DOL complaint - history	Handled by DOL employee complaint process. The e-mail alleges that a personal e-mail was inappropriately categorized as LSN relevant. Resolved, no further action.	The email is a response to an earlier email detailing a number of concerns about a job action a firm was taking. It references a number of other emails in an attempt to complete the record

## Second BSC Email Review (28 Emails)

Accession Number	Email Date	Issue Area	Topic	Description	Disposition	Status	
						regarding the situation. The e-mail alleges that a personal e-mail was inappropriately categorized as LSN relevant. <b>Resolved – no further action needed.</b>	
5	ALA.20051018.3988	8/01/05	DOE	Personnel – unknown	Employee DOL complaint - history	Handled by DOL employee complaint process. The e-mail alleges that a personal e-mail was inappropriately categorized as LSN relevant. Resolved, no further action.	The email is further clarification to ALA.20051018.4835. It references a number of other emails in an attempt to complete the record regarding the situation. <b>Resolved – no further action needed.</b>
6	ALA.2005815.4506	6/01/05	DOE	Personnel – whistleblower	Assertion that whistleblower is unknown to OCP	Further investigation could not confirm that “whistleblower” worked for the Yucca Mountain Project, no further action required.	The email discusses a person who claims to be a “whistle blower” regarding Yucca Mountain in a news report. The email discusses the fact that they cannot find a record of the individual’s name. <b>Resolved -- no further action needed.</b>
7	ALA.20050815.0382	6/06/05	DOE	Personnel – whistleblower	Assertion that whistleblower is unknown to OCP	Further investigation could not confirm that “whistleblower” worked for the Yucca Mountain Project, no further action required.	The email discusses a person who claims to be a “whistle blower” regarding Yucca Mountain in a news report. The email discusses the fact that they cannot find a record of the individual’s name. This is same as ALA.20050815.4506 but was sent to another individual. <b>Resolved -- no further action needed.</b>
8	ALA.20050721.2806	5/11/05	DOE	Personnel – SCWE	Employee recounting SCWE and ECP concerns to OCP	Employee recounting SCWE and ECP concerns previously handled by OCP, no further action required.	The email discusses a previously known personnel issue in OPME and OPMI. <b>Resolved – No Further action needed.</b>
9	ALA.20050721.2232	5/02/05	ECP	Personnel – unfair treatment/	Employee retaliation claim	Employee retaliation claim reviewed and resolved, no further action required.	The email appears to be a discussion of the FOCUS committee review

## Second BSC Email Review (28 Emails)

Accession Number	Email Date	Issue Area	Topic	Description	Disposition	Status
			harassment			process and the need to perform a review for an individual. However, there are allegations in the originating emails that are being reviewed under the ECP. <b>Resolved – no further action needed.</b>
10	ALB.20051018.3382	08/23/05	ECP	Personnel – unfair treatment/ harassment	Possible intimidation	Referred to BSC ECP 12/7/05 for investigation.  The email appears to detail negative reactions from senior BSC staff regarding an IVRT review of the TSPA-LA model. There appears to be a possibility that intimidation was used on the staff performing the review. <b>Resolved – no further action needed.</b>
11	ALC.20050214.4497	08/10/99	Tech	Backdating	Possible inaccurate Scientific Notebook date information	Discussed with Technical POC 12/08/05. The LotusNotes database is non-Q, and apparently had a substitute initial date (referred to as “fictitious”). The database appears to have been updated with the correct date of 6/15/98 for initiation. <b>Resolved - no further action needed.</b>
12	ALB.20051018.4160	08/26/05	Tech	QA – records management	Question of adequacy of database search	Discussed with Technical POC on 12/7/05. Author of message is pointing out that electronic search approach will not identify records, if a signature is the identifier. <b>Resolved - no further action needed.</b>

## Second BSC Email Review (28 Emails)

Accession Number		Email Date	Issue Area	Topic	Description	Disposition	Status
13	ALA.20051020.0813	09/23/05	Tech	QA – scientific notebooks	Possible QA noncompliance for Scientific Notebook	Discussed with Technical POC 12/7/05. Section 5.1.1.10 of LP-SIII. 11Q-BSC states that “each entry shall be signed/initialed by the person making the entry”. This email suggests a participant was initialing for another individual after the entry was made. The initialer was not the supervisor of the other two individuals mentioned. Even though it was the participant’s notebook, the person making the entry should have initialed the entry. The notebook has been submitted for records processing, and is not immediately available. Resolution of the issue may need more than examination of the notebook. Hence, the matter of noncompliance with respect to the initialing of entries is indeterminate, and CR 7148 was initiated.  Relative to the question of lining through blank space, there is nothing in the procedure to preclude doing what is described as one makes entries.	<b>CR 7148 initiated.</b>
14	ALA.20050721.1430	05/13/05	Tech	QA – computer account control (CR 7176)	Lack of control of sensitive unclassified computer account	Initiated CR 7176 to evaluate and address process resulting in loss of proper controls.	<b>CR 7176 initiated.</b>
15	ALA.20050722.5169	05/23/05	Tech	QA – computer account control (CR 7176)	Lack of control of sensitive unclassified computer account	Initiated CR 7176 to evaluate and address process resulting in loss of proper controls.	<b>CR 7176 initiated.</b>
16	ALA.20050722.5384	05/23/05	Tech	QA – computer account control (CR 7176)	Lack of control of sensitive unclassified computer account	Initiated CR 7176 to evaluate and address process resulting in loss of proper controls.	<b>CR 7176 initiated.</b>

**Second BSC Email Review (28 Emails)**

Accession Number		Email Date	Issue Area	Topic	Description	Disposition	Status
17	ALA.20050722.5604	05/23/05	Tech	QA – computer account control (CR 7176)	Lack of control of sensitive unclassified computer account	Initiated CR 7176 to evaluate and address process resulting in loss of proper controls.	<b>CR 7176 initiated.</b>
18	ALA.20050722.5635	05/23/05	Tech	QA – computer account control (CR 7176)	Lack of control of sensitive unclassified computer account	Initiated CR 7176 to evaluate and address process resulting in loss of proper controls.	<b>CR 7176 initiated.</b>
19	ALA.20050722.5639	05/23/05	Tech	QA – computer account control (CR 7176)	Lack of control of sensitive unclassified computer account	Initiated CR 7176 to evaluate and address process resulting in loss of proper controls.	<b>CR 7176 initiated.</b>
20	ALA.20050722.5833	05/23/05	Tech	QA – computer account control (CR 7176)	Lack of control of sensitive unclassified computer account	Initiated CR 7176 to evaluate and address process resulting in loss of proper controls.	<b>CR 7176 initiated.</b>
21	ALA.20050722.6076	05/23/05	Tech	QA – computer account control (CR 7176)	Lack of control of sensitive unclassified computer account	Initiated CR 7176 to evaluate and address process resulting in loss of proper controls.	<b>CR 7176 initiated.</b>
22	ALA.20050815.5514	06/08/05	Tech	QA – computer account control (CR 7176)	Lack of control of sensitive unclassified computer account	Initiated CR 7176 to evaluate and address process resulting in loss of proper controls.	<b>CR 7176 initiated.</b>
23	ALA.20050815.5513	06/08/05	Tech	QA – computer account control (CR 7176)	Lack of control of sensitive unclassified computer account	Initiated CR 7176 to evaluate and address process resulting in loss of proper controls.	<b>Initiated CR 7176</b>
24	ALA.20050815.3361	06/08/05	Tech	QA – computer account control (CR 7176)	Lack of control of sensitive unclassified computer account	Initiated CR 7176 to evaluate and address process resulting in loss of proper controls.	<b>Initiated CR 7176</b>
25	ALA.20050801.8949	06/09/05	Tech	QA – computer account control (CR 7176)	Lack of control of sensitive unclassified computer account	Initiated CR 7176 to evaluate and address process resulting in loss of proper controls.	<b>CR 7176 initiated.</b>
26	ALA.20050801.3398	06/09/05	Tech	QA – computer account control (CR 7176)	Lack of control of sensitive unclassified computer account	Initiated CR 7176 to evaluate and address process resulting in loss of proper controls.	<b>CR 7176 initiated.</b>
27	ALA.20050801.3981	06/14/05	Tech	QA – computer account control (CR 7176)	Lack of control of sensitive unclassified computer account	Initiated CR 7176 to evaluate and address process resulting in loss of proper controls.	<b>CR 7176 initiated.</b>

**Second BSC Email Review (28 Emails)**

Accession Number		Email Date	Issue Area	Topic	Description	Disposition	Status
28	ALA.20050801.2064	06/16/05	Tech	QA – computer account control (CR 7176)	Lack of control of sensitive unclassified computer account	Initiated CR 7176 to evaluate and address process resulting in loss of proper controls.	<b>CR 7176 initiated.</b>

## **ATTACHMENT F**

### **DISPOSITION OF NON-RELEVANT EMAIL RECORDS**

ATTACHMENT F - DISPOSITION OF NON-RELEVANT E-MAIL RECORDS

Accession Number or Email Date		Topic	Subject	Copy of Email Text or Summary Statement <sup>1</sup>	Disposition
1	05/08/97	Technical/Data – modeling	Re: <i>[Name withheld]</i>	Discussion re: coordinating modeling approaches. The email addressed substantive modeling ideas and is not QA related.	<b>Resolved - no further action needed.</b>
2	09/11/97	Technical/Data – unknown	Re: PRA	"We'll see if the defense works" Discussion re: This brief email could apply to anything. It does not contain much data, but it is not likely QA related.	<b>Resolved - no further action needed.</b>
	09/29/97	Technical/Data – modeling	<i>[Name]'s Paper</i>	Acknowledgment of a technical error in a paper. "I'm actually praying that if the report does get published, no one looks at it too closely."	<b>Added to CR 5223</b>
3	04/08/98	Technical/Data – data qualification	Deliverables	Discussion re: Lists preliminary status of data, including Q and Un Q'd prior to finalizing data. While the email does not show willful noncompliance, it does identify QA related problems with 4 deliverables. ORD Management found the issue is not willful noncompliance.	An attempt to find the documents discussed in the email was unsuccessful (12/20/05). <b>Resolved - no further action needed.</b>
4	12/18/98	Technical/Data – document preparation	UZ F&T	Discussion re: The author discusses the inability to find a document because he "must have purged from his files the document in question as well as other contentious documents upon receiving [a] positive note" on the issue. ORD Management found the issue is not willful noncompliance.	An attempt to find the documents discussed in the email was unsuccessful (12/20/05). <b>Resolved - no further action needed.</b>
5	01/21/99	Management – Supervision/ direction	Re: being overworked...	Discussion re: concern about a USGS proposal that the author fears "would imply a lack of confidence in Project scientists." It questions DOE Management decision; it is not QA related.	<b>Resolved - no further action needed.</b>
6	01/12/00	QA – QA process	Re: Nagra/PSI TDB	Discussion re: what the author sees as a project undertaken "in a hurry without adequate review ...." Potentially related to QA if the review was inadequate. ORD Management found the issue is not willful noncompliance.	An attempt to find the documents discussed in the email was unsuccessful (12/20/05). <b>Resolved - no further action needed.</b>
7	03/24/00	Technical/Data – data qualification	Preliminary Data Checklist Sampling Results	Discussion re: preliminary status of data, including Q and Un Q'd prior to finalizing data. It lists failure rates of data that could not be verified Q. While it does not reflect willful non compliance, it is QA related.	The information in the email was a status on the outcome of data verification efforts. All of the data were qualified per the data qualification report TDR-NBS-GS-000008. The recommendations from the data qualification report to revise and supersede the water table altitude was implemented. The DTNs are controlled and qualified, with the required Records Roadmap. <b>Resolved - no further action needed.</b>
8	LN-003 02/15/98	Technical/Data – document preparation	Are you okay?	"Not proud of this product at all, but my goal is just to get it off my desk, in whatever shape I can. Not putting my name on it, let it be an anonymous donation that just mysteriously appeared on the M&O doorstep."	<b>Added to CR 5223</b>
9	LN-004 09/29/97	Technical/Data – data qualification	Paper	"The data presented in the report are in error due to the prior identified in the raingage calibration program. "I'm actually praying that if the report does get published, no one looks at it too closely."	<b>Added to CR 5223</b>

ATTACHMENT F - DISPOSITION OF NON-RELEVANT E-MAIL RECORDS

Accession Number or Email Date		Topic	Subject	Copy of Email Text or Summary Statement <sup>1</sup>	Disposition
10	LN-005 01/04/2001	QA QA requirements	Re: Audit M&O-ARC-01-03	"Heads up! The train wreck is about to occur. Don't get caught under the wreckage"	A review of the QA audit M&O-ARC-01-03 indicated one CAQ that resulted in a DR. The DR identified failure to comply with submittal requirements for deliverables submitted to DOE IAW the requirements of AP-7.5Q, "Submittal, Review, and Acceptance of Deliverables." This email is a non-issue. <b>Resolved - no further action needed.</b>
11	LN-008 02/15/2000	Management – planning	Re: Changes necessary to ATDT to support AP-3.15Q	"Even though the DAR I wrote <b>has not been approved yet, I am planning to send</b> ( <i>emphasis added</i> ) AP-SIII.3Q to TPM this morning for preparation."	The document represents a series of communications regarding the alignment of the definition of Technical Product Output in several draft project procedures in development at the time and the project automated technical data tracking system. The definition of Technical Product Output has been resolved. There was no discussion of an approved project requirement or procedure that had been violated in the fax. No issue. <b>Resolved - no further action needed.</b>
12	LN-017 08/11/1998	Management – planning	Re: Responses to Comments from individual	"Either I answer the comments when I can, or we don't address them."	Personnel in email are no longer on Project. [However, comments that are not addressed during a review cycle may be submitted at a later time via a Document Action Request (DAR) to be addressed.] <b>Resolved - no further action needed.</b>

ATTACHMENT F - DISPOSITION OF NON-RELEVANT E-MAIL RECORDS

Accession Number or Email Date		Topic	Subject	Copy of Email Text or Summary Statement <sup>1</sup>	Disposition
13	LN-019 01/11/1999	Technical/Data – document preparation	Re: Disposal Criticality Analyses Methodology Topical Report	"We will not write a DR or NCR at this time. Please do a white paper that includes an investigative action, and within that, make a determination that this is an isolated case or not."	<p>The "White Paper" issued indicates the incident was an isolated case; however the "White Paper" does not identify how/what objective evidence was reviewed to determine this was an isolated case.</p> <p>As a result of BSC's review of the Document Control and Technical Publications Management issues in the subject white paper noted in the email, no other cases such as the one identified in the white paper have come to BSC's attention since the date of the white paper. It is important to note, however, that in the process of producing complex technical documents, there is the possibility that authors or reviewer's directions or comments may not initially be fully incorporated due to human performance factors. Again, to the best of BSC's knowledge, any editorial omissions are noticed in subsequent draft reviews and incorporated before final publication. BSC will submit Condition Report as an opportunity for improvement (level D) that will identify the need for development of a performance document that will formally provide document preparation guidance to technical editors and word processors.</p> <p align="right"><b>CR 8157 initiated.</b></p>
14	LN-020 03/21/2000	Management – Supervision/ direction	Re: Fwd: ISM Draft Report Factual Accuracy Files	"Maybe I am out there on a limb, but I feel the evidence (documentation) of oversight is ineffective. As it stands now, I feel the ARG Facility Rep is just tagging along offering no value."	<p>Neither the report nor the email refer to any YMP activities.</p> <p align="right"><b>Resolved - no further action needed.</b></p>

ATTACHMENT F - DISPOSITION OF NON-RELEVANT E-MAIL RECORDS

Accession Number or Email Date		Topic	Subject	Copy of Email Text or Summary Statement <sup>1</sup>	Disposition
15	LN-021 04/23/2002	Technical/Data – data qualification	Re: Guidance for my previous request	"Except initially, there was not a systematic review of external literature to obtain the bulk of the data in order to maximize the chances of obtaining a "reasonably complete set of results"."	The accession numbers associated with individual's work show that the reports used technical assessment and corroborating data methods according to Attachment 2 of AP.S111.2Q, Rev 0, ICN 3, "Qualification of Unqualified Data and the Documentation of Rationale for Accepted Data." The corroborating data method was used in making cross comparisons to evaluate the consistency of independently acquired data. No issue. <b>Resolved - no further action needed.</b>
16	LN-023 06/18/1997	Management – Supervision/ direction	Lessons Learned	"During this alcove 5 drilling program the one single item that stands out is lack or presents of M&O safety"	Email deals with dust and use of respirators. There is ongoing ES&H litigation. <b>Referred to BSC litigation counsel.</b>
17	LN-024 10/14/1997	Technical/Data – data use	Re: Water Inference	"In conclusion, the inference I draw from this data is that there is not enough data to make truly meaningful conclusions. Do we have USGS data from the previous samplings?"	Email references radon. There is ongoing ES&H litigation. <b>Referred to BSC litigation counsel.</b>
18	LN-025 06/10/1999	Technical/Data – data use	RE: New time for Principal Factors Meeting	"This is important, because according to Larry there is no way we are going to have proper QA in place for most of the models and data – not just by this fall, but by LA – and so for the LA safety case he says we have to use conservative, bounding assumptions...".	The RIT looked at direct input DTSS. Refer to CR16 and an effectiveness review which also identified 4 DARs. This email also was sent "to" or sent "by" individuals involved in the initial email "Extent of Condition". CR0016 addressed data confirmation to consistently produce transparent and traceable data sets. <b>Covered under existing CR 0016.</b>
19	LN-026 01/23/1997	QA – QARD process	Re: Revision to: Limiting Dimensions and Mass for Canistered Navy Fuel	"This is fine information, but it can not be used for design! We need to start to put all of this in a QAP-3-9 so we can reference the data. ... please do not take this the wrong way. We simply need to think in QAP-3-9 terms."	This email discusses Navy canisters and compatibility with waste package design at the time (9 years ago). The issues raised in the emails have been overcome by events. Subsequent to the email discussions, there was a reappraisal of repository design, including waste packages, as part of the License Application for Design Selections (LADS) effort which resulted in substantial changes to waste package design and made any issues raised in the emails moot. Not an issue. <b>Resolved - no further action needed.</b>

ATTACHMENT F - DISPOSITION OF NON-RELEVANT E-MAIL RECORDS

Accession Number or Email Date		Topic	Subject	Copy of Email Text or Summary Statement <sup>1</sup>	Disposition
20	LN-031 02/16/2001	Technical/Data – data qualification	Re; Plan for qualifying matrix property DTNs	"It's almost like we can take anything, technically flawed or not, and qualify it."	Based upon SME and other comments regarding the email and a review of the Data Qualifications Plan for Matrix Hydrologic Properties..., the Data Qualification Report: Matrix Hydrologic Properties..., correspondence between BSC and the ORD Office of Project Execution and ORD Office of Project Execution Letter concurring on the results of the Data Qualification Report, the data was reviewed and found to be qualified. Therefore, this is a non-issue.  <b>Resolved - no further action needed.</b>
<p><b>Note 1.</b> The information in this column is either a copy of the complete email text or a brief summary. Summaries were used in situations where the text was too long to be easily included.</p>					

**ATTACHMENT G**

**DISPOSITION OF 111 EMAILS FROM THE YUCCA  
MOUNTAIN EMAIL WAREHOUSE**

ATTACHMENT G – DISPOSITION OF 111 EMAILS FROM THE OCRWM EMAIL WAREHOUSE

Sequence No	Sample	Email #	Date	Topic	Subject	Dispositions
1	1	85	04/04/02	Technical/Data – Modeling	Water usage for criticality calculations	Based upon reviewer comments and an explanation from the originator of the email, the email was not directing non-“Q” work. The author was pointing out that the official starting model was not valid at the time. The phrase “not officially Q” was meant to say “not yet validated.” The TSPA-FEIS and associated sub-models were validated. Therefore, this email content is a non-issue. <b>Resolved - no further action needed.</b>
2	5	22	11/13/98	QA – QA Process	Re: Guidance on TDPP vs 3-12 for DA5	Since QAP 3.12 was already in use by all participating groups in LADS, it was decided to continue using that procedure. A TDPP was used but only in connection with report preparation and not for quantitative information transmittals. <b>Resolved - no further action needed.</b>
3	5	116	08/27/02	Not related to YM	just a heads up	<b>Resolved - no further action needed.</b>
4	5	124	10/09/02	QA – scientific notebook	Re: Help requested with AP-SI.1Q compliance	Based upon reviewers’ comments this email appears to be an exchange clarifying a procedural process. <b>Resolved - no further action needed.</b>
5	5	182	12/10/03	Technical/Data – other	Re: ANL-NBS-HS-000031 Review	The DTN referenced in the email which had a statement referring to some data that had been developed using unqualified software was superseded by another DTN, which is qualified. This was resolved. <b>Resolved - no further action needed.</b>
6	6	242	03/28/05	Technical/Data – records management	Follow up to Phone Message	Email discusses administrative issues (errors) in preparing records for submission to the Records Processing Center. This is a non-issue. <b>Resolved - no further action needed.</b>
7	8	162	10/22/03	Technical/Data – other	Corrected Industrial Hygiene Measurements	Based on the reviewer’s comments and phone call with email originator, the report was likely air flow measurements within the tunnel to measure air quality, quantity, CO <sub>2</sub> content, etc. Sometimes additional measurements are necessary with the fan “on” and/or the fan “off.” This is not a “Q” activity. <b>Resolved - no further action needed.</b>

ATTACHMENT G – DISPOSITION OF 111 EMAILS FROM THE OCRWM EMAIL WAREHOUSE

Sequence No	Sample	Email #	Date	Topic	Subject	Dispositions
8	9	20	11/20/98	Technical/Data - requirements	Action on LBL	An investigation found that although the two individuals attended Radon Awareness Training, LBNL staff failed to follow procedures. In response to this incident, protocol had been reinforced by requiring each tunnel entrant to sign a Radon Protocol acknowledgement form prior to each tunnel entry. This email is not an issue. <b>Resolved - no further action needed.</b>
9	9	50	03/23/00	Management - security	0	The issue described in the email is no longer an issue. Bechtel Nevada now does all the hiring of Craft personnel for the YMP. Badging of employees does not take place until after drug testing is complete. <b>Resolved - no further action needed.</b>
10	9	84	03/26/02	SOFTWARE	0	Appears to address ASME Code III development. This does not appear to be an issue that warrants a CR. <b>Resolved - no further action needed.</b>
11	10	99	05/24/02	Technical/Data – DTN	Superseded DTNs that aren't truly superseded	The issue regarding supervision of DTNs was resolved by requiring the new DTN to include all the corrected data including unchanged data into the new DTN or splitting the superseded DTN into two DTNs if the object is to separate the qualified and unqualified data. For old data, the management decision was to correct DTNs as they were used to support SR and LA. This issue appears to have been resolved. <b>Resolved - no further action needed.</b>

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Sequence No	Sample	Email #	Date	Topic	Subject	Dispositions
12	11	37	05/08/99	QA – scientific notebook	Scientific Notebook Records	<p>Based on the reviewer’s comments and the following response from an individual who was “cc” on the email in question, this appears to be a non-issue.</p> <p>Email response to our inquiry.</p> <p>“It appears that the concern was title mismatches in the Scientific Notebook Register. In 1999, when I am told this email was sent, the Scientific Notebook Register database was replacing the tracing system used at the laboratories. LBNL had their own numbering system that included the initials of the principle investigator in the number. ... As use of this database was learned, the numbers and titles of the LBNL scientific notebooks became more standard and were used to identify each unique notebook in the register. ... The numbers and titles of each notebook at LBNL have been standardized for use in the Scientific Notebook Register.”</p> <p><b>Resolved - no further action needed.</b></p>
13	11	143	02/26/03	QA – records management	Missing System Description	<p>Two documents were removed from a fire safe apparently without completing a sign-out form. This is an administrative and security issue and does not warrant a CR</p> <p><b>Resolved - no further action needed.</b></p>
14	12	167	09/25/03	Technical/Data – DTN	Re: Roadmap for DTN LB970500123142.003	<p>Based on input from LBNL personnel cognizant of the issue and Technical Data Management System personnel, the calibration records for items 1, 2, and 3 discussed in the email are in the Records Processing Center (RPC), except for one calibration record which was found and placed in the RPC 3/16/06. Additionally, the DTN referenced in the email is not being used as direct input to an AMR and is currently referenced in a summary report; but not as direct input. Per the Technical Data Information Form (TDIF) the DTN would require verification prior to direct use. The road map for this DTN was not finalized because the DTN was not going to be used for direct input and consequently will not be qualified.</p> <p><b>Resolved - no further action needed.</b></p>
15	13	22	02/12/99	TECHNICAL/DA TA – other	FY99 Backup on Friday, 2/11	<p>A mistake was made in the naming of a backup tape that does not appear to have had any impact.</p> <p><b>Resolved - no further action needed..</b></p>

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16	13	127	10/29/02	TECHNICAL/DA TA – requirements	Weld Area Walkdown	<b>Resolved - no further action needed.</b>
17	13	158	05/29/03	QA – QA process	Re: NCR USGS- 03-0041	Based on reviewer’s comments, the email this appears to be a non-issue. <b>Resolved - no further action needed.</b>
18	14	131	04/07/03	QA – records management	Color Records	Based upon reviewer comments, and especially OQA and the Subject Matter Expert (SME) responses, providing a copy of a QA record is not contrary to the QA Program. <b>Resolved - no further action needed.</b>
19	16	205	06/11/04	Personnel – job performance	Re: D&E folks charging to RD indirect	The issue in the email was an administrative issue related to how to appropriately charge hours on a task. <b>Resolved - no further action needed.</b>
20	23	216	09/22/04	Personnel – job performance	Re: !!	This was an administrative and personnel matter not related to QA. <b>Resolved - no further action needed.</b>
21	26	55	02/09/00	QA – QA process	summary of wkly mtg.	Email discusses public information materials which is a non-Q process. The procedure referred to in the email is a non-Q procedure. <b>Resolved - no further action needed.</b>
22	27	26	06/11/99	QA – QA process	USGS	Based on comments from reviewers of the email and first hand knowledge by the Subject Matter Expert, this is a non-issue. This is an example of Management’s attempt to assist line organizations in resolving and closing CAQs in a timely manner. <b>Resolved - no further action needed.</b>
23	27	191	03/22/04	Software	ASHPLUME Software Error	Based upon reviewer’s comments and a BSC review of the email content, the issue was resolved via CR 2330. The CR was closed on 9/1/04. This is a non-issue. <b>Covered under existing CR 2330.</b>
24	28	111	08/15/02	Technical/Data – DTN	Re: DTN: LL991000125021. 090...	Based on reviewer comments and a review of ATDT (Automated Technical Data Tracking) the DTN is correctly entered. This is a non-issue. <b>Resolved - no further action needed.</b>
25	32	57	07/31/00	Technical/Data – modeling	Re: criticality topical and TSPA	Topical reports are not governed by the QA Program. This is office discussion regarding regulatory compliance strategy. Not an issue. <b>Resolved - no further action needed.</b>
26	43	49	11/09/00	Technical/Data – modeling	Re: USGS Data Packages in Support EBS AMR/PMR’s	The reviewers determined that the email was a light-hearted discussion that had no bearing on QA issues. <b>Resolved - no further action needed.</b>
27	47	32	07/07/99	Technical/Data – other	Solar Power at MGR	Based upon the review comments and that a solar power alternative at the site is not governed by the QA program. <b>Resolved - no further action needed.</b>

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28	48	11	07/27/98	QA – calibration	Re: calibration	It is not uncommon for transducers in boreholes to become inactive or “dead.” Per QA, there are provisions when this occurs. Also the Subject Matter Expert and Technical Program Manager do not see this situation as unusual as some do fail. <b>Resolved - no further action needed.</b>
29	48	113	12/17/02	QA – records management	Re: Dirs Lockdown	This does not appear to be a QA process/issue. The email discusses an issue that two documents in DIRS did not have an author’s name entered. Without an author’s name the document is not “locked” to prevent unauthorized changes to the document. Subsequent to the 2002 email, the DIRS system software has been upgraded with additional safeguards. <b>Resolved - no further action needed.</b>
30	48	155	08/27/03	Software	Question on AP-S1.4Q Legacy Code...	Based upon comments from reviewers and an explanation from the email author, both the department manager and the project manager provide concurrence signatures for the list of codes for the product being reviewed. The exempt codes were reviewed to confirm their exempt status. These issues appear to have been resolved. <b>Resolved - no further action needed.</b>
31	48	220	09/07/04	QA – QA process	Re: LP3.2OQ	Based upon reviewer’s comments and a review of LP-3.30Q, the applicability paragraph of the LP does not specify applicability to Summerlin Office facilities. It was determined that LP-3.30Q-BSC was not the appropriate place to document a safety and health baseline for BSC facilities. Consequently, a safety and health baseline for BSC facilities has been established in the BSC Baseline Hazards Inventory. <b>Resolved - no further action needed.</b>

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32	51	10	03/16/98	Management - security	Blank	<p>This is not a QA issue. This issue of the compromise of a computer access password occurred 8 years ago. Since that time, General Employee Training Annual Refresher Training cyber security section discusses that an employee shall not divulge or share his/her private password with any other person, nor shall an employee grant account access to another employee. Additionally, the OCRWM Computer Account Access Request contains a “User Responsibility Compliance Acknowledgement” that contains the same statement. In order to obtain a computer account, the requestor must read and sign the acknowledgement. Computer Security has no indication that this issue is recurring.</p> <p><b>Resolved - no further action needed.</b></p>
33	52	8	04/13/98	QA – QA process	Q-List, Revision 5 vs QAP-2-3 Classification Analyses.	<p>At the time of this email, the Program did not have a Corrective Action Program (CAP). Additionally, the focus of the Program and design has changed. Rev 5 of the Q-list was superseded in May 2000 by Rev 6. Additionally, the Q-list was replaced by the BSC Q-list (TDR-MGR-RL-000005) on 10/1/03. AP-2.22Q, <i>Classification Analyses and Maintenance of the Q-List</i>, establishes process for the revision of the Q-list. Also, technical input status of reference is identified and tracked in accordance with LP-3.15Q-BSC, <i>Managing Technical Product Inputs, To Be Verified (TBV) and unresolved Reference Numbers (URNs)</i>. A system is in place to assure currency of the Q-list.</p> <p><b>Resolved - no further action needed.</b></p>
34	52	9	06/25/98	Technical/Data – modeling	Re: CDA TDSS Assumption on percolation flux	<p>Per the SME and QA comments, the email describes a process of treating certain documents as requirements. The email describes the direction to treat Controlled Design Assumptions document as a requirement QAP 3.12, the CDA and Technical Document Preparation Plan (TDPP) are listed as references in the License Application Design Selection Report. The recommended design was incorporated into the YMSCO Project Baseline. SDDs were likewise treated as requirements.</p> <p><b>Resolved - no further action needed.</b></p>

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35	52	148	07/21/03	Technical/Data – DTN	DTN: MO0307MWDDD INT.000	<p>Based on the reviewer’s comments and the explanation from individual (shown below) who was on “cc” of the email, this is not an issue worthy of a CR.</p> <p>“Email addresses the entry of a DTN and its metadata into ATDT (part of TDMS). The TDMS procedure provides the originator a short period of time to verify the entries made into TDMS including the data and metadata and to make needed corrections. In this case the DTN was superseding another recent DTN associated with the data. We used the information from that DTN for the initial entries...”</p> <p>The DTN and the issues have all been resolved. The DTN TDIF contains the correct information in the metadata description.</p> <p><b>Resolved - no further action needed.</b></p>
36	53	6	08/26/97	QA – records management	Concurrence on CDA Rev. 04, ICN 2	<p>Based on reviewer’s comments, and especially the SME’s response that none of the work discussed is being used in the “safety case,” this is not an issue.</p> <p><b>Resolved - no further action needed.</b></p>
37	53	34	05/27/99	QA – QA process	Approach to the definition and use of Accepted Data in AP-3.10Q Analyses	<p>Email proposes an approach to the use and definition of accepted data. It is a conversation between the author and recipient. There is no QA-related issue here.</p> <p><b>Resolved - no further action needed</b></p>
38	54	33	11/29/99	Technical/Data - requirements	Re: BDCF’s	<p>Based on reviewer’s comments that this appears to be a non-issue and the email author’s explanation that the APs were followed for the Biosphere PMR supports that this email content is a non-issue. The direction applied to the Reasonably Maximally Exposed Individual (RMEI); however, it did not apply to Rev 0 of the PMR.</p> <p><b>Resolved - no further action needed.</b></p>
39	54	135	05/08/03	QA – records management	Timely Submittal of Records	<p>The issue was documented in a Quality Observation, BSC (B)-03-0-092, which described the issue discussed in the email as well as the corrective actions taken. The corrective actions were identified by QA and closed on 6/6/03.</p> <p><b>Covered by existing BSC Quality Observation.</b></p>

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40	55	25	01/11/99	TECHNICAL/DA TA – records management	ECRB Crossdrift Construction Report	Discussion of a report is not QA-related. There is no negative discussion of QA in the email. <b>Resolved - no further action needed.</b>
41	55	141	04/02/03	TECHNICAL/DA TA – records management	Update: Let me know about data submittal	Based on reviewer’s comments, this was a communication error between personnel. <b>Resolved - no further action needed.</b>
42	55	183	01/19/04	Personnel - SCWE	OFO ES&H Surveillance of Bldg 4314	This email discussed an environmental surveillance of building 4314. A number of issues were identified at the time, resulting in CAP items. CRs 1734, 1735, 1737, and 1741 addressed the deficiencies identified in the surveillance. All deficiencies were corrected. All items discussed in the email have been subsequently addressed through vacating the facility. By December 2005 the facility was returned to Bechtel Nevada. <b>Covered by existing CRs.</b>
43	55	197	04/15/04	QA – QA process	Minor crisis – LP 4.1	The email documents a misunderstanding between co-workers. The manager and preparer were in agreement with the procedure. <b>Resolved - no further action needed.</b>
44	55	235	02/08/05	Management - security	Re: ProWatch	Based on reviewer’s comments, and the SME comments (Security Manager for ORD), this email discussed training for new receptionists. The receptionist has duties to issue visitor badges via the Pro Watch computer program. This is not an issue. <b>Resolved - no further action needed.</b>
45	56	32	05/27/99	QA – QA process	Re: ESF Log Sheets	Radon logs are not a “Q” process. At the time of the email as well as the present time, there is procedure that calls for workers to log in and out of various work areas. When collecting data whether it be from a log or a dosimeter, there must be processes in place that allows for the “recreation” of the dose estimate if the “data” collection system fails. The email discusses a process for the Hygiene/Health Physics professionals to recreate the estimate and enter the estimates in the log. The written process is described in the procedure. This is a normal process in the worker health protection world. <b>Resolved - no further action needed.</b>

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46	56	175	02/06/04	Technical/Data – modeling	Re: Ventilation Model Delays	The contractor delivered the update by an errata sheet to the AMR rather than a revision or ICN to the AMR. This was not contrary to QA requirements, but was inconsistent with DOE’s expectations. Per the SME, this is not a condition adverse to quality. <b>Resolved - no further action needed.</b>
47	56	198	06/05/04	QA – scientific notebook	New versions of initial Entries – PLEASE IGNORE PREVIOUS EMAILS	Based on reviewer’s comments it does not appear to be an issue to use updated entries of draft entries from Lab notebooks or an initial entry as a template for future entries. <b>Resolved - no further action needed.</b>
48	56	247	06/20/05	Technical/Data – records management	Re: Biosphere Result Reproducibility Task	The reviewers found nothing of concern in the email which discussed software user requests. <b>Resolved - no further action needed.</b>
49	57	94	03/15/02	QA – QA process	AP-17.1Q Question - §5.2d)	Email author is asking for clarification of a procedural requirement. <b>Resolved - no further action needed.</b>
50	57	218	08/17/04	Personnel – job performance	FW: VOEEs required for [name withheld & name withheld]	CR 3714 had been written to document a potential lack of VOEEs for INL personnel. There was no basis for the issue and no condition adverse to quality existed. The CR was closed on 11/08/04. <b>Covered by existing CR.</b>
51	57	239	03/03/05	Technical/Data – records management	Re: Data	The use of non-Q software during scoping work is an acceptable process. If/when the work became “Q,” the software would need to be “Qed.” <b>Resolved - no further action needed.</b>
52	58	99	07/08/02	QA – QA process	Re: Status of Sierra Instruments	BSC QA conducted a surveillance of Sierra Instruments on 6/13/02. The Surveillance Report identified issues discussed in the emails. These issues were also documented in DR.BSCQA-02-S-033 and corrective actions verified by a BSC QAR. <b>Covered by existing DR.</b>
53	59	14	06/01/98	Technical/Data – records management	Diffusion Coefficient Data	The consensus is that this issue does not meet the criteria for a CR. Additionally, OQA stated in its comment that the data would have to have been submitted to TDMS to be referencable in a Project product. This data is now 12 years old and may have been superseded by other data. <b>Resolved - no further action needed.</b>

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54	59	128	02/20/03	Personnel - training	Re: Request for Training Verification for PREINFIL	The email documents a discrepancy between the Sandia National Lab training records and BSC (YMP) Training Department. Review found that the individual was trained and is still currently trained to the appropriate current software management procedures. <b>Resolved - no further action needed.</b>
55	60	53	05/15/00	QA – scientific notebook	Re: Audit Notification: SNL-AR-00-012	The Scientific Notebook was reviewed and it was found that nothing was deleted from it. The email in question probably refers to an email from Science and Engineering Associates that states that “although these predictive calculations are being performed in accordance with AP-3.12Q, the results presented here are preliminary and should not a yet be regarded as Q-data.” The final check copy of the calculations was submitted to the Records Center in 2001. <b>Resolved - no further action needed.</b>
56	60	128	11/06/02	Technical/Data – other	Weld flaws	The email asked for clarification for discrepancies between preliminary weld flaw data and a preliminary report that documented these data. Because the data were preliminary, they were subject to changes. The email was aimed at obtaining the latest, more accurate version of the data. The weld flaw data were preliminary data that had not yet been qualified. Evolution of data that are undergoing a qualification process is normal. The emails should not be interpreted as denoting a CAQ. The qualification statues of the weld flaw data was handled appropriately in the analysis and future revisions. Because the qualification process of the weld flaw data had not been completed, and subject to future change, a TBV (TBV-5082) was assigned to track any change in accordance with the relevant quality procedure. The qualification process resulted in changes to the data. The qualified data were assigned a DTN which replaced the interoffice memorandum. The TBV was closed because the analysis was now using qualified controlled data. <b>Resolved - no further action needed.</b>

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57	60	200	04/29/04	QA – records management	DIF Editorial change	The email describes an error that was discovered during the RIT review process. As a result of the discovery, the DTN comment section was corrected. The DTN now shows as output from Revision 02 of ANL-MDL-MGR-000001 which was an approved revision developed during the RIT process. <b>Resolved - no further action needed.</b>
58	61	65	03/26/01	QA – QA process	CIRS # 702 (Re-opened) (New Action Plan Due 4/16/01)	The email discusses the need to add a statement to the applicability section of a “non-Q” procedure. It appears that CIRS 702 was re-opened to add this insert. <b>Covered by existing CIRS item.</b>
59	61	190	12/17/03	Technical/Data – records management	Re: Reference Only Status and TBVs	Email is a discussion regarding when a TBV is required and the process to obtain a TBV number. <b>Resolved - no further action needed.</b>
60	62	124	01/19/03	Software	MACCS2v1.12	MACCS2V1.12 was eventually baselined (comments addressed) and is still on the active database. Therefore, there is no quality issue. <b>Resolved - no further action needed.</b>
61	62	159	09/29/03	Technical/Data – DTN	USGS TPO DTNs and RECIRC review	Based upon opinions from reviewers of the email, this appears to be a discussion to obtain clarification or procedural steps. <b>Resolved - no further action needed.</b>
62	67	201	04/26/04	Technical/Data – records management	Re: Alara	The document 168895 was verified by a quality checker and placed in the Records Center per 17.1Q. <b>Resolved - no further action needed.</b>
63	68	120	12/11/02	Technical/Data – records management	Re: VTR review	Appears to be discussion and path forward regarding a draft document. <b>Resolved - no further action needed.</b>
64	69	186	03/17/04	Technical/Data – records management	Re: What is considered data?	Based upon reviewer’s comments and OQA’s response that the email properly clarified that only direct inputs need to have a status of “qualified,” this email appears to be a non-issue. <b>Resolved - no further action needed.</b>
65	72	103	08/12/02	Technical/Data – records management	Engineering Review of Desktop Instructions	Just a request for “Engineering” to review a desktop instruction. <b>Resolved - no further action needed.</b>
66	73	2	03/27/97	QA – QA process	Transition of M&O QA Activities to OQA	<b>Resolved - no further action needed.</b>
67	73	37	02/26/99	Technical/Data – other	RE: TDIF #306221,...	As a result of an audit of Scientific Notebooks, the auditors have recommended that some DTNs be changed from “Q” to “non-Q” in order that corrections can be made. <b>Resolved - no further action needed.</b>

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68	73	46	10/06/99	Technical/Data – records management	Re: CAR02 Remediation	The email appears to discuss replacement of a memo as part of the remediation effort for a DTN related to CAR-02. Per OQA, the CAR was satisfactorily resolved by OQA. <b>Resolved - no further action needed.</b>
69	73	181	11/05/03	Technical/Data – DTN	Record Roadmap for LBNL...	Per the Subject Matter Expert, the email describes the ordinary course of work of assembling a package of records. The subject DTN was verified per AP-3.15Q on March 26, 2001 and has a Data Confirmation Checklist with an attached Records Roadmap linked on the TDIF (MOL.20010403.0130). A reviewer found some references in a scientific notebook that were not listed on the Records Roadmap. The records were found and were re-submitted to the RPC (calibration certificate). The procurement of the thermometer appears to be a non-Q procurement with a Q calibration. Lastly, data impact records are not necessary since thermometer was within its calibration period. <b>Resolved - no further action needed.</b>
70	74	131	05/01/03	QA – records management	RE: Legacy documents	Based upon the detailed explanation from the Subject Matter Expert, the content of the email documents the normal course of business. Duplicate records were sent, not the originals. <b>Resolved - no further action needed.</b>
71	75	218	10/07/04	Technical/Data – modeling	Re: S0010_ANL-NBS-MD000010_REV01	Based upon reviewers comments the email appears to be office chit chat regarding a process. <b>Resolved - no further action needed.</b>
72	78	12	06/20/98	Technical/Data – records management	Review of Cross Drift Prediction	The email is simply a discussion of a complex model that has uncertainties, used to describe a system for which there is no unique, one-and-only “right” answer. <b>Resolved - no further action needed.</b>
73	79	134	05/19/03	QA – records management	Verification of TWP	This email is a non-issue. Per follow-up phone call, the email was a discussion between employees on work the Records Processing Center does in preparing or verifying records prior to processing into the Records. The individual was frustrated with another employee on the length of time it was taking to complete part of the process so that she could complete her portion of the process. <b>Resolved - no further action needed.</b>

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74	80	96	06/17/02	Technical/Data – records management	PNL data	Email author is asking for guidance/clarification regarding a procedure. <b>Resolved - no further action needed.</b>
75	80	114	11/20/02	QA – QA process	LTI 525 Specimen Order Status	The email discusses the result of a hold point in the procurement process prior to shipment to LLNL. The documentation was not acceptable because call outs for the 100 prisms were not all documented. The issue was resolved when LTI documented the call outs and resubmitted the documentation. The welded prisms were accepted on 12/20/02. <b>Resolved - no further action needed.</b>
76	81	202	06/09/04	Technical/Data – records management	MO0404SPAMCR AE. 001	Per OQA the DTN discussed in the emails has since been “qualified.” <b>Resolved - no further action needed.</b>
77	82	141	07/21/03	Technical/Data – records management	MDL-EBS-GS000002 REV 00; IGNEOUS INTRUSION IMPACTS ON WASTE PACKAGE AND WASTE FORM	Based on the information received from the DIRS Reference Researcher, the statuses for reference discussed in the email have all been addressed. <b>Resolved - no further action needed.</b>
78	83	101	10/30/02	QA – QA process	REISSUANCE OF DEFICIENCY REPORT (DR) BSC-02-D-090 AS CORRECTIVE ACTION REPORT (CAR) BSC-02-090	The email was a simple request for information as part of an effort to upgrade a DR to a CAR. <b>Resolved - no further action needed.</b>
79	83	153	07/01/03	QA – QA process	BSC (O)-03-D-070	The Condition Report (CR) BSC(O)-03-D-070 discussed in the email was converted to CR 39 due to the conversion per AP-16.1Q, Rev. 7, ICN 0 of open CRs to the new Corrective Action Program (CAP). CR 39 actions were addressed and closed on 1/7/2004. <b>Covered by existing CR.</b>
80	84	28	09/21/99	Management – supervision/direction	Status of LBNL Procurements	The issue in the email was a discussion between lab personnel and QA personnel regarding revision to procedure QAP 2-0, “Conduct of Activities.” The procedure was revised and became effective 11/9/99. It has since been cancelled and superseded by AP-2.16Q. This does not appear to be a negative attitude regarding QA; but an effort to revise a draft document for issuance as an “effective” document. <b>Resolved - no further action needed.</b>

ATTACHMENT G – DISPOSITION OF 111 EMAILS FROM THE OCRWM EMAIL WAREHOUSE

Sequence No	Sample	Email #	Date	Topic	Subject	Dispositions
81	84	139	03/19/03	Technical/Data – records management	Re: 2000 TIC Inventory, Lost Items	Past practice was to allow a TIC item to be checked out; but current practice does not allow checkout if only one item is on the shelf. TIC does not contain “Q” documents No issue. <b>Resolved - no further action needed.</b>
82	85	50	03/20/00	QA – records management	More Re: 3F6604, 3F6605, 3F6606, 3F6607	The subject line of the email refers to “Job Numbers” (JNs) which were charge codes. Actual costs were costed against JNs. It appears that JNs for some actuals were being changed. Perhaps incorrect JNs were used in the original data and needed to be corrected. <b>Resolved - no further action needed.</b>
83	86	21	08/26/98	TECHNICAL/DA TA – modeling	Review of Criticality Analysis	The conflicting comments in the email dealt with the level of detail required. Once the different reviewers discussed the reasoning of their comments together, a common level of detail was agreed to, the formal comment responses generated, document modified, and reviewers indicated their acceptance by signing the reviewer comment sheets per procedure in effect at the time. The question of the procedure process being followed was a misunderstanding concerning the guidance to set a phone call between different reviewers with conflicting comments to allow them to resolve their comments, rather than directions not consistent with procedure. The review was in the normal comment resolution step and so had not reached the escalation step, and that DOE was part of the normal review process. <b>Resolved - no further action needed.</b>
84	87	56	05/11/00	QA – analysis model reports	Unqualified LANL data	The DTN discussed in the email had a TBV attached to it in order to quality the data at a later date. Subsequently, the data (unqualified DTN) is no longer being referenced in any licensing supporting document. Per the SME, the data in question is not being used and cannot be used unless verified and the rounding errors and naming differences sorted out. <b>Resolved - no further action needed.</b>
85	87	112	08/13/02	QA – QA process	Re: QARD – Procedures-Guidance issue	At the time, the Chief Science Officer determined that the detail in the procedure was adequate. Not related to this specific issue, CR 7046 was issued in 12/05 and is related to the use of a “guidance document”. A root cause determination regarding the issue contained in the CR is underway. <b>Covered by existing CR.</b>

ATTACHMENT G – DISPOSITION OF 111 EMAILS FROM THE OCRWM EMAIL WAREHOUSE

Sequence No	Sample	Email #	Date	Topic	Subject	Dispositions
86	87	189	02/18/04	Software	3Q Code Remediation	<p>Per a Subject Master Expert (SME) the attachments to the SMR were submitted to the Records Information Center (RIC). During the CAR-002 3Q remediation and resolution process, the review and evaluation of the software item documentation package for GENMESH, V.6.08 were identified in the RIS. Currently, there are thirty-three (33) record packages in RIS to support the documentation traceability for GENMESH V.6.08. The records evaluation revealed submittals commencement back to March 8, 2003. The email participant also provided traceability documentation to support the closure of the CAR-002 actions for 3Q remediation/resolution.</p> <p><b>Resolved - no further action needed.</b></p>
87	88	13	09/25/98	Technical/Data - DTN	Additional feedback	<p>Issue discussed in the email relates to the TSPA-VA which is a “non-Q” product. The email discusses the approach to answer a question from the NRC on the “Q” status or the input to the TSPA-VA.</p> <p><b>Resolved - no further action needed.</b></p>
88	88	136	01/07/03	Technical/Data – records management	Re: Drawing	<p>Based upon responses from the email reviewers and a participant in the email, there does not appear to be an issue. There cannot be two dates entered in the system for the draft document date of a drawing. Document Control goes through annual audit which indicates that this is not a system problem; but an isolated event, possibly a typo error.</p> <p><b>Resolved - no further action needed.</b></p>
89	91	117	11/08/02	QA – QA process	QA Review of CIRS #3384	<p>A review of the CIRS history indicated that the email was administrative in nature and did not require a CR.</p> <p><b>Resolved - no further action needed.</b></p>
90	92	67	03/01/02	Technical/Data – records management	[Name withheld] – DIRS - 105510	<p>The email discusses verification of page numbers from a journal article that was donated to the Project to be used as a reference. The page range issue was resolved as evidenced by the verified reference and Techlib catalogue entry in DIRS. This is not an issue.</p> <p><b>Resolved - no further action needed.</b></p>
91	92	95	07/25/02	Technical/Data – records management	Re: PEST and LaGrIT	<p>As required by AP-16.1Q, a DR had been initiated to address the issue discussed in the email. DR LANL (B)-02-0-061 documented the issue. It was found by QA that no remedial actions were required. However, future submittals should follow the steps outlined within the procedure.</p> <p><b>Covered by existing DR.</b></p>

ATTACHMENT G – DISPOSITION OF 111 EMAILS FROM THE OCRWM EMAIL WAREHOUSE

Sequence No	Sample	Email #	Date	Topic	Subject	Dispositions
92	92	121	12/10/02	QA – QA process	Evaluation of Complete Response to DR USGS(V)-02-D-189	The email was a request to discuss issues concerning a DR and a request to review a response before approving it. <b>Resolved - no further action needed.</b>
93	92	194	04/29/04	QA – QA process	Re: CR-1741: Action 1741-002 Due Date Adjustment	The email adjusted actions due dates for CR1741 and was appropriate. <b>Resolved - no further action needed.</b>
94	93	109	08/20/02	Technical/Data – DTN	DTN: LB0207REVUZP RP.001 TDIF:313175	The request in the email was part of the normal business process of maintaining the Technical Data Management System (TDMS). Once the data were accepted, the DTN was “QCed” and placed under controls that prevented changes from occurring. If changes became necessary, the DTN would be reviewed for compliance and then “re-QC” the DTN to put it back under the controlled database. This is not an issue. <b>Resolved - no further action needed.</b>
95	93	113	09/03/02	Technical/Data – records management	Re: “98-99” RTN Records	The email relates to Requirements Traceability Network (RTN) records where changes should have been signed and dated, but the staff involved were no longer on the project. This was addressed during resolution of DR YMSCO-98-D-125. Based on QA’s recommendation, the RTN records were submitted to the Records Processing Center (RTC) with a memo explaining why they were not signed and dated. <b>Covered by existing DR.</b>
96	93	174	10/30/03	Technical/Data – DTN	feedback please	Consensus of reviewers is that this is a straight forward request between employees for information. <b>Resolved - no further action needed.</b>
97	93	218	09/02/04	Technical/Data – modeling	Sensitivity of Number of Waste Packages Hit to Dike and Drift Buffering Feature	This email is not an issue. The subject was dispositioned in Revision 2 of the AMR (ANL-MGR-GS-00003). The buffer zone issues were addressed in Appendix G of Rev. 2. <b>Resolved - no further action needed.</b>
98	94	2	02/10/98	Technical/Data – records management	Re: Baseline of the eyeball	The majority opinion of the reviewers is that the email is a discussion of how best to provide version control for a sketch. The Subject Matter Expert states that this sketch has been superseded by more definite work in support of the draft LA of 2005. The consensus is that a CR is not warranted. <b>Resolved - no further action needed.</b>

ATTACHMENT G – DISPOSITION OF 111 EMAILS FROM THE OCRWM EMAIL WAREHOUSE

Sequence No	Sample	Email #	Date	Topic	Subject	Dispositions
99	94	175	03/08/04	QA – records management	Re: Supplier Doc – Content Swapping Items	Documents submittal to the Records Processing Center (RPC) was not timely as required by procedure. CR 2264 had previously been written to address these 5 supplier documents. The condition was corrected and verified by QA. <b>Covered by existing CR.</b>
100	94	195	06/10/04	Technical/Data – DTN	Re: Direct Input DTN SNC206T0503102 .005/Question to <i>[Name withheld]</i>	The subject DTN of the email was superseded by DTN0303 to 503102.008 because the data analysis for these parameters was revised based on model validation and re-examination of model inputs for the AMR. The subject DTN is still available in the TDMS as unqualified preliminary data from MDL-NBS-GS-000006, Rev. 0. The inconsistencies in the use of this DTN, and the lack of traceability to the actual data that were used, leave questions on whether unqualified data were used in direct support of a product that is subject to the QARD. Consequently, CR8152 (Level B) was written to investigate and resolve this issue. <b>CR 8152 initiated.</b>
101	94	189	07/08/04	Technical/Data – records management	Re: MDL-NBS-HS-000003 REV 02 Autochecker Results	The email discusses MDL-NBS-HS-000003 REV 02 (Ghezzehei) Autochecker Results. The autochecker may be thought of as a tool something like a spell checker, except that it doesn't search for mis-spellings. It compares the references found in the text with the references found in the DIRS report, to see if there are any differences. The DIRS report for this model report was locked October 1, 2004 and the report approved October 4, 2004. The fields in the DIRS report are all populated. There is evidence the DIRS details discussed in the email were add-ressed to completion. <b>Resolved - no further action needed.</b>
102	95	110	10/01/02	Management – supervision/direction	PPOD 10Oct02	The email is the transmittal of notes (minutes) from a meeting. Most meetings begin with a “Quality Topic” which in this case appears to have been a discussion of the new code of accounts. <b>Resolved - no further action needed.</b>
103	96	67	03/22/01	QA – QA process	Re: New CIRS Items	The email appeared to convey a negative attitude toward CIRS. Discussion with manager indicated that referenced work was completed and there were no quality issues with this employee (now deceased). <b>No CR initiated, but identified as issue.</b>

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Sequence No	Sample	Email #	Date	Topic	Subject	Dispositions
104	97	11	07/13/98	Technical/Data – requirements	Subsurface Central Control System (SCCS) Classification	The email was written because the Q determination process used at the time did not utilize the System Decision Documents (SDD) as specific references to base preliminary classification. The issue was resolved and overcome by changes to the SDDs, further advancement on the subsurface control system design, and pre-closure safety procedure changes. <b>Resolved – no further action needed.</b>
105	97	37	07/18/00	QA – calibration	Re: Status of Data collected with calibrated gages prior to post cal	The preparer of the email appears to be asking questions to elicit critical thinking on the subject of quality and what steps, if any, are needed to correct the condition discussed. There is no requirement in AP-SIII.3Q to obtain a TBV for data being submitted to the TDMS prior to completion of post-test calibrations. The data can be submitted, and upon completion of the normal technical review, can be upgraded to a final, qualified DTN, as long as the data were acquired under approved QA procedures. If the post-test calibration identifies problems, then LP-12.1Q-BSC (formerly AP-12.1Q) requires that an Out of Calibration Report be initiated. The process for notification and impact review is described in Sec. 5.7 of that procedure. If an impact is identified, a Condition Report would be initiated, and related DTNs would be downgraded to unqualified, if appropriate. <b>Resolved - no further action needed.</b>
106	98	103	07/30/02	QA – QA process	DR BSC(V)-02-D-152	DR BSC(V)-02-D-152 was closed on November 5, 2002. <b>Covered under existing DR.</b>
107	98	150	05/22/03	Software	Revision – Clarification of use of unqualified software during the checking process.	This email clarifies how unqualified software is handled (controlled) during the checking process. The controlling process described in the email is correct. The subject in the email was not related to the software CAR BSC-01-C-002. This email is not an issue. <b>Resolved - no further action needed.</b>
108	98	182	02/19/04	Technical/Data – records management	Positionner	Email appears to be a discussion of a mistake that was found in a draft document and subsequently corrected. This was an editorial correction with no impact on the calculation. <b>Resolved - no further action needed.</b>

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Sequence No	Sample	Email #	Date	Topic	Subject	Dispositions
109	100	37	01/16/03	QA – QA process	I am of the opinion that the DR as it now stands would not pass NRC audit. However, I do not know how to proceed with this matter. It may not be an option but the simplest way may be for you to re-assess the response and reject it.	DR BSC(B)-030D-051 was closed on March 31, 2003. <b>Covered under existing DR.</b>
110	100	44	09/17/03	Technical/Data – records management	Re: CHF FDD	Based on comments from reviewers, the SME, and an original email participant in the string of emails, an explanation of the process and governing procedures for referencing and statusing vendor drawings was provided. Simply, based on the status of a vendor document, a status is assigned that determines if it is entered into DIRS at that time or resides within InfoWorks, entered as a reference in DIRS but not statused as verified. Conclusion is that there is clarity in the process described in governing procedures. Therefore, this is not an issue. <b>Resolved - no further action needed.</b>
111	101	102	07/11/02	Technical/Data – requirements	Environmental Microbiology	There was no incorrect reporting on the samples resulting from this occurrence because both laboratories are accredited and authorized to analyze the type of samples they received. The employee was new to the project and it was considered a training issue. Since the incident in question, there has been no re-occurrence of this type. This is a non-issue. <b>Resolved - no further action needed.</b>

## **Attachment H**

### **Disposition of the OCRWM Concerns Program Records**

ATTACHMENT H - DISPOSITION OF THE OCRWM CONCERNS PROGRAM RECORDS

**Disposition of the OCRWM Concerns Program Records**

YEAR	TOPIC	OCP CONCERN #	LONGEVITY	ATTITUDE	WILLFUL	Summary of Allegations (S = Substantiated; NS = Not Substantiated; PS = partially substantiated; IND = Indeterminate; SBA = substantiated but previously addressed)
1994	Data Issues	0-94-010	N/A	N/A	N/A	USGS handling of neutron borehole data, subsequently determined to be non-Q data; no procedural noncompliance; NS
1995	USGS Budget Cuts	0-95-038	None	None	None	USGS budget cuts
1997	Hiring Practices	0-97-015	9/95 - 4/96 Not Actual Misconduct	Inexperienced QA Personnel	N/A	Alleged ineffective USGS QA Program due to inexperienced personnel; led to CAR YM-98-C-002 and USGS CAR 98-C-004; PS
1999	QARD Requirements	0-99-009	Unknown	Potential	Potential	Alleged inconsistent application of QARD requirements by OQA; S
2000	Program Issues	0-00-008	N/A	N/A	N/A	QA Program Issues; 6 issues (5 issues = NS; 1 issue = S; 3 deficiency reports issued)
2000	Data Issues	0-00-10	Unknown	Not Negative but QARD not followed	Potential	To Be Verified Data Issues; S (other concerns associated: 01-040, 01-071, 01-110B, 01-134, 01-147, 01-154, 01-161, 01-199)
2000	QA Procedures	0-00-019	Unknown	Yes	Yes	Technical Report Review Process; NS; Attempted circumvention of QA procedures alleged- USGS
2000	Program Issues	0-00-038	N/A	Potential	Potential	Quality Affecting Issue; S
2000	Program Issues	0-00-040	N/A	N/A	N/A	Quality Affecting Program Issues; NS
2000	Program Issues	0-00-041	N/A	N/A	N/A	Quality Affecting Program Issues; NS
2001	Program Issues	0-01-002	Unknown	Potential	Potential	QA Software Issues; S; There are 14 other concerns associated with this issue; Final report contained in 01-002 <u>only</u> ; CAR BSC-01-C-002 issued. CAR closed 3/30/04;

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2001	Software	0-01-003	Unknown	Potential	Potential	Validation of software; S; There are 14 other concerns associated with this issue; Final report contained in 01-002 only; CAR BSC-01-002 issued. CAR closed 3/30/04
2001	Program Issues	0-01-009	Unknown	Potential	Potential	QA deficiencies allegedly not resolved in a timely manner; S
2001	Software	0-01-016	Unknown	Potential	Unknown	Quality Software; See 01-002; S
2001	Software	0-01-024	Unknown	Potential	Potential	Software QA Procedure Associated with 01-002; S
2001	Program Issues	0-01-027	N/A	N/A	N/A	Overly Complex QA Program and Procedures; S; See 01-041/01-063
2001	Software	0-01-030	Unknown	Potential	Potential	QA Software; S; See 01-002
2001	QA Requirements	0-01-031	N/A	N/A	N/A	QA Requirements and Working Overtime; S
2001	QA Requirements	0-01-035	N/A	Potential	N/A	QA Allegedly Affixes Unnecessary Requirements; NS
2001	PVAR Process	0-01-037	N/A	N/A	N/A	QA Process Validation and Reengineering (PVAR) process; PS; PVAR Process Discontinued by BSC
2001	Software	0-01-040	Unknown	Potential	Potential	Technical Data Management System (TDMS) /Q Data; S *See Concern 00-010
2001	QA Requirements	0-01-041	N/A	N/A	N/A	QA Procedures Are allegedly Excessive; S
2001	QA Requirements	0-01-042	N/A	N/A	N/A	Q Procedures allegedly Revised Too Frequently; NS; See 01-078; 01-088(a)
2001	QA Requirements	0-01-044	Unknown	Potential	Potential	Complex Q Procedures - AP-SI-IQ; S; See 01-002
2001	Software	0-01-051	Unknown	Potential	Potential	QA Software; S; See 01-002
2001	Program Issues	0-01-058	Unknown	Potential	Potential	QA Program allegedly Compromised AP-SI-IQ; S; See 01-002

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2001	Program Issues	0-01-063	N/A	N/A	N/A	Q Procedures alleged Ineffective Revision Process; S/*PS *No explanation as to why not investigated by OCP; No investigation plan; No explanation as to why sent to DOE 18 months later
2001	Software	0-01-066	N/A	N/A	N/A	QA Program allegedly Too Large and Cumbersome; S. (Confidential Informant) CI alleged BSC was making improvements after the transition; The substantiation for this concern is based on the results of Concern 01-002, QA Software
2001	PVAR Issues	0-01-071	Unknown	Potential	Potential	QA Program Issues. Data and PVAR Issues; S; See Concern 00-010
2001	Program Issues	0-01-077	N/A	N/A	N/A	QA Program Issues; S
2001	Program Issues	0-01-088	N/A	N/A	N/A	QA Program Issues; NS
2001	Software	0-01-096	N/A	N/A	N/A	Software Classifications; S *See 01-002/CAR BSC-01-C-002
2001	Software	0-01-110	Unknown	Potential	Potential	1. ES & H Issues; 2. Data Quality *S *See 00-010 Concern
2001	Software	0-01-131	Unknown	Potential	Potential	AP-SI-IQ Software Management; S; *See 01-002
2001	Program Issues	0-01-137	N/A	N/A	N/A	1. Management Issues; 2. Work Scope Additions With No Budget; 3. QA; S
2001	Program Issues	0-01-139	N/A	N/A	N/A	QA Program Issues; NS
2001	Software	0-01-142	Unknown	Potential	Potential	AP-SI-IQ/Management Personnel; QA Software Qualification; S; See 01-002
2001	Software	0-01-143	Unknown	Potential	Potential	QA Software Issues; S; See 01-002
2001	Program Issues	0-01-149	N/A	N/A	N/A	QA Program Issues; NS; No Investigation Conducted
2001	Software	0-01-154	Unknown	Potential	Potential	QA Data Issues; S; See 00-010

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2001	PVAR Issue	0-01-161	Unknown	Potential	Potential	PVAR Process – analysis and modeling reports (AMR's) and PMR's; S; See 00-010
2001	Software	0-01-170	Unknown	Potential	Potential	AP-SI-IQ/Software QA; S; See 01-002
2001	Program Issues	0-01-174	N/A	N/A	N/A	QA Program Issues; S
2001	Software	0-01-199	Unknown	Potential	Potential	Software Validation and Data Qualification; S; See 00-010
2001	Program Issues	0-01-201	N/A	N/A	N/A	QA Program Issues; DOE headquarters performed investigation; NS
2001	Software	0-01-206	Unknown - 1 year	Unknown	Potential	Allegedly Unqualified Computer Code; Work Environment Issue; S
2001	Program Issues	0-01-221	N/A	Potential	N/A	Quality Related Management Issues; S; Investigated by OCP and RW-1
2001	Program Issues	0-01-223	N/A	N/A	N/A	QA Program Issues; N/S
2001	Software	0-01-239	N/A	N/A	N/A	Software Work Environment; S
2001	Software	0-01-240	N/A	N/A	N/A	Software Work Environment; S
2001	Software	0-01-241	N/A	N/A	N/A	Software Work Environment; S
2001	Program Issues	0-01-249	N/A	N/A	N/A	Alleged Deletion of Project Documentation; NS; This concern was raised at a public meeting held in Sept. 2001 by a former employee; Not investigated as CI refused to supply specific information
2002	Software	0-02-010	Unknown	Potential	Potential	Software Issues; S (Issue #1 - NS, Issue #2 - NS, Issue #3 - NS, Issue #4 - NS, Issue #5- S)
2002	Program Issues	0-02-054	Unknown	Potential	Potential	Alleged QA Program Violation Management Actions; S
2003	Personnel Issues	0-03-023	N/A	N/A	N/A	People selected to fill 3 posted DOE QA positions have allegedly been pre-selected; NS

ATTACHMENT H - DISPOSITION OF THE OCRWM CONCERNS PROGRAM RECORDS

<b>YEAR</b>	<b>TOPIC</b>	<b>OCP CONCERN #</b>	<b>LONGEVITY</b>	<b>ATTITUDE</b>	<b>WILLFUL</b>	<b>Summary of Allegations</b> ( <i>S = Substantiated; NS = Not Substantiated; PS = partially substantiated; IND = Indeterminate; SBA = substantiated but previously addressed</i> )
2003	Program Issues	0-03-044	Unknown	Potential	Potential	Management allegedly directed process issues not be documented on comment sheets in violation of QARD Section 16.0; SBA/NS; *2 issues
2003	Personnel Issues	0-03-050	N/A	N/A	N/A	Management allegedly threatened employees with loss of jobs; NS
2003	Personnel Issues	0-03-052	N/A	N/A	N/A	After stating opinion on quality related matters CI was allegedly removed as the quality contact; NS
2003	Program Issues	0-03-054	N/A	N/A	N/A	QARD, Section 2.2.1.C identifies the Environmental Management (EM) High Level Waste Verification Program & EM Management National Spent Nuclear Fuel Programs as "Affected Organizations." QARD Requirements allegedly not being met. SBA
2004	Management	0-04-003	N/A	N/A	N/A	Management allegedly does not interact properly with other organizations; NS
2004	Management	0-04-005	N/A	N/A	N/A	Management allegedly is not sufficiently knowledgeable and does not interact properly with staff; S (Not QA Related)
2004	Record Alteration	0-04-006	Unknown	Potential	Potential	Alleged Attempt to alter the QA Review Record for "UCCSN Task Order for Task 25;" S
2004	SCWE	0-04-024	N/A	N/A	N/A	OCRWM allegedly not meeting the intent of the SCWE policy. S/SBA/NS; See Concern 04-005
2004	QARD/NRC	0-04-029	N/A	N/A	N/A	QARD allegedly not kept pace with NRC risk-informed, performance-based rulemaking. QARD was made consistent with regulatory requirements of 10 CFR Part 63 with the issuance of QARD Rev. 18.

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<b>YEAR</b>	<b>TOPIC</b>	<b>OCP CONCERN #</b>	<b>LONGEVITY</b>	<b>ATTITUDE</b>	<b>WILLFUL</b>	<b>Summary of Allegations</b> <i>(S = Substantiated; NS = Not Substantiated; PS = partially substantiated; IND = Indeterminate; SBA = substantiated but previously addressed)</i>
2004	Management	0-04-032	N/A	N/A	N/A	OCP investigation of a Director has not been addressed by Executive Management; NS; See 04-005
2005	LA/SAR	0-05-002	Unknown	Potential	Potential	Office of Repository Development (ORD) is allegedly currently using unqualified software in the technical analysis and modeling supporting a license application (LA) which puts the basis for the LA at risk; S
2005	Management and Personnel	0-05-008	N/A	N/A	N/A	Audit personnel allegedly being asked to reduce the level of detail and quality or oversight performed by DOE; N/A; Transferred to Office of Independent Evaluation and Oversight.
2005	LA/SAR	0-05-010	N/A	N/A	N/A	1. Management allegedly desires employees to sign document attesting to adequacy of draft document without time to complete review 2. ORD personnel allegedly being requested to sign accountability statement without requisite experience and knowledge. Alleged inconsistency with NSPE code - IND
2005	Document Falsification	0-05-015				1. Allegation that employees falsified documents = NA 2. Allegations the employees improperly charged government = NA 3. Technical basis for AMR questioned = NA All 3 issues transferred to ORD management
2005	Management	0-05-024	N/A	N/A	N/A	A director is allegedly not taking appropriate action to address technical issues; N/A; Transferred to Office of Independent Evaluation and Oversight

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2005	Email Categorization	0-05-029	N/A	N/A	N/A	Alleged improper categorization of e-mails; N/A; Transferred to RW-3
2005	Management	0-05-034	N/A	N/A	N/A	A director has allegedly placed budget above quality; N/A; Transferred to Office of Independent Evaluation and Oversight
2005	Management	0-05-037	N/A	N/A	N/A	1. Alleged lack of professional and tech. management skills on part of director = NA 2. ORD allegedly failed to take action on concerns after concerns had been repeatedly identified = NA Transferred to Office of Independent Evaluation and Oversight
2005	Management and Personnel	0-05-038	N/A	N/A	N/A	1. DOE contract award allegedly inconsistent with QA requirements = NS 2. DOE employees behavior allegedly inconsistent with SCWE = NS 3. DOE management has allegedly not taken action to address a known QA deficiency = NS
2005	LA/SAR	0-05-039	N/A	N/A	N/A	1. Draft documents allegedly not consistent with AP-6.1Q = NS 2. Reviews of a draft document allegedly not performed to any approved established implementing process = NS 3. Office of Quality Assurance review of draft documents could allegedly result in conflict of interest = NS 4. 2 DOE employees do not meet requirements for position = NS
2005	Management and Personnel	0-05-040	N/A	N/A	N/A	1. Alleged intentional misrepresentation by a DOE employee on a training session = IND 2. Memo allegedly inappropriately withdrawn from local records center = IND 3. An individual was allegedly advised that lying was an act of good faith = IND

ATTACHMENT H - DISPOSITION OF THE OCRWM CONCERNS PROGRAM RECORDS

YEAR	TOPIC	OCP CONCERN #	LONGEVITY	ATTITUDE	WILLFUL	Summary of Allegations (S = Substantiated; NS = Not Substantiated; PS = partially substantiated; IND = Indeterminate; SBA = substantiated but previously addressed)
2005	Management and Personnel	0-05-050				1. Support contract employees allegedly forced to sign non-compete employee agreement = NA 2. Employees allegedly deceived into thinking they would be employed by specific company and later instructed to list another as employer = NA 3. Employees allegedly being doubled charged for medical insurance for April 2005 = NA 4. Employees allegedly afraid to raise concerns for fear of being replaced in position = S
2005	Management and Personnel	0-05-054	N/A	N/A	N/A	An individual alleges harassment by BSC QA; NS
2005	Management and Personnel	0-05-058	Unknown	Potential	Potential	1. CI views layoff as retaliation for having initiated CR adverse to quality 2. SCWE principles allegedly not practiced by management 3. QA requirements being interpreted by various organizations allegedly resulting in diverse and potentially non-compliant conditions; #1 and #2 sent to BSC ECP for investigation; #3 = S; #4 = S; #5 = S; #6 = S; #7 = not investigated as CI indicated it was CI's opinion
2005	LA/SAR	0-05-062				1. Employees allegedly requested to sign sufficiency statement for draft documents that were previously reviewed, but were revised without opportunity to review revised section 2. Allegedly requested to sign sufficiency statement putting signator in position of having to defend or justify documents not yet finalized; In Process

ATTACHMENT H - DISPOSITION OF THE OCRWM CONCERNS PROGRAM RECORDS

YEAR	TOPIC	OCP CONCERN #	LONGEVITY	ATTITUDE	WILLFUL	Summary of Allegations (S = Substantiated; NS = Not Substantiated; PS = partially substantiated; IND = Indeterminate; SBA = substantiated but previously addressed)
2005	Management and Personnel	0-05-063	N/A	N/A	N/A	1. A position was allegedly filled without position being posted for bid. = NS 2. An individual has allegedly been appointed to a position for which they are not qualified = NS
2005	Control Design Changes	0-05-066				BSC allegedly does not have a formal tracking process to control design changes; In Process as of 11/28/05
2005	Management and Personnel	0-05-067				1, A BSC employee has allegedly been retaliated against for issuing a Condition Report (CR) 2. BSC employee alleges chilling effect within a department; In Process
2005	Management and Personnel	0-05-068				1. Employees are allegedly being intimidated and retaliated against for raising concerns to their manager 2. Employee allegedly intimidated for raising concerns to DOE SCWE manager 3. ORD managers actions allegedly were not consistent with SCWE principles; In Process
2005	LA/SAR	0-05-071				AMR's and a license application are allegedly not as traceable or transparent as they should be; CR 6830 initiated to resolve issue; In Process
2005	CR Record Packages	0-05-074				Alleged incomplete CAP CR records packages; In Process; * Referred to IG on 11/17/05

**ATTACHMENT I**

**DOE OFFICE OF INSPECTOR GENERAL**

**EMAIL REVIEW**

## **Attachment I: DOE Office of Inspector General Email Review**

### **Background**

When OCRWM management was made aware of the discovery of the USGS emails in March 2005, OCRWM immediately notified the DOE Office of the Inspector General. On March 16, 2005, the Secretary of Energy announced that an OIG investigation into potential criminal misconduct would be conducted. The DOE OIG worked jointly with the Department of Interior's Office of Inspector General and the Federal Bureau of Investigation, and was in regular consultation with the United States Attorney's Office in Nevada.

The DOE OIG investigation included, along with interviews and an examination of documents, a review of approximately 150,000 emails. The OIG did not divulge its methodology for selecting the emails or conducting the review.

### **Investigation Results**

On April 25, 2006, the DOE Inspector General issued a memorandum<sup>2</sup> summarizing its investigation findings. The U.S. Attorney's Office declined to conduct criminal prosecution in the matter; based on this determination, the DOE OIG announced its intention to close its investigation into potential criminal misconduct. However, the DOE OIG made observations regarding three "internal control deficiencies" that needed to be addressed by OCRWM:

- The delay in finding and reporting the emails
- Compromise of scientific notebook requirements
- Failure to properly maintain control files for the infiltration AMR.

The OIG concluded that OCRWM should strengthen its policies and practices in these areas.

Additionally, in August 2006, the OIG provided to OCRWM copies of emails from its review that the OIG considered potential indicators of misconduct or quality problems. While the date of delivery and the separate nature of the OIG investigation meant that these emails were not included in the main body of the *Methodology and Results of Review Processes for Emails, Condition Reports, and Employee Concerns* report, OCRWM nonetheless examined these emails to identify and follow up upon issues. Some of the emails provided by the OIG had been found and addressed during prior OCRWM searches. A review identified seven emails (or threads of emails) suggesting

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<sup>1</sup> DOE OIG, Investigations Memorandum 2006-04-25, "Investigation of Allegations Involving False Statements and False Claims at the Yucca Mountain Project (OIG Case No. I05LV002), April 25, 2006.

noncompliance with quality assurance requirements or other areas of concern. Due to the limited context provided in the emails, OCRWM has not been able to identify the full issues associated with these emails. Searches of other databases have been conducted but to date have not resulted in more information on these specific matters. The emails have been added to CR 5223 and were addressed in a general manner as part of the resolution of that CR.

## **Appendix A6**

### **1988 USGS Letter Regarding USGS Role in Yucca Mountain Site Characterization**



7 0 3 5 2 5 9

# United States Department of the Interior



GEOLOGICAL SURVEY  
BOX 25046 M.S. 421  
DENVER FEDERAL CENTER  
DENVER, COLORADO 80225

August 17, 1988

IN REPLY REFER TO:  
**Memorandum**

HQX.881221.0002

**To:** Verne Schneider, Assistant Chief Hydrologist for Program  
Coordination and Technical Support, USGS, WRD, Reston, VA

**Through:** Larry Hayes, Chief, Branch of Nevada Nuclear Waste Storage  
Investigations, USGS, WRD, Lakewood, CO

**From:** The undersigned, Hydrologists and Hydrologic Technicians,  
Nuclear Hydrology Program, Nevada Nuclear Waste  
Investigations, USGS, WRD, Lakewood, CO and Mercury, NV

**Subject:** USGS role in Yucca Mountain Site Characterization Effort

As you may know, scientists in the Nevada Nuclear Waste Storage Investigations (NNWSI) Branch, and particularly hydrologists in the Nuclear Hydrology Program (NHP), have been struggling for the past several years to maintain morale and motivation in the site characterization program at Yucca Mountain, Nevada. During this time the Department of Energy (DOE) has essentially converted the USGS's active role in site investigations to a passive role as a DOE consultant for hydrologic/geologic document preparation. Our program has doubled in size with an influx of many managers and few technical people. We also see that our organization is conforming to a host of policies which, in many respects, diminish our scientific credibility and hamper our efforts to implement a sound technical evaluation. In a recent meeting with NNWSI management, for example, the term "embarrassment" was used to describe the USGS management attitude toward our previous technical work.

We believe that these issues require immediate attention, and, in their neglect, call into question our ability to satisfy our mission within the current program context (that mission being the "...wise management of the Nation's natural resources and the potential health, safety and well-being of the people"). As a result, we recommend that a group outside of NNWSI, such as the Chron Committee, review this program and determine what action should be taken to ensure that the scientific issues do not continue to diminish in importance.

In memoranda and in meetings, the technical staff have outlined very clearly a number of problems that severely impact the scientific credibility of our work as well as the likelihood of success in our mission at Yucca Mountain (e.g. memorandum to Larry Hayes, Chief, Branch of NNWSI, dated August 5, 1987). Despite our efforts, we believe that USGS-NNWSI

management has not been receptive to the concerns of the technical staff. This failure at dialogue and consequent lack of autonomy for the USGS program has severely hindered program-managed technical activity over the last two and one-half years. The few significant achievements have been accomplished in spite of, and in most cases outside of the program protocol.

In light of these circumstances, our ability to conduct objective, credible scientific investigations is in jeopardy. It is certain that the good reputation of the USGS is being eroded by the action of DOE, due to our own inaction. The USGS is capable of providing most of the earth science analysis in the characterization effort. It is clear from both intra-program and public meetings, that we contribute most to the body of information concerning the site. As a result we have a responsibility to ourselves and the public to apply this knowledge. However, we lack the control to exercise our responsibility. In the absence of this control, as a minimum, we desire a specific definition of our mission and goals, other than to abide by DOE's. The combination of responsibility without control is a well recognized formula for anxiety and failure. These anxieties are manifest in the low morale (reflected in a high attrition rate of technical staff), diminished motivation, and stifled productivity prevalent in our program.

As a result of these management policies, specific technical concerns are not receiving adequate attention. The following is a sampling of some of those priority issues that we feel are critically important to responsible site characterization:

1. Topographically affected air flow -- Topographically induced air circulation through Yucca Mountain may negatively affect the suitability of the site as a repository in the following way. The circulation will shorten the residence time of gaseous radionuclides in the unsaturated zone before being discharged to the atmosphere. This issue is particularly critical with regard to the issue of  $^{14}\text{CO}_2$  emissions. Regulations state that no more than 200 curies of  $^{14}\text{CO}_2$  be released to the atmosphere in the first 1000 years after repository closure. Because  $^{14}\text{C}$  is produced by neutron bombardment of the Zircalloy cladding around the spent fuel rods, a real possibility exists that current repository design might fail this objective. Personnel at Sandia National Laboratory and the Desert Research Institute are concerned with this problem, and are modeling such circulation. Data

collection on gas circulation requires open boreholes, but USGS-NNSWI has forbidden such data collection until paperwork is completed, at which time the holes are to be stemmed. Thus USGS-NNSWI management seems unconcerned about losing potentially irretrievable data, in this case data on gas circulation, to the detriment of scientific evaluation of the site.

2. Water in the neutron holes -- Water from snowmelt and from a recent (April 1988) heavy rain has collected in four neutron holes, including two in Pagany Wash and one each in Coyote and Wren washes. Three of these holes are in welded tuff from top to bottom, and the fourth penetrates 40 feet of alluvium, with the bottom 5 feet in welded tuff. The fact that water collected in these neutron holes tells much about recharge mechanisms, and its chemical composition may indicate whether ground water beneath the site originated by deep percolation through Yucca Mountain or by recharge in Fortymile Wash. However, neither support nor urgency for sampling these wells has been shown by USGS-NNSWI management, and existing samples and analyses have been obtained in spite of NNSWI, again to the likely detriment of scientific evaluation of the site.

3. Strain-related water-table fluctuations -- Water-level fluctuations of up to a meter which are correlated with large sudden changes in atmospheric pressure have occurred in test wells USW-H5, USW-H3, USW-G3, located on the crest of Yucca Mountain and in USW-H6 located west of Yucca Mountain in Solitario Canyon. The time series of water-level changes does not correlate with other physical phenomena, such as other meteorological events, seismicity, or hydrologic effects. One plausible explanation is aseismic fault creep, possibly triggered by changes in atmospheric load. The well hydrographs are not unlike the water-level changes measured along the San Andreas Fault in response to fault-creep events. The active movement of a fault or faults in the immediate vicinity of the proposed repository is an obvious negative factor for the stability and predictability of the repository environment. Although this issue has received some attention from USGS-NNSWI, the interpretation of water-level records from these wells is currently forbidden by the recent stop-work order issued by DOE for the USGS.

4. The steep hydraulic gradient of the water table -- For a distance of several kilometers north and east of the design repository, the horizontal hydraulic gradient of the water

table is about .15, whereas downgradient from Yucca Mountain, the hydraulic gradient is about .0001. Although the cause and nature of the anomalously large hydraulic gradient is not known, several explanations have been offered: (1) along nontransmissive faults, nontransmissive tuffs juxtapose transmissive tuffs; (2) the presence of an intrusive body such as a volcanic dike; or (3) a change in the orientation of fractures and a change in the hydraulic aperture of fractures based on their orientation relative to the regional stresses. Because the design repository will be located between about 100 to 400 meters above the water table, and because it will be located immediately downgradient from the steep hydraulic gradient, the stability of the nontransmissive property of this barrier to ground-water flow is of primary importance. Neotectonics may have a large effect on this stability. While NNWSI has been receptive to motions advocating the examination of the steep gradient, nothing is now being done to assess this critical issue which has the potential of disqualifying the site. Any further interpretation of the steep gradient based on water-level data is currently forbidden by the stop-work order. X

5. Extravaqant Nevada Test Site contractor costs -- Our dollars buy much less science at the Nevada Test Site (NTS) than on the open market. In general we pay an order of magnitude more for contractor services at NTS than conservatively priced services off-site. For example, one of our projects requested 14 rocks from G-tunnel. They asked for 2 rocks (1-foot cubed) to be removed from the tunnel wall at six different locations, along with 2 rocks from a rubble pile, waxed and delivered to the Core Library at NTS. The request was made only after a USGS hydrologist was turned away by union laborers when he attempted to retrieve the rocks himself. The cost estimate (attached) from the NTS contractor was \$74,960! This included a \$19,500 charge to upgrade the ventilation system. By itself, this work order cost estimate may be laughable but taken together with other costs it is all too typical.

6. Research and engineering -- There seems to be some disagreement as to whether research has a place in the evaluation of Yucca Mountain as a nuclear waste repository. One view, common at DOE and ostensibly supported by USGS-NNWSI management, is that research is inappropriate to the evaluation process. This is naive for two reasons: (1) engineering and research are hardly mutually exclusive and;

(2) this is the first project of its kind ever to be attempted - whatever is done will be research, regardless of what it is called. Because of the uniqueness of this undertaking, standard approaches, whether they be scientific investigation techniques or engineering procedures, will be inadequate or inappropriate to characterize the site- to accomplish this will require either the extension of standard techniques, or the development of entirely new techniques. Both of these approaches are rightfully called research and play a central role in developing the information base needed to rationally assess the site, as well as being the necessary basis for developing the standards for a pure engineering approach. Any reasonable strategy for evaluating Yucca Mountain will necessarily involve research as a significant component. If we approach the characterization effort from the perspective of a purely engineered repository without an adequate research base, our engineering assumptions are tenuous at best, and we've moved away from objective site characterization and into site construction.

7. Quality assurance -- We are aware that the USGS QA manager has the difficult job of designing a QA program that is palatable to the USGS as well as satisfactory to DOE. It is also generally recognized that our current quality assurance (QA) program is modeled after the nuclear power industry's reactor facilities QA guidelines. As a result, the present QA program is engineering oriented, inappropriate in most instances, and counterproductive to the needs of good scientific investigations. There is no facility for trial-and-error, for genuine research, for innovation, or for creativity. In addition, those portions of the QA program that have been successfully modified to better suit the needs of our work have been seriously eroded by USGS-NNWSI's enthusiastic intent to fall into DOE's favor by refusing to defend our program or our technical staff.

It is appropriate to refer to the Challenger space shuttle disaster as a profound example of what happens when management is unresponsive to the concerns of the technical staff. The attached article by the late Richard P. Feynman, Nobel laureate, was published in Physics Today and provides a detailed assessment of a general deterioration at NASA, brought about, according to his theory, by an unwillingness of

management to heed various engineering and scientific problems. Dr. Feynman refers to this as a "loss of common interest between the engineers and scientists on the one hand and management on the other".

It is our urgent recommendation that we prevent our own 'NNWSI disaster' by making USGS-NNWSI management aware that in subjugating the technical program to satisfy DOE political objectives, we may succeed in making the program comply with regulations, while being scientifically indefensible. A joint effort is required and some bold action may be necessary as we re-evaluate the nature of our working relationship with DOE. We are anxious and prepared to discuss specific matters of concern -- in addition to the issues presented above. We are eager for a meaningful dialogue and we appreciate your willingness to engage our communication.

Respectfully,

<u>Philip Standa</u>	<u>Alvin Galloway</u>	<u>Edwin P. Weeks</u>
<u>Charles Petrus</u>	<u>Robert C. Trumb</u>	<u>Han C. Rigge</u>
<u>Joe S. Downey</u>	<u>Edwin P. Weeks</u>	<u>James W. McKinley</u>
<u>John B. Zarnoch</u>	<u>James L. Robinson</u>	<u>Arthur Galt</u>
<u>Kurt C. Hoover</u>	<u>Albert Goff</u>	<u>Peter Sinton</u>

William J. Duffield  
for Allen Flint, Jr

attachments (2)

cc (with attachments):

- CERON Committee: Jim Devine, DO
  - Ike Winograd, WRD
  - George Dinwiddie, WRD
  - Pete Stevens, WRD
  - Glen Faulkner, WRD
  - Ian Zen, GD
  - Nevell Trask, GD
  - Ray Wallace, GD
  - Dan Gillies, Acting Chief, Nuclear Hydrology Program, WRD
  - Bob Raup, Jr., ORG, GD
- USGS RC/1231/3/morale, stop-work order, technical concerns

## **Appendix A7**

### **March 29, 2000 USGS Memorandum Concerning the Infiltration Report**



## United States Department of the Interior

U.S. GEOLOGICAL SURVEY  
Reston, Virginia 20192In Reply Refer To:  
Mail Stop 439

March 29, 2000 ✓

## MEMORANDUM

To: Robert W. Craig,  
Chief, Yucca Mountain Project, WRD, Lakewood, CO

Through: Bruce T. Brady, *B. Brady 3/31/00*  
Yucca Mountain Project, Report Specialist, WRD, Lakewood, CO

From: Celso Puente, *Celso Puente*  
Senior Reports Advisor, WRD, Reston, VA

Subject: PUBLICATIONS—Report, "Conceptual and numerical models of infiltration for the Yucca Mountain areas, Nevada," by Alan Flint, Joseph Hevesi, and Lorraine Flint

Regretfully, the subject report is returned to the authors for additional work and explanation. A technical review by Dr. Glendon Gee, Batelle Pacific Northwest Laboratory, Richland, Washington, revealed several problems that need to be reconciled before the report can be approved for release by the USGS Director. Some of Dr. Gee's technical comments address terminology, model calibration, drainage estimates, water storage and drainage estimates by neutron logs, and estimates of soil and rooting depths.

Additionally, many citations that significantly support major findings in the report refer to reports that were incomplete (rejected or conditionally approved). There is no evidence that the reports were ever revised and resubmitted for Director's approval. Conditionally approved reports are contingent on post-approval revisions to be made by the authors, and as such they are not approved for release until the report is revised and resubmitted for Director's final examination and approval.

Furthermore, several citations in the "written communications" format refer to technical reports that were returned to the author's office without Director's approval. Written communications based on rejected reports or conditionally approved reports that were not finally approved represent a breach of USGS policy on release of information. These problems must be corrected.

p. 1 of 3

A sampling of incomplete reports (conditionally approved, or rejected reports) that are extensively cited in the report include:

Hevesi, Ambos, Flint, "Analysis of regional precipitation and synoptic weather patterns during water years 1992 and 1993 for the Yucca Mountain region." This report was submitted for approval as a WRIR and returned unapproved on July 31, 1996. Report was returned to authors, but the report was not revised and resubmitted for approval.

Hevesi, Flint, "A geostatistical model for estimating precipitation and recharge for the Yucca Mountain region, Nevada-California." This report was conditionally approved as WRIR 96-4123 on May 24, 1996; and returned to the authors, but the report was not revised and resubmitted for final approval.

Hudson and Flint, "Estimation of shallow infiltration and presence of potential fast pathways for shallow infiltration in the Yucca Mountain region." The report was submitted for approval as a WRIR and was rejected on August 8, 1996. The report was returned to the authors; however, the report was not revised and resubmitted for approval.

Lundstrom, Mahan, Paces, "Preliminary surficial deposits map of the northwest quarter of the Busted Butte 7.5' quadrangle, Nye County, Nevada." The report was conditionally approved as OFR 95-133 on February 10, 1995 and returned to the authors. The report was not revised and resubmitted for final Director's approval.

Lundstrom, Taylor, "Preliminary surficial deposits map of the southern half of the Topopah Spring NW quadrangle" (1:12,000). The report was approved conditionally as OFR 95-132 on February 6, 1995. The report was not resubmitted for final approval.

Lundstrom, Wesling, Taylor, "Preliminary surficial deposits map of the northeast quarter of the Busted Butte quadrangle" (1:12,000). The report was approved conditionally as OFR 94-341 and returned to the authors, but the report was not resubmitted for final approval.

Lundstrom, Whitney, Paces, Mahan, Ludwig, "Preliminary map of the surficial deposits of the southern half of the Busted butte 3.5' quadrangle, Nye County, Nevada." The report was approved conditionally as OFR 95-311 and was returned to the authors, but the report was never resubmitted for final approval.

Data/information citations in "written commun," format that refer to uncompleted reports (rejected or conditionally approved) are as follows:

- p. 17, paragraph 1, line 1
- p. 18, paragraph 1, lines 1, 2
- "    , paragraph 4, lines 1, 2
- p. 22, paragraph 1, lines 2, 4, and 5
- p. 28, paragraph 2, several Lundstrom and others citations
- p. 29, Table 3, title caption

p. 2 of 3

p. 30, paragraph 1, line 3  
p. 39, paragraph 4, line 4, data never released to TDB; unresolved deficiencies  
p. 41, paragraph 1, last sentence  
p. 57, paragraph 2, lines 1, 2, report rejected, never revised and approved  
p. 60, paragraph 1, lines 2, 3  
p. 61, Table 6; data qualified?  
p. 63, paragraph 3, lines 10, 11, report rejected  
p. 64, paragraph 1  
p. 66, paragraph 1, lines 11, 12, 15, and 16  
p. 69, paragraph 3, line 3  
p. 71, paragraph 1, line 7  
p. 78, paragraph 2, line 5  
p. 79, paragraph 1, lines 3, 7  
p. 82, paragraph 1, line 6  
p. 83, paragraph 1, line 9  
p. 84, Table 7 and caption; data qualified?  
Figure 36, title caption

Please have the authors carefully consider all reviewer's comments and revise the report accordingly. After revisions, please return all marked-up review copies and supporting correspondence when the revised report is resubmitted for Director's approval. In accordance with established guidelines by the Yucca Mountain Project Staff, the U.S. Geological Survey, and the Department of Energy, the revised report will be forwarded to Dr. Glendon Gee for examination of and concurrence with revisions made by the authors in response to his various comments. If the authors have any questions regarding the technical comments, please contact Dr. Glendon Gee at (509) 372-6096 or at email address: [glendon.gee@pnl.gov](mailto:glendon.gee@pnl.gov). For questions regarding references, written comments, and other citations, the authors should contact Tim Brady, Yucca Mountain Project Reports Specialists.

Attachment

p. 3 of 3

# **Appendix A8**

## **Regulatory Integration Team Decision Summary**

During the early stages of assembling and reviewing material that would support the license application, a Regulatory Integration Team (RIT) was formed in April 2004 to address regulatory compliance and technical issues associated with AMRs. The RIT review of the infiltration AMR identified 17 issues, of which 13 were resolved and corrective actions were completed during the RIT process. Four issues were carried forward.

This appendix contains the RIT Decision Summary. This summary documents the review conducted by the RIT including recommendations regarding the issues identified. This summary also documents the management decisions regarding which corrective actions would be taken during the RIT process and which would be deferred to a later date for resolution.

The 17 issues identified by the RIT are listed on the RIT Action Item List on pages A8-15 and A8-16.

RIT DECISION SUMMARY

QA:NA  
6/4/04

**AMR Title:** Simulation of Net Infiltration for Modern and Potential Future  
Climates

MOL.20050113.0065

**Document ID:** ANL-NBS-HS-000032 REV00 ICN 02 (U0010)

**Purpose:** Develop infiltration maps for modern and future climates

**Feed to TSPA:** Spatially distributed infiltration-rate data developed in this AMR are used in UZ Flow Models and Submodels (U0050) and Particle Tracking Model and Abstraction of Transport Processes (U0065)) that provide direct input to TSPA.

The document was prepared under AP-3.10Q in 2001.

**Key FEPs:**

FEP No.	FEP Name
1.3.01.00.0A	Climate Change
2.3.11.01.0A	Precipitation
2.3.11.02.0A	Surface Runoff and Flooding
2.3.11.03.0A	Infiltration and Recharge
2.2.07.0.2.0A	Unsaturated Groundwater Flow in Geosphere
2.2.07.01.0A	Locally Saturated Flow at Bedrock/Alluvium Contact

**Recommendations:**

Prepare a revision of this report to address key issues raised during the RIT evaluation and other reviews:

1. Resolve the issue of bedrock permeability by recalibrating the infiltration model with measured permeability - Option 1 (See attached for details of the issue and other options). (500 hr). (Additional impact analysis to be performed in UZ Flow Models and Submodels (U0050) to demonstrate that potential variability in infiltration resulting from the recalibrated model will not have a significant effect on percolation flux distributions in repository level and below. 120 hr)
2. Resolve data issues: Complete road maps for 6 pre-PVAR DTNs that are used as direct input. Convert technical information to data per AP-3.15Q. (154 hr)
3. Improve model validation with most recent results from TBD #1. (16 hr)
4. Document changes in percent vegetative cover as climate changes. (16 hr)
5. Address YMRP acceptance criteria; Address transparency comments; add FEPs list. (52 hr)
6. Address CR-662C and CR-241D. (20 hr)

7. Conversion into AP-SIII.10Q document. Editorial, DIRS (80 hr). Revise TWP (10 hr)

**Resources required:** Preparation: 848 hr (including 154 hr for Data); Checking: 160 hr.

**Schedule:** Preparation June 7 – August 10; Checking: August 11 – August 27.

**Staff:** Author: Dan Levitt; Support: Chun Li; Yu-Shu Wu; Checker: Boris Faybishenko/Peter Persoff

**Risks Carried Forward:** Potential sensitivity of transport or coupled processes models to the change in the mean or distribution of infiltration rate.

## Attachment I

### Simulation of Net Infiltration and Potential Future Climates (U0010), ANL-NBS-HS-000032 REV 00 ICN 02

Issue(s): Bedrock permeability is one of the most sensitive parameters for determining the net-infiltration rate using the current infiltration model, as demonstrated in AMR Analysis of Infiltration Uncertainty (U0095). A larger permeability corresponds to a larger infiltration rate. Overall, net infiltration is among the most important parameters for TSPA calculations of UZ flow and transport, drift seepage, and canister corrosion and waste mobilization. In addition, infiltration is the ultimate source for water that carries radionuclides from the repository to the water table in the UZ.

In AMR U0010, bedrock permeabilities that are 1-2 orders of magnitude lower than the field observations (Alcove 1 and air permeability data), which results from an inconsistency between the conceptual and numerical models used to determine infiltration rates. While the conceptual model correctly acknowledges the co-existence of open and filled fractures at the soil-bedrock interface, the numerical model considers all the fractures to be filled. No direct field observations in the UZ support the use of such low bedrock permeabilities.

Remediation Option 1: Recalibrate the infiltration model to justify the currently used infiltration rates using the following two steps:

A. Perform calibration of the infiltration model by fixing the bedrock permeability values obtained from fracture permeability measurements and varying the other parameters (e.g., ET parameters). The most suitable data (e.g., discharge rate and water content data) will be used in the model calibration.

This activity will demonstrate that mean infiltration rate is still reasonable even when the incorrect permeability value was used. This results from a potentially high degree of correlation between different model parameters used in the infiltration model. It is very likely that the ET coefficients were too low which if increased, could compensate for increasing the bedrock permeability.

Man power: 500 person-hours.

B. The newly calibrated model will likely provide a larger degree of spatial variability of infiltration rate. To demonstrate that this changed variability will not have a significant effect on percolation flux distributions in repository level and below, percolation flux distributions (below PTn) simulated with site-scale UZ Flow Model using old and new infiltration maps will be compared. The PTN layer generally damps the spatial variability of the infiltration/percolation flux.

Man power: 120 person-hours.

Remediation Option 2: Confirm (or justify) the currently estimated infiltration rates and their spatial distributions by comparing results from a coupled surface/subsurface flow model (rigorously considering flow in both surface and the subsurface) and the current values. The code is available for estimating net infiltration rates and only needs to be qualified. Comparisons for about two cases are needed. The activity can also help address three infiltration-related KTIs (*TSPAI 3.18 Technical basis for the water-balance plug-flow model adequately representing the nonlinear flow processes represented by Richards' equation*, *USFIC 3.02 AIN-1 Parameters of infiltration uncertainty analysis* and *TSPAI 3.21 AIN-1 Near-Surface Lateral Flow Effects on Net Infiltration*). This option requires about 1500 person-hours (about 3-4 months for 3 people).

Remediation Option 3A: Re-run INFIL model with permeabilities consistent with other field data. Complete revision of U0010 (and U0095) will require estimated about 3000 person-hours. This will completely fix the problem, but result in subsequent impact on all downstream AMRs that require about 6-8 months for revisions.

Remediation Option 3B: Conduct impact analysis with limited number of reruns of INFIL. Rerun the UZ Flow and Transport Model and the related coupled process models for the limited cases corresponding to the new INFIL results. Incorporate TSPA risk information to demonstrate the impact of infiltration model uncertainty on dose calculation is minimal, so that original input to TSPA remains valid. Reruns are required for infiltration, UZ flow, the multiscale model, and drift-scale THC, at a minimum. This option requires about 2000 person-hours per infiltration sensitivity case (about 4-5 months for 8 people) (not including the man-power and time needed by TSPA).

ANALYSIS AND MODEL CHECKLIST

MOL.20050113.0066

Review Team:

- Natural System
- Engineered Barrier System
- Near Field Environment/Transport
- Igneous
- Seismic

Document Identifier: ANL-NBS-HS-000032 \_\_\_\_\_

Document Title: Simulation of Net Infiltration for Modern and Potential Future Climates \_\_\_\_\_

Evaluator (Name): Dan Levitt, H.H. Liu, A. Baker, S. Darnell \_\_\_ Date: 4/6/2004 \_\_\_\_\_

Note: The Evaluator may expand on any comments, since the checklist cannot cover every contingency.

Chapter 4, Inputs

- 1. Are the data references specific to the actual data, i.e., section, page number, etc.?  Yes  No

Comment \_\_\_\_\_

- 2. Are the applicable YMRP criteria described in Section 4.2?  Yes  No

Comment: Criteria should be revised to include Acceptance Criteria in Section 2.2.1.3.5 of the YMRP, removing previous DOE interim guidance. \_\_\_\_\_

Chapter 5, Assumptions

- 3. Are the assumptions and their bases and impacts clearly presented and cited or otherwise explained?  Yes  No

Comment \_\_\_\_\_

- 4. Where an assumption is characterized as "conservative" or "bounding", is the basis clearly explained?  Yes  No

Comment N/A. Those words are not mentioned in this AMR. \_\_\_\_\_

- 5. Are assumptions and simplifications consistent between analyses/models that are coupled or that impact each other?  Yes  No

Comment \_\_\_\_\_

**Chapter 6, Model or Analysis Discussion**

Note: Some items may be N/A for Scientific Analyses.

6. Are the objectives and use of the analysis/model clearly explained and described in context with other analyses/models?  Yes  No

Comment \_\_\_\_\_

7. Is the analyses/model properly documented with cited references including appropriate regulations?  Yes  No

Comment \_\_\_\_\_

8. Are different versions of the analysis/model used to accommodate different scenario classes (i.e., nominal scenario class vs. disruptive events) adequately discussed?  Yes  No

Comment \_\_\_\_\_

9. Is there a statement that a single analysis/model version applies to all scenario classes?  Yes  No

Comment \_\_\_\_\_

10. Is a discussion of the alternative conceptualizations of the system provided?  Yes  No

Comment \_\_\_\_\_

11. Is a clear discussion provided of the key uncertainties and their impacts on model results?  Yes  No

Comment: This AMR refers to U0095 for the discussion of key uncertainties and their impacts on model results. \_\_\_\_\_

12. Is a clear discussion provided of the limitations?  Yes  No

Comment \_\_\_\_\_

13. Is the analysis/model coupled to other analysis/models supporting the TSPA clearly described?  Yes  No

Comment: This AMR only mentions U0095, but U0035, U0050, U0090, U0105, U0170 also use output from this AMR (from Houseworth's comment in file CR\_UZ.XLS). \_\_\_\_\_

14. For Scientific Analyses, does the text provide adequate justification for: a) use of a previously validated model, or b) use of accepted scientific practice, approach, or methods?  Yes  No

Comment: Although this is a model report, the above question is applied to the report. \_\_\_\_\_

No  Yes

### Chapter 7 Model Validation

Note: Go to Conclusions, items 17-22, for Analyses.

15. Does Chapter 7 identify and provide a justification for model validation activities that will extend beyond document preparation?  Yes  No

Comment: This is an old AMR and Chapter 7 is not "Model Validation" chapter. Suggest creating a new chapter to summarize the model validation activities reported in Section 6.12.

There are many other methods for estimating net infiltration and/or recharge that are not used for comparison in this AMR, but exist in recent literature. \_\_\_\_\_

16. Are the validation criteria consistent with the appropriate TWP and the model validated for its intended purpose to the level of confidence required by the model's relative importance to the potential performance of the repository system?  Yes  No

Comment \_\_\_\_\_

### Chapters 7 or 8, Conclusions

Note: Some items may be N/A for Scientific Analyses.

17. Do the conclusions clearly summarize the work completed and documented with supporting references?  Yes  No

Comment \_\_\_\_\_

18. Are there any statements in the conclusion that could be interpreted to introduce new technical issues not discussed in the AMR?  Yes  No

Comment: "A more rigorous and physically based model of wind and terrain effects on snow redistribution and the snow pack energy balance was beyond the scope of this analysis." Page 78, 4<sup>th</sup> paragraph. \_\_\_\_\_

19. Do the conclusions explicitly state that the analysis/model is adequate for its intended use?  Yes  No

Comment \_\_\_\_\_

20. Is every conclusion supported by the technical basis provided in the body of the report?  Yes  No

Comment \_\_\_\_\_

21. Can any conclusions be construed as requests for additional work?  Yes  No

Comment: See Comment #18. \_\_\_\_\_

22. Are all applicable YMRP criteria demonstrated to be met?  Yes  No

Comment: See Comment #2. \_\_\_\_\_

Comment: Admonition to potential users should be removed from Section 7.2, last paragraph.

**Chapter 1 or Chapter 6, Features, Events, and Processes**

23. Is there a list or table of Included FEPs in Section 1 or Section 6?  Yes  No

Comment \_\_\_\_\_

24. Does the list or table of Included FEPs contain the same FEPs that are identified in the "map" of LA FEPs to AMRs?  Yes  No

Comment: N/A \_\_\_\_\_

25. If not, identify any differences:

Comment \_\_\_\_\_

26. Is the TSPA disposition consistent with the TSPA disposition in the current FEPs reports?  Yes  No

Comment: N/A \_\_\_\_\_

27. For each included FEP, is a FEP number identified, and is it identical to the FEP Number in the LA FEP list?  Yes  No

Comment: N/A \_\_\_\_\_

28. For each included FEP, is a FEP Name identified, and is it identical to the FEP Name in the LA FEP List?  Yes  No

Comment: N/A \_\_\_\_\_

29. For each included FEP, is a "Section Where the Disposition is Described" identified?  Yes  No

Comment: N/A \_\_\_\_\_

30. Does the "Section Where the Disposition is Described" point to a section or sections in this AMR?  Yes  No

Comment: N/A \_\_\_\_\_

31. Is the "Section Where the Disposition is Described" identified with sufficient detail so that the relevant supporting text can be easily located (i.e., Section 6.3.2 rather than just Section 6)?  Yes  No

Comment: N/A \_\_\_\_\_

32. For each included FEP, is a "Summary of Disposition in TSPA-LA" provided?  Yes  No

Comment: N/A \_\_\_\_\_

33. Does the "Summary of Disposition in TSPA-LA" provide an adequate summary of the information presented in the "Section Where the Disposition is Described"?  Yes  No

(Note that in cases where the supporting information has been recently updated (i.e, in response to RIT reviews), these updates must be reflected, where appropriate, in the Summary of Disposition.)

Comment: N/A. There is no "Summary of Disposition in TSPA-LA" in this AMR. \_\_\_\_\_

34. Does the "Summary of Disposition in TSPA-LA" describe the full or partial implementation of the FEP in the TSPA-LA model?  Yes  No

Comment: N/A. There is no "Summary of Disposition in TSPA-LA" in this AMR. \_\_\_\_\_

35. If not, does it describe the full or partial implementation of the FEP in a supporting process model? (This may be the case for some AMRs that do not provide a direct feed to TSPA-LA.)  Yes  No

Comment: N/A \_\_\_\_\_

36. Does the "Summary of Disposition in TSPA-LA" identify models used and/or model input parameters and/or model outputs?  Yes  No

Comment: N/A. There is no "Summary of Disposition in TSPA-LA" in this AMR. \_\_\_\_\_

37. If the "Summary of Disposition in TSPA-LA" states that the FEP is only partially addressed in this AMR, does it provide a reference to another AMR(s) where it is also addressed?  Yes  No

Comment: N/A. There is no "Summary of Disposition in TSPA-LA" in this AMR. \_\_\_\_\_

NOTE: The evaluator may provide additional comments not covered by the questions above, but relevant to regulatory integration.

Additional Comments \_\_\_\_\_

1. There are 3 KTI agreements, TSPA.I.3.18, TSPA.I.3.19, and TSPA.I.3.21 that DOE agreed to address in updates to this AMR. These KTIs were recently addressed in TBD01 *Climate and Infiltration*. This AMR should be updated with the information presented in TBD01 to resolve these KTIs. (Bruce Hastings).

2. In the 2nd paragraph on page 21, the conceptual model for infiltration correctly implies that at the surface of bedrock, fractures can be open and filled. However, on page IV-6, the report indicates that "bulk bedrock conductivity was calculated using measured saturated hydraulic conductivity of fracture fill materials". It is not clear how the open fractures in the conceptual model come to play in the numerical model. If the filled fractures were used only, the bedrock

permeability could be significantly underestimated and therefore the infiltration rates could be underestimated. As a matter of the fact, the bedrock permeability used in the infiltration model is indeed much smaller than those from other measurements (such as Alcove 1 test results and air-k permeability data). The current estimations based on small rock permeability are not conservative. At least, an impact analysis is needed to check the effects of enhanced bedrock permeability on the estimated infiltration maps (including both mean and higher bound values). (H.H. Liu).

3. Because the infiltration model is largely an empirical model, appropriate calibration is critical to the model defensibility. Although FY96 model was calibrated with water content data, the new model was not (Section 6.8). Considering the importance of water content data, simulation results of the current model should be compared with these data sets to demonstrate the appropriateness of the model. (H.H. Liu).

4. Bedrock permeabilities are too low compared to other data (Alcove 1 and air permeability data). Permeabilities used in U0010 appear to be ~1-2 orders of magnitude lower than those used in Table 15 of Calibrated Properties Model AMR.

5. Bedrock permeability data is not traceable to its source (permeabilities of 250 um filled fractures are different from values in Table 2 of Flint et al. 1996).

6. Documentation of change in percent vegetative cover (20, 40, 60) as climate changes is not complete (see page 61). Text describes change in cover from modern to upper monsoon and to upper glacial transition climates. What about lower and mean monsoon and glacial transition climates?

7. Adel Bakr Phase II comment regarding statement on page 27 (may be a typo, need to check code for answer).

8. Use of mean of upper and lower glacial transition climate datasets for mean glacial climate is not consistent with use of Tule Lake dataset in U0095.

9. Typos not yet corrected in errata sheets:

Page 21: Kwickis should be Kwicklis

Page 23: "...because bare-soil evaporation extends to approximately..."

Page 50: both eqn 17 and 18 have equal signs. Only one should have that.

Page 53: space between 2\_m.

Page 59: space between 31, 1993.

Page 61: delete sentence: "The upper bound glacial..."

Page 75: assumption should be plural.

Page IV-6: densities is misspelled.

**RIT Action Item List for MDL-NBS-HS-000023**  
**Previous DI is ANL-NBS-HS-000032**

AMR Title	AMR Number	ID	Issue Description
Simulation of Net Infiltration for Modern & Future Climate	MDL-NBS-HS-000023	PLI-090904-100436-83 *	001 - Rerun calculations 002 - Discuss in RIT rev of AMR 003 - Flag DTN as applicable--- Technical error in Att. 1, Simulation of Net Infiltration AMR. RIT identified, CR in EVAL
Simulation of Net Infiltration for Modern & Future Climate	MDL-NBS-HS-000023	PLI-052004-081400-08 *	See Attachment CR 1821C Action 006: During revisions of AMRs in the RIT the information included on Errata Sheets on AMRs will undergo the same reviews as the rest of the AMR.
Simulation of Net Infiltration for Modern & Future Climate	MDL-NBS-HS-000023	PLI-052004-081127-34	See Attachment CR 1821C Action 006: During revisions of AMRs in the RIT the information included on Errata Sheets on AMRs will undergo the same reviews as the rest of the AMR.
Simulation of Net Infiltration for Modern & Future Climate	MDL-NBS-HS-000023	PLI-071704-081745-26	Evaluate and incorporate recommendations from audit OCRWMP-BSC-04-16 as appropriate.
Simulation of Net Infiltration for Modern & Future Climate	MDL-NBS-HS-000023	PLI-042804-105402-74 *	CR states "[This AMR] should identify limitations to end users of data."
Simulation of Net Infiltration for Modern & Future Climate	MDL-NBS-HS-000023	PLI-040904-141623-90	TER-03-0038 contains technical errors in this AMR. See Attachment
Simulation of Net Infiltration for Modern & Future Climate	MDL-NBS-HS-000023	PLI-050304-153442-75	Use of 6-m deep Rooting depths need to be justified
Simulation of Net Infiltration for Modern & Future Climate	MDL-NBS-HS-000023	PLI-041504-164035-36 *	ANL-NBS-HS-000032 (R0, I2, E2) (Simul. of Net Infil. for Modern & Potential Future Climates) (Section 6.9.1) gives climate durations of "approximately" 600 & 1400 years and cites ANL-NBS-GS-000008 (Future Climate) as the source. It is this
Simulation of Net Infiltration for Modern & Future Climate	MDL-NBS-HS-000023	PLI-050304-153346-38	Documentation of change in percent vegetative cover (20, 40, 60) as climate changes is not complete (see page 61). Text describes change in cover from modern to upper monsoon and to upper glacial transition climates. What about lower and me
Simulation of Net Infiltration for Modern & Future Climate	MDL-NBS-HS-000023	PLI-050304-154941-57 *	Possible typo with important implications in statement on p. 27 (Higher or lower)
Simulation of Net Infiltration for Modern & Future Climate	MDL-NBS-HS-000023	PLI-042104-082445-85 *	DTN GS000308311221.005 (TPO from U-0010; ANL-NBS-HS-000032, Simulation of Net Infiltration for M & P Climate) has unqualified and superceded DTNs in its source tree. DTN GS000308311221.005 is used as direct input in U0105. (PLI-042004-1340
Simulation of Net Infiltration for Modern & Future Climate	MDL-NBS-HS-000023	PLI-050304-153259-46 *	Use of mean of upper and lower glacial transition climate datasets for mean glacial climate is not consistent with use of Tule Lake dataset in U0085
Simulation of Net Infiltration for Modern & Future Climate	MDL-NBS-HS-000023	PLI-050304-152231-37	Many other methods of model validation have been completed and should be documented in this AMR in Section 6.12.

\* Data Confirmation related action items

5 of 8

**RIT Action Item List for MDL-NBS-HS-000023**  
**Previous DI is ANL-NBS-HS-000032**

<b>AMR Title</b>	<b>AMR Number</b>	<b>ID</b>	<b>Issue Description</b>
Simulation of Net Infiltration for Modern & Future Climate	MDL-NBS-HS-000023	PLI-050304-152156-18*	1996 INFIL model calibrated with neutron logging data while 1999 INFIL model was calibrated with stream flow data (and neutron logging data were not used).
Simulation of Net Infiltration for Modern & Future Climate	MDL-NBS-HS-000023	PLI-050304-152121-46*	Bedrock permeability data is not traceable to its source (different from Flint et al., 1996).
Simulation of Net Infiltration for Modern & Future Climate	MDL-NBS-HS-000023	PLI-050304-152019-34	Bedrock permeabilities are too low compared to other data (Alcove 1 and air permeability data). Permeabilities used in U0010 are 1-2 orders of magnitude lower than used in Table 15 of Calibrated Properties Model AMR
Simulation of Net Infiltration for Modern & Future Climate	MDL-NBS-HS-000023	PLI-041904-141314-03*	ANL-NBS-HS-000032 (R0, I2, E2) (Simul. of Net Infil. for Modern & Potential Future Climates) (Section 6.9.1) gives climate durations of "approximately" 500 & 1400 years and cites ANL-NBS-GS-000008 (Future Climate) as the source. It is this

6 of 8

\* Data Confirmation related action items

Doc title:	Simulation of Net Infiltration for Modern and Potential Future Climates
Doc code:	U0010
DI:	ANL-NBS-HS-000032
DIRS:	160355
ACC #:	MOL.20011119.0334

**Punch List (prioritized) with Recommended Remediation:**

By Dan Levitt, April 6, 2004

**Problem:**

9) All the other RIT comments and software issue.

1) Bedrock permeabilities are too low compared to other data (Alcove 1 and air permeability data). Permeabilities used in U0010 are 1-2 orders of magnitude lower than used in Table 15 of Calibrated Properties Model AMR.

2) Bedrock permeability data is not traceable to its source (different from Flint et al. 1996).

3) 1996 INFIL model calibrated with neutron logging data while 1999 INFIL model was calibrated with stream flow data (and neutron logging data were not used).

4) Many other methods of model validation have been completed and should be documented in this AMR in Section 6.12.

5) Use of mean of upper and lower glacial transition climate datasets for mean glacial climate is not consistent with use of Tule Lake dataset in U0095.

6) Documentation of change in percent vegetative cover (20, 40, 60) as climate changes is not complete (see page 61). Text describes change in cover from modern to upper monsoon and to upper glacial transition climates. What about lower and mean monsoon and glacial transition climates?

7) Use of 6-m deep Rooting depths need to be justified.

8) Adel Bakr Phase II comment regarding statement on page 27 (may be a typo, need to check code for answer).

Remediation:

- 1) Re-run INFIL model with permeabilities consistent with other field data. Complete revision of U0010 (and U0095) will require an estimated 2,000 to 3,000 man-hours.
  
- 2) No apparent solution other than using other data sources (such as in other AMRs).
  
- 3) Re-run INFIL model and calibrate using neutron logging data.
  
- 4) Other methods of validation can be included during a revision or ICN of the AMR.
  
- 5) Subject the Tule Lake dataset to an adjustment factor such that its mean equals that used in U0010. Also, combine U0010 and U0095 into one AMR.
  
- 6) Documentation can be clarified during a revision or ICN.
  
- 7) Rooting depths were justified in REV01 of U0095. These 2 AMRs should be combined into one AMR.
  
- 8) Check INFIL code to see if statement has a typo or if model uses a non-conservative decision.
  
- 9) Improve the report by responding all the other RIT comments.



710, TSPA will provide justification for the use of single values for the climate changes.	
<b>Closure Date</b>	07/11/2004
<b>Potential New CAQ</b>	<input type="radio"/> Yes <input checked="" type="radio"/> No <b>Date Decided</b> 5/20/2005 1:49:48 PM

<b>Action Item Not Implemented</b>	
<b>Decision Made By:</b> Ming Zhu	
<b>Date:</b> 07/11/2004 06:34:06 PM	

**Save Action Item**

# AMR Action Items

<b>Natural System Simulation of Net Infiltration for Modern &amp; Future Climate</b>	
<b>AMR Number</b>	MDL-NBS-HS-000023
<b>ID</b>	PLI-050304-153259-46
<b>Status</b>	Closed
<b>Priority Of Item</b>	3

<b>Evaluator</b>	Daniel Levitt/YM/RWDOE
<b>Evaluation Team</b>	<input checked="" type="radio"/> Model Team <input type="radio"/> FEPs Team <input type="radio"/> Parameter Team
<b>Date Identified</b>	05/03/2004 03:30:36 PM
<b>Responsible Lead</b>	Ming Zhu

<b>Item Categorization</b>	<input type="radio"/> CR <input type="radio"/> Assumptions <input type="radio"/> Conclusions <input type="radio"/> TBV <input type="radio"/> SAR Chapter 2 Related <input type="radio"/> FEPs <input type="radio"/> DTN <input checked="" type="radio"/> Model or Analysis Discussion <input type="radio"/> Inputs <input type="radio"/> Model Validation
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<b>Item Categorization #</b>	
Use of mean of upper and lower glacial transition climate datasets for mean glacial climate is not consistent with use of Tule Lake dataset in U0095	

<b>Type and Impact of Issue</b>	<b>Type of issue:</b> <input checked="" type="radio"/> Technical Problem Or Error <input type="radio"/> Insufficient Model Support Or Justification; Lack Of Traceability <input type="radio"/> Procedural or Quality Error <input type="radio"/> Style Or Clarity Or Documentation Problem  <b>If The Identified Issue Was Of The Most Serious Type, Would It:</b> <input type="radio"/> Potentially Impact The TSPA Model <input type="radio"/> Potentially Impact Discussions In The SAR Or Previous KTI <input type="radio"/> Change The Estimated Capability Or Performance Of A Barrier <input checked="" type="radio"/> Have Minimal Or No Effect On The Licensing Argument <input type="radio"/> Request Integration Team Review
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<b>Implication Of Proposed Action</b>	<b>The Proposed Action: (Check Any That Apply):</b> <input type="checkbox"/> Requires TSPA Model Runs Or Sensitivity Analyses <input type="checkbox"/> Requires New Calculations Or Process Model Runs <input type="checkbox"/> Requires Changes To Multiple AMRs <input type="checkbox"/> Requires Resources Not Currently Available <input type="checkbox"/> Action Can Not Be Completed By 05/28/2004
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<b>Action Needed to Close</b>	Subject the Tule Lake dataset to an adjustment factor such that it's mean equals that used in U0010 (24 person-hours). Also, combine U0010 and U0095 into one AMR. (included in the 2K-3K person-hours from item 1).
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<b>Estimated Man Hours to Resolve Issue (Excluding Production Time)</b>	
<b>Due Date</b>	
<b>Document Attachments</b>	

<b>Closure Description</b>	
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TBD	
<b>Closure Date</b>	07/11/2004
<b>Potential New CAQ</b>	<input type="radio"/> Yes <input checked="" type="radio"/> No <b>Date Decided</b> 7/11/2005 1:39:31 PM
<b>Action Item Not Implemented</b> <b>Decision Made By:</b> Ming Zhu <b>Date:</b> 07/11/2004 06:35:41 PM	

**Save Action Item**



regenerate output files for evaluation.	
<b>Closure Date</b>	11/05/2004
<b>Potential New CAQ</b>	<input type="radio"/> Yes <input checked="" type="radio"/> No <b>Date Decided</b> 05/06/2005
<b>Action Item Not Implemented</b> Decision Made By: Daniel Levitt Date: 11/05/2004 12:11:31 PM	

**Save Action Item**



	<input type="radio"/> Yes <input checked="" type="radio"/> No	<b>Date Decided</b> 7/11/2005 1:37:16 PM
<b>Potential New CAQ</b>		

	<b>Action Item Not Implemented</b> Decision Made By: Stefan Finsterle Date: 07/09/2004 12:46:26 PM
--	--

**Save Action Item**



<b>Closure Description</b> Information in Errata sheets was reviewed and incorporated into revision of AMR as appropriate. In some cases, the text was deleted entirely if it didn't add value to the discussion.	
<b>Closure Date</b>	11/05/2004
<b>Potential New CAQ</b>	<input type="radio"/> Yes <input checked="" type="radio"/> No <b>Date Decided</b> 6/22/2004 8:21:50 AM

<b>Action Item Implemented</b> <b>Decision Made By:</b> Daniel Levitt <b>Date:</b> 11/05/2004 11:59:16 AM	
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**Save Action Item**



Limitations and Uncertainties are included in Section 8.2.	
Closure Date	11/05/2004
Potential New CAQ	<input type="radio"/> Yes <input checked="" type="radio"/> No      Date Decided 6/22/2004 8:21:56 AM
<b>Action Item Implemented</b> Decision Made By: Daniel Levitt Date: 11/05/2004 12:06:53 PM	

**Save Action Item**



<b>Closure Description</b> This DTN is qualified.	
<b>Closure Date</b>	11/05/2004
<b>Potential New CAQ</b>	<input type="radio"/> Yes <input checked="" type="radio"/> No <b>Date Decided</b> 05/06/2005
<b>Action Item Implemented</b> Decision Made By: Daniel Levitt Date: 11/05/2004 12:37:21 PM	

**Save Action Item**



1) Details of VEGCOV01 are given in Appendix J. 2) Veg type is not used in INFIL, but veg cover is used. Veg cover is input into the control file, not the geospatial input file. 3) This is correct. VEGCOV01 also adjust vegetative cover based on slope, soil thickness, aspect, and geology, as described in Appendix J, however, these calculations are not used by INFIL. 4) The calcs of veg cover are not mentioned in the text of the AMR because they are not used by INFIL. INFIL only uses "hard-wired" values of 60% for upper glacial, 40% for upper monsoon and lower glacial, and 20% for lower, mean, and upper present-day and lower monsoon climates in the control files.

<b>Closure Date</b>	11/05/2004
<b>Potential New CAQ</b>	<input type="radio"/> Yes <input checked="" type="radio"/> No <b>Date Decided</b> 6/22/2004 8:22:02 AM

<b>Action Item Implemented</b> <b>Decision Made By:</b> Daniel Levitt <b>Date:</b> 11/05/2004 12:12:59 PM	
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**Save Action Item**

**OFFICE OF CIVILIAN RADIOACTIVE WASTE MANAGEMENT**

QA: QA

TER No. TER-03-0038 **TECHNICAL ERROR REPORT**

Page 1 of 1

Initiator: (Print Name) M McCleary		Organization: Performance Assessment Technical Inputs		Date: 7/30/03			
Product ID: ANL-NBS-HS-000032		Title Simulation of Infiltration for Modern and Potential Future Climates (U0010)			Revision: REV00 ICN02		
2. Description of Technical Error		3. Validation		4. Disposition		5. Technical Justification	
1. The routine VEGCOV01 V1.0 was used in the development of geospatial input parameters for the model, as were several other routines. The		Valid		UAI			
		Invalid		C/R			
		Name:		Correct			
		Initial:		WP			
2. The text of the AMR in section 6.6 lists geospatial input parameters for INFIL which include vegetation type and vegetation cover, thus giving the		Valid		UAI			
		Invalid		C/R			
		Name:		Correct			
		Initial:		WP			
3. Attachment XII of the AMR, which attempts to document the code VEGCOV01, does describe how the routine was used to change the saturated hydraulic		Valid		UAI			
		Invalid		C/R			
		Name:		Correct			
		Initial:		WP			
4. The text of the AMR should describe how geospatial input parameters were developed, including the use of the various software codes employed in the		Valid		UAI			
		Invalid		C/R			
		Name:		Correct			
		Initial:		WP			
		Valid		UAI			
		Invalid		C/R			
		Name:		Correct			
		Initial:		WP			
		Valid		UAI			
		Invalid		C/R			
		Name:		Correct			
		Initial:		WP			

6. Technical Evaluator: (Print Name)		Initials:	Date:
7. Corrective Action Required?			
<input type="checkbox"/> Yes. DR/QO/CAR (Number) _____ <input type="checkbox"/> No <input type="checkbox"/> Yes. NCR (Number) _____ <input type="checkbox"/> No			
8. QER Review: (Print Name)		Initials:	Date:
9. Disposition Approved: (Print Name)		Initials:	Date:
10. QER Verification: (Print Name)		Initials:	Date:
11. Disposition Complete: (Print Name)		Initials:	Date:

**Addendum 1**

main text of the AMR describes the use of the other routines but does not discuss how and why VEGCOV01 was used. In short, the text is incomplete in describing how geospatial input parameters were developed, so that discussion is not transparent.

**Addendum 2**

impression that vegetation type and cover are considered by the model. However, MOL.20001030.0022 makes the explicit statement that vegetation type and vegetation cover are not used by INFIL 2.0.

**Addendum 3**

conductivity of the Tpy. However the source code listing also states that the program "also provides estimates of plant cover", which was apparently not done per MOL.20001030.0022..

**Addendum 4**

process. In the case of VEGCOV01, this was not done.



YMP Corrective Action Program  
Condition Report  
Record Report



CR Num	CR Level	CR Type	Step Entry Date	Step	Step Resp	Step Owner
662	C	Non-Q	10/20/2003 10:15:55 AM	Evaluate CR		Whitcraft, James

**Routing Notes:**

Apr 25 2004 Tricia Smith

CR Responsible Org changed from Natural Systems to Management Systems

Todd Griffin (10/20/03) This issue is being re-assigned from Technical Product Input to Natural Systems. Please see comments below for additional details.

Per discussion with Jim Houseworth on 10/17/03, this CR should be addressed by his organization as the responsible manager for ANL-NBS-HS-000032. (AGB 10/17/03)

**Condition Information**

**CR Title:** Simulation of Infiltration for Modern and Potential Future Climates (U0010)

**Date Found:** 30-Jul-03  
**Time Found:** 12:00

**Site:** Summerlin  
**Location:** Summerlin

**CR Initiating Org:** Technical Product Input  
**CR Initiator:** McCleary, Jefferson  
**Recommended CR Level:** C

**Condition Description:**  
ANL-NBS-HS-000032 REV 00 ICN 02

**Possible Solution:**

Immediate Action Taken?	No	CAQ / Q NCR?	No
Hold Tag Applied?	?	OQA Scope?	No
Stop Work?	No	Initiated By OQA?	No
Resolved / Closed?	No		
Requirement Involved?	No		

**Requirement:**

**Immediate Action Desc:**

**Business Process:** Technical Error Rpt  
**Business Process ID:** TER-03-0038



YMP Corrective Action Program  
Condition Report  
Record Report



CR Num 662  
CR Level C

CR Type Non-Q

Step Entry Date 10/20/2003 10:15:55 AM

Step Evaluate CR

Step Resp

Step Owner Whitcraft, James

**Affected Resources:**

**Condition Information**

Assignment Information

Ownership Organization: Repository Development Mgr  
Responsible Organization: Management Systems

Oversight Organization: Postclosure & License Acq  
Oversight Lead: Tynan, Mark  
Business Process Review Org:

Assignment Information

Screening Information

CR Level: C

Category: Human Perform

Date Submitted: 7/30/2003

Date Issued: 8/28/2003

CST / MRC Conclusions:

Staff - ok to review

Screening Information

Evaluation Information

**Extent of Condition:**

No impact to other documents

**CR Previous Similar Event(s):**

Functional Evaluation Req? ?

Interim Action Required? No

Effectiveness Rev Required? ?

Functional Evaluations

**Cond. Release Disposition**

Step

Step Entry Date

< NO FUNCTIONAL EVALUATIONS CREATED FOR THIS CONDITION REPORT >

Interim Actions

Type

Accepting Org / Assigned To Org

Step Entry Date

Step

< NO INTERIM ACTIONS CREATED FOR THIS CONDITION REPORT >



YMP Correction Program  
Condition Report  
Record Report

CR Num 662 CR Level C CR Type Non-Q Step Entry Date 10/20/2003 10:15:55 AM Step Resp Evaluate CR Step Owner Whitcraft, James

Evaluation Information

Cause Analysis Information

Cause Analysis Type: Apparent Cause Responsible Org: Management Systems CR Planner: Birmingham, Andrew

CAR # 167 Probable Solution

Step Completed

Cause Analysis Reports

2/13/2004 (Tom Reynolds): Probable solutions for this condition are as follows -

1) Review the subject AMR documentation for the affected software. Determine if their use in the AMR was in fact completely and/or clearly described.

@) If their use was not completely or clearly described, generate an errata sheet to provide the necessary clarification or additional information.

Cause Code(s):

< NO CAUSE CODES LINKED TO THIS CONDITION REPORT >

Event Code(s):

< NO EVENT CODES LINKED TO THIS CONDITION REPORT >

Cause Analysis Information

Stop Work Information

SWO # Title

< NO STOP WORKS CREATED FOR THIS CONDITION REPORT >

Type

Assigned to Org.

Date Issued

Date Stopped

Step

Stop Work Information



YMP Corrective Action Program  
**Condition Report  
Record Report**



CR Num 662 CR Level C CR Type Non-Q Step Entry Date 10/20/2003 10:15:55 AM Evaluate CR Step Resp Step Owner Whitcraft, James

**Plan Information**

Plan Due Date: 9/27/2003

Original Est Close Date:

Date Completed:

Plan Completed Date:

Current Est Close Date:

Date Closed:

**Corrective Action Plan Summary:**

Action Title Type Accepting Org / Assigned To Org Step Entry Date Step  
< NO CORRECTIVE ACTIONS CREATED FOR THIS CONDITION REPORT >

**CR Attachments**

Filename

TER-03-0038.pdf

Size

179 kb

Date

CR Attachments



YMP Correction Program  
**Condition Report  
Record Report**  
Cause Analysis Report



CR Num 662	Cause Analysis # 167	Step Entry Date 2/25/2004 8:42:39 AM	Step Completed	Step Resp N/A	Step Owner N/A
---------------	-------------------------	---	-------------------	------------------	-------------------

**Routing Notes:**

2/13/2004 (Tom Reynolds): Tom Reynolds conducted this cause analysis on this date.

**Cause Analysis Information**

**Cause Analysis #** 167 **Cause Analysis Type:** Apparent Cause

**Cause Analysis Title:**

Simulation of Infiltration for Modern and Potential Future Climates (U0010)

**Investigation Findings:**

2/13/2004 (Tom Reynolds): CR 662 is TER-03-0038, translated into the CAP System. The subject of TER-03-0038 is AMR ANL-NBS-HS-000032 Rev 00 ICN 02. There are four technical errors listed in this TER. They can be summarized by stating that the author of the TER found the use of software routines in this AMR, particularly VEGCOV01 and INFIL, to be incompletely described. The four errors are examples of how these descriptions were found to be incomplete.

This is an isolated incident, restricted to the review of this document. There is no apparent impact to waste isolation or the AMR, since descriptions of the software use were provided but were found to be ambiguous. Thus, critical information is not clearly missing.

This condition appears to be a request for clarification generated during a normal review process. Accordingly, it is neither a violation or a breakdown in the review process.

**Cause Analysis Results:**

2/13/2004 (Tom Reynolds): This is an isolated incident, restricted to the review of this document. There is no apparent impact to waste isolation or the AMR, since descriptions of the software use were provided but were found to be ambiguous. Thus, critical information is not clearly missing.

The apparent cause of this condition is less than adequate written communication.

**Recurrence Control:**

**Probable Solution:**



YMP Correction Program  
Condition Report  
Record Report  
Cause Analysis Report



CR Num	Cause Analysis #	Step Entry Date	Step	Step Resp	Step Owner
662	167	2/25/2004 8:42:39 AM	Completed	N/A	N/A

2/13/2004 (Tom Reynolds): Probable solutions for this condition are as follows -

1) Review the subject AMR documentation for the affected software. Determine if their use in the AMR was in fact completely and/or clearly described.

@) If their use was not completely or clearly described, generate an errata sheet to provide the necessary clarification or additional information.

LL/GI Required? No CR Causing Org:

Reason LL/GI Not Created:

2/13/2004 (Tom Reynolds): No Lessons Learned is required, since this condition appears to be a routine request for clarification generated during a normal review of a technical product. There is no clear violation or breakdown of the review process involved.

Cause Analysis Information

Cause Analysis Team Members

Team Member Name: Reynolds, Thomas  
Team Member Organization: Condition Report Mgt

Cause Analysis Team Members

Cause Analysis Attachments

Filename: < NO ATTACHMENTS LINKED TO THIS CAUSE ANALYSIS REPORT >

Cause Analysis Attachments



## Corrective Action Summary Details



CR Num  
2805

Action Num  
2805-001

Step Entry Date  
6/23/2004 10:10:36

Step  
Perform Action

Step Resp

Step Owner  
Feldman, Sandra

### Routing Notes:

### Action Details

<b>Action Number:</b>	2805-001	<b>Current Due Date:</b>	8/31/2004	<b>Date Completed:</b>		<b>Date Closed:</b>	
<b>Action Type:</b>	Essential	<b>Original Due Date:</b>	8/31/2004				
<b>Accepting Org:</b>	Condition Report Mgt	<b>Site:</b>	Summerlin				
<b>Assigned To Org:</b>	Condition Report Mgt						
<b>Action Title:</b>	ANL-NBS-HS-000032 Recommendations to RIT						

### Action Description:

ANL-NBS-HS-000032, Rev 0, Simulation of Net Infiltration for Modern and Potential Future Climates, Recommendations from OCRWMP-BSC-04-16

The activities are being passed to the RIT. The RIT will address the recommendations cited in the Condition Report (CR) description.

Evaluate and incorporate, as appropriate, the following recommendations.

There are three climate scenarios as input to the infiltration model. Erosion processes and geomorphology of the channels and ridges may change with the wetter climates and should be evaluated. The infiltration model has not been validated for the wetter climates.

PLI- 050304-153259-46 identifies the need to redo the glacial climate input to be similar to the process used to develop the input for present day climate. The impact of erosion processes were updated in a draft response to a Key Technical Issue (KTI) response to USFIC 3.01 AIN-1. (Technical Basis Document No1: Climate and Infiltration, Revision 1, Appendix D-10, dated May 2004). There is a reference to Simon, A. M. 2004 that states the expected erosion of sediments and exposed bedrock is expected to be on the order of centimeters over the 10,000 years. It is not clear if this statement includes channel geomorphology.

Note: Items previously identified as RIT Action Items will be cross-referenced to CR 2805.



**Corrective Action  
Summary Details**

<b>CR Num</b> 2805	<b>Action Num</b> 2805-001	<b>Step Entry Date</b> 6/23/2004 10:10:36	<b>Step</b> Perform Action	<b>Step Resp</b>	<b>Step Owner</b> Feldman, Sandra
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Objective evidence will be a copy of the signed Cover Page and revised pages of ANL-NBS-HS-000032, Simulation of Net Infiltration for Modern and Potential Future Climates, or, if applicable, documented rationale for non-incorporation of the recommendations.

**Action Taken:**

**Action Details**

**Action Adjustments**

**Adjustment Num Adjustment Title**

< NO ADJUSTMENTS LINKED TO THIS CORRECTIVE ACTION >

**Proposed Due Date Step**

**Action Adjustments**

**Action Attachments**

**Filename**

< NO ATTACHMENTS LINKED TO THIS CORRECTIVE ACTION >

**Size Date**

**Action Attachments**



OCRWM Co. Action Program  
**Condition Report  
 Record Report**



CR Num	CR Level	CR Type	Step Entry Date	Step	Step Resp	Step Owner
241	D	Non-Q	9/6/2002	Oversee Implementatn		Feldman, Sandra

**Routing Notes:**

May 24 2004 Andrew Moroz

CR Responsible Org changed from Management Systems to Condition Report Mgt at the request of Jeff Weaver

Apr 25 2004 Tricia Smith

CR Responsible Org changed from Natural Systems to Management Systems

Reference attached Historical CIRS record

**Condition Information**

**CR Title:** QA audit M O-ARP-00-04 The following action plan has been submitted and the resp

**Date Found:** 04-Sep-02  
**Time Found:** 12:00

**Site:** Summerlin  
**Location:** Summerlin Bldg 03

**CR Initiating Org:** Commitment Mgt  
**CR Initiator:** Weaver, Jeffrey  
**Recommended CR Level:** D

**Condition Description:**

QA audit M O-ARP-00-04 The following action plan has been submitted and the responsible individual is Jim Houseworth (UZ dept. deputy manager): This recommendation will be incorporated to the extent possible with the constraint that recommendations are not to be included in AMRs per M O Regulatory and Licensing direction. AMR U0000, ANL-NBS-HS-000015 revision is in P3 as activity number PAUZ407 to be finalized Nov. 13, 2002. AMR U0015, ANL-NBS-HS-000005 revision is in P3 as activity PASAUZ7400 to be finalized June 6, 2003. This CIRS item will be verified closed by August 6, 2003. This is judged to be a Priority Level IV, OI. \*\*\*QA audit M O-ARP-00-04 was conducted during the old PMR development process. Old audit recommendations were tracked on a separate Lotus Notes database, but they are now being moved to the new CIRS system. This audit contained the following recommendation number 6: Subject: U0000, U0010, and U0015 AMRs should identify limitations to end users of data. These limitations should be transparent to ensure correct applicability in future use. A section should be included in the AMR to provide recommendations to improve technical adequacy. The following action plan has been submitted and the responsible individual is Jim Houseworth (UZ dept. deputy manager): This recommendation will be incorporated to the extent possible with the constraint that recommendations are not to be included in AMRs per M O Regulatory and Licensing direction. Technical adequacy will be discussed by making direct recommendations for future work. U0000: Section 7.1 of Revision 00 of AMR U0000 discusses Limitations and Uncertainties to a degree that is deemed sufficient for end users. Technical adequacy can be improved by



OCRWM Corrective Action Program  
**Condition Report  
Record Report**

CR Num 241	CR Level D	CR Type Non-Q	Step Entry Date 9/6/2002	Step Oversee Implementatn	Step Resp Feldman, Sandra	Step Owner Feldman, Sandra
---------------	---------------	------------------	-----------------------------	------------------------------	------------------------------	-------------------------------

incorporating new geologic and hydrogeologic data (particularly, ISM updates), as they become available, and by performing additional sensitivity studies with regard to grid resolution and presentation of vitric/zeolitic tuffs beneath the potential repository. These comments about technical adequacy will be included in a revision of AMR U0000.U0010: This AMR is not in the P3 schedule to be revised in support of LA.U0015: Sections 1 and 7 on constraints, caveats, and limitations of test results will be further expanded to include technical adequacy, as appropriate. AMR U0000, ANL-NBS-HS-000015 revision is in P3 as activity number PAUZ407 to be finalized Nov. 13, 2002. AMR U0015, ANL-NBS-HS-00005 revision is in P3 as activity PASAUZ7400 to be finalized June 6, 2003. This CIRS item will be verified closed by August 6, 2003. This is judged to be a Priority Level IV, OI. OQA Audit/Surveillance M O-ARP-00-04

**Possible Solution:**

Immediate Action Taken?	No	Business Process:	CIRS	CAQ / Q NCR?	No
Hold Tag Applied?	?	Business Process ID:	003111	OQA Scope?	No
Stop Work?	No			Initiated By OQA?	No
Resolved / Closed?	?				
Requirement Involved?	Yes	Requirement:	ANL-NBS-HS-000015 ANL-NBS-HS-000005		

**Immediate Action Desc:****Affected Resources:****Condition Information****Assignment Information**

Ownership Organization:	Repository Development Mgr	Oversight Organization:	Postclosure & License Acq
Responsible Organization:	Condition Report Mgt	Oversight Lead:	Tynan, Mark
Business Process Review Org:		Quality Assurance Rep (QAR):	

**Assignment Information****Screening Information**

CR Level: D	Date Submitted: 9/4/2002
CST / MRC Conclusions:	Date Issued: 9/5/2002
Reference attached Historical CIRS record	

**Screening Information**



04-Jun



OCRWM Condition Report  
Action Program  
Condition Report  
Record Report



3

CR Num 241 CR Level D CR Type Non-Q Step Entry Date 9/6/2002 Step Resp Oversees Implementatn Step Owner Feldman, Sandra

Evaluation Information

Extent of Condition:  
This field could not be converted from CIRS

CR Previous Similar Event(s):

Functional Evaluation Req? No Interim Action Required? No Effectiveness Rev Required? No

FEV Num Title Cond. Release Disposition Step Entry Date Step  
< NO FUNCTIONAL EVALUATIONS CREATED FOR THIS CONDITION REPORT >

Interim Actions

Action Title Type Accepting Org / Assigned To Org Step Entry Date Step  
< NO INTERIM ACTIONS CREATED FOR THIS CONDITION REPORT >

Evaluation Information

Cause Analysis Information

Cause Analysis Type: N/A Responsible Org: Condition Report Mgt CR Planner:

CAR # Probable Solution Step  
< NO CAUSE ANALYSIS REPORTS CREATED FOR THIS CONDITION REPORT >

Cause Code(s):  
A5B2C05 - Ambiguous instructions / requirements

Event Code(s):  
169 - Corrective action - other

Cause Analysis Information



OCRWM Corrective Action Program  
Condition Report  
Record Report

CR Num 241 CR Level D CR Type Non-Q Step Entry Date 9/6/2002 Step Oversee Implementation Step Resp Date Issued Date Stopped Step Owner Feldman, Sandra

Stop Work Information

SWO # Title  
< NO STOP WORKS CREATED FOR THIS CONDITION REPORT >

Stop Work Information

Plan Information

Plan Due Date: 10/5/2002 Original Est Close Date: 12/15/2003 Date Completed:  
Plan Completed Date: 9/6/2002 Current Est Close Date: 9/7/2004 Date Closed:

Corrective Action Plan Summary:

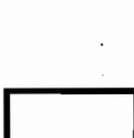
Action plan already developed with submission, and Jim Houseworth has been assigned action to complete activities stated in plan.

AMR U0000, ANL-NBS-HS-000015 revision is in P3 as activity number PAUZ407 to be finalized Nov. 13, 2002. AMR U0015, ANL-NBS-HS-000005 revision is in P3 as activity PASAUZ7400 to be finalized June 6, 2003. This CIRS item will be verified closed by August 6, 2003. This is judged to be a Priority Level IV, OI.

Action	Title	Type	Accepting Org / Assigned To Org	Step Entry Date	Step
241-001	241-001 : Develop action plan for CIRS # 3111 (OI) action due 9/26/02	Essential	Natural Systems / Natural Systems	9/5/2002	Plan Action
241-001	241-001 : Develop action plan for CIRS # 3111 (OI) action due 9/26/02	Essential	Natural Systems / Natural Systems	9/5/2002	Accept Action
241-001	241-001 : Develop action plan for CIRS # 3111 (OI) action due 9/26/02	Essential	Natural Systems / Natural Systems	9/5/2002	Perform Action
241-001	241-001 : Develop action plan for CIRS # 3111 (OI) action due 9/26/02	Essential	Natural Systems / Natural Systems	9/6/2002	Org Verify Action
241-001	241-001 : Develop action plan for CIRS # 3111 (OI) action due 9/26/02	Essential	Natural Systems / Natural Systems	9/6/2002	Completed
241-002	241-002 : Implement plan as described in Description field of CIRS 3111	Essential	Natural Systems / Natural Systems	9/6/2002	Plan Action
241-002	241-002 : Implement plan as described in Description field of CIRS 3111	Essential	Natural Systems / Natural Systems	9/6/2002	Accept Action
241-002	241-002 : Implement plan as described in Description field of CIRS 3111	Essential	Management Systems / Management Systems	9/6/2002	Perform Action



OCRWM Condition Report Record Report



CR Num	CR Level	CR Type	Step Entry Date	Step	Step Resp	Step Owner
241	D	Non-Q	9/6/2002	Oversee Implementatn		Feldman, Sandra
241-002	241-002 : Implement plan as described in Description field of CIRS 3111		Essential	Management Systems / Management Systems	4/30/2004 9:16:48 AM	Accept Action
241-002	241-002 : Implement plan as described in Description field of CIRS 3111		Essential	Condition Report Mgt / Management Systems	4/30/2004 9:17:25 AM	Plan Action
241-002	241-002 : Implement plan as described in Description field of CIRS 3111		Essential	Condition Report Mgt / Condition Report Mgt	4/30/2004 9:20:06 AM	Accept Action
241-002	241-002 : Implement plan as described in Description field of CIRS 3111		Essential	Condition Report Mgt / Condition Report Mgt	4/30/2004 9:20:46 AM	Perform Action

Plan Information

CR Attachments

Filename	Size	Date
003111.PDF	11823 kb	24-Sep-03

CR Attachments



**OCRWM Corrective Action Program**  
**Condition Report**  
**Record Report**  
 Corrective Action Report



CR Num 241      Action Num 241-001      Step Entry Date 9/6/2002      Step Completed      Step Resp N/A      Step Owner N/A

**Routing Notes:**  
6022

**Action Details**

**Action Number:** 241-001      **Current Due Date:** 9/26/2002      **Date Completed:** 9/6/2002      **Date Closed:** 9/6/2002  
**Action Type:** Essential      **Original Due Date:** 9/26/2002  
**Accepting Org:** Natural Systems      **Site:** Summerlin  
**Assigned To Org:** Natural Systems  
**Action Title:** 241-001 : Develop action plan for CIRS # 3111 (OI) action due 9/26/02

**Action Description:**

Develop action plan or assign new action to RI to develop action plan.

**Action Taken:**

Action plan already developed with submission, and Jim Houseworth has been assigned action to complete activities stated in plan.

AMR U0000, ANL-NBS-HS-000015 revision is in P3 as activity number PAUZ407 to be finalized Nov. 13, 2002. AMR U0015, ANL-NBS-HS-000005 revision is in P3 as activity PASAUZ7400 to be finalized June 6, 2003. This CIRS item will be verified closed by August 6, 2003. This is judged to be a Priority Level IV, OI.

**Action Details**

**Action Adjustments**

**Adjustment Num**      **Adjustment Title**  
 < NO ADJUSTMENTS LINKED TO THIS CORRECTIVE ACTION >

**Action Adjustments**

**Action Attachments**

Filename	Size	Date



OCRWM Co Action Program  
**Condition Report  
 Record Report**  
 Corrective Action Report



CR Num	Action Num	Step Entry Date	Step	Step Resp	Step Owner
241	241-001	9/6/2002	Completed	N/A	N/A

< NO ATTACHMENTS LINKED TO THIS CORRECTIVE ACTION >

Action Attachments



Action Program  
**Condition Report  
 Record Report**  
 Corrective Action Report

CR Num	Action Num	Step Entry Date	Step	Step Resp	Step Owner
241	241-002	4/30/2004 9:20:46	Perform Action		Feldman, Sandra

**Routing Notes:**

Sandra Feldman 4/30/04. Routed back to Plan Action to change organization to Condition Report Management and to change Action Due Date to 8/31/04 since activity sent to RIT.

Apr 25 2004 Tricia Smith

CA Accepting Org changed from Natural Systems to Management Systems

CA Assigned To Org changed from Natural Systems to Management Systems

6070

**Action Details**

<b>Action Number:</b>	241-002	<b>Current Due Date:</b>	8/31/2004	<b>Date Completed:</b>		<b>Date Closed:</b>	
<b>Action Type:</b>	Essential	<b>Original Due Date:</b>	12/8/2003				
<b>Accepting Org:</b>	Condition Report Mgt	<b>Site:</b>	Feldman, Sandra	<b>Site:</b>	Summerlin		
<b>Assigned To Org:</b>	Condition Report Mgt		Feldman, Sandra				
<b>Action Title:</b>	241-002 : Implement plan as described in Description field of CIRS 3111						
<b>Action Description:</b>	Implement plan						
<b>Action Taken:</b>	5/29/03 (TBR): The due date for this action has been changed to make it consistent with the currently scheduled completion dates for the affected AMR.						

**Action Details****Action Adjustments****Adjustment Num Adjustment Title**

< NO ADJUSTMENTS LINKED TO THIS CORRECTIVE ACTION >

**Proposed Due Date Step**



OCRWM Condition Report  
**Condition Report**  
**Record Report**  
 Corrective Action Report



CR Num 241	Action Num 241-002	Step Entry Date 4/30/2004 9:20:46	Step Perform Action	Step Resp	Step Owner Feldman, Sandra
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**Action Adjustments**

**Action Attachments**

Filename  
< NO ATTACHMENTS LINKED TO THIS CORRECTIVE ACTION >

**Action Attachments**





Potential New CAQ	<input type="radio"/> Yes <input checked="" type="radio"/> No	Date Decided 6/29/2004 7:32:15 AM
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<b>Action Item Implemented</b> Decision Made By: Roger Dupere Date: 06/29/2004 07:32:07 AM	
--	--

**Save Action Item**



<b>Closure Description</b> This DTN is qualified.	
<b>Closure Date</b>	11/05/2004
<b>Potential New CAQ</b>	<input type="radio"/> Yes <input checked="" type="radio"/> No <b>Date Decided</b> 05/06/2005
<b>Action Item Implemented</b> <b>Decision Made By:</b> Daniel Levitt <b>Date:</b> 11/05/2004 12:37:21 PM	

Save/Action Item



**Closure Description**  
Information in Errata sheets was reviewed and incorporated into revision of AMR as appropriate. In some cases, the text was deleted entirely if it didn't add value to the discussion.

**Closure Date** 11/05/2004

**Potential New CAQ**  Yes  No **Date Decided** 6/22/2004 8:22:09 AM

**Action Item Implemented**  
**Decision Made By:** Daniel Levitt  
**Date:** 11/05/2004 12:38:09 PM

**Save Action Item**



measured at Alcove 1 experiments).	
Closure Date	11/05/2004
Potential New CAQ	<input type="radio"/> Yes <input checked="" type="radio"/> No      Date Decided 7/11/2005 1:35:20 PM
<b>Action Item Implemented</b>	
Decision Made By: Daniel Levitt Date: 11/05/2004 12:39:29 PM	

Save Action Item



Closure Date	11/05/2004
Potential New CAQ	<input type="radio"/> Yes <input checked="" type="radio"/> No      Date Decided 7/11/2005 1:36:08 PM

<b>Action Item Implemented</b> Decision Made By: Daniel Levitt Date: 11/05/2004 12:40:49 PM	
---	--

**Save Action Item**



Potential New CAQ  Yes  No Date Decided 7/11/2005 1:38:17 PM

<b>Action Item Implemented</b> Decision Made By: Daniel Levitt Date: 11/05/2004 12:41:27 PM	
---	--

Save As: [Redacted]



Potential New CAQ	<input type="radio"/> Yes <input checked="" type="radio"/> No	Date Decided 7/11/2005 1:41:27 PM
-------------------	---	-----------------------------------

<b>Action Item Implemented</b> Decision Made By: Daniel Levitt Date: 11/05/2004 12:42:11 PM	
---	--

**Save Action Item**



Potential New CAQ	<input type="radio"/> Yes <input checked="" type="radio"/> No	Date Decided 7/11/2005 1:42:23 PM
-------------------	---	-----------------------------------

<b>Action Item Implemented</b> Decision Made By: Daniel Levitt Date: 11/05/2004 12:44:05 PM	
---	--

**Save Action Item**



Potential New CAQ  Yes  No Date Decided 7/11/2005 1:43:05 PM

**Action Item Implemented**  
Decision Made By: Daniel Levitt  
Date: 11/05/2004 12:44:45 PM

**Save Action Item**



regenerate output files for evaluation.	
Closure Date	11/05/2004
Potential New CAQ	<input type="radio"/> Yes <input checked="" type="radio"/> No      Date Decided 05/06/2005
<b>Action Item Not Implemented</b> Decision Made By: Daniel Levitt Date: 11/05/2004 12:11:31 PM	

Save Action Item



710, TSPA will provide justification for the use of single values for the climate changes.	
Closure Date	07/11/2004
Potential New CAQ	<input type="radio"/> Yes <input checked="" type="radio"/> No      Date Decided 5/20/2005 1:49:48 PM
<b>Action Item Not Implemented</b> Decision Made By: Ming Zhu Date: 07/11/2004 06:34:06 PM	

Save Action Item



Potential New CAQ	<input type="radio"/> Yes <input checked="" type="radio"/> No	Date Decided 7/11/2005 1:37:16 PM
-------------------	---	-----------------------------------

<b>Action Item Not Implemented</b> Decision Made By: Stefan Finsterle Date: 07/09/2004 12:46:26 PM
--

**SAC ACTION ITEM**



TBD	
Closure Date	07/11/2004
Potential New CAQ	<input type="radio"/> Yes <input checked="" type="radio"/> No      Date Decided 7/11/2005 1:39:31 PM
<b>Action Item Not Implemented</b> Decision Made By: Ming Zhu Date: 07/11/2004 06:35:41 PM	

Save CAQ

# **Appendix A9**

## **Analysis of Documents Related to AMRs/Models**

## **Appendix A9.1**

### **Analysis of a Sample of Model-Related CRs (Infiltration AMR and Others)**

**Table A9.1-1 – Analysis of a Sample of Model-Related CRs 2002 - 2006**

**Description and Use**

Evaluations of CR data were performed to determine if the infiltration AMR was unique relative to the types of issues identified in the CRs and whether or not the extent of condition was identified in the CRs. This evaluation was performed by comparing the CRs on the infiltration AMR and associated infiltration reports with CRs written against non-infiltration AMRs.

**Input**

The following information was used as input to the evaluation:

- Table A9.1-1 presents data from 145 CRs written against various non-infiltration AMRs from 2002 – 2006.
- Table A9.1-2 presents data from 35 CRs pertaining to the infiltration AMR and associated infiltration reports.

**Results of Analysis**

When compared, the two sets of data described in this Appendix (i.e., the CRs related to the infiltration AMR and the CRs related to AMRs in general) identify similar distributions of cause codes. Additionally, both sets also have a similar percentage of CRs that describe the extent of condition as being “isolated.” The cause codes associated with each set of CRs are summarized below:

**Comparison of CRs on Infiltration and Non-Infiltration AMRs**

<b>CR Category (Cause Codes)</b>	<b>Cause Code Description</b>	<b># of CRs on Infiltration AMR and Related Reports</b>	<b># of CRs on Non-Infiltration AMRs</b>
Human Performance	Rule, skill, knowledge-based causes, poor work practices, alertness, and checking	29	117
Management	1) Unclear directions, policies, and methods; 2) Change management, planning, resources, and emphasis on schedule	7	33
Miscellaneous	Level D's and miscellaneous CRs	7	20
Communications	Communications between management, personnel, organizations, etc.	8	20
<b>Total*</b>		<b>50*</b>	<b>192*</b>

\* **Note:** The number of cause codes listed above differs from the total number of CRs because some CRs have multiple cause codes while others (Level D) are not required to list a cause code.

**Table A9.1-1 – Analysis of a Sample of Model-Related CRs, 2002 - 2006**

#	Doc.	Date Found	Issue	Product/Information	Comments
1.	CR 7819 Level C	3/06/06	Reproducibility study of a sample of 5 AMRs performed to determine the extent of condition as part of the investigation of the INFIL model issues.	MDL-NBS-HS-000019, R1	<ul style="list-style-type: none"> <li>• 6 reproduced values did not precisely agree with the AMR values (due to round-off errors)</li> <li>• Values were corrected</li> </ul> <p>Cause Code: A3B1 Human Performance – Skill-Based</p>
2.	CR 7640 Level C	02/02/06	During surveillance OQA-SI-06-008, after the checking process, supporting evidence not provided that supported the qualification	Infiltration MDL-NBS-HS-000023	<ul style="list-style-type: none"> <li>• Isolated case since none other found during the surveillance</li> <li>• The condition was corrected during the surveillance</li> </ul> <p>Cause Code: A3B1– Human Performance – Skill-Based</p>
3.	CR 7626 Level D	2/15/06	An evaluation of DTNs using exceptional rigor	Infiltration MDL-NBS-HS-000023	<ul style="list-style-type: none"> <li>• This was an “Atta-Boy”</li> <li>• The same rigor should be applied to all data</li> </ul> <p>Cause Codes: A3B1 – Human Performance Error – Skill Based A3B2 – Human Performance Error – Rule Based</p>

**Table A9.1-1 – Analysis of a Sample of Model-Related CRs, 2002 - 2006**

4.	CR 7544 Level C	02/02/06	Records not submitted in 14 days	Infiltration LSN records were not submitted within the procedural requirements.	CR closed  Cause Code: A3B2 Human Performance - Rule Based
5.	CR 7533 Level C	02/17/06	Failure to submit Software User Request (SUR)	SNL staff overlooked preparing and submitting an INFIL SUR as required by procedure	<ul style="list-style-type: none"> <li>• Review indicated this was only occurrence of SUR not submitted</li> <li>• No impact on waste isolation</li> <li>• SUR prepared and submitted</li> </ul> Cause Code: A3B1 Human Performance – Skill-Based
6.	CR 7422 Level C	1/12/06	2 emails suggest “backdating” of Scientific Notebook SN-123. Investigation- backdating of the initial entry occurred, but with no adverse conditions	Infiltration Emails Regarding Scientific Notebook 123	<ul style="list-style-type: none"> <li>• Related to CR 5223, 6682</li> <li>• C/A Initiate new CR to address the technical aspects of CR 6682, Case 23</li> <li>• EOC - 2 emails that suggest backdating</li> </ul> Cause Code: A4B4 - Management Problems - Supervisory Methods LTA
7.	CR 7419 Level C	1/12/06	Email suggests “backdating” of Scientific Notebook SN-127	Infiltration Emails Regarding Scientific Notebook 127	<ul style="list-style-type: none"> <li>• Related to CR 5223, 6682</li> <li>• C/A Initiate new CR to address the technical aspects of CR 6682, Case 2.</li> <li>• SN treated as non-Q by USGS since it did not contain investigative or data entries.</li> <li>• EOC – 5 emails that suggest backdating</li> <li>• C/A review the rationale provided in CR for it not being a “backdating” issue</li> </ul> Cause Code: A4B4 – Management Practices LTA

**Table A9.1-1 – Analysis of a Sample of Model-Related CRs, 2002 - 2006**

8.	CR 7414 Level C	1/12/06	5 emails suggesting “backdating” of Scientific Notebooks and Training Records	Infiltration MDL-NBS-HS-000023	<ul style="list-style-type: none"> <li>• Related to CR 5223, CR 6682</li> <li>• EOC – 5 emails that suggest backdating</li> <li>• C/A Initiate new CR to address the technical aspects of CR 6682, Case 4.</li> </ul> <p>Cause Code: A7B3 – Other Problem – Other</p>
9.	CR 7036 Level B from Level A	11/09/05	Based on the three recommendations in the I.G. report.	These three recommendations were to: 1) expand the review of emails to identify and correct CAQs, 2) Ensure current and future emails are reviewed for CAQs, and 3) Instruct all OCRWM personnel in the application of the CAP system	<ul style="list-style-type: none"> <li>• Intended to address the recommendation in the I.G. report relative to the USGS emails</li> </ul> <p>Cause Code: A4B1 – Management Problem – Management Methods LTA</p>
10.	CR 6968 Level C	10/13/04	Blank disks were submitted to the Records Processing Center in a data package	Record processing personnel had medical leave and job was not kept up during this period	<ul style="list-style-type: none"> <li>• References CR 6735</li> <li>• This CR was cancelled</li> </ul> <p>No Cause Code given</p>
11.	CR 6729 Level C	9/22/06	Reproducibility study of a sample of 5 AMRs performed to determine the extent of condition as part of the investigation of the INFIL model issues.	MDL-MGR-GS-000002	<ul style="list-style-type: none"> <li>• Errors in DTN and Table would not have allowed the model to run properly.</li> <li>• No impact was identified</li> <li>• Errors were corrected</li> </ul> <p>Cause Codes: A3B1 - Human Performance – Skill-Based A4B1 - Management Problem – Management Methods LTA</p>
12.	CR 6575	9/19/05	Engineering Systems DTNs:	INFIL DTNs	<ul style="list-style-type: none"> <li>• C/A – Correct the DTN parameter titles</li> </ul>

**Table A9.1-1 – Analysis of a Sample of Model-Related CRs, 2002 - 2006**

	Level C		GS980708312242.010 and GS980808312242.014 contain parameter title heading transposition		<ul style="list-style-type: none"> <li>No Cause identified</li> <li>Identified as isolated</li> </ul> <p>Cause Code: A3B1 Human Performance – Skill-Based</p>
13.	CR 6076 Level C	7/12/05	Sandia Late Records Submittal (not w/in 60 day)	Not INFIL	<ul style="list-style-type: none"> <li>Cause not identified</li> <li>Isolated</li> </ul> <p>Cause Code: A3B1 – Human Performance - Skill-Based</p>
14.	CR 6034 Level C	6/30/05	Test Coordination Error in Formula Used in Water Potential Calculations by the Filter Paper Technique	INFIL – Formula error	<ul style="list-style-type: none"> <li>No Extent of Condition needed</li> <li>Cause not identified</li> </ul> <p>Cause Code: A3B1 – Human Performance - Skill-Based</p>
15.	CR 6011 Level B	6/29/05	Post-closure Checker errors in Analysis and Modeling Reports	Self-assessment review of checker errors	<ul style="list-style-type: none"> <li>Handed off to CR 5559</li> </ul> <p>Cause Code not required</p>
16.	CR 6009 Level C	6/29/05	Igneous Activity Input traceability issues found in MDL-MGR-GS-000005 R01	MDL-MGR-GS-000005 Rev 01, Dike Drift Interactions	<ul style="list-style-type: none"> <li>Cause – disbanded RIT and AMR author changed responsibilities</li> <li>Isolated Case</li> <li>Lesson learned distributed</li> <li>Impact on downstream evaluated</li> </ul> <p>Cause Code: A3B1 – Human Performance - Skill-Based (questionable)</p>

**Table A9.1-1 – Analysis of a Sample of Model-Related CRs, 2002 - 2006**

17.	CR 5957 Level C	6/22/05	LA Completion Inadequate Record – Change History Illegible	ANL-WIS-MD-00005 Rev 2, DE FEPS	<ul style="list-style-type: none"> <li>• Illegible AMR change history also in DIRS and CDIS – corrected</li> <li>• Review others</li> <li>• Cause: coversheet fixed</li> </ul> <p>Cause Code: A3B1 – Human Performance - Skill-Based</p>
18.	CR 5918 Level C	6/15/05	AMR Particle Size Data Sources Not Traceable	ANL-MGR-GS-000002, Rev 02, Eruptive Processes	<ul style="list-style-type: none"> <li>• Identified in Self-Assessment</li> <li>• Isolated – no other found in self-assessment</li> </ul> <p>Cause Code: A3B3 – Human Performance - Knowledge-Based</p>
19.	CR 5917 Level C	6/15/05	TSPA AMRs using data from other AMRs and not using output DTNs as sources	ANL-NBS-MD-000001; FEPS in UZ Flow ANL-MGR-GS-000002, Eruptive processes	<ul style="list-style-type: none"> <li>• Closed and included in CR 5600, Level B</li> </ul> <p>Cause Code: A3B2 – Human Performance - Rule-Based</p>
20.	CR 5914 Level C	6/15/05	TSPA TBV Resolution Incorrectly Defined per LP-3.15Q-BSC	ANL-NBS-MD-000001; FEPS in UZ Flow MDL-MGR-GS-000005; Dike Drift Interaction	<ul style="list-style-type: none"> <li>• Identified in Self-Assessment</li> <li>• C/A: AMRs updated to cite right DTN</li> </ul> <p>Cause Code: A3B1 – Human Performance - Skill-Based</p>
21.	CR 5871 Level None	6/10/05	Supplement to CR 5559 of CR's with certain words	Sort of many AMRs	<ul style="list-style-type: none"> <li>• Move to CR5559</li> <li>• No actions taken – will be CR 5539</li> </ul> <p>No Cause Code given</p>

**Table A9.1-1 – Analysis of a Sample of Model-Related CRs, 2002 - 2006**

22.	CR 5806 Level C	5/27/05	OQA Assessment Mandatory review comment dispositions not accepted by reviewer.	None listed	<ul style="list-style-type: none"> <li>• Initiated 3 procedures to identify requirements</li> <li>• Evaluated extent of 20 incorrect</li> <li>• No impact on Quality</li> <li>• Remedial actions taken (Nothing done with Management or Training)</li> </ul> <p>Cause Codes: A3B3 – Human Performance – Knowledge Based A4B3 – Management A6B1 – Training</p>
23.	CR 5644 Level C	5/2/05	No Documented Evidence the Technical Work Plan Manager Initiated a Review of Plan TWP-WIS-MD-000007, Rev 06	TWP-TWO-WIS-MD-000007	<ul style="list-style-type: none"> <li>• Review records not included in Records – lost during RIT disbanding</li> <li>• Isolated</li> <li>• Will evaluate impact of lost review records – no impact determined</li> </ul> <p>Cause Code: A4B1 – Management Problem – Management Methods LTA</p>
24.	CR 5600 Level B	5/5/05	QA Direct inputs of unqualified data for FEPs AMRs	ANL-MGR-MD-000011 R-04; ANL-NBS-MD-000002 R-03; ANL-NBS-MD-000001 R-03; ANL-WIS-MD-000019 R-02; ANL-EBS-AP-000002 R-03; ANL-WIS-MD-000008 R-02; ANL-EBS-NU-000002 R-03; ANL-WIS-MD-000005 R-02, DE FEPS	<ul style="list-style-type: none"> <li>• A further review identified 9 of 10 FEP AMRs had the same condition</li> <li>• C/A – No need to change since procedure will be revised to clarify the definition of product output so that internally developed data, results and conclusions generated from direct inputs are included in the definition..</li> <li>• Cause – Procedure is not clear. No definition of output data.</li> <li>• C/A – Lessons learned will be initiated;</li> </ul>

**Table A9.1-1 – Analysis of a Sample of Model-Related CRs, 2002 - 2006**

					<p>QMD will assign a “requirements owner”</p> <ul style="list-style-type: none"> <li>• Extent – may be in other AMRs</li> </ul> <p>Cause Code: A3B2 – Human Performance - Rule-Based</p>
25.	CR 5576 Level C	5/6/05	Post-Closure Activities - Procurement Checklist not completed for Pre-PVAR Data Confirm	DTN - LB0306VSP95DAT.001	<ul style="list-style-type: none"> <li>• Reviewed roadmaps and DTNs for other cases (6 of 15 not correct)</li> </ul> <p>Cause Code: A3B1 – Human Performance - Skill-Based</p>
26.	CR 5559 Level B  (down-graded from A to B)	4/4/05	MTS - Licensing Extensive rework of technical work products (models, technical reports, software, calculations, scientific notebooks, etc) Reliance on reviewers and checkers to find errors	<ul style="list-style-type: none"> <li>• See also CR 6011 &amp; 5871</li> <li>• The same problems are still recurring; previous C/As were not effective even after RIT</li> <li>• Covers many products</li> <li>• Data management and checking issues</li> <li>• Inadequate time for reviews and checking</li> </ul>	<ul style="list-style-type: none"> <li>• Cause –</li> <li>• Not enough time to check</li> <li>• Supporting information not available in a timely manner during product development</li> <li>• Unclear roles and responsibilities</li> <li>• Previous C/As were not effective</li> <li>• CR 5559 Cause Analysis Team determination: <ul style="list-style-type: none"> <li>○ “Checking and quality reviews are not inadequate or ineffective</li> <li>○ Checking processes have inefficiencies that could be improved</li> <li>○ Products are “modified” not “reworked”</li> <li>○ Checking and quality reviews do not result in inferior work products</li> <li>○ No actions</li> </ul> </li> </ul> <p>9 Cause Codes listed and 8 procedures involved</p>
27.	CR 5532 Level D from level	4/29/05	Licensing - Use of procedure for technical evaluation of USGS data	<ul style="list-style-type: none"> <li>• Management reviews of an issue that was not performed under a</li> </ul>	<ul style="list-style-type: none"> <li>• Extent of Conditions done in CR 5223</li> <li>• Not required to be under a procedure –</li> </ul>

**Table A9.1-1 – Analysis of a Sample of Model-Related CRs, 2002 - 2006**

	C		issue	procedure	Cause Code not required
28.	CR 5484 Level B	4/19/05	QA Failure to conduct data reviews as required prior to final data in TDMS	<ul style="list-style-type: none"> <li>Generic issue to data in TDMS</li> </ul>	<ul style="list-style-type: none"> <li>Extent of Condition – Reviewed additional 24 and 1 identified. “Isolated”</li> <li>Procedures: (SI III.9Q and .10Q) don’t specifically require documentation of the Review of DTNs</li> <li>Checker focused on wrong procedure</li> <li>Don’t need actions to preclude recurrence</li> <li>Lessons Learned to be issued</li> </ul> <p>Cause Codes: A3B3 – Human Performance- Knowledge-Based A4B3 – Management – Work Organization/Planning LTA</p>
29.	CR 5395 Level C	4/14/05	RIT - Failure to document review sessions to discuss model validation quality issues	TWP-TWP-MGR-PA-000018	<ul style="list-style-type: none"> <li>Self-Assessment</li> <li>Extent – 45 AMRs</li> <li>Isolated</li> <li>Perform Impact Analysis</li> <li>TWP did not contain requirements to document the review</li> </ul> <p>Cause Code: A3B1 – Human Performance - Skill-Based</p>

**Table A9.1-1 – Analysis of a Sample of Model-Related CRs, 2002 - 2006**

30.	CR 5384 Level C	4/13/05	TSPA Igneous Impacts on Waste Package Model (Ph values) not Validated by Field Data	Intrusion on Waste Package MDL-EBS-GS-000002; AMR has been canceled MDL-MGR-GS-000005; Dike/Drift	See also CR 5438, CR 6044 (Level C) <ul style="list-style-type: none"> <li>• ACN the AMR</li> <li>• Track condition until next AMR revision</li> </ul> Cause Code: A3B1 – Human Performance - Skill-Based
31.	CR 5356 Level C	4/6/05	Post Closure Activities - Errors identified in Figures 7-1 and 7-2 of MDL-NBS-HS-000023 REV 00 – Data source not cited	MDL-NBS-HS-000023 REV 00 – Net Infiltration	<ul style="list-style-type: none"> <li>• Isolated</li> <li>• No action to preclude recurrence</li> </ul> Cause Code: A3B1 – Human Performance - Skill-Based
32.	CR 5347 Level C	4/10/05	Employee Concerns Review of loose documents for LSN relevancy after RIT left	None	<ul style="list-style-type: none"> <li>• Communicate to employees what to do with records when leaving the activity</li> <li>• Train new employees</li> </ul> Cause Code: A4B3 – Management Work Planning
33.	CR 5345 Level C	4/8/05	Quality Verification Open TBVs had not been closed upon approval of the document as required by LP-3.15Q-BSC	None	<ul style="list-style-type: none"> <li>• Cause – RIT transition</li> <li>• C/A – review for open TBV's (103) – 85 were closed (review Natural Systems open TBVs)</li> </ul> Cause Code: A4B2 – Management - Management Resource LTA
34.	CR 5173 Level C	2/17/05	Overdue annual review of Scientific Notebook SN- SNL-SCI-031-V1	Notebooks SN-SNL-SCI-031-VI	<ul style="list-style-type: none"> <li>• Origination of SN re-assigned</li> <li>• Technical and compliance reviews completed</li> </ul> Cause Code: A3B1 – Human Performance - Skill-Based
35.	CR 5172	3/2/05	Sandia NL - Records not submitted within 60 days	None	<ul style="list-style-type: none"> <li>• Cause – Records Coordinator assigned to RIT – C/A Records package submitted</li> </ul>

**Table A9.1-1 – Analysis of a Sample of Model-Related CRs, 2002 - 2006**

	Level C		of completion		Cause Code: A3B1 – Human Performance - Skill-Based
36.	CR 5169 Level C	3/10/05	Igneous Activity Scientific activities performed without an updated TWP	TWP-WIS-MD-000007	<ul style="list-style-type: none"> <li>• The TWP was updated to reflect current activities</li> <li>• Cause not identified</li> <li>• Isolated condition (one TWP and 1 manager)</li> </ul> <p>Cause Code: A3B1 – Human Performance - Skill-Based</p>
37.	CR 5110 Level C	3/9/05	Process TDIF Report Number Field not updated to maintain traceability	A difference of opinion	<ul style="list-style-type: none"> <li>• Revise TDIF</li> <li>• Procedures changed (action deferred)</li> <li>• Email sent</li> </ul> <p>Cause Code: A5B2 - Communications LTA – Written Communication Content LTA</p>
38.	CR 5071 Level B upgraded from Level C	2/21/05	Post-closure Lack of DTN Traceability Relating to MDL-NBS-HS-000023	MDL-NBS-HS-000023 REV 00, INFIL Model <ul style="list-style-type: none"> <li>• INFIL control files not found</li> <li>• Checker could not validate</li> </ul>	<ul style="list-style-type: none"> <li>• Get back with originator</li> <li>• Qualify data with a sensitivity study</li> <li>• Review AMRs (prior to 12/01) to see if other files are missing.</li> <li>• Cause – procedures and processes (prior to 12/01)</li> </ul> <p>Cause Code: A3B2 – Human Performance - Rule -Based</p>

**Table A9.1-1 – Analysis of a Sample of Model-Related CRs, 2002 - 2006**

39.	CR 4972 Level C	12/16/04	RIT Data used from canceled document (MDL-DSU-MD-000001)	ANL-EBS-MD-000033 Rev 03	<ul style="list-style-type: none"> <li>• Was OK when DTN was used</li> <li>• Isolated</li> <li>• When the model was canceled, follow through not done</li> <li>• Other similar RIT issues were not found</li> <li>• Action – put flag about DTN in the ATDT</li> </ul> <p>Cause Code: A3B1 – Human Performance - Skill - Based</p>
40.	CR 4951 Level C	2/3/05	Information Technology- Failure to meet Capability Maturity Model (CMM) Process Goals 2 and 3 for Software Configuration Management (SCM)	CMM implementation not INFIL	<ul style="list-style-type: none"> <li>• Non-Q software</li> <li>• Resources diverted to RIT</li> </ul> <p>Cause Code: A4B2 – Management, Resources</p>
41.	CR 4950 Level C	2/3/05	Information Technology- Failure to meet CMM Process Goals 1, 2 and 4 for Software Q (SQA)	CMM implementation not INFIL	<ul style="list-style-type: none"> <li>• Non-Q software</li> <li>• Resources diverted to RIT</li> </ul> <p>Cause Code: A4B3 –Human Performance - Planning</p>
42.	CR 4949 Level C	2/3/05	IT - Failure to meet Capability Maturity Model (CMM) Process Goals 3 and 4 for Software Subcontract Management (SSM)	CMM implementation not INFIL	<ul style="list-style-type: none"> <li>• Not all requirements included in the subcontractor's contract</li> </ul> <p>Cause Code: A4B5 – Management Problem - Change Management LTA</p>

**Table A9.1-1 – Analysis of a Sample of Model-Related CRs, 2002 - 2006**

43.	CR 4948 Level C	2/3/05	IT - Failure to meet CMM Process Goals 2 and 3 for SPTO	CMM implementation not INFIL	<ul style="list-style-type: none"> <li>Resources diverted to RIT</li> </ul> <p>Cause Code: A4B2 – Management Resources</p>
44.	CR 4947 Level C	2/3/05	IT - Failure to meet CMM Process Goal 1 for Software Project Planning	CMM implementation not INFIL	<ul style="list-style-type: none"> <li>Resources diverted to RIT</li> </ul> <p>Cause Code: A4B2 – Management Resources</p>
45.	CR 4946 Level C	2/3/05	IT - Failure to meet CMM Process Goal 2 for Req. Management (RM)	CMM implementation not INFIL	<ul style="list-style-type: none"> <li>Resources diverted to RIT</li> </ul> <p>Cause Code: A4B2 – Management Resources</p>
46.	CR 4943 Level B	2/10/05	Quality Verification Data Confirmation Project Document Package does not meet TWP requirements.	ANL-EBS-PA-000002 Rev 2; ANL-EBS-MD-000037 Rev 3; ANL-NBS-GS-000008 Rev 01; ANL-NBS-GS-000013 Rev 01; ANL-MGR-MD-000003 Rev 3; ANL-EBS-MD-000027 Rev 2	<ul style="list-style-type: none"> <li>Review all DTNs and record the basis for the qualification of each LA DTN</li> <li>Causes: <ul style="list-style-type: none"> <li>RIT re-organized</li> <li>Staff not provided to coordinate RIT data issues</li> <li>Redundant tracking processes</li> <li>Employees managed process with heavy workloads</li> <li>Some “no” answers were in error</li> </ul> </li> </ul> <p>Reference: CR 4231</p> <p>Cause Codes: A3B2 – Human Performance – Rule-Based A4B2 – Management Problem – Resource Management LTA A4B4 – Management Problem – Supervisory Methods LTA</p>

**Table A9.1-1 – Analysis of a Sample of Model-Related CRs, 2002 - 2006**

47.	CR 4888 Level C	2/7/05	Data Confirmation Near-Field MDL-NBS-HS-000001 – Roadmaps and DTNs	MDL-NBS-HS-000001, Drift THP seepage model	<ul style="list-style-type: none"> <li>No extent of condition</li> </ul> <p>C/A – remove extraneous DTN. Develop records maps</p> <p>Cause Code: A3B1 – Human Performance - Skill-Based</p>
48.	CR 4766 Level C	1/24/05	TSPA Impact to TMRB Configuration Management Decisions on TSPA	TSPA issue spreadsheet identified errors in decision proposals	<ul style="list-style-type: none"> <li>DOE expectations for TSPA cannot be met in a timely manner</li> <li>Database not user-friendly nor kept current</li> <li>7 decision proposals with errors</li> <li>Responsibilities and roles not clear</li> </ul> <p>A0B0C00 – N/A</p>
49.	CR 4760 Level B	1/21/05	Process Organization Errors in DTN feeds to TSPA-LA	Multi-scale ThermoHydrologic ANL-EBS-MD-000016 REV 02; ANL-EBS-MD-000049 REV 01 ICN 01	<ul style="list-style-type: none"> <li>Errors to be corrected at a later date not tracked to completion</li> <li>C/A – issue lessons learned</li> <li>Errors on tech data on informal forms</li> <li>Transparency and Traceability Issues</li> </ul> <p>Cause Codes: A3B1 – Human Performance - Skill-Based A3B3 – Human Performance – Knowledge-Based</p>
50.	CR 4675 Level C	1/6/05	Facility Integration - ANL-EBS-MD-000049 Rev 02 Input Citation Corrections	ANL-EBS-MD-000049 Rev 02 – Proposed technical changes	<ul style="list-style-type: none"> <li>Isolated to this AMR because they are minor in nature</li> </ul> <p>ACNs written</p> <p>Cause Code: A3B1 – Human Performance - Skill-Based</p>

**Table A9.1-1 – Analysis of a Sample of Model-Related CRs, 2002 - 2006**

51.	CR 4652 Level C	1/4/05	Integration Team - Lost QA:QA RIT Records	Qualification Report for FEPS	<ul style="list-style-type: none"> <li>Missing records due to RIT changing</li> </ul> <p>Cause Code: A3B1 – Human Performance - Skill-Based</p>
52.	CR 4637 Level C	1/3/05	Errors in Record Package MOY-041220-21-01 for ANL-WIS-MD-000005 (DE FEPS)	ANL-WIS-MD-000005 REV 2, DE FEPS AMR	<ul style="list-style-type: none"> <li>Wrong records package</li> <li>Remedial actions taken to fix</li> <li>Isolated</li> </ul> <p>A0B0C00 – N/A</p>
53.	CR 4544 Level C	12/20/04	Quality Verification Data Confirmation Project Checklist Remediation	UZ Flow Models and Sub- Models MDL-NBS-HS-000006, ANL-EBS-MD-000033 Physical and Chemical Environmental Model	<ul style="list-style-type: none"> <li>Isolated - forms not properly filled out for products as indicated in BSC surveillance</li> <li>Cause – lack of transparency of responses to data confirmation</li> <li>Impact not identified (Level C)</li> <li>Actions – Correct forms</li> </ul> <p>Cause Code: A3B1 – Human Performance - Skill-Based</p>
54.	CR 4514 Level C	2/13/04	Engineering Process Missing QE Checklist	ANL-WIS-PA-000002 Rev 03, Degradation modes abstraction	<ul style="list-style-type: none"> <li>QE checklist not found – see CR 4437</li> <li>Isolated to these 2 checklists</li> <li>No actions taken since QE signed AMR</li> </ul> <p>Cause Code: A3B1 – Human Performance - Skill-Based</p>
55.	CR 4509 Level C	12/16/04	RIT Data confirmation issues found in Approved RIT document	MDL-MGR-GS-000002 Rev 2, Characterize eruptive processes	<ul style="list-style-type: none"> <li>Data checklists incorrect</li> <li>See CR 4544</li> <li>Isolated to this one AMR</li> <li>Trending would pick up any similar</li> </ul> <p>Checklist corrected</p> <p>Cause Code: A3B1 – Human Performance - Skill-Based</p>

**Table A9.1-1 – Analysis of a Sample of Model-Related CRs, 2002 - 2006**

56.	CR 4488 Level C	12/10/04	Quality Verification No documentation that user obtained qualified software from SCM	ANL-WIS-MD-000010, REV 3, Dissolved concentration of radioactive elements	<ul style="list-style-type: none"> <li>No documentation to indicate that software was obtained from SCM</li> <li>Isolated - only one found in surveillance</li> <li>C/A – rerun using SCM version. No impact</li> </ul> <p>Cause Code: A3B1 – Human Performance - Skill-Based</p>
57.	CR 4437 Level C	12/10/04	RIT Missing QE Checklist	ANL-EBS-MD-000037 Rev 03, In-package chemistry abstraction	<p>See CR 4514</p> <ul style="list-style-type: none"> <li>RIT reviews docs. as part of their activity</li> <li>Records Problem Report submitted</li> </ul> <p>Cause Code: A3B1 – Human Performance - Skill-Based</p>
58.	CR 4433 Level Non	12/13/04	RIT Unresolved data confirmation issues in approved AMR	ANL-MGR-GS-000002, REV 2, Characterize Eruptive processes	<ul style="list-style-type: none"> <li>Cause – Failure of the checking process – see CR 3235, 2940, 4231</li> <li>CR closed per CR 4231 as a non-issue*</li> <li>No corrective actions</li> <li>No cause and no extent</li> </ul> <p>Cause Code not given – Not Required</p>
59.	CR 4406 Level Non	12/8/04	Science Regulator Int. Impact on DE FEP AMR from Changes to Dike/Drift AMR	ANL-WIS-MD-000005, REV 2, DE FEPs AMR	<ul style="list-style-type: none"> <li>Isolated to TBV 6177, No cause</li> <li>Not a CAQ since already being tracked</li> <li>AP-SIII.9Q will define process</li> </ul> <p>A0B0C00 – N/A</p>

**Table A9.1-1 – Analysis of a Sample of Model-Related CRs, 2002 - 2006**

60.	CR 4388 Level C From Level D	12/7/04	Project Field Engineering Improper Seal Installation on PAA Shelter Door	None	<ul style="list-style-type: none"> <li>• Incorrectly installed PAA weather strip</li> <li>• Brief Crafts and re-install stripping</li> <li>• Remove water and damaged containers</li> <li>• Isolated, Cause – may have been improper installation</li> </ul> <p>Cause Code: A3B1 – Human Performance - Skill-Based</p>
61.	CR 4368 Level C	12/01/04	Project Field Engineering 7009 Fire Safety Assessment for Backflow Preventer	None	<ul style="list-style-type: none"> <li>• Fire risers require backflow preventor and valve</li> <li>• Fire Protection Engineer to evaluate</li> <li>• Doesn't address cause or extent or actions to preclude recurrence</li> </ul> <p>Cause Code: A1B4 – Human Performance - Engineering</p>
62.	CR 4344 Level C from Level D	12/2/04	RIT Incorrect PDF file was controlled and distributed	MDL-NBS-HS-000001, REV 3, Drift Scale THC seepage model	<ul style="list-style-type: none"> <li>• 3 changes made in 2 days</li> <li>• Document Control placed correct file in CDIS</li> <li>• Isolated</li> <li>• Full comparison of files was made – OK</li> </ul> <p>Cause Code: A3B2 – Human Performance - Rule-Based</p>
63.	CR 4305 Level C	11/17/04	RIT Records Package Submission Exceeding 60 days	MD-NBS-HS-000005, REV 1, Conceptual Model – “Unsaturated Zone Flow and Transport”	<ul style="list-style-type: none"> <li>• Cause – missing records (QE checklists)</li> <li>• Reference CR 4186</li> <li>• RIT team reviewing records packages for completeness for the 89 AMRs reviewed</li> </ul> <p>Cause Code: A3B2 – Human Performance - Rule-Based</p>

**Table A9.1-1 – Analysis of a Sample of Model-Related CRs, 2002 - 2006**

64.	CR 4304 Level C	12/2/04	RIT Incorrect Output DTN numbers in Approved Document	MDL-MGR-GS-000005 Rev 01, Dike/Drift Interactions	<ul style="list-style-type: none"> <li>• Isolated to specified DTNs</li> <li>• Typographical and editorial errors</li> <li>• DTNs submitted to ATDT</li> <li>• Errors occurred because of time and schedule placed on checking</li> </ul> <p>Cause Code: A3B1 – Human Performance - Skill-Based</p>
65.	CR 4298 Level C	12/1/04	RIT Data Input Issues with AMR-MDL-NBS-GS-000003 Rev 01	MDL-NBS-GS-000003 Rev 01, Mineralogic Model	<ul style="list-style-type: none"> <li>• AMR cites 2 superseded DTNs</li> <li>• Roadmap not completed, DIRs entry incorrect</li> <li>• TDIF errors</li> <li>• No changes made to AMR – later determined changes needed</li> <li>• TDIFs corrected</li> </ul> <p>Cause Code: A3B1 – Human Performance - Skill-Based</p>
66.	CR 4293 Level C	10/19/04	RIT AMR cites incorrect part of procedure for model validation	MDL-NBS-HS-000015 Rev 01, DS coupled processes (DST & TH seepage)	<ul style="list-style-type: none"> <li>• Wrong procedure section cited</li> <li>• Revise procedure to allow for expedited changes</li> </ul> <p>Cause Code: A3B1 – Human Performance - Skill-Based</p>

**Table A9.1-1 – Analysis of a Sample of Model-Related CRs, 2002 - 2006**

67.	CR 4277 Level C	11/30/04	RIT MO0306MWDBGSMF.00 1 Technical Data Information Form Update	ANL-MGR-MD-000003 Rev 03, Biosphere Dose Conversion Factor analysis	<ul style="list-style-type: none"> <li>• TDIF errors</li> <li>• Update TDIF in the ATDT system</li> <li>• Does not warrant extent of condition</li> </ul> <p>Cause Code: A3B1 – Human Performance - Skill-Based</p>
68.	CR 4231 Level B	11/22/04	RIT Errors found in approved RIT document	ANL-MGR-GS-000002, REV 2, Characterize Eruptive Processes	<ul style="list-style-type: none"> <li>• CRs 4433, 3235, 2940 moved to this CR</li> <li>• Cause – a failed checking process</li> <li>• Extent – limited to AMRs reviewed by RIT – non systemic issue – a single checker looked at this AMR, therefore, isolated</li> </ul> <p>Correct the AMR errors for CRs 4433, 3235, 2940</p> <p>Cause Code: A3B1 – Human Performance - Skill-Based</p>
69.	CR 4186 Level C from Level D	10/29/04	RIT Records Package Submission Exceeded 60 days	None	<ul style="list-style-type: none"> <li>• Cause – Misunderstood management guidance</li> <li>• See CR 4305</li> <li>• Records packages incomplete, corrected and submitted</li> </ul> <p>Cause Code: A3B1 – Human Performance - Skill-Based</p>
70.	CR 4166 Level C	11/9/04	Operations & Support Team Acceptance report for calibration services form not submitted with Calibration D	None – Pressure Transducer documentation	<ul style="list-style-type: none"> <li>• M&amp;TE report not completed per procedure</li> <li>• Operator did not check latest version of the procedure for changes</li> <li>• Extent – these transducers were the only calibrations performed since the changes and therefore is isolated</li> <li>• Needed records supplemented</li> </ul>

**Table A9.1-1 – Analysis of a Sample of Model-Related CRs, 2002 - 2006**

					<ul style="list-style-type: none"> <li>No other actions needed</li> </ul> <p>Cause Code: A3B2 – Human Performance - Rule-Based</p>
71.	CR 4070 Level C	11/1/04	Quality Verification AMR Review Deficiencies	Mineralogic Model MDL-NBS-GS-000003 REV 1; MDL-NBS-GS-000002 REV 2; ANL-NBS-HS-000015 REV 2; MDL-NBS-HS-000004 REV 3, Seepage Calibration & Model Testing	<ul style="list-style-type: none"> <li>Extent – 4 other AMRs reviewed to determine if references were proper</li> <li>Errors corrected</li> </ul> <p>Cause Code: A3B1 – Human Performance - Skill-Based</p>
72.	CR 4019 Level C	10/26/04	Quality Verification TWP for data confirmation project – technical product review	MDL-WIS-ND-000001, Pitting Model for Zirconium Alloyed Cladding	<ul style="list-style-type: none"> <li>Errors in data confirmation project                             <ul style="list-style-type: none"> <li>Document package errors, incomplete, not traceable</li> </ul> </li> </ul> <p>Package corrected</p> <p>Cause Code: A3B2 – Human Performance - Rule-Based</p>
73.	CR 3980 Level C	10/18/04	Facilities Integration - ANL-WIS-PA-000001 Water Saturation Equation Error	ANL-WIS-PA-000001, EBS Radionuclide Transport Abstraction	<ul style="list-style-type: none"> <li>Review other TSPA equations for errors</li> <li>Correct water saturation equation</li> </ul> <p>Equation corrected</p> <p>Cause Code: A3B1 – Human Performance - Skill-Based</p>
74.	CR 3962 Level C	10/15/04	RIT - Software user request not in SCM for the originator of the developed data	GoldSim files, ASHPLUME	<ul style="list-style-type: none"> <li>Identified by review of Roadmap</li> <li>Investigated and determined no impact</li> </ul> <p>Cause Code: A3B2 – Human Performance - Rule-Based</p>

**Table A9.1-1 – Analysis of a Sample of Model-Related CRs, 2002 - 2006**

75.	CR 3890 Level B	9/16/04	QA Assessments Insufficient TSPA and AMR traceability and transparency regarding MIC	ANL-EBS-MD-000003 REV 00, ICN 01, Corrosion of WP outer barrier; MDL-WIS-PA-000004 REV 00A	<ul style="list-style-type: none"> <li>Recommended correction rejected due to lack of funding for BSC</li> <li>Extent: only involves 1 AMR Improve transparency and traceability</li> </ul> <p>Cause Code: A3B1 – Human Performance - Skill-Based</p>
76.	CR 3885 Level C	9/9/04	Contract requirement not being met by Augmented Staff - Itasca	MDL-NBS-HS-000001, Drift Scale THC seepage model	<ul style="list-style-type: none"> <li>Isolated</li> <li>No actions necessary</li> </ul> <p>Cause Code: A5B2 – Communications LTA - Written Communication Content LTA</p>
77.	CR 3880 Level C	10/4/04	RIT Uncontrolled software use to develop inputs for THC model	Drift Scale THC seepage MDL-NBS-HS-000001 REV 02; ANL-NBS-HS-000043 REV 00, THC Data Qualification Report	<ul style="list-style-type: none"> <li>Isolated No impact</li> <li>Compile data qualifications report</li> </ul> <p>The unqualified software has been removed from the baseline</p> <p>Cause Code: A3B2 – Human Performance - Rule-Based</p>
78.	CR 3852 Level C	9/29/04	AMR Incorrect Reference Section Numbers in 2 AMRs	Disruptive Event Biosphere Dose Conversion Factor ANL-MGR-MD-000003 REV 3; ANL-MGR-MD-000009 REV 3, Nominal Performance Biosphere Dose Conversions	<ul style="list-style-type: none"> <li>Extent – 5 other AMRs are potentially affected</li> <li>AMRs corrected</li> <li>Other AMRs reviewed</li> </ul> <p>Cause Code: A3B1 – Human Performance - Skill-Based</p>
79.	CR 3769 Level C	9/7/04	RIT DTN LA000000000011.001 misclassified in ATDT	ANL-MGR-MD-000011 R04, FEPs for the Biosphere Model	<ul style="list-style-type: none"> <li>Cause: TDMS rejected DTNs 5 years after entered, without reason for rejection</li> <li>Data has been reviewed, accepted, and documented</li> </ul> <p>Isolated – no other rejected DTNs found, no other action required</p> <p>Cause Code: A7B3 – Other</p>
80.	CR 3732	9/14/04	Performance Document	General –	<ul style="list-style-type: none"> <li>Cause: work overload due to transfer of</li> </ul>

**Table A9.1-1 – Analysis of a Sample of Model-Related CRs, 2002 - 2006**

	Level C		Management - Non-compliance on AP-17.1Q for records package submittals.	Records packages not submitted timely per procedure	<p>personnel to RIT</p> <ul style="list-style-type: none"> <li>Resources moved to submit packages</li> </ul> <p>Cause Code: A4B2 – Management Resources</p>
81.	CR 3688 Level B9	9/4/04	Regulatory Coordination Disregarding procedural requirements	<ul style="list-style-type: none"> <li>Felt that management directed non-compliance with procedure</li> </ul>	<ul style="list-style-type: none"> <li>Cause: poor communications; lack of interpretation policy</li> <li>Revised AP-SIII.9Q and 10Q to clarify “List”</li> <li>Trend CR issued</li> <li>Lessons Learned issued</li> <li>GM-DIR-10 issued, Performance Document system</li> </ul> <p>Cause Code: A5B4 – Communications LTA – Verbal Communication LTA</p>
82.	CR 3622 Level C	8/31/04	QE-BSC Acceptance of review of mandatory comments not obtained prior to issuance of TWP	TWP-MGR-PA-00013, Near-Field Environment and Transport In-Drift Geochemistry analyses	<ul style="list-style-type: none"> <li>Extent: No one knows of other cases – isolated</li> <li>Cause: Email not forwarded to QER; TWP issued without QER approval</li> <li>QER reviewed and accepted responses</li> </ul> <p>Cause Code: A3B4 – Human Performance - Work Practices</p>
83.	CR 3574 Level C	8/24/04	RIT Errors in Actinide and Zeolite thermodynamic Data in data0.ymp.R2	TDR-EBS-MD-00002 has technical errors	<ul style="list-style-type: none"> <li>Data wrongly implemented in spreadsheet</li> <li>Closed out/added to CR 168.</li> <li>Extent: Not addressed; separate report may have been initiated</li> </ul> <p>Cause Code: A3B1 – Human Performance - Skill-Based</p>

**Table A9.1-1 – Analysis of a Sample of Model-Related CRs, 2002 - 2006**

84.	CR 3540 Level C	6/18/04	Qualification Status of DTN: LADV831321AQ97.007	Mineralogic Model MDL-NBS-GS-000003 REV01; MDL-NBS-GS-000004 REV01, Rock Properties; MDL-NBS-HS-000010 REV02, Site Scale SZ Transport Model	<ul style="list-style-type: none"> <li>• Developed action plan to qualify data</li> <li>• Reference CR 3539</li> </ul> <p>Cause Code:A3B4 – Human Performance - Work Practices LTA</p>
85.	CR 3539 Level C	6/18/04	Qualification Status of DTN: LADV831321AQ97.001	TDR-NBS-HS-000005 REV00; MDL-NBS-GS-000003 REV01; MDL-NBS-GS-000004 REV01, Rock Properties; MDL-NBS-HS-000010 REV02, Site Scale SZ Transport	<ul style="list-style-type: none"> <li>• 3 actions identified</li> <li>• Downgrade DTN to Unqualified</li> <li>• Reference CR 3540</li> </ul> <p>Cause Code: A3B4 – Human Performance - Work Practices LTA</p>
86.	CR 3529 Level C	8/20/04	RIT The Hydrologic Framework Model is a mathematical representation of a conceptual model that requires validation.	MDL-NBS-HS-000024 REV 00, TWP-NBS-MD-000002 REV 2, Hydrogeologic Framework for SZ Scale Flow and Transport	<ul style="list-style-type: none"> <li>• Extent: Not needed since RIT is looking at the model validations</li> <li>• Cause: TWP stated no validation required for this AMR</li> <li>• Independent review performed and it was OK, but had recommended actions</li> <li>• No actions to preclude recurrence</li> </ul> <p>Cause Code: A3B3 – Human Performance - Knowledge-Based</p>
87.	CR 3496 Level C	8/16/04	RIT No Records Roadmap DTN LA0306GH831811.001	TDIF in ATDT does not have a roadmap	<ul style="list-style-type: none"> <li>• Isolated case since RIT will review</li> <li>• Cause: inadequate work performance, did not follow procedure</li> <li>• Prepare roadmap</li> <li>• No actions required preclude recurrence</li> </ul>

**Table A9.1-1 – Analysis of a Sample of Model-Related CRs, 2002 - 2006**

					Cause Code: A3B4 – Human Performance - Work Practices
88.	CR 3489 Level C	8/12/04	Criticality Oxygen missing in list of Alloy N06464 composition	ANL-DSD-MD-000001 REV 00, Aqueous Corrosion Rates for Waste Package Materials	<ul style="list-style-type: none"> <li>Isolated: because it was oversight</li> <li>Correct and notify others</li> </ul> <p>Cause Code: A3B4 – Human Performance - Work Practices</p>
89.	CR 3399 Level C	8/2/04	Failure to Submit Records Package to the RPC within 60 days	Aqueous Corrosion Rates for Waste Package Materials ANL-DSD-MD-000001 R 00	<ul style="list-style-type: none"> <li>No cause, No extent of condition, No actions to preclude recurrence</li> </ul> <p>Cause Code: A3B4 – Human Performance - Work Practices</p>
90.	CR 3353 Level C	7/16/04	6 Cases of Software Compliance Late submission of SPR Impact Evaluation	None	<ul style="list-style-type: none"> <li>Check for others, none found</li> <li>Completed and sent to SCM</li> </ul> <p>Cause Code: A3B4 – Human Performance - Work Practices</p>
91.	CR 3347 Level B	7/22/04	CAP Organization CR 2263 not fully evaluated for causes/extent of condition	Adverse trend not identified of errors in issued documents	<ul style="list-style-type: none"> <li>Reference CR 2263 and 3235 and 3009</li> <li>Cause: Poor communications with CR originators</li> <li>New Checkers not enough time to review</li> <li>Lack of Rigor in Apparent Cause</li> <li>Training will be evaluated</li> </ul> <p>Cause Codes A4B1 – Management Problem – Management Methods LTA A5B4 – Communications LTA – Verbal Communication LTA</p>
92.	CR 3346 Level C	7/23/04	Untimely Records Submittal	See Page Collection Records package	<ul style="list-style-type: none"> <li>Responsible person assigned to RIT in LV from LBNL</li> </ul>

**Table A9.1-1 – Analysis of a Sample of Model-Related CRs, 2002 - 2006**

					<ul style="list-style-type: none"> <li>• Isolated condition</li> <li>• Records package submitted</li> </ul> <p>Cause Code: A4B3 – Human Performance - Work Practices</p>
93.	CR 3337 Level C	7/26/04	Error in TWP-NBS-HS-000003 Acceptance Criteria Numbering	TWP-NBS-HS-000003, Performance Assessment of UZ	<ul style="list-style-type: none"> <li>• Cause: Used draft YMRP numbering</li> <li>• Isolated to this AMR</li> <li>• Evaluated difference between draft and final YMRP</li> </ul> <p>A0B0C00 – NA</p>
94.	CR 3336 Level C	7/8/04	Operations & Support Failure to report sample tracking information within 30 days	USGS Convergent Tracer test of 2,013 samples, 1,158 samples not identified to the SMF	<ul style="list-style-type: none"> <li>• Isolated to this DTN</li> <li>• Search of 2 other DTNs – All ok</li> <li>• A sample collection report made for 1158</li> <li>• No actions to preclude recurrence</li> </ul> <p>Cause Code: A5B2 – Communications LTA - Written Communication Content LTA</p>
95.	CR 3264 Level B	7/27/04	Quality Verification QA Surveillance of MDL-EBS-MD-000001, In-Drift Natural Convection and Condensation – Model confidence level not in section 7	MDL-EBS-MD-000001, In-Drift Natural Convection and Condensation	<ul style="list-style-type: none"> <li>• Procedural violations (7); Incorrect references</li> <li>• CR 3084 also written for same condition</li> <li>• Complete the checking and technical reviews</li> <li>• Condition was known by manager – no CR</li> <li>• Manager did not know the purpose of the surveillance</li> </ul> <p>Cause Code: A4B1 – Management Problem - Management Methods LTA</p>
96.	CR 3258 Level None	7/23/04	RIT Inadequate Version Control on Draft Documents	ANL-WIS-MD-000010, Dissolved concentration limits of radioactive elements	<ul style="list-style-type: none"> <li>• Draft memo value wrong</li> <li>• Closed as a non-issue</li> </ul> <p>Cause Code - None</p>
97.	CR 3242	7/25/04	CR Management	ANL-WIS-MD-000019 REV	<ul style="list-style-type: none"> <li>• Will correct in next change</li> </ul>

**Table A9.1-1 – Analysis of a Sample of Model-Related CRs, 2002 - 2006**

	Level C		Incorrect DIRS Number in ANL-WIS-MD-000019 REV 01, FEPS – system level	01, FEPS-System Level	<ul style="list-style-type: none"> <li>No other instances in AMR</li> <li>Transposition error</li> <li>No actions to preclude recurrence – RIT will check</li> </ul> <p>Cause Code: A3B4 – Human Performance - Work Practices</p>
98.	CR 3230 Level C	7/9/04	AMR and resulting output DTNs contain suspect data	ANL-NBS-GS-000005	<p>QA approval not required. Involves differing professional opinion</p> <p>Cause Code: A3B3 – Human Performance - Knowledge-Based</p>
99.	CR 3213 Level C	7/21/04	RIT Minor Error in solubilities due to a calculation error	ANL-WIS-MD-000010 Dissolved Concentration Limits of Radioactive Elements	<ul style="list-style-type: none"> <li>Negligible effect on TSPA.</li> <li>Isolated: because they're calculation errors</li> <li>Cause: Probably a transcription from spreadsheet</li> </ul> <p>Cause Code: A3B4 – Human Performance - Work Practices</p>
100.	CR 3212 Level C	6/15/04	The requirements of AP-SIII.10Q not met	ANL-MGR-GS-000005 Magna Dynamics at YMP	<p>Did not meet eight format and administrative items</p> <p>Cause Code: A3B1 – Human Performance - Skill-Based</p>
101.	CR 3205 Level B	7/16/04	Potential Problem with NOAA Wind Data input to ASHPLUME	None	<p>AMR ANL-MLD-MGR-GS-000002 Need to evaluate data set against the preferred NOAA version of the data</p> <p>Cause Code: A7B3 – Other Problem</p>
102.	CR 3099 Level C	6/7/04	Incorrect DTN not detected during the checking process	ANL-EBS-MD-000016 HLW Glass Degradation Model	<ul style="list-style-type: none"> <li>Isolated to this DTN and 2 AMRs</li> <li>Correct during Checking process</li> <li>OK, was a “Conservative Approach”</li> </ul>

**Table A9.1-1 – Analysis of a Sample of Model-Related CRs, 2002 - 2006**

					<ul style="list-style-type: none"> <li>Reference CRs 3213, 3220 for recurrence</li> </ul> <p>Cause Code: A3B4 – Human Performance - Work Practices LTA</p>
103.	CR 3084 Level B	7/7/04	17 procedural violations in ANL-WIS-PA-000001	ANL-WIS-PA-000001, Rev 1	<ul style="list-style-type: none"> <li>Many technical issues identified during surveillance</li> <li>Extent of Condition – Found 1 other from same RIT Manager</li> </ul> <p>Cause Code: A4B1 – Management Problem - Management Methods LTA</p>
104.	CR 3057 Level C	5/17/04	RIT SZ Infiltration Boundary Conditions incorrect	SZ Scale Flow and Transport Model ANL-NBS-MD-000010 SZ Infiltration Boundary Conditions incorrect	<ul style="list-style-type: none"> <li>Condition in the model was corrected – This was a transcription error – The CR was written to document that it was found and corrected.</li> <li>Extent: Limited to this AMR</li> <li>Cause: transcription error</li> <li>C/A: RIT fix problem, DTN corrected</li> </ul> <p>Cause Code: A3B3 – Human Performance - Knowledge-Based</p>

**Table A9.1-1 – Analysis of a Sample of Model-Related CRs, 2002 - 2006**

105.	CR 3025 Level B	6/29/04	AMR revised without a planning document (TWP)	ANL-MGR-GS-000002 Eruptive Processes	<ul style="list-style-type: none"> <li>• RIT work done before approval of TWP</li> <li>• Current ones have TWP approved</li> <li>• Briefed personnel</li> <li>• No impact</li> </ul> <p>Cause Code: A4B3 – Human Performance - Management Problem - Planning</p>
106.	CR 2978 Non Level	6/28/04	Missing AMR Reference Page	ANL-EBS-MD-000049 MSTHM	<ul style="list-style-type: none"> <li>• Not a valid condition</li> </ul> <p>No Cause Code given</p>
107.	CR 2940 Level B	6/24/04	Technical Issues	ANL-EBS-MD-000030 Ventilation Model	<ul style="list-style-type: none"> <li>• 3 technical issues (Pre-RIT)</li> <li>• Isolated</li> <li>• Will be corrected next quarterly change</li> </ul> <p>Cause Code: A4B3 – Human Performance - Management Problem - Planning</p>
108.	CR 2926 Non Level	6/22/04	Inappropriate guidance on TDMS and DTNs	None	<ul style="list-style-type: none"> <li>• Traceability Issue</li> </ul> <p>Cause Code: A5B2C07 – Communications LTA - Requirement Not Correct</p>
109.	CR 2917 Level B	6/23/04	Directions regarding Under Development Technical Product input conflict with procedure	None	<p>Cause Code: A5B1 – Human Performance - Communications LTA</p>

**Table A9.1-1 – Analysis of a Sample of Model-Related CRs, 2002 - 2006**

110.	CR 2877 Level B	6/17/04	DIRS Implementation Process for RIT – Updated Rev 4	RIT guidance is in direct contradiction with the requirements of AP-SIII.10Q	<ul style="list-style-type: none"> <li>• Guidance modified</li> <li>• Isolated</li> <li>• No impact</li> </ul> <p>Cause Code: A5B1 – Communications LTA – Written Communication Methods LTA</p>
111.	CR 2867 Level B	6/14/04	Data/Document Transparency	AP-3.15Q does not indicate where transparency and traceability information is located.	<ul style="list-style-type: none"> <li>• Transparency and traceability issues</li> <li>• AP-3.15Q revised</li> <li>• Extent not required, no violation</li> </ul> <p>Cause Code: A5B2 – Communications LTA – Written Communication Content LTA</p>
112.	CR 2847 Level B	5/28/04	Quality Verification Technical issues with ANL-NBS-MD-000002 REV 2	ANL-NBS-MD-000002 REV 002, FEPS in UZ Flow and Transport	<ul style="list-style-type: none"> <li>• Numerous technical issues identified. CAQs are a result of documentation that did not provide sufficient technical transparency or defensibility</li> <li>• Isolated – any others will be identified in trending</li> <li>• Cause: Failed to follow procedure – failure to ensure the completeness and accuracy of the DIRS report</li> <li>• C/A: Address CAQs in next AMR revision</li> </ul> <p>Cause Code: A3B1 – Human Performance – Skill-Based A5B2 – Communications LTA – Written Communication Content LTA</p>
113.	CR 2845 Level B	5/28/04	Quality Verification Technical issues with ANL-NBS-HS-000021	ANL-NBS-HS-000021 REV 001, Geochemical & Isotopic constraints on Groundwater Flow	<ul style="list-style-type: none"> <li>• 29 data and other technical issues. CAQs are a result of documentation that did not provide sufficient technical transparency or defensibility</li> </ul>

**Table A9.1-1 – Analysis of a Sample of Model-Related CRs, 2002 - 2006**

					<ul style="list-style-type: none"> <li>• Data, software, DTNs, and DIRs problems</li> <li>• Cause: Failed to follow procedure - using unqualified data as direct input</li> <li>• C/A: Address CAQs in next AMR revision</li> </ul> <p>Cause Code: A3B1 – Human Performance - Skill-Based A5B2 – Communications LTA – Written Communication Content LTA</p>
114.	CR 2834 Level B	5/28/04	Quality Verification DIRS and technical issues with ANL-MGR- GS-000001	Framework for Igneous Activity ANL-MGR-GS-000001; ANL-MGR-GS-000003, Waste Packages Hit by Igneous Intrusion	<ul style="list-style-type: none"> <li>• Technical issues</li> <li>• Isolated: only ones found during audit</li> <li>• Cause: failed to follow procedures</li> <li>• C/A: Fixed DIRs; clarified assessment sources</li> </ul> <p>Cause Code: A3B1 – Human Performance - Skill-Based</p>
115.	CR 2823 Level B	6/11/04	KTI Team Incorrect Velocity Correlation Input Used in Development of Seismic. Ground Motions.	MDL-MGR-GS-000003 REV 00, Waste Packages hit by Igneous Intrusion	<ul style="list-style-type: none"> <li>• Create Lessons Learned on use of TDMS data</li> <li>• Document impact</li> <li>• Letter to URS PEA (suppliers)</li> <li>• Correct the seismic velocity correlation model</li> </ul> <p>Cause Codes: A3B1 – Human Performance - Skill-Based; A3B2 – Human Performance - Rule-Based A4B3 – Management Practices</p>
116.	CR 2794 Level B	6/9/04	Integration Team AP-SV.1Q not completed prior to starting draft technical work plan.	TWP-NBS-GS-000003 REV 05, Integrated site model	<ul style="list-style-type: none"> <li>• Extent: Limited to this TWP and no impact</li> <li>• Cause: “Momentary distraction” due to other work.</li> <li>• Condition: Evaluation per AP-SV.1Q not</li> </ul>

**Table A9.1-1 – Analysis of a Sample of Model-Related CRs, 2002 - 2006**

					<p>performed C/A: Complete the evaluation</p> <p>Cause Code: A5B3 –Communications LTA – Written Communication Not Used</p>
117.	CR 2781 Level B	6/4/04	Integration Team Use of FLAC3D Software Outside the Intended Use	MDL-MGR-GS-000005 REV 00, Dike/Drift Interactions	<ul style="list-style-type: none"> <li>• Condition: Several fluid parameters outside of validation testing</li> <li>• Cause: The fluid mechanics software was not included in software qualification</li> </ul> <p>C/A: Notify users and complete qualification</p> <p>Cause Code: A3B3 – Human Performance - Knowledge-Based</p>
118.	CR 2752 Level B	6/4/04	Use of unqualified data as direct input to model report.	MDL-NBS-GS-000003, INC 02, Waste Packages Hit by Igneous Intrusion	<ul style="list-style-type: none"> <li>• Data used as input and was not qualified</li> <li>• Isolated case: CR 2054</li> </ul> <p>C/A: Qualify the data in 2 unqualified DTNs</p> <p>Cause Codes: A4B1C01 and A4B1C04 - Management A5B2 – Communications LTA – Written Communication Content LTA</p>
119.	CR 2714 Level B	5/25/04	RIT Inaccurate Source Listing on DTN LA0311DK831811.001	ANL-MGR-GS-000002 REV 1, Characterize Eruptive Process	<ul style="list-style-type: none"> <li>• Data and source info improperly referenced</li> <li>• Extent: none needed</li> <li>• Cause: Copied DTN numbers without checking</li> <li>• C/A: Linked to source</li> </ul> <p>Cause Code: A3B1 – Human Performance - Skill-Based</p>

**Table A9.1-1 – Analysis of a Sample of Model-Related CRs, 2002 - 2006**

120.	CR 2710 Level B	5/25/04	RIT Non-compliant Model Validation Method	MDL-MGR-GS-000005 REV 00, Dike/Drift Interactions	<ul style="list-style-type: none"> <li>• Same information used to develop and validate model</li> <li>• Reference CR 2052, same issue</li> <li>• Extent: no others</li> </ul> <p>C/A: delete information from model validation section</p> <p>Cause Code: A3B1 – Human Performance - Skill-Based</p>
121.	CR 2704 Level B	5/25/04	RIT Inadequate planning for model validation in TWP- WIS-MD-000007	TWP-WIS-MD-000007 REV 03; Igneous Activity Analysis MDL-MGR-GS-000005 REV 00, Dike/Drift Interaction	<ul style="list-style-type: none"> <li>• TWP did not have specific validation criteria</li> <li>• Extent: only this AMR</li> <li>• Cause: lack of experience</li> <li>• C/A: fixed TWP by RIT</li> </ul> <p>Cause Codes: A3B1 – Human Performance - Skill-Based</p>
122.	CR 2688 Level B	5/24/04	RIT DTN MO0206SASWVSP1.001 has no Road Map	ANL-WIS-MD-000005 R01, FEPS for Disruptive Events	<ul style="list-style-type: none"> <li>• Extent: 6 others found</li> <li>• C/A: RIT prepared roadmap</li> <li>• C/A: Others – URS generated roadmaps</li> <li>• Cause: Rush to perform another activity</li> </ul> <p>Cause Codes: A3B1 – Human Performance - Skill-Based A4B4 – Management Problem - Supervisory Methods LTA</p>

**Table A9.1-1 – Analysis of a Sample of Model-Related CRs, 2002 - 2006**

123.	CR 2666 Level B	5/17/05	Assessments Use of data from National Spent Nuclear Fuel Technical Products	ANL-EBS-MD-000037, In-Package Chemistry Abstraction	<ul style="list-style-type: none"> <li>No evidence that the data was qualified</li> <li>Condition was already identified</li> <li>TDMS and DIRs created confusion about qualification - C/A: Clarify citations</li> <li>AMR analysis corrected</li> </ul> <p>Cause Code: A5B2 – Communications LTA - Written Communication Content LTA</p>
124.	CR 2660 Level B	5/19/04	Quality Verification Specified calibration accuracy not correctly referenced on Calib. Report.	TCO-WI-CAL-0105 R03, USGS Scientific Data Logger	<ul style="list-style-type: none"> <li>Unique to Bechtel at USGS</li> <li>Extent: Only at USGS</li> <li>Cause: Checking of work inadequate</li> <li>C/A: Memo sent to personnel; Cal Report fixed</li> </ul> <p>Cause Code: A3B1 – Human Performance - Skill-Based</p>
125.	CR 2608 Level B	5/12/04	OQA Incomplete QA records for Models subject to the QARD	7 AMRs	<ul style="list-style-type: none"> <li>Extent: Limited to these out of a sample of 33</li> <li>RIT will review for this condition and it will be trended</li> <li>C/A: Fix the 7 records packages in question</li> </ul> <p>Cause Code: A3B1 – Human Performance - Skill-Based</p>
126.	CR 2567 Level B	4/21/04	Process Failure to sign/initial and date records by procedural requirements.	ANL-WIS-MD-000019 REV 01	<ul style="list-style-type: none"> <li>Checking signatures not provided as the work is being done</li> <li>Obtain missing signatures</li> </ul> <p>Cause Code: A3B1 – Human Performance - Skill-Based</p>
127.	CR 2565 Level B	4/29/04	RIT Document review	MDL-EBS-GS-000002 REV 01D,	<ul style="list-style-type: none"> <li>Revised AMR did not go back to checkers</li> <li>Extent: Limited to this AMR</li> </ul>

**Table A9.1-1 – Analysis of a Sample of Model-Related CRs, 2002 - 2006**

			process not followed for MDL-EBS-GS-000002 REV 01	Igneous Intrusion impacts on Waste packages and Waste Forms	<ul style="list-style-type: none"> <li>• See also CRs 2446 and 2538</li> <li>• C/A: Perform a self-assessment</li> <li>• Cause: Unclear management direction</li> </ul> <p>Cause Code: A4B1 – Management Problem – Management Methods LTA</p>
128.	CR 2562 Level B	4/28/04	RIT Technical error in ANL-MGR-GS-000003 REV 00	ANL-MGR-GS-000003 REV 0, Waste Package Hit by Igneous Intrusion	<ul style="list-style-type: none"> <li>• AMR text does not match DTN</li> <li>• Pressure to meet schedule constraints</li> <li>• C/A: RIT will update text and table</li> </ul> <p>Cause Codes: A3B1 – Human Performance - Skill-Based A3B4 – Human Performance – Work Practices A5B2 – Communications LTA – Written Communication Content LTA</p>
129.	CR 2554 Level B	3/19/04	TSPA Error in TPO calculation of ANL-EBS-MD-000016	ANL-EBS-MD-000016, Defense HLW Glass Degradation Model	<ul style="list-style-type: none"> <li>• Isolated – this error has been corrected in the AMR</li> <li>• Correct error the next AMR revision</li> <li>• Checkers failed to adequately check document – mental lapse</li> </ul> <p>Cause Code: A3B1 – Human Performance - Skill-Based</p>

**Table A9.1-1 – Analysis of a Sample of Model-Related CRs, 2002 - 2006**

130.	CR 2551 Level B	4/23/04	RIT Checker comments not fully addressed prior to an AP-2.14Q review.	ANL-WIS-PA-000002 REV 02, EBS FEPS/Degradation Modes Abstraction	<ul style="list-style-type: none"> <li>No actions required, checker comments were reduced</li> </ul> <p>Cause Code: A4B4C05 – Management Problem - Schedule Emphasis</p>
131.	CR 2538 Level B	4/29/04	RIT Unqualified Data was inadequately qualified for use.	MDL-EBS-GS-000002 REV 001, Igneous Intrusion Impacts on Waste Packages and Waste Forms	<ul style="list-style-type: none"> <li>See CRs 2446 and 2567</li> <li>Isolated to this literature and AMR</li> <li>C/A: RIT to clarify and provide examples</li> <li>Refer to CR 2446</li> <li>Cause: Author did not gather enough information and checker failed to adequately check it for transparency</li> </ul> <p>Cause Code: A3B1 – Human Performance - Skill-Based</p>
132.	CR 2478 Level B	3/30/04	Engineered Systems DOE/RW-0184-R1 Bad reference directed to be removed by DR	Data from database DOERW-0184 has error	<ul style="list-style-type: none"> <li>DR on a database prematurely closed – isolated</li> <li>List of AMRs affected prepared</li> <li>Notified users</li> <li>Corrected process and errors</li> <li>Procedures contained gaps</li> </ul> <p>Cause Code: A4B1 – Management Problem Management Methods LTA</p>

**Table A9.1-1 – Analysis of a Sample of Model-Related CRs, 2002 - 2006**

133.	CR 2454 Level B	4/8/04	Unauthorized Commitment for MR#QA-SRA-00132	RIT began work on a procurement prior to being authorized	<ul style="list-style-type: none"> <li>• Isolated</li> <li>• Used biased evidence</li> </ul> <p>Cause Codes: A3B3C03 – Individual justified action by focusing on biased evidence A5B4C01 – Communications between work groups LTA</p>
134.	CR 2071	2/27/04	Quality Verification Documentation errors and transparency issues with ANL-NBS-MD-000015 REV 001, 7 issues	ANL-NBS-MD-000015 REV 001, CSNF Waste Form Degradation Model	<ul style="list-style-type: none"> <li>• Isolated to this AMR</li> <li>• Inadequate checking was covered in CR 1497</li> <li>• AMR revised</li> </ul> <p>Cause Code: A3B1 – Human Performance – Skill-Based</p>
135.	CR 2052 Level B	2/27/04	Quality Verification Same data used in model development and validation.	MDL-NBS-GS-000003, Mineralogic Model; MDL-NBS-GS-000004, Rock Properties Model; MDL-NBS-GS-000005, Thermal Conductivity; MDL-WIS-MD-000001, Zirconium Alloy Cladding Pitting	<ul style="list-style-type: none"> <li>• Isolated to these 4 AMRs (the ones identified in the surveillance) – no further extent needed</li> <li>• CR 1497 addresses the Human Performance issues</li> <li>• Change AMR text</li> <li>• RIT to review</li> </ul> <p>Cause Code: A4B1 – Management Problem - Management Methods LTA</p>
136.	CR 2048 Level B	2/27/04	Model reports do not include all pertinent assumptions. 4 detailed examples given.	MDL-MGR-GS-000005, Dike/Drift Interactions; ANL-EBS-MD-000015, CSNF Waste Form Degradation	<ul style="list-style-type: none"> <li>• Assumptions not clearly defined</li> <li>• Isolated to those identified in surveillance</li> <li>• Management guidance not clear</li> <li>• Errors corrected</li> </ul> <p>Cause Code: A4B5 – Management Problem - Change Management LTA</p>

**Table A9.1-1 – Analysis of a Sample of Model-Related CRs, 2002 - 2006**

137.	CR 1805 Level B	1/29/04	Assessments - No specified method to check that software is adequate for its intended range of use. Checkers did not verify the range of use.	ANL-EBS-MD-000030 REV 3 ICN 3, ANL-NBS-HS-000021 R 1; ANL-EBS-MD-000002 R 1; ANL-MGR-GS-000003 R 0; MDL-MGR-GS-00000 R 0	<ul style="list-style-type: none"> <li>Evaluate 15 AMRs to verify range of use</li> <li>Revise AP-SIII.9Q and .10Q. These were revised.</li> <li>Sample evaluated after checkers asked how to check software for the intended use.</li> </ul> <p>Cause Code: A3B1 – Human Performance - Skill-Based</p>
138.	CR 1619 Level C	1/11/04	Named boreholes with unknown locations.	ANL-NBS-MD-000001	<ul style="list-style-type: none"> <li>Update the AMR</li> <li>Evaluate the 22 borehole locations; Used an old borehole listing</li> </ul> <p>Cause Code: A5B2 – Communications LTA - Written Communication Content LTA</p>
139.	CR 1100 Level B	10/31/03	Technical Product Input Draft MR used as source of direct input to approved MR with TBV	MDL-NBS-HS-000017 REV 00 ICN 01, DS THM Coupled Process; MDL-NBS-HS-000015 REV 00, 3D UZ S/S Model Grid;	<ul style="list-style-type: none"> <li>7 Problems with AMR</li> <li>Isolated – even though others were affected</li> <li>Management place hold on input AMR – risks not evaluated</li> <li>Update input AMR and Notify authors of affected AMRs to reference TBV</li> <li>Update affected AMRs and Correct DIRS, prepare trend, lessons learned, and Records</li> </ul> <p>Cause Codes: 6 Cause Codes listed</p>
140.	CR 0304 Level C	2/24/03	Commitment Mgmt. Engineered Systems include database qualification (not adequately qualified).	Software codes	<ul style="list-style-type: none"> <li>Open CIRs issue</li> <li>Develop plan</li> <li>Qualify database and check document</li> </ul> <p>Cause Code: A5B2 – Communications LTA - Written Communication Content LTA</p>
141.	CR 0239	8/28/02	FEPs AMR is not correct regarding how the naval	ANL-WIS-MD-000009, WF FEPS Screening,	<ul style="list-style-type: none"> <li>Came from CIRs</li> <li>Develop Action plan</li> </ul>

**Table A9.1-1 – Analysis of a Sample of Model-Related CRs, 2002 - 2006**

			fuels were represented	ANL-WIS-MD-000006, Radionuclide Inventory Model	<ul style="list-style-type: none"> <li>Implement plan</li> </ul> <p>A0B0C00 – Not Required</p>
142.	CR 0206 Level C	11/1/01	Post-Closure Safety Analysis Self-Assessment SA-PROJ-2001-001 Track commitment made in response to TDR-0096 pertaining to TSPA	TSPA	<ul style="list-style-type: none"> <li>From CIRs</li> <li>Develop Action Plan</li> <li>Implement Action Plan</li> </ul> <p>Cause Codes: A4B3C11 – Inadequate work package preparation A5B2C08 – Incomplete / situation not covered</p>
143.	CR 0187 Level D	6/22/00	Quality Engineering OQA PE Team evaluated AMR (ANL-NBS-HS-000031, R0). Consistency of data sets in the AMR	ANL-NBS-HS-000031 REV 00, SZ Colloid-Facilitated Transport	<ul style="list-style-type: none"> <li>Will address items depending on funding – partially funded for ICN of AMR – funding may not be sufficient to respond to the OI</li> <li>Develop Action Plan</li> <li>Implement Plan</li> <li>Closed to the Business Process AP-16.1Q</li> <li>RIT will fix</li> </ul> <p>A0B0C00 – Not Required</p>
144.	CR 0185 Level D	6/22/00	Quality Engineering OQA PE Team Evaluated AMR (ANL-NBS-HS-000031, R0) – Conclusions, Model Analysis, uncertainties and restrictions	ANL-NBS-HS-000031 Rev 00, SZ Colloid-Facilitated Transport	<ul style="list-style-type: none"> <li>Recommend additional discussions of uncertainties in AMR conclusions section</li> <li>From CIRs</li> <li>Develop Action and Implement Plans</li> </ul> <p>A0B0C00 – Not Required</p>
145.	CR 0164 Level C	2/24/03	Engineered Systems In-Drift Microbial Communities	ANL-EBS-MD-00038 Rev 0 ICN 1, In-Drift Microbial communities	<ul style="list-style-type: none"> <li>Incorporate TER in AMR</li> <li>No issue</li> </ul> <p>Cause Code: A5B2 – Communications LTA - Written Communication LTA</p>

**Table A9.1-2 – Analysis of a Sample of Infiltration Model-Related CRs, 2002 - 2006**

#	Doc.	Date	Issue	Product/Information	Comments
1.	CR 8712 Level C  Related to the Issue in CR 7627	06/19/06	All of the necessary information for the Curatorial Sample Inventory and Tracking System (CSIT) was not on the sample summary sheet and was not transmitted to the SMF.	DTN GS950708312211.003 does not contain all sample numbers documented in CSITS.	<ul style="list-style-type: none"> <li>• Determined to be Isolated.</li> <li>• Objective evidence of the information found and provided to SMF.</li> <li>• The missing Sample Collection Report information was identified in e-mails as being filled out from the supporting information record and a single form was submitted to the SMF for their review.</li> </ul> <p>Cause Codes: A3B3 - Human Performance – Knowledge-Based A4B4 – Management Problem - Supervisory Methods LTA</p>
2.	CR 8352 Level C	5/17/06	PH meter calibration records do not contain required information	Related to the extent of condition for CRs 6334 and 7627 (related to the INFIL issues)	<ul style="list-style-type: none"> <li>• Extent of Condition - PH meter used for many samples (1994-1995)</li> <li>• Will correct calibration documentation</li> <li>• Will be solved as part of CRs 6334 and 7627</li> </ul> <p>Cause Code: A3B1 - Human Performance – Skill-Based Error</p>
3.	CR 8154 Level C	02/26/06	Adequacy of Checking process	Checking on MDL-NBS-HS-000023 Revision 00. The checker of the INFIL Model had indicated to the originator that the checking could not be done without receiving related documentation which was never provided, but the checker approved the AMR.	<ul style="list-style-type: none"> <li>• This issue is contrary to the requirements of AP-SIII.10Q, Rev 2, ICN 07.</li> <li>• Product inputs were corrected</li> </ul> <p>Cause Code: A5B4 –Communications LTA</p>

**Table A9.1-2 – Analysis of a Sample of Infiltration Model-Related CRs, 2002 - 2006**

4.	CR 7729 Level C	02/27/06	The software crashes when the input files in the DTNs are used without deleting the headers	Inability to reproduce outputs of Markow/PPTSim using the inputs in records.	<ul style="list-style-type: none"> <li>Extent of Condition is not needed.</li> <li>Markow/PPTSim had an error that was fixed in Prep Daily V.1.0</li> </ul> <p>Cause Code: A4B5 - Management– Problem – Change Management LTA</p>
5.	CR 7629 Level C	02/02/06	The Records roadmap not included in the reference package that is referenced in the ATDP for this DTN	Infiltration MDL-NBS-HS-000023	<p>Isolated case since about 50 DTNs were reviewed during surveillance ) QA-SI-06-008 and this was the only case where the DTNs were not properly controlled</p> <p>Cause Code: A3B1 – Human Performance - Skill-Based</p>
6.	CR 7627 Level B	10/13/05	Infiltration Model data inputs evaluated to determine if traceable, transparent, accurate, adequate, and complete	Infiltration MDL-NBS-HS-000023	<p>Associated with CR 6334 Data inputs separated from CR 6334 Evaluations are completed and undergoing management review</p> <p>Cause Codes: A3B1 – Human Performance – Skill-Based A3B3 – Human Performance – Knowledge-Based A4B5 – Management Problem – Change Management LTA</p>
7.	CR 7593 Level C	2/06/06	Circular reference in DTNs GS960408312212.005 and M09903COV96274.000 as the source of the data.	Infiltration MDL-NBS-HS-000023	<ul style="list-style-type: none"> <li>DTN corrected</li> <li>Extent limited to the geographical data related to infiltration</li> <li>Initial extent of condition identified more DTNs and therefore Spot checked a number of 623 DTNs, No other ones were found</li> </ul> <p>Cause Code: A3B1- Human Performance – Skill-Based</p>

**Table A9.1-2 – Analysis of a Sample of Infiltration Model-Related CRs, 2002 - 2006**

8.	CR 7589 Level B	01/19/06	Stream flow gauges improper location in 2 DTNs	Some stream flow data that will be used to calibrate or validate the new SNL net infiltration model (MASSIF) have been found to be from USGS stream flow monitoring stations that did not have unique reproducible locations.	<ul style="list-style-type: none"> <li>• Recurrence will be addressed in the CR 7589 corrective action plan</li> <li>• These data were used to calibrate the USGS INFIL model of 1999-2000</li> <li>• The Why Staircase was used to identify the cause – the involved personnel were not available for interview</li> <li>• Topographic maps were not updated based on formal surveying techniques.</li> <li>• Extremely precise locations is not needed for MASSIF</li> </ul> <p>Cause Code:A4B5 – Management Problem – Change Management LTA</p>
9.	CR 7587 Level C	01/27/06	Software Item Problem Report – The transpiration algorithm was not completely defined. A syntax error causing the values of TRUE to be erratic was identified.	Infiltration Model sensitivity runs conducted in January 2006 identified 2 software problems INFIL V.2.1. STN 10307.2.1.00	<ul style="list-style-type: none"> <li>• Isolated. No further extent of condition is needed.</li> <li>• INFIL V.2.2 will address the issues.</li> </ul> <p>Cause Code: A3B1- Human Performance – Skill-Based</p>
10.	CR 7487 Level C	1/23/06	DTNs were incorrectly classified in TDMS as “established fact” for the Priestley-Taylor empirical equation”.	Self-Assessment related to CR 5559	<p>Wrong idea of the meaning of “established Fact”.</p> <p>Cause Code: A4B5 – Management Problem – Change Management LTA</p>
11.	CR 7413 Level C	1/12/06	2 emails identified suggesting non-compliance of QA software documentation	Infiltration MDL-NBS-HS-000023	<p>Related to CR 5223, 6681 Will be addressed as part of CR 5223 EOC – 5 emails that suggest back dating</p> <p>Cause Code: A7B3 – Other Problem</p>
12.	CR 7246 Level C	12/19/05	Infiltration Model maps records are difficult to trace, are incomplete,	Infiltration MDL-NBS-HS-000023	<p>Extent – Isolated to this DTN Cause illegible copies due to 2<sup>nd</sup> level generation copies</p>

**Table A9.1-2 – Analysis of a Sample of Infiltration Model-Related CRs, 2002 - 2006**

			and don't agree with the scientific notebooks		C/A Evaluate the condition and document results in a written summary  Cause Code: A7B3 – Other Problem
13.	CR 7184 Level D	12/08/05	This CR was to track CRs for 4 RIT action items that were categorized as “closed, risk carried forward”	Infiltration MDL-NBS-HS-000023	Issued as an opportunity for improvement  A0B0C00 – Not required
14.	CR 6938 Level C	10/31/05	One of two LBL checker training records could not be found	Infiltration MDL-NBS-HS-000023	Extent- also applies to MDL-NBS-HS-000020 Documents changed by a trained checker Training records placed in RISWeb Checkers to receive CBT checker training  Cause Code: A6B1 – Training Deficiency – No Training Provided
15.	CR 6678 Level C	09/29/05	Data qualification records do not provide the necessary data to substantiate the qualification statement in the Data Qualification Report.	Infiltration Rate Data for YMP does not provide basis for qualification of differing parameter data from 3 DTNs	<ul style="list-style-type: none"> <li>By referring to the listed DTNs and creating a comparison sheet of the DTNs and the Data Qualification Report (TDR-NBS-HS-000014), the basis for the qualification statement in the TDR can be made. But the qualification report does not independently support the basis. The evidence is lacking.</li> </ul> Cause Code: A3B1 Human Performance – Skill-Based
16.	CR 6460 Level C	8/19/05	BSC Licensing Submittal of issues into CAP not made in a timely manner	MDL-NBS-HS-000023, Infiltration Model	BCP 062 to fix CRs 5071, 5222 and 5223 <ul style="list-style-type: none"> <li>C/A – Organizations reviewed to ensure that CAQ's have been entered into CAP</li> <li>No cause identified</li> <li>Individual counseled for not issuing CR</li> </ul> Cause Code: A3B2 – Human Performance - Rule-Based

**Table A9.1-2 – Analysis of a Sample of Infiltration Model-Related CRs, 2002 - 2006**

17.	CR 6334 Level B	4/21/05	Natural Systems Errors and inconsistencies in the Simulation of Net Infiltration – 8 technical issues	MDL-NBS-HS-000023, MDL-NBS-HS-000032, Infiltration Model issues <ul style="list-style-type: none"> <li>• Technical inadequacy, software, inconsistency with TDMS</li> <li>• Software discrepancies</li> <li>• uncertainty inconsistent</li> <li>• error in control files</li> <li>• 8 of 9 maps produced</li> <li>• Others</li> </ul>	<ul style="list-style-type: none"> <li>• Impact analysis performed (34 pages of errors)</li> <li>• 85% of errors occurred in previous Analysis and not identified by checking in either version of Infiltration</li> <li>• Inadequate technical document preparation and checking</li> <li>• Lack of rigorous, verbatim use of the procedure.</li> <li>• Checker not trained</li> <li>• The entire revised document was not checked.</li> <li>• See also CRs 8154, 5384, 5438, 3235, and 5559</li> </ul> <p>Cause Codes: A3B1 – Human Performance - Skill-Based; A3B3 – Human Performance - Knowledge-Based A4B5 – Management Problem – Change Management LTA</p>
18.	CR 6312 Level C	3/9/05	Post-closure & Licensing Difference in mean precipitation values	MDL-NBS-HS-000023 Rev 00; ANL-NBS-HS-000027 Rev 01, Infiltration Analysis uncertainty	<ul style="list-style-type: none"> <li>• Isolated condition</li> <li>• Revise and sign cover page of AMR</li> </ul> <p>Cause Code: A3B3 – Human Performance - Knowledge-Based</p>
19.	CR 5907 Level C	6/14/05	Quality and Compliance Exempt Software Compliance (ARC INFO) Algorithms incorrect and doc. requirements not met	ANL-NBS-HS-000023 Rev 00 Infiltration; ANL-NBS-HS-000032 Rev 00 Infiltration	<ul style="list-style-type: none"> <li>• Reference CR 4196</li> <li>• Isolated case</li> <li>• C/A AMR updated and software was base-lined</li> </ul> <p>Cause Code: Human Performance - A3B2 – Rule-Based</p>

**Table A9.1-2 – Analysis of a Sample of Infiltration Model-Related CRs, 2002 - 2006**

20.	CR 5698 Level C	5/19/05	TSPA Table notes in ANL-NBS- HS-000027 REV 01 misabeled	ANL-MBS-HS-000027 Rev 01, analysis of Infiltration uncertainty	<ul style="list-style-type: none"> <li>• Isolated</li> <li>• TSPA to identify similar cases and become a reviewer of all AMR changes</li> </ul> <p>Cause Code: A3B1 – Human Performance - Skill-Based</p>
21.	CR 5356 Level C	4/6/05	Post Closure Activities - Errors identified in Figures 7-1 and 7-2 of MDL-NBS-HS-000023 REV 00 – Data source not cited	MDL-NBS-HS-000023 REV 00 – Infiltration	<ul style="list-style-type: none"> <li>• Isolated</li> <li>• No action to preclude recurrence</li> </ul> <p>Cause Code: A3B1 – Human Performance - Skill-Based</p>
22.	CR 5320 Level B	4/6/05	Quality Verification Noncompliance with AP- 16.1Q Requirements for Timely CR Initiation	Delay in documenting e-mail situation on CR	<p>Reference CR 5223</p> <ul style="list-style-type: none"> <li>• BSC Mgr communicate to personnel</li> <li>• Include in training</li> <li>• Lessons learned</li> </ul> <p>Cause Codes: A3B1 – Human Performance – Skill-Based A3B3 – Human Performance – Knowledge-Based A4B1 – Management Problem – Management Methods LTA A5B2 – Communications LTA – Written Communication LTA</p>
23.	CR 5223 Level A	3/11/05	Sandia NL Potential Noncompliance with Qualification Requirements	USGS emails and extent of condition cause, culture and technical issues, and recommendations	<p>See CR 5532</p> <ul style="list-style-type: none"> <li>• Upgraded to A from level B</li> <li>• Stop work evaluation performed</li> <li>• Root Cause Team assigned</li> </ul> <p>No Cause Code given</p>

**Table A9.1-2 – Analysis of a Sample of Infiltration Model-Related CRs, 2002 - 2006**

24.	CR 5222 Level C from B	3/17/05	Natural Systems Neutron Logging Data Problems within AMR MDL-NBS-HS-000023 Rev 00	MDL-NBS-HS-000023 Infiltration Model	Downgraded from a B CR to C <ul style="list-style-type: none"> <li>Isolated condition</li> <li>TDMS and DTNs corrected</li> <li>30 pages of logging errors (from 1990's)</li> <li>No effect on AMR results/conclusions</li> <li>Software Impact Evaluation (Problems and impact on Infiltration)</li> </ul> <p>Cause Code: A3B1 – Human Performance - Skill-Based</p>
25.	CR 5071 Level B – upgraded from Level C	2/21/05	Post-closure Lack of DTN Traceability Relating to MDL-NBS- HS-000023	MDL-NBS-HS-000023 REV 00, Infiltration Model <ul style="list-style-type: none"> <li>Infiltration control files not found</li> <li>Checker could not validate</li> </ul>	<ul style="list-style-type: none"> <li>Get back with originator</li> <li>Qualify data with a sensitivity study</li> <li>Review AMRs (prior to 12/01) to see if other files are missing.</li> <li>Cause – procedure and process (prior to 12/01)</li> </ul> <p>Cause Code: A3B2 – Human Performance - Rule-Based</p>
26.	CR 4507 Level C	12/2/04	RIT MDL-NBS-HS-000023 Rev 00 INFIL Data Input Issue	MDL-NBS-HS-000023, REV 0, Infiltration	<ul style="list-style-type: none"> <li>DIRS does not show a TBV for a direct input</li> <li>Cause – done under previous procedure revision</li> <li>Isolated – RIT did not find other cases</li> <li>Trending process would find any others</li> </ul> <p>Cause Code: A3B1 – Human Performance - Skill-Based</p>
27.	CR 3551 Level C	8/23/04	Technical Error in Att. I of ANL-NBS-HS-000032 Rev 00-all versions	ANL-NBS-HS-000032 Infiltration	<ul style="list-style-type: none"> <li>Cause: Software errors (software not in baseline)</li> <li>Correct software; recalculate values; submit SPR</li> <li>Extent: technical anomaly in AMR – artifact of the particular data sets that were</li> </ul>

**Table A9.1-2 – Analysis of a Sample of Infiltration Model-Related CRs, 2002 - 2006**

					used - limited to this AMR Cause Code: A3B1 – Human Performance - Skill-Based Note: USGS problems could have been detected earlier.
28.	CR 2842 Level B	5/28/04	Quality Verification Technical issues and qualification status of inputs for ANL-NBS-HS-000027 REV 1	ANL-NBS-HS-000027 REV 1, Analysis of Infiltration Uncertainty Changed to MDL-NBS-HS-000023, Simulation of Net Infiltration Model	<ul style="list-style-type: none"> <li>• CAQs are a result of documentation that did not provide sufficient technical transparency or defensibility</li> <li>• QA deemed AMR as technically inadequate</li> <li>• Extent of Condition evaluation determined - Isolated: Narrowly focused and any others will be identified during trending</li> <li>• C/A: RIT will review and fix those that need fixing at next revision of AMR</li> <li>• Cause: Failed to follow procedure</li> <li>• C/A: Address CAQs in next AMR revision</li> </ul> <p>Cause Code: A5B2 – Communications LTA - Written Communication LTA</p>
29.	CR 1862 Level B	2/10/04	Report Number missing in TDMS for Output DTNs	ANL-NBS-HS-000027, Analysis of Infiltration Uncertainty	<ul style="list-style-type: none"> <li>• Extent is limited to those identified during the surveillance – isolated</li> <li>• DTN not found in ATDT but referenced in other AMRs and exhibits the CR 1863 condition</li> <li>• Errata sheet created</li> </ul> <p>Cause Code: A3B1C03 – Human Performance - Incorrect Performance Due to Mental Lapse</p>
30.	CR 1821 Level B	1/27/04	License Application Inadequate review of AMR/Analysis/Model Changes (Errata sheet)	ANL-NBS-HS-000032 Infiltration	<ul style="list-style-type: none"> <li>• Reference CR 2329</li> <li>• Many other Errata sheets not reviewed</li> <li>• Isolated to AP-SIII.9Q, 10Q and AP-16.1Q</li> <li>• Review for Errata sheets not reviewed</li> </ul>

**Table A9.1-2 – Analysis of a Sample of Infiltration Model-Related CRs, 2002 - 2006**

					<ul style="list-style-type: none"> <li>• Evaluate AMR changes</li> <li>• Revise AP-16.1Q</li> <li>• Errata sheets not with procedure – fixed</li> </ul> <p>Cause Code: A5B2 – Communications LTA - Written Communication LTA</p>
31.	CR 1554 Level C	12/8/03	Records packages submitted beyond the 60 day requirement	ANL-NBS-HS-000032, Infiltration	<ul style="list-style-type: none"> <li>• Evaluate AMR changes</li> <li>• Revise AP-16.1Q</li> <li>• Errata sheets not with procedure – fixed</li> </ul> <p>Cause Code: A5B2 – Communications LTA - Written Communication LTA</p> <p>Cause Code: A3B2C05 – Human Performance – Rule-Based</p>
32.	CR 0763 Level B	9/26/03	Site Quality Failure to submit calibration documents to Records	Instruments used on infiltration activities	<ul style="list-style-type: none"> <li>• Isolated to 2 Bechtel Nevada Reports</li> <li>• Correct reports and submit to Records</li> <li>• In future, submit partial packages as completed</li> </ul> <p>Cause Code: A3B1C05 – Human Performance - Delay in Submittal</p>
33.	CR 0662 Level C	7/30/03	Technical Product Input Simulation of Infiltration for Modern and Potential Future Climates (U0010) inadequately described	ANL-NBS-HS-000032 REV 00 ICN 02, Simulation of Infiltration for modern and potential future climates	<ul style="list-style-type: none"> <li>• Isolated to this document</li> <li>• Review AMR software documentation</li> <li>• A routine request for clarification</li> <li>• RIT to fix in MDL-NBS-HS-000023</li> </ul> <p>Cause Code: A5B2 – Communications LTA - Written Communication LTA</p>
34.	CR 0160 Level C	6/20/02	Natural Systems Analysis of Infiltration uncertainty	ANL-NBS-HS-000027, Analysis of Infiltration uncertainty	<ul style="list-style-type: none"> <li>• Table has errors</li> <li>• Correct errors</li> </ul> <p>Cause Code: A5B2C06 – Communications LTA - Typographical Errors</p>
35.	CR 0138 Level C	2/20/02	Post Closure Simulation of net infiltration for Modern and Future Climate	ANL-NBS-HS-000032, Analysis of Infiltration uncertainty	<ul style="list-style-type: none"> <li>• 11 technical errors</li> <li>• From Self-Assessment</li> <li>• From CIRs</li> </ul> <p>Cause Code: A3B1C01 – Human Performance - Inadequate Checking</p>

## **Appendix A9.2**

### **Timeline Summary of USGS Audits, Surveillances, Deficiencies, Stop Work, and Ancillary Topics**

**Table A9.2 -- Timeline Summary of USGS Audits, Surveillances, Deficiencies, Stop Work, and Ancillary Topics**

82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	2000	01	02	03	04								
<b>Assessments and Results</b>																Subject emails written														
A-SNL [NS] 5 CAQs	A-SNL [NS] 15 CAQs	A-SAIC [NS] 10 CAQs	A-SAIC [NS] 7 CAQs	A-SAIC 22 CAQs	A-SAIC [NS] 4 CAQs	A-SAIC [NS] 8 CAQs	A-OQA [NS]	A-OQA [NS] Adq & Eff	A-OQA [NS] Adq & Eff	A-OQA [NS]	A-OQA [NS] Adq & Eff	A-OQA [NS] Ineff QA Program	PBA OQA [NS] [SCARS] Program	PBA OQA [NS] Ineff QA Program	PBA OQA [NS] Adq & Eff	PBA OQA [NS] Adq & Eff	A-OQA [NS] Adq & Eff	PBA-OQA [2 DRs]	A-OQA [NS] Adq & Eff	A-OQA [NS] Adq & Eff	A-OQA [NS] Adq & Eff	A-OQA & BSC [NS] Adq & Eff								
				S-YMPO [CAR]	S-YMPO [NS]	S-YMPO [NS]	S-YMPO [CAR] [NS]	S-YMPO [NS] USGS	S-YMPO [NS] USGS	S-QAD [NS] USGS	S-QAD [NS] USGS	S-QAD [NS] USGS	S-OQA [NS] USGS	S-OQA [NS] USGS	S-OQA [NS] USGS	S-OQA [NS] USGS	S-OQA [NS] USGS	S-OQA [NS] USGS	S-OQA [NS] USGS	S-OQA [NS] USGS	S-OQA [NS] USGS	S-OQA [NS] USGS	S-OQA [NS] USGS							
								did 37 SS	did 15 SS	did 13 SS	did 9 SS	did 12 SS	did 18 SS	did 4 SS																
<b>Assessment Notes</b>																														
				A-86-2	A-87-7	A-88-04	S HQ-SR-89-011	S YMP-SR-90-017	S YMP-SR-90-019	A-YM-92-13	A-YM-93-10	A-YM-94-06	A-YMP-95-04	A-YMP-95-09	A-YMP-95-12	A-YMP-96-01	A-YMP-96-20	A-USGS-97-03	A-USGS-97-15	A-USGS-98-07	A-USGS-98-01	A-USGS-98-10	A-USGS-99-D-040	A-M&O-ARP-00-004-1-28-00	A-M&O-ARP-00-016-7-28-00	A-M&O-ARP-01-02-2-9-01	A-USGS-ARC-02-011-6-1-02	A-USGS-ARC-01-011-6-29-01	A-OCRWM-USGS-04-09-7-22-04	
							S YMP-SR-90-006	S YMP-SR-90-019	S YMP-SR-90-026	S YMP-SR-90-029	S YMP-SR-90-038	A-YMP-SR-90-003																		
<b>QARD Revisions</b>																														
← Multiple QA Programs →							← Consolidate QA →					QARD R0	QARD R1	QARD R2, R3, R4, R5	QARD R6, R7	QARD R8	QARD R9, R10	QARD R11, R12	QARD R13	QARD R14, R15, R16										
								RW-014 & RW-015																						

**Table A9.2 -- Timeline Summary of USGS Audits, Surveillances, Deficiencies, Stop Work, and Ancillary Topics**

82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	2000	01	02	03	04
																		ISMQAP				414.1B
SNL Oversight		SAIC oversight for YMPO				Oversight by SAIC for OCRWM				Oversight by QATSS				← OQA/SAIC Assumes all QA program oversight →				OQA/NQS & M&O split QA				
LANL Audited USGS →			Participants perform own Audits and OQA oversight, After 1995 only OQA performed Audits →										Infiltration Model Audit 2000									
<b>Ancillary Items</b>																						
NWPA issued			Inadeq Sample Control Stop Work Issued to 5 Orgs. "Inadeq QA"	NWPA Amend issued	Ltd Stop Work Issued	NRC – Not Accept "Frag. QA Prog."	NRC Accepts QA Progs.	TRW M&O							VA	Scientific Notebook SCWE initiated		INFIL Tech Defic "USGS Needs Imprv"	BSC M&O	Site Rec	Final YMRP AQAP & not ISMQAP	
<b>Summary of CARs, SDRs, DRs, and CRs</b>																						
			CAR 86-1		SDRs 142, 143, 144, 145, 146, 147, 148, 149, 150, 151, 152, 153, 154, 155, 156, 157, 158, 159, 160, 161, 162			CARs YMP-92-002, YM-ARP 91-05,	YM-ARP 92-13				CARs 95-04, 95-20, 95-21, 95-22, 95-41, 95-42, 95-51, DRs 95-16, 95-17, 95-18		CARs LVM O-98-C-002, 98-C-004	98-023 & 98-043 CAR 98-C-006, 99-C-001, 99-C-002, DR's USGS-98-D-116	DRs 99-D-040	CARs LVMO -00-C-001, BSC-01-C-001, DRs D-029, D-034, D-036, D-037, D-038, D-039	CARs BSC-01-C-002			0
<b>E-Mail Usage Memos</b>																						

**Table A9.2 -- Timeline Summary of USGS Audits, Surveillances, Deficiencies, Stop Work, and Ancillary Topics**

82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	2000	01	02	03	04	
											Emails are Fed Records		OCRWM Emails  Other Email Memos				OCRWM Emails  Other Email Memos	Emails go to RMS		OCRWM Emails  Other Email Memos			
											<b>QA Programs and Requirements</b>												
DOE O 5700.6	Part 60										QARD ok by NRC	830.12							Part 63				QAMP AQAP

**Acronyms:**

A = Audit  
 Adq = Adequate  
 AQAP = Augmented Quality Assurance Program  
 BSC = Bechtel SAIC Company  
 CAQ = Condition Adverse to Quality  
 CAR = Corrective Action Request  
 CR = Condition Report  
 DOE O = Department of Energy Order  
 DR = Deficiency Report  
 Eff = Effective  
 Frag = Fragmented  
 Inadeq = Inadequate  
 Ineff = Ineffective  
 ISMQAP = Integrated Safety Management Quality Assurance Program  
 LANL = Los Alamos National Laboratory  
 Ltd = Limited

M&O = Management and Operating  
 NQS = Navarro Quality Services  
 NRC = Nuclear Regulatory Commission  
 [NS] = No Significant Issues  
 NWPA = Nuclear Waste Policy Act  
 OCRWM = Office of Civilian Radioactive Waste Management  
 OQA = Office of Quality Assurance  
 Org = Organization  
 PBA = Performance-Based Audit  
 QA = Quality Assurance  
 QAD = Quality Assurance Division  
 QAMA = Quality Assurance Management Assessment  
 QAMP = Quality Assurance Management Policy  
 QARD = Quality Assurance Requirements and Description

QATSS = Quality Assurance Technical Support Services  
 R = Revision  
 RMS = Record Management System  
 S = Surveillance  
 SAIC = Science Applications International Corporation  
 SCWE = Safety Conscious Work Environment  
 SDRs = Significant Deficiency Reports  
 SNL = Sandia National Laboratories  
 SS = Self Surveillance  
 Unsat = Unsatisfactory  
 USGS = United States Geological Survey  
 VA = Viability Assessment  
 WMPO = Waste Management Project Office  
 YMRP = Yucca Mountain Review Plan  
 YMPO = Yucca Mountain Project Office

**Assessments in Chart During the Period 1983-2004 - Assessments = 23 Surveillances = 11 QAMA = 3**

## **Appendix A10**

### **Historical Perspective on Past Identified Lessons Learned**

This appendix identifies some of the lessons learned and proposed corrective actions that the OCRWM program has identified from previous experience.

### The 2000 Nuclear Energy Institute (NEI) “Yucca Mountain Project Independent Quality Review”

In May 2000, 11 members from the NEI Spent Nuclear Fuel Working Group conducted an independent quality review of various Yucca Mountain Project activities in six topical areas (Project Management, Geosciences, Software Controls, Safety Culture, Employee Concerns Program, and the Corrective Action Program). Their report, issued in August 2000, identified deficiencies and included the following observations and conclusions:

- YMP is moving forward in a positive manner.
- Significant process improvements were noted over previous reviews; however, continued progress is needed in many areas. The team identified 38 recommendations throughout the six topical areas.
- The Project should expedite the implementation of a uniform problem or condition reporting system.
- Self-assessment and Performance Indicator programs need management attention to be effectively implemented.

### 2001 BSC/SAIC Evaluation

In 2001, a high level team from BSC/SAIC contractors evaluated root causes for model deficiencies based upon eight NRC technical concerns. The report from this evaluation, *Root Cause Analysis Report for Yucca Mountain Project Technical Document Deficiencies*, was issued August 17, 2001. The report identified four root causes:

1. Ineffective Configuration Management,
2. Expectations and Accountability,
3. Ineffective Program Management, and
4. Low Expectations for an Effective Issues Management Process.

The report also identified the “Generic Cause” as – “DOE and the M&O believed meeting the timeline window (schedule) was more critical to Project success than producing error-free documents. Consequently, the M&O and DOE managed accordingly, resulting in the documents being issued with the deficiencies.”

For each of the four root causes, the evaluation team identified Recommended Corrective Actions:

1. Ineffective Configuration Management
  - Senior management must value a robust checking and review process to ensure errors in documents are identified and reconciled before a document is issued. This can be accomplished by management adopting this as a Project value.
  - Senior management must establish the proper configuration management process, which must include a final checking and review of a frozen document. Document planning must explicitly plan for a final check and review process of a frozen document.

- Benchmark and assess configuration management processes used to develop technical documents. Where gaps are determined, prepare and issue appropriate configuration management procedures.

## 2. Expectations and Accountability

- Senior management must set high values and expectations for technical document quality. This can be accomplished by management adopting this as a Project value. A good example of such a value is AP 3.11Q Section 3.18 (Signature of Author, Checker and Responsible Manager).
- Conduct facilitated management off-site sessions with participation, as applicable, from DOE, BSC, the National Laboratories, and USGS. In these sessions, document, sign, and communicate a high-level set of common:
  - Project values,
  - Consistent rewards and consequences, and
  - Processes to hold each other accountable.
- Establish a set of performance indicators to track the recommended common and generic corrective actions. Set goals, monitor, trend, conduct assessments, and take management actions when progress fails to achieve expectations. Communicate goals and progress to all personnel. Report results quarterly to Bechtel corporate management. Bechtel corporate management should challenge the Project's performance and conduct field evaluations to validate the performance.

## 3. Ineffective Program Management

- Lack of appropriate contract management and compliance with contractual requirements (i.e., flowdown, change control, impact, and communication) by DOE and the M&O contractor.
- Inconsistent use of integrated resource loaded schedules and integrated baseline schedules with effective change control.
- Lack of lower level resource-loaded schedules with accurate depiction of process steps, and realistic duration necessary to perform work consistently.
- Middle management unwilling to change, unable to remove barriers, and lacked a critical mass of change management leaders.
- Lack of fundamental understanding that quality should be built-in vs. inspected-in.

## 4. Low Expectations for an Effective Issues Management Process

- Senior management must establish a value and expectation for a positive issue management process. This will require that issues management process be separated from commitment tracking.

- Senior management must implement a positive and definitive process for self-identification, tracking, and resolution of issues. This process should allow for easy documentation and closure of minor issues.
- Develop a BSC quality assurance plan that implements the existing contract allowing management assessments and independent assessments, and change the contract to allow BSC to perform surveillances.
- Benchmark issue management programs at DOE facilities and/or commercial nuclear facilities to identify best practices and revise as appropriate the issue management program. As a minimum:
  - Set a lower threshold for initiation of root cause evaluations, management directed self-assessments and employee self-identification of issues.
  - Establish a senior manager to conduct daily screening and assignment of responsibility for employee self identified issues.
  - Create performance measures for root cause evaluations, self-assessments and employee issues identification, set goals, and trend.
  - Conduct an effectiveness review of the revised issues management program and performance measures six months after implementation.
- Communicate and train the Project staff on the issue management program requirements and management expectations for implementation.
- Continue development of an effective issues management trending program for the identification of potential issues.

Based upon this root cause analysis, corrective actions were identified in CARs BSC-01-C-001 and BSC-01-C-002. These CARs, dealing with modeling and software issues, were opened in 2001 but not closed until 2004. The Management Improvement Initiative (MII) initiated in 2002 addressed CAR 001 and CAR 002, as well as other management improvements.

### 2002 Lessons Learned Evaluation

The OCRWM's Lessons Learned Program presented a listing of barriers and lessons learned from previous improvement initiatives in Lessons Learned OCRWM-LL-2002-026, entitled, *The Yucca Mountain Project Organizational Culture Must Change to Attain a Level of Performance Expected in a Regulated Environment*. This document describes the review conducted to identify common barriers and contributors to the success of initiatives (as described below) such that recommendations could be used to help assure the success of the OCRWM Management Improvement Initiative (OMII). The review involved the examination of three major management initiatives, Integrated Safety Management, Nuclear Culture, and Process Validation and Re-Engineering (PVAR). The review also involved the examination of six Corrective Action Reports dealing with weaknesses in implementation of the OCRWM Quality Assurance Program.

Several common causes that impeded the success of previous management initiatives were identified as follows:

- Denial of the need to change
- Lack of sustained management commitment

- Priority of schedule over quality
- Lack of acceptance of quality assurance as an inherent means of doing work
- Failure to value corrective actions
- Failure to resolve barriers to progress in a timely manner

Some of the barriers to success identified in the lesson learned review included:

- Perception that management does not “walk the talk”
- Lack of organizational buy-in
- Lack of sustained focus on results
- Failure to improve processes sufficiently because of schedule concerns
- Quality assurance is too often considered an adjunct program as opposed to an inherent way of doing business
- As a whole, the organization does not value the timely identification of quality deficiencies, appropriate root causes, and necessary corrective actions; little benefit or consequence is associated with correcting problems
- The organization lacks conflict resolution skills and issue escalation/resolution processes; management is often not aware of or fails to remove conflicts impeding work progress
- Mixed messages regarding the relative importance of quality and schedule; focus on perceived short-term schedule requirements impedes methodical development and monitoring of corrective actions
- Corrective action efforts are activity vs. results oriented

Some of the recommended actions included:

- Progress must be consistently communicated throughout the organization
- Successes must be publicly acknowledged
- Detailed, resource loaded, logic driven project schedules are necessary to provide direction and focus, and help identification of real, versus perceived, schedule impacts so that priorities can be based on fact
- Appropriate quality assurance requirements for technical products must be carefully determined, clearly defined, well communicated, and achieved
- Roles and responsibilities for implementing the Quality Assurance Program need to be re-evaluated and communicated; line management ownership of quality needs to be developed
- The Quality Assurance Program and processes need to be simplified and the quality assurance role well understood so line management can effectively implement quality assurance requirements
- Quality principles, such as self-assessment, deficiency reporting, and prompt corrective action must be established as a cultural value
- User-friendly processes for timely identification and reporting of deficiencies, completion of root cause analyses, and development of corrective actions are needed
- Additional emphasis should be placed on determining extent of issues, conditions, or problems when investigating deficiencies
- Greater emphasis should be placed on self-assessments.

## CR 3235 on Corrective Action Program

A root cause analysis for CR 3235 (Level A) identified issues with the corrective action process and summarized many of the failures in the current and recent past corrective actions for OCRWM items and activities. These issues are summarized below.

1. Work products need to meet all requirements, including those that result in transparency, traceability, and defensibility. CR 3235 identified that actions need to be taken to provide guidance, design control, technical requirements management, and to address human performance issues.
2. There needs to be greater consistency during the parallel development of documents including actions needed for the approach to work execution and design control.
3. Needed actions identified in CR 3235 included:
  - Identifying, communicating, and validating expectations for product traceability and transparency;
  - Translating the expectations into attributes that constitute product traceability and transparency;
  - Developing or revising product processes and implementing documents so that expectations will be clearly and consistently implemented;
  - Establishing expectations and implementing mechanisms to ensure that other written documents, verbal communications, and interpersonal interactions support the expectations for product traceability and transparency;
  - Revising processes for managing technical change, including roles, responsibilities, authorities, accountability, interfaces, and communications between individuals, groups, and organizations;
  - Providing for an independent assessment by subject matter experts to address human performance and behavior analysis;
  - Defining the technical requirements document hierarchy including program definitions, expectations, and guidance for the identification, development, change, and implementation; and
  - Updating the Repository Development Execution Plan and those of other subordinate organizations to reflect the current approach to work execution and effective change management.
4. The CR also evaluated and made recommendations in several other areas of the OCRWM program, including:
  - Performing management self-assessments (7 were performed);
  - Determining procedural adequacy (conclusion was that “actions involving procedure changes would not be an effective approach to preclude recurrence for the identified causes;
  - Developing an Action Plan to address the 56 identified causes of the condition which include:
    - Common project terminology lacks definition/clarity (4 cases);
    - Differing content expectation between reviewer and originator (13 cases);
    - Differing opinions between originator and reviewer (2 cases);
    - Less attention paid to table references than actual values (2 cases);

- Originator oversight (8 cases);
- The rationale for inputs not required by procedure (4 cases);
- Misunderstanding of the meaning of “criterion” and “assumptions” (4 cases);
- Lack of guidance regarding how and what to document as an assumption (4 cases);
- The originator did not recognize it as an assumption (3 cases);
- Extraneous information confused reviewer (3 cases);
- Relied on the checking and review processes (4 cases); and
- Concurrently preparing documents (3 cases).

The observations of the CR 3235 Root Cause Analysis Team are reflective of those identified during this root cause investigation.

### External Lessons Learned

OCRWM analyzed lessons learned from an external causal analysis of two major events, the Columbia space shuttle accident and the reactor vessel corrosion event at Davis-Besse nuclear plant in Ohio. OCRWM’s evaluation built on the identification by a DOE-wide working group of lessons learned germane to DOE projects. In September 2005, OCRWM issued the report, *Office of Civilian Radioactive Waste Management Lessons Learned Actions from the Columbia Space Shuttle Accident and Davis-Besse Reactor Pressure-Vessel Head Corrosion Event*. The report described completed and planned OCRWM actions in response to these incidents and in support of Departmental efforts to apply the lessons learned, as summarized below.

*People and organizations need to learn valuable lessons from internal and external operating experience to avoid repeating mistakes and to improve operations.* OCRWM has a Lessons Learned Program. OCRWM will determine whether any additional OCRWM actions are needed to enhance the existing OCRWM Lessons Learned Program.

*Budget and schedule pressures must be balanced by safety considerations to prevent unsound program decisions.* When DOE measures to ensure that contracts emphasize safe performance are put in place, OCRWM will ensure that appropriate managers and staff are involved with contracting and complete the DOE-wide training.

*Routine deviations from an established standard can desensitize awareness to prescribed operating requirements and allow a low-probability event to occur.*

OCRWM reviewed its management and operating contract to ensure that the safety requirements and standards are complete, current, and correct.

*To ensure safety, managers need to encourage employees to freely communicate safety concerns and differing professional opinions.* OCRWM has had an established differing professional opinion program at the Yucca Mountain Project for the past 10 years, and will evaluate it against the DOE-wide policy when that policy becomes available.

*Safety efforts should focus more on planning and preventive actions rather than investigations and corrective actions resulting from accidents or events.* DOE actions for this Lesson Learned address application of the Human Performance Initiative (HPI) at DOE sites to promote behaviors that support safe and reliable operation in every organization. OCRWM is currently implementing HPI across all work tasks and among individual workers, leaders, and the organization as a whole.

## Overview and Conclusion of Current and Past Analyses

The analysis determined that many of the barriers, causes, and lessons learned from the current investigation are the same or similar to those that were provided during previous analyses. Specifically, the following are some recurring themes from previous root cause analysis reports:

- Quality assurance should be:
  - Built-in vs. inspected in to products
  - An inherent means of doing work.
- Configuration Management – robust review and checking process should be used to ensure error-free products.
- Management should ensure that barriers are removed or resolved.

This suggests that appropriate and rigorous learning from past situations has not always been effective. The overall lesson that the Team feels should be learned from this root cause analysis is summarized as follows:

- ⇒ The OCRWM program must embrace the concept of utilizing past experiences to learn and prevent future problems from occurring, and to learn from successes that enhance program activities and the ability to meet program objectives. The Team recommends that managers at all levels focus on opportunities to sustain improvement activities and stabilize the various processes and approaches to achieve desired goals and objectives.

# **Appendix A11**

## **CR 6334**

This appendix contains CR 6334 and associated information.

CR 6334 is a Level B CR that identifies many of the issues identified by the Infiltration Technical Team Special Project (ITTSP). The original eight issues were identified in April 2005; however, the CR was not written until August 2005. In addition to the original eight issues, a database of approximately 100 additional items was created to track the issues as they were identified by the ITTSP. Each of these issues is being addressed with the new infiltration AMR and associated activities. In addition, CR 7627 was initiated to track some of the issues that could have other impacts on the program.

Appendix A11.1 contains CR 6334 as generated by the CAP system. This CR describes the original eight issues, the extent of condition, and associated corrective actions. The corrective actions include a detailed review of AMRs with similar history as the infiltration AMR to determine if similar issues can be found.

Appendix A11.2 contains the database of approximately 100 additional issues that were identified by the ITTSP. Each of these issues will be addressed by the updated infiltration AMR and associated products as appropriate.

# **Appendix A11.1**

## **CR 6334 from CAP**



OCRWM Corrective Action Program  
**Condition Report**  
**Current Record Report**



\*\*\* Condition Report is currently in this process step \*\*\*

CR Num	CR Level	CR Type	Step Entry Date	Step	Step Resp	Step Owner
6334	B	CAQ	2/27/2006 6:56:47 PM	Oversee Implementation	Nieder-Westermann, Gerald	Nieder-Westermann, Gerald

**Routing Notes:**

Jan 31 2006 (Staci Hanson) CR Ownership Org changed from Post Closure Activities to Infiltration Technical Tm, and CR Responsible Org changed from Infiltration Technical Tm to Infiltration Technical Tm based on organizational structure changes.

Oct 5 2005 (Staci Hanson) CR Step Owner changed from Watson, William to Nieder-Westermann, Gerald CR Responsible Org changed from Post Closure Activities to Infiltration Technical Tm CR Step Responsible changed from Nieder-Westermann, Gerald to Beach, Charles based on organizational structure changes.

**Condition Information**

**CR Title:** Errors and Inconsistencies in the Simulation of Net Infiltration

**Date Found:** 21-Apr-05  
**Time Found:** 12:00

**Site:** USGS  
**Location:** USGS

**CR Initiator:** Rehfeldt, Kenneth  
**CR Initiating Org:** Natural Systems  
**Involve Initiator?** Yes

**Condition Description:**

A review of the report Simulation of Net Infiltration for Present-Day and Potential Future Climates (BSC 2004 [DIRS 170007]) has identified eight (8) issues / errors that need to be addressed. These are:

1) The Upper Present-Day (PD) climate is documented in Simulation of Net Infiltration for Present-Day and Potential Future Climates(BSC 2004 [DIRS 170007]) as being calculated as the average of the results using the mod3ppt and Area12 climate files (see page 6-61). However, the Upper PD climate results in TDMS are the result of taking the average of the mean PD results, and the Area 12 climate file results. The results tabulated in Table 6-8 on pages 6-67 to 6-68 are also the average of the mean PD results, and the Area 12 climate file results. Therefore, the method described in the text is inconsistent with the results in TDMS, and the method described in the text is inconsistent with the results tabulated in Table 6-8 in the AMR.

2) The Potential Evapotranspiration (PET) submodel built into INFIL appears to be erroneous. In Figure 29 of Flint et al. (1996) [DIRS 100147], the max PET value in summer is only about 5 mm/day. This value should be about 10 mm/day. Also, the original estimate of annual PET given in Flint et al. (1996) is only 876 mm/yr, while this value should be about double that, or 1600 to 1800 mm/yr to be consistent with other sources (DIRS 171280 and 171281). The 2003 version of Simulation of Net Infiltration for Modern and Potential Future Climates (BSC 2003 [DIRS 166518]) stated that PET is 6 times greater than precipitation. In the 2004 revision of this document, now titled Simulation of Net Infiltration for Present-Day and Potential Future Climates(BSC 2004



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[DIRS 170007]), the text was changed to state that PET is nine times greater than precipitation, based on new sources. However, the model output was not checked to see if modeled PET is 6 or 9 times greater than precipitation. Equations 6-8 through 6-11, and the results of the subroutine SOLRAD must be checked for accuracy. Then the INFIL code should be checked for accuracy in order to resolve this apparent discrepancy between sources of PET values for the area.

3) Some parameters used in the control file for the Analysis of Infiltration Uncertainty (BSC 2003 [DIRS 165991]) are not consistent with the logic used in the control files for Simulation of Net Infiltration for Present-Day and Potential Future Climates(BSC 2004 [DIRS 170007]) as climate changes from PD to monsoon to glacial-transition (GT). For example, the vegetative cover parameter FVEGC should be 0.5 rather than 0.4. This is because the value for FVEGC is 0.4 for the lower GT climate and 0.6 for the upper GT climate, and Analysis of Infiltration Uncertainty (BSC 2003 [DIRS 165991]) simulates the mean GT climate. Other parameters that should be changed include the bedrock rooting depth parameter, and the rock evaporation parameter beta. Discrepancies in the control files need to be resolved.

4) There is an apparent error in one of the control files for Upper Monsoon. The rooting depth parameters MAXWGT1 thru 4 are not the same between the Hobbs and Nogales analogue climate files that represent the upper monsoon climate. These parameters should be exactly the same. This discrepancy needs to be resolved.

5) During the 2004 revision of Simulation of Net Infiltration for Modern and Potential Future Climates(BSC 2003 [DIRS 166518]), 2 spreadsheets were delivered from USGS with the model re-calibration data from streamflow and flux. There are errors in both spreadsheets. In the streamflow spreadsheet, a conversion of 43,580 square feet per acre was used. This should have been 43,560 square feet per acre. It is not a big error, but an error nonetheless. In the flux spreadsheet, the modeled flux data identified as the H104 model is not consistent with the flux results in TDMS (generated using the control files that were delivered by USGS). In addition, in the flux spreadsheet, the measured flux for 2 of 41 boreholes is different from the flux data DTN.

6) The mod3ppt file CAN be found in TDMS. However, the hardcopy listing of these data in Appendix A of Simulation of Net Infiltration for Present-Day and Potential Future Climates(BSC 2004 [DIRS 170007]) is incomplete. It lists data from 1980 through 1992, but it should list data from 1980 through 1995.

7) As part of resolution of CR 5071, 8 of 9 infiltration maps have been replicated. As of now, we have been unable to reproduce the control files for the 10-yr subset of 4JA climate file that is required for the lower present-day climate model runs. The problem is that the text states that the 10-yr subset corresponds to the 1980-1990 period (see Table 6-7 on page 6-67 of Simulation of Net Infiltration for Present-Day and Potential Future Climates(BSC 2004 [DIRS 170007])), but this is actually an 11-yr period, and the time periods may correspond to calendar years or USGS water years (equivalent to Govt FY). Additional work is needed to resolve this last remaining issue with respect to CR 5071 by trial-and-error model runs in order to reproduce the 9th of the 9 infiltration basecase maps.



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8) The DTNs for the streamflow data used in U0010 are: GS941208312121.001 and GS960908312121.001. Two (2) locations have been found for the streamflow gage station called Pagany Wash near the Prow. This is station # 102512531. On page 8 of the GS94 DTN, the location (lat/long) for this station is given as 36d 52 min 28 sec and 116d 27 min 04 sec. The web site(<http://waterdata.usgs.gov/nwis/discharge>) lists the location for this station number as 36d 52 min 06 sec and 116d 26 min 50 sec. This discrepancy needs to be resolved.

**Supplemental Information:**

From Immediate action of CR 6460

One additional case of a USGS data issue had been found during the initial investigation into CR 5223 during April. During the initial investigation initiated by CR 5223 into the USGS e-mails (i.e., review of USGS work on the infiltration model, data, and software), an individual identified that approximately 35 USGS technical data information forms in ATDT had been changed, but the corresponding record for the change does not exist in RIS.

It then adds that it will be added to CR 6334. This is that addition.

USGS DTNS WITHOUT CORRECTED TDIFS IN RISWEB

	DTN	TDIF #
1	GS030908315121.001	315500
2	GS000208312111.002	309886
3	GS000208312111.003	309955
4	GS000408312231.003	310387
5	GS000408312231.004	310536
6	GS000508312231.005	310546
7	GS000508312231.006	310623
8	GS000508312231.007	310649
9	GS010408312111.001	311911
10	GS920508312231.012	300453



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11	GS930108312231.006		300935			
12	GS940408312231.004		303173			
13	GS940508312231.006		303221			
14	GS941208312121.001		303850			
15	GS950308312231.002		304164			
16	GS950408312231.004		304288			
17	GS950608312231.008		304430			
18	GS950708312211.002	304577				
19	GS951108312231.009	305056				
20	GS951108312231.010	305057				
21	GS951108312231.011	305058				
22	GS960108312211.002	305148				
23	GS960808312231.001	305620				
24	GS960808312231.003	305639				
25	GS960808312231.004	305636				
26	GS960808312231.005	305637				
27	GS960908312121.001	305767				
28	GS950608312231.006	304420				
29	GS950808312212.001	304638				
30	GS960108312212.001	305244				
31	GS950408312231.005	304289				
32	GS980708312242.011	306976				
33	GS980808312242.012	307000				
34	GS980908312242.038	307266				



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35	GS980908312242.039	307267				

**Possible Solution:**

Possible solutions to the items identified in the condition description are:

- 1) The upper present-day climate as used in the INFIL model needs to be investigated and verified. Then, the documentation of the INFIL model and associated DTNs must be made consistent.
- 2) Equations 6-8 through 6-11, and the results of the subroutine SOLRAD must be checked for accuracy. Then the INFIL code should be checked for accuracy in order to resolve this apparent discrepancy between sources of PET values for the area.
- 3) Upon detailed review of the INFIL documentation and model files, any discrepancies will need to be corrected and documented.
- 4) The parameters for the Hobbs and Nogales analogue climate files need to be made consistent.
- 5) The errors in the spreadsheets need to be corrected. Then, revised output from the spreadsheets needs to be implemented in a revision of the INFIL model.
- 6) The hardcopy listing of the mod3ppt file in the AMR will be made complete.
- 7) Additional work is needed to resolve the last remaining issue with respect to CR 5071 by trial-and-error model runs in order to reproduce the 9th of the 9 infiltration basecase maps. This should be done as part of an overall revision to INFIL.
- 8) The discrepancy in streamflow data location may be resolved with a more detailed look at the associated DTNs and notebooks. If not, then a GPS survey of the location in the field should provide location information accurate enough to determine which of the two locations is correct.



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General. An ongoing effort to verify the validity of the INFIL model and associated data will address each of these items in turn. The work of the Infiltration Technical Team Special Project will address each of these items as part of their work.

**Requirement Involved?** Yes  
**Requirement:** LP-SIII.10Q-BSC Rev 0 ICN 1

**Recommended CR Level:**  
**Resolved / Closed?** No  
**CAQ / Q NCR?** Yes  
**DOE Scope?** No

**Business Process:**  
**Business Process ID:**

**Immediate Action Taken?** No  
**Immediate Action Desc:**

**Affected Resources:**

### Condition Information

### Assignment Information

<b>Ownership Organization:</b>	Infiltration Technical Tm	<b>Oversight Organization:</b>	Postclosure & License Acq
<b>Responsible Organization:</b>	Infiltration Technical Tm	<b>Oversight Lead:</b>	Smistad, Eric
<b>Business Process Review Org:</b>		<b>Quality Assurance Rep (QAR):</b>	Svalstad, Darrell

### Assignment Information

### Screening Information

<b>CR Level:</b> B	<b>Category:</b> Human Perform	<b>Date Submitted:</b> 8/23/2005	<b>Date Issued:</b> 8/24/2005
<b>CST / MRC Conclusions:</b> 8.24.05 M. Cleveland/CAP Staff Significance Determination established at Level B. DOE Scope field was changed from Yes to No.			

### Screening Information



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### Evaluation Information

#### Extent of Condition:

2/26/2006 (Tom Reynolds): The CR 6334 extent of condition is limited to that population of older (pre-2002) analysis/model reports (AMRs) which were substantially updated, including new model validation work, by the Regulatory Integration Team (RIT).

This is because the CR 6334 condition was caused when an AMR (ANL-NBS-HS-000032 Rev 00) that had not had a full revision under AP-SIII.10Q (Models) was revised by the RIT using a new document identifier number (MDL-NBS-HS-000023 Rev 00). This revision involved substantial additional model validation, and a new format, because the requirements for model validation and software were substantially changed in AP-SIII.10Q, from those in AP-3.10Q (Analyses and Models).

ANL-NBS-HS-000032 was prepared under AP-3.10Q. ANL-NBS-HS-000032 Rev 000 was effective on 26-Jul-2000. AP-SIII.10Q Rev 000 ICN 0 (Models) was effective on 21-Dec-2001. Therefore, the CR 6334 extent of condition is limited to those older AMRs that were revised by the RIT, including additional model validation work. The subject older AMRs are those that were approved prior to 21-Dec-2001, and have had only ICNs or Errata since then.

Other CRs have identified conditions similar to the CR 6334 condition. Examples include CRs 5384 and 5438, which had to do with information that was incompletely transmitted from an old AMR to a new AMR with different authors. Note that unlike CR 6334, CRs 5384 and 5438 have to do with a new AMR, not a revision to an old one.

Finally, other CRs such as 3235 and 5559 have addressed or are addressing the overall technical document checking process. However these are of limited applicability to CR 6334, since the CR 6334 issue only concerns the performance of the checking process under limited, specialized conditions (RIT revision of older technical documents). Therefore, the CR 6334 condition has very limited process implications.

#### Impact of Condition:

2/26/2006 (Tom Reynolds): Under AP-16.1Q Rev 8 ICN 6 (Condition Reporting and Resolution), it is not required for a B-level CR to document the impact relative to waste isolation, safety, or quality.

#### CR Previous Similar Event(s):

2/26/2006 (Tom Reynolds): As discussed under Extent of Condition, similar conditions have been documented in CRs 5384 and 5438. CR 7627 has been initiated to address data issues related to CR 6334.

Functional Evaluation Req?	Hold Tag Applied?	Effectiveness Rev Required?	No	Effectiveness Rev Days
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Functional Evaluations

FEV Num	Title	Cond. Release Disposition	Step Entry Date	Step
< NO FUNCTIONAL EVALUATIONS CREATED FOR THIS CONDITION REPORT >				

**Evaluation Information**

**Cause Analysis Information**

**Cause Analysis Type:** Apparent Cause

**Cause Analysis Results:**

2/26/2006 (Tom Reynolds): The CR 6334 condition has to do with a variety of software, technical, and editorial issues and errors that have been found in the analysis/model report (AMR) Simulation of Net Infiltration for Present-Day and Future Climates (MDL-NBS-HS-000023 Rev 00). Many of these issues and errors were carried forward from an older AMR (Simulation of Net Infiltration for Modern and Future Climates, ANL-NBS-HS-000032) without being detected. Thus, the appropriate event codes to document errors that were created and carried forward into future revisions without being detected are as follows:

EVENT CODES

PA-B: Performance Assessment and Confirmation - Data

PA-C: Performance Assessment and Confirmation - Analysis

PA-D: Performance Assessment and Confirmation - Models

These issues and errors were caused by inadequate document preparation and checking in both ANL-NBS-HS-000032 and MDL-NBS-HS-000023 Rev 00. The inadequate document preparation and checking in both AMRs was caused by human performance (skill and knowledge based errors).

The inadequate document preparation and checking in MDL-NBS-HS-000023 Rev 00 was also caused by RIT management guidance for a limited, narrowly focused review that was too limited for the types of changes in MDL-NBS-HS-000023 Rev 00. These changes were incurred by adding new technical material on model validation and calibration, which was necessary in updating an older AMR (ANL-NBS-HS-000032) to a new procedure.



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Thus, the appropriate Cause Codes are as follows:

#### CAUSE CODES

A3B1: Human Performance/Skill Based Error

A3B3: Human Performance/Knowledge Based Error

A4B5: Management Problem/Change Management LTA

#### Recurrence Control:

2/26/2006 (Tom Reynolds): CR 6334 is focused primarily on identifying and correcting the issue and errors in infiltration, because that is the scope of the Infiltration Technical Team Special Project (ITTSP). Therefore, recurrence control outside of infiltration will be accomplished through action 6334-004. Specifically, this action will require an evaluation of the results of action 6334-003. Action 6334-004 will require the development of appropriate recurrence control measures, if the results of action 6334-003 indicate that other older AMRs that were revised by the RIT contain issues or errors comparable to those documented in CR 6334.

#### Investigation Findings:

2/26/2006 (Tom Reynolds):

#### PROBLEM STATEMENT:

A review of the analysis/model report (AMR) Simulation of Net Infiltration for Present-Day and Future Climates (MDL-NBS-HS-000023 Rev 00) initially identified eight issues or errors that need to be addressed in the report. Ongoing evaluation by the Infiltration Technical Team Special Project (ITTSP) has revealed more issues or errors that need to be addressed in the report. These issues are documented in the attached database named ITTSP CR database R3.mdb. Please note that this database is being regularly updated, and that the file ITTSP CR database R3.mdb is the most recent version to date.

The other attached files such as Table 6.xls are also included for convenience, because they are cited within the file ITTSP CR database R3.mdb.

#### APPARENT CAUSE EVALUATION METHODOLOGY:



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This apparent cause evaluation was conducted using the Why Staircase methodology. The Why Staircase was implemented via personnel interviews and technical document reviews. A Why Tree Structure graphic can be found in the attached file named CR6334\_Why\_Tree\_Structure\_2\_26a.xls.

#### APPARENT CAUSE EVALUATION FINDINGS:

##### a) What Caused the CR 6334 Issues?

Evaluation of MDL-NBS-HS-000023 Rev 00 shows that the CR 6334 issues were caused by a combination of software, technical adequacy, and editorial errors. These issues and errors affect the traceability and transparency of MDL-NBS-HS-000023 Rev 00.

##### b) What Caused the Software, Technical Adequacy, and Editorial Issues?

MDL-NBS-HS-000023 Rev 00 is a revision of an older AMR named Simulation of Net Infiltration for Modern and Future Climates (ANL-NBS-HS-000032 Rev 00), which dates from June 2000. MDL-NBS-HS-000023 Rev 00 was created by the Regulatory Integration Team (RIT), and became effective in November 2004.

ANL-NBS-HS-000032 Rev 00 had been given two ICNs and two Errata, but no full revision, prior to being revised by the RIT. Review of both ANL-NBS-HS-000032 Rev 00 (including subsequent ICNs and Errata), and MDL-NBS-HS Rev 00, indicates that approximately 85% of the CR 6334 issues originated in ANL-NBS-HS-000032 but were not caught by checking in either ANL-NBS-HS-000032 or MDL-NBS-HS-000023. Thus, the CR 6334 software, technical adequacy, and editorial issues were caused by inadequate technical document preparation and checking in both ANL-NBS-HS-000032 and MDL-NBS-HS-000023.

##### c) Why were the CR 6334 Issues Not Caught During Preparation and Checking of ANL-NBS-HS-000032 Rev 00?



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The personnel who prepared and checked ANL-NBS-HS-000032 Rev 00 were not available for interview during this apparent cause analysis. Based on review of ANL-NBS-HS-000032 Rev 00, human performance (skill based error) is the most likely explanation for why the ANL-NBS-HS-000032 Rev 00 preparation and checking were inadequate.

d) Why were the CR 6334 Issues Not Detected During Preparation and Checking of MDL-NBS-HS-000023 Rev 00?

As noted in section b) above, the CR 6334 issues were not detected in MDL-NBS-HS-000023 Rev 00 because of inadequate checking.

MDL-NBS-HS-000023 Rev 00 received inadequate checking because of inadequate attention to detail and a lack of rigorous, verbatim use of the procedure on the part of the document preparers and checkers. For example, one of the checkers approved the document even though that person stated in interview that they had not received all of the requested support material. Interviews with checkers also indicated that they had a perception of schedule pressure.

In addition, one checker was not checker-trained (this is a human performance-knowledge based error). This was confirmed by asking the individual, and by a search of the training records. This checker was responsible for section 7 (model validation), which was the major reason for the creation of MDL-NBS-HS-000023 Rev 00. CR 6938 has been created to document this lack of training.

MDL-NBS-HS-000023 Rev 00 is a revision of a four year old AMR (ANL-NBS-HS-000023 Rev 00). MDL-NBS-HS-000023 Rev 00 was prepared in accordance with a different procedure (AP-SIII.10Q, Models) from AP-3.10Q (Analyses and Models), which was used to prepare the older AMR ANL-NBS-HS-000032 Rev 00. The requirements for model validation and software verification in AP-SIII.10Q were quite different from those in AP-3.10Q. Meeting these new requirements produced substantial changes in MDL-NBS-HS-000023 Rev 00. For example, MDL-NBS-HS-000023 Rev 00 section 6 is nearly twice as long as ANL-NBS-HS-000032 Rev 00 Section 6.

The implementing plan for MDL-NBS-HS-000023 Rev 00 was TWP-MGR-HS-000001 Rev 00 (Technical Work Plan for: Unsaturated Zone Flow Analysis and Model Report Integration). In section 1.2.3, this plan required the recalibration of the infiltration model and the improvement of model validation, as well as the conversion of ANL-NBS-HS-000032 Rev 00 into an AP-SIII.10Q document.

Following RIT management guidance, MDL-NBS-HS-000023 Rev 00 checking focused only on changes made by the RIT. The Change History section of MDL-NBS-HS-000023 Rev 00 says (quote)...The entire model documentation was revised. Changes were too extensive to use Step 5.8f)1) per AP-



OCRWM Corrective Action Program  
**Condition Report**  
**Current Record Report**



CR Num	CR Level	CR Type	Step Entry Date	Step	Step Resp	Step Owner
6334	B	CAQ	2/27/2006 6:56:47 PM	Oversee Implementation	Nieder-Westermann, Gerald	Nieder-Westermann, Gerald

SIII.10Q REV 02, ICN 07 (end quote). The cited requirement, Step 5.8f)1) refers to the use of change bars to mark which parts of the text were changed. However, if the entire model documentation was revised, and change bars were not used, then in effect the whole document should have been checked because the changes were not identified.

In addition, the substantive changes to infiltration model calibration and validation in MDL-NBS-HS-000023 Rev 00 should have caused the entire model documentation to be checked. This can be seen by the issues in the attached database, many of which involve calculation or input transcription or software errors. These errors should have been caught during model validation, recalibration, and confidence as described in TWP-MGR-HS-000001 Rev 00 section 2.2.1.2. Examples include issues number 15, number 48, and number 61.

Thus, the CR 6334 issues and errors were not caught during preparation and checking of MDL-NBS-HS-000023 Rev 00 because of a combination of human performance on the part of the checkers in particular, but also because of conflicting management guidance as to the scope of the document revision and checking. MDL-NBS-HS-000023 Rev 00 was treated as a limited revision, even though converting ANL-NBS-HS-000032 Rev 00 to an AP-SIII.10Q document required substantial additional model calibration and verification. The changes made in MDL-NBS-HS-000023 Rev 00 were so numerous that change bars were not used, making it difficult or even impossible to check only those parts of the document that had changed.

**Probable Solution:**

2/26/2006 (Tom Reynolds): Continue evaluation of Simulation of Net Infiltration for Present-Day and Future Climates (MDL-NBS-HS-000023 Rev 00) in order to identify further CR 6334-type issues or errors. Create and maintain a database in which to track those issues or errors. Resolve and close those issues or errors as applicable. Finally, evaluate other analysis/model reports (AMRs) similar to MDL-NBS-HS-000023 Rev 00, that are RIT revisions of



**OCRWM Corrective Action Program**  
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CR Num	CR Level	CR Type	Step Entry Date	Step	Step Resp	Step Owner
6334	B	CAQ	2/27/2006 6:56:47 PM	Oversee Implementation	Nieder-Westermann, Gerald	Nieder-Westermann, Gerald

AMRs that had not been previously updated under AP-SIII.10Q (Models), to see if they contain CR 6334-type issues or errors. If they are found, create new CRs as applicable to address those issues or errors.

**LL/GI Required?** No

**Reason LL/GI Not Performed:**

2/16/2006 (Tom Reynolds): The CR 6334 condition is highly focused on the revision and updating of scientific documents under unique circumstances. Therefore it is of limited applicability to the Project at large.

**Cause Analysis Team Members**

Team Member Name	Team Member Organization
Burningham-MS, Andrew	Management Systems
Beach, Charles	Infiltration Technical Tm
Nieder-Westermann, Gerald	Performance Assessmnt Ops
Reynolds-PCA, Thomas	Post Closure Activities

**Cause Code(s):**

- A3B1 - Human Performance Error - Skill Based Error
- A3B3 - Human Performance Error - Knowledge Based Error
- A4B5 - Management Problem - Change Management LTA

**Event Code(s):**

- PAB - PA Conf Data
- PAC - PA Conf Analysis
- PAD - PA Conf Model

**Cause Analysis Information**

**Plan Information**

<b>Plan Due Date:</b> 9/23/2005	<b>Completion Goal Date:</b> 10/23/2005	<b>Date Completed:</b>
<b>Plan Completed Date:</b> 2/16/2006	<b>Original Est Comp Date:</b> 8/4/2006	<b>Date Closed:</b>
	<b>Current Est Comp Date:</b> 9/1/2006	
<b>Actions Required?</b> Yes	<b>Verify Actions?</b> Yes	



**OCRWM Corrective Action Program**  
**Condition Report**  
**Current Record Report**



CR Num	CR Level	CR Type	Step Entry Date	Step	Step Resp	Step Owner
6334	B	CAQ	2/27/2006 6:56:47 PM	Oversee Implementation	Nieder-Westermann, Gerald	Nieder-Westermann, Gerald

**Corrective Action Plan Summary:**

2/26/2006 (Tom Reynolds): The CR 6334 corrective action plan consists of four essential actions.

In the first essential action, the issues and errors documented in the CR 6334 database will be resolved as appropriate. This database was created to document the ongoing evaluation for additional CR 6334 issues and errors in the analysis/model report (AMR) Simulation of Net Infiltration for Present-Day and Future Climates (MDL-NBS-HS-000023 Rev 00). Please note that any issues in the database that are potential conditions adverse to quality (CAQs) will be resolved under CR 6334. Additional CRs will be written as necessary or applicable, to document issues in the database. If additional CRs are written, then they will be identified in the database.

In the second essential action, the CR 6334 database will be maintained. New issues will be added as appropriate, based on ongoing evaluation of MDL-NBS-HS-000023 Rev 00.

In the third essential action, other older AMRs that were revised or updated by RIT will be sampled, to see if CR 6334 issues exist in them as well as in MDL-NBS-HS-000023 Rev 00. If they do exist, they will be addressed in new CRs.

In the fourth essential action, the results of the survey in the third essential action will be used to develop and implement recurrence control measures as appropriate.

Action	Title	Type	Accepting Org / Assigned To Org	Step Entry Date	Step
6334-001	Resolve issues in attached database	Essential	Infiltration Technical Tm /	10/21/2005 1:55:26	Plan Action
6334-001	Resolve issues in attached database	Essential	Infiltration Technical Tm / Infiltration Technical Tm	10/21/2005 2:06:26	Accept Action
6334-001	Resolve issues in attached database	Essential	Infiltration Technical Tm / Infiltration Technical Tm	1/26/2006 10:22:14	Perform Action
6334-001	Resolve issues in attached database	Essential	Infiltration Technical Tm / Infiltration Technical Tm	2/16/2006 1:40:52 PM	Plan Action
6334-001	Resolve issues in attached database	Essential	Infiltration Technical Tm / Infiltration Technical Tm	2/16/2006 4:47:47 PM	Perform Action
6334-001	Resolve issues in attached database	Essential	Infiltration Technical Tm / Infiltration Technical Tm	2/24/2006 6:36:12 PM	Plan Action
6334-001	Resolve issues in attached database	Essential	Infiltration Technical Tm / Infiltration Technical Tm	2/27/2006 4:07:11 PM	Perform Action



**OCRWM Corrective Action Program**  
**Condition Report**  
**Current Record Report**



CR Num	CR Level	CR Type	Step Entry Date	Step	Step Resp	Step Owner
6334	B	CAQ	2/27/2006 6:56:47 PM	Oversee Implementation	Nieder-Westermann, Gerald	Nieder-Westermann, Gerald
6334-002	Maintain database of issues		Essential	Infiltration Technical Tm /	10/21/2005 2:40:02	Plan Action
6334-002	Maintain database of issues		Essential	Infiltration Technical Tm / Infiltration Technical Tm	10/21/2005 2:43:44	Accept Action
6334-002	Maintain database of issues		Essential	Infiltration Technical Tm / Infiltration Technical Tm	10/24/2005 1:16:22	Perform Action
6334-002	Maintain database of issues		Essential	Infiltration Technical Tm / Infiltration Technical Tm	2/16/2006 1:41:27 PM	Plan Action
6334-002	Maintain database of issues		Essential	Infiltration Technical Tm / Infiltration Technical Tm	2/16/2006 4:48:24 PM	Perform Action
6334-003	Evaluate other Older AMRs for Comparable Issues		Essential	Post Closure Activities /	2/9/2006 1:57:19 PM	Plan Action
6334-003	Evaluate other Older AMRs for Comparable Issues		Essential	Post Closure Activities / Post Closure Activities	2/16/2006 4:48:55 PM	Accept Action
6334-003	Evaluate other Older AMRs for Comparable Issues		Essential	Post Closure Activities / Post Closure Activities	4/18/2006 4:42:35 PM	Perform Action
6334-004	Evaluate 6334-003 Results for Appropriate Recurrence Control		Essential	Post Closure Activities /	2/27/2006 1:28:35 PM	Plan Action
6334-004	Evaluate 6334-003 Results for Appropriate Recurrence Control		Essential	Post Closure Activities / Post Closure Activities	2/27/2006 4:12:13 PM	Accept Action
6334-004	Evaluate 6334-003 Results for Appropriate Recurrence Control		Essential	Post Closure Activities / Post Closure Activities	4/18/2006 4:43:35 PM	Perform Action

**Plan Information**

**Review Information**

**Supv Review Plan**

Step Completion Date	Person that performed review	Plan Approval Indicator and Comments, if any
2/16/2006 5:15:41 PM	Nieder-Westermann, Gerald	Yes 02/16/2006 (G.H. Nieder-Westermann) I accept the plan to resolve the infiltration related issues as described in the CR plan.
2/27/2006 4:21:54 PM	Nieder-Westermann, Gerald	Yes 02/27/2006 (G.H. Nieder-Westermann) I have reviewed and concur with the plan as presented in this CR.



**OCRWM Corrective Action Program**  
**Condition Report**  
**Current Record Report**



CR Num	CR Level	CR Type	Step Entry Date	Step	Step Resp	Step Owner
6334	B	CAQ	2/27/2006 6:56:47 PM	Oversee Implementation	Nieder-Westermann, Gerald	Nieder-Westermann, Gerald

**QA Review Plan**

Step Completion Date	Person that performed review	Plan Approval Indicator and Comments, if any
2/16/2006 5:43:09 PM	Svalstad, Darrell	Yes 02/16/06 - Darrell Svalstad - I have reviewed the response to CR-6334, find that the response meets AP-16.1Q requirements, and concur with the submitted corrective action plan.
2/27/2006 6:56:47 PM	Svalstad, Darrell	Yes 02/27/06 - Darrell Svalstad - I have reviewed the revised response to CR-6334, find that the response meets AP-16.1Q requirements, and concur with the submitted corrective action plan, which includes the addition of action 6334-004.

**Oversee Implementation**

Step Completion Date	Person that performed review	Implementation Done Indicator and Comments, if any
2/24/2006 6:35:26 PM	Nieder-Westermann, Gerald	No 02/24/2006 (G.H. Nieder-Westermann)  Back routed to Plan CR to address management comments.

CR currently in this step

**Review Information****CR Attachments**

Filename	Size	Date
<a href="#">B-4 analysis.doc</a>	57 kb	
<a href="#">CR6334 Why Tree Structure 2 26a.xls</a>	20 kb	
<a href="#">INFL 2.doc</a>	22 kb	
<a href="#">INFL IMPACT EVALUATION.doc</a>	22 kb	
<a href="#">ITTSP CR database R3.mdb</a>	688 kb	
<a href="#">MARKOV IMPACT EVALUATION.doc</a>	23 kb	
<a href="#">MOD3PPT1.XLS</a>	7322 kb	
<a href="#">PPTSIM IMPACT EVALUATION.doc</a>	20 kb	
<a href="#">Table 6.xls</a>	18 kb	
<a href="#">Table 6.xls</a>	18 kb	
<a href="#">weightfact.xls</a>	45 kb	
<a href="#">wtfactor.mcd</a>	8 kb	



OCRWM Corrective Action Program  
**Condition Report**  
**Current Record Report**



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CR Num	CR Level	CR Type	Step Entry Date	Step	Step Resp	Step Owner
6334	B	CAQ	2/27/2006 6:56:47 PM	Oversee Implementation	Nieder-Westermann, Gerald	Nieder-Westermann, Gerald

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[CR Attachments](#)



OCRWM Corrective Action Program
<b>Condition Report</b>
<b>Current Record Report</b>
Corrective Action Report



CR Num	Action Num	Step Entry Date	Step	Step Resp	Step Owner
6334	6334-001	2/27/2006 4:07:11	Perform Action		Nieder-Westermann, Gerald

**Routing Notes:**

Jan 31 2006 (Staci Hanson) CA Accepting Org changed from Infiltration Technical Tm to Infiltration Technical Tm, and CA Assigned To Org changed from Infiltration Technical Tm to Infiltration Technical Tm based on organizational structure changes.

**Action Details**

<b>Action Number:</b> 6334-001	<b>Current Due Date:</b> 7/28/2006	<b>Date Completed:</b>	<b>Date Closed:</b>
<b>Action Type:</b> Essential	<b>Original Due Date:</b> 4/28/2006		
<b>Accepting Org:</b> Infiltration Technical Tm	<i>Nieder-Westermann, Gerald</i>	<b>Milestone:</b>	
<b>Assigned To Org:</b> Infiltration Technical Tm	<i>Nieder-Westermann, Gerald</i>	<b>Site:</b> Las Vegas	
<b>Action Title:</b> Resolve issues in attached database			

**Action Description:**

Resolve issues described in attached database (ITTSP CR database.mdb)

Objective evidence of completion will be the resolution of each issue recorded in the database and the signed cover and pertinent pages of the revised infiltraion model or other documents as appropriate.

**Action Taken:**

**Action Details**

**Action Adjustments**

Adjustment Num	Adjustment Title	Proposed Due Date	Step
< NO ADJUSTMENTS LINKED TO THIS CORRECTIVE ACTION >			

**Action Adjustments**

**Action Attachments**

Filename	Size	Date
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OCRWM Corrective Action Program
<b>Condition Report</b>
<b>Current Record Report</b>
Corrective Action Report



CR Num	Action Num	Step Entry Date	Step	Step Resp	Step Owner
6334	6334-001	2/27/2006 4:07:11	Perform Action		Nieder-Westermann, Gerald
				<a href="#">B-4 analysis.doc</a>	57 kb
				<a href="#">INFL 2.doc</a>	22 kb
				<a href="#">INFL IMPACT EVALUATION.doc</a>	22 kb
				<a href="#">MARKOV IMPACT EVALUATION.doc</a>	23 kb
				<a href="#">PPTSIM IMPACT EVALUATION.doc</a>	20 kb

**Action Attachments**



OCRWM Corrective Action Program
<b>Condition Report</b>
<b>Current Record Report</b>
Corrective Action Report



CR Num	Action Num	Step Entry Date	Step	Step Resp	Step Owner
6334	6334-002	2/16/2006 4:48:24	Perform Action		Nieder-Westermann, Gerald

**Routing Notes:**

Jan 31 2006 (Staci Hanson) CA Accepting Org changed from Infiltration Technical Tm to Infiltration Technical Tm, and CA Assigned To Org changed from Infiltration Technical Tm to Infiltration Technical Tm based on organizational structure changes.

**Action Details**

<b>Action Number:</b> 6334-002	<b>Current Due Date:</b> 7/28/2006	<b>Date Completed:</b>	<b>Date Closed:</b>
<b>Action Type:</b> Essential	<b>Original Due Date:</b> 4/28/2006		
<b>Accepting Org:</b> Infiltration Technical Tm	<i>Nieder-Westermann, Gerald</i>	<b>Milestone:</b>	
<b>Assigned To Org:</b> Infiltration Technical Tm	<i>Nieder-Westermann, Gerald</i>	<b>Site:</b> Las Vegas	
<b>Action Title:</b> Maintain database of issues			

**Action Description:**

Maintain database of issues. Add issues as necessary. This method (maintenance of a database) has been approved by the MRC.

Objective evidence for closure will be closure of all database items signified by documentation, in the database, of resolution activities for each item in the database.

**Action Taken:**

**Action Details**

**Action Adjustments**

Adjustment Num	Adjustment Title	Proposed Due Date	Step
< NO ADJUSTMENTS LINKED TO THIS CORRECTIVE ACTION >			

**Action Adjustments**

**Action Attachments**

Filename	Size	Date
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<p>OCRWM Corrective Action Program</p> <p><b>Condition Report</b></p> <p><b>Current Record Report</b></p> <p>Corrective Action Report</p>
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CR Num	Action Num	Step Entry Date	Step	Step Resp	Step Owner
6334	6334-002	2/16/2006 4:48:24	Perform Action		Nieder-Westermann, Gerald
<a href="#">IMSE CR 6334 Issues Tracking final 2-6-06.xls</a>				284 kb	
<a href="#">ITTSP CR database R4.mdb</a>				688 kb	

**Action Attachments**



CR Num	Action Num	Step Entry Date	Step	Step Resp	Step Owner
6334	6334-003	4/18/2006 4:42:35	Perform Action	Jaeger, Michael	Watson, William

**Routing Notes:****Action Details**

<b>Action Number:</b>	6334-003	<b>Current Due Date:</b> 7/28/2006	<b>Date Completed:</b>	<b>Date Closed:</b>
<b>Action Type:</b>	Essential	<b>Original Due Date:</b> 7/28/2006		
<b>Accepting Org:</b>	Post Closure Activities	<i>Watson, William</i>	<b>Milestone:</b>	
<b>Assigned To Org:</b>	Post Closure Activities	<i>Watson, William</i>	<b>Site:</b>	Las Vegas
<b>Action Title:</b>	Evaluate other Older AMRs for Comparable Issues			

**Action Description:**

2/16/2006 (Tom Reynolds): Post Closure Activities (PCA) will identify all Analysis/Model Reports (AMRs) that were revised under similar conditions to the AMR named Simulation of Net Infiltration for Present-Day and Future Climates (MDL-NBS-HS-000023 Rev 00). Namely, PCA will identify all AMRs that were revised by the Regulatory Integration Team (RIT), that had not been previously revised under AP-SIII.10Q (Models).

PCA will evaluate 10 percent, or a minimum of 5, of those AMRs that were revised under similar conditions to MDL-NBS-HS-000023 Rev 00. This 10 percent, or a minimum of 5, will be chosen from those AMRs that had the most RIT changes, or have the most potential impact on the License Application, or both. The purpose of this evaluation will be to determine if CR6334-type issues or errors exist in those AMRs as well as in MDL-NBS-HS-000023 Rev 00. If CR6334-type issues or errors are found in those other AMRs, then the extent of condition will be reevaluated at that time. In addition, PCA will initiate new CRs to document and address those issues or errors.

Objective evidence of completion will be a memo documenting the names and numbers of all the AMRs that were identified as having been revised under similar conditions to MDL-NBS-HS-000023 Rev 00. This memo will also identify which AMRs were evaluated, by name and number, the reasons why they were chosen for evaluation, and the results of each evaluation.



OCRWM Corrective Action Program
<b>Condition Report</b>
<b>Current Record Report</b>
Corrective Action Report



<b>CR Num</b> 6334	<b>Action Num</b> 6334-003	<b>Step Entry Date</b> 4/18/2006 4:42:35	<b>Step</b> Perform Action	<b>Step Resp</b> Jaeger, Michael	<b>Step Owner</b> Watson, William
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If CR6334-type issues or errors are found in other AMRs, then this memo will document the numbers of the new Condition Report or Reports (CRs) that were initiated to document the issues or errors found in the other AMRs. The memo will be attached electronically to this action.

**Action Taken:**

[Action Details](#)

[Action Adjustments](#)

Adjustment Num	Adjustment Title	Proposed Due Date	Step
< NO ADJUSTMENTS LINKED TO THIS CORRECTIVE ACTION >			

[Action Adjustments](#)

[Action Attachments](#)

Filename	Size	Date
< NO ATTACHMENTS LINKED TO THIS CORRECTIVE ACTION >		

[Action Attachments](#)



**OCRWM Corrective Action Program**  
**Condition Report**  
**Current Record Report**  
**Corrective Action Report**



<b>CR Num</b> 6334	<b>Action Num</b> 6334-004	<b>Step Entry Date</b> 4/18/2006 4:43:35	<b>Step</b> Perform Action	<b>Step Resp</b> Jaeger, Michael	<b>Step Owner</b> Watson, William
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**Routing Notes:**

**Action Details**

<b>Action Number:</b>	6334-004	<b>Current Due Date:</b>	8/25/2006	<b>Date Completed:</b>		<b>Date Closed:</b>	
<b>Action Type:</b>	Essential	<b>Original Due Date:</b>	8/25/2006	<b>Milestone:</b>			
<b>Accepting Org:</b>	Post Closure Activities		<i>Watson, William</i>	<b>Site:</b>	Las Vegas		
<b>Assigned To Org:</b>	Post Closure Activities		<i>Watson, William</i>				
<b>Action Title:</b>	Evaluate 6334-003 Results for Appropriate Recurrence Control						

**Action Description:**

2/27/2006 (Tom Reynolds): Post Closure Activities (PCA) will evaluate the results of action 6334-003 as to the number of other older AMRs that were revised by the RIT, if any, that contain CR 6334 type issues and errors. Based on these results, PCA will develop and implement appropriate recurrence control measures and document them in an email. If no recurrence control measures are necessary, then PCA will document that outcome in an email.

Objective evidence of completion will be an email documenting what recurrence controls were implemented, if any. The email will be attached electronically to this action.

**Action Taken:**

**Action Details**

**Action Adjustments**

Adjustment Num	Adjustment Title	Proposed Due Date	Step
< NO ADJUSTMENTS LINKED TO THIS CORRECTIVE ACTION >			

**Action Adjustments**



OCRWM Corrective Action Program
<b>Condition Report</b>
<b>Current Record Report</b>
Corrective Action Report



<b>CR Num</b> 6334	<b>Action Num</b> 6334-004	<b>Step Entry Date</b> 4/18/2006 4:43:35	<b>Step</b> Perform Action	<b>Step Resp</b> Jaeger, Michael	<b>Step Owner</b> Watson, William
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**Action Attachments**

Filename	Size	Date
< NO ATTACHMENTS LINKED TO THIS CORRECTIVE ACTION >		

[Action Attachments](#)

# **Appendix A11.2**

## **CR 6334 Additional Issues**

# CR Table

<b>ID</b>	1	<b>Type</b>	Editorial
<b>Document</b>	MDL-NBS-HS-000023	<b>Initiator</b>	Beach
<b>Title</b>	DIRS minor errors		
<b>Description</b>	DIRS 146816 should list Table 6-6 also. DIRS 147228 should also list Fig 6-7 and delete reference to fig 6-4		
<b>Extent of condition</b>	Unique to infiltration AMR		
<b>Requirement</b>			
<b>Immediate Action</b>	No		
<b>Resolution</b>			
<b>CR number</b>	6334	<b>Attachments</b>	No
<b>ID</b>	2	<b>Type</b>	Editorial
<b>Document</b>	MDL-NBS-HS-000023	<b>Initiator</b>	Beach
<b>Title</b>	AMR has two sections 9.2		
<b>Description</b>	AMR has two sections 9.2, the second should be 9.3.		
<b>Extent of condition</b>	Unique to infiltration AMR		
<b>Requirement</b>			
<b>Immediate Action</b>	No		
<b>Resolution</b>			
<b>CR number</b>	6334	<b>Attachments</b>	No
<b>ID</b>	3	<b>Type</b>	Editorial
<b>Document</b>	MDL-NBS-HS-000023	<b>Initiator</b>	Beach
<b>Title</b>	AMR table B-4 error		
<b>Description</b>	AMR Table B-4 value for column -n-, row -soil unit 5- should be 1.78 not 1.28. Source is DIRS 100147 Table 4 page 42.		
<b>Extent of condition</b>	Unique to infiltration AMR		
<b>Requirement</b>			
<b>Immediate Action</b>	No		
<b>Resolution</b>			
<b>CR number</b>	6334	<b>Attachments</b>	No

Monday, May 22, 2006

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<b>ID</b>	4	<b>Type</b>	Technical
<b>Document</b>	MDL-NBS-HS-000023	<b>Initiator</b>	Beach
<b>Title</b>	DIRS 100147 (The 1996 model) is incorrectly listed as indirect input.		
<b>Description</b>	<p>It should be direct input. For example, from section 5 of the AMR "The infiltration model documented in this model report is based on the assumption that the 1996 infiltration model, which was based on the distributed-parameter, water-balance approach and was calibrated using a variety of field data collected from 1984 through 1995, adequately represents the major features and processes controlling present-day and future infiltration at Yucca Mountain. The principal basis for the assumptions, discussed below, is that the resulting net-infiltration model quantitatively accounts for all major water inflow and outflow processes on a cell-by-cell basis and strictly imposes the conservation of total water mass within each model cell. The calculation results do not account for error propagation from the various components of the mass balance, such as measurement error associated with the various model inputs." And from section 6 of the AMR "The 1999 model development (USGS 2003 [DIRS 166518]) does not completely replace the 1996 model, but supplements and enhances the 1996 model, particularly with respect to evapotranspiration from the root zone and the infiltration of surface run-on in the channels of washes. " The new model should stand alone with appropriate justifications and explanations. Since the 1996 model is essential to assumptions and is not totally replaced in the model, it therefore seems likely it is direct input. Since the 1996 model is draft and conceptual and not an appropriate direct reference, suggest therefore, that the 1996 model be deleted as a reference and replaced appropriately with the inputs needed to support the model.</p>		
<b>Extent of condition</b>	Unique to infiltration AMR		
<b>Requirement</b>			
<b>Immediate Action</b>	No		
<b>Resolution</b>			
<b>CR number</b>	6334	<b>Attachments</b>	No

<b>ID</b>	5	<b>Type</b>	Technical																																																																		
<b>Document</b>	MDL-NBS-HS-000023	<b>Initiator</b>	Beach																																																																		
<b>Title</b>	AMR MDL-NBS-HS-000023 page B-7 references an equation 6.12 that does not seem to work (Refere																																																																				
<b>Description</b>	<p>AMR MDL-NBS-HS-000023 page B-7 references an equation 6.12 that does not seem to work as stated in the Soil physics textbook referenced. Seven other soil physics references from TIC were consulted to try and resolve the equation problem with no success.</p> <p>From the AMR, page B-7 -Saturated hydraulic conductivity was measured using a double-ring infiltrometer on soils in locations where it could be measured and then compared to conductivity simulated using textural data for the fine-soil fraction (less than 2 mm) by using Equation 6.12 of Soil Physics with BASIC Transport Models for Soil-Plant Systems (Campbell 1985 [DIRS 100565]). Log-log water-characteristic curves were determined using Equations 2.15, 2.16, 2.17, 2.18, 5.10, and 5.11 of Soil Physics with BASIC Transport Models for Soil-Plant Systems (Campbell 1985 [DIRS 100565]) and were converted to van Genuchten curves in Excel.-</p> <p>From the textbook Soil Physics with BASIC Transport Models for Soil-Plant Systems (Campbell 1985 [DIRS 100565]).(See soil physics chapter 6.doc)</p> <p>-6.4 CALCULATING SATURATED CONDUCTIVITY FROM SOIL TEXTURE DATA The relationships between moisture retention and soil texture in Chapter 5 and the result obtained in eq. 6.10 suggest that saturated conductivity might be related to soil texture. Engineers frequently use soil texture to estimate saturated conductivity for design purposes. Hydraulic Conductivities published by Israelsen and Hansen (1962) are given in Table 6.1 as examples. Table 6.1. Typical saturated hydraulic conductivities for soils of various texture. Values are given in g s m-3. Multiply by 10-3 to get kg s m-3.</p> <table border="1"> <thead> <tr> <th>Soil Texture</th> <th>Silt fraction</th> <th>Clay fraction</th> <th>ks*</th> <th>ks†</th> <th>ks‡</th> </tr> </thead> <tbody> <tr> <td>sand</td> <td>0.05</td> <td>0.05</td> <td>1.4 (0.7-7)</td> <td>1.3</td> <td>2.6</td> </tr> <tr> <td>Loamy sand</td> <td>0.10</td> <td>0.07</td> <td>1.0</td> <td>1.9</td> <td></td> </tr> <tr> <td>Sandy loam</td> <td>0.25</td> <td>0.10</td> <td>0.7(0.4-2)</td> <td>0.45</td> <td>0.9</td> </tr> <tr> <td>Silt loam</td> <td>0.65</td> <td>0.15</td> <td>0.07</td> <td>0.14</td> <td></td> </tr> <tr> <td>Loam</td> <td>0.40</td> <td>0.18</td> <td>0.4(0.2-0.6)</td> <td>0.17</td> <td>0.29</td> </tr> <tr> <td>Sandy clay loam</td> <td>0.13</td> <td>0.27</td> <td>0.36</td> <td>0.42</td> <td></td> </tr> <tr> <td>Silty clay loam</td> <td>0.55</td> <td>0.34</td> <td>0.05</td> <td>0.06</td> <td></td> </tr> <tr> <td>Clay loam</td> <td>0.35</td> <td>0.34</td> <td>0.2(0.1-0.4)</td> <td>0.11</td> <td>0.12</td> </tr> <tr> <td>Silty clay</td> <td>0.47</td> <td>0.47</td> <td>0.07(0.01-0.1)</td> <td>0.04</td> <td>0.03</td> </tr> <tr> <td>clay</td> <td>0.20</td> <td>0.60</td> <td>0.1(0.04-0.3)</td> <td>0.07</td> <td>0.03</td> </tr> </tbody> </table> <p>* From Israelsen and Hansen (1962). Numbers in parenthesis indicate range. † Calculated using eq 6.11. ‡ Calculated using eq 6.12 with C = 4X10-3 kg s m-3.</p> <p>Bloemen (1980) related saturated hydraulic conductivity and air entry potential to properties of the particle size distribution function. Campbell and Campbell (1982) correlated the hydraulic conductivity data from Bloemen (1980) with silt plus clay content of the soil to obtain  <math display="block">k_s = 2 \times 10^{-3} \exp[-4.26(ms + mc)] \quad (6.11)</math> where ms and mc are silt and clay mass fractions, and ks is in kg s m-3. Saturated conductivity calculated using eq. 6.11 with representative values for silt and clay contents are also shown in Table 6.1.  While eq. 6.11 has a generally correct response to texture, the numbers in Table 6.1 suggest too great a sensitivity to the silt fraction. An equation which weighs clay more heavily than silt would give better results. It would also help to have an equation which correctly predicts changes in ks with bulk density. Combining eqs. 6.10, 5.10, 2.15, and 2.17, gives  <math display="block">k_s = C \exp(-6.9 mc - 3.7 ms) \quad (6.12)</math> with C, a constant, to be evaluated from data. Best fit to data from several sources appears to occur when C = 4x10-3 kg s/m-3 which corresponds to a value for the constant in eq. 6.10 of 1x10-3 kg m s-3. Values for ks calculated using eq. 6.12 are shown in the last column of Table 6.1. These are generally in good agreement with the other values, but do not show the exaggerated silt sensitivity of eq. 6.11.  Bulk density dependence of ks is introduced by substituting ye from eq. 5.12 into eq. 6.10 in place of yes, which was used to obtain eq. 6.12. The resulting equation is  <math display="block">k_s = 4 \times 10^{-3} (1.3/rb)^{1.3b} \exp(-6.9 mc - 3.7 ms) \quad (6.12a)</math></p>			Soil Texture	Silt fraction	Clay fraction	ks*	ks†	ks‡	sand	0.05	0.05	1.4 (0.7-7)	1.3	2.6	Loamy sand	0.10	0.07	1.0	1.9		Sandy loam	0.25	0.10	0.7(0.4-2)	0.45	0.9	Silt loam	0.65	0.15	0.07	0.14		Loam	0.40	0.18	0.4(0.2-0.6)	0.17	0.29	Sandy clay loam	0.13	0.27	0.36	0.42		Silty clay loam	0.55	0.34	0.05	0.06		Clay loam	0.35	0.34	0.2(0.1-0.4)	0.11	0.12	Silty clay	0.47	0.47	0.07(0.01-0.1)	0.04	0.03	clay	0.20	0.60	0.1(0.04-0.3)	0.07	0.03
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A spreadsheet of table 6-1 shows that eq. 6.11 shows good agreement with the values in the table, but eq. 6.12 does not agree well. Since equation 6.12 is used in the AMR and the other equation (6.11) is reproducible, it appears there is an error in equation 6.12 in the textbook. (See Table 6.1 from soil physics.xls). Note that a constant of 4.4 instead of 4 shows good agreement in the table.

<b>Extent of condition</b>	Unique to infiltration AMR		
<b>Requirement</b>			
<b>Immediate Action</b>	No		
<b>Resolution</b>			
<b>CR number</b>	6334	<b>Attachments</b>	Yes
<b>ID</b>	6	<b>Type</b>	Technical
<b>Document</b>	MDL-NBS-HS-000023	<b>Initiator</b>	Beach
<b>Title</b>	Table B-4 from AMR MDL-NBS-HS-000023 is not traceable.(Error in table)		
<b>Description</b>	<p>AMR MDL-NBS-HS-000023 indicates B-4 is derived from DTNs:</p> <p>GS950708312211.002 [DIRS 146874] - "FY94 and FY95 Laboratory Measurements of Physical Properties of Surficial Materials at Yucca Mountain, Nevada."</p> <p>GS031208312211.001 [DIRS 171543] - "FY95 Lab Measurements of Physical Properties of Surficial Material, at Yucca Mountain, NV PART II."</p> <p>GS960108312211.002 [DIRS 149478] - "Gravimetric and Volumetric Water Content and Rock Fragment Content of 31 Selected Sites at Yucca Mountain, NV: FY95 Laboratory Measurements of Physical Properties of Surficial Material at Yucca Mountain, Part III."</p> <p>However, The table appears to be a composite of several samples not suitably correlated to the table. (See B-4 analysis.doc)</p>		
<b>Extent of condition</b>	Unique to infiltration AMR		
<b>Requirement</b>			
<b>Immediate Action</b>	No		
<b>Resolution</b>			
<b>CR number</b>	6334	<b>Attachments</b>	Yes

<b>ID</b>	8	<b>Type</b>	Technical
<b>Document</b>	MDL-NBS-HS-000023	<b>Initiator</b>	Beach
<b>Title</b>	AMR does not properly justify all assumptions (Scientific judgments) (Non-conservative assumptions,		
<b>Description</b>	<p>AMR does not properly justify all assumptions as required by LP-SIII.10Q -5.4.3 a. 5) Any assumption, data undergoing qualification per LP-SIII.2Q-BSC, or other input values are clearly identified and justified.-</p> <p>For example:</p> <p>A.In Appendix A -A3. SPREADSHEET CALCULATIONS Calculations in the spreadsheet MOD3-PPT.xls are done following a series of steps outlined in the first sheet of the file, and reiterated here. Step 1: Average daily precipitation is calculated for USGS weather stations WX1 and WX3 for the period July 17, 1987 through September 30, 1994. For gaps in the record, a value of zero is estimated.-</p> <p>No justification for assuming zero- is given. It seems likely this not a conservative assumption. This assumption is repeated in 6.9.3 and C4.</p> <p>B.In the same section -Step 3: An inverse-distance-squared interpolation is performed to estimate the mean daily precipitation for WX1 and WX3 for the period July 17, 1987 – July 30, 1994.-</p> <p>No justification given for this assumption.</p> <p>C. Use of log mean for hydraulic conductivity in section 7.7.2 and B-5 not justified.</p> <p>D. Section 5 states lateral flow is 3 to 6 meters in 30 days but does not show the work that results in that answer nor the justification.</p> <p>E. Section 6.9.2 uses a stochastic precipitation model to develop the 100-year simulation , but does not state the justification.</p>		
<b>Extent of condition</b>	Could apply to other AMRs		
<b>Requirement</b>	LP-SIII.10Q -5.4.3 a. 5)		
<b>Immediate Action</b>	No		
<b>Resolution</b>			
<b>CR number</b>	6334	<b>Attachments</b>	No

<b>ID</b>	9	<b>Type</b>	Editorial
<b>Document</b>	MDL-NBS-HS-000023	<b>Initiator</b>	Beach
<b>Title</b>	Direct input DTNs have been superseded or have sources that have been superseded.		
<b>Description</b>	GS960908312211.003 and GS971208314221.003 have source DTNs that have been superseded. GS950308312231.003 and GS960808312231.002 have been directly superseded.		
<b>Extent of condition</b>	Unique to infiltration AMR		
<b>Requirement</b>			
<b>Immediate Action</b>	No		
<b>Resolution</b>			
<b>CR number</b>	6334	<b>Attachments</b>	No

<b>ID</b>	11	<b>Type</b>	Editorial
<b>Document</b>	MDL-NBS-HS-000023	<b>Initiator</b>	Mitcheltree
<b>Title</b>	No reference to the legacy testing		
<b>Description</b>	There is no reference to the legacy testing in the following statement: "The software successfully went through LP-SI.14Q-BSC, Legacy Management (legacy testing), with nothing more than documentation issues." Page 3-1		
<b>Extent of condition</b>	Unique to infiltration AMR		
<b>Requirement</b>			
<b>Immediate Action</b>	No		
<b>Resolution</b>			
<b>CR number</b>	6334	<b>Attachments</b>	No

<b>ID</b>	12	<b>Type</b>	Technical
<b>Document</b>	MDL-NBS-HS-000023	<b>Initiator</b>	Mitcheltree
<b>Title</b>	Error in assuming Zero for missing precipitation data (non-conservative assumption)		
<b>Description</b>	<p>Mod3ppl1.xls from DTN GS000208311221_001 has errors in the step 1 worksheet. Zero is assumed for missing data. This is definitely not conservative. Since averages are used this becomes important. See MOD3PPT1.XLS</p> <p>The AMR states "gaps in the record, a value of zero is estimate", in these cases a zero should not be the estimate - instead do the calculation without that station.</p> <p>Page A-2</p>		
<b>Extent of condition</b>	Unique to infiltration model		
<b>Requirement</b>			
<b>Immediate Action</b>	No		
<b>Resolution</b>			
<b>CR number</b>	6334	<b>Attachments</b>	Yes

<b>ID</b>	13	<b>Type</b>	Software
<b>Document</b>	MDL-NBS-HS-000023	<b>Initiator</b>	Chris Pflum
<b>Title</b>	ARCINFO used for more than graphical representations		
<b>Description</b>	<p>Simulation of Net Infiltration for Present-Day and Potential Future Climates (MDL-NBS-HS-000023 REV 00, November 2004), Section 3.0, page 3-1, last paragraph.</p> <p>The last sentence states,</p> <p>ARCINFO V6.1.2 was used for visual and graphical representation of ground surface data and parameters. This commercially available software product is an exempt software application in accordance with Section 2.1 of LP-SI.11Q-BSC."</p> <p>This software is not exempt from quality requirements because it does more than just present data graphically. It performs raster data conversions, coordinate transformations, and slope and aspect calculations. In this case, the software created a soils map that is the basis for the Project's infiltration model.</p> <p>The Project recognized that ARCINFO affects quality when it baselined version 7.2.1 on November 20, 2000. Although the baselined version was available four years before this report was issued, the authors used and exempted an earlier, unqualified version 6.1.2.</p> <p>The report indicates that ARCINFO version 6.1.2 also supported at least the following products:</p> <ul style="list-style-type: none"> <li>·soil type and depth (DTN: GS000308311221.004),</li> <li>·infiltration (DTN: GS000308311221.005),</li> <li>·bedrock maps (DTN: GS971208314221.003),</li> <li>·slope (DTN: GS000308311221.006),</li> <li>·software (BLOCKR7, SOILMAP6 V1.0, NEWGEOL.DAT), and</li> <li>·Digital Elevation Model or DEM (DTN: GS000308311221.006).</li> </ul> <p>Either qualify and baseline ARCINFO Version 6.1.2, or qualify the images that the software created .</p>		
<b>Extent of condition</b>	Could be in other AMRs		
<b>Requirement</b>			
<b>Immediate Action</b>	No		
<b>Resolution</b>			
<b>CR number</b>	6334	<b>Attachments</b>	No

<b>ID</b>	14	<b>Type</b>	Technical
<b>Document</b>	MDL-NBS-HS-000023	<b>Initiator</b>	Levitt
<b>Title</b>	The arithmetic mean was used instead of log-mean for fracture fill permeabilities (non-conservative as		
<b>Description</b>	The arithmetic mean was used instead of log-mean for fracture fill permeabilities (DTN: GS950708312211.003). The arithmetic mean is 46.7 mm/d while the log-mean is 0.2 mm/day. (B-5) and 7.7.2. Note that B-5 uses the term geometric mean and 7.7.2 uses the term log mean. They are interchangeable, but for clarity the AMR should use one or the other.		
<b>Extent of condition</b>	Unique to infiltration model		
<b>Requirement</b>			
<b>Immediate Action</b>	No		
<b>Resolution</b>			
<b>CR number</b>	6334	<b>Attachments</b>	No

<b>ID</b>	15	<b>Type</b>	Software
<b>Document</b>	MDL-NBS-HS-000023	<b>Initiator</b>	Chris Pflum
<b>Title</b>	Single use routines not qualified		
<b>Description</b>	<p>Simulation of Net Infiltration for Present-Day and Potential Future Climates (MDL-NBS-HS-000023 REV 00, November 2004) Table 3-1, page 3-2</p> <p>Nine of the 14 software items (items 6 through 14) that were used to develop estimates of net infiltration are not included in the retired or current software baseline. The text explains that these "single use routines were subject to the requirements listed in Section 5.1.1.2 of AP-SI.1Q, and documentation to satisfy these requirements is included in this report as Appendices C through M." Routines subject to these requirements did not need to be baselined at that time; now, however, they do.</p> <p>The current procedure for software management (LP-SI.11Q-BSC) does not exempt "single use" routines from being baselined. The procedure applies to software that did not reach a "Control Point Review" on the effective date of the procedure (November 5, 2004). Control Point is defined as "A point at which the products of a series of life cycle phases are baselined and controlled." (IBID, Section 2.0, paragraph 3). Even though the nine software items may have been exempt under the old procedure, they are not exempt under the current procedure because they never reached the control point review.</p> <p>Even if the software management procedures had not changed, the software should still have been baselined. The software documentation in Appendices C through M is valid only for "single use routines". These routines were used again in 2004 when the 1999-infiltration model was updated. The updates include seventeen sources of direct input (Table 4-1, page 4-1) that were submitted to the records processing center after 1999.</p>		
<b>Extent of condition</b>	Could apply to other AMRs		
<b>Requirement</b>			
<b>Immediate Action</b>	No		
<b>Resolution</b>			
<b>CR number</b>	6334	<b>Attachments</b>	No

<b>ID</b>	16	<b>Type</b>	Technical
<b>Document</b>	MDL-NBS-HS-000023	<b>Initiator</b>	Pflum
<b>Title</b>	Figure 6-8 boundaries not fully explained. (Error in Table)		
<b>Description</b>	<p>Simulation of Net Infiltration for Present-Day and Potential Future Climates (MDL-NBS-HS-000023 REV 00, November 2004), Figure 6-8, page 6-33.</p> <p>The figure should identify the two areas circumscribed by dashed white lines. The text calls them the “license application boundaries” but they could be any one of several boundaries used in the LA such as, the controlled area, restricted area, repository footprint, waste emplacement area, or surface facilities.</p> <p>The other boundaries in this figure are in color and keyed to an explanation, but the same boundaries in subsequent figures are all the same color (white) and are not explained. Explain or label these boundaries in all the figures that show them.</p> <p>DTN: GS000308311221.006 is cited as the source of this figure as well as Figures 6-9, 6-10 and 6-11. According to the Technical Document Information Form (TDIF) that submitted these data to the TDMS, DTN: GS000308311221.006 is an output from this report - not a source to it. Moreover, the records package for DTN: GS000308311221.006 does not include these figures. Clarify whether this data set is a source to or output from the modeling report, and add the figures to the data records.</p>		
<b>Extent of condition</b>	Unique to infiltration AMR		
<b>Requirement</b>			
<b>Immediate Action</b>	No		
<b>Resolution</b>			
<b>CR number</b>	6334	<b>Attachments</b>	No

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<b>ID</b>	17	<b>Type</b>	Software
<b>Document</b>	MDL-NBS-HS-000023	<b>Initiator</b>	Pflum
<b>Title</b>	Surficial maps use unqualified software ARCINFO		
<b>Description</b>	<p>Two similar maps of surficial deposits at Yucca Mountain reside in the Technical Data Management System (TDMS). One was submitted on March 29, 1999 as unqualified data (MO9906COV96173.000), and the other was submitted on June 24, 1999 as qualified data (MO9903COV96274.000). The first map is unqualified because unqualified software (ARCINFO version 6.1.2) created it. The second map is said to be qualified because a qualified but unspecified version of ARCINFO created it.</p> <p>A data qualification report is being prepared to qualify the unqualified map in accordance with the Office of Civilian Radioactive Waste Procedure, Qualification of Unqualified Data (LP-SIII.2Q-BSC/Rev. 01/ICN 0). In the meantime, the other so-called "qualified" map should be removed from the TDMS.</p> <p>The data records indicate that the so-called qualified digital map (MO9903COV96274.000) is not really qualified. The records state that the map was created with qualified version of ARCINFO, but a qualified version was not available when the map was submitted to the TDMS on June 24, 1999. The Software Baseline Control Report shows that the qualified version (7.2.1) was not baselined and available to project participants until November 20, 2000: eighteen months after the qualified map was submitted. Moreover, this so-called qualified map is the product of a draft unqualified report .</p>		
<b>Extent of condition</b>	Unique to infiltration AMR		
<b>Requirement</b>			
<b>Immediate Action</b>	No		
<b>Resolution</b>			
<b>CR number</b>	6334	<b>Attachments</b>	No

<b>ID</b>	18	<b>Type</b>	Technical
<b>Document</b>	MDL-NBS-HS-000023	<b>Initiator</b>	Pflum
<b>Title</b>	AMR uses "preliminary maps" (Improper use of preliminary data)		
<b>Description</b>	<p>Between 1988 and 1995 , the USGS developed six preliminary maps of surficial deposits at Yucca Mountain. Collectively covering approximately 130 square miles at a scale of 1:12,000, the maps interpret aerial photographs and satellite imagery. The interpretations are documented in four draft reports that reside with the preliminary maps in four data sets (DTN: GS940108315142.004, GS940708315142.008, GS950408315142.004 and GS940108315142.005). The draft reports describe and classify the deposits in areas that are keyed to the maps.</p> <p>In January 1995, the preliminary maps were reviewed under a procedure for "approval and distribution of YMP-USGS publications" (QMP-3.04, R5-M1) . Although the review was completed and all comments were resolved, the preliminary maps were never published because additional unresolved comments were added to the record some seven years after the technical review ended.</p> <p>The maps and reports have now been unpublished preliminary drafts since 1995. Three reports (DTN: GS940708315142.008, GS950408315142.004 and GS940108315142.005) appear to be marked-up review copies and two reports (DTN: GS940708315142.008 and GS940108315142.005) are not dated or signed. Only one report (GS940108315142.004) was formatted for publication, but it did not include the map.</p> <p>Despite their unfinished and unprofessional appearance, the USGS submitted the reports to the TDMS as verified/qualified data, and they have subsequently been used as direct inputs to the following products:</p> <ul style="list-style-type: none"> <li>· Site Atlas,</li> <li>· Calibrated Properties Model,</li> <li>· UZ Flow Models and Submodels,</li> <li>· Analysis of Infiltration Uncertainty,</li> <li>· Mountain-Scale Coupled Processes (TH/THC/THM); and</li> <li>· Features, Events, and Processes in UZ Flow and Transport.</li> </ul> <p>While the draft reports may conform to quality requirements, they do not look like quality products. The USGS should either resolve or retract the outstanding comments on the reports and explain why they were added to the record some seven years after the review ended. The USGS should then finish the reports that accompany the map and remove the words "Preliminary Draft" from the map and reports.</p>		
<b>Extent of condition</b>	Unique to infiltration AMR		
<b>Requirement</b>			
<b>Immediate Action</b>	No		
<b>Resolution</b>			
<b>CR number</b>	6334	<b>Attachments</b>	No

<b>ID</b>	19	<b>Type</b>	Editorial
<b>Document</b>	MDL-NBS-HS-000023	<b>Initiator</b>	Beach
<b>Title</b>	DTN GS031208312211.001 package does not include closing calibration of Ph meter		
<b>Description</b>	GS031208312211.001 records package MOY-040213-13-01 has opening calibration for Ph meter W574934 but does not include closing calibration of Ph meter on MOL.19960524.0188. The records package contains closing calibrations for all of the other test instrumentaion.		
<b>Extent of condition</b>	Calibrations are checked in data process. This was probably just an oversight.		
<b>Requirement</b>			
<b>Immediate Action</b>	No		
<b>Resolution</b>			
<b>CR number</b>	6334	<b>Attachments</b>	No

<b>ID</b>	22	<b>Type</b>	Editorial
<b>Document</b>	MDL-NBS-HS-000023	<b>Initiator</b>	Mitcheltree
<b>Title</b>	Missing reference		
<b>Description</b>	There is no reference to the following statement: "Guidance, as specified in a RIT Broadcast Message dated August 12, 2004".Page 3-1		
<b>Extent of condition</b>	Unique to infiltration AMR		
<b>Requirement</b>			
<b>Immediate Action</b>	No		
<b>Resolution</b>			
<b>CR number</b>	6334	<b>Attachments</b>	No

<b>ID</b>	24	<b>Type</b>	Techical
<b>Document</b>	MDL-NBS-HS-000023	<b>Initiator</b>	Mitcheltree
<b>Title</b>	DTN GS000200001221.002 date range in error. (not properly transcribed)		
<b>Description</b>	This DTN does not contain data precipitation data from 1957-1959. The data starts on 1/1/59. Page 4-1		
<b>Extent of condition</b>	Unique to infiltration AMR		
<b>Requirement</b>			
<b>Immediate Action</b>	No		
<b>Resolution</b>			
<b>CR number</b>	6334	<b>Attachments</b>	No

<b>ID</b>	25	<b>Type</b>	Software
<b>Document</b>	MDL-NBS-HS-000023	<b>Initiator</b>	Miller
<b>Title</b>	Software issues		
<b>Description</b>	<p>A list of software issues requiring update or correction is attached in CR IMSE Issues Tracking.xls under worksheet labeled Tracking.</p> <p>See also impact evaluations INFL 2.a1 IMPACT EVALUATION.doc, INFL IMPACT EVALUATION.doc, MARKOV IMPACT EVALUATION.doc, and PPTSIM IMPACT EVALUATION.doc.</p>		
<b>Extent of condition</b>	Could apply to ther AMRs		
<b>Requirement</b>			
<b>Immediate Action</b>	No		
<b>Resolution</b>			
<b>CR number</b>	6334	<b>Attachments</b>	Yes

<b>ID</b>	26	<b>Type</b>	Techical
<b>Document</b>	MDL-NBS-HS-000023	<b>Initiator</b>	Mitcheltree
<b>Title</b>	Errors in Table 6-1 (error in table)		
<b>Description</b>	<p>1). This table needs a source for the column titled "Average Annual Precipitation", my guess is that it should be product output GS000208311221.001.</p> <p>2). Amargosa Farms should be Amargosa Farms Garey.</p> <p>3). Cane Spring is referred to as Cane Valley in GS000208311221.001 file "MOD3PPT1.xls". Cane Spring is correct.</p> <p>4). Weather station #1 has data missing from 7/17/87 to 12/31/87, so "0" was estimated.</p> <p>5). Cannot trace the station's UTM and elevation for Weather station #1 and #3.</p> <p>6). Record starting and ending dates for all stations are incorrect, the following are the correct dates: Beatty 8 N, 12/01/72 to 12/31/97; Amargosa Farms Garey, 12/01/65 to 12/31/97; 4JA, 1/01/59 to 07/31/05; 40MN, 02/01/60 to 07/31/05; Rock Valley, 03/01//63 to 07/31/05; Cane Spring, 09/01/64 to 07/31/05; Mid Valley, 09//01/64 to 07/31/05; Tippiah Spring #2, 05/01/60 to 07/31/05; Weather Station #1, 01/01/88 to 09/30/94; Weather Station #3, 07/17/97 to 09/30/94.</p> <p>7). File "Mod3ppt1.xls" for Average Annual Precipitation does not match this table in 3 stations: Cane Spring should be 178 instead of 202; Weather station #1 should be 145 instead of 157; Weather station #3 should be 162 instead of 179.</p> <p>8). Top of page 6-52, Station Area 12 Mesa and 4JA were used for developing the 100 year model, this should be in its own table because it does not match table heading.</p> <p>9). Top of page 6-52, Need product output DTN for stations 4JA and Area 12 Mesa for average annual precipitation.</p> <p>10). Top of page 6-52, dates for 4JA should be 1/1/59 to 7/31/05; elevation and dates for Area 12 Mesa should 2285 and 3/1/59 to 7/31/05.</p> <p>Page 6-51, Table 6-1</p>		
<b>Extent of condition</b>	Unique to infiltration AMR		
<b>Requirement</b>			
<b>Immediate Action</b>	No		
<b>Resolution</b>			
<b>CR number</b>	6334	<b>Attachments</b>	No

<b>ID</b>	27	<b>Type</b>	Editorial
<b>Document</b>	MDL-NBS-HS-000023	<b>Initiator</b>	Mitcheltree
<b>Title</b>	GS000208311221.001 should be listed as a "output DTN"		
<b>Description</b>	GS000208311221.001 should be listed as a "output DTN" instead of "Source DTN", this applies to the rest of AMR (including pages 6-56, page 6-62, page 6-70, A-25, etc.). Page 6-52, Figure 6-17		
<b>Extent of condition</b>	Unique to infiltration AMR		
<b>Requirement</b>			
<b>Immediate Action</b>	No		
<b>Resolution</b>			
<b>CR number</b>	6334	<b>Attachments</b>	No

<b>ID</b>	28	<b>Type</b>	Editorial
<b>Document</b>	MDL-NBS-HS-000023	<b>Initiator</b>	Mitcheltree
<b>Title</b>	GS000208311221.003 needs to be added to MDL-NBS-HS-000023		
<b>Description</b>	The product output (GS000208311221.003) for 4JA and Area 12 Mesa Stochastic Simulation needs to be added to this AMR. Through the revision between ANL-NBS-HS-000032 and MDL-NBS-HS-000023 I think it was mistakenly left out (unless there is a reason?). Page 6-62, Table 6-3		
<b>Extent of condition</b>	Unique to infiltration AMR		
<b>Requirement</b>			
<b>Immediate Action</b>	No		
<b>Resolution</b>			
<b>CR number</b>	6334	<b>Attachments</b>	No

<b>ID</b>	29	<b>Type</b>	Technical
<b>Document</b>	MDL-NBS-HS-000023	<b>Initiator</b>	Mitcheltree
<b>Title</b>	Table 6-4 problems (error in table)		
<b>Description</b>	1). Hobbs station Mean Oct.-Dec precipitation should be 68.8 instead of 140.2. 2). Need to add a footnote about 10:1 water equivalent for snow (this would apply to Table 6-5 and 6-6). 3). The mean temperatures are an average between max and min, that would be a median not mean (this would apply to Table 6-5 and 6-6).  Page 6-63, Table 6-4		
<b>Extent of condition</b>	Unique to infiltration AMR		
<b>Requirement</b>			
<b>Immediate Action</b>	No		
<b>Resolution</b>			
<b>CR number</b>	6334	<b>Attachments</b>	No

<b>ID</b>	30	<b>Type</b>	Technical
<b>Document</b>	MDL-NBS-HS-000023	<b>Initiator</b>	Mitcheltree
<b>Title</b>	Table 6-5 problems (Error in table)		
<b>Description</b>	1). Beowawe station--> the elevation should be 1433, mean Oct.-Dec. precipitation should be 57.4, Max. daily precipitation should be 41.4. 2). Delta station--> Mean Oct.-Dec. precipitation should be 51.3.  Page 6-64, Table 6-5		
<b>Extent of condition</b>	Unique to infiltration AMR		
<b>Requirement</b>			
<b>Immediate Action</b>	No		
<b>Resolution</b>			
<b>CR number</b>	6334	<b>Attachments</b>	No

<b>ID</b>	31	<b>Type</b>	Technical
<b>Document</b>	MDL-NBS-HS-000023	<b>Initiator</b>	Mitcheltree
<b>Title</b>	Table 6-6 problems (Error in table)		
<b>Description</b>	1). Rosalia station--> elevation should be 732 and mean Oct.-Dec. precipitation should be 150.9. 2). Spokane station--> the station name should be Spokane WSO Airport and mean Oct.-Dec. precipitation should be 139.2. 3). St. John station --> mean Oct.-Dec. precipitation should be 145.0.  Page 6-65, Table 6-6		
<b>Extent of condition</b>	Unique to infiltration AMR		
<b>Requirement</b>			
<b>Immediate Action</b>	No		
<b>Resolution</b>			
<b>CR number</b>	6334	<b>Attachments</b>	No

<b>ID</b>	32	<b>Type</b>	Editorial
<b>Document</b>	MDL-NBS-HS-000023	<b>Initiator</b>	Mitcheltree
<b>Title</b>	GS970108312111.001 has no precipitation data, it should not be listed on this page.		
<b>Description</b>	GS970108312111.001 has no precipitation data, it should not be listed on this page.  Page A-1		
<b>Extent of condition</b>	Unique to infiltration AMR		
<b>Requirement</b>			
<b>Immediate Action</b>	No		
<b>Resolution</b>			
<b>CR number</b>	6334	<b>Attachments</b>	No

<b>ID</b>	34	<b>Type</b>	Editorial
<b>Document</b>	MDL-NBS-HS-000023	<b>Initiator</b>	Mitcheltree
<b>Title</b>	Typo in file name mod3-ppt.day		
<b>Description</b>	file mod3-ppt.day does not exist it probably should be mod3-ppt.dat.  Page A-3		
<b>Extent of condition</b>	Unique to infiltration AMR		
<b>Requirement</b>			
<b>Immediate Action</b>	No		
<b>Resolution</b>			
<b>CR number</b>	6334	<b>Attachments</b>	No

<b>ID</b>	35	<b>Type</b>	Editorial
<b>Document</b>	MDL-NBS-HS-000023	<b>Initiator</b>	Mitcheltree
<b>Title</b>	Table A-1 problems		
<b>Description</b>	1). There is formatting problem with this table (columns do not match with following pages). 2). Why does this table stop at 1992, when the product output files go to 1994. Page A-3, Table A-1		
<b>Extent of condition</b>	Unique to infiltration AMR		
<b>Requirement</b>			
<b>Immediate Action</b>	No		
<b>Resolution</b>			
<b>CR number</b>	6334	<b>Attachments</b>	No

<b>ID</b>	36	<b>Type</b>	Technical
<b>Document</b>	MDL-NBS-HS-000023	<b>Initiator</b>	Mitcheltree
<b>Title</b>	DIRS 100394 listed as indirect , used as direct and is UN-Q (Unqualified DTN)		
<b>Description</b>	DIRS 100394 is UN-Q, however it was used for soil depths. It was called Indirect input but the way it was seems to be direct. Page B-3		
<b>Extent of condition</b>	Unique to infiltration AMR		
<b>Requirement</b>			
<b>Immediate Action</b>	No		
<b>Resolution</b>			
<b>CR number</b>	6334	<b>Attachments</b>	No

<b>ID</b>	37	<b>Type</b>	Technical
<b>Document</b>	MDL-NBS-HS-000023	<b>Initiator</b>	Jim Kam
<b>Title</b>	Inconsistency in the assumption of average land surface slope (not properly transcribed)		
<b>Description</b>	In Section 5, 3rd paragraph, it is stated in DTN: GS000308311221.004 that the average land surface slope for the entire model area is 13 degrees with a range of 0 to 46 degrees. However, a slope of approximately 4 to 6 degrees is used to estimate travel time of lateral flow.		
<b>Extent of condition</b>	Unique to infiltration AMR		
<b>Requirement</b>			
<b>Immediate Action</b>	No		
<b>Resolution</b>			
<b>CR number</b>	6334	<b>Attachments</b>	No

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<b>ID</b>	38	<b>Type</b>	Technical
<b>Document</b>	MDL-NBS-HS-000023	<b>Initiator</b>	Jim Kam
<b>Title</b>	Requirement of additional conditions necessary to satisfy water balance equations. (Assumption not pr		
<b>Description</b>	In Section 6.3.1, Figure 6-2, should add condition that water content before and after change will always be at or less than field capacity in order for equation 1 to be true; also, add condition that water content before and after change will have to be more than field capacity for equation 2 to be true. Add another condition for water content change from above to below field capacity or vice versa.		
<b>Extent of condition</b>	Unique to infiltration AMR		
<b>Requirement</b>			
<b>Immediate Action</b>	No		
<b>Resolution</b>			
<b>CR number</b>	6334	<b>Attachments</b>	No

<b>ID</b>	39	<b>Type</b>	Technical
<b>Document</b>	MDL-NBS-HS-000023	<b>Initiator</b>	Jim Kam
<b>Title</b>	Insufficient data to generate water retention curve. (Referenced data in error)		
<b>Description</b>	Section 6.3.4, 1st paragraph on pg. 6-17 states that "The moisture-retention curve for this location (App. B, Geospatial Input Data for INFIL V2.0 FY99, Table B-4) was used to convert water potential to water content (Figure 6-5B)". However, Table B-4 only provides 2 points (water contents at -0.1 and -60 bars for each soil texture) on the water retention curve and thus would not be able to convert a range of water potentials to its corresponding range of water contents.		
<b>Extent of condition</b>	Unique to infiltration AMR		
<b>Requirement</b>			
<b>Immediate Action</b>	No		
<b>Resolution</b>			
<b>CR number</b>	6334	<b>Attachments</b>	No

<b>ID</b>	40	<b>Type</b>	Technical
<b>Document</b>	MDL-NBS-HS-000023	<b>Initiator</b>	Jim Kam
<b>Title</b>	Evaporation rate calculation not traceable. (Parameter not adequately defined)		
<b>Description</b>	Section 6.3.4, end of 1st paragraph on pg. 6-17 states that "The evaporation rate was estimated to be no more than two mm/day on the basis of PET calculation using the Priestley-Taylor equation - - -." Parameters used in the equation are not provided.		
<b>Extent of condition</b>	Unique to infiltration AMR, However the issue of providing sources and justification may be generic.		
<b>Requirement</b>			
<b>Immediate Action</b>	No		
<b>Resolution</b>			
<b>CR number</b>	6334	<b>Attachments</b>	No

<b>ID</b>	41	<b>Type</b>	Technical
<b>Document</b>	MDL-NBS-HS-000023	<b>Initiator</b>	Jim Kam
<b>Title</b>	Additional explanation required for certain events in the Flow Chart of Model Algorithm. (Assumptions		
<b>Description</b>	In Section 6.4, Figure 6-6, need to explain how to deal with any potential ponding condition; also, "If total soil water content > total field capacity, add excess to storage term and excess > 40 mm drains into bedrock"; what is the basis for the "40 mm"?		
<b>Extent of condition</b>	Unique to infiltration AMR, However the issue of providing sources and justification may be generic.		
<b>Requirement</b>			
<b>Immediate Action</b>	No		
<b>Resolution</b>			
<b>CR number</b>	6334	<b>Attachments</b>	No

<b>ID</b>	42	<b>Type</b>	Technical
<b>Document</b>	MDL-NBS-HS-000023	<b>Initiator</b>	Jim Kam
<b>Title</b>	Erroneous assumption of unit gradient for estimating net infiltration. (Invalid assumption)		
<b>Description</b>	Section 6.4.1, bottom of pg. 6-21 assumes a unit gradient for estimating the net infiltration. A unit gradient is justified for a long-term, quasi-steady state condition but cannot be assumed during transient stage when a steeper gradient is expected.		
<b>Extent of condition</b>	Unique to infiltration AMR		
<b>Requirement</b>			
<b>Immediate Action</b>	No		
<b>Resolution</b>			
<b>CR number</b>	6334	<b>Attachments</b>	No

<b>ID</b>	43	<b>Type</b>	Technical
<b>Document</b>	MDL-NBS-HS-000023	<b>Initiator</b>	Jim Kam
<b>Title</b>	Source of equation (Eq.6-2) not provided. (Source not provided)		
<b>Description</b>	In Section 6.4.2, pg. 6-23, Eq. 6-2 is cited from Flint et al. 1996 [DIRS 100147] which does not provide the derivation or source of the equation.		
<b>Extent of condition</b>	Unique to infiltration AMR, However the issue of providing sources and justification may be generic.		
<b>Requirement</b>			
<b>Immediate Action</b>	No		
<b>Resolution</b>			
<b>CR number</b>	6334	<b>Attachments</b>	No

<b>ID</b>	44	<b>Type</b>	Technical.
<b>Document</b>	MDL-NBS-HS-000023	<b>Initiator</b>	Jim Kam
<b>Title</b>	Wrong citation for precipitation/elevation correlation used for INFIL. (Equation source not provided)		
<b>Description</b>	In Section 6.4.2 pg.6-23, Eq. 6-3 is cited from Table 4 of Hevesi and Flint 1998 [DIRS 125323] which has no such table.		
<b>Extent of condition</b>	Unique to infiltration AMR		
<b>Requirement</b>			
<b>Immediate Action</b>	No		
<b>Resolution</b>			
<b>CR number</b>	6334	<b>Attachments</b>	No

<b>ID</b>	45	<b>Type</b>	Technical
<b>Document</b>	MDL-NBS-HS-000023	<b>Initiator</b>	Jim Kam
<b>Title</b>	Source of citation not provided for Eq. 6-5. (source not provided)		
<b>Description</b>	In Section 6.4.2, pg. 6-24, Eq. 6-5 is referred to the computer code on pg. 143 of Flint et al. 1996 [DIRS 100147] which does not provide the source of the equation.		
<b>Extent of condition</b>	Unique to infiltration AMR, However the issue of providing sources and justification may be generic.		
<b>Requirement</b>			
<b>Immediate Action</b>	No		
<b>Resolution</b>			
<b>CR number</b>	6334	<b>Attachments</b>	No

<b>ID</b>	46	<b>Type</b>	Technical
<b>Document</b>	MDL-NBS-HS-000023	<b>Initiator</b>	Jim Kam
<b>Title</b>	Units not defined in Eq. 6-8. (Equation parameters not adequately defined)		
<b>Description</b>	Section 6.4.4, pg. 6-26, a constant for unit conversion is included in Eq. 6-8 without defining the energy units used in the equation.		
<b>Extent of condition</b>	Unique to infiltration AMR		
<b>Requirement</b>			
<b>Immediate Action</b>	No		
<b>Resolution</b>			
<b>CR number</b>	6334	<b>Attachments</b>	No

<b>ID</b>	47	<b>Type</b>	Technical
<b>Document</b>	MDL-NBS-HS-000023	<b>Initiator</b>	Jim Kam
<b>Title</b>	Citation not provided for Eq. 6-9. (Source not provided)		
<b>Description</b>	In Section 6.4.4, pg. 6-26, Eq. 6-9 is cited from Flint et al. (1996 [DIRS 100147]). However, this citation does not provide the derivation or source of the equation.		
<b>Extent of condition</b>	Unique to infiltration AMR, However the issue of providing sources and justification may be generic.		
<b>Requirement</b>			
<b>Immediate Action</b>	No		
<b>Resolution</b>			
<b>CR number</b>	6334	<b>Attachments</b>	No

<b>ID</b>	48	<b>Type</b>	Technical
<b>Document</b>	MDL-NBS-HS-000023	<b>Initiator</b>	Jim Kam
<b>Title</b>	Incorrect lateral flow distance computed based on Darcy's law (Assumption not valid)		
<b>Description</b>	In Section 5, 3rd paragraph, using a saturated K of 3.8E-5 m/s for a land surface slope of 6 degrees and a porosity of 28.1 %, the distance that lateral flow would travel in 30 days should be calculated to be 36.6 meters rather than 6 meters.		
<b>Extent of condition</b>	Unique to infiltration AMR,		
<b>Requirement</b>			
<b>Immediate Action</b>	No		
<b>Resolution</b>			
<b>CR number</b>	6334	<b>Attachments</b>	No

<b>ID</b>	49	<b>Type</b>	Technical
<b>Document</b>	MDL-NBS-HS-000023	<b>Initiator</b>	Jim Kam
<b>Title</b>	Equation 6-10 different from citation. (Source not provided, parameters not adequately defined)		
<b>Description</b>	In Section 6.4.4, pg. 6-26, Eq. 6-10 is cited from Eq. 19 of Flint et al. 1996 [DIRS 100147]) which has an additional parameter K, undefined in the citation. Also, when Eq. 6-10 is plotted on Figure 6-7, it shows lower values than the curve on the figure.		
<b>Extent of condition</b>	Unique to infiltration AMR,		
<b>Requirement</b>			
<b>Immediate Action</b>	No		
<b>Resolution</b>			
<b>CR number</b>	6334	<b>Attachments</b>	No

<b>ID</b>	50	<b>Type</b>	Technical
<b>Document</b>	MDL-NBS-HS-000023	<b>Initiator</b>	Jim Kam
<b>Title</b>	Source of Eq. 6-11 not provided.		
<b>Description</b>	In Section 6.4.4, pg. 6-26, Eq. 6-11 is cited from Eq. 21 of Flint et al. 1996 [DIRS 100147] which does not provide the derivation or source of the equation.		
<b>Extent of condition</b>	Unique to infiltration AMR, However the issue of providing sources and justification may be generic.		
<b>Requirement</b>			
<b>Immediate Action</b>	No		
<b>Resolution</b>			
<b>CR number</b>	6334	<b>Attachments</b>	No

<b>ID</b>	51	<b>Type</b>	Technical
<b>Document</b>	MDL-NBS-HS-000023	<b>Initiator</b>	Jim Kam
<b>Title</b>	Citation not provided for regression Coefficients in Eq. 6-12. (parameters not adequately defined)		
<b>Description</b>	In Section 6.4.6, the coefficients a and b in Eq. 6-12 are not given in the citation Priestly and Taylor 1972 [DIRS 125321].		
<b>Extent of condition</b>	Unique to infiltration AMR,		
<b>Requirement</b>			
<b>Immediate Action</b>	No		
<b>Resolution</b>			
<b>CR number</b>	6334	<b>Attachments</b>	No

<b>ID</b>	52	<b>Type</b>	Technical
<b>Document</b>	MDL-NBS-HS-000023	<b>Initiator</b>	Jim Kam
<b>Title</b>	Error in water balance equation. (Not properly transcribed)		
<b>Description</b>	In Section 6.4.7, pg. 6-30, Eq. 6-13 has the term "-SW" which should be "+SW", according to Eq. 6-1.		
<b>Extent of condition</b>	Unique to infiltration AMR,		
<b>Requirement</b>			
<b>Immediate Action</b>	No		
<b>Resolution</b>			
<b>CR number</b>	6334	<b>Attachments</b>	No

<b>ID</b>	53	<b>Type</b>	Technical
<b>Document</b>	MDL-NBS-HS-000023	<b>Initiator</b>	Jim Kam
<b>Title</b>	Justification for limited data usage required. (assumption not properly justified)		
<b>Description</b>	In Section 5, pg. 5-2, it is stated that "The development of the climate inputs to the INFIL model is on limited data". What is the impact of this limitation on the results? Clarify "the basis for this assumption is that multiple data sets from multiple locations are combined into one data set".		
<b>Extent of condition</b>	Unique to infiltration AMR, However the issue of providing sources and justification may be generic.		
<b>Requirement</b>			
<b>Immediate Action</b>	No		
<b>Resolution</b>			
<b>CR number</b>	6334	<b>Attachments</b>	No

<b>ID</b>	54	<b>Type</b>	Technical
<b>Document</b>	MDL-NBS-HS-000023	<b>Initiator</b>	Jim Kam
<b>Title</b>	Justification of assumption required for vegetation cover and rooting depths. (assumption not properly j		
<b>Description</b>	In Section 5, pg.5-2, justify that "for the upper bound monsoon climate, the root-zone weighting parameters were adjusted to approximate a 40% vegetation cover - - - - and the maximum thickness of the bedrock root zone layer was increased from 2 to 2.5 meters. For the upper bound glacial-transition climate, - - - as assumed 60% vegetation cover and the maximum thickness of the bedrock root zone layer was increased to three meters." Justify all the numbers in the above statements or provide citations.		
<b>Extent of condition</b>	Unique to infiltration AMR, However the issue of providing sources and justification may be generic.		
<b>Requirement</b>			
<b>Immediate Action</b>	No		
<b>Resolution</b>			
<b>CR number</b>	6334	<b>Attachments</b>	No

<b>ID</b>	55	<b>Type</b>	Technical
<b>Document</b>	MDL-NBS-HS-000023	<b>Initiator</b>	Jim Kam
<b>Title</b>	Justification of assumed value for evaporation of snowmelt parameter required. (assumption not prope		
<b>Description</b>	In Section 5, pg. 5-3, justification has not been provided for assuming the evaporation of snowmelt parameter (A2) to be three times greater than the A1 parameter. Cited reference (Maidment 1993 [DIRS 125317], pg. 7.4 to 7.10) does not specifically state so.		
<b>Extent of condition</b>	Unique to infiltration AMR, However the issue of providing sources and justification may be generic.		
<b>Requirement</b>			
<b>Immediate Action</b>	No		
<b>Resolution</b>			
<b>CR number</b>	6334	<b>Attachments</b>	No

<b>ID</b>	56	<b>Type</b>	Technical
<b>Document</b>	MDL-NBS-HS-000023	<b>Initiator</b>	Jim Kam
<b>Title</b>	Citation of depth limit for bare soil evaporation not found. (source not provided))		
<b>Description</b>	In Section 6.1.4, pg. 6-6, for "The redistribution of water within the root zone affects the total evapotranspiration rate because bare soil evaporation extends to depths of approximately 10 to 30 cm (Hanks et al 1967 [DIRS 171454])", the "30 cm" is not found in the cited reference.		
<b>Extent of condition</b>	Unique to infiltration AMR, However the issue of providing sources and justification may be generic.		
<b>Requirement</b>			
<b>Immediate Action</b>	No		
<b>Resolution</b>			
<b>CR number</b>	6334	<b>Attachments</b>	No

<b>ID</b>	57	<b>Type</b>	Technical
<b>Document</b>	MDL-NBS-HS-000023	<b>Initiator</b>	Jim Kam
<b>Title</b>	Cited information re: field capacity not found. (source not provided))		
<b>Description</b>	Section 6.1.5, pg. 6-6 states " Field capacity is defined as the water content of the near surface soil profile at which drainage becomes negligible (several orders of magnitude less than the saturated flux rate) (Jury et al. 1991 [DIRS 102010], pg.150)" but the information re: several orders of magnitude less, etc. cannot be found in the cited reference.		
<b>Extent of condition</b>	Unique to infiltration AMR, However the issue of providing sources and justification may be generic.		
<b>Requirement</b>			
<b>Immediate Action</b>	No		
<b>Resolution</b>			
<b>CR number</b>	6334	<b>Attachments</b>	No

<b>ID</b>	58	<b>Type</b>	Technical
<b>Document</b>	MDL-NBS-HS-000023	<b>Initiator</b>	Jim Kam
<b>Title</b>	Unconservative assumption of -0.1 bar for soil water potential at field capacity. (non-conservative assu		
<b>Description</b>	In Section 6.1.5, pg. 6-7, the assumption of field capacity to be at -0.1bar rather than -0.33 bar (which was commonly used for agricultural soils) for modeling infiltration is not conservative because the water content at a field capacity of -0.1 bar would be higher for a given soil texture, implying more water retention and less infiltration.		
<b>Extent of condition</b>	Unique to infiltration AMR, However the issue of providing sources and justification may be generic.		
<b>Requirement</b>			
<b>Immediate Action</b>	No		
<b>Resolution</b>			
<b>CR number</b>	6334	<b>Attachments</b>	No

<b>ID</b>	59	<b>Type</b>	Technical
<b>Document</b>	MDL-NBS-HS-000023	<b>Initiator</b>	Jim Kam
<b>Title</b>	Net infiltration not computed conservatively. (non-conservative assumption)		
<b>Description</b>	Section 6.3.1. pg. 6-9, end of 1st paragraph states that " - - - -if water continues to infiltrate or percolate into the bedrock layer, net infiltration was calculated based on either the saturated hydraulic conductivity of the bedrock layer or the amount of available water (whichever determines the lower net infiltration amount)." Even this is theoretically true, the actual physics of infiltration into the bedrock layer is not considered, and therefore, it would be conservative to assume the net infiltration to be whichever determines the higher rather than lower amount.		
<b>Extent of condition</b>	Unique to infiltration AMR, However the issue of providing sources and justification may be generic.		
<b>Requirement</b>			
<b>Immediate Action</b>	No		
<b>Resolution</b>			
<b>CR number</b>	6334	<b>Attachments</b>	No

<b>ID</b>	60	<b>Type</b>	Technical
<b>Document</b>	MDL-NBS-HS-000023	<b>Initiator</b>	Mitchelltree
<b>Title</b>	Errors in data transfer from DTNs to input precipitation file (not properly transcribed)		
<b>Description</b>	<p>Appendix A, file MOD3PPT1.XLS (precipitation data). (GS010408312111.001, GS000208312111.003, GS000208312111.001)</p> <p>A comparison was performed against file MOD3PPT1.XLS and the source DTNs and errors were found as follows--&gt;</p> <p>Station WX1: 7/17/87 to 12/31/87, 10/01/94 to 11/01/94, and 7/18/95 to 9/30/95 in the source no data exists but zero was estimated in MOD3PPT1.XLS; 10/24/88, 10/26/88, 9/16/91 to 9/24/91, 2/5/94 to 3/2/94 the datalogger read -99 (which indicates an error) but zero was estimated in MOD3PPT1.XLS; 8/29/94, 12/25/94, 3/23/95, 3/24/95, 4/24/95, 4/25/95 the source has values but MOD3PPT1.XLS states they were estimated; 1/7/95 value is incorrect should be 1 instead of 7; 2/28/95 value is incorrect should be 13 instead of 14.</p> <p>Station WX3: 10/1/94 to 11/01/94 and 7/18/95 to 10/01/95 in the source no data exists but zero was estimated in MOD3PPT1.XLS; 1/2/89, 5/26/89 to 6/8/89 the datalogger read -99 (which indicates an error) but zero was estimated in MOD3PPT1.XLS; 2/22/89 to 5/25/89, 6/9/89 to 10/31/89, 12/19/94, 4/24/95 the source has values but MOD3PPT1.XLS states they were estimated; 11/2/94 value is incorrect should be 0 instead of 2, 11/10/94 should be 0 instead of 12, 11/18/94 should be 0 instead of 1, 12/24/94 should be 0 instead of 12, 12/25/94 should be 0 instead if 19, 12/29/94 should 0 instead of 2, 3/4/95 should be 7 instead of 0, 3/5/95 should be 0 instead of 7, 3/9/95 should be 61 instead of 2, 3/10/95 should be 1 instead of 33, 3/11/95 should be 6 instead of 33, 4/13/95 should be 2 instead of 3,</p>		
<b>Extent of condition</b>			
<b>Requirement</b>			
<b>Immediate Action</b>			
<b>Resolution</b>			
<b>CR number</b>		<b>Attachments</b>	

<b>ID</b>	61	<b>Type</b>	Technical
<b>Document</b>	MDL-NBS-HS-000023	<b>Initiator</b>	Mitchelltree
<b>Title</b>	More Errors in data transfer from DTNs to input precipitation file (Not properly transcribed)		
<b>Description</b>	<p>Appendix A, file MOD3PPT1.XLS (precipitation data) (GS000100001221.001)(Source DTN)</p> <p>Station Beatty 8N: 8/1/84 to 10/31/84, 2/18/87, 2/20/87, 2/8/89, 12/14/93, 12/15/93, 2/19/94 in the source no data exists but zero was estimated in MOD3PPT1.XLS; 12/19/84 value is incorrect should be 120 instead of 12 (.01 inch). (Source data versus output file)</p> <p>Station Amargosa Farms: No problems.</p>		
<b>Extent of condition</b>			
<b>Requirement</b>			
<b>Immediate Action</b>			
<b>Resolution</b>			
<b>CR number</b>		<b>Attachments</b>	

<b>ID</b>	62	<b>Type</b>	Technical
<b>Document</b>	MDL-NBS-HS-000023	<b>Initiator</b>	Mitchelltree
<b>Title</b>	More Errors in data transfer from DTNs to input precipitation file (Not properly transcribed)		
<b>Description</b>	<p>Appendix A, file MOD3PPT1.XLS (precipitation data) (GS000200001221.002)(Source DTN)(Source data versus output file)</p> <p>Stations 4ja, 40MN, Rock Valley, Cane Valley, Mid Valley, Tip spg2: These stations are difficult to understand because it was not explained very well, but this is my understanding. There are 2 sets of numbers for each station, one set labeled "1994 data" and the other labeled "1999 data". Within MOD3PPT1.XLS under tab titled "Explanation" it defines the "1994 data" as obtained from NTS1.dat and NTS2.dat ASCII files, except for 1994 which was obtained from hard-copy sheets; and the "1999 data" as data downloaded from ARL website. Every time the "1994 data" does not match the "1999 data" an "X" is put beside those values to flag it. The calculations however only use the "1994 data". There is no current source for the "1994 data", so in every case the values are flagged, they are not traceable. Several of these stations where zero was estimated if data was missing.</p>		
<b>Extent of condition</b>			
<b>Requirement</b>			
<b>Immediate Action</b>			
<b>Resolution</b>			
<b>CR number</b>		<b>Attachments</b>	

<b>ID</b>	63	<b>Type</b>	Technical
<b>Document</b>	MDL-NBS-HS-000023	<b>Initiator</b>	Jim Kam
<b>Title</b>	Clarification required for hydraulic conductivity (parameters not adequately defined)		
<b>Description</b>	In the last paragraph of Section 6.6.4, pg. 6-44, "saturated hydraulic conductivity" should be "bulk saturated hydraulic conductivity", according to Table B-3, to distinguish it from saturated hydraulic conductivity of fractures or matrix.		
<b>Extent of condition</b>			
<b>Requirement</b>			
<b>Immediate Action</b>			
<b>Resolution</b>			
<b>CR number</b>		<b>Attachments</b>	

<b>ID</b>	64	<b>Type</b>	Technical
<b>Document</b>	MDL-NBS-HS-000023	<b>Initiator</b>	Jim Kam
<b>Title</b>	Inconsistency in defining ranges of soil depths (parameters not adequately defined)		
<b>Description</b>	In Section 6.7.1 Eq. 6-14 (same as Eq.14 in App. B) defines a range of soil depths from 0.01 to 0.4 m. for class #1, but bottom paragraph on pg. B-3 defines class #1 depths from 0 – 0.5 m. Eq. 6-15 (same as Eq.15 in App. B) defines soil depths for class #2 from 0.4 to 2 m. whereas pg. B-3 states a range from 0.5 to 3 m. Likewise for Eq. 6-16 (same as Eq. 16 in App. B) which defines class # 3 depths from 2 to 6 m., as compared to a range from 3 to 6 m. on pg. B-3. Also, the first 2 equations under Eq. 14 have overlapping range of soil depths. That is, different slopes may lead to the same soil depth.		
<b>Extent of condition</b>			
<b>Requirement</b>			
<b>Immediate Action</b>			
<b>Resolution</b>			
<b>CR number</b>		<b>Attachments</b>	

<b>ID</b>	65	<b>Type</b>	Technical
<b>Document</b>	MDL-NBS-HS-000023	<b>Initiator</b>	Jim Kam
<b>Title</b>	Inconsistency in defining root-zone layer thickness (parameters not adequately defined)		
<b>Description</b>	In Section 6.7.3, the second and third sets of equations under Eq. 6-18 have overlapping range of soil depths (for example, SD = 1.4 m.) that result in different thicknesses for the second layer. Also, it is stated in the paragraph following equations 6-18 that the maximum thickness of the third layer can be 4.5 m. but Equations 6-18 would not lead to that number. Additionally, the last sentence of the same paragraph states " - - - while alluvial fan terraces having 6 m or greater soil thickness have three soil layer and no bedrock layer". However, Equations 6-18 do not describe this.		
<b>Extent of condition</b>			
<b>Requirement</b>			
<b>Immediate Action</b>			
<b>Resolution</b>			
<b>CR number</b>		<b>Attachments</b>	

<b>ID</b>	66	<b>Type</b>	Technical
<b>Document</b>	MDL-NBS-HS-000023	<b>Initiator</b>	Jim Kam
<b>Title</b>	Justification required for assumed root-density-weighting factors (Assumption not properly justified)		
<b>Description</b>	In Section 6.7.3, bottom paragraph on pg. 6-47, justification is required for the statement " These root-density-weighting factors were assumed, but are partially based on field observations of root distributions of various plant types at Yucca Mountain". Are there references for these factors?		
<b>Extent of condition</b>			
<b>Requirement</b>			
<b>Immediate Action</b>			
<b>Resolution</b>			
<b>CR number</b>		<b>Attachments</b>	

<b>ID</b>	67	<b>Type</b>	Technical
<b>Document</b>	MDL-NBS-HS-000023	<b>Initiator</b>	Jim Kam
<b>Title</b>	Inconsistency of cited values for root-zone-density weighting parameters (parameters not adequately		
<b>Description</b>	In Section 6.8, 3rd paragraph on pg. 6-49 states that the root-zone-density weighting parameters for the four root-zone layers range from 0.01 to 0.6, but is different from the range of 0.01 to 1.0 described in the bottom paragraph on pg. 6-58.		
<b>Extent of condition</b>			
<b>Requirement</b>			
<b>Immediate Action</b>			
<b>Resolution</b>			
<b>CR number</b>		<b>Attachments</b>	

<b>ID</b>	68	<b>Type</b>	Technical
<b>Document</b>	MDL-NBS-HS-000023	<b>Initiator</b>	Jim Kam
<b>Title</b>	Inconsistency in specifying overlapping period of precipitation data (Assumption not properly justified)		
<b>Description</b>	In Section 6.8.1, two sets of precipitation data, one from 1988 through 1995 and the other from 1980 through 1987, are mentioned with their overlapping period from July 17, 1987 through September 30, 1994. This inconsistency requires clarification.		
<b>Extent of condition</b>			
<b>Requirement</b>			
<b>Immediate Action</b>			
<b>Resolution</b>			
<b>CR number</b>		<b>Attachments</b>	

<b>ID</b>	69	<b>Type</b>	Technical
<b>Document</b>	MDL-NBS-HS-000023	<b>Initiator</b>	Jim Kam
<b>Title</b>	Clarification required for the 17 sub-watersheds extracted for uncertainty analysis (Assumption not pro		
<b>Description</b>	The 2nd paragraph in Section 6.10 mentions 17 sub-watersheds were extracted using WATSHD20 for future climate uncertainty analysis. What are these sub-watersheds? They are not described in any other part of the AMR.		
<b>Extent of condition</b>			
<b>Requirement</b>			
<b>Immediate Action</b>			
<b>Resolution</b>			
<b>CR number</b>		<b>Attachments</b>	

<b>ID</b>	70	<b>Type</b>	Technical
<b>Document</b>	MDL-NBS-HS-000023	<b>Initiator</b>	Jim Kam
<b>Title</b>	Calculated hydrologic parameters in Table B-4 not traceable (Error in table)		
<b>Description</b>	<p>In Appendix B2, pg. B-2 mentions that "Saturated hydraulic conductivity, moisture retention curve fit parameters alpha and n, water content at -0.1 bar water potential, and water content at -60 bars water potential were estimated using empirical equations from Campbell 1985 [DIRS 100565]." Also, middle of pg. B-7 states "listed in Table B-4 are the soil-water contents corresponding to -0.1 and -60 bars water potential for each soil type, calculated using the fitted water-retention van Genuchten curve for each soil type." However, the calculated values in that table are not traceable and they cannot be derived using any of the two methods described above.</p> <p>Additionally, the n value of 1.28 for Soil unit # 5 in Table B-4 should be 1.78, per Table 4 of Flint et al' 96 [DIRS 100147] p.42.</p>		
<b>Extent of condition</b>			
<b>Requirement</b>			
<b>Immediate Action</b>			
<b>Resolution</b>			
<b>CR number</b>		<b>Attachments</b>	

<b>ID</b>	71	<b>Type</b>	Technical
<b>Document</b>	MDL-NBS-HS-000023	<b>Initiator</b>	Jim Kam
<b>Title</b>	Miscalculated mean values for the Monsoon Climate Scenarios (Error in table)		
<b>Description</b>	<p>In Section 6.11.2, first paragraph on pg. 6-78 states that the results for the mean monsoon climate scenario were calculated as the arithmetic mean of the lower bound and upper bound Monsoon climate scenarios. Therefore, in Table 6-13, the mean maximum evapotranspiration, infiltrated surface-water run-on, and net infiltration should be 516.5, 647.5 and 639.8 mm/yr., respectively. Likewise in Table 6-14, the mean maximum and mean minimum evapotranspiration should be 469.7 and 215.9 mm/yr, respectively.</p>		
<b>Extent of condition</b>			
<b>Requirement</b>			
<b>Immediate Action</b>			
<b>Resolution</b>			
<b>CR number</b>		<b>Attachments</b>	

<b>ID</b>	72	<b>Type</b>	Technical
<b>Document</b>	MDL-NBS-HS-000023	<b>Initiator</b>	Jim Kam
<b>Title</b>	Miscalculated mean values for the glacial-transition climate scenarios (error in table)		
<b>Description</b>	In Section 6.11.3, first paragraph on pg. 6-86 states the results of the mean glacial-transition climate scenario were calculated as the arithmetic mean of the results for the lower and upper bound glacial-transition scenarios. Therefore, in Table 6-17, the mean maximum evapotranspiration, infiltrated surface-water run-on, and net infiltration should be 638.5, 4003.2 and 3929.8 mm/yr., respectively. In Table 6-18, the mean maximum evapotranspiration, infiltrated surface-water run-on, and net infiltration should be 538.6, 1389.6 and 1387.1 mm/yr., respectively. Likewise in Table 6-19, the mean maximum and mean minimum evapotranspiration should be 484.0 and 218.1 mm/yr., respectively, and the mean maximum infiltrated surface-water run-on and net infiltration should be 717.6 and 648.9 mm/yr., respectively.		
<b>Extent of condition</b>			
<b>Requirement</b>			
<b>Immediate Action</b>			
<b>Resolution</b>			
<b>CR number</b>		<b>Attachments</b>	

<b>ID</b>	73	<b>Type</b>	Technical
<b>Document</b>	MDL-NBS-HS-000023	<b>Initiator</b>	Jim Kam
<b>Title</b>	Error in citing basin-wide precipitation from Lichty and McKinley 1995 [DIRS 100589] (Error in value)		
<b>Description</b>	In Section 7.2.1, 3rd paragraph cites Lichty and McKinley 1995 [DIRS 100589] with "Their results yielded recharge rates of 10 to 30 mm/yr for a drainage basin with an average annual precipitation of 270 mm, - - - -." However, according to Table 15 of Lichty and McKinley 1995 [DIRS100589], "270 mm" should be "336 mm".		
<b>Extent of condition</b>			
<b>Requirement</b>			
<b>Immediate Action</b>			
<b>Resolution</b>			
<b>CR number</b>		<b>Attachments</b>	

<b>ID</b>	74	<b>Type</b>	Technical
<b>Document</b>	MDL-NBS-HS-000023	<b>Initiator</b>	Jim Kam
<b>Title</b>	Wrong figure caption and figure citation (Invalid reference)		
<b>Description</b>	The caption of Figure 6-19 states "Graphs of Comparisons of Simulated (1996 Model) Net Infiltration Using Water Content in Neutron Boreholes -----" but shows only water content and not net infiltration. Also in Section 7.2.1, first paragraph on page 7-6 states "The net infiltration for selected modeling domains (Figure 6-11) and calibration watersheds (Figure 6-19) at Yucca Mountain is shown on Figure 7-2." However, Figure 6-19 does not show anything related to the "calibration watersheds".		
<b>Extent of condition</b>			
<b>Requirement</b>			
<b>Immediate Action</b>			
<b>Resolution</b>			
<b>CR number</b>		<b>Attachments</b>	

<b>ID</b>	75	<b>Type</b>	Technical
<b>Document</b>	MDL-NBS-HS-000023	<b>Initiator</b>	Jim Kam
<b>Title</b>	Wrong value from citation Flint et al. 2002 [DIRS 157411] (error in value)		
<b>Description</b>	The 2nd paragraph in Section 7.2.1 on pg. 7-6 states "All three of these values are well within an order of magnitude of the mean values of 5, 6.5, and 8.5 mm/yr ----- reported by Flint et al. (2002 [DIRS 157411], pp. 201 to 202) -----." "5 mm/yr" is an error.		
<b>Extent of condition</b>			
<b>Requirement</b>			
<b>Immediate Action</b>			
<b>Resolution</b>			
<b>CR number</b>		<b>Attachments</b>	

<b>ID</b>	76	<b>Type</b>	Technical
<b>Document</b>	MDL-NBS-HS-000023	<b>Initiator</b>	Jim Kam
<b>Title</b>	Wrong value from citation Liu et al 2003 [DIRS 162470] (reference does not contain cited value)		
<b>Description</b>	In Section 7.2.2, 2nd paragraph under "Hydraulic Conductivity Data" states the conductivity of the upper lithophysal zone of the Tiva Canyon Tuff determined during the Alcove 1 infiltration experiments is 21.5 mm/day (Liu et al. 2003 [DIRS 162470]). However, "21.5 mm/day" cannot be found in the citation.		
<b>Extent of condition</b>			
<b>Requirement</b>			
<b>Immediate Action</b>			
<b>Resolution</b>			
<b>CR number</b>		<b>Attachments</b>	

<b>ID</b>	77	<b>Type</b>	Technical
<b>Document</b>	MDL-NBS-HS-000023	<b>Initiator</b>	Jim Kam
<b>Title</b>	Clarification required for units shown on Figure 7-7 (parameter not adequately defined)		
<b>Description</b>	Figure 7-7 expresses stream flow in terms of "acre-feet". Is this flow volume per watershed area for the whole year, either 1999 or 2004?		
<b>Extent of condition</b>			
<b>Requirement</b>			
<b>Immediate Action</b>			
<b>Resolution</b>			
<b>CR number</b>		<b>Attachments</b>	

<b>ID</b>	78	<b>Type</b>	Technical
<b>Document</b>	MDL-NBS-HS-000023	<b>Initiator</b>	Jim Kam
<b>Title</b>	Unit conversion error from cfs to acre-feet (Error in value)		
<b>Description</b>	The footnote in Table 7-3 shows the conversion from cfs to acre feet with cfs being a flow rate (volume per unit time) and acre-feet as a volume. The conversion from cfs to acre-feet per day should actually be the multiplier $3600 \times 24 / 43560$ rather than $1 / (43560 \times 3600 \times 24)$ .		
<b>Extent of condition</b>			
<b>Requirement</b>			
<b>Immediate Action</b>			
<b>Resolution</b>			
<b>CR number</b>		<b>Attachments</b>	

<b>ID</b>	79	<b>Type</b>	Technical
<b>Document</b>	ANL-NBS-HS-000027 REV 01	<b>Initiator</b>	Jim Kam
<b>Title</b>	Dimensionality of Surface Flow Runoff Area not well defined.		
<b>Description</b>	Table 6-1 defines FLAREA as Surface Flow Runoff Area, which, according to Table 6-2, is dimensionless. If FLAREA is an area, it should have a unit for area unless it is an area factor or coefficient. This parameter also occurs in Section 6.1.2.3.		
<b>Extent of condition</b>			
<b>Requirement</b>			
<b>Immediate Action</b>			
<b>Resolution</b>			
<b>CR number</b>		<b>Attachments</b>	

<b>ID</b>	80	<b>Type</b>	Technical
<b>Document</b>	ANL-NBS-HS-000027 REV 01	<b>Initiator</b>	Jim Kam
<b>Title</b>	Dimensionality and Traceability problem for Snowmelt and Sublimation Coefficients.		
<b>Description</b>	In Section 6.1.2.3, under "Snow-melt and Sublimation", SNOPAR1 and SUBPAR1 have been defined as dimensionless parameters in Table 6-3 and are referred to A of Equation 7 and A1 of Equation 6 of USGS 2001 [160355], respectively. However, these equations from the citation show that both A and A1 should not be dimensionless.		
<b>Extent of condition</b>			
<b>Requirement</b>			
<b>Immediate Action</b>			
<b>Resolution</b>			
<b>CR number</b>		<b>Attachments</b>	

<b>ID</b>	81	<b>Type</b>	Technical
<b>Document</b>	ANL-NBS-HS-000027 REV 01	<b>Initiator</b>	Jim Kam
<b>Title</b>	Traceability problem regarding Tiva Canyon Tuff Permeability Data.		
<b>Description</b>	<p>In Section 6.1.2.4, middle of 3rd paragraph, "The range of flux was from 0 to 30 mm/d (3.54 E-14 m2 [assuming a hydraulic gradient equal to a unit-gradient condition]) from February 19, 1999 to December 15, 1999 (Flint et al. 2000 [162880])." This range of flux is not traceable.</p> <p>Also, at the end of the same paragraph, "In both the Phase I test (from March 8, 1998, to December 4, 1998, see DTN: GS990108312242.006 [162979]) and the Phase II tests (from January 29, 1999 to June 20, 2000, see DTN: GS000808312242.006 [162980]), water application was controlled such that no surface runoff occurred." "January 29" should be "February 19".</p>		
<b>Extent of condition</b>			
<b>Requirement</b>			
<b>Immediate Action</b>			
<b>Resolution</b>			
<b>CR number</b>		<b>Attachments</b>	

<b>ID</b>	82	<b>Type</b>	Technical
<b>Document</b>	ANL-NBS-HS-000027 REV 01	<b>Initiator</b>	Jim Kam
<b>Title</b>	Questionable log mean value of air permeability and conflict in justifying the range of air permeability f		
<b>Description</b>	<p>In Section 6.1.2.4, middle of 6th paragraph states "LeCain (1998 [100052]) reports a natural log mean of 2.772 (16.0 E-12 m2) for air permeability for boreholes RBT#1, RBT#2, and RBT#3 in the Tpcpul unit." The value "2.772" is questionable and not traceable.</p> <p>End of the same paragraph states that "This permeability estimate is approximately four orders of magnitude larger than the value reported in Table IV-3 of Simulation of Net Infiltration for Modern and Potential Future Climates (USGS 2001 [160355])." But later on the same page (pg.43), in justifying a range of + and - 1.0 (log K) for BRPERM (bedrock permeability), the reported air permeability data from LeCain [100052, 100153] "rarely demonstrate a range larger than 2 orders of magnitude for a given rock unit, even though the reported air permeabilities are much larger than those reported in Table IV-3 of Simulation of Net Infiltration for Modern and Potential Future Climates (USGS 2001 [160355]) for the Tpcpul unit." Then, why is the permeability range selected in favor of LeCain's values as opposed to those cited from USGS?</p>		
<b>Extent of condition</b>			
<b>Requirement</b>			
<b>Immediate Action</b>			
<b>Resolution</b>			
<b>CR number</b>		<b>Attachments</b>	

<b>ID</b>	83	<b>Type</b>	Technical
<b>Document</b>	ANL-NBS-HS-000027 REV 01	<b>Initiator</b>	Jim Kam
<b>Title</b>	Incorrect value cited from DTN.		
<b>Description</b>	In Table 6-4, first row under column "% Relative Difference (nearest tenth of 1%)", the value "3.7" for Present-day climate should be "4.0", according to Output DTN: SN0309T0503100.010.		
<b>Extent of condition</b>			
<b>Requirement</b>			
<b>Immediate Action</b>			
<b>Resolution</b>			
<b>CR number</b>		<b>Attachments</b>	

<b>ID</b>	84	<b>Type</b>	Technical
<b>Document</b>	ANL-NBS-HS-000027 REV 01	<b>Initiator</b>	Jim Kam
<b>Title</b>	Inconsistency in Analog value between Figure in AMR and DTN.		
<b>Description</b>	In Figure 6-2a, an analog value of 33 mm/yr for upper-bound infiltration is shown consistently with the value presented in Table 6-7 but is different from "34" shown in a corresponding figure in DTN: SNO308T0503100.008 even though the Table in the DTN shows "33 mm/yr". All these figures have the horizontal axes labeled as "Net Infiltration" but with units missing and they do not provide source references.		
<b>Extent of condition</b>			
<b>Requirement</b>			
<b>Immediate Action</b>			
<b>Resolution</b>			
<b>CR number</b>		<b>Attachments</b>	

<b>ID</b>	85	<b>Type</b>	Technical
<b>Document</b>	ANL-NBS-HS-000027 REV 01	<b>Initiator</b>	Jim Kam
<b>Title</b>	Incorrect description of how Weighting Factors are calculated		
<b>Description</b>	In Section 6.3.1 (Calculation Including Contingency Area), end of 3rd paragraph, "There are two (should be one) complete bins (moving from left to right) and 9/10 of 2nd bin within the low climate analog boundaries. -----. All of the remaining bins, of course, fall completely within the high climate analog (there are 12 (should be 14) of them), counting the included empty bins."		
<b>Extent of condition</b>			
<b>Requirement</b>			
<b>Immediate Action</b>			
<b>Resolution</b>			
<b>CR number</b>		<b>Attachments</b>	

<b>ID</b>	86	<b>Type</b>	Technical
<b>Document</b>	ANL-NBS-HS-000027 REV 01	<b>Initiator</b>	Jim Kam
<b>Title</b>	Traceability problem regarding mean temperature for the glacial transition climate.		
<b>Description</b>	In Section 6.4.2, 2nd paragraph states that "the mean daily temperature in Tulelake.inp is about 8 degrees Celsius, and the mean temperatures used in the lower-bound and upper-bound glacial transition climates were both approximately 9 –10 degrees Celsius, respectively (USGS 2001 [160355], Table 6-6)." Table 6-6 contains data only for upper-bound glacial transition climate. Therefore, Table 6-5 of the same reference should be cited for the lower-bound glacial transition climate.		
<b>Extent of condition</b>			
<b>Requirement</b>			
<b>Immediate Action</b>			
<b>Resolution</b>			
<b>CR number</b>		<b>Attachments</b>	

<b>ID</b>	87	<b>Type</b>	Technical
<b>Document</b>	ANL-NBS-HS-000027 REV 01	<b>Initiator</b>	Jim Kam
<b>Title</b>	More justification required for using one method over another to calculate weighting factors for differen		
<b>Description</b>	Attached are the files that calculate the weighting factors using the method from Rev00 of Analysis of Infiltration Uncertainty, ANL-NBS-HS-000027. The excel file (weightfact.xls) formulates 3 equations with the 3 unknown weighting factors and the MathCad file (wtfactor.mcd) solves the 3 equations. The resulting weighting factors are significantly different from those shown in Table 6-7 of Rev 01 of the subject report. Rev 01 uses a different method that does not consider the mean and standard deviation of the results of realization.  The only justification for using the Rev01 method over the Rev00 method is that the former is more transparent, as stated in the 2nd paragraph on pg. 55 of the Rev01 report. More justification than just "transparency" is required because the Rev01 method provides a lower weighting factor for the upper-bound infiltration range and thus is less conservative.		
<b>Extent of condition</b>			
<b>Requirement</b>			
<b>Immediate Action</b>			
<b>Resolution</b>			
<b>CR number</b>		<b>Attachments</b>	

<b>ID</b>	88	<b>Type</b>	Technical
<b>Document</b>	ANL-NBS-HS-000027 REV 01	<b>Initiator</b>	Jim Kam
<b>Title</b>	Not both aleatoric and epistemic uncertainty considered as said in the report		
<b>Description</b>	In Section 1.1, top of pg. 12 states that both aleatoric and epistemic uncertainty are considered in the report. In Helton & Davis, 2000, Sampling-Based Methods for Uncertainty and Sensitivity Analysis, SAND99-2240, TIC: 251256, epistemic uncertainty can be defined as a property of the analysts carrying the study. Thus, it can be a kind of systematic uncertainty related to measurements. This type of uncertainty has not been addressed in this report for those uncertain parameters that were determined by experiments and testing.		
<b>Extent of condition</b>			
<b>Requirement</b>			
<b>Immediate Action</b>			
<b>Resolution</b>			
<b>CR number</b>		<b>Attachments</b>	

<b>ID</b>	89	<b>Type</b>	Technical
<b>Document</b>	ANL-NBS-HS-000027 REV 01	<b>Initiator</b>	Jim Kam
<b>Title</b>	Volumetric contents at Field Capacity (-0.1 bar) and -60 bars not considered as Uncertain Input Para		
<b>Description</b>	In Section 4.1.1, water contents at -0.1 bar and -60 bars should be two of the uncertain input parameters but have been left out in the uncertainty analysis.		
<b>Extent of condition</b>			
<b>Requirement</b>			
<b>Immediate Action</b>			
<b>Resolution</b>			
<b>CR number</b>		<b>Attachments</b>	

<b>ID</b>	90	<b>Type</b>	Technical
<b>Document</b>	ANL-NBS-HS-000027 REV 01	<b>Initiator</b>	Jim Kam
<b>Title</b>	Traceability problem and incorrect description regarding relative positioning of the climate analog value		
<b>Description</b>	In Section 6.3.1, 2nd paragraph states that based on "the relative positioning of the climate analog values calculated (Attachment IV), a decision was made to use a simple graphical partitioning of the distribution -----." In Attachment IV, these values are not calculated but are simply cited from other references. In addition, the information presented in items 2 through 5 is not traceable. Perhaps a roadmap should be provided to retrieve the tabulated data in the Attachment.		
<b>Extent of condition</b>			
<b>Requirement</b>			
<b>Immediate Action</b>			
<b>Resolution</b>			
<b>CR number</b>		<b>Attachments</b>	

<b>ID</b>	91	<b>Type</b>	Technical
<b>Document</b>	ANL-NBS-HS-000027 REV 01	<b>Initiator</b>	Jim Kam
<b>Title</b>	Fracture porosity not found in cited DTN as said in report.		
<b>Description</b>	In Section 6.1.2.1, "See Analysis of Hydrologic Properties Data - - - or based on the distribution type of the actual dataset e.g. fracture porosity and precipitation DTN: SN0309T0503100.011", but "Fracture porosity" is not found in the cited DTN. This problem also occurs in Section 6.1.2.2.		
<b>Extent of condition</b>			
<b>Requirement</b>			
<b>Immediate Action</b>			
<b>Resolution</b>			
<b>CR number</b>		<b>Attachments</b>	

<b>ID</b>	92	<b>Type</b>	Technical
<b>Document</b>	ANL-NBS-HS-000027 REV 01	<b>Initiator</b>	Jim Kam
<b>Title</b>	Justification of upper- and lower-bound estimates for soil thickness required.		
<b>Description</b>	Citation should be provided to justify the range of multiplier SOILDEPM used in the uncertainty analysis.		
<b>Extent of condition</b>			
<b>Requirement</b>			
<b>Immediate Action</b>			
<b>Resolution</b>			
<b>CR number</b>		<b>Attachments</b>	

<b>ID</b>	93	<b>Type</b>	Technical
<b>Document</b>	ANL-NBS-HS-000027 REV 01	<b>Initiator</b>	Jim Kam
<b>Title</b>	Coefficients for estimating rooting depths for Glacial-Transition Climate not provided.		
<b>Description</b>	<p>In Sections 6.1.2.2 and 6.1.2.3, under "Bedrock Root-zone Thickness", "Refer to Figure 6-1 for a graphical representation of the relationship between soil depth and rooting depth for present-day and glacial-transition climates, as defined by Equation 17 in Simulation of Net Infiltration for Modern and Potential Future Climates (USGS 2001 [160355], pp. 50-51)".</p> <p>Equation 17 of citation provides coefficients RZc (=2) and RZd (=2) only for the present-day climate but not for the glacial-transition climate. In order to derive the relationship between soil depth and rooting depth as depicted in Figure 6-1 for the glacial-transition climate, RZc and RZd need to be specified as 3 and 2, respectively.</p>		
<b>Extent of condition</b>			
<b>Requirement</b>			
<b>Immediate Action</b>			
<b>Resolution</b>			
<b>CR number</b>		<b>Attachments</b>	

<b>ID</b>	94	<b>Type</b>	Technical
<b>Document</b>	ANL-NBS-HS-000027 REV 01	<b>Initiator</b>	Jim Kam
<b>Title</b>	Multiplier range for Precipitation and Potential Evapotranspiration not justified		
<b>Description</b>	<p>In Section 6.1.2.2, 1st paragraph under "Precipitation and Potential Evapotranspiration", "the multiplier range of +and -0.4 was consistent with the ranges of mean annual precipitation between the upper and lower climate bounds for modern, monsoon, and glacial transition climates used in Simulation of Net Infiltration for Modern and Potential Future Climates (USGS 2001 [160355], Table 6-19)." But in Table 6-19, the upper and lower bounds for modern and monsoon climates are not provided. Also in the Table, the upper and lower bounds of precipitation vary from the mean by a multiplier different from 0.4.</p> <p>The 2nd paragraph states that the distribution of precipitation "was consistent with the ranges of mean annual precipitation between the upper and lower climate bounds. For example, the mean annual precipitation during the mean present-day climate is 197mm, which is 41% lower than the mean annual precipitation for the upper-bound present-day climate (USGS 2001 [160355]), Table 6-10." This is true for the upper bound but not for the lower bound.</p> <p>In the 3rd paragraph, justification should be provided for "the range of multipliers between the lower and upper bounds of potential evapotranspiration for present-day (and monsoon) climates is expected to be the same as the range between the lower and upper bounds of precipitation for each climate."</p>		
<b>Extent of condition</b>			
<b>Requirement</b>			
<b>Immediate Action</b>			
<b>Resolution</b>			
<b>CR number</b>		<b>Attachments</b>	

<b>ID</b>	95	<b>Type</b>	Technical
<b>Document</b>	ANL-NBS-HS-000027 REV 01	<b>Initiator</b>	Jim Kam
<b>Title</b>	Traceability problem in citing the average standard deviation of fracture permeability data.		
<b>Description</b>	In Section 6.1.2.2, under "Bedrock and Soil Permeability", about middle of first paragraph, "This range in standard deviation of permeability reported in Freeze and Cherry (1979 [101173], p. 31) is consistent with the average standard deviation of 0.57 for the exposed units (top 12 layers) of fracture permeability data reported in Analysis of Hydrologic Properties Data (BSC 2003 [161773], Table 7)." The value 0.57 is not traceable from the cited Table.		
<b>Extent of condition</b>			
<b>Requirement</b>			
<b>Immediate Action</b>			
<b>Resolution</b>			
<b>CR number</b>		<b>Attachments</b>	

<b>ID</b>	96	<b>Type</b>	Technical
<b>Document</b>	ANL-NBS-HS-000027 REV 01	<b>Initiator</b>	Technical
<b>Title</b>	Traceability problem regarding values of Evapotranspiration Coefficients.		
<b>Description</b>	In Section 6.1.2.2, under "Evapotranspiration Coefficients A & B", "Normal distributions for the parameters ETCOEFFA and ETCOEFFB are used in the modified Priestley-Taylor equation (Priestley and Taylor 1972 [125321]; Flint and Childs 1991 [124946] for the estimation of bare-soil evaporation". However, there is nothing mentioned in these citation regarding normal distribution of these coefficients. Also in the same paragraph, "note that the bare-soil coefficients alpha and beta in Flint and Childs (1991 [124946]) are renamed ETCOEFFB and ETCOEFFA, respectively, - ---- and in this uncertainty analysis." but in Flint and Childs (1991), alpha/beta and ETCOEFFA/ETCOEFFB are expressed differently.		
<b>Extent of condition</b>			
<b>Requirement</b>			
<b>Immediate Action</b>			
<b>Resolution</b>			
<b>CR number</b>		<b>Attachments</b>	

<b>ID</b>	97	<b>Type</b>	Technical
<b>Document</b>	MDL-NBS-HS-000023	<b>Initiator</b>	Charles Beach
<b>Title</b>	35 DTNs need update		
<b>Description</b>	One additional case of a USGS data issue had been found during the initial investigation into CR 5223 during April. During the initial investigation initiated by CR 5223 into the USGS e-mails (i.e., review of USGS work on the infiltration model, data, and software), an individual identified that approximately 35 USGS technical data information forms in ATDT had been changed, but the corresponding record for the change does not exist in RIS. The individual has been directed to add this condition to those identified in CR 6334 and the individual responsible for the resolution of CR 6334 has been notified to expect this addition.		
<b>Extent of condition</b>			
<b>Requirement</b>			
<b>Immediate Action</b>			
<b>Resolution</b>			
<b>CR number</b>		<b>Attachments</b>	

<b>ID</b>	98	<b>Type</b>	Software
<b>Document</b>	MDL-NBS-HS-000023	<b>Initiator</b>	Ed Miller
<b>Title</b>	INFIL V2.0 code problems		
<b>Description</b>	<p>In the course of reviewing the INFIL V2.0 code as part of the Infiltration Special Project Technical Team, several changes to the code have been recommended by domain experts. The changes and justification are described below.</p> <p>1) Daily09 – allow the end year for climate data to be read as 2010.</p> <p>Condition: The climate data end date is 1995 in the present version of INFIL. The current end date is not an error, rather it reflects the extent of the climate data at the time the model was created. Changing the end date allows the model to be run using more recent data.</p> <p>Resolution: The Daily09 code will be modified to include the new end date.</p> <p>2) Transpiration in soil layers 2, 3, and 4 does not account for vegetation cover.</p> <p>Condition: The INFIL V2.0 code uses an algorithm to calculate how much water evaporates or transpires from the root zone. In the uppermost layer, layer number 1, the model allows for part of the water loss to be evaporation from bare soil and part to be lost by plant transpiration. A vegetation cover term, vegc, is defined as the proportion of the total surface area that is covered by plants. The soil evaporation term is multiplied by (1 – vegc) to account for the smaller surface area that is bare. The transpiration term is multiplied by vegc to account for the possibility of bare soil. In layers 2 to 4 of the model, bare soil evaporation is not allowed, so the only water loss term is the transpiration from plant roots. The transpiration water loss term for layers 2 to 4 does not contain the multiplier for vegc. The lack of the vegc term has been identified as a potential error because in the limit as vegc goes to zero, there should be zero transpiration, yet the current formulation would still calculate a transpiration loss. However, the INFIL V2.0 model does not allow vegc to be zero, rather it always maintains minimum vegetation cover value defined by a term named fvegc. Secondly, the current formulation allows the roots to utilize all the available water in the in layers 2 to 4. If the vegc multiplier were used, then the roots would be artificially prevented from using (1-vegc) portion of the available moisture, and that does not appear justified. Therefore, it is not clear if the lack of the vegc multiplier in layers 2 to 4 is truly an error.</p> <p>Resolution: The INFIL V2.1 will be programmed with a toggle switch to allow one or the other formulation to be used to determine the transpiration in layers 2 to 4. Additionally, there are other adjustable parameters that are part of the transpiration calculation that may change during calibration of the model. It is possible the either formulation would produce the same infiltration, albeit with slightly different parameter sets.</p> <p>3) The parameter soilmm is not properly dimensioned and initialized in INFIL V2.0.</p> <p>Condition: The dimension state that allocates memory in a FORTRAN code defines soilmm as a (3,n) array, where n is the number of model cells, and 3 is the number of layers. In the code, the soilmm array is called in a do-loop with an array of (4,n). This may create a significant error if the code is accessing memory outside of the defined (3,n) dimension statement.</p> <p>Resolution: The dimension statement needs to be corrected and the model recompiled. Then simulations must be performed with both versions of the model to determine the impact, if any.</p> <p>4) Equation 6-10 of the AMR has incorrect coefficients</p> <p>Condition: The equation 6-10 of the AMR (MDL-NBS-HS-000023) has three coefficients based on a polynomial regression to data presented in Figure 6-7 of the AMR. The equation 6-10 as written does not match the observed data. In addition, the same equation is incorrectly programmed into INFIL V2.0. A subsequent analysis has shown that the coefficients must be modified for the equation to match the observed data.</p> <p>Resolution: The data will be matched with a new regression analysis. The resulting coefficients will be recorded and the INFIL V2.1 will be modified to use the new coefficients.</p> <p>5) Weight parameter for layer 1 must have a value of 1 on input</p>		

Condition: The parameters referred to as the dynamic root zone weights are part of the model input. After input, the weights are modified by the code as part of the simulations. If the weight of layer 1 is not assigned a value of 1, then the model does not correctly normalize the weights during the simulation.

Resolution: The code can be modified to require that the input value of the weight for layer 1 is always given a value of 1. Alternatively, the documentation can make it clear that a value of 1 is required.

6) Priestley –Taylor ET parameters have tolerable limits

Condition: The parameters of the Priestley-Taylor ET equations can be adjusted during the calibration of the model. However, if the parameters are modified outside of their tolerable range, the model will calculate actual ET larger than potential ET, which is not physically possible.

Resolution: The code could be modified to check that actual ET < potential ET at all nodes and all times and notify the user that a physically impossible situation has occurred. Alternatively, a warning can be placed in the user documentation to remind the user to check for physically unrealistic results caused by Priestley-Taylor parameters outside of the tolerable range.

<b>Extent of condition</b>		
<b>Requirement</b>		
<b>Immediate Action</b>		
<b>Resolution</b>		
<b>CR number</b>	<input type="text"/>	<b>Attachments</b> <input type="text"/>

<b>ID</b>	<input type="text" value="99"/>	<b>Type</b>	<input type="text" value="Technical"/>
<b>Document</b>	<input type="text" value="MDL-NBS-HS-000023"/>	<b>Initiator</b>	<input type="text" value="Grant"/>
<b>Title</b>	<input type="text" value="Infiltration input file not put in output DTN"/>		
<b>Description</b>	Appendix G of the AMR discusses the generation of a file (SOILMAP6.INP) that is used as input to the infiltration model. The current AMR does not provide any link (through either a DTN or record) as to where this file can be found. As an intermediate output from the AMR, this file should have been included in a product output DTN since the model cannot be reproduced or evaluated without this file (although LP-SIII.10Q-BSC makes creating DTNs for output that is not discussed in Section 8 optional). This file (and several others) were originally included on CDs that were intended to be attached to the previous version of the AMR (ANL-NBS-HS-000032). However, these files were not carried forward when the MDL version of the AMR was prepared, although the discussion of the creation and use of these files is retained in the AMR.		
<b>Extent of condition</b>	There are several other files and routines that are discussed in the AMR for which a link is not provided to allow the user or reviewer to view the files. These files appear on in the following RIS records: MOL.20050801.0162-0165.		
<b>Requirement</b>			
<b>Immediate Action</b>			
<b>Resolution</b>	A DTN has been created for this file in order to provide a source for this information on soil depths that can be used by modelers preparing the revised version of the infiltration model.		
<b>CR number</b>	<input type="text"/>	<b>Attachments</b>	<input type="text"/>

<b>ID</b>	100	<b>Type</b>	Technical
<b>Document</b>	MDL-NBS-HS-000023	<b>Initiator</b>	Milinka Watson-Garrett
<b>Title</b>	Evaporation equation validity		
<b>Description</b>	<p>Input DTN GS000300001221.009 (TIC 241865) was used as input to MDL-NBS-HS-000023 Rev 00. TDMS states that the data is established fact-qualified, but an evaluation of this reference indicates that the modified equations used from this reference do not meet the requirements of established fact per LP-3.15Q-BSC Attachment 3.</p> <p>The modification of the Priestley-Taylor equation for soil water limited conditions in Use of the Priestley-Taylor evaporation equation for soil water limited conditions in a small forest clearcut (1991, Agricultural and Forest Meteorology, 56) may not be considered established fact for several reasons: 1) the modification is not traceable to engineering handbooks etc. as outlined in LP-3.15Q-BSC/Rev. 0/ICN 2. 2) The approach involves calibrating the modified P-T equation to a small forest clearcut in Oregon. It's not clear that the same modification/calibration would be reasonable for Yucca Mountain.</p>		
<b>Extent of condition</b>			
<b>Requirement</b>			
<b>Immediate Action</b>			
<b>Resolution</b>			
<b>CR number</b>		<b>Attachments</b>	

# **Appendix B1**

## **Eight Questions**

## Description

This analysis provides summary answers to the Eight Questions for Insight, one of the Phoenix Approach© tools, and is a brief high-level summary of the event that is being investigated. This eight-question analysis relates to issues concerning the subject USGS emails and infiltration modeling, and must be viewed in the context of the *Root Cause Analysis Report in Response to Condition Report CR 5223*.

The Eight Questions for Insight	
Impact	1. What are the consequences? 2. What is the significance?
Influences	3. What set up the situation? 4. What triggered the event? 5. What made the consequences as bad as they were? 6. What kept the consequences from being a lot worse?
Closure (Outcome)	7. What should be learned from it? 8. What should be done about it?

## Use

**The Team used the Eight Questions analysis early in the root cause analysis process as a framework for structuring preliminary insights gleaned from interviews and document reviews for later consideration and follow-up. Many of the statements in the Eight Questions analysis are speculative, and many of the preliminary indicators documented in this tool were not substantiated by later data collection and evaluation. The tool is included here to illustrate one approach that was used by the Team during its analysis, but only those conclusions and recommended actions that are reflected in the Root Cause Analysis Report itself represent the Team's final analysis.**

## Output and Analysis

Some of the output from the Eight Questions analysis was incorporated in the following sections of the root cause analysis report:

Impacts –	Background (Section 2.0), Analysis Regarding USGS Emails (Section 4.0)
Influences –	Background (Section 2.0), Analysis Regarding USGS Emails (Section 4.0)
Closure –	Causes/Extent of Causes (Section 9.0), Recommendations (Section 10.0)

## Eight Question Analysis

One of the fundamental bases of the Phoenix Approach© is the answering of eight basic, common-sense questions about the episode being investigated. These eight questions elicit analytical and speculative information and address the impact of the episode, the factors that resulted in the consequences, and the close-out of the issue. The following is a summary of the information for this investigation.

<b>Eight Question Analysis of Apparent Noncompliance with Quality Requirements as Detailed in Condition Report (CR) 5223</b>	
<b>Impact</b>	
<p>1. Consequences (Tangible and intangible outcomes)</p>	<ul style="list-style-type: none"> <li>• <u>Actual Consequences:</u> <ul style="list-style-type: none"> <li>- No lost production, injuries, equipment damage, radiation doses, or risk to the health and safety of the public were involved</li> <li>- Costs of rework of unsuitable work products (tens of millions of dollars)</li> <li>- Potential embarrassment to OCRWM</li> <li>- Costs of investigations and discussions</li> <li>- Costs related to correcting multiple organizational and cultural issues</li> <li>- Costs of supporting Congressional inquiries</li> </ul> </li> <li>• <u>Expected Consequences:</u> <ul style="list-style-type: none"> <li>- More difficulty in getting Congressional support</li> <li>- Closer NRC scrutiny</li> <li>- Encouragement to opponents of OCRWM</li> </ul> </li> <li>• <u>Potential Consequences:</u> <ul style="list-style-type: none"> <li>- Potential unplanned buildups of spent nuclear fuel at existing nuclear power plants [not substantiated because license application had already been delayed]</li> <li>- Potential lawsuits of utilities due to delays in acceptance of spent fuel [not substantiated because license application had already been delayed]</li> <li>- Above types of costs could have been a lot higher if the problems had not surfaced when they did</li> </ul> </li> </ul>

<b>Impact (Continued)</b>	
<p>2. Significance (What this event should mean to OCRWM.)</p>	<ul style="list-style-type: none"> <li>• <u>Precursor to:</u> <ul style="list-style-type: none"> <li>- Potentially more serious regulatory consequences and probable funding impacts</li> </ul> </li> <li>• <u>Spatial and Temporal Extent:</u> <ul style="list-style-type: none"> <li>- Many of the causes have been previously identified</li> <li>- Barriers similar to those that did not succeed (below) could be in a weak condition in other applications [early indicator – not substantiated by later analysis]</li> <li>- The behaviors and conditions involved could extend to other technical work products [early indicator – not substantiated by later analysis]</li> </ul> </li> <li>• <u>Barriers That Did Not Succeed With Respect to Infiltration Products (partial list):</u> <ul style="list-style-type: none"> <li>- Program management</li> <li>- Oversight did not sufficiently emphasize limiting weaknesses including lack of performance-based audits and ineffective trending</li> <li>- Policies and procedures in deterring issues</li> <li>- Professional behavior and personal ownership of quality</li> </ul> </li> <li>• <u>Successful and Unchallenged Barriers:</u> <ul style="list-style-type: none"> <li>- Screening found subject USGS emails</li> <li>- Subsequent action found nonconforming work products</li> <li>- If OCRWM had not found the problems, they would have been found by NRC</li> </ul> </li> <li>• <u>Quality Issues Associated With Infiltration Products:</u> <ul style="list-style-type: none"> <li>- Business-like compliance to QA criteria</li> <li>- Safety and quality culture</li> <li>- Ability of organization to “connect the dots”</li> <li>- Sensitivity to anomalies that could indicate quality issues</li> <li>- Systematic approach to production</li> <li>- Questioning (behavior) attitude</li> <li>- Accuracy of information</li> <li>- QA of information intended to be given to NRC</li> <li>- Expectations for professional behavior</li> <li>- Rigors of the licensing process</li> </ul> </li> </ul>

<b>Influences on Consequences</b>	
<p>3. Vulnerability (What set-up OCRWM for the event)</p>	<ul style="list-style-type: none"> <li>• There was insufficient focus on assuring that infiltration products would be suitable for their intended purposes and perform satisfactorily in service</li> <li>• USGS was not used to working in a rigorous regulated environment</li> <li>• USGS was not used to preparing work products for NRC scrutiny</li> <li>• There was an overreliance on checking to catch problems with the infiltration products</li> <li>• Underlying causes were not corrected to prevent recurrence</li> <li>• There was a focus on compliance-based rather than performance-based processes associated with the infiltration products</li> <li>• Changing organizational structure, requirements, funding, and schedules</li> <li>• There was insufficient emphasis on accountability for infiltration product quality</li> <li>• There was limited communications of expectations for worker or management professional behavior</li> </ul>
<p>4. Trigger (What triggered the event)</p>	<ul style="list-style-type: none"> <li>• Non-acceptance of the LSN by NRC resulting in a review of legacy emails</li> </ul>
<p>5. Exacerbation (What made the consequences as bad as they were)</p>	<ul style="list-style-type: none"> <li>• Infiltration work product nonconformances were not identified by: <ul style="list-style-type: none"> <li>- Principal Investigator, author</li> <li>- Supervisor</li> <li>- Responsible managers</li> <li>- Reviewers, checkers, QERs</li> <li>- OCRWM line organization</li> </ul> </li> <li>• The causes of infiltration work product nonconformances were not identified by oversight activities, including QA activities</li> <li>• Root cause analyses prior to this one did not effectively address the lack of emphasis on self-identification of problems</li> <li>• Nonconformances were expensive to address</li> </ul>
<p>6. Mitigation (What kept the consequences from being worse)</p>	<ul style="list-style-type: none"> <li>• The license application had not been submitted and therefore the infiltration product nonconformances were self-identified by OCRWM</li> <li>• The public was notified immediately as soon as OCRWM management knew of the issue</li> <li>• No issues were identified that affected the integrity of the Site Recommendation</li> <li>• The subject USGS emails were detected by screeners</li> <li>• Once DOE was made aware of the emails, the response was prompt and effective</li> <li>• Subject emails only reference issues in the infiltration AMRs</li> <li>• Delays in project schedule are not causing any nuclear reactors to shut down for lack of a place to put spent fuel</li> </ul>

<b>Close Out</b>	
<p>7. Lessons to be Learned from the Assessment of USGS Emails</p>	<ul style="list-style-type: none"> <li>• It is extremely difficult to achieve consistent quality unless there is stability of management, organization, requirements, processes, procedures, culture, schedule, and funding</li> <li>• In the absence of rigorous management commitment to quality, non-performing personnel and organizations may be tempted to use the above issues as excuses for their non-performance</li> <li>• Management must communicate as an over-arching expectation that the organization produce products that will meet requirements, perform satisfactorily in service, and be suitable for their intended purpose</li> <li>• Oversight must focus on identifying the limiting weaknesses impeding the consistent production of products that will meet requirements, perform satisfactorily in service, and be suitable for their intended purpose</li> <li>• Failures to detect and/or address previous causes are among the causes of the current event now being investigated</li> <li>• Transparent, planned processes are more likely to produce quality work than unplanned and opaque processes</li> <li>• Production activities should be conducted in accordance with written plans that include measures to assure that the activity was done correctly</li> </ul>

<b>Close Out (Continued)</b>	
<p>8. Candidate Corrective Actions for the USGS Email Assessment [Potential Corrective Actions for Consideration During Root Cause Analysis]</p>	<ul style="list-style-type: none"> <li>• Interim compensatory measures: <ul style="list-style-type: none"> <li>- Email problems sensitized personnel to non-professional communications</li> <li>- License application had been delayed; therefore, no other interim compensatory measures were needed</li> </ul> </li> <li>• Corrective actions for symptoms and effects: <ul style="list-style-type: none"> <li>- Plans were made for rectifying of nonconforming work products</li> </ul> </li> <li>• Corrective actions for causes: <ul style="list-style-type: none"> <li>- Expectations for professional behavior should be promulgated and enforced</li> <li>- Processes to prevent recurrence should be improved</li> </ul> </li> <li>• Corrective actions for generic implications: <ul style="list-style-type: none"> <li>- Other similar processes should be assessed to identify identical weaknesses on a sampling basis</li> <li>- Technical work products should be assessed for conformance, suitability for intended purposes, and for the likelihood of satisfactory performance in service</li> </ul> </li> <li>• Corrective actions for self-assessment deficiencies: <ul style="list-style-type: none"> <li>- QA should independently investigate what it is about the way it does business that made it fail to detect and induce correction of any of the causes of this event</li> <li>- Line organizations should independently investigate what it is about the way they do business that made them fail to detect and induce correction of any of the causes of this event</li> </ul> </li> <li>• Follow-up plans: <ul style="list-style-type: none"> <li>- QA should include corrective actions and lessons to be learned from this report in their routine sampling activities</li> <li>- All OCRWM “self-assessments” should include corrective actions and lessons to be learned from this report in their routine sampling activities</li> <li>- OCRWM management should monitor this issue to identify any events that would indicate that the causes of this event are still active</li> </ul> </li> </ul>

## **Appendix B2**

### **Comparative Timeline©**

## **Description**

The Comparative Timeline© (CTL) is a tool developed to sequentially arrange data about events important to the issue being investigated. The CTL addresses behaviors and conditions in sequence leading up to the consequences. The CTL compares what actually happened to what should have happened. It also includes the immediate result of the entry and evaluation of the significance.

## **Use**

The CTL was used as an organizing activity to facilitate discussion of the events involved in the episode. The CTL was used for a number of analyses such as the factor trees, the Eight Question Analysis, the Missed Opportunities Matrix, and the Barrier Analysis Matrix©.

## **Input**

The following information was used as inputs into the CTL:

- Audits,
- Surveillances,
- Procedures,
- Quality Assurance Requirements and Description (QARD),
- Policies,
- Condition Reports,
- Lessons Learned,
- Training,
- Subject USGS mails,
- Infiltration Model,
- NRC activities, and
- External reviews, e.g. GAO, IG, NEI.

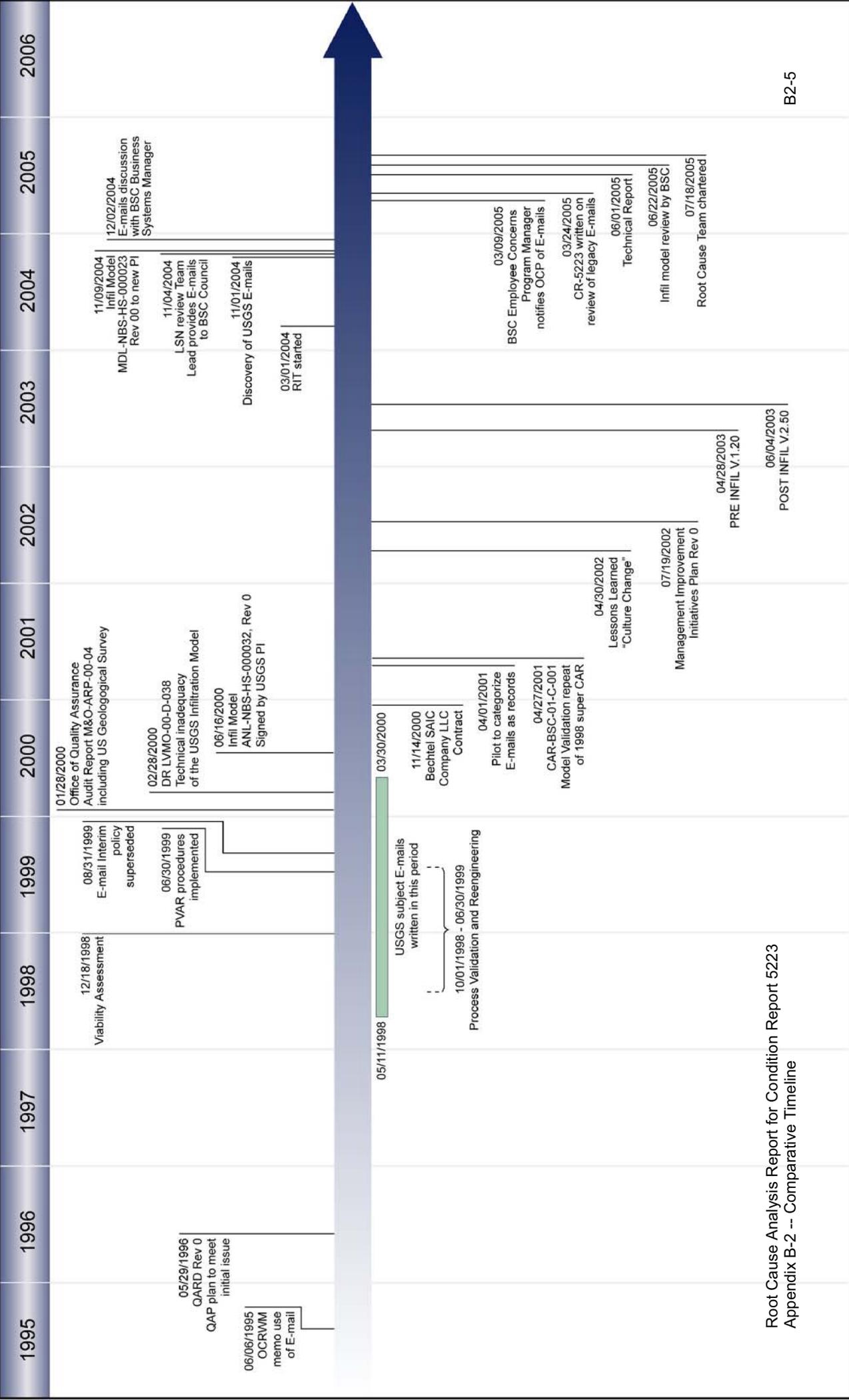
## **Summary**

The root cause analysis considered information dating back to 1982. The CTL has been used to look at the number of audits and surveillances that have occurred and the Condition Reports that have been written as a result. In addition it has allowed the Team to look at the sequence of events and determine the impacts on issues reviewed.

Attached are excerpts from the CTL to provide readers with an indication of how the CTL was employed by the Root Cause Analysis Team.

Date	What Happened?	What Should Have Happened?	Impact of Difference	Significance of the Impact
6/6/1995	<p>OCRWM Memo to staff on Use of Electronic Mail is issued. It discusses email but does not give guidance on what is acceptable and unacceptable in email. OCRWM approach to email does not include follow-up activities such as sampling of actual emails to determine the effectiveness of the policy.</p>	<p>Email policy should have established acceptability criteria for email. OCRWM should have conducted sampling of emails.</p>	<p>Employees were not given criteria for what was acceptable and unacceptable for emails. Unprofessional emails, when sent, were not promptly identified.</p>	<p>A limited number of USGS employees continued to exchange emails indicating negative attitude toward quality. Quality issues mentioned in emails were not addressed for many years.</p>
1/28/2000	<p>An audit is conducted by OQA of USGS - technical inadequacy of the USGS infiltration model /AMR. (M&amp;O-ARP-00-04) DR LVMO-00-D-039. All four of the AMRs evaluated used routines and/or macros. Of the 24 routines and macros reviewed, all had at least one, or more, anomalies in what was required to be documented in accordance with AP-SI.1Q. The anomalies ranged from not identifying the software identification and version number to lack of documentation to support the validation of the routine/macro. AMR-U0010 was one of the four; 11 of the 24 routines were associated with this AMR. The above audit indicates that USGS is not promptly identifying its own conditions adverse to quality as required by QA requirements.</p>	<p>All of the problems of the audit should have been self-identified by USGS and reported on Condition Reports promptly rather than being left for discovery in the audits. The audit should have included multiple findings that USGS is not promptly identifying conditions adverse to quality.</p>	<p>Missed opportunity to self identify issues. USGS continued to produce nonconforming products and OCRWM continued to accept them.</p>	<p>Audits that did not indicate prompt identification of conditions adverse to quality ultimately resulted in the current model nonconformances. The Infiltration model is being replaced.</p>

Date	What Happened?	What Should Have Happened?	Impact of Difference	Significance of the Impact
6/16/2000	Infiltration Model ANL-NBS-HS-000032, Rev 00 is accepted by M&O contractor, after reviews by USGS and other Program personnel. .	At least one of the reviewers (USGS, M&O, OCRWM) should have identified the conditions adverse to quality that were identified in 2004, 2005, and 2006.	The undetected conditions adverse to quality are left in a document intended to be input in the licensing application.	Major missed opportunity. Failure of reviewers to identify conditions adverse to quality in a document that is intended to be input in the license application ultimately resulted in the current model nonconformances.
4/30/2002	"Lesson Learned;" OCRWM-LL-2002-026 "Culture Change" was issued. The purpose was to get OCRWM to perform as a regulated entity. OCRWM did not subsequently follow up on the "Lesson Learned" and therefore did not find out that the culture change was insufficient to correct the previous problem.	Management should have clearly communicated expectations.	Some previous behaviors continued. OCRWM management did not find out that the Lesson Learned was not learned.	Missed opportunity – could have made a significant difference.
7/2/2003	OCRWM did not ensure that products that would become part of the licensing application were in conformance with NUREG 1804, Rev 2, "Yucca Mountain Review Plan Final Report".	OCRWM should have conducted a detailed review of NUREG 1804 and should have ensured incorporation into the license application development process.	License application input products may not have met NRC expectations and may not have been suitable for their intended purpose.	Major missed opportunity. Failure to ensure adherence to NUREG 1804 may have ultimately resulted in the current infiltration model nonconformances.



Root Cause Analysis Report for Condition Report 5223  
Appendix B-2 -- Comparative Timeline

# **Appendix B3**

## **Factor Tree Analysis**

## **Description**

The Factor Tree is a tool that is used to generate a sequence of potential causes leading to the triggering of a defined event. The basic idea is that this process is a methodical way of identifying potential causes. It differs from some of the other tools in that it does not necessarily lead to one answer, but may identify several major causes, if not the root cause that led to the event.

## **Factor Tree Construction**

Factor Trees are generally constructed by starting with the defined consequences of an event and working backwards toward one or several triggering actions (causes).

## **Use of the Factor Tree Tool**

After construction, the Factor Tree is used as a tool to know where to investigate other objective evidence and where to start addressing the root cause(s).

This tool is good for exploring the basis for an event more than one or two questions deep. It provides a good visual to allow you to see the sequence of activities leading to an event and to gain insight into the possible reasons for the event occurring. With several potential causes identified, further analysis is required to dig down in the objective evidence to determine the probability and validity of the potential cause.

## **Input**

Input for the Factor Tree analyses was the preliminary review of the original emails, CRs, and interviews.

## **Summary**

The following is a summary of the major factors apparent in the analysis of the infiltration products:

- Schedule and funding pressures,
- Lack of accountability,
- Integration of quality into the infiltration work products,
- High tolerance for sloppy work, conditions adverse to quality, and risks,
- Low tolerance for procedures, quality concepts, other organizations, and QA,
- Failed: processes, barriers, trending, implementation, planning, management, detection, professionalism, self-assessments, training, culture, corrective actions, product acceptance, change management, and program management.

The following analysis provides a summary of the details identified in the graphical representations of the Factor Trees.

## **Part 1: USGS Workers Write Multiple Emails that Become Public**

1. USGS is not held accountable for unprofessional behaviors expressed in emails and therefore, other emails are written with management personnel included on distribution.
2. USGS personnel have other priorities and frustrations, leading to poor quality assurance practices and the expression of disdain for quality assurance concepts, requirements, expectations, and the QA organization.
3. Upon the discovery of the emails, four months passed before actions were taken to address the issues.
4. After discovery and release to the public, extensive evaluation activities were required; doubt was cast upon the integrity of the infiltration model; and extensive costs and impacts to planned schedules have been experienced.

## **Part 2: Infiltration Technical Products Do Not Meet All Requirements**

1. USGS, BSC, and DOE did not detect the technical, quality, and administrative requirement noncompliances. The discovery was during the unrelated review for relevancy of emails prior to inclusion into the LSN.
2. The planning processes for funding, resources, and schedule extensions were ineffective in light of changing scopes, changing requirements, changing organizations, and changing expectations.
3. Quality considerations were not effectively built into the product development processes. Verbatim compliance with procedures was not effective.
4. Management did not properly manage the work efforts and tolerated nonconforming work products.
5. Schedule pressures adversely affected implementation of quality processes.
6. "Work-around" activities were employed to meet schedules and funding levels.
7. OCRWM, BSC, and USGS had a high level of tolerance for poor quality assurance practices.
8. Trending, compliance audits, self-assessments, management assessments, checking, and other processes were ineffective in identifying technical issues with the work products.
9. Failure of the barriers that were set up to preclude problems was not detected until the discovery of the emails.
10. USGS was not treated like a vendor; it was treated as a Federal agency partner, not subject to NQA-1 acceptance standards.
11. OCRWM, BSC, and USGS tolerated audit findings and poor work products due to the lack of a rigorous acceptance process upon product turnover.

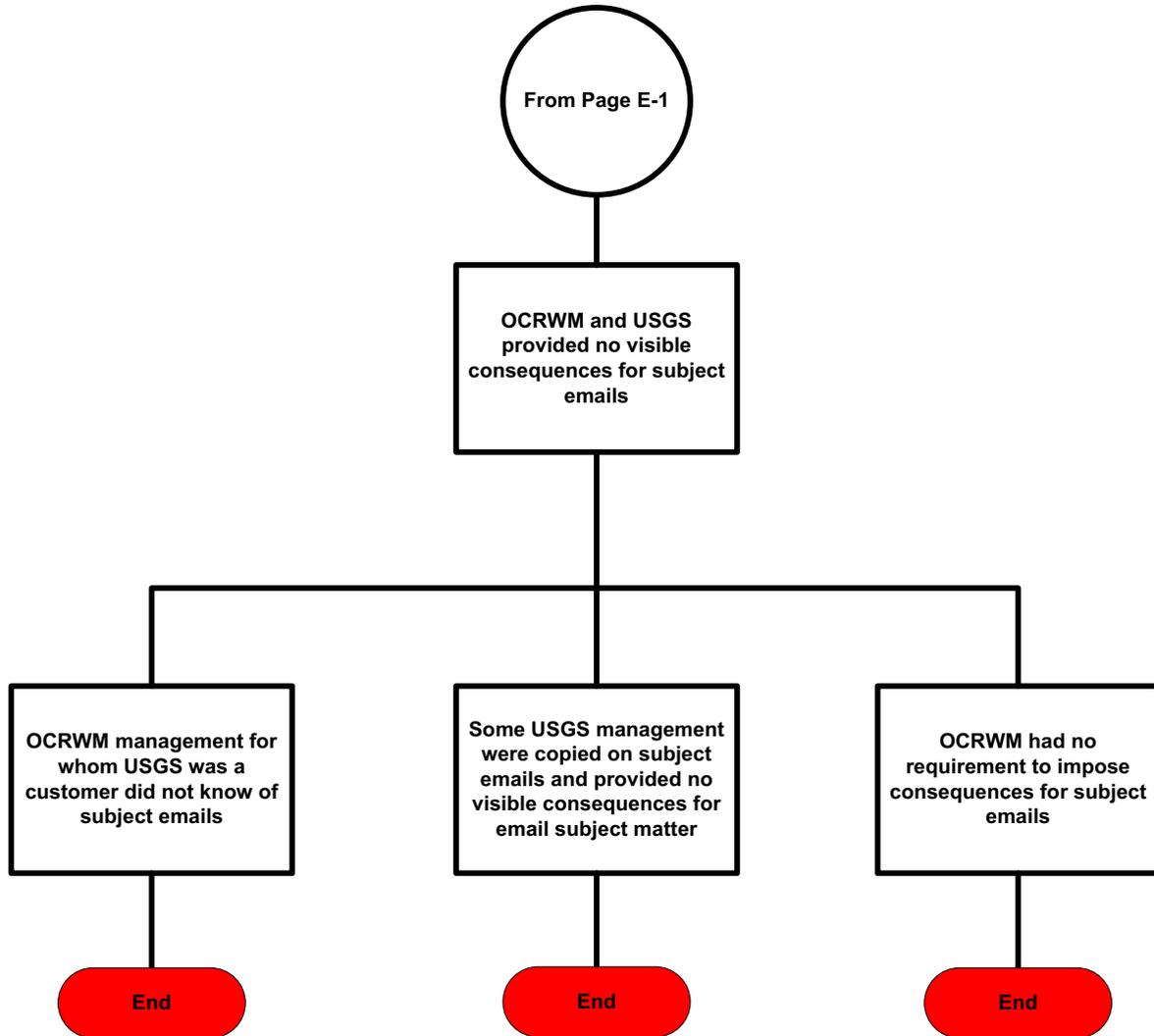
12. The product acceptance process was not clearly defined, not properly scheduled, and was not audited to determine its effectiveness.

### **Part 3: The Quality Assurance Program Implementation Is Ineffective as Related to Infiltration Modeling Work**

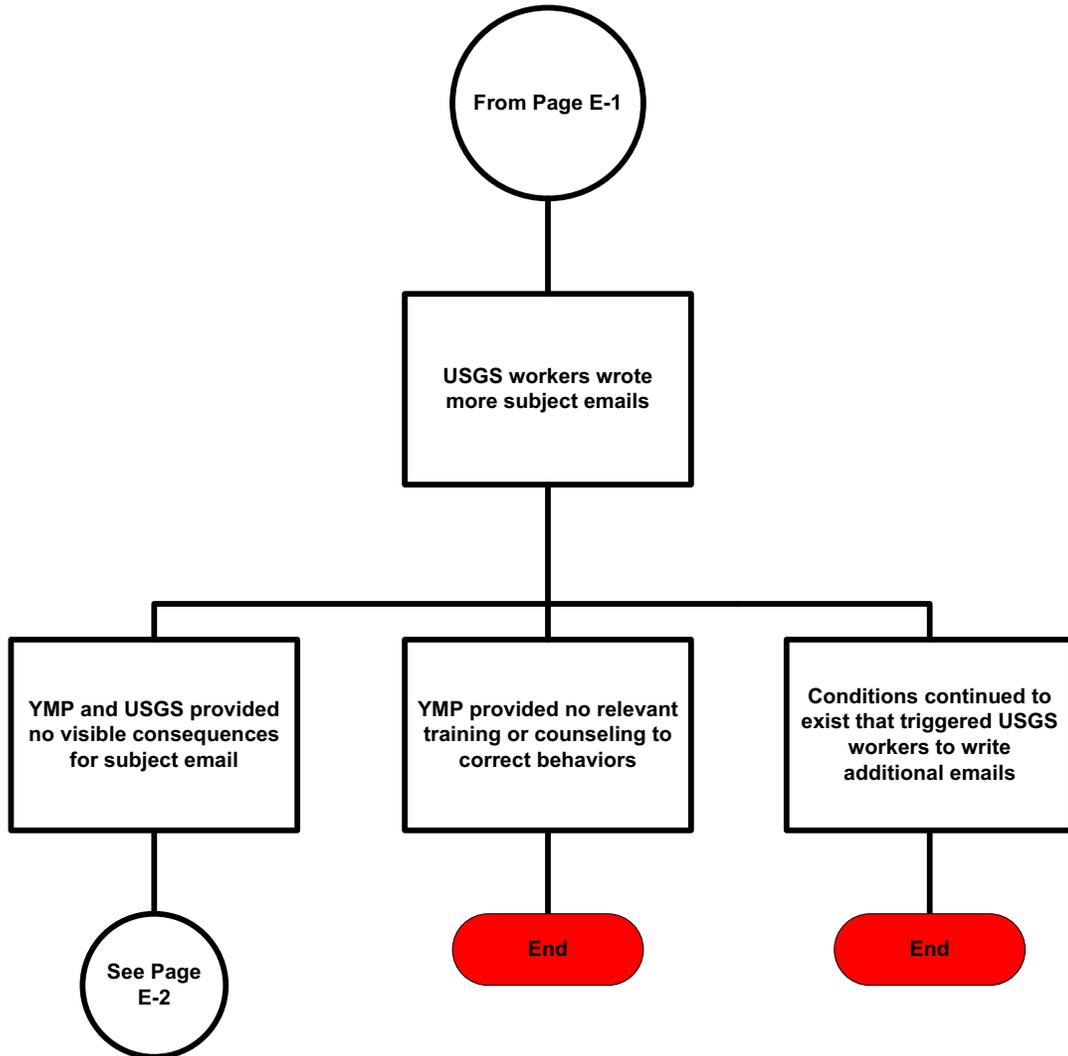
1. Individuals and organizations, performing poor quality work, were not held accountable.
2. Individuals, organizations, and management placed schedule and costs over quality requirements.
  - Schedules and costs were easily measured; quality was not.
  - Quality was viewed as a hindrance to completing work products. Oversight activities were viewed as hindrances as opposed to evaluations for management's benefit.
  - Favorable interpretations of quality requirements and expectations and "work-around" activities were used to avoid any impacts on schedule, costs, and other resources.
  - The quality organization had not effectively promoted (through training and demonstration): the importance and benefits of quality concepts in obtaining an NRC license; the need for nuclear culture; and the importance of having effective program management and planning processes.
  - The importance of NRC concepts was not well understood (i.e., conservative decision-making, defense-in-depth, and the NRC acceptance criteria detailed in NUREG 1804).
3. There was ineffective implementation of quality and procedural requirements, corrective actions, and recommendations.
4. Corrective action, trending, and self-assessment processes were ineffective in identifying, correcting, and preventing conditions adverse to quality.
5. Organizations, management, scopes, approaches, upper-tier documents, the QARD, implementing procedures, funding, and schedules were changed frequently causing a lack of program stability, confusion, product rejection, and rework.
6. Quality assurance requirements and the required resources were ineffectively integrated into product planning and implementation processes in lieu of a final inspection.
7. There was a lack of a rigorous work product acceptance process between organizations, groups, and individuals.
8. USGS employees involved in developing the infiltration products did not exhibit behavior consistent with a good nuclear culture.



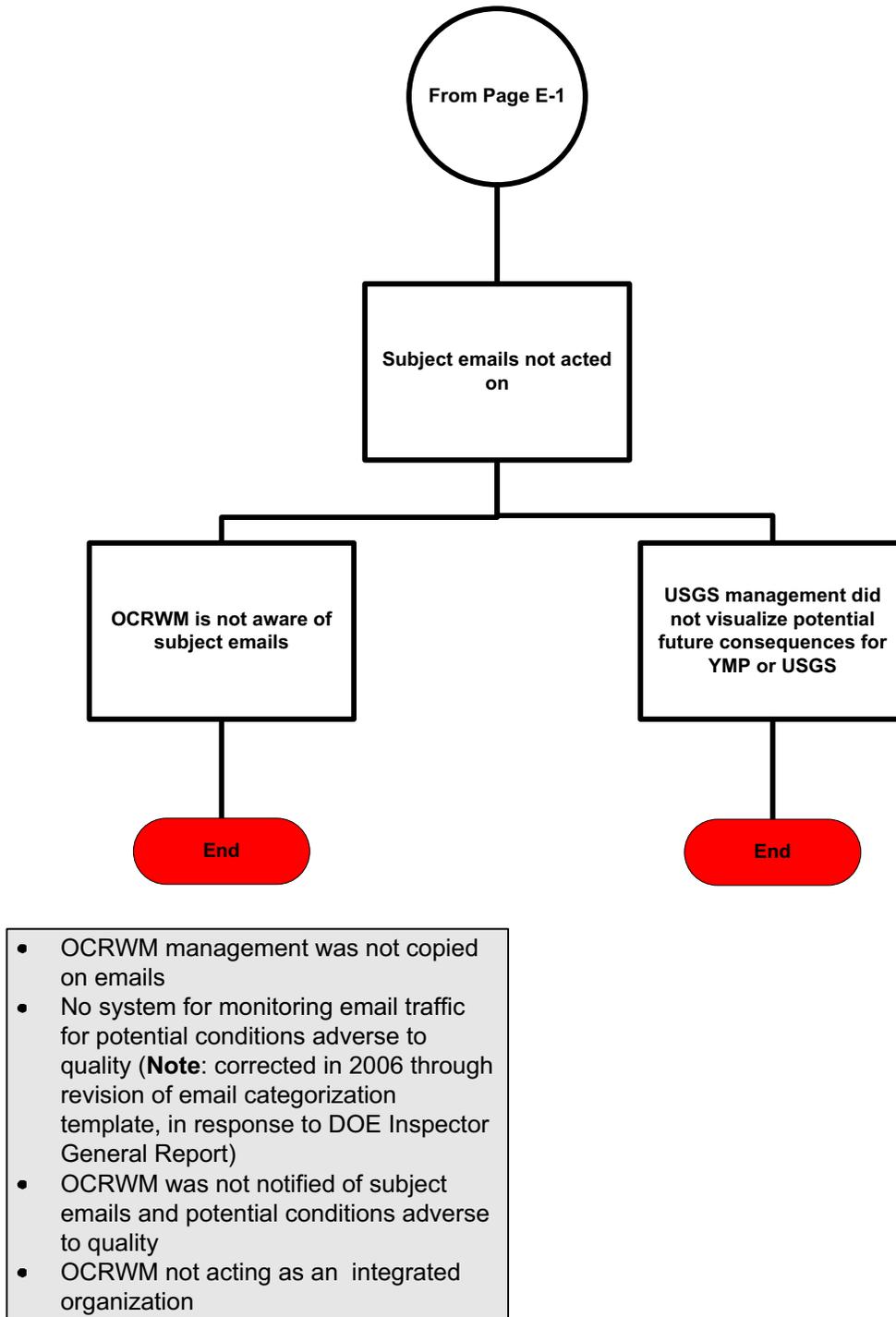
# FACTOR TREE - Email Issues



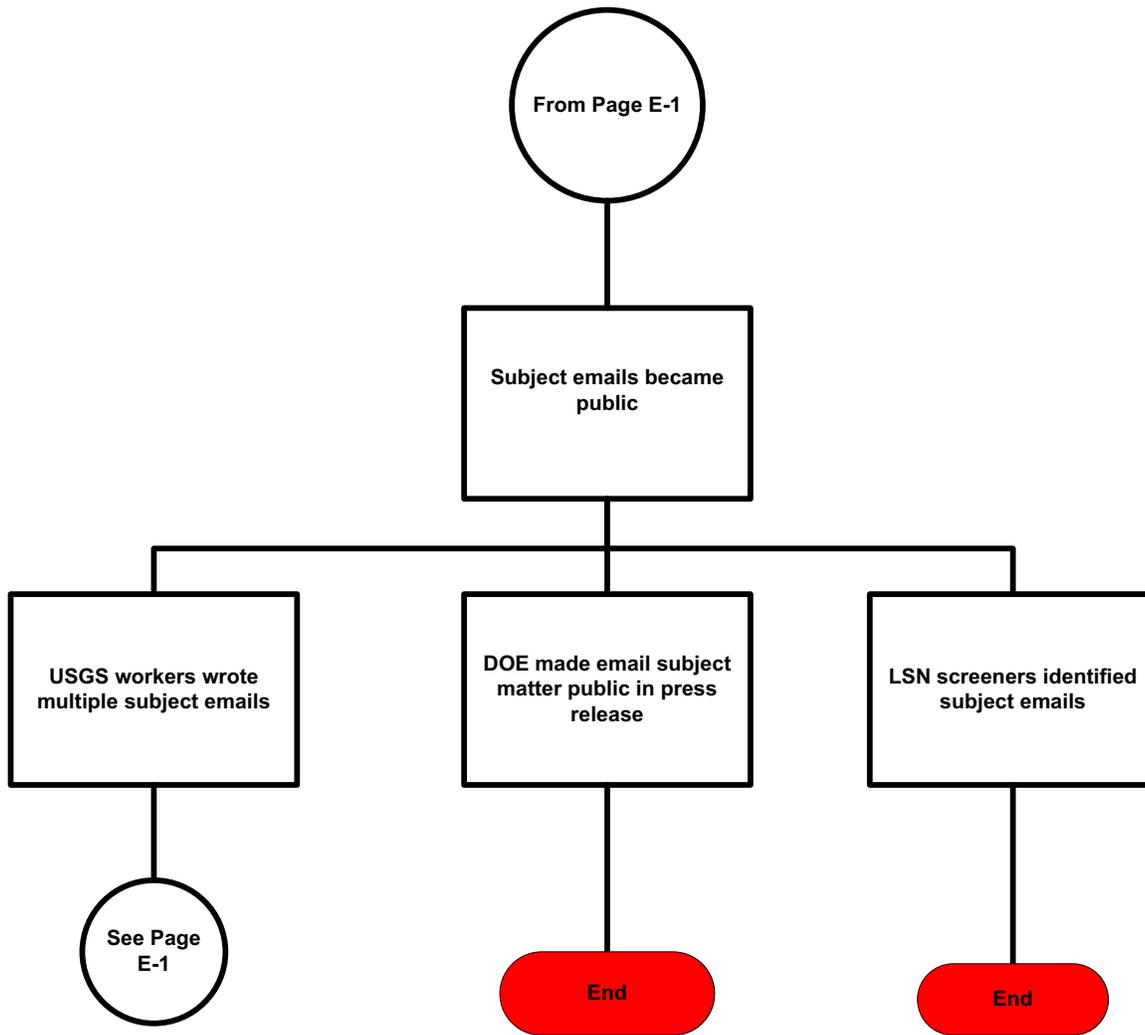
# FACTOR TREE - Email Issues



# FACTOR TREE - Email Issues

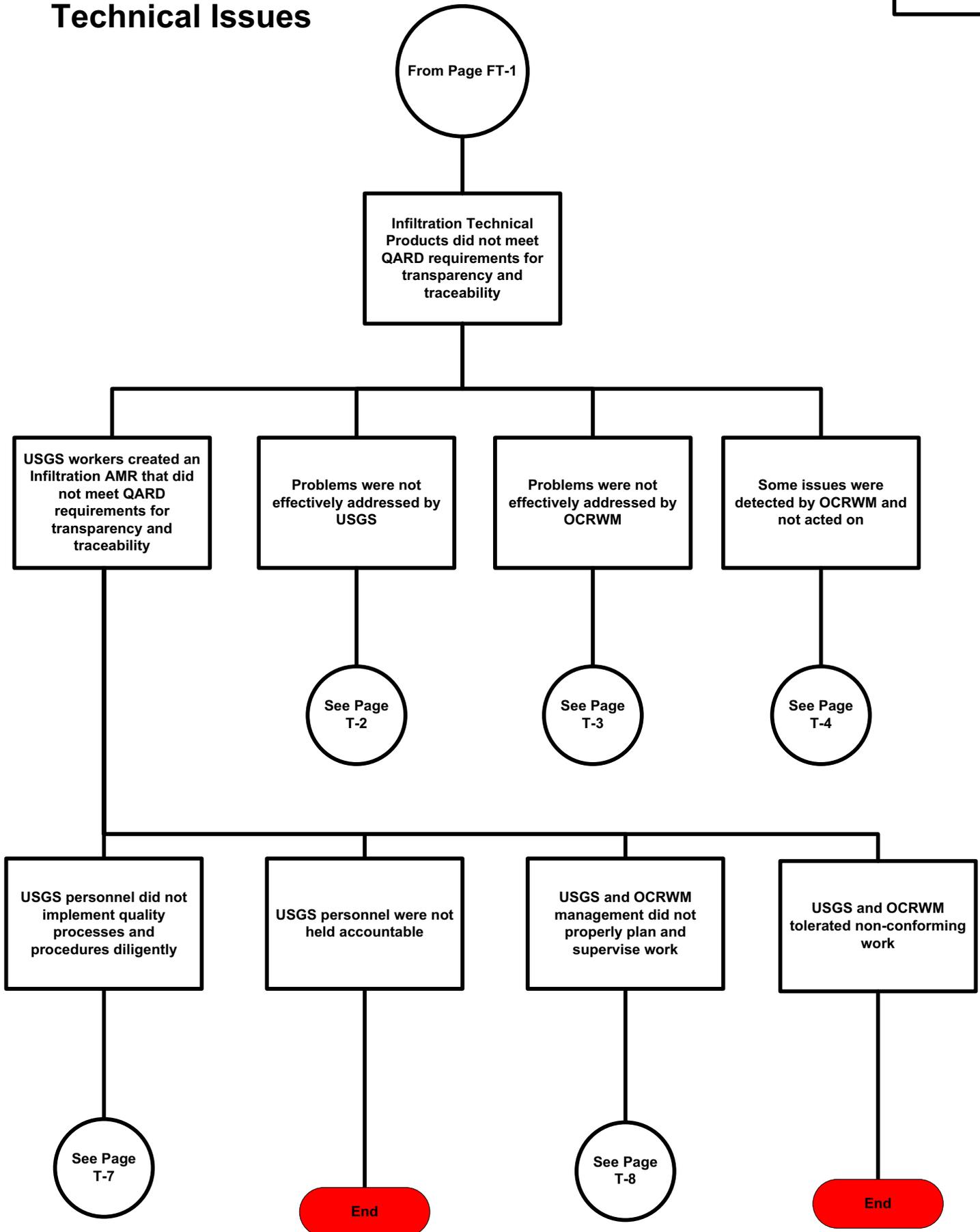


# FACTOR TREE - Email Issues

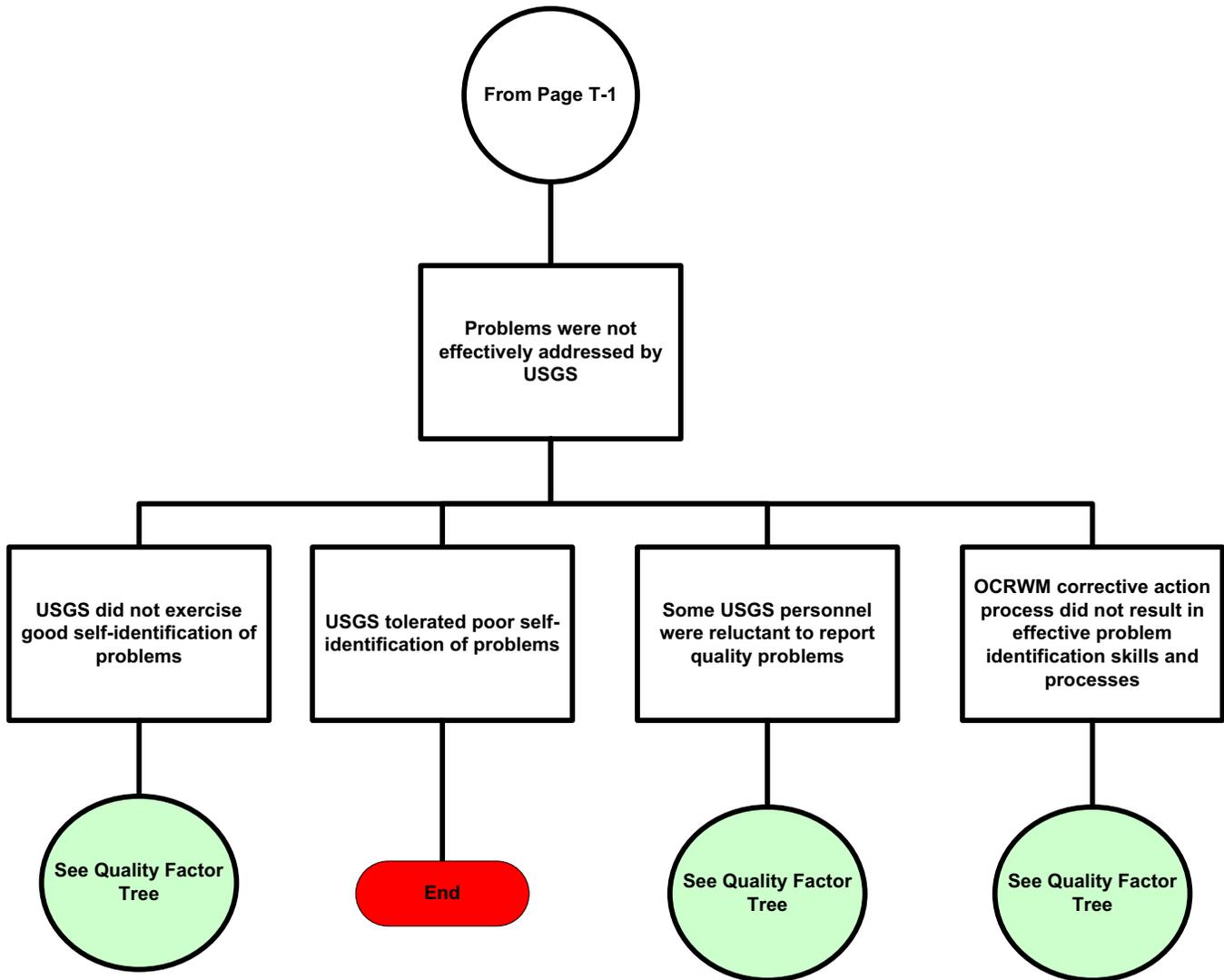


- Screeners brought issues to BSC management
- Delay in bringing the email issue forward to OCRWM management
- No guidance to identify conditions adverse to quality in screening process
- IG inspectors identified issue in recent report

# FACTOR TREE - Technical Issues



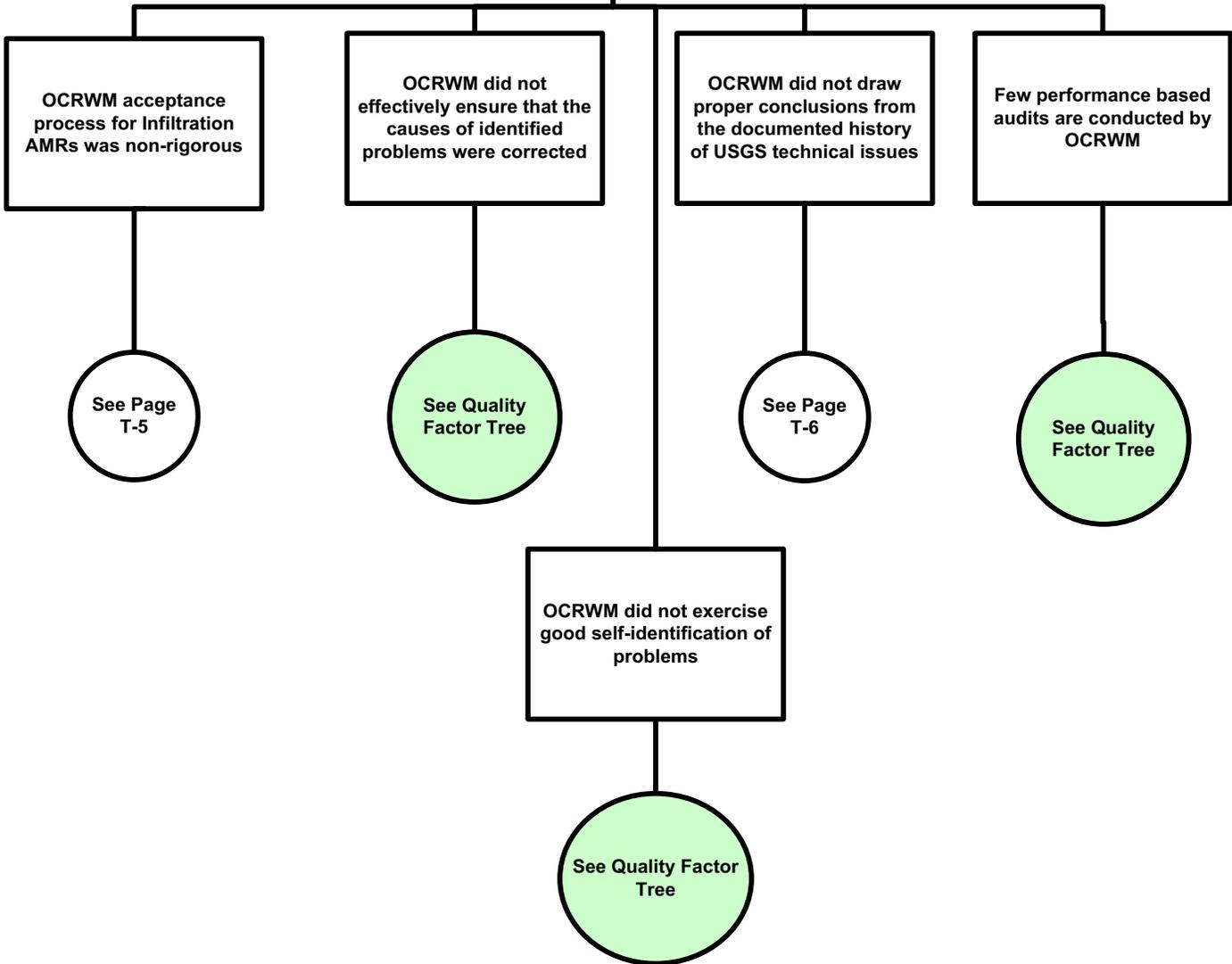
# FACTOR TREE - Technical Issues



# FACTOR TREE - Technical Issues

From Page T-1

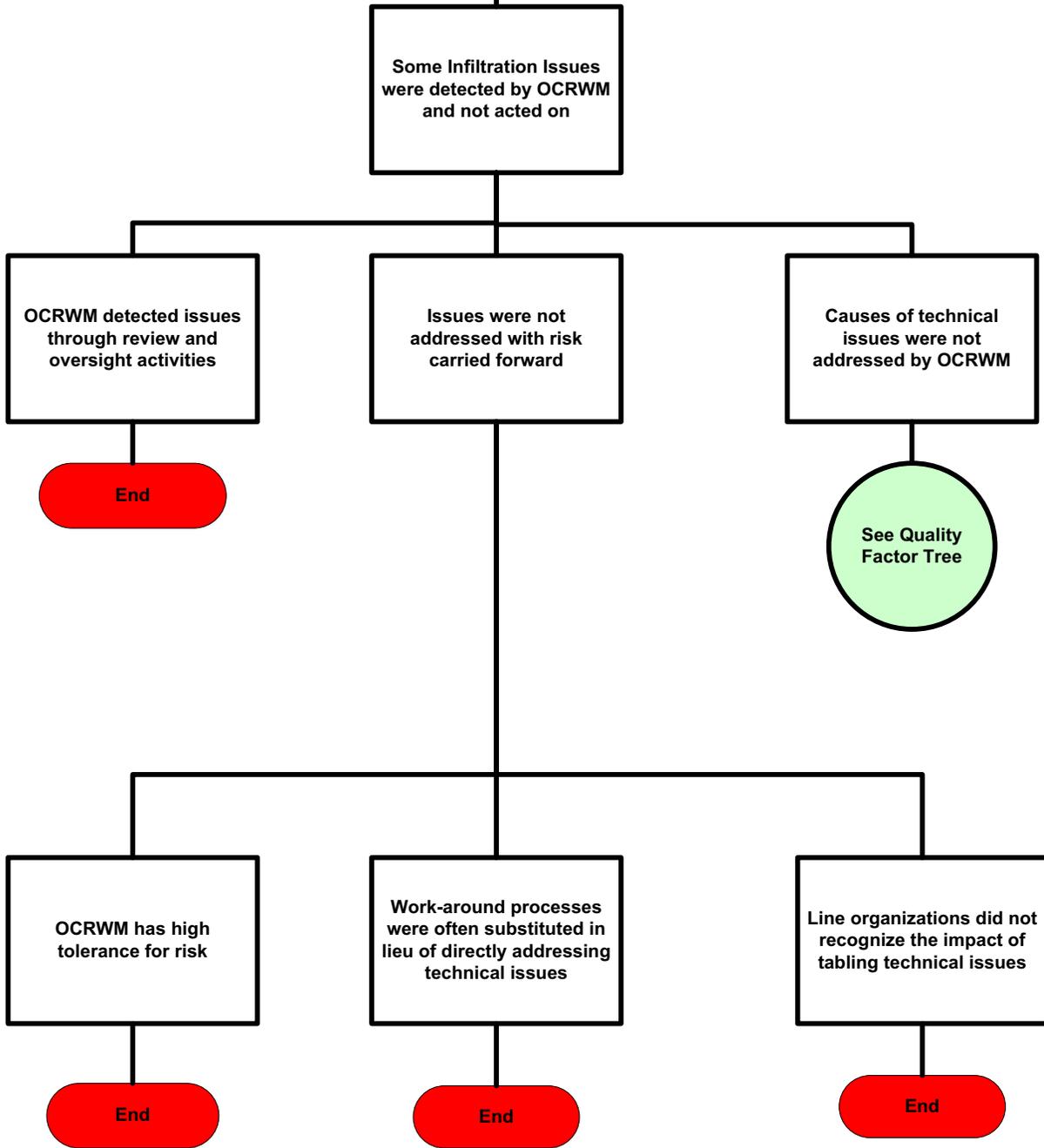
Infiltration Problems were not effectively addressed by OCRWM



# FACTOR TREE - Technical Issues

Appendix B3.2

From Page T-1



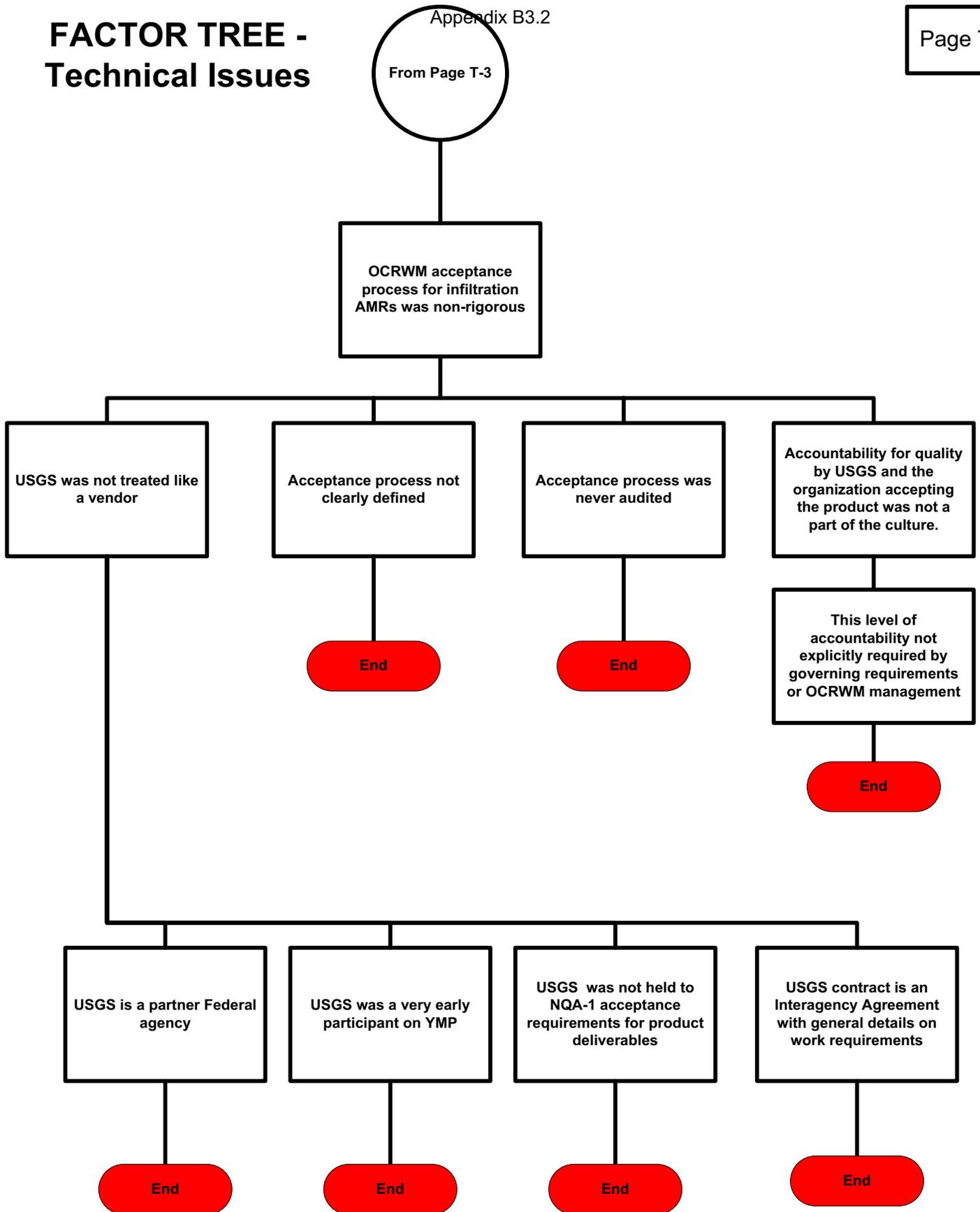
- Schedule
- Cost
- Resources
- Management Decisions
- Acceptance of Errors/Known Issues
- Changing Program Direction
- Performance Based Incentives

- Project Management
- Planning
- Integration
- Resources
- Trending
- Communication
- Teamwork

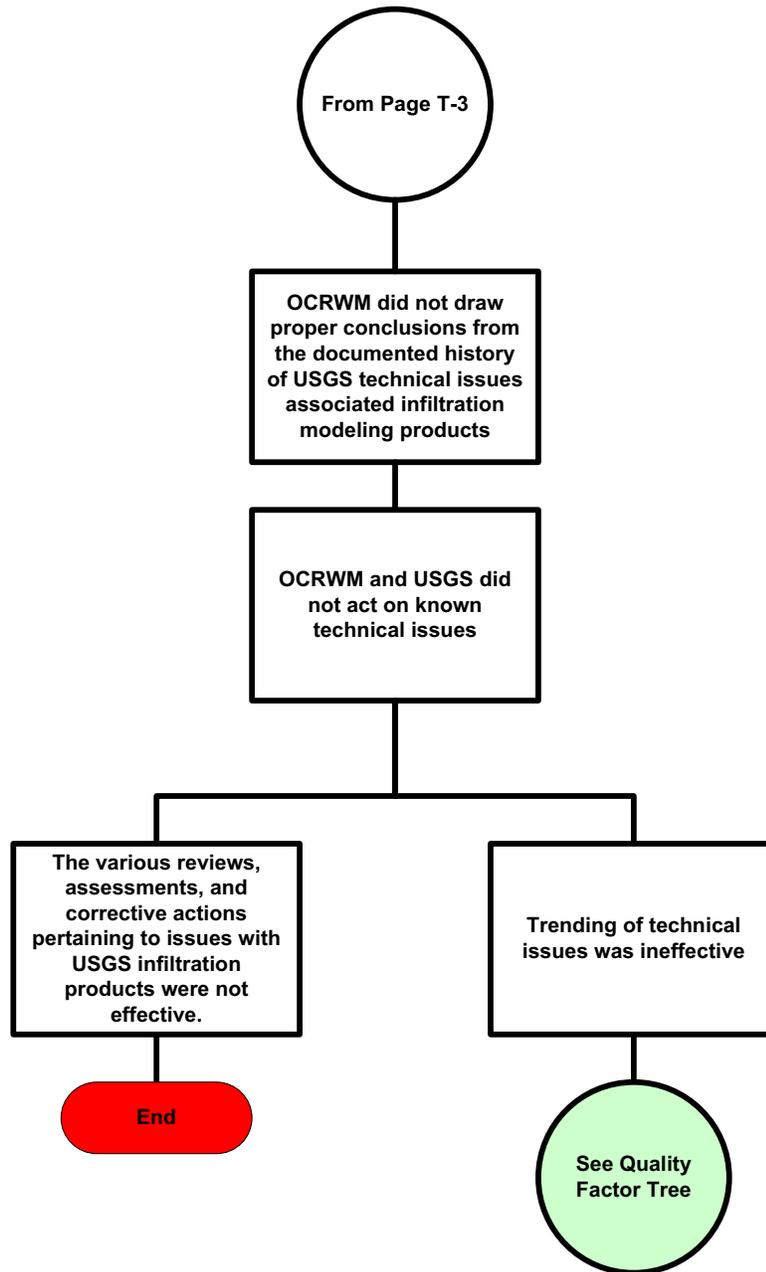
# FACTOR TREE - Technical Issues

Appendix B3.2

Page T-5



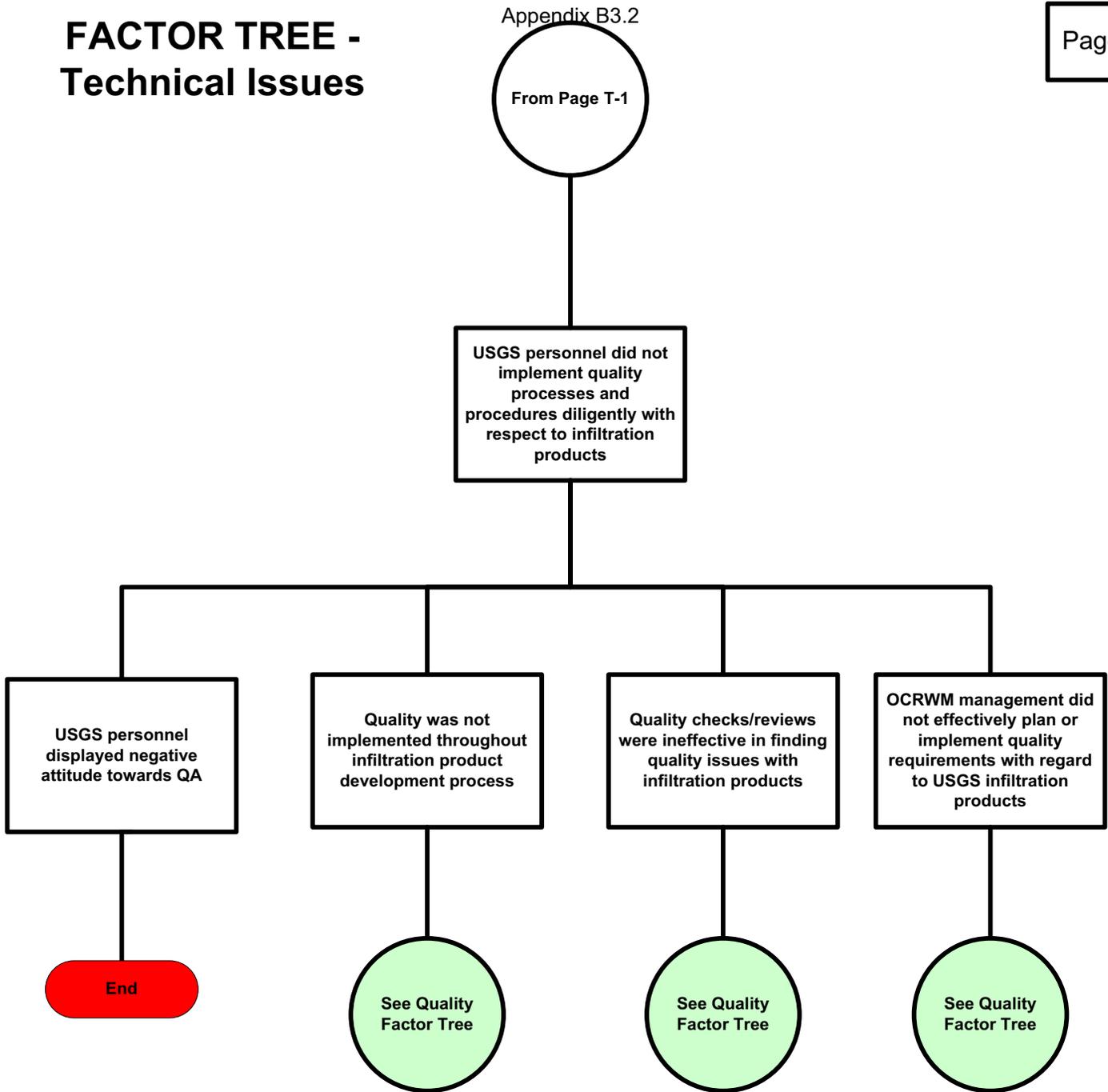
# FACTOR TREE - Technical Issues



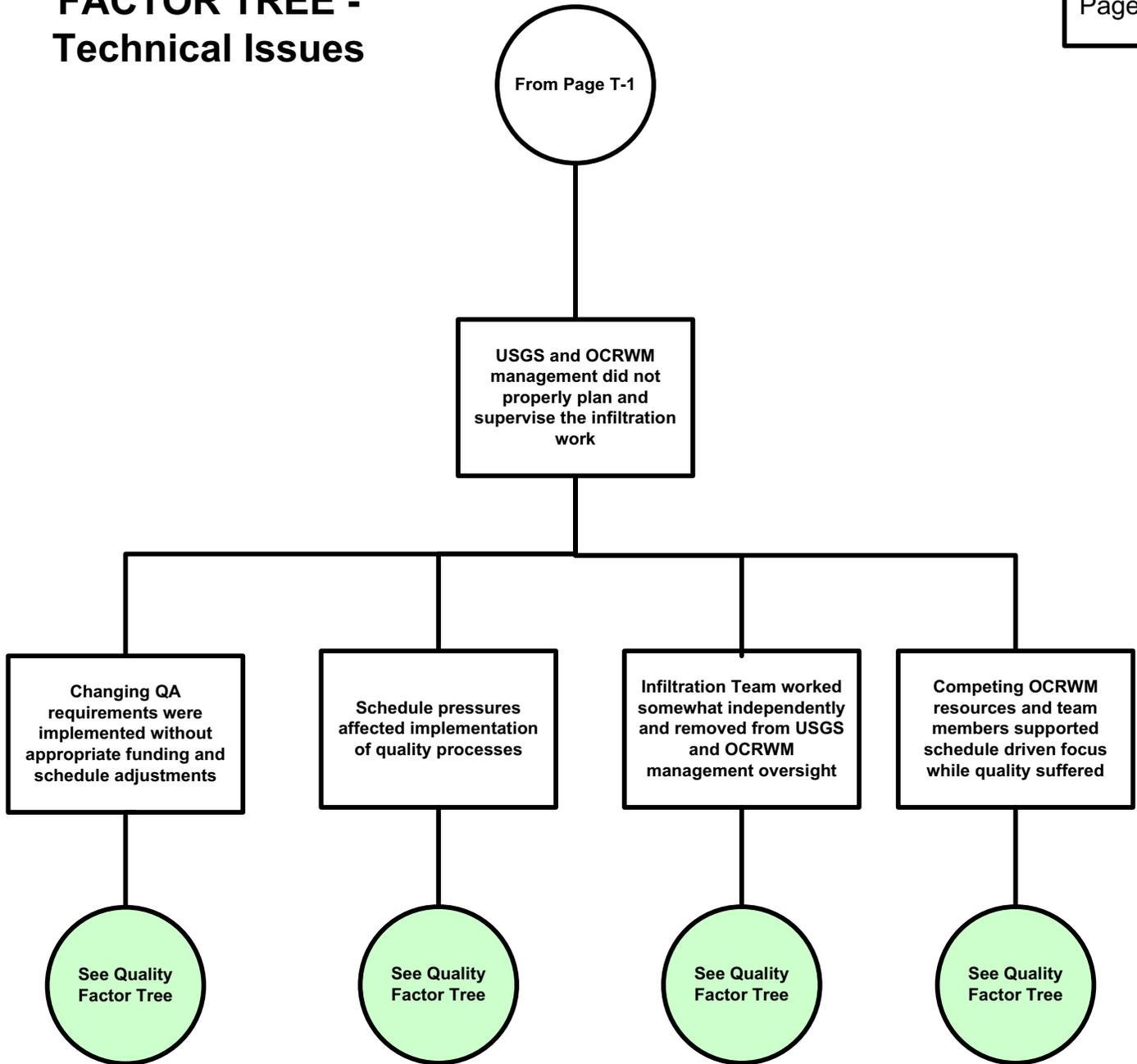
# FACTOR TREE - Technical Issues

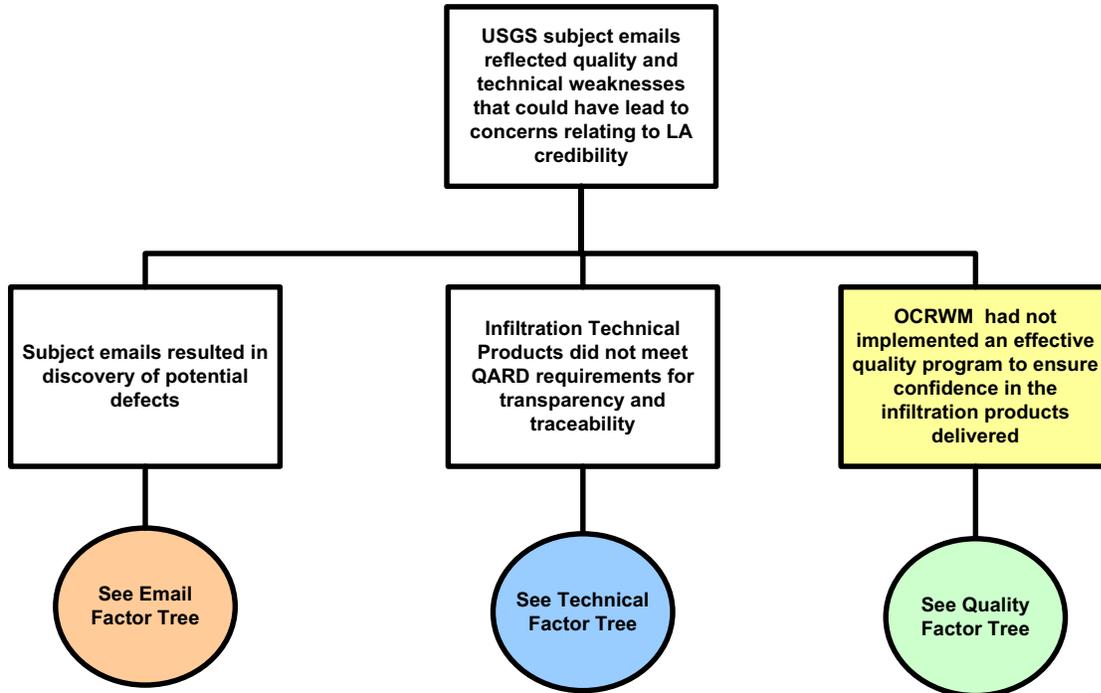
Appendix B3.2

Page T-7

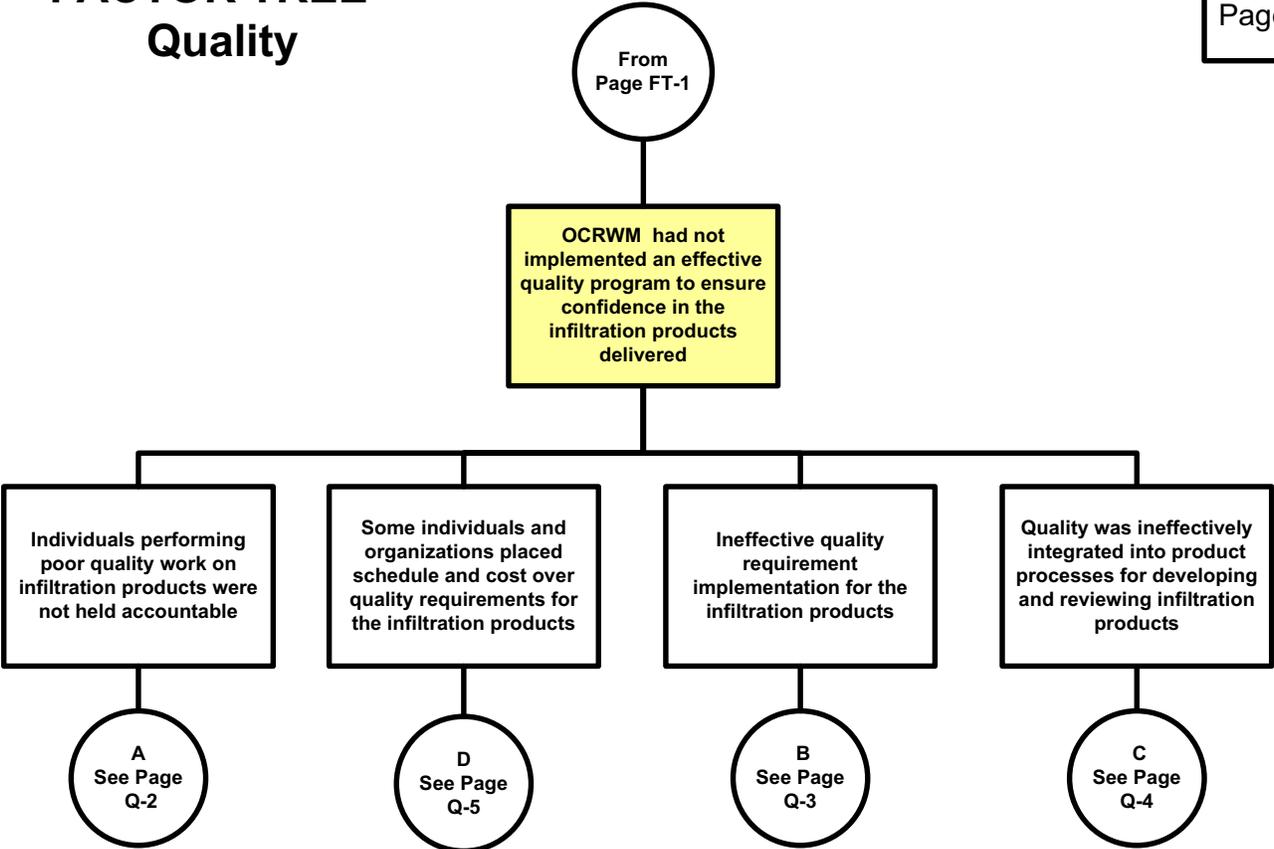


# FACTOR TREE - Technical Issues

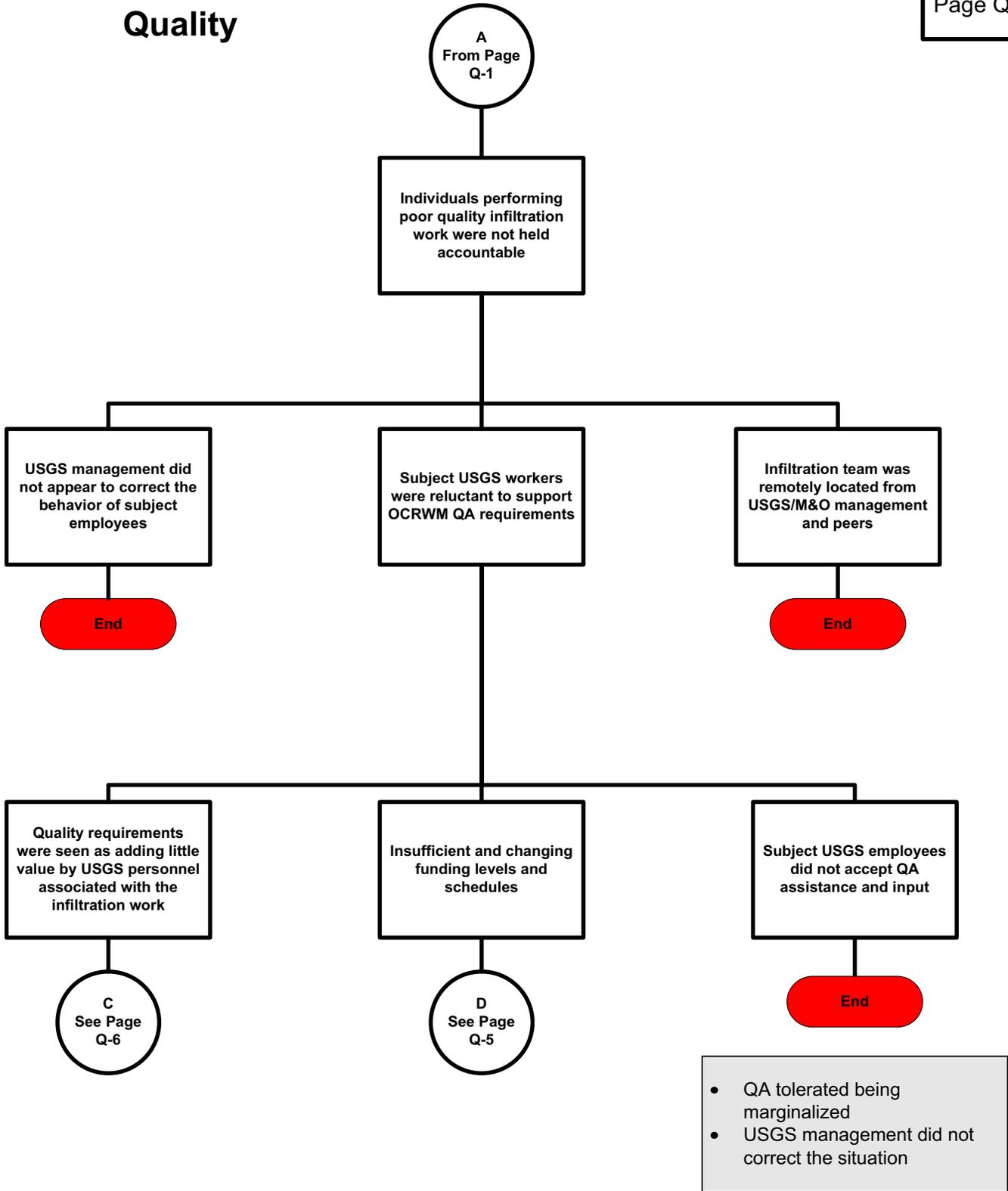




# FACTOR TREE - Quality

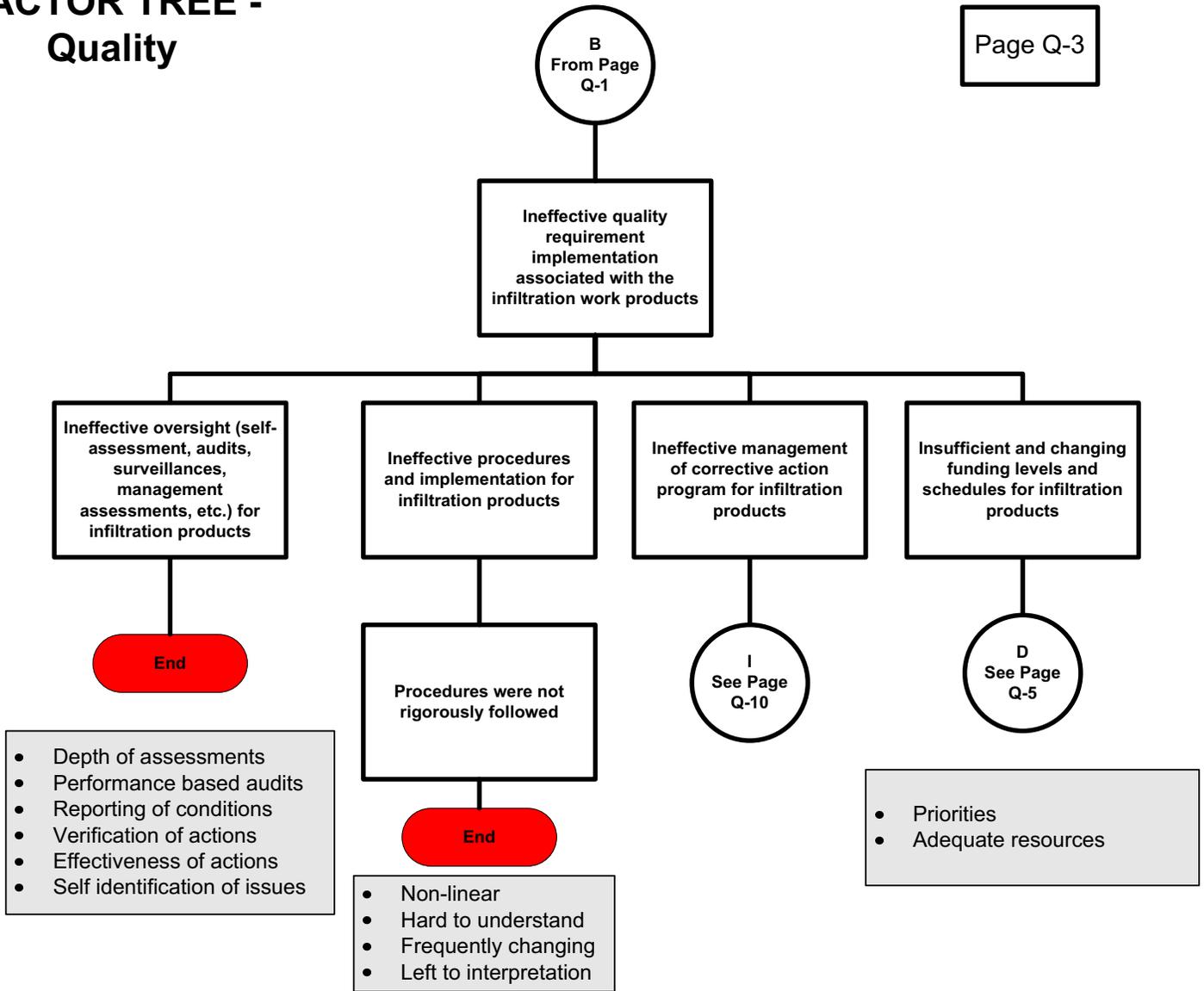


# FACTOR TREE - Quality

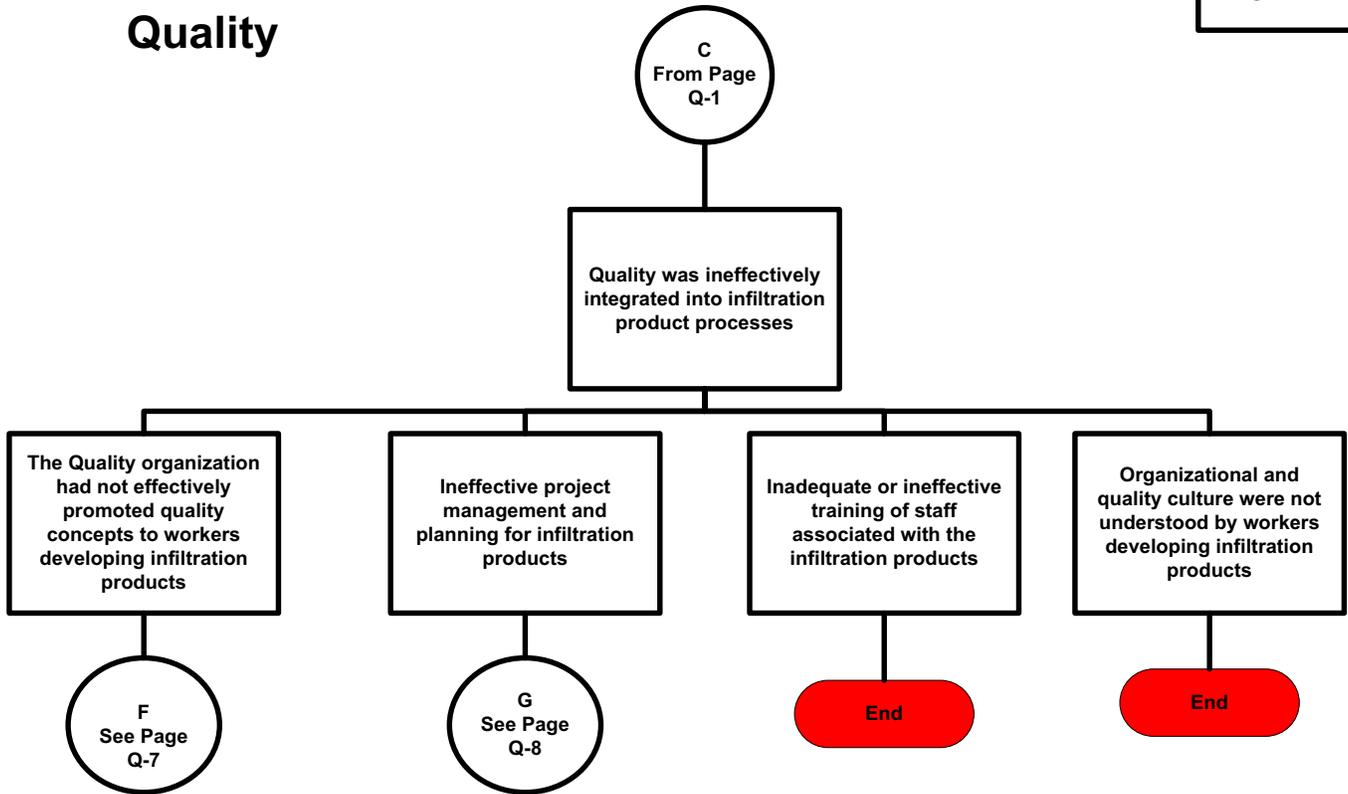


# FACTOR TREE - Quality

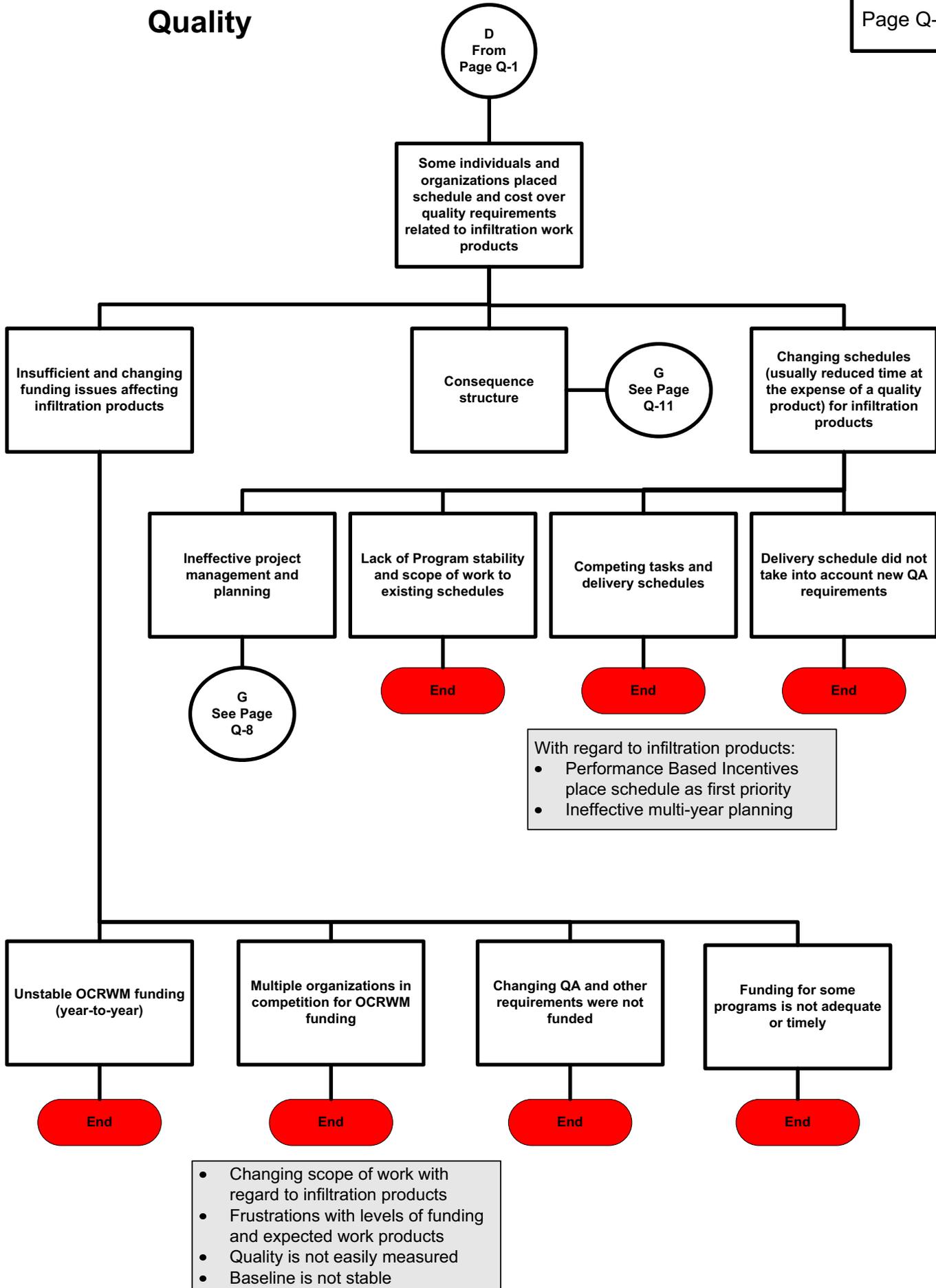
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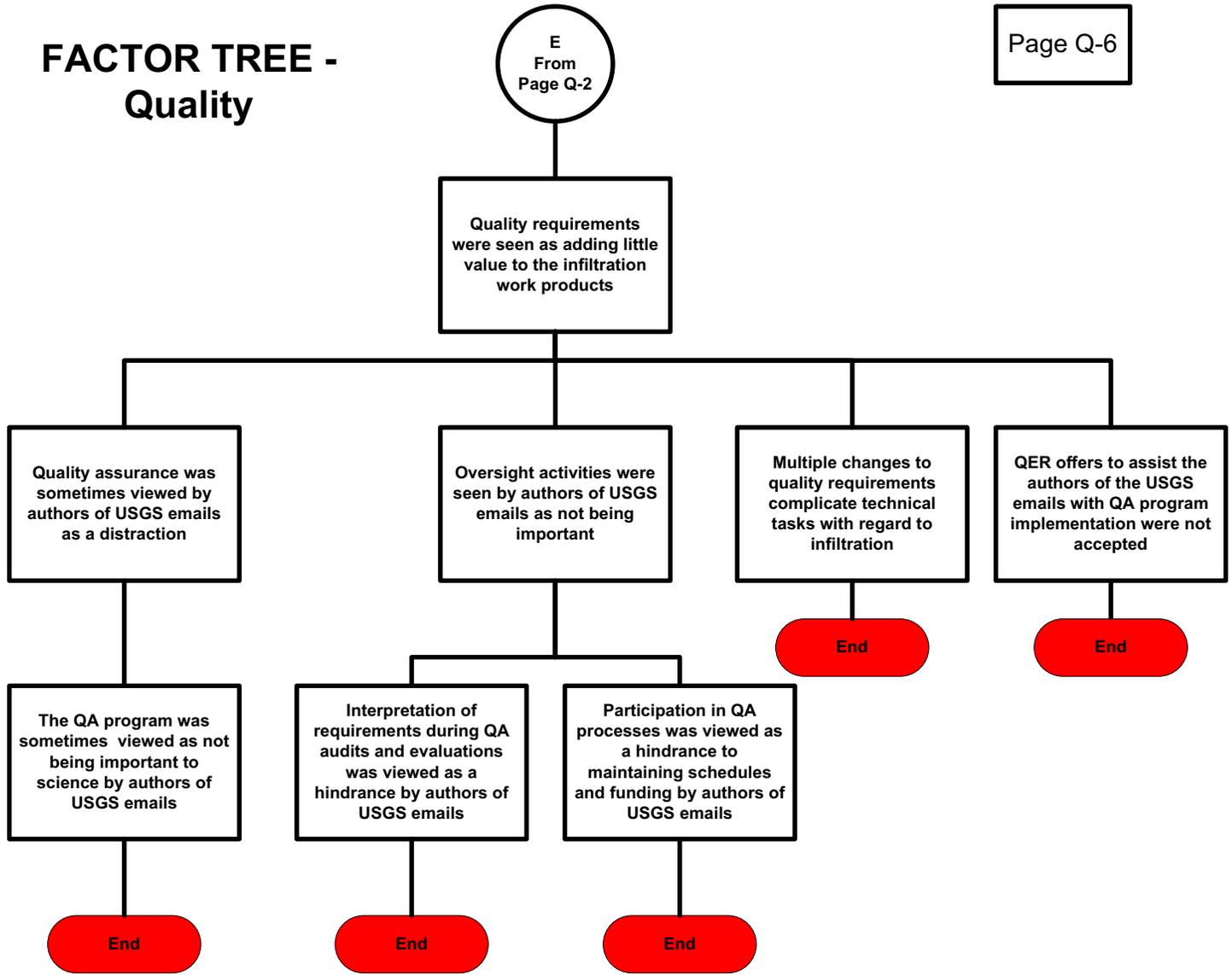
# FACTOR TREE - Quality



# FACTOR TREE - Quality

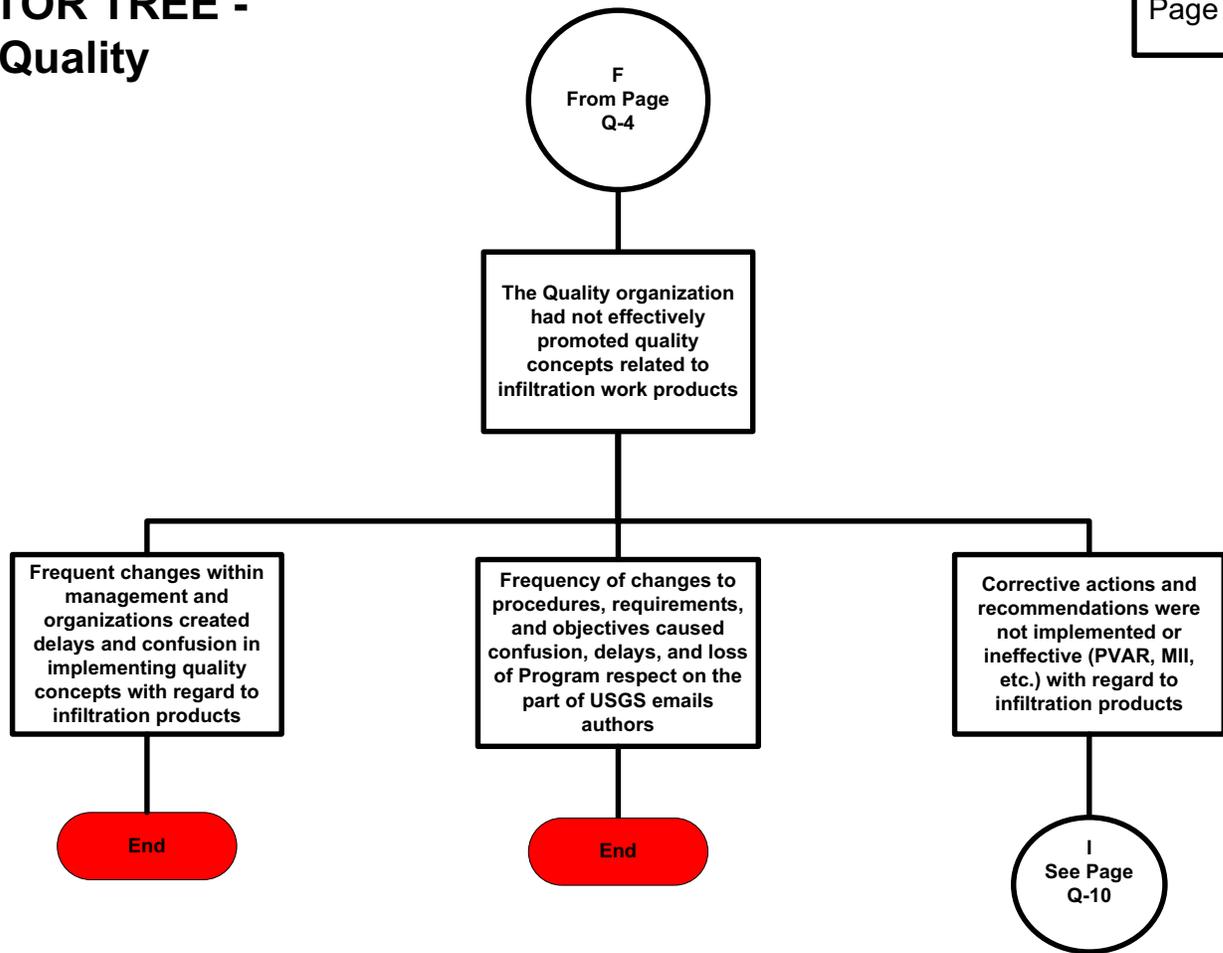


# FACTOR TREE - Quality



- Reluctance to report quality issues affecting infiltration products

# FACTOR TREE - Quality



# FACTOR TREE - Quality

G  
From Page  
Q-4

Ineffective project  
management and  
planning related to  
infiltration work products

Interfaces and  
competition within  
OCRWM organizations led  
to ineffective  
communication

Permissive management  
allowed poor quality  
USGS work practices and  
products to continue  
without correction

Frequent changes within  
management and  
organizations created  
delays and confusion in  
implementing quality  
concepts into infiltration  
work

Ineffective planning with  
regard to infiltration  
products

H  
See Page  
Q-9

USGS emails suggested  
little respect for other  
OCRWM organizations

OCRWM objectives were  
not clearly communicated  
or accepted

End

End

End

Schedules and funding  
may have impacted  
quality of infiltration  
products

USGS Management did  
not emphasize quality  
first or correct improper  
conduct

Management didn't take  
accountability for work  
efforts and products

USGS and BSC  
Management knew of  
quality issues but did not  
take steps to address the  
issues and causes

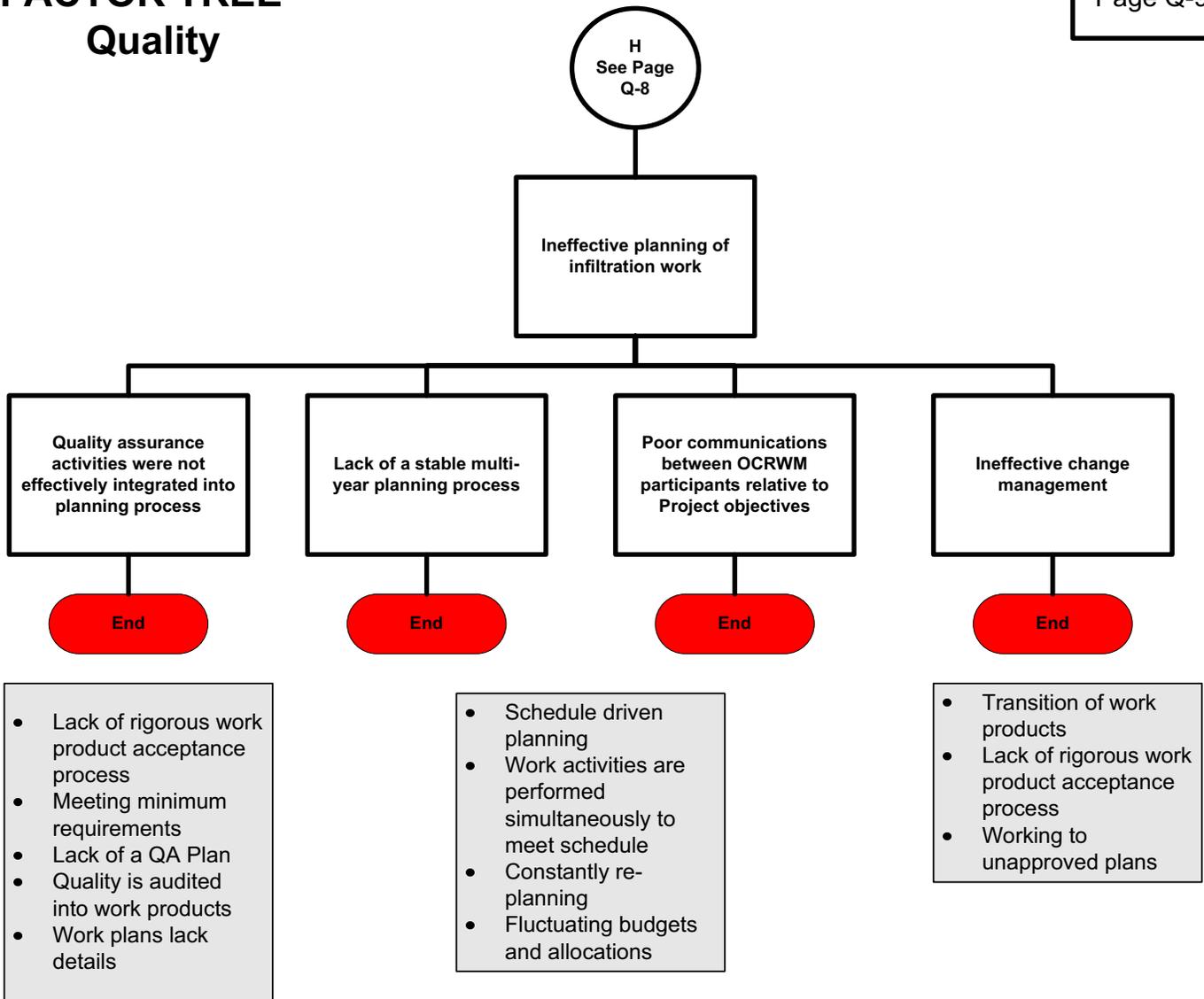
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Q-5

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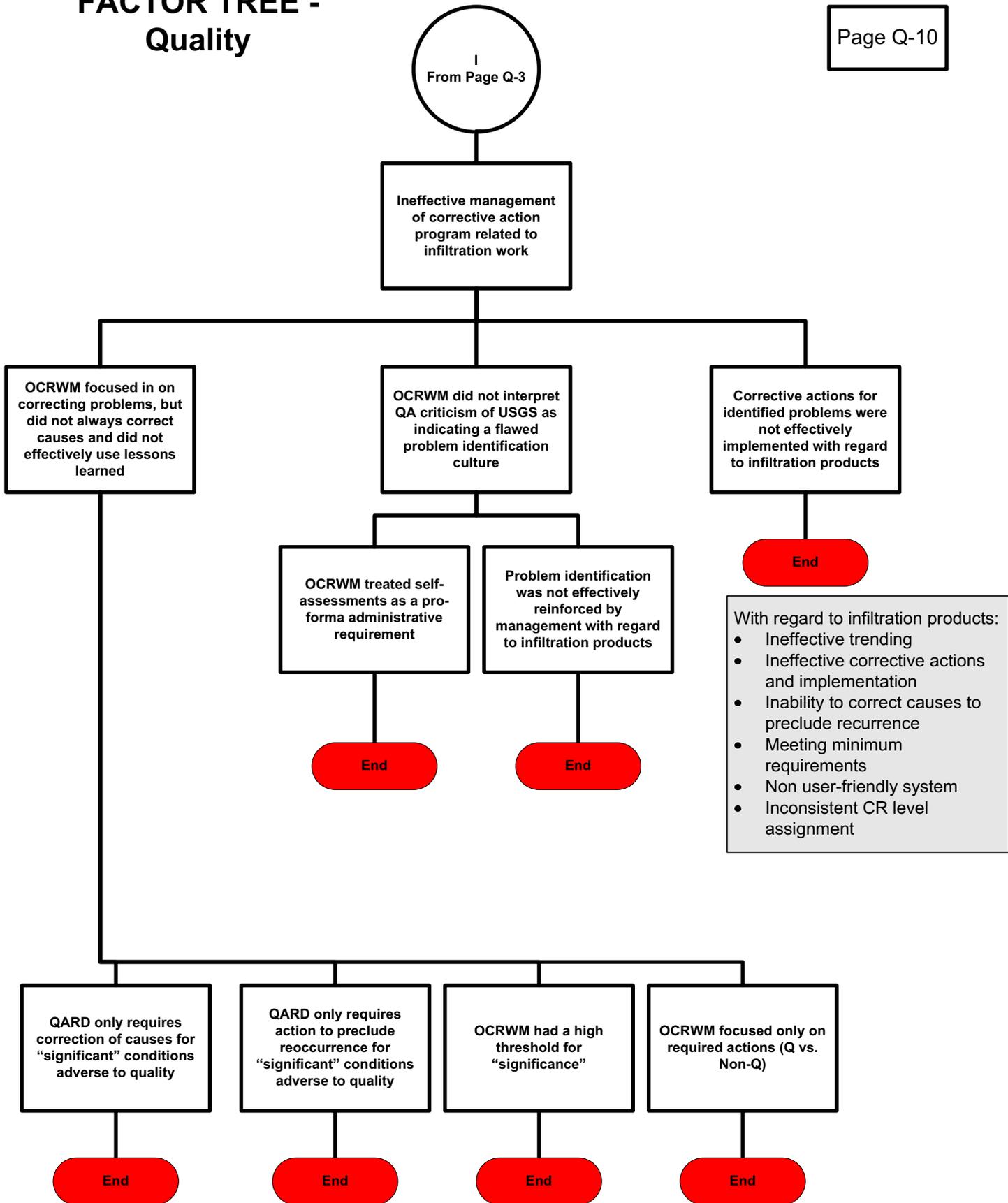
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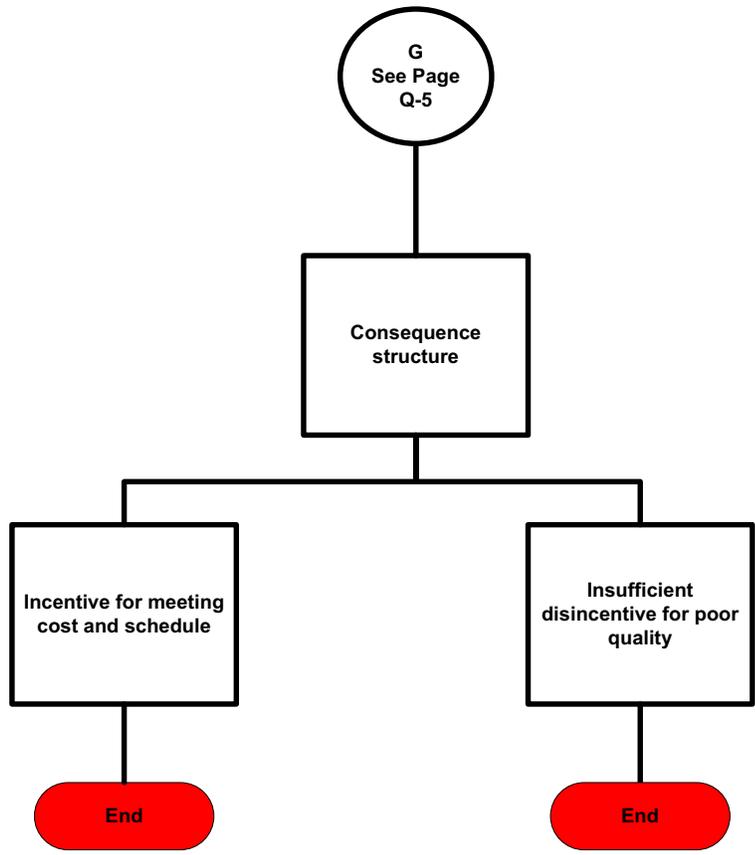
# FACTOR TREE - Quality



# FACTOR TREE - Quality



# FACTOR TREE - Quality



# **Appendix B4**

## **Barrier Analysis**

## Description

The barrier analysis process is an analytical tool that can be used to determine causal factors of an event, evaluate the significance of an event, and generate candidate corrective action options. The basic idea of this analysis is the relationship between three entities: threats, targets, and barriers.

- A threat is any phenomenon that can adversely affect a target. The threat can be in the form of poor quality workmanship, all the way to direct danger to humans and equipment.
- A target is any entity that needs to be protected.
- A barrier is anything that tends to protect the target or reduce the likelihood or severity of the threat. Barriers, in this context, are positive entities that include any physical structure, device, configuration, process, control or measure that can detect, delay or prevent the effect of a threat on a target.

## Use

The barriers, threats, and protected targets are documented in a matrix with a commentary on the effectiveness or use of the particular barrier. The barrier analysis also considers barriers that could/should have been in place in addition to those that may have failed. This analysis tool was used to address the following questions in the investigation of root cause for CR 5223:

- What barriers were in place when the issues occurred?
- Was the barrier effective at protecting the target?
- Should additional barriers have been in place?

The barrier analysis is used as a feed to the Factor Tree and other causal analysis tools. Because this root cause analysis does not involve a specific safety-related event or a specific quality requirement nonconformance, the barriers are more subjective and administrative in nature.

## Input

The following information was used as input:

- Interviews
- Documents including:
  - CRs,
  - Comparative Time Line Items,
  - Corrective actions,
  - Emails,
  - Prior root cause analysis reports, and
  - Policies and procedures.

## Summary

The Team evaluated the existing and missing barriers associated with the issues that were the subject of this root cause analysis. The Team's analysis identified the effective, ineffective, and missing barriers associated with this root cause analysis. The Team identified multiple barriers that were ineffective. These barrier failures ranged from inappropriate individual and professional

behaviors to poor quality process implementation and oversight, and USGS, OCRWM, and M&O contractor management failing to identify and fix recurring problems.

The following is a categorized list of findings associated with the barrier analysis:

1. Oversight – Numerous product revisions, checks, reviews, assessments, audits, surveillances, and trending were in place and failed to detect and/or fix the continuing issues with the Infiltration products. These conclusions are based on the review of oversight documents, interviews with subject matter experts, and existing issues as documented in the active CR listings for the Infiltration products.
2. Policies and Procedures – There were several policies and procedures in place, but they were ineffective in deterring or guiding the behavior that led to the writing of the subject emails or the propagation of technical and quality issues. Procedures alone only act as a guide or deterrent. To produce desired results, behaviors including personal accountability and management oversight are required. Based on the findings of this analysis, additional policy and procedure guidance might help in achieving effective behavior, but is not the primary barrier failure.
3. Management – Numerous management barriers failed, including effective project planning, stable funding, stable project directions, and employee oversight. Management must provide adequate time and resources as well as stable direction to gain the desired quality results. Management, itself, at all levels of an organization, must be held accountable for the quality of its products and for identifying and dealing with issues in a timely manner. Most barriers will fail if they are not effectively implemented and the individual performers encouraged to perform in a certain way. Management is the biggest driver to an effective organizational or quality (nuclear) culture. If this barrier fails, the others will not be effective.
4. Professional Behavior – Even with all of the other barriers in place, individuals failed to detect and/or fix several deficiencies described initially in the emails and subsequently displayed in the work quality and work ethic carried throughout the product development cycle. Ultimately, individuals must take ownership and be held accountable for their actions and integration of quality into their work process and work products. Without personal ownership of quality, reinforced by management and peers, administrative barriers will fail, as identified in this root cause analysis.

# **Appendix B4.1**

## **Oversight Barrier Analysis**

## 1.0 Introduction

Oversight, as a function, is intended to help preclude negative events from occurring by observing work as it is performed, or by reviewing evidence of completed work that indicates whether or not requirements have been met

This appendix includes an analysis of various oversight barriers and their effectiveness relative to the USGS infiltration products. The barriers reviewed include assessments, trending, involvement of Quality Assurance personnel with the line organization, and reviews of technical products.

## 2.0 Barrier Analysis

### 2.1 Assessments

The Team reviewed previous assessments (audits and surveillances) as part of the root cause analysis. Assessment tools are very useful when properly implemented in a responsive organization. However, as a barrier, audits and surveillances have their limitations. The assessment barrier can fail if:

- The assessments are not performed; assessments are performed but are not effective; later conditions adverse to quality occur; or the sample selection did not permit an evaluation of the condition;
- Assessors are not qualified;
- There is a reluctance to identify problems;
- The extent of condition is not properly performed; and/or
- The corrective actions are not implemented or they are ineffective.

Many assessments (audits, surveillances, management assessments, and self-assessments) have been conducted by the OCRWM program over the years. During the period of 1995 through 2004, the OCRWM Office of Quality Assurance (OQA) performed 18 audits of USGS, as indicated below.

#### Audits

Yr	Audit Performed by	Results	Issues
1995	OQA	Unsat	Performance-based audit – modeling of the UZ
1995	OQA	Unsat	Performance-based audit – the procurement process
1995	OQA	Unsat	Performance-based audit of the UZ modeling
1996	OQA	Sat	Performance-based audit
1996	OQA	Sat	Compliance-based audit
1997	OQA	Sat	Compliance-based audit
1997	OQA	Sat	Performance-based audit

Yr		Audit Performed by	Results	Issues
1998		OQA	Sat	Compliance-based audit
1998		OQA	Sat	Performance-based audit – Note: the audit of LANL on UZ Transport Model unsat due to Scientific Notebook use and preparation
1999		OQA	Sat	Performance-based audit
1999		OQA	Sat	Compliance-based audit
2000		OQA	Sat	Compliance-based audit
2000		OQA	Unsat	Performance-based audit of USGS Infiltration Model Analysis for Technical inadequacies, and software; The AMR was revised and removed software from the baseline until procedures were upgraded and additional reviews were performed
2001		OQA	Sat	Compliance-based audit
2002		OQA	Sat	Limited scope, compliance-based audit
2003		OQA	Sat	Compliance-based audit
2003		OQA	Sat	Performance-based audit
2004		OQA	Sat	Compliance-based audit

Of the 18 audits, nine were compliance-based and nine were performance-based. None of the compliance-based audits identified any “unsatisfactory” results. Four of the nine performance-based audits identified “unsatisfactory” results.

During the period of 1995 through 2004, the following surveillances of the USGS were performed:

### Surveillances

Yr		Audit Performed by	Results	Issues
1995		USGS	Sat	USGS performed 18 surveillances of their activities – No significant issues identified.
1996		USGS	Sat	USGS performed 4 surveillances of their activities – No significant issues identified
1997		USGS	Sat	USGS performed 3 surveillances of their activities – No significant issues identified
1998		OQA	Unsat	OQA performed at least 3 surveillances of USGS in 1998; significant issues included Scientific Notebooks and pass-down of the QARD procurement requirements
1999		OQA	Sat	No significant issues identified
2000		OQA	Sat	No significant issues identified
2001		OQA	Sat	No significant issues identified
2002		OQA	Sat	No significant issues identified
2003		OQA	Sat	No significant issues identified
2003		OQA	Sat	Performance-based audit

Yr		Audit Performed by	Results	Issues
2004		OQA	Sat	Performance-based audit

### Effectiveness of Assessment Barrier

The Team determined that (at least in part) the Assessment Barrier failed in connection with the USGS infiltration products:

1. Although audits and surveillances were conducted, their overall effectiveness was limited. The assessments provided numerous opportunities to identify and correct issues with the USGS infiltration products; however, only a few of the assessments indicated an unsatisfactory rating.
2. The failure of the assessment barrier is due, in part, to limitations of the assessment process (e.g., sample size and selection).
3. Corrective actions identified were not always effective as evidenced by recurrence of the same or similar issues at a later date.
4. Performance-based assessments appear to be more effective in identifying problems than compliance-based assessments.
5. From the results of the oversight, it appears that management did not always pursue the correction of deficiencies and other problems.
6. The Quality Assurance organization did not adequately ensure that corrective actions and actions to preclude recurrence were effective.
7. The scope of the audits did not include a review of emails or a search for deliberate nonconformance with quality assurance requirements. These areas are beyond the normal QA assessment practices and are generally management responsibilities.

### 2.2 Trending

The Team reviewed Trend Evaluations produced from November 2003 through February 2006 as part of the root cause analysis. Trending of audit, surveillance, and other problems and conditions adverse to quality is a tool used to identify where positive or negative values are 1) headed; 2) most prevalent; and 3) where actions should be taken. As a barrier, successful and effective trending can be used to prevent future problems or to continue successful performance. Once an area of concern has been identified, corrective actions need to be taken that will preclude the concern from recurring.

The Trending Barrier can fail if:

- Trending is not performed;
- The data are improperly collected or the wrong data are collected;

- The data are not properly normalized for events such as vacations, assessments, status of the activities, external factors, or other reasons for a change in trend level;
- The Action Trigger Level (the level at which actions should be taken) is not adequately defined or well understood;
- The variables that are trended do not encourage quality improvement;
- The trending period is not properly selected;
- There is a reluctance to identify problems; and/or
- Once identified, inadequate, ineffective or no actions are taken to improve the situation.

### **Overall Trending**

- The trending process is currently being performed on a quarterly basis. An evaluation of CRs is conducted for commonality of issues and the direction of identified trends.

The following summarizes the items in the various reports since November 2003:

1. Error-prone procedures are identified. The listed issues are either a lack of flow-down of requirements, inattention to detail during implementation, or the complexity of the documents.
2. Human performance, management, and communication issues are reported each period along with an evaluation of whether they are increasing or decreasing. A team to address human performance was initiated.
3. The number of CRs initiated by the process owner organization is followed and a larger number indicates that more problems are being self-identified by the line organization and is perceived to be a positive.
4. In some cases, corrective actions have been identified and teams have been established to address the issue (e.g., Human Performance Improvement Team and a Six Sigma team to address procedural issues).
5. In other cases, the corrective action does not appear to be effectively applied to reduce recurrence (e.g., procedural implementation and the flow-down of requirements).

### **Effectiveness of Trending Barrier**

The Team determined that (at least in part) the Trending Barrier failed in connection with the USGS infiltration products.

- During the period when the subject USGS emails were written (1998 through 2004), trending activities focused on high level trends. The level of detail did not adequately allow effective trending to be performed down to the technical product or specific function or activity being performed.

- The revised trending program (3rd quarter of 2003) is more sophisticated, but it still operates at a level that is neither conducive to the identification of problems for a specific product (e.g., INFIL) nor for problems related to specific organizations (e.g., USGS) based upon a normalizing factor.
- The identified trends and evaluations seem to recur. For example, human performance does not appear to have improved over the last 23 months, and procedural concerns frequently occur.
- The trending appears to be at too high of a level to detect specific concerns with USGS work activities and any unusual problems with a specific work product (e.g., INFIL).
- Considering additional CRs to indicate that problems are being self-identified is probably a good indicator at the present time, but at some point, with an effective corrective action process, it should be expected that the total number of CRs will decrease.
- The trending data should be “normalized” to account for special activities being performed during the time period (e.g., assessments and self-assessments performed in a specific area will most likely contribute to increased problems identified in that area or if a light design effort is applied during the reporting period, a reduction of problems would be expected). Therefore, what appears to be an upward or downward trend may only be caused by the use of non-normalized data.
- Some trend directions seem to encompass too short of a time period to really understand if the underlying problems have been corrected.

### **2.3 QA Involvement with the Line Organizations**

In many cases the line organizations are not aware of the detailed quality requirements, concepts, and processes that are needed to ensure that requirements are being met and that appropriate corrective actions are taken to fix and prevent problems. Providing QA support to the line organizations is a barrier that is intended to assist the line organization in the quality arena.

The QA/Line interface barrier can fail if:

- The QER concept is not used within the organization and if the various disciplines do not complement or use the expertise of the rest of the team;
- The interface, roles, and responsibilities are not properly determined between all parties, prior to implementation of the interface;
- The assigned QA individual is not viewed as a useful asset to the line organization;
- The QA and/or line organization does not comply with the intended interface agreement;
- Appropriate QA recommendations are not followed; and/or
- Reviews and recommendations are inadequate or ineffective.

## Effectiveness of the QA/Line Interface Barrier

The Team determined that (at least in part) the QA/Line Interface Barrier failed in connection with the USGS infiltration products.

- In interviews conducted by the Team, the interface between QA and the USGS principal investigator on the infiltration team was described as not cooperative. The USGS infiltration team did not seek the help of the assigned QERs.
- Several USGS emails reflect a disdain for quality assurance requirements.

### 2.4 Review of Technical Products

Procedures, independent reviews, and evaluations are barriers employed to help ensure that technical and other products meet requirements and are defensible and transparent.

Reviews are conducted in accordance with various procedures depending on the type of product being reviewed. The procedures most often referred to in the Trend Reports (November 2003 through February 2006) as “error prone” are identified below. According to the Trend Reports, a recurring issue with these procedures is the fact that they require multiple interfaces across organizations:

- AP-5.1Q, Procedure Preparation, Review, and Approval.

This procedure was originated in November 1993 as YAP 5.1Q and became AP-5.1Q in June 1999. It is the procedure that describes how to prepare, review, and issue technical and administrative procedures. AP-5.1Q includes processes for:

- The identification of the need to develop or revise a procedure,
- Tracking of the implementation of the development or revision process,
- Review of the document and the resolution of comments, and
- The approval, issuance, and effectiveness of the document.

Since its origination, there have been 29 changes to the procedure. Frequent revisions tend to make the work efforts of individuals and organization unstable with respect to processes and activities to be performed. Frequent changes may lead to confusion and inattention to detail, as indicated in the Trend Reports.

- AP-2.14Q, Review of Technical Products (now superseded)

This procedure describes the process for conducting and documenting reviews of documents, and the preparation and resolution of review comments.

AP-2.14Q includes processes for:

- The preparation and approval of the review package for technical products,
- Constraints on the type of review and the acceptance criteria,
- The resolution of review comments, and
- The escalation of comments, approval, and issuance of the technical product.

AP-2.14Q was originated in June 1999 and was changed 8 times through January 2005, when it was replaced with LP-2.14Q-BSC, which has been changed once.

- AP-3.15Q, Managing Technical Product Input

This procedure describes the responsibilities and processes required to capture, track, and status technical product inputs, To Be Verified (TBV) information, and Unresolved Reference Numbers (URNs).

AP-3.15Q includes processes for:

- Independently verifying that the Document Input Reference System (DIRS) inputs are correct,
- The escalation of needed inputs to ensure timely resolution,
- The control, update, and tracking of databases and status,
- Reviews and approval of the technical product, and
- The use of a Record Road Map to ensure that all records are identified and that data inputs have been qualified.

AP-3.15Q was originated in June 1999 and was changed 19 times through January 2005, when it was converted to LP-3.15Q-BSC, which has undergone two changes to date. A total of 21 changes have been made in 6 years.

- AP-16.1Q, Managing Conditions Adverse to Quality

This procedure describes the process steps to identify, review, and correct problem areas.

AP-16.1Q includes processes for:

- The initiation of Condition Reports (CRs) for any problems and by anyone;
- Evaluation of the condition and the level of severity by a screening team;
- Identification of the processes for cause determination, remedial actions, and actions to preclude recurrence;
- Evaluation for a stop work condition;
- Verification of the completeness and effectiveness of the corrective actions; and
- Approval and closure actions.

AP-16.1Q was originated in July 1995 and has been changed 37 times since then.

- AP-SIII.9Q, Scientific Analysis

This procedure has been superseded by LP-SIII.9Q-BSC, which covers the same areas. These procedures describe the process steps to perform and document scientific and performance assessment analyses and calculations subject to the QARD.

AP-SIII.9Q includes processes for:

- Planning for the development and implementation of the technical product;
- The actual development and documentation of the analyses;
- The checking and review of the technical product;
- The product output;
- The necessary approvals;
- The change control process; and
- The methods used to make editorial corrections.

This procedure has changed 21 times in 7 years. This procedure was originated as AP-3.10Q, Analysis and Models, in February 1999 and was changed 10 times through December 2001, when it was canceled and superseded by AP-SIII.9Q and AP-SIII.10Q. It was then changed nine times, before being converted to LP-SIII.9Q-BSC in February 2005.

- AP-SIII.10Q, Models

This procedure has been superseded by LP-SIII.10Q-BSC which covers the same areas. These procedures describe the process steps to perform and document scientific and performance assessment modeling that is subject to the QARD.

AP-SIII.9Q includes processes for:

- Planning for the development and implementation of the model;
- Development of the model documentation;
- The process for model validation;
- The process to check and review the model and documentation;
- The product output;
- The concurrence and approval process;
- The methods used to make editorial corrections; and
- The change control process.

This procedure was originated December 2001 and was changed 13 times through December 2001, when it was canceled and superseded by AP-SIII.9Q. It was then changed nine times, before being changed to LP-SIII.9Q-BSC, where it is now in its second change. In seven years, the procedure has been changed 21 times.

### **The Importance of Stability of Procedures**

The effectiveness of the checks, reviews, approvals and other imposed barriers within the procedure can be measured to some degree based upon the stability of the procedure (how often it is changed), the absence of problems, and the attainment of satisfactory results of the process.

### **Effectiveness of Technical Product Review Barrier**

The Team determined that the Review of Technical Products Barrier failed with regard to the USGS infiltration products.

- The multitude of procedural changes provided an environment of continual change and therefore a lack of stability;
- Previous attempts to improve procedures and processes (e.g., PVAR, MII, etc.) did not preclude problems from occurring.
- Assessments identified issues with procedures not being properly implemented.

# **Appendix B5**

## **Missed Opportunities**

## **Description**

The Missed Opportunity Matrix is an analytical tool used to identify actions or events that, had they been effective or implemented, would have avoided, mitigated, or reduced the severity of the direct or associated consequences.

## **Use**

The missed opportunities are documented in a matrix with a commentary on the expected results had the actions been implemented effectively. Missed opportunities can be in the form of events or actions that were either ineffective or that did not occur.

The Missed Opportunity Matrix is used as a feed to the Factor Tree and other causal analysis tools used in this root cause analysis. Many of the missed opportunities are also captured in the Barrier Analysis. This root cause analysis does not involve a clearly defined nor a specific safety-related event, so the missed opportunities are more subjective and administrative in nature.

## **Input**

The following information was used as input:

- Interviews
- Documents including:
  - CRs,
  - Comparative Time Line Items,
  - Corrective actions,
  - Emails,
  - Prior root cause analysis reports,
  - Policies and procedures, and
  - Trend reports.

## **Summary**

The Team evaluated the missed opportunities associated with the issues that were the subject of this root cause analysis. The attached Missed Opportunity Matrix (see below) describes potential events or situations for which the opportunity existed to identify and/or fix issues before the consequences occurred and/or became worse. In the case of this root cause analysis, there were numerous missed opportunities where issues could or should have been identified or were even identified, but actions were ineffective at fixing the problems.

The missed opportunities are summarized below:

1. Oversight Activities – There were numerous audits, surveillances, and assessments conducted during the life-cycle of the infiltration products. Even though some of these activities identified issues, the problems continued to occur throughout the product history.
2. Management – There were numerous opportunities for management to deal with the USGS employees' negative attitudes toward QA, the technical product issues, and the implementation of quality assurance processes throughout the program, yet issues continued.

3. QA Program – In addition to missing opportunities to identify issues during oversight activities, OCRWM did not effectively implement the quality assurance program. Individuals did not always take responsibility for the quality of their work activities and sometimes relied on the QA oversight organization to find their problems. CRs were not always initiated in a timely manner.
4. Corrective Actions – Numerous corrective actions were identified, yet issues continued. Corrective actions were ineffective at solving the causes of the issues, therefore the issues recurred.
5. Trending – Management’s use of trending was ineffective. If management had tracked the recurring issues associated with the USGS infiltration products, they could have intervened earlier and the consequences would not have been as severe.
6. RIT – The Repository Integration Team was initiated in response to findings of an NRC review of technical products and the findings of quality assurance and regulatory compliance issues. RIT was formed to evaluate and fix issues with the technical products in preparation for the planned December 2004 license application submittal. Many of the issues that presently exist were identified and documented during the RIT review activities but some corrective actions were deferred. This was a missed opportunity to improve the quality of the infiltration products that could have mitigated the need for the rework currently in process.
7. MII – The Management Improvement Initiative was originated in July 2002 as a result of CAR BSC-01-C-001 (CAR 001) and BSC-01-C-002 (CAR 002). The MII charter was to implement improvement initiatives including clarifying roles, responsibilities, authority, and accountability as identified in the Root Cause Analysis for CAR 001 and CAR 002. MII was integrated into ongoing line management functions in 2004, with a letter from the Director of the program to NRC. Although MII met some of its intended objectives, it was not fully effective in implementing accountability and technical work product improvements and therefore represented some missed opportunities to identify and correct issues associated with the preparation of infiltration products.
8. Technical Reviews – Many of the technical issues that have recently been identified should have been caught during the extensive quality and technical reviews of the Infiltration products. Even when issues were identified, the corrective actions failed to fix the causes of the issues and the same types of issues continued forward.
9. PVAR – The Process Validation and Re-engineering in the 1998-1999 timeframe was initiated to integrate all of the technical quality assurance procedures under a central management. Previous corrective actions identified issues with each participating organization (e.g., USGS, national laboratories, M&O contractor) working under its own implementing procedures. The PVAR process integrated the quality assurance procedures, yet failed to fully implement a quality-focused culture that consistently produced quality products. This missed opportunity was later described in CAR 001 and CAR 002 and resulted in the MII activities.

**Missed Opportunity Matrix  
Related to Condition Report (CR) 5223**

<b>Who</b>	<b>Situation</b>	<b>Missed Opportunity (Action)</b>	<b>Expected Result</b>	<b>Impact on Consequences/ Remarks</b>
OCRWM Personnel	First realization that some USGS workers were not supportive of quality assurance requirements. (1988, 1992, multiple opportunities since)	Notify OCRWM upper management (e.g. write a CR or employee concern)	OCRWM would inform USGS management of its expectations. USGS workers would undergo attitude improvements and be more supportive of quality requirements.	No emails suggesting noncompliance with quality assurance requirements.
USGS Management	Noticing emails suggesting potential noncompliance with quality assurance requirements (1998-2004)	Identify problem individuals/teams within USGS	Confront individuals/teams with expectations for appropriate professional behavior and consequences if behavior persists	<ul style="list-style-type: none"> <li>No emails suggesting noncompliance with quality assurance requirements.</li> <li>Immediate management action after receiving first email suggesting noncompliance with quality assurance requirements.</li> </ul>
OCRWM Top Management	Drafting Interagency Agreement with USGS	Specify the importance of quality in all work products and correspondence	OCRWM would have better defined, communicated, and implemented expectations for work product acceptance	<ul style="list-style-type: none"> <li>No emails suggesting noncompliance with quality assurance requirements.</li> <li>Immediate management action after first email suggesting noncompliance with quality assurance requirements.</li> <li>USGS infiltration products would have met quality assurance requirements.</li> </ul>
OCRWM Management	Process Validation and Reengineering (PVAR) (1999)	Identify and resolve failings in the product development and quality assurance processes	Technical products that are suitable for their intended purposes	The reengineering process of PVAR (1999) failed to fully implement effective quality assurance processes

**Missed Opportunity Matrix  
Related to Condition Report (CR) 5223**

<b>Who</b>	<b>Situation</b>	<b>Missed Opportunity (Action)</b>	<b>Expected Result</b>	<b>Impact on Consequences/ Remarks</b>
OCRWM Management	Initiation of AMR product development process	Initial planning of technical product development process, including adequate resources and funding to meet schedules and quality assurance requirements	Quality products produced to stable funding and schedule	Adequate planning including stable program direction, funding, resources, and schedules would allow for quality products to be produced without the discontent as referenced in the subject USGS emails.
OCRWM	Audit M&O-ARP-00-04, and DR USGS-00-D-034 (reproducibility, transparency, etc.) (Feb 2000)	Ensure that corrective actions effectively address causes that allowed technical and quality issues to continue. In addition, ensure that verification of corrective actions to preclude recurrence was effective.	The causes of the problems would have been found and addressed, including many of the issues documented in this root cause analysis report	It is likely that the correction of the causes of the problems found in 2000 would have prevented the problems with the infiltration AMR.
Chief, USGS Yucca Mountain Project Branch	Planning the corrective action to preclude recurrence of the conditions reported in DR USGS-00-D-034 (Feb 2000)	Follow up on 2/26/00 email to all USGS Yucca Mountain Project Branch employees telling them of their responsibility for reading and understanding procedures	USGS Yucca Mountain Project Branch employees would have found their own problems	Finding that the corrective actions were ineffective would likely have prevented the problems that currently exist.
OCRWM QA	Following any of the many audits of USGS that identified noncompliances (2000, multiple opportunities since)	Require USGS to find out why it has recurring issues with infiltration products	USGS would have found out that it 1) does business in such a way as to produce noncompliances and 2) it is ineffective in finding its own quality process weaknesses	USGS would have improved its business processes and its self-assessment processes, reducing OCRWM QA findings and reducing or eliminating technical product non-compliances in the infiltration work.
OCRWM QA	Audits of software product output (June 2000, multiple opportunities since)	Request OCRWM to independently run numerical models to see if output could be independently reproduced	OQA would have found out that 1) the software was missing key components and 2) data sets are not easily found from the references and data warehouse	USGS would have produced infiltration products that met quality assurance requirements.

**Missed Opportunity Matrix  
Related to Condition Report (CR) 5223**

<b>Who</b>	<b>Situation</b>	<b>Missed Opportunity (Action)</b>	<b>Expected Result</b>	<b>Impact on Consequences/ Remarks</b>
OCRWM Management	Planning the work of product checkers and reviewers	Find out what schedule and other support are necessary for thorough product review	Product checkers and reviewers would have enough time to do the job right	Many of the infiltration product non-conformances found in 2004 and later, would have been found earlier
Product Checkers and Reviewers	Technical product checks and reviews of Infiltration products (2000, 2004)	Identify and resolve technical product issues to ensure suitability for intended purpose	Technical products that are suitable for their intended purpose	If Infiltration products had undergone adequate checking and review, potential issues would have been identified and corrected prior to the email discovery, thereby mitigating the consequences
USGS	Prior to presenting infiltration products to OCRWM (June 2000)	Re-run codes and conduct adequacy evaluation of infiltration products	Many current problems would have surfaced earlier	Technical product problems would have been found and fixed, mitigating the consequences
BSC Natural Systems	Acceptance of Infiltration Products (June 2000, Nov. 2004)	Acceptance of Infiltration products without verifying or re-running codes to reproduce infiltration maps	Many current problems would have surfaced earlier	Technical product problems would have been fixed
OCRWM	Initiation of Licensing Support Network categorization process	Establishment of a process for identification and action to address emails indicating conditions adverse to quality found during Licensing Support Network screening	Immediate and appropriate action upon identification of emails suggesting noncompliance with QA	Four-month delay in notification of OCRWM management would have been avoided
OCRWM Management	Receiving the root cause analysis report for CAR 001/002	To plan, execute, and follow up on recommended corrective actions in the root cause analysis report	Establishment of measures to assure that conditions adverse to quality are promptly identified and corrected	No nonconformances in infiltration products
Corrective Action Program (CAP) Management	Periodic review of CAP effectiveness (2001, multiple opportunities)	To determine that the "root causes" from CAR 001/002 "Root Cause Analysis Report for YMP Technical Document Deficiencies," August 17, 2001 still existed	Launch a concerted effort to assure that those conditions adverse to quality and associated causes were promptly corrected	Finding that the corrective actions were ineffective would likely have prevented the problems that currently exist

**Missed Opportunity Matrix**  
**Related to Condition Report (CR) 5223**

<b>Who</b>	<b>Situation</b>	<b>Missed Opportunity (Action)</b>	<b>Expected Result</b>	<b>Impact on Consequences/ Remarks</b>
OCRWM Management	Management Improvement Initiative (MII) (2002-2004) implementation of improvements to roles, responsibilities, authority, and accountability; quality procedures; corrective assurance; safety action program; safety conscious work environment	Improve management's implementation and enforcement of roles, responsibilities, authority, and accountability as stated in the MII.	Program participants would understand their roles and responsibilities, be given authority to perform their jobs without concern for schedule pressures over quality, and be held accountable for their actions and performance in conducting their job functions	The infiltration products would not have the issues that currently exist if the principle investigators, checkers, reviewers, and responsible managers had taken ownership and accepted responsibility for the overall quality of the technical products. OCRWM holds the participants accountable for the quality of the technical products and takes responsibility for stabilizing the requirements, funding, and schedule needed to accomplish the mission.
OCRWM Management	Organizational and product transition and acceptance (BSC 2001, Regulatory Integration Team 2004)	Perform assessment of activities and products to evaluate acceptance and accountability	Products more likely to meet quality assurance requirements. OCRWM would have become aware of issues with technical products earlier in development process.	USGS infiltration products would have met quality assurance requirements
OCRWM QA	Auditing product acceptance criteria and processes (multiple opportunities)	Document the basis for acceptance requirements related to potential quality and technical issues	Require documentation of bases for acceptance criteria including potential quality and technical issues	OCRWM would have found the infiltration product issues earlier
OCRWM QA	Audit of CAP (2001, multiple opportunities since)	Determine that the "root causes" from CAR 001/002 "Root Cause Analysis Report for YMP Technical Document Deficiencies," August 17, 2001 still existed	Launch a concerted effort to assure that the causes of the issues were corrected	Finding that the corrective actions were ineffective would likely have prevented the problems that currently exist

**Missed Opportunity Matrix**  
**Related to Condition Report (CR) 5223**

<b>Who</b>	<b>Situation</b>	<b>Missed Opportunity (Action)</b>	<b>Expected Result</b>	<b>Impact on Consequences/ Remarks</b>
RIT/OCRWM Management	RIT Product Improvement Initiative (April – November 2004)	Determine and correct problems with transparency, traceability, and reproducibility of technical products	Launch a concerted effort to determine technical product quality and reproducibility and promptly correct all known issues	It is likely that the infiltration AMR would have been rerun as suggested in associated Action Items and Decision Summary and reproducibility issues discovered and fixed
LSN Screener/ Management	Discovery of emails suggesting noncompliance with quality assurance requirements (November 2004)	Write CR to identify and resolve potential conditions adverse to quality in a timely manner	Potential issues are promptly identified, tracked, and resolved	Prompt reporting of issues likely would mitigate program consequences and impact
BSC Legal Counsel	Being informed of subject USGS emails	Immediately inform BSC and OCRWM top management	Actions to investigate extent of condition	Early actions to inform stakeholders and perform root cause analysis