



U.S. Department of Energy
Office of River Protection

P.O. Box 450
Richland, Washington 99352

03-ESQ-054

AUG 19 2003

Mr. E. S. Aromi, President
and General Manager
CH2M HILL Hanford Group, Inc.
Richland, Washington 99352

Dear Mr. Aromi:

CONTRACT NO. DE-AC27-99RL14047 – U.S. DEPARTMENT OF ENERGY, OFFICE OF RIVER PROTECTION (ORP) ASSESSMENT REPORT, A-03-ESQ-TANKFARM-004, OF CH2M HILL HANFORD GROUP, INC. (CH2M HILL) PROGRAM FOR DESIGN CONTROL, DESIGN CONFIGURATION MANAGEMENT, OPERATIONAL CONFIGURATION MANAGEMENT, AND SOFTWARE QUALITY ASSURANCE (SQA)

This letter forwards the results of the ORP assessment of the CH2M HILL programs for Design Control, Design Configuration Management, Operational Configuration Management, and SQA conducted July 7 through 11, 2003. Two Findings were identified during the assessment. The Findings represent isolated cases of noncompliance and resulted in no significant safety issue. The Findings are discussed further in the Notice of Finding (Attachment 1). The assessment report is included as Attachment 2.

The assessment team concluded, with the exception of Findings A-03-ESQ-TANKFARM-004-F-01 and F-02, CH2M HILL's Programs for Design Control, Configuration Management, Operational Configuration Management, and SQA activities were effective and met contractual requirements.

If you have any questions, please contact me, or your staff may call Robert C. Barr, Director, Office of Environmental Safety and Quality, (509) 376-7851.

Sincerely,

Roy J. Schepens
Manager

ESQ:SAV

Attachments (2)

Notice of Finding

The responsibilities of CH2M HILL Hanford Group, Inc. (CH2M HILL) as they relate to the Quality Assurance (QA) requirements of CH2M HILL's scope of work are defined in the River Protection Project Tank Farm Contract, Part I – The Schedule, Section H, H.30 *Quality Assurance System*. H.30 states, "The Contractor shall develop and implement a company specific Quality Assurance Program (QAP), supported by documentation that describes its overall implementation of Quality Assurance (QA) requirements." The QAP shall be developed based on:

- Title 10 Code of Federal Regulations (CFR) Part 830.122 for all nuclear facilities and projects within the scope of that document;
- DOE O 414.1A, *Quality Assurance*, requirements for facilities and projects not within the scope of 10 CFR 830.120; and
- Office of Civilian Radioactive Waste Management DOE/RW-0333P, *Quality Assurance Requirements and Description*, for those elements of CH2M HILL's scope of work that involve the interim storage of spent nuclear fuel and high-level radioactive waste.

CH2M HILL's QA program is defined in TFC-PLN-02, *CH2M HILL Hanford Group, Inc. Quality Assurance Program Description*. Implementing procedures describe processes to meet the requirements described in CH2M HILL's Quality Assurance Program Description (QAPD).

During performance of an assessment of CH2M HILL's programs for Design Control, Design Configuration Management, Operational Configuration Management, and Software Quality Assurance, conducted July 7 through 11, 2003, at CH2M HILL's offices, the U.S. Department of Energy, Office of River Protection (ORP) identified two Findings and two Observations. The two Findings are discussed below. The Observations are discussed in the assessment report.

A-03-ESQ-TANKFARM-004-F-01 – CH2M HILL procedures did not provide a method for controlling unverified portions of designs.

Requirement:

TFC-PLN-02, Revision A-1, *Quality Assurance Program Description*, Section 2.1.3.6, stated, "Processes that implement the QAPD and are common to multiple CH2M HILL TFC organizations are defined in company-wide procedures."

Discussion:

Contrary to the above requirement, CH2M HILL procedures did not specify a mechanism for controlling unverified portions of designs, as specified in the QAPD. QAPD Section 2.6.2.3.3 stated, "If design outputs are used to support other work (e.g., procurement, manufacture, construction, or experiment) before design verification is complete, then the unverified portion of the design outputs shall be identified and controlled." There was no procedure implementing this requirement.

Attachment 1
A-03-ESQ-TANKFARM-004

This problem was illustrated by the 241-C-106 Retrieval Box Assembly design, documented on drawing H-14-106214, Revision 0. CH2M HILL began, but had not yet completed, a verification of this design at the time the drawing was released for fabrication. When fabrication was complete, the component was taken to the field, but was not yet in service. Later, CH2M HILL conducted and completed a second design verification activity associated with the Engineering Change Notice that was to authorize installation. While the second design verification was complete, the initial design verification remained incomplete, even though the equipment was ready for service. It was clear to the assessors that responsible individuals were fully aware of the status of the equipment and would not have allowed it to be relied upon in its function before the initial design verification was complete. However, CH2M HILL was relying on the diligence of these individuals, rather than the formalized process required by the QAPD.

A-03-ESQ-TANKFARM-004-F-02 – There was no objective evidence of spreadsheet verification for waste compatibility assessments for tank farm waste transfers.

Requirement:

- TFC-ENG-CHEM-D-33, Revision A-1, Spreadsheet Verification, dated March 31, 2003, Section 4.1.5 Spreadsheet Formula Verification stated, “5. The spread sheet owner is to complete spreadsheet verification and sign the Spreadsheet Verification Form.”
- TFC-ENG-DESIGN-C-10, Revision A, Engineering Calculations, dated May 5, 2003, Section 4.4.2, Calculations Using Excel, “1. Calculations performed using Excel must conform to Attachment A.” Attachment A, A.8., “Use of Computer Software” stated “if the calculation is performed by a spreadsheet (Excel) application, include the following information. See TFC-ENG-CHEM-33 for further details.
 - Spreadsheet owner, spreadsheet name and location of spreadsheet
 - List of cell formulas used in spreadsheet
 - For each unique cell formula, the intended formula function and intended mathematical equation to be executed by the cell formula
 - Verification that the cell formula syntax will implement the intended function
 - Verification that the cell formula is logically capable of executing the intended function.”

Discussion:

The assessors reviewed spreadsheet documentation, spreadsheet control procedures, and interviewed engineering personnel to verify spreadsheets were controlled and verified. Contrary to the requirements described in the Spreadsheet Verification procedure, CH2M HILL did not provide documented evidence Excel spreadsheet “OCD-015 Rev5 WCA.xls,” used for waste compatibility assessments for tanks, was verified after changes to spreadsheet cell formulas were made. In one instance dated November 8, 2002, a calculation in the spreadsheet was changed to correct an error in the conversion factor for liters to cubic feet.

Attachment 1
A-03-ESQ-TANKFARM-004

Contrary to the requirements described in the Engineering Calculations procedure, RPP-16042, Revision 0, "Waste Compatibility Assessment of DCRT 244-A Waste with Tank 241-AP-107 Waste," dated May 29, 2003, Appendix B, "Calculations Used in the Transfer of Waste from DCRT 244-A Waste to Tank 241-AP-107," did not provide documented evidence of:

- Spreadsheet owner, spreadsheet name and location of spreadsheet;
- List of cell formulas used in spreadsheet;
- For each unique cell formula, the intended formula function and intended mathematical equation to be executed by the cell formula;
- Verification that the cell formula syntax would implement the intended function; and
- Verification that the cell formula was logically capable of executing the intended function.

ORP requests that CH2M HILL provide, within 30 days from the date of the letter that transmitted this Notice, a reply to the Findings above. The reply should include: 1) admission or denial of the Findings; 2) the reason for the Findings, if admitted, and if denied, the reason why; 3) the corrective steps that have been taken and the results achieved; 4) the corrective steps that will be taken to avoid further Findings; and 5) the date when full compliance with the applicable commitments in CH2M HILL's QAPD will be achieved. Where good cause is shown, consideration will be given to extending the requested response time.

Attachment 2
03-ESQ-054
A-03-ESQ-TANKFARM-004

U.S. DEPARTMENT OF ENERGY
Office of River Protection
Environmental Safety and Quality

ASSESSMENT: TANK FARM CONTRACTOR DESIGN CONTROL AND SOFTWARE
QUALITY ASSURANCE

REPORT: A-03-ESQ-TANKFARM-004

FACILITY: CH2M HILL Hanford Group, Inc.

LOCATION: P.O. Box 1500, H6-63
Richland, Washington 99352

DATES: July 7 through 11, 2003

ASSESSORS: S. A. Vega, Lead Assessor
D. H. Brown, Assessor
H. J. Stafford, Assessor in Training
L. Dell, Assessor

APPROVED BY: N. Hunemuller, Team Lead, Quality and Industrial Safety

Attachment 2
A-03-ESQ-TANKFARM-004

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EXECUTIVE SUMMARY

INTRODUCTION

This assessment of CH2M HILL Hanford Group, Inc. (CH2M HILL) covered the following specific areas:

- Design Control (Section 1.2);
- Configuration Management of Design (Section 1.3);
- Software Quality Assurance (Section 1.4); and
- Operational Configuration Management (Appendix A).

The assessors concluded that, notwithstanding findings A-03-ESQ-TANKFARM-004-F-01 and F-02, CH2M HILL had established and effectively implemented processes for programs for Design Control, Design Configuration Management, Operational Configuration Management, and Software Quality Assurance (SQA) activities.

SIGNIFICANT OBSERVATIONS AND CONCLUSIONS

Effectiveness of Procedures

The assessors reviewed CH2M HILL's procedures for Design Control, Design Configuration Management, SQA, and Operational Configuration Management activities. The assessors confirmed, with the exception of Finding A-03-ESQ-TANKFARM-004-F-01, that these procedures contained the requirements of the CH2M HILL *Quality Assurance Program Description*, TFC-PLN-02, Revision A, and CH2M HILL *Conduct of Operations Manual*, dated March 31, 2003, and were adequately implemented.

Design Control

The assessors concluded that CH2M HILL had appropriate processes for establishing design inputs, performing design analysis and verification, and producing design outputs. The management and staff interviewed understood the design control requirements and documented their activities adequately. The assessors confirmed, with the exception of Finding A-03-ESQ-TANKFARM-004-F-01 and Observation A-03-ESQ-TANKFARM-004-O-01, CH2M HILL had adequate design control processes, knowledgeable staff, and effective implementation for all design control activities reviewed.

Design Configuration Management

The assessors concluded CH2M HILL's processes for configuration changes, design changes, documentation, and design interfaces, were adequate and effectively implemented.

Operational Configuration Management

The assessors concluded CH2M HILL's control of operational configuration management was effective. CH2M HILL had identified its own problems and actions were under way to correct them. The assessors concluded that completion of the actions will correct the problems that have occurred and improve the effectiveness and implementation of configuration management in the field. The assessment of operational configuration management was performed by a separate team provided by the U.S. Department of Energy, Office of River Protection Office of the Assistant Manager for Tank Farms (AMTF). Appendix A provides the results of assessment activities conducted by AMTF.

Software Quality Assurance

The addition of dedicated personnel in the engineering organization in April 2003 to ensure implementation of SQA has helped CH2M HILL self-identify and correct problems, and implement SQA as part of the engineering process. Self-identified problems include the need to update software configuration items, verification and validation of commercial off-the-shelf software, and failure to have software purchase requisitions reviewed by Fluor Hanford, Inc. Acquisition Verification Services.

Notwithstanding Finding A-03-ESQ-TANKFARM-004-F-02 and Observation A-03-ESQ-TANKFARM-004-O-02, CH2M HILL had an adequate and effectively implemented program for ensuring the development, procurement, installation, and use of computer software.

Table of Contents

1.0 REPORT DETAILS..... 1

 1.1 Introduction..... 1

 1.2 Design Control..... 1

 1.2.1 Assessment Scope..... 1

 1.2.2 Observations and Assessments 1

 1.2.3 Conclusions..... 3

 1.3 Design Configuration Management..... 3

 1.3.1 Assessment Scope..... 3

 1.3.2 Observations and Assessments 3

 1.3.3 Conclusions..... 4

 1.4 Software Quality 4

 1.4.1 Assessment Scope..... 4

 1.4.2 Observations and Assessments 5

 1.4.3 Conclusion 7

2.0 EXIT MEETING SUMMARY..... 7

3.0 REPORT BACKGROUND INFORMATION..... 7

 3.1 Partial List of Persons Interviewed..... 7

 3.2 Records Reviewed 8

 3.2.1 Documents 8

 3.2.2 Procedures and Other Directives 12

 3.2.3 Problem Evaluation Reports 14

 3.3 Assessment Procedures Used..... 16

 3.4 List of Items Opened, Closed, and Discussed..... 16

 3.4.1 Items Opened 16

 3.4.2 Items Closed..... 17

 3.4.3 Items Discussed 18

 3.5 List of Acronyms 18

Appendix

Appendix A: Results of Assistant Manager for Tank Farms
 Assessment Activities 19

Tank Farm Contractor Design Control, Configuration Management, and Software Quality Assurance

1.0 REPORT DETAILS

1.1 Introduction

In accordance with the River Protection Project Tank Farm Contract,¹ CH2M HILL Hanford Group, Inc. (CH2M HILL) must comply with the accepted and approved *Quality Assurance Program Description* (QAPD), TFC-PLN-02, Revision A, and CH2M HILL *Conduct of Operations Manual* (CONOPS), dated March 31, 2003.

The assessors reviewed CH2M HILL's processes for programs for Design Control, Design Configuration Management, Operational Configuration Management, and SQA to determine if they complied with the commitments in the QAPD, CONOPS manual, and related implementing procedures. The onsite review was conducted from July 7 through July 11, 2003. An exit meeting was conducted on July 11, 2003.

The assessment of operational configuration management was performed by a separate team provided by the U.S. Department of Energy, Office of River Protection (ORP) Office of the Assistant Manager for Tank Farms (AMTF). Appendix A provides the results of assessment activities conducted by AMTF.

1.2 Design Control

1.2.1 Assessment Scope

The assessors reviewed procedures describing the design process for both CH2M HILL and Fluor Federal Services, Inc. (FFS), selected a sample of designs for Project W-211 and the C-106 Retrieval Project to verify implementation of the procedures, and verified implementation of the procedures by evaluating the design media and interviewing personnel who performed the design work.

1.2.2 Observations and Assessments

Notwithstanding Finding A-03-ESQ-TANKFARM-004-F-01 and Observation A-03-ESQ-TANKFARM-004-O-01, CH2M HILL and FFS had coherent programs for identifying design requirements, developing designs, analyzing designs, and verifying designs. The programs were defined in well-written procedures. The assessors verified that CH2M HILL personnel understood and followed the procedures.

¹ Contract DE-AC27-99RL14047 between the U.S. Department of Energy and CH2M HILL Hanford Group Inc., dated September 30, 1999.

Effective New Procedures

At the time of the assessment, CH2M HILL was developing and issuing new procedures to cover all aspects of their operations. The assessors found CH2M HILL had significantly improved implementation of the QAPD in comparison to its older procedures. The new procedures were clearly written and, with the exception of one design verification requirement, systematically implemented the QAPD requirements.

The assessors selected a sample of design media from Project W-211 (primarily FFS work) and the C-106 Retrieval Project (primarily CH2M HILL work). The assessors reviewed the designs and interviewed CH2M HILL personnel who had participated in developing and verifying the designs. Personnel interviewed by the assessors understood the CH2M HILL procedures and executed the design activities in accordance with procedures.

Weak Procedural Control on Incomplete Design Verification

The assessors reviewed the process for design verification. With few exceptions, the design verification process was appropriately described in both CH2M HILL and FFS procedures. One exception was that CH2M HILL procedures lacked a mechanism for controlling unverified portions of designs. The CH2M HILL QAPD required that, if designs were released before design verification was complete, the unverified portion was to be controlled. This was to assure that all designs were verified and verification issues were resolved before the design was relied on to perform its function. When the assessors pointed out to CH2M HILL management that their procedures lacked this control, they acknowledged the deficiency and immediately initiated a Problem Evaluation Report (PER) PER-2003-2676.

The assessors reviewed released designs for which there remained incomplete design verification activity. They found that CH2M HILL personnel in the field, particularly system engineers, were controlling the unverified portions of the designs even though they lacked a formal mechanism for this. The assessors described the procedure deficiency in Finding A-03-ESQ-TANKFARM-004-F-01.

Weak FFS Design Verification Procedures

The assessors reviewed the FFS procedures for design control, including the procedures for design verification. They also reviewed a sample of FFS design work on Project W-211 and interviewed FFS managers. The assessors found that FFS procedures described a comprehensive design control program, except that there were weaknesses in the treatment of design verification. Specifically, the FFS independent design verification procedure² limited its applicability to safety class structures, systems, and components (SSC), excluding safety significant and general service SSCs in nuclear facilities.

The Quality Assurance Rule (Title 10 Code of Federal Regulations [CFR] 830.122) required that designs of SSCs in nuclear facilities be verified. While the rule permitted applying a graded approach to the extent of design verification, it did not permit limiting application of the

²FFS Practice 134 200 0945 (January 1, 2002), *Independent Design Verification*

requirement to safety class SSCs. The FFS quality assurance program document³ stated, "The extent to which design verification is performed depends on the complexity, risk, and uniqueness of the design." Limiting applicability of the procedure to safety class SSCs failed to allow for applying independent design verification to non-safety class SSCs that were unusually complex or unique.

The FFS design control program provided several other processes that the assessors considered qualified as forms of design verification. These were routinely applied to non-safety class designs; therefore, the assessors concluded that FFS was meeting the requirement for design verification. Also, the CH2M HILL 90% design review process invoked the CH2M HILL design verification process on all FFS designs for CH2M HILL nuclear facilities. The CH2M HILL design verification procedure⁴ included appropriate checklists and methods to assure that designs are properly verified. Therefore, CH2M HILL was satisfying the design verification requirement for FFS work on CH2M HILL nuclear facilities. The assessors documented the problem of the unclear FFS independent design review process in Observation A-03-ESQ-TANKFARM-004-O-01.

1.2.3 Conclusions

CH2M HILL and FFS had appropriate programs for control of the design process. CH2M HILL's procedures were sound and personnel understood and followed the procedures. However, there was one finding and one observation. The finding documented a missing control in the CH2M HILL design verification process, and the observation documented a weakness in FFS' design verification procedures. Except for these issues, CH2M HILL had an adequate and effective process for conducting design work.

1.3 Design Configuration Management

1.3.1 Assessment Scope

The assessors reviewed documentation and interviewed CH2M HILL personnel to verify equipment configuration and design changes, documentation, and design interfaces were controlled for Tank Farm SSCs. The primary focus was on safety class and safety significant SSCs.

1.3.2 Observations and Assessments

Design Configuration Management

The assessors reviewed procedures, a sample of 15 documents, and interviewed CH2M HILL personnel to verify design configuration was documented and changes to designs were adequately and effectively controlled. The assessors concluded design configuration was documented and changes to designs were adequately and effectively controlled.

³ 134 000 1100 (March 1, 2002), *Quality Management Program*

Interface Control

The assessors examined the performance of CH2M HILL's interface control activities as they related to the design process for conformance with the QAPD, Section 2.6.22. The assessors conducted discussions with responsible personnel and examined documentation establishing the administrative, functional and physical design related interfaces, and the interface controls. The assessors also examined the established interfaces and controls between CH2M HILL and subcontractors to assess effectiveness in establishing and controlling these interfaces and to verify implementation of quality assurance (QA) requirements.

The assessors verified CH2M HILL had a process in place for establishing interfaces during the design process and verified those processes were being implemented. The inspectors examined objective evidence to confirm interfaces were established and controlled in accordance with the interface control procedure⁵. The inspectors examined interface documentation such as the statement of work, the work implementation plan, interface control drawings, the design drawings, and document transmittals for Projects W-211, C106, and C-200. These documents indicated administrative, functional, and physical interfaces were established as required. Interviews with project engineering staff indicated that these interfaces were known and implemented by CH2M HILL and subcontractor staff. The inspectors also verified that design documents were properly transferred and controlled from the subcontractor to CH2M HILL via the use of a transmittal, which documented the transfer and progression of a document from initiation to approving and issuing the documents.

1.3.3 Conclusions

The CH2M HILL engineering organization was effective in implementing and controlling design configuration and interfaces. Everyone interviewed understood the processes, and each reviewed project had established proper design configuration and interface control.

1.4 Software Quality

1.4.1 Assessment Scope

The assessors reviewed procedures and software configuration baseline items, inspected software installations, and interviewed CH2M HILL personnel. This was done to verify computer software used for the design, construction, operation, modification, repair, and maintenance of CH2M HILL's nuclear facilities, including safety analysis, was developed, procured, installed, used, and modified in accordance with management approved controlled documents.

⁴ TFC-ENG-DESIGN-P-17, Revision A-1, Design Verification

⁵ HNF-IP-0842, Volume 4, Engineering, Section 2.8, Revision 2c, *Interface Control*, dated March 31, 2003

1.4.2 Observations and Assessments

Commercial Off-the Shelf Software (COTS)

The assessors reviewed the following COTS software validation documentation to verify the COTS software had been validated for use as required by procedure⁶:

- RPP-9186, *Validation of ANSYS 7.0 Finite Element Analysis Software*, Revision 1, dated June 27, 2003.
- Assessment Memo, *Assessment of Fluor Federal Services (FFS) FLUENT Application, Version 5.5 to Part II Subpart 2.7 of ASME NQA-1-1997 Edition 'Quality Assurance Requirements for Nuclear Facility Application' with ASME NQA-1a-1999 Addenda requirements*, dated March 13, 2003.
- Assessment Memo, *Assessment of Fluor Federal Services (FFS) MCNP Application, Version 4C to ASME NQA-1-1997 Edition 'Quality Assurance Requirements for Nuclear Facility Application' with ASME NQA-1a-1999 Addenda requirements*, dated January 6, 2003.
- Assessment Memo, *Assessment of Fauske & Associates, Inc (FAI) HADCRT Application, Version 1.4 to Part II Subpart 2.7 of ASME NQA-1-1997 Edition 'Quality Assurance Requirements for Nuclear Facility Application' with ASME NQA-1a-1999 Addenda requirements*, dated January 8, 2003.
- Assessment Memo, *Re-assessment of Pacific Northwest Laboratories (PNNL) ESP Application, Version 6.5 to ASME NQA-1-1997 Edition 'Quality Assurance Requirements for Nuclear Facility Application' with ASME NQA-1a-1999 Addenda requirements*, dated November 11, 2002.

The assessors verified the COTS software had been adequately validated for use as required by the CH2M HILL procedure for COTS.

Spreadsheets

The assessors reviewed spreadsheet documentation, reviewed spreadsheet control procedures, and interviewed engineering personnel to verify a sample of 22 waste compatibility spreadsheets and an engineering inventory of 77 spreadsheet calculations were controlled, documented, and verified per the engineering calculations⁷ and spreadsheet verification⁸ procedures. Contrary to the requirements described in the spreadsheet verification procedure, CH2M HILL did not provide documented evidence Excel spreadsheet "OCD-015 Rev5 WCA.xls," used for waste compatibility assessments for tanks, was verified after changes to spreadsheet cell formulas were made. The change to the spreadsheet dated November 8, 2002, involved a calculation in the spreadsheet to correct an error in the conversion factor for liters to cubic feet.

⁶ TFC-BSM-IRM_HSCC-02, Revision A-1, *COTS Software Acquisition, Implementation, and Management*, dated March 7, 2003.

⁷ TFC-ENG-DESIGN-C-10, Revision A, *Engineering Calculations*, dated May 5, 2003.

⁸ TFC-ENG-CHEM-D-33, Revision A-1, *Spreadsheet Verification*, dated March 31, 2003.

In another example spreadsheet titled, "Waste Compatibility Assessment of DCRT 244-A Waste with Tank 241-AP-107 Waste," dated May 29, 2003, did not contain the following documentation required by the Engineering Calculations procedure:

- Spreadsheet owner, spreadsheet name, and location of spreadsheet;
- List of cell formulas used in spreadsheet;
- Intended formula function and intended mathematical equation to be executed by the cell formula for each unique cell formula;
- Verification that the cell formula syntax would implement the intended function; and
- Verification that the cell formula was logically capable of executing the intended function.

This is documented in Finding A-03-ESQ-TANKFARM-004-F-02 and CH2M HILL initiated PER-2003-2702 to document this condition.

Developed Software

The assessors reviewed three software packages developed for CH2M HILL to verify the software had been developed, installed, used, and modified in accordance with the following management approved controlled documents:

- HNF-IP-0842, Volume 17, IRM, Section 3.3, Revision 1a, *IRM Application Software System Life Cycle Standards*, dated February 8, 2002;
- TFC-BSM-IRM-STD-01, Revision A-2, *Software Life Cycle Standard*, dated June 4, 2003;
- TFC-BSM-IRM-STD-02, Revision A-1, *Software Configuration Management Standard*, dated June 4, 2003;
- TFC-BSM-IRM_HS-C-01, Revision A-3, *Software Development, Implementation, and Management*, dated June 16, 2003; and
- TFC-BSM-IRM_HSCC-03, Revision A-1, *Custom Software Development, Implementation and Management*, dated March 7, 2003.

The assessors reviewed baseline documentation and interviewed personnel to verify CH2M HILL developed, installed, used, and modified the following software in accordance with the procedures listed above:

- Tank Monitoring and Control System;
- 244-AR Ventilation and Transfer System; and
- Surveillance System.

The assessors discovered differences in time and date stamps for 11 of 16 files during an inspection of installed script files for the liquid observation well (LOW) system installed in mobile vans. Script files were used to instruct instrument activity for:

- Depth of the observation well;
- Speed of descent and ascent; and

- Instrument probe configuration.

Time and date information is important in configuration management because the information is an indicator that script files employed by the instrument are the ones intended to be employed in a production environment. The assessors performed a follow up review of the contents of the script files with a controlled copy of the script files and verified the instructions in the installed script files were identical. During an interview with a surveillance system engineer the assessors verified the process for LOW script updating was not documented. CH2M HILL initiated PER-2003-2704 to document this condition.

The assessors verified, notwithstanding Observation A-03-ESQ-TANKFARM-004-O-02, the software had been developed, installed, used, and modified in accordance with management approved controlled documents. Observation A-03-ESQ-TANKFARM-004-O-02 documented the script file time and date stamp discrepancies in the LOW script files.

1.4.3 Conclusion

The addition of dedicated personnel in the engineering organization in April 2003 to ensure implementation of SQA has helped CH2M HILL self-identify and correct problems, and implement SQA as part of the engineering process.

Notwithstanding Finding A-03-ESQ-TANKFARM-004-F-02 and Observation A-03-ESQ-TANKFARM-004-O-02, CH2M HILL had an adequate and effectively implemented program for ensuring the development, procurement, installation, and use of computer software.

2.0 EXIT MEETING SUMMARY

Preliminary assessment results were presented to CH2M HILL management at an exit meeting held on July 11, 2003. CH2M HILL acknowledged the findings and conclusions presented.

CH2M HILL verified that no materials examined during the assessment were proprietary data.

3.0 REPORT BACKGROUND INFORMATION

3.1 Partial List of Persons Interviewed

D. G. Baide, CH2M HILL Closure Projects Engineering Support
D. A. Barnes, CH2M HILL, Surveillance Systems Engineer
W. B. Barton, CH2M HILL Closure Projects Engineering Support
J. R. Bellomy, CH2M HILL Retrieval/Closure System Engineering
S. R. Briggs, CH2M HILL DST Projects and Maintenance (Project W-211)
D. W. Brown, Closure Project Support
P. A. Clark, LMSI
G. J. Coleman, System Engineer

G. M. Cooper, LMSI
 G. L. Crawford, CH2M HILL Engineering Support
 C. Defigh-Price, Engineering Services Director
 D. K. DeFord, System Engineer
 L. A. Domnoske-Rauch, Process/Waste Transfer Engineer
 M. A. Fish, CH2M HILL Engineering Standards
 L. E. Fox, Configuration Documentation Specialist
 A. H. Friberg, CH2M HILL Engineer Standards
 C. E. Graves, CH2M HILL Project Definition
 E. R. Hamm, CH2M HILL, Engineering Standards, Engineer
 D. T. Heimberger, CH2M HILL, Systems Engineering, Engineer
 L. J. Julyk, CH2M HILL, Design Engineering, Structural Specialist
 M. R. Kembel, WFO Shift Operation/Sampling Director
 W. J. Kennedy, Transfer Operations & Acceptance Manager
 J. W. Kissel, Closure Projects Planner
 M. A. Knight, CH2M HILL, Engineering Standards, lead Process Engineer
 D. L. Kubie, Training
 R. E. Larson, CH2M HILL Engineering Standards
 D. Lowe, Chief Engineer
 T. C. Mackey, CH2M HILL Design Engineering
 C. Maciuca, CH2M HILL, Quality Assurance, Lead Software QA Engineer
 N. J. Milliken, Closure Project Support Manager
 C. T. Narquis, FFS Quality Assurance Manager
 J. R. Nicholson, FFS Engineering Manager, Project W-211
 N. D. O'Brien, LMSI, Scientific Systems Services, Computer Software Engineer
 W. L. Parnell, WFO, Facility Coordinator
 T. L. Pope, CH2M HILL, Quality Assurance, Administrative Specialist
 J. G. Propson, CH2M HILL Closure Projects Engineering Support
 C. A. Rieck, CH2M HILL W-211 Retrieval Project
 K. M. Smith, CP Planning
 D. J. Saueressig, Retrieval Operations Project Manager
 M. J. Sutey, Retrieval/Closure System Engineering Manager
 S. D. Ringo, T-Shift Senior Shift Manager
 B. L. Wallace, Lock & Tag Technical Reviewer
 W. D. Winkelman, CH2M HILL, DST Systems Engineering, Systems Engineer
 W. R. Wier, Engineering Standards

3.2 Records Reviewed

3.2.1 Documents

1. RPP-13297, *Software Quality Assurance Plan for 244-AR Ventilation and Transfer System*, Revision 0a, dated December 30, 2002.
2. RPP-11448, Revision 0a, *Software Configuration Management Plan for 244-AR Vault Interim Stabilization Transfer System*, dated December 5, 2002.

3. RPP-9186, *Validation of ANSYS 7.0 Finite Element Analysis Software*, Revision 1, dated June 27, 2003.
4. Engineering Change Notice (ECN) 720707, Revision 0, dated June 27, 2003.
5. ECN 671933, Release December 5, 2002, Installed December 20, 2002.
6. ECN 720188, Release February 25, 2003, Installed March 6, 2003.
7. ECN 671933, Release April 15, 2003, Installed April 16, 2003.
8. *244-AR_rev1.rss, 244-AR Vault Monitoring Control System*, dated April 16, 2003.
9. HNF-3200, Revision 0, *Liquid Observation Well Van Program (LOWVP) Year 2000 Final Test Report*, dated August 17, 1998.
10. HNF-SD-WM-OTE-201, Revision 0, *Operational Test Report for the New Liquid Observation Well (LOW) Vans*, dated March 14, 1997.
11. WHC-SD-WM-ATR-152, Revision 0, *Liquid Observation Well (LOW) Surveillance Van Acceptance Test Report*, dated December 4, 1996.
12. WHC-SD-WM-ATR-152, Revision 0, *Liquid Observation Well (LOW) Surveillance Van Acceptance Test Procedure (ATP)*, Greenspan Incorporated, dated September 7, 1995,
13. Assessment Memo, *Assessment of the Processes and Procedures of Fauske & Associates, Inc. (FAI) to Part II Subpart 2.7 of ASME NQA-1-1997 Edition 'Quality Assurance Requirements for Nuclear Facility Application' with ASME NQA-1a-1999 Addenda requirements*, dated January 8, 2002.
14. Assessment Memo, *Assessment of Fauske & Associates, Inc (FAI) HADCRT Application, Version 1.4 to Part II Subpart 2.7 of ASME NQA-1-1997 Edition 'Quality Assurance Requirements for Nuclear Facility Application' with ASME NQA-1a-1999 Addenda requirements*, dated January 8, 2003.
15. Assessment Memo, *Re-assessment of Pacific Northwest Laboratories (PNNL) ESP Application, Version 6.5 to ASME NQA-1-1997 Edition 'Quality Assurance Requirements for Nuclear Facility Application' with ASME NQA-1a-1999 Addenda requirements*, dated November 11, 2002.
16. RPP-13851, *Operational Test Report for the 244AR Vault Interim Stabilization Transfer System*, Revision 0, dated January 8, 2003.
17. Assessment Memo, *Assessment of Fluor Federal Services (FFS) FLUENT Application, Version 5.5 to Part II Subpart 2.7 of ASME NQA-1-1997 Edition 'Quality Assurance Requirements for Nuclear Facility Application' with ASME NQA-1a-1999 Addenda requirements*, dated March 13, 2003.
18. Assessment Memo, *Assessment of Fluor Federal Services (FFS) MCNP Application, Version 4C to ASME NQA-1-1997 Edition 'Quality Assurance Requirements for Nuclear Facility Application' with ASME NQA-1a-1999 Addenda requirements*, dated January 6, 2003.
19. WHC-S-0197, Revision 1, *Specification for Drywell Van Upgrades*, dated March 17, 1994.
20. *Production Readiness Review Board Submission Package, Tank monitoring and Control System, Release 14.1*
21. *Test Plan for TMACS Release 14.1*, dated May 13, 2002.
22. *TMACS Installation Checklist Performed by the Developers*, dated June 11, 2002.
23. *TMACS Release 14.1 Data Manager Checklist*, dated June 19, 2002.
24. HNF-3967, *Tank Monitoring and Control System (TMACS) Acceptance Test Procedure*, Revision 0, dated May 20, 2002.

25. RPP-10840, *Tank Monitoring and Control System (TMACS) Acceptance Test Report*, Revision 0, dated June 11, 2002.
26. RPP-14083, *Software Quality Assurance Plan Tank Monitoring and Control System (TMACS)*, dated February 18, 2003.
27. RPP-10684, Revision 1, *System Design Description for Tank Monitoring and Control System*, dated October 15, 2002.
28. HNF-SD-WM-CSCM-019, Revision 2, *Software Configuration Management Plan (SCMP) for the Tank Monitoring and Control System (TMACS)*, dated February 18, 2003.
29. *Software QA Inventory*, dated July 7, 2003.
30. *Table 1 – Software QA Inventory*, dated February 4, 2003.
31. CH2M HILL Engineering System Applications Inventory, Engineering Software List.xls, dated July 1, 2003.
32. RPP-15469, *TANK 241-AP-105 Grab Sampling and Analysis Plan in Support of Evaporator Campaign 04-02*, Revision 0, dated June 2003.
33. RPP-13297, Revision 0a, *Software Quality Assurance Plan for 244-AR Ventilation and Transfer System*, dated December 30, 2002.
34. Letter of Transmittal, No. 00046, IDC File index: 04.05.02, ECN's for release; Pkg 12 EDT's; RPP-16155; RPP-16231, IDC Project No: 7642, dated July 3, 2003.
35. Letter of Transmittal, No. 00003, Package 4 , IDC Project No: 7642, dated March 26, 2003.
36. Letter of Transmittal, No. 00016, IDC File Index:04.05.02, Package 4 – Manifolds and Diversion Box Issue for Review #2, IDC Project No: 7642, dated April 15, 2003.
37. Letter of Transmittal, No. 00026, IDC File Index: 04.05.02, Package 4 – Manifolds and Diversion Box IFC Dwgs & Specs (RPP-15874), IDC Project No: 7642, dated April 29, 2003.
38. Letter of Transmittal, No. 00032, IDC File Index:04.05.02, ECN 720554 R0 (Package 4) IFR, IDC Project No: 7642, dated May 15, 2003.
39. Letter of Transmittal, No. 00038, IDC File Index:04.05.02, Package 12: 90% Review Drawings; Specs; O&M; Calcs; Compl. Matrix, IDC Project No: 7642, dated May 15, 2003.
40. Letter of Transmittal, No. 00045, IDC File Index:04.05.02, EDT #636551, IDC Project No: 7642, dated May 15, 2003.
41. EDT 636541, Engineering Data Transmittal, *C200 series Waste Retrieval System – Specifications for the Purchase of Manifolds and Diversion Box*, dated May 7, 2003.
42. EDT 636551, *Controls Block Diagram; C-200 WRS Pump Shutdown System Block Diagram; WRS PLC to MRS PLC Permissive*, dated July 6, 2003.
43. ECN 720048, *TANK 241-C-106 Waste Retrieval Level 2 Specification*, dated May 21, 2003.
44. EDT 631260, Engineering Data Transmittal, *241-C-106 WRP PEP*, dated January 7, 2003.
45. EDT 636235, Engineering Data Transmittal, *Power to PLC; MPS Actuation Interlock; Nitrogen gas and filtered raw water instrumentation; Mixer Pump/Turntable Motor & associated equip wiring*, dated June 12, 2003.
46. RPP-14983, Revision 0, *Project Execution Plan for 241-C-200 Series Tank Waste Retrieval/Closure Project*, dated April 2, 2003

47. HNF-1507, Revision 2, *Interface Document for Project W-211, Initial Tank Retrieval Systems*, dated May 31, 2002.
48. HNF-333, Revision 5, *Project Execution Plan for Project W-211, Initial Tank Retrieval Systems*, dated April 21, 2003.
49. Requisition # 96812, Contract 18089, Release 2, *200 Series SSTs Waste Retrieval System Final Design*, Revision 4, dated June 2, 2003.
50. Review Comment Record, *IDC Package 4 – Manifolds and Diversion Box (2nd review)*, dated April 30, 2003.
51. Review Comment Record, *C200 Series Retrieval*, dated April 2, 2003.
52. Review Comment Record, *H-14-106132*, dated June 26, 2003.
53. Review Comment Record, *H-14-105969*, dated June 27, 2003.
54. FFS Project Execution Plan, Contract 653005, *Engineering/Design*.
55. CH2M HILL letter from J. R. Holder to D. J. Foucault, FFS, *Audit Report, RPP-A-01-08, Revision 0, Fluor Federal Services Engineering*, CHG-0104924, dated September 20, 2001.
56. CH2M HILL letter from K. M. McLerran to W. A. Brever, FFS, *Request for Corrective Action to Resolve Questions of Independent Design Verification*, CHG-0106469, dated November 12, 2001.
57. C200 Series WRS Project Master Document Tracking List.
58. Design Verification Review Comment Records for Project W-211, Tank AN-101 Retrieval.
59. FDNW-W-211-SEP, Revision 1, System Engineering Plan, Project W-211 Initial Retrieval Systems Title II Design.
60. Statement of Work for Final Design, Engineering Services During Construction, System Integration, and Support to Construction Management for 200 Series SSTs Waste Retrieval System, Revision 4.
61. Statement of Work, Requisition # 83699 #86228, W-211, Tank AN-107 Title II Engineering, Revision 0A, date April 3, 2002.
62. ECN W211-TP2-047
63. ECN W211-TP2-036
64. Calculation No. W211-AN07-C-002
65. Work Package, WS-03-774, 241-C-106 Install Mixing Eductor 06A Pit
66. Work Package, WS-02-617, 241-C-106 Modify 06B Heel Pit
67. Work Package, WS-03-003, 241-C-103, Remove HIHTL
68. Work Package, WS-03-073, 241-C-106 HIHTL Installation 06B *Senior Shift Supervisor & Shift Manager East Area Turnover Status Sheet*, July 8, 2003.
69. *Daily Release Sheet, WFO*, dated July 8, 2003.
70. *Daily Release Sheet, CP*, dated July 8, 2003.
71. Alarm Status Logbook for 271-AW Instrument Building
72. Alarm Status Logbook for 271-AP Instrument Building
73. Alarm Status Logbook for 242-S Evaporator Cross-Site Transfer Control Room

Design Media Documents

74. RPP-15199, *Shielding Calculations and ALARA Screening for 241-C 200 Series Tank Retrieval*.

75. RPP-15873, *C-200 Waste Retrieval System – Specification for the Purchase of Supply Water Skid.*
76. RPP-16231, *Hand Calculations for the 241-C-200 Series Tank Waste Retrieval System*, dated June 25, 2003
77. Ninety Percent Design Review Comment Records, IDC Project 07642.
78. RPP-16155, Revision 0, *Electronic Calculations for the Construction of the 241-C-200 Series Tank Waste Retrieval System.*
79. RPP-16249, Revision 0, *Mixing Eductor Operating Flow and Pressure for C-106 Flygt Pumps.*
80. RPP-16248, *Flygt Pump Performance Calculation for C-106 Waste Transfer.*
81. RPP-16253, Revision 0, Acid Dissolution Eductor Assembly and Support Structure.
82. RPP-13631, Revision 0, Hose-in-Hose Transfer Lines Calculation Document for the 241-C-106 Retrieval Program.
83. RPP-15873, Revision 0, C200 Series Waste Retrieval System – Specifications for the Purchase of Water Supply Skid.
84. RPP-11567, Revision 2, Level 2 Specification for a Waste Retrieval System for Single-Shell Tank 241-C-106.
85. HNF-1507, Revision 2, Interface Document For Project W-211, Initial Tank Retrieval System Procedures.
86. Drawing H-14-106214, Revision 0, 241-C-106 Retrieval Shield Box Assembly.
87. Drawing H-14-106211, Revision 0, 241-C-106 Retrieval Mixing Eductor Assembly.
88. Drawing H-14-106208, Revision 0, Waste Retrieval System 241-C-106 Acid Addition P & ID.
89. Drawing H-2-830814, Revision 0, Electrical 241-C-106 Power Rack Assembly.
90. Drawing H-14-105651, Revision 0, Hydraulic Ram for Heel Jet Removal 241-C-06B Heel Pit.
91. ECN 72307, Revision 1, with associated design verification documents.
92. ECN 72307, Revision 2, with associated design verification documents.
93. ECN 72370, Revision 0, with associated design verification documents.
94. ECN 720492, Revision 0, with associated design verification documents.
95. ECN 720734, Revision 0, with associated design verification documents.
96. ECN 720392, Revision 0, with associated design verification documents Drawing H-14-106202, *Jumper Assembly 241-C-106B*, Revision 0.
97. ECN 720544, *HIHTL C-106 to An-106*, Revision 0, June 2, 2003.
98. ECN 720390, *Addition of Mixing Eductor Assembly to C-106*, Revision 1, dated July 2, 2003.

3.2.2 Procedures and Other Directives

1. TFC-PLN-02, Revision A-1, *Quality Assurance Program Description*, dated March 1, 2003.
2. TFC-ESHQ-Q_ADM-D-04, Revision A-1, *Quality Assurance Program Description Implementation Matrix*, dated March 31, 2003.
3. TFC-ENG-CHEM-D-33, Revision A-1, *Spreadsheet Verification*, dated March 31, 2003.
4. TFC-ENG-DESIGN-C-01, Revision A-1, *Development of System and Subsystem* TFC-ENG-DESIGN-C-10, Revision A, *Engineering Calculations*, dated May 5, 2003.

5. TFC-ENG-DESIGN-C-06, Revision B, *Engineering Change Control*, dated June 13, 2003.
6. TFC-ENG-DESIGN-C-06, Revision C, *Engineering Change Control*, dated July 10, 2003
7. TFC-ENG-DESIGN-P-17, Revision A-1, *Design Verification*, dated March 31, 2003.
8. TFC-ENG-STD-05, *Master Equipment List Standard*, Revision A-1, dated March 31, 2003.
9. TFC-ENG-FAC SUP-P-01, *Conduct of System Engineering*, Revision A-2, dated June 13, 2003.
10. TFC-OPS-MAINT-C-01, *Work Planning Guidance*, Revision D, dated June 30, 2003.
11. TFC-OPS-OPER-C-05, *Lockout/Tagout Program*, Revision A-7, dated June 16, 2003.
12. TFC-OPS-OPER-C-07, *Turnover of Shift Responsibility*, Revision A-1, dated May 26, 2003.
13. TFC-OPS-OPER-C-08, *Shift Routines and Operating Practices*, Revision A-9, dated May 22, 2003.
14. TFC-OPS-OPER-D-03, *Shift Office Status Board User's Guide*, Revision A, dated October 30, 2002.
15. HNF-IP-0842, Volume 17, IRM, Section 3.3, Revision 1a, *IRM Application Software System Life Cycle Standards*, dated February 8, 2002.
16. TFC-BSM-IRM-STD-01, Revision A-2, *Software Life Cycle Standard*, dated June 4, 2003.
17. TFC-BSM-IRM-STD-02, Revision A-1, *Software Configuration Management Standard*, dated June 4, 2003,
18. TFC-BSM-IRM_HS-C-01, Revision A-3, *Software Development, Implementation, and Management*, dated June 16, 2003.
19. TFC-BSM-IRM_HS-C-02, Revision A-1, *COTS Software Acquisition, Implementation, and Management*, dated March 7, 2003.
20. TFC-BSM-IRM_HS-C-03, Revision A-1, *Custom Software Development, Implementation and Management*, dated March 7, 2003.
21. TFC-BSM-IRM_HS-C-04, Revision A-1, *Applications Using COTS Software Implementation and Management*, dated March 7, 2003.
22. TFC-BSM-IRM_HS-C-05, Revision A-1, *Software Retirement, replacement, and Data Preservation*, dated March 7, 2003.
23. TO-040-333, *Liquid Observation Well (LOW) Surveillance Van Startup and Operation Procedure*, dated April 1, 2003.
24. TFC-ESHQ-Q_INSP-C-05, Revision A-3, *Independent Review and Approval of Documents*, dated March 31, 2003.
25. HNF-IP-0842, Volume 4, Engineering, Section 4.26, Revision 0i, *Supporting Document Requirements*, dated June 30, 2003.
26. HNF-IP-0842, Volume 4, Engineering, Section 4.30, Revision 1a, *Engineering Data Transmittal Requirements*, dated March 31, 2003.
27. HNF-IP-0842, Volume 4, Engineering, Section 1.2, Revision 0d, *Engineering Requirements*, dated March 31, 2003.
28. HNF-IP-0842, Volume 4, Engineering, Section 2.8, Revision 2c, *Interface Control*, dated March 31, 2003.

29. HNF-IP-0842, Volume 4, Engineering, Section 4.25, *Engineering Drawings*, Revision 0g, dated March 31, 2003.
30. HNF-IP-0842, Volume 2, Operations, Section 4.3.1, *Control Area Activities*, Revision 1h, dated May 21, 2003.
31. HNF-IP-0842, Volume 2, Operations, Section 4.8.2, *Routing Boards*, Revision 0L, dated June 13, 2003.
32. HNF-IP-0842, Volume 2, Operations, Section 4.8.3, *Operational Configuration Control*, Revision 1j.
33. HNF-IP-0842, Volume 2, Operations, Section 4.10.1, *Independent Verification*, Revision 3g, dated June 4, 2003.
34. HNF-IP-0842, Volume 2, Operations, Section 4.11.1, *Operating Logbooks*, Revision 4L, dated May 26, 2003.
35. HNF-IP-0842, Volume 2, Operations, Section 6.1, *Tank Farm Operations Equipment Labeling*, Revision 1a, dated May 22, 2003.
36. HNF-IP-0842, Volume 2, Operations, Section 6.2, *Control of Tank Farm Essential Electrical Panel Board Schedule Drawings*, Revision 2b, dated March 31, 2003.
37. HNF-1900, *Configuration Management Plan for the Tank Farm Contractor*, Revision 2, dated February 2002.
38. HNF-1901, *Technical Baseline Summary Description for the Tank Farm Contractor*, Revision 2, dated April 2000.
39. HNF-1939, *Waste Feed Delivery Technical Basis, Volume III, Waste Feed Delivery System Description*, Revision 0A, dated August 2, 1999.
40. TO-430-200, *Transfer from 241-SY-102 to 241-SY-101*, Revision A-6.
41. TP-260-080, *External Transfer from 244-AR Tank 001 to 241-AY-102*, Revision B-11, date July 8, 2003.
42. HNF-IP-0842, Volume 4, Engineering, Section 4.29, Revision 4f, *Engineering Document Change Control Requirements*, dated March 31, 2003.

FFS Practices

43. 000 200 1036 (March 24, 1993), *Interdisciplinary Document Reviews*.
44. 134 000 1100 (March 1, 2002), *Quality Management Program*.
45. 134 200 1020 (March 1, 2002), *Engineering Calculations*.
46. 134 200 0945 (January 1, 2002), *Independent Design Verification*.
47. 134 200 1021 (September 1, 2002) *Preparation and Checking, Engineering Drawings and Sketches*.
48. 134 200 0230 (March 1, 2002), *Engineering Document Checking and Approval*.

3.2.3 Problem Evaluation Reports

1. PER-2003-2067, *Engineering Management Assessment on Calculations (2003-ENG-M-0012)*, dated May 30, 2003.
2. PER-2003-2063, *Engineering Management Assessment Microshield Software*, dated May 30, 2003.
3. PER-2003-2267, *SY-B Train Exhauster Out of Service as a Result of Maintenance*, dated June 12, 2003.

Attachment 2
A-03-ESQ-TANKFARM-004

4. PER-2003-1911, *SY-B Train Exhauster Unexpectedly Shutting Down*, dated May 19, 2003.
5. PER-2003-1664, *QA Software Control Audit*, dated April 30, 2003.
6. PER-2003-1589, *Not All Software Quality Checks Have Been Completed*, dated April 23, 2003.
7. PER-2003-1448, *QA Audit RPP-A-03-01*, dated April 10, 2003.
8. PER-2003-0428, *Software Control Process Not Implemented Effectively*, dated January 24, 2003.
9. PER-2003-0315, *CHG Using Unapproved Network Operating System*, dated January 22, 2003.
10. PER-2003-0058, *Best Basis Inventory Software Procured Without Software Quality Assurance*, dated December 27, 2002.
11. PER-2002-6185, *Hanford Tank Waste Operations Simulator*, dated November 21, 2002.
12. PER-2002-6184, *Hanford Tank Waste Operations Simulator*, dated November 21, 2002.
13. PER-2002-6183, *Hanford Tank Waste Operations Simulator*, dated November 21, 2002.
14. PER-2002-6182, *Hanford Tank Waste Operations Simulator*, dated November 21, 2002.
15. PER-2002-6181, *Hanford Tank Waste Operations Simulator*, dated November 11, 2002.
16. PER-2002-5716, *SY-B Train Software Documentation Deficiency*, dated October 28, 2002.
17. PER-2002-5576, *CAMP-Out Software Faults Cause Report Error*, dated October 1, 2002.
18. PER-2002-5316, *Software Used During W314 MPSS Acceptance Test Procedure*, dated September 26, 2002.
19. PER-2002-3161, *Flowdown Requirements for Instrument & Control Software*, dated June 11, 2002.
20. PER-2002-2659, *JCS Software Issues*, dated May 16, 2002.
21. PER-2002-2558, *Improper Reference Used in IP-0842, Vol. 4, Sect. 1.2*, dated April 30, 2002.
22. PER-2002-1610, *Software Changes for 242-S MCS Not Reflected in Cross-Site Transfer Procedure*, dated March 24, 2002.
23. PER-2002-1526, *Corrective Action Group Consistency*, dated March 19, 2002.
24. PER-2002-1403, *Vital Safety System Assessment*, dated March 8, 2002.
25. PER-2002-1399, *Vital Safety System Assessment Finding*, dated February 25, 2002.
26. PER-2002-1397, *Safety Basis Assessment Finding*, dated February 25, 2002.
27. PER-2002-1396, *Safety Basis Assessment Finding*, dated February 25, 2002.
28. PER-2002-4545, *Unplanned LCO 3.2.6 Entry Created by L&T AN Farm*.
29. PER-2003-1375, *244-BX to AP-102 Transfer Stopped because Valve V-314 was Repositioned*, dated April 1, 2003.
30. PER-2003-2415, *W-211 Process Water Lines on Routing Boards*, dated June 25, 2003.
31. PER-2003-2219, *244-AR to AY-102 Transfer Stopped because ENRAF at AY-102 was Raised for Maintenance*, dated June 10, 2003.
32. PER-2003-2229, *Process Memo Concerns*, dated June 11, 2003.
33. PER-2003-2234, *Unplanned LCO 3.2.1 at 702-AZ*, dated June 10, 2003.
34. PER-2003-2235, *Unplanned Entry into LCO 3.2.6. AN-102/103 Annulus CAMs O/S*, dated June 11, 2003.
35. PER-2003-2241, *DST Waste Transfer Containment System PERs*, dated June 12, 2003.

36. PER-2003-2245, *Unplanned Entry into LCO 3.2.1 at 702-AZ*, dated June 10, 2003.
37. PER-2003-2575, *Unplanned Entry into LCO 3.2.6 in AN Farm*, dated July 2, 2003.

3.3 Assessment Procedures Used

ORP M 220.1 R1, *ORP Integrated Assessment Program*, dated May 16, 2002.

3.4 List of Items Opened, Closed, and Discussed

3.4.1 Items Opened

Findings

A-03-ESQ-TANKFARM-004-F-01 – CH2M HILL procedures did not provide a method for controlling unverified portions of designs. See Attachment 1, Notice of Finding, and Section 1.2 for details.

A-03-ESQ-TANKFARM-004-F-02 – There was no objective evidence of spreadsheet verification for waste compatibility assessments for Tank Farm waste transfers. See Attachment 1, Notice of Finding, and Section 1.5 for details.

Observations

A-03-ESQ-TANKFARM-004-O-01 - The FFS design verification process had limited applicability.

Project designs provided by FFS were ultimately verified during the 90% design review process. This invokes CH2M HILL procedure TFC-ENG-DESIGN-P-17, Revision A-1, *Design Verification*, which includes comprehensive checklists and documentation of the design verification process. However, statements of work for CH2M HILL projects impose the requirements of NQA-1, Supplement 3S-1 on FFS, so that FFS should have its own design verification process. The assessors reviewed the FFS procedures implementing the design verification requirements of NQA-1 Supplement 3S-1 and found several weaknesses. These were:

- FFS Practice 134 200 0945, *Independent Design Verification*, limited its scope to Safety Class equipment. It excluded Safety Significant equipment, as well as complex or unique general service equipment. The corresponding process in CH2M HILL applied independent design verification requirements to Safety Significant equipment and, on a case basis, general service equipment. The design verification requirements specified in 10 CFR 830.122 were applicable to SSCs in nuclear facilities, and were not limited to Safety Class SSCs.
- For non-Safety Class designs, FFS management said the design verification requirements were satisfied by FFS Practice 134 200 0230, *Engineering Document Checking and*

Approval, but this procedure did not satisfy the requirements of NQA-1, Supplement 3S-1. Specifically, the procedure did not provide a record of the design verification execution, and it did not provide the NQA-1 requirements for independence of verifying personnel. For example, the procedure did not provide a checklist to be retained as a record, such as the one specified in the CH2M HILL process.

NQA-1 Supplement 3S-1 states, "Design documentation and records, which provide evidence that the design and design verification processes were performed in accordance with the requirements of this Standard, shall be collected, stored, and maintained in accordance with documented procedures." It also states, "This verification may be performed by the originator's supervisor, provided the supervisor did not specify a singular design approach or rule out certain design considerations and did not establish the design inputs used in the design or, provided the supervisor is the only individual in the organization competent to perform the verification." Neither of these requirements was specified for design verification activities performed in accordance with FFS Practice 134 200 0230.

- FFS Practice 134 000 1100, *Quality Management Program*, dated May 1, 2002, states, "The extent to which design verification is performed depends on the complexity, risk, and uniqueness of the design." These criteria are not implemented in FFS Practice 134 200 0945, which applies the procedure exclusively to Safety Class equipment.

A-03-ESQ-TANKFARM-004-O-02 - The process for Liquid Observation Well (LOW) Van script updating was not documented.

The assessors discovered differences in time and date stamps for 11 of 16 files during an inspection of installed script files for the LOW system installed in mobile vans. Script files were used to instruct instrument activity for:

- Depth of the observation well;
- Speed of descent and ascent; and
- Instrument probe configuration.

Time and date information is important in configuration management because the information is an indicator that script files employed by the instrument are the ones intended to be employed in a production environment. The assessors performed a follow up review of the contents of the script files with a controlled copy of the script files and verified the instructions in the installed script files were identical. During an interview with a surveillance system engineer the assessors verified the process for LOW script updating was not documented. CH2M HILL initiated PER-2003-2704 to document this condition.

3.4.2 Items Closed

None

3.4.3 Items Discussed

None

3.5 List of Acronyms

AMTF	Office of Assistant Manager for Tank Farms
ARP	Alarm Response Procedures
CCC	Central Command and Control
CH2M HILL	CH2M HILL Hanford Group, Inc.
CONOPS	Conduct of Operations
COTS	Commercial Off-The Shelf
ECN	Engineering Change Notice
FFS	Fluor Federal Services
HDCS	Hanford Document Control System
LCO	Limiting Conditions for Operation
LOW	Liquid Observation Well
ORP	Office of River Protection
OTP	Operations Test Procedures
PER	Problem Evaluation Report
QA	Quality Assurance
QAPD	Quality Assurance Program Description
RMIS	Records Management Information System
SQA	Software Quality Assurance
SSC	structures, systems, or component
TFC	Tank Farm Contractor

Appendix A: Results of Assistant Manager for Tank Farms Assessment Activities

A.1 Operational Configuration Management

A.1.1 Assessment Scope

The assessors reviewed CH2M HILL activities to:

- Determine that responsibilities and authorities for maintaining proper configuration control are defined, implemented, and practiced;
- Verify that alignment procedures and/or checklists are used to establish correct component positions and alignments;
- Verify that operations shift management and operators have access to current facility configuration;
- Assure that operational information is accurately recorded in log books, turnover sheets, status boards, and other communications tools;
- Assure that testing following maintenance and modifications is used to demonstrate that equipment is capable of performing its intended function; and
- Determine that current, controlled design information is used for evaluating changes to facility configuration or changes in facility configuration resulting from events/equipment failures (e.g., preparation of lock out/tag out boundaries, establishment of transfer paths, operational events).

The assessors reviewed procedures, design media, status/information tools, and turnover checklists; interviewed CH2M HILL personnel; and inspected several facilities. The assessors observed physical configurations, alarm statuses, panel boards, and verified the representation of configuration in engineering drawings, shift office status boards, turnover checklists, and alarm status logs, to ensure correlation of information.

A.1.2 Observations and Assessments

Shift Managers Responsible for Facility Configuration and Change Authorization

The assessors interviewed shift management, transfer operations staff, and lock and tag technical reviewers and administrators to verify they had an adequate understanding of the roles and responsibilities for operational and facility configuration control. The assessors interviewed operations and engineering personnel to verify they had adequate knowledge and use of controlled information (e.g., engineering drawings, facility configuration status, and operational status) in:

- The preparation and installation of locks and tags;
- The development, alignment, and execution of waste transfers; and
- Responses to normal daily operating situations and events.

The assessors conducted interviews to verify authorized personnel approved changes in facility or equipment configuration. The assessors toured the 242-S Evaporator, the C Tank Farm, 271-AP and 271-AW, and recorded facility status information, such as alarm status and transfer piping manifold configurations. The assessors reviewed facility status information and operational status information in Central Command and Control (CCC) to determine the accuracy of facility information available to the Senior Shift Manager and operations staff.

The assessors verified the requirements for maintaining and controlling facility and equipment configuration were adequately implemented for Closure Projects and Waste Feed Operations by Shift Managers, in conjunction with the Senior Shift Manager located in CCC within their areas of jurisdiction. The assessors verified Shift Managers and Senior Shift Managers were implementing their responsibilities for facility and equipment configuration and authorizing changes to plant configuration. Interviews with operations and engineering staff verified personnel understood the authority of the Shift Managers and Senior Shift Managers with respect to control of facility and equipment configuration. Staff clearly understood the process and the information needed to obtain shift management authorization for changes to facility configuration.

The assessors reviewed the process for shift turnovers as required by TFC-OPS-OPER-C-07, *Turnover of Shift Responsibility*, Revision A-1, dated May 26, 2003, sampled shift turnover checklists for July 8, 2003, and reviewed portions of the Senior Shift Manager shift logs for the period of July 6 through 8, 2003. They found that status of systems and equipment was accurate and up to date. The assessors verified that the responsibilities and authorities of, and the interfaces between the Shift Managers relative to each other and the Senior Shift Manager, were clearly understood and implemented by the individuals interviewed and observed during the assessment. Shift briefings and periodic communication during the day kept operators informed of changes to relevant facility status. During the course of interviews, the assessors observed shift operations communications and log keeping were consistent with conduct of operations principles.

The assessors concluded operations and engineering personnel understood and adequately implemented the requirements for the shift manager's responsibility for facility configuration and change authorization.

Alignment Checklists and/or Procedures Used to Establish Component Positions

The assessors interviewed Shift Managers and Operations Engineers, reviewed Lockouts/Tagouts, reviewed valve alignment checklists, and reviewed pertinent waste transfer procedures to verify information provided during interviews.

The assessors verified the Shift Manager or the Operations Engineer, if authorized as the Shift Manager's designee, approved configuration changes for systems and equipment. Evidence of approval was documented in procedures, valve lineup checklists, or Lockout/Tagout log book entries. The assessors verified the Senior Shift Manager demonstrated ultimate authority for clearing the administrative lock from a transfer pump and authorizing a waste transfer. The Shift Manager demonstrated sole responsibility for updating the routing board for configuration changes involving waste transfers.

Valve lineup checklists were used to establish configuration both prior to a transfer and after the transfer was completed. Independent verification was accomplished for all configuration changes for waste transfers and for safety related equipment. Valve lineup checklists recorded configuration changes and were maintained as quality records that could be readily referenced by operations personnel. The assessors concluded alignment checklists and procedures to establish component positions were adequately and effectively used to maintain plant configuration and establish configuration prior to and after waste transfers.

Operations Documentation of Limiting Conditions for Operation (LCO)

The assessors interviewed shift management and reviewed operations records to determine the implementation of the methods used to control status in response to operational limits and conditions. The assessors verified interfaces between the Shift Managers relative to each other and the Senior Shift Manager were clearly understood and implemented by the individuals interviewed and observed during the assessment. The assessors reviewed the shift managers logs, electronic status boards, and turnover sheets and found that the status of the LCOs were adequately controlled. The responsible Shift Manager log was the official document used to record the status of LCO action entry conditions and actions taken. A red arrow entry in the logbook was the method used to highlight and track LCO entry and exit conditions. The logs reviewed accurately reflected the current status of the active LCO actions. The assessors concluded operations documentation of LCO was adequate to ensure safe plant status.

Identification of Deficient Equipment

The assessors interviewed shift management, transfer operations staff, and lock and tag technical reviewers and administrators to verify they had an adequate understanding of the process for identifying and communicating the condition of deficient or failed equipment. The assessors toured 242-S Evaporator, the C Tank Farm, 271-AP and 271-AW facilities looking for failed or deficient equipment to compare against information displayed in the Shift and Senior Shift Managers' offices. The assessors observed several annunciator panels with current alarms and some with out-of-service or eliminated alarms. The assessors compared the information to the daily turnover sheet and Senior Shift Manager's logbook. The assessors verified all sampled facility information correctly recorded in the Senior Shift Manager's turnover checklist and logbook used for shift turnovers correctly communicated the status of current and emerging out-of-service equipment. The assessors concluded the identification of deficient equipment was adequate to maintain plant configuration.

Authorization of Shift Activities on Equipment Important to Safety

The assessors interviewed operations personnel to verify the method used for authorizing work activities was performed according to the requirements of TFC-OPS-MAINT-C-01, *Tank Farm Contractor Work Control*. The assessors verified the Closure Projects and Waste Feed Operations Shift Managers, in conjunction with the Senior Shift Manager located in CCC, were responsible for authorizing and controlling work activities related to facility operations and equipment configuration within their areas of jurisdiction. This was established by the Tank Farm Contractor (TFC) Work Control procedure. The assessors verified that the interfaces between the Shift Managers relative to each other and the Senior Shift Manager were clearly understood and implemented by the individuals interviewed. Interviews with other operations staff verified personnel adequately understood the process to obtain shift management authorization for facility work activities. The assessors reviewed documents for work release and found work authorizations were contained in work packages, transfer procedures, and on daily release sheets. The assessors reviewed three events documented in PER numbers PER-2002-4545, PER-2003-1375, and PER-2003-2415, related to coordination of work activities and found compensatory corrective actions were adequately implemented. Long-term actions included ongoing procedure development. The assessors concluded work authorization of shift activities on equipment important to safety was adequately and effectively documented and controlled.

Post Maintenance/Modification Testing Used to Verify Configuration

The assessors interviewed the Senior Shift Manager to determine the reliance placed on post-maintenance and post-modification testing to establish correct equipment performance, alignment, and configuration. The maintenance organization and the project organizations were responsible for specifying and conducting testing following maintenance and modification work activities. The tests established equipment had been either restored to its original condition, in the case of maintenance, or if new or modified, equipment performed as designed. Operations personnel reviewed the results of the test before acceptance by operations. Operations then performed operations test procedures (OTP) to demonstrate the system or equipment met operational requirements (e.g., Technical Safety Requirements and safety basis) requirements. Operations engineers reviewed the results of the OTPs and, when the equipment passed the test criteria, the Shift or Senior Shift Manager declared the equipment operable. The assessors concluded post maintenance and modification testing was adequately and effectively implemented to verify plant configuration.

Status of Control and/or Local Panel Alarms

The assessors interviewed two Shift Managers, walked down alarm panels in the AW and AP instrument buildings, and walked down alarm panels in the 242-S control area for cross-site transfers. This was done to verify the status of control and local panel alarms were adequately maintained and documented. Inactive alarm windows were observed for blanks installed and were compared to the Alarm Response Procedures (ARP) to verify that all inactive alarms had the ARPs removed from the binder. The alarm status books were reviewed to ensure that all acknowledged alarms were accounted for and three inactive stickers were also examined on three different alarm windows. The assessors verified the status of control panel alarms and local

panel alarms was readily available to operators, including information on which alarms are inactive. The assessors concluded the status of control and local panel alarms were adequately maintained and documented.

System for Access to the Latest Engineering Drawings and Specifications

The assessors interviewed operations personnel and attended training to verify CH2M HILL had established a system to enable all necessary personnel to identify and access the latest revision to engineering drawings and specifications. This system is the Hanford Document Control System (HDCS). The assessors observed operation of the HDCS and verified when a drawing number was entered into HDCS the latest revision to the drawing was displayed as well as all of the ECNs or other changes outstanding against the latest revision. HDCS interfaced directly with the Records Management Information System (RMIS) such that all these engineering design media could be accessed and displayed automatically for ready reference. The assessors examined several examples of drawings and ECNs in HDCS.

Numerous TFC personnel used this system for various purposes. For example, Lock and Tag Technical Reviewers used current drawings to establish isolation boundaries for Lockout/Tagouts. Maintenance Planners used HDCS as part of work package preparation to ensure work was conducted on the current configuration of systems or equipment. The assessors determined operators themselves rarely had need to access drawings or specifications as their responsibilities in the tank farm setting typically did not require it. The assessors interviewed TFC personnel who needed to be able to access current drawings, including Operations Engineers, Shift Managers, Lock and Tag Administrators and Technical Reviewers, Maintenance Planners, System Engineers, and Transfer Engineers, in order to evaluate their knowledge of HDCS. All were knowledgeable with exception of two Shift Managers who were qualified as Lock and Tag Administrators but had not yet taken the training for HDCS. They expressed the belief that RMIS could be entered directly to access the latest revision to a drawing with all of its outstanding ECNs. This was an incorrect assumption. The assessors pursued this issue and determined that the TFC had previously documented this issue in PER 2002-4545. Part of the corrective action for this PER was to revise the Lock and Tag Technical Reviewer Qualification Card to include familiarity with HDCS and to include a performance demonstration of proficiency in the use of engineering drawings and HDCS. This revision to the Qualification Card was completed on May 30, 2003. Further, all currently qualified Lock and Tag Technical Reviewers need to be trained and complete their performance demonstrations by September 1, 2003, or be disqualified. Until that time, all Lockouts/Tagouts are reviewed by the cognizant System Engineer per Standing Orders WFO-02-013 and CP-02-013, *Review of Lockout/Tagout and Caution Tag Installations that Change Facility Configuration*.

One of the assessors attended the training given to Lock and Tag personnel on HDCS to evaluate the content of the training. The assessor verified the training clearly and firmly established that the HDCS must be used to identify the current configuration of equipment. Class attendees had the opportunity to use their current responsibilities as examples in the class and were required to demonstrate proficiency in using HDCS to identify current drawings and outstanding changes to those drawings.

The assessors considered this corrective action for the previously identified issue to be sufficient to resolve their issue with the two Shift Managers discussed above, since these two had not yet taken the training for HDCS and the standing orders would ensure that knowledgeable personnel reviewed any lockout/tagout packages processed by these individuals.

The assessors also selected a representative design drawing, H-14-106202, and two ECNs, 720544 and 720390, of new equipment in the C Tank Farm and walked down the installations to evaluate the as-built configuration against the design media. No issues were identified.

The assessors concluded CH2M HILL had established a system to enable all personnel to identify and access the latest revision to engineering drawings and specifications.

A.1.3 Conclusions

The assessors concluded CH2M HILL's control of operational configuration management was effective. CH2M HILL had identified its own problems and corrective actions were underway to correct them. The assessors concluded that completion of the corrective actions will correct the problems that have occurred and improve the effectiveness and implementation of configuration management in the field.

E-STARSTM Report
Task Detail Report
08/19/2003 10:08

TASK INFORMATION

Task#	ORP-ESQ-2003-0050	Status	CLOSED
Subject	CONCUR:03-ESQ-054;ORP ASSESSMENT REPORT, A-03-ESQ-TANKFARM-004, OF CH2M HILL PROGRAM FOR DESIGN CONTROL, DESIGN CONFIGURATION MANAGEMENT, OPERATIONAL		
Parent Task#		Due	
Reference	03-ESQ-054	Priority	None
Originator	Mosby, Debbie A	Category	None
Originator Phone	(509) 376-9106	Generic1	
Origination Date	08/11/2003 09:38	Generic2	
Remote Task#		Generic3	
Deliverable	None	View Permissions	Normal
Class	None		
Instructions	BCC: ESQ OFF FILE ESQ RDG FILE MGR RDG FILE JH SWAILLES, AMTF RC BARR, ESQ DH BROWN, ESQ NK HUNEMULLER, ESQ SA VEGA, ESQ JS O'CONNOR, OPA L DELL, PEC HJ STAFFORD, TOD		

ROUTING LISTS

1	Route List	Inactive
	<ul style="list-style-type: none"> • Vega, Samuel A - Assign - Completed with comments - 08/18/2003 13:46 • Hunemuller, Neal K - Assign - Completed with comments - 08/12/2003 09:47 • Barr, Robert C - Assign - Completed - 08/14/2003 08:00 • Swalles, John H - Assign - Completed with comments - 08/14/2003 11:51 • O'Connor, Judith S - Assign - Completed with comments - 08/14/2003 15:24 • Erickson, Leif - Assign - Completed - 08/18/2003 10:02 • Schepens, Roy J - Assign - Completed with comments - 08/19/2003 09:54 	

ATTACHMENTS

Attachments	<ol style="list-style-type: none"> 1. 03-ESQ-054.att1.Notice of Finding Dgn Ctrl and SQA.doc 2. 03-ESQ-054.att2.A-03-TANKFARM-004.doc 3. 03-ESQ-054.sav.Transmittal ltr.doc
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COMMENTS

Poster	Hunemuller, Neal K (Hunemuller, Neal K) - 08/12/2003 09:08
	Completed
	Editorial comments on hardcopy. NKH 08/12/03.
Poster	Swalles, John H (Struthers, Deborah J) - 08/14/2003 11:08
	Completed

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John signed hard copy

Poster O'Connor, Judith S (Almaraz, Angela) - 08/14/2003 03:08

Completed

Mike Barrett signed for Judy O'Connor 8/14/03.

Poster Vega, Samuel A (Mosby, Debbie A) - 08/18/2003 01:08

Completed

Neal Hunemuller concurred for Sam Vega. Debbie

Poster Schepens, Roy J (Poynor, Cathy D) - 08/19/2003 09:08

Completed

Signed by L. Erickson for Roy Schepens.

TASK DUE DATE HISTORY

No Due Date History

SUB TASK HISTORY

No Subtasks

-- end of report --

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E-STARSTM Report
Task Detail Report
08/11/2003 10:08

TASK INFORMATION

Task#	ORP-ESQ-2003-0050	Status	Open
Subject	CONCUR:03-ESQ-054;ORP ASSESSMENT REPORT, A-03-ESQ-TANKFARM-004, OF CH2M HILL PROGRAM FOR DESIGN CONTROL, DESIGN CONFIGURATION MANAGEMENT, OPERATIONAL		
Parent Task#		Due	
Reference	03-ESQ-054	Priority	None
Originator	Mosby, Debbie A	Category	None
Originator Phone	(509) 376-9106	Generic1	
Origination Date	08/11/2003 09:38	Generic2	
Remote Task#		Generic3	
Deliverable	None	View Permissions	Normal
Class	None		
Instructions	BCC: ESQ OFF FILE ESQ RDG FILE MGR RDG FILE JH SWAILES, AMTF RC BARR, ESQ DH BROWN, ESQ NK HUNEMULLER, ESQ SA VEGA, ESQ JS O'CONNOR, OPA L DELL, PEC HJ STAFFORD, TOD		

ROUTING LISTS

1 Route List Active

- Vega, Samuel A - Assign - Awaiting Response *NKA for 8/12/03*
- Hunemuller, Neal K - Assign - Awaiting Response *NKA 8/12/03*
- Barr, Robert C - Assign - Awaiting Response *RUB 8/13/03*
- JS* Swailes, John H - Assign - Awaiting Response *John 8/14/03*
- J* O'Connor, Judith S - Assign - Awaiting Response *MB for JSO 8-14-03*
- Erickson, Leif - Assign - Awaiting Response *Leif 18 Aug 2003*
- for* Schepens, Roy J - Assign - Awaiting Response *19 Aug 2003*

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- Attachments
1. 03-ESQ-054.att1.Notice of Finding Dgn Ctrl and SQA.doc
 2. 03-ESQ-054.att2.A-03-TANKFARM-004.doc
 3. 03-ESQ-054.sav.Transmittal ltr.doc

COMMENTS

No Comments

closes CARs 4587, # 5

TASK DUE DATE HISTORY

No Due Date History

SUB TASK HISTORY

No Subtasks

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