Department of Energy
Washington, DC 20585

April 27, 2005

The Honorable A. J. Eggenberger
Acting Chairman
Defense Nuclear Facilities Safety Board
625 Indiana Avenue, NW, Suite 700
Washington, D.C. 20004-2901

Dear Dr. Eggenberger:

The purpose of this letter is to provide the results of the independent Tank Farm Integrated Safety Management System (ISMS) improvement validations. Department of Energy (DOE), Office of River Protection (ORP) Management and the team leader for the ISMS improvement validations briefed members of the Defense Nuclear Facilities Safety Board (Board) on the review results in November 2004 and March 2005, and provided a copy of the associated reports to the Board staff.

The Improvement Validation Team concluded that corrective actions have been properly established and implemented to improve the Tank Farm Contractor's (TFC) ISMS. The Validation Team also noted that the roles and responsibilities for ISMS are clearly identified, particularly at the work activity level. The Improvement Validation reports are enclosed for your information to complete actions identified in the October 22, 2004, letter from Environmental Management to the Board.

DOE is committed to ensuring that the ISMS improvements and corrective actions are effective and sustainable.

If you have any further questions, please call me at (202) 586-7709 or Mr. Roy Schepens, Manager, Office of River Protection, at (509) 376-6677.

Sincerely,

Paul M. Golan
Principal Deputy Assistant Secretary
for Environmental Management

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DEFENSE NUCLEAR FACILITY SAFETY BOARD

Enclosures

cc: R. J. Schepens, ORP
M. Whitaker, DR-1

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SEPARATION

PAGE

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Enclosure 1

U.S. Department of Energy
Office of River Protection
P.O. Box 450, MSIN H6-60
Richland, Washington 99352

NOV 24 2004

04-TF-025

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

Dear Mr. Aromi:

CONTRACT NO. DE-AC27-99RL14047 – SUBMITTAL OF THE PRE-IMPLEMENTATION PORTION OF THE INTEGRATED SAFETY MANAGEMENT (ISM) IMPROVEMENT VALIDATION AT THE HANFORD TANK FARM FINAL REPORT

The attached Report of the Pre-Implementation Portion of the Integrated Safety Management Improvement Validation at the Hanford Tank Farm, Final Report, dated November 8, 2004, is being submitted to CH2M HILL Hanford Group, Inc. (CH2M HILL) for review.

The report concludes that CH2M HILL has identified required improvements in ISM, and that the current path forward can be successful in achieving these improvements. However, significant management team in-field presence and involvement, and worker buy-in will be necessary to achieve improvement objectives.

The validation team identified eight Findings requiring resolution. The validation team noted some uncertainty in timely corrective action implementation being able to support the CH2M HILL February 2005 midpoint assessment, and the March 2005 U.S. Department of Energy validation. Please advise me of the actions you are taking to assure timely and effective completion of corrective actions. CH2M HILL should respond to these Findings, identifying corrective actions to be taken within 30 days from the date of this letter.

If you have any questions, please contact me, or your staff may contact T. Zack Smith, Acting Assistant Manager for Tank Farms, (509)372-9735.

Sincerely,

for Roy J. Schepens
Manager

TF:TZS

Attachment

cc w/attach:
D. I. Allen, CH2M HILL
R. A. Dodd, CH2M HILL
R. L. Higgins, CH2M HILL
V. M. Pizzuto, CH2M HILL
P. M. Golan, EM-1
I. R. Triay, EM-3
P. M. Bubar, EM-3.2
M. T. Sautman, RL

Attachment
04-TF-025

Report of the Pre-Implementation Portion of the Integrated Safety Management Improvement Validation at the Hanford Tank Farm

(79 pages total,
including coversheet)

Report of the Pre-Implementation Portion of the Integrated Safety Management Improvement Validation at the Hanford Tank Farm

November 8, 2004

FINAL REPORT

TEAM MEMBER APPROVAL

Frank McCoy, WSMS (Team Lead)

Bill Lloyd, WSMS

Mark Brown, DOE-ORP

Susan J. Coleman, DOE-ORP

Joe Arango, DOE-EM

Terry Krietz, DOE-EM

John Longenecker, Longenecker&Associates

Gregg Doss, HAMTC Representative

List of Acronyms, Abbreviations, and Units

ACL	Administrative Control Level
AJRG	ALARA Joint Review Group
ALARA	As Low As Reasonably Achievable
BNI	Bechtel National, Inc.
CA	Contaminated Area
CCA	Common Cause Analysis
CFR	Code of Federal Regulations
COB	Clean-out Box
DEAR	Department of Energy Acquisition Regulations
DNFSB	Defense Nuclear Facilities Safety Board
DOE	U.S. Department of Energy
ESH&Q	Environmental, Safety, Health and Quality
EM	Office of Environmental Management
EWP	Enhanced Work Planning
FWS	Field Work Supervisor
HAMTC	Hanford Atomic Metal Trades Council
HRA	High Radiation Area
IH	Industrial Hygiene
ISM	Integrated Safety Management
ISMS	Integrated Safety Management System
JHA	Job Hazard Analysis
LLCE	Long Length Contaminated Equipment
NCO	Nuclear Chemical Operator
ORP	Office of River Protection
ORPS	Occurrence Reporting and Processing System
PER	Problem Evaluation Request
PPE	Personal Protection Equipment
RCA	Root Cause Analysis
RCT	Radiological Control Technician
RWP	Radiological Work Permit
SSW	Senior Supervisory Watch
TFC	Tank Farm Contractor
TUF	Track Until Fit
WSMS	Washington Safety Management Solutions
WTP	Waste Treatment and Immobilization Plant

Table of Contents

APPENDICES

EXECUTIVE SUMMARY

From October 18, 2004, to October 28, 2004, a review team, chartered by the U.S. Department of Energy (DOE) Office of River Protection (ORP) conducted the pre-implementation portion of an Integrated Safety Management (ISM) Improvement Validation of Tank Farms Contractor (TFC) activities at the Hanford Site Tank Farms. This pre-implementation review focused on the areas of work planning; conduct of operations; and relevant management programs, including feedback and improvement. The review assessed, for selected recent incidents, causal and common cause analysis effectiveness, corrective action determination effectiveness, corrective action implementation progress, and compensatory measure determination and implementation effectiveness. A post-implementation review, which will be conducted following corrective action implementation, will assess corrective action implementation effectiveness.

This report describes the results, conclusions and findings of the pre-implementation review portion of the ISM Improvement Validation.

Background

This ISM Improvement Validation effort was commissioned by ORP as recommended in the report of the *Integrated Safety Management System Assessment for the U.S. Department of Energy Office of River Protection*, dated August 2004. The results of the Improvement Validation will also be used to address concerns raised by the Defense Nuclear Facilities Safety Board (DNFSB) in their September 8, 2004, letter to the Acting Assistant Secretary for Environmental Management. These concerns involved, for the most part, incidents that have occurred at the Hanford Tank Farm over the past fifteen months.

ISM Improvement Validation Process

Under the current contract, the TFC, CHM2 HILL Hanford Group, Inc., implemented its Integrated Safety Management System (ISMS) and DOE then verified that the system was implemented, and approved the ISMS Program Description in June 2000. Subsequent annual assessments of the ISMS occurred in April 2001 and September 2002. The ISMS Program Description was updated several times and the last DOE approval of updates occurred in March 2003. In August 2004, ORP performed an ISM focused review in response to the DOE Office of Environmental Management (EM) direction for each operations office to declare the status of their ISMS. As a result of that review, it was recommended that an ISM Improvement Validation be performed to examine the effectiveness of corrective actions taken in response to recent incidents. The review documented in this report is the pre-corrective action implementation review of this Validation. A post-corrective action implementation review is currently scheduled to be accomplished in March 2005.

The purpose of this pre-implementation review of the ISM Improvement Validation is to ascertain causal and common cause analysis effectiveness, corrective action determination effectiveness, corrective action implementation progress, and compensatory measure determination and implementation effectiveness for the following incidents:

- the 244–CR vault incident;

- the six incidents (including the 244-CR incident delineated above) addressed in ORP letter, *Conditional Payment of Fee Determination*, 04-ORP-054, R.J. Schepens to E.S. Aromi, dated August 24, 2004;
- the S-112 transfer incident; and
- other incidents specified by ORP.

The ISM Improvement Validation team members were selected based on their significant relevant experience in ISM, nuclear safety and operation, safety health and quality programs, radiological control, project management, and work control.

The approach for this pre-implementation review consisted of the following elements with respect to the incidents specified above:

- Review of ORP, DNFSB, and TFC correspondence, selected past and recent documented ISMS reviews, and the TFC compensatory measures document (TFC-MD-038, *Compensatory Controls for Radiological Control Performance*).
- Review of Occurrence Reports, Problem Evaluation Requests, and Price Anderson Amendments Act Nuclear Tracking System Reports.
- Review of documented Causal Analyses.
- Review of Corrective Action Plans.
- Interviews of project and program level personnel responsible for the causal analyses and corrective action determinations.
- Interviews of project and program level personnel responsible for compensatory measure determination and implementation, and corrective action implementation.
- Interviews with selected first line supervisors and groups of hourly workers.
- Observation of selected work planning meetings, As Low As Reasonably Achievable (ALARA) reviews, Plan of the Day meetings, morning meetings, and pre-job briefings.
- Observation of selected compensatory measure implementation meetings.
- Observation of selected post-job debriefings

The review team observed three pre-job briefings, four work planning meetings, three work release/plan of the day meetings, an ALARA Joint Review Group meeting, and an intermediate post-job review. Over 125 personnel were interviewed, including 11 Nuclear Chemical Operators, 10 craft personnel, 20 first line supervisors, 26 technicians, 36 engineers and managers, and the President and Vice Presidents of the TFC. The team reviewed 48 documents, including procedures, problem evaluation requests, occurrence reports, event investigation reports, non-compliance tracking system reports, management and independent assessment reports, external review reports, and various types of formal correspondence.

Results

The team generally concurred with the corrective actions identified in the 244-CR Vault event root cause analysis and the compensatory measures described in the TFC's management directive, MD-038. The team did, however, identify eight Findings related to work planning, management programs (including feedback and improvement), and the CR Vault corrective action plan:

Finding 1: Worker involvement in work planning appears to be less than effective.

Finding 2: Job Hazard Analyses reviewed do not provide a job-specific, work step analysis of hazards.

Finding 3: Management expectations regarding major issues, their significance, and changes required for resolution of these issues were not consistent and a single, simple, unified message of "what needs to change and why" was not communicated by management.

Finding 4: Some deficiencies were identified with the corrective actions detailed in the 244-CR Vault event root cause analysis.

Finding 5: The radiological event common cause analysis report transmitted to DOE on September 30, 2004, did not systematically identify which causes were substantially common to a majority of those events, and did not identify the analytical basis for conclusions reached other than through employee interviews.

Finding 6: The TFC has not corrected the record (formal correspondence) regarding the submission of a radiological event common cause analysis.

Finding 7: Inadequacies identified in the critique of the CR Vault event were not formally identified, nor were corrective actions taken as a result of the poor critique.

Finding 8: First line supervisors and their work crews demonstrated weaknesses in level of knowledge in the practical application of radiological controls for ionizing radiation (including fundamentals and limitations). Additionally, some first line supervisors were unable to clearly articulate Conduct of Operations and ISMS attributes.

Conclusions

The team considers that the TFC has identified required improvements in ISM and that the TFC's current path forward can be successful. However, significant management team in-field presence and involvement and worker buy-in will be necessary to achieve improvements.

1.0 INTRODUCTION

1.1 Purpose

The purpose of this report is to document the results of the pre-implementation review portion of an Integrated Safety Management (ISM) Improvement Validation of Tank Farm contractor (TFC) activities at the Hanford Site Tank Farms in the areas of work planning; conduct of operations; and relevant management programs, including feedback and improvement. This pre-implementation review assessed, for selected recent incidents, causal and common cause analysis effectiveness, corrective action determination effectiveness, corrective action implementation progress, and compensatory measure determination and implementation effectiveness. A post-implementation review, which will be conducted following implementation of corrective actions, will assess the effectiveness of the actions.

1.2 Background

The Hanford Site is located in southeastern Washington State and contains a large concentration of radioactive waste that is the legacy of 45 years of plutonium production for nuclear weapons. The plutonium production mission began with the Manhattan Project in the 1940s, continued through most of the Cold War, and concluded in 1989. Two hundred thousand cubic meters (53 million gallons) of high-level radioactive waste were stored in 177 underground tanks, 149 of which are older single shell tanks. Sixty-seven of the 149 older single-shell tanks have leaked an estimated 3800 cubic meters (1 million gallons) of waste to the soil. Some of that waste has been detected in the groundwater that flows to the Columbia River seven miles away. Efforts are underway to reduce the risk of future leaks from the tanks.

In May 1989, the U.S. Department of Energy (DOE), the U.S. Environmental Protection Agency, and the State of Washington Department of Ecology signed a comprehensive Hanford Site cleanup and compliance agreement entitled the *Hanford Federal Facility Agreement and Consent Order,* commonly referred to as the Tri-Party Agreement. This agreement includes legally enforceable commitments and milestones on storing, treating and disposing of the tank waste.

Cleanup of Hanford Site tank waste will require the Tank Farms to function as part of a waste treatment complex. The Tank Farms must be (1) safely and efficiently operated, and maintained to store the waste to be treated, and (2) upgraded and operated to retrieve the waste and deliver it to the treatment plant. Many of the tank and waste transfer systems needed to support future retrieval of waste for treatment are well beyond their design life.

To accomplish the DOE mission, Office of River Protection (ORP) was established to operate as a single, integrated project. ORP and its two main contractors are responsible for performing work necessary to complete the mission. The first is the TFC, CH2M HILL Hanford Group, Inc., responsible for ensuring safe storage, retrieval, storage and disposal of the immobilized waste, decontamination and decommissioning, and initiation of post closure monitoring of the tank farms. The second is a contractor (Bechtel National, Inc. [BNI]) responsible for designing, constructing, commissioning, and supporting the transition of the Waste Treatment and Immobilization Plant (WTP).

The TFC is responsible for safe storage and retrieval for treatment of the approximately 53 million gallons of highly radioactive and hazardous waste stored in the 177 large underground tanks. In January 2001, the TFC signed a six-year $2.2 billion contract extension with ORP to perform $2.5 billion worth of work, with a key feature of this contract extension being the inclusion of specific performance-based incentives. In 2003, the contract was further renegotiated to further optimize Tank Farm resources and priorities towards acceleration of the EM mission.

The TFC is responsible for interfacing and coordinating with other Hanford Site prime contractors in the performance of this work. They are required to ensure that requirements for services provided by them to other Hanford Site contractors and received by them from other site contractors are integrated with other Hanford Site contractors and provided for in the baseline.

The TFC is required to conduct business to achieve the following outcomes:

- Maintain Tank Farm waste and infrastructure in a safe environmentally compliant and stable configuration.
- Retrieve tank wastes to the extent needed for tank closure and deliver to the WTP contractor for treatment and immobilization.
- Properly dispose of the immobilized low-activity waste fraction either onsite or offsite.
- Store, on an interim basis, the immobilized high-level waste fraction until it can be shipped offsite for disposal (planned for the Yucca Mountain geologic repository).
- Efficiently and cost effectively close all Hanford Tank Farms.

Achievement of these outcomes must fully consider protection of worker safety and health, public safety and health, and the environment; effective leadership and management; management responsiveness to customers; responsive communications with external and internal Hanford customers; and proficient partnering with other Hanford Site prime contractors.

The TFC is required to integrate safety and environmental awareness into all activities, including those of subcontractors at all levels consistent with ISM principles. Work must be accomplished in a manner that achieves high levels of quality, protects the environment, the safety and health of workers and the public, and complies with requirements. The TFC is also required to identify hazards, manage risks, identify and implement good management practices, and make continued improvements in environment, safety, health, and quality (ESH&Q) performance.

The TFC is contractually required to accomplish its mission in a safe, compliant and efficient manner. Key ESH&Q considerations are addressed in the following sections of the contract:

- Section C.2(d), *Environment, Safety, Health and Quality (ESH&Q)*
- Section H.15, *Emergency Clause*
- Section H.16, *Shutdown Authorization*
- Section H.31, *Subcontractor Environment, Safety, Quality, and Health Requirements*
- Section I.108, DEAR 970.5204-2, *Laws, Regulations, and DOE Directives (DEC 2000)*
- Section I.116, DEAR 970.5223-1, *Integration of Environment, Safety, and Health into Work Planning and Execution (DEC 2000)*
- Section J, Attachment C, *DOE Directives and* Attachment F, *Environment, Safety, and Health Budget Planning and Execution*

2.0 INTEGRATED SAFETY MANAGEMENT IMPOVEMENT VALIDATION PROCESS

DOE has established the expectation that each contractor will develop and implement an Integrated Safety Management System (ISMS) for conducting work safely as described in DOE Policy 450.4, *Safety Management System Policy*, and the associated guide, DOE G 450.4-1A, *Integrated Safety Management System Guide*. The expectations and essential attributes for ISM are also described in the U.S. Department of Energy Acquisition Regulations (DEAR) contract clauses, 48 Code of Federal Regulations (CFR) 970.5223-1 and 970.5204-2. These require the contractor to integrate ESH&Q into work planning and execution, comply with Federal, State, and local laws and regulations, and comply with DOE contractual requirements. The contract clauses allow for tailoring of the contract requirements to ensure a safety management system suitable to a site's mission. The policy and the DEAR clauses require that the contractor develop a description of the ISMS for approval by DOE. The contractor is then required to implement the system defined in the approved description. Once the contractor determines that they have implemented the ISMS in compliance with the approved description and meet the expectations of the Policy, DOE conducts a verification of the adequacy of the ISMS that the contractor has implemented.

Under the current contract, the TFC implemented its ISMS and DOE then verified that the system was implemented and approved the ISMS Program Description in June 2000. Subsequent annual assessments of the ISMS occurred in April 2001 and September 2002. The ISMS Program Description was updated several times and the last DOE approval of updates occurred in March 2003.

Over the past fifteen months, the TFC has experienced a number of incidents at the Hanford Site Tank Farms that indicate weakness in their implementation of the ISMS; particularly in the areas of work planning, conduct of operations, and some management programs, including feedback and improvement. These incidents include:

The June 25, 2003, AW-01A Pit Transfer Jumper Removal resulting in personnel contamination

During removal of an old waste transfer jumper from the AW-01A pit, a loss of contamination control resulted in personnel exposure to chemical and radiological contamination. Two workers had skin contamination on the face and twelve workers had positive nasal smears.

Prior to this job, which was in support of pit upgrades, 18 of 37 pit upgrades were completed without any personnel contamination problems. Contamination control methods (use of fixative prior to cover block removal and water mist during work) had been successful on prior jobs and a generic Enhanced Work Planning(EWP) was used for a group of pit jobs with similar tasks. Based on prior successes and radiation surveys of the pit, respiratory protection was not required for the AW-01A work.

The jumper was being sleeved as it was removed from the pit by crane. Dry powder fell out of the jumper internals to the pit floor, causing airborne contamination in the immediate area and contamination spread outside the pit. Water mist was used in an attempt to keep contamination down, but the jumper internals were not wetted. Once the Radiological Control Technician (RCT) found contamination on the windbreak around the pit, the Field Work Supervisor (FWS) made the decision to put the job in safe condition - the jumper removal was completed and the jumper was bagged. At this point, some of the workers were determined to be contaminated.

The November 14, 2003, C-106 Eductor Removal resulting in an individual exceeding administrative radiation exposure limits

The eductor assembly was 40 feet long and weighed 3,000 pounds. The eductor removal work was attempted twice using a crane to pull the eductor into a containment sleeve.

During the first removal, the eductor lifting was stopped due to increasing load because the mixing nozzle interfered with the bottom of the tank riser. The radiation levels exceeded the Radiological Work Permit (RWP) void limit of 50 Rad per hour(Rad/hr) primarily due to high energy beta. The radiation monitoring instruments used to measure the dose rate were at full scale and the higher range instrument was not available at the work location. The work crew stayed clear of the high radiation location but continued work to investigate the cause of the interference and attempted to free the eductor. The eductor was lowered back into the tank and the job suspended after discussions prompted by the ORP Facility Representative related to the RWP void limit. The Conduct of Operations issues related to this were:

- *The proper radiation monitoring instrument used for dose control was not available at the job location, and*
- *The crew continued to work after exceeding the RWP limit until prompted by the ORP Facility Representative.*

The job was re-planned using an in-process As Low As Reasonably Achievable (ALARA) review. The RWP void limit was increased, additional beta shielding (rubber matting) was required, time keeping was required for personnel handling the item, and instruments with a higher range were obtained. The eductor was successfully removed during the second attempt. However, one worker received a whole body dose rate that exceeded the 500 mrem administrative control limit. This was evaluated and found that the dosimeter used by the worker was worn backwards (inadvertently flipped during bending) while performing work.

The May 6, 2004, AP-01A Improper Pressurization Alarm Response;

Two jobs were being performed in 241-AP Tank Farm. Plant Forces were performing work at the AP-03A pit and Construction Forces were installing a jumper at the AP-01A pit per work package 2E-02-0848. Workers at the AP-01A pit had just removed a process blank at Nozzle E and had it suspended from a crane when a pressurization alarm went off. Procedure # ARP-T-271-00103 requires that all workers exit the farm immediately upon receipt of a pressurization alarm. The FWS at the AP-01A pit held a portion of the

crew on the job to lower the suspended load into the AP-01A pit that he considered was a safe configuration before exiting the farm. The other workers at the AP-03A pit had already exited the farm. A pressurization alarm was not anticipated during either job. Total response time was 20 minutes.

During the fact-finding, it was determined that AP-01A Nozzle E and the drain in AP-03A pit may have been open at the same time and contributed to the pressurization alarm.

A Stop Work was issued regarding the lack of timely egress by employees and responsibility of the change trailer operator during emergency response/egress.

The May 20, 2004, Clean-out Box (COB) AW2 Investigation resulting in unauthorized performance of work

The scope of the work was to investigate whether there was an apparent spill from the SL-167 transfer line after it was discovered that a transfer line was used while the COB was in a state of construction (dismantlement). There was discussion that removing contaminated items if found was not part of the scope of the work and the personal protection equipment (PPE) and void limits of the RWP were not established for that purpose. No plastic outer layer of PPE was specified as one might expect if removing radioactive liquids was planned. Upon entry into the excavated area around COB AW2, it was soon apparent that a leak had occurred and handling of significantly contaminated padding and liquid-containing bags was done because the FWS wanted to remove the hazard from the area. An RCT noted a smudge on a worker's outer PPE and upon surveying it, found that the level of contamination on the worker's clothing had exceeded the RWP void limit. The RCT immediately ordered the work to stop as the RWP was voided at this point.

The May 24, 2004, AN-01A Pump Removal resulting in radioactive contamination of two workers.

Removal of the AN-01A pump from the trailer to sawhorses for cut-up resulted in clothing contamination of two workers. Inadequate RWP requirements specified for the work is identified as a potential root cause in the event investigation team report. Work was conducted in an area not designated as a contaminated area (CA) and no PPE was required. Therefore, there was only one barrier (plastic bag) between the radiologically contaminated pump and workers. Work was not stopped when multiple holes were found in the pump bag during this job. Additionally, the RCT covering the job left the job site while lowering the pump onto the sawhorses was in progress. While the RCT was gone, work continued in the high radiation area (HRA) by continuing to lower the pump onto the sawhorses, although the RWP (PC-0093) required continuous RCT coverage.

The July 22, 2004, 244-CR Vault Thermocouple Removal Event resulting in an individual exceeding administrative radiation exposure limits for extremity dose

While pulling a thermocouple from the 244-CR Vault (CR-002 Tank) early on the July 22, 2004, graveyard shift, a Nuclear Chemical Operator (NCO) exceeded the extremity/skin Administrative Control Level (ACL) of 15 Rem. The operator received an extremity dose of

22.057 Rem to the hands and a deep dose of 0.28 Rem. With approximately 30 feet of the thermocouple withdrawn (total length is approximately 36 feet) a rapid increase in the dose rate on the RO-20 was identified. The levels encountered exceeded the RWP limits. The instrument used by the RCT could not read the actual beta dose at the thermocouple due to the instrument being off-scale high on the highest range, indicating a level of > 50 Rad/hr at 30 cm. A decision to continue removing the thermocouple was made and the extremity/skin overexposure occurred as the worker applied the duct tape to the herculite bag surrounding the thermocouple.

The TFC has indicated that common elements to all of these incidents include unexpected radiological conditions, lack of upfront contingency planning, lack of preparation to implement effective contingency actions, failure to follow and live to RWP limits when unexpected conditions were encountered, continuing in the face of uncertainty as a default "safe condition," violation of procedures on numerous occasions, lack of root cause investigations (except for CR-Vault), and unwillingness to suspend work when encountering unexpected hazards.

In August 2004, ORP conducted an ISM focused review to provide assurance that the TFC and BNI ISM Programs are maintained and have improved subsequent to the most recent verification reviews. This review was conducted in response to the DOE Office of Environmental Management (EM) direction for each Operations Office to declare the status of their ISMS. Based on ORP oversight activities and assessment results, this review focused on the work scope definition and the feedback and improvement processes, particularly those associated with engineering issues. In addition, based on two recent events in the DOE complex resulting in the death of subcontractor workers, the review evaluated the processes and mechanisms for establishing safety programs and requirements associated with subcontractor work activities, along with the monitoring and enforcement of those requirements. The review resulted in the following overall conclusions about the status and effectiveness of the ORP/WTP/TFC ISMS:

- ISM elements are maintained and improvements were apparent.
- ORP has identified feedback and improvement issues associated with TFC operations. These issues indicate some weakness of ISM processes; but not broad programmatic breakdowns.
- Events and deficiencies indicate specific problems with ISM implementation; however, overall, the system is adequate and capable of ensuring safe performance of work.

Based on the results of the assessment, the team recommended that the ORP Manager establish a Tank Farm ISM Improvement Validation Team to validate the adequacy of the following associated with the events previously described:

- Investigation of each of the events,
- Determination of causes,
- Identification of corrective actions, and

- Completion of corrective actions.

On September 8, 2004, the Defense Nuclear Facilities Safety Board (DNFSB) formally notified the DOE acting Assistant Secretary for Environmental Management (EM-1) of their concern that the "Integrated Safety Management (ISM) System for the Hanford tank farms is failing to control work activities adequately."

The ORP Manager informed the DNFSB that he concurred with their concerns and had communicated similar concerns to the TFC in multiple letters during the previous twelve months. Additionally, the ORP Manager reduced the TFC fee by $300,000 in August 2004, because of the concerns. Although extensive DOE oversight is ongoing, the ORP Manager chartered a more comprehensive review, the Tank Farm ISM Improvement Validation. From October 18, 2004 to October 28, 2004, a review team conducted the pre-implementation portion of an ISM Improvement Validation of the TFC activities at the Hanford Site Tank Farms in the areas of Work Planning; Conduct of Operations; and Relevant Management Programs, including Feedback and Improvement. This review assessed, for selected recent incidents, causal and common cause analysis effectiveness, corrective action determination effectiveness, corrective action implementation progress, and compensatory measure determination and implementation effectiveness. A post-implementation review, which will be conducted following corrective action implementation, will assess corrective action implementation effectiveness.

The review team was led by Frank McCoy of Washington Safety Management Solutions (WSMS) and consisted of Bill Lloyd of WSMS, Mark Brown of DOE-ORP, Susan Coleman of Innovations Corp. (DOE-ORP support contractor), Terry Krietz of DOE-EM, Joe Arango of DOE-EM, Gregg Doss representing Hanford Atomic Metals Trades Council (HAMTC), and John Longenecker of Longenecker and Associates. Team members were selected based on their significant relevant experience in ISM, nuclear safety and operation, safety health and quality programs, radiological control, project management, and work control. The team member's biographies are included in Appendix A.

The ISM Improvement Validation is being performed in two parts consisting of a pre-implementation review prior to full implementation of corrective actions and a post-implementation review after full implementation of corrective actions. The review documented in this report is the pre-implementation review. This pre-implementation review was conducted primarily through performance-based monitoring of work planning activities, program reviews, and personnel interviews. The review ascertained the causal and common cause analysis effectiveness, corrective action determination effectiveness, corrective action implementation progress, and compensatory measure determination and implementation effectiveness for the following incidents:

- the 244–CR vault incident;
- the six incidents (including the 244-CR incident delineated above) addressed in ORP letter, *Conditional Payment of Fee Determination*, 04-ORP-054, R.J. Schepens to E.S. Aromi, dated August 24, 2004;

- the S-112 transfer incident; and
- other incidents specified by ORP.

A post-implementation review, which will be conducted following implementation of corrective actions, will ascertain their effectiveness.

The approach for this review consisted of the following elements with respect to the incidents specified above:

- Review of ORP, DNFSB, and the TFC correspondence, selected past and recent documented ISMS reviews, and the TFC compensatory measures document (TFC-MD-038, *Compensatory Controls for Radiological Control Performance*).
- Review of Occurrence Reports, Problem Evaluation Requests (PERs), and Price Anderson Amendments Act Nuclear Tracking System Reports.
- Review of documented Causal Analyses.
- Review of Corrective Action Plans.
- Interviews of project and program level personnel responsible for the causal analyses and corrective action determinations.
- Interviews of project and program level personnel responsible for compensatory measure determination and implementation, and corrective action implementation.
- Interviews with selected first line supervisors and groups of hourly workers.
- Observation of selected work planning meetings, ALARA reviews, Plan of the Day meetings, morning meetings, and pre-job briefings.
- Observation of selected compensatory measure implementation meetings.
- Observation of selected post-job briefings.

The review team observed three pre-job briefings, four work planning meetings, three work release/plan of the day meetings, an ALARA Joint Review Group (AJRG) meeting, and an intermediate post-job review. Over 125 personnel were interviewed, including 11 NCOs, 10 craft personnel, 20 first line supervisors, 26 technicians, 36 engineers and managers, and the President and Vice Presidents of the TFC. The team reviewed 48 documents, including procedures, PERs, occurrence reports, event investigation reports, non-compliance tracking system reports, management and independent assessment reports, external review reports, and various types of formal correspondence.

3.0 OBJECTIVES, CRITERIA, AND RESULTS

DOE G 450.4-1B, *Integrated Safety Management System Guide for use with Safety Management System Policies (DOE P 450.4, DOE P 450.5, and DOE P 450.6); The Functions, Responsibilities, and Authorities Manual; and the DOE Acquisition Regulation* identifies continuing core expectations developed from the DOE policies, the requirements of the DEAR, and the fundamental attributes that support the implementation of ISM. These continuing core expectations were developed to provide a reference or starting point, which can serve as the basis for developing site- or facility-specific objectives and criteria in support of assessing an ISMS. Tailoring of the continuing core expectations for Hanford Site Tank Farms resulted in the objectives and criteria used during this review. The ISM objectives and criteria are provided in three major functional areas (1) Work Planning, (2) Conduct of Operations, (3) Relevant Management Programs, including Feedback and Improvement. The functional areas were then divided into pre-implementation review objectives and criteria, and post-implementation review objectives and criteria. The post-implementation review criteria will be expanded as necessary following completion of the pre-implementation review.

3.1 Work Planning

The Work Planning functional area includes all aspects of the Integrated Work Control Process implemented by the Hanford Site TFC. Included in the scope of this area are:

- Implementation of job hazards analyses,
- Implementation of radiological work permits,
- Incorporation of hazard controls into work packages and procedures,
- Work Planning and Scheduling,
- Pre-job briefings, and
- Work authorization process.

The 244 CR vault incident, the six incidents discussed in ORP letter 04-ORP-54, and the S-112 transfer incident reflected weaknesses in work planning at the Hanford Site Tank Farms.

Pre-Implementation Objective: Determine if:

- Causal and common cause analysis and corrective action determinations for the above incidents are effective.
- Causal analyses appropriately identify ISM weakness and corrective actions are appropriate for resolution.
- Corrective action implementation for the above incidents is progressing satisfactorily.
- Current Work Control Compensatory Measures for the above incidents are adequate, implemented and effective.

Post-Implementation Objective: Will determine if:

- Work Planning and Control corrective actions are substantially implemented.
- Work at Hanford Tank Farms is planned, authorized, and conducted in accordance with the process described in TFC-OPS-MAINT-C-01, *Tank Farm Contractor Work Control*, for all activities.
- Hazards for each task are appropriately analyzed and controls implemented.
- Worker involvement is an integral part of the work planning and hazard analysis process.
- Management is closely involved in all aspects of the planning, analysis, authorization, performance, and lessons learned processes.

Pre-Implementation Criteria: The Team determined the extent to which:

A. The Corrective Action Plan is supported by appropriate causal analyses.

B. The Corrective Action Plan is supported by appropriate common cause analyses.

C. The Corrective Action Plan has effective corrective actions.

D. The causal analyses appropriately identify ISM weaknesses and the corrective actions appropriately address those weaknesses.

E. The progress of corrective action implementation for Work Planning is adequate.

F. The Compensatory measures for Work Planning are adequate, implemented and effective.

G. Program reviews, observations, and interviews demonstrate that the implemented work control process is adequately described by TFC-OPS-MAINT-C-01, *Tank Farm Contractor Work Control.*

H. Worker involvement in work planning is required and is observed to occur.

I. Program reviews, observations, and interviews demonstrate that RWPs, Job Hazard Analyses (JHAs), and Industrial Hygiene (IH) Monitoring Plans are sufficient and appropriate for the work being performed.

Post Implementation Criteria: The Team will determine the extent to which:

A. Work Planning and Control corrective actions are substantially implemented.

B. Activity observations and interviews demonstrate that work planning is accomplished in accordance with the approved work planning and control procedures.

C. Worker involvement in work planning is required and is observed to occur.

D. Program reviews, observations, and interviews demonstrate that RWPs, JHAs, and IH Monitoring Plans are sufficient and appropriate for the work being performed.

E. Program reviews, observations, and interviews clearly show a rigorous and comprehensive process is required and implemented for the identification of hazards during the work planning process.

F. Program reviews and observations show that an appropriate review and authorization process exists for controlling and coordinating the performance of work. Appropriate equipment control processes exist for assisting facility personnel in managing equipment/facility status during all phases of a work activity.

G. Program reviews and observations demonstrate effective and appropriate hazard controls are implemented into work packages and procedures for the performance of work.

H. Observations show that procedures, work packages, and other performance documents are written to an adequate level of detail such that workers can safely and efficiently perform each task in the order specified with minimal interpretation or clarification from other personnel.

J. Observations demonstrate sufficiency of safety requirement specification into work packages and procedures.

K. The Compensatory Measures for Work Planning are adequate, implemented and effective.

I. Program reviews, observations, and interviews demonstrate that radiological work areas are surveyed, documented, and posted at specific frequencies, that routine radiation/contamination surveys are conducted in radiologically controlled areas, and that the results of radiological surveys are posted at the entrance to radiological work areas.

J. Observations, and interviews demonstrate that areas established to control the spread of radioactive contamination (Radiological Buffer Areas, CAs, Fixed Contamination Areas, and Soil Contamination Areas) are barricaded and marked to prevent inadvertent entry.

3.2 Conduct of Operations

The Operations, Training, and Authorization Basis Implementation functional area consists of all aspects of Conduct of Operations, including associated implementation plans and applicability matrices. Included in the scope of this area are:

- Procedure compliance,
- Equipment and system status control,
- Review and authorization of work,
- Standing and shift orders,

- Response to abnormal and emergency conditions, and
- Performance of work.

The 244 CR vault incident, the six incidents discussed in ORP letter 04-ORP-54, and the S-112 transfer incident reflected weaknesses in Conduct of Operations at the Hanford Site Tank Farms.

Pre-Implementation Objective: Determine if:

- Causal and common cause analysis and corrective action determinations for the above incidents are effective.
- Causal analyses appropriately identify ISM weakness and corrective actions are appropriate for resolution.
- Corrective action implementation for the above incidents is progressing satisfactorily.
- Current Work Control Compensatory Measures for the above incidents are adequate, implemented and effective.

Post-Implementation Objective: Will determine if:

- Conduct of Operations corrective actions are substantially implemented.
- Competence is commensurate with responsibility for facility management and operations personnel.
- Processes to verify readiness at the facility level have been implemented in accordance with DOE order requirements, where applicable.
- Conduct of Operations is implemented in accordance with DOE Order requirements.

Pre-Implementation Criteria: The Team determined the extent to which:

A. The Corrective Action Plan is supported by appropriate causal analyses.

B. The Corrective Action Plan is supported by appropriate common cause analyses.

C. The Corrective Action Plan has effective corrective actions.

D. The causal analyses appropriately identify ISM weaknesses and the corrective actions appropriately address those weaknesses.

E. The progress of corrective action implementation for Conduct of Operations is adequate.

F. The Compensatory measures for Conduct of Operations are adequate, implemented and effective.

G. Program reviews, observations, and interviews show that a procedure usage and compliance policy exists and is implemented. Personnel demonstrate an understanding of the procedure compliance policy.

H. Program reviews show that the conduct of operations program is consistent with the DOE approved Conduct of Operations Applicability Matrix.

I. Observations show that the use of procedures, work packages, JHAs, RWPs, IH Monitoring Plans, and other documents is appropriate and adequate for safe performance of work.

J. Observations, program reviews, and interviews show that if work packages or procedures can not be performed as written, work is suspended and the documents are appropriately changed, reviewed, and approved prior to continuing work.

K. During the work planning or execution process personnel demonstrate the ability to recognize changing and/or unknown conditions and appropriately suspend work activities until they are appropriately dealt with.

Post Implementation Criteria: The Team will determine the extent to which:

A. Conduct of Operations corrective actions have been substantially implemented.

B. The Compensatory measures for Conduct of Operations are adequate, implemented and effective.

C. Program reviews, observations and interviews show that "readiness to proceed" is appropriately confirmed prior to start of new work activities.

D. Observations demonstrate that operations personnel are responsible for the review, coordination, and approval of work activities prior to their start.

E. Program reviews, observations, and interviews show that a procedure usage and compliance policy exists and is implemented. Personnel are observed to perform work in accordance with the procedure compliance policy.

F. Program reviews, observations, and interviews demonstrate that operations personnel understand their roles and responsibilities during abnormal and emergency conditions.

G. Program reviews show that the training program is consistent with the DOE approved Training Implementation Matrix.

H. Observations show that the use of procedures, work packages, JHAs, RWPs, IH Monitoring Plans, and other documents is appropriate and adequate for safe performance of work.

I. Observations show that personnel performing work fully understand and comply with all aspects of the hazard controls within their work packages and procedures.

J. Observations, program reviews, and interviews show that if work packages or procedures can not be performed as written, work is suspended and the documents are appropriately changed, reviewed, and approved prior to continuing work.

K. During the work planning or execution process personnel demonstrate the ability to recognize changing and/or unknown conditions and appropriately suspend work activities until they are appropriately dealt with.

L. Observations and interviews reflect that during work performance personnel can be expected to utilize their Stop Work Authority, when required.

3.3 Relevant Management Programs Including Feedback and Improvement

The Management Programs functional area includes various site programs that represent Relevant Management Program (including Feedback and Improvement) components of ISM, as they relate to the scope of this review. Additionally, the Hanford Site Tank Farms ISMS program description is addressed in this functional area. Included in the scope of this area are:

- Management Assessment program,
- Independent Assessment program,
- Post-job briefings,
- Track and Trend Performance Indicators,
- Occurrence Reporting and Processing System (ORPS) and incident investigation,
- Corrective Action Plans, and
- Implementation of lessons learned and performance feedback.

The 244 CR vault incident, the six incidents discussed in ORP letter 04-ORP-54, and the S-112 transfer incident reflected weaknesses in some management programs including feedback and improvement at the Hanford Site Tank Farms.

Pre-Implementation Objective: Determine if:

- Causal and common cause analysis and corrective action determinations for the above incidents are effective.
- Causal analyses appropriately identify ISM weakness and corrective actions are appropriate for resolution.
- Corrective action implementation for the above incidents is progressing satisfactorily.
- Current Work Control Compensatory Measures for the above incidents are adequate, implemented and effective.

Post-Implementation Objective: Will determine if:

- Feedback and Improvement corrective actions are substantially implemented.
- The contractor's implemented Feedback and Improvement programs are consistent with and in accordance with the ISMS Manual.
- Contractor roles and responsibilities are clearly defined to ensure satisfactory safety, accountability, and authority.
- Line management is responsible for safety.
- Feedback information on the effectiveness of the ISM is gathered, opportunities for improvement are identified and implemented, and line and independent oversight is conducted.

Pre-Implementation Criteria: The Team determined the extent to which:

A. The Corrective Action Plan is supported by appropriate causal analyses.

B. The Corrective Action Plan is supported by appropriate common cause analyses.

C. The Corrective Action Plan has effective corrective actions.

D. The causal analyses appropriately identify ISM weaknesses and the corrective actions appropriately address those weaknesses.

E. The progress of corrective action implementation for Feedback and Improvement is adequate.

F. The Compensatory measures for Feedback and Improvement are adequate, implemented and effective.

G. Program reviews show that procedures and/or mechanisms are in place that define clear roles and responsibilities within the facility to ensure that safety is maintained at all levels.

H. Program reviews interviews and observations demonstrate that line management is responsible for safety.

I. Program reviews show that the occurrence reporting process as required by DOE is fully implemented.

J. Program reviews show that the site issues management program is effective in developing corrective action plans, where appropriate, and that management aggressively pursues timely completion of these action items.

K. Program reviews and interviews show that critiques and investigations are conducted for incidents, including near misses that result, or could result, in occupational injury, illness or death. (Investigation reports identify causes, findings, track hazards to correction, and identify any preventive or corrective actions to eliminate the recurrence of the incident.)

Post Implementation Criteria: The Team will determine the extent to which:

A. Feedback and Improvement corrective actions are substantially implemented.

B. The compensatory measures for feedback and improvement are adequate, implemented and effective.

C. Program reviews and observations show that procedures and/or mechanisms are in place that define clear roles and responsibilities within the facility to ensure that safety is maintained at all levels.

D. Program reviews and observations demonstrate that line management is responsible for safety.

E. Observations demonstrate that personnel are competent commensurate with their responsibility.

F. Program reviews and observations show that the occurrence reporting process as required by DOE is fully implemented.

G. Program reviews and observations show that a process to develop Feedback and Improvement information opportunities at the site and facility levels, as well as, the individual work activity level is implemented.

H. Program reviews and observations show that critiques and investigations are conducted for incidents, including near misses that result, or could result, in occupational injury, illness or death. (Investigation reports identify causes, findings, track hazards to correction, and identify any preventive or corrective actions to eliminate the recurrence of the incident.)

I. Program reviews and observations show that the organization and/or facilities perform trend analysis of performance indicators and safety and health data (including injury and illness, accident investigation, assessment and audit, and employee safety report experience) for identification and resolution of programmatic or systemic weakness.

J. Program reviews and observations show that the site issues management program is effective in developing corrective action plans, where appropriate, and that management aggressively pursues timely completion of these action items.

K. Program reviews and observations demonstrate that a process is in place and is utilized by managers for considering and resolving recommendations for improvement, including worker suggestions.

L. Program reviews and observations indicate that identified work package and procedure improvements and lessons learned are incorporated into the process. Post-job reviews are performed for specified activities.

M. Program reviews and observations demonstrate that a formally structured, auditable facility program is in place to ensure that exposures are maintained ALARA.

N. Observations demonstrate sufficiency of management and supervisory oversight of work performance.

3.4 Authorization Basis implementation during finalization of post-implementation criteria finalization.

Post implementation objectives and criteria to be established by February 2005.

3.5 Results

The results of this review are documented in Sections 4.0 through 7.0. An analysis of whether and how the results meet the criteria, whether the team concurs or non-concurs with the TFC associated corrective actions, and identification of Findings for additional action are provided in Section 8.0 and the team's conclusions are provided in Section 9.0.

4.0 ASSESSMENT OF IMPROVEMENT IN WORK PLANNING

4.1 Causal and Common Cause Analyses and Corrective Action Determination Effectiveness

The Causal Analysis Report, 244-CR Vault Thermocouple Removal; Extremity Administrative Control Level Exceeded, dated September 22, 2004, was reviewed to identify planned ISMS improvements, particularly in the area of work planning. The Root Cause Analysis (RCA) was a thorough evaluation of the event. The RCA accurately determined the causal factors associated with the event and included appropriate corrective actions. Since the RCA determined work planning weaknesses (hazard identification and control development) to be one of the root causes, corrective actions and improvements were provided for the area of work planning. These corrective actions were evaluated for their ability to prevent recurrence of the 244-CR Vault event and similar events; the corrective actions were determined to be adequate and, if effectively implemented, would prevent the aforementioned recurrences. Some deficiencies in the determination of corrective actions are noted in Section 6.7 of this report.

Additionally, the corrective actions in work planning were evaluated to determine their extent and capability at improving the TFC ISMS. The RCA corrective actions specifically focused on the ISMS core functions of defining the scope of work, hazard identification and developing controls to prevent or mitigate the hazards. These have the potential to be of significant value in improving the TFC ISMS. Examples of specific, planned ISMS program improvements noted in the area of work planning include:

- Develop a repeatable process for hazard identification that will ensure available data is obtained and data uncertainty is applied to support development of applicable hazard controls and contingency plans.
- Train and qualify appropriate personnel on the new hazard identification process.

This DOE ISMS Improvement Validation review also included a review of the *CH2M HILL Hanford Group Common Cause Analysis of Radiation Control Events*, dated September 30, 2004. This Common Cause Analysis (CCA), formally transmitted to DOE, was reviewed by the team to determine the effectiveness of the CCA at identifying improvements in the area of work planning. During this Improvement Validation review, the team determined that the CCA previously submitted to DOE was inadequate. As a result, the TFC immediately chartered a trained and experienced TFC team to perform a separate CCA, and report the results of this CCA to TFC management and DOE in November 2004. As a result, this report will not include a determination of the effectiveness of the CCA in evaluating the TFC work planning process. Additional information on the team's ISM Improvement Validation review of the September 2004 CCA can be found in Section 6.7 of this report.

4.2 Appropiateness of Weaknesses in the Tank Farm ISM System Derived from the Causal Analyses and Addressed by the Corrective Actions and as Identified in this Review.

The 244-CR Vault event RCA was reviewed to determine the adequacy of the RCA in identifying weaknesses in the TFC ISMS in the area of work planning. The RCA was a thorough evaluation of the event. The RCA accurately determined the weaknesses in the TFC's work planning process, developed the causal factors, and included appropriate corrective actions to improve the TFC ISMS. Specific weaknesses identified in the RCA related to work planning included (summarized):

- Inadequate radiological hazard characterization.
- Inadequate training on a new requirement for single Enhanced Work Planning Sessions for each radiologically high risk work package.
- Shielding controls were not planned for or implemented as intended.
- Poor planning in developing dose rate monitoring methods.

The team considers this determination of ISM weaknesses in work planning to be appropriate.

The 244-CR Vault RCA did identify as a causal factor deficiencies in the implementation of the EWP process. This team also identified deficiencies in the TFC's implementation of the EWP process. Deficiencies were identified as a result of direct observation of a pre-job brief and interviews, and centered on inadequate worker involvement in the work planning process. Deficiencies included:

- Some workers who were interviewed stated that they were not involved in the work planning process.
- Some workers stated that, although they were involved in the work planning, including EWP sessions, their suggested changes to the work sequence/steps were ignored.

During the course of this review, the team observed a pre-job briefing, scheduled as a pre-work planning walk down of the work site by work group representatives. As a prelude to the pre-job brief, the FWS discussed the scope of the work packages (six) that were being planned and walked down. Both the planners and the FWS made statements during the meeting that indicated that worker input into certain portions of the jobs would not be considered due to schedule constraints and other reasons. This does not facilitate worker involvement in the planning process.

Team members also observed an AJRG meeting that was led by operations and attended by all relevant functional groups. There was active engagement and participation by the attendees.

Interviews with work groups, managers, and workers also revealed an inherent value in having the same work team that plans the work also conduct the work. This type of approach to work planning and conduct has value as evidenced by interviews with specific groups that practice this approach, including the Fluor Federal Services construction group, and 222-S Laboratory staff. Benefits to retaining this "continuity" in the process can include improved coordination, safety, efficiency, morale, ownership, and participation in the planning process. Interviews with TFC senior management indicated that plans were being developed to implement a similar work planning and conduct process throughout the organization.

This DOE ISMS Improvement Validation review also included a review of the CCA to determine the effectiveness of the CCA at identifying weaknesses in the TFC ISMS, specifically in the area of work planning. As mentioned in Section 4.1 of this report, this report will not include a determination of the effectiveness of the CCA in evaluating TFC Conduct of Operations.

4.3 Corrective Action Implementation Progress

The established corrective actions in work planning have progressed to the point that the TFC-OPS-MAINT-C-01, *Tank Farm Contractor Work Control*, and TFC-OPS-MAINT-D-01.1, *Work Planning Guidance*, were issued on October 15, 2004 and became effective on October 25, 2004. These primary work controls procedures for tank farm operations incorporated the appropriate elements of TFC-MD-038, Revision D-5, *Compensatory Controls for Radiological Control Performance*. However, the team noted that the requirement to revise the ALARA Work Planning procedure (TFC-ESHQ-RP_RWP-C-03, issued July 21, 2004) to elevate the review and approval for determination of need and level of mock-ups to be performed for high risk radiological work to the Director level was not accomplished as scheduled. This procedure is currently in draft form, and based on the Significant PER, is now expected by November 30, 2004. This corrective action was originally due by October 15, 2004. Additional discussion on the progress of corrective action implementation is provided under the specific criteria in Sections 5.0 and 6.0.

4.4 Current Work Control Compensatory Measure Determination and Implementation Effectiveness

Implementation of the current work control compensatory measures contained in TFC- MD-038, Revision D-5, *Compensatory Controls for Radiological Control Performance,* has been effective in ensuring that radiological work is appropriately categorized as low, medium, or high. In addition, contingency plans are included in the technical work documents as part of the planning process. Observation of an AJRG meeting indicated that appropriate aspects of the work, RWP and safety condition controls, lessons learned, and other topics were reviewed. Pre-job briefings addressed and emphasized the MD-038 compensatory measures.

4.5 Adequacy with Which the Work Planning and Control Manual Describes the Implemented Program

The revised TFC-OPS-MAINT-C-01, *Tank Farm Contractor Work Control*, and TFC-OPS-MAINT-D-01.1, *Work Planning Guidance*, was recently approved and became effective during this review. Interviews with the planning manager, a planning lead, planners, and various craft personnel, in conjunction with observation of planning meetings indicates that there is a basic understanding of the revised process, but full implementation will still require a strong emphasis on training and mentoring. Assessment of the implementation of the new work planning and control procedures will be a major focus of the March 2005 review.

4.6 Effectiveness of Worker Involvement in Work Planning

Interviews of FWSs, operators, planners, and observation of planning meetings and pre-job briefings indicate there is mixed success in ensuring effective worker involvement in work planning. In two pre-job briefs that were observed, employees were alert, provided good comments about the work and safety controls, and asked appropriate questions regarding equipment use, contingency plans, and other aspects of the job to ensure there was a clear understanding of the work and controls. In one observed planning meeting workers and appropriate craft were involved and active in the discussion on step-by-step procedures. Their input allowed for changes to the work package to provide an improved workspace.

However, interviews with planners, supervisors and workers, indicated several concerns for implementing some of the worker involvement enhancements. There was a concern regarding the expectation for involving the workers who will be performing the work, will be the ones engaged in the planning progress, including the team planning meeting (similar to an EWP meeting). The concern centers on the logistics for ensuring the continuity of workers throughout the work planning through execution of the work, given that there can be up to a two-month period before work is executed. Through worker interviews, it was noted that there is a perception among the workers that their input to the work package and safety controls are not always included in the final work package. The FWS on the other hand, appeared frustrated that workers performing the work were not the workers involved in the planning, and that as a result they expressed differing views or work preferences as the work started. The RCTs interviewed believed that they are not being adequately involved in RWP development.

Based on interviews, first line supervisors are effectively engaged in work planning, however, worker involvement appears to be less than effective. The TFC should examine those Hanford examples cited as effective in Sections 4.2 and 7.0, as well as, changes recently implemented at CH2M HILL-affiliate sites to better understand how to improve in this area. **(FINDING)**

4.7 Effectiveness of RWPs, JHAs, and IH Monitoring Plans

Several work packages and their associated RWPs, JHAs, and IH monitoring plans were reviewed. The job specific RWPs now being developed were found to be comprehensive and address action, safe condition and void limits. However, interviews with the RCTs indicated they have not embraced the job-specific RWP system. The RCTs believe that there is additional training necessary to fully comprehend the RWP directions, and believe the RCTs need to be involved more directly in RWP development.

The status of the IH monitoring plans is improving with an overall IH monitoring strategy for the Tank Farms. With the conservative protection posture relating to non-radiological airborne contaminants and respirator protection in the Tank Farms, the current IH monitoring plans are adequate until the overall IH tank farm corrective actions are in place and decisions are made to provide different IH controls based on the new characterization data for potential exposures.

The expectations for how JHAs are prepared are included in revised TFC procedures, and interviews with planners indicate a basic understanding of the new JHA expectations. A review of a number of JHAs currently going through the planning process indicates that they have not yet met the expectations for a job specific and step-by-step analysis of the hazards associated with each step and the specific control needed at that point in the work. **(FINDING)** Several older standing JHAs were pieced together to have a "composite" JHA, but still remained high-level, general, and simply reflected a laundry list of hazards that may be associated with the work, e.g., fall hazards, excavating, overhead, or electrical. Additional training, mentoring and use of examples or standard formats could help in the implementation of job specific (step-by-step) JHAs. However, the team noted that the work instructions themselves are now showing more detail in work steps and specific hazard controls.

5.0 ASSESSMENT OF IMPROVEMENT IN CONDUCT OF OPERATIONS

5.1 Causal and Common Cause Analyses and Corrective Action Determination Effectiveness

The 244-CR Vault event RCA was reviewed to identify planned ISMS improvements, particularly in the area of Conduct of Operations. The RCA was determined to be a thorough evaluation of the event. The RCA accurately determined the causal factors associated with the event and included appropriate corrective actions. Since the RCA determined Conduct of Operations weaknesses to be one of the contributing causes, the RCA did identify corrective actions and improvements in the area of Conduct of Operations. These corrective actions were evaluated for their ability to prevent recurrence of the 244-CR Vault event and similar events; the corrective actions were determined to be adequate and, if effectively implemented, would prevent the aforementioned recurrences. Some deficiencies are noted in Section 6.0 and 7.0 of this report.

Additionally, the corrective actions in Conduct of Operations were evaluated to determine their extent and capability at improving the TFC ISMS. The RCA corrective actions specifically focused on the ISMS core functions of performing work within the defined scope and controls, and in ensuring an effective feedback and improvement process. The corrective actions have the potential to be of significant value in improving the TFC ISMS. Examples of specific, planned ISMS program improvements noted in the area of Conduct of Operations include:

- Develop classroom training on Conduct of Operations (to be provided as part of continuing training).
- Update qualification requirements for some workers to include demonstration of conduct of operations.
- Implement an Operations Table Top drill program.
- Obtain available technology for improved communication devices for use with respirators.
- Revise pre-job briefing procedure to address command and control and communications.

This ISM Improvement Validation review also included a review of the CCA to determine the effectiveness of the CCA at identifying improvements in the area of Conduct of Operations. As mentioned in Section 4.1 of this report, this report will not include a determination of the effectiveness of the CCA in evaluating TFC Conduct of Operations.

5.2 Appropriateness of Weaknesses in the Tank Farm ISM System as Derived from the Causal Analyses and Addressed by the Corrective Actions and as Identified in this Review

The 244-CR Vault event RCA was reviewed to determine the adequacy of the RCA in identifying weaknesses in the TFC ISMS in the area of Conduct of Operations. The RCA was determined to be a thorough evaluation of the event. The RCA accurately determined the weaknesses in the TFC's Conduct of Operations, developed the causal factors, and included appropriate corrective actions to improve the TFC ISMS. Specific weaknesses identified in the RCA related to Conduct of Operations included (summarized):

- Shared command and control structure led to an inappropriate decision.
- Communications in the field were less than adequate.
- Response to over-ranged dose rate monitoring equipment and exceeding void limits was inadequate.
- Management has not ensured implementation of Conduct of Operations in field work activities.

The team considers this identification of ISM weaknesses to be appropriate.

This DOE ISMS Improvement Validation review also included a review of the CCA, to determine the effectiveness of the CCA at identifying weaknesses in the TFC ISMS, specifically in the area of Conduct of Operations. As mentioned in Section 4.1 of this report, this report will not include a determination of the effectiveness of the CCA in evaluating TFC Conduct of Operations.

5.3 Corrective Action Implementation Progress

Of the 34 corrective actions for the 244-CR vault thermocouple removal event, contained in Attachment J of the TFC Causal Analysis Report dated September 22, 2004, six corrective actions were due to be completed by the time of this review (two were due in September and four were due earlier in October). The team reviewed the status of the action items, and determined that four of the six are complete. The remaining two actions are overdue, based on the corrective action plan. There are 28 additional corrective actions due by February 2005. Further, the common cause analysis may add additional corrective actions that must be closed by February 2005.

There are 11 corrective actions directly related to Conduct of Operations with the root cause that management has not ensured that Conduct of Operations attributes applicable to field work activities have been fully implemented. One of these actions was to revise the ALARA Work Planning procedure to elevate the review and approval for determination of the need for mock-ups for high risk radiological work to the Director level (due October 15, 2004). This action is not yet complete. A revision to the ALARA Work planning procedure, TFC-ESHQ-RP-RWP-C-03, was drafted, but not yet issued. The team reviewed the draft procedure and confirmed that

the corrective action was incorporated into the draft. Another one of the 11 corrective actions was to develop classroom training on Conduct of Operations (due October 28, 2004). The initial classroom training was prepared and presented in a pilot session on October 26, 2004; however, the training materials were determined to be inadequate. Formal training was to be initially presented on October 28 and 29, 2004, but the training was delayed in order to address the weaknesses identified in the training materials.

The team considers that progress of corrective action implementation for Conduct of Operations may not be adequate. It is not apparent that progress to date will support the TFC February 2005 mid-point assessment and/or the March 2005 ISM Improvement Validation assessment.

5.4 Current Conduct of Operations Compensatory Measure Determination and Implementation Effectiveness

The compensatory measures in MD-038 are narrowly focused to immediately change the behavior of the affected crews. The compensatory measures significantly reduce the discretion of the field level manager/FWS in the execution of field activities. These compensatory measures are warranted at this time. The TFC may wish to modify these actions when performance meets and or exceeds expectations.

The compensatory measures in MD-038 are well understood by the field crews. The field crews stated that they would "*stop and pull out, place personnel in a safe condition*" at the first indication of a changing condition, change in scope or any other anomaly that was not included as a contingency in the work package.

Acceptance of the MD-038 requirements has not been fully realized. The crews consist of many highly experienced personnel. These personnel have a wealth of knowledge that includes a full set of workarounds that have been used for many years. Management must continuously reinforce MD-038 expectations to ensure enduring improvement. Management must not communicate any mixed messages.

The policy in MD-038 for the use of the Senior Supervisory Watch (SSW) is adequate. Based on interviews, each SSW understands his roles, responsibilities and authority. The current approved list of SSWs is limited. The requirements of MD-038 were embraced by each SSW. MD-038 requires every medium and high risk evolution to include the SSW as a part of the evolution. This construct will work in the near-term, but operations will need to add additional personnel to the list as work tempo increases.

5.5 Current Conduct of Operations Compensatory Measure Determination and Implementation Effectiveness

Based on interviews with tank farm personnel, policy with respect to procedure usage and compliance is well understood. This is a direct result of the implementation of MD-038. TFC personnel stated that "procedures must be followed as written." This was echoed by the first line managers and FWSs.

5.6 Consistency of the Conduct of Operations Program with the Approved Conduct of Operations Applicability Matrix

The team determined that the Conduct of Operations program is consistent with the ORP-approved Conduct of Operations Applicability Matrix. The Conduct of Operations Matrix is included as Attachment A in the *Conduct of Operations Implementation Plan*, TFC-PLN-05, Revision B-8, which was most recently updated and approved on March 17, 2004. The Plan clearly states that changes to the Conduct of Operations Matrix require DOE approval and that the matrix is being maintained current on at least an annual basis, as required. The Matrix specifies the TFC's implementing policy documents and procedures, as well as, specifying the scope of applicability and any deviations for the chapters in DOE Order 5480.19, *Conduct of Operations*.

Observations of the implementation of conduct of operations was limited in this review to mostly work planning sessions, pre-evolution briefs, and a post-work review between an FWS and the work crew. Based upon those limited observations, the team determined the Conduct of Operations Matrix was implemented for the pertinent elements related to those evolutions observed. The team expects to focus the second part of its review effort, scheduled for March 2005, on actual field implementation. This will provide a broader basis for determination of the effectiveness of the actual field implementation of the Conduct of Operations program.

5.7 Effectiveness of the Use of Procedures, Work Packages, JHAs, RWPs, IH Monitoring Plans and Other Documents during Work Performance

Based on interviews, it is clear that personnel intend to follow the technical work documents. If the technical work documents cannot be followed as written, work will stop and revisions will be made. This area will be fully assessed in March 2005.

5.8 Ability to Recognize Changing and/or Unknown Conditions and Appropriately Suspend Work Activities Until They are Appropriately Dealt With

Based on interviews with planners, managers, senior supervisor watch managers, workers, and observations of several work planning sessions, it was observed that TFC understood the expectations of TFC-MD-038 to plan for changing and unknown conditions. The ability to recognize these types of conditions during planning was evident.

The field crews stated that they would "*stop and pull out, place personnel in a safe condition*" at the first indication of a changing condition, change in scope or any other anomaly that was not included as a contingency in the work package. Full understanding of whether or not the planning process is identifying and accounting for all relevant contingencies, and the work forces response to actual condition will occur during the March 2005 assessment.

5.9 Ability to Appropriately Suspend Work and Modify Work Documents When Work Documents Cannot be Performed as Written

No field work was assessed during this phase of the review. Based on interviews, it is clear that personnel intend to follow the technical work documents. The work control procedures for the Tank Farms provides for steps to take when conditions have changed or work cannot be performed as provided for in the work package. The steps appear to be workable for minor steps, but there does appear to be a concern over the ability to quickly resolve "stop work" issues and continue the work. The field crews stated that they would "*stop and pull out, place personnel in a safe condition*" at the first indication of a changing condition, change in scope or any other anomaly that was not included as a contingency in the work package. This area will be fully assessed in the March 2005 assessment.

6.0 ASSESSMENT OF IMPROVEMENT IN MANAGEMENT PROGRAMS, INCLUDING FEEDBACK AND IMPROVEMENT

6.1 Causal and Common Cause Analyses and Corrective Action Determination Effectiveness

The 244-CR Vault event RCA was reviewed to identify planned ISMS improvements, particularly in the area of Management Programs, including Feedback and Improvement. The RCA was a thorough evaluation of the event. The RCA accurately determined the causal factors associated with the event and included appropriate corrective actions. Since the RCA determined weakness in feedback and improvement to be a contributing cause, the RCA also identified corrective actions and improvements in the area of feedback and improvement. These corrective actions were evaluated for their ability to prevent recurrence of the 244-CR Vault event and similar events; the corrective actions were determined to be adequate and, if effectively implemented, would prevent the aforementioned recurrences.

Additionally, the corrective actions in Management Programs, including Feedback and Improvement were evaluated to determine their extent and capability at improving the TFC ISMS. The RCA corrective actions focused on the ISMS core function of effective feedback and continuous improvement have the potential to be of significant value in improving the TFC ISMS. Examples of specific, planned ISMS program improvements noted in the area of feedback and continuous improvement include:

- Develop process for improving the use of lessons learned in work planning.
- Train appropriate personnel in the use of the lessons learned work planning database.
- Modify ALARA management processes to incorporate applicable lessons learned in the radiological planning process.

This DOE ISMS Improvement Validation review also included a review of the CCA to determine the effectiveness of the CCA at identifying improvements in the area of Conduct of Operations. As mentioned in Section 4.1 of this report, this report will not include a determination of the effectiveness of the CCA in evaluating TFC Conduct of Operations.

6.2 Appropriateness of Weaknesses in the Tank Farm ISM System as Derived from the Causal Analyses and Addressed by the Corrective Actions and as Identified in this Review

The 244-CR Vault event RCA was reviewed to determine the adequacy of the RCA in identifying weaknesses in the TFC ISMS in the area of management programs, including feedback and improvement. The RCA was a thorough evaluation of the event. The RCA accurately determined weaknesses in some management programs, including feedback and improvement, developed the causal factors, and included appropriate corrective actions to improve the TFC ISMS. Specific weaknesses identified in the RCA related to management programs, including feedback and improvement, included (summarized):

- Past lessons learned from work activities with high energy beta radiation were not adequately applied.
- Management has not adequately defined what constitutes "placing the plant in a safe condition."
- Management has not ensured implementation of Conduct of Operations in field work activities.

The Team considers this identification of ISM weaknesses to be appropriate.

This DOE ISMS Improvement Validation review also included a review of the CCA to determine the effectiveness of the CCA at identifying weaknesses in the TFC ISMS, specifically in the area of management programs. As mentioned in Section 4.1 of this report, this report will not include a determination of the effectiveness of the CCA in evaluating TFC Conduct of Operations.

6.3 Corrective Action Implementation Progress

Of the 34 corrective actions for the 244-CR vault thermocouple removal event, contained in Attachment J of the TFC Causal Analysis Report dated September 22, 2004, six corrective actions were due to be completed by the time of this review (two were due in September and four were due earlier in October). The team reviewed the status of the action items and determined that four of the six are complete. The remaining two actions are overdue, based on the corrective action plan. There are 28 additional corrective actions due by February 2005. Further, the common cause analysis may add additional corrective actions that must be closed by February 2005.

One of the overdue actions was to procure and develop a process for use of electronic personal dosimetry with both beta and gamma measurement capabilities (due September 27, 2004). Some equipment had been procured by the due date and was tested in the field in late October, but the process for use has not yet been developed. The second overdue action was to revise the ALARA Work Planning procedure to elevate the review and approval for determination of the need for mock-ups for high risk radiological work to the Director level (due October 15

2004). A revision to the ALARA Work Planning procedure, TFC-ESHQ-RP_RWP-C-03, was drafted but not yet issued. The team reviewed the draft procedure and confirmed that the corrective action was incorporated into the draft.

The team considers that progress of corrective action implementation for Feedback and Improvement may not be fully adequate. It is not apparent that progress to date, will support the TFC February mid-point assessment and/or the March 2005 assessment.

6.4 Current Feedback and Improvement Compensatory Measure Determination and Implementation Effectiveness

The compensatory measures in MD-038 are adequate. It requires the workers be involved in the planning process and included in the feedback process. The use of roundtable planning sessions, enhanced work planning sessions, intermediate post job reviews and post job reviews are evident.

The team interviewed field crews, construction crews and their supervisors, as well as, the SSWs and Radiological Control Area managers. These crews were from Waste Feed Operations and Closure Projects. The interviews included questions specific to expectations in the area of ISMS. The interviewees identified that the overwhelming weakness in the ISMS program is Feedback and Improvement.

The workers indicated that they have provided input into the work package development process. The workers stated that although their input is provided, the finished package does not consistently reflect their input. Some workers indicated that their input is largely unused and sometimes ignored.

It is clear to the team that all input is not required to be included into the work documents, as there are many ways to complete a given task. The weakness may be that management is not clearly communicating the outcome to the workers. If this situation continues the workers may remove themselves from the process.

6.5 Effectiveness of Clear Definition of Roles and Responsibilities for Safe Performance of Work

The TFC has an ISMS Description and other management procedure documentation that outlines roles and responsibility for safe performance of work. There have been a number of organizational changes over the last six months. In fact, a reorganization was in progress during the team's on-site visit. Many of these changes are to align support organizations, such as, radiation control, industrial safety, IH, and planning staff as a direct part of the operations line management. Central organizations to provide direction, guidance and interpretation services for the support groups now in the line are currently being staffed. While most managers and workers believed that their specific safety-related responsibilities did not change and could be effective under operations line management control, several RCTs believed working directly under operations line management may compromise their ability to ensure radiological safety requirements due to the potential for pressure to continue work.

The team believes the TFC has partially met the criteria due to the need to verify all the recent and pending organizational changes are properly documented, implemented and all central program staffs are in place. In addition, the TFC should clarify how technical support personnel interact with the central program staffs to resolve technical issues effecting safety of the work.

The roles and responsibilities outlined in MD-038 are clear. These responsibilities are well understood and embraced by first line supervisors. The acceptance of these new requirements appears to be lacking at the worker level. The workers understand that these are requirements and that they must comply with them, but they have also stated that they believe the represent an overreaction to the situation. Management must ensure that they continue to communicate the necessity and value of this change to the workforce.

6.6 Effectiveness of Line Management Responsibility for Safety

In assessing the interview results summarized in Section 7.0, the Team considers that managers, above the first line supervisory level, are rarely seen at the worksite by the workforce. Consequently, they are unable to manage the perceptions of the work force and are unable to function as effective change agents. In this regard, the Team believes that managers at all levels should spend significantly more time with the work force observing planning and actual performance of work with the goal to understand and remove barriers to safe and effective work performance and to coach and mentor specific management expectations. The Team also believes that management expectations regarding major issues, their significance, and required changes were not consistently being communicated with a single, simple, unified message of "what needs to change and why." Such a message should emanate from the TFC President through the line managers and supervisors to the workforce. **(FINDING)**

6.7 Effectiveness of Occurrence Reporting, Issues Management, Lessons Learned Program, and Conduct of Critiques and Investigations

Root Cause Analysis for the 244-CR Vault Overexposure Event

The team reviewed the *Causal Analysis Report, 244-CR Vault Thermocouple Removal; Extremity Administrative Control Level Exceeded*, dated September 22, 2004, to determine the following:

- Was the analysis effective at determining the appropriate causal factors for the event?
- Were the root causes correctly identified—If the root causes were corrected, would this prevent recurrence of this and similar events?
- Verify that the identified corrective actions address the causes.
- Determine if the corrective actions will prevent recurrence of the identified causes.

- Determine if the immediate actions taken were appropriate, effective, and ensure safe operations pending completion of the causal analysis corrective actions.

The TFC chartered a RCA team for the CR Vault event approximately two days after the event. The team was made up of trained, knowledgeable, experienced causal analysis evaluators. The ISM Improvement Validation team evaluated the RCA and found it to have been adequately performed, identifying appropriate causal factors and meaningful corrective actions.

One of the first actions taken by the RCA team was to conduct separate interviews of all personnel involved in the event, including work planners and other support personnel. This action was critical to gather relevant facts, since the critique of the event, which occurred a day after the event, was determined by the RCA team to have been inadequate in gathering relevant facts and developing an accurate timeline of the event.

Once the RCA team gathered all relevant facts, the team worked to determine the causal factors and corrective actions. Classical causal analysis techniques were employed to evaluate the event, including Barrier Analysis and Event and Causal Factor Charting.

The DOE ISMS team developed the following conclusions regarding the RCA:

- **Was the analysis effective at determining the appropriate causal factors for the event?**

  Based on interviews and a detailed review of the event, the appropriate causal factors were identified in the RCA. The analysis was consistent with DOE-NE-STD-1004-92, *Root Cause Analysis Guidance Document*, in conducting root cause analysis.

- **Were the root causes correctly identified—If the root causes were corrected, would this prevent recurrence of this and similar events?**

  The RCA correctly identified 3 root causes for the event. Root cause analysis techniques were properly employed by the RCA team to determine the root causes for the event. Based on analysis of the root causes identified, correcting the causes will prevent recurrence of this and similar events.

- **Verify that the identified corrective actions address the causes.**

  All corrective actions identified by the RCA team were reviewed to ensure that they adequately addressed the causes identified in the report. The RCA team identified 34 corrective actions. Some deficiencies were identified with the corrective actions for five of the causes detailed in the RCA. **(FINDING)** The following discussion provides specific details of the deficiencies:

- RC02: *Management has not ensured that Conduct of Operations attributes applicable to field work activities have been fully implemented*—the corrective actions for this root cause do not include a requirement for management to reinforce Conduct of Operations expectations in the field through direct observation and reinforcement. This is critical to ensure that the corrective actions associated with training, qualification, use of mock-ups, and drills are effective in improving Conduct of Operations in the field.
- RC03: *Management has not established the correct standard and process for what constitutes "placing the plant in a safe condition"*—the corrective actions for this root cause do not include a requirement for management to reinforce expectations for placing the plant in a safe condition through direct observation and reinforcement. This is critical to ensure that the new requirements implemented in MD-038 and other procedures are understood and adequately implemented in the field.
- CC01: *Past lessons learned from LLCE removal activities for use of beta shielding materials (leaded gloves/rubber matting) and remote handling techniques were not adequately applied*—the corrective actions for this contributing cause were not specific enough to adequately focus efforts to minimize or prohibit direct contact handling of Long Length Contaminated Equipment (LLCE) and similar tank waste contacted equipment that have the potential to emit significant amounts of radiation and can (and have) result in excessive exposure to the workers.
- CC02: *The engineering controls to utilize spray washers to reduce dose rates was not verified to be operating correctly*—The corrective action to "Incorporate requirements for engineering control verification of operability into the work planning checklist" is inadequate in preventing recurrence of the problem. Specifically, it was determined in the RCA that the spray ring assembly was not verified to be properly operating during the work activity. Procedure TFC-ESHQ-RP-RWP-C-03, *ALARA Work Planning*, requires that the Support Health Physicist will "Verify engineered barriers for minimizing contamination of equipment will perform, or have performed their intended function before relying on the barrier." This requirement is sufficiently vague to permit the pre-use verification without subsequent in-use verification.
- CC05: *The failure of the RCT to adequately ensure that the operators and the FWS understood the actual levels encountered and the failure to understand what the RWP void limits were contributed to the lack of knowledge and subsequent lack of urgency during the remaining field work activities which added to the amount of*

exposure received—No corrective actions were listed for this contributing cause other than "progressive performance management." However, some corrective actions are appropriate for this contributing cause. The DOE ISM Improvement Validation team noted that the TFC has taken corrective measures for this cause and should include this information in the report (e.g., including RWP action levels in the work steps, management's expectation that the FWS not rely on the RCT to ensure compliance with the RWP, corrective actions associated with communications, command and control, and conduct of operations, etc.).

- **Determine if the corrective actions will prevent recurrence of the identified causes**

  The team reviewed the corrective actions detailed in the RCA. Although some deficiencies were identified with the corrective action plan (previously identified in this section of the report), the team determined that the corrective actions, if effectively completed, could prevent recurrence of the CR Vault event and similar events. As previously stated, the corrective action plan did not include regular management involvement in the implementation of the corrective measures. Although midpoint and endpoint assessments are planned, continuous management involvement throughout the implementation phase is critical to observe field implementation of the corrective actions, and to reinforce expectations.

- **Determine if the immediate actions taken were appropriate, effective, and ensure safe operations pending completion of the causal analysis corrective actions.**

  The immediate actions taken following the 244-CR Vault event, along with the compensatory measures developed and promulgated in management directive, MD-038, were determined to be appropriate and effective in ensuring safe operations, pending completion of the RCA corrective actions. The actions taken by the TFC were appropriately conservative, ensuring protection of the workforce.

Common Cause Analysis of Radiation Control Events

This DOE ISM Improvement Validation review also included a review of the *CH2M HILL Hanford Group Common Cause Analysis of Radiation Control Events*, dated September 30, 2004. The team reviewed the CCA to determine the effectiveness of the CCA at identifying commonalities in several events that have occurred over the past 15 months, in developing causes for the recurrence of the events, and in developing a corrective action plan to address the identified common causes to prevent their recurrence. This CCA was performed by a subcontractor to the TFC (Performance Improvement International, PII), and included two TFC team members.

The PII report that was transmitted to DOE as a CCA did not systematically identify which causes were substantially common to a majority of those events, and did not identify the analytical basis for conclusions reached other than through employee interviews. (**FINDING**) Rather, the report's conclusions were supported by quotes from employee interviews that may or may not accurately reflect the facts related to the seven identified radiological events. Since the PII report is not considered a CAA, the TFC should take appropriate action to correct the record with DOE. (**FINDING**) The following specific actions are expected:

- Correct the record (TFC letter to DOE forwarding the PII report) to specifically state what the PII report represents.
- Prompt completion of the planned, more rigorous CCA, and transmit it to DOE.

The CCA identified the common cause of the failures of the radiological events as:

a. Ineffective management control of performance,

b. Management actions to prioritize production outcomes above safety and quality, and

c. Lack of emphasis on "changing the people" as a part of a strategic change management effort.

This characterization does not relate directly to the ISMS elements at issue including improper work planning and hazard identification, work done outside the established work package controls, and a breakdown in the feedback and improvement process.

Another deficiency in the PII analysis was that it did not identify as a common cause, communication problems/failures between the RCTs and the work crews that contributed to the events.

During this DOE ISM Improvement Validation review, both the DOE team and the TFC determined that the PII report, previously submitted to DOE, was inadequate. As a result, the TFC immediately chartered a trained and experienced TFC team to perform a separate, more rigorous CCA and report the results of this CCA to TFC management and DOE in November 2004. DOE will review the CCA once it is completed and submitted by the TFC. However, the TFC should correct the record on what the PII report represents relative to an effective common cause analysis. This team will also review the TFC CCA when it is completed, and issue a supplement to this report.

The team conducted a general review of the PERs, occurrence reports, and event investigation team reports and causal analyses of the six radiological events identified in the DOE letter from R.J. Schepens, ORP Manager, to E. S.Aromi, TFC President, dated August 24, 2004. The team noted that an adequate causal analysis was not conducted for all of the events. Therefore, it would be prudent for the TFC to ensure that the causal factors are adequately identified for each event when conducting the common cause analysis.

Occurrence Reporting Process

The DOE occurrence reporting process was determined to be implemented as evidenced by interviews with DOE and TFC personnel, and document reviews. One previously identified deficiency exists regarding the DOE M 231.1-2 requirement for the TFC to conduct periodic performance analyses of events to identify trends and to report the results of these analyses to DOE. During this review, the TFC was conducting the first of these analyses and, in parallel, developing procedures to implement this DOE Manual requirement. Reviews of several occurrence reports, the most recent TFC management assessment of occurrence reporting, and interviews with the DOE-ORP occurrence reporting program manager revealed no other deficiencies.

Issues Management Program

Interviews and our review of PER system reports indicated a negative trend in the average time to closure for ESTARS actions associated with PERs. The cycle time for PER closure has increased from 91 days in March 2004 to 120 days in September 2004. The TFC indicated that this trend could be due to several factors including:

- High number of PERS that were entered into the system during this time (more than 1000 per month) likely due to the number of assessments performed on the TFC during this period,
- Change in criteria for dealing with PERs relating to illnesses and injuries,
- High number of PERs resulting from a 2004 review of drawing discrepancies in the field.
- Deferral of Track Until Fix (TUF) items, such as, housekeeping and minor maintenance items during the period in which work must be performed on supplied air.

The March 2005 ISM Improvement Validation review will evaluate whether the cycle time for PER closure has improved, as well as, whether corrective actions have been implemented to prevent recurrence of problems in the field.

Lessons Learned

From the interviews, the team concluded that Feedback and Improvement mechanisms need to be improved to assure that lessons learned are provided to those who plan and conduct the work in a manner that is timely, concise and user friendly. Specifically, work planners need prompt and easy access to lessons learned for similar jobs.

Interviews indicated that some find it very work intensive and time consuming to get lessons learned data out of the system. However, the resource page on the web site is a positive improvement that is now starting to be used by work planners. The overarching goal should be to provide lessons learned for similar jobs to those planning and conducting the work without the necessity for them to sort through the entirety of the lessons learned that populate the database.

A January 2004 TFC assessment of the lessons learned program also concluded that no formal process exists for incorporating lessons learned into future training courses. This assessment also noted that performance metrics for the lessons learned program are not generated monthly as committed to in past corrective actions.

During the March 2005 review, the team will assess the lessons learned program, evaluating the effectiveness of the program in enabling timely changes to work processes based on lessons learned.

Critiques and Investigations

The TFC process for the conduct of critiques and investigations was reviewed and revealed no deficiencies. Interviews and document reviews revealed that critiques and investigations are appropriately conducted for incidents, including near misses that result, or could result, in occupational injury, illness or death. Critique and investigation reports reviewed were determined to be adequate.

During the course of review of the 244-CR Vault Root Cause Analysis, the team determined that the critique performed following the event was inadequate. Interviews with personnel present at the critique identified the following specific deficiencies:

- An excessive number of personnel attended the critique (estimated to be 60).
- An accurate timeline was not developed.
- One individual dominated the discussion (an FWS).
- Personal statements were not obtained prior to the critique.
- The critique leader did not drive the gathering of relevant facts.
- The critique was too narrowly focused on one part of the entire event.
- Senior managers present at the critique did not enforce their expectations for critique conduct.

A review of the PER database, and interviews with the RCA team indicate that the inadequacies identified in the critique of the CR Vault event were not formally identified, nor were corrective actions taken as a result of the inadequate critique. **(FINDING)** Discussions with DOE Facility Representatives indicate that inadequate critiques, such as the CR Vault critique, are a recurring issue.

Other Management Programs (Competence commensurate with responsibility)

The team observed that many supervisors and hourly workers appeared to be weak in the practical application of radiological controls associated with ionizing radiation. Additionally, hourly workers appeared to lack some fundamentals knowledge regarding ionizing radiation hazards and limitations. In this regard radiation hazards were not considered by many supervisors or hourly workers to be dominant hazards. In addition, work practices such as hand contact of high beta – gamma dose materials reinforced the need to improve in this area. Additionally, some first line supervisors were unable to clearly articulate Conduct of Operations and ISMS attributes. **(FINDING)**

7.0 WORK CREW AND FIRST LINE SUPERVISOR INTERVIEW ASSESSMENT

Team members interviewed over 125 TFC personnel. These personnel included bargaining unit workers, first line managers, and managers throughout the line organization. A set of lines of inquiry was developed to provide some consistency in each of the interviews and to assure that questioning addressed such things as recent incidents, compensatory measures and corrective actions, worker involvement in planning, stop work authority, and salient elements of conduct of operations. Interviews were in a closed-door office setting. Some interviews were conducted in a group setting, while others were individual interviews. This assessment focused on interviewee input that the Team considered was relevant to this validation effort, represented the norm of interviewees rather than isolated extremes, and was considered by consensus to represent a correct and valid statement of the input. Interviewee input meeting the above criteria is delineated below.

- Supervisors and hourly workers were found to be generally smart, willing to change, and concerned about future job security.
- Supervisors appeared to be "results oriented" with a self-motivated desire to get work done. In this regard they expressed some frustration with delays in work planning and package development due to resource limitations, excessive PPE for situations that they do not believe pose real hazards, and maintaining stop work conditions for excessive periods of time to fully resolve some raised issues when there is believed to be no imminent hazard. Some hourly workers shared similar frustrations.
- In some cases, hourly workers indicated that their input into work planning was not reflected in the final work plan and was sometimes ignored. Also, review of correspondence between hourly workers and middle managers indicated real or perceived conduct of operations, management, and safety issues that were not believed to be properly attended to by first line supervisors and other middle managers.
- Supervisors and hourly workers demonstrated understanding of MD-038 compensatory measures. One exception is that they did not appear to recognize that stopping work can be of short duration and resolution can be real time. The hourly workers perceived the MD-038 solution to be overly reactive and too prescriptive to enable effective work performance. The Team considers that achievement of full buy-in and recognition that these new measures can enable rather than hinder work performance will require continued mentoring as well as gaining experience with the new packages and action levels during continuing work performance.

- Supervisors and hourly workers appeared to be weak in the practical application of radiological controls associated with ionizing radiation. Additionally, hourly workers appeared to lack some fundamentals knowledge regarding ionizing radiation hazards and limitations. In this regard radiation hazards were not considered by many supervisors or hourly workers to be dominant hazards and hand contact with high dose materials was considered acceptable.
- Supervisors demonstrated an understanding of the fundamentals of Conduct of Operations; however some could not clearly articulate attributes of ISM or Conduct of Operations. Hourly workers demonstrated an understanding of those Conduct of Operations fundamentals embodied within MD-038, but not those outside of MD-038.
- Supervisors and hourly workers indicated they rarely saw management above the first line supervisor in the field observing work. They also questioned what value management could add by being there.
- Hourly workers expressed a perception that, with the exception of first line supervisors, management doesn't care about them and they in turn generally distrust management.
- Most hourly workers indicated that they do not believe they are adequately involved in work planning. An exception is with the Fluor Federal Services construction crews and the 222-S Laboratory staff. In these exception cases there also appeared to be good teamwork. In some cases workers indicated that their inputs into planning were ignored.
- During observations of pre-job briefings (with one exception discussed in Section 4.2), hourly workers were observed to be on time for the briefings and attentive. This is an improvement over what some team members observed two years ago during previous ISM reviews.

Interviews with some senior and middle managers yielded observations that were also relevant to this particular assessment.

- Managers were observed to be smart, experienced, and self-motivated and expressed a good partnering relationship with DOE.
- Managers were also observed to be willing to change. While the team notes that there has been improvement in self generated proactive change over the past two years (PERs, Corrective Action Review Board, Independent Assessment Function, and the most recent CR Vault causal analysis), the team considers that change is still too often reactive and driven by external pressure.
- Managers understood MD-038 compensatory measures. However, they were unable to communicate a unified message of specific expectations, significance of the collective incidents subject to this review, or needed changes to assure safe and effective work performance.

In assessing these interview results, the team considers that managers, above the first line supervisory level, are rarely seen at the worksite by the workforce. Consequently, they are unable to manage the perceptions of the work force and are unable to function as effective change agents. In this regard, the team believes that managers at all levels should spend significantly more time with the work force observing planning and actual performance of work with the goal to understand and remove barriers to safe and effective work performance and coach and mentor specific management expectations. The team observed that management expectations regarding major issues, their significance, and required changes for timely resolution were not consistent and were not conveyed via a simple single unified message of "what needs to change and why." The team considers that such a message should emanate from the TFC President through the line managers and supervisors to the workforce.

The team considers that achievement of full acceptance of the MD-038 compensatory measures and recognition that these new measures can enable rather than hinder work performance will require continued mentoring, as well as, gaining experience with the new packages and action levels during future work performance.

While the team observed first line supervisors effectively engaged in work planning, worker involvement appears to be less than optimal. The TFC should examine those Hanford examples cited as effective as well as changes recently implemented at affiliate sites to better understand how to improve in this area.

The team considers that the TFC should continue to improve their ability to find and fix their own problems and move more from reactive to proactive issue resolution.

8.0 ANALYSIS OF ASSESSMENT RESULTS AGAINST DESIGNATED CRITERIA

Page 55 of 82 of D6696263

8.1 Work Planning

Criterion	Met	Partially Met	Not Met	Discussion
The Corrective Action Plan is supported by appropriate causal analyses.	✔			Section 6.7.
The Corrective Action Plan is supported by appropriate common cause analyses.			✔	Section 6.7. Common Cause analysis determined to be inadequate, being redone by the TFC to be completed in November 2004
The Corrective Action Plan has effective corrective actions.		✔		Section 6.7. Some deficiencies were identified in the corrective actions for the Root Cause Analysis.
The causal analyses appropriately identify ISM weaknesses and the corrective actions appropriately address those weaknesses.		✔		Section 6.7. Some deficiencies were identified in the corrective actions for the Root Cause Analysis.
The progress of corrective action implementation for Work Planning is adequate.		✔		The team noted that the corrective action to change the ALARA Planning Procedure to elevate the review and decision on when to use mock-ups for high risk work to the Director level was not accomplished by October 15, 2004. A working draft was available, but publication is scheduled for November 13, 2004.
The Compensatory measures for Work Planning are adequate, implemented and effective.		✔		Further review required. This is a major focus for the March 2005 post-implementation review.

Criterion	Met	Partially Met	Not Met	Discussion
Program reviews, observations, and interviews demonstrate that the implemented work control process is adequately described by TFC-OPS-MAINT-C-01, Revision F, *Tank Farm Contractor Work Control.*		✓		Further review required. This is a major focus for the March 2005 post-implementation review.
Worker involvement in work planning is required and is observed to occur.		✓		While the Team observed first line supervisors effectively engaged in work planning, worker involvement appears to be less than effective.
Program reviews, observations, and interviews demonstrate that RWPs, JHAs, and IH Monitoring Plans are sufficient and appropriate for the work being performed.		✓		A review of a number of JHAs currently going through the planning process indicates that they have not yet met the expectations for a job specific and step-by-step analysis of the hazards associated with each step and the specific control needed at that point in the work. It should be noted though, that the work instructions are now showing more detail of work steps and specific hazard controls imbedded into that step.

Page 57 of 82 of D6696263

Concurrence or Non-concurrence with Corrective Actions and Associated Findings

The review team concurs with corrective actions identified in the 244-CR Vault event root cause analysis. However, some deficiencies were identified in the area of work planning.

Finding 1: Worker involvement in work planning appears to be less than optimal.

Finding 2: Job Hazard Analyses reviewed do not provide a job specific, work step analysis of hazards.

8.2 Conduct of Operations

Criterion	Met	Partially Met	Not Met	Discussion
The Corrective Action Plan is supported by appropriate causal analyses.	✓			Section 6.7.
The Corrective Action Plan is supported by appropriate common cause analyses.			✓	Section 6.7. Common Cause analysis determined to be inadequate, being redone by the TFC to be completed in November 2004
The Corrective Action Plan has effective corrective actions.		✓		Section 6.7. Some deficiencies were identified in the corrective actions for the Root Cause Analysis.
The causal analyses appropriately identify ISM weaknesses and the corrective actions appropriately address those weaknesses.		✓		Section 6.7. Some deficiencies were identified in the corrective actions for the Root Cause Analysis.

Page 59 of 82 of D6696263

Criterion	Met	Partially Met	Not Met	Discussion
The progress of corrective action implementation for Conduct of Operations is adequate.		✓		Of the 34 corrective actions for the 244-CR vault thermocouple removal event, contained in Attachment J of the TFC Causal Analysis Report dated July 22, 2004, six corrective actions were due to be completed by the time of this review (two were due in September and four were due earlier in October). The team reviewed the current progress on completion of the action items and determined that four of the six due to this point had been completed based upon the due dates in the actual corrective action plan (vice the adjusted due dates being tracked in PERS for some actions).
The Compensatory measures for Conduct of Operations are adequate, implemented and effective.		✓		See Section 5.4. Further review required. This is a major focus for the March 2005 post-implementation review
Program reviews, observations, and interviews show that a procedure usage and compliance policy exists and is implemented. Personnel demonstrate an understanding of the procedure compliance policy.		✓		Further review required. This is a major focus for the March 2005 post-implementation review
Observations show that the use of procedures, work packages, JHAs, RWPs, IH Monitoring Plans and other documents is appropriate and adequate for safe performance of work.		✓		See section 5.7. Further review required. This is a major focus for the March 2005 post-implementation review

Criterion	Met	Partially Met	Not Met	Discussion
Program reviews show that the conduct of operations program is consistent with the DOE approved Conduct of Operations Applicability Matrix.	✓			The conduct of operations program is consistent with the ORP-approved Conduct of Operations Applicability Matrix included as Attachment A in the *Conduct of Operations Implementation Plan*, TFC-PLN-05, Rev B-8. The Matrix specifies the contractor's implementing policy documents and procedures as well as specifying the scope of applicability and any deviations for the Chapters in DOE Order 5480.19, *Conduct of Operations*.
Observations, program reviews, and interviews show that if work packages or procedures can not be performed as written, work is suspended and the documents are appropriately changed, reviewed, and approved prior to continuing work.		✓		Further review required. This is a major focus for the March 2005 post-implementation review.
During the work planning or execution process personnel demonstrate the ability to recognize changing and/or unknown conditions and appropriately suspend work activities until they are appropriately dealt with.		✓		Further review required. This is a major focus for the March 2005 post-implementation review.

Concurrence or Non-concurrence with Corrective Actions and Associated Findings

The review team concurs with corrective actions identified in the 244-CR Vault event root cause analysis.

8.3 Relevant Management Programs Including Feedback and Improvement

Criterion	Met	Partially Met	Not Met	Discussion
The Corrective Action Plan is supported by appropriate causal analyses.	✔			Section 6.7.
The Corrective Action Plan is supported by appropriate common cause analyses.			✔	Section 6.7. Common Cause analysis determined to be inadequate, being redone by the TFC to be completed in November 2004.
The Corrective Action Plan has effective corrective actions.		✔		Section 6.7. Some deficiencies were identified in the corrective actions for the Root Cause Analysis.
The causal analyses appropriately identify ISM weaknesses and the corrective actions appropriately address those weaknesses.		✔		Section 6.7. Some deficiencies were identified in the corrective actions for the Root Cause Analysis.

Criterion	Met	Partially Met	Not Met	Discussion
The progress of corrective action implementation for Feedback and Improvement is adequate.		✓		Of the 34 corrective actions for the 244-CR vault thermocouple removal event, contained in Attachment J of the TFC Causal Analysis Report dated July 22, 2004, six corrective actions were due to be completed by the time of this review (two were due in September and four were due earlier in October). The team reviewed the current progress on completion of the action items and determined that four of the six due to this point had been completed based upon the due dates in the actual corrective action plan (vice the adjusted due dates being tracked in PERS for some actions).
The Compensatory measures for Feedback and Improvement are adequate, implemented and effective.		✓		Further review required. This is a major focus for the March 2005 post-implementation review

Criterion	Met	Partially Met	Not Met	Discussion
Program reviews show that procedures and/or mechanisms are in place that define clear roles and responsibilities within the facility to ensure that safety is maintained at all levels.		✔		The team believes the TFC has partially met the this criteria due to the need to verify all the recent and pending organizational changes are properly documented, implemented and all central program staffs are in place. In addition, the TFC should clarify how technical support personnel interact with the central program staffs to resolve technical issues effecting safety of the work. Further review required. This is a major focus for the March 2005 post-implementation review
Program reviews show that the occurrence reporting process as required by DOE is fully implemented.		✔		Section 6.7. Previously identified deficiency in quarterly trend reporting.
Program reviews show that the site issues management program is effective in developing corrective action plans, where appropriate, and that management aggressively pursues timely completion of these action items.		✔		Section 6.7. Based on review of the PER system there has been a trend toward an increasing time to closure for PER Corrective Actions.

Criterion	Met	Partially Met	Not Met	Discussion
Program reviews and interviews show that critiques and investigations are conducted for incidents, including near misses that result, or could result, in occupational injury, illness or death. (Investigation reports identify causes, findings, track hazards to correction, and identify any preventive or corrective actions to eliminate the recurrence of the incident.)	✓			Section 6.7. Critique conduct needs improvement.
Program reviews and interviews show that the Lessons Learned program is effective.		✓		Section 6.7. Existing program needs to be streamlined to facilitate effective use by planners.

Concurrence or Non-concurrence with Corrective Actions and Associated Findings

The team concurs with corrective actions identified in the 244-CR Vault event root cause analysis. However, some deficiencies were identified in the areas of line management responsibility for safety, root cause analysis, and management programs, including feedback and improvement.

Finding 3: Management expectations regarding major issues, their significance, and required change for resolution were not consistent and were not communicated via a single, simple unified message for "what needs to change and why."

Finding 4: Some deficiencies were identified with the corrective actions detailed in the 244-CR Vault event root cause analysis.

Finding 5: The radiological event common cause analysis report transmitted to DOE on September 30, 2004, did not systematically identify which causes were substantially common to a majority of those events, and did not identify the analytical basis for conclusions reached other than through employee interviews.

Finding 6: The TFC has not corrected the record (formal correspondence) regarding the submission of a radiological event common cause analysis.

Page 65 of 82 of D6696263

Finding 7: Inadequacies identified in the critique of the CR Vault event were not formally identified, nor were corrective actions taken as a result of the poor critique.

Finding 8: First line supervisors and their work crews demonstrated weaknesses in level of knowledge in the areas of practical application of radiological controls for ionizing radiation (including fundamentals and limitations); first line supervisors were unable to clearly articulate Conduct of Operations and ISMS attributes.

9.0 REVIEW TEAM CONCLUSIONS

The team considers that the TFC has identified required improvements in ISM and that the TFC's current path forward can be successful. However, significant management team in-field presence and involvement and worker buy-in will be necessary to achieve improvement objectives.

10.0 REFERENCES

1. DOE Policy P 450.4, *Safety Management System Policy*, U.S. Department of Energy, October 15, 1996.
2. DOE G 450.4-1B, *Integrated Safety Management System Guide*. U.S. Department of Energy, March 1, 2001.
3. DOE O 425.1C, *Startup and Restart of Nuclear Facilities*. U.S. Department of Energy, March 13, 2003.
4. 48 CFR Chapter 9, *Department of Energy*, 970.5223-1, *Integration of Environment, Safety, and Health into Work Planning and Execution*. Federal Acquisition Regulations System.
5. 48 CFR Chapter 9, *Department of Energy*, 970.5204-2, *Laws, Regulations, and DOE Directives*. Federal Acquisition Regulations System.
6. 10 CFR 830, *Nuclear Safety Management*, Subpart A, *Quality Assurance*. Department of Energy.
7. 10 CFR 830, *Nuclear Safety Management*, Subpart B, *Safety Basis Requirements*. Department of Energy.

Appendix A - Team Member Biographies

Frank McCoy: Mr. McCoy has over thirty-five years of experience in the operation, regulation, and management of U.S. DOE, commercial and naval nuclear facilities including power and production reactors, chemical processing facilities, and laboratories. This experience has included management and senior executive positions with DOE, Department of Navy, and the U.S. Nuclear Regulatory Commission (NRC), as well as private sector companies. Currently Mr. McCoy is a Principal with Washington Safety Management Solutions (WSMS) where he is responsible for managing all WSMS services for closure projects. As a WSMS Principal Mr. McCoy has also personally supported many sites in the both the DOE and DoD including: supporting West Valley Nuclear Services Company on deactivation, decontamination and decommissioning activities; supporting the Yucca Mountain Project with ISM development and implementation; supporting Savannah River Site in accident investigations and senior safety reviews; providing nuclear facility management, operational readiness, and ISM consulting services to Bechtel at the Nevada Test Site and Hanford Waste Treatment Plant Project; supporting Oak Ridge National Laboratory in the Operational Readiness Review of the High Flux Isotope Reactor; providing Integrated Safety Management and Quality Assurance assessment services to Rocky Flats Environmental Technology Site and Brookhaven National Laboratory, and providing management support to the Army Chemical Demilitarization facilities at Tooele, Umatilla, and Anniston. Prior to retiring from government service and joining WSMS, Mr. McCoy was a Senior Executive within DOE where his last assignment was serving as Deputy Manager at the Savannah River Site (SRS). In this capacity he served as Chief Operating Officer for SRS nuclear operations. In 1996 and 1997, he served as a Special Assistant to the Under Secretary of Energy where he led the DOE's efforts to establish and implement an Integrated Safety Management System across the DOE complex. Prior to joining DOE, Mr. McCoy was as a manager in NRC where his last assignment was as Assistant Director for Inspection Programs. In this capacity, he was responsible to the NRC's Office of Special Projects for inspection and assessment activities associated with recovery of the five TVA licensed reactors following prolonged shutdown as "watch-listed" problem utilities. While in NRC, his activities also involved leading and/or participating in the Operational Readiness Reviews for NRC operating license approval of the Vogtle, Sheron Harris, and Catawba nuclear units. He also performed numerous onsite response inspections of reactor unusual events, routine assessments of licensed operator training, maintenance, and operations programs and participated in Safety System Functional Inspections and Augmented Inspection Team Inspections. During nearly 15 years with the Department of Navy, Mr. McCoy was a Chief Refueling Engineer, Project Manager, and Physicist at the Charleston Naval Shipyard. Mr. McCoy holds a Masters degree in Physics from Georgia Tech and Bachelor of Science degree from The Citadel.

Joseph Arango: Mr. Arango has sixteen years of experience in various engineering disciplines supporting the development and implementation of program plans for the Department of Energy and the Department of Defense. He holds a Masters degree in Industrial and Systems Engineering from Virginia Tech and a B.S. in Mathematics from the U.S. Naval Academy. Mr. Arango currently works in the DOE EM Headquarters Office of Integrated Safety Management/Operations Oversight. He has led a number of reviews conducted consistent with the Department's line oversight policy, and he has been designated as an Integrated Safety Management System Verification Team Leader. He was the DOE Operational Readiness Review (ORR) Team Leader for the Supernate Process of the TRU/Alpha Low Level Waste Treatment Project startup at Oak Ridge in January 2004. He completed the DOE Operational Readiness Review Training Course for ORR Team Leaders and Team Members in November 2002. From 1995 to 2001, he worked in the Office of the Departmental Representative to the Defense Nuclear Facilities Safety Board on a variety of safety issues identified by the Board including integrated safety management. Mr. Arango also served for two years as the Headquarters Program Manager for the Facility Representative Program guiding Department-wide program implementation and continuous improvement. From 1988 to 1995, as an Acquisition and Engineering Manager in private industry, he provided program management and engineering support for a Navy combat system design and development contract. Prior to 1988, he gained seven years of experience in the Navy nuclear power program where he qualified in submarines and as a Nuclear Engineering Officer and a Nuclear Weapons Handling Supervisor. He participated in Integrated Safety Management System Phase I and II Verifications at Rocky Flats and at the Oak Ridge Y-12 Plant in 1998, as well as a preliminary Phase I Verification at Lawrence Livermore National Laboratory's Building 332. He was the Idaho National Engineering and Environmental Laboratory Verification Team Leader for both the Phase I and the initial Phase II Verification in 1999. He was a sub-team leader for the August 2000 Verification at the Y-12 Plant and he led an Integrated Safety Management System Assessment for the Y-12 Area Office in 2001 and for the Idaho Operations Office in 2002.

Terry E. Krietz: Mr. Krietz is the worker safety and health subject matter expert for the Office of Engineering on detail to the Chief Safety Officer position for the Office of Environmental Management. He has 25 years experience in safety management of highly hazardous operations. Eleven of those years were spent developing DOE-wide worker safety and health policy and providing technical assistance to the DOE field elements. He earned Bachelor of Science degrees in biology and geo-environmental studies at Shippensburg University.

Before coming to DOE, Mr. Krietz served as Safety Director at the Sierra Army Depot and the Senior Safety Manager for the U.S. Army Depot System Command. He completed the U.S. Army Materiel Command Safety Management Intern Program and technical training in the chemical, explosives, nuclear, and radiological areas. Mr. Krietz has served as lead, co-lead, or participant on over 40 comprehensive safety and health program evaluations of U.S. Army Depot System Command installations. He has also been accident investigation board chairman for fatality investigations at Anniston and Tobyhanna Army Depots. He

has been the lead, co-lead, or participant on pre-operational surveys of toxic chemical weapon operations at Anniston, Blue-Grass, Pueblo, Tooele, and Umatilla Army Depots, and has been the lead for Army safety and health inspections of industrial, explosives and construction operations at U.S. Army Depots. With DOE, he has served as an evaluator for the DOE Voluntary Protection Program evaluations at Savannah River and INEEL and has been an evaluator for DOE EH/EM reviews of site safety and health programs. Terry has participated in ISMS reviews and re-verifications at the DOE Office of River Protection, CH2MHill Hanford Group Tank Farm and Bechtel National Waste Treatment Plant at Hanford, the Oak Ridge Operations Office/Bechtel-Jacobs ETTP; and the DOE Savannah River Oversight Review of Westinghouse Savannah River Company ISMS review.

Bill Lloyd: Mr. Lloyd brings over 20 year of experience in the operation of nuclear facilities. He is degreed in Chemical Engineering from Illinois Institute of Technology. Mr. Lloyd began his career as an operator in the nuclear power industry. This experience includes initial startup of both Boiling Water Reactor (GE) and Pressurized Water Reactor (W) operations. In addition to qualification as a nuclear operator, he also qualified as a radiation- chemistry technician. These positions allowed Mr. Lloyd to become intimately familiar with all facets of power plant operation. These include reactor power operations, radwaste operations, health physics, radiation safety and reactor and secondary water chemistry.

Mr. Lloyd has also worked in the Nuclear Weapons Complex. He has extensive experience in Nuclear Materials processing. Mr. Lloyd was integral to implementing the restart (after a six-year shutdown) and continuous safe operation of this plutonium manufacturing, stabilization, packaging and storage facilities. These facilities converted Plutonium nitrate solution into a Plutonium Metal product. This product is then processed into a weapon useable form. In this capacity, Mr. Lloyd had fully authority and accountability for all operations and for all materials. Mr. Lloyd also has extensive experience in the area of Material Protection Control and Accountability (MPCA) as well as Safeguards and Security (S&S).

Mr. Lloyd has demonstrated a keen sense of scheduling, planning, budget management, Authorization Basis management and the effects of plutonium, highly enriched uranium, americium and other special nuclear material. He has a proven ability to get things safely done within budget caps and with imagination, leadership and intelligence.

Mr. Lloyd has also acted as a Senior Advisor in the area of operations at Los Alamos National Laboratory. In the capacity, he advised the Associate Director for Weapons Engineering and Manufacturing (ADWEM) in the area of operations improvement. These duties included the areas of Plutonium processing and Tritium processing for weapons development and life extension issues.

John R. Longenecker: Mr. Longenecker has over 30 years experience in the energy industry in the areas of independent assessment, project management and regulatory compliance in various programs including waste management, nuclear reactor development,

and advanced technology development and deployment. Unique strengths and experience include independent assessment, strategic planning, regulatory compliance, nuclear safety, and quality assurance.

Mr. Longenecker's energy related experience includes performing strategic planning, technical and management assessments of nuclear fuel cycle projects and facilities including the Hanford site, Yucca Mountain High Level Waste Project, the Idaho Spent Fuel Project, and the Tank Waste Remediation System Project (TWRS). In 2000, Mr. Longenecker and several Longenecker & Associates staff served as members of a DOE review of the TWRS project that was mandated by Congress. Mr. Longenecker also serves as Managing Director and Working Group Coordinator of the DOE's Energy Facilities Contractors Operating Group (EFCOG).

Mr. Longenecker experience with DOE programs includes serving on review and advisory panels at Los Alamos National Laboratory, Lawrence Livermore National Laboratory, the Yucca Mountain Project, Fluor Hanford and the Office of River Protection, and performing quality assurance management assessments from 1990-2002 for DOE's Office of Civilian Radioactive Waste Management, including the Yucca Mountain High Level Waste Project, Mr. Longenecker was appointed by President Bush in December 1992 to serve as Transition Manager for the United States Enrichment Corporation, a government owned, for-profit corporation that provides uranium enrichment services to electric utilities throughout the world.

In the area of commercial nuclear power, Mr. Longenecker has served as a member of the Board of Directors of the Nuclear Energy Institute. In addition, from 1997-1999 Mr. Longenecker assisted Ontario Hydro Nuclear in developing and implementing a more effective regulatory compliance strategy for their 20 nuclear power plants.

Prior to the formation of Longenecker & Associates in May 1989, Mr. Longenecker was Chairman of General Atomics International Services Corporation (ISC) in La Jolla, California. ISC provided operational and quality support services to electric utilities and other private sector customers throughout the world. Mr. Longenecker joined General Atomics as Director of Special Projects in August 1987.

From 1983 to 1987 Mr. Longenecker served in the Reagan administration as the Deputy Assistant Secretary for Uranium Enrichment in the U.S. Department of Energy. Prior to managing the U.S. uranium enrichment enterprise, Mr. Longenecker held other management positions in DOE and its predecessor agencies, including serving from 1981 to 1983 as the Program Manager for the CRBRP Project. In this position, Mr. Longenecker was the primary interface with the NRC during the project licensing process.

Mr. Longenecker has appeared before the Congress of the United States on numerous occasions, and has presented papers in various national and international forums. Mr. Longenecker is a member of board of directors of the Nuclear Energy Institute, and has served as chairman of the USCEA Uranium Enrichment Task Force. Mr. Longenecker is a member

of Tau Beta Pi Honorary Engineering Society, the American Nuclear Society, and the University Club.

Mr. Longenecker received both his Bachelor of Science and Master of Science degrees, with academic honors, from the Pennsylvania State University, and has served as a member of the Penn State Industrial Professional Advisory Council.

Mark Brown: Mr. Brown has over 21 years experience with nuclear operations and providing oversight of environmental restoration activities. Mr. Brown's professional involvement included supervision of U.S. Navy nuclear reactor and steam plant operations, maintenance and overhaul, and oversight and assessment of operating Department of Energy non-reactor nuclear facilities. Mr. Brown holds a Bachelor of Science degree in Mathematics from the University of Texas.

Mr. Brown's career included over eleven years as a naval nuclear submarine officer where he qualified for and supervised the operations of 5 different naval reactor plants, with two years as the lead instructor in the operation of naval reactor and steam plants. Mr. Brown's career with the Department of Energy has included one year evaluating Hanford contractor training and qualification programs, and over 8 years as a Facility Representative for the Office of River Protection. Mr. Brown has extensive experience in conducting assessments of nuclear operations. He has been a review team member for several readiness assessments and operational readiness reviews, and a team leader for several major assessments of Hanford contractors in areas including maintenance, construction, training and operations. Mr. Brown is an NQA-1 certified lead auditor.

Gregg C. Doss: Mr. Doss has been employed at the Hanford Site for 11 years as a Senior Health Physics Technician. For the last 3 years he has also been appointed as a Union Safety Representative for Hanford Atomic Metals Trade Council (HAMTC.) in Waste Feed Operations. As a HAMTC Safety Representative, Mr. Doss received training in Principles of Accident Investigation, Operations Managers' Safety Training, Audit Training, OSHA Record Keeping Rule Training, and Event Investigations and Root Cause Analysis Training. He is currently pursing a Health and Safety Certification from the Region X OSHA Training Institute.

His functions as a HAMTC Safety Representative include:

- Assisting DOE and contractors in resolving HAMTC employee concerns related to health and safety
- Working with Labor Relations, the Employee Concerns Program, and the Employee Response Team to resolve work place issues
- Serving as the point of contact for *Stop Work, Work Pause,* fact findings, event investigations or other activities where HAMTC employees are involved
- Participating in management staff meetings to aid in resolving health and safety issues

- Participating and seeking worker involvement in the health and safety programs, such as Safety Councils, Integrated Safety Management, VPP, and the Safety EXPO.

Prior to coming to the Hanford Site, Mr. Doss served six years and was honorably discharged from the U.S. ARMY National Guard Reserve, holding the position of Tank Commander/Asst. Platoon leader Grade E-6. While in the Army, he completed the Non Commissioned Officer's School, advanced training in primary leadership development, and trainer instructor courses. Mr. Doss attended Columbia Basin College where he earned an Associate Degree in Nuclear Technology. He also earned a 22-month certification in welding technologies from the Job Corps Conservation Center.

Susan Coleman: Ms. Coleman has over 25 years experience in the areas of program/project management, security, and document production, as evidence during assignments with the U.S. Department of Energy Hanford Site and U.S. Navy/Naval Reserve (CTACS, Retired). Ms. Coleman has a Bachelor of Science degree in Business Administration (with a Labor Relations concentration) from Bowie State University. Due to knowledge and/or extensive experience in numerous areas of the DOE Office of River Protection mission, Ms. Coleman currently supports the Manager's Office and senior management team in various capacities, such as, developing technical reports and documents, and facilitating closure of a wide range of technical activities; as an experienced technical expert in the area of Security she supports the ORP Security Point of Contact in the oversight of the DOE program and prime contractors, CH2M HILL Hanford Group, Inc. responsible for the Hanford Site tank farms, and Bechtel National, Inc. responsible for the design, construction and commissioning of a vitrification plant. She is an advisor to the DOE Federal Technical Capability Panel Chairman and Panel, which is responsible for overseeing, developing, implementing, and/or resolving issues related to recruiting, developing, and retaining technical capability within DOE. In 1999, Ms. Coleman participated on a team to successfully place a contract valued at $6.5 billion to develop a Waste Treatment Complex and the team negotiating an extension of the current Tank Farms contract. From 1986 to 1999, Ms Coleman supported the organization responsible for integrating activities between DOE and the two prime contractors, CH2M HILL and BNFL, Inc., and the $9M Single-Shell Tank Program, responsible for the technical activities for waste retrieval, technology demonstration, tank farm closure, tank leak contamination studies and corrective measures including reviewing authorization basis documents and developing evaluation reports; necessary to continue safe operation of the Hanford Site Tank Farms. From 1995 to 1996, Ms. Coleman supported the team responsible for developing the initial Request for Proposals (RFP) provided to commercial industry to build the nations largest vitrification facility to treat nuclear waste. From 1994 to 1995, Ms. Coleman coordinated the DOE Standards/Requirements Identification Document (S/RID) project, which developed a comprehensive document that included the environmental, health and safety requirements necessary to manage the Hanford Site. During 1993, Ms. Coleman was Project Lead of a group responsible for identifying historical information relevant to the "Downwinders" class-action lawsuits; which charged deleterious health effects to people in the Hanford vicinity during the period 1944 to 1947

From 1977 to 1997, Ms. Coleman was a Crytologic Technician Administrative, Senior Chief Petty Officer (Retired) with the U. S. Naval Security Group (1977-1986) and U.S. Naval Reserve Security Group (1986-1997). She was responsible for administrative, personnel, training, procurement, and security (physical, information, personnel) areas of the organization. In 1994, she was the Senior Enlisted Advisor for the Pacific Northwest region responsible for personnel/organizational issues associated with personnel in the States of Washington, Idaho, and Oregon. Due to her experience in the area of Security, Ms. Coleman developed a Naval Reserve Security Group Program manual governing information/personnel security and records management programs guidance for security professionals. Also during late 1993 to early 1994, she returned to active duty temporarily to manage the ~2000 person nationwide U.S. Naval Reserve Security Group Program, and during 1989, she returned to active-duty to prepare a comprehensive site *Emergency Action Plan* that identified the physical security/counter-terrorism needs and plans (submitted to the United States Congress) for an active site in Germany. In recognition of her efforts she has received numerous commendations for superior performance.

Appendix B - List of Interviewee Positions

WORKERS (21)
Nuclear Chemical Operator (11)
Construction Craft (10)

SUPERVISORS (20)
FWS (20)

TECHNICIANS (26)
RCT (9)
IH Technicians (5)
QA Inspector (1)
Planners (8)
Instrument Technicians (3)

ENGINEERS AND MANAGERS (36)
Waste Feed Operations Facility Operations Director
Waste Feed Operations Shift Operations Director
Closure Project Facilities Director
Closure Project Radiological Control Director
Closure Support Technical Specialist
Closure Project Facilities Manager
Laboratory Facilities Director
ATS Radiological Control Director
222-S Laboratory Analytical Services Manager
Corrective Action Program Manager
Training and Procedures Manager
Executive Assistant to the President
Waste Feed Operations IH
SSW (10)
Shift Operations Managers (3)
Waste Feed Operations Radiological Control Director
Director, Safety and Health
Director, Work Planning
Manager, Employee Concerns
Senior Director, Safety Programs
Manager, Closure Project IH
Director, Environmental Health
Occupational Safety Specialist (2)
Waste Feed Operations Conduct of Operations Compliance Officer

SENIOR MANAGEMENT (7)
President and General Manager
Senior Vice President, Nuclear Operations
Vice President, Waste Feed Operations
Vice President, Closure Operations
Vice President, Analytical Technical Services
Vice President, Performance Assurance
Vice President, Project Delivery

DOE FACILITY REPRESENTATIVES AND DOE MANAGEMENT (5)
Facility Representatives (4)
Acting Assistant Manager, Tank Farms Project

Appendix C - Documents Reviewed

1. Action Tracking Status Report for PER-2004-4057, Corrective Action Plan for 244-CR Vault Thermocouple Event, dated October 27, 2004
2. Assessment Report FY-2004-CH3M-I-0126, Rev. 1, April 2004 *Independent Assessment of CH2MHILL Hanford Group, Inc., Radiological Controls ALARA Program, Radiological Work Planning, and Field Implementation of Radiological Controls*
3. Assessment FY-2004-CH2M-I-0034, Draft September, 2004, *Independent Assessment of CH2MHILL Hanford Group, Inc., Closure Project and Radiological Training*
4. ATS-MD-1015, Rev 4, Compensatory Measures for Radiological Hazard Control Performance, dated September 14, 2004
5. Briefing materials regarding Summary of Five Recent Events with Common Failure Modes to the July 22, 2004, 244-CR Vault Thermocouple Removal Event, dated August 11, 2004
6. Briefing materials on Common Cause Analysis of Recent Radiological Control Events, dated October 18, 2004
7. Causal Analysis Report for 244-CR Vault Thermocouple Removal dated September 22, 2004
8. *CH2M HILL Hanford Group Common Cause Analysis of Radiation Control Events*, Final Report September 30, 2004
9. *CH2M HILL Occurrence Reporting Management Assessment*, dated July 21, 2004
10. CH2M HILL General Delivery Message 04-302, *Meeting Free Day*, dated October 12, 2004
11. Corrective Action Plan, Attachment J from Causal Analysis Report, dated September 22, 2004
12. CP Daily Reports
13. Daily Operations Report for Plan of the Day meeting dated October 26, 2004
14. DOE EM Headquarters letter to the DNFSB dated October 22, 2004 regarding ISMS for the Hanford Tank Farms
15. DOE Facility Representative email from Courtney Blanchard, DOE-ORP, *CR Vault Procedure Vio—Similar Events*, dated September 2, 2004
16. DOE-NE-STD-1004-92, *Root Cause Analysis Guidance Document*
17. DNFSB letter to EM Headquarters dated September 8, 2004 with 60-day reporting requirement on weaknesses in the ISM System for the Tank Farms

18. Fiscal Year 2004 – Lessons Learned Program Performance Assessment, CH2M HILL report 7X500-NJM-04-013

19. Form A-6003-707, Work Package Planning Checklist, dated October 2004

20. Integrated Safety Management System Assessment for ORP Final Report dated August 2004

21. Lessons Learned Bulletins, IB-04-41, 42, and 43, 244-CR Vault Thermocouple Removal, dated October 13, 2004

22. Lessons Learned Bulletins IB-04-46 dated 10/20/04, IB-04-45 dated 10/18/04, IB-04-41 dated 10/13/04, IB-04-40 dated 10/13/04, IB-04-43, dated 10/13/04, IB-04-42, dated 10/13/04*The Causal Analysis Report, 244-CR Vault Thermocouple Removal; Extremity Administrative Control Level Exceeded*, dated September 22, 2004

23. Significant PER-2004-2900 on Work Planning Assessment Results

24. TFC-ESHQ-Q_ADM-C-11, *Root and Common Cause Analysis and Corrective Action Planning*

25. TFC-ESHQ-Q_C-C-02, *PER Tracking Data and Trending Analysis Program*

26. TFC-ESHQ-RP_ADM-C-11, *ALARA Joint Review Group*, Rev A-4

27. TFC-ESHQ-RP_RWP-C-03, *ALARA Work Planning*, Rev D-6

28. TFC-ESHQ-RP_RWP-C-04, *Radiological Work Permits*, Rev C

29. TFC-ESHQ-S_SAF-C-02, *Job Hazard* Analysis, Rev B-2

30. TFC-ESHQ-S_SAF-C-04, *Stop Work Authority*, Rev. B-3

31. TFC-MD-038 *Compensatory Controls for Radiological Control Performance*, Revs D-4; D-5; D-6

32. TFC-OPS-MAINT-C-01, *Tank Farm Contractor Work Control,* Rev F,

33. TFC-OPS-MAINT-C-02, *Pre-Job Briefing,* Rev B-1

34. TFC-OPS-MAINT-D-01.1, *Work Planning Guidance,* Rev B

35. TFC-OPS-OPER-C-14, *Event Investigation Process*

36. TFC-OPS-OPER-D-25, *Occurrence Reporting Guidance*

37. TFC-PLN-05, Rev B-8, Conduct of Operations Implementation Plan, dated March 17, 2004

38. Occurrence Report RP-CHG-TANKFARM-2003-0058, Operating Experience Demonstrated Insufficient Training of Operating Staff, dated December 10, 2003

39. Occurrence Reports RP—CHG-TANKFARM-2004-0006, -0027, -0055

40. ORP Manager letter to CH2MHILL President dated August 25, 2004 regarding Conditional Payment of Fee Determination

41. PER Performance Indicator reports on open ESTARS actions associated with PERs, PER Cycle Time, PER Cycle time for PER Closure
42. PERs: 2004-2301, 2004-4585, 2003-4632, 2004-2593, 2004-2882, 2003-4736, 2004-2837, 2004-2839, 2004-0596
43. PER Search results for Work Planning issues
44. Planning Resource Center (Intranet webpages)
45. Problem Evaluation Request, PER-2003-4736, S-112 Retrieval Pumping Event, Closure Report dated July 23, 2004
46. Problem Evaluation Request, PER-2004-3122, Radiological Conduct of Operations Discrepancies, In Process Report dated June 10, 2004
47. Work Instructions with associated RWP and JHA (6)
48. DOE letter from Paul M. Golan, EM-1 (Acting), to John T. Conway, Chairman, DNFSB, dated October 22, 2004

Appendix D - Evolutions Observed

Pre-job Briefings (3)
Closure Project Tailgate Meetings (2)
Planning Meetings (4)
ALARA Joint Review Group Meeting (1)
Plan of the Day Meetings (3)
244-CR Post Fieldwork Debrief

Enclosure 2

U.S. Department of Energy
[redacted]
P.O. Box 450, MSIN H6-60
Richland, Washington 99352

MAR 28 2005

05-TF-003

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

Dear Mr. Aromi:

CONTRACT NO. DE-AC27-99RL14047 – SUBMITTAL OF THE POST-IMPLEMENTATION PORTION OF THE INTEGRATED SAFETY MANAGEMENT (ISM) IMPROVEMENT VALIDATION AT THE HANFORD TANK FARM, FINAL REPORT

The attached Report of the "Post-Implementation Portion of the Integrated Safety Management Improvement Validation at the Hanford Tank Farm, Final Report," dated March 28, 2005, is provided to CH2M HILL Hanford Group, Inc. (CH2M HILL).

The report concludes that CH2M HILL has substantially completed corrective actions associated with the 244-CR Vault Event that occurred in July 2004, as well as actions associated with the Consolidated Corrective Action Plan, which includes those actions resulting from a common cause analysis of significant events that occurred from June 2003 through November 2004. The report also concludes that CH2M HILL is beginning to realize the benefits of corrective action implementation.

The review team identified no Findings. However, several Observations are provided in the report. CH2M HILL is expected to make appropriate improvements to processes, procedures and practices based on the Observations provided. CH2M HILL has made significant improvements to ISM over the past several months, primarily due to thorough event analyses, diligent corrective action plan development, and focused effort to implement the corrective actions. In many cases, the improvements have been recently implemented and are in their infancy. It is critical that CH2M HILL strives for sustained improvement in ISM to ensure effectiveness of the corrective actions and to ensure future success.

If you have any questions, you may contact me, or your staff may contact T. Zack Smith, Acting Assistant Manager for Tank Farms, (509)372-9735.

Sincerely,

Roy J. Schepens
Manager

TF:MCB

Attachment

cc: See page 2

cc w/attach:
D. I. Allen, CH2M HILL
R. A. Dodd, CH2M HILL
R. L. Higgins, CH2M HILL
V. M. Pizzuto, CH2M HILL
J. A. McDonald, CH2M HILL
P. M. Golan, EM-2
M. J. Weis, Acting EM-3
P. M. Bubar, EM-3.2
M. T. Sautman, DNFSB
R. Quirk, DNFSB

Attachment
05-TF-003

Report of the Post-Implementation Portion of the Integrated Safety Management Improvement Validation at the Hanford Tank Farm

(66 pages total,
including coversheet)

SEPARATION

PAGE

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Report of the Post-Implementation Portion of the Integrated Safety Management Improvement Validation at the Hanford Tank Farm

March 28, 2005

Final Report

TEAM MEMBER APPROVAL

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Terry Krietz, DOE-EM

John Longenecker, Longenecker&Associates

Jill Molnaa, HAMTC Representative

List of Acronyms, Abbreviations, and Units

ACE	Access Control Entry
ACL	Administrative Control Level
AJRG	ALARA Joint Review Group
ALARA	As Low As Reasonably Achievable
AMW	As Low As Reasonable Achievable Management Worksheet
BNI	Bechtel National, Inc.
CA	Contaminated Area
CCA	Common Cause Analysis
CFR	Code of Federal Regulations
COB	Clean-out Box
DEAR	Department of Energy Acquisition Regulations
DNFSB	Defense Nuclear Facilities Safety Board
DOE	U.S. Department of Energy
ESH&Q	Environmental, Safety, Health and Quality
EM	Office of Environmental Management
EWP	Enhanced Work Planning
FWS	Field Work Supervisor
HAMTC	Hanford Atomic Metal Trades Council
HRA	High Radiation Area
IH	Industrial Hygienist
IHT	Industrial Hygiene Technician
IRT	Independent Review Team
ISM	Integrated Safety Management
ISMS	Integrated Safety Management System
JHA	Job Hazard Analysis
LCO	Limited Conditions for Operation
LLCE	Long Length Contaminated Equipment
MOP	Management Observation Program
NCO	Nuclear Chemical Operator
ORP	Office of River Protection
ORPS	Occurrence Reporting and Processing System
PER	Problem Evaluation Request
PPE	Personal Protection Equipment
RCA	Root Cause Analysis
RCT	Radiological Control Technician
RWP	Radiological Work Permit
SB	Safety Basis
SBCA	Self-contained Breathing Apparatus
SSW	Senior Supervisory Watch
TFC	Tank Farm Contractor
TUF	Track Until Fit
WSMS	Washington Safety Management Solutions
WTP	Waste Treatment and Immobilization Plant

Table of Contents

EXECUTIVE SUMMARY

From March 7 – 18, 2005, a review team, chartered by the U.S. Department of Energy (DOE) Office of River Protection (ORP) conducted the post-implementation portion of an Integrated Safety Management (ISM) Improvement Validation of Tank Farm Contractor (TFC) activities at the Hanford Site. This post-implementation review focused on the areas of work planning; conduct of operations; and relevant management programs, including feedback and improvement. The review assessed, for selected recent incidents and review findings, effectiveness of corrective action implementation.

This report describes the results, conclusions and findings of the post-implementation review portion of the ISM Improvement Validation.

Background

This ISM Improvement Validation effort was commissioned by ORP as recommended in the report of the *Integrated Safety Management System Assessment for the U.S. Department of Energy Office of River Protection*, dated August 2004. The results of the Improvement Validation will also be used to address concerns raised by the Defense Nuclear Facilities Safety Board (DNFSB) in their September 8, 2004, letter to the Acting Assistant Secretary for Environmental Management. These concerns involved, for the most part, incidents that have occurred at the Hanford tank farms from June 2003 to August 2004.

ISM Improvement Validation Process

Under the current contract, the TFC, CHM2 HILL Hanford Group, Inc., implemented its Integrated Safety Management (ISM) System and DOE then verified that the system was implemented, and approved the ISM Program Description in June 2000. Subsequent annual assessments of the ISM System occurred in April 2001 and September 2002. The ISM Program Description was updated several times and the last DOE approval of updates occurred in March 2003. In August 2004, ORP performed an ISM focused review in response to the DOE Office of Environmental Management (EM) direction for each operations office to declare the status of their ISM System. As a result of that review, it was recommended that an ISM Improvement Validation be performed to examine the effectiveness of corrective actions taken in response to several incidents that had occurred between June 2003 and August 2004. In October 2004, the pre-implementation portion of the ISM Improvement Validation assessed, for selected recent incidents, causal and common cause analysis effectiveness, corrective action determination effectiveness, corrective action implementation progress, and compensatory measure determination and implementation effectiveness in the areas of work planning; conduct of operations; and relevant management programs, including feedback and improvement. The pre-implementation effort identified eight findings and concluded that the TFC had identified required improvements for ISM and had established a path forward that could be successful provided that significant management team field presence and involvement and worker buy-in were in place to achieve improvements. In December 2004, select members of the ISM Improvement Validation Team reviewed a new TFC Common Cause Analysis developed in response to one of the findings identified in the pre-implementation review and concluded that the new common cause analysis was adequate.

The review documented in this report is the post corrective action implementation review of the ISM Improvement Validation. The purpose of this post-implementation review is to ascertain effectiveness of corrective action implementation for the following:

- the findings of the pre-implementation review of the ISM Improvement Validation conducted in October 2004.
- the 244–CR vault incident;
- the six incidents addressed in ORP letter, *Conditional Payment of Fee Determination*, 04-ORP-054, R.J. Schepens to E.S. Aromi, dated August 24, 2004;
- the S-112 transfer incident; and
- the December 2004 TFC Common Cause Analysis.

The ISM Improvement Validation team members were selected based on their significant relevant experience in ISM, nuclear safety and operation, safety health and quality programs, radiological control, project management, and work control.

The approach for this review consisted primarily of observation of managers, supervisors, workers and support personnel as they prepared for and performed work to determine if the behaviors of involved personnel during conduct of observed activities reflected that corrective action implementation had been effective. Interviews were conducted as part of the observation at the scene of the work or work preparation as well as in an office setting. In addition evidence files were reviewed to determine the extent to which corrective actions associated with the reviews and incidents identified above were substantially completed.

The review team observed over 10 work activities, 1 planning walkdown, 2 table top drills, 15 pre-job briefings, 3 shift turnovers, 4 tailgate safety meetings, 5 planning meetings, 2 post job briefings and 16 management meetings. The Team also reviewed over 70 documents, including 4 completed work packages and fourteen volumes of evidence files for completed corrective actions. Additionally, the Team interviewed over 130 workers, supervisors, technicians, engineers, mentors and managers.

The Team concluded that corrective actions associated with reviews and incidents identified above have been substantially completed, recognizing that some additional actions are required to implement task specific job hazard analyses, improve assurance of readiness to proceed with work, improve implementation of conduct of operations expectations, improve housekeeping in parts of the tank farms , improve Problem Evaluation Request (PER) closure effectiveness, timeliness and feedback, and increase sufficiency of engineering and management oversight of work performance. The Team noted that the benefits of corrective action implementation were beginning to be realized, that the TFC is at the beginning of this effort, not the end, and that a year or more of continued deliberate management attention will likely be required to assure sustained improvement and culture change. No findings were identified.

The Team recommends that the TFC continue to implement the Comprehensive Corrective Action Plan with sustained deliberate management attention and that increased focus for continued improvement be placed on:

- implementing task specific job hazard analyses
- improving assurance of readiness to proceed with work
- improving implementation of conduct of operations expectations
- improving PER closure effectiveness, timeliness, and feedback and
- increasing sufficiency of engineering and management oversight of work performance

1.0 INTRODUCTION

1.1 Purpose

The purpose of this report is to document the results of the post-implementation review portion of an Integrated Safety Management (ISM) Improvement Validation of Tank Farm contractor (TFC) activities at the Hanford Site in the areas of work planning; conduct of operations; and relevant management programs, including feedback and improvement. This post-implementation review assessed the effectiveness of corrective actions implemented in response to selected recent incidents and review findings.

1.2 Background

The Hanford Site is located in southeastern Washington state and contains a large concentration of radioactive waste that is the legacy of 45 years of plutonium production for nuclear weapons. The plutonium production mission began with the Manhattan Project in the 1940s, continued through most of the Cold War, and concluded in 1989. This mission generated approximately two hundred thousand cubic meters (53 million gallons) of high-level radioactive waste stored in 177 underground tanks. One hundred and forty nine of these tanks are older single shell tanks and sixty-seven of the 149 older single-shell tanks have leaked an estimated 3800 cubic meters (1 million gallons) of waste to the soil. Some of that waste has been detected in the groundwater that flows to the Columbia River seven miles away. Efforts are underway to reduce the risk of future leaks from the tanks.

In May 1989, the U.S. Department of Energy (DOE), the U.S. Environmental Protection Agency, and the State of Washington Department of Ecology signed a comprehensive Hanford Site cleanup and compliance agreement entitled the *Hanford Federal Facility Agreement and Consent Order,* commonly referred to as the Tri-Party Agreement. This agreement includes legally enforceable commitments and milestones on storing, treating and disposing of the tank waste.

Cleanup of Hanford Site tank waste will require the tank farms to function as part of a waste treatment complex. The tank farms must be (1) safely and efficiently operated, and maintained to store the waste to be treated, and (2) upgraded and operated to retrieve the waste and deliver it to the treatment plant. Many of the tank and waste transfer systems needed to support future retrieval of waste for treatment are well beyond their design life.

To accomplish the DOE mission, Office of River Protection (ORP) was established to operate as a single, integrated project. ORP and its two main contractors are responsible for performing work necessary to complete the mission. The first contractor is the TFC, CH2M HILL Hanford Group, Inc., responsible for (1) ensuring safe storage, retrieval, and disposal of the high level radioactive waste, (2) decontamination and decommissioning of the tank farms, and (3) initiation of post closure monitoring of the tank farms. The second contractor is Bechtel National, Inc. (BNI), responsible for designing, constructing, commissioning, and supporting the transition of the Waste Treatment and Immobilization Plant (WTP).

In January 2001, the TFC signed a six-year $2.2 billion contract extension with ORP to perform $2.5 billion worth of work, with a key feature of this contract extension being the inclusion of specific performance-based incentives. In 2003, the contract was further renegotiated to further optimize tank farm resources and priorities towards acceleration of the EM mission.

The TFC is responsible for interfacing and coordinating with other Hanford Site prime contractors in the performance of this work. They are required to ensure that requirements for services provided by them to other Hanford Site contractors and received by them from other site contractors are integrated with other Hanford Site contractors and provided for in the baseline.

The TFC is required to conduct business to achieve the following outcomes:

- Maintain tank farm waste and infrastructure in a safe environmentally compliant and stable configuration.
- Retrieve tank wastes to the extent needed for tank closure and deliver to the WTP contractor for treatment and immobilization.
- Properly dispose of the immobilized low-activity waste fraction either onsite or offsite.
- Store, on an interim basis, the immobilized high-level waste fraction until it can be shipped offsite for disposal (planned for the Yucca Mountain geologic repository).
- Efficiently and cost effectively close all Hanford tank farms.

Achievement of these outcomes must fully consider protection of worker safety and health, public safety and health, and the environment; effective leadership and management; management responsiveness to customers; responsive communications with external and internal Hanford customers; and proficient partnering with other Hanford Site prime contractors.

The TFC is required to integrate safety and environmental awareness into all activities, including those of subcontractors at all levels consistent with ISM principles. Work must be accomplished in a manner that achieves high levels of quality, protects the environment, the safety and health of workers and the public, and complies with requirements. The TFC is also required to identify hazards, manage risks, identify and implement good management practices, and make continued improvements in environment, safety, health, and quality (ESH&Q) performance.

The TFC is contractually required to accomplish its mission in a safe, compliant and efficient manner. Key ESH&Q considerations are addressed in the following sections of the contract:

- Section C.2(d), *Environment, Safety, Health and Quality (ESH&Q)*
- Section H.15, *Emergency Clause*
- Section H.16, *Shutdown Authorization*
- Section H.31, *Subcontractor Environment, Safety, Quality, and Health Requirements*
- Section I.108, DEAR 970.5204-2, *Laws, Regulations, and DOE Directives (DEC 2000)*
- Section I.116, DEAR 970.5223-1, *Integration of Environment, Safety, and Health into Work Planning and Execution (DEC 2000)*
- Section J, Attachment C, *DOE Directives and* Attachment F, *Environment, Safety, and Health Budget Planning and Execution*

2.0 INTEGRATED SAFETY MANAGEMENT IMPOVEMENT VALIDATION PROCESS

DOE has established the expectation that each contractor will develop and implement an Integrated Safety Management (ISM) System for conducting work safely as described in DOE Policy 450.4, *Safety Management System Policy*, and the associated guide, DOE G 450.4-1A, *Integrated Safety Management System Guide*. The expectations and essential attributes for ISM are also described in the U.S. Department of Energy Acquisition Regulations (DEAR) contract clauses, 48 Code of Federal Regulations (CFR) 970.5223-1 and 970.5204-2. These require the contractor to integrate ESH&Q into work planning and execution, comply with Federal, State, and local laws and regulations, and comply with DOE contractual requirements. The contract clauses allow for tailoring of the contract requirements to ensure a safety management system suitable to a site's mission. The policy and the DEAR clauses require that the contractor develop a description of the ISM System for approval by DOE. The contractor is then required to implement the system defined in the approved description. Once the contractor determines that they have implemented the ISM System in compliance with the approved description and meet the expectations of the Policy, DOE conducts a verification of the adequacy of the ISM System that the contractor has implemented.

Under the current contract, the TFC implemented its ISM System and DOE then verified that the system was implemented and approved the ISM Program Description in June 2000. Subsequent annual assessments of the ISM System occurred in April 2001 and September 2002. The ISM Program Description was updated several times and the last DOE approval of updates occurred in March 2003.

From June 2003 to August 2004, the TFC experienced a number of incidents at the Hanford Site tank farms that indicate weakness in their implementation of ISM; particularly in the areas of work planning, conduct of operations, and some management programs, including feedback and improvement. These incidents included:

The June 25, 2003, AW-01A Pit Transfer Jumper Removal resulting in personnel contamination

During removal of an old waste transfer jumper from the AW-01A pit, a loss of contamination control resulted in personnel exposure to chemical and radiological contamination. Two workers had skin contamination on the face and twelve workers had positive nasal smears.

Prior to this job, which was in support of pit upgrades, 18 of 37 pit upgrades were completed without any personnel contamination problems. Contamination control methods (use of fixative prior to cover block removal and water mist during work) had been successful on prior jobs and a generic Enhanced Work Planning (EWP) was used for a group of pit jobs with similar tasks. Based on prior successes and radiation surveys of the pit, respiratory protection was not required for the AW-01A work.

The jumper was being sleeved as it was removed from the pit by crane. Dry powder fell out of the jumper internals to the pit floor, causing airborne contamination in the immediate

area and contamination spread outside the pit. Water mist was used in an attempt to keep contamination down, but the jumper internals were not wetted. Once the Radiological Control Technician (RCT) found contamination on the windbreak around the pit, the Field Work Supervisor (FWS) made the decision to put the job in safe condition - the jumper removal was completed and the jumper was bagged. At this point, some of the workers were determined to be contaminated.

The November 14, 2003, C-106 Eductor Removal resulting in an individual exceeding administrative radiation exposure limits

The eductor assembly was 40 feet long and weighed 3,000 pounds. The eductor removal work was attempted twice using a crane to pull the eductor into a containment sleeve.

During the first removal, the eductor lifting was stopped due to increasing load because the mixing nozzle interfered with the bottom of the tank riser. The radiation levels exceeded the Radiological Work Permit (RWP) void limit of 50 Rad/hr primarily due to high energy beta. The radiation monitoring instruments used to measure the dose rate were at full scale and the higher range instrument was not available at the work location. The work crew stayed clear of the high radiation location but continued work to investigate the cause of the interference and attempted to free the eductor. The eductor was lowered back into the tank and the job suspended after discussions prompted by the ORP Facility Representative related to the RWP void limit. The conduct of operations issues related to this were:

- *The proper radiation monitoring instrument used for dose control was not available at the job location, and*
- *The crew continued to work after exceeding the RWP limit until prompted by the ORP Facility Representative.*

The job was re-planned using an in-process As Low As Reasonably Achievable (ALARA) review. The RWP void limit was increased, additional beta shielding (rubber matting) was required, time keeping was required for personnel handling the item, and instruments with a higher range were obtained. The eductor was successfully removed during the second attempt.

The May 6, 2004, AP-01A Improper Pressurization Alarm Response;

Two jobs were being performed in 241-AP Tank Farm. Plant forces were performing work at the AP-03A pit and Construction forces were installing a jumper at the AP-01A pit per work package 2E-02-0848. Workers at the AP-01A pit had just removed a process blank at Nozzle E and had it suspended from a crane when a pressurization alarm went off. Procedure # ARP-T-271-00103 requires that all workers exit the farm immediately upon receipt of a pressurization alarm. The FWS at the AP-01A pit held a portion of the crew on the job to lower the suspended load into the AP-01A pit that he considered was a safe configuration before exiting the farm. The other workers at the AP-03A pit had already exited the farm. A pressurization alarm was not anticipated during either job. Total response time was 20 minutes.

During the fact-finding, it was determined that AP-01A Nozzle E and the drain in AP-03A pit may have been open at the same time and contributed to the pressurization alarm.

A Stop Work was issued regarding the lack of timely egress by employees and responsibility of the change trailer operator during emergency response/egress.

The May 20, 2004, Clean-out Box (COB) AW2 Investigation resulting in unauthorized performance of work

The scope of the work was to investigate whether there was an apparent spill from the SL-167 transfer line after it was discovered that a transfer line was used while the COB was in a state of construction (dismantlement). There was discussion that removing contaminated items if found was not part of the scope of the work and the personal protection equipment (PPE) and void limits of the RWP were not established for that purpose. No plastic outer layer of PPE was specified as one might expect if removing radioactive liquids was planned. Upon entry into the excavated area around COB AW2, it was soon apparent that a leak had occurred and handling of significantly contaminated padding and liquid-containing bags was done because the FWS wanted to remove the hazard from the area. An RCT noted a smudge on a worker's outer PPE and upon surveying it, found that the level of contamination on the worker's clothing had exceeded the RWP void limit. The RCT immediately ordered the work to stop as the RWP was voided at this point.

The May 24, 2004, AN-01A Pump Removal resulting in radioactive contamination of two workers.

Removal of the AN-01A pump from the trailer to sawhorses for cut-up resulted in clothing contamination of two workers. Inadequate RWP requirements specified for the work is identified as a potential root cause in the event investigation team report. Work was conducted in an area not designated as a contaminated area (CA) and no PPE was required. Therefore, there was only one barrier (plastic bag) between the radiologically contaminated pump and workers. Work was not stopped when multiple holes were found in the pump bag during this job. Additionally, the RCT covering the job left the job site while lowering the pump onto the sawhorses was in progress. While the RCT was gone, work continued in the high radiation area (HRA) by continuing to lower the pump onto the sawhorses, although the RWP (PC-0093) required continuous RCT coverage.

The July 22, 2004, 244-CR Vault Thermocouple Removal Event resulting in an individual exceeding administrative radiation exposure limits for extremity dose

While pulling a thermocouple from the 244-CR Vault (CR-002 Tank) early on the July 22, 2004, graveyard shift, a Nuclear Chemical Operator (NCO) exceeded the extremity/skin Administrative Control Level (ACL) of 15 Rem. The operator received an extremity dose of 22.057 Rem to the hands and a deep dose of 0.28 Rem. With approximately 30 feet of the thermocouple withdrawn (total length is approximately 36 feet) a rapid increase in the dose rate on the RO-20 was identified. The levels encountered exceeded the RWP limits. The instrument used by the RCT could not read the actual beta dose at the thermocouple due to the instrument being off-scale high on the highest range, indicating a level of > 50 Rad/hr at 30 cm. A decision to continue removing the thermocouple was made and

the extremity/skin overexposure occurred as the worker applied the duct tape to the herculite bag surrounding the thermocouple.

The TFC has indicated that common elements to all of these incidents include unexpected radiological conditions, lack of upfront contingency planning, lack of preparation to implement effective contingency actions, failure to follow and live to RWP limits when unexpected conditions were encountered, continuing in the face of uncertainty as a default "safe condition," violation of procedures on numerous occasions, lack of root cause investigations (except for CR-Vault event and the AW-01A contamination event), and unwillingness to suspend work when encountering unexpected hazards.

In August 2004, ORP conducted an ISM focused review to provide assurance that the TFC and BNI ISM Systems are maintained and have improved subsequent to the most recent verification reviews. This review was conducted in response to the DOE Office of Environmental Management (EM) direction for each Operations Office to declare the status of their ISM System. Based on ORP oversight activities and assessment results, this review focused on the work scope definition and the feedback and improvement processes, particularly those associated with engineering issues. In addition, based on two recent events in the DOE complex resulting in the death of subcontractor workers, the review evaluated the processes and mechanisms for establishing safety programs and requirements associated with subcontractor work activities, along with the monitoring and enforcement of those requirements. The review resulted in the following overall conclusions about the status and effectiveness of the ORP/WTP/TFC ISM System:

- ISM elements are maintained and improvements were apparent.
- ORP has identified feedback and improvement issues associated with TFC operations. These issues indicate some weakness of ISM processes; but not broad programmatic breakdowns.
- Events and deficiencies indicate specific problems with ISM implementation; however, overall, the system is adequate and capable of ensuring safe performance of work.

Based on the results of the assessment, the Team recommended that the ORP Manager establish a Tank Farm ISM Improvement Validation Team to validate the adequacy of the following associated with the events previously described:

- Investigation of each of the events,
- Determination of causes,
- Identification of corrective actions, and
- Completion of corrective actions.

On September 8, 2004, the Defense Nuclear Facilities Safety Board (DNFSB) formally notified the DOE acting Assistant Secretary for Environmental Management (EM-1) of their concern that the "Integrated Safety Management (ISM) System for the Hanford tank farms is failing to control work activities adequately."

The ORP Manager informed the DNFSB that he concurred with their concerns and had communicated similar concerns to the TFC in multiple letters during the previous twelve months. Additionally, the ORP Manager reduced the TFC fee by $300,000 in August 2004, because of the concerns. Although extensive DOE oversight is ongoing, the ORP Manager chartered a more comprehensive review, the Tank Farm ISM Improvement Validation.

In October 2004, the pre-implementation portion of this ISM Improvement Validation assessed, for selected recent incidents, causal and common cause analysis effectiveness, corrective action determination effectiveness, corrective action implementation progress, and compensatory measure determination and implementation effectiveness in the areas of work planning; conduct of operations; and relevant management programs, including feedback and improvement. The pre-implementation effort identified eight findings and concluded that the TFC had identified required improvements for ISM and had established a path forward that could be successful provided that significant management team in-field presence and involvement and worker buy-in were in-place to achieve improvements. In December 2004, select members of the ISM Improvement Validation Team reviewed a new TFC Common Cause Analysis developed in response to one of the findings identified in the pre-implementation review and concluded that the new common cause analysis was adequate.

From March 7 – 18, 2005, a post-implementation review was conducted to assess corrective action implementation effectiveness. The review team was led by Frank McCoy of Washington Safety Management Solutions (WSMS) and consisted of Bill Lloyd of WSMS, Mark Brown of DOE-ORP, Terry Krietz of DOE-EM, Joe Arango of DOE-EM, Jill Molnaa representing Hanford Atomic Metals Trades Council (HAMTC), and John Longenecker of Longenecker and Associates. Team members were selected based on their significant relevant experience in ISM, nuclear safety and operation, safety health and quality programs, radiological control, project management, and work control. The team member's biographies are included in Appendix A.

The approach for this review consisted primarily of observation of managers, supervisors, workers and support personnel as they prepared for and performed work to determine if the behaviors of involved personnel during conduct of observed activities reflected that corrective action implementation had been effective. Interviews were conducted as part of the observations at the scene of the work or work preparation as well as in an office setting. In addition, evidence files were reviewed to determine the extent to which corrective actions associated with the 244-CR Vault Event, the six incidents addressed in ORP letter, *Conditional Payment of Fee Determination*, 04-ORP-054, RJ Schepens to E.S. Aromi dated August 24, 2004, the S-112 transfer incident, the December 2004 TFC Common Cause Analysis, and the pre-implementation ISM Improvement Validation were substantially completed.

The review team observed over 10 work activities, 1 planning walkdown, 2 table top drills, 15 pre-job briefings, 3 shift turnovers, 4 tailgate safety meetings, 5 planning meetings, 2 post job briefings and 16 management meetings (plans of the day, daily report meetings, management brown bag meetings, etc). The Team also reviewed over 70 documents, including 4 completed work packages and fourteen volumes of evidence files for completed corrective actions. Additionally, the Team interviewed over 130 workers, supervisors, technicians, engineers, mentors and managers.

3.0 OBJECTIVES, CRITERIA, AND RESULTS

DOE G 450.4-1B, *Integrated Safety Management System Guide for use with Safety Management System Policies (DOE P 450.4, DOE P 450.5, and DOE P 450.6); The Functions, Responsibilities, and Authorities Manual; and the DOE Acquisition Regulation* identifies continuing core expectations developed from the DOE policies, the requirements of the DEAR, and the fundamental attributes that support the implementation of ISM. These continuing core expectations were developed to provide a reference or starting point, which can serve as the basis for developing site- or facility-specific objectives and criteria in support of assessing an ISM System. Tailoring of the continuing core expectations for Hanford Site tank farms resulted in the objectives and criteria used during this review. The ISM objectives and criteria are provided in three major functional areas (1) work planning, (2) conduct of operations, and (3) relevant management programs, including feedback and improvement.

3.1 Work Planning and Execution

The work planning functional area includes all aspects of the Integrated Work Control Process implemented by the Hanford Site TFC. Included in the scope of this area are:

- Implementation of job hazards analyses,
- Implementation of radiological work permits,
- Incorporation of hazard controls into work packages and procedures,
- work planning and scheduling,
- Pre-job briefings, and
- Work authorization process.

The 244 CR vault incident, the six incidents discussed in ORP letter 04-ORP-54, and the S-112 transfer incident reflected weaknesses in work planning at the Hanford Site tank farms.

Post-Implementation Objective: Determine the extent to which:

- Work at Hanford tank farms is planned, authorized, and conducted in accordance with the process described in TFC-OPS-MAINT-C-01, *Tank Farm Contractor Work Control*, for all activities.
- Hazards for each task are appropriately analyzed and controls implemented.
- Worker involvement is an integral part of the work planning and hazard analysis process.
- Management is closely involved in all aspects of defining the scope of work, analyzing hazards, developing hazard controls, work authorization, performance, and feedback.

Post Implementation Criteria: Through activity observations and selected interviews, the Team will evaluate:

A. **Work Planning:** accomplished in accordance with the approved work planning and control procedures.

B. **Worker Involvement in Work Planning:** required by established processes and is observed to occur.

C. **Work Permits (RWPs, JHAs, and IH Monitoring Plans, etc.):** appropriate hazard controls are established and adequately communicated to ensure work is performed safely.

D. **Hazard Identification:** a rigorous and comprehensive process is established and implemented for the task-level identification of hazards during the work planning process.

E. **Hazard Controls:** effective and appropriate hazard controls are implemented into work packages and procedures for the performance of work.

F. **Perform Work:** procedures, work packages, and other performance documents are written to an adequate level of detail such that workers can safely and efficiently perform each task in the order specified with minimal interpretation or clarification from other personnel.

G. **Feedback and Improvement:** processes and procedures are implemented to adequately capture feedback following work activities; lessons learned and other forms of feedback are retrievable, meaningful, and are used in planning work.

H. **Worker Understanding:** workers have a clear understanding of the work scope, why the work is being performed, the hazards involved, the controls in place to protect workers, when work should be stopped, and who is responsible for safety.

3.2 Conduct of Operations

The conduct of operations functional area consists of all aspects of conduct of operations, including:

- Procedure compliance,
- Equipment and system status control,
- Review and authorization of work,
- Standing and shift orders,
- Response to abnormal and emergency conditions, and
- Performance of work.

The 244 CR vault incident, the six incidents discussed in ORP letter 04-ORP-54, and the S-112 transfer incident reflected weaknesses in conduct of operations at the Hanford Site tank farms.

Post-Implementation Objective: Determine the extent to which:

- Competence is commensurate with responsibility for facility management and operations personnel.
- Processes to verify readiness at the facility level have been implemented in accordance with DOE order requirements, where applicable.
- Conduct of operations is implemented in accordance with DOE Order requirements.
- Contractor roles and responsibilities are clearly defined to ensure satisfactory safety, accountability, and authority.
- Line management is responsible for safety.

Post Implementation Criteria: Through activity observations and selected interviews, the Team will evaluate:

A. The Compensatory measures of MD-038 are adequate, implemented and effective.

B. Program reviews and observations show that procedures and/or mechanisms are in place that define clear roles and responsibilities within the facility to ensure that safety is maintained at all levels.

C. Program reviews and observations demonstrate that line management is responsible for safety.

D. Observations demonstrate that personnel are competent commensurate with their responsibility.

E. Program reviews, observations and interviews show that "readiness to proceed" is appropriately confirmed prior to start of new work activities.

F. Observations demonstrate that operations personnel are responsible for the review, coordination, and approval of work activities prior to their start.

G. Program reviews, observations, and interviews show that a procedure usage and compliance policy exists and is implemented. Personnel are observed to perform work in accordance with the procedure compliance policy.

H. Program reviews, observations, and interviews demonstrate that operations personnel understand their roles and responsibilities during abnormal and emergency conditions.

I. Observations show that the use of procedures, work packages, JHAs, RWPs, IH monitoring plans, and other documents is appropriate and adequate for safe performance of work.

J. Observations show that personnel performing work fully understand and comply with all aspects of the hazard controls within their work packages and procedures.

K. Observations, program reviews, and interviews show that if work packages or procedures can not be performed as written, work is suspended and the

documents are appropriately changed, reviewed, and approved prior to continuing work.

L. During the work planning or execution process personnel demonstrate the ability to recognize changing and/or unknown conditions and appropriately suspend work activities until they are appropriately dealt with.

M. Observations and interviews reflect that during work performance personnel can be expected to utilize their stop work authority, when required.

3.3 Relevant Management Programs Including Feedback and Improvement

The management programs functional area includes various site programs that represent relevant management program (including feedback and improvement) components of ISM, as they relate to the scope of this review. Additionally, the Hanford Site tank farms ISM program description is addressed in this functional area. Included in the scope of this area are:

- Management assessment program,
- Independent assessment program,
- Post-job briefings,
- Track and trend performance indicators,
- Occurrence Reporting and Processing System (ORPS) and incident investigation,
- Corrective Action Plans, and
- Implementation of lessons learned and performance feedback.

The 244 CR vault incident, the six incidents discussed in ORP letter 04-ORP-54, and the S-112 transfer incident reflected weaknesses in some management programs including feedback and improvement at the Hanford Site tank farms.

Post-Implementation Objective: Determine the extent to which:

- Corrective Actions associated with the findings of the pre-implementation review of the ISM Improvement Validation conducted in October 2004 the 244-CR vault incident; the six incidents addressed in ORP letter, *Conditional Payment of Fee Determination*, 04-ORP-054, R.J. Schepens to E.S. Aromi, dated August 24, 2004; the S-112 transfer incident; the December 2004 TFC Common Cause Analysis are substantially completed.
- The contractor's implemented feedback and improvement programs are consistent with and in accordance with the ISMS Manual.
- Feedback information on the effectiveness of the ISM is gathered, opportunities for improvement are identified and implemented, and line and independent oversight is conducted.

Post Implementation Criteria: Through activity observations, program and document review, and selected interviews, the Team will evaluate:

A. Corrective actions associated with the findings of the pre-implementation review of the ISM Improvement Validation conducted in October 2004 the 244-CR vault incident; the six incidents addressed in ORP letter, *Conditional Payment of Fee Determination*, 04-ORP-054, R.J. Schepens to E.S. Aromi, dated August 24, 2004; the S-112 transfer incident; the December 2004 TFC Common Cause Analysis have been substantially completed.

B. Program reviews and observations show that the occurrence reporting process as required by DOE is fully implemented.

C. Program reviews and observations show that a process to develop feedback and improvement information opportunities at the site and facility levels, as well as, the individual work activity level is implemented.

D. Program reviews and observations show that critiques and investigations are conducted for incidents, including near misses that result, or could result, in occupational injury, illness or death. Investigation reports identify causes, findings, track hazards to correction, and identify any preventive or corrective actions to eliminate the recurrence of the incident.

E. Program reviews and observations show that the organizations and/or facilities perform trend analysis of performance indicators and safety and health data (including injury and illness, accident investigation, assessment and audit, and employee safety report experience) for identification and resolution of programmatic or systemic weakness.

F. Program reviews and observations show that the site issues management program is effective in developing corrective action plans, where appropriate, and that management aggressively pursues timely completion of these action items.

G. Program reviews and observations demonstrate that a process is in place and is utilized by managers for considering and resolving recommendations for improvement, including worker suggestions.

H. Program reviews and observations indicate that identified work package and procedure improvements and lessons learned are incorporated into the process. Post-job reviews are performed for specified activities.

I. Program reviews and observations demonstrate that a formally structured, auditable facility program is in place to ensure that exposures are maintained ALARA.

J. Observations demonstrate sufficiency of management and supervisory oversight of work performance.

3.4 Safety Basis Implementation

The Safety Basis Implementation functional area ensures that there is an adequate flow down of applicable safety basis requirements to the working level procedures. Included in the scope of this area are:

- Implementation of Technical Safety Requirement (TSR) Limiting Conditions for Operation (LCO)
- Implementation of TSR Administrative Controls (AC) (including safety management programs)

Post-Implementation Objective: Determine the extent to which work at Hanford Tank Farms is planned, authorized, and conducted in accordance with the safety basis requirements.

Post Implementation Criteria: Through activity observations, document reviews and selected interviews, the Team will evaluate the following criteria at a depth and breadth as determined by the Team members:

A. **Radiological Controls:** the radiological control safety management program is adequately implemented to ensure that: radiological surveys of work areas are performed at the required periodicity, survey results are posted at the entrances to radiological areas, and that areas are properly identified and posted to prevent inadvertent entry.

B. **Technical Safety Requirements:** LCO and AC requirements are appropriately included in working level documents and procedures; field implementation is observed.

3.5 Results

The results of this review are documented in Sections 4.0 through 7.0 of this report. An analysis of whether and how the results meet the criteria, whether the team concurs or non-concurs that the TFC associated corrective actions have been effective and identification of findings for additional action are provided in Section 8.0. The team's conclusions are provided in Section 9.0.

4.0 ASSESSMENT OF IMPROVEMENT IN WORK PLANNING

The contractor's work control procedure was reviewed (TFC-OPS-MAINT-C-01, Tank Farm Contractor Work Control) and the process was observed to be implemented. Work planning meetings were observed to be consistent with procedural requirements. The planning meetings generally started late for various reasons, however, appropriate representative personnel were present at and participated in the meetings. In general, the meetings were effective in planning the intended scope of work. The Team noted additional management involvement in the work planning meetings could significantly contribute to the effectiveness and efficiency of the process. Additional efficiencies could be realized through a more active involvement of the FWS in the planning meetings; particularly, the FWS has leadership and in-depth facility knowledge to add to the discussions.

One instance was noted at an early planning session where the scope of work was not sufficiently defined to adequately complete the goals for the planning session. At the planning roundtable meeting for work to conduct SY pit videos and radiological surveys, in support of Project W-314 (Tank Farm Upgrades) (work package 2W-04-02868), it was not known if only radiation dose rates were to be taken in the pits, or if radiation dose rates and contamination surveys would be obtained. Additionally, the planner was unsure of how to plan the work, as he was directed to plan the package so that it could be applied to other double shell tank farms and other miscellaneous pits. The planning meeting was stopped by the planner after 2 hours had been spent reviewing the 2 Radiological Work Permits (RWP) (one for each scope set) and the As Low As Reasonably Achievable Management Worksheet (AMW).

The ISMS review team observed a planning walk down, as part of the early planning process for work to decontaminate the SY B Train exhauster. Appropriate representative personnel were present for the pre-job brief for the walk down, and for the actual field walk down. Although communication in the field was somewhat hampered due to personnel wearing Self Contained Breathing Apparatus (SCBA), the planning walk down was observed to be invaluable to the planning process.

One team planning meeting, for the AN-101 transfer line encasement pressure test, was observed to be well-run. The meeting was efficiently conducted with appropriate worker representation in attendance. The team did note, however, that the planning meeting started approximately 20 minutes late due to the initial lack of a required craft representative.

Worker involvement opportunities and mechanisms in the work planning process were found to be well-defined in work planning, pre-job briefing and job hazard analysis procedures. Interviews with workers found that opportunities for involvement have improved over the last 4 months. Appropriate craft workers were well-represented at observed team planning meetings, and pre-and post-job briefings. A review of four

recently completed work package records indicate that workers performing the work evolution attended the pre-job walkdown to ensure they understood the scope of the work and safety-related information. Also noted was a fair amount of continuity of workers involved throughout the planning process for individual work packages, especially in Waste Feed Operations, where dedicated work crews have been created. The workers observed during the team planning meetings were found to be knowledgeable and provided valuable input during the meetings.

The review team determined that appropriate hazard controls were established and adequately communicated to ensure work was performed safely. RWP's were understandable and could be implemented in the field. RWPs included controls and limits as defined in the AMW. One instance was identified by the review team where a specified radiation dose rate instrument and a radiological drape required by the AMW were not included in the draft RWP (TFJ-135, identified during the work planning session for work package 2W-04-02868, "Perform Rad/Video Surveys"). An additional instance was identified by the Radiological Control Technician (RCT) where the portable air sample requirement identified in the RWP was not included in the work steps (removal of S-102 video camera, WS-04-002894; RWP IS-525). The Field Work Supervisor (FWS) took immediate corrective action to properly revise the work instructions to be consistent with the RWP requirements, obtained the necessary approvals for the change, and continued with the work with minimal interruption.

A procedure has been established for the task-level identification and documentation of hazards during the work planning process to address deficiencies found by independent assessments. In early 2004, an OA investigation report on tank farm vapor issues identified that the tank farm job hazard analysis (JHA) process was not rigorous enough to ensure an adequate understanding of hazards and the necessary hazard controls at the step in the work instruction in which the controls apply. The pre-implementation review by this team in October, 2004, found that the task-specific JHA process was not yet implemented. The task-specific JHA procedure was established on October 15, 2004, and a series of further corrective actions to implement the task-level JHA procedure and documentation were completed on February 15, 2005. The work observed and the work package documents reviewed by the review team did not have task-specific JHAs required by the revised procedure. Upon request by the team, three work packages, in an early stage of planning, were provided to show where task-specific JHAs were being developed and hazard controls placed at the appropriate step in the work instruction.

A TFC Management Assessment on tank farm work planning and JHA improvements published February 28, 2005, also found implementation of the new task-specific JHA requirements to be less than adequate, requiring further actions to ensure effective implementation. TFC senior management is aware that additional actions and mentoring is required to fully implement the task-specific JHA procedure.

Based on the team's observation of work, review of work instructions being planned, and review of four completed work packages (including the general JHAs and RWPs used in conjunction with the work packages), the team found effective and appropriate hazard

controls were implemented into work packages and procedures for the performance of work. The additional planning rigor over the last 4 months that has occurred while tank farm field work activities have been limited, including multiple (iterative) team planning meetings for the same work package, additional emphasis on radiological ALARA planning, mandated safety and health subject matter expert reviews, and senior management review and approval of medium and high risk radiological work, has provided ample opportunities to identify hazards and hazard controls. When work activities in the field increase, and the time for planning and worker involvement in work planning decreases, the use of a task-specific JHA approach will become more important to identify hazards and controls.

The team observed the conduct of work in the field and determined that the procedures, work packages, and other performance documents were written to an appropriate level of detail. Once adequate preparations were made to conduct the work, workers safely and efficiently performed each task in the order specified with minimal interpretation or clarification from other personnel. One instance was noted where the work steps did not give adequate direction for a valve manipulation; this is discussed in Section 5 of this report. The team did note that there was a very effective use of drawings and photographs of actual field conditions during work planning and pre-job briefs. These greatly aided the work planning and performance process.

Based on interviews with workers, field work supervisors, and planners, and observation of team planning meetings, pre- and post-job briefings and shift turnover meetings, the team found that feedback and improvement information was identified, shared and incorporated into work in the field. A Work Planning Resource Toolbox (web-based) provides a good source of retrievable, meaningful lessons-learned. Interviews with work planners indicate that the Resource Toolbox is being used to identify lessons-learned specific to the work being planned. The TFC lessons-learned database in the Resource Toolbox continues to be populated since it was reviewed as part of the pre-implementation ISM improvement assessment in October, 2004. For example, the Radiological Control organization recently developed a lessons-learned memorandum to document lessons-learned from the review of work packages going through the Independent Review Team and ALARA Joint Review Group for approval, and placed it on the Resource Toolbox web page. There was one team planning meeting for pit preparation, cleaning and painting where lessons-learned from similar recent work was not fully being captured in the work instructions under development. The Work Control Director sitting in on this team planning meeting promptly addressed this issue. The Team found the post-job reviews were being consistently held immediately after the work evolution, and worker suggestions and identified lessons-learned were being discussed in subsequent pre-job briefings (including turnover to swing shift) for implementation.

Workers were interviewed at the work site and demonstrated a clear understanding of work scope, the reason for conducting the work, hazards involved, and controls in place to protect the workers. This information was communicated in the pre-job briefings and the information was effectively retained by the workers in the field. Workers also had a very clear understanding of when it would be appropriate to stop the work based on changing field conditions, work outside approved permits, and for unexpected conditions or hazards. It was evident from interviews with workers that they felt it was their responsibility to work safely and in accordance with established hazard controls.

5.0 ASSESSMENT OF IMPROVEMENT IN CONDUCT OF OPERATIONS

The Team observed high hazard, medium hazard and low hazard evolutions. These evolutions included operator rounds, monthly radiological surveys, tank retrievals, modifications to plant equipment, tank pit work, evaporator startup preparations and the planning sequence. The pre-job briefings were attended for all observed evolutions. In addition, the Team attended the management planning meetings and observed table top drills in both Closure Operations and Waste Feed Operations.

The Team determined that the compensatory measures of MD-038 related to conduct of operations are adequately implemented and effective based upon observations of work activities in both Waste Feed Operations and Closure Operations as well as in construction work at the site. The compensatory measures for Senior Supervisory Watches (SSWs), for ALARA Joint Review Group (AJRG) reviews, and Independent Review Team (IRT) reviews have been incorporated into the contractor's work planning processes and practices. The Team did a complete crosswalk of the flowdown of the MD-038 compensatory measures into the TFC procedures and documents and found that the measures had been incorporated for high risk radiological work. Management has decided to keep MD-038 in place with the compensatory measures still required for medium risk radiological work.

The requirement for establishment of an SSW for new activities and other activities defined by senior management is incorporated in the Conduct of Operations Management Plan (TFC-PLN-05). The SSW is responsible per the Conduct of Operations Plan for providing oversight as it relates to conduct of operations. The review team observed three work activities that had SSWs in place and properly performing their oversight role. They were observed executing their role by reviewing work packages for radiological limits and for the specific procedure steps that they were to oversee, by interacting with Field Work Supervisors at pre-job briefings, and by monitoring the safe accomplishment of work. The review team determined that the SSWs are helping to implement the conduct of operations expectations at the work site and that they should remain in place for medium and high risk work.

Procedures are in place which define clear roles and responsibilities within the tank farms for conduct of operations to ensure that safety is maintained at all levels. The operations organizational relationships and responsibilities are clearly defined in the Conduct of Operations Plan for both Waste Feed and Closure Operations. The operations expectations for all employees are listed in Attachment C of the Conduct of Operations Plan as well as on large three-section posters that have been developed and posted throughout the site as a reminder and aid. The posters list the expectations for all employees, for managers and supervisors, and for senior management. The team observed shift managers, first line managers, Field Work Supervisors, and the workforce carrying out their roles and responsibilities in the conduct of over 50 activities during this review.

Line management is responsible for safety. The line organizations are responsible for preparation of work packages and procedures for the workforce to use. The Team observed the authorization of work through the plan of the day meetings in both Waste Feed and Closure Operations. The team observed the weekly brown bag lunch discussions by senior

managers in Waste Feed Operations. Discussions included lessons learned from recent work pauses and stop works, use of personal protective equipment (PPE), dealing with the summer heat and work scheduling, as well as ways to improve feedback to the workforce on concerns and suggestions. The senior managers demonstrated their understanding of their responsibility to communicate and enforce their expectations for safe work accomplishment by the first line managers, Field Work Supervisors, and workforce.

The team observed that personnel are competent commensurate with their responsibility. Based upon over 130 interviews with employees, the team determined that the workforce is knowledgeable of their roles and responsibilities. The actual work evolutions observed demonstrated that the workers were skilled at their jobs. Once coordination barriers were removed and work activities were actually underway for those activities observed during this review, the workforce demonstrated competence by performing the work competently and relatively quickly. The team observed that much more time was spent in pre-job briefs, assembling the correct people and equipment, and donning PPE than in the actual work accomplishment. Workers were observed demonstrating and sharing their knowledge of equipment and operations by providing inputs on lessons learned from previous similar work activities during the pre-job briefings.

Observations and interviews showed that "readiness to proceed" is often not appropriately confirmed prior to start of new work activities. There was some confusion and delay for the work crew for the HEGA filter halide test while radiological postings were confirmed and personal dosimetry was issued. There was delay for the 241-AW-101 ENRAF flush and calibration while water hose/meter equipment was found, and while an operator was found to replace the first two operators who were not fully qualified or did not have enough time remaining in their work day. A number of the work activities such as the SY-A pit construction work were observed delayed in starting while work crews waited for the RCTs to arrive for the pre-job briefs and work evolutions. After a work pause on the transfer from 241-C-203 to 241-AN-106 tank work, there was delay carrying over into a lunch break while the Industrial Hygiene Technicians obtained additional personal air sampling equipment for workers to wear. Ultimately, the Team was not able to observe the waste transfer scheduled that day since a procedure requirement to ensure no excavations within five feet of the transfer line was not met. This caused the work to be appropriately rescheduled until the excavation area could be backfilled. The Team also observed multiple administrative (training class) and equipment (diesel generator, fans) problems which caused delays in the startup of the 242-A evaporator.

The review team observed the removal and repair of the S-102 video camera. Upon removal of the camera, workers were to decontaminate and replace the camera inside a glove bag at the 244-AR facility. The glove bag had been previously removed, requiring operators to construct a new glove bag, delaying the work half a shift. The Team also observed delays in work execution when workers were observed "scrounging" for setup equipment for the 241-A Inspection of Tank Laterals. The Team observed inefficiencies and lack of preparedness that resulted in work delays of several days from the intended start of the inspections.

The team did observe that the mask stations in both Waste Feed and Closure Operations were efficiently run and did support the readiness to proceed with work, and that the C-200 vacuum skid water separator weld work was completed in a very efficient and timely manner. However, overall, improvement is needed in determining the readiness to proceed with work and ensuring that the proper personnel and equipment resources are available and assigned.

Operations personnel are responsible for the review, coordination, and approval of work activities prior to their start. The Conduct of Operations Plan contains the work release approval process which the team observed was implemented in both Waste Feed and Closure Operations through the shift manager. The approved work packages are discussed at plan of the day meetings with operations supervisors in both the morning and the afternoon. Upon approval, the shift manager releases the work to the Field Work Supervisor who then executes the work according to the work package and procedures. The team observed five plan of the day meetings in Waste Feed and five in Closure Operations demonstrating that operations personnel are responsible for approval of work activities.

A mandatory procedure compliance policy exists in the Conduct of Operations Plan. The team observed that the procedure use policy is implemented. The procedure compliance policy and expectations were also observed on the Senior Vice President for Nuclear Operations "Good Advice" cards, and the posters listing the expectations for all employees, for managers and supervisors, and for senior management. Most of the procedures at the tank farm were observed to be "Continuous" type procedures which require step-by-step compliance. The work package instructions for which implementation was observed varied from step-by-step compliance to reference. The Team noted that many of the pre-job briefings covered the procedure compliance expectations and interviews with workers revealed that the workforce understands procedure compliance. Personnel were observed to perform work in accordance with the procedure compliance policy with some limited exceptions noted.

The evolutions observed by the Team demonstrated that tank farm personnel understand their roles and responsibilities with respect to abnormal and emergency conditions. These roles and responsibilities, which are discussed in the pre-job briefing, included but were not limited to, loss of breathing air, increased radiation rates/dose, loss of control of the evolution and spills. The Field Work Supervisor (FWS) briefed each abnormal event in depth and covered emergency actions. The general emergency action is evacuation. No actual abnormal or emergency conditions were encountered by the crews.

The team witnessed two drills. These drills were table top in nature. This was due in part to strong wind conditions. The drills simulated changes in radiological conditions. In both cases, the drill participants responded appropriately. The actions taken and procedures used would have assured a safe outcome from the transient condition.

The drill program is an extension of the training program. The complexity and fidelity of the drills should be increased. It was apparent that the FWS participant was aware of the drill scenario for the personnel contamination drill before the drill was run which reduces the

realism and complexity of the drill program. The Team was told that starting in the April timeframe some drills will be run with participants in supplied air in order to be more realistic. The Team observed the drill mock-up area that was recently acquired. The mock-up is just now being outfitted with appropriate equipment and materials. In the near term, the frequency of tabletop drills should be reduced and the frequency of in field drills should be increased.

During the C-241-C-103 Install Sluicer Nozzle in Riser #3 work evolution, a rigger was observed placing his arm under a suspended load to adjust wood cribbing for a coverblock being lowered into place (about 2 feet above ground level). The lead rigger was later interviewed and acknowledged that was an inappropriate practice, but due to inability to immediately communicate while wearing SCBA mask, he was not able to quickly stop the action. The placement of the arm under the suspended load happened twice in short period of time.

The team reviewed many technical work documents. These included work packages, procedures, JHAs, RWP, IH Plans, critical lift plans, and rigging plans. The detail in these documents is commensurate with the complexity and hazards associated with tank farm work. The volume of information in some work packages is overwhelming.

The FWS pre-briefed the crews prior to execution of the task. These pre-job briefings ensured that the crews fully understood the nature and complexity of the task. In general, the pre-job briefings were well done. Some pre-job briefs were quite long. The briefing may lose their effectiveness when the briefing is far in excess of one hour. All observed evolutions were executed within the stated hazard controls.

In general work evolutions, were executed with strict procedure and work package compliance. Particularly, during the S-102 video cameral removal job, the FWS identified that it would be necessary at some point to remove the camera top hat assembly from S-102 Riser #1. The FWS also identified that this scope was not included in the existing work package, and would be higher risk work, requiring additional planning and approvals. As a result, the FWS clearly excluded this scope of work from the planned activities.

Some procedure non-compliances were observed by the team. These were on the AP-105 pit flush and the HEGA filter Halide test. The AP-105 pit flush used a verbal RWP action limit. This RWP should have been revised to include this action limit for increased dose rate. The HEGA filter halide test procedure was missing a step to introduce the motive force (air) into the system. This direction was given verbally. The procedure should have been revised prior to proceeding with the evolution. A strict verification and validation program should be instituted to ensure that the field procedures are workable as written.

During observations of work activities, the Team noted very poor housekeeping in S and SY Tank Farms. However, the team also observed the FWS for the S-102 video camera removal actually collecting trash that was previously left in place by other work crews. The general housekeeping of the tank farms is adequate; however several areas require attention including C, S, and SY tank farms. These areas contain historical waste items that are large and will

require extensive effort for removal. Improvement in this area will require a long term and concerted effort. Additional attention is needed to maintain appropriate housekeeping conditions.

Several evolutions required intervention. The Team noted that personnel recognized changing and abnormal conditions. TFC personnel appropriately suspended work until the issues were resolved. Examples include the 242A evaporator start-up, S-112 control station software (MCS), 241-C-203 tank transfer to 241-AN-106, and the 241-AP-02A clean, preparation and paint pit work.

The use of "stop work" and "work pause" is apparent. The employees and Field Work Supervisors use this authority when required. The Team recognized that at least 7 work stops and/or work pauses were issued and resolved during our review.

It is clear that management takes the appropriate action to resolve these issues in a timely fashion. In addition, the frequency of stop work and work pause use is greatly reduced from the October 2004 timeframe. This is a positive trend that reflects positively on the ability of management to successfully resolve issues in a timely manner in concert with the workforce.

6.0 ASSESSMENT OF IMPROVEMENT IN MANAGEMENT PROGRAMS, INCLUDING FEEDBACK AND IMPROVEMENT

The Team considers that corrective actions associated with the findings of the pre-implementation review of the ISM Improvement Validation conducted in October 2004; the 244–CR vault incident; the six incidents addressed in ORP letter, *Conditional Payment of Fee Determination*, 04-ORP-054, R.J. Schepens to E.S. Aromi, dated August 24, 2004; the S-112 transfer incident; and the December 2004 TFC Common Cause Analysis are substantially completed based on:

- Review of the ISM Improvement Consolidated Corrective Action Plan, supported by 14 volumes of documentation, with appropriate basis for closure.
- Closure of 118 of the original 128 actions. The remaining 10 are scheduled to be closed in March (6) April (2), and May (2). The closure packages are well documented.

The Team observed that the ORPS process for the TFC is governed by the procedure TFC-OPS-OPER-C-24, REV B, Occurrence Reporting and Processing of Operations Information. This procedure was observed to be effectively implemented, with items being accurately screened and reported to DOE.

A process to develop feedback and improvement information opportunities at the site and facility levels, as well as, the individual work activity level was determined to be implemented. One key aspect of the feedback and improvement process is the TFC assessment program. The program is governed by TFC-PLN-10, REV A-3, Assessment Program Plan, dated May 2004. Based on some observed weaknesses in the program (see below), the procedure is being revised, and is expected to be issued in late March 2005. The Team reviewed a draft of the revised procedure and considers significant strengthening has occurred in several areas including making it more outcome driven and improving the effectiveness of the assessment process by having it fit within and strengthen the ISM system.

Another key element is the TFC work planning process. The governing document for this process is TFC-OPS-MAINT-C-01, REV G-1, dated February 4, 2005. In implementing the procedure, TFC has made significant progress in developing and implementing a planners Tool Box that provides lessons learned information in a web based system to all planners. Information is logically grouped by subject area, is readily accessible and is updated frequently. In addition, TFC has increased the number of work planners, who now total approximately 50, to assure that adequate manpower exists for work planning and incorporation of lessons learned. The planners Tool Box is evolving, and should be even more useful in the future as it matures.

A third element in the feedback and improvement program is the TFC lessons learned activity. This activity is governed by TFC-ORPS-OPER-C28-Rev A, Lessons Learned. The TFC program obtains lessons learned from external sources such as the DOE lessons learned program and EFCOG and also utilizes feedback from TFC work planning lessons

learned. Lessons learned are made actionable by TFC by generating a Problem Evaluation Request (PER), that requires tracking and disposition. Periodic assessments of the effectiveness of the lessons learned program are conducted, with the most recent performed in 2004.

Interviews and document reviews indicate that critiques and investigations are conducted for incidents, and that these investigations typically identify causes, findings, track hazards to corrections and identify preventative actions to eliminate the recurrence of the incident. The procedure governing this process is TFC-OPS-OPER-C-14, REV A-7, Event Investigation Process. The procedure defines a reasonable process for conducting event analysis. Implementation of the procedure appears to have improved since the October 2004 ISM review. During this review, the Team reviewed the causal analysis for the 241-C103 zip cord event and found that it was of high quality. A key factor in assuring success of these analyses is in the selection of qualified, experienced team members.

The procedure that governs the TFC trending program is PER Tracking Data and Trending Analysis Program, TFC-ESHQ-Q C-C02, rev B, March 2004. The goal of the TFC program is to identify leading indicators from the trending program to allow managers to make decisions based on relevant facts. At the outset of the process, performance indicators are agreed to between the TFC and DOE, performance data is evaluated monthly, and trends are identified. The TFC has identified ten top areas that are deemed critical to mission success. These include injury safety consequence codes, work practice safety, field work safety, environmental events, waste transport issues, vapor issues, lock and tag safety, vehicle safety and security, personnel contamination, and radiological dose. The TFC Corrective Action Group gathers the statistics on company performance in these areas and analyzes trends and causes. Performance data and trends are made available to all TFC managers on a monthly basis, and are discussed in various management forums including the President's Quality Council, the Presidents Accident Prevention Council, Presidents Safety Integration Council.

The Team observed that site issues management program implementation warrants some improvement particularly with respect to closure effectiveness, timeliness and feedback. Interviews and document reviews indicate that the TFC uses the PER process as its primary issues management tool. The PER process is described inTFC-ESHQ-Q-C-C-01, Rev B 11 dated March 9, 2005. This procedure was revised recently to incorporate results of a value engineering review of the PER process that was conducted in September 2004. A further revision to this procedure is planned for May 2005 to incorporate suggested software changes to the procedure.

In principle, the PER process is an effective tool for managing site issues, provided that it is used properly and consistently. Over the past year, a range of issues with the PER process implementation have been identified. Some of the implementation issues, including a revision of PER significance levels to allow minor PERs to be processed more quickly, have been implemented in the March 2005 procedure revision. Another issue observed is the time to closure for items in the PER process. Specifically, at the time of this review, there were more than 60 PERs that had been open longer than 365 days. TFC Waste Feed and Engineering organizations had that the largest number of PERs that had been open for more than 180 days. In addition, the average time to closure continues to

increase, and at the end of January 2005 was about 150 days. When the Team conducted its review in October 2004, the average time to closure (September 2004 data) was approximately 120 days. This compares to an average time to closure in March 2004 of 91 days, when a greater number of PERs were being generated. The "green" control limit in the TFC system for average time to closure is 180 days.

The TFC also self identified some program deficiencies with the PER process. The TFC had a series of corrective actions to address due to an independent assessment (OA Investigation into tank vapor issues in the spring of 2004 and the ISM improvement validation pre-implementation assessment in October, 2004) findings regarding the need for task specific job hazard analyses. The series of corrective actions were complete on February 15, 2005 according to the document provided by the TFC; however, the team found that implementation of these corrective actions had not been effectively completed. The Team noted that a TFC management assessment on tank farm work planning and job hazard analysis improvements published February 28, 2005, also found implementation of the new task-specific JHA requirements to be less than adequate, requiring further actions to ensure effective implementation.

Worker interviews also reflected some level of dissatisfaction with feedback of information concerning PERs they had generated. The TFC should consider placing a strong emphasis on getting consistency in the PER closure process, on reducing the control limit below 180 days for average time to closure and closing open PERs in a more timely manner, evaluating the effectiveness of the PER closure process on a regular basis, and improving feedback to PER generators.

From our observations of field work, and interviews with workers and managers, the Team concluded that a process is in place for identifying and resolving recommendations for improvement, including worker suggestions. TFC managers acknowledged in interviews the essential nature of worker feedback. TFC management also stated that improving the process of obtaining recommendations for improvement is a top priority. Mechanisms for obtaining recommendations for improvement include more interactive pre-job briefs, post job-debriefs, tailgate sessions, and implementation of the ALARA concerns program. With respect to worker suggestions, one mechanism for collecting this data is having supervisors complete a RPP JCS Work Record at the end of each shift. The last line of this form contains the question "Are there any suggestions?" Completed forms are collected and reviewed to extract the feedback and determine how to factor the lessons learned into future work planning. If the feedback warrants, a PER is generated and entered into the system and the item is tracked to resolution. The Team notes that significant reliance is placed on the PERS system for implementing the feedback process.

From observations, document reviews and interviews with workers and managers, the Team concluded that work packages have improved over the past year. Some visible improvements include the use of the CHAMPS system for work control, and the conduct of daily post job reviews. TFC performed an assessment of the effectiveness of these post job reviews in January 2005, and concluded that the process was working effectively. A key conclusion of this review was that field work supervisors are factoring in worker feedback in continuing work evolutions and future work planning. Two issues noted in interviews relate to the methods for providing feedback to workers to explain how their

comments/suggestions have been dispositioned, and the timeliness of getting the post job review feedback to the work planners. Both of these issues deserve management attention in the months ahead to assure that the worker feedback process is used most effectively.

The TFC ALARA program is governed by procedure TFC-ESHQ-RP-RWP-C-03, REV F-3, ALARA Work Planning. Other relevant documents include: TFC-ESHQ-RP-ADM-C-11, REV B-1, ALARA Joint Review Group; TFC-ESHQ-RP-ADM-C-13, REV B, ALARA Goals; and TFC-PLN-48, REV A, ALARA Program Plan. TFC annually establishes its ALARA goals and then tracks progress against these goals on a monthly basis. In 2004, TFC exceeded its limit for extremity collective dose due to the July 2004 thermocouple incident. All other ALARA goals were met. An independent assessment of the ALARA program was conducted by TFC in June 2004 (Independent Assessment of TFC Hanford Group, Inc. Radiological Work Planning and Field Implementation of Radiological Control". This assessment concluded that the ALARA program had deficiencies with implementation of fundamental planning activities that required immediate attention to implement a work planning process consistent with ISMS. A management assessment of the ALARA program that was conducted by TFC in February 2005 found that, "in general, the elements of ALARA program previously identified by Independent Assessment, FY-2004-CH2M-I-0126, as not being consistently implemented are now effectively in place". The 2005 report provided adequate justification for the conclusions. The Team conducted a document review and interviews to determine the health of the TFC's ALARA program. Radiological Control Program performance indicators were reviewed (dated March 1, 2005) for the past year. Improvements in program performance were substantiated by the performance indicators. This information is also consistent with the results detailed in a March 7, 2005 TFC ALARA program year-end status report. Interviews with the tank farm Central Radiological Control organization also indicated that additional initiatives are being developed to strengthen the ALARA program. Based on document reviews, interviews and observation of field work, the review team concluded that the ALARA program is implemented and continues to result in the reduction of personnel exposure.

Management and supervisory oversight of work performance involvement is evident, and workers noted more management or engineering visibility, than in October 2004. Field Work Supervisors (FWS) were observed to be knowledgeable of the work control process, work scope, hazards, hazard controls, and had a clear understanding of the work instructions. These attributes were demonstrated during the planning meetings, pre-job briefs, and in the field during work execution. The FWSs' maintained effective command and control over the work evolutions observed.

The team also observed the conduct of operations Mentors during pre-job briefs and planning meetings. The Mentors' were observed providing appropriate input to the work planning process. It was clear to the review team that their contributions have resulted in improvement in work planning and performance. Additionally, as stated earlier, SSWs' were observed to be in place and properly performing their oversight role.

However, the team observed some continued weaknesses with the lack of senior management presence in the field observing the work activities "within the fence". Of the work activities observed during the first week of the review, there was very limited management presence at the work site beyond the SSWs' required to be there. There was

less engineering presence. During the second week of the review, the Team did observe an increased presence with senior managers in the field. Based upon record reviews from the Management Observation Program (MOP), managers' calendars, and Access Control Entry (ACE) System records, the team also concluded that the management field presence has improved since the October 2004 review. The Team concluded that line managers and engineers will need to maintain a steady and visible presence at the work sites in order to help remove barriers to work efficiency and to help maintain the conduct of operations expectations. Additionally, increased engineering and management presence in the field would help both in understanding the nature of work flow, issues leading to delays, and in conveying a sense of teamwork with field workers.

7.0 ASSESSMENT OF SAFETY BASIS IMPLEMENTATION

During the course of the review, the team evaluated the flow down of Safety Basis (SB) requirements to the work in the field. The team reviewed the implementation of Technical Safety Requirement Limiting Conditions for Operation (LCO) and Administrative Controls (AC), including the Radiation Protection Safety Management Program (SMP).

The Radiation Protection SMP was determined by the Team to be adequately implemented. Specific focus areas included: ensuring radiological surveys were conducted at the required periodicity; observing survey results posted at the entrances to radiological areas; and verifying that areas were properly posted and identified to prevent inadvertent entry. Some isolated deficiencies were identified. In the SY change trailer, the radiation survey maps for the 244-S area and the "Boneyard" did not have a current signature for the survey data, indicating that the radiation survey data was out of date. The team also observed an RCT conducting radiation and contamination surveys with instruments that did not have the required daily source check. One RCT was observed inappropriately taking ground contamination surveys by dangling the probe by its cord. These observations were determined to be isolated events, since many examples were observed of up to date survey maps and instrument source checks, and proper use of instruments.

The Team observed effective implementation of TSR LCOs and ACs in work documents and procedures, as evidenced by completed surveillances and as observed in field work activities. LCO Surveillance Requirement performance was evaluated through field observation during the conduct of surveillance rounds, interviews with Nuclear Chemical Operators (NCO), system engineers, and Shift Operations Managers (SOM), and based on review of completed round sheets. Compliance with LCO's was observed through review of completed round sheets, review of work packages and procedures, and by direct observation in the field. Compliance with TSR AC's was observed through review of planned and completed work packages, and through direct observation of work in the field, where implementation was demonstrated through performance of the work instructions. No deficiencies were identified in this area.

8.0 ANALYSIS OF ASSESSMENT RESULTS AGAINST DESIGNATED CRITERIA

8.1 Work Planning

Criterion	Met	Partially Met	Not Met	Discussion
Work Planning: accomplished in accordance with the approved work planning and control procedures.	✓			
Worker Involvement in Work Planning: required by established processes and is observed to occur.	✓			
Work Permits (RWPs, JHAs, and IH Monitoring Plans, etc.): appropriate hazard controls are established and adequately communicated to ensure work is performed safely.	✓			
Hazard Identification: a rigorous and comprehensive process is established and implemented for the task-level identification of hazards during the work planning process.		✓		The task-specific job hazard analysis (JHA) procedure was established on October 15, 2004 and a series of further corrective actions to implement the task-level JHA procedure and documentation were completed on February 15, 2005. The work observed and the work package documents reviewed by the review team did not have task-specific JHAs required by the procedure. Upon request of the

Criterion	Met	Partially Met	Not Met	Discussion
				team, three work packages that were in the early planning stage were provided to show where task-specific JHAs were being developed. A TFC Management Assessment on Work Planning and Job Hazard Analysis improvements published February 28, 2005, also found implementation of the new task-specific JHA requirements to be less than adequate, requiring further actions to ensure effective implementation.
Hazard Controls: Effective and appropriate hazard controls are implemented into work packages and procedures for performance of work	✓			
Perform Work: procedures, work packages, and other performance documents are written to an adequate level of detail such that workers can safely and efficiently perform each task in the order specified with minimal interpretation or clarification from other personnel.	✓			

Criterion	Met	Partially Met	Not Met	Discussion
Feedback and Improvement: processes and procedures are implemented to adequately capture feedback following work activities; lessons learned and other forms of feedback are retrievable, meaningful, and are used in planning work.	✓			
Worker Understanding: workers have a clear understanding of the work scope, why the work is being performed, the hazards involved, the controls in place to protect workers, when work should be stopped, and who is responsible for safety.	✓			

The Team concurs with the effectiveness of corrective action implementation, recognizing that additional action is required to implement task specific JHAs.

The Team identified no findings in this area.

Page 45 of 70 of D7642466

8.2 Conduct of Operations

Criterion	Met	Partially Met	Not Met	Discussion
The Compensatory measures of MD-038 are adequate, implemented and effective.	✓			
Program reviews and observations show that procedures and/or mechanisms are in place that define clear roles and responsibilities within the facility to ensure that safety is maintained at all levels.	✓			
Program reviews and observations demonstrate that line management is responsible for safety.	✓			
Observations demonstrate that personnel are competent commensurate with their responsibility.	✓			

Criterion	Met	Partially Met	Not Met	Discussion
Program reviews, observations and interviews show that "readiness to proceed" is appropriately confirmed prior to start of new work activities.		✓		Observations and interviews showed that "readiness to proceed" is often not appropriately confirmed prior to start of new work activities. A number of work activities observed by the team were delayed by problems which included administrative, equipment readiness or availability, personnel availability, personnel timeliness to pre-job briefs or the work location, or other types of barriers. Improvement is needed in determining the readiness to proceed with work and ensuring that the proper personnel and equipment resources are available and assigned.
Observations demonstrate that operations personnel are responsible for the review, coordination, and approval of work activities prior to their start.	✓			
Program reviews, observations, and interviews show that a procedure usage and compliance policy exists and is implemented. Personnel are observed to perform work in accordance with the procedure compliance policy.	✓			
Program reviews, observations, and interviews demonstrate that operations personnel understand their roles and responsibilities during abnormal and emergency conditions.	✓			

Page 47 of 70 of D7642466

Criterion	Met	Partially Met	Not Met	Discussion
Observations show that the use of procedures, work packages, JHAs, RWPs, IH monitoring plans, and other documents are appropriate and adequate for safe performance of work.	✓			
Observations show that personnel performing work fully understand and comply with all aspects of the hazard controls within their work packages and procedures.		✓		During one activity a worker placed his arm and hand under a suspended load.
Observations, program reviews, and interviews show that if work packages or procedures can not be performed as written, work is suspended and the documents are appropriately changed, reviewed, and approved prior to continuing work.		✓		In general, work evolutions were executed with strict procedure and work package compliance. Some procedure non-compliances were observed by the team. These were minor in nature.
During the work planning or execution process personnel demonstrate the ability to recognize changing and/or unknown conditions and appropriately suspend work activities until they are appropriately dealt with.	✓			
Observations and interviews reflect that during work performance personnel can be expected to utilize their stop work authority, when required.	✓			

The Team concurs with the effectiveness of corrective action implementation, recognizing that additional action is required to improve assurance of readiness to proceed with work, improve implementation of conduct of operations expectations, and improve housekeeping in portions of the tank farms.

The Team identified no findings in this area.

Page 48 of 70 of D7642466

8.3 Relevant Management Programs Including Feedback and Improvement

Criterion	Met	Partially Met	Not Met	Discussion
Corrective actions associated with the findings of the pre-implementation review of the ISM Improvement Validation conducted in October 2004, the 244–CR vault incident; the six incidents addressed in ORP letter, *Conditional Payment of Fee Determination*, 04-ORP-054, R.J. Schepens to E.S. Aromi, dated August 24, 2004; the S-112 transfer incident; and the December 2004 TFC Common Cause Analysis are substantially completed.	✓			
Program reviews and observations show that the occurrence reporting process as required by DOE is fully implemented.	✓			
Program reviews and observations show that a process to develop feedback and improvement information opportunities at the site and facility levels, as well as, the individual work activity level is implemented.	✓			
Program reviews and observations show that critiques and investigations are conducted for incidents, including near misses that result, or could result, in occupational injury, illness or death. Investigation reports identify causes,	✓			

Criterion	Met	Partially Met	Not Met	Discussion
findings, track hazards to correction, and identify any preventive or corrective actions to eliminate the recurrence of the incident.				
Program reviews and observations show that the organization and/or facilities perform trend analysis of performance indicators and safety and health data (including injury and illness, accident investigation, assessment and audit, and employee safety report experience) for identification and resolution of programmatic or systemic weakness.	✓			
Program reviews and observations show that the site issues management program is effective in developing corrective action plans, where appropriate, and that management aggressively pursues timely completion of these action items.		✓		PER closure effectiveness, timeliness, and feedback warrant improvement.
Program reviews and observations demonstrate that a process is in place and is utilized by managers for considering and resolving recommendations for improvement, including worker suggestions.		✓		Significant reliance on PERs for some feedback.
Program reviews and observations indicate that identified work package and procedure improvements and lessons learned are incorporated into the process. Post-job reviews are performed for specified activities.	✓			

Criterion	Met	Partially Met	Not Met	Discussion
Program reviews and observations demonstrate that a formally structured, auditable facility program is in place to ensure that exposures are maintained ALARA.	✓			
Observations demonstrate sufficiency of management and supervisory oversight of work performance.		✓		The team observed some continued weaknesses with the lack of engineering and senior management presence in the field observing the work activities "inside the fence". Of the work activities observed during the first week of the review, there was very limited management presence at the work site beyond the SSWs required to be there. During the second week of the review, the team did observe an increased presence with senior managers out in the field. Based upon record reviews from the Management Observation Program (MOP), managers' calendars, and Access Control Entry (ACE) System records, the team also concluded that the management presence out of their offices has improved since the previous October review by the team. The team determined that line managers and engineers will need to maintain a steady and visible presence "inside the fence" at the work sites in order to help remove

Criterion	Met	Partially Met	Not Met	Discussion
				barriers to work efficiency and to help maintain the conduct of operations expectations.

The Team concurs with the effectiveness of corrective action implementation, recognizing that additional action is required to improve the effectiveness of issues management in the area of PER closure effectiveness, timeliness and feedback and to increase sufficiency of engineering and management oversight of work performance.

The Team identified no findings in this area.

8.4 Safety Basis Implementation Assessment

Criterion	Met	Partially Met	Not Met	Discussion
Radiological Controls: the radiological controls safety management program is adequately implemented to ensure that: radiological surveys of work areas are performed at the required periodicity, survey results are posted at the entrances to radiological areas, and that areas are properly identified and posted to prevent inadvertent entry.	✓			
Technical Safety Requirements: LCO and AC requirements are appropriately included in working level documents and procedures; field implementation is answered.	✓			

The Team concurs that the safety basis is effectively implemented and identified no findings in this area.

9.0 REVIEW TEAM CONCLUSIONS

The team concluded that the corrective actions associated with:

- the findings of the pre-implementation review of the ISM Improvement Validation conducted in October 2004.
- the 244–CR vault incident;
- the six incidents addressed in ORP letter, *Conditional Payment of Fee Determination*, 04-ORP-054, R.J. Schepens to E.S. Aromi, dated August 24, 2004;
- the S-112 transfer incident;
- the December 2004 Tank Farm Contractor Common Cause Analysis

have been substantially completed and the benefits of their implementation are beginning to be realized.

The Team also concluded that this is the beginning of performance improvement, not the end, and that a year or more of continued deliberate management attention will likely be required to assure sustained improvement and desired culture change.

The Team had no findings.

The Team recommends that the TFC continue to implement the Comprehensive Corrective Action Plan with sustained deliberate management attention and that increased focus for continued improvement be placed:

- implementing task specific job hazard analyses
- improving assurance of readiness to proceed with work
- improving implementation of conduct of operations expectations
- improving PER closure effectiveness, timeliness, and feedback and
- increasing sufficiency of engineering and management oversight of work performance

10.0 REFERENCES

1. DOE Policy P 450.4, *Safety Management System Policy*, U.S. Department of Energy, October 15, 1996.
2. DOE G 450.4-1B, *Integrated Safety Management System Guide*. U.S. Department of Energy, March 1, 2001.
3. DOE O 425.1C, *Startup and Restart of Nuclear Facilities*. U.S. Department of Energy, March 13, 2003.
4. 48 CFR Chapter 9, *Department of Energy*, 970.5223-1, *Integration of Environment, Safety, and Health into Work Planning and Execution*. Federal Acquisition Regulations System.
5. 48 CFR Chapter 9, *Department of Energy*, 970.5204-2, *Laws, Regulations, and DOE Directives*. Federal Acquisition Regulations System.
6. 10 CFR 830, *Nuclear Safety Management*, Subpart A, *Quality Assurance*. Department of Energy.
7. 10 CFR 830, *Nuclear Safety Management*, Subpart B, *Safety Basis Requirements*. Department of Energy.

Appendix A - Team Member Biographies

Frank McCoy: Mr. McCoy has over thirty-five years of experience in the operation, regulation, and management of U.S. DOE, commercial and naval nuclear facilities including power and production reactors, chemical processing facilities, and laboratories. This experience has included management and senior executive positions with DOE, Department of Navy, and the U.S. Nuclear Regulatory Commission (NRC), as well as private sector companies. Currently Mr. McCoy is a Principal with Washington Safety Management Solutions (WSMS) where he is responsible for managing all WSMS services for closure projects. As a WSMS Principal Mr. McCoy has also personally supported many sites in the both the DOE and DoD including: supporting West Valley Nuclear Services Company on deactivation, decontamination and decommissioning activities; supporting the Yucca Mountain Project with ISM development and implementation; supporting Savannah River Site in accident investigations and senior safety reviews; providing nuclear facility management, operational readiness, and ISM consulting services to Bechtel at the Nevada Test Site and Hanford Waste Treatment Plant Project; supporting Oak Ridge National Laboratory in the Operational Readiness Review of the High Flux Isotope Reactor; providing Integrated Safety Management and Quality Assurance assessment services to Rocky Flats Environmental Technology Site and Brookhaven National Laboratory, and providing management support to the Army Chemical Demilitarization facilities at Tooele, Umatilla, and Anniston. Prior to retiring from government service and joining WSMS, Mr. McCoy was a Senior Executive within DOE where his last assignment was serving as Deputy Manager at the Savannah River Site (SRS). In this capacity he served as Chief Operating Officer for SRS nuclear operations. In 1996 and 1997, he served as a Special Assistant to the Under Secretary of Energy where he led the DOE's efforts to establish and implement an Integrated Safety Management System across the DOE complex. Prior to joining DOE, Mr. McCoy was as a manager in NRC where his last assignment was as Assistant Director for Inspection Programs. In this capacity, he was responsible to the NRC's Office of Special Projects for inspection and assessment activities associated with recovery of the five TVA licensed reactors following prolonged shutdown as "watch-listed" problem utilities. While in NRC, his activities also involved leading and/or participating in the Operational Readiness Reviews for NRC operating license approval of the Vogtle, Sheron Harris, and Catawba nuclear units. He also performed numerous onsite response inspections of reactor unusual events, routine assessments of licensed operator training, maintenance, and operations programs and participated in Safety System Functional Inspections and Augmented Inspection Team Inspections. During nearly 15 years with the Department of Navy, Mr. McCoy was a Chief Refueling Engineer, Project Manager, and Physicist at the Charleston Naval Shipyard. Mr. McCoy holds a Masters degree in Physics from Georgia Tech and Bachelor of Science degree from The Citadel.

Joseph Arango: Mr. Arango has sixteen years of experience in various engineering disciplines supporting the development and implementation of program plans for the Department of Energy and the Department of Defense. He holds a Masters degree in Industrial and Systems Engineering from Virginia Tech and a B.S. in Mathematics from the U.S. Naval Academy. Mr. Arango currently works in the DOE EM Headquarters Office of Integrated Safety Management/Operations Oversight. He has led a number of reviews conducted consistent with the Department's line oversight policy, and he has been designated as an Integrated Safety Management System Verification Team Leader. He was the DOE Operational Readiness Review (ORR) Team Leader for the Supernate Process of the TRU/Alpha Low Level Waste Treatment Project startup at Oak Ridge in January 2004. He completed the DOE Operational Readiness Review Training Course for ORR Team Leaders and Team Members in November 2002. From 1995 to 2001, he worked in the Office of the Departmental Representative to the Defense Nuclear Facilities Safety Board on a variety of safety issues identified by the Board including integrated safety management. Mr. Arango also served for two years as the Headquarters Program Manager for the Facility Representative Program guiding Department-wide program implementation and continuous improvement. From 1988 to 1995, as an Acquisition and Engineering Manager in private industry, he provided program management and engineering support for a Navy combat system design and development contract. Prior to 1988, he gained seven years of experience in the Navy nuclear power program where he qualified in submarines and as a Nuclear Engineering Officer and a Nuclear Weapons Handling Supervisor. He participated in Integrated Safety Management System Phase I and II Verifications at Rocky Flats and at the Oak Ridge Y-12 Plant in 1998, as well as a preliminary Phase I Verification at Lawrence Livermore National Laboratory's Building 332. He was the Idaho National Engineering and Environmental Laboratory Verification Team Leader for both the Phase I and the initial Phase II Verification in 1999. He was a sub-team leader for the August 2000 Verification at the Y-12 Plant and he led an Integrated Safety Management System Assessment for the Y-12 Area Office in 2001 and for the Idaho Operations Office in 2002.

Terry E. Krietz: Mr. Krietz is the worker safety and health subject matter expert for the Office of Engineering on detail to the Chief Safety Officer position for the Office of Environmental Management. He has 25 years experience in safety management of highly hazardous operations. Eleven of those years were spent developing DOE-wide worker safety and health policy and providing technical assistance to the DOE field elements. He earned Bachelor of Science degrees in biology and geo-environmental studies at Shippensburg University.

Before coming to DOE, Mr. Krietz served as Safety Director at the Sierra Army Depot and the Senior Safety Manager for the U.S. Army Depot System Command. He completed the U.S. Army Materiel Command Safety Management Intern Program and technical training in the chemical, explosives, nuclear, and radiological areas. Mr. Krietz has served as lead, co-lead, or participant on over 40 comprehensive safety and health program evaluations of U.S. Army Depot System Command installations. He has also been accident investigation board chairman for fatality investigations at Anniston and Tobyhanna Army Depots. He has been the lead, co-lead, or participant on pre-operational surveys of toxic chemical

weapon operations at Anniston, Blue-Grass, Pueblo, Tooele, and Umatilla Army Depots, and has been the lead for Army safety and health inspections of industrial, explosives and construction operations at U.S. Army Depots. With DOE, he has served as an evaluator for the DOE Voluntary Protection Program evaluations at Savannah River and INEEL and has been an evaluator for DOE EH/EM reviews of site safety and health programs. Terry has participated in ISMS reviews and re-verifications at the DOE Office of River Protection, CH2M HILL Hanford Group Tank Farm and Bechtel National Waste Treatment Plant at Hanford, the Oak Ridge Operations Office/Bechtel-Jacobs ETTP; and the DOE Savannah River Oversight Review of Westinghouse Savannah River Company ISMS review.

Bill Lloyd: Mr. Lloyd brings over 20 year of experience in the operation of nuclear facilities. He is degreed in Chemical Engineering from Illinois Institute of Technology. Mr. Lloyd began his career as an operator in the nuclear power industry. This experience includes initial startup of both Boiling Water Reactor (GE) and Pressurized Water Reactor (W) operations. In addition to qualification as a nuclear operator, he also qualified as a radiation-chemistry technician. These positions allowed Mr. Lloyd to become intimately familiar with all facets of power plant operation. These include reactor power operations, radwaste operations, health physics, radiation safety and reactor and secondary water chemistry.

Mr. Lloyd has also worked in the Nuclear Weapons Complex. He has extensive experience in Nuclear Materials processing. Mr. Lloyd was integral to implementing the restart (after a six-year shutdown) and continuous safe operation of this plutonium manufacturing, stabilization, packaging and storage facilities. These facilities converted Plutonium nitrate solution into a Plutonium Metal product. This product is then processed into a weapon useable form. In this capacity, Mr. Lloyd had fully authority and accountability for all operations and for all materials. Mr. Lloyd also has extensive experience in the area of Material Protection Control and Accountability (MPCA) as well as Safeguards and Security (S&S).

Mr. Lloyd has demonstrated a keen sense of scheduling, planning, budget management, Authorization Basis management and the effects of plutonium, highly enriched uranium, americium and other special nuclear material. He has a proven ability to get things safely done within budget caps and with imagination, leadership and intelligence.

Mr. Lloyd has also acted as a Senior Advisor in the area of operations at Los Alamos National Laboratory. In the capacity, he advised the Associate Director for Weapons Engineering and Manufacturing (ADWEM) in the area of operations improvement. These duties included the areas of Plutonium processing and Tritium processing for weapons development and life extension issues.

John R. Longenecker: Mr. Longenecker has over 30 years experience in the energy industry in the areas of independent assessment, project management and regulatory compliance in various programs including waste management, nuclear reactor development, and advanced technology development and deployment. Unique strengths and experience

include independent assessment, strategic planning, regulatory compliance, nuclear safety, and quality assurance.

Mr. Longenecker's energy related experience includes performing strategic planning, technical and management assessments of nuclear fuel cycle projects and facilities including the Hanford site, Yucca Mountain High Level Waste Project, the Idaho Spent Fuel Project, and the Tank Waste Remediation System Project (TWRS). In 2000, Mr. Longenecker and several Longenecker & Associates staff served as members of a DOE review of the TWRS project that was mandated by Congress. Mr. Longenecker also serves as Managing Director and Working Group Coordinator of the DOE's Energy Facilities Contractors Operating Group (EFCOG).

Mr. Longenecker experience with DOE programs includes serving on review and advisory panels at Los Alamos National Laboratory, Lawrence Livermore National Laboratory, the Yucca Mountain Project, Fluor Hanford and the Office of River Protection, and performing quality assurance management assessments from 1990-2002 for DOE's Office of Civilian Radioactive Waste Management, including the Yucca Mountain High Level Waste Project, Mr. Longenecker was appointed by President Bush in December 1992 to serve as Transition Manager for the United States Enrichment Corporation, a government owned, for-profit corporation that provides uranium enrichment services to electric utilities throughout the world.

In the area of commercial nuclear power, Mr. Longenecker has served as a member of the Board of Directors of the Nuclear Energy Institute. In addition, from 1997-1999 Mr. Longenecker assisted Ontario Hydro Nuclear in developing and implementing a more effective regulatory compliance strategy for their 20 nuclear power plants.

Prior to the formation of Longenecker & Associates in May 1989, Mr. Longenecker was Chairman of General Atomics International Services Corporation (ISC) in La Jolla, California. ISC provided operational and quality support services to electric utilities and other private sector customers throughout the world. Mr. Longenecker joined General Atomics as Director of Special Projects in August 1987.

From 1983 to 1987 Mr. Longenecker served in the Reagan administration as the Deputy Assistant Secretary for Uranium Enrichment in the U.S. Department of Energy. Prior to managing the U.S. uranium enrichment enterprise, Mr. Longenecker held other management positions in DOE and its predecessor agencies, including serving from 1981 to 1983 as the Program Manager for the CRBRP Project. In this position, Mr. Longenecker was the primary interface with the NRC during the project licensing process.

Mr. Longenecker has appeared before the Congress of the United States on numerous occasions, and has presented papers in various national and international forums. Mr. Longenecker is a member of board of directors of the Nuclear Energy Institute, and has served as chairman of the USCEA Uranium Enrichment Task Force. Mr. Longenecker is a member of Tau Beta Pi Honorary Engineering Society, the American Nuclear Society, and the University Club.

Mr. Longenecker received both his Bachelor of Science and Master of Science degrees, with academic honors, from the Pennsylvania State University, and has served as a member of the Penn State Industrial Professional Advisory Council.

Mark Brown: Mr. Brown has over 21 years experience with nuclear operations and providing oversight of environmental restoration activities. Mr. Brown's professional involvement included supervision of U.S. Navy nuclear reactor and steam plant operations, maintenance and overhaul, and oversight and assessment of operating Department of Energy non-reactor nuclear facilities. Mr. Brown holds a Bachelor of Science degree in Mathematics from the University of Texas.

Mr. Brown's career included over eleven years as a naval nuclear submarine officer where he qualified for and supervised the operations of 5 different naval reactor plants, with two years as the lead instructor in the operation of naval reactor and steam plants. Mr. Brown's career with the Department of Energy has included one year evaluating Hanford contractor training and qualification programs, and over 8 years as a Facility Representative for the Office of River Protection. Mr. Brown has extensive experience in conducting assessments of nuclear operations. He has been a review team member for several readiness assessments and operational readiness reviews, and a team leader for several major assessments of Hanford contractors in areas including maintenance, construction, training and operations. Mr. Brown is an NQA-1 certified lead auditor.

Jill M. Molnaa: has worked at the Hanford site for 23 years. She was a truck driver for 15 of those years and is a member of the Hanford Atomic Metal Trades (HAMTC). Jill is also a member of the Teamsters Local 839. During her years as a truck driver she worked on the road crew and at that time received her Washington State herbicide license. Ms. Molnaa also worked at Central Stores Delivery, and for Bechtel, Hanford Inc., at which time she attained her class A CDL license. Ms. Molnaa has worked for several of the Hanford Site contractors throughout her 23 years, which included such experience as furniture moving, crane and rigging on the tank farms, and transportation of hazardous waste.

Along with Ms. Molnaa's experience as a qualified teamster, she has also served in the capacity of Integrated Safety Management Systems (ISMS) HAMTC Lead for Fluor Hanford, as well as the HAMTC Safety representative for the HAMMER training facility. Ms. Molnaa played a vital role in helping HAMMER achieve Star recognition within the Department of Energy's (DOE) Voluntary Protection Program (VPP). She was instrumental in the development of the VPP application, and conducting interviews for their annual self assessment. Ms. Molnaa has participated in several VPP reviews at the Hanford site.

Ms. Molnaa has been involved with Fluor Hanford and DOE safety concerns programs (addressing safety issues), and has mentored Spent Nuclear Fuels in improving their safety culture by participating as a member of the "Work Place Enhancement Team." Ms. Molnaa was also a critical team member in the initial planning, education, and implementation of ISMS within all the Fluor Hanford projects.

Ms. Molnaa is currently the lead HAMTC Safety representative for TFC. She has been certified in conducting Accident Investigations, Root Cause Analysis, various safety training classes, and has received OSHA 500 training for Construction and General Industry.

Ms. Molnaa's functions as the Lead HAMTC Safety representative include: Assisting DOE and contractors in resolving HAMTC employee concerns related to health and safety; working with senior management, Labor Relations, and Employee Concerns to resolve work place issues; serving as a point of contact for Stop Work events, work pause events, fact findings, event investigations, and other activities in which HAMTC employees are involved. Ms. Molnaa also meets regularly with the President and General Manager of CH2M HILL and the HAMTC President to communicate issues. Ms. Molnaa participates in management staff meetings to aid in resolving Health and safety issues, and supports and promotes worker involvement in our safety and health programs, such as safety councils, ISMS, VPP and the Safety and Health Expo.

Appendix B - List of Interviewee Positions

WORKERS

- Crane Operators (2)
- Test Crew Operators (2)
- Nuclear Chemical Operators (12)
- WGI Construction Workers (5)
- Power Operator (1)
- Laborer (5)
- Lead Fitter (1)
- Lead NCO WFO Crew (1)

SUPERVISORS

- FWS (14)
- Test Crew Lead
- Critical Lift Person In Charge (2)

TECHNICIANS

- Health Physics Technician (19)
- Instrument Technicians (3)
- Quality Assurance Technician
- Industrial Hygienists (4)
- Conduct of Ops Mentors (2)
- Operations Specialists (26)
- Drill Controllers (4)
- Planners (11)

ENGINEERS AND MANAGERS

- Shift Managers (6)
- Senior Supervisory Watch (4)
- Operating Engineer (2)
- Independent Assessment Manager
- System Engineer (2)
- JHA SME
- WFO Support Manager
- Plant Engineer
- Engineer Analyst
- Lessons Learned Manager
- Radiological Engineer

SENIOR MANAGEMENT

- Maintenance Director
- Safety & Health Director
- Director of Work Planning
- Radcon Program Director
- Senior Technical Advisor to Vice President of Performance Assurance (1)
- Senior Technical Advisor to the Office of the President (1)
- Director of Integration and Performance Analysis
- Senior Technical Advisor
- TFC ALARA chairperson
- Executive Assistant to the Office of the President
- Acting Deputy General Manager
- Senior Vice President of Nuclear Operations
- Vice President of Engineering
- Director of Safety Programs
- Director of 222-S Laboratory Facilities
- Vice President of Analytical Technical Services
- Vice President of Closure Operations
- Vice President of Waste Feed Operations
- Deputy Vice President of Closure Operations
- Deputy Vice President of Waste Feed Operations
- Director of Mission Analysis

Appendix C - Documents Reviewed

1. C200 Weld Vacuum Skid Water Separator Work Package
2. TFC Hanford Group, Inc. Year-End Status Report of Calendar Year 2004 as Low as Reasonably Achievable Goals and Performance Indicators
3. Transmittal of Revision 1A, FY-2004-CH2M-I-0126, *"Independent Assessment of CH2M HILL Hanford Group, Inc. Radiological Controls ALARA Program, Radiological Work Planning and Field Implementation of Radiological Controls"*
4. 242 A Evaporator Technical Safety Requirements Tank Farm Plant Operating Procedure TO-600-030, *"Startup 242-A Evaporator System"*
5. Management Assessment Report, February 2005
6. RWP 2W-168 R2
7. Work Package 2W-04-00928, 241-A Inspection of Tank Laterals
8. RWP TF-001
9. HNF-SD-WM-TSR-006, *"Tank Farms Technical Safety Requirements"*
10. HNF-IP-1266, *"Tank Farm Operations Administrative Controls"*
11. TFC-OPS-OPER-C-10, *"Vehicle and Dome Load Control in Tank Farm Facilities"*
12. TFC-OPS-OPER-C-14, *"Event Investigation Process"*
13. Work Package WFO-05-0834, 702 AZ B-Train HEGA Filter Halide Test
14. Tank Farm Maintenance Procedure 3-VBP-159, Rev. B-1, dated 9/2/04, *"HEGA Filter In-Place Leak Test"*
15. Tank Farm Maintenance Procedure 5-LCD-300, Rev F-3, dated 1/11/05, *"ENRAF Series 854 Displacer Weight Check and Calibration Check"*
16. Tank Farm Plant Operating Procedure TO-020-420, Rev F-3, dated 1/11/05, *"Clean, Level Indicating Transmitter tapes, Plummets and Displacers"*
17. Tank Farm Plant Operating Procedure TO-040-540, G-4, Dated 9/20/04, *"Water Surveillance and Usage"*
18. Work Package 2W-03-01369/K, SY-A Pit Construction
19. Work Instruction TFC-WI-001, SY-A Pit Modifications and Restoration
20. TFC-PLN-05, Rev B-9, dated 1/5/05, *"Conduct of Operations Implementation Plan"*
21. Tank Farm Operating Procedure, TO-220-106, Rev A-13, dated 12/15/04, *"Transfer from 241-C-200 Series Tanks to 241-AN-106"*
22. Tank Farm Plant Operating Procedure TO-320-032, Rev A-14, dated 11/16/04, *"Operation of 241-C-200 Series Tanks MRS in Automatic/Manual Mode"*

23. Tank Farm Plant Operating Procedure TO-320-030, Rev. A-10, dated 12/13/04, *"Startup / Shutdown of 241-C-200 Tanks WRS Support / Utility Systems"*
24. Tank Farm Operating Procedure TO-060-010, Rev A-24, date 3/4/05, *"Operate POR 03 Exhauster"*
25. Radiological Work Permit IS-538, Rev.0, 241-C-103/106, PRO 08 Exhauster
26. Tank Farm Work Instruction, WS-04-00712, 241-C-103/105, *"Exhauster Tie-in POR008"*
27. IH Area Sampling Results Handout from Tailgate Meeting
28. TFC-OPS-OPER-C28, Rev. A, *"Lessons Learned"*
29. *"End Point Assessment of ISMS Improvement Consolidated CAP Closure Status"*, Vols. 1-14
30. TFC-OPS-OPER-C-24, Rev. B., *"Occurrence Reporting and Processing of Operations Information"*
31. TFC-OPS-OPER-C-14, Rev. A-7, *"Event Investigation Process"*
32. TFC-ESHQ-QC-C02, Rev. B, March 2004, *"Trend Analysis Procedure PER Tracking Data and Trending Analysis Program"*
33. TFC-PLN-10, Rev. A-3, May 2004, *"Assessment Program Plan"*
34. TFC-ESHQ-RP-RWP-C-03, Rev. F-3, *"ALARA Work Planning"*
35. TFC-ESHQ-RP-ADM-C-11, Rev. B-1, *"ALARA Joint Review Group"*
36. TFC-ESHQ-RP-ADM-C-13, Rev. B, *"ALARA Goals"*
37. TFC-PLN-48, Rev. A, *"ALARA Program Plan"*
38. TFC-ESHQ-S_SAF-C-02, Rev B-2, 10/15/04, *"Job Hazard Analysis"*
39. TFC-ESHQ-RP_ADM-C-11, Rev B-1, 2/18/05, *"ALARA Joint Review Group"*
40. TFC-ESHQ-S_SAF-C-04, Rev B-5, 1/19/05, *"Stop Work Authority"*
41. TFC-ESHQ-S_IH_D-08, Rev A-4, 1/11/05, *"Industrial Hygiene Monitoring and Control Strategies During Tank Retrieval and Transfers"*
42. TFC-OPS-MAINT_C-02, Rev B-1, 3/23/04, *"Pre-Job Briefing"*
43. TFC-MD-038, Rev E-1, 2/17/05, *"Compensatory Controls for Medium Risk Radiological Control Performance"*
44. TFC-OPS-OPER-C-31, Rev A-3, 2/18/05, *"Communication Guidelines"*
45. TFC-ESHQ-S_IH-P-09, Rev A-1, 12/8/04, *"Industrial Hygiene Personal/Area Exposure Monitoring"*
46. TFC-ESHQ-RP_RWP-C-03, Rev F-2, 1/27/05, *"ALARA Work Planning"*
47. TFC-OPS-MAINT-C-01, Rev G-1, 2/4/05, *"Tank Farm Contractor Work Control"*
48. Form A-6002-893, 01/05, Pre-Job Briefing

49. Form A-6003-211, 01/05, Walkdown, TPM, and Pre-Job Attendance Roster
50. Form A-6003-707, 02/05, Work Order Planning Checklist
51. FY2005-CP-M-0169, Appendix 8, MD-038 Cross Walk
52. Completed Work Packages (4)
53. ES-03-00139/M, RWP E-1488, Rev 004; AMW AW-0734; JHA (old format), *"241-AP-07A, Clean and Prepare Pit for Painting"*
54. EE-04-01058; RWP E-1516, Rev 001; AMW AW-0850; JHA # JHA-EE-04-1058, 2/18/05 (old format), *"242-A Perform Housekeeping in Loadout Room"*
55. WS-04-2207/W; RWP IS-505, Rev 001; AMW AW-0803, Rev 001; JHA (old format) (started in July, 2004) (old format), *"Perform Calibration or Replace Level Indicator on C-200 Pump Vessel Skid"*
56. WS-04-00722/M RWP IS-504, Rev 000; AMW AW-0801 rev 000, *"241-AN-106 Supernate Pump/Distributor Installed"*
57. RWP Number IS-482/AMW Number 0750, Rev 2, 2/22/05
58. Standing JHA Number TF-SJHA-0001, General Tank Farm Hazards JHA, Rev 9, 8/18/04
59. Job Specific JHAs as part of work packages (7; 1 as part of observed evolution; 2 as part of Team Planning Meeting; and 4 as part of completed work packages)
60. Task-Specific JHA model (draft JHA-CLO-WO-000102) used in training
61. Draft Task-Specific JHAs (part of work planning packages recently initiated)
62. Interoffice Memo from RadCon Program, 1/20/05, subject: *"Job Planning Lessons Learned"*, (discussed lessons learned from a series of Independent Review Team and ALARA Joint Review Group meetings)
63. Interoffice Memo From Work Planning to V.M. Pizzuto, Work Planning Improvements and Job Hazard Analysis Management Assessment, with Enclosure 7W100-TLJ-05-003, Work Planning Improvements and JHA Management Assessment Report, 2/28/05
64. Problem Evaluation Reports, PER-2005-0872 through 0875, related to implementation of task-specific JHAs finding contained in 7W100-TLJ-05-003, Work Planning Improvements and JHA Management Assessment Report, 2/28/05
65. Integrated Safety Management System Improvement Consolidated Corrective Action Plan Status of Corrective Actions by Due Dates as of March 7, 2005 (TFC Inbrief Presentation)
66. FDM-05-13, Drill Scenario and Control Guide, *"Cross Site Transfer Radiation Levels Exceeded in Pit"*
67. AOP-TF-020, *"Abnormal Operating Procedure"*
68. Problem Evaluation Request (PER) Process Improvement, 9/27-29/04, *"Value Engineering Study Report"*

69. *"Integrated Assessment Schedule"*, 2/9/05

70. 04-ESQ-107, 11/9-16/04, *"A-04-ESQ-TANKFARM-104"*

71. PER 2005-0057, 3/8/05, *"Root Cause Analysis Report"*

72. Reviewed work packages 2W-04-00928, *"241-A Inspection of Tank Lateral"s*, WS-04-002894, *"241-S-102 Remove/Repair In-tank Cameras"*, 2W-04-02868/W, *"Perform Rad/Video Surveys"*, 2E-04-01595/W, *"241-AN-101 Air Pressure Test via 01A"*, 2W-04-00928/W, *"241-A Perform Inspections of Tank Laterals"*, and Operating Procedure TO-020-005, *"Perform Pit Video Examinations and Leak Checks Using a Remotely Controlled Camera"*.

73. FDH-05-12, Drill Scenario and Control Guide, *"Contamination Drill"*

74. TO-410-900, Rev. b-17, dated 3/11/05, *"TSR Compliance241-S Farm"*

75. PER-2005-1087, dated 3/11/05, *"SPG Alarm failed to alarm when the high SPG alarm set point was reached and exceeded while running the S-112 transfer pump"*

76. PER-2005-0912, dated 2/21/05, *"Generated per TFC-ENG-DESIGN-P-12 Requirement"*

77. PER-2005-0783, dated 2/21/05, *"When S-102 Computers were rebooted the wrong rev. of the software was loaded"*

78. RWPs TFJ-135 and TFJ-136

79. Planning Package 2W-04-02868

80. January 2005 performance indicators for skin and clothing contaminations at the tank farms

81. TFC Interoffice Memo 7B800-ODB-05-009, dated March 7, 2005,"*CH2M HILL Hanford Group, Inc. Yearend Status Report of Calenday Year 2004 As Low As Reasonably Achievable Goals and Performance Indicators*"

Appendix D - Evolutions Observed (Including Safety, Planning, and Pre and Post Job Review Meetings)

C-200 Tank Water Separator Weld Repair

Plan of the Day (10)

Daily Report Morning Meeting (6)

242-A Evaporator Briefing

242-A Evaporator Day Shift to Night Shift Turnover

Tailgate Meeting (4)

Field Crew Daily Briefing

Pre-job Briefing (15)

Pre-job Surveys for A Farm lateral work

Area Contamination Surveys (routines) in AY Farm RBA

702 AZ B-Train HEGA Filter Halide Test

Weekly WFO Vice President and Managers Brown Bag Lunch Meeting

241-AW-101 ENRAF Flush and Calibration

SY-A Pit Construction Work

Closure SCBA/SKA Issue Station Operation

FWS Shift Turnovers (WS-04-710 "C-241-C-103 Install Sluicer Nozzle Riser #3")

C-241-C-103 Install Sluicer Nozzle Riser #3

Team Planning Meeting for (ES-03-00167/M) "241-AP-02A Clean, Prep and Paint Pit"

Team Planning Meeting for (WS-04-02573/M and WS-04-02576/M "Remove Remote Water Distribution Device in tank S-102 Riser 14 and 11; Install Remote Water Distribution"

WFO Table Top Drill for Cross Site Transfer Radiation Levels Exceeded in Pit

C Tank Farms POR-03 Exhauster Startup

CO Contamination Table Top Drill

Planning Meeting (Roundtable meeting) for work to conduct SY pit videos and radiological surveys, in support of Project W-314 (Tank Farm Upgrades) (work package 2W-04-02868)

Team Planning Meeting for AN-101 transfer line encasement pressure test

Management Observation Program, *"CHAMPS (Computerized History and Maintenance Planning Software)"*

Planning walk down for work to decontaminate the SY-B Train exhauster

Drill Coordinators Meeting

Drill Pre-Brief Meeting (2)

AP-105 Pit Flush

S-112 Transfer

S-112 Transfer Rounds

S-112 Transfer Follow up

Post-job review following removal of the S-102 video camera