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

08-ESQ-080

Mr. John C. Fulton, President
and Chief Executive Officer
CH2M HILL Hanford Group, Inc.
2440 Stevens Center Place
Richland, Washington 99354

Dear Mr. Fulton:

CONTRACT NO. DE-AC27-99RL14047 – ASSESSMENT A-08-ESQ-TANKFARM-003 OF CH2M HILL HANFORD GROUP, INC. C-FARM CONTAMINATION CONTROL

This letter forwards the results of the U.S. Department of Energy, Office of River Protection assessment of contamination control conducted March 17 through 24, 2008, and requests your action to correct the assessment issues. The assessment evaluated implementation of contamination control practices, focusing primarily on C-Farm.

This assessment identified weaknesses in contaminated control practices similar to issues identified during the ongoing S-102 storage tank spill recovery activity.

Within 30 days of receipt of this letter please respond to the assessment findings. For the findings and the observations regarding the air sampler location, your response should include:

- The cause(s);
- The corrective actions that have been taken to control or remove any adverse impact from non-compliant conditions (remedial actions) and the results achieved;
- The corrective actions that will be taken to identify the extent of condition, correct the cause(s), and prevent further recurrence; and
- The date when all corrective actions will be completed, verified, and compliance to applicable requirements achieved.

If you have any questions, please contact me, or your staff may contact Jason A. Armstrong, Office of Environmental Safety and Quality, (509) 372-0787.

Sincerely,

William J. Taylor, Assistant Manager
ESQ:JAA Office of Environmental Safety and Quality

Attachment

cc w/attach:
T. E. Bratvold, CH2M HILL
K. W. Daniels, CH2M HILL
J. W. Long, CH2M HILL
CH2M HILL Correspondence

Attachment
08-ESQ-080
A-08-ESQ-TANKFARM-003

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

ASSESSMENT:	CH2M HILL Hanford Group, Inc., Tank Farms, C-Farm Contamination Control
REPORT:	A-08-ESQ-TANKFARM-003
FACILITY:	Tank Farms, C-Farm Complex
LOCATION:	Richland, Washington
DATES:	March 17 through 24, 2008
ASSESSORS:	Patrick P. Carier, ORP, Lead Assessor William L. Smoot, (PAC, Asst. Lead Assessor) Jason A. Armstrong, ORP Rick S. Jansons, PAC Cliff E. Hampton, PAC
APPROVED BY:	William J. Taylor, Assistant Manager, ESQ

Executive Summary

The U.S. Department of Energy (DOE), Office of River Protection (ORP) conducted an assessment of the Tank Farm Contractor (CH2M HILL Hanford Group, Inc.) Contamination Control program at C-Farm Complex from March 17 through 24, 2008. The assessment fulfills a scheduled requirement of the Fiscal Year 2008 ORP Assessment Plan. The assessment was conducted in accordance with the requirements of ORP M 220.1, "Integrated Assessment Program," Revision 5.

This assessment also serves to meet DOE P 441.1, DOE Radiological Health and Safety Policy, Section 3.H requirements to conduct oversight to ensure departmental requirements are being complied with the appropriate radiological work practices and are being implemented.

While the assessment did not identify instances in which inadequate contamination control practices resulted in the spread of radioactive contamination outside of controlled areas or onto personnel, the assessment identified instances in which personnel actions could have spread contamination to worker's skin and/or personal clothing, and/or spread of contamination outside of Contamination Area boundaries. These issues concerned the assessment team because they are similar to issues identified during the ongoing S-102 storage tank spill recovery activity.

The assessment team identified four findings as follows:

- A-08-ESQ-TANKFARM-003-F01: Conduct of Operations deficiencies that resulted in degraded radiological controls were observed during performance of work activities at C-Farm.

- A-08-ESQ-TANKFARM-003-F02: Two instances were identified in which required contamination surveys were not performed or documented.

- A-08-ESQ-TANKFARM-003-F03: Instructions for removing protective clothing were not posted at C-Farm step-off pad areas.

- A-08-ESQ-TANKFARM-003-F04: Radiation Survey Task Descriptions do not meet requirements.

The assessment also identified two observations which are discussed within this report.

- A-08-ESQ-TANKFARM-003-O01: Documentation for Radiological Surveys Logs need continued attention.

- A-08-ESQ-TANKFARM-003-O02: The air sampler suction hose used to collect a grab air sample to verify the effectiveness of the engineering controls used to contain contamination during the insertion and removal of the articulated go/no-go gauge was not located near enough to the glove bag to achieve the air sampling goal.

Table of Contents

List of Acronyms

ALARA	As Low As Reasonably Achievable
CA	Contamination Area
CFR	Code of Federal Regulations
CH2M HILL	CH2M HILL Hanford Group, Inc.
DOE	U.S. Department of Energy
FCA	Fixed Contamination Area
HID	Hanford Identification Number
ORP	Office of River Protection
PER	Problem Evaluation Report
PPE	Personal Protective Equipment
RBA	Radiological Buffer Area
RC	Radiological Controls
RCT	Radiological Control Technician
RCV	Radiological Controlled Vehicles
RSTD	Radiological Survey Task Description
RWP	Radiological Work Permit
TFC	Tank Farm Contractor

U.S. Department of Energy, Office of River Protection
Assessment of C-Farm Contamination Control

1.0 Purpose and Scope

U.S. Department of Energy (DOE), Office of River Protection (ORP), conducted an assessment of the Tank Farm Contractor (TFC) Contamination Control program at the C-Farm Complex. This assessment fulfilled a scheduled requirement of the ORP Annual Assessment Plan. The requirements of ORP M 220.1, "Integrated Assessment Program," Revision 5, directed the conduct of the assessment.

This assessment also served to meet DOE P 441.1, DOE Radiological Health and Safety Policy, Section 3.H requirements to conduct oversight to ensure departmental requirements are being complied with and appropriate radiological work practices are being implemented.

The assessment scope included document reviews, personnel interviews, and observation of activities at the C-Farm Complex. Specific subtopics that support the contamination control program that were evaluated during this assessment include radiological monitoring of personnel, radiological housekeeping, radioactive material release, work planning, radiological area entry/exit controls, posting and labeling, and routine surveillances.

Assessment Results:

Performance Objective RC-01:

CH2M HILL Hanford Group, Inc. (CH2M HILL) has an implemented process that results in effective housekeeping practices implemented in and around the C-Tank Farm.

During the period of this assessment the team noted that the posted radiological work and storage areas in C-Farm were generally free of waste, clutter, and environmental materials. Specific work activities were being conducted to improve the housekeeping in C-Farm to support an upcoming readiness review. The work was mainly focused on improving the housekeeping around the C-200 retrieval equipment left over from previous work.

At a program level, the TFC conducts focused clean-up activities on a monthly basis rotating Farms that need attention. The Tank Farm selected for April 2008, is SY-Farm. During work activities, it is up to the construction, retrieval, or sampling crew to clean-up after their work. TFC procedures specify that Operations will inspect the work area for cleanliness prior to close-out of the work procedure.

Performance Objective RC-02:

Radiological Controls (RC) work planning activities in C-Tank Farm are properly executed in accordance with work package instructions. However, poor work practices that could result in the spread of contamination were observed.

Installation of an articulated plug gauge was monitored to evaluate the effectiveness of the contamination controls employed by CH2M HILL. The work was categorized as high risk work because it involved installation and removal of equipment into a single-shell tank containing high levels of radioactive waste. The work was conducted using work order CLO-WO-08-0115 C-109 – Gauge Riser 3 of C-109 for Fold Track MT Install, and Radiological Work Permit (RWP) CO-450. The work order, RWP, and the associate As Low As Reasonably Achievable (ALARA) Management Worksheet (AW-1376) were reviewed to support the evaluation of the work conducted in the field.

The work involved using a crane to move a large cylindrical two-piece object into and out of a 12 inch riser on Tank 241-C-109. Radiological engineering controls (glove bag and sleeving) were used and were effective in controlling contamination spread while working in an open riser. The work was completed without spreading contamination outside the glove bag and sleeving. All personnel were observed to comply with the work order. Multiple surveys to detect the gradual build up of contamination that would indicate a failure or leak of the engineering controls were observed. Although good radiological work controls were demonstrated, an exception was noted involved the placement of the portable air sampler used to verify the effectiveness of the engineering controls (A-08-ESQ-TANKFARM-003-O02). The low volume air sampler was located such that the suction was greater than six feet from the containment. CH2M HILL procedures specify that the sampler be located as close as possible to the containment.

The work was closely supervised by an RC Supervisor and radiological support was provided by two RC technicians. These personnel demonstrated through their actions and discussions at the pre-job briefings good knowledge of the work steps and the RC specified in the RWP.

Poor contamination control practices were also observed during other work activities at C-Farm. The majority of these poor contamination control practices occurred on jobs co-located with, but not part of, the C-109 plug gauge installation. Workers were observed improperly wearing anti-contamination clothing. Workers were observed with hair extending past their collars. One worker was not wearing a hood properly (it was tied around his neck like a scarf). Two of three workers were also observed using their cell phones in the Contamination Area (CA) in a manner that could lead to facial contamination. One worker was observed with his sweatshirt hood outside of the anti-contamination coveralls and extending past his collar. The worker was observed carrying contaminated wire hoist chokers over his shoulder and on his sweatshirt hood. The ORP Assessor immediately notified the RC Supervisor so appropriate surveys could be performed. (See Finding A-08-ESQ-TANKFARM-003-F01)

Performance Objective RC-03:

During work activities at the C-Farm Complex, personnel and equipment were observed performing ingress and egress processes from radiological areas. The assessment team did not identify instances in which inadequate contamination control practices resulted in spread of radioactive contamination outside of controlled areas or onto personnel. However, the team identified instances in which personnel improperly performed work activities at C-Farm that could have resulted in spreading contamination to worker's skin and/or personal clothing, and/or spread of contamination outside CA boundaries.

Instances were identified where personnel wearing anti-contamination clothing had not taken effective action to prevent their hair from hanging down over their anti-contamination clothing. This is a repeat issue from the S-102 Tank review. (See Finding A-08-ESQ-TANKFARM-003-F01)

The process for moving Radiologically Controlled Vehicles into and out of radiological areas was not controlled by procedure, demonstrated unsafe worker actions, and could have resulted in loss of contamination control and spread of contamination outside CA boundaries or onto workers. Workers exiting through the change trailer or construction egress tent were either not supplied with or were provided incomplete undress instructions. (See Finding A-08-ESQ-TANKFARM-003-F03) Workers were observed performing actions that could lead to personnel contamination and/or spread contamination beyond the CA boundary, including handling dosimetry with the outer set of anti-contamination gloves, stepping across the CA/Radiological Buffer Area (RBA) boundary, and in one instance whipping the used anti-contamination clothing across the laundry hamper to free the stuck tape. (See Finding A-08-ESQ-TANKFARM-003-F01) Improved awareness by workers is required to ensure contamination is not spread to personnel or to areas outside the CA boundary.

Performance Objective RC-04:

Access into C-Farm is controlled through the proper use of RWPs and by the Access Control Entry System station. Review of RWPs in place for the work activities observed by the assessment team concluded that the RWPs were appropriate for the work activities, area entry requirements, and had the appropriate authorization signatures.

Performance Objective RC-05:

Radiological Area postings were established for radiological work and storage areas and addressed potential radiological hazards. CH2M HILL posting and labeling procedures were consistent with 10 Code of Federal Regulations (CFR) 835 requirements.

Radiological area posting and labeling was observed by the assessment team during articulated plug gauge installation and other work activities at the C-Farm Complex. The observed radiological postings and labeling met requirements. Postings contained the standard radiation trefoil, were clearly and conspicuously posted, and include radiological protection requirements. Items and containers observed at the C-Farm Complex were appropriately labeled.

Performance Objective RC-06:

The radiological surveillance program was reviewed. Radiological conditions were adequately documented to detect changes and identify potential sources of individual exposures to radiation and contamination. Monitoring for radiation and radioactive material is performed in accordance with 10 CFR 835 requirements. Over 400 radiological survey records were reviewed. At the time of this assessment, CH2M HILL had implemented a process requiring two individuals to review the radiological surveys for errors after the Radiological Control Technician (RCT)

completed the survey and prior to the RCT Supervisor approving the survey. This process has reduced the error rate in completed radiological surveys.

The routine radiological surveillance program is effectively implemented. The frequency of routine surveillances appears to be appropriate for the radiological conditions and/or area. Routine radiological surveys instructions are provided to the RCT in a Radiological Survey Task Description (RSTD). The RSTDs provide clear expectations to the RCT for completing the radiological survey. However, there were 10 instances in which the assessor identified RSTDs that were not reviewed annually as required by procedure and instances in which radiological survey logs were not completely filled out in accordance to procedure requirements. There were also differences in instructions for the RCT to respond to anomalies encountered when conducting a routine radiological surveillance, e.g., whether or not to issue a Problem Evaluation Report (PER).

CH2M HILL also performs a quarterly trend review of routine radiological surveillances. The assessor reviewed the previous three quarters of trend reports. The quarterly trend report is documented in an Inter-Office Memorandum that is transmitted to the program RC Office. These reports are "basic" and provide status of changing radiological conditions. Conversations with the C-Farm RC Manager indicated that improving the quarterly trend report is a planned element for Fiscal Year 2009.

Walkthroughs of radiological areas found that the areas have appropriate radiological postings. The postings are clear and conspicuous and indicate entry requirements. No Fixed Contamination Areas (FCA) were seen during this assessment, however CH2M HILL does have a program for managing FCAs that appears appropriate.

2.0 Findings and Observations

Finding A-08-ESQ-TANKFARM-003-F01: Conduct of Operations deficiencies were observed during performance of contamination control activities at C-Farm.

Requirements:

HNF-5183, Tank Farms RC Manual, Article 123, states in part:

"Trained personnel should recognize that their actions directly affect contamination control, personnel radiation exposure and the overall radiological environment associated with their work. The following radiological control rules are applicable to each person in the workplace:

- Obey posted, written, and oral radiological control instructions and procedures.
- Be sure to wear Personal Protective Equipment (PPE) and Clothing properly whenever required by Radiological Work Permits or postings.
- Be sure to avoid contact of skin, clothing, and equipment with contaminated surfaces.

- Upon leaving the area properly remove PPE and Clothing to minimize the spread of contamination.

- Upon leaving the area, frisk or be frisked for contamination when entering an uncontaminated area after exiting posted Contamination, High Contamination or Airborne Radioactivity Areas and associated Radiological Buffer Areas."

HNF-5183, Tank Farms RC Manual, Article 335.3, states:

"Personnel exiting Contamination, High Contamination or Airborne Radioactivity Areas should remove protective clothing as specified in Appendix 3C; and should, when entering an uncontaminated area, perform whole body frisking to detect personnel contamination in accordance with Article 338."

Discussion:

Contrary to the above requirements, personnel were observed performing work activities at C-Farm that could spread contamination to worker's skin and/or personal clothing, and/or spread of contamination outside CA boundaries. Examples include:

- Personnel were observed driving a forklift and a tractor-trailer combination truck, (Radiologically Controlled Vehicles [RCV]), into a CA at C-Farm without wearing anti-contamination clothing. The driver drove the vehicles into the CA to a point where the driver was approximately three feet inside the CA boundary. The driver then opened the door, and jumped from the cab, across the CA boundary, and landed in an RBA. Another driver inside the CA, appropriately dressed in anti-contamination clothing, then climbed into the cab and drove the RCV completely into the CA.

The process for driving the RCV out of the CA was similar. The driver in anti-contamination clothing drove the RCV out of the CA and approximately three feet into the RBA. The driver then opened the door, and jumped from the cab, across the boundary, and landed in the CA. Surveys of the cab interior were performed; then a driver without anti-contamination clothing stepped into the cab and drove the RCV completely out of the CA.

The above process for driving a vehicle into and out of a CA does not ensure that the drivers are meeting the PPE requirements for the areas they are entering and could lead to contamination spreading to personnel or the environment.

The process of jumping from a RCV from the CA to the RBA or RBA to CA is not consistent with CH2M HILL management expectations for conducting work safely and does not demonstrate good hazard awareness by the personnel observed.

Three personnel at C-Farm were observed with hair extending past their collars on the anti-contamination coveralls used to prevent skin contamination. One of the three workers was also not wearing a hood properly (it was tied around his neck like a scarf).

One worker was observed with his sweatshirt hood outside of the anti-contamination coveralls and extending past his collar. The worker was observed carrying contaminated wire hoist chokers over his shoulder and across his sweatshirt hood. The ORP Assessor immediately notified the RC Supervisor so appropriate surveys could be performed.

Two of the personnel with hair extending beyond their collars were also observed to have their hair hanging over their collars during the clean up of S-102. (See Observation A-07-TOD-TANKFARM-011-O09)

Two personnel were observed using their cell phones in the C-Farm CA without following training protocol taught in Radiological Worker II to preclude cross contamination or contamination of their face during use. The Senior Supervisory Watch was observed performing the correct protocol during his phone use.

One worker was observed crossing the CA boundary into the RBA in the C-Farm Change Trailer. The worker inside the CA was talking with an RC Technician in the RBA. During the conversation, the CA worker's feet moved approximately 4" to 6" into the RBA and his arms were completely over the CA/RBA boundary. The ORP Assessor immediately notified the RC Supervisor so appropriate surveys could be performed.

Personnel did not follow posted undress instructions and demonstrated poor contamination control practices while removing anti-contamination clothing at the C-Farm Change Trailer.

- Over half of the workers observed exiting the CA removed their electronic dosimetry while wearing their outer gloves, contrary to techniques taught in Radiological Worker II training and contrary to posted instructions.
- A majority of the workers did not appropriately utilize the two Step-Off Pad configuration at the change trailer. The posted anti-contamination doffing instructions did not address using two step-off pads.
- One worker was observed whipping his anti-contamination gloves across the clothes hamper to remove tape potentially spreading contamination.

Finding A-08-ESQ-TANKFARM-003-F02: Two instances were identified in which required contamination surveys were not performed or documented.

Requirements:

TFC-ESHQ-RP_MON-C-14, Revision D-2, Section 4.1, states in part:

"Alpha surveys are required for all waste intrusive work, to verify the effectiveness of engineered controls, when beta/gamma contamination is identified, and to verify RWP action and safe condition levels or void limits."

TFC-ESHQ-RP_MON-C-23, Revision E-4, Section 4.2, Step 1, states in part:

"If the radiological control project or program director approves a characterization study of the facility, area, or activity which identifies that "alpha only" or "beta-gamma only" contamination surveys are sufficient for release of material and equipment to uncontrolled areas, then the other

type of survey may be omitted. However, if contamination is detected during single radiation type release surveys, then both alpha and beta surveys will be performed and documented."

Discussion:

One of five TFC Radiological Survey Reports reviewed for required surveillance completion identified beta/gamma contamination levels above detectable limits. Contrary to procedure requirements, no alpha contamination survey was performed.

Additionally, the TFC Radiological Survey Report (COC-000929) was used to document completion of required surveillance COO-VAR4 on March 3, 2008, on the "Closure Project Facilities Daily Routine Sign-Off Sheet." Contrary to this, a review of COC-000929 determined no actions were taken to meet COO-VAR4 surveillance requirements.

Finding A-08-ESQ-TANKFARM-003-F03: Instructions for removing protective clothing were not posted at C-Farm step-off pad areas.

Requirements:

TFRCM Article 325.6 states: "Instructions for donning and removing protective clothing should be posted at the dress-out and step-off pad areas."

Discussion:

Instructions for removing protective clothing were not posted at the C-Farm egress tent. In addition, the instructions for removing protective clothing posted at the C-Farm Change Trailer were not complete (Part A of the undress procedure was not posted; only Part B was posted). Although a two step-off pad configuration was provided in the change trailer, the instructions for removing protective clothing did not reflect the "Sequence for Removing a Double Set of Protective Clothing using Two Step-Off Pads" provided in Appendix 3C of the TFRCM.

Finding A-08-ESQ-TANKFARM-003-F04: Radiation Survey Task Descriptions did not meet requirements.

Requirements:

TFC-ESHQ-RP_MON-P-10, Revision D-7, Required Radiological Surveillances, February 28, 2008.

Discussion:

Contrary to the above requirements, RSTDs were not reviewed annually. In addition, as required by procedure, the RSTD did not have an applicable RWP number listed. Ten RSTDs were reviewed by the assessor and seven were found to be older than one year. None of the reviewed RSTDs had an applicable RWP number listed.

The process for the RCT to respond to an anomaly as described in the RSTD was not consistent, nor was clear direction provided in the procedure for the RSTD developer. In some cases the RCT was directed to "evaluate" the need to issue a PER, in another case the RCT was "directed" to issue a PER, and in a third case "no" direction was provided to the RCT to initiate a PER. In a conversation with the RC Manager, the expectation was that the RCT issue a PER if an anomaly is discovered during the performance of a RSTD.

Observation A-08-ESQ-TANKFARM-003-O01 – Documentation for Radiological Surveys Logs need continued attention.

Requirements:

TFC-ESHQ-RP_ADM-P-09, Revision D-11, Documentation of Radiological Surveys, February 12, 2008.

Discussion:

Contrary to the above requirements, there were a few observations that RCTs did not enter their Hanford Identification Number (HID) or payroll number in the Radiological Survey Log. In addition, there were a few instances in which the RCT did not provide an adequate description of the radiological survey in the Radiological Survey Log.

While the above are procedure non-compliances, this is identified as an observation for this assessment. The assessor reviewed radiological surveys COF-006701 through COF-007000 and COC-00601 through COC-00700 and identified 10 incidents where RCTs failed to enter their HID or payroll number in the Radiological Survey Log. In addition, there were 26 entries where the radiological survey description should have provided more information.

The assessment team did identify one circumstance in which the Radiological Survey Log description did not match the applicable radiological survey record. In addition, this radiological survey identified beta-gamma contamination which was not followed up with an alpha survey as required. (See Finding A-08-ESQ-TANKFARM-003-F02)

A-08-ESQ-TANKFARM-003-O02: The air sampler suction hose used to collect a grab air sample to verify the effectiveness of the engineering controls used to contain contamination during the insertion and removal of the articulated go/no-go gauge was not located near enough to the glove bag to achieve the air sampling goal.

Requirement: TFC-ESHQ-RP_MON-P-09, "GRAB AIR SAMPLING," Step 4.1.5.a and d

Position the air sampler to achieve the air sampling goal.

"a. For a job-specific air sample that will be used to establish air activity concentrations in the work area, place the air sampler at the worker's location."

"d. For verifying the effectiveness of engineering controls such as ventilation, vacuum cleaners, or containment devices, place the air sampler as close to the potential release point as possible and in a downstream direction (e.g., sampler is placed downstream of a glove bag)."

TFC-5183, "TANK FARMS RADIOLOGICAL CONTROLS MANUAL," Article 551.1e
Monitoring of individuals and areas shall be performed to:

"e. Verify the effectiveness of engineering and process controls in containing radioactive material and reducing radiation exposure."

TFC-5183, "TANK FARMS RADIOLOGICAL CONTROLS MANUAL," Article 555.4

"4. Air sampling equipment should be positioned to measure air concentrations to which persons are exposed. If this can not be achieved, a program of personal breathing-zone air sampling should be initiated."

Discussion:

Contrary to the above requirements, the location of the air sampler suction hose was not as close to the potential release point as possible as required and was not close enough to the engineered glove bag to validate the effectiveness of the containment. The ALARA Management Worksheet for this activity specified that work place grab air sampling was required when a riser was open and when working inside the glove bag. The air sampler hose was located on the far corner of the scaffolding used to provide a work platform for inserting the go/no-go gauge into Riser 3 on Tank C-109. This resulted in the sampler being located approximately six feet from the glove bag.

Additionally, the air sampler location was not adequate to monitor the airborne contamination levels at the workers location for those workers working in the glove bag. Other personal breathing zone air sampling was not conducted.