

Assessing Chemical Hazards at The Plutonium Finishing Plant for Planning Future Decontamination and Decommissioning

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ABSTRACT

This paper documents the fiscal year (FY) 2006 assessment to evaluate potential chemical and radiological hazards associated with vessels and piping in the former plutonium process areas at Hanford's Plutonium Finishing Plant (PFP). Evaluations by PFP engineers as design authorities for specific systems and other subject-matter experts were conducted to identify the chemical hazards associated with transitioning the process areas for the long-term layup of PFP before its eventual final decontamination and decommissioning (D&D). D&D activities in the main process facilities were suspended in September 2005 for a period of between 5 and 10 years.

A previous assessment conducted in FY 2003 found that certain activities to mitigate chemical hazards could be deferred safely until the D&D of PFP, which had been scheduled to result in a slab-on-grade condition by 2009. As a result of necessary planning changes, however, D&D activities at PFP will be delayed until after the 2009 time frame

Given the extended project and plant life, it was determined that a review of the plant chemical hazards should be conducted. This review to determine the extended life impact of chemicals is called the *Plutonium Finishing Plant Chemical Hazards Assessment, FY 2006*. This FY 2006 assessment addresses potential chemical and radiological hazard areas identified by facility personnel and subject-matter experts who reevaluated all the chemical systems (items) from the FY 2003 assessment. This paper provides the results of the FY 2006 chemical hazards assessment and describes the methodology used to assign a hazard ranking to the items reviewed.

INTRODUCTION

The FY 2006 assessment was undertaken to identify and evaluate potential chemical hazards associated with vessels and piping in the former process areas of the PFP. Engineers and

subject-matter experts identified and evaluated the chemical hazards associated with transitioning the process areas for long-term layup of the PFP facility. The layup of the facility was necessary when D&D activities in the main process facilities were suspended in September 2005. A previous assessment, HNF-13971, *Plutonium Finishing Plant Residual Chemical Hazards Assessment* [1] (FY 2003 RCHA), found that in some cases certain activities to mitigate chemical hazards could be deferred safely until PFP D&D, which was scheduled to result in a slab-on-grade condition in 2009. With the U.S. Department of Energy's (DOE's) direction to suspend much of D&D work at PFP, many of the mitigation activities were not initiated. In some cases, D&D activities were initiated but not completed, potentially increasing the hazard. The FY 2006 assessment addresses potential chemical hazard areas identified by facility personnel and re-visits all items from the FY 2003 RCHA. The 2006 hazards assessment report, HNF-29561, *Plutonium Finishing Plant Chemical Hazard Assessment FY 2006* [2], provides the results of the FY 2006 chemical hazards assessment, and is intended to be used as information to identify residual chemical and some radiological risks that need to be addressed during the layup process.

The evaluation process used for items in the FY 2006 assessment included the following considerations and methods:

- Identification of potential chemical hazard areas identified by PFP personnel during a series of hazard assessment meetings
- Assessment activities (including walkdowns of current plant configurations) performed by design authorities
- Application of a risk-based relative ranking system, evaluation criteria, and relative risk ranking methods to assessed items
- Verification workshops held to review evaluation forms, ensure consistency, and finalize the results
- Independent review of process and methodology employed.

General findings and specific concerns provided a description of the assessment results, and the conclusions of the assessment.

BACKGROUND

In response to a chemical tank explosion in the Plutonium Reclamation Facility (PRF), in May 1997, PFP personnel performed several assessments to identify chemical risks and mitigating activities necessary to address those risks. One of those assessments, the PFP FY 2003 RCHA, was completed in December 2003 using a risk-based relative ranking system that provided a hazard score for each item (i.e., process equipment or system) assessed. The FY 2003 RCHA was conducted to satisfy *Hanford Federal Facility Agreement and Consent Order* [3] Milestone M-83-21, *Submit to the Washington State Department of Ecology a PFP Residual Chemical Hazards Assessment as a Primary Document*. Information reviewed for the

FY 2003 RCHA included vessel inventory databases, engineering drawings, process history information, interviews of both engineering and design authority personnel, and physical inspections by subject-matter experts. The FY 2003 RCHA was updated in FY 2006 to identify residual chemical risks remaining in the facility and those resulting from D&D efforts since the last evaluation.

The FY 2003 chemical hazards assessment began with an item-by-item examination of items that were of highest concern at that time and then adding new items as a result of the physical inspections and document reviews conducted .

Once inspections were completed, each item was evaluated and scored. As part of this scoring, a numerical value was assigned to reflect the level of confidence in the available data used in assessing a particular item. Previous assessments had used data quality numbers from 1 (best) to 5 (worst). For the FY 2003 RCHA, the quality of characterization data was rated as '1' for all systems that were physically inspected. This value of '1' reflected the high level of confidence in the information as a result of the physical inspection of the items, or for those items that were difficult to inspect, reflected the confidence in the information researched.

Hazard scores for items assessed in 2003 were determined in part by the likelihood of occurrences involving the loss of control of a material through an uncontrolled reaction or a leak. Likelihood factors were mitigated due to planned and scheduled D&D activities that would either shortly address the hazard or completely dismantle and remove the equipment or system thereby eliminating the hazard.

With the suspension of D&D activities in the process facilities, completing D&D activities will be delayed until a much later date than assumed during the FY 2003 RCHA. The FY 2003 RCHA cited PFP planning documents that had PFP facilities to a slab-on-grade condition by 2009. In some cases, unfinished D&D activities may have increased an item's potential for an uncontrolled reaction or leak release. In other cases, D&D activities had not yet been initiated. As the FY 2003 RCHA mitigated certain hazard scores based on anticipated completion of D&D activities, delay of those D&D activities may result in higher hazard scores for the assessed items.

FY 2006 CHEMICAL HAZARDS ASSESSMENT PROCESS

The FY 2006 chemical hazards assessment was performed to identify the risks posed by residual chemicals at PFP that remain after deferring D&D activities. This assessment made use of the established PFP risk-based relative ranking method (used for the FY 2003 RCHA) that evaluates risk relative to human health and the environment and to personnel safety. With the direction to suspend process facility D&D, some activities previously planned to address residual chemical risks have been stopped. This assessment identifies items requiring mitigation or further evaluation before a long-term safe configuration can be achieved or where continued monitoring or surveillance will be necessary during the layup period. PFP management will use the information and recommendations from this assessment to supplement layup plans as necessary. The layup period for this evaluation is defined as between 5 and 20 years to allow for a margin of safety beyond the regulatory cleanup milestone date of 2016.

To accomplish a comprehensive evaluation, a team of safety, process engineering, scientists, and technical specialists was assembled. Team members conducted either physical inspections by 'walkdowns,' or relied on system configuration documentation and personnel testimonies to assess the items. Documentation relating to the items assessed was gathered. Once areas were addressed, the PFP chemical hazard facility vulnerability assessment (FVA) database was updated on an item by item basis. This database contains evaluation information on each item reviewed and provides each item's relative risk hazard score.

The general approach for the FY 2006 work was as follows:

- Identify high-priority residual chemical concerns as identified by PFP personnel during an extended series of hazard assessment meetings;
- Evaluate areas of high-priority residual chemical concerns and areas known to have a changed status because of D&D activities performed on the systems, using physical inspections, records review, and interviews;
- Re-assess remaining items identified during the FY 2003 RCHA; and
- Update PFP chemical hazard database and compute risk-based ranking hazard scores for all items reviewed.

The scope of the FY 2006 review included areas identified by PFP personnel prior to start of the assessment activities. A series of meetings were held to describe existing hazards and potential new hazards at PFP due to the extension of the facility's life. The meetings relied on the opinions of design authorities and subject-matter experts for the various facilities, laboratories, and systems. Because of these meetings, certain chemical hazards related to PFP process vessels and systems were identified. These were called high-priority items. High priority items for evaluation included the following: the 26-inch vacuum system; 291-Z building galvanized ducting; the PRF pencil tanks and gallery gloveboxes; 242-Z Waste Treatment Facility, including the 242-Z filter box; E-4 ventilation system (process area ventilation system), plutonium transfer lines, remote mechanical A line; remote mechanical C line; the Analytical Laboratory; the Standards Laboratory; the Plutonium Process Support Laboratory; drains; 2735-Z Bulk Chemical Storage Tank Building; sealed systems with the potential for hydrogen buildup; and radioactive acid digestion test unit. These high-priority items were the first to be assessed by the physical inspections.

Equipment and systems were inspected physically to the practical extent afforded by access and visibility restrictions. The walkdowns involved looking at the equipment, piping, vessel, or glovebox. Above-grade pipelines to and from the item also were inspected. Finally, the area around each item was inspected for secondary problems or mitigating barriers. Conditions offering possibilities for unfavorable interactions included overhead sprinkler lines, other vessels, or other nearby chemical transfer lines. Possible mitigating barriers could include blanked ports on a glovebox or the glovebox itself as sealed containment. Secondary problems

resulting from an uncontrolled reaction or a leak release (e.g., potential for a leak to occur, and for the leaked fluid to corrode a safety system below) were also examined.

Areas previously evaluated but changed in configuration due to D&D activities received the next highest priority. All of the previous FY 2003 RCHA items were also re-evaluated during the walkdowns as the third priority.

Waste tanks in the 241-Z Liquid Liquid Waste Treatment Facility were not assessed as D&D activities for these tanks are on-going.

Areas difficult to physically inspect because of their conditions, which involved high contamination levels or lack of a practical access were nevertheless assessed through document reviews.

In addition to the physical inspections conducted, a records review was conducted for certain items using a graded approach. These records were used to document existing conditions; record mitigation measures already taken to reduce risk, such as tank removals, tank emptying and flushing, and line draining and flushing. Records reviewed included, but were not limited to, the following:

- Work packages
- Process flow sheets
- Process documentation
- Engineering drawings.

These records as well as current photographs, if available, were associated with the database in support files. Data was collected based on a graded approach, i.e., there are less data for items with less relative risk than for those items with greater relative risk. Because of the graded approach, data packages with the additional information were not necessary for some items.

The relative risk of each residual chemical concern being assessed was quantified by using the existing FY 2003 RCHA risk quantification methodology. Data quality and the hazard characteristics of the material associated with the item being assessed were also factored into the hazard score. A description of these hazard scoring factors is presented in this section. Evaluation forms prepared for process equipment and systems assessed, contain hazard score factors along with other pertinent information (e.g., identification, location, chemicals, assumptions, status, and controls). Because of acknowledged limitations of the FY 2003 RCHA methodology, special verification workshops were held during the FY 2006 assessment, to review, ensure consistency, and finalize the evaluation forms. Reviewers were acknowledged experts in nuclear safety, chemistry, and PFP process history.

Eight severity and likelihood factors were used, as was the case in the FY 2003 RCHA. The following factors, in addition to data quality and hazard characteristics of material, were

considered to influence the severity of consequences resulting from the loss of control of material, such as through an uncontrolled reaction or a leak release or to influence the likelihood of occurrences involving the loss of control of a material.

Three types of severity factors were considered :

- (1) Potential for human injury. Considerations included accessibility to personnel, number of persons potentially affected, and expected severity.
- (2) Potential for human exposure. Considerations included vessel location relative to people, number of persons potentially affected, and likely exposure scenarios.
- (3) Potential and significance of secondary impact. Considerations included other systems, structures, and components that could magnify consequences, e.g., presence of radioactive contamination, safety-critical systems, ventilation systems; and considerations such as distances or barriers between systems, and hazard characteristics of materials impacted.

Five types of likelihood factors were considered:

- (1) Design. Considerations included safety features, as applicable; e.g., pressure relief, secondary containment, air filtration, hydrogen mitigation, shielding, and seismic resistance capacity.
- (2) Operation. Considerations included whether the vessel and any ancillary equipment are operated as designed, per manufacturer's specifications (including design life), and within the documented safety envelope.
- (3) Containment vessel condition. Considerations included integrity testing, protection from corrosion, modifications that potentially degrade integrity, and visual condition.
- (4) Emergency planning and safety authorization basis. Considerations included whether the configuration of the containment vessel and ancillary equipment is adequately documented, reviewed, and approved; and whether it is subject to established programs, such as for inventory control, standards and requirements identification, authorization basis, fire protection, and emergency planning.
- (5) Maintenance and inspection. Consideration included whether preventive maintenance and inspections are scheduled regularly and implemented.

Because of the possibility of unrecognized increased risk due to the lack of adequate information about an assessed item, data quality was rated based on the following criteria:

- Confidence in data is high/Score is assigned as '1': data is of sufficient quality and completeness for safety characterization and system condition/contents are supported by:
 - Testimony provided by a person with primary knowledge, *or*

- Process Knowledge that is supported by controlled, peer-reviewed documentation, *or*
- Analytical Data generated under an established/documented quality assurance plan and is consistent with intended use.

- Confidence in data is medium/Score is assigned as '3': data is of marginal quality and completeness for safety characterization, and system condition/contents are supported by:
 - Testimony provided by a person with reasonable expectation of accuracy (e.g., design authority, subject-matter expert) but not primary knowledge, *or*
 - Process Knowledge that is supported by other information (e.g., weekly reports, memoranda, or other uncontrolled documentation). Not strictly peer reviewed but on distribution and subject to comment and revision, *or*
 - Analytical Data at a lower quality level than needed to fully characterize (i.e., screening data, non-validated data). Some quality assurance requirements, but not an established program.

Confidence in data is low/Score is assigned as '5': System condition/contents are not supported by testimony, process knowledge, or analytical data.

These data quality definitions differ somewhat from those used during the FY 2003 RCHA and other previous assessments, but were adopted for use during the FY 2006 assessment. As during the FY 2003 RCHA, materials in an item being assessed were assigned to one or more of the four hazard groups based on their reactivity hazard:

- Group (1): explosive, unstable reactive, unstable over time (e.g., because of aging in storage or contamination during use), and organic peroxides [29 Code of Federal Regulations (CFR) 1910.1200]. This group was assigned a score of '16' in order to give more emphasis to potentially explosive conditions.

- Group (2): pyrophoric, water reactive, flammable gas, fissile materials (29 CFR 1910.1200). This group was assigned a score of '9.'

- Group (3): corrosive and highly toxic materials (29 CFR 1910.1003, 1017, 1044-50). This group was assigned a score of '4.' This is because of the generally small quantities associated with highly toxic materials and the non-explosive, non-flammable nature of the chemicals in this group.

- Group (4): all other materials (generally not very reactive but, may be flammable or toxic). This group was assigned a score of '1.'

The severity and likelihood factors were scored by assigning values of '1' through '5.' The data quality values were assigned as either '1,' '3,' or '5.' The hazard group of material for each item was scored the value '1' to reflect as representing the best condition and the value '5' as representing the worst condition. Hazard scoring was performed on each item evaluated.

For scoring, a lower number is considered better, i.e., more safe than a higher number. Both the FY 2003 RCHA and the FY 2006 assessment scoring criteria ranged from a minimum score of '2' through a maximum attainable score of '100.' This spread was established deliberately to provide good relative ranking of the data. To account for items that currently are removed from the system and shipped, or awaiting shipment (and thus posing zero risk), the score criteria were modified to provide a score of '0'.

The FY 2003 RCHA methodology was used in the past as a way to prioritize residual chemical concerns, but the FY 2006 effort needed to be supplemented for the current effort in order to ensure that an acceptable level of risk for the layup period is defined and achieved. This section discusses acknowledged limitations of the FY 2003 RCHA methodology for this application and describes how it was augmented in the form of verification workshops. Several limitations were identified:

- (1) In the past, there has been some variability (professional analysis and judgment of risk) between evaluators for the same kind of residual chemical and situations.
- (2) Many of the factors contributing to criteria for determining 'Likelihood Ranking' will be impacted by layup or could change during the maintenance and surveillance period following layup. For example, 'Containment vessel condition' is likely to change over time due to aging, corrosion and other effects. Also, activities during layup could include additional mitigating actions such as extended surveillances.
- (3) The 'risk evaluation scoring' algorithm is complex and not specifically designed to produce absolute risk values that could be correlated to worker health effects and traditional risk acceptance values.

Accordingly, the FY 2003 RCHA process was supplemented by reviewing all identified residual chemical and radiological risk concerns in special verification workshops. The verification workshop team consisted of a chemical hazard specialist, an accident analysis specialist, and cognizant engineers responsible for the process systems and equipment being addressed. Personnel with expert process and historical knowledge of the systems and equipment being addressed also attended the workshops. All information was normalized by being reviewed by the same group. The verification team also considered how the hazard might change over a 5 to 20 year period. Special care was given to determining the relative uncertainty of the information involved, in the form of the data quality factor.

To maximize the effectiveness of the planned use of the data in this report, an independent review by a subject-matter expert was performed. The review focused on the assessment process and the risk scoring methodology used in the FY 2006 chemical hazards assessment.

The review process used in the FY 2006 effort involved a systematic approach in which items were evaluated with respect to a single defined set of criteria by a team of participants with appropriate knowledge of equipment, systems, history, relevant chemistry and safety issues. The scoring system employed is one that provides a consistent methodology for addressing factors which influence risk.

The review found that the system used in this assessment produces a risk score that is more linear rather than the usual logarithmic metric. The risk ranking used in the FY 2006 assessment provides a threshold risk score that is suggested by the assessment team and the independent reviewer to be used to identify items requiring further attention. Caution should be used with actions such as prioritization or determining risk distribution.

RESULTS OF THE FY 2006 ASSESSMENT

Identification of all residual chemical risk concerns assessed, along with their relative risk score, are provided in HNF-29577, *Plutonium Finishing Plant Chemical Hazard Assessment FY 2006 – Data* [4], Hazardous conditions identified during the verification workshops that represent general categories of concern are listed below:

- (1) Sealed vessels and pipelines containing enough residual plutonium to generate hydrogen and potentially overpressure the vessel/pipeline or reach the Lower Flammability Limit (LFL).
- (2) Vessels or pipelines with residual amounts of liquid acid or caustic that could leak onto a worker or be available for contact.
- (3) Vessels or pipelines with residual amounts of toxic chemical residues that are open or could be breached allowing dry residual material to migrate and/or become airborne.
- (4) Vessels or pipelines with residual contamination that are open or could be breached allowing dry residual material to migrate and/or be airborne.

Key assumptions included the following:

- Vessels or pipelines estimated to contain 15 grams or more of plutonium were assumed to represent a fissile quantity and were assigned to Hazard Group '2.'
- Ventilation systems continue to perform their safety function during long term layup.
- Surveillance continues at the complex as-is during long term layup.
- Fire Protection Systems continue to perform their safety function during long term layup.

These assumptions need to be protected. For example, there is evidence that the E-3 and E-4 ventilation systems are deteriorating. The ability of the E-3 and E-4 systems to continue to perform their safety function needs to be assured.

Relative risk ranking scores can range from '0' (i.e., hazard removed) to '100' (i.e., worst case) and are listed in HNF-29577 [4] and score distributions for the FY 2006 assessment are provided. The score of '17' was chosen to reflect items requiring attention prior to layup. Seventeen was chosen because it is the score that would be obtained if all likelihood and severity factors are as low as possible (i.e., '1'), but the uncertainty (i.e., data quality) was marginal

(i.e., '3') and hazardous material (i.e., hazard group) was highly reactive (i.e., a hazard group score of '1' or '2'). This was judged the lowest score that still represents a concern that should be addressed.

The FY 2006 assessment items were classified into two categories: (1) 'high priority' and (2) 'deferred until after PFP layup.' All FY 2006 assessment items are listed in Appendix A of the report.

High Priority: High priority items have been determined through the relative risk values as requiring response actions prior to PFP layup.

Deferred until after PFP layup: These items are judged as items that pose minimal relative risk and can be deferred safely until after the PFP layup interval has elapsed.

Figure 1 provides an example of items (identified in the FY 2003 assessment) that were dispositioned and have a FY 2006 relative risk ranking score of '0.'



Figure 1 – The removal of the bulk chemical feed tanks and draining of the chemical feed lines from rooms 336 and 337 is one of the many efforts to remove chemical concerns from the facility.

Since the objective of the chemical hazards assessment was to focus on the systems being prepared for layup at PFP, certain systems that are to remain active during the layup period were excluded from this assessment effort. Additionally, the 241-Z Liquid Liquid Waste Treatment Facility was not assessed because the system is undergoing closure and D&D. Because these items were not part of the FY 2006 assessment effort, their ranking scores (from the 2003

RCHA) were deleted from the scoring distribution determination. The items remain in the database, however. Figure 2 shows the relative hazard ranking of items from the FY 2006 effort.

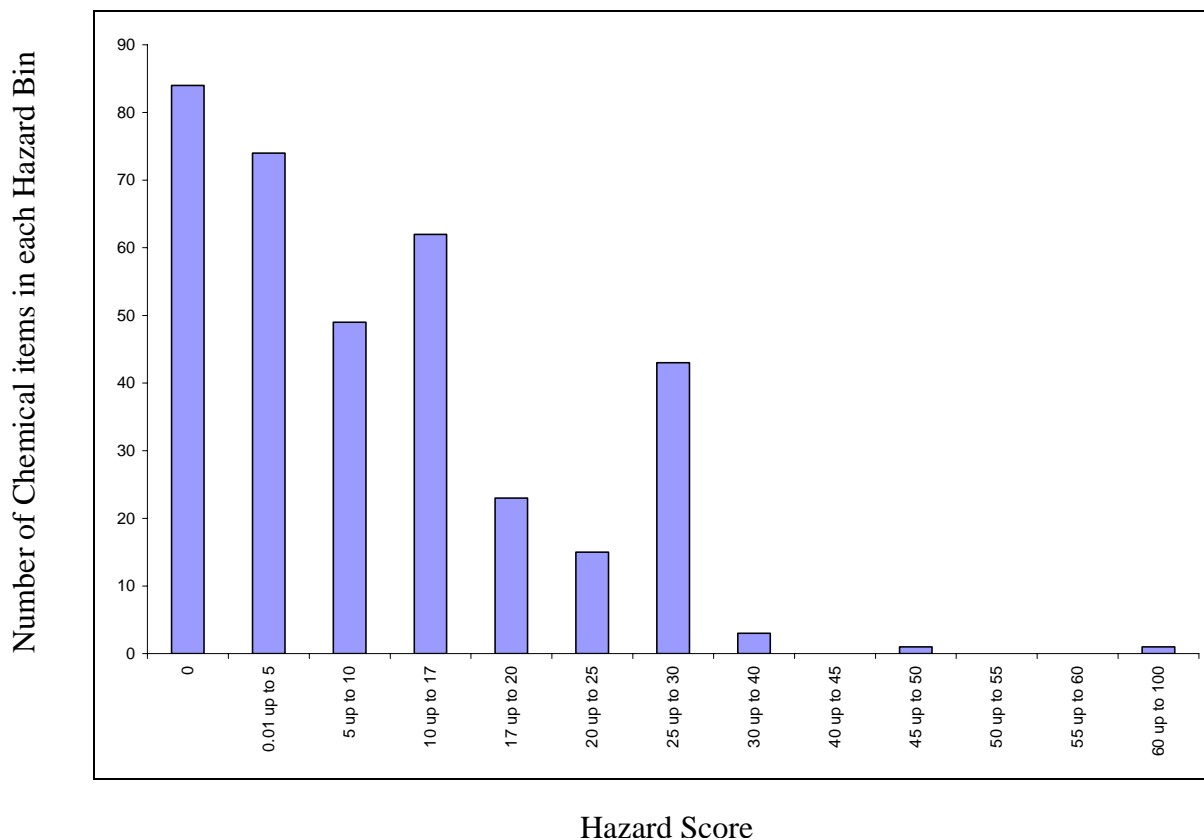


Figure 2 shows the distribution of chemical systems (items) by the hazard score grouping or bin. The higher the hazard score, the higher the concern for the risks remaining in the chemical system.

During the assessment, evaluators determined that the 242-Z Facility and Room 232A of the 234-5Z Plutonium Fabrication Facility, would not be accessed for any reason during the lay-up period. Severe contamination in these two locations prevents access without extensive protocol. No events were identified that could produce consequences to workers who were not physically present in the 242-Z Facility or in Room 232A during an event. Therefore, physical injury or exposure potential to humans was assumed not to be possible.

Data uncertainty caused high scoring for items associated with the poly cube-impacted section of the 26-inch vacuum system (HNF-29593, *Data Quality Objective Process Summary Report For 26-Inch Vacuum System* [5]), the tanks in the 242-Z Facility, and equipment inside the 236-Z galley gloveboxes. In the Plutonium Finishing Plant Planning Case: PBS RL-011 (*Transmittal of Plutonium Finishing Plant Planning Case*[6]), Fluor Hanford, Inc. has submitted plans to further characterize these areas as part of layup (for the 26-inch vacuum system) or as part of accelerated D&D (for the 242-Z Facility and the 236-Z gallery gloveboxes).

CONCLUSIONS

The FY 2006 assessment was performed to evaluate potential chemical hazards to determine actions necessary to allow for long-term layup of the facility. The total of 355 items were evaluated during the FY 2006 assessment of which 85 items have been completed, i.e., tank or equipment removed. Figure 3 provides an example of equipment removal.



Figure 3 – Many of the chemical systems are located in large gloveboxes within the process facility. Glovebox HC-7C (above) once contained many large Plutonium product storage tanks that have now been removed by the project.

There were 86 High Priority residual chemical concerns posing a significant risk . Relative risk values reached 65. Some level of disposition was recommended for these items (e.g. removal, periodic surveillance, or repair). Recommendations from the assessment include the following:

- (1) Sealed vessels and larger diameter pipelines containing enough residual plutonium to generate hydrogen and potentially overpressure the vessel or reach the LFL should be vented or shown to be not sealed.

- (2) Surveillance be maintained to detect leaks from vessels or pipelines with residual amounts of liquid acid or caustic that could leak onto a worker or be available for contact.
- (3) Surveillance be maintained for vessels or pipelines with residual amounts of toxic chemical residues that are open or could be breached allowing dry residual material to migrate and/or be airborne.
- (4) Surveillance be maintained for vessels or pipelines with residual contamination that are open or could be breached allowing dry residual material to migrate and/or become airborne.
- (5) The ability of the E-3 and E-4 ventilation systems to perform their safety function be maintained during long term layup. This may require that further assessments of aging sections be performed as the E-3 and E-4 represent vital safety systems.
- (6) The ability of the Fire Protection Systems to perform their safety function be maintained during term layup.

The FY 2006 chemical hazard assessment was developed in conjunction with the PFP process facility layup plan, a documented safety analysis based hazards assessment of the proposed PFP layup condition, and an accelerated work scope plan (FH-0503662A R2 [6]) to support future planned work scope schedule and funding. The integration of these documents and plans has resulted in developing the path forward discussed below.

As a result of the hazard analysis performed for the layup scenario, the hazard analysis team determined that the radiation controls currently in place and projected to be in place at PFP for the duration of the layup period are adequate to protect human health and the environment.

As noted in the PFP layup plan, additional characterization is planned during the layup phase for the 26-inch vacuum system to more fully determine the nature of the chemical hazards associated with the chemical holdup in the system. In HNF-29593 [5], the data quality objectives team concluded that there were insufficient data to determine if certain sections of the vacuum system containing chemical holdup were subject to autocatalytic explosive reactions. Therefore, further research, including sampling and analysis is planned.

The current planning case for D&D activities, described in the PFP planning case document (FH-0503662A R2 [6]), that are planned for execution during the layup period will, upon completion, properly disposition or characterize the following items:

- The planned acceleration of gallery glovebox D&D in PRF (236-Z) will result in the mitigation or characterization of hazards associated with items that relate to the PRF gallery gloveboxes.
- The D&D work planned for the 242-Z will result in the further characterization

- The planned acceleration of the 216-Z-9 crib workscope consisting of D&D of the 216-Z-9 above grade structures will eliminate or characterize the hazards associated with item 437, which is the drain line from 234-5Z to the 216-Z-9 crib.

The following items will be dispositioned as part of the layup plan tasking:

- At the 291-Z building, stabilizing the galvanized ducting will mitigate/stabilize the hazard associated with item 353 by containing the contamination within the ducting.
- The hazard of hydrogen accumulation in the process transfer pipelines will be mitigated by venting the pipelines to the gloveboxes that are ventilated to the E4 system.
- The hazards of corrosivity in the chemical acid pipelines will be mitigated by draining the pipelines.
- The primary hazard in the pulsar glovebox will be mitigated by draining the glovebox.
- The 26-inch vacuum system will be vented and the silencer tank will be isolated from the main process water pipeline to prevent the inflow of water into the system which contains plutonium. The sections of the 26-inch vacuum system that were effected by the poly cube stabilization effort will be further characterized.

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