

## **Third Party Qualified Independent Review**

### ***Report 5***

### ***Adopting Hazard-based Respiratory Protection in the Hanford Tank Farms:***

### ***A Readiness Assessment***

**Submitted to  
Hanford Atomic Metal Trades Council  
and  
Hanford Tank Waste Operations & Closure, LLC**

**Agreement No. 93164**

**September 30, 2026**

**This report is prepared for DOE, H2C, and HAMTC to Provide a Record of Progress to Date and to Ensure Continuity in the Efforts to Provide Hanford Tank Farm Workers with Needed Respiratory Protection**

**This is our 29<sup>th</sup> and Final Report, which Provides Closure to our Work as the Hanford Tank Farms Independent Third Party Review Team**

**We reserve the right to amend this report as more information becomes available.**

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## DISCLAIMERS

This independent third-party review was conducted by a team of subject matter experts assembled by Stoneturn Consultants (STC). It was conducted because of an agreement between Hanford Atomic Metal Trades Council (HAMTC) and Washington River Protection Solutions (WRPS) dated August 31, 2016. STC was selected by HAMTC to perform the review.

The review was continued after Hanford Tank Waste Operation & Closure (H2C) assumed the Tank Farm operation contract on February 24, 2025. The review and assessments are based on documentation supplied by H2C and interviews with staff from H2C, leaders and representatives of HAMTC and CWBCTC, site workers and presentations by experts.

Two team members (Dr. Ringen and Dr. Lippy) made site visits at the request of H2C to observe the state of operational readiness on April 5-8, 2026, and June 21-25, 2026, including observations of work being performed. During those visits several meetings with H2C staff and HAMTC were arranged so that other STC team members could participate via video link. STC team members participated virtually in multiple presentations by H2C subject matter experts and were afforded opportunities to ask questions and seek clarification on the information presented. H2C further supported the review by providing 183 documents describing its programs, plans, practices, and procedures.

This report was provided in a draft version to H2C and HAMTC, in which we invited their comments. This was done to expedite addressing any misunderstandings, contested issues or errors. We informed H2C and HAMTC in advance that any substantive changes made because of their recommendations would be described in our report and included in Attachment 8.

This review and related assessments are based on the evidence presented to us. We did not attempt to verify the accuracy of this information. We did not observe the conduct of any field testing, sampling or monitoring in sufficient detail to assess the quality, and we did not attempt to re-compute any statistical analyses that had been performed. Therefore, we do not in any way warrant the validity of the information that we relied on for this assessment. Nor do we warrant, whether express or implied, any health protection stated or implied as a result of the changes in safety and health procedures described here.

Any mention of any commercial products in this report does not in any way constitute an endorsement or recommendation by STC or the review team.

## CONTEXT

This report builds on the eight preliminary cartridge testing reports, fourteen respiratory protection reports and two final reports that have preceded it:

- **FFAPR Cartridge Testing Reports:**
  - Report No. 1: AP Tank Farm, December 11, 2016
  - Report No. 1, *Addendum 1*: SY-102 Tank, February 8, 2017
  - Report No. 1, *Addendum 2 (corrected)*: A-101 Tank, February 16, 2017
  - Report No. 1, *Addendum 3*: BY-108 Tank, February 16, 2017

- Report No. 1, *Addendum 4*: 702-AZ Primary Exhauster, March 10, 2017
- Report No. 1, *Addendum 5*: AX-101 Tank, March 10, 2017
- Report No. 1, *Addendum 6*: AW Tank Farm, April 13, 2017
- Report No. 1, *Addendum 7*: AN Tank Farm, April 13, 2017
- **PAPR Cartridge Testing Report:**
  - Report No. 4: Testing of Powered Air-Purifying (PAPR) Respirator Cartridge Performance. May 25, 2020
- **Respiratory Protection Reports:**
  - Report No 2: Review of: Use of Full Face Air Purifying Respirators in AP Tank Farm for Low-Hazard Tasks. January 31, 2017
  - Report No 2, *Addendum 1*: Review of Final Plan Implementation of APR in AP Tank Farm (Email Report). March 1, 2017
  - Report No 2, *Addendum 2*: Early Implementation of APR in AP Tank Farm. April 11, 2017
  - Report No 2, *Addendum 3*: Review of Hazard Assessment and Radiological Work Permit for SY Farm (Email Report). July 31, 2017
  - Report No. 2, *Addendum 4*: Review of Industrial Hygiene Hazard Baseline Assessment 241-SY Double Shell Tank Farm (TOC-IH-EA-DRAFT). (Email Report), September 26, 2017
  - Report No. 2, *Addendum 5*: Review of Industrial Hygiene Hazard Analysis Report - 241-SY Double Shell Tank Farm (TOC-IH-EA-DRAFT). (Email Report). October 24, 2017
  - Report No. 2, *Addendum 6*: Review of Industrial Hygiene Hazard Analysis Report - 241-SY Double Shell Tank Farm (TOC-IH-EA-DRAFT). (Email Report). November 27, 2017
  - Report No. 2, *Addendum 7*: Review of Industrial Hygiene Hazard Analysis Report - 241-SY Double Shell Tank Farm (TOC-IH-EA-DRAFT). December 4, 2017
  - Report No. 2, *Addendum 8*: Review of Industrial Hygiene Hazard Analysis Report – 241-AP Double Shell Tank (TOC-IH-EA-50017), February 6, 2018
  - Report No. 2, *Addendum 9*: Review of: Industrial Hygiene Hazard Analysis Report – 241-AP Double Shell Tank (TOC-IH-EA-50017). April 2, 2018
  - Report No. 2, *Addendum 10*: Review of Hazard Assessment and Related Procedures for Implementation of FFAPR in the Tank Farm. (Email Report). May 15, 2018
  - Report No. 2, *Addendum 11*: Review of Hazard Assessment and Related Procedures for Implementation of FFAPR in the Tank Farm. (Email Report), August 7, 2018
  - Report No. 2, *Addendum 12*: Review of Hazard Assessment and Related Procedures for Implementation of FFAPR in the Tank Farm. (Email Report). August 21, 2018
  - Report No. 2, *Addendum 13*: Review of Hazard Assessment and Related Procedures for Implementation of FFAPR in the Tank Farm. (Email Report). October 15, 2018
- **Combined Report 1 and 2 Final:**
  - Final Combined Report 1 and 2: Third Party Qualified Independent Review: Hanford Tank Farm Respirator Cartridge Testing and Respiratory Program Implementation. September 6, 2017
  - Final Combined Report 1 and 2, *Addendum 1*: Technical basis for Moving from Management Directed to Hazard Based Respiratory Protection. March 7, 2019
- **Readiness Assessment Reports:**

- Report No. 3: Adopting Risk-based Respiratory Protection in the Hanford Tank Farms: A Readiness Assessment, August 22, 2019; *Amendment 1*, September 20, 2019
- Report No. 3, *Addendum 1*: Warm up/rest tents for personnel and/or equipment in A, AX, AZ farms. (Email Report). November 10, 2020
- Report No. 3, *Addendum 2*: Review of Proposed AN Tank Farm Respiratory Protection Pilot Implementation. (Email Report). June 21, 2021
- Report No. 5: Adopting Hazard-based Respiratory Protection in the Hanford Tank Farms: A Readiness Assessment. September 8, 2026

## INDEPENDENT REVIEW TEAM

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*Note: Dr. Dement did not participate in this review.*

## ACRONYMS USED IN THIS REPORT

ALARA. As low as reasonably achievable, as used in radiation protection

ACGIH. American Conference of Governmental Industrial Hygienists

AL. Action level

AOP. Abnormal operating procedure

AP. Administrative procedure

APR. Air-purifying respirator

AR. Action request

ARPA. Alternative respiratory protection assessment

BDGRE. Buoyant Displacement Gas Release Event

BEI. Biological exposure indices

BI. Business intelligence dashboard

C. Controlled document/procedure

CD. Contractor document

CFR. Code of Federal Regulations

CIO. Continuous improvement opportunity

COC. Chemical of concern

COPC. Chemical of potential concern

CPCCo. Central Plateau Cleanup Company

CPWR. The Center for Construction Research and Training

CR. Condition reports

CRZ. Chemical Contamination Reduction Zone

CWBCTC. Central Washington Building and Construction Trades Council

DOE. US Department Energy

DOOR. Dynamic Object-Oriented Requirements System

ESHQ. Environment, safety, health and quality

EFCOG. Energy Facility Contractors Group

EJTA. Employee Job Task Analysis

EMS. Environmental management system  
EZ. Exclusion Zone  
FFAPR. Full-face air-purifying respirator  
GC-MS. Gas chromatography–mass spectrometry  
H2C. Hanford Tank Waste Operations & Closure, LLC  
HAMMER. Volpentest Hazardous Materials Management and Emergency Response  
HAMTC. Hanford Atomic Metal Trades Council  
HAZWOPER. Hazardous waste operations  
HFD. Hanford Fire Department  
HFO. Hanford Field Office (Regional DOE Office)  
HID. Hanford Identification Number  
HLMI. Hanford Laboratory Management and Integration, LLC  
HMIS. Hanford Mission Integration Solutions, LLC  
HMESC. Hanford Mission Essential Services Contract  
HPI. Human Performance Improvement  
HSRPP. Hanford Site Respiratory Protection Program  
HEPA. High-efficiency particulate air  
HVISM. Hanford Vapor Integrated Safety Management  
I&C. Issues and concerns  
iCAS. Integrated Contractor Assurance System  
IDLH. Immediately Dangerous to Life or Health  
IDMS. Integrated Document Management System  
IH. Industrial hygiene  
IHA. Inomedic Health Applications, Inc  
IHEA. Industrial hygiene exposure assessment  
IHT. Industrial Hygiene Technician  
IPC. Immersive Proficiency Center  
ISMS. Integrated Safety Management Systems  
ITDC. Integrated Tank Disposal Contract  
IZ. Industrial Zone  
LMS. Learning Management System  
LOI. Lines of inquiry  
LPM. Liter per minute  
MAINT. Maintenance  
MD. Management Directed/Management Directive  
MDRPF. Management Directed Respiratory Protection Form  
MOA. Memorandum of Agreement (between WRPS and HAMTC dated August 31, 2016)  
MSA. This is the name of a respirator manufacturer  
NDEA. N-nitrosodiethylamine (a chemical in the Nitrosamine family)  
NDMA. N-Nitrosodimethylamine (a chemical in the Nitrosamine family)  
NIOSH. National Institute for Occupational Safety and Health  
OEL. Occupational exposure limit  
OFI. Opportunity for improvement  
OPS. Operations  
OPT. Observation Performance Tracking  
ORP. DOE Office of River Protection

OSHA. Occupational Safety and Health Administration, US Department of Labor  
 PAAA. Price-Anderson Amendments Act  
 PAM. Personal ammonia monitor  
 PAPR. Powered air-purifying respirator  
 PER. Problem evaluation request  
 PLN. Plan  
 PNNL. Pacific Northwest National Laboratory  
 POC. Point of contact  
 PPE. Person protective equipment  
 PPB. Part per billion  
 PPM. Part per million  
 QRA. Quantitative risk analysis  
 RadCon. Radiological control  
 RC. Risk classification  
 RETS. Respiratory equipment tracking system  
 RH. Relative humidity  
 RL. DOE Richland Operations Office  
 RM. Responsible manager  
 RPC. Respiratory protection committee  
 RPD. Respiratory protection device  
 RPE. Respiratory protective equipment  
 RPF. Respiratory protection form  
 RPP. Respiratory protection program  
 RPPA. Respiratory protection program administrator  
 STD. Standard  
 S. Safety  
 SAF. Safety Assessment Form  
 SAR. Supplied air respirator  
 SCBA. Self-contained breathing apparatus  
 SME. Subject Matter Expert  
 SOMC. Site occupational medical contractor  
 TCR. Training completion record  
 TO. Tank operations  
 TOC. Tank farms operating contractor  
 TQ. Training and qualifications  
 TVAT. Tank Vapor Assessment Team (2014, Savannah River National Laboratory)  
 TVRP. Tank Vapor Respiratory Program  
 USEE. Unexpected short-term exposure episode  
 VMDS. Vapor Monitoring and Detection System  
 VMEP. Vapor Management Expert Panel, appointed by RL to review Tank Farm conditions.  
 VOC. Volatile organic compound  
 VPP. Voluntary Protection Program  
 VPPPA. Voluntary Protection Program Participants' Association  
 WC. Tank Vapor Work Category  
 WHC. Westinghouse Hanford Company  
 WRPS. Washington River Protection Solutions

## **KEY TAKEAWAYS**

**STC concurs with the following elements of H2C's vapor control program:**

- **The technical basis and management strategy to move from management-directed to hazard-based respiratory protection.**
- **Use of ammonia as the sentinel<sup>1</sup> indicator of tank vapors in the farm. The exposure data provided to us indicate that COPCs have not occurred above their action limits when ammonia vapors are controlled.**
- **Adoption of Tank Vapor Work Categories (WC). This is predicated on continuous monitoring of tank vapor exhaust in tandem with PAMs for WC-1 and WC-2.<sup>2</sup> We have higher confidence in the VMDS administrative control<sup>3</sup> of tank vapor exhaust than we do in alternative monitoring practices.**
- **The proposed approach of hazard-based respiratory protection. The H2C RPP is supported by a management system containing integrated policies, programs, practices, and procedures with clear authority and responsibility for program implementation and oversight. The RPP provides a strong framework for protecting workers from tank waste chemical vapors when respiratory protection is required.**
- **FFAPR cartridge service life and change-out schedules, and with supplied air respiratory protection being required when exposure to ammonia may exceed 99 ppm.**

**We recommend H2C ensures workforce readiness before adopting any hazard-based respiratory protection assignments, as the workforce's preparedness for this change is not yet fully understood. We also recommend that H2C assess workforce perceptions of its vapor controls and IH hazard assessments through annual employee surveys. In support of this recommendation, and at H2C's request, a suggested survey instrument has already been provided to H2C and is included in this report as Attachment 5.**

**Because workers are likely to encounter unfamiliar odors without respirators, we recommend that H2C strengthen its response procedures to ensure that these events are assessed and investigated promptly.**

**We find that there is room for improvement in three areas in particular:**

- **Integrating co-located work into job task planning.**
- **Including "borrowed workers" in H2C vapor control and RPP requirements.**
- **Ensuring subcontractors understand and follow H2C's vapor control and RPP requirements.**

**H2C has significantly enhanced engineering and administrative controls, integrated industrial hygiene, engineering and operations into the earliest stages of work planning and has strengthened its IH and Respiratory Protection Programs. Consequently, we find that H2C has addressed the concerns we have expressed in the 28 reports we have submitted in the past.**

**H2C's assessment (ITDC-WP-26-2853) documents how H2C has fulfilled its respiratory protection obligations under the MOA. STC concurs with H2C's conclusion, leading us to conclude that our role as independent third party under the WRPS/H2C-HAMTC MOA is completed.<sup>4</sup> We leave the disposition of the MOA to the signatory parties.**

## SUMMARY

Under a 2016 Memorandum of Agreement (MOA) between HAMTC and the Tank Farm Operating Contractor (TOC)<sup>5</sup>, STC was selected by HAMTC as an independent third party to review any proposed alternative respiratory protection in the Tank Farms. From 2017 to 2020 our review resulted in eight preliminary cartridge testing reports, fourteen respiratory protection reports and three final reports, all of which were submitted to HAMTC and Washington River Protection Solutions (WRPS), the Tank Farm TOC during this period. The Covid-19 pandemic then suspended any further STC formal engagement in Tank Farm review from 2021-2025, and while STC stayed in communication with management and union leadership our team was largely inactive during this time.

In 2025 STC was asked by Hanford Tank Waste Operations & Closure, LLC (H2C), the new Tank Farm TOC, to assess whether the technical basis for understanding and managing tank chemical vapors is sufficiently robust to move from a management-directed requirement that all workers wear respiratory protection when working within the fence lines of every Tank Farm to a hazard-based determination.

In STC's last assessment in 2019-20, we concluded that the TOC's understanding of and approach to managing tank chemical vapors had improved sufficiently so that under very limited conditions it could be appropriate to end the requirement for mandatory respiratory protection provided that workers could voluntarily select to use such protection. That recommendation was not implemented due to lingering effects of the Covid-19 pandemic, including a massive workforce turnover; and a protracted process of soliciting for a new TOC.

After H2C assumed the TOC contract on February 24, 2025, STC was asked to assess its plan to end mandatory respiratory protection in the Tank Farms and to conclude the MOA with HAMTC.<sup>6</sup> This review was performed from March through September 2026.

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<sup>1</sup> Changed from "leading" to "sentinel" per recommendation from H2C. See H2C Comment 1 in Attachment 8 for elaboration.

<sup>2</sup> The following addition (in bold) was recommended by H2C: This is predicated on continuous monitoring of tank vapor exhaust in tandem with PAMs **for WC-1 and WC-2**.<sup>2</sup>

<sup>3</sup> We accepted H2C's recommendation that we change our characterization of VMDS from an engineering control to an *administrative* control. See H2C Comment 2 in Attachment 8 for elaboration.

<sup>4</sup> As suggested by H2C, the first three sentences of this paragraph were rewritten to make them consistent with text in Section 2.2 and Conclusions.

<sup>5</sup>From inception of the MOA to February 24, 2025, the TOC was Washington River Protection Solutions (WRPS). Since February 24, 2025, the TOC has been Hanford Tank Waste Operation & Closure (H2C).

<sup>6</sup> The MOA requires the mandatory wearing of respiratory protection inside tank farms until the: "...emergence of additional engineering controls or other approaches are implemented and proven to be effective. This shall be conducted on a Farm by Farm basis."

We found that the strategy and technical basis for understanding and managing tank vapors, building on improvements initiated by WRPS and with new H2C enhancements, were substantially strengthened over what we had seen in 2019-21, mainly in the following areas:

- Increasing the height of the exhaust stacks;
- Developing Quantitative Risk Assessments (QRA) for tank vapor concentrations at ground level in the Tank Farms based on atmospheric conditions and concentrations of vapors exhausted from the stacks and terrain at various farms;
- Installing VMDS monitors to continuously monitor ammonia concentrations in the exhaust;
- Implementing personal ammonia alarms (PAMs) for the workforce;
- Substantially improving the industrial hygiene program by increasing the number of industrial hygienists (IHs) and industrial hygiene technicians (IHTs) employed at the farms, improving their training, upgrading exposure monitoring, data analyses and procedures for both routine and unexpected exposure events; and
- Improving training, communication and coordination on all levels, including integrating IH, engineering and operations from the earliest stages of work planning and execution.

We found the implementation of the site-wide RPP to be substantially improved by H2C in terms of clarity of integrated practices and procedures for selecting, issuing and managing RPEs. In addition, during two visits (April 2026 and June 2026), we observed that the culture of the Tank Farms workforce appeared to be significantly improved, but we did not confirm this observation through a workforce survey. Therefore, we could not determine whether the confidence in the vapor management resulted from having mandatory respiratory protection or if the workforce was confident in H2C's ability to understand and prevent chemical vapor exposures. We were impressed with the expertise of H2C IH leadership and subject matter experts and their confidence that they have developed a technical basis and management system that is sufficiently robust to adopt hazard-based respiratory protection decisions.<sup>7</sup>

In our opinion, the technical basis and management strategy presented by H2C supports hazard-based respiratory protection selection that may result in some tasks in the Tank Farms no longer requiring respiratory protection. We recommend H2C:

- Ensure the workforce is prepared before adoption of any hazard-based respiratory protection assignment given the probability of increased odors being experienced once RPE is not required.
  - H2C's own program evaluation<sup>8</sup> notes opportunities for improvements to better understand the workforce's current knowledge and preparedness. It also may be that some workers will object to the odors from tank vapors or find them irritating. This should be assessed through ongoing surveys of the workforce that document the effectiveness of management's responses to issues and concerns (I&C) raised by workers. We have developed suggestions for how this may be done. (See Section 2)

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<sup>7</sup> The evidence for this is presented in three main documents: TOC-IH-59014 **Rev.** 01, January 28, 2026; TOC-IH-58435. Revision 02, February 18, 2026; TFC-ESHQ-IH-C-48, REV C. February 22, 2026.

<sup>8</sup> H2C. Tank Vapor Program Evaluation. TOC-IH-65892, Rev. 00. June 30, 2026.

- We strongly recommend that H2C phase in the hazard-based approach to RPP to determine how well the workforce adapts to not wearing RPP for some tasks.
- Strengthen procedures in three areas where H2C’s self-assessments or stakeholder concerns have identified room for improvement (see Section 2):
  - Integrating co-located work into job task planning.
  - “Borrowed workers,” such as those supplied from time to time by HMIS, are adequately informed about H2C’s vapor control and RPP requirements.
  - Subcontractors understand and follow H2C’s vapor control and RPP requirements.
- Strengthen continuous monitoring of stack emissions, especially during waste-disturbing events, which is an essential control in double-shell Tank Farms. H2C has told us that the VMDS systems operate as little as 50% of the time<sup>9</sup> and that H2C is looking for alternative technologies that are more reliable. H2C considers intermittent monitoring by an IHT to be a safe alternative when a continuous monitor is not operational, because tank vapors emissions do not change sufficiently to necessitate monitoring more frequently even during waste-disturbing events. However, we find that engineering controls like VMDS provide more reliable safety outcomes than administrative controls like IHT monitoring. Therefore, we encourage the continued practice of conducting tank vapor-disturbing operations only when continuous monitoring is available. (See Section 3.)
- Continue to allow workers to voluntarily upgrade their respiratory protection, except in rare cases where it may cause a safety risk due to the nature of the task. (See section 4)
- Continue following existing procedures for assigning, issuing and managing respiratory protection equipment. They are sound.
- We offer several opportunities for further RPP improvement. (See section 4.)

**These conclusions are based on the premise that ammonia is the sentinel indicator of tank vapors in the farm. The exposure data that we reviewed provides evidence that COPCs have not occurred above their action level when ammonia vapors are controlled.**

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<sup>9</sup> In its comments on this draft, H2C clarified that the “VMDS systems have a range of operability (~50-90%), depending on the farm...”

# 1 INTRODUCTION

This report is part of an ongoing effort to determine if H2C is ready to adopt a hazard-based<sup>10</sup> approach to selection of respiratory protection in the Hanford Tank Farms, with emphasis on protecting workers from potentially injurious chemical vapor exposure episodes, previously termed Unexpected Short-term Exposure Episodes (USEEs) by STC. It is a follow-up to STC Report No. 3, which we submitted on August 22, 2019. That report addressed the STC assessment of 1) the new WRPS Hanford Vapors Integrated Safety Management System (HVISMS) strategy; 2) readiness of management, IH program, and workforce to control and manage chemical vapor exposures; and 3) WRPS's activities to engage workers and enhance communications with all stakeholders.

In this report we assess progress made in the past six years. As we will document, much has been improved, and in many areas, substantially so.

## 1.1 Background

In 2016 WRPS and HAMTC reached an agreement (hereafter referred to as "MOA"), in resolution of HAMTC's stop work order, which required:

- All work inside the perimeter fences of any tank farm be performed while wearing mandatory supplied air until FFAPR cartridge testing was completed and demonstrated to provide worker protection from tank vapor emissions.
- Use of mandatory respiratory protections until emergence of additional engineered controls or other approaches are implemented and proven effective.
- HAMTC to select a "Qualified Independent Third Party" to review and concur in the alternative respiratory protection proposed by WRPS.

HAMTC selected Stoneturn Consultants (STC) to serve as Third Party. Over the last 10 years STC has been engaged in a process of reviewing WRPS and H2C plans to resolve the issues addressed by the MOA and consequently to ensure that workers in the Hanford Tank Farms are protected from unexpected short-term airborne exposures to chemical vapors. However, STC was largely inactive between 2021 and 2026, in part due to the lingering effects of the Covid-19 pandemic and a protracted process of shifting the tank operations contract from WRPS to H2C, which happened in 2025.

In December 2016 STC issued the first of many reports on APR cartridge testing and noted that cartridges alone do not confer respiratory protection. It is the quality of the respiratory protection program (RPP) as a whole that determines respiratory protection.<sup>11</sup> Subsequently, WRPS requested that STC review its overall respiratory protection program, in addition to the review of respiratory cartridge testing results.<sup>12</sup> This resulted in a dual review: one of cartridge

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<sup>10</sup> The term "hazard-based" has been adopted by H2C to replace the term "risk-based" which was used during our previous reviews to conform with terminology used by WRPS. In our Report No 2, Addendum 1, we recommended the adoption of "hazard-based" to more accurately describe intent.

<sup>11</sup> STC. Report No. 1: AP Tank Farm, December 11, 2016

<sup>12</sup> The documentation for this request and subsequent interactions with WRPS and HAMTC on establishing the RPP review can be found in Stoneturn Consultants: Final Combined Report 1 and 2, Sept 6, 2017, pp. 39-40.

testing (Report Series 1), the other of the respiratory protection program and IH and operational functions that support respiratory protection (Report Series 2).<sup>13</sup>

Initially, WRPS requested that STC expedite a review of proposed procedures to implement FFAPR in the AP Tank Farm for identified work tasks<sup>14</sup>, which were to be followed by reviews covering other tanks or tank farms.

By September 2017 STC had accumulated enough evidence to issue a combined assessment summarizing its reviews to date and concluded that *“Respiratory protection in the tank farms should be mandatory until episodic tank releases (known in the TVAT report as “Bolus”) are understood, predicted and prevented...Until the IH program can develop a science-based approach to explaining, detecting, anticipating and preventing acute episodic exposures the decision to require respiratory protection is ultimately a management directive — as a defense-in-depth strategy.”*<sup>15</sup>

Over the next two years WRPS developed and deployed extensive engineering controls, built new chemical monitoring and sampling systems, revised administrative controls and completely revamped its industrial hygiene (IH) practices during a process aimed at gradually introducing FFAPRs in low-risk activities as an alternative to SCBA, and ultimately to move from a management directed to a risk based respiratory protection program. STC has reviewed this process in a series of addendums to Report No. 2.

By August 2019 STC had accumulated sufficient evidence to issue Report No. 3, focusing on WRPS’s readiness to adopt a risk-based approach to selecting respiratory protection.<sup>16</sup> The recommendations in Report No. 3 are summarized in Attachment 1. The report included in Exhibit 1 a respiratory protection program template describing conditions appropriate for work without respirators. In 2021 we were asked to review plans for a pilot project in which a risk-based approach to respiratory protection based on the template would be tested in AN Tank Farm. Upon review we cautioned WRPS that it had not developed adequate pilot program evaluation criteria and methods without which the pilot would be premature,<sup>17</sup> and the pilot was not implemented.

After H2C became the Tank Farms operator in early 2025, STC was asked to review the plans it was developing for respiratory protection. That review began in spring of 2026 and culminated in this Report No. 5.

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<sup>13</sup> In addition, WRPS asked STC to review its testing of PAPR cartridges, which we did in a separate report, No. 4.

<sup>14</sup> Report No 2: Review of: Use of Full-Face Air Purifying Respirators in AP Tank Farm for Low-Hazard Tasks. January 31, 2017.

<sup>15</sup> STC. Final Combined Report 1 and 2, Sept 6, 2017.

<sup>16</sup> STC Report No. 3: Adopting Risk-based Respiratory Protection in the Hanford Tank Farms: A Readiness Assessment, August 22, 2019, *Amendment 1*, September 20, 2019.

<sup>17</sup> STC Report No. 3, *Addendum 2: Review of Proposed AN Tank Farm Respiratory Protection Pilot Implementation*. (Email Report), June 21, 2021.

## 1.2 Approach to This Review

We planned a three-part review:

- Review of the H2C Vapor Control Program.
- Review of the H2C Respiratory Protection Program.
- Review of Workforce Readiness for a Hazard-based Respiratory Protection Selection Procedure.

In all we reviewed 183 documents and participated in over a dozen meetings with more than three dozen presentations. We asked numerous questions and these were answered in full, with reference to documentation supporting the answers.

As part of the review, we considered previous STC recommendations (see Attachment 1) to determine the extent to which they have been addressed.

## 1.3 STC's Understanding of H2C's Core Capabilities

In 2026, H2C updated the *Industrial Hygiene Program Plan*<sup>18</sup> for the Tank Farms, which it considers to be "...the 'Road Map' of Industrial Hygiene (IH) program requirements, the hierarchy of implementation documents, the execution of program elements, and the responsibilities for developing and implementing the program." In accordance with it, H2C has used three principal documents to demonstrate its capabilities for controlling worker exposures to tank chemical vapors:

- *Tank Waste Chemical Vapors; Evaluation and Management Strategy*.<sup>19</sup> "The purpose of this paper is to provide an overview of the evaluation and management strategy for Tank Waste Chemical Vapors (Tank Vapors)."
- *Industrial Hygiene Technical Basis for Applicable Requirements*.<sup>20</sup> "The purpose of the Industrial Hygiene (IH) Technical Basis is to establish a framework for protecting worker health, ensuring regulatory compliance, and continuously improving workplace health and safety. The IH program satisfies the requirements outlined in Title 10 Code of Federal Regulations Part 851, "Worker Safety and Health Program" ([10 CFR 851](#)) and Title 10 Code of Federal Regulations (CFR) 850, "Chronic Beryllium Disease Prevention Program" ([10 CFR 850](#)). These regulations, as mandated by the Integrated Tank Disposition Contract (ITDC [89303324DEM000096]) with the Department of Energy (DOE), direct the use of recognized safety and health standards during the evaluation of occupational hazards in the workplace, including:
  - American Conference of Governmental Industrial Hygienists (ACGIH), "Threshold Limit Values for Chemical Substances and Physical Agents and Biological Exposure Indices," (2016)
  - American National Standards Institute (ANSI) Z88.2, "American National Standard Practices for Respiratory Protection," (2015)
  - ANSI Z136.1, "Safe Use of Lasers," (2013)
  - Title 29 CFR, Part 1910, "Occupational Safety and Health Standards," excluding 29 CFR 1910.1096, "Ionizing Radiation."
  - Title 29 CFR, Part 1926, "Safety and Health Regulations for Construction."

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<sup>18</sup> TFC-PLN-55, REV C-2, August 20, 2026.

<sup>19</sup> TOC-IH-59014 Rev. 01, January 28, 2026.

<sup>20</sup> TOC-IH-58435. Revision 02 February 18, 2026.

“Together, these regulations and standards ensure that the IH program integrates evidence-based practices and maintains alignment with regulatory and industry requirements. A sound technical basis is critical to the success of any IH program. It serves as the foundation for consistent and effective management of workplace hazards, supporting informed decision-making and risk mitigation strategies.”

- *Managing Tank Chemical Vapors*.<sup>21</sup> “The purpose [of this procedure] is to provide guidance for implementation of standardized controls for the management of Tank Vapors. The scope of this procedure applies to activities performed by H2C and its subcontractors where there is potential for worker exposure to chemical vapors from Tank Waste.”

H2C also prepared two reports specifically for this review to document how well it has:

- Responded to STC’s recommendations which were presented in STC Report No. 3 (2019).<sup>22</sup> The objective was to “[d]emonstrate the maturity of the Industrial Hygiene program in the protection of H2C employees through identification of hazards and application of the appropriate controls for Tank Vapor hazards.”<sup>23</sup>
- Met its obligations under the 2016 MOA which leads it to conclude that establishment of hazard-based RPP is now feasible. It concluded that “H2C has developed and implemented an effective integrated Tank Vapor Respiratory Program (TVRP) as contemplated by the Memorandum of Agreement (MOA) between Washington River Protection Solutions (WRPS) and Hanford Atomic Metals Trades Council (HAMTC) for protecting workers from tank vapor emissions through technical analysis and evaluation, control selection and implementation, monitoring, respiratory protection, response capability, worker training, communication, records management, program assessment, and continuous improvement.”<sup>24</sup>

Based on these documents and the overview presentations made by H2C SMEs during our visits in April 2026 and June 2026 it was evident to our team that significant advances had been made in understanding tank waste composition, potential for worker exposures, ability to control such exposures, and the RPP where RPE is required. Our main task then became confirmation that the underlying documentation used to prepare these overarching reports supported the findings presented to us.

## 1.4 Assessment Limitations

We identified three aspects to respiratory protection in the Hanford Tank Farms, but limited our review to the first two because we had no role in the third:

1. H2C’s understanding of occupational exposure hazards and its ability to implement controls that prevent such exposures.
2. The workforce’s understanding of H2C’s capabilities.
3. The dynamic relationship between the owner (DOE), TOC (H2C) and representatives for the workforce (HAMTC and CWBCTC).

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<sup>21</sup> TFC-ESHQ-IH-C-48, REV C-2. February 26, 2026.

<sup>22</sup> H2C. Tank Vapor Program Evaluation. TOC-IH-65892, Rev. 00. June 30, 2026.

<sup>23</sup> These recommendations are summarized in Attachment, below.

<sup>24</sup> H2C. H2C Tank Vapor Respiratory Program Effectiveness Assessment. ITDC-WP-26-2853, Rev 0. July 16, 2026.

Additional limitations include:

- The primary focus for our assessment of H2C's IH Program for controlling vapors was WC-1 and WC-2 tasks.<sup>25</sup>
- We reviewed H2C's RPP but did not examine DOE support contractor RPP functions and activities.
- We did not perform onsite interviews with workers.
- Our onsite inspections of RPE issuing stations were limited.
- We did not assess any challenges that may arise from integrating the Waste Treatment and Immobilization Plant, with its unique IH and RP programs, into H2C's operations.

## 2 REVIEW OF H2C'S READINESS SELF-ASSESSMENTS/WORKFORCE READINESS RECOMMENDATIONS

**STC concurs generally with H2C's technical basis and management strategy as presented in its two self-assessments to move from management directed to hazard-based respiratory protection, but we also encourage H2C to ensure the workforce is prepared before adoption of any hazard-based respiratory protection assignment since it is uncertain about the workforce's readiness for this change. Moreover, we encourage H2C to include questions about its vapor controls in its annual surveys of its workforce, and to that end we have provided H2C a draft survey instrument for its consideration.**

### 2.1 Review of H2C's Readiness Self-Assessments

H2C has provided two self-assessments which we interpret as fulfilling two connected but different purposes:

- TOC-IH-65892<sup>26</sup> documents how H2C has created an IH program that has addressed the concerns STC has raised in our prior reports.
- ITDC-WP-26-2853<sup>27</sup> documents how H2C has fulfilled its respiratory protection obligations under the MOA.

#### 2.1.1 Tank Vapor Program Evaluation

The purpose of H2C's Tank Vapor Program Evaluation (TOC-IH-65892) is to demonstrate the maturity of the IH program in the protection of H2C employees through identification of hazards and application of the appropriate controls for tank vapor hazards. It also addresses specific concerns STC has raised in its previous reports. STC agrees that there have been numerous advancements and improvements in the overall IH program, tank vapor program management, and integrated plans and practices to assess and control hazards, and ensure staff, including IHs and IHTs, are qualified.

As outlined in the Summary of this report above and detailed in Section 3: *Review of H2C's Vapor Control Program*, and Section 4: *Review of H2C's Respiratory Protection Program*, below, we concur with H2C's evaluation and find the management strategy and technical basis

<sup>25</sup> This sentence was rewritten based on a suggestion from H2C.

<sup>26</sup> H2C. Tank Vapor Program Evaluation. TOC-IH-65892, Rev. 00. June 30, 2026.

<sup>27</sup> H2C. H2C Tank Vapor Respiratory Program Effectiveness Assessment. ITDC-WP-26-2853, Rev 0. July 16, 2026.

for understanding and managing tank vapors significantly strengthened, in addition to overall RPP improvements in terms of procedures for selecting, issuing and managing RPEs.

From a purely technical standpoint, we conclude that based on improvements as described in TOC-IH-65892 and ITDC-WP-26-2853, H2C is ready to move from mandatory use of RPE to a hazard-based determination.<sup>28</sup>

However, H2C's evaluation did not include an evaluation of workforce readiness; therefore, it is unclear to us whether H2C believes the workforce is ready or not.<sup>29</sup> As part of our review, STC developed a table (Attachment 2) to track all the report listings of Opportunities for Continuous Improvements (OFCIs), many of which aim to evaluate the workforce's understanding of their work environment and controls, including their understanding of tank vapor hazard control. STC strongly supports H2C's approach of identifying opportunities for continuous improvement across all programs, recognizing its particular importance to worker training to ensure proficiency and effective communication as an ongoing loop of worker feedback and continuous improvement. This keeps workers informed, up to date, and confident in the IH program.

We could not find where H2C has made any type of formal workforce assessment of readiness, either through worker surveys, interviews, focus groups, or training evaluations about experiences and response to odors when RPE is removed. Nor could we determine that they have developed a standard (or set of standards) that need to be met.<sup>30</sup> Rather, H2C identifies as an opportunity for continuous improvement the need to "evaluate the Workforce's current understanding of the Tank Vapor hazard control sets."<sup>31</sup>

This could imply that H2C does not know whether the workforce is ready and how it will respond to hazard-based assessment where no RPE is required, which should be a prerequisite for proceeding with such an approach. Given the substantial improvements to the vapor control and respiratory protection programs, however, STC assumes that H2C does have an understanding of the workforce's current readiness to move to a hazard-based approach, and this topic, along with many others in the area of workforce training and communication, was listed in the report as an OFCI due to the need for ongoing assessments/evaluations and worker feedback.

This needs to be clarified, as it is unclear what evaluation has been carried out to ensure workers are prepared to move to a hazard-based approach. Specific to worker training and communications, the report describes in detail the multi-layered approach to communications across the Tank Farms and throughout the organization, citing its ability to tailor communications to specific audiences, "including tank farm workforce, field Industrial Hygienists, supervisors, and cross-disciplinary partners" as a strength of its program.

While STC did not conduct any worker interviews as part of this assessment, it's clear from the report that the workforce appears to have much more confidence in event responses and reports (TF-AOP-015 and TFC-OPS-OPER-C-67), which was a significant area of distrust among the

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<sup>28</sup> We use the term "hazard-base" where we previously used "risk-base" to be consistent with H2C's nomenclature.

<sup>29</sup> This sentence was rewritten based on a suggestion from H2C.

<sup>30</sup> In 2014 WRPS adopted the following standard, which may or may not be valid still: "...a risk-based approach to PPE selection is appropriate if workers are fully informed, understand and support the risk assessments." See WRPS. Effectiveness Review Report.PER-2014-0602, 2014.

<sup>31</sup> H2C. Tank Vapor Program Evaluation. TOC-IH-65892, Rev. 00, p. 12 and p. 48. June 30, 2026.

workforce and union leadership when we started our assessment in 2016. This is a critically important step forward in building trust, and we include a summary of these events in Section 3 below.

The H2C evaluation report describes in detail the significant expansion and enhancements in IH training, administration and processing, including integrated improvements, phased onboarding, qualification card restructuring, etc. While the report did not indicate whether the updated worker chemical training course has been assessed in any structured way, based on our on-site observations we assume the training has been sufficiently effective for H2C to make the determination to proceed with a hazard-based approach to respiratory protection in the Tank Farms. All other educational initiatives described in the report, including development of new materials and education strategies, were listed as OFCIs (see Attachment 2).

Our concern about workforce readiness was also reinforced by the fact that as part of the review and approval of the report by members of the evaluation team, most of the HAMTC and CWBCTC representatives on the committee voted YES to approval of the report by default. While we understand non-responsiveness and the need to move the process forward, it would have been comforting to see more of the evaluation team's worker representatives proactively engaged in the voting process.<sup>32</sup> Perhaps not so much as a matter of substance, but as a matter of appearance, that underscores active workforce engagement.

### **2.1.2 Tank Vapor Respiratory Program Effectiveness Assessment**

H2C's assessment (ITDC-WP-26-2853) documents how H2C has fulfilled its respiratory protection obligations under the MOA. STC concurs with H2C's conclusion, leading us to conclude that our role as Independent Third Party under the WRPS/H2C-HAMTC MOA is completed.

H2C's assessment succinctly describes key improvements, which we address in the sections below, to the Tank Vapor Respiratory Program (TVRP) since MOA execution in 2016. STC concurs with the assessment that with these improvements the program has matured into an integrated management system that characterizes tank vapor hazards, selects appropriate controls, monitors, investigates, and communicates with the workforce. Integrating IH Exposure Assessment directly into work planning and the Job Hazard Analysis (JHA) process is highlighted in the assessment as "a cornerstone" of H2C hazards identification and control processes. H2C is confident that this integrated approach not only results in the selection of appropriate controls for a particular work task based on specific hazards present, it "empowers the workforce with transparent, accessible information about the hazards they face and the measure in place to protect them." We applaud H2C for this approach, and its continuous improvement efforts to engage with and communicate to the workforce.

We were unable to determine in this assessment or in the 2026 Tank Vapor Program Evaluation if worker engagement and workforce communications efforts applied equally to H2C's in-house employees and contract employees. Based on our site visit in June 2026 it is our understanding that approximately one-third of the workers in the Tank Farms are employed by various sub-contractors, but it is not clear how communication channels and messaging changes, when taking into account the addition of sub-contractors, and union representation. As described and

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<sup>32</sup> Rephrased at suggestion from H2C.

appended as Attachment 5 to this report, STC has developed and provided to H2C a worker assessment survey which was drafted to be administered to both in-house and contract workers. If H2C chooses to proceed with the survey it could be particularly revealing and important to assess differences in responses from the two workforces, to support its efforts to continuously improve workforce engagement and communications to both in-house employees and contract workers.

STC agrees with H2C's conclusion that it has established and implemented an effective TVRP for identifying vapor-related hazards for all Tank Farms, and that tank vapor controls can be effectively selected and implemented as detailed in this assessment. Taken together all the key improvements described in this assessment have demonstrated that H2C's TVRP is effective.

## **2.2 Workforce Readiness Recommendations**

Overall, we believe report TOC-IH-65892 reinforces H2C's technical readiness to proceed with a hazard-based respiratory protection approach, but it needs to ensure the workforce is ready to proceed with implementation. Per discussions with H2C and as noted above, we have prepared a survey instrument for this purpose, which has previously been provided to H2C for consideration and included in this report as Attachment 5. Based on our review of H2C's self-assessments we conclude that H2C could benefit from ongoing surveys of its workforce about its understanding of vapor controls, IH hazard assessment and RPE determinations. From our discussions with H2C we suggest for consideration that this could be incorporated into the VPP surveys it currently conducts.

We believe that hazard-based Respiratory Protection Training focused on expectations would be beneficial prior to the initiation of hazard-based RPE selection. As hazard-based respiratory protection is implemented, consideration should be given to incorporating respiratory protection topics into Safety Integration, Stepping Stones, Chemical Worker Training, or other workforce training activities. These training opportunities can help prepare workers for performing tasks without respiratory protective equipment when appropriate.

Because workers may experience a noticeable increase in perceived odors with potential psychosomatic symptoms when working without RPE, training could address expectations, required responses, and documentation practices associated with such events. Chemical Worker Training also provides an opportunity to explain hazard-based RPE selection processes and reinforce the basis for respiratory protection decisions. Improved workforce understanding of these processes may also help reduce unnecessary requests for voluntary upgrades in respiratory protection.

In terms of workforce readiness, and in addition to the survey included in Attachment 5, we also recommend that H2C:

- Evaluate the effectiveness of the revised/updated Chemical Worker Training course (a Tank Farm entry requirement), which defines tank vapor WCs in very useful diagrams to aid worker understanding of the vapor control sets.
- Accelerate the implementation of OFCIs identified in H2C report TOC-IH-65892, such as conducting a workforce survey regarding industrial hygiene communications; evaluating building trades/sub-contractor opportunities to participate in the hazard

analysis processes; and considering establishment of an IH Committee for tank vapors to promote workforce engagement.

- Conduct a phased-in implementation of hazard-base respiratory protection to assess empirically how well the workforce adapts to work without wearing RPEs.

## **2.3 Three Areas with Room for Room for Improvement**

We have identified three additional areas where we encourage H2C to focus on in terms of continuous improvement. These were identified either through H2C's self-assessment, field observations or stakeholder feedback.

### **2.3.1 Co-located Work**

Frequently more than one job task is performed simultaneously in adjoining areas within a Tank Farm. These may be performed by different H2C teams, or subcontractors (frequently building trades; see section 2.3.3). We have heard from various stakeholders that coordination between such tasks has historically been a weakness, which is also recognized by H2C in this CIO: "Develop communication methods (e.g., pre-job briefing) for worker knowledge of co-located work that may impact Tank Vapor concentrations and/or be odorous."<sup>33</sup>

### **2.3.2 Borrowed Workers**

Within Hanford, it is not uncommon for contractors to lend workers (particularly ones with unique skills) to other contractors for specialized needs. It is one way to optimize available resources. However, this comes with some added risk since each of these contractors has its own unique procedures. For instance, even though there is a site-wise RPP which all Hanford contractors must adhere to, there can be significant differences among them. We observed one "borrowed worker" ask a lot of questions about FFAPRs during a pre-job briefing, because he had never been assigned one before since the contractor he works for relies on PAPRs when RPEs are required. This suggests to us that H2C should consider developing procedures to "vet" borrowed workers and make sure they are inducted into H2C's vapor control and RPP procedures.

### **2.3.3 Subcontractors**

We have heard repeatedly from H2C and building trades workers over many years that subcontractors have substandard safety and health programs, particularly if they do not regularly perform work at Hanford. H2C has identified this as a continuous improvement opportunity: "Evaluate Building Trades/Subcontractor's opportunities to participate in the hazard analysis process and various safety councils (e.g., EAPC). Identify processes to improve participation."<sup>34</sup> We encourage H2C to think about this need more broadly, to ensure that subcontractors are fully inducted into H2C's vapor control and RPP procedures.<sup>35</sup>

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<sup>33</sup> H2C. Tank Vapor Program Evaluation. TOC-IH-65892, Rev. 00, p. 114. June 30, 2026.

<sup>34</sup> Ibid., p. 133.

<sup>35</sup> H2C response: "Subcontractors do have to follow H2C's vapor control and RPP procedures. Where improvements are necessary are in communication and opportunities for participation in hazard analysis/safety councils."

### 3 REVIEW OF VAPOR CONTROL PROGRAM

**STC concurs with H2C's use of ammonia as the sentinel indicator of tank vapors. The exposure data provided to us indicate that COPCs have not occurred above their action limits when ammonia vapors are controlled.**

**STC concurs with H2C's adoption of "Tank Vapor Work Categories (WC)" and concurs with the proposed approach of hazard-based respiratory protection selection for work tasks. However, this is predicated on the adequate monitoring of tank vapor exhaust in tandem with PAMs for WC-1 and WC-2. We have higher confidence in the VMDS administrative control of tank vapor exhaust than we do in alternative monitoring practices.**

**STC concurs with H2C's FFAPR cartridge service life and change-out schedule. STC also concurs with supplied air respiratory protection being required when exposure to ammonia may exceed 99 ppm.**

#### 3.1 Introduction

Since 2016 workers who enter the double-shell Tank Farms have been required to wear as a minimum a NIOSH-approved full-facepiece respirator with a multi-gas (ammonia, acid gas and organic vapor) air-purifying cartridge.<sup>36</sup> The Hanford industrial hygiene and engineering groups tested these multi-gas cartridges with tank vapors from several different tanks to confirm the suitability and capacity. PNNL was hired to evaluate the results.<sup>37</sup>

STC also evaluated the testing approach for and results in AP Exhauster, SY-102 Tank, A-101 Tank, BY-108 Tank, 702AZ Exhauster, AX-101 Tank, AW Exhauster, AN Exhauster,<sup>38</sup> and concluded that NIOSH-approved respirators with these multi-gas cartridges were capable of providing suitable protection to workers for many of the tasks performed in the Tank Farms.<sup>39</sup>

Many engineering, technical and administrative improvements have occurred since 2016 that should offer improved protection to workers.<sup>40</sup> These include:

- Increasing the height of the exhaust stacks;
- Developing Quantitative Risk Analysis (QRA) for tank vapor concentrations at ground level based on atmospheric conditions, concentrations of vapors exhausted from the stacks and terrain at various farms;

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<sup>36</sup> A mercury vapor cartridge is substituted for the multi-gas cartridge when there is a potential for mercury vapor exposure at or above the Action Limit and other tank farm vapors are below their Occupational Exposure Limits.

<sup>37</sup> Overview of 2016 Testing of Respirator Cartridge Performance on Multiple Hanford Tank Headspace and Exhausters. PNNL 26821 September, 2017.

<sup>38</sup> Description of test locations changed based on suggestion from H2C.

<sup>39</sup> STC. Report No. 1 and 7 Addendums. 2016-2017.

<sup>40</sup> The engineering improvements have been to the actively ventillated tank farms (DST)

- Installing VMDS monitors to continuously monitor ammonia concentrations in the exhaust;
- Implementing personal ammonia monitors (PAMs) for the workforce;
- Substantially improving the industrial hygiene program, including but not limited to significant increases in the number of IH and IHT personnel, strengthened qualification requirements for its staff, improved exposure monitoring, data analyses and procedures for both routine and unexpected exposure events.

WRPS, the former TOC, entered into a MOA with HAMTC in 2016 that required the mandatory wearing of respiratory protection inside Tank Farms until the: "...emergence of additional engineering controls or other approaches are implemented and proven to be effective."

The purpose of this review is to determine if the requirements of the MOA have been met and whether the mandatory wearing of respiratory protection can be replaced with hazard-based selection. Our review of "The Industrial Hygiene Program Plan" indicated a comprehensive industrial hygiene program that identifies: "... approximately seventy plans, standards, implementing procedure, technical procedures supporting various IH categories, including Tank Chemical Vapors, Chemical Hazards, Physical Hazards, Biological Hazards, IH Exposure Assessment Strategy, IH Site-Wide Programs,"<sup>41</sup> This document describes the goal of creating a state-of-the-art program that meets relevant government regulations, voluntary standards (e.g. ACGIH TLVs), and adopts professional programs (e.g. AIHA Exposure Assessment Strategy).

We have limited our specific data review to the double-shell Tank Farms and workers performing non-intrusive operations under normal operating conditions (i.e., the exhaust system is properly functioning). These workers were performing WC-1 and WC-2 tasks described in the document Managing Tank Chemical Vapors.<sup>42</sup> These may be the largest number of workers who could be affected by a change from management-directed respiratory protection to hazard-based selection.

### 3.2 Quantitative Risk Analysis (QRA)

QRA results are used in administratively controlling exhaust concentrations to protect employees from the variety of chemicals in the tanks. PNNL conducted a study of various computer models to determine the one best suited for worker safety and emergency planning.<sup>43</sup> PNNL recommended the use of Fire Dynamics Simulator (FDS), developed by the National Institute of Science and Technology (NIST). The model relies on computational fluid dynamics that requires a precise knowledge of the physical environment. While the model relies on the concentration of many Chemicals of Potential Concern (COPCs) in tank headspace, of particular interest is ammonia which has been identified as a chemical common to all the tanks and a sentinel indicator of other COPCs.

WRPS engaged Kenexis Consulting Corporation to conduct a QRA of potential chemical vapor release events.<sup>44</sup> Each QRA is for a specific Tank Farm and as applicable includes the prediction

<sup>41</sup> The Industrial Hygiene Plan. TFC-PLN-55, REV C-2, p.6, August 20, 2026.

<sup>42</sup> Managing Tank Chemical Vapors. TFC-ESHQ-IH-C-48 May, 2026.

<sup>43</sup> Atmospheric Dispersion Modeling Tools for Hanford Tank Farms Applications, PNNL-25654, 2017.

<sup>44</sup> Vapor Monitoring & Detection System Quantitative Risk Analysis 241-SY Tank Farm. RPP-RPT-62214, May,

of the stack and breather exhaust concentrations of chemicals that could result in a concentration at or above their Action Level (AL) to workers on the ground level of the farm. QRAs have been conducted for both actively ventilated and passively ventilated tank farms.<sup>45</sup> The QRA can be used to help workers manage activities during waste-disturbing events. The variables for the QRA are the concentration of vapors in the exhaust and the atmospheric conditions at the time. The concentration of vapors in the exhaust during a waste-disturbing event can be managed by workers following specific validated procedures, but the atmospheric condition cannot. Therefore, setting limits for chemicals in the exhaust against the most severe atmospheric condition (inversion) has been implemented.<sup>46</sup>

### 3.3 Monitoring Stack Emissions from the Tank Farm

The implementation of the QRA for each Tank Farm requires monitoring chemicals in the stack exhaust to keep workers safe, especially during waste-disturbing events. PNNL evaluated COPCs in the Tank Farms and concluded that ammonia was a useful sentinel indicator to measure.<sup>47</sup> Ammonia is present in all the tanks and can be measured at levels far below its OEL using a variety of analytical methods. Other COPCs are difficult to measure using direct-reading methods and at levels below their OEL.

Continuous stack monitoring of ammonia using the VMDS system is the best and safest approach to monitor tank vapors. When the VMDS system is not operational, there is an alternative procedure requiring an IHT to manually take ammonia readings.<sup>48</sup> Most tanks that are in a quiescent state have stable ammonia levels in the exhaust and frequent monitoring should not be necessary. H2C told us that when the VMDS system is not operational, waste transfer and possibly other tank disturbing tasks are curtailed.<sup>49</sup> However, if necessary, manual monitoring by an IHT on an hourly basis would probably be sufficient based on the historical rate of change of ammonia concentrations in the exhaust.

We noted some conflicting information that was later clarified by H2C:

- The Tank Vapor Program Evaluation stated that when the VMDS is out of service, an IHT will monitor the exhaust once per calendar day (TF-OPS-IHT-037) until the VMDS is restored to service. There is no mention of whether conditions are quiescent or waste-disturbing.<sup>50</sup>
- The document *Ammonia Monitoring – Rate of Change of Tank Vapor Source Concentration and Monitoring Frequency* indicated that monitoring tank exhaust once every four days is sufficient based on a historical examination of exhaust data.<sup>51</sup> H2C indicated the Rate of Change Document factored into their implemented minimum requirements, with the difference between that Report's recommendation and the

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2020.

<sup>45</sup> Language clarified based on suggestions from H2C.

<sup>46</sup> Personal communication, July 14, 2026.

<sup>47</sup> Leading Indicator Phase 2 Report. PNNL-27449, 2018.

<sup>48</sup> Ammonia Monitoring on Exhausters. TF-OPS-IHT-037 January 29, 2026.

<sup>49</sup> Personal communication, July 14, 2026.

<sup>50</sup> Tank Vapor Program Evaluation. TOC-IH-65892, June, 2026.

<sup>51</sup> Ammonia Monitoring – Rate of Change of Tank Vapor Source Concentration and Monitoring Frequency. TOC-IH-RPT-50042 May, 2021.

implemented minimum being discussed in the Evaluation and Management Strategy [TOC-IH-59014, Section 4.2.1 (pdf pages 18-19)].

The combination of the QRA and VMDS monitoring system has resulted in the use of alarms that trigger action for Tank Farm operations to protect workers. These alarms are relevant when there are intentional waste-disturbing events occurring (also for the rare BDGRE events for the few relevant tanks). There are high alarms designed to change operating conditions to reduce ammonia levels in the exhaust and high-high alarms to have workers shut down the operation they are performing. The following is a table comparing ammonia exhaust values and alarms with the maximum intended ammonia concentrations on the ground (i.e., in worker breathing zone) under the most severe atmospheric conditions (an inversion resulting in a “capping” or “fumigating” plume).<sup>52,53</sup>

**Table 3.1: Ammonia PPM Levels in Tank Farm Exhaust**

| Tank Farm | High Alarm | High-High Alarm | 2.5 ppm at the Ground <sup>54</sup> | 12.5 ppm at the Ground |
|-----------|------------|-----------------|-------------------------------------|------------------------|
| A         | 160        | 320             | 163                                 | 816                    |
| AN        | 460        | 920             | 2600                                | 13000                  |
| AP        | 460        | 920             | 1,150                               | 2500                   |
| AW        | 460        | 920             | 1300                                | 6500                   |
| AY/AZ     | 460        | 920             | 2500                                | 13000                  |
| SY        | 310        | 620             | 310                                 | 1700                   |

H2C explained to us that the high alarm from the ammonia exhaust was intended to result in concentrations no higher than 2.5 ppm ammonia on the ground.<sup>55</sup> It is unclear why some Tank Farms have much higher safety factors.<sup>56</sup> See H2C comment 3 in Attachment 8 for elaboration.

### 3.4 Personal Ammonia Monitor (PAM)

Workers in the Tank Farms are required to wear Ventis Pro5 personal ammonia monitors, or equivalent, as directed by IH, for WC-1 and WC-2 activities. The monitors provide direct reading levels of ammonia and alarm at 6 ppm or higher concentration. The document *Field Use of Ventis Pro5 Personal Ammonia Monitor* details the procedure to be followed by workers.<sup>57</sup> The units are designed to operate for 12 hours and are always in the on position. The most important instruction to workers is to make sure the units are worn outside of their clothing and that the inlet to the unit is unblocked.

When the unit has a RL or AL alarm, workers are required to notify adjacent workers to avoid the area, exit the area (RL) or farm (AL), and immediately notify the Shift Manager. The Shift Manager then reviews the TF-AOP-015 entry criteria. H2C clarified that TF-AOP-015 does not need to be entered for the following situations: planned conditions that would result in a personal

<sup>52</sup> IHT Ammonia Monitoring on Exhausters, TF-OPS-IHT-037, January 2026.

<sup>53</sup> Common COPC Action Levels and Calibration Concentrations for Tank Farm Source Monitors. RPP-RPT 61386.

<sup>54</sup> The values in the table represent the concentration of ammonia in the tank exhaust that result in 2.5 ppm ammonia levels on the ground using linear extrapolation from QRA Action Level values under the most severe weather conditions.

<sup>55</sup> H2C personal communication, July 14, 2026.

<sup>56</sup> Ratio of tank alarm levels: exhaust concentrations resulting in a 2.5 ppm ammonia at ground level.

<sup>57</sup> Field Use of the Ventis Pro5 Personal Ammonia Monitor and PAM-C KIOSK. TFC-ESHQ-IH-C-78, September 2025.

ammonia monitor alarm, odors detected without a personal monitor ammonia alarm, when personal ammonia monitor fault conditions are evident, occur in a location not likely to be impacted by tank farm vapors (i.e., general purpose facilities), or alternate monitoring (for example, MultiRAE) in the same space indicates conditions are below alarm set point values. Having more than one personal monitor alarm in the same space voids this exception.<sup>58</sup> In addition, there are beacons strategically located on the Tank Farm perimeter and exclusion zones that facilitate identification of PAM locations.<sup>59</sup>

The choice of having the PAMs alarm initiated at 6 ppm, approximately one-quarter of the OEL for ammonia, is to indicate an unexpected concentration event that requires investigation. The VMDS continuous monitor in the farm stack is designed to alarm at an ammonia level corresponding to a ground level concentration of no more than 2.5 ppm under the most unfavorable weather conditions (an inversion). When workers are wearing respiratory protection, they should not smell ammonia, and the PAMs are the main source for knowing when Tank Vapors may be occurring in their area when Tank Vapors are not anticipated. When Tank Vapor containing systems are breached and/or Tank Vapors are anticipated, IHT DRI monitoring is the main source of knowing that an unexpected Tank Farm chemical (WC-2) or an expected Tank Farm chemical (WC-3 & WC-4) may be occurring in their area. PAMs for WC-2 activities are defense-in-depth. However, if respirators are removed, it is likely that workers may at times report stronger than expected odors, initiating a C-67 investigation without the PAM units alarming.

### 3.5 Summary of Industrial Hygiene Exposure Data from the A-Complex

We reviewed four reports containing summaries of industrial hygiene exposure monitoring at Tank Farms in the A-Complex during FY 2022-2023. These reports were organized by the tasks workers performed (WC1-4). We focused only on the data that cover WC-1 and WC-2 tasks in double-shell tanks.<sup>60</sup>

**Table 3.2: Summary of Industrial Hygiene Sampling Results for DST A-Complex Tank Farms\***

| COPC             | WC-1 Tasks          |                                | WC-2 Tasks       |              |
|------------------|---------------------|--------------------------------|------------------|--------------|
|                  | Personal Samples    | Area Samples                   | Personal Samples | Area Samples |
| 1,3 Butadiene    | ND (12)             | ND-<<OEL <sup>b</sup><br>(162) | ND (8)           |              |
| 1-Butanol        | ND (18)             | ND (161)                       | ND (10)          |              |
| Acetonitrile     | ND-<<OEL (43)       | ND-<<OEL<br>(251)              | ND-<10% OEL (14) |              |
| Aldehydes        | ND-<<OEL<br>(17-22) | ND-<< OEL<br>(119-155)         | ND-<<OEL (5-8)   |              |
| Aliphatic Amines | ND-<<OEL<br>(11-13) | ND (124)                       | ND (3)           |              |
| Ammonia          | ND (27)             | ND (166)                       | ND (12)          |              |
| Mercury          | ND (31)             | ND (165)                       | ND (12)          |              |
| Nitrosamines     | ND (25-27)          | ND (158-161)                   | ND-<<OEL (9-11)  |              |

<sup>58</sup> TF-AOP-015 pdf page 3.

<sup>59</sup> Vapor Program Evaluation, p.11. TOC-IH-65892, June 30, 2026.

<sup>60</sup> Table 3.2 contains data from SIHEA-PO-MULTI-001 & SIHEA-PO-MULTI-002. Table 3.3 contains data from Industrial Hygiene Tank Vapor Personal Sampling: FY22 [& FY23] Data [Summaries] - Waste Disturbing Tank Farms. Clarification provided by H2C.

|                     |                  |                    |                 |                |
|---------------------|------------------|--------------------|-----------------|----------------|
| Nitrous Oxide       | ND (2)           | ND (161)           | ND (1)          |                |
| VOCs                | ND-<<OEL (18-26) | ND-<<OEL (128-142) | ND-<<OEL (8-12) |                |
| <b>DRI Readings</b> |                  |                    |                 |                |
| Ammonia             | ND (4)           | ND-1 ppm (426)     | ND-3 ppm (30)   | ND-1 ppm (350) |
| Mercury             | No results       | ND (14)            | ND (7)          | ND (25)        |
| VOCs                | ND (4)           | ND-<<AL (424)      | ND-<10% AL (30) | <10% AL (346)  |

\*Number of samples in (). ND means None detected.

<sup>b</sup><< means much less than. VOC AL is 2ppm established by facility

The data described in the two reports indicate that most of the sample results and COPC analyses were non-detectable and the rest were below 10% of the OEL. Individual COPC results can be compared to time-weighted average OELs and DRI results to peak or ceiling standards. Results from WC-2 operations were more limited in their numbers, and area samples for individual or groups of COPC (e.g. aldehydes) were not provided. There were far more personal and area results for COPCs from samples taken during WC-1 tasks.

These data noted above did not differentiate whether waste-disturbing activities were occurring for any of the results. We were interested in examining whether the QRA and VMDS controls were successful in limiting worker exposures to below action limits for COPCs. For this reason, we requested data from personal exposure monitoring taken on days when waste-disturbing tasks, including transfers, were occurring and we were provided with the following data:<sup>61</sup>

**Table 3.3 Summary of Personal Air Sampling Results in A-Complex Waste Disturbing Farms  
FY 22 and FY23**

| <b>COPC</b>                   | <b>FY 22</b>                                  | <b>FY 23</b>                               |
|-------------------------------|-----------------------------------------------|--------------------------------------------|
| 1,3 Butadiene                 | <10% OEL (108) <sup>a</sup>                   | <10% OEL (28)                              |
| 1-Butanol                     | <10% OEL (105)                                | <10% OEL (17)                              |
| Acetonitrile                  | <10% OEL (77)                                 | <10% OEL (35)                              |
| Aldehydes (7)<br>Formaldehyde | <10% OEL, (159)<br>>10%OEL (1) <sup>b</sup>   | <10% OEL, (98)                             |
| Aliphatic Amines (3)          | <10% OEL (4)                                  | <10% OEL (9)                               |
| Ammonia                       | <10% OEL (185)                                | <10% OEL (94)                              |
| Mercury                       | <10% OEL (218)                                | <10% OEL (81)                              |
| Nitrosamines (8)<br>NDMA      | <10% OEL (187)<br>>10% limit <sup>c</sup> (1) | <10% OEL (39)<br>>10% OEL (1) <sup>d</sup> |
| Nitrous Oxide                 | <10% OEL (43)                                 | <10% OEL (32)                              |
| VOCs (51)                     | <10% OEL (109)                                | <10% OEL (48)                              |

<sup>a</sup>number of samples

<sup>b</sup>one sample at 16% OEL

<sup>c</sup>one sample at 22% of limit

<sup>d</sup>one sample 22% OEL, 5 samples >10% limit

A review of the personal air sampling data from two years of waste-disturbing activities at the A-complex indicated employee exposures to all COPCs monitored were below their respective

<sup>61</sup> Industrial Hygiene Tank Vapor Personal Sampling: FY22 Data Summary – Waste Disturbing Tank Farms October 01, 2021 to September 30, 2022 (2026). <sup>61</sup> Industrial Hygiene Tank Vapor Personal Sampling: FY23 Data Summary – Waste Disturbing Tank Farms October 01, 2022 to September 30, 2023 (2026).

OELs. More importantly, ammonia exposures were below 10% of their OEL or 2.5 ppm, the target level for the VMDS (See Table 2.1). This confirms that monitoring exhaust levels was successful in protecting workers during waste-disturbing periods of increased COPC concentrations in the tanks.

### 3.6 Review of AOP-15 Reports

We chose to review a small number of recent AOP-15 reports from the H2C report: *AOP-15 Event Investigation Reports* to determine if we could uncover any relevant information. The following table summarizes the number of these reports for each year:

**Table 3.4: Total Number of AOP-15 Reports**

| 2026 | 2025 | 2024 | 2023 | 2022 | 2021 | 2020 | 2019 | 2018 | 2017 | 2016 | 2015 | 2014 |
|------|------|------|------|------|------|------|------|------|------|------|------|------|
| 6    | 4    | 2    | 8    | 17   | 7    | 9    | 18   | 8    | 6    | 18   | 9    | 14   |

We reviewed 19 of the most recent AOP-15 reports covering 2023-2026 (partial year) and a summary is shown in Attachment 3. Ten of these reports indicated that the PAM inlet had likely been blocked or the unit malfunctioned. In only one of the reports, the presence of ammonia was confirmed by workers who were spraying a material that contained ammonium hydroxide. In all cases, AOP-15 notifications resulted in removing workers from the area where the PAM had alarmed until an IHT collected data that the CSM used to determine the area was safe, once results were validated, i.e. the DRI passed post-use function tests. There was no evidence in these reports that PAM alarms were due to tank vapors.

Our review indicated that it took approximately one hour (range from 46-154 minutes) for an IHT to respond to an AOP-15 from the time it was reported by workers. Some of this time was a delay from workers reporting the incident to a Central Shift Supervisor requesting an IHT investigation. H2C commented that delivering the PAM to verify the peak reading has an additional impact on response times but is critical for ensuring responding personnel are in the proper RPE. If the peak is < 12 ppm no respiratory protection is required. If the peak is  $\geq 12$  ppm respiratory protection is required following a hazard-based approach. Additionally, the peak reading determines the procedural steps the CSM must follow. The peak reading is often of such brief duration that by the time the worker looks at the PAM it may no longer be displaying the peak. H2C reports they start with the verbal report and confirm by reviewing the peak reading from the device before dispatching an IHTs.

### 3.7 Review of C-67 Reports

H2C pointed out that the purpose of TFC-OPS-OPER-C-67 response actions is to ensure that one of the following is met before work is allowed to continue:

1. The work areas are safe from hazardous chemical vapors, or
2. Additional controls are put into place for the hazard identified.

If no hazards are present in the field, the IHIR process will investigate possible causes of the odor (e.g., stack emissions, co-located work).

STC chose to review a small number of reports from the document *C-67 Event Investigation Reports* to identify any useful information. This document contains reports from 2023-2026 (partial year). The following table summarizes the number of reports for each year.

**Table 3.5: Total Number of C-67 Reports**

| 2026 | 2025 | 2024 | 2023 |
|------|------|------|------|
| 6    | 15   | 18   | 15   |

A summary of the 21 reports we reviewed covering the years 2025-2026 (partial) is shown in Attachment 4. These events typically occurred outside of the Tank Farms and none of the reports attributed the odors to Tank Farm vapors.

### 3.8 Comments on Work in Single-Shell Tank Farms and WC-3 and WC-4 Work in Double-Shell Tank Farms<sup>62</sup>

Currently WC-3 and WC-4 work requires the wearing of supplied-air respiratory protection. The size of the area of the EZ is determined by a hazard-based assessment and we expect this to continue with hazard-based respiratory selection. H2C clarified that there are different types of EZs, permanent EZs (WC-3) and temporary EZs (WC-2, WC-3, or WC-4). Respiratory protection requirements are associated with the WC rather than EZ, as the EZ designation on its own does not automatically require respiratory protection. If mandatory use of respiratory protection in double-shell Tank Farms becomes hazard-based for workers, we expect that this assessment will likely result in WC-3 and WC-4 work continuing respiratory protection, but possibly at a lesser level (i.e., FFAPR rather than SCBA). H2C noted that the current Tank Vapor hazard-based minimum requirement for WC-3 & WC-4 work activities is FFAPR with farm appropriate cartridge.<sup>63</sup>

We reviewed IH sampling data for WC-1 and WC-2 tasks from FY2022-2023 for two SSTs: 241-A and 241-AX farms. (See Table 3.6). There were few data for these tasks (generally 1-2 personal air samples), but most results were non-detectable. All detectable levels were less or much less than their ALs. While these limited data give us some degree of confidence in the controls that are in place, mandatory wearing of PAMs is recommended.



**Table 3.6: Summary of Industrial Hygiene Sampling Results for SST 241-A and 241-AX Tank Farms, 2022-2023\***

| COPC          | WC-1 Tasks                                                |              | WC-2 Tasks                               |              |
|---------------|-----------------------------------------------------------|--------------|------------------------------------------|--------------|
|               | Personal Samples                                          | Area Samples | Personal Samples                         | Area Samples |
| 1,3 Butadiene | ND (1)                                                    |              | ND (1)                                   |              |
| 1-Butanol     | No Data                                                   |              | No Data                                  |              |
| Acetonitrile  | ND (3)                                                    |              | No Data                                  |              |
| Aldehydes     | ND (3) except<br>Formaldehyde,<br>Acetaldehyde<br><10%OEL |              | ND (2)except<br>formaldehyde <10%<br>OEL |              |

<sup>62</sup> The second paragraph in this section was inserted after the draft report was submitted to HAMTC and H2C for review.

<sup>63</sup> TOC-IH-59014 Section 5.3.1.5, pdf page 45.

|                     |                 |              |                          |            |
|---------------------|-----------------|--------------|--------------------------|------------|
| Aliphatic Amines    | No Data         |              | ND (1)                   |            |
| Ammonia             | ND (7)          |              | ND (2)                   |            |
| Mercury             | ND (8)          |              | ND (2)                   |            |
| Nitrosamines        | ND (8)          |              | No Data                  |            |
| Nitrous Oxide       | No Data         |              | ND (1)                   |            |
| VOCs                | ND-<<AL (18-26) |              | ND (1)<br>N-hexane <<OEL |            |
| <b>DRI Readings</b> |                 |              |                          |            |
| Ammonia             | ND (1)          | ND (1)       | 1 ppm (5)                | <1 ppm (2) |
| Mercury             | <<10%OEL (8)    | No results   | No Data                  | No Data    |
| VOCs                | ND (1)          | <AL<br>(107) | ND (1)<br><10% OEL (1)   | <ND (8)    |

\*Number of samples in (). ND means None detected. << means much less than. VOC AL is 2ppm established by facility

<sup>b</sup><< is much less than

### 3.9 STC's Understanding of RPE Selection and Cartridge Change Schedules

It is our understanding that H2C allows the use of APR devices for work where exposure potential for ammonia does not exceed 99 ppm, with a mandatory change schedule for APR cartridges of no longer than 2 hours.<sup>64</sup> If exposure potential exceeds 99 ppm, supplied air respirators will be required.

STC agrees with this approach based on the evidence we have assessed from WRPS cartridge testing, in which 1) ammonia is a sentinel indicator (the first to be detected in the cartridge) among all the COPCs tested, and 2) ammonia also is the first chemical to break through the cartridges. We used the manufacturer's change calculator for 99 ppm ammonia, considering the most adverse temperature and humidity conditions, and found that the cartridges used by H2C can be used for 2.5 hours, so the 2-hour limit selected by H2C provides a sufficient safety factor.<sup>65</sup>

Combined with our assessment of the robustness of the H2C RPP (see Section 4), we have confidence in the respiratory protection provided to Tank Farm workers.

### 3.10 Conclusions

We find that the improvements implemented since the MOA between WRPS and HAMTC in 2016 support the requirement of: "additional engineering controls or other approaches are implemented and proven to be effective." These improvements include:

- The development of a QRA for each Tank Farm that identifies stack concentrations associated with ammonia concentrations at ground level that can expose workers to

<sup>64</sup> H2C. Tank Waste Chemical Vapors: Evaluation and Management Strategy, TOC-IH-59014, Section 5.3.1.3. January, 2026.

<sup>65</sup> This paragraph was changed based on suggestions from H2C. See H2C comment 4 in Attachment 8 for elaboration.

concentrations above the Action Level under the most severe atmospheric conditions (inversion);

- The implementation of the VMDS continuous ammonia monitoring system of tank exhaust to control operations during waste-disturbing events;
- The requirement that workers in Tank Farms wear PAMs that alarm at levels approximately one-half of the Action Limit or have equivalent monitoring as directed by IH, for WC-1 and WC-2 activities; and
- The increased number of IHTs employed in the Tank Farm along with many new procedures designed to protect and document that workers are not over-exposed to tank vapors.

These improvements make it possible to change from management-mandated to hazard-based respiratory selection. The controls are based on the premise that ammonia is the sentinel indicator of tank vapors. The exposure data that we reviewed provide evidence that COPCs did not occur above their AL when ammonia vapors are controlled.

We find that the use of continuous monitoring of ammonia in stack emissions, especially during waste-disturbing events, is an important control that helps protect workers. H2C has told us that periodic monitoring by an IHT when a continuous monitor is not operational is a safe alternative. However, we have higher confidence in the VMDS engineering control of tank vapor exhaust than we do in alternative monitoring practices. We would encourage the continued practice of conducting tank vapor-disturbing operations only when continuous monitoring is available.

The current respiratory protection program in the Tank Farms allows workers to voluntarily use and upgrade their protection, except in rare cases where it may cause a safety risk due to the nature of the task. If hazard-based respiratory protection is implemented in the Tank Farm, we would recommend that the practice of allowing voluntary use and upgrade of respirators be continued. It may be that some workers will object to the odors from vapors in the Tank Farm or find them irritating during normal operations. This supports the need for the targeted training and communication efforts that H2C plans to prepare the workforce for the inevitability of odors.

## 4 REVIEW OF RESPIRATORY PROTECTION PROGRAM

**STC finds the H2C respiratory protection program provides a strong framework for protecting workers from tank waste chemical vapors when respiratory protection is required. It is supported by a management system containing integrated policies, programs, practices, and procedures with clear authority and responsibility for program implementation and oversight.**

### 4.1 Overview

The H2C respiratory protection program (RPP) is defined in two key documents; DOE 0352<sup>66</sup>, and a Respiratory Protection Manual, TFC-ESHQ-IH-STD-07.<sup>67</sup> DOE 0352 sets minimum

<sup>66</sup> Hanford Site Respiratory Protection Program (HSRPP), DOE-0352 1-1

<sup>67</sup> Respiratory Protection, TFC-ESHQ-IH-STD-07, REV A-3

requirements for respiratory protection at the Hanford Site for all prime contractors, and the H2C manual documents requirements that go beyond DOE's minimum requirements. Two new documents provide an overview of the evaluation and management strategy for tank waste chemical vapors: IH Technical Basis for Applicable Requirements (TOC-IH-58435 Rev 02), and Tank Waste Chemical Vapors: Evaluation and Management Strategy (TOC-IH-59014 Rev 01). Collectively, with an updated document for Managing Tank Chemical Vapors (TFC-ESHQ-IH-C-48 Rev C-2), they established a framework to comply with the DOE 0352 requirement that the contractor develop management systems necessary to implement the Hanford Site Respiratory Protection Program (HSRPP). A multitude of additional H2C documented programs, plans, practices, and procedures enable full conformance with and implementation of DOE requirements and effectively manage and implement a hazard-based respirator selection process.

The RPP is necessarily multifaceted due to DOE's integrated site-wide operations and requirements. Elements of the RPP are performed both directly by H2C and by DOE service contractors that have responsibilities to support all the prime contractors and their subcontractors. The aim of DOE is to have efficient common services provided by independent contractors across the site by not requiring each prime contractor to develop its own duplicate services. The following are service contractors supporting RPP activities.

- **Site Occupational Medical Contractor (SOMC), Inomedic Health Applications, Inc. (IHA)**<sup>68</sup> provides medical testing and services. DOE awarded IHA the Hanford Occupational Medical Services contract in October 2023, and IHA assumed operations on January 1, 2024. Services include the following.
  - Providing occupational medical services to Hanford federal and contractor employees;
  - Operating clinics in Richland and the 200-West Area; and
  - Conducting medical surveillance, fitness-for-duty evaluations, work-related medical evaluations, and other occupational health services required for Hanford workers.

All contractor employees that are respirator wearers must have a medical evaluation under the HSRPP, and the medical clearance is administered through SOMC.

- **Hanford Mission Integration Solutions, LLC (HMIS)**<sup>69</sup> is a sitewide services contractor providing a multitude of administrative, engineering, information, logistics, security and other support services. HMIS operates respiratory protection training support by the HAMMER Federal Training Center.<sup>70</sup>
- **Unitech Services Group** operates facilities that sanitize and clean respirator masks using approved processes and manufacturer-recommended cleaning solutions. The Unitech contract is maintained by the DOE Hanford Field Office, (DOE-HFO).<sup>71</sup>
- **Hanford Fire Department (HFD)** tests and maintains all sites self-contained breathing apparatus (SCBA), dual flow regulator systems, airline regulators, and wheel carts in accordance with 29.1910.134(h). The HFD also tests, maintains, and refills SCBA and

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<sup>68</sup> [Hanford – Inomedic Health Applications, Inc \(IHA\)](#)

<sup>69</sup> [Hanford Mission Integration Solutions.](#)

<sup>70</sup> [HMIS Fact Sheet 2026 - for print.pdf](#), Integrated Services & Logistics Fact Sheet.

<sup>71</sup> [PowerPoint Presentation](#), Tank Farms Respiratory Equipment Management Program, 2018.

escape bottles in accordance with 29.1910.134(i), and coordinates the acquisition of the above respiratory protection breathing equipment.<sup>72</sup>

Respiratory protection issues and concerns (I&C) raised by workers during DOE support contractor services are discussed at HSRPP committee meetings attended by the H2C Respiratory Protection Program Administrator (RPPA).<sup>73</sup>

H2C Tank Farm operations and industrial hygiene (IH) improvements, including enhancements to engineering controls, management of tank chemical vapors, and associated programs and practices, currently support management-directed respiratory protection in accordance with TFC-MD-207 and TFC-ESHQ-IH-STD-07 for personnel entering within the perimeter fence of Tank Farms. The updated TFC-MD-207 indicates it is consistent with the 2016 Memorandum of Agreement between WRPS and HAMTC and the 2023 Settlement Agreement Modification (Subparagraph III.A.2), as discussed in Section 4.0. Tank vapor management practices and work category correlations are described in TFC-ESHQ-IH-C-48. TFC-MD-207 directive formalizes the process for implementing mandatory respiratory protection requirements in Tank Farms, except for work activities that utilize the Alternative Respiratory Protection Assessment (ARPA) process specified in TFC-ESHQ-IH-STD-07. The ARPA process, which is unique to H2C, is required when the use of respiratory protection equipment would introduce a greater safety hazard than the potential exposure to tank chemical vapors, such as supplied-air work within an arc-flash boundary or elevated work performed from ladders.<sup>74,75</sup>

STC reviewed H2C Tank Farm vapor management practices (TFC-ESHQ-IH-C-48) and integrated plans and procedures, to determine how the operational controls and hazard assessments contribute to more effective and efficient respiratory protection selection. This section describes H2C's RPP based on a review of program documentation, presentations, and observations made during site visits. It highlights Program strengths and identifies opportunities for improvement (OFIs).

STC did not assess the operations or effectiveness of the respiratory protection services provided by DOE site contractors. However, we examined the coordination and communication among the H2C RPPA, DOE site services contractors, and the HSRPP committee.

## **4.2 Requirement Sources**

H2C is one of several prime contractors that manage and operate nuclear facilities and provide mission integration for the DOE Hanford Field Office (HFO). Each prime contractor is required to implement the DOE integrated Hanford Site Respiratory Protection Program (DOE 0352 1-1). The HSRPP provides information and requirements for consistent multi-contractor respiratory

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<sup>72</sup> Hanford Fire Department Services, TFC-ESHQ-FP-STD-12, REV A-10, May 6, 2025.

<sup>73</sup> H2C. RPPA Roles and Framework. Presentation on July 16, 2026.

<sup>74</sup> H2C. Managing Tank Chemical Vapors, TFC-ESHQ-IH-C-48 Presentation, March 2026; Use of Respiratory Protection in Tank Farms, TFC-MD-207, September 22, 2026; Respiratory Protection, TFC-ESHQ-IH-STD-07, September 23, 2025.

<sup>75</sup> This paragraph was revised based on information provided in an H2C email dated September 28, 2026. For elaboration, please see Attachment 8, H2C Comment 5.

protection. DOE-0352 requirements are derived from the following federal regulations, DOE standards, and voluntary national consensus standards.

- 10 CFR 851, Department of Energy (DOE) Worker Safety and Health Program.
- OSHA, Title 29, Code of Federal Regulations (CFR), Part 1910.134, Respiratory Protection, which incorporates 29 CFR 1926.103, Respiratory Protection for Construction Work.
- DOE-STD-1167-2003, Respiratory Acceptance Program for Supplied-Air Suits.
- ANSI/ASSE Z88.2-2015, Practices for Respiratory Protection.

Section 4.3, Integration of Permissible Practices, provides a list of key contracts, federal regulations, DOE standards, national consensus standards, and site-specific documents that serve as the H2C Program governing requirements and guidance sources.

The HSRPP aims to ensure worker health is protected, and regulatory compliance via the following mechanisms:<sup>76</sup>

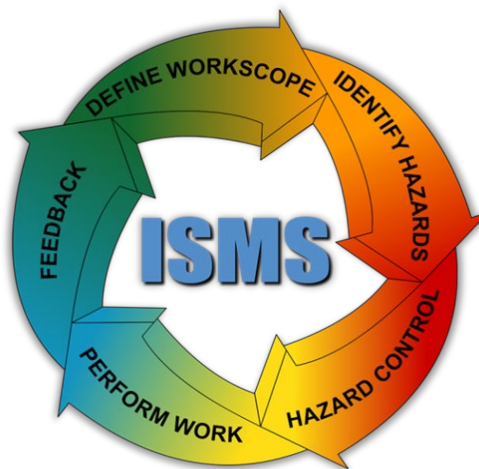
- Collecting, tracking, and trending issue and concern forms;
- Addressing issues in the field and issuing guidance;
- Conducting internal respiratory protection meetings (at least quarterly) with bargaining and non-bargaining employees;
- Attending monthly HSRPP Committee meetings sharing relevant information.
- Performing gap analyses; and
- Performing annual respiratory assessments.

The HSRPP Committee ensures the site-wide Program is effective, up-to-date, and responsive to both regulatory requirements and the needs of the workforce.

### 4.3 Integration of Permissible Practices

DOE's Integrated Safety Management System (ISMS) is structured to integrate environment, safety, health, and quality (ESH&Q) into work planning and execution. The purpose of ISMS is to ensure that work is performed safely while protecting workers, the public, and the environment by systematically integrating safety into management and work practices at every level.<sup>77</sup>

Integration is accomplished at the contractor, facility, and activity levels. A comprehensive Environmental Management System (EMS) is interwoven with the ISMS for all actions with potential environmental impacts.



<sup>76</sup> Tank Vapor Program Evaluation, TOC-IH-65892 REV 00, June 30, 2026.

<sup>77</sup> Integrated Safety Management System Description, TFC-PLN-41, March 25, 2019.

Total Environmental, Safety, Health, and Quality (ESH&Q) integration enables the assigned missions to be efficient and effective while protecting the workers, the public, and the environment.

Nine guiding principles help achieve effective integration:

1. Line management responsibility for safety.
2. Clear roles and responsibilities.
3. Competence commensurate with responsibilities.
4. Balanced priorities.
5. Identification of safety standards and requirements.
6. Hazard controls are tailored to work being performed.
7. Operations authorization.
8. Employee involvement.
9. Safety and health programs are integrated into work planning and execution.

Five key functions are integrated:

1. Define the scope of work.
2. Analyze hazards.
3. Develop and implement controls.
4. Perform work within controls.
5. Provide feedback and continuous improvement.

The management strategy and permissible practices for effective respiratory protection begin with the flow down of applicable federal regulations, integrated tank disposal contract (ITDC) requirements, Hanford Mission Essential Services Contract requirements (HMESC), national consensus standards, and respiratory protection program standards and practices.

## **Example Regulations, Contracts, and National Consensus Standards, Site Documents**

### **Regulations**

- DOE Worker Protection rule (10CFR851).
- OSHA Respiratory Protection (29CFR1910.134).
- OSHA Respiratory Protection (29CFR1926.103).
- OSHA Hazardous Waste Operations (29CFR1910.120).
- OSHA Air Contaminants (29CFR1910.1000).

### **Contracts**

- ITDC Master Contract (H2C contract).
- HMESC Contract (HMIS LLL contract).

### **Consensus Standards**

- ANSI/ASSE Z88.2-2015, Practices for Respiratory Protection.
- American Conference of Governmental Industrial Hygienists (ACGIH), Threshold Limit Values (TLVs) and Biological Exposure Indices.

### **Site Documents**

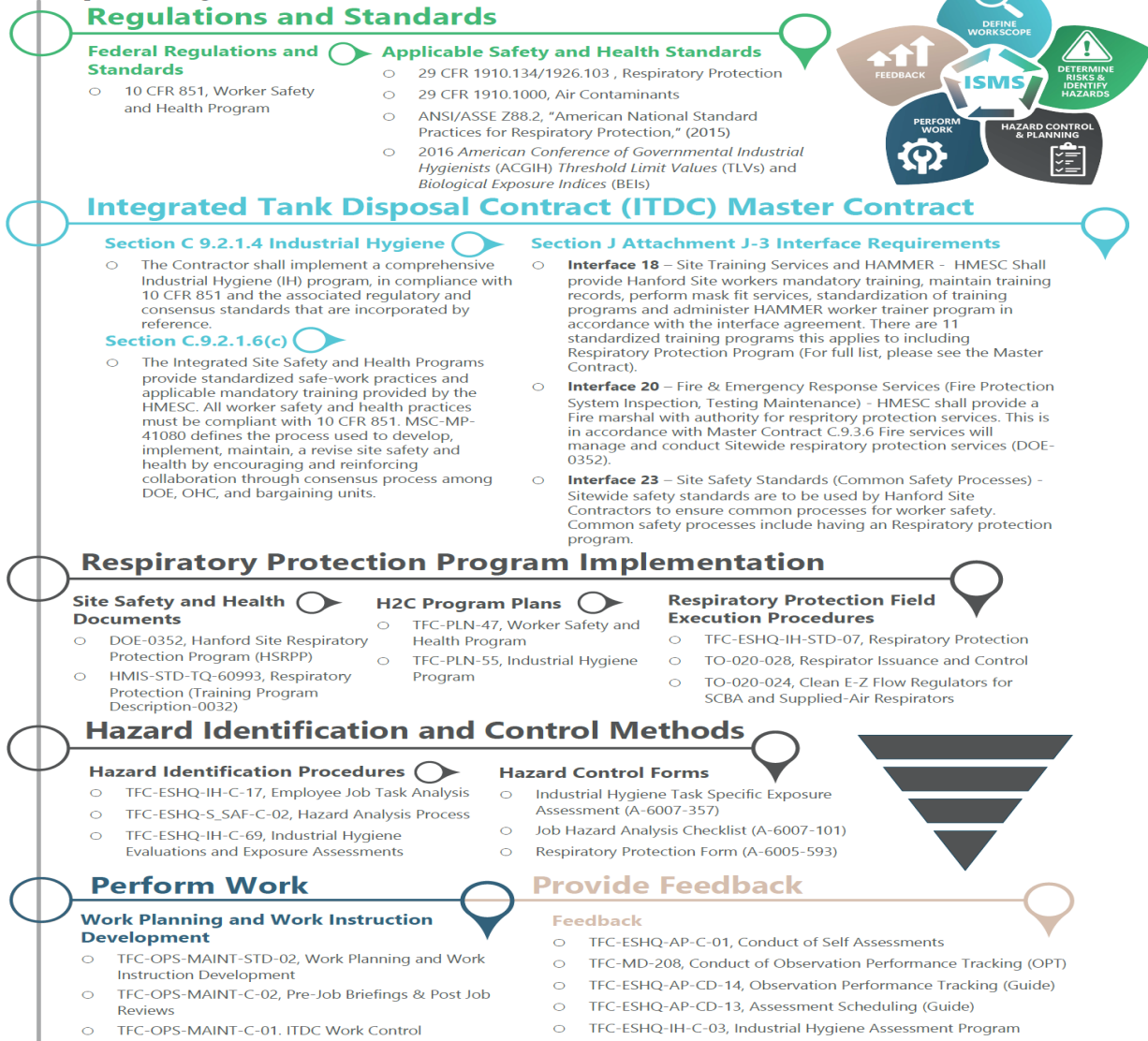
- DOE Hanford Site Respiratory Protection Program (DOE 0352, 1-1).
- H2C Respiratory Protection Manual (TFC-ESHQ-IH-STD-07, REV A-3).
- HMIS-STD-TQ-60993, Respiratory protection (Training Program Description-0032).
- TFC-PLN-47, Worker Safety and Health Program.
- TFC-PLN-55, Industrial Hygiene Program.
- TO-020-028, Respirator Issuance and Control.
- TO-020-024, Clean EZ Flow Regulators for SCBA and SAR.
- Work Package procedures
  - Job Hazard Analysis.
  - Respiratory protection Form.
- RPE User Qualification Verification (HSWET)

The following ISMS functions are mapped as viewed by STC with key applicable plans, standards, and permissible practices that have been identified in prior WRPS documents and the H2C Industrial Hygiene Requirements Flow Diagram for Respiratory Protection (Figure below).<sup>78</sup> The lists below contain key plans, standards, and permissible practices derived from these two sources.

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<sup>78</sup> Presentation, Respiratory Protection Program, June 24, 2026.

## Industrial Hygiene Requirements Flow Diagram: Respiratory Protection



**Define the scope of work** - Work scope is a process in which mission expectations are defined, prioritized, and divided into discrete activities that account for the associated hazards, requirements, controls, and funding needed to complete the mission. IH may be consulted about possible hazards and solutions, but as a supporting member of a multi-disciplinary team comprised of technical and operational personnel, management, ESH&Q, customer representatives, and subject matter experts (SME).

- TFC-OPS-MAINT-STD-02, Work Planning and Work Instruction Development
- TFC-OPS-MAINT-C-01, IDTC Work Control
- Employee Training Plan

**Analyze Hazards** - During the hazard identification process, all hazards associated with that work scope are identified on a JHA form. Personnel on the walk down may include a combination of the following:<sup>79</sup>

- Procedure user(s) (worker(s))
- Operations representative(s)
- Field Work Supervisor
- Environmental representative(s)
- Radiological Control representative(s)
- Industrial Safety representative(s)
- Industrial Hygiene representative(s)

Practices include:

- TFC-PLN-174, Chemical Vapor Technical Basis Program Plan
- TFC-ESHQ-IH-C-66, Identifying Chemicals of Concern in Hanford Tank Farms
- RPP-22491, Chemical Vapor Technical Basis
- TFC-ESHQ-IH-C-67, Maintenance of the IH Chemical Vapor Technical Basis
- TFC-ESHQ-IH-C-69, Industrial Hygiene Evaluations and Exposure Assessments
- TFC-PLN-34, IH Exposure Assessment Strategy
- TOC-IH-EA-50032, Industrial Hygiene Exposure Assessment Strategy
- TFC-ESHQ-S\_SAF-C-02 Section 4.2.1, pdf page 6: Contractor Safety Management (Hazard Analysis Process previously titled Job Hazard Analysis) WRPS IHWP was combined with JHA
- TFC-ESHQ-IH-17, Employee Job Task Analysis
- A-6007-357, Industrial Hygiene Task Specific Exposure Assessment
- A-6004-101, Job Hazard Analysis Checklist

### **Develop and Implement Controls**

- TOC-IH-58435, Tank Chemical Vapors Management Strategy, Appendix F
- TOC-IH-59014, Tank Waste Chemical Vapors: Evaluation and Management Strategy
- TFC-ESHQ-S\_IH-C-48, Managing Tank Chemical Vapors
- TFC-MD-207, Management Directed
- MDRPF-PLN-173, MDRFP-STD-07, Management Directed Respiratory Protection
- A-6005-593, Respiratory Protection Form
- TVIS-AP-001, Tank Vapor Information Sheets

### **Perform Work**

- TFC-OPS-MAINT-C-02, Pre-job Briefing & Post Job Reviews
- RPE User Qualification Verification, Hanford Site Worker Eligibility Tool (HSWET)
  - Respirator Worker Training (HAMMER)
  - Medical Evaluation (Site Occupational Medical Contractor (SOMC))
  - Worker restrictions
- Respirator Issuance and Control (TO-020-028)
  - RPE Issued (A-6005-593 — Respiratory Protection Form)
  - Respiratory Equipment Tracking System (RETS). (TO-020-028 Section 5.1, p. 10<sup>80</sup>)

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<sup>79</sup> H2C. Hazard Analysis Process. TFC-ESHQ-S\_SAF-C-02 Section 4.2.1, March 2, 2026.

<sup>80</sup> Added at suggestion of H2C.

- Package Released for Work
- Work Package Performed

#### **Obtain Feedback**

- TFC-OPS-MAINT-C-02, Pre-job Briefing & Post Job Reviews
- TFC-ESHQ-AP-C-01, Conduct of Self Assessments
- TFC-ESHQ-AP-CD-14, Observation Performance Tracking (Guide)
- TFC-MD-208, Conduct of Observation Performance Tracking (OPT)
- TFC-ESHQ-AP-CD-13, Assessment Scheduling (Guide)
- TFC-ESHQ-IH-C-03, Industrial Hygiene Assessment Program

#### **4.4 Conclusions**

The DOE-0352 HSRPP is a well sourced and comprehensive Program. It applies to all Hanford Site Prime Contractors, and all subcontractors who use respiratory protection. The Program applies to activities where respiratory protection is required to protect workers from hazards. The Hanford Mission Essential Services Contract (HMESC), currently issued to HMIS, is responsible for supporting the HSRPP Committee and for gathering relevant data and making it available to all contractors through the HSRPP website. H2C has developed management systems necessary to implement the HSRPP, updated permissible practices, conducts on-going surveillance and conducts annual self-assessments and triennial independent assessments.

The focus of this STC assessment was to review and evaluate H2C's Program based on evidence presented by H2C of its programs, plans, practices and procedures to demonstrate compliance with the DOE site-wide HSRPP and other source requirements. STC specifically focused on the following topics:

- Management system and practices to implement DOE-0352 HSRPP.
- Roles and qualifications of the H2C RPPA.
- Activities of the contractor's lower tier respiratory protection committee.
- Management of RPE.
- Integration of permissible practices across ISMS functions and Program elements.
- Training and Qualifications of principal officials and workers.
- Program Assessments.

STC has reviewed programs, plans, practices and procedures including a few past assessments to conclude that the Program meets DOE-0352 minimum requirements and goes beyond those requirements as documented in its Respiratory Protection Procedure, TFC-ESHQ-IH-STD-07, REV A-3. After careful consideration of the evidence presented to us, we identify several program strengths and a few opportunities for additional improvement:

#### **Strengths**

##### **1. Tank Waste Chemical Vapors Management Strategy**

The updated framework for managing tank waste chemical vapors for compliance with DOE-0352 requirement for the contractor to develop management systems necessary to implement the HSRPP. Two new H2C documents provide an overview of the evaluation and management strategy for tank waste chemical vapors: IH Technical Basis for Applicable Requirements (TOC-IH-58435 Rev 02), and Tank Waste Chemical Vapors:

Evaluation and Management Strategy (TOC-IH-59014 Rev 01). Collectively, with an updated document for Managing Tank Chemical Vapors (TFC-ESHQ-IH-C-48 Rev C-2), a framework is established to protect the health of the workforce and transition to a hazard-based respirator selection process.

## **2. Integration of RPP and ISMS Requirements**

H2C is actively mapping HSRPP requirements, plans, and permissible practices to the applicable ISMS functions and RPP elements. This effort is particularly beneficial because it improves transparency and understanding among workers, management, and other stakeholders regarding how requirements, controls, work practices, and governing documents are integrated to support effective program implementation and oversight.<sup>81</sup>

## **3. Respiratory Protective Equipment Management and Control**

All respiratory protective equipment (RPE) approved for use at the site is stored, secured, maintained, issued, tracked, and processed in a climate-controlled facility by trained and qualified respiratory issuance personnel. Issuers are highly knowledgeable and follow established procedures governing regulatory compliance, equipment storage, issuance, inventory management, sanitation, maintenance, repair activities, and disposal. H2C continues to pursue improvements to its equipment management processes, including enhanced integration between employee training records, fit-testing information, and assigned equipment. Planned system enhancements also include updating functionality with pop-up messaging regarding associations of worker qualification and fit testing, through a mandatory comment field before equipment can be issued.<sup>82</sup>

## **4. Workforce Qualification and Development**

Workforce qualification and professional development remain clear management priorities. This commitment is demonstrated through a variety of programs and initiatives designed to ensure workers understand the purpose and importance of permissible practices and possess the knowledge and qualifications necessary to perform work safely and in compliance with program requirements.

## **5. Communication and Workforce Engagement**

H2C employs a wide range of communication methods tailored to the needs of specific audiences, including the Tank Farm workforce, field industrial hygiene personnel, supervisors, and cross-disciplinary partners. Workers are provided numerous opportunities to ask questions, raise concerns, and provide feedback. Collectively, these communication efforts promote transparency, strengthen coordination across organizations, reinforce a positive safety culture, and encourage active employee involvement.<sup>83</sup>

In addition, H2C's communications program has significantly enhanced workforce engagement through a comprehensive, multi-layered communication framework that reaches employees at all levels of the organization. By integrating formal and informal communication channels, as well as digital and face-to-face interactions, H2C helps ensure that important information is communicated consistently, employees remain

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<sup>81</sup> Presentation, Respiratory Protection Program Administration, June 24, 2026

<sup>82</sup> Tank Vapor Program Evaluation, TOC-IH-65892 Rev 00. June 30, 2026.

<sup>83</sup> Tank Vapor Program Evaluation, TOC-IH-65892 REV 00, June 30, 2026.

actively involved in operational and safety discussions, and workforce feedback is effectively shared and addressed.

**6. Voluntary Respiratory Protection Upgrades**

Workers continue to have the option to voluntarily upgrade their respiratory protection without concern for criticism, judgment, or adverse treatment. H2C supports these requests and ensures that any voluntarily selected respiratory protective equipment is evaluated to confirm that it does not introduce additional hazards to the wearer.

**Opportunities for Improvement**

**1. H2C Respiratory Protection Committee Charter**

The RPPA conducts regular meetings of the contractor's Respiratory Protection Program (RPP) Committee to discuss respiratory protection issues as required by the HSRPP. However, the committee's operations appear to lack the level of formality appropriate for its important role in supporting the RPP. Specifically, no documented charter was identified to establish the committee's purpose, responsibilities, structure, and operating procedures. Given the committee's critical function in maintaining an effective respiratory protection program and facilitating communication of workforce concerns, H2C could consider developing and implementing a formal charter for the contractor's lower-tier RPP Committee. In addition, meeting records should consistently document the meeting date, location, attendees (including absences), standing agenda items, new business and the RPPA's signature.

**2. Hazard-based Respiratory Protection Expectations Training**

As hazard-based respiratory protection is implemented, consideration should be given to incorporating respiratory protection topics into Safety Integration, Stepping Stones, Chemical Worker Training, or other workforce training activities. These training opportunities can help prepare workers for performing tasks without respiratory protective equipment when appropriate. Because workers may experience a noticeable increase in perceived odors with potential psychosomatic symptoms when working without RPE, training could address expectations, required responses, and documentation practices associated with such events. Chemical Worker Training also provides an opportunity to explain hazard-based RPE selection processes and reinforce the basis for respiratory protection decisions. Improved workforce understanding of these processes may also help reduce unnecessary requests for voluntary upgrades in respiratory protection.

**3. DOE Support Contractors use of the H2C I&C Form**

DOE Support Contractors use of the H2C I&C form (Form A-6005-205) as an official means for reporting worker respiratory protection issues and concerns raised during services provided may be more effective than orally passing on information to RPPA and during the HSRPP Committee meetings.

**Note:**

**Attachment 6, Supporting Evidence for RPP Review Conclusions, describes additional evidence reviewed to reach these conclusions.**

## 5 CONCLUSION

When STC agreed to serve as the Independent Third Party stipulated in the MOA between HAMTC and WRPS (and H2C later), we were told we should anticipate an assignment lasting 2-3 months, focusing on review of APR cartridge testing. Then our task was expanded to review the vapor control program and respiratory protection requirements more broadly, in response to the MOA provision that "...both parties agree to the interim use of mandatory respiratory protections...until emergence of additional engineered controls or other approaches are implemented and proven to be effective... on a Farm by Farm basis."

Over the last decade of our involvement with respiratory protection in the Tank Farms, we have seen very significant improvements in engineering controls, administrative controls including comprehensive written programs and policies, and worker engagement.

With the enhancements made by WRPS and H2C in engineering and administrative controls, integration of industrial hygiene, engineering and operations perspectives from the earliest stages of work planning, and strengthening of its IH Program and RPP, we find that H2C has addressed the concerns we have expressed in the 28 reports we have submitted in the past.

Having said that, we caution that H2C should move carefully towards hazard-based respiratory protection considering uncertainty about workforce readiness and the need for a more reliable VMDS.

While we have evaluated only the A-Complex<sup>84</sup> Tank Farms, the QRA modeling, industrial hygiene monitoring and respiratory protection program provide confidence that workers can be protected throughout the other farms if the same systems, diligence and workforce involvement are applied.

Based on this review, we conclude that our responsibilities as the Independent Third Party have been met and that our work associated with the MOA is completed.

## 6 CERTIFICATION

I certify that this is a true description of the process and findings of this Review, and that all members of the Review Team concurred. H2C and HAMTC were offered the opportunity to review a draft of this report, and their comments were considered where appropriate. The final product is solely the responsibility of the Team.



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Knut Ringen, DrPH, MHA, MPH  
Project Director

Date: September 30, 2026

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<sup>84</sup> We added the term Complex for clarification peer suggestion from H2C.

## ATTACHMENT 1: STC Recommendations from Report No. 3

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Chemical Vapor Short Duration Exposure Management and Control</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| <b>Assess and implement special projects</b> <p>STC recommended the full development and implementation of multiple salient projects. 2-p-7, p8</p> <p>These must be fully developed, confirmed and integrated into IH, RPP and operational practice before risk-based approaches are fully implemented.2-p7, p-11</p> <p>They must be integrated into IH, RPP and operational practice and confirmed, including during waste disturbance, before a final decision about risk-based respiratory protection for USEEs can be made.2-p11</p> <p>Salient projects currently implemented or developed must be regularly assessed and updated as part of a continuous improvement. These should be integrated into IH, RPP and operational practices and confirmed before risk-based approaches are fully implemented.2-p9</p> |
| <b>Demonstrate enhanced engineering controls work effectively</b> <p>Results from the upgraded engineering controls and source and personal monitoring for ammonia need to demonstrate they characterize, control or eliminate USEEs.2-p39</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| <b>Continuous Improvement of strategy and plans</b> <p>USEEs are not specifically singled out for special emphasis in CVAP protection actions, performance parameters, or outcome categories, although the QRAs that are in development seek to do so.2-p32</p> <p>Continued surveillance of personal and engineering controls, and assessment of collected data and appropriate communication and training of frontline supervisors and workers in cooperation between HAMTC and WRPS moving forward.1-pp12-13</p> <p>Review the OSHA Process Safety Management standard and relevant consensus standards to more robustly protect against equipment failures and equipment changes that could adversely impact work in the tank farms with respect to exposures to COPCs.2-p34</p>                                      |
| <b>IH Program</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| <b>Adopt a new paradigm in order to manage, control and mitigate USEEs.2-p16</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |

Until data become available to show that USEEs can be effectively managed, controlled, and mitigated in the tank farms, a combination of a risk-based and a management directed respirator program is needed to address this risk uncertainty.2-p13

Carefully assess how to apply the hazard-based approach to passively ventilated tanks, waste disturbing periods, and RC3 and RC 4 work activities before any changes in respiratory protection is proposed.1-p6

Such approaches will need to be confirmed during future waste retrieval and transfer operations.2-p13

### **Strengthen Technical Basis for Worker Protection Zones.2-p46**

WRPS has not yet provided a sufficient technical basis for determining their boundaries. This is particularly true for the Chemical Contamination Reduction Zone (CRZ), and to a lesser extent the Exclusion Zone (EZ).2-p23

WRPS adopted RCs focused on the efficacy of controls, while AIHA SEGs focus on exposure potential. STC recommended these classifications be eliminated. STC recommended a Task-based Exposure Assessment methodology.2-p47

### **Active ventilation**

STC recommended that enhanced active ventilation be implemented in all tank farms.

### **Surveillance of source, area, and personal breathing zones is required.1-p6**

Stack/exhauster monitoring should be continuous and in real time where possible. Routine monitoring, which is not continuous and real-time may provide a better understanding of the chemical compositions of exhausted air but will not provide reliable information on transient and unanticipated ammonia and other COPC releases. 1-p12

### **Sentinel or Leading Chemical Indicators**

Need to clearly define terms and consistently use them.

WRPS needs to verify the technical basis of the use of ammonia as an indicator, effectiveness of how it is used by WRPS, and how WRPS maintains an on-going evaluation and continuous improvement of the use of indicators. Developmental work regarding leading indicators should be continued and verified.2-p7, 2-p33, 2-p34, p45

Ammonia is ubiquitous to all tanks and was the first chemical to break through cartridge filters in the tests. Moreover, ammonia can be monitored in real time, and there are chemical detectors that workers can wear that will alarm when ammonia is present at set concentrations in the air.2-p15

Ammonia will be monitored and alarmed at the stacks/exhausters, but there may be opportunities for other COPCs, possibly measured as VOCs, to be monitored.1-p12

Following this up with assigned personal real-time ammonia monitors to each worker in the tank farms has been another critical improvement that strengthens the respiratory protection program immensely.2-p22

Implement real-time personal monitors worn by tank farm workers to provide needed information when a change in workplace conditions has occurred requiring protective actions by management and employees.1-p7

Ammonia vapors will need to be appropriately monitored in real-time. 1-p11

WRPS should evaluate expanding the use of personal real-time ammonia monitors for all workers employed in outdoor work throughout the tank farms Industrial Zone (IZ). WRPS should continue to assign ToxiRAE (or other alarmed monitors) to workers inside the Chemical Contamination Reduction Zone (CRZ).

We caution that these monitors do not lead to overconfidence and a sense that USEEs no longer need to be of concern. 2. P-9

WRPS should explore use of passive samplers (e.g., SKC Passive Ammonia Badge) for workers employed inside IZ but outside CCRZ. 2-p46

### **Single document to address WRPS actions for USEE protection**

WRPS should document in a single output the essential enhancements it has made in its hazard assessments and IH program that support the hazard-based respiratory protection program. Such documentation should be a key component in updating its communications with the workforce (and other stakeholders) and training.1-p13, 2-p32

WRPS published two documents instead of one document: 1) Cause Analysis Report WRPS-PER-2014-0602 Tank Farm Chemical Vapor Odor Detection Events, 9/2019; 2) Short-Duration Vapor Concentrations in Worker Breathing Zones In and Near the Hanford Tank Farms: A Summary of Current Knowledge, RPP-RPT-61280 Rev.00, 10/15/2019. I note that the actual document has the revision level 0 the same as the document we reviewed and commented on.

## **Respiratory Protection Program**

### **Adopt Recommended RPD Template, Exhibit 1 guidance for respiratory protection against USSEs. 2-p-8, p45**

Apply defense-in-depth precautions until the TOC can demonstrate with sufficient empirical data that it can manage, control and mitigate all exposures including USEEs.2-p9

Because data, technology and process limitations, and lack of experience during waste disturbing operations, moving to a risk-based respirator program is only partially possible at this time.

Therefore, we have provided a template to guide respiratory protection that is also in part management directed. See Exhibit 1.2-pp12

This recommendation is limited to conditions that have been evaluated to date: actively ventilated tanks or tank farms, during non-waste disturbing activities, and for RC 1 and RC 2 work activities.1-p12

With upgraded engineering controls and sufficient objective data this approach could potentially be expanded to include work within the passively ventilated tank farms, during waste-disturbing events and for RC-3 and RC-4 work activities.1-p12

**Update the WRPS RPP Manual.2-p48**

Revise RPP procedures to include all of the program elements with identification of related reference documents in one place to minimize confusion.2-p35, p-37, p-38

There needs to be continuity in the respiratory protection program so that there is no backsliding.2-p16

**Workforce Engagement, Training and Communications****Maintain CPPO**

Maintain CPPO to monitor progress of improvements projects.2-p47

We encourage WRPS to continue past CPPO efforts to engage field personnel in focus groups, surveys, and other interactive methods to get feedback on AOPs specifically. 2-p.48

Instead of eliminating CPPO and the ESH&Q/CPI Office they could be refocused and reorganized to independently monitor, report, and produce appropriate communications with the workforce and other key stakeholders.2-p32

**Engage Workforce****Maintain CPPO**

Maintain CPPO to monitor progress of improvements projects.2-p47

We encourage WRPS to continue past CPPO efforts to engage field personnel in focus groups, surveys, and other interactive methods to get feedback on AOPs specifically. 2-p.48

Instead of eliminating CPPO and the ESH&Q/CPI Office they could be refocused and reorganized to independently monitor, report, and produce appropriate communications with the workforce and other key stakeholders.2-p32

**Training**

Implementation of real-time personal ammonia monitors must be accompanied by updated training of all workers to ensure their effective use.1-p11

If confirmed and continuously improved, this can also instill greater confidence of the workforce in the management, control, and mitigation of all potential exposures, including USEEs.2-p25

Consider having frontline supervisors take the Foundations for Safety Leadership (FSL) training, a two-hour course developed by CPWR and offered at HAMMER.2-p43

Many frontline supervisors and workers ranged from not very confident to downright distrustful of AOP investigations. We strongly recommend that the AOP process be looked at closely and continuously assessed moving forward.2-p43

**Communications**

We recommend that WRPS support these frontline supervisors to improve and bring consistency to communications. 2-p-43

We believe it is the utmost importance that workers fully understand the basis under which WRPS has concluded that FFAPR use is acceptable and any conditions limiting that use.1-p.46  
Maintain Consistent Communications.2-p48

## ATTACHMENT 2: Opportunities for Improvement from H2C Self-Evaluation<sup>85</sup>

Source: H2C. Tank Vapor Program Evaluation. TOC-IH-65892, Rev. 00. June 30, 2026.

We made some changes to this Attachment based on comments from H2C. They did not change its purpose or the findings we have drawn from it.

*Note: page numbers refer to those on the bottom of the report pages.*

| Item/page                                                           | Key Developments | Opportunities for Continuous Improvement                                                                                                                                      |
|---------------------------------------------------------------------|------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Opportunities for Continuous Improvement Summary (pp. 12-13)</b> |                  |                                                                                                                                                                               |
| Tank Vapor Protection Strategy (p 12)                               |                  | 1. Evaluate the Workforce's current understanding of the Tank Vapor hazard control sets [i.e., Tank Vapor Work Categories (WCs)]                                              |
|                                                                     |                  | a. Utilize evaluation to identify opportunities for improvement (e.g., how IH communicates Tank Vapor hazards to the workforce, workforce education process)                  |
|                                                                     |                  | 2. Evaluate process(es) to conduct and document field walkdowns focused on assessing the status of Tank Vapor related equipment.                                              |
| Event response (p 12)                                               |                  | 1. Review/revalidate Memo WRPS-1904672.1                                                                                                                                      |
|                                                                     |                  | 2. Evaluate the Workforce's current understanding of the requirements of PAM use and how to respond to PAM alarms. Include pre-job briefing discussions.                      |
| RPP. (p 12)                                                         |                  | 1. Evaluate the Workforce's current understanding of the hazard driver(s) for their RPE                                                                                       |
|                                                                     |                  | 2. Evaluate the Workforce's current understanding of how to determine the Respiratory Protection Form (RPF) task necessary for issuance.                                      |
|                                                                     |                  | 3. Utilize evaluations to identify opportunities for improvement (e.g., how IH/RadCon communicate hazards to the workforce, workforce education process).                     |
|                                                                     |                  | 4. Evaluate establishing a standardized process for pre-job briefing discussions on RPE [e.g., inclusion in Field Work Supervisor (FWS) training]                             |
| Training (p 13)                                                     |                  | 1. Develop Workforce educational material and education strategy (e.g., Course 350358, <i>Chemical Worker Training</i> ) to provide more in-depth knowledge of the Tank Vapor |

<sup>85</sup> This attachment has been corrected for factual errors pointed out by H2C.

|                                               |  |                                                                                                                                                                                                                                                                                                                                          |
|-----------------------------------------------|--|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                               |  | hazard and its associated controls. Material should cover topics such as Tank Waste composition, Tank Vapor headspace dynamics, job scenarios with associated application of Tank Vapor controls.<br>a. Evaluate additional training approaches to begin expansion of Tank Vapor training material while developing long-term solutions. |
|                                               |  | 2. Develop Workforce educational material and education strategy (e.g., Course 350358, <i>Chemical Worker Training</i> ) for hierarchy of IH sampling and monitoring. Include representative personal sample process.                                                                                                                    |
|                                               |  | 3. Develop Workforce educational material and education strategy for weather's impact on Tank Vapors (e.g., SmartSite, at times it will be more odorous).                                                                                                                                                                                |
|                                               |  | 4. Develop Workforce educational material and education strategy for response to Personal Ammonia Monitor alarms. Include importance of timely delivery of alarming device to the Central Shift Office and how the information from the device determines respiratory protection requirements for responding personnel.                  |
|                                               |  | 5. Develop Workforce educational material and education strategy for response to stronger than normal odors. Include importance of Odor/Vapor Response Cards in building response plan. Describe how response plans are developed (graded approach).                                                                                     |
|                                               |  | 6. Evaluate development of Tank Vapor training for managers/Supervisors/Union Representations [e.g., pre-job briefing expectations, utilization of data visualization tools (PAM dashboard, VMDS, SmartSite)].                                                                                                                           |
| Workforce Communication & Engagement. (p. 13) |  | 1. Develop communication methods (e.g., pre-job briefing) for worker knowledge of co-located work that may impact Tank Vapor concentrations and/or be odorous.                                                                                                                                                                           |
|                                               |  | 2. Evaluate the Industrial Hygiene Communication process regarding communication development and distribution. Identify distribution process improvements for workers without access to computers.                                                                                                                                       |

|                                                       |                                                                                                                                                                                                                                          |                                                                                                                                                                                                |
|-------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                                       |                                                                                                                                                                                                                                          | 3. Conduct a workforce survey regarding Industrial Hygiene Communications.                                                                                                                     |
|                                                       |                                                                                                                                                                                                                                          | 4. Evaluate the Workforce's current understanding of accessing data related to Tank Vapors (e.g., SWIHD, IDAV, PAM, VMDS, SmartSite).                                                          |
|                                                       |                                                                                                                                                                                                                                          | 5. Evaluate Building Trades/Subcontractor's opportunities to participate in the hazard analysis process and various safety councils (e.g., EAPC). Identify processes to improve participation. |
|                                                       |                                                                                                                                                                                                                                          | 6. Evaluate establishing an IH Committee for Tank Vapors to promote workforce engagement.                                                                                                      |
| <b>1.0 IH Program (pp. 18-44)</b>                     |                                                                                                                                                                                                                                          |                                                                                                                                                                                                |
| Subsection                                            | Key Developments                                                                                                                                                                                                                         | OCIs                                                                                                                                                                                           |
| 1.1 Overview (pp 18-21)                               | Revised Industrial Hygiene Manual: IH Technical Basis for Applicable Requirements, Reinstated/revised IH Program Plan. Training: Immersive Proficiency Center (IPC) for IHTs training IHTs, IH Professional Qualification Card process." | None                                                                                                                                                                                           |
| 1.2 Requirements and Elements<br>pp 22-26)            | Publication of Industrial Hygiene Business Processes. Dedicated storage location for non-exposure monitoring Industrial Hygiene records. Major revision of the procedure Hazard Analysis Process.                                        | None                                                                                                                                                                                           |
| 1.3 Records Mgt (pp 27-33)                            | Publication of Industrial Hygiene Business Processes. Dedicated storage location for non-exposure monitoring Industrial Hygiene records. Major revision of the procedure Hazard Analysis Process."                                       | None                                                                                                                                                                                           |
| 1.4 Measure Program (pp 34-36)                        | None                                                                                                                                                                                                                                     | 1. Evaluate current Industrial Hygiene Department Level Metrics and determine value provided by tracking/trending.                                                                             |
| 1.5 IH Program Assessment (pp 37-41)                  | None                                                                                                                                                                                                                                     | 1. Establish process to ensure Assessment Team members are equipped with the right expertise and framework to produce more robust assessment outcomes.                                         |
| 1.6 External Program Assessment (pp 42-44)            | None                                                                                                                                                                                                                                     | None                                                                                                                                                                                           |
| <b>2.0 Tank Vapor Protection Strategy (pp. 45-65)</b> |                                                                                                                                                                                                                                          |                                                                                                                                                                                                |
| Subsection                                            | Key Developments                                                                                                                                                                                                                         | OCIs                                                                                                                                                                                           |
| 2.1 IH Chem Tech Basis<br>(pp 45-47)                  | Publication of Analysis of Chemical Vapor Data Collected during Waste Disturbing Activities. Publication of a summary of current knowledge regarding Short-Duration                                                                      | 1. Add RPP-RPT-61280 and RPP-RPT-61924 to TFC-PLN-174 Attachment B, Reference List.                                                                                                            |

|                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                                                                                                                                                                                                                                                                                                                                                                               |
|-------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                                 | Vapor Events. Incorporation of Short-Duration Vapor Events into the Tank Vapor Evaluation and Management documentation ( <a href="#">Section 2.2</a> ).                                                                                                                                                                                                                                                                                  |                                                                                                                                                                                                                                                                                                                                                                                                                               |
|                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                          | 2. Develop an Implementation Plan to Incorporate OFIs and Recommendations from Recent Self-Assessments.                                                                                                                                                                                                                                                                                                                       |
|                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                          | 3. Establish process, and incorporate into associated procedures, for Engineering input (e.g., Process Control Plan) when populating the Tank Vapor Information Sheet (TVIS). New term introduced with TFC-ESHQ-IH-C-48 revision (Tank Vapor Watchlist Chemical) provides the avenue to capture Engineering's predictions for changing in waste composition upon transferring/mixing.                                         |
|                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                          | 4. Establish process for Industrial Hygiene and Engineering collaboration for hazard evaluation (e.g., Tank Vapors).                                                                                                                                                                                                                                                                                                          |
| 2.2 Tank Vapor Eval and Mgt Strategy (pp 48-55) | Publication of Quantitative Risk Analysis, Engineering evaluation of rate of change in headspace concentrations ahead of waste disturbing activities. Publication of Tank Waste Chemical Vapors: Evaluation and Management Strategy, incorporation of Tank Vapor management plan into the IH Technical Basis for Applicable Requirements, major revision of Managing Tank Chemical Vapors. Indication of changing conditions- VMDS, PAM. | 1. Evaluate the Workforce's current understanding of the Tank Vapor hazard control sets [i.e., Tank Vapor Work Categories (WCs)].<br>a. Utilize evaluation to identify opportunities for improvement (e.g., how IH communicates Tank Vapor hazards to the workforce, workforce education process).                                                                                                                            |
|                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                          | 2. Revision of TOC-IH-59014 to include overview of Engineering's evaluation process for waste disturbing activities (e.g., Process Control Plan, modeling ahead of activity).<br>a. Capture Engineering's "legacy knowledge" of specific tanks with higher inventories of volatile organic compounds (VOCs) and mercury. When these tanks are retrieved in the future, expanded stack monitoring capabilities will be needed. |
|                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                          | 3. Revision of TOC-IH-59014 to include Engineering's analysis of chemical vapor data collected during waste disturbing activities (RPP-RPT-61924).<br>a. Capture highlights/summary of gas and vapor releases, including waste disturbing activity's potential to release gas and vapors.                                                                                                                                     |

|                                                            |                                                                                                                                                                                                                                                                                                                              |                                                                                                                                                                                                                                                                                               |
|------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                                            |                                                                                                                                                                                                                                                                                                                              | 4. Evaluate process(es) to conduct and document field walkdowns focused on assessing the status of Tank Vapor related equipment.                                                                                                                                                              |
|                                                            |                                                                                                                                                                                                                                                                                                                              | 5. Develop process for maintaining/updating PI Vision™ displays relating to VMDS.                                                                                                                                                                                                             |
| 2.3 Hazard Evaluation (pp 56-58)<br>(Refer to 5.1 and 5.2) | Procedure for Industrial Hygiene Exposure Assessments expanded to include different levels of evaluations.                                                                                                                                                                                                                   | None                                                                                                                                                                                                                                                                                          |
| 2.4 Tank Vapor IH Sampling/Monitoring Strategy (pp 59-62)  | Publication of Tank Waste Chemical Vapors: Evaluation and Management Strategy, incorporation of Tank Vapor management plan into the IH Technical Basis for Applicable Requirements, major revision of Managing Tank Chemical Vapors. Publication of Tank Farm COPC/COC Sampling: Requested Flow Rates and Sampling Duration. | 1. Procedure/process for tank headspace characterization.                                                                                                                                                                                                                                     |
|                                                            |                                                                                                                                                                                                                                                                                                                              | 2. Documented strategy for Fugitive Emissions and publication of data summaries.                                                                                                                                                                                                              |
|                                                            |                                                                                                                                                                                                                                                                                                                              | 3. Documented strategies for non-Tank Vapor sampling methods on the IH Sampling Methods poster.                                                                                                                                                                                               |
| 2.5 Tank Vapor Evaluations (pp 63-65)<br>(Refer to 2.2)    | Publication of QRAs (Section 2.2), Engineering evaluation of rate of change in headspace concentrations ahead of waste disturbing activities, Publication of Tank Waste Chemical Vapors: Evaluation and Management Strategy, Data summaries for VMDS.                                                                        | 1. Procedure/process for tank headspace characterization.                                                                                                                                                                                                                                     |
|                                                            |                                                                                                                                                                                                                                                                                                                              | 2. Process/procedure for Industrial Hygiene data summaries. Include expectations for occurrence, and guidance on content to include.                                                                                                                                                          |
| <b>3.0 EVENT RESPONSE (PP 66-88)</b>                       |                                                                                                                                                                                                                                                                                                                              |                                                                                                                                                                                                                                                                                               |
| Subsection                                                 | Key Developments                                                                                                                                                                                                                                                                                                             | OICs                                                                                                                                                                                                                                                                                          |
| 3.1 Exhauster Ammonia Monitoring Alarms (pp. 66-74)        | Quantitative Risk Analysis, Engineering evaluation of rate of change in headspace concentrations ahead of waste disturbing activities, SmartSite (formerly known as DFAS), Publication of Tank Waste Chemical Vapors: Evaluation and Management Strategy, Data summaries for VMDS (Section 2.5).                             | 1. Revision of TOC-IH-59014 to include overview of Engineering's evaluation for waste disturbing activities. Describe which type of waste disturbing activities will require an increase to the standard once-per-calendar-day alternate monitoring frequency utilized for static conditions. |
|                                                            |                                                                                                                                                                                                                                                                                                                              | 2. Review/revalidate Memo WRPS-1904672.1.                                                                                                                                                                                                                                                     |
| 3.2 Personal Ammonia Monitors (pp 75-78)                   | Response to Personal Ammonia Monitor Alarms: Publication of Tank Waste Chemical Vapors: Evaluation and Management Strategy, incorporation of Tank Vapor management plan into the                                                                                                                                             | 1. Publish Industrial Hygiene Response and Investigation Checklist for TF-AOP-015.                                                                                                                                                                                                            |

|                                                            |                                                                                                                                                                                                                                                                                       |                                                                                                                                                          |
|------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                                            | IH Technical Basis for Applicable Requirements, SmartSite (formerly known as DFAS), Communication & Public Relations issuance of communication for TF-AOP-015 responses ( <a href="#">Section 6.1</a> ). Instrumentation: Use of Ventis Pro5 for Personal Ammonia Monitors.           |                                                                                                                                                          |
|                                                            |                                                                                                                                                                                                                                                                                       | 2. Evaluate the Workforce's current understanding of the requirements of PAM use and how to respond to PAM alarms. Include pre-job briefing discussions. |
| 3.3 Response to Stronger than Normal Odors (pp 79-81)      | Publication of Monitoring Strategy for Response to Odors: Common Odor Sources in the 200 East, 200 West, & 600 Areas. SmartSite (formerly known as DFAS). Communication & Public Relations issuance of communication for TFC-OPS-OPER-C-67 responses ( <a href="#">Section 6.1</a> ). | 1. Develop and publish Industrial Hygiene Response and Investigation Checklist for TFC-OPS-OPER-C-67.                                                    |
| 3.4 IH Investigations (pp 82-84)<br>(Refer to 6.1 and 6.2) | Revision of Industrial Hygiene Event Investigation form. Creation of Industrial Hygiene Event Investigation form. SmartSite (formerly known as DFAS).                                                                                                                                 | 1. Publish Industrial Hygiene Response and Investigation Checklist for TF-AOP-015 and TFC-OPS-OPER-C-67.                                                 |
| 3.5 Other Abnormal Operating Procedures (pp 85-88)         | None                                                                                                                                                                                                                                                                                  | None                                                                                                                                                     |
| <b>4.0 RESPIRATORY PROTECTION PROGRAM (PP 89-105)</b>      |                                                                                                                                                                                                                                                                                       |                                                                                                                                                          |
| <b>Subsection</b>                                          | <b>Key Developments</b>                                                                                                                                                                                                                                                               | <b>CIOs</b>                                                                                                                                              |
| 4.1 RPP Mgt. (pp 89-92)<br>(Reference 2.2 and 6.1)         | Short-Duration Vapor Events, work in passively ventilated farms, waste disturbing activities, WC-2, WC-3, WC-4 work activities, RPE evaluation: Publication of Tank Waste Chemical Vapors: Evaluation and Management Strategy, Communication with Workforce                           | None                                                                                                                                                     |
| 4.2 RP Collaboration (pp 93-95)                            | None                                                                                                                                                                                                                                                                                  | 1. Establish RPF record management process for all H2C RPFs.                                                                                             |
|                                                            |                                                                                                                                                                                                                                                                                       | 2. Evaluate establishing a standardized process for Industrial Hygiene & Radiological Control collaboration on RPFs                                      |
| 4.3 Respiratory Protection Issuance (pp 96-102)            | None                                                                                                                                                                                                                                                                                  | 1. Evaluate the Workforce's current understanding of the hazard driver for their RPE.                                                                    |
|                                                            |                                                                                                                                                                                                                                                                                       | 2. Evaluate the Workforce's current understanding of how to determine the RPF task necessary for issuance.                                               |
|                                                            |                                                                                                                                                                                                                                                                                       | 3. Utilize evaluations to identify opportunities for improvement (e.g., how IH/RadCon communicate hazards                                                |

|                                                                       |                                                                                                                                                                                                                                                                                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|-----------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                                                       |                                                                                                                                                                                                                                                                                                            | to the workforce, workforce education process).                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|                                                                       |                                                                                                                                                                                                                                                                                                            | 4. Evaluate establishing a standardized process for pre-job briefing discussions on RPE (e.g., inclusion in FWS training).                                                                                                                                                                                                                                                                                                                                                                                             |
|                                                                       |                                                                                                                                                                                                                                                                                                            | 5. Evaluate establishing a recurring FWS meeting to discuss hazard topics (e.g., respiratory protection).                                                                                                                                                                                                                                                                                                                                                                                                              |
| 4.4 RPE Issues and Concerns (pp 103-105)                              | Workforce Values & Behaviors: Own It, Make It Better, Listen First.                                                                                                                                                                                                                                        | None                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| <b>5.0 TRAINING (pp 106-113)</b>                                      |                                                                                                                                                                                                                                                                                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| Subsection                                                            | Key Development                                                                                                                                                                                                                                                                                            | CIOs                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| 5.1 Industrial Hygiene Department Training & Proficiency (pp 106-111) | Training: Immersive Proficiency Center (IPC), worker led initiative, IHTs training IHTs for enhanced proficiency. Expansion of the IH Professional Qualification program, phased approach qualifications, IH Collaboration meetings, and professional development meetings (e.g., IH Workshops, Pathways). | 1. Create a Tank Vapor and/or IH Qual Card section in the Classroom+ Study Material for Industrial Hygiene, with a category for Tank Vapor IH Qual Card.                                                                                                                                                                                                                                                                                                                                                               |
|                                                                       |                                                                                                                                                                                                                                                                                                            | 2. Evaluate adding Course 351753 (Gas & Vapor Transport During Waste Disturbing Activities) to the Industrial Hygiene Professional Phase 2 Task Specific Checklist for Tank Vapors.                                                                                                                                                                                                                                                                                                                                    |
|                                                                       |                                                                                                                                                                                                                                                                                                            | 3. Develop Workforce educational material and education strategy for the Emergency Response Organization role of Chemical Hazards Assessor (CHA).                                                                                                                                                                                                                                                                                                                                                                      |
| 5.2 Tank Vapor Training and Feedback (pp 112-113)<br>(Reference 2.2)  | Chemical Worker Training revision. Publication of Tank Waste Chemical Vapors: Evaluation and Management Strategy, incorporation of Tank Vapor management plan into the IH Technical Basis for Applicable Requirements, major revision of Managing Tank Chemical Vapors                                     | 1. Develop Workforce educational material and education strategy (e.g., Course 350358, <i>Chemical Worker Training</i> ) to provide more in-depth knowledge of the Tank Vapor hazard and its associated controls. Material should cover topics such as Tank Waste composition, Tank Vapor headspace dynamics, job scenarios with associated application of Tank Vapor controls.<br>a. Evaluate additional training approaches to begin expansion of Tank Vapor training material while developing long-term solutions. |
|                                                                       |                                                                                                                                                                                                                                                                                                            | 2. Develop Workforce educational material and education strategy for Engineering Process Control Plans.                                                                                                                                                                                                                                                                                                                                                                                                                |
|                                                                       |                                                                                                                                                                                                                                                                                                            | 3. Develop Workforce educational material and education strategy (e.g., Course 350358, <i>Chemical Worker Training</i> ) for hierarchy of IH sampling and monitoring. Include representative personal sample process.                                                                                                                                                                                                                                                                                                  |

|                                                                 |                                                                                                         |                                                                                                                                                                                                                                                                                                                                   |
|-----------------------------------------------------------------|---------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                                                 |                                                                                                         | 4. Develop Workforce educational material and education strategy for weather's impact on Tank Vapors (e.g., SmartSite, at times it will be more odorous).                                                                                                                                                                         |
|                                                                 |                                                                                                         | 5. Develop Workforce educational material and education strategy for response to Personal Ammonia Monitor alarms. Include importance of timely delivery of alarming device to the Central Shift Office and how the information from the device determines respiratory protection requirements for responding personnel.           |
|                                                                 |                                                                                                         | 6. Develop Workforce educational material and education strategy for response to stronger than normal odors. Include importance of Odor/Vapor Response Cards in building response plan. Describe how response plans are developed (graded approach).                                                                              |
|                                                                 |                                                                                                         | 7. Develop Workforce educational material and education strategy for Industrial Hygiene data access software programs [e.g., VMDS data from PI Vision™, SmartSite, Internal Data Access and Visualization (IDAV)]. Education material should include items such as software navigation and basic data interpretation/limitations. |
|                                                                 |                                                                                                         | 8. Evaluate development of Tank Vapor training for Managers/Supervisors/Union Representatives [e.g., pre-job briefing expectations, utilization of data visualization tools (PAM dashboard, VMDS, SmartSite)].                                                                                                                    |
| <b>6.0 WORKFORCE COMMUNICATION (pp 114-131)</b>                 |                                                                                                         |                                                                                                                                                                                                                                                                                                                                   |
| Subsection                                                      | Key Developments                                                                                        | CIOs                                                                                                                                                                                                                                                                                                                              |
| 6.1 Procedures/Policies on Workforce Communication (pp 114-124) | Communication & Public Relations issuance of communication for TF-AOP-015 and TFC-OPS-OPER-C-67 events. | 1. Evaluate workforce communication pathway(s) for confirmed Tank Vapor PAM alarms that do not meet the entry criteria for TF-AOP-015.                                                                                                                                                                                            |
|                                                                 |                                                                                                         | 2. Develop communication methods (e.g., pre-job briefing) for worker knowledge of co-located work that may impact Tank Vapor concentrations and/or be odorous.                                                                                                                                                                    |
|                                                                 |                                                                                                         | 3. Evaluate communication method for IHIR follow-up. Focusing on how to let the Workforce know where they can access the information for TFC-OPS-OPER-C-67 (odor) events and TF-AOP-015 events.                                                                                                                                   |

|                                                                 |                 |                                                                                                                                                                                                                        |
|-----------------------------------------------------------------|-----------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                                                 |                 | 4. Establish processes and/or expectations to engage and enlist the help of the Union Stewards with communicating Industrial Hygiene process changes (e.g., Tank Vapor Control Strategy).                              |
|                                                                 |                 | 5. Evaluate documentation method(s) to capture the requirement to utilize Message Reader Boards to communicate a waste disturbing activity is in progress.                                                             |
|                                                                 |                 | 6. Develop an Industrial Hygiene Department process for workforce communications with Other Prime Contractors, Building Trades, and Subcontractors.                                                                    |
|                                                                 |                 | 7. Evaluate use of Industrial Hygiene Training Tiles as a communication pathway for the Workforce.                                                                                                                     |
|                                                                 |                 | 8. Evaluate the Industrial Hygiene Communication process regarding communication development and distribution. Identify distribution process improvements for workers without access to computers.                     |
|                                                                 |                 | 9. Evaluate the Industrial Hygiene Department's process for Required Readings. Include processes for determining the introduction statement, target audience, and required reading attachments (e.g., latest mark-up). |
|                                                                 |                 | 10. Evaluate workforce communication pathway(s) to follow up on TF-AOP-015 and TFC-OPS-OPER-C-67 events once the IHIR process has been concluded.                                                                      |
|                                                                 |                 | 11. Conduct a workforce survey regarding Industrial Hygiene Communications.                                                                                                                                            |
| 6.2 Data Transparency with Workforce (pp 125-131)               | None            | 1. Evaluate continued development of VMDS overlay feature for IDAV.                                                                                                                                                    |
|                                                                 |                 | 2. Evaluate the Workforce's current understanding of accessing data related to Tank Vapors (e.g., SWIHD, IDAV, PAM, VMDS, SmartSite).                                                                                  |
|                                                                 |                 | 3. Evaluate additional methods of communicating Industrial Hygiene data to the workforce (e.g., IH Data display in change trailers).                                                                                   |
| <b>7.0 WORKFORCE ENGAGEMENT (pp 132-139)</b>                    |                 |                                                                                                                                                                                                                        |
| Subsection                                                      | Key Development | CIOs                                                                                                                                                                                                                   |
| 7.1 HAMTC/Building Trades/Subcontractor Engagement (pp 132-135) | None            | 1. Evaluate Building Trades/Subcontractor's opportunities to participate in the hazard analysis                                                                                                                        |

|                                                           |                                                                                                                                                     |                                                                                                                                                                                                                                         |
|-----------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                                           |                                                                                                                                                     | process and various safety councils (e.g., EAPC). Identify processes to improve participation.                                                                                                                                          |
|                                                           |                                                                                                                                                     | 2. Evaluate establishing an IH Committee for Tank Vapors to promote workforce engagement.                                                                                                                                               |
| 7.2 Management Engagement with Workforce (pp136-137)      | None                                                                                                                                                | 1. Evaluate process(es) to enforce current H2C expectations on Management Engagement with the workforce.                                                                                                                                |
| 7.3 Safety Culture (pp138-139)                            | None                                                                                                                                                | None                                                                                                                                                                                                                                    |
| <b>8.0 CORRECTIVE ACTION MANAGEMENT (pp140-151)</b>       |                                                                                                                                                     |                                                                                                                                                                                                                                         |
| Subsection                                                | Key Developments                                                                                                                                    | CIOs                                                                                                                                                                                                                                    |
| 8.1 Corrective Action Management Systems (pp 140-144)     | The iCAS issues management modules expanded on the former PERS by allowing users to enter identified issues, but also strengths and good practices. | 1. Evaluate methods (e.g., training) to improve consistency in AR close-out process.<br>2. Evaluate reestablishing a quorum process for iCAS items [e.g., Collective Significance Review (CSR), Corrective Action Review Board (CARB)]. |
| 8.2 CAM System Capabilities (pp 145-148)                  | The iCAS issues management modules expanded on the former PERS by allowing users to enter identified issues, but also strengths and good practices. | 1. Evaluate expanded CAM System capabilities to support tracking Industrial Hygiene purposes (e.g., initiatives).                                                                                                                       |
| 8.3 Tracking Action Items with CAM Systems (pp 149-151)   | iCAS Task Tracker.                                                                                                                                  | 1. Evaluate expanded CAM System capabilities to support tracking Industrial Hygiene purposes (e.g., initiatives).                                                                                                                       |
| <b>9.0 CONTINUOUS IMPROVEMENT (pp 152-153)</b>            |                                                                                                                                                     |                                                                                                                                                                                                                                         |
| Subsection                                                | Key Developments                                                                                                                                    | CIOs                                                                                                                                                                                                                                    |
| 9.1 Industrial Hygiene Department Annual Goals (p 152)    | None                                                                                                                                                | 1. Evaluate developing a process for workers outside of the IH Department to submit ideas for IH continuous improvement.                                                                                                                |
| 9.2 Industrial Hygiene Department Long-Term Goals (p 153) | None                                                                                                                                                | 1. Evaluate developing a process for workers outside of the IH Department to submit ideas for IH continuous improvement.                                                                                                                |

### ATTACHMENT 3: Summary of AOP-15 Reports

We made some changes to this Attachment based on comments from H2C. They did not change our findings or conclusions. Changes of a factual nature are footnoted.

| Report Date | Report #     | Finding                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|-------------|--------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 7/22/26     | EIR-2026-051 | Two H2C Radiological Control Technicians (RCTs) were performing a transfer line walkdown in A-Farm when one of the RCT's PAM alarmed. IHT could not find any indication of a problem. PAM unit was tested and found sensitive to inlet obstruction and sent to mfg. IHT concluded response in 90 minutes.                                                                                                                                                                                                                                                                                                |
| 6/11/26     | EIR-2026-044 | 4-electricians at A-103 had one PAM alarm go off (6 pm). VMDS of nearest headspace indicated no ammonia (< 1ppm). IHT could not find ammonia. Conclusion: bad sensor on PAM unit<br><b>No information on response time entered.</b>                                                                                                                                                                                                                                                                                                                                                                      |
| 5/26/26     | EIR-2026-035 | A worker was performing a walkdown in A-Farm when their PAM alarmed at 7 parts per million (ppm) near A-103 Riser 12. A-Farm evacuated. VDMS system indicated <1 ppm. IHT could not detect ammonia. PAM unit was brought in and when inlet was obstructed it read 4 ppm ammonia. Unit to be sent to mfg.<br><b>IHT responded in 97 min. to respond (took 40 min. to enter AOP-15 into system.)</b>                                                                                                                                                                                                       |
| 4/6/26      | EIR-2026-023 | Worker performing administrative rounds near 241-AW leak detection pit had PAM alarm at 14 ppm and within 2 seconds went to 0 ppm. Two workers nearby one had a PAM reading. Farm was evacuated. PAM unit checked out ok in lab but was going to be sent to mfg. Thought was maybe inlet was restricted.<br><b>IHT took 70 min. to respond (took 55 min. to enter an AOP-15)</b>                                                                                                                                                                                                                         |
| 2/25/26     | EIR-2026-029 | Worker inside 241-S farm near crane had PAM alarm at 12 ppm. Another worker nearby wearing PAM did not alarm. PAM tested in lab and could not reproduce alarm even with restricted inlet. Unit to be sent to mfg.<br><b>It took 19 min. to restrict farm due to ammonia and 132 min. to reopen farm (other details not avail.)</b>                                                                                                                                                                                                                                                                       |
| 11/11/25    | EIR-2026-006 | Construction worker at 241-S-109 was preparing for removal of equipment and PAM alarmed at 8 ppm. <sup>86</sup> Two other workers in area did not have PAM alarm. Workers left area for 2 hours. PAM unit in lab found to exhibit high ammonia levels when inlet blocked (a sign that sensor maybe getting bad) and unit sent to mfg.<br><b>IHT response in 32 min.</b>                                                                                                                                                                                                                                  |
| 11/5/25     | EIR-2026-005 | Construction workers supporting WO# 1215709, 241-S-109 South Hatchway Equipment Removal and Cover Installation, had just entered 241-S Farm to install ground cover for upcoming work activities removing a condenser pit demister assembly from 241-S-109 when a laborers' PAM alarmed at >12 ppm while accessing a job box. The laborer stated the Ventis® Pro PAM displayed 28 ppm ammonia at the time of the alarm. 3 additional workers did not have any alarms go off. Work area was restricted for 5.5 hrs. Examination of PAM showed high ammonia levels in clean air when inlet was restricted. |

<sup>86</sup> Sentence corrected based on additional information supplied by H2C.

|          |              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|----------|--------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|          |              | <b>62 min for IHT response.</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| 10/8/25  | EIR-2025-074 | Worker had PAM alarm inside 217AY-1 change tent (>6 ppm). Seven other workers were in the trailer when the PAM began to alarm. Of the remaining seven workers, two had PAMs and verified their PAMs did not alarm. <sup>87</sup> IHT did not find any levels above AL. Simply indicated equipment failure<br><b>IHT response was 79 min (19 min to record AOP)</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| 7/8/25   | EIR-2025-055 | A crew of approximately 20 workers had completed crane operations in support of Work Order (WO) #1048207, “TBI Extraction and Storage”. Two Nuclear Chemical Operators (NCO) were escorting a crane exiting SY farm. At approximately 0951 hours the PAM of the NCO in a van began alarming at 6 ppm. The PAM of the other NCO in the immediate area did not alarm. No other PAM alarmed. IHT found readings below action level.<br><b>IHT response was 51 min. (11 min to enter AOP)</b>                                                                                                                                                                                                                                                                                                                                                           |
| 1/11/24  | EIR-2024-001 | While surveying equipment, an RCT noticed a PAM alarming. The RCT picked up the RPE (FF-APR mask) and the personal ammonia monitor stopped alarming. The RCT noted that the PAM placed under the mask was alarming and notified the Field Work Supervisor (FWS). Once the mask was lifted the alarm quickly dissipated back to 0 ppm. At the time of the event the RCTs inside 217-AW-1 Change Tent did not report experiencing symptoms and were offered, yet declined, precautionary medical evaluation. Access was restricted to 217-AW-1 Change Tent for approximately 1 hour. IHT found nothing above action level. Investigation could not find source of alarm and assumed inlet had been blocked.<br><b>IHT responded in 57 min (arrived at Central Shift Area) and AOP filed in 49 min. Not sure if IHT took ammonia readings in area?</b> |
| 9/9/24   | EIR-2024-068 | Ironworkers at AX-101 were building scaffolding when one of their PAM alarms went off (9 ppm). Other workers PAMs did not alarm. Work was stopped and access to farm restricted. IHT found readings of ammonia and VOCs to be non-detectable. Found that worker was wearing PAM under clothing which is not correct as it restricts flow.<br><b>IHT completed survey in 70 min (took 4 min to contact Central office of event).</b>                                                                                                                                                                                                                                                                                                                                                                                                                 |
| 11/30/23 | EIR-2023-083 | Field Work Supervisor’s PAM alarmed in 241-B farm as workers were preparing a drilling rig. The unit read zero when the Affected Worker looked at their PAM. The peak reading on the display when checked by the IHT was 5 ppm. <sup>88</sup> Area was restricted for 1 hr and IHT conducted survey finding non-detectable ammonia. Evaluation of the unit indicated that it had never alarmed so unclear whether the alarm came from somewhere else (rad equipment).<br><b>IHT response 76 min.</b>                                                                                                                                                                                                                                                                                                                                                |
| 9/12/23  | EIR-2023-068 | Workers excavating at 241-A-105 (SST) when FWS PAM alarmed at 7 ppm. 11 <sup>89</sup> workers in area had no PAM readings or alarms. Workers exited Farm. IHT found no ammonia readings. Instrument passed calibration test but sent to mfg.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |

<sup>87</sup> Sentence changed based on information supplied by H2C.

<sup>88</sup> Sentence changed based on information supplied by H2C.

<sup>89</sup> Number corrected based on information supplied by H2C.

|         |              |                                                                                                                                                                                                                                                                                                                                                                                                               |
|---------|--------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|         |              | <b>IHT response was 63 min</b>                                                                                                                                                                                                                                                                                                                                                                                |
| 8/16/23 | EIR-2023-061 | 7 workers at AP-104 farm were working when 1 PAM alarmed. They all left the area and responding <sup>90</sup> IHT found no readings above Action Level. When examined, one of the other units recorded 3 ppm at the same time as the other alarm. Unit was taken out of service.<br><b>IHT Response time was 46 min (12 min. to report AOP)</b>                                                               |
| 7/27/23 | EIR-2023-056 | Workers were resting at the U Farm change trailer when one PAM unit alarmed. Several workers reported symptoms (e.g headaches, sore throat). One reported odor (not ammonia). PAM unit that alarmed passed calibration following this event occurrence and was returned to service. <sup>91</sup><br><b>It took 16 min. to initiate AOP, IHT looked at several PAMs but did not seem to take any samples.</b> |
| 6/13/23 | EIR-2023-043 | Worker operating a soil compactor in AP Farm had PAM go off (8 ppm). 7 other workers in area did not have any PAM alarms. Crew exited farms, no information about checking on PAM.<br><b>IHT response was 106 min.</b>                                                                                                                                                                                        |
| 5/19/23 | EIR-2023-034 | Worker in AY change tent had PAM alarm. 12 other workers there w/o PAM alarms. Workers exited tent. Cause of PAM alarm was unknown. IHT results were at or below background.<br><b>IHT response was 55 min</b>                                                                                                                                                                                                |
| 5/30/23 | EIR-2023-030 | Insulator at TX farm was filling bucket with paint spraying material when PAM alarmed (8 ppm). While putting workplace in safe condition a second insulator's PAM alarmed. IHT found no levels above Action Level. It was determined that the product being sprayed contained Ammonium Hydroxide and was likely responsible for the alarms.<br><b>IHT response was 154 min (35 min for AOP)</b>               |
| 1/23/23 | EIR-2023-004 | Worker in SY Farm change trailer had PAM alarm. 9 other workers in area did not have alarms. Access to trailer was then restricted. PAM was checked and removed from service. <sup>92</sup><br><b>IHT response was 70 min (17 min for AOP)</b>                                                                                                                                                                |

<sup>90</sup> Word added based on information supplied by H2C.

<sup>91</sup> Sentence corrected based on information supplied by H2C.

<sup>92</sup> Sentence corrected based on information supplied by H2C.

## ATTACHMENT 4: Summary of C-67 Reports

We made some changes to this Attachment based on comments from H2C.  
They did not change our findings or conclusions. Changes of a factual nature are footnoted.

| Report Date | Report #     | Finding                                                                                                                                                                                                                                                                                                                 |
|-------------|--------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 6/17/26     | EIR-2026-047 | 218A Conditioned Storage Building<br>Attributed to dry water trap. Building restricted for 2 hours.<br>Time to complete: 2 hours                                                                                                                                                                                        |
| 6/8/26      | EIR-2026-041 | 272W Parking lot. Attributed to prior use of propane forklift. Bldg restricted until investigation completed.<br>Time to complete: 3.5 hours                                                                                                                                                                            |
| 4/29/26     | EIR-2026-032 | 2025 E. Process Area: IHT found nothing above background. Odors attributed to low-level process filters in bags left for 3 months.<br>Time to complete: 3 hours                                                                                                                                                         |
| 4/23/26     | EIR-2026-030 | 200E/241-AP LLW Trailer and 241-AW LLW Trailer:<br>Employee had symptoms nausea and light-headed and did seek medical attention. IHT did not find tank farm vapors and thought it was from "plastic from LLW bags."<br>Time to complete: 2 hours                                                                        |
| 3/10/26     | EIR-2026-025 | Room D106 at Building 2025E. Musty odors were attributed to water leaks above ceiling tiles.<br>Time to complete: 2.5 hours                                                                                                                                                                                             |
| 1/12/26     | EIR-2026-018 | 272-WA/Women's Locker Room. Reports of propane-like odor. Tests indicated below background levels and there were no sources of propane there.<br>Time to complete: 2hrs.                                                                                                                                                |
| 10/9/25     | EIR-2026-001 | MO531: Refrigerant fluid found on the ground while moving a refrigerator. The fluid was determined to have no OELs and to be of low toxicity.<br>Time to complete: 1.5 hours                                                                                                                                            |
| 10/8/25     | EIR-2025-076 | MO159 Mobile office: Rotten egg odors reported outside. Monitoring indicated tank farm vapors were not the source. Area is near a sewer lift station and had a history of odors reported.<br>Time to complete: 1.5 hours                                                                                                |
| 11/10/25    | EIR-2025-075 | 217AY-1 Change Tent Parking Lot: Burning plastic or welding smell reported. No detection of chemicals noted. Possible coming from "light plants West of MO2254/MO2255."<br>Time to complete 1.5 hours                                                                                                                   |
| 9/18/25     | EIR 2025-071 | Walking from the 2237E electrical shop to AY farm:<br>Two different events three hours apart were reported from this area. IHT could not find any detectable vapors associated with tank farm chemicals. Possible sources were gas/diesel generation or fermenting onions.<br>Time to complete: 2.5 hours and 3.5 hours |
| 10/7/25     | EIR 2025-068 | MO217G change trailer: Workers laundering clothing reported organic solvent/glue smell. DRI readings taken and adhesive material in trash bin were assumed to be responsible for odors.<br>Time to complete: 2 hours                                                                                                    |
| 7/23/25     | EIR 2025-058 | ATCO Shop near bldg. 277A: Odors were septic, rotten eggs. IHTs found nothing beyond the building.<br>Time to complete: 1.5 hours                                                                                                                                                                                       |

|         |              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|---------|--------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 7/9/25  | EIR-2025-054 | MO-2522 shower trailer: Odors were similar to those from dried water traps. IHTs found nothing above action level (ammonia, VOCs, hydrogen sulfide).<br>Time to complete: 2 hours                                                                                                                                                                                                                                                                                                                                                                      |
| 5/21/25 | EIR-2025-044 | 217-SY Change Tent Parking Lot: Odors were plastic and chemical. A service truck was pumping sewage upwind of workers. DRI readings all below AL.<br>Time to complete: 2hours                                                                                                                                                                                                                                                                                                                                                                          |
| 5/8/25  | EIR-2025-042 | Multiple (83) workers in the 200 East area of the Hanford Site reported smelling stronger than normal odors from Canton Ave and WTP Loop Road to Canton Ave and 4th St, west to Buffalo Ave and east to 4th St Loop. Odors included septic, rotten eggs. DRI readings taken at multiple locations for ammonia, VOCs, and hydrogen sulfide. Only a couple of VOCs were above limit of detection and below AL. Odors attributed to performing pumping of sewage vaults. Several workers transported for medical evaluation.<br>Time to complete: 3 hours |
| 3/3/25  | EIR-2025-029 | North of 241-AW farm and northeast of 217-AW1 Change Tent: Odor was sulfur/rotten eggs. DRI was non-detectable or below AL. "The Affected Area had a long history of similar odors."<br>Time to complete: 1.5 hours                                                                                                                                                                                                                                                                                                                                    |
| 3/4/25  | EIR-2025-028 | 241-AP Farm change trailer MO-2259: Event occurred after PAM alarm went off (malfunction-AOP-15?). A burnt odor was smelled. IHT DRI for three agents (ammonia, VOCs and SO2) all were ND.<br>Time to complete: 4 hours                                                                                                                                                                                                                                                                                                                                |
| 2/6/25  | EIR-2025-025 | Laydown yard north of the 616 Building: Various individuals reported diesel-like odors inside and outside of building. Three workers sought medical attention. DRI readings showed low level of NO2. A truck was seen idling and maybe source.<br>Time to complete: 3 hours                                                                                                                                                                                                                                                                            |
| 2/4/25  | EIR-2025-023 | 242-A Evaporator/242-A Condenser Room: 11 workers reported natural gas-like odor. One worker sought medical attention. DRI: ND. No definitive source detected.<br>Time to complete: 2 hours                                                                                                                                                                                                                                                                                                                                                            |
| 1/7/25  | EIR-2025-021 | 616 building: multiple workers reported chlorine or bleach-like smell. No chlorine DRI unit immediately <sup>93</sup> available. DRI did detect NO2 above AL. Inlet to AC for building recently moved from roof to ground (?). Truck and/or forklift activity had occurred recently in the area.<br>Time to complete: 3 hours.                                                                                                                                                                                                                         |

<sup>93</sup> Word inserted at suggestion of H2C.

## ATTACHMENT 5: Questionnaire for H2C Worker Interviews

### FINAL Version 8-21-26, Revised from 2019 form

Date: \_\_\_\_\_ In person interview ☐ Phone ☐ Questionnaire Number \_\_\_\_\_

Trade \_\_\_\_\_ Nuclear Chemical worker ☐ Field Work ☐  
Supervisor ☐ Industrial Hygienist ☐ IH Tech ☐ HAMTC Safety Rep ☐ Building  
Trades Safety Rep ☐

Time at Hanford \_\_\_\_\_ (months) Time in Tank Farms \_\_\_\_\_ (months)  
Approximate start date in Tank Farms? \_\_\_\_\_

Are you a contract employee? ☐ yes ☐ no

#### General introduction to be spoken at the beginning of interview:

Hello, I am \_\_\_\_\_. I work for \_\_\_\_\_. We are interested in your opinion about proposed changes to the respiratory protection approach and general safety culture here at the Tank Farms. This should take less than 20 minutes, and I can assure you that nothing you tell me will ever be linked to you personally. I won't write down your name or any identifying information. Period. Feel free to not answer any question or to stop this interview at any time for any reason. Is it okay to start?

1. How important is the subject of tank vapors to you? [Read options]

- \_\_\_\_\_ Very important
- \_\_\_\_\_ Somewhat important
- \_\_\_\_\_ Not important
- \_\_\_\_\_ No opinion

2. On this jobsite, who is responsible for safety? [do not give options]

Me ☐ My Foreman ☐ The safety rep ☐ The general contractor ☐  
Everyone ☐ No one ☐ Not Sure ☐  
Other: \_\_\_\_\_

3. Have you worn a respirator in the Tank Farm? Yes \_\_\_\_\_ No \_\_\_\_\_

If yes, which types? [list all] SCBA ☐ PAPR ☐ FFAPR ☐

4. Are you currently wearing a respirator regularly in your work?

Yes ☐ No ☐

If yes, what kind do you regularly wear?

SCBA ☐ PAPR ☐ FAPR ☐

5. If FFAPR, have you detected any odors while wearing your respirator in the Tank Farms?

Yes ☐

No ☐

Not Sure ☐

Not applicable ☐

6. Rate this statement: "My safety and health are high priorities on this project."

\_\_\_ totally disagree (1)

\_\_\_ disagree (2)

\_\_\_ not sure (3)

\_\_\_ agree (4)

\_\_\_ totally agree (5)

7. Are you aware that H2C is moving from a management-directed to a hazard-based respiratory protection?

Yes ☐

No ☐

Not Sure ☐

8. Can you tell me what that means?

Yes ☐

No ☐

Not Sure ☐

[If yes, capture their words:

[Explanation: "The use of SCBAs following the stop work action is an example of a decision by management to ensure maximum protection. That lead to a cartridge testing program that pulled mixed vapors directly from the tank headspaces into respirator cartridges to test if and when breakthrough occurred. Basing respirator selection on the results of those tests is a risk-based approach.]

**Rate these statements:**

9. "With this change to a hazard-based approach, I am confident that the respirator program on the Tank Farms will adequately protecting my health."

\_\_\_ totally disagree (1)

\_\_\_ disagree (2)

\_\_\_ not sure (3)

\_\_\_ agree (4)

\_\_\_ totally agree (5)

10. "I think that the respirator program on the Tank Farms is well managed."

\_\_\_ totally disagree (1)

\_\_\_ disagree (2)

\_\_\_ not sure (3)

\_\_\_ agree (4)

\_\_\_ totally agree (5)

11. "If I had the opportunity to work in lower levels of respiratory protection, I would."

- ☐ totally disagree (1)
- ☐ disagree (2)
- ☐ not sure (3)
- ☐ agree (4)
- ☐ totally agree (5)

12. "Face-to-face dialogue between H2C managers and the workforce has improved over the last 12 months.

- ☐ totally disagree (1)
- ☐ disagree (2)
- ☐ not sure (3)
- ☐ agree (4)
- ☐ totally agree (5)

13. "My immediate supervisor demonstrates safety leadership."

- ☐ totally disagree (1)
- ☐ disagree (2)
- ☐ not sure (3)
- ☐ agree (4)
- ☐ totally agree (5)

14. Where do you usually get safety and health information about the Tank Farms?

15. Are there any specific vapor-related communications that you generally trust?

Yes ☐ No ☐ Not Sure ☐

If yes, what are they? [Do not read options, just mark them]

- ☐ Briefings from your manager
- ☐ Notebooks – weekly vapors presentations
- ☐ RPP Committee meeting or video
- ☐ All employee email messages
- ☐ Communications from industrial hygiene or toxicology experts
- ☐ Internal H2C website
- ☐ External HanfordVapors.com website
- ☐ Web Report videos

16. Are there any specific vapor-related training or communications that you find to be unclear or difficult to understand?

Yes ☐ No ☐ Not Sure ☐

If yes, what are they?

- ☐ Briefings from your manager
- ☐ Notebook – weekly vapors presentations
- ☐ RPP committee meeting
- ☐ All-employee email messages
- ☐ Communications from Industrial hygiene or toxicology experts
- ☐ Internal H2C website
- ☐ External HanfordVapors.com website
- ☐ Web Report videos

Any suggested improvements?

17. Have you ever gone to the Tank Vapors website?

Yes ☐ No ☐ Not Sure ☐

If yes, how often do you visit the site? [Read options]

Daily ☐ Weekly ☐ Monthly ☐ other \_\_\_\_\_

18. Are you encouraged to raise safety and health concerns with your immediate supervisor or other project officials?

Yes ☐ No ☐ Not Sure ☐

Have you ever raised an issue? If yes, what happened?

Yes ☐ No ☐ Not Sure ☐

19. What are the channels for workers on this site to raise issues or concerns?

RPPA ☐ Hammer ☐ RP Committee ☐ other \_\_\_\_\_

20. When issues are raised, are they recorded, tracked, and quickly corrected?

Yes ☐ No ☐ Not Sure ☐

21. Is there a way to raise issues or concerns anonymously? If so, how?

Yes ☐ No ☐ Not Sure ☐

22. Do you have the authority to shut down any work that you feel is unsafe?

Yes ☐ No ☐ Not Sure ☐

If so, have you ever actually stopped work? Tell us about it.

Yes ☐ No ☐ Not Sure ☐

23. There are many chemical vapors in the tank headspaces. Do you know why ammonia was chosen for real-time personal monitoring?

Yes ☐ No ☐ Not Sure ☐

[If yes, capture their words; If no or not sure explain what it means]

[Explanation: Ammonia is not the most toxic chemical in the tanks; it is primarily an eye and upper respiratory tract irritant. But it is one that is present in every tank and in higher concentrations than the other chemicals. It also breaks through the cartridges quicker than the more toxic vapors. Consequently, it is a good indicator gas. It has an OSHA Permissible Exposure Limit of 50ppm as an eight-hour time-weighted average, but when it reaches 6 ppm in your breathing zone, it will alarm, signaling for you to leave that work area before you experience exposures to the more toxic vapors.]

24. Do you regularly wear an ammonia monitor?

Yes ☐ No ☐ Not Sure ☐

25. If yes, has it ever alarmed?

Yes ☐ No ☐ Not Sure ☐

26. If yes, what did you do?

27. If a monitor alarms at 12 ppm, you are supposed to follow the abbreviation "SWIM"  
What does that stand for?

28. Have you ever filled out an Odor Response Card?

Yes ☐ No ☐ Not Sure ☐

29. If yes, did you feel the response was timely?

Yes ☐ No ☐ Not Sure ☐

30. Was the resolution acceptable to you?

Yes ☐ No ☐ Not Sure ☐

31. Do you know where to find a copy of the written respirator program for your worksite?

Yes ☐

No ☐

Not Sure ☐

32. Do you have any suggestions about things we should be paying special attention to while doing this assessment?

33. **[For IH Techs only]** Have you recorded any significantly elevated short-term exposures?

Yes ☐

No ☐

Not Sure ☐

If yes, please describe them.

34. Have you received training on how tank vapors are controlled?

Yes ☐

No ☐

Not Sure ☐

35. Have you received training on QRAs and their roles in hazard-assessment?

Yes ☐

No ☐

Not Sure ☐

**Rate your confidence in the following:**

36. HAMMER RPE training and fit testing you received.

\_\_\_ No confidence at all (1)

\_\_\_ Limited confidence (2)

\_\_\_ Not sure (3)

\_\_\_ Fairly confident (4)

\_\_\_ Totally confident (5)

37. H2C Chemical Worker Training you received.

\_\_\_ No confidence at all (1)

\_\_\_ Limited confidence (2)

\_\_\_ Not sure (3)

- ☐ Fairly confident (4)
- ☐ Totally confident (5)

38. Your safety representatives.

- ☐ No confidence at all (1)
- ☐ Limited confidence (2)
- ☐ Not sure (3)
- ☐ Fairly confident (4)
- ☐ Totally confident (5)

39. Your IH subject matter expert (SME).

- ☐ No confidence at all (1)
- ☐ Limited confidence (2)
- ☐ Not sure (3)
- ☐ Fairly confident (4)
- ☐ Totally confident (5)

40. Your Respiratory Protection Program Administrator (RPPA).

- ☐ No confidence at all (1)
- ☐ Limited confidence (2)
- ☐ Not sure (3)
- ☐ Fairly confident (4)
- ☐ Totally confident (5)

41. The operations and administrative controls.

- ☐ No confidence at all (1)
- ☐ Limited confidence (2)
- ☐ Not sure (3)
- ☐ Fairly confident (4)
- ☐ Totally confident (5)

42. The Respiratory Protection Equipment (RPE).

- ☐ No confidence at all (1)
- ☐ Limited confidence (2)
- ☐ Not sure (3)
- ☐ Fairly confident (4)
- ☐ Totally confident (5)

43. The pre-job briefings

- ☐ No confidence at all (1)
- ☐ Limited confidence (2)
- ☐ Not sure (3)
- ☐ Fairly confident (4)
- ☐ Totally confident (5)

44. The hazard assessments.

- ☐ No confidence at all (1)
- ☐ Limited confidence (2)
- ☐ Not sure (3)
- ☐ Fairly confident (4)
- ☐ Totally confident (5)

Do you have any recommendations for improvements?

[These questions would be addressed **AFTER** the proposed pilot]

**Rate the following questions addressing the pilot of risk based respiratory program management**

44. "I was ready to remove my respirator for the pilot."

- ☐ totally disagree (1)
- ☐ disagree (2)
- ☐ not sure (3)
- ☐ agree (4)
- ☐ totally agree (5)

45. "The training I received prepared me for the pilot and reduced my concerns."

- ☐ totally disagree (1)
- ☐ disagree (2)
- ☐ not sure (3)
- ☐ agree (4)
- ☐ totally agree (5)

46. "Seeing management and safety personnel working without respirators had a positive effect on my decision."

- ☐ totally disagree (1)
- ☐ disagree (2)
- ☐ not sure (3)
- ☐ agree (4)
- ☐ totally agree (5)

Did you experience an odor while working without a respirator during the pilot."

Yes ☐ No ☐

If yes, rate this statement: "I experienced an odor, but knew what to do."

- ☐ totally disagree (1)
- ☐ disagree (2)
- ☐ not sure (3)
- ☐ agree (4)

\_\_\_\_\_ totally agree (5)  
Describe what steps you took:

[This is the end of the interview. Thank you so much for your time. Allow me to again assure you that we will not associate your name with any of these answers. If you have any further information you want to relate or any questions for us, call\_\_\_\_\_.]]

## ATTACHMENT 6: Supporting Evidence for RPP Review Conclusions

Our review of the Respiratory Protection Program focused on several key program elements, including the roles and responsibilities of the RPPA and the H2C Lower-Tier Respiratory Protection Program Committee; management of respiratory protective equipment, including issuance stations; Industrial Hygiene (IH) oversight of exposure management, hazard assessments, and the respiratory protective equipment selection processes; training and qualification requirements for principal officials and the workforce; and program assessments and surveillance activities. Each area was supported by adequate documentation. Overall, the RPP is well integrated, systematically managed, and built on a strong foundation that effectively supports respiratory protection across all worksites and work activities.

### Respiratory Protection Program Administrator

The RPPA for H2C has the following responsibilities in the Program.<sup>94</sup>

- Administrating and coordinating the Program.
- Serving as the interpretive authority for respiratory protection issues.
- Tracking respiratory protection issues or concerns, maintaining and evaluating proposed resolutions, and determining whether issues are submitted to the contractor's corrective action system.
- Ensuring the quality of compressed gas cylinder or compressor supplied breathing air meets the air quality standards listed in Section 13.2.2, Breathing-Air Quality.
- Evaluating new types of respiratory protective equipment (RPE) that have received National Institute for Occupational Safety and Health (NIOSH) approval.
- Approving RPE procurement and use.<sup>95</sup>
- Maintaining knowledge of RPE being used on the Hanford Site.
- Keeping abreast of current issues, advances, and regulations through interacting with other RPPAs, manufacturers, etc.
- Coordinating with the HSRPP Committee:
  - Reporting any I&C, with wider application requiring further action for resolution.
  - Providing lessons learned and other sources of information to the HSRPP Committee, and others, as appropriate.
  - Serving as the primary point of contact for the HSRPP Committee for contractor-level issue resolution.
  - Participating in the HSRPP Committee as primary contractor representative or designating an alternate.

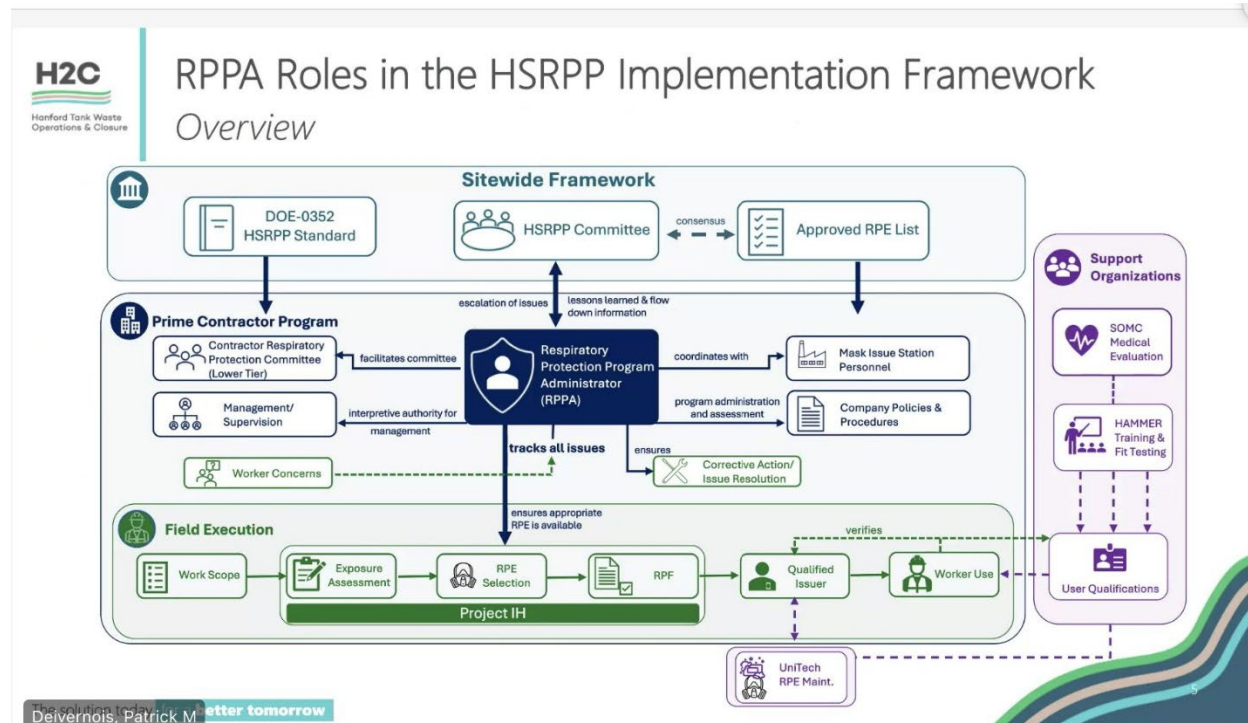
The Figure below, RPPA Roles in the HSRPP Implementation Framework, depicts roles of H2C's RPPA. The RPPA serves a critical role in ensuring the effectiveness of the Program through coordination and oversight across the Hanford Site. As a member of the DOE HSRPP and chair of the H2C Respiratory Protection Program Committee, the RPPA coordinates sitewide respiratory protection activities, including collaboration with DOE support contractors that provide essential services supporting the Program. Acting as a liaison between management,

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<sup>94</sup> Hanford Site Respiratory Protection Program (HSRPP), DOE 352 1-1.

<sup>95</sup> *Approval of use* refers to ensuring that RPE approved by HSRPP is used. RPPA Presentation on July 16, 2026.

supervision, and program personnel, the RPPA interprets regulatory and program requirements and provides guidance to ensure consistent conforming implementation.



The RPPA works closely with Industrial Hygiene (IH), Radiological Control (RadCon), and field organizations to support exposure assessments and ensure the selection of only approved RPE are documented on the Respiratory Protection Form (RPF)(A-6005-593 (REV 7) and are essential to protecting workers from occupational respiratory hazards. Another key responsibility is coordinating with the RPE Mask Issue Station to ensure that only approved RPE is issued to workers who are medically qualified, trained, and authorized to use the equipment.

The RPPA is responsible for documenting, tracking, and facilitating the resolution of worker issues, concerns, and associated program improvement opportunities. An Integrated Contractor Assurance System (iCAS) is used sitewide at Hanford to integrate contractor assurance processes, standardize terminology and expectations among contractors, improve access to performance and oversight information, and enhance communication and transparency between contractors and the U.S. Department of Energy. The program has a formal feedback loop for equipment issues, corrective actions and continuous improvement.<sup>96,97</sup> An example of information tracked in iCAS is the status of RPP assessment OFI.

Respiratory protection issues and concerns (Form A-6006-205i REV 4) raised by workers are documented, tracked, trended, and dispositioned through logs with respiratory metrics maintained and shared by the RPPA. I&C subjects are not entered into the iCAS as are action requests (AR) and OFI. The form is used to record general information, description of the equipment issue, type of equipment issue (i.e., pre-issuance, pre-entry, during use, post use, and

<sup>96</sup> RPPA Presentation discussion on July 16, 2026

<sup>97</sup> H2C Tank Vapor Respiratory Program Effectiveness Assessment. ITDC-WP-26-2853 Revision 0, July 2026.

others), environmental conditions, Issuer/SME/IH signature, details of the evaluation, investigation or review, and resolution by the RPPA.<sup>98</sup> An example I&C completed form was reviewed dated December 2025.<sup>99</sup> I&C's are discussed at HSRPP Committee meetings.

## **Respiratory Protection Committee**

The H2C RPC is a lower-tier committee chaired by the RPPA and includes both bargaining-unit and non-bargaining-unit employees. The committee provides a forum for communicating the status of the Program and for discussing respiratory protection-related issues and concerns affecting the workforce. Typical topics include field concerns, RPE issues, program performance trends, worker questions, lessons learned, and upcoming program activities.

Consistent with DOE 352 requirements, the committee has the following roles:

- Actively solicit and consider worker input.
- Meeting as needed, but no less than quarterly.
- Maintaining representation from both bargaining-unit and non-bargaining-unit employees.
- Supporting annual evaluations of the Program's effectiveness.
- Assisting line management in the consistent implementation of requirements.
- Reviewing program performance, trends, incidents, good practices, lessons learned, and assessment results.
- Communicating program information and recommending opportunities for improvement.
- Elevating workers I&C and reporting to the HSRPP Committee through designated representatives.

Meetings are held monthly, as evidenced by documented meeting minutes reviewed for the period from November 2025 through June 2026.<sup>100</sup> Discussion topics generally include Value Share, Field Issues, Important Information (e.g., safety and health practices, document updates, planned activities including preparation for the Pilot to demonstrate hazard-based RPE selection), Issues and Concerns (e.g., 12 reported to date of meeting in 2026, indicating leaking regulators, mechanical issues on racks, failed low flow alarms, straps breaking on the 3M 6000 series RPE), Site-Wide HSRPP Committee updates when available, Around-the-Table (i.e., attendee-raised topics), and schedule for the next meeting.

## **Management of Respiratory Protective Equipment**

H2C follows the DOE sitewide process for evaluating respiratory equipment for use at the site to ensure equipment has been properly evaluated and vetted for use. The process is summarized in Appendix C of DOE 352. The need for RPE is identified and discussed with the RPPA who reviews what is available in the industry and establishes a list of primary choices. The RPPA develops parameters for evaluations and field trials, as applicable. Evaluations may include literature review, comparison of testing results, and interactions with the manufacturer. The RPPA ensures input and feedback from the HSRPP Committee, as well as affected parties,

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<sup>98</sup> Form A-6006-205i Rev 4.

<sup>99</sup> FY25-ESHQ-R-Respiratory Protection Program, ITDC-ASMT-2025-0036-R0, March 3, 2025.

<sup>100</sup> H2C Internal Respiratory Meeting, June 23, 2026.

followed by a presentation of the data and conclusions to determine the path forward for the equipment.<sup>101</sup> All RPE added to or removed from the HSRPP Approved RPE List is determined by review and consensus of the HSRPP Committee.

Only approved RPE, governed by HSRPP, is available to workers. RPE is selected as follows:

- The Project IH/RPPA and the Radiological Engineer are responsible for selecting and approving RPE for use.
- For non-radiological hazards, the project IH selects the RPE from the approved list and the Radiological Engineer reviews it for concurrence.
- For radiological hazards, the Radiological Engineer selects the RPE from the approved list and the project IH reviews it for concurrence.
- When both radiological and non-radiological hazards exist, the IH project and Radiological Engineer jointly collaborate to select and approve the appropriate RPE from the approved list.<sup>102</sup>

The RPPA ensures that only approved RPE is selected.

### **Respiratory Protective Equipment – Issuance Stations**

Processes are established for identification of respiratory protection issuance stations and issuance and control of RPE (pre-issuance verification, sources of verification, issuing requirements, issuance log). There are several Respiratory Issue Stations at the Tank Farm complex. Each station is staffed by qualified Mask Station Issuers (Nuclear Chemical Operators and Laborers).<sup>103</sup>

Stations are operated by qualified RPE Issuers at the following current locations:

- 2704-HV, (509-373-2082), Retrieval Operations Issue Station
- 278-AW (509-373-0050), Operations Field Support Issue Station
- MO-2256 (509-373-6655), Construction Satellite Issue Station
- E-38129 Mobil Issuing Station, Closed Loop (Bottles only)
- E-203093 Mobil Issuing Station, Closed Loop (Bottles only)
- MO-0193 AY-2 Change Trailer, Closed Loop (Bottles only)
- 272WA 200W (509-372-8337), West Operations Issue Station (west)
- MO-148 (509-376-2994), Effluent Treatment Facility (ETF).

RPE Issuance Stations are designated by H2C management on the Respiratory Protection Equipment (RPE) Issuance Station Identification Form (A-6006-204), approved by the RPPA. Only RPE identified on the Respiratory Protection Form (A-6005-593) is authorized to be issued.

H2C administers and oversees respirator issuance activities for its workforce in the areas and facilities under its operational control to ensure:

- Only trained and qualified issuers are assigned to issue RPE.
- Positive control of the area is maintained, and the area is not open to unauthorized personnel.

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<sup>101</sup> Tank Vapor Program Evaluation, TOC-IH-65892 REV 00, June 30, 2026.

<sup>102</sup> RPPA Presentation on July 16, 2026.

<sup>103</sup> Respirator Issuance and Control, Rev. C23, TO-020-028, December 4, 2025.

- Issuers are made aware of additional needs for future work projects.
- Sufficient RPE is made available for work being performed.
- RPE is issued according to Program requirements. However, RPE used or designated for field trials, respiratory training, and mask fit purposes are exempt from issuance requirements.
- A unique identification number or barcode is assigned for RPE that requires maintenance and/or calibration (or any equipment designated by the RPPA) that is available for use.
  - Equipment is tracked and documented using the unique identification number or barcode.
  - RPE removed from service is documented using the unique identifier. The operations manager responsible, or RPPA is notified when an item is removed from inventory.

The Respirator Equipment Tracking System (RETS) is considered an administrative Human Performance Improvement (HPI) tool to assist in day-to-day operations of tracking the use of RPE. The system is primarily used to check out/check in respirators to employees at issuing stations.

Recent Software modifications include making the application more secure for use by enabling the Single Sign-on ability within the application, performing a check of the training courses for the issuer based on location, ensuring the training courses (including retraining) is properly retrieved from the Learning Management System (LMS)— the online training platform used to assign, track, complete, and document employee training, qualifications, and compliance requirements. Hanford contractors and DOE personnel use the LMS to manage required safety, security, radiological, environmental, and job-specific training records. LMS allows for better tracking to include when equipment is sent for cleaning and tying the mask fit test and training together.

At the issuance station, respiratory wearer qualifications are verified prior to RPE issuance:

- SOMC medical clearance.
- Training required for the type of RPE requested.
- Successful mask fit with make, model, and size of facepiece to be issued.
- Verification may be accomplished using several sources such as, but not limited to:
  - Hanford Site Mask Fit card.
  - Hanford Site Worker Eligibility Tool (HSWET).
  - Crystal Reports database.
  - Training Completion Record (TCR).
  - Other RPPA-approved verification sources.

For tight fitting facepiece RPE, issuers use the mask fit picture to aid in verifying that the wearer is clean shaven and that physical/facial features have not changed in a way that may affect RPE fit. The following changes are considered:

- Additional facial hair.
- New facial surgery/scarring.
- Obvious weight gain or loss.
- Significant dental changes (e.g., dentures, braces).
- Facial piercings and/or jewelry in the seal surface area.

- Other conditions that may affect facepiece seal.

For RPE with hoods or helmets the issuer ensures the wearer shall not have facial hair or other condition that interferes with the neck band on a single bib hood per manufacturer's instructions.

A log is used to record information using Respiratory Equipment Tracking System (RETS) (digital tracking system) approved by RPPA or paper log sheets provided by procedure if digital program is unavailable may also include, but is not limited to, the following.

- Time issued
- Hanford Identification Number (HID)
- Applicable work control document number
- Mask issuance station location/identification number Mask fit expiration date
- Training expiration date
- Medical/physical expiration date
- Length of Equipment Issuance
- RPE shall be issued for the entry or shift but shall not exceed a maximum of two (2) consecutive (back-to-back) shifts.

Exclusive use of RPE is assigned to an individual, typically welders mask or helmet for powered air purifying respirators (PAPR), for a period exceeding two (2) consecutive (back-to-back) shifts and is approved by the RPPA. An alternate return cycle is established, documented, and approved by the RPPA. All requirements for storage, cleaning, and change-out schedules are applicable.

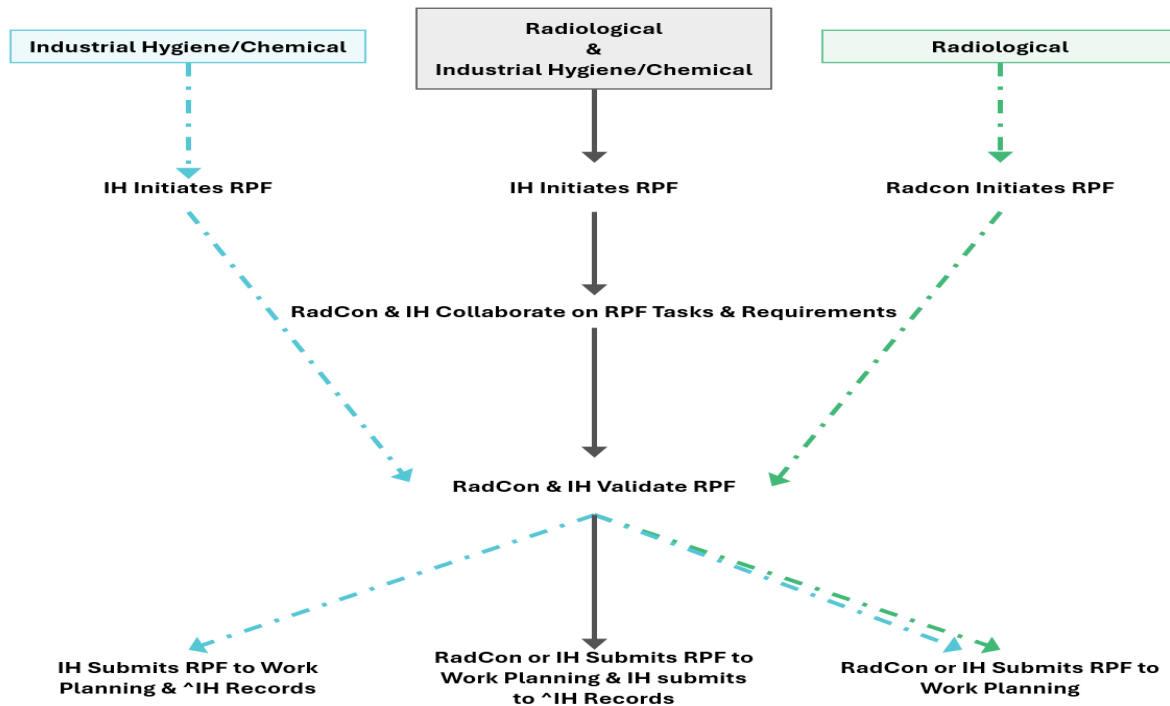
The issuing station interaction with the HFD regarding I&C is typically limited to problems involving SCBA racks or Carri-Air racks. When an issue with RPE is identified, the mask stations tag the equipment and send it to HFD. At HFD, technicians certified by the manufacturer 3M/Scott are responsible for troubleshooting and performing maintenance on the equipment. Upon receiving RPE for testing, they carry out troubleshooting procedures and make any necessary adjustments. Communication with H2C is infrequent and generally occurs only if there is a major issue or significant modifications are required. If requested by the RPPA, HFD is willing to provide information regarding equipment inspections.

### **IH Management of Exposures – Hazard Assessment, RPE Selection**

Processes are in place for the Radiological Engineer/Radiological Work Planner and the Industrial Hygienist to collaborate on prescribing respiratory protection (Figure below).<sup>104</sup>

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<sup>104</sup> Tank Vapor Program Evaluation, TOC-IH-65892 REV 00, June 30, 2026.



During work scope planning process (TFC-ESHQ-S\_SAF-C-02), Industrial Hygiene and Radiological Engineer or Work Planner evaluate their respective hazards to determine respiratory protection requirements. If it is determined that radiological hazards require the use of RPE, but IH hazards do not (e.g., beryllium, silica, asbestos, chemical vapors/particulates), then the Radiological Engineer or Work Planner initiates the RPF. If it is determined that IH hazards require the use of RPE, but radiological hazards do not, then the Industrial Hygienist initiates the RPF process. If both radiological and IH hazards require the use of RPE, then the IH initiates the RPF. Regardless of who initiates the RPF, both IH and radiation control (RadCon) work together to ensure that the appropriate RPE is selected (i.e., cartridge selection, assigned protection factor). RadCon and IH collaboration is captured through the finalized RPF document, as both signatures are required for the RPF to be valid.

The responsibility for RPF creation is currently enforced informally through IH Department and RadCon Department management. While document creation expectations are informal, the peer review process is enforced through the Hanford Site Respiratory Protection Program (DOE-0352).

Tank Waste Chemical Vapors, Evaluation and Management Strategy (TOC-IH-59014) also establishes default minimum respiratory protection requirements for tank vapors based on the Tank Vapor Work Category (WC). Note: The default minimum RPE requirements are established for a broad range of work activities. These requirements may be upgraded or downgraded or individual/specific work activities through additional evaluation/Industrial Hygiene Task Specific Exposure Assessment(s).

The IH Department has established a rolling 3-year schedule for IH Program Assessments. This schedule is communicated to Hanford Atomic Metal Trades Council (HAMTC) Safety, ensuring

resources are available and can be planned accordingly. Assessment items, as well as Department initiatives, are tracked with the Integrated Contractor Assurance System (iCAS). The iCAS issues management modules expanded on the former Problem Evaluation Request System (PERS) by allowing users to enter identified issues as well as capturing strengths and good practices. The iCAS Task Tracker feature expands capabilities for tracking initiatives as well as assessment items.

Additionally, the IH department engages in benchmarking activities, including monthly Energy Facility Contractors Group (EFCOG) meetings and Amentum's IH FACT meetings. These methods help facilitate communication not only with Hanford contractors, but also with contracts outside the Hanford site. Each tank vapor control set defines the engineering controls, boundary postings, monitoring such as personal ammonia monitors (PAM) or intermittent or continuous industrial hygiene technician (IHT) monitoring, and the minimum RPE requirements. When tasks or conditions cannot ensure tank vapor exposures remain at *de minimis*, appropriate RPE is required. RPE selection is done by the project responsible Industrial Hygienist (IH) based on the project hazard assessment. RPE selected is documented in a project work package on the Respiratory Protection Form (RPF), A-6005-593 REV 7. The RPF provides essential information including appropriate RPE, cartridge change schedule for air-purifying respirators, and special instructions. Permissible RPE is selected from a HSRPP Committee list of approved equipment. The RPF also documents RPE required for an abnormal operating procedure (AOP).

Subcontractors and their workers employed on the Hanford Site for specialized/unique work for 30 working days or less annually and who require RPE not available through this Program may request an RPPA review for equivalency. RPPAs may grant equivalencies to the Program, provided those subcontractors' programs have been reviewed and deemed by the RPPA as providing the same level of protection as the HSRPP. The RPPA informs the HSRPP Committee of requested and granted equivalencies. The HSRPP Committee documents granted equivalencies.

## **Training and Qualifications of Principal Officials, Workforce**

### **Industrial Hygienist Subject Matter Expert**

The Industrial Hygiene Department has strengthened its end-to-end training and qualification framework to ensure all Industrial Hygienists and Industrial Hygiene Technicians achieve baseline proficiency early in their careers and continue to build professional competency through structured, experience-based development.<sup>105</sup> The goal is to provide training and qualification requirements for the required IH Department positions (e.g., RPE selection). Processes are in place to develop and maintain a comprehensive skill based aligned with the Industrial Hygiene Department position.

The onboarding process for industrial hygienists, described in IH Professional Training Implementation, TFC-ESHQ-IH-CD-26, is designed to ensure baseline proficiency and support development of professional competency over time. The primary outcome is for new Industrial Hygienists to achieve signature authority for IH documents. The training and qualification

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<sup>105</sup> Tank Vapor Program Evaluation, TOC-IH-65892 REV 00, June 30, 2026.

process begins with completion of Phase 1 within one year of the hire date and progressing to Phase 2 as assigned by management. New hires complete the Industrial Hygiene Professional Course 350882 qualification card to initiate field application and prepare for advanced competency development. Completion and managerial sign-off of qualifications allow the new Industrial Hygienist to independently perform specific IH functions prior to completion of Phase 1 in entirety. Timelines and goals of Phase 2 are directed by management.

IH and IHT staff receive training through onboarding, qualification cards, workshops, IH Pathways, collaboration meetings, and the Immersive Proficiency Center. The Immersive Proficiency Center (IPC) offers a safe, controlled environment where employees sharpen their instrumentation skills, work on task-based modules, and benefit from personalized coaching. The IPC promotes teamwork across different groups and includes playbooks, demonstrations, open house events, and activities that build on formal coursework. The program creates learning opportunities for both IH and IHTs, uniting field support teams. H2C has moved from basic program knowledge sharing to structured, experience-driven proficiency development.<sup>106</sup> To advance consistency, quality, and long-term development, H2C is implementing a phased onboarding model for Industrial Hygienists, ensuring deliberate progression from baseline knowledge to increasingly complex field responsibilities, supported by the IH Professional Course and qualification card system.

A key development is the expansion of the IH Professional Qualification program, phased approach to qualifications with IH collaboration meetings, and professional development meetings (e.g., IH Workshops, Pathways). The IH program supports Industrial Hygienists through multiple avenues, including IH Collaboration, IH Workshops, and IH Pathways, each serving a distinct purpose in professional engagement and development.

- IH Collaboration Monthly Meetings provide an ongoing forum for all IH professionals and scientists to share project updates, discuss challenges, strengthen teamwork, and develop recommendations for management, with a focus on broad engagement beyond routine training.
- IH Workshops are structured onboarding sessions required for new hires that introduce programmatic requirements, key regulations, references, and essential resources for the onboarding and qualification process.
- The IH Pathways Program is a progressive, in-house educational series designed to deepen IH technical knowledge, support understanding of Hanford specific processes, and guide staff along the path toward achieving the CIH certification through both foundational (Pathway 1) and advanced (Pathway 2) learning phases.

### **Respiratory Protection Program Administrator**

IH SME training and qualification is a prerequisite for an RPPA. In addition to Industrial Hygiene Professional Course 3500882, an RPPA must be qualified through Phase 2 of the IH Professional Qualification Program training with demonstration of knowledge, skills, and abilities listed in IH Phase 2 Task Specific Checklist: Respiratory SME.<sup>107</sup> Core reference documents and resources establish the foundation for the RPPA respiratory protection qualifications which also support the DOE sitewide RPP.

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<sup>106</sup> H2C Tank Vapor Respiratory Program Effectiveness Assessment, ITDC-WP-26-2853 Revision 0, July, 2026.

<sup>107</sup> Phase\_2\_Checklist\_Perform\_Respiratory\_Duties\_as\_the\_Role\_of\_the\_SME, Not Dated.

**References**

- 29 CFR 1910.134, Respiratory Protection
- 29 CFR 1926.103, Respiratory Protection
- DOE-0352, Hanford Site Respiratory Protection Program
- ANSI Z88.2, American National Standard for Respiratory Protection
- TFC-ESHQ-IH-STD-07, Respiratory Protection

**Resources**

- Hanford Site Respiratory Protection Program Approved RPE List
- HSRPP Lines of Inquiry

Eighteen (18) criteria are listed in the checklist used to evaluate an IH SME competency as demonstrated a thorough understanding of the Respiratory Program, and roles and responsibilities in relation to respiratory hazards. The qualifications checklist consists of knowledge, skill, and ability-based criteria to ensure the RPPA is qualified to competently perform IH SME respiratory functions. Thus, the qualifications are summarized below in those categories.

**Knowledge**

- IH SME level training plus respiratory credentials
- Reference and resource documents that define DOE 352 RPP requirements including LOI used in conducting RPP Assessments
- OSHA regulations, updates, and website alerts
- History of respiratory protection and issues at Hanford, how they were addressed, and where to find documentation
- RPP Assessments including conclusions associated with strengths, OFI, and adverse conditions
- DOE support contractors and others associated with respiratory protection, such as Unitech, HFD, SOMC-IHA, RPE suppliers, etc.

**Skills:**

- Oversight and visits of Mask Issue Station sites
- Access RETS reports and data
- Use and manage I&C data
- Attend HSRPP Committee meetings, prepare for and discuss pertinent topics such as I&C
- Communicate with IHTs to ensure clarity of roles and responsibilities, and processes involved in projects

**Abilities:**

- Assess previous Program gaps and how they have been addressed
- Conduct lower-tier RPP Committee meetings, setting agenda's recording minutes, etc.
- Observe field work (attend pre-job meetings, examine RPE checking out and work practices

- Review SME interview questions and answers related to the Phase 1 qualification process
- Access the Enterprise Asset Management (EAM) inventory for cartridge and mask inventories
- Audit HAMMER Course 020104 Respiratory Protection Issuer Training

### **RPE Station Issuer**

H2C's RPPA provides oversight of the Mask Stations. Mask Station Issuers by virtue of H2C labor-management agreements are members of a bargaining unit: Building Trades or HAMTC. On-the-job training (OJT) and on-the job evaluation (OJE) qualifications for Mask Issuers are comprehensive.<sup>108,109</sup> Requirements are very similar. There is a record within each of the training courses that notes revisions as training material of qualifications are updated. This is an excellent means to show advancements of the OJT and OJE material as a reflection of RPP updates. This training is approved in accordance with TFC-BSM-TQ\_ADD-C-01, Conduct of Training Administration.

Training consists of two phases. In the first OJT phase is a task demonstrated by an instructor, then performed by the trainee with coaching assistance from the instructor until the trainee masters the task. The second OJE phase is a task that is performed by the trainee and valued to verify competency in performing the task. The evaluation is performed by an authorized person(s) other than the phase 1 OJT Instructor. The Evaluation phase is stopped if any actions are performed that could impact on the safety of personnel, equipment, or the environment. An OJT Card (i.e., qualification card or task qualification record) is completed in accordance with the procedure TFC-BSM-TQ\_IMP-C-04, Conduct of On-The-Job Training/Evaluation (OJT/OJE).

Competencies evaluated include safety, radiological controls, procedure compliance, response to alarms, understanding the system, records, logs, and rounds documentations, communications. Grading training proficiency is to standards criteria based on a pass or fail bases. The OJT is either rated successful or unsuccessful.

Prerequisite qualifications for a Mask Issuer qualification are Respiratory Protection Issuer Training course 020104 and Bloodborne Pathogens Course 170648. Trainees must demonstrate the following H2C required knowledge, skills, and abilities. STC established the groupings below which may not be representative of how H2C would group the training content.

### **Knowledge**

DOE-0352, "Hanford Site Respiratory Protection Program (HSRPP)  
 GHS-SDS #079555, Georgia Steel Fresh Gear, Georgia Steel & Chemical Co., (FG350-G,GC)  
 TFC-ESHQ-IH-STD-07, "Respiratory Protection "  
 TFC-ESHQ-S-STD-24, "Bloodborne Pathogen Exposure Control Standard"  
 TFC-ESHQ-S-STD-25, "Storing, Using, Handling, and Transporting Compressed and Liquefied Gases"  
 TFC-PLN-173, "Use of FFAPR in Actively Ventilated Tank Farms"

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<sup>108</sup> Tank Farm Training, Building Trades Mask Issuer, Course 357846 Rev 005C.

<sup>109</sup> Tank Farms Training, Tank Farms Mask Issuer, Course 357845 Rev 009B.

TO-020-024, "Clean E-Z Flow Regulators for SCBA and Supplied-Air Respirators"

TO-020-028, "Respirator Issuance and Control"

Respiratory Issuance and Control practices

Mask Stations locations

Roles & responsibilities of:

- Issuer
- SME
- Lead Issuer
- User
- Manager
- RPPA

Terms & definitions related to Respiratory Issuance and Control (e.g., RPE, RETS, RPPA, TVIS, RPF, SCBA, APR, etc.)

Type of PPE required for Issuers, when PPE is required to be worn

### **Skills**

- Check in/Check out equipment
- Use the Respiratory Protection Form (RPF)
- Assess facial appearance
- Verify Mask User Qualifications
- Recognizing PPE requirements
- Perform daily/monthly equipment checks and inventories
- Recognizing the proper response when respiratory equipment is contaminated with blood, vomit (Bloodborne Pathogen), or has caused irritation/rash
- Manage the return and staging of used PAPRs
- Assert Positive Control/Accountability
- Inspect and use a Carri-Air Caddy

### **Ability**

Perform Verification of user respiratory equipment qualifications

- Respiratory Knowledge Base (initial or refresher)
- Medically Cleared
- Specific Mask Fit
- Specific Mask Training
- Specific Equipment Training

Perform use of the SCBA Bottle Tracking and Issuing Log

Identify RPE use restrictions

Demonstrate

- Use the Respiratory Equipment Tracking System (RETS)
- How to run misc. reports
- Stocking of respiratory equipment and supplies
- Use of the RPF to issue and stage RPE
- Issuance of respiratory voice communicators, battery installation and change out.
- How to log, tag, and stage equipment to be repaired or calibrated
- Use(s) of the Bulk Issue/Equipment Repair/Calibration Paper log
- Proper cleaning, drying, and sanitizing of the SCBA Harness Hard Case

- Proper cleaning procedures for E-Z Airline Regulators
- Correct rinse and dry of E-Z Airline Regulators
- How to find training courses
- Proper housekeeping

### **Worker and Other Training Initiatives**

Respiratory protection training is provided by H2C and the HAMMER Worker-Training Program. HAMMER training is a critical part of the site-wide successful respiratory protection program. Collectively, training initiatives of H2C and Hammer training services effectively prepare workers who are required to wear respirators.

Hammer's training prepares the Hanford Site workforce to work safely in hazardous atmospheric and industrial environments.<sup>110</sup> Its training facility is used for multiple purposes:

- Hazardous waste operations (HAZWOPER)
- Emergency response
- Confined-space rescue and industrial safety
- Radiological worker training and mock-up exercises supporting Hanford cleanup activities
- Respiratory protection and personal protective equipment (PPE) for workers entering hazardous environments

Respiratory protection training and fit testing conducted by HAMMER provides centralized training support and a common understanding of sitewide requirements. HAMMER services provide efficiency by not requiring each contractor to develop its own training. The Program provides hands-on respiratory protection training consistent with the DOE HSRPP requirements to ensure the best respiratory protection for every worker. HAMMER offers training on 34 different pieces of respiratory protection equipment (RPE) with over 100 combinations. Each respiratory user receives training that meets DOE, OSHA and ANSI requirements as well as hands-on experience for those units that they will use in the workplace. Training includes selection, inspection, assembly, use and participation in realistic hands-on training scenarios that mimic situations encountered in the field. HAMMER provides the vital service of qualifying workers for use of RPE including training on the specific RPE to be used and conducting fit tests to ensure the equipment fits properly. HAMMER conducts quantitative respirator fit testing offering services to over 4,000 personnel annually on 60 mask combinations.<sup>111</sup>

HAMMER actively seeks input from workers to continuously enhance training and safety procedures. Issues raised by workers during training or use of RPE are raised by HAMMER with the RPPA and shared among the members of the HSRPP committee. Feedback is collected through post training evaluations, including suggestions for improvement and through direct communication with instructors.

When a student asks an instructor a question that cannot be immediately answered, worker trainers escalate the inquiry to the HAMMER Respiratory Training Program Manager. If they are

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<sup>110</sup> [hammer.hanford.gov/page.cfm/Respiratory](https://hammer.hanford.gov/page.cfm/Respiratory).

<sup>111</sup> [hammer.hanford.gov/page.cfm/MaskFitServices](https://hammer.hanford.gov/page.cfm/MaskFitServices).

unable to provide an answer, they will promptly reach out to a contractor RPPA to ensure the question is addressed in a timely manner. For equipment-related queries, the HAMMER Respiratory Training Program Manager contacts the manufacturer directly, obtains the necessary information via email, and relays the answer to the worker. Additionally, this information is shared with all contractor RPPAs and discussed during HSRPP Committee meetings to ensure everyone is informed. All feedback and questions are reviewed by the -Program staff, who collaborate with stakeholders to resolve issues and incorporate suggestions into future training. This process ensures that concerns are promptly addressed and supports ongoing commitment to continuous improvement.

Additionally, annual refresher courses are established to maintain proficiency.<sup>112</sup> The courses are designed to ensure they meet all safety and regulatory requirements for respiratory hazards per HSRPP. Below are links to examples of HAMMER refresher training videos for Air Purifying Respirators, Powered Air Purifying Respirators, and Supplied Air Respirators. These videos are to be used as refresher training only and not meant to replace actual training provided.

- [Air Purifying Respirator \(APR\) videos](#)
- [Powered Air Purifying Respirator \(PAPR\) videos](#)
- [Supplied Air videos](#)

H2C Chemical Worker Training addresses past and present operations, hazards, controls, tank vapor work categories, effects of vapor exposures, and monitoring and sampling strategies and practices.<sup>113</sup> Training is comprehensive providing instructions on hierarchy of controls including engineering and administrative controls applied by H2C, describes chemical hazards and odors, their origins, and their effects, how IH monitors and samples for their presence, and the use of work categories and how they are integrated for respiratory protection. Instructions on odor identification and odor response cards prepare chemical workers with descriptions to identify, and report odors. Group discussions are held on different ways to describe odors. With an aim of continuous improvement, feedback from workers is used to identify opportunities to increase depth and integrate scenario-based learning. The current training program provides foundational awareness with expanded materials that strengthen employee knowledge. Other vapor related courses include training on Base Operations qualifications (Course 350341), General employee training (Course 358001), Gas and Vapor Transport During Waste Disturbing Activities (Course 351753), and DRI Monitoring Suite including content on monitoring equipment. Courses are specifically tailored to target populations of workers.

Other means for workforce training and qualification building is through the DOE Voluntary Protection Program (VPP)<sup>114</sup> which promotes safety and health excellence through cooperative efforts among labor, management, and government at DOE contractor sites. Key tenets of VPP include management leadership and commitment, employee involvement, work site analysis, hazard prevention and control, and safety and health training. It's the framework DOE uses to measure whether employees are actively engaged in safety and whether management is listening and responding to concerns. Strong employee participation in VPP is often viewed favorably

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<sup>112</sup> Tank Vapor Program Evaluation. TOC-IH-65892 REV 00, June 30, 2026.

<sup>113</sup> Presentation, Chemical Worker Training, Program Scope, Requirements, and Implementation Overview, June 24, 2026.

<sup>114</sup> [Hanford Site Voluntary Protection Program - Hanford Site](#).

during assessments and site evaluations. VPP is a significant part of the site's safety culture at H2C.

The Immersive Proficiency Center (IPC) is H2C's advanced training and workforce-development facility that uses immersive technologies to prepare employees for tank farm and waste-treatment operations. It is designed to improve worker proficiency, safety, and operational readiness before personnel enter actual facilities. The following are typical IPC capabilities.

- Virtual Reality (VR) training for tank farm and facility operations.
- Digital twins and simulated environments that replicate Hanford facilities.
- Procedure-based training and rehearsals for complex or infrequently performed tasks.
- Safety and hazard recognition training in a risk-free environment.
- Qualification and proficiency assessments for operators, maintenance personnel, and supervisors.
- Work planning and mock-up activities to allow crews to practice jobs before field execution.

The IPC supports one of the major goals of the Hanford Integrated Tank Disposition Contract: building a highly trained workforce capable of safely operating tank farms today and eventually supporting Waste Treatment and Immobilization Plant operations.

The H2C team behind the Immersive Proficiency Center received the Voluntary Protection Program Participants' Association (VPPPA) Region X Innovation Award for its innovative, employee-led approach to safety training for their Stepping Stones program.<sup>115</sup>

A center for training was created to provide a realistic but hazard-free environment where employees can practice field activities, develop technical skills, and improve safety performance before working in actual tank farm operations. Training includes the Immersive Proficiency Center (IPC), worker led initiative, for industrial hygiene technician (IHT) training for enhanced proficiency. IPC provides several safety benefits:<sup>116</sup>

- Simulates a real tank farm work environment without operational hazards.
- Improves worker competency and consistency.
- Allows IHTs and other workers to practice procedures, monitoring techniques, and job planning activities.
- Uses structured training playbooks covering pre-job planning, work execution, and post-job evaluation.
- Enhances safety by allowing mistakes to be identified and corrected in a controlled environment.
- Supports both new employee onboarding and refresher training for experienced personnel.

H2C has established processes to receive feedback on issues and concerns directly from workers, including regarding Respiratory Protection Equipment issues and concerns.

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<sup>115</sup> [H2C Two-Minute Take, June 5, 2025](#), (VPP Award for Stepping Stones described at 1.29).

<sup>116</sup> Ibid. (Immersive Proficiency Center described at 2.35).

## Employee Accident Prevention Council (EAPC) Safety Book<sup>117</sup>

The purpose EAPC of the Safety Book is to identify safety activities or conditions that require correction and opportunities for improvement, while recognizing both individual and project safety successes. The EAPC Safety Book is an available avenue for employees to report observed safety issues or conditions (positive and/or negative) without fear of reprisal.

The EAPC Safety Book is not intended to be a replacement for immediate notification to supervisors for situations or conditions that require immediate notification or implementation of the stop work process.

The My Safety Focus Value card provides another opportunity for employees to make a commitment on safe work practices and actions. It is based on a continuous feedback loop where all employees provide input on improving safety for themselves and others. The data provided by filling out the My Safety Focus Value cards can then be analyzed to develop applicable training and/or other programs to strengthen H2C safety culture.

## RPP Assessments

### Program Assessments and Surveillance

Hanford-Site Contractors, in coordination with their designated RPPA, are required to conduct ongoing evaluations and surveillance of the workplace as necessary to ensure that the Program is effective. Both annual and triannual assessments are required. The H2C RPPA leads the assessments of the Program's effectiveness. H2C does not lead assessments of the practices of the independent DOE RP supporting contractors. However, each contractor may utilize sources of information from third parties or other contractors to supplement their own assessments. H2C and other contractor assessments are conducted using the Lines of Inquiry (LOI) that are developed by the HSRPP Committee. The LOI includes all elements of the Program.

The H2C RPPA is designated to administer and coordinate the Program with primary authority to interpret respiratory protection issues, track concerns and their resolutions, assure supplied air meets quality standards, evaluate new types of NIOSH Approved<sup>®</sup> RPE, approve procurement and use, maintain knowledge of RPE being used on the Hanford site, keep abreast of current and advances in regulations, and serve as the H2C primary point of contact on the Hanford Site RPP Committee. The RPPA regularly consults employees



Date: \_\_\_\_\_ Please Circle your EAPC SEAPC NEAPC PRISM Ret/Pro  
Name: \_\_\_\_\_ (Optional) HED: \_\_\_\_\_ (Optional)

**MY Safety Focus Values** (For additional risk key words, please feel free to add below)

Check Category Circle Key Risks

☐ Slips, Trips, & Falls Distractions, Eyes on Path, Handrail, Footwear, Stairs

☐ Vehicle Safety Speed, 360 Plus, Cell Phone Use, Distractions, Backing

☐ Contact Hazard Chemical/Struck By/Against, Pinch, Puncture/Cut

☐ Back 2 Basics Hazards, Tools, Potential Risks

**Respond to Applicable Questions Below**

Do You Endorse a 24/7 Safety Culture?  
☐ Yes ☐ No How? \_\_\_\_\_

Did You Check Your Work Area for Hazards?  
☐ Yes ☐ No Comment \_\_\_\_\_

Did Your Supervisor Communicate the Hazards?  
☐ Yes ☐ No What? \_\_\_\_\_

Did You Help Your Co-Workers Stay Safe Today?  
☐ Yes ☐ No How? \_\_\_\_\_

Did You Hold Yourself or Co-Workers Accountable Today?  
☐ Yes ☐ No How? \_\_\_\_\_

Were Any Improvement Opportunities Identified?  
☐ Yes ☐ No What? \_\_\_\_\_

Comments: \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

14C2250009

Please Return Completed Card to the "MY Safety Focus" drop box, your local EAPC member or MSN R1-09

<sup>117</sup> Safety Integration \_Presentation on June 24, 2026.

required to use RPE to obtain employee views on program effectiveness and to identify any issues.

Communication and feedback include but are not limited to respirator fit (including the ability to use the respirator without interfering with effective workplace performance), appropriate RPE selection for the hazards to which the employee is exposed, proper RPE use in workplace conditions the employee encounters, proper RPE maintenance, communication effectiveness, and issue resolution.

Per DOE-0352, contractors are required to conduct company-level respiratory meetings. At least quarterly to serve as a conduit for raising concerns from the field, communicating developments within the program, and flowing down information from the Sitewide Committee. Due to the increased optics of respiratory protection at Tank Farms, H2C typically conducts these meetings monthly, with a recurring calendar invite. The meeting invite list includes mask station managers, issuers, IHs, and HAMTC Safety Representatives, as well as being open for any H2C employee to attend. When meetings cannot occur monthly due to scheduling conflicts, H2C still adheres to the minimum requirement of a quarterly meeting.

The Respiratory Protection Issue and Concerns Form (A-6006-205) serves as an important tool for documenting and resolving issues related to RPE. When a wearer encounters a problem with their RPE, they return the equipment and, with assistance from the issuer if needed, complete the I&C form. If the issue requires investigation by IH, the equipment is set aside and held for inspection by the RPPA

After retrieving the form and performing any necessary inspections, IH will determine and document what should be done with the equipment based on their evaluation. If wearer feedback is requested, the RPPA will communicate the findings, disposition, and any other important information for the wearer. All completed forms are tracked in a master Excel spreadsheet for I&S. Each form is also scanned into the IH Records area of IDMS and assigned a unique identifier to support record retention and retrieval.

H2C's communications program has significantly enhanced workforce engagement by establishing a comprehensive, multi-layered communication framework that reaches employees at all levels of the organization. Through deliberate integration of formal, informal, digital, and in-person communication channels, H2C ensures that critical information is conveyed consistently, that workers remain actively involved in safety and operational discussions, and that feedback flows efficiently across the workforce.

H2C provided STC with documentation for four (4) assessments of the respiratory protection program: three (3) by conducted under WRPS contract: ITDC-ASTM-2025-0036, WRPS-ASMT-2024-0015, and WRPS-ASMT-0022-0054; and the current one (1) by H2C ITDC-ASMT-2026-0112 - FY26-ESHQ-R - Respiratory Protection Program Assessment Report, March 2025. The Assessment reviews of respiratory protection effectiveness at the Hanford site use evaluation criteria specified in Lines of Inquiry selected by the HSRPP Committee that are aligned with 10 CFR 851 Worker Safety and Health Program, 29 CFR 1910.134 Respiratory Protection, and the Hanford Site Respiratory Protection Program (DOE-0352) requirements

which serves as the governing respiratory protection standard for Hanford contractors. The contractor may have additional inquiries that are addressed regarding specific interests, such as increase or decrease in issues and concerns, transition from SCBA to primarily FFAPR, progress of mandatory FFAPR usage, etc.<sup>118</sup>

HSRPP LOI are very comprehensive, addressing all the elements of the DOE sitewide RPP including program management and administration, hazard identification and exposure assessment, medical qualification, training and qualification, fit testing, RPE selection, equipment control, maintenance and issuance, supplied-air breathing systems, field implementation, program effectiveness and continuous improvement. Assessments are evidence-based, including examination of documentation, field observations, and interviews with management representatives and the workforce. Assessment teams include members of the bargaining unit (i.e. HAMTC representative) and non-bargaining unit employees (i.e., IH). The contractor respiratory protection committee consisting of both categories of employees provides support.

The following are examples of evidence used to demonstrate that respiratory protection complies with the minimum requirements of the DOE Program:

1. Management and Administration
  - Respiratory Protection Program documents
  - Program administrator qualifications
  - Contractor implementing procedures
  - Self-assessments and management reviews
2. Hazard Identification and Exposure Assessment
  - IH surveys and exposure assessments
  - Air monitoring records
  - Job Hazard Analyses (JHAs)
  - Respirator selection documentation
3. Medical Qualification
  - Medical clearance records
  - Occupational medicine procedures
  - Tracking databases
4. Training and Qualification
  - HAMMER training documentation
  - Qualification records
  - Hands-on practical evaluations
  - Interview results
5. Fit Testing
  - Fit test records
  - Quantitative fit-test results
  - Tracking systems
  - Employee interviews
6. Respirator Selection and Use
  - RETS worksheets
  - Change-out schedules

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<sup>118</sup> FY2021-ESHQ-R-0171 – Respiratory Protection Program, Assessment, March 4, 2021.

- Field observations
- Work package documentation
- 7. Equipment Control, Maintenance, and Issuance
  - Issuance logs
  - RETS records
  - Inspection records
  - Storage area inspections
- 8. Supplied-Air and Breathing-Air Systems
  - Air-quality certification reports
  - Compressor maintenance records
  - Cylinder inspection records
  - Emergency equipment inspections
- 9. Field Implementation
  - Field observations
  - Worker interviews
  - Supervisor interviews
  - Conduct of operations reviews
- 10. Program Effectiveness and Continuous Improvement
  - Assessment reports
  - Corrective action tracking systems
  - Lessons learned
  - Performance metrics

DOE performance-based inquiries during interviews with workers seek to verify knowledge and correct use of RPE. The following are example topics:

- Correct RPE is assigned and properly used
- Fit testing done and new fit tests performed as required
- Limitations of the assigned respirator
- Cartridge change schedule
- Proper action(s) to take if odor is smelled or contaminants are tasted while wearing a respirator
- Causes to stop work and leave the area

The following information describes STC observations made for the 2026 H2C Assessment and the 2025 WRPS Assessment. The latter Assessment spanned the transition period between WRPS contract and the H2C contract.

### **H2C 2026 Assessment - ITDC-ASMT-2026-0112**

The most recent H2C assessment of its practices to meet site-wide DOE requirements is presented in ITDC-ASMT-2026-0112 - FY26-ESHQ-R - Respiratory Protection Program Assessment Report, March 2025. This assessment is approximately 1-year following its official replacement of WRPS (February 24, 2025) and becoming responsible for safely retrieving, treating, and disposing of radioactive tank waste at Hanford. Between March 2nd, 2026, and March 19th, 2026, an assessment team comprised of the IH department conducted an evaluation using LOI established by the Subject Matter Expert (SME) and the assessment team lead. The LOIs, addressed requirements from DOE-0352, HSRPP, 10 CFR 85 - Worker Safety and Health

Program, 29 CFR 1910.134 - Respiratory Protection, 29 CFR 1926.103 - Respiratory Protection, ANSI Z88.2-2015 – Practices for Respiratory Protection, and DOE-STD- 1167-2003 -"DOE Standard: Respiratory Acceptance Program for Supplied-Air Suits. The assessment concluded that H2C maintains a compliant program but identified several OFI and strengths of its practices.

### **Strengths**

1. An RPPA has been appointed by the head of the Industrial Hygiene Department for H2C. It was noted that the new RPPA is highly visible to Mask Station personnel, consistently visiting each Mask Station on a weekly basis. This is a point of particular interest of the STC assessment to assure that the RPPA observes the practices and effectiveness of the RPE Issuing Stations.
2. The H2C IH Exposure Assessment Program adopts a systematic and comprehensive approach to exposure assessments, ensuring program functions are consistently managed to effectively control risks to workers and promote lasting improvement. Plan TFC-PLN-34, "Industrial Hygiene Exposure Assessment Strategy," describes the IH program approach to the development of a written exposure assessment in alignment with the guidelines from the American Industrial Hygiene Association (AIHA). The major steps of this strategy are described in TOC-IH-58435 Appendix F, Industrial Hygiene Technical Basis for Applicable Requirements, February 18, 2026. STC understands that The Tank Vapor Management Strategy is outlined in TOC-IH-58435 and implemented through TFC-ESHQ-IH-C-48 C-2, Managing Tank Chemical Vapors, February 26, 2026. An important companion document helpful to understanding the strategy is documented in TOC-IH-59014, Tank Waste Chemical Vapors: Evaluation and Management Strategy, January 2026. It provides an overview of the evaluation and management strategy for Tank Waste Chemical Vapors including descriptions of sources, source and exposure characterizations, monitoring and sampling, quantitative risk analysis, short duration event scenarios, controls and personal protective equipment including RPE. The strategy and implementation practices are comprehensive, involving a continual process of collecting information, prioritizing controls, and gathering follow-up information. It is established upon many years of study, experience, and advancements in technology.
3. Trained and qualified RPE Issuers consistently demonstrated comprehensive knowledge of requirements and take full ownership of RPE issuance. Observations verified that Issuers meticulously adhere to program standards, reflecting a strong commitment to excellence and pride in their work. Procedure, TO-020-028, Respirator Issuance and Control, addresses the storage, issuance and control of respirators and equipment at Respiratory Issue Stations.

STC observed an Issue Station during a site visit on June 24, 2026, and one on March 30, 2017. During those visits the Station was observed to be very organized and the computer system had robust quality control to prevent workers being issued the wrong respirator, including preventing issuance to a worker who hadn't turned in respirators issued the day before. The Station most recently visited issued about 500 respirators a day, approximately 60,000 issued last year. Currently Scott, MSA and 3M respirators are

available. The station issue about 30-40 PAPRs per week. Several workers indicated the respirator issuance program had multiple checks and balances.

4. Program training to qualify personnel on procedures and processes is implemented and verified to be accurate and effective, as demonstrated by documented HAMMER training visits, administrator expertise, and responsive improvement based on worker feedback. The assessment noted there is documented evidence of a HAMMER visit found in iCAS, ITDC-OPT-2026-2679. The purpose of the visit was to gain information about the overall effectiveness and maturity of HAMMER's respiratory protection training provided to H2C workers, as well as to understand how worker feedback is collected and resolved. HAMMER's Respiratory Protection Training Administrator demonstrated exceptional expertise and commitment, ensuring effective guidance, responsiveness to student feedback, and continuous improvement for comprehensive worker protection. Section 4.4 addresses information STC acquired concerning qualifications and training.

### **Opportunities for Improvement**

1. Sufficient RPE was observed at all RPE Issue Stations for work performed, but delays in returning cleaned RPE at one station indicate a need for process review. At the Station the Area Manager and Issuers expressed concern about delays in the return of RPE after it was cleaned. Because this may indicate a process deficiency, further investigation is warranted.
2. All of the RPE inspected had barcodes with unique identifiers. All RPE requiring maintenance or calibration are tracked with unique ID number or barcodes, ensuring compliance with program requirements. However, there is a concern over the ability to create barcodes for entering information into RETS. The OFI recommendation is to develop and implement guidance for barcode creation to ensure consistency and accuracy of information entered into RETS.
3. RPE is issued in accordance with the RPF. Issuers consistently review, track, and verify equipment and required information, as well as teamwork to ensure all RPF data is properly entered. Issuers described and demonstrated processes for issuing RPE in accordance with RPFs, including reviewing and tracking RPFs within the Issue Station, verifying issued equipment against RPFs, and working collaboratively to ensure all RPF information is accurately entered into the tracking system. However, Issuers described a concern regarding communication of completed RPFs to Issue Stations causing bottlenecks that could impact field work. There is an opportunity to streamline communication of completed and signed RPFs to the Issue Stations. The opportunity is to evaluate and propose a streamlined process for transmitting signed RPFs to issue stations for increased efficiency.
4. Radiological and IH exposure assessments follow the same documentation protocol, using the RPF. All associated sampling and monitoring data are stored in IDMS, supporting unified recordkeeping and retrieval. Exposure assessments, radiological sampling, and monitoring data records are maintained in IDMS using RPF documentation protocols, ensuring unified recordkeeping and compliance with program requirements. During the review, the concern of inconsistent RPF documentation was raised by Issuers.

The recommendation is to standardize cartridge listing practices and streamline RPF documentation to enhance Issue Station efficiency and improve accuracy in the issuance process.

5. The source requirements outlined in 10 CFR 851 are fully implemented and uploaded into the Dynamic Object-Oriented Requirements System (DOOR), demonstrating compliance. However, an opportunity exists to conduct a defense-in-depth analysis of the flow down of requirements within the respiratory protection program. This analysis will help ensure that all program requirements are adequately communicated and implemented across the organization. The recommended improvement is to conduct a thorough requirements analysis on the respiratory protection program to enhance clarity and effectiveness of requirement application to workplace safety. STC notes that the DOORS system is a management software system used to capture, organize, trace, and control regulatory, safety, engineering, and operational requirements. Contractors at Hanford use DOORS as a central repository to:
  - Manage DOE, federal, state, and site requirements.
  - Flow requirements down from high-level regulations into procedures, work instructions, and technical documents.
  - Maintain traceability between requirements and their implementing documents.
  - Support configuration management and audits.
  - Demonstrate compliance during reviews and assessments.

On June 24, 2026, STC was provided with a chart by the RPPA showing IH Requirements Flow Diagram for respiratory protection. The chart documented the mapping of DOE ISMS functions, Federal regulations and standards, contract requirements, RPP implementation, hazard identification and control methods, perform work and feedback. As intended by the OFI recommendation, this proved to be very helpful in comprehending the integration of programs, plans, practices, and procedures. This is discussed in greater detail in Section 4.3, Integration of Permissible Practices.

### **WRPS 2025 Assessment - ITDC-ASMT-2025-0036**

From January 27, 2025, to March 31, 2025, a fourteen-person assessment team comprised of industrial hygienists, IH managers, a Union Steward, and two Operational Specialists assessed Hanford Tank Waste Operations & Closure (H2C) implementation of DOE-0352, HSRPP requirements. The HSRPP Committee established the required LOI on 6/26/2024. The RPPA was excluded as a participating member of the assessment team, but consistent with his role defined in DOE 352, was utilized as an interview resource for clarification of LOI during the assessment.

It's noteworthy that the annual Assessment, ITDC-ASMT-2025-0036 - FY25-ESHQ-Respiratory Protection Program occurred during the transition period from site support contractor Mission Support Alliance (MSA) to HMIS, and H2C officially taking over the Hanford tank waste contract from WRPS (Washington River Protection Solutions) on February 24, 2025.

The team assessed field activities, reviewed respirator program documentation, and interviewed personnel responsible for implementation of the program, training personnel, records personnel,

and non-WRPS personnel. The review included examining a random selection of Industrial Hygiene Respiratory Protection documentation from across the organization, conducting interviews, and observing activities at H2C's issue stations. Additionally, the team thoroughly evaluated records generated and maintained by H2C.

One hundred and thirty-seven (137) of the Site Wide LOIs and additional interests including interviews of mask station personnel to define a metric of the number of respiratory issues and concerns forms tracked within the last year, and WRPS cartridge testing contract, scope of work and the deliverable items for past performance and improvement were assessed resulting in One Adverse Condition (AC), two Opportunities for Improvement (OFIs), and four Strengths (STR).

STC assessment did not examine DOE contractors who provide RPP support services. It was an interest to verify the extent to which WRPS or H2C assess those services in their annual or triennial Assessments. The findings of this Assessment indicate that the SOMC practices were reviewed and OFI were noted.

### **Strengths**

1. Respiratory protective equipment checkout conducted at all RPE Issue Stations is an acknowledged strength given their organization and efficiency.
2. The IH department's communication with subcontractors to flow down respiratory protection program requirements and practices for effective implementation was recognized as above and beyond the minimum requirements of DOE-0352.
3. Review of the requirements management program to identify any possible gaps in accordance with the implementation of the program.
4. Cartridge Testing Review was noted as a commendable and identified as a proactive example, that identifies a positive direction for H2C and the implementation of a Respiratory Protection Program well above the minimum requirements of DOE-0352. The Assessment Report Attachment 4, Cartridge Testing Review, indicated that in 2017 cartridge testing was completed on the AZ exhauster during waste disturbing activities using Scott FFAPR cartridges. PAPR testing on SSTs (BY and SX) and DST (AX and AP). STC reviewed in-situ FFAPR cartridge testing in STC Report 1, where STC recommended investigating PAPR cartridges and testing both cartridges under waste disturbing activities. WRPS had already initiated both STC recommendations independently of STC review. STC reviewed testing for PAPR cartridges and waste disturbing activities in STC Report 2. Field testing determined that ammonia breakthrough occurred before other COPCs in the majority of tests and was in line with the service life calculator.

The second phase of in-situ cartridge test results identified limitations and uncertainty of field testing. The key findings identified the need for laboratory testing to determine breakthrough time for elevated concentrations representative of potential maximum headspace concentrations, control environmental variables (relative humidity and temperature), and determine better methods for quantifying furan and nitrosamine breakthrough times and concentrations. WRPS worked with Pacific Northwest National Laboratory (PNNL) to design a Laboratory Respiratory Cartridge Testing System (LRCTS). PNNL had been maintaining the monthly reporting and property records

required. PNNL completed the “Standardized Test Protocol for Qualifying New APR and PAPR Cartridges for Use in Hanford Tank Farms” and submitted PNNL-35586 “Basis for Cartridge Performance Testing – Hanford Tank Farms” to satisfy the requirements. As changes are made to the LRCTS system the standardized protocol will require document revisions. The FY24 reports (Draft and Final) were postponed due to data and laboratory issues and postponed until FY25. Current cartridge testing is on hold and under SWOT review by H2C management.

### **Opportunities for Improvement**

The OFIs identified in the ITDC-ASMT-2025-0036 - FY25-ESHQ-R-Respiratory Protection Program Assessment are important enhancements that we recognize, from H2C presentations, that H2C is addressing.

#### **1. Medical Evaluation Process**

At Hanford, an Employee Job Task Analysis (EJTA) is a formal process used to document:

- An employee's job duties and essential functions
- Physical job demands
- Potential workplace hazards and exposures (chemical, radiologic, biologic, ergonomic, noise, etc.)

Medical qualification requirements (such as RPE use, beryllium work, hearing conservation, lead work, etc.) The primary purpose of the EJTA is to communicate job-task and hazard information to the SOMC so employees are enrolled in the appropriate medical surveillance and qualification programs required under DOE worker safety regulations. The Assessment found that worker medical programs are assigned by management using the EJTA process. The EJTA Form identifies whether workers are required to wear impermeable PPE, work in hot/cold conditions, and the possible physical demands of their job. However, it was observed by an IH during the assessment that the current EJTA Form does not specify anticipated duration and frequency of RPE usage. The Form is also set up to identify hazards that would require RPE use. The assessment team identified the EJTA Form as a document that could be reformatted to group all RPE use together and not have multiple sections for respiratory hazards spread out across the EJTA form. The Team suggested a review of the EJTA process and forms to consider grouping questions that pertain to respiratory usage and working conditions together in one section of the form.

#### **2. Medical Evaluation Process**

During an interview with the IH for the SOMC, Inomedic Health Applications, Inc. (IHA), the IH communicated to a team member that EJTA forms were not communicated to them, and the respirator use, duration and frequency was communicated to health care professionals using a questionnaire during the annual physical. The team assessed that some form of communication between the medical provider and the worker needs to be documented and communicated possibly including more data on respirator use and frequency.

### **Adverse Conditions (AC)**

1. An IH review of RPFs and work control documents (e.g., IHWPs, IH Sample Plans, and Field Work Packages) concluded that the cartridge change out frequency was not

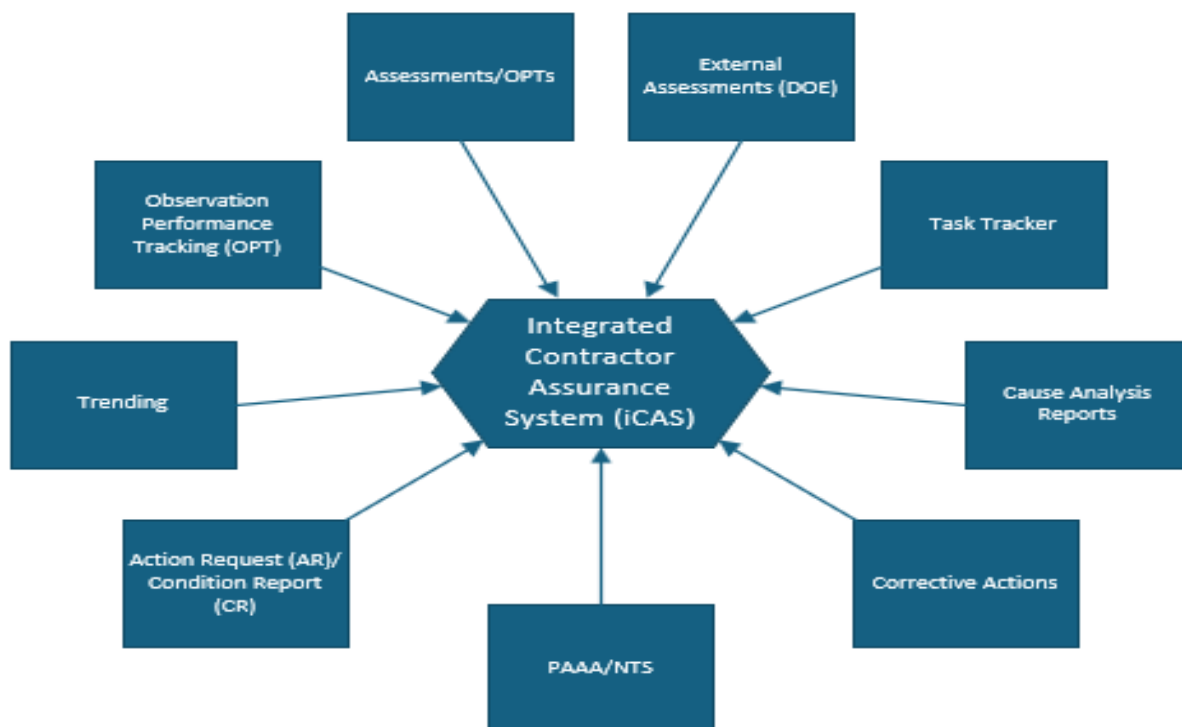
captured or documented. Further discussion with the assessment team led to the possibility of cartridges being used longer than the recommended by the manufacturer in cases where cartridges are not disposed of for radiological reasons or for the contractual mandated three-hour limit agreed upon with the Hanford Atomic Metal Trades Council (HAMTC).

STC noted that the RPF sample documentation provided by H2C had RPE cartridge change schedules clearly indicated.

## IH Program Assessments

IH Department has established a rolling 3-year schedule for IH Program Assessments, in addition to annual and triannual assessments of the RPP. That schedule is communicated to Hanford Atomic Metal Trades Council (HAMTC) Safety, ensuring resources are available and can be planned accordingly. Assessment items are selected from lines of inquiry (LOI) and findings, as well as Department initiatives, are tracked with the Integrated Contractor Assurance System (iCAS).<sup>119</sup>

iCAS issues management modules expanded from the former Problem Evaluation Request System by allowing users to enter identified issues as well as capturing strengths and good practices. The iCAS Task Tracker feature expands capabilities for tracking initiatives as well as assessment items.



iCAS captures issues, tracks, and manages action requests (ARs), condition reports (CRs), actions, and related workflows. Assessments support planning, executing, and documenting

<sup>119</sup> Tank Vapor Program Evaluation, TOC-IH-65892 REV 00, June 30, 2026.

assessments. Observation performance allows employees to perform operational performance task (OPTs) tracking enables assignment, progress tracking, reviews, and approvals. Trend Analysis uses data which is analyzed and reviewed for trends with use of functional area codes, information codes, and other data points applied to issues during the workflow life cycle. Examples of Trend Analysis include TF-OPS-OPER-C-67 event and TF-AOP-15 event responses.

The AR Initiator receives an email once the AR has been screened, which identifies the Responsible Manager (RM) assigned to the issue. If the Initiator wishes to discuss the AR further, they are welcome to contact the RM at any time. Although H2S's procedure states that it is best practice for the RM to reach out to the Initiator for clarification, this is not a requirement. After the AR is submitted, the Initiator relinquishes ownership of the issues to the RM (Issue Owner). When the AR/CR process is complete, the Initiator will receive an email confirming that the CR has been closed. If the Initiator is not satisfied with the closure, they may submit a new AR. The Operational Performance Tracking (OPT) Business Intelligence (BI) dashboard enables the visualization of the OPT program by providing interactive, real-time insights into employee and manager participation, observation data, and engagement trends across H2C. By translating key OPT metrics and observation results into clear visual formats, the dashboard helps highlight how active participation supports H2C's core values and company-wide continuous improvement. This visualization empowers leaders to identify progress, reinforce positive behaviors, and drive meaningful enhancement in safety, teamwork, and organizational culture.

The OPT program is a resource and tool available to all employees at H2C. Through active participation in OPT, employees and managers engage in meaningful observations and interactions that contribute to company-wide continuous improvement. Emphasis is placed on observing work activities as a fundamental demonstration of the H2C values: "Live Safely; Listen First; Act With Integrity; Commit to the Mission; Own It; and Make It Better."

OPT encourages face-to-face employee and management interactions within respective departments and/or field environments. Furthermore, these interactions help managers foster desired behaviors, increase engagement, and reinforce expectations. OPT is designed to enhance processes, procedures, and programs by fostering a culture of safety, integrity, teamwork, productivity, and results.

## **ATTACHMENT 7: STC Review Team Bios**

### ***Project Director***

#### **Knut Ringen, DrPH, MHA, MPH, Project Director**

Dr. Knut Ringen is a principal in Stoneturn Consultants, located in Seattle, WA. He is also the Senior Science Advisor, CPWR: The Center for Construction Research and Training ([www.cpwr.com](http://www.cpwr.com)) in Washington, DC, which is a global leader in construction safety and health research, and for which he served as founding executive director. He has also held appointments at the U.S National Academy of Sciences, where he served as study director on major scientific reviews, and the National Institutes of Health, where he helped lead the early work on health disparities.

He has chaired the Scientific Committee on Occupational Health in the Construction Industry, International Commission on Occupational Health (ICOH); and is Vice President, Construction Section of the International Social Security Association (ISSA). He was Chairman, Department of Labor's National Advisory Committee on Construction Safety and Health from 1993 to 1997. He is an elected Fellow of the European Academy of Sciences and the Collegium Ramazzini. He received a master's degree in health administration from the Medical College of Virginia (now part of VCU) and master's degree and a doctorate degree in public health from Johns Hopkins University.

Over the years he has led several programs that have made significant changes in safety and health policies in the US and internationally, especially in the construction industry. Since 1996 he has also led an effort to evaluate the health of older construction trades workers in America's nuclear weapons facilities, including over 5,000 former Hanford workers, many of whom have had experience in the Tank Farms.

In 2011, the Secretary of Energy's Blue Ribbon Commission on America's Nuclear Future commissioned him to conduct an assessment of the state of occupational safety and health throughout the civilian nuclear fuels cycle, and compare it to other sources of energy, including fossil/hydrocarbon fuels and alternative sources of energy. He has served on several National Academies Committees to review respiratory PPE requirements including Committee on Personal Protective Equipment in the Workplace; Committee to Review the NIOSH Personal Protective Technology Program; Committee for the Assessment of the NIOSH Head-and-Face Anthropometric Survey of U.S. Respirator Users.

### ***Subject Matter Experts***

#### **Howard J. Cohen, PhD, CIH, Subject Matter Expert**

Dr. Cohen is located in New Haven, CT. He has worked in industrial hygiene for 40 years, of which the first 17 years for Monsanto and Olin Corporations, and then switching to an academic career at University of New Haven and Yale University. He is widely recognized for his

expertise in the administration of respiratory protection programs and in carbon chemistry used in respirator cartridges and canisters. He has served on many National Academy Committees in the area of personal protective equipment, and was chair of the 2010 Certification Study of Personal Protective Technology. He is a current member of the Committee on Personal Protective Equipment in the Workplace. He has been Chair of the ANSI Z88.2 Committee on Respiratory Protection. He has received numerous professional awards for his work. He received his master's degree and PhD in industrial health from the University of Michigan.

**John M. Dement, PhD, CIH, Subject Matter Expert.**

Dr. John M. Dement is Professor Emeritus in the Division of Occupational and Environmental Medicine, Duke University Medical Center. He also is an Adjunct Professor in the Department of Epidemiology at the University of North Carolina at Chapel Hill, School of Public Health. Dr. Dement is certified in the Comprehensive Practice of Industrial Hygiene and holds a B.S. in Mechanical Engineering from N.C. State University, an M.S. in Industrial Hygiene from the Harvard School of Public Health, and a Ph.D. in Industrial Hygiene/Epidemiology from the UNC School of Public Health.

Prior joining the Duke faculty in 1993 Dr. Dement served in the U.S. Public Health Service for 22 years where he was employed in various research and management positions by the National Institute for Occupational Safety and Health (NIOSH) as deputy director of the Division of Respiratory Health, and the National Institute of Environmental Health Sciences (NIEHS). He has authored well over 160 peer-reviewed publications concerned with a broad spectrum of occupational health and safety issues including exposure assessment methods for epidemiological studies, occupational respiratory diseases, occupational cancers, occupational injury epidemiology, and the development and implementation of occupational health and safety surveillance systems. Dr. Dement has served on numerous national and international panels and committees convened by governmental organizations, the World Health Organization, the Institute of Medicine, labor organizations, and industry groups. He served on the NIOSH Board of Scientific Counselors 1994-2003 and ACGIH Board of Directors 1987-1990, serving as Chair in 1989. Most recently, Dr. Dement served two terms (2016- 2020) on the U.S. Department of Labor (DOL), Advisory Board on Toxic Substances and Worker Health.

Since 1997 Dr. Dement has provided industrial hygiene and epidemiological expertise to the Building Trades National Medical Screening Program (BTMed). BTMed is funded through a cooperative agreement between the U.S Department of Energy (DOE) and the Center for Construction Research and Training (CPWR) and provides occupational medicine screening examinations to former workers from 35 DOE sites throughout the U.S. From 2004-2006 Dr. Dement also served as an expert on a Health Effect Panel which evaluated medical surveillance data (lung function and liver function) for workers engaged in Hanford tank farm work. Dr. Dement is located in Holly Springs, NC.

**James S. Johnson, PhD, CIH, QEP, Subject Matter Expert**

Dr. Johnson is a nationally recognized respirator subject matter expert who is located in Pleasanton, CA. He has been involved in wide variety of respirator research and program topics such as hazard assessment, proper selection, filter and cartridge performance, fit, fit testing, maintenance, storage and disposal. Before retiring from full-time employment in 2006, he

worked in the occupational safety and health program at Lawrence Livermore National Laboratory for 45 years. Since then he has worked as private consultant to government and private sector clients. He also directs, manages and participates on several national consensus standards, e.g. ANSI/ASSE Z 88 on Respiratory Protection and NFPA Technical Correlating Committee on Fire and Emergency Services Protective Clothing and Equipment. He has served on numerous national consensus development and review committees that have driven development of PPE technologies and programs in the US, including the National Academies' Standing Committee on Personal Protective Equipment for Workplace Safety and Health, 2009-2014. He earned a BA in chemistry, a MSH in air pollution and industrial hygiene, and PhD in organic and inorganic chemistry.

**Bruce Lippy, PhD, CIH, CSP, FAIHA, Subject Matter Expert**

Dr. Lippy began his career in industrial hygiene in 1978 working for Maryland OSHA, where he routinely trained workers, union groups and contractors about respiratory protection. He was certified in the comprehensive practice of Industrial Hygiene in 1985 (#3023) and as a Safety Professional in 1992 (#11472). He is a member of the National Response team and served at the cleanup of the World Trade Centers. During his two months at the site, he provided hundreds of respirators to the heavy equipment operators on the pile and taught them proper donning, doffing and cleaning of the respirators. He also worked with NIOSH to determine breakthrough of carbon cartridges on the site. He was a co-director and safety officer of the sampling team that opened the anthrax-contaminated AMI Building in Boca Raton, Florida. His duties there included quantitatively fit testing the team members and workers on the site, all of whom wore full-face powered air purifying respirators. As Director of Special Projects with the Operating Engineers National Hazmat Program, he led several teams evaluating innovative personal protective equipment for the Department of Energy, including a level B ensemble that uses liquid air to supply breathing gas and cooling to a garment for over an hour. Under a grant from the Department of Homeland Security, Dr. Lippy created and delivered training to a broad range of responders who would have to put down an Avian Influenza outbreak among poultry in the midwest. He was responsible for the training on proper respiratory protection in the various scenarios. He has spent hundreds of hours wearing respiratory protection on a wide variety of industrial and disaster worksites. Dr. Lippy was awarded a Distinguished Fellow of the AIHA at the 2015 annual conference.

**Richard W. Metzler, MSIE, Subject Matter Expert**

Rich Metzler has 49 years of experience directing, managing, and performing assessment activities in the field of occupational safety and health in conformance with National Institute for Occupational Safety and Health (NIOSH) and Mine Safety and Health Administration (MSHA) respiratory protective device (RPD) and mining equipment Federal regulations, Occupational Safety and Health Administration (OSHA) and National Fire Protection Association (NFPA) personal protective equipment and RPD regulations and standards. Experience includes scientific research and engineering investigations related to product safety standards, laboratory, and field product evaluations including investigations related to product conformance, injuries, or fatalities. Experience includes more than 35 years directing Federal product approval, certification, and research programs including the supporting laboratories. This experience includes both leadership skills and engineering expertise with national and international

respiratory protective device design, performance, quality and reliability standards and associated test procedures

**Erich J (Pete) Stafford, BS, Subject Matter Expert**

Pete Stafford was Executive Director of the CPWR-The Center for Construction Research and Training, Safety and Health Director for North America's Building Trades Unions (NABTU), and Chair of U.S. DOL/OSHA's Advisory Committee on Construction Safety and Health (ACCSH) until Dec. 31, 2016, when he retired after 27 years of service at CPWR. Mr. Stafford has 35 years of experience in construction safety and health, serves on many construction industry advisory boards and committees, and is currently a CPWR Senior Advisor and Special Assistant to the NABTU President, where one of his primary responsibilities is coordination and conduct of safety culture/climate assessments of complex nuclear and industrial construction projects.

## **ATTACHMENT 8: Comments on Draft from H2C and HAMTC and STC Responses**

### **A Note on H2C and HAMTC Review of a Draft of this Report**

A draft of this report was provided to H2C and HAMTC for review on September 8, 2026, with a request that they return any comments by September 17. We added these to the final submission. Minor changes such as spelling, punctuation or document titles or numbers have been made but are not recorded. Any substantive changes are recorded in a footnote where they were made and are noted here.

### **H2C Comments**

#### **H2C Comment 1 (p. 10, FN 1):**

H2C has clarified ammonia's role as a "sentinel" indicator of changing vapor conditions, and both defines and uses the term consistently in vapor management strategy and procedures.

#### **STC Response:**

We have accepted this recommendation and changed the term throughout the report.

#### **H2C Comment 2 (p. 10, FN 4) :**

VMDS is an administrative control on the engineering control. VMDS monitoring has specified actions to be taken at specified set-points.

#### **STC Response:**

We have accepted this change and now describe VMDS as an "administrative control."

#### **H2C Comment 3 (p.26):**

H2C Comment: "Clarification: The lower values reflect instrument concentration constraints, not an added safety factor; where ammonia MTCs exceeded the validated 5 - 4750 ppm instrument range, conservative in-range action levels were applied instead. (RPP-RPT-61386, Rev. 0, Sec. 5.1.2-5.1.3; Tables 8-10).

H2C Comment 2: The limit they are discussing with this statement is the high alarm compared to the 2.5 ppm ammonia on the ground. A Farm has a High Alarm of 160 ppm, slightly rounded down from the 2.5 ppm on the ground. SY Farm's High Alarm and 2.5 ppm on the ground are equal. AX Farm, when it was actively ventilated, also had equal High Alarm and 2.5 ppm on the ground. AN, AP, AW, and AY/AZ's 2.5 ppm on the ground is considerably higher than their High Alarm. I believe this was to reduce HPI concerns [3 sets of alarm values vs 7 sets of alarm values (each farm with its own)]. However, I am not sure if that is documented anywhere stating that effect.

#### **STC Response:**

This is still unclear.

#### **H2C Comment 4 (p. 31, FN 64):**

The cartridge change-out schedule associated with the use of the 99 ppm AL is 2.5 hours, as the results of the MSA® Response Guide Cartridge Life Expectancy Calculator estimates the breakthrough time as 2 hours and 44 minutes for all combinations of temperature (32°F, 70°F, 105°F), humidity (10%, 75%, 90%), and breathing rate [60 LPM (moderate), 85 LPM (heavy)] for a constant concentration of 99 ppm, breakthrough of 25% PEL, and a safety factor of 5%. These results were rounded down to 2.5 hrs. The cartridge change-out schedule was not rounded down further as it is implemented with the administrative control of continuous monitoring. If monitoring results reach 99 ppm (AL), then work is placed in a safe configuration, and workers will relocate to a safe area. TOC-IH-59014 Section 5.3.1.3 (pdf page 43) notes that “[m]ost WC-3 and WC-4 work activities are ≤ 2-hour in duration”.

**STC Response:**

This clarification is helpful and accepted.

**H2C Comment 5 (p. 33, FN 75):**

Initially on September 15, 2026, H2C inserted comments into STC Report 5 draft, September 8, 2026, that expressed three factual clarifications concerning a paragraph in Section 4.1 related to a description of TFC-MD-207 and TFC-PLN-173. The clarifications identified the following points:

1. Add "MDRPF-PLN-173". Additional information for Clarification: There are currently 2 MDRPFs, MDRPF-STD-07 [Passively Ventilated Farms (All WCs), Actively Ventilated Farms (WC-3 & WC-4)] & MDRPF-PLN-173 [Actively Ventilated Farms (WC-1 & WC-2)]
2. FFAPR is allowed for WC-1 and WC-2 activities in both actively ventilated and passively ventilated Tank Farms. Currently, there is a procedure associated WC-1 and WC-2 activities in actively ventilated Tank Farms (TFC-PLN-173). This procedure was introduced to transition from management directed SCBA for those activities to FFAPR.
3. Update to “Alternatively, work may utilize the hazard-based RPF if it provides equal or more protective requirements than the MDRPF.” [TFC-MD-207 Section 4.2 (page 3), TFC-ESHQ-IH-C-48 Revision Presentation R3 (pdf page 10)]. Additional information for Clarification: The ARPA process is utilized to downgrade requirements from Management Directed RPE. Subsequently, it is an exception to TFC-MD-207 (TFC-MD-207 Section 1.0, page 2). "An ARPA is unique to H2C and is required for work activities where the use of respiratory equipment introduces a greater safety hazard than the potential exposure to chemical vapors (e.g., supplied air work within an arc flash boundary, elevated work on ladders)" (TFC-ESHQ-IH-STD-07 Section 3.3.5, pdf page 6).

On September 28, 2026, STC was notified via an email that TFC-MD-207 had been updated to improve consistency and simplify the management-directed respiratory protection process. As part of this update, TFC-PLN-173 and TFC-MD-207 were combined and consolidated.

**STC Response:**

STC initially considered re-writing a paragraph as follows to address H2C September 15, 2026 comments:

H2C Tank Farm operations and industrial hygiene (IH) improvements, including enhancements to engineering controls, IH management of tank chemical vapors, and associated programs and practices, currently support management-directed respiratory protection (TFC-MD-207, MDRPF-STD-07, MDRPF-PLN-173) for all personnel entering within the perimeter fence of a Tank Farm with the provisions for the use of full face air-purifying respirators (FFAPR). Management Directive, Use of Respiratory Protection in Tank Farms, TFC-MD-207 remains in effect. This management directive applies to all personnel entering within the perimeter fence of any tank farm with exception of work that utilizes that uses the Alternative Respiratory Protection Assessment (ARPA) process specified TFC-ESHQ-IH-STD-07. MDRPF-STD-07 addresses all work categories in passively ventilated farms, and work categories 3 and 4 in actively ventilated farms. MDRPF-PLN-173 addresses work categories 1 and 2 in actively ventilated farms. Alternatively, work may utilize the hazard-based RPF if it provides equal or more protective requirements than the applicable MDRPF. An ARPA is unique to H2C and is required for work activities where the use of respiratory equipment introduces a greater safety hazard than the potential exposure to chemical vapors (e.g., supplied air work within an arc flash boundary, elevated work on ladders). [FN: Managing Tank Chemical Vapors, TFC-ESHQ-IH-C-48 Presentation, March 2026; Use of Respiratory Protection in Tank Farms, TFC-MD-207, add date; Respiratory Protection, TFC-ESHQ-IH-STD-07, September 23, 2025]

Given the updated TFC-MD-207, REV 3, September 22, 2026, document, STC revised the Section 4 paragraph as follows:

H2C Tank Farm operations and industrial hygiene (IH) improvements, including enhancements to engineering controls, management of tank chemical vapors, and associated programs and practices, currently support management-directed respiratory protection in accordance with TFC-MD-207 and TFC-ESHQ-IH-STD-07 for personnel entering within the perimeter fence of Tank Farms. The updated TFC-MD-207 indicates it is consistent with the 2016 Memorandum of Agreement between WRPS and HAMTC and the 2023 Settlement Agreement Modification (Subparagraph III.A.2), as discussed in Section 4.0. Tank vapor management practices and work category correlations are described in TFC-ESHQ-IH-C-48. TFC-MD-207 directive formalizes the process for implementing mandatory respiratory protection requirements in Tank Farms, except for work activities that utilize the Alternative Respiratory Protection Assessment (ARPA) process specified in TFC-ESHQ-IH-STD-07. The ARPA process, which is unique to H2C, is required when the use of respiratory protection equipment would introduce a greater safety hazard than the potential exposure to tank chemical vapors, such as supplied-air work within an arc-flash boundary or elevated work performed from ladders.

### **HAMTC Comments**

HAMTC provided detailed comments on our report, in which it raised issues about the timing and H2C's organizational readiness to adopt hazard-based respiratory protection as proposed. Many of these comments highlight issues we (as well as H2C's self-assessments) have identified, and which have led us to caution about implementation speed, the importance of maintaining organizational diligence, and ongoing assessment of workforce readiness. Otherwise, we let HAMTC's statement speak for itself. We have included it in its entirety in Attachment 9.

## **ATTACHMENT 9: HAMTC Statement**

# Hanford Tank Vapor Program

HAMTC Senior Management Report: Worker Protection Position,  
Residual Risk, and Required Assurance

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**Presented to:** Stoneturn Consultants

**Presented by:** HAMTC

**Report date:** September 29, 2026

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## Executive Summary

Substantial improvements have been made in response to the deficiencies identified in the 2014 Hanford Tank Vapor Assessment Team review, including engineering controls, vapor monitoring, industrial hygiene capability, respiratory protection governance, and integrated safety planning. However, most of this work was completed under the previous contractor, Washington River Protection Solutions (WRPS), and should not be attributed to H2C. Although the 2026 Stoneturn Consultants review concludes that the program provides a technical basis for transitioning toward hazard-based respiratory protection, HAMTC does not agree that implementation should proceed at this time.

**HAMTC position:** Existing respiratory protections should remain in place, and the proposed hazard-based respiratory protection plan should not proceed unless and until H2C establishes a sustained, independently verifiable record of commitment to worker safety. H2C has not operated the tank farms long enough for HAMTC to evaluate that commitment through demonstrated performance. The unresolved concerns include workforce trust, VMDS reliability, contractor integration, transparent communication, and the transfer and continued effectiveness of WRPS-era controls.

### Management Decisions Requested

1. **Do not authorize implementation** of the proposed hazard-based respiratory protection plan at this time; maintain existing respiratory protections.
2. **Require an H2C assurance period** with defined duration, measurable safety-performance criteria, and independent verification before reconsidering any reduction in respiratory protection.
3. **Direct a VMDS recovery plan** with a target availability of at least 95%, defined redundancy, preventive-maintenance actions, and routine executive reporting.
4. **Require common vapor-protection qualification** for borrowed workers, building trades personnel, and subcontractors before assignment to affected work.
5. **Establish joint oversight with HAMTC** to verify workforce engagement, corrective-action durability, and the continued effectiveness of controls developed under WRPS.

### Residual Risk Dashboard

| Residual Risk                                 | Rating | Required Management Control                                                                              |
|-----------------------------------------------|--------|----------------------------------------------------------------------------------------------------------|
| H2C safety commitment and performance history | High   | Maintain existing respiratory protection during a defined assurance period with independent verification |

|                                                   |                      |                                                                                                                                   |
|---------------------------------------------------|----------------------|-----------------------------------------------------------------------------------------------------------------------------------|
| <b>Workforce readiness and trust</b>              | <b>High</b>          | HAMTC participation, workforce survey, transparent criteria, and no implementation without demonstrated acceptance and protection |
| <b>VMDS reliability</b>                           | <b>High</b>          | At least 95% availability, redundancy, and routine performance reporting                                                          |
| <b>Transfer of WRPS-era controls</b>              | <b>High</b>          | Verify that inherited controls, staffing, procedures, and competencies remain effective under H2C                                 |
| <b>Contractor and borrowed-worker integration</b> | <b>Moderate–High</b> | Standard qualification before assignment                                                                                          |

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# Legacy Accomplishments Requiring H2C Sustainment

## 1. Vapor Control Program Improvements Developed Primarily Under WRPS

Major program enhancements were developed and implemented principally during the WRPS contract period. H2C inherited these controls and must demonstrate that it can sustain and improve them, including:

- Quantitative Risk Assessments (QRA)
- Elevated exhaust stacks
- Vapor Monitoring and Detection System (VMDS)
- Personal Ammonia Monitors (PAMs)
- Improved industrial hygiene staffing and qualifications
- Enhanced integration of engineering, operations, and industrial hygiene into work planning processes.

## 2. Inherited Respiratory Protection Program Capabilities

The current Respiratory Protection Program includes the following capabilities, developed largely before H2C assumed responsibility. Their continued effectiveness under H2C requires verification:

- Clear governance structure
- Improved qualification and training systems
- Robust equipment control and tracking
- Effective respiratory equipment issuance processes
- Integration with DOE-wide respiratory protection requirements.

## 3. Industrial Hygiene Capability Built Since the 2014 Review

The TVAT identified industrial hygiene staffing and expertise as a major weakness in 2014. Capability grew substantially after that review, primarily during the WRPS period. H2C must now demonstrate that staffing, expertise, exposure assessment, and worker-support systems remain effective and adequately resourced:

- Certified expertise
  - Qualification programs
  - Exposure assessment methods
  - Worker support capability
  - Continuous improvement systems.
-

# Key Remaining Risks

## Risk #1: Workforce Readiness and Trust

Risk Level: HIGH

STC was unable to identify a formal workforce readiness assessment, and HAMTC has not received sufficient evidence to conclude that workforce concerns regarding vapor protection have been resolved.

Current gaps include:

- No documented workforce survey
- No readiness criteria
- No evidence of measuring worker acceptance
- Uncertainty regarding workforce confidence in the adequacy and reliability of current vapor protections.

### Potential Consequences

- Loss of workforce trust
- Increased symptom reporting
- Increased voluntary respirator upgrades
- Labor-management conflict
- Reduced confidence in hazard assessment decisions.

### Recommendation

Maintain existing respiratory protections and conduct a formal workforce safety-climate and readiness assessment to document concerns, evaluate trust, and establish evidence for corrective action:

- Workforce survey
  - Focus groups
  - Safety-climate and trust metrics
  - Documented corrective actions and closure criteria developed with HAMTC
  - Independent verification that existing respiratory protections remain effective.
- 

## Risk #2: VMDS Reliability

Risk Level: HIGH

Continuous stack monitoring is a foundational element of the hazard-based strategy.

STC reports:

- VMDS availability may only be approximately 50%.
- Alternative monitoring relies on administrative controls and manual observations.
- STC expressed greater confidence in VMDS engineering controls than intermittent monitoring methods.

### Potential Consequences

- Reduced confidence in hazard-based protection
- Increased risk during waste-disturbing activities
- Dependence on less protective controls

### Recommendation

Establish a VMDS reliability improvement program:

- Availability target  $\geq 95\%$
  - Redundant monitoring technologies
  - Enhanced preventive maintenance
  - Performance metric reporting to senior management.
- 

## Risk #3: Contractor and Borrowed Worker Integration

Risk Level: MODERATE-HIGH

STC identified recurring concerns regarding:

- Borrowed workers
- Building trades personnel
- Subcontractors
- Co-located work operations.

These workers may not have equivalent understanding of:

- Vapor controls
- Work categories
- PAM response expectations
- Respiratory protection requirements

### Recommendation

Develop a formal vapor qualification process for:

- Borrowed workers
- Short-term workers

- Construction contractors
  - Subcontractors
- 

## Risk #4: Workforce Communication and Trust

Risk Level: MODERATE

The 2014 TVAT report repeatedly emphasized worker trust and communication as essential safety functions. Although substantial improvements have been made, STC continues to identify communication-related opportunities for improvement.

Examples include:

- Communication of incident follow-up
- Access to monitoring data
- Workforce understanding of vapor controls
- Union engagement

## Recommendation

Establish a formal communications program with:

- Quarterly vapor briefings
  - Workforce dashboards
  - Survey results publication
  - Closure reports for major vapor events
-

## Management Assurance Plan: Next 12 Months

| Priority | Management Action                                                                                      | Accountable Lead                                       | Target Timing         | Evidence Required                                                                                   |
|----------|--------------------------------------------------------------------------------------------------------|--------------------------------------------------------|-----------------------|-----------------------------------------------------------------------------------------------------|
| 1        | Maintain existing respiratory protection requirements; do not implement the proposed hazard-based plan | DOE and H2C leadership                                 | Immediate and ongoing | Written direction confirming protections remain in effect pending formal reconsideration            |
| 2        | Establish an H2C safety assurance period and baseline                                                  | DOE with independent oversight and HAMTC participation | 0–3 months            | Defined duration, leading and lagging indicators, audit protocol, and transparent reporting cadence |
| 3        | Verify sustainment of WRPS-era vapor controls, staffing, procedures, and competencies                  | Independent review team                                | 0–6 months            | Documented control-by-control verification and corrective-action closure                            |
| 4        | Improve VMDS availability and redundancy                                                               | Engineering and Operations                             | 0–6 months            | Availability at or above 95%, preventive-maintenance plan, and recurring performance reports        |
| 5        | Conduct workforce safety-climate and readiness assessment with HAMTC                                   | Joint labor-management team                            | 3–9 months            | Survey and focus-group results, documented concerns, and agreed closure criteria                    |
| 6        | Strengthen contractor and                                                                              | Training and contractor management                     | 0–6 months            | Common vapor-protection qualification                                                               |

|   |                                                                             |                     |                                  |                                                                                                     |
|---|-----------------------------------------------------------------------------|---------------------|----------------------------------|-----------------------------------------------------------------------------------------------------|
|   | borrowed-worker integration                                                 |                     |                                  | required before assignment                                                                          |
| 7 | Return any future proposal to senior management and HAMTC for formal review | DOE, H2C, and HAMTC | After assurance criteria are met | Independent evidence package demonstrating sustained performance and resolution of identified risks |

## HAMTC Conclusion

HAMTC does not concur with proceeding with the proposed hazard-based respiratory protection plan at this time. The technical and program improvements described in this report were accomplished largely under WRPS, and H2C's tenure is not yet sufficient to establish a reliable record of commitment to worker safety or to demonstrate durable performance of the inherited controls. Senior management should maintain existing respiratory protections, require an independently verifiable H2C assurance period, confirm the sustained effectiveness of WRPS-era controls, and resolve the identified monitoring, workforce-trust, and contractor-integration risks before any future proposal is considered. Any reconsideration should require formal review with HAMTC and documented evidence that worker protection will not be reduced.