washington river protection solutions

CPPO Chemical Protection Program Office

CPPO Weekly Report Covers from the 4th Quarter of FY 2018

***Top Left**: Early morning at the central residence for the IHTs in the 200 East area, August 2018, courtesy C. Holst.*
***Top Right:** New sign marking the boundary of a potential vapor emission source greater than or equal to 50 percent of the OEL, September 5, 2018, all-employee email (one of multiple notifications communicated to the workforce) notified the workforce of the changes captured in TFC-ESHQ-IH-C-48.*
***Bottom Left:** The new TerraGraphics Mobile Laboratory, August 2018, courtesy of K. Riedner.*
***Bottom Right:** Above-ceiling HLAN and HVAC installation in the Industrial Hygiene 10-Wide, September 2018, courtesy L. Parks-Beyer.*

Tank Operations Contract Chemical Protection Program Office Fiscal Year 2018 Annual Summary

October 18, 2018

The CPPO Fiscal Year (FY) 2018 Annual Summary is a description of WRPS's FY 2018 scope and activities performed in support of the ongoing chemical vapors hazard control efforts.

1. STATE of VAPORS RELATED ACTIVITIES

Washington River Protection Solutions LLC (WRPS), answering the Tank Vapors Assessment Team (TVAT) recommendations offered in the 2014 *Hanford Tank Vapor Assessment Report,* created the 2015 *Implementation Plan for Hanford Tank Vapor Assessment Report Recommendations* (WRPS-1500142). The implementation plan actions were completed at the end of fiscal year (FY) 2016, and included the validation/update of headspace characterization; the research and development of new monitoring and detection equipment; the development of an enhanced Industrial Hygiene (IH) program focused on creating parity with the Radiological Control program; and the development of new and enhanced training to educate workers about the hazards of working in and around the tank farms. The Chemical Protection Program Office (CPPO) was established coincidentally.

As the implementation plan unfolded, multiple agencies conducted assessments, including the National Institute for Occupational Safety and Health (NIOSH), Department of Energy -Office of Inspector General (DOE-OIG), CTEH, and DOE-Office Environment, Safety, and Health Assessments (EA-32). The observations and recommendations for enhancing the vapor management strategies coupled with feedback from stakeholders were incorporated into a comprehensive vapor management strategy. Consequently, a *Comprehensive Vapor Action Plan* (CVAP) was drafted. The CVAP replaced the *Implementation Plan for Hanford Tank Vapor Assessment Report Recommendations,* and in so doing, defined the eight key performance parameters (KPPs) that WRPS used to monitor and measure progress and success in FY 2017 and FY 2018. The eight KPPs are:

1. Establish a comprehensive vapor management communication plan, engagement processes, and effectiveness measurements.
2. Maintain the *Industrial Hygiene Chemical Vapor Technical Basis* document and the chemicals of potential concern (COPC). Institutionalize a disciplined and rigorous process for updates to include new scientific findings and enhanced understandings of potential exposures.
3. Maintain Industrial Hygiene Program and institutionalize vapor program requirements, best practices and program parity, and complete necessary training to support full implementation at the beginning of FY 2018.
4. Complete engineering control concept demonstrations for Strobic®[1] Air Tri-Stack and NUCON®[2] International Inc. thermal combustion concepts in support of unrestricted work boundaries.
5. Define unrestricted work boundaries and implement monitoring on active stack ventilation and unrestricted work boundaries in the A Farms to provide defense-in-depth.

6. Institutionalize a tank operations stewardship program that minimizes required tank farm personnel entries and establishes parameters for locating ancillary personnel and offices.
7. Provide options to promote the hierarchy of controls for chemical vapor respiratory protection beyond current use self-contained breathing apparatus.
8. Support medical program enhancements in conjunction with responsible Hanford Site organizations and establish update to WRPS process/procedures.

At the beginning of FY 2017, WRPS President Mark Lindholm wrote, "[f]ostering chemical vapor-related communications was another major focus in FY 2016. To meet this challenge, we established the **Chemical Protection Program Office**, or CPPO, to oversee chemical protection initiatives." The CPPO's debut *Weekly Report* was published on October 20, 2016. At that time, its reporting format was organized around WRPS's progress on the TVAT recommendations. The CPPO Weekly Report was restructured to reflect the comprehensive vapors mitigation approach as envisioned in the CVAP on March 16, 2017. From that publication to the FY 2018 Annual Summary, the CVAP KPPs have served as the organizing focus and are updated weekly. Significant progress was made in all KPPs in FY 2017, and many were worked to completion in FY 2018.

Just as CPPO's weekly reports and notebooks document the vapors management outcomes over the last year, so too has the CPPO labored to track-to-completion the many assessment recommendations, including those from TVAT, DOE-OIG, EA-32, and CTEH. By the end of FY 2018, a total of 371 vapors-management recommendations had been identified from 3rd party assessors. Eighty-three (83) recommendations had been completed by the end of FY 2017, 63 of which were from the original TVAT report. Throughout FY 2018, the recommendations were tracked and statused under the following criteria:

- **Complete** - The scope and deliverable(s) (i.e. final report or documentation) addressing the recommendation is complete and closed. CPPO validated the deliverable(s) as complete.
- **Field Work Complete** - The scope addressing the recommendation is complete, but the final deliverable(s) is not complete (i.e. final report or documentation).
- **In Progress** - The scope addressing the recommendation is in progress.
- **Pending Validation** - Status of the scope addressing the recommendation and associated deliverable(s) is awaiting initial CPPO review.

Over the course of the year, the percentage of the number of actions generated by the recommendations that were completed rose from 25 percent to 88 percent. The status of the recommendations is listed below:

- 75 percent have been verified **Complete** and are considered closed.
- 13 percent are verified as **Field Work Complete** and are awaiting final deliverables (i.e. documentation) to close.

- 12 percent have ongoing actions and are **In Progress.**
- 0 percent are **Pending.**

The remaining work (with the exception of Aerosol Studies) generated by the recommendations is scheduled for completion in FY 2019.

Table 1. Completion Status of External Assessments Recommendations - FY 2018

Report	As of September 30, 2018				
	Total	Validated Complete	Field Work Complete	In Progress	Pending
TVAT	117	94	11	12	0
OIG	3	3	0	0	0
NIOSH	54	34	9	11	0
EA-32	31	21	4	6	0
CTEH	24	22	0	2	0
VMEP I, II	67	53	10	4	0
Other	75	51	15	9	0
Total	371	278	49	44	0

External Assessments Recommendations Status

At the tail-end of FY 2018, The Department of Energy (DOE) and WRPS announced that a settlement agreement had been signed regarding lawsuits brought by the State of Washington and by Hanford Challenge and Local 598 of the United Association of Plumbers and Steamfitters. The lawsuits were based on concerns about potential health risks posed by vapors vented from mixed waste stored in underground tanks at Hanford.

The settlement agreement acknowledged the many actions DOE and WRPS have taken to protect workers from potential exposure to chemical vapors, including implementing recommendations from independent program reviews conducted between 2014-2018 as described above.

The chemical vapors protection program integrates IH best practices (KPPs 2 and 3) with engineering controls (KPP 4), use of personal protection equipment (PPE) (KPP 7), and robust communications with the workforce before, during, and after work is performed (KPP 1). To complement this approach, WRPS continues to hold regular meetings with workers to foster open dialogue and early identification of safety concerns. WRPS developed a website to provide workers and stakeholders with timely access to information about Hanford tank vapors and workforce protections. The hanfordvapors.com website provides current and

historical data, sampling results, background information, reference materials, and regular IH program updates.

The settlement agreement describes testing engineering controls (KPP 4), including testing a system that may prove capable of reducing vapors by thermal treatment (NUCON® Thermal Oxidation), a vapor control system that uses a high velocity fan to mix the contents of a tank ventilation stack (gases and vapors) with ambient air (Strobic® Air Dilution Fan), and additional work to install an active exhaust ventilation system in the A Farm. WRPS agreed to complete the design of the optimal components and configuration of the Vapors Monitoring and Detection System (VMDS) for exhaust stack monitoring in the A and AX Farms. The agreement notes that DOE and WRPS installed public address and event notification systems in the tank farms to facilitate immediate notifications to workers (KPP 5).

2. CHEMICAL PROTECTION PROGRAM OFFICE (CPPO) ACTIVITIES STATUS

The CPPO, staffed with technical subject matter experts, project managers, and communications expertise, has become a reliable resource for vapors presentations and information, workforce engagement initiatives, weekly CVAP KPP updates, communication effectiveness measures, vapor mitigation activity metrics, tracking external assessments recommendations, and the oversight and integration of vapors activities performed in accordance with the CVAP. Additionally, the CPPO is responsible for addressing draft **Key Performance Parameter #1** (Communications) of the CVAP, and provides the lead interface for continuing refinement of the Data Access and Visualization (DAV) tool. The CPPO Annual Summary includes a description of CPPO's FY 2018 scope and contributions to the vapors efforts, and is CPPO's 85th publication since its inception in October 2016.

In keeping with its mandate, the CPPO oversaw many chemical protection initiatives, including providing pertinent and timely reports and summaries to the HanfordVapors.com website; supporting managers in their vapors discussions with their staff by providing a weekly *CPPO Notebook*; and encouraging the workforce to offer assessments about vapors management through a formal survey, a question/answer feature online, and a focus group.

One employee effectiveness measure, the *Workforce Vapors Information Survey,* was distributed in January 2018. The full report, *2018 Workforce – Vapors Information Survey Results,* was published in May 2018. A second effectiveness measure was a week-long series of focus groups in July and August 2018. The focus group's participants were Hanford Tank Farm field workers, the WRPS employees most impacted by chemical vapors concerns. Overall, the data shows the participants trust the vapors-related information they receive. Respondents consider the use of third party experts, such as CTEH, an effective way to verify information. Resoundingly, face-to-face communications are preferred by the respondents, whereas electronic communications channels are experienced as a less successful means for delivering

information. The respondents reported that they spend little time on a computer during their work day making it very difficult to take advantage of the website offering.

The CPPO group continued to provide outstanding presentations for field organizations through the *CPPO Notebook* in FY 2018, including many well-received presentations written by CTEH professionals and CPPO Subject Matter Experts. The rich *CPPO Notebook* library includes a four-part series on Furans, a two-part series on Dimethylmecury, and an EA-32 Out brief. A full index of the *CPPO Notebook* can be found in Appendix A.

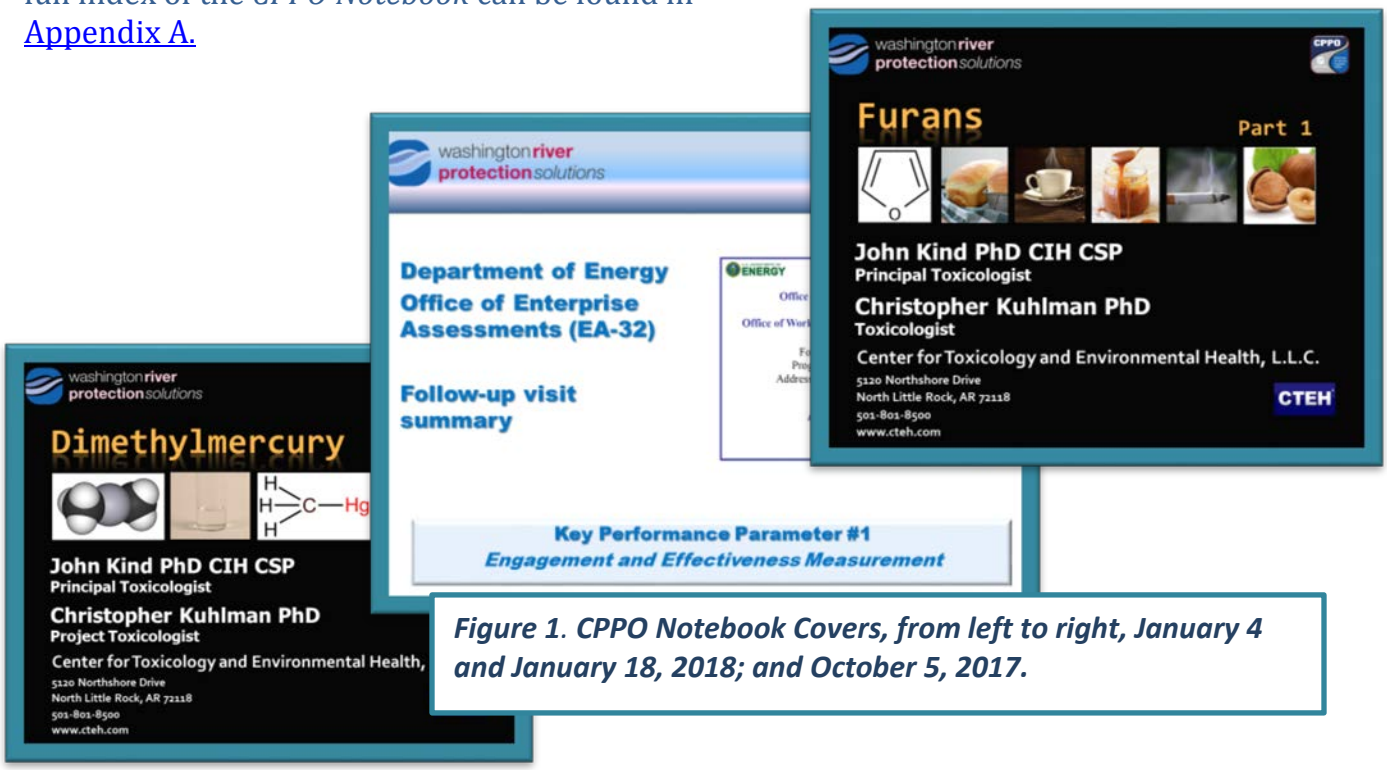


Figure 1. CPPO Notebook Covers, from left to right, January 4 and January 18, 2018; and October 5, 2017.

Ever mindful of supporting the workforce, the CPPO offered via direct email and HanfordVapors.com, a weekly update on the broad and innovative vapors mitigation efforts mapped out in the CVAP. In addition to the weekly progress report on the KPPs, the *CPPO Weekly Report* tracks the vapors related communications WRPS produces and distributes to the workforce and public. The tracking effort is captured in one of the four metrics CPPO produced every month in FY 2018. In addition to the Communications Metric, CPPO produced Website Statistics, Cost and Schedule Metric, and Corrective Action Tracking. A full index of the *CPPO Weekly Report* is in Appendix B.

Additional CPPO activities in the 4th Quarter include the following:

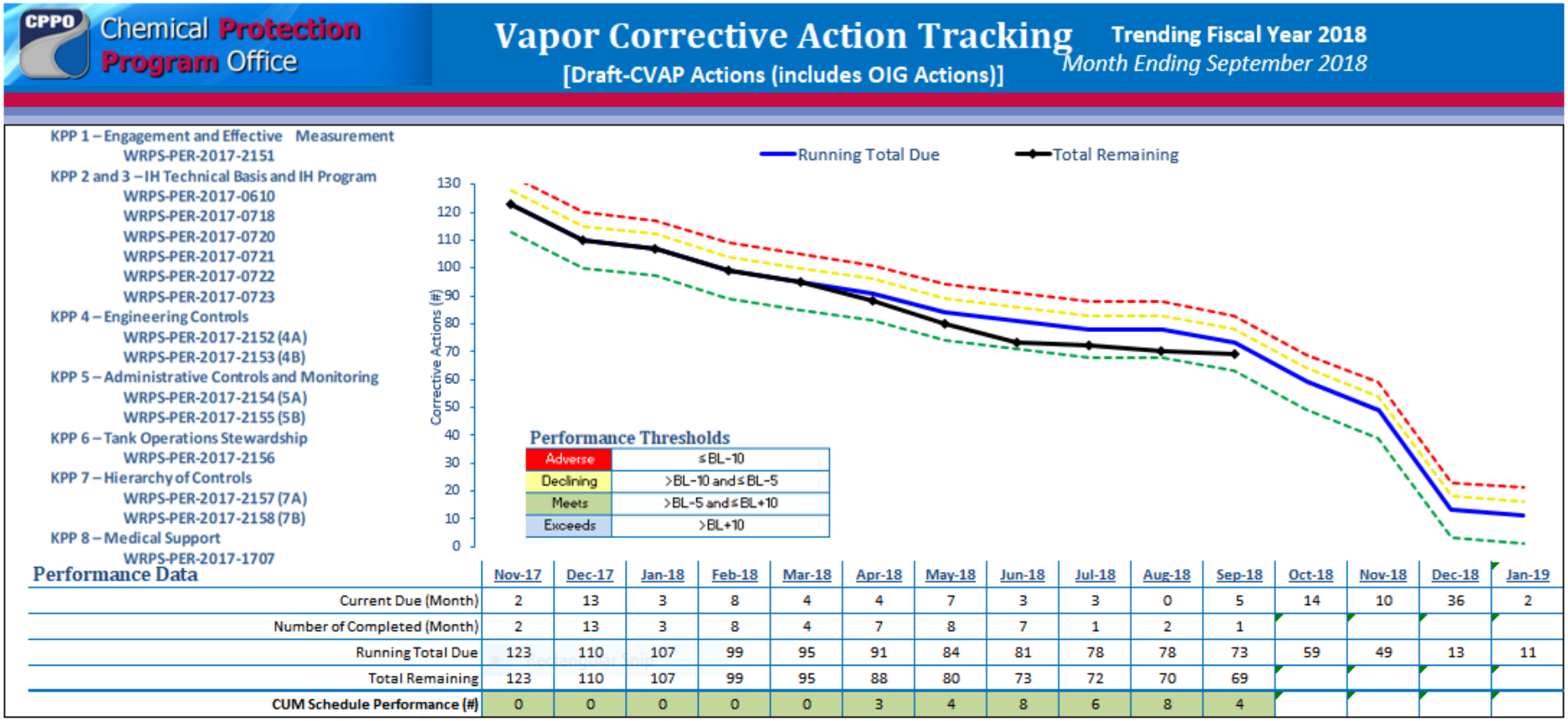
- Planning and implementing vapors-related communications which are detailed in the CPPO Look Ahead
- Developing vapors-related information for communication to broad audiences within WRPS
- Engaging in a weekly information exchange with the HAMTC Safety Representatives and members of the workforce
- Reporting on all the efforts that are made to obtain worker feedback on vapors-related activities
- Supporting the Chemical Vapors Solution Team's (CVST) sub-committees including the Source Apportionment and Fugitive Emissions Identification and Investigation Team (SAFEITT), colloquially known as the Fugitive Emissions Sub-committee, the CVST Communications Sub-committee, as well as the CVST Chemical Cartridge and New Technology Sub-committees
- Continuing to develop multiple metrics to support a draft CVAP monitoring dashboard
- Cataloguing hundreds of vapors-related communications, correspondence, *CPPO Notebooks*, historical documents, photographs, charts, and references for the CPPO Library and IDMS
- Ongoing vapors website maintenance
- Ongoing CTEH field engagement activities
- Ongoing CTEH follow-up assessment report
- Ongoing DAV Tool project management

Oversight and Tracking

The Oversight and Tracking section is a revolving schedule of metrics published in the CPPO Weekly Report:

- Week 1 – Vapors Corrective Action Status
- Week 2 – Vapors Website
- Week 3 – Cost and Schedule Metric
- Week 4 – Communication Metric

Vapors Corrective Action Status – FY 2018



Performance Data

	Nov-17	Dec-17	Jan-18	Feb-18	Mar-18	Apr-18	May-18	Jun-18	Jul-18	Aug-18	Sep-18	Oct-18	Nov-18	Dec-18	Jan-19
Current Due (Month)	2	13	3	8	4	4	7	3	3	0	5	14	10	36	2
Number of Completed (Month)	2	13	3	8	4	7	8	7	1	2	1				
Running Total Due	123	110	107	99	95	91	84	81	78	78	73	59	49	13	11
Total Remaining	123	110	107	99	95	88	80	73	72	70	69				
CUM Schedule Performance (#)	0	0	0	0	0	3	4	8	6	8	4				

Figure 2. Vapor Corrective Action Tracking – FY 2018

Vapors Corrective Action Status

The CPPO tracks vapor-related Problem Evaluation Requests (PER), with the goal of communicating PER resolution status. The performance data in **Figure 2** above are defined as follows:

- **Current Due** (Month) – Current corrective actions due for the month
- **Number of Completed** (Month) – Number of corrective actions completed for the month
- **Running Total Due** – Total cumulative actions scheduled to be completed
- **Total Remaining** – Total cumulative actions remaining to be completed
- **Cumulative Schedule Performance** – Total cumulative actions completed compared to the Running Total Due.

The 128 CVAP actions are captured in the PERs listed in **Figure 2** above, including the 3 DOE-OIG actions captured in WRPS-PER-2016-2433 thru 2435 and 4 Office of River Protection (ORP) Facility Representative Surveillance (17173-TF) actions captured in WRPS-PER-2018-0551 thru 0554. Sixty-three TVAT actions were completed during Phase I (FY 2016) and the DOE-OIG actions were completed in FY 2017; its completions are documented in the Electronic Suspense Tracking and Routing System (E-STARS). The remaining TVAT actions have been rolled into the CVAP. The remaining recommendations from NIOSH, EA-32, CTEH, and the VMEP were added to the PER system and corrective actions launched. **Figure 2**, following several corrective action due date extensions, depicts the status of the CVAP total corrective actions and shows that 1 action was completed in August, for a total of 4 actions completed early in FY 2018. In addition, approximately 45 percent of the total CVAP actions were completed in FY 2018; of the remaining open actions, approximately 85 percent are scheduled to be completed in the 1st Quarter FY 2019.

Figure 3. FY 2018 Comprehensive Vapors Action Plan Costs

Most of the ongoing vapor projects supporting the CVAP KPPs finished in FY 2018, while the rest of the projects continue to complete integration into FY 2019. **Figure 3** shows the FY 2018 costs per month. The beginning of the year started slow as projects moved from design to procurement and installation phases of the projects. It was expected that most of the work would start in the spring and remain constant through the summer months. In FY 2018, DOE invested $48.6M implementing engineering controls, monitoring equipment, and PPE for the safety of the workforce, along with communicating information through a variety of tools. **Figure 4** shows FY 2018 with a positive cost variance that was created by the savings Strobic® was able to perform during testing. The schedule variance held level, despite the permitting delays for stack extensions. Also, while VMDS testing has been completed, the procurement and installations are still working to regain schedule variance.

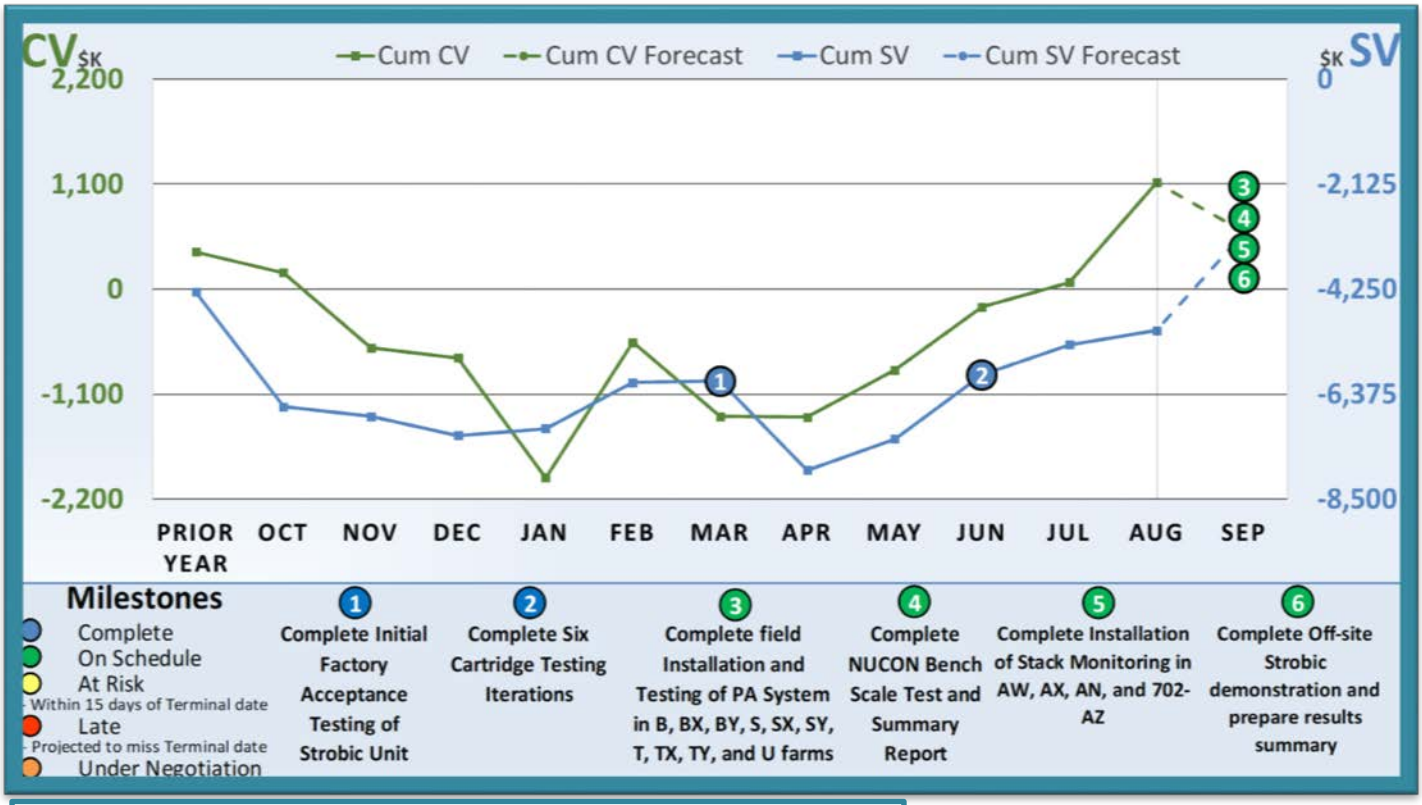


Figure 4. FY 2018 Cost and Schedule Variances for the CVAP

HanfordVapors.com Website

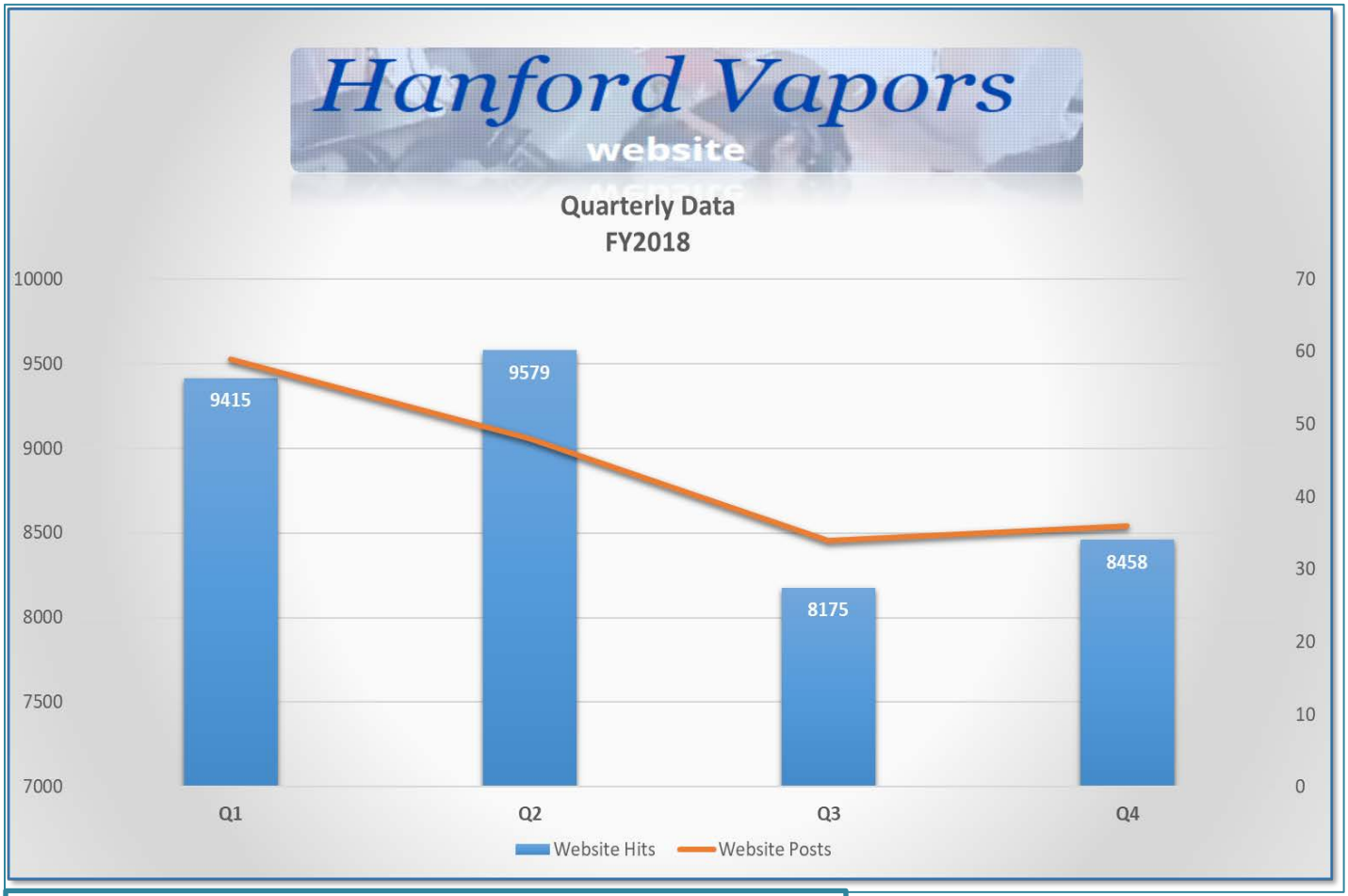


Figure 5. Hanford Vapors Website Statistics – FY 2018

The Hanford Vapors website logged over 35,000 views in FY 2018. Its heaviest use was observed in the 2nd Quarter of the year. The increase in viewership is attributed to the release of the EA-32 report, popular *CPPO Notebook* topics, and information uploaded to the webpage regarding odors reported outside SY Tank Farm. There was a moderate drop in traffic in the 3rd Quarter, attributable to fewer than normal postings to the webpage. Views increased in the 4th Quarter, particularly in July, after a significant increase in the number of new/updated materials posted. The 4th Quarter uptick was so substantial, it resulted in a 20% increase over the yearly average.

In particular, the largest number of views occurred on the days that the *Hanford Vapors Weekly Update* was posted, with carryover views logged on the days immediately following the updates, especially when the update was on an odor event. **Figure 5** shows the relationship between new posts and website hits each quarter. In FY 2018, the website attracted an average of 2,969 hits per month, and 98 hits per day. The *2018 Workforce - Vapors Information Survey*

revealed that the Hanford Vapors website was one of the least used avenues by the workforce for obtaining vapors-related information. The total webpage views in FY 2018 were more than 30 percent fewer than in FY 2017, substantiating the information survey's findings.

During the 2018 Focus Group discussions, workers expressed that it is often difficult to find the information they care about on the vapors web pages. They reported that navigating the external and internal websites was difficult, and that they struggle through various layers of pages to find their topic of interest. To improve the ability to locate information, workers suggested that key information should be accessible with no more than 2 clicks away from the home page. Subsequently, CPPO conducted an internal assessment that evaluated how to improve the webpage's design and functionality. The recommendations for the webpage improvements will be evaluated for implementation in FY 2019.

The CPPO Notebook

The *CPPO Notebook* was developed as an additional mechanism for managers to share vapors-related information with the workforce. It is delivered on a weekly basis in multiple formats: a 'One-Sheet' summary of the weekly topic, a PowerPoint presentation (with speaker notes), and a video narrated by a technical expert. Forty-nine *CPPO Notebooks* were distributed in FY 2018 on a range of topics:

- Seven notebooks on independent assessments or employee surveys
- Twenty-two notebooks on IH sampling, IH program, or monitoring
- Four notebooks on respiratory protection and testing
- One notebook on engineered controls
- Nine notebooks on contaminates of potential concern
- Five notebooks on tank farm operations and conditions
- One notebook on CVAP accomplishments

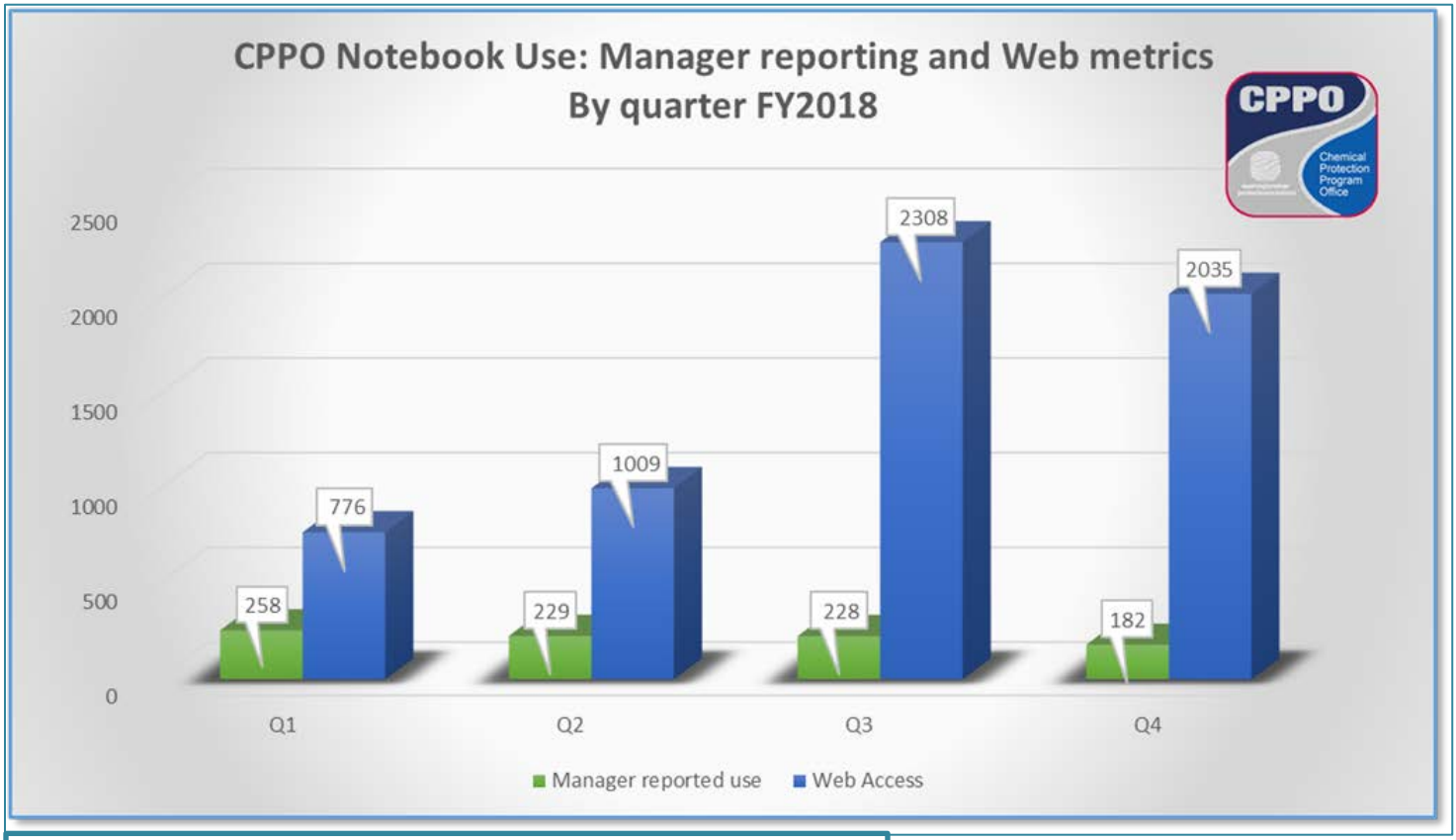


Figure 6. CPPO Notebook Activity FY 2018

The *Workforce Vapors Information Survey* participants indicated levels of interest in different topics; the *CPPO Notebook* topics were driven by the survey. Management's use of the *CPPO Notebook* is determined through self-reporting via email buttons that are provided as part of the distribution each week. **Figure 6** shows a general trend in the utilization of this vapors communication tool over the course of FY 2018. In FY 2018, the *CPPO Notebook* was presented 875 times, an average of 22 managers per week. This is a 21 percent increase in *CPPO Notebook* presentations over FY 2017. The *CPPO Notebooks* are also located on the WRPS intranet, available to all WRPS employees. This figure further shows the total number of times that the notebook files were accessed by quarter, demonstrating a significantly increased reach beyond the manager presentations.

Table 2. CPPO Vapors Information Products Completed FY 2018

CPPO Vapors Information Products Completed FY-18	Q1	Q2	Q3	Q4	FY Total
Data Report (Monitoring Data)	6	14	1	0	**21**
Presentations (includes CPPO Notebook and CVST)	11	13	13	13	**50**
CPPO Reports and Weekly Report	11	11	11	11	**44**
Information Requests	0	1	0	0	**1**
Articles, Summaries, and Message Maps	5	6	1	5	**17**
Surveys and Focus Groups	4	1	0	1	**6**
Website Requests/Site Updates	0	1	2	9	**12**
Videos	0	0	0	0	**0**
Totals	**37**	**47**	**28**	**39**	**151**

The CPPO routinely summarizes complex, technical vapors-related information for a general audience, and has provided monitoring results, report summaries, presentations, a weekly report on WRPS vapors activities, and other information for distribution through established communication mechanisms such as the *Solutions* newsletter and the HanfordVapors.com website. In FY 2018, 151 vapor-related communication products were developed and delivered. **Table 2** shows the volume of activity over the course of FY 2018. The increase in the 2nd Quarter reflects the significant effort undertaken by the CPPO to provide additional monitoring reports and AOP-015 data for the HanfordVapors.com website during this timeframe. Overall, CPPO maintained a very active production pace throughout the year.

The CPPO tracks the distribution of identified vapors-related communications throughout WRPS. The data for FY 2018 is shown in **Table 3.** Vapors-related information was shared with the workforce 5,992 times in a variety of formats in FY 2018.

The Morning/Pre-Shift Brief continues to be a primary avenue for delivering vapors-related communications to the workforce, followed by the *CPPO Notebook*. In addition, a significant number of updates were posted to the Hanford Vapors website. Other events occur less frequently, such as the CVST meeting, but provide targeted vapors-related information to the workforce.

Table 3. WRPS Vapors Information Distribution Avenue FY 2018

WRPS Vapors Information Distribution Avenue	Q1	Q2	Q3	Q4	FY Total
All Employee Email/Meetings & ESHQ Comm.	13	9	11	14	**47**
CPPO CPPO Notebook*	319	205	240	170	**934**
CPPO Report and Weekly Report	11	11	11	18	**51**
Fact Sheet & Information	0	0	0	0	**0**
Meeting - CVST *	4	3	3	3	**13**
Meeting - CVST Sub-team meeting *	12	10	6	9	**37**
Meeting - Hanford Advisory Board Briefing *	0	1	1	0	**2**
Meeting/Briefing*	12	6	13	10	**41**
Meeting -Morning/Pre-Shift Brief*†	1083	1148	1222	1190	**4643**
Presentation*	0	0	0	0	**0**
Safety Start	0	1	3	4	**8**
SOEN	5	5	11	6	**27**
Solution Article	6	6	7	6	**25**
Survey and Focus Group	1	1	0	1	**3**
Tours*	0	0	0	0	**0**
Website/Individual Inquiry	0	0	0	4	**4**
Vapors Weekly Update or Website Post	59	29	40	29	**157**
Video	0	0	0	0	**0**
Totals	**1525**	**1435**	**1568**	**1464**	**5992**

* Face-to-face communication †Morning/Pre-Shift Brief expanded to include field personnel interactions

3. COMPREHENSIVE VAPOR ACTION PLAN Key Performance Parameters

KPP 1. Engagement and Effective Measurement

Key Performance Parameter 1

Establish a comprehensive vapor management communication plan, engagement processes, and effectiveness measurements.

The CPPO Look-Ahead

CPPO's engagement activities and worker communications were, in large part, predicated on the cooperative efforts of CPPO's multi-disciplined approach to planning, and documented in the CPPO Look-Ahead Tool. The Look-Ahead was developed in FY 2018 and used throughout the year to assist with planning vapors-related information and delivery to the workforce. In so doing, the Look-Ahead served to fulfill CPPO's function in delivering the *WRPS Vapors Communication Plan*. The CPPO Look-Ahead was shared regularly with C&PR, the CVST leadership, IH, and with DOE-ORP to facilitate integration and collaboration, and to promote leveraging multiple communication and distribution avenues when possible. The comprehensive avenues of input resulted in meaningful and timely communications, including coordinated messaging across organizations. The data shows that by using this approach, the workforce engagement increased. For example, when *Solutions* wrote about the *CPPO Notebook* for a particular week, the number of people accessing the *CPPO Notebook* that week spiked appreciably. Additionally, the Look-Ahead proved a valuable tool in coordinating multi-organizational approaches to delivering vapor-related information to the workforce, such as work boundary signage, and implementation of ToxiRAE^3 personal ammonia monitors.

Chemical Protection Engagement: CTEH

In FY 2018, CTEH toxicologists and industrial hygienists developed relationships with WRPS IHs, CPPO, the medical SMEs at HPMC, and the tank farm workforce. In so doing, CTEH personnel provided a wide variety of toxicology and health risk information addressing tank vapors health questions. CTEH experts, working with IH, developed *CPPO Notebooks* that provided concise information on health effects from potential exposures to prominent chemicals in the tank farm vapors. They also introduced workers to key concepts of differentiating chemical hazards from risks, as well as the process through which industrial hygienists use toxicology data to set occupational exposure limits for tank vapor chemicals. The *CPPO Notebook*s, in the form of 4-6-minute video presentations, were made available to WRPS managers and supervisors to share with their work teams. Many of the *CPPO Notebooks* were presented at CVST meetings. The CTEH odor perception notebooks have been embedded into the new *Chemical Worker Tier III* training, as have a selected number of CTEH-created notebooks on COPCs. Trainees have

acknowledged how helpful in understanding differences between odor-inducing and actual toxic exposure levels of tank vapors the notebooks have been. CTEH-developed notebooks have also found their way into worker training for other Hanford site DOE contractors.

CTEH toxicologists worked with HMPC-OMS physicians, epidemiologists, and industrial hygienists in exploring creative solutions for improving communication of the results of clinical exams and tests to affected workers. The aim was to reduce uncertainty in the minds of workers regarding HPMC-OMS determinations of return-to-work status. At the request of Dr. Sandy Rock, CTEH researched scientific literature on the biomarkers of COPC exposure. The results of the research will demonstrate due diligence in the selection of clinical tests and will be presented to the WRPS workforce in *CPPO Notebooks* in FY 2019.

The focus of CTEH SME efforts in FY 2018 was face-to-face engagement with tank farm workers. Engagement took many forms, including meetings with workers, initiating and moderating question and answer (Q&A) sessions to address workers' concerns regarding tank vapor exposure, toxicology, and health protection; CTEH experts attended tank farm team morning meetings, project pre-job meetings, and safety tailgate meetings to meet workers and answer questions. They also visited the tank farms to observe work evolutions and talk with workers to better understand how various work tasks could translate to potential exposure scenarios.

Meetings with workers involved informal conversations with 1 to 10 workers or stand-up Q&A session with up to 150 workers at a time. CTEH toxicologists visited the weekly Chemical Worker Tier III classes and held Q&A sessions after the course tests were administered. CTEH helped moderate workforce focus group meetings to gather information on workforce perception of WRPS response to tank vapors issues. Questions typically asked during worker interaction involved potential effects from specific compounds (i.e., ammonia, nitrosamines), whether tank vapor compounds were completely characterized, use of the IH air sampling and monitoring data for health protection decisions, sample analysis techniques, health effect issues involving PPE, and the effect that various engineering controls would have on reducing health risks. Workers regularly asked CTEH experts to share their experiences at non-Hanford chemical release incidents and industrial sites and compare those hazards and risks with the Hanford site.

CTEH experts also met weekly with groups of or individual HAMTC safety representatives to understand worker concerns. These relationships were valuable for CPPO for feedback on risk communication effectiveness; the discussions with HAMTC reps have resulted in the development of multiple risk pieces for presentation to the workforce. In total, CTEH experts met with hundreds of

Hanford tank farm workers throughout the year and engaged in Q&A sessions ranging from minutes to over an hour.

CTEH drafted a reassessment of the tank vapors IH technical basis, due for release the 1st Quarter of FY 2019. The report provides CTEH's assessment of the progress made in addressing tank vapors issues with risk communication and worker training.

Chemical Protection Engagement: Chemical Vapors Solutions Teams

The purpose and scope of the CVST as defined in the CVST Charter is, "… a joint management/employee initiative to review processes and solutions to improve Washington River Protection Solutions LLC's (WRPS's) hazard identification, controls, training, and communication for Tank Farm chemical odors and vapors" (TFC-CHARTER-21, Rev E-2, pg. 1). The CVST Charter also states that, "[t]he CVST shall regularly conduct meetings that are open to the general workforce" (pg.1). During the 4th Quarter, Co-Chairman Environmental, Safety, Health & Quality (ESH&Q) Chemical Protection Integration Manager, Steve Killoy, oversaw three general workforce meetings which were held on July 11, August 8, and September 12, 2018. The CVST held a total of 13 meetings in FY 2018.

Figure 7. Carrie Jacobs described the accomplishments of the CVST Communication Sub-committee to the October 11, 2017, CVST meeting (FY 2018), including recognizing CPPO's Notebook as an important contribution to the workforce's "regular briefings," a Communication Sub-committee goal.

CVST New Technology Sub-team

The purpose of the CVST New Technology sub-team is to identify potentially new vapor-related technology and equipment, provide feedback on the deployment of the pilot/bench scale testing of the new equipment, and to interface with program personnel on the data collection related to process improvements. Topics discussed during the meetings included the Autosampler, C_2Sense®[4] monitoring, VMDS equipment selection process, VMDS equipment supporting full-time operations, NUCON®, Fugitive Emissions, and the AW Farm Stack Extension. In addition to input from the team leader, technical SMEs from WRPS and PNNL contributed to the status as-needed. A major subject of interest discussed throughout the fiscal year was the viability of continuing the CVST New Technology Sub-Team. The team leader acknowledged that the team had identified, tested, and moved to operations on many vapor-related new technologies through the VMDS. Consequently, the need for vapor-related new technologies is less crucial. The topic remains open for discussion. The CVST New Technology Sub-team held the following meetings in FY 2018:

- 1st Quarter: November 8, December 13, 2017
- 2nd Quarter: February 14, 2018, March 14, 2018
- 3rd Quarter: May 9, 2018, May 13, 2018
- 4th Quarter: July 25, 2018, September 12, 2018

CVST Communications Sub-team

The purpose of the CVST Communications Sub-team is to provide general vapor and sub-team product updates, outreach and presentations to other Hanford site contractors, and develop focused presentations of vapor items/activities. Eighteen meetings were held in FY 2018. Representatives from IH Programs, Management, Operations, HAMTC Safety Representatives, Safety, Nuclear Chemical Operators, CPPO, Radiological Control Technicians, and the 222-S lab routinely attended, as well as a number of the Team Vapor Representatives (TVR). Topics discussed during the meetings included:

- Development of a TVR workshop
- Status of Stoneturn Consultant activities regarding use of Full Face Air Purifying Respirator (FFAPR) at AP-Farm
- Strapping cylinders on golf carts as an alternative to SCBA
- Overviews were provided of the Hanford Vapors Website and the DAV tool
- Updates and reasons behind stop work issues (e.g., face-mask, cartridge)
- Rollout of FFAPR at AP Farm and AN Farm
- Clarification of waste disturbing versus waste intruding activities, since it is one of the criteria for determining the use of FFAPR.
- Methods for improving the CVST meeting
- Updates on the Workforce Incentive Plan
- Updates on the litigation and settlement discussions

- Applicability of sunshields for PPE
- Visiting the mask cleaning station, or developing a video, to review the mask cleaning process
- Availability and capability of Mobile Laboratory for vapor monitoring
- Discussion of the monthly routine testing process for respiratory protective equipment.
- Reminders to use a questioning attitude at PODs to ensure all activities are understood
- Feedback on CPPO site briefings at the PODs
- Availability of CTEH to answer workforce questions
- Status of alpha contamination discovered on pre-filters at 222-S
- Status of both C_2Sense® testing and the purchase of ToxiRae personal monitors.

The CVST Communication Sub-team held the following meetings:

- 1st Quarter: October 2, October 16, November 6, November 27, Dec 11, 2017
- 2nd Quarter: January 8, January 22, February 5, March 12, March 26, 2018.
- 3rd Quarter: April 23, May 7, June 4, June 18, 2018
- 4th Quarter: July 16, August 13, August 27, September 24, 2018

The workforce is heavily represented and instrumental in determining paths forward, communication efforts, and strategies to bolster workforce confidence in contemporary vapors-related efforts.

CVST Chemical Cartridge Sub-team

The CVST Chemical Cartridge Sub-team held the following meetings in FY 2018:

- 1st Quarter: October 4, November 15, December 6, 2017, December 20, 2018
- 2nd Quarter: January 3, February 7, March 21, 2018
- 3rd Quarter: April 4, May 2, May 16, June 20, 2018
- 4th Quarter: August 1, August 15, 2018

CVST Fugitive Emissions Sub-team

The newest CVST Sub-committee, Source Apportionment and Fugitive Emissions Identification and Investigation Team (SAFEIIT), colloquially known as the Fugitive Emissions Team, held their kick-off meeting on October 31, 2017. The team held the following meetings in FY 2018:

- 1st Quarter: October 31, November 14, December 6, 2017
- 2nd Quarter: February 22, 2018
- 3rd Quarter: April 19, 2018
- 4th Quarter: None

The mission of the Fugitive Emissions CVST Sub-team is to investigate documented incidents of planned chemical releases (i.e. cribs, ditches, and evaporation ponds), as well as investigate reports of unplanned chemical releases with the goal of identifying, locating, and characterizing emissions to the site and its workers in

order to evaluate odors in terms of odor thresholds and occupational exposure limits. The sub-team selected 4th and Buffalo as the first site to be investigated. In the 2nd Quarter, the Fugitive Emissions team began developing a gap analysis to identify historical characterization data and potential sources in and around 4th and Buffalo. Small group meetings were established with workforce representatives (including operations, Industrial Hygiene Technicians (IHT), and sampling) to ensure worker feedback / input was provided, and to capitalize on the sampling and characterization knowledge of the workforce. In the 2nd Quarter, the Initial Investigation Strategy was presented, the purpose of which is to evaluate historical information, determine data gaps, evaluate test equipment, and determine a viability methodology for performing fugitive emissions investigations. In the 3rd Quarter, the proposed work plan (including schedule and cost estimate) for the fugitive emission investigation at 4th and Buffalo was reviewed to receive the CVST sub-team concurrence before moving forward with a presentation to the CVST. As in all CVST meetings, the workforce is heavily represented and instrumental in determining paths forward, communication efforts, and strategies to bolster workforce confidence in contemporary vapors-related efforts.

Chemical Protection Engagement: 4th Quarter Communication Highlights

For a comprehensive list of FY 2018 WRPS vapors-related communications, see Appendix C.

Solutions, Issue 445, published July 23, 2018, pointed its readers to the four-part *CPPO Notebook* covering toxicology and IH fundamentals.

A Shift Office Event Notice was released on Thursday, August 9, 2018, issuing a standing order on VMDS chemical concentration values.

The following three Shift Office Event Notifications (SOEN) were released during the week of August 13 through 16, 2018:

- On August 13, 2018, a SOEN was issued announcing the West area Pubic Address (PA) system testing.
- On August 14, 2018, a SOEN was issued to announce restricted access to the Middle-C Farm Change Tent because strong herbicide odors were reported.
- Again on August 16, 2018, a SOEN was issued restricting access to the Middle-C Farm tent due to strong herbicide odors. Access was restored soon after the SOEN was issued.

The 448th Issue of *Solutions,* which was released August 13, 2018, contained an article summarizing the *CPPO Notebook* on leading indicators that was released on August 2, 2018.

The August 2018 *Industrial Hygiene Newsletter* featured a write-up on ToxiRAE Monitors, which are direct-read instruments for ammonia exposure that will be onsite and in use at the Hanford Tank Farms within the next few weeks.

Doug Greenwell sent an all-employee message on August 23, 2018. Mr. Greenwell described the "aggressive industrial hygiene (IH) and monitoring plan to protect workers from potential chemical vapors" during the final water rinse in double-shell tank AY-102.

WRPS Communications & Public Relations sent an all-WRPS-employees email on August 29, 2018, stating, "[b]eginning Sept. 4, workers will have the option to use full-face air-purifying respirators (FFAPRs) equipped with filter cartridges for low-hazard, non-waste-disturbing work in the AN double-shell tank farm."

On August 29, 2018, an *Industrial Hygiene Flash* updated the WRPS employees on "Charcoal dusting when using Scott 7422-SC1 and 7422-SD1 cartridges."

Hanford Vapors posted an announcement on the HanfordVapors.com website reading, *Air-purifying respirators approved for AN Farm*, on August 30, 2018. An email with a link to the announcement was sent to WRPS employees on August 31, 2018.

An all-employee email dated September 4, 2018, described the analytical results of the respiratory protective equipment (RPE) testing in July. The results "indicated that there were no instances of chemical (anion) contamination on any of the RPE tested. Likewise, there were no instances of bacterial contamination on the RPE and surfaces that were evaluated."

IH communicated a major revision to TFC-ESHQ-IH-C-48, *Managing Tank Chemical Vapors,* intended to "simplify risk classification categories, align terminology with industry standards, and assist in the demarcation and communication of areas with greater potential of tank chemical hazards." *Exclusion Zones* **replaces** *Vapor Control Zone* as the term used to demarcate "the boundary of potential vapor emission source greater than 50 percent of the OEL." The cover of this Weekly Report depicts the **new** sign as described in the September 5, 2018, all-employee email.

WRPS is implementing the ToxiRAE personal ammonia monitor. Details on the rollout and implementation phases were communicated to the workforce in an all-employee email, distributed by Industrial Hygiene, on September 6, 2018. "The monitors have been procured and received," stated the email. Furthermore, "WRPS will rollout ToxiRAE use gradually."

In an all-employee email on September 10, 2018, IH communicated a major revision to TFC-ESHQ-IH-C-48, *Managing Tank Chemical Vapors,* intended to "simplify risk classification categories, align terminology with industry standards, and assist in the demarcation and communication of areas with greater potential of tank chemical hazards." *Exclusion Zones* **replaces** *Vapor Control Zone* as the term used to demarcate "the boundary of potential vapor emission source greater than 50 percent of the OEL."

Solutions, Issue 451, published on September 10, 2018, invited readers to investigate the CPPO Weekly Report and provided a link to HanfordVapors.com.

Solutions, Issue 452, published on September 17, 2018, featured the new 10-wide, Building MO-2563. *Solutions* reported, "[t]he new 10-wide building in the 200 East Area will soon house about 100 members of the WRPS Industrial Hygiene staff."

Solutions, Issue 452, published on September 17, 2018, alerted its audience to a new three-part *CPPO Notebook*, *Chemicals in the Tank Headspace, Parts 1-3.* A link to the CPPO Notebook was provided.

A Shift Office Event Notification (SOEN) issued on September 18, 2018, at 11:33 a.m. stated, "Entering AOP-015 for odors causing symptoms in SX Farm."

An all-employee email, issued on September 18, 2018, at 12:40 p.m. reported, "A Hanford worker reported symptoms and is undergoing precautionary medical evaluation today after smelling odors at the SX Tank Farm. Industrial hygiene technicians were monitoring at the time and are collecting samples in the area. "

A SOEN issued on September 18, 2018, at 1:04 p.m. stated, "Initiated Event Investigation (EIR-2018-033) for the SX Farm AOP-015 event."

A SOEN issued on September 18, 2018, at 6:32 p.m. stated, "Sample analysis for the SX TF-AOP-015 event has been completed and the results are below action limits. Exiting TF-AOP-015."

"Odors reported at SX Farm," read the title of a September 18, 2018, post to the HanfordVapors.com website. Furthermore, it read, "A Hanford worker has been released back to work after undergoing precautionary medical evaluation today for odors reported at the SX Tank Farm."

News from Hanford Tank Vapors, posted on September 19, 2018, reported that the "Department of Energy (DOE) and Washington River Protection Solutions, LLC (WRPS) are pleased to announce today that a settlement agreement has been signed regarding lawsuits brought by the State of Washington and by Hanford Challenge and Local 598 of the United Association of Plumbers and Steamfitters." The Settlement Agreement was posted to the external website and is available here.

Chemical Protection Engagement: Hanford Vapors Website Updates

Appendix B catalogues the over one hundred and fifty website posts added this year. For analysis, see the Oversight and Tracking section.

Chemical Protection Engagement: Workforce Engagement Activities

Early in FY 2018, the CPPO completed an employee vapors information effectiveness survey, where it was found a majority of the surveyed were either unaware of CPPO's job scope or unaware of some of the vapors-related information available. In reviewing the survey results at a CPPO/HAMTC interface meeting, it was suggested that CPPO visit the tank farm teams to educate the workforce about the resources accessible through CPPO. During the visits, the WRPS field teams were introduced to SMEs matrixed to CPPO, and to inform them on what vapors information products are available and where to find them. All of the site managers solicited expressed an enthusiastic interest in having CPPO visit with their groups. The site visits were started in the 3rd Quarter of FY 2018, with the following PODs attended:

- AN-Team
- Facilities Maintenance
- AZ-Team
- ST-Team
- EV-Team
- Shift Production Operations (four briefings were provided to this group so that all shift members could be addressed).
- Waste Operations

During each briefing, in which approximately 25-40 people were in attendance, CPPO provided a summary about the CPPO group and what vapors information products were available and where to find them. The briefing was followed by a Q&A session, where the workforce provided feedback to the CPPO team. During the 4th Quarter, CPPO decided to suspend site briefings for the remainder of FY 2018 to allow the workforce to focus on completing end-of-the-year commitments. The tentative plan is to re-start the site briefings in FY 2019.

CTEH experts also met weekly with members of the workforce at the CPPO/HAMTC Safety Representative meeting, frequently providing risk communication effectiveness ideas. At the participant's request, follow-up meetings were held and

specific CPPO Notebooks were developed. In total, CTEH experts met with hundreds of Hanford tank farm workers throughout the year and engaged in numerous Q&A sessions.

Duplicate for the purpose of highlighting Worker Feedback: CTEH toxicologists visited the weekly Chemical Worker Tier III classes and held Q&A sessions after the course tests were administered. CTEH helped moderate workforce focus group meetings to gather information on workforce perception of WRPS response to tank vapors issues. Questions typically asked during worker interaction involved potential effects from specific compounds (i.e., ammonia, nitrosamines), whether tank vapor compounds were completely characterized, use of the IH air sampling and monitoring data for health protection decisions, sample analysis techniques, health effect issues involving PPE, and the effect that various engineering controls would have on reducing health risks. Workers regularly asked CTEH experts to share their experiences at non-Hanford chemical release incidents and industrial sites and compare those hazards and risks with the Hanford site.

Duplicate for the purposes of highlighting Worker Feedback: A meeting was held with the workforce as part of the weekly HAMTC/CPPO meeting. The Project Manager of the Mobile Laboratory provided details of the *FY 2018 Spring Background Study*. The group discussed locations where monitoring would occur. Feedback was provided by the workforce on alternate locations, which the Project Manager agreed to take into consideration.

Chemical Protection Engagement: Worker Feedback

The CPPO Team was tasked with identifying opportunities for worker feedback on CVAP product development. Discussions with CVAP subject matter experts identified projects where this feedback could be established. These projects included NUCON®, Mobile Lab, SST Stewardship Program, C_2Sense® Personal Vapor Monitoring, CVST Fugitive Emissions Sub-Team and worker engagement (see details below). Throughout the fiscal year, the workforce played an integral part in researching technologies, preparing procedures, fabricating components and presenting concepts to management.

NUCON®

Workers in Operations were very interested in the *CPPO Notebook* on the NUCON® engineering-scale testing, and asked to share some lessons learned with the Chief Technology Office (CTO)/ NUCON® team. A meeting was held between CPPO, CTO, and Operations during which, the technologies in the context of the worker's many years of experience in the tank farms was discussed. At the meeting, it was determined that all issues brought up were already being addressed by the NUCON team. Historical lessons learned were examined and NUCON®'s depth of knowledge about the tank farms was increased.

Mobile Lab
A meeting was held with the workforce as part of the weekly HAMTC/CPPO meeting. The Project Manager of the Mobile Laboratory provided details of the *FY 2018 Spring Background Study*. The group discussed locations where monitoring would occur. Feedback was provided by the workforce on alternate locations, which the Project Manager agreed to take into consideration.

SST Stewardship Program
A draft of the *SST Stewardship Execution Strategy Document* was submitted for internal review. Since this was a first-of-its-kind document, the purpose of the preliminary review was to solicit feedback and confirm that WRPS was satisfied with the direction of this document. The format of the document was improved as a result of this feedback.

C_2Sense® Personal Vapor Monitoring
During the C_2Sense® field demonstration, data from four C_2Sense® detectors and two ground truth instruments were collected from the A-103 PBF. Instrument readings at the PBF showed ammonia concentrations as high as 93 ppm, but concentrations at the C_2Sense® and ground truth ammonia detectors were lower than desired (≤2 ppm). The detectors were re-located to as close as possible to the PBF, but this did not significantly increase the ammonia concentrations (≤3 ppm). The workforce then provided feedback on a more optimal configuration. The detectors were removed from the field and reconfigured to increase the ammonia concentration by using a pump to pull high ammonia concentration air from the PBF and deliver it to an ice chest with the detectors enclosed. The new configuration produced excellent results with ammonia concentrations from 0 to 200+ ppm.

CVST Fugitive Emissions Sub-Team Mtg.
As previously mentioned, the CVST Fugitive Emissions sub-team performed a gap analysis to identify historical characterization data and potential sources in and around 4th and Buffalo. Small group meetings were established with workforce representatives (including operations, IHTs, and sampling) to ensure worker feedback / input was provided into the process and to capitalize on the sampling and characterization knowledge of the workforce. The workforce played an integral part in researching technologies, developing sampling strategies and presenting concepts to management.

Chemical Protection Engagement: Data Access and Visualization Tool

Since the Data Access and Visualization (DAV) tool was launched in October 2017, data from the more than one hundred thousand chemical samples from IH Sampling that have been logged into the Site Wide Industrial Hygiene Database (SWIHD), has become available to the workforce. In the past year, 3,850 people

have viewed the DAV tool as shown in **Figure 8**. Most of the people using the tool are local. As shown in **Figure 9**, 4 percent were from the other side of the state, while 12 percent were elsewhere in the nation.

During 2018, WRPS worked with PNNL on the second generation DAV tool, the goal of which was to enhance its capabilities to include the next iteration of data generated by the VMDS. The VMDS equipment is capable of testing air samples 24 hours a day, 7 days a week, providing a detailed look at which chemicals exist in which farms, the levels of each chemical, and in close to real-time. The workforce participated in the development of the tool. Their suggestions on ways to improve the tool's effectiveness were successfully tested and reviewed by management. The enhanced DAV tool will go live after the stack monitors have been turned over to Operations.

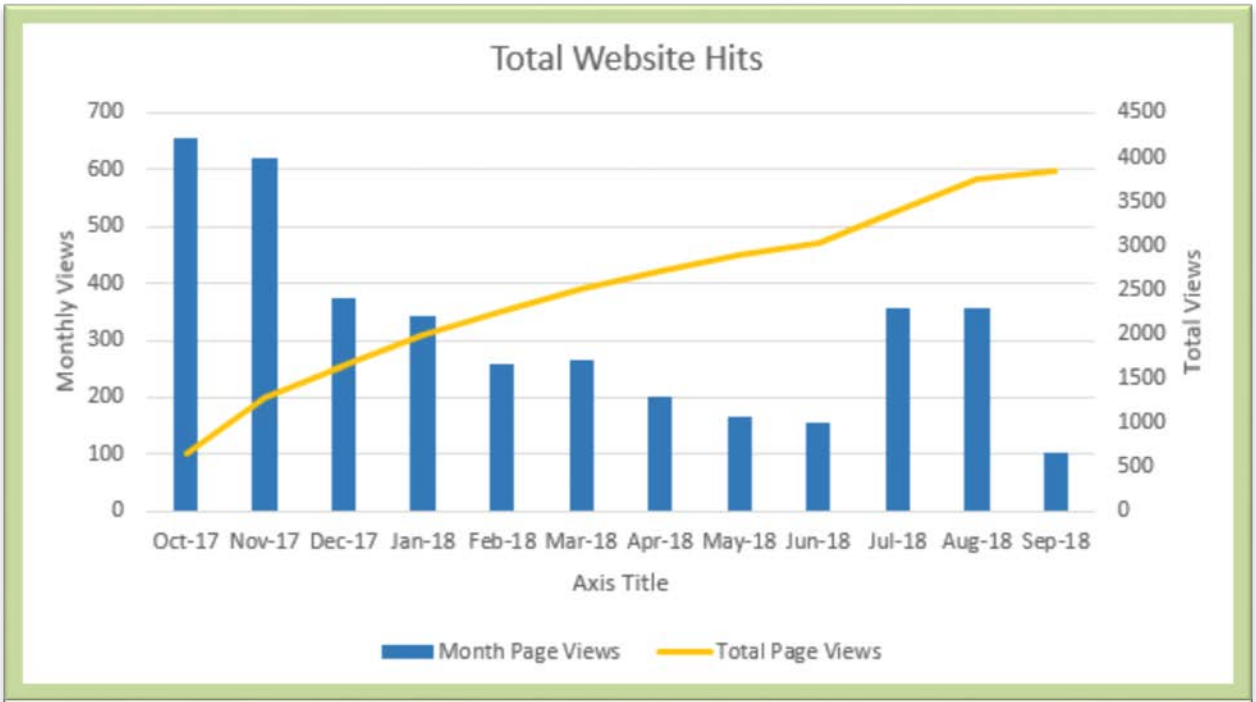


Figure 8. Total DAV Tool Website Hits – FY 2018

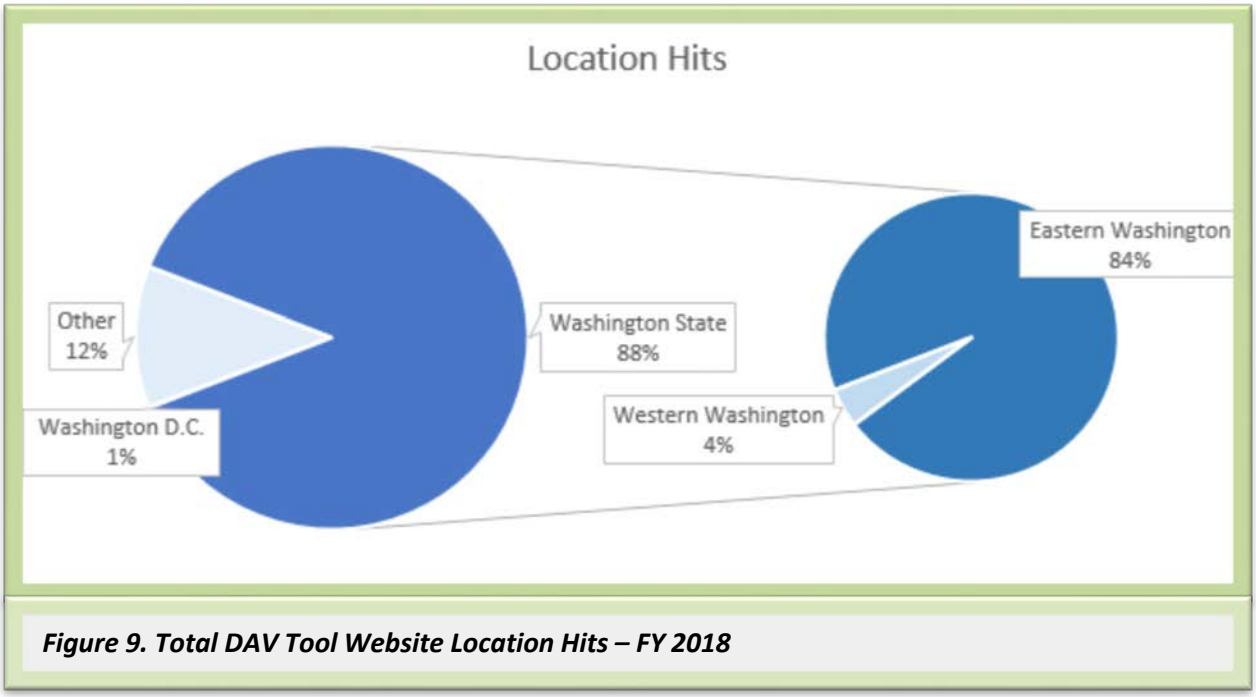


Figure 9. Total DAV Tool Website Location Hits – FY 2018

KPPs 2 and 3. IH Technical Basis and IH Program

IH Manual and Technical Basis

FY 2018 Summary:

WRPS completed the update of RPP-22491, *Industrial Hygiene Chemical Technical Basis,* and developed detailed, institutionalizing documents, including the following:

- TFC-ESHQ-S_IH-C-66, *Identifying Chemicals of Concern in Hanford Tank Farms*
- TFC-ESHQ-S_IH-C-67, *Maintenance of the Industrial Hygiene Chemical Vapor Technical Basis*
- TFC-ESHQ-S_IH-C-48, *Managing Tank Chemical Vapors*
- TFC-PLN-34, *Industrial Hygiene Exposure*
- *Assessment Strategy*
- TFC-PLN-174, *Industrial Hygiene Chemical Vapor Technical Basis Program Plan*
- TFC-ESHQ-S_IH-C-63, *Modeling/Mapping Procedure*

Key Performance Parameter 2

Maintain Industrial Hygiene Chemical Vapor Technical Basis and the chemicals of potential concern (COPC). Institutionalize a disciplined and rigorous process for updates to include new scientific findings and enhanced understandings of potential exposures.

Providing a disciplined and rigorous process to periodically review IH data to identify new or changing information regarding tank vapors was a major and successful undertaking in FY 2018. The new information is analyzed in light of current scientific and regulatory information to determine if a new chemical of potential concern (COPC) should be identified. This analytical process determines if a regulatory Occupational Exposure Limit (OEL) exists for the newly identified COPC. Furthermore, the process determines when a new Hanford Tank Farm OEL (HTFOEL) should be created.

IH held an all-hands meeting in September to communicate the progress on the TOC-IH-58435, *Industrial Hygiene Manual.* The re-formatted document navigated the ORP review successfully, and is in the Smartplant Foundation for publication. The document is available on the IH website.

IH communicated a major revision to TFC-ESHQ-IH-C-48, *Managing Tank Chemical Vapors,* intended to "simplify risk classification categories, align terminology with industry standards, and assist in the demarcation and communication of areas with greater potential of tank chemical hazards." *Exclusion Zones* **replaces** *Vapor Control Zone* as the term used to demarcate "the boundary of potential vapor emission source greater than 50 percent of the OEL."

Figure 10. Depicted is the new sign marking the boundary of a potential vapor emission source greater than or equal to 50 percent of the OEL. On September 5, 2018, Industrial Hygiene, in an all-employee email, notified the workforce of a major revision to TFC-ESHQ-IH-C-48, Managing Tank Chemical Vapors.

The revision includes a white paper detailing the incorporation of boundaries, changes to the signage, and the consolidation of the double shell tank and single shell tank risk classification tables.

TFC-PLN-34, *Industrial Hygiene Exposure Assessment Strategy*, is WRPS's published guideline for developing exposure assessments. TFC-IH-C-69, Exposure Assessment Procedure, was published on September 4, 2018. The exposure assessments for A Farm, AW Farm, and AP Farm in SPF for publication. TFC-PLN-173, *Use of FFAPR in Actively Ventilated Tank Farms*, is posted on the website for implementation in SY, AP, and AN Farms. It was edited to include AN Farm on September 4, 2018.

IH is reporting 100 percent of the IH workforce are trained in *Risk Communication Techniques* and ~100 percent are trained in *Crucial Conversations*.

Health Process Plan

Key Performance Parameter 3

Maintain Industrial Hygiene Program and institutionalize vapor program requirements, best practices and program parity, and complete necessary training to support full implementation at the beginning of FY 2018.

FY 2018 Summary: WRPS created a new Health Process Plan (HPP) review process, TFC-CHARTER-71, *WRPS Internal Review Panel and External Review Panel Process for Review of Health Process Plan Recommendations* in FY 2017. The review process evaluates the HPP recommendations and evaluates the economic and feasibility impacts of implementation. TFC-CHARTER-71 provides recommendations to the Office of River Protection (ORP) regarding the implementation of proposed changes, and was used to evaluate the following reports in FY 2018:

- *Proposed OELs for Chronic Exposures – COPCs with Regulatory Guidelines,*
- *Hanford Tank Vapors FY 2017 Chemicals of Potential Concern Update*
- *Proposed OELs for Chronic Exposures – Nitrile Class COPCs and 2,4-Dimethylpyridine*
- *Proposed Acute Exposure Limits for COPCs with Regulatory Guidelines and Recommendations for Sampling and Analysis of Hanford Waste Tank Vapors. Sampling and Analysis Plan*

The report, *Proposed Risk-Based Approach for Nitrosamine Chemical-of- Potential Concern*, has been reviewed by IH for economic and technical feasibility impacts. The report, *Proposed Occupational Exposure Limits for Furans*, will proceed further through the Charter 71 process in FY 2019.

Leading Indicators

FY 2018 Summary: FINAL UPDATE**JULY 26, 2018**

Over **1,200** different chemicals have been identified in tank farm headspace vapors. Some of the chemicals have Occupational Exposure Limit (OEL) levels that are lower than the ability to detect and measure them with real-time instruments. Ideally, the measurements of one chemical will tell us something about the levels of the more difficult-to-measure Chemicals of Potential Concern (COPCs). When such relationships exist, the measureable chemicals are called **leading indicators (LIs)**. For more information, view the *CPPO Notebook*, *Leading Indicators*, the cover of which is depicted in **Figure 11**. The final version of *FY18 Leading Indicator Phase 2 Report*, PNNL – 27449, released in April, describes a process for identifying LIs for use

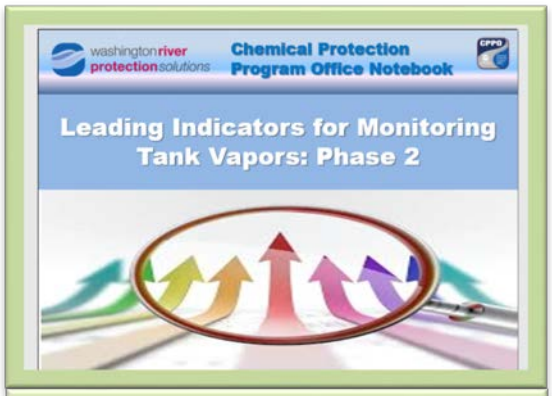


Figure 11. August 2, 2018, CPPO Notebook on Leading Indicators.

across the tank farms. While the 2016 Phase 1 report relied on pairs of analytical sampling data from the Tank Waste Information Network System (TWINS) and Site Wide Industrial Hygiene Database (SWIHD), the Phase 2 report took advantage of data not previously available, including data from the respirator cartridge filter testing program, and the RJ Lee Mobile Laboratory. The Phase 2 report adopted a more conservative statistical process for determining the confidence level for an LI to predict whether one or more COPCs are present above or below their OEL levels. The PNNL researchers reported that the trio of ammonia, nitrous oxide, and mercury may together serve as LIs for up to 45 of the 61 total COPCs, and 21 of 24 COPCs found on Tank Vapor Information Sheets (TVIS) for individual tank farms. The three candidate compounds are routinely monitored in real-time using direct reading instruments in the tank farms.

KPP 3 – Leading Indicators is complete with the publication of PNNL-27449 and will no longer be reported on in the CPPO Weekly Report. PNNL-27449 will be posted to the external website once it has gone through clearance.

Air Dispersion Modeling

FY 2018 Summary:

The Air Pollutant Graphical Environmental Monitoring System (APGEMS) modeling software (version 1.0) and accompanying report were released in May. The report describes the APGEMS-TF software and presented three tests cases illustrating model performance for simulations involving the AP, AW, and AN Stacks, as well as the 242-A Evaporator. The test cases were selected to provide model predictions of ammonia and mercury air emissions during low, medium, or high wind conditions. The APGEMS-TF software was refined and version 1.1 was delivered to WRPS for acceptance testing. WRPS Engineering and IH are evaluating the software and providing feedback to the PNNL team. Representatives from Process Engineering and CTO Fugitive Emissions team were trained in the use of APGEMS-TF Version 1.1.

Figure 12. *Left: Pictured is the future centralized mobile office building location for Retrieval Industrial Hygiene Technicians and Supervisors (in 200 East Area, near 218A across from PUREX, looking east). Note: 242-A Evaporator in the background. (Photo courtesy of Gregory N. Hanson, March 2018)*

Central Residence for IHTs

November 2, 2017: "IHTs and their first line supervisors will be relocated to a centralized mobile office (MO) building. The MO is slated to house approximately 100 workers. According to retrieval field support, this new space will be large enough to house all retrieval IHTs and their first line supervisors. Plans are to install the MO in 200 East across from Purex area near the vicinity of Baltimore Avenue and 4th street **(Figure 12)**. **July 26, 2018:** The 10-Wide trailer has been constructed and is currently stored at the Pac Mobile yard in Pasco, Washington. The installation site is in the 200 East area on 4th Street near 218A across from PUREX. The subcontractor cleared and grubbed 95% of the site and completed the excavation for the large tie down slabs used to anchor the 10-Wide **(Figures 13 - 16)**. The formwork and rebar for the trailer tie down slabs is being installed in preparation for concrete placement. The existing parking lot is acceptable for reuse, and the area has been cleared. The lot will be crack sealed, striped and bumpers placed for parking.

Figure 13. Left: New 10-Wide Mobile Office Site – Looking North. (Photo courtesy of Mark Cranston, Site Evaluation Review)

Figure 14. IH Trailer Construction Site, July 2018. (Photo courtesy of C. Holst.)

Figure 15. Above: The existing parking lot near new IH Trailer location has been cleared. (Photo courtesy of L. Parks-Beyer)

Figure 16. The IH Trailer Construction Site, July 2018. (Photo courtesy of D. Merrill).

Figure 17. Smoke hangs over the 10-Wide IH Trailer Site, August 2018. (Contributed by D. Merrill.)

August 16, 2018:

About 100 members of the WRPS Industrial Hygiene (IH) staff will soon have a new home closer to the tank farms where they perform the bulk of their work," stated last week's *Solutions*. Building MO-2553 is commonly known as the 10-wide and is "the nearly completed office building on 4th Street, a little northwest of the PUREX plant." *Solutions* reported, "Construction Manager Jeremey White said the new building should be finished by Oct. 20."

Figures 17-20 depict the gradual assembly of the 10-Wide trailers.

September 20, 2018:

Figure 18. The IH Trailers as they are being connected. (Photo courtesy of Darren Merrill.)

Figure 19. Left is an above-ceiling HLAN and HVAC installation in the Industrial Hygiene Trailer. (Contributed by L. Parker-Beyers.)

Figure 20. Right is an above-ceiling fire protection pipe in the Industrial Hygiene Trailer. (Photo courtesy of L. Parks-Beyer)
IH Trailer

KPP 4. Engineering Controls

Key Performance Parameter 4

Complete engineering control concept demonstrations for Strobic Air Tri-Stack® and NUCON® International, Inc. thermal combustion in support of unrestricted work boundaries.

AW Stack Extension

FY 2018 Summary:

It was WRPS's intention to extend the AW Stack from 27 feet to 60 feet by the end of FY 2018. However, as a result of issues identified during the permitting review process, the AW Stack extension will carry over into FY 2019. A summary of the accomplishments during the year include the following:

Design: During the 1st Quarter of FY 2018, the team focused on preparing the design package for the fabrication of the stack extension, which had been started in late FY 2017. Both the 30 percent and 60 percent design packages were complete by early December; the final design was approved during the 2nd Quarter.

Stack Installation: The draft Plant Forces Work Review (PFWR), the document which determines the organization responsible for installation activities, was started during the 1st Quarter and completed during the 2nd Quarter; installation work was awarded, and the contract was approved during the 3rd Quarter. During the 3rd Quarter, the concrete forms were installed, and the stack foundations were poured. The foundations were completed during the 4th Quarter. Comments on the final lift plan to support the stack installation are being resolved and will carry over into FY 2019.

Stack Fabrication: The contract to fabricate the stack was awarded during the 2nd Quarter. Work was initiated in 3rd Quarter, and continues. **Figure 21** shows the AW Stack Extension being assembled.

Permitting: During the 3rd Quarter, the radiological permit review was completed by DOE and submitted to the Department of Health for review. The non-radiological permit was

Figure 21. *AW Farm Exhaust Stack shop assembly (Contributed by L. Parker-Beyers.)*

also sent to the Department of Ecology for review. Several issues were identified during the permitting review process. Consequently, AW Stack Extension activities will carry over into FY 2019.

AN Stack Extension

FY 2018 Summary:

By the 2nd Quarter, engineering evaluations were being performed to determine the optimum height required for the stack, and whether the existing superstructure could support that stack height increase. Upon review during the 4th Quarter, it was decided that the cons out-weighed the pros for the stack extension; the effort is placed on-hold.

A Farm Exhausters

FY 2018 Summary:

FY 2018 exhauster activities included pouring concrete pads to accommodate future installation of the exhauster skids and isolating the existing ventilation ducting for all A Farm tanks. A summary of FY 2018 accomplishments follows:

Exhausters: The two A Farm Exhausters, which were fabricated in FY 2017, were shipped and placed in storage in Blackfoot, Idaho **(Figure 22)**. They will be shipped to Hanford when the pad is installed and site preparations are completed.

Figure 22. The A Farm Exhauster, fabricated in FY 2017, is currently located in Blackfoot, Idaho, at the manufacturer's facility. (Picture courtesy Mark A.)

Figure 23. Focused view of Exhauster Slab Retaining Walls for A Farm Exhausters (Photo taken in May 2018. Contributed by M. Allen.)

FY 2018 exhauster activities included pouring concrete pads to accommodate the exhauster skids, as well as isolating the existing ventilation ducting for all A Farm tanks **(Figure 23)**. Isolation is necessary to establish enough vacuum for tank ventilation. During the 1st Quarter, design constraints for installation of the new exhauster were defined and the preliminary engineering design package was submitted in mid-December. During the 2nd Quarter, the design package was prepared and the subcontract to construct the new exhauster slab was awarded; excavation of the exhauster slab retaining wall footings for both the south and north walls were completed **(Figures 25 and 26)**. During the 3rd Quarter, crews continued constructing the A Farm Exhauster retaining walls. The team poured the south retaining wall and completed the backfill and compaction between the north and south retaining walls, followed by conduit installation, backfilling and compacting the area above the conduit. Midway through the 4th Quarter, concrete pours for the exhauster slab were completed **(Figure 24)**.

Vent Ducting Isolation: Early in the 1st Quarter, a contract was awarded to American Electric Inc. (AEI) to remove equipment from A Farm, thus allowing the installation of the exhauster ducting and isolation of existing A Farm ducting. During the 2nd Quarter, AEI successfully conducted their "proof-of-concept" test for verifying isolation of the A Farm ventilation ducting and started duct isolation activities.

Procurement/Fabrication: Efforts needed to support installation of the two exhausters in FY 2019 were started during the 3rd Quarter. A material request was prepared to procure the POR518/POR519 exhauster valve manifold, manifold support and access platform, exhauster ducting, grout boxes, and duct stand

assemblies and blocks. This led to procurement of the POR518/POR519 exhauster valve manifold, manifold support and access platform, ventilation ducting, riser assemblies, work platforms, cover plates, grout boxes and large spray rings during the 4th Quarter. In addition, subcontracts were awarded for fabrication of the stand assemblies, demister shields, and grout boxes.

Figure 24. Exhauster Slab for A Farm Exhausters (Photo taken in August 2018. Contributed by M. Allen.)

Figure 25. Panoramic view of the A Farm Exhausters slab retaining walls. (Photo courtesy of M. Allen, June 2018.)

Figure 26. Depicted are the A Farm Exhausters slap retaining walls after the backfill and compaction was completed. (Photo courtesy of M. Allen, June 2018.)

Strobic® Air Dilution Fan

Figure 27. Fabricated in Pennsylvania at the Strobic facility, the above unit was completed in March 2018. (Photo courtesy of T. Stoner.)

FY 2018 Summary:

The goals for FY 2018 were to complete a factory acceptance test (FAT) by March 2018, and a full-scale off-site demonstration of the Strobic® unit by September 2018. The project began in FY 2016 when the CTO, working with Savannah River National Laboratory, assessed the feasibility of identified options to develop and test supplemental exhaust equipment. Starting in FY 2017, the project team contracted with Strobic® Air to develop the technology. Below is a summary of what was accomplishment in FY 2018.

Factory Acceptance Test: Early in the 1st Quarter, efforts focused on awarding Strobic® a fabrication contract to support the FAT, which was awarded in late November. The purpose of the FAT was to evaluate the capabilities of a mobile, skid-mounted unit to support future Hanford activities. During the 2nd Quarter of FY 2018, WRPS visited the Strobic® facility on a couple of occasions to assist in completion of the FAT. As a result of this collaboration between the companies, the FAT was completed the week of March 19, 2018. **Figure 27** depicts the Strobic® unit fabricated in Pennsylvania.

Full-Scale Demonstration: After Strobic® completed the FAT, the unit was shipped to Hanford for an off-site, full-scale demonstration to evaluate the capabilities of the fan and its capacity to support future Hanford activities. The statement of work for the test plan was approved and submitted for solicitation near the end of the 1st Quarter. Hi-Line was awarded the contract to the full-scale demonstration, which was performed at their off-site facility. The preparations necessary to support the demonstration, and repairs to the unit acquired during shipping, were the focus of 3rd Quarter activities. Towards the end of the 3rd Quarter, the unit was assembled and tested as depicted in **Figures 28-30**. Successfully completed by the end of FY 2018 was the testing, evaluation of the data, and the test report on the Strobic®.

Figure 28. The Strobic Unit used for off-site testing (Front View). (Photo courtesy of T. Stoner)

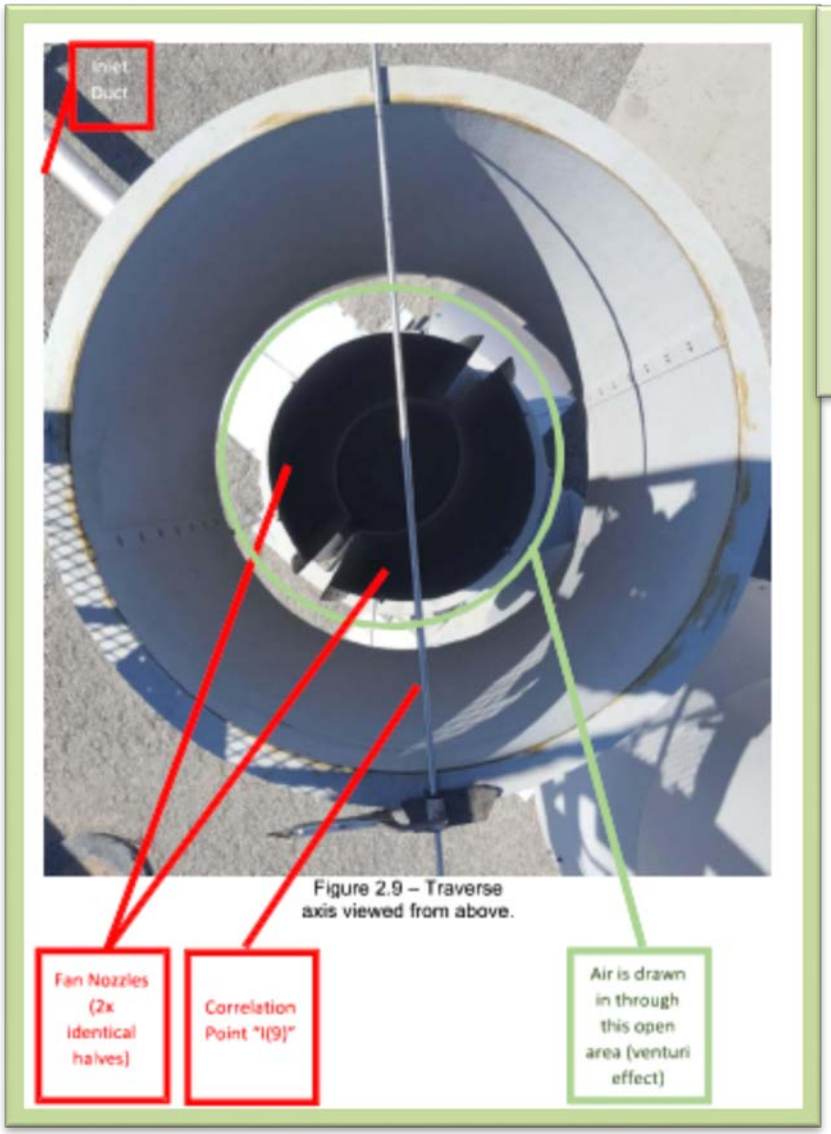


Figure 29. The bottom view of the Strobic® Unit used for off-site testing. (Photo courtesy of T. Stoner)

Figure 30. The Strobic® Unit used for off-site smoke test. (Photo courtesy of T. Stoner)

NUCON® Thermal Oxidation Proof-of-Concept

FY 2018 Summary:

In FY 2017, a proof-of-concept test successfully demonstrated the removal of greater than 95 percent of the chemical vapors fed to the NUCON® system. Uncertainties in the results however, led to the recommendation that the proof-of-principle tests be repeated in FY 2018 as part of an engineering-scale test. The information collected in the engineering-scale test would support the potential design and permitting of a full-scale demonstration. The engineering-scale test was performed in FY 2018 and was a collaborative effort between WRPS, PNNL, TerraGraphics, and NUCON®. WRPS was responsible for overall coordination and management. PNNL was responsible for developing the test plan, securing equipment, and conducting the test. TerraGraphics was responsible for infrastructure (trailers, power, etc.), while NUCON® was responsible for modifications and delivery of the prototype unit. The engineering-scale test was completed in FY 2018. The results of the engineering-scale test supported the decision to continue to a full-scale demonstration. WRPS selected Tank BY-108 as the site for the demonstration because of its worst-case concentrations COPC. Design and permitting is scheduled to begin in FY 2019. Following is a summary of the FY 2018 activities.

Figure 31. NUCON® Instrumentation Trailer, May 2018. (Photo courtesy of E. Morrey.)

PNNL:

- PNNL developed COPC-simulation gas-mixtures encountered in the tank headspace; a final selection was made in late November.
- In the 1st Quarter, PNNL started preparing analytical equipment needed to support the engineering-scale test. All equipment, including the Ultra-Violet Fourier transform infrared spectroscopy (UV-FTIR), proton transfer reaction-mass spectrometry (PTR-MS), and pre-concentrator were deemed acceptable to support testing, and the analytical trailer was turned over to the testing team in the 3rd Quarter as shown in **Figure 31**.
- PNNL prepared equipment and systems to support testing activities (i.e., injection, sampling and calibration systems). All systems were turned over

to the testing team the week of April 30, 2018, and testing was begun (**Figure 32**).

- PNNL supported implementation of the engineering-scale test, which was completed towards the end of the third quarter. After testing was completed, PNNL issued the *NUCON® Vapor Abatement Unit Performance on Hanford Tank Farm Chemicals of Potential Concern* quick look draft (which used preliminary data) as an initial review of system performance. During the 4th Quarter, PNNL prepared and submitted the final test report to WRPS summarizing NUCON® engineering-scale testing activities, entitled *NUCON® Vapor Abatement Unit Performance on Hanford Tank Farm Chemicals of Potential Concern.*

Figure 32. NUCON® Vapor Abatement Unit and instrumentation Trailer, May 2018. (Photo courtesy of E. Morrey.)

WRPS:

- A major priority in the 1st Quarter was to prepare and present the *Propane Decision Paper*. A propane-powered NUCON® unit was used for the proof-of-concept test. Before proceeding with further testing, the feasibility of using a propane-powered unit in the Hanford Tank Farms was evaluated. The evaluation identified multiple safety issues thus excluding propane at the tank farms, and the decision was made to use diesel. The evaluation is detailed in the *Propane Decision Paper* which was presented to both WRPS and ORP management.
- As a result of switching to diesel, the post-exhaust needs were re-evaluated during the 1st Quarter. Due to the incomplete combustion of the diesel fuel, the decision was made to include a diesel oxidative catalyst, diesel

particulate filter (DPF), and selective catalytic reduction in the unit. These help in destroying the COPC generated as a result of incomplete diesel combustion.

- Supported by WRPS, PNNL prepared test plans and procedures, and developed analytical and injection systems. They also provided major support for solving analytical challenges encountered during the engineering-scale test.
- Supported by WRPS, Terragraphics worked on the conceptual design for the BY-108 full-scale demonstration.
- WRPS issued the final test report summarizing NUCON® engineering-scale testing activities entitled *NUCON® Vapor Abatement Unit Performance on Hanford Tank Farm Chemicals of Potential Concern.* The results of the test support the decision to continue to a full-scale demonstration on-site. Based on its worst case concentrations of COPC, WRPS selected tank BY-108 to be the site for the demonstration. The conceptual design for the effort started in FY 2018, with initiation of the detailed design and permitting planned for FY 2019.

TerraGraphics:

- In FY 2018, Terragraphics completed activities needed to establish electrical power for the engineering-scale test. To support testing activities, a trailer was purchased. The trailer was delivered to the test site during the 2nd Quarter. In the 3rd Quarter, test and design engineers also provided support for startup and training activities, including repairing leaks on the DPF **(Figure 33).**
- Near the end of the 1st Quarter, TerraGraphics started work on the *Site Selection Criteria Report,* the purpose of which was to select the tank farm to support potential full-scale demonstration testing in the future. TerraGraphics evaluated the tank farm candidates early in the 2nd Quarter, and ultimately selected BY-108 for the demonstration. The *Site Selection Report* was issued at the end of the 2nd Quarter. The 60 percent conceptual design package was complete at the end of the 2nd Quarter. The 90 percent conceptual design package, started in the 3rd Quarter, continued into the 4th Quarter. Comments are currently in resolution.

Figure 33. Repair of the diesel particulate filter soot leak with the high-temperature seal. The insulation was removed during a pre-testing repair, May 2018. (Photo courtesy of G. Weeks.)

Figure 34. Nucon® Diesel Upgrade Kit - Prepared to Ship to WRPS. (Photo courtesy of G. Weeks.)

NUCON:

- In mid-November, NUCON® started working on the design and fabrication of the diesel conversion kit, which was fabricated during the 2nd Quarter. The diesel conversion kit was required because the original propane-powered generator presented potential nuclear safety concerns at the Hanford Site. The diesel generator kit and upgrade kit were shipped to the PNNL test site and a NUCON® technical representative arrived on-site to assist with the start-up of the vapor abatement unit shown in **Figure 34**. NUCON also provided technical support during startup, testing, and data evaluation activities throughout the 3rd and 4th Quarters.

KPP 5. Administrative Controls and Monitoring

Permanent Installation of VMDS Equipment in A and AP Farms

FY 2018 Summary:

Key Performance Parameter 5

Define unrestricted work boundaries and implement monitoring on active stack ventilation and unrestricted work boundaries in the A farms to provide defense-in-depth.

In FY 2017, WRPS identified viable VMDS components for use in the tank farms, one of which is the UV-FTIR. The main goal for FY 2018 was turnover of the AP Farm stack monitor (UV-FTIR) to Operations. Turnover accomplishments during the fiscal year included:

- **Functions and Requirements Document**: During the 1st Quarter, efforts on the functions-and-requirements (F&R) document, titled *Chemical Vapor Source Monitor Functional and Operational Requirements Document,* RPP-RPT-60580, were started. The purpose of the F&R is to define functional requirements and associated design features for chemical vapor monitors on the Hanford Site. The document, which was a key component to supporting turnover activities, was approved during the 3rd Quarter.
- **Calculations/Evaluations**: Both the calibration gas calculation (RPP-CALC-62150) and uncertainty evaluation (RPP-RPT-60669) were prepared and approved during the fiscal year. The purpose of the calibration gas calculation, which was approved during the 3rd Quarter, is to calculate required spike gas concentrations to complete both the verification check and general testing activities. The purpose of the uncertainty evaluation, which was approved during the 4th Quarter, is to summarize the instrument errors associated with the UV-FTIR Vapor Monitoring System spectrometer for selected gases and concentrations.
- **Operational Acceptance Tests (OAT)**: A number of OAT were prepared during the fiscal year in support of turnover activities. The OAT was split into three separate test to optimize the approval process. The first OAT addressed interim reliability of the system to support startup testing; the second OAT addressed startup activities where no gas testing is required;

while the third OAT addressed startup activities when gas testing is required. A status for each OAT is provided below:

- **Interim Reliability OAT:** This OAT has been prepared and approved. Efforts are currently on-going to support software modifications needed to continue testing requirements listed in this OAT.
- **No-Gas Testing OAT**: The draft OAT was prepared and comments have been incorporated. The OAT is currently awaiting final approvals.
- **Gas Testing OAT**: The draft OAT is currently being prepared and is targeted to be approved in FY 2019.

In addition to AP Farm turnover activities, the following were performed in support of permanent VMDS equipment installation:

- **Phase 2 Pilot-Scale Report**: The *Phase 2 Pilot-Scale Report*, a report summarizing the results of the FY 2017 viability assessments used to select VMDS equipment for full-time operations, was prepared in FY 2017. Comments have been resolved, and the report is currently in the approval cycle with targeted completion in FY 2019.
- **Autosampler**: Modification of the Autosampler (Real-Time Detecting, Optimized-Sample-Selection [RDOSS] system) for stack monitoring continued during the first half of FY 2018 **(Figure 35)**. The RDOSS is fitted with a gas chromatograph flame-ionization detector and Ultra Violet- Differential Optical Absorption Spectrometer (UV-DOAS); this unit provides real-time analysis of easily detectable indicator COPC (e.g., NH3 and mercury), hourly analysis of a suite of COPC, and can also collect targeted laboratory samples for analysis that will provide more accurate detection and characterization of Hanford COPC. Towards the middle of the quarter, autosampler development was deferred until FY 2019.

Figure 35. The Exhaust Stack Probe Ports on the Autosampler. (Photo courtesy of R. Yonochko)

The following was accomplished during FY 2018:

- During the 1st Quarter, efforts were initiated to determine gas standards for testing, which is a key component in development of the RDOSS. In support of developing test gas standards, samples were collected during waste disturbing and quiescent (inactive or dormant) activities at AP Farm. The samples were analyzed by both the 222-S Lab and an off-site vendor in order to confirm that the sample adequately supports integrated testing. The results confirmed the gas standards could support testing.
    - Procurement of key equipment (probes, pumps, UV-DOAS) needed to support integrated testing was started in the 1st and 2nd Quarter, and subsequently deferred until FY 2019.

Preparation of the draft test procedure, which will be used for integrated testing, was completed during the 2nd Quarter. After the draft was completed, remaining efforts were deferred until FY 2019.

Stack and Boundary Monitors

FY 2018 Summary:

In addition to the turnover of the AP Farm UV-FTIR stack monitor to Operations previously discussed, other stack monitoring activities were performed during the fiscal year. The goal for FY 2018 was to complete installation of stack monitors on the AW, AX (two), AN, and 702-AZ Exhausters. Below is a summary of what was accomplished during FY 2018:

- **Design:** Efforts started early in the 1st Quarter to prepare final design packages for each monitor installation. Both 60 percent and 90 percent design installation packages were submitted for internal review and comment incorporation during the 2nd Quarter. The design packages for 702-AZ and AN Farm stack monitors were approved during the 3rd Quarter, while the AW and AX Farm designs were completed in the 4th Quarter.
- **Procurement**: A key issue during the 1st Quarter was the delayed procurement of 13 UV-DOAS units needed to support FY 2018 stack monitoring installation and future VMDS activities. Questions were raised by the WRPS Quality Assurance (QA) department on the ability of the vendor's QA plan to align with WRPS requirements. The concerns were resolved and procurement of the units moved forward.
- **Installation:** During the 1st Quarter, the PFWR was completed for stack monitor installation, with the work being awarded to construction forces. The contract for installation of the stack monitors, started in the 2nd Quarter, was awarded. The 3rd Quarter saw the completion of work packages needed to support installation of the monitors, and site preparation work started during the quarter. During the 4th Quarter, installation, final startup, and testing of the 702 AZ, AN Farm, and AX Farm UV-DOAS stack monitors, as well as the AW Farm UV-FTIR stack monitor, were completed.

Establishing Safe Unrestricted Boundaries

FY 2018 Summary: FINAL UPDATE***CLOSED**

WRPS, in coordination with ORP S&H, developed a white paper defining the unrestricted work boundary related to tank vapor management titled *Industrial Hygiene Basis for Defining the Unrestricted Work Boundary*. It was released via SPF on April 3, 2018. Completed on September 11, 2018, was the revision to TFC-ESHQ-S_IH-C-48, *Managing Tank Chemical Vapors* to include the above described white paper, sign changes **(Figure 36)**, the consolidation of the RC tables for the double and single shell tanks into a single table, and terminology changes. IH communicated a major revision to TFC-ESHQ-IH-C-48, *Managing Tank Chemical Vapors,* intended to "simplify risk classification categories, align terminology with industry standards, and assist in the demarcation and communication of areas with greater potential of tank chemical hazards." *Exclusion Zones* **replaces** *Vapor Control Zone* as the term used to demarcate "the boundary of potential vapor emission source greater than 50 percent of the OEL."

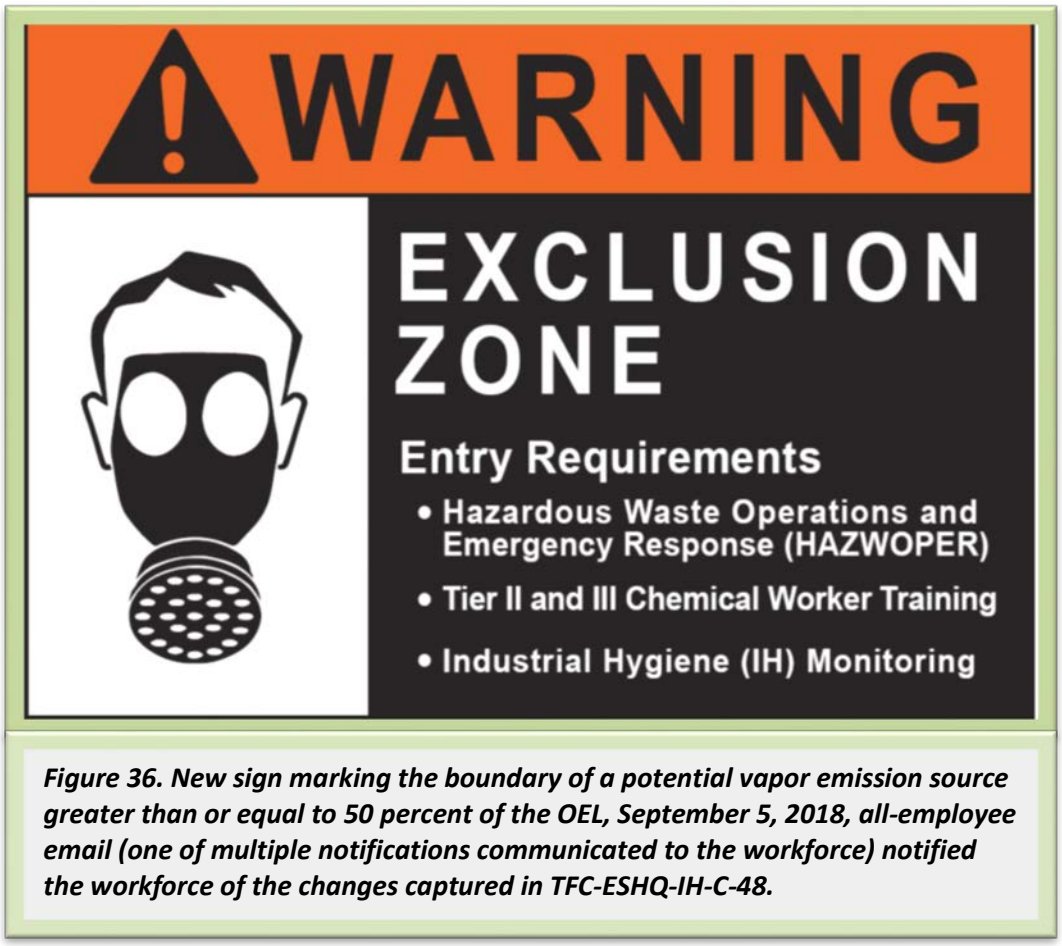


Figure 36. New sign marking the boundary of a potential vapor emission source greater than or equal to 50 percent of the OEL, September 5, 2018, all-employee email (one of multiple notifications communicated to the workforce) notified the workforce of the changes captured in TFC-ESHQ-IH-C-48.

Public Address System

FY 2018 Summary:

The main goal of the Public Address System project in FY 2018 was to complete the public address (PA) system field installations and functional testing of the speaker systems at B, BX, BY, S, SX, SY, T, TX, TY, and U Farms by the end of FY 2018. In addition to this effort, turnover of the PA systems previously installed in FY 2017 (A, AX, AY, AZ, AW, AN, AP, and C Farms) to Operations was also scheduled to be performed in FY 2018. Below is a summary of what was accomplished during FY 2018:

Installation: Efforts were started on the design packages for B, BX, BY, S, SX, SY, T, TX, TY, and U Farms in the 1st Quarter, with all of them approved in the 2nd Quarter. In addition to the design packages, the ground scans, crossing lists, and excavation permits were completed for all the farms in the 2nd Quarter. During the 3rd Quarter, excavation, trenching, wiring, and conduit installations were completed at S, SX, and SY Farms, and started at the B, T, and U Farm complexes. Fieldwork for B, T, and U Farm complexes were completed early in the 4th Quarter. Functional testing of S, T, U, and B Farm PA systems was completed towards the end of the fiscal year. Installation is complete. **Figures 37 and 38** depicts the speakers in AP Farm and B Complex.

Turnover: The first set of PA systems (A, AX, AY and AZ-Farms) were turned over to Operations towards the end of the 2nd Quarter. The remaining PA systems (AW, AN, AP and C Farms) were turned over in the 4th Quarter.

Figure 38. B Complex PA Speaker (Photo courtesy B. Nelson)

Figure 37. AP Farm Speaker (Photo courtesy B. Nelson)

KPP 6. Tank Operations Stewardship

Pilot SST Stewardship Program

Key Performance Parameter 6

Institutionalize a tank operations stewardship program that minimizes required tank farm personnel entries; and establishes parameters for locating ancillary personnel and offices.

FY 2018 Summary:

The purpose of the single-shell tank (SST) Stewardship Program is to identify and evaluate procedures requiring entry into SSTs, and determine whether the requirements can be reduced or eliminated. The goals for FY 2018 included the following:

- Complete the design, procurement, and installation of remote monitoring equipment in TY Farm, and complete the design of TX Farm by 9/30/18.
- Develop and issue a plan for implementing feasible recommendations from the FY 2015 LEAN event focused on reducing tank farm entries by the end of FY 2018 (*SST Stewardship Project (T1P180) Project Execution Strategy*).
- Develop and issue a report on work location evaluations by the end of FY 2018.

During the 3rd Quarter, the SST Stewardship Program's scope and schedule were reviewed. It was determined that the TY Farm installation activities would be deferred until FY 2019, while the TX Farm and TY Farm designs, along with the *SST Stewardship Project (T1P180) Project Execution Strategy* (FY 2015 LEAN Report), would still be completed in FY 2018. A summary of activities performed during FY 2018 are discussed below:

SST Remote Monitoring Equipment: An engineering contract for the TY Farm design was awarded the week of November 6, 2017, and work was immediately started with a kick-off meeting the week of November 13. Shortly after, efforts were in full swing for both the TY Farm temperature and surface level designs **(Figure 39)**. Towards the end of November, it was announced that TX Farm would be the second SST farm to be designed. During the 2nd Quarter, the TY Farm 60 percent design package was completed and work started on the 90 percent design package. Efforts were also started to procure a vendor for the TX Farm design package. In the 3rd Quarter, the TY Farm temperature and surface level design packages were completed, and the contract for the TX Farm design package was awarded. Also during the 3rd Quarter, the draft 60 percent TX Farm package was completed, while the final design package was completed during the 4th Quarter. At the end of FY 2018, efforts continued on preparing a statement of work for FY 2019 activities, which will support T Farm complex installation activities. In addition to the design packages, Mission Support Alliance started laying fiber in support of network development activities during the 4th Quarter.

Figure 39. Walkdown to Support TY Farm Design (Photo courtesy of D. Larsen)

SST Stewardship Project (T1P180) Project Execution Strategy (FY2015 LEAN Report): The engineering services contract for preparing this report was awarded to ARES in October 2017, and a kick-off meeting was held. A detailed draft outline of the *SST Stewardship Project (T1P180) Project Execution Strategy* was prepared, which addressed all topics identified in the FY 2015 LEAN event, in addition to numerous other activities which may help reduce SST entries. In the 2nd Quarter, two drafts of the *SST Stewardship Project (T1P180) Project Execution Strategy* were submitted for review. Both of the reviews were completed during the quarter and comments incorporated. The document (RPP-RPT-60443) was approved in the 3rd quarter.

Work Location Evaluations: The purpose of the evaluation is to describe the approach for locating people and facilities around the tank farms, with consideration for individual and group work scope, accessibility requirements and established restricted work boundaries. Management met during the 1st Quarter to develop the scope and schedule for this effort. During this meeting, the work scope was defined and a tentative completion date of January 31, 2018 was established. The work location evaluation was completed during the 2nd Quarter of FY 2018.

KPP 7. Hierarchy of Controls

Cartridge Testing and SCBA Alternatives

Key Performance Parameter 7

Provide options to promote the hierarchy of controls for chemical vapor respiratory protection beyond current use self-contained breathing apparatus.

FY 2018 Summary: FINAL UPDATE****

During the 4th quarter of FY 2017, WRPS and HAMTC agreed upon the implementation and use of Full-Face Air-Purifying Respirators (FFAPR). In the 1st Quarter of FY 2018, WRPS and HAMTC jointly agreed to expand the use of FFAPRs to 241 SY Tank Farm for specific work evolutions. On December 14, 2018, WRPS implemented FFAPR use in 241 SY Farm, and limited their use to low hazard work during non-waste disturbing activities (SEG 1 and SEG 2). However, on February 7, 2018, WRPS issued an *IH Safety Flash* entitled "Revision to Use of FFAPR in AP Farm." This *IH Safety Flash* indicated a new report from Stoneturn Consultants (STC), the independent third party reviewer selected by HAMTC, had been received, recommending that WRPS no longer approve the use of FFAPRs in AP Farm. STC's reason for this recommendation is based on the review of sample data collected from within the AP Exhauster (source data) that shows >50x the OEL for N-nitrosodimethylamine (NDMA) and >8x the OEL for furans. It is important to note that STC's decision does not take into consideration WRPS engineering controls (active ventilation and extended stack height). STC's decision is also based on the lack information on the adequacy of FFAPR cartridges on furans. Headspace sampling at BY Farm was completed the weekend of February 9, 2018. On the weekend of February 24th, Cartridge testing was conducted at BY 108 (**Figure 33**) and BY 110, and included PAPR and APR cartridge testing. By the end of FY 2018, WRPS had had the following successes:

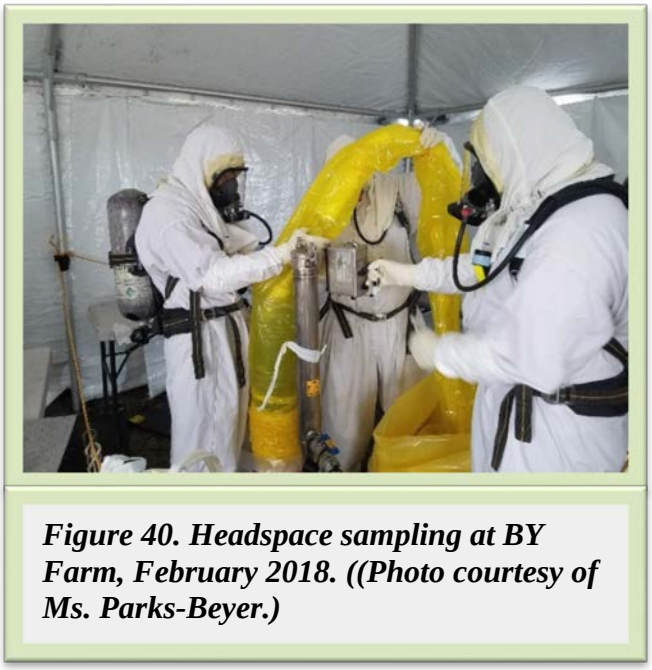


Figure 40. Headspace sampling at BY Farm, February 2018. ((Photo courtesy of Ms. Parks-Beyer.)

- On May 3, 2018, a briefing titled *AP Farm: Use of Full Face Air Purifying Respirators (FFAPR), Briefing Package was* delivered to managers which read, "SY Farm transitioned from supplied air (SA) to full-face air purifying respirators (FFAPR) in December 2017. AP Farm scheduled to transition on May 15, 2018. Implementation at other actively ventilated tank farms will

follow assessment of AP Farm implementation: AY/AZ, AX, AW, AN (*Briefing Package*, pg. 2)." The transition is consistent with the Memorandum of Agreement between WRPS and HAMTC. Workers retain the right to voluntarily upgrade to supplied air, and all entries in AP Farm require IHT coverage even when using supplied air.

- On May 17, 2018, an all-employee email stated, "Beginning as early as Tuesday, May 22, workers in AP Farm will have the option of using full-face air-purifying respirators (FFAPRs) equipped with filter cartridges for low-hazard non-waste-disturbing work in the AP Tank Farm rather than supplied-air respirators such as self-contained breathing apparatus (SCBA)."
- During the 3rd Quarter, IH began developing hazard assessments for SEG 1 & 2 work in the ventilated farms.
- In the 3rd Quarter, PNNL began circulating the draft report of its APR test findings from the SX Farm conducted in June 2017. Recent cartridge testing data collected from the AX Exhauster has been analyzed and the report is in draft. It is numbered PNNL-27558 and consists of 2 volumes. The report is in review before general distribution.
- During the 3rd Quarter, a few respirator cartridges were found with carbon dusting after use. APR cartridge testing for excess charcoal dust was completed. The inventory of concern was returned to the manufacturer and replaced with fresher/newer cartridges. Cartridge lots from May 18 forward were approved for use. The dusting was determined to be a quality issue, and the manufacturer put in additional steps to prevent a recurrence.
- WRPS began the work package to support PAPR testing in BY-108. All six cartridge tests were completed; the last 2 tests on the AW Stack were completed on June 9, 2018. On June 25, WRPS updated TFC-PLN-168, *Industrial Hygiene Sampling, and Analysis Plan for Respirator Cartridge Testing*, to incorporate Wastren Advantage Incorporated, Hanford Laboratory (WHL).
- SCBA chest straps on order arrived during the 3rd Quarter.
- Air Purifying Respirator (APR) and Powered air purifying respirator (PAPR) cartridge testing, the last of the cartridge testing for FY 2018, was completed at the AW Farm primary exhaust stack during the transfer of AW-106 to AW-102.
- In September 2018, PNNL sent to WRPS for review, PNNL-27860, Rev. A, *Analysis of Air-Purifying Respirator (APR) and Powered Air-Purifying Respirator (PAPR) Cartridge Performance Testing on a Hanford AX Tank Farm Exhauster Slipstream, Volumes 1 and 2.*

Mobile Laboratory

FY 2018 Summary:

Key Performance Parameter 7

Provide options to promote the hierarchy of controls for chemical vapor respiratory protection beyond current use self-contained breathing apparatus.

Throughout the 1ST Quarter, efforts focused on determining the FY 2018 work scope for RJ Lee. Because the work scope could not be defined and a new contract issued, mobile laboratory activities were placed on-hold during the 1st Quarter. In the 2nd Quarter, the work scope was determined and a contract to RJ Lee was issued for supporting the FY 2018 spring background study using the mobile laboratories. The purpose of the spring background study was to evaluate the seasonal effects of the nitrosamine and furan concentrations both on- and off-site, and up- and down-wind of the tank farms. After the contract was awarded, a kickoff meeting was held with RJ Lee to discuss details of the study, which began late in the 2nd Quarter, and was completed during the 3rd Quarter. Also during the 2nd Quarter, work was started on the new Mobile Lab Services contract, which was eventually awarded to TerraGraphics.

During the 4th Quarter, TerraGraphics completed building the new mobile laboratory. The new mobile laboratory features enhanced capabilities, including a more sensitive PTR-MS, UV-DOAS, Fourier transform infrared spectroscopy, Flame Ionizing Detector, Photo Ionizing Detector and a Picarro ammonia analyzer. Tours of the new Mobile Laboratory were conducted at the 3110 Port of Building parking lot **(Figure 41)**. Activities performed by the new mobile laboratory in the 4th Quarter included:

- Area monitoring support for the AY-102 Rinse Evolution
- Sampling around the SX tank farm during initial activities associated with the paving project.
- Supporting the Fugitive Emissions initiative:
    - Sampled around the septic tanks located near the 242-A evaporator
    - Sampled downwind of the septic tanks, near 244-AR
    - Sampled in the vicinity of a local onion producer

Figure 41. TerraGraphic's New Mobile Laboratory, August 2018. (Photo courtesy K. Riedner)

Personal Vapor Monitor

FY 2018 Summary:

C_2Sense®, at the request and funding of DOE, is developing a personal ammonia sensor. The goal for FY 2017 was to begin developing a prototype personal vapor monitor that could be worn by tank farm workers. Towards the end of FY 2017, an initial integration test was completed. The goal for FY 2018 was to further develop the sensor through testing at both on-site and off-site locations. Below is a summary of what was accomplished during FY 2018:

- During the 1st Quarter, the first five ammonia prototype sensors were delivered by C_2Sense® to WRPS **(Figures 40 and 41)**. The white and grey items are the sensor chip holders and associated electronics. The black item is an external battery. The sensor chip is the brown card inserted into the holder. The system has a local alarm that can be set to inform the wearer when the ammonia concentration is above the alarm threshold and provides

continuous ammonia concentrations for each tank farm worker to the central shift office. Initial testing showed the device would detect ammonia at about 250 ppb (0.25 ppm).

As a first prototype, a number of necessary improvements were identified. Primarily, the improvements include a reduction in size (the goal is about 25 percent of the current size) and the incorporation of the battery inside the unit.

Figure 42. The picture on the left is of the first working prototype of the C_2Sense® personal ammonia monitor. (Picture courtesy of G. Weeks)

2nd Quarter activities centered on initiating the C_2Sense® field demonstration in the tank farms. An integrated project team, comprised of management, engineering, safety, Industrial Hygiene (IH), and HAMTC representatives, held a kick-off meeting on January 18, 2018, to start planning for the field demonstration. The fabrication of the mounting plates used to secure the ammonia sensors was begun mid-quarter. The procedures and work packages needed to support the C_2Sense® field trial were started and approved during the 2nd Quarter and were prepared with the support of the WRPS Industrial Hygiene group. Another 2nd Quarter activity for WRPS was conducting a market survey for other personal ammonia detectors that could potentially be tested along with the C_2Sense® monitor.

Figure 43. Right. Pictured is one of the first five working prototype of the C_2Sense® personal ammonia monitor. (Picture courtesy of E. Morrey)

The 3rd Quarter activities focused on conducting the C_2Sense® field demonstration. The ToxiRAE Pro, [5]Ventis™Pro V, and the [6]GfG Micro IV detectors, along with the [7]ChromAir® Badges were received and included in the field demonstration **(Figure 44)**. Initially, C_2Sense® data from four C_2Sense® detectors and two ground truth instruments were collected from the A-103 passive breather filters (PBF) (**Figure 45).** Instrument readings at the PBF (air drawn from under the PBF), showed ammonia concentrations as high as 93 ppm, but concentrations at the C_2Sense® and ground truth ammonia detectors were lower than desired (≤2 ppm). The detectors were re-located to as close as possible to the PBF, but this did not significantly increase the ammonia concentrations (≤3 ppm). The detectors were removed from the field and reconfigured to increase the ammonia concentration by using a pump to pull high ammonia concentration air from the PBF and deliver it to an ice chest with the detectors enclosed **(Figure 46).** The new configuration produced excellent results with ammonia concentrations from 0 to 200+ ppm. The field demonstration allowed C_2Sense® to complete the first version of algorithms for their ammonia detectors that allows conversion of a raw conductance signal to ammonia concentration.

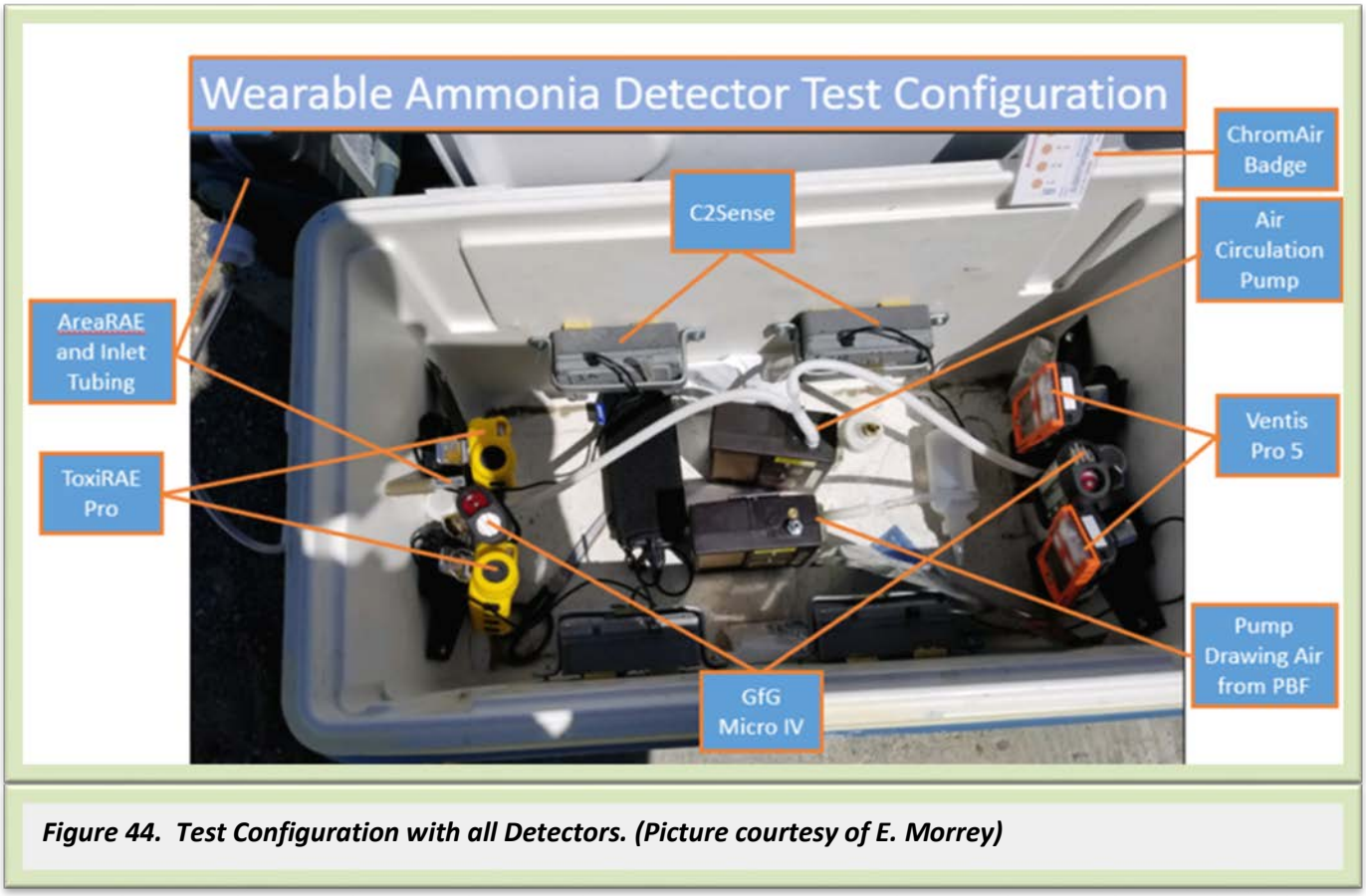


Figure 44. Test Configuration with all Detectors. (Picture courtesy of E. Morrey)

The 4th Quarter activities focused on completing data analysis of the ToxiRAE Pro, Ventis™Pro V, and the GfG Micro IV detectors' performance, along with the ChromAir® Badges. Phase II of the field testing was cancelled due to limited Radiological Control Technician and IHT support for the remainder of the quarter. Phase II would have analyzed the various devices' accuracies using ammonia gas pulled from a stack to the mobile laboratory. Phase III of the testing, to collect zero ammonia background data for instrument sensitivity calculations, was completed. A final report for the wearable ammonia detector field trials in A Farm was completed. It included the ToxiRAE Pro, Ventis™Pro V, GfG Micro IV detectors and the ChromAir® Badges. It supported the use of either the ToxiRAE Pro or the Ventis™Pro V as ammonia detection devices. C_2Sense® submitted a presentation summarizing efforts to improve its sensor algorithms. They concluded the C_2Sense® ammonia sensor prototype in its current state cannot be used to reliably quantify ammonia concentration in real-time. IH purchased ToxiRAE Pro units for use in the field. The ToxiRAE Pro detectors will be rolled out into the field in FY 2019.

Figure 45. Sample Pump Tubing Running to A-103 HEPA Filter. (Picture courtesy of E. Morrey)

Figure 46. Left. Pictured is the modified C_2Sense® System installed at A-103 Passive Breather Filter. (Picture courtesy of E. Morrey)

KPP 8. Medical Support

Key Performance Parameter 8

Support medical program enhancements in conjunction with responsible Hanford Site organizations and establish update to WRPS process/procedures.

The scope of KPP 8 is to support DOE Richland Operations Office (RL) medical program enhancements in conjunction with other Hanford Site organizations. WRPS has provided support to HPMC-OMS Occupational Medical Services (HPMC-OMS) as recommended. HPMC-OMS participates in WRPS-led CVST meetings. There, HPMC-OMS presented on the tank farm vapors-related occupational medical services, and answered questions from the workforce. HPMC- OMR presented on:

- *Chemical Exposure Evaluation Process for Tank Farm Workers*
- *Learning Opportunity: Occupational and Environmental Health Course*
- HPMC-OMS procedure updates
- Observations from medical surveillance
- Introduction to and updates on ongoing *Tank Farm Worker Epidemiologic Study*

WRPS contracted CTEH to provide toxicological support to the tank farms. WRPS also uses CTEH expertise to supplement chemical worker training provided by HPMC-OMS. CTEH toxicologists host question and answer sessions for workers after they complete their chemical worker training provided by HPMC-OMS.

CTEH toxicologists support HPMC-OMS in determining the ideal time to test for Biomarkers of Effect (BoE) for exposure to COPCs, as well as the possible availability of other BoEs. Currently, direct testing for mercury and benzene is done. Those two are the only COPCs for which there are commercially available direct tests in body fluids. HPMC-OMS confirmed they are currently working on an epidemiologic study comparing Hanford workers who describe themselves as having been exposed to vapors and those who do not.

Discussions took place between the HAMTC President and committee related to revising the *Access Control Entry System* (ACES) exclusion note in the TFC-BSM-HR_EM-C-10, *Reasonable Accommodations* procedure. The HAMTC President did not agree with the committee's recommendation to replace the ACES exclusion note with "employees with minimal or no symptoms and a normal exam may be returned to work with or without restrictions while lab test results are pending." Finally, WRPS hosted a meeting with the Washington State Department of Labor and Industries (L&I), Office of the Ombudsman for Injured Workers of Self-Insured Businesses on June 26, 2017. A second series of meeting from Washington State L&I, Office of the Ombudsman for Injured Workers of Self-Insured Businesses was cancelled. The meetings were originally scheduled to take place in February and March 2018. No new visit has been scheduled.

[1]Strobic Air Tri Stack is a registered trademark of Strobic Air Corporation, Bensalem, Pennsylvania.
[2]NUCON is a registered trademark of Nucon International, Inc., Columbus, Ohio.
[3]C_2Sense is a registered trademark by C_2Sense®, Inc., Cambridge, Massachusetts.
[4]RAE Systems by Honeywell, San Jose, California.
[5]Ventis™ Pro5 Multi-Gas Monitor is a registered trademark by Industrial Scientific in Pittsburgh, Pennsylvania
[6]GfG Micro IV Single Gas Detector from GfG Instrumentation, Inc.
[7]ChromAir is registered to Morphix Technologies, Virginia Beach, Virginia.

Appendix A

FY2018 CPPO Notebook
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Appendix B

Chemical Protection Program Office

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Hanford Vapors Website FY 2018 Updates 1st Quarter Summary

Website Article and Page Updates

Chemicals of Potential Concern, WRPS-1604188.1 Rev. 1, 9/21/2017			
Updated EA-32 Section under Independent Assessments			
Office of Enterprise Assessments Follow-up Assessment of Progress on Actions Taken to Address Tank Vapor Concerns at the Hanford Site January 2017			
Office of Enterprise Assessments Office of Worker Safety and Health Assessments Follow-Up Assessment of Progress on Actions Taken to Address Tank Vapor Concerns at the Hanford Site Kevin G. Kilp, Acting Director DOE/HQ EA-32 November 16, 2017			
Updated VMEP section under Independent Assessments			
VAPOR MANAGEMENT EXPERT PANEL REPORT, NOVEMBER 2016 Safety and Health Division Office File			

Report Summaries

PNNL-26041	*Analysis of Respirator Cartridge Performance Testing on Hanford Tank SY-102 Test Dates: July 8-10, 2016*
PNNL-26131	*Analysis of Respirator Cartridge Performance Testing on Hanford Tank A-101 Test Dates: July 8-10, 2016*
PNNL-26180	*Analysis of Respirator Cartridge Performance Testing on Hanford Tank BY-108 Test Dates: July 15-17, 2016*
PNNL-26243	*Analysis of Respirator Cartridge Performance Testing on the 702-AZ Primary Exhauster for the Hanford AY/AZ Tank Farms Testing dates: August 26-27, 2016*
PNNL- 26254	*Analysis of Respirator Cartridge Performance Testing on Hanford Tank AX-101 Test Dates: September 9-11, 2016*
PNNL-26317	*Analysis of Respirator Cartridge Performance Testing on a Hanford AN Tank Farm Exhauster Slipstream Testing dates: September 30 – October 2, 2016*
PNNL-26337	*Analysis of Respirator Cartridge Performance Testing on a Hanford AW Tank Farm Exhauster Slipstream Testing dates: September 23–25, 2016*
RPP-PLAN-59972 Rev. 0	*Technology Maturation Plan for the Tank Farm Vapors Monitoring and Detection System*
PNNL-25880	*Hanford Tank Vapors COPCs Update*
PNNL-25892	*Summary of VMDS Bench-Scale Testing (PNNL-25892)*
PNNL-25790	*Summary of State of Knowledge Assessment: COP/Exposure Limits (PNNL-25790)*
RPP-RPT-59584	*SCBA Equipment Evaluation Report Summary*
PNNL-25654, Rev. 1	*Atmospheric Dispersion Modeling*

AP Stack Weekly Reports

AP Stack Weekly Report: December 7-14, 2016	AP Stack Weekly Report: December 14-21, 2016
AP Stack Weekly Report: December 21-28, 2016	AP Stack Weekly Report: January 4-11, 2017
AP Stack Weekly Report: January 18-25, 2017	AP Stack Weekly Report: January 11-18, 2017

VMDS Pilot-Scale Testing Data

VMDS Weekly Report	March 29 – April 5, 2017	VMDS Weekly Report	March 8 – 15, 2017
VMDS Weekly Report	April 5 – 12, 2017		

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RJ Lee Mobile Lab Weekly Reports			
RJ Lee Monthly Report Summary for February 2017			
RJ Lee Monthly Report Summary for January 2017			
Vapors Weekly Update for FY2017			
Vapors Weekly Updt.	October 12, 2017		
Vapors Weekly Updt.	October 18, 2017		
Vapors Weekly Updt.	October 18, 2017 Update)		
Vapors Weekly Updt.	October 26, 2017		
Vapors Weekly Updt.	November 2, 2017		
Vapors Weekly Updt.	November 16, 2017		
Vapors Weekly Updt.	November 28, 2017		
Vapors Weekly Updt	December 7, 2017		
Vapors Weekly Updt.	December 14, 2017		
Chemical Vapors Solution Team Agendas and Meeting Minutes			
October 11, 2017	CVST Meeting Agenda	CVST Meeting Minutes	
October 25, 2017	CVST Meeting Agenda	CVST Meeting Minutes	
November 29, 2017	CVST Meeting Agenda	CVST Meeting Minutes	
December 13, 2017	CVST Meeting Agenda		
CPPO Weekly Reports			
CPPO Weekly Report	October 5, 2017 (FY2017 Annual Summary)	CPPO Weekly Report	October 12, 2017
CPPO Weekly Report	October 19, 2017	CPPO Weekly Report	October 26, 2017
CPPO Weekly Report	November 2, 2017	CPPO Weekly Report	November 9, 2017
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CPPO Weekly Report	December 21, 2017		

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Hanford Vapors Website FY2018 Updates 2nd Quarter Summary			
Website Articles and Page Updates			
Update: Odors reported inside 702-AZ exhauster building			
Update: Odors reported outside SY Tank Farm			
Update: Access restored to 702-AZ exhauster building			
Update: Access restored to SY Farm area after report of odors			
Reports and CPPO Summaries			
SRNL-L3100-2016-00142	*Evaluation of Photocatalytic Oxidation Degradation of Ammonia Summary*		
SRNL-TR-2016-00193	*Particle Collection and Analysis from Hanford Tank Farm Operations Summary*		
RJ Lee Group March, 2017	Chemical Vapor Initiative 3.0 Monthly Report, Rev. 1, Summary		
RJ Lee Group April, 2017	Chemical Vapor Initiative 4.0 Monthly Report, Rev. 0		
RJ Lee Group May, 2017	Chemical Vapor Initiative 5.0 Monthly Report, Rev. 0		
RJ Lee Group September, 2017	*Fiscal Year 2017 Mobile Laboratory Vapor Monitoring at the Hanford Site: Monitoring During Waste Disturbing Activities and Background Study* Summary		
Vapor Management Expert Panel	*Second Vapor Management Expert Panel Periodic Report and Recommendations October 2016 through June 2017.*		
Chemical Protection Program Office	Second Vapor Management Expert Panel(VMEP) 17-TRS-OO015 Report Summary		
Vapors Management Expert Panel	*Second Vapor Management Expert Panel Report*		
Chemical Protection Program Office	*Report Summary of PNNL-26821: Overview of 2016 Testing of Respirator Cartridge Performance on Multiple Hanford Tank Headspaces and Exhausters*		
Office of Enterprise Assessments	*Office of Enterprise Assessments Follow-up of Progress on Actions Taken to Address Tank Vapor Concerns at the Hanford Site February 2018.*		
VMDS Weekly Report (Library)			
Vapor Monitoring Detection System Weekly Report	January 25, 2017 – February 1, 2017		
VMDS AP Tank Farm Stack Monitoring	February 8 – 15, 2017	VMDS AP Tank Farm Stack Monitoring	February 15 – 22, 2017
VMDS AP Tank Farm Stack Monitoring	February 22 –March 1, 2017	VMDS AP Tank Farm Stack Monitoring	March 15 – 22, 2017
VMDS AP Tank Farm Stack Monitoring	March 22-29, 2017	VMDS AP Tank Farm Stack Monitoring	March 29-April 30, 2017
VMDS A and AP Tank Farm Field Instrument Report	March 15 – March 22, 2017	VMDS A and AP Tank Farm Field Instrument Report	March 22 – March 29, 2017
VMDS A and AP Tank Farm Field Instrument Report	April 26 – May 3, 2017	VMDS A and AP Tank Farm Field Instrument Report	May 3 – May 10, 2017
VMDS A and AP Tank Farm Field Instrument Report	May 10 - May 17, 2017	VMDS AP Tank Farm Stack Monitoring	March 22 – March 29, 2018

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VMDS A and AP Tank Farm Field Instrument Report	April 19 – April 26, 2017	VMDS A and AP Tank Farm Field Instrument Report	May 17 – May 24, 2017
Vapors Weekly Update for FY2018			
Vapors Weekly Updt.	January 17, 2018		
Vapors Weekly Updt.	February 1, 2018		
Vapors Weekly Updt.	February 15, 2018		
Vapors Weekly Updt.	March 1, 2018		
Vapors Weekly Updt.	March 21, 2018		
Chemical Vapors Solution Team Agendas and Meeting Minutes			
CVST Minutes	December 13, 2017	Here	
CVST Minutes	January 17, 2018	Here	
CPPO Weekly Reports			
CPPO Weekly Report (1st Quarter Summary)	January 12, 2018	CPPO Weekly Report	January 18, 2018
CPPO Weekly Report	January 25, 2018	CPPO Weekly Report	February 1, 2018
CPPO Weekly Report	February 8, 2018	CPPO Weekly Report	February 15, 2018
CPPO Weekly Report	March 1, 2018	CPPO Weekly Report	March 8, 2018
CPPO Weekly Report	March 15, 2018	CPPO Weekly Report	March 22, 2018
CPPO Notebook			
C-105 Retrieval: Industrial sampling and monitoring results			
242-A Evaporator Campaign-07: Industrial hygiene sampling and monitoring results			
AOP-015s and Event Investigation Reports			
EIR-2017-35, Investigation of AOP-015 Entry outside TX Change Tent (NA)			
EIR-2017-43, TF-AOP-015 for Odors Reported Inside 241-AW-271			
Miscellaneous			

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Website Articles and Page Updates			
Odors reported in 242-A pump storage room			
Odors reported outside of AW Farm			
Update: Odors reported outside of AW Farm			
Office of Enterprise Assessments Introduction Page			
Population Health Trending Summary, Tank Farm Hazardous Waste Worker			
The Mobile Laboratory			
VMDS Consolidated Weekly Report	April 12-19, 2017	Clarification statement for the FY17 R.J. Lee PTR-MS mobile lab monthly reports was posted.	Updated: Terragraphics Mobile Organic Monitoring Laboratory
VMDS AP Stack Monthly	March 29 – April 3, 2017		
Vapors Weekly Update for FY2018			
Vapors Weekly Updt.	April 11, 2018		
Vapors Weekly Updt.	April 18, 2018		
Vapors Weekly Updt.	May 16, 2018		
Vapors Weekly Updt.	June 12, 2018		
Vapors Weekly Updt.	June 22, 2018		
CPPO Weekly Reports			
CPPO Weekly Report	April 12, 2018 2nd Quarter Summary	CPPO Weekly Report	May 17, 2018
CPPO Weekly Report	April 19, 2018	CPPO Weekly Report	May 10, 2018
CPPO Weekly Report	April 26, 2018	CPPO Weekly Report	May 24, 2018
CPPO Weekly Report	May 3, 2018	CPPO Weekly Report	June 7, 2018
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CVST Agenda	February 14, 2018	CVST Agenda	April 11, 2018
CVST Agenda	March 14, 2018		
AOP-015s and Event Investigation Reports			
EIR-2018-010: SY Farm Emergency Shower AOP-015 Event	April 3, 2018	EIR-2018-09: TF-AOP-015 for Odors Reported Inside Building 241-AZ-702	April 2018
EIR-2015-008: AOP-015 Entry in AN Farm	April 3, 2018	EIR-2016-014: AOP-015 Entry with odors near Exhauster and Tank AP-107	April 11, 2018
Miscellaneous			
Hanford Workforce Engagement Center (HWEC) Link			

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Website Articles and Page Updates

Introduction to the 222-S Laboratory
Hanford Tank Farm Health Process Plan (HPP)
Air-purifying respirators approved
Odors reported at SX Farm
Settlement Agreement Reached on Hanford Vapors Litigation

Report Summaries

PNNL-26777	*Proposed $_{HTF}$OELs for Chronic Exposures – COPCs with Regulatory Guidelines,* Rev. 0
PNNL-26819	*Proposed $_{HTF}$OELs for Chronic Exposures – Nitrile-Class COPCs and 2,4-Dimethylpyridine,* Rev.0
PNNL-26820	*Hanford Tank Vapor Chemicals of Potential Concern Update for Fiscal Year 2017,* Rev. 0
PNNL-27530	*The APGEMS-TF Atmospheric Dispersion Model for Tank Farms Applications*, Rev. 0
PNNL-27449	*Leading Indicators Phase 2 Final FY18 Report*
PNNL-26850	*Proposed Acute Exposure Concentration Limits for COPCs with Regulatory Guidelines, Rev. 0 Summary*
PNNL-25791	*Hanford Tank Farm Occupational Exposure and Risk Assessment Plan Report Summary*
RPP-RPT-60443	*SST Stewardship Project (T1P180) Project Execution Strategy*
Strobic Job #11953	*Strobic Air Technologies Factory Acceptance Testing Report Hanford Site*
TOC-IH-58451	*Unrestricted Work Boundary Report Summary, Rev. 0*

Vapors Update

Vapors Update	August 30, 2018		

Chemical Vapors Solution Team Agendas and Meeting Minutes

CVST Meeting Agenda	July 11, 2018	CVST Meeting Agenda	August 30, 2018

CPPO Weekly Reports

CPPO Weekly Report	June 14, 2018	CPPO Weekly Report	August 16, 2018
CPPO Weekly Report	June 21, 2018	CPPO Weekly Report	August 23, 2018
CPPO Weekly Report	June 28, 2018	CPPO Weekly Report	August 30, 2018
CPPO Weekly Report 3rd Quarter Summary	July 19, 2018	CPPO Weekly Report	September 6, 2018
CPPO Weekly Report	July 26, 2018	CPPO Weekly Report	September 13, 2018
CPPO Weekly Report	August 2, 2018	CPPO Weekly Report	September 20, 2018

AOP-015s and Event Investigation Reports

EIR-2014-008 241-T-201 Primary Tank Video Vapor Event
EIR-2018-021: Investigation of the AW Farm Exterior AOP-015 Entry

Appendix C

Chemical Protection Program Office
Engagement: WRPS Communications – FY2018

10/4/2017	On October 4, 2017, WRPS SST Retrievals Manager sent an all-employee email on the "Residual Waste from AY-102 Annulus to Primary Tank." The email communicated that the industrial hygiene (IH) controls "used will be typical of DST-DST waste transfer activities, including: Backshift and weekend operation Readerboards will be placed informing personnel that a waste transfer is in progress Enhanced IH monitoring/sampling"
10/6/2017	An October 6, 2017, all-employee email, Message from Mark, looked back at "our accomplishments over the past 12 months." Safety performance, waste retrieval, the VPP Innovation Award, and WRPS's many charitable contributions to our community were some of the successes he noted. Additionally, he described the Chemical Vapors Program initiatives as essential to performing work safely, and acknowledged the role CPPO played in 2017 in meeting the challenge of vapor-related communications and overseeing chemical protection initiatives.
10/10/2017	An all-employee Industrial Hygiene Flash was issued on October 10, 2017. The communication reviewed cartridge testing efforts and results over the last year. In conclusion, the Industrial Hygiene Flash stated, "[m]oving forward, WRPS will continue to work with HAMTC and building trades. Individual hazard assessments are being completed for actively ventilated tank farms, with a targeted completion date [at the] end of calendar year 2017."
10/11/2017	An all-employee announcement published on October 11, 2017, informed the workforce that Mr. Steve Killoy "has been named manager of Environmental, Safety, Health, and Quality (ESH&Q) Chemical Protection Integration. In this new role, Steve will be the primary interface for Comprehensive Vapor Action Plan (CVAP) activities – both internally and with the DOE Office of River Protection."
10/16/2017	Solution, Issue 411, dated October 16, 2017, noted that "[a]dditional safety precautions were put into place to protect them from chemical vapors generated during waste retrieval," in an article titled AY-102 retrieval project a finalist for international award."
10/18/2017	"Six Hanford workers have declined precautionary medical evaluation after reporting odors outside of TX Farm" read the all employee email issued on October 18, 2017. The email described how "[t]he employees were preparing to perform electrical maintenance at the time of reported odors and were not in an area that requires use of a supplied-air respirator."
10/19/2017	An all employee email updated the odors report on October 19, 2017, reporting that access was restored to the area near TX Farm, and that "…industrial hygiene technicians collected air samples and results were less than the action level of chemicals evaluated." Furthermore, "[n]one of the six workers experienced symptoms…"
10/23/2017	*Solutions, Issue 413*, dated October 23, 2017, noted that "[a]dditional safety precautions were put in place to protect them from chemical vapors generated during

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	waste retrieval," in an article titled *AY-102 retrieval project named PMI's Project of the Year.*
10/26/2017	An October 26, 2017, all-employee email notified the WRPS workforce that the EA follow-up assessment of the Hanford Tank Farms vapor issues will resume on October 30. "During this period, the EA team will conduct document reviews, observations, interviews, and focus groups."
10/26/2017	*Hanford Tank Vapors,* published on October 26, 2017, discussed the strengths and opportunities identified during the Safety Culture Work Environment survey conducted in July 2017.
10/30/2017	The U.S. Department of Energy Office of Enterprise Assessments (EA) is scheduled to conduct a follow-up assessment of the Hanford tank farms vapor issues Oct. 30 to Nov. 16. This assessment is a follow-up to a previous follow-up assessment conducted by EA in January 2017 to evaluate the progress on actions taken to address the recommendations from the Savannah River National Laboratory (SRNL)-led Tank Vapor Assessment Team (TVAT) report from October 2014.
11/2/2017	A November 2, 2017, all-employee email informed the WRPS workforce that preparations for a DST-to-DST waste transfer were underway for the weekend of November 4. "Depending upon equipment availability, the sequence of these transfers may change, however, the industrial hygiene (IH) controls will remain [the same]." Reviewed by the Chemical Vapor Solutions Team and HAMTC leadership, the IH controls include backshift and weekend operations, reader boards, supplemental AreaRAEs, and enhanced IH monitoring and sampling during the waste transfers.
11/6/2017	Solutions, Issue 414, dated November 6, 2017, reported on the Safety Culture Survey results, reporting that "[s]ome workers stated that safety issues are readily identified, but slowly resolved, a perception influenced by efforts to control chemical vapors."
11/13/2017	Solutions, Issue 415, dated November 13, 2017, reported on the IH Data Access & Visualization (DAV) application, stating that "[a] new tool is now available on the Hanford vapors website…"
11/28/2017	The SOEN System alerted the Hanford community of a significant operational issue on November 28, 2017, at 9:13 a.m. when it reported, "Entering AOP-015 for 271AW. All personnel perform orderly exit of 271AW. Access is restricted to 271AW."
11/28/2017	The SOEN System alerted the Hanford community of an event investigation initiation on November 28, 2017, at 9:54 a.m. when it reported, "Initiated Event Investigation (EIR-2017-043) for 271AW Instrument Building AOP-015 Event."
11/28/2017	The SOEN System alerted the Hanford community of a personnel injury or illness on November 28, 2017, at 10:30 a.m. when it reported, "Three NCOs reported odor concerns at 271AW and were taken to HPMC."
11/28/2017	WRPS Communications & Public Relations sent an all-employee email on November 28, 2017, at 11:50 a.m. in which it reported, "Odors reported inside instrument facility."
11/28/2017	The SOEN System alerted the Hanford community of a significant operational issue on November 28, 2017, at 2:16 p.m. when it reported, "Sample analysis for the 271AW

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	TF-AOP-015 event has been completed and the results are below action limits. Exiting TF-AOP-015."
11/28/2017	WRPS Communications & Public Relations sent an all-employee email on November 28, 2017, at 4:28 p.m. in which it reported an update to, "Odors reported inside instrument facility."
11/28/2017	Hanford Vapors, posted to the HanfordVapors.com website on November 28, 2017, at 7:31 p.m. reported on the vapors event stating, "Three Hanford workers were cleared to return to work after receiving precautionary medical evaluations for odors reported today inside the 271AW instrument building near AW Farm."
12/11/2017	Solutions, Issue 418, published on December 11, 2017, reported on the CPPO and C&PR collaboration, Video Tour: The WRPS Intranet. Presented during a CVST meeting, the tour focuses on three core elements: the WRPS intranet, the hanfordvapors.com website, and the Industrial Hygiene Data Access & Visualization (IH DAV) explorer.
12/11/2018	Solutions, Issue 418, published on December 11, 2017, reported, "WRPS and the Hanford Atomic Metal Trades Council (HAMTC) have jointly agreed to allow use of full-face air-purifying respirators (FFAPRs) in Hanford's SY Farm for specific work evolutions. The decision is consistent with the Memorandum of Agreement for use of respiratory protection between WRPS and HAMTC issued in August 2016."
12/14/2017	Hanford Tank Vapors, Vapors Weekly Update published on December 14, 2017, reported, "Washington River Protection Solutions (WRPS) and the Hanford Atomic Metal Trades Council (HAMTC) have jointly agreed to allow use of full-face air-purifying respirators (FFAPRs) in Hanford's SY Farm for specific work evolutions. The decisions consistent with the Memorandum of Agreement for use of respiratory protection between WRPS and HAMTC issued in August 2016."
1/15/2018	Solutions, Issue 421, published on January 15, 2018, reported, "Use of an air-line breathing system inside the Tank Farms can be a beneficial, but limited, alternative to self-contained breathing apparatus (SCBA) in specific work activities, based on the results of recently completed worker evaluations (RPP-RPT-60438, Airline Equipment Evaluation)."
1/15/2018	Training bulletin TB-18-01, The New Chemical Worker Training Program, was issued to WRPS as required reading on January 15, 2018. The bulletin introduced Chemical Worker Tier Trainings. Determining that a "tiered approach to training is more effective because less time is spent in training that is not needed for your job requirements," WRPS created three tiers of training and its commensurate refresher course.
1/17/2018	Hanford Tank Vapors, published on Hanfordvapors.com and distributed in an all-employee email on January 17, 2018, discussed air-line respirators as well.
1/22/2018	Solutions, Issue 422, published on January 22, 2018, reported, "…WRPS's AP Farm Exhauster Upgrade Project received the PMI Award for Project Excellence – one of only two awards for the North American region. Previously, the project was named the Project of the Year."
1/29/2018	Solutions, Issue 423, published January 29, 2018, reported, "[t]he 222-S Laboratory Organic Studies group recently was reaccredited for analyzing industrial hygiene samples of organic chemicals in tank vapors by the American Industrial Hygiene

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	Association Laboratory Accreditation Program (AIHA-LAP). This marks the 5th reaccreditation since its initial accreditation on Aug. 1, 2007. The group of 13, led by manager Dan Hansen, performs special analyses of volatile and semi-volatile organic chemicals of potential concern in tank vapors. They processed 5,065 samples last fiscal year."
1/29/2018	Solutions, Issue 423, published January 29, 2018, reported that a new chemical worker training program is in place, and that ongoing worker participation and feedback impacted the final product. "Training Specialist Matt Tom assembled a team of workers, including industrial hygiene technicians, nuclear chemical operators and radiological control technicians, who met regularly for months to develop the Chemical-Worker Tier 3 training program."
2/5/2018	An Industrial Hygiene Communication all-employee email was published February 5, 2018, informing WRPS that "the term Similarly Exposed Groups (SEG) was changed to Risk Classification (RC)."
2/5/2018	The SOEN System alerted the Hanford community of a significant operational issue on February 5, 2018, at 3:26 p.m., reporting, "[i]nitiated EIR-2018-009 '702AZ AOP-015 Event'. CSM."
2/5/2018	An all-employee email was issued on February 5, 2018, at 3:55 p.m., reporting "[o]dors reported inside 702-AZ exhauster building."
2/5/2018	The SOEN System alerted the Hanford community of a significant operational issue on February 5, 2018, at 9:52 p.m., reporting, "[e]xited AOP-015 for odors in 702AZ building. IH samples have been analyzed; there were no chemicals above action levels. Normal access is restored to 702AZ. CSM."
2/6/2018	The SOEN System alerted the Hanford community of a significant operational issue on February 6, 2018, at 10:48 a.m., reporting, "[e]ntering AOP-015 for odors on the exterior north/northwest side of SY Farm. Stay clear of this area. CSM."
2/6/2018	The SOEN System alerted the Hanford community of a significant operational issue on February 6, 2018, at 11:04 a.m., reporting, "[i]nitiated event investigation for the SY Farm emergency shower AOP-015 event. Stay clear of this area. CSM."
2/6/2018	An all-employee email was issued on February 6, 2018, at 12:19 p.m., reporting "[o]dors reported outside SY Tank Farm."
2/6/2018	Hanford Vapors, News from Hanford Tank Vapors published on February 6, 2018, at 12:29 p.m., reported "[a]ccess restored to 702-AZ exhauster building after air monitoring and sampling results showed no chemicals above action levels."
2/6/2018	Hanford Vapors, News from Hanford Tank Vapors published on February 6, 2018, at 3:19 p.m., reported "[o]dors reported outside SY Tank Farm."
2/6/2018	The SOEN System alerted the Hanford community of a significant operational issue on February 6, 2018, at 5:26 p.m., reporting, "[s]ample analysis for the TF-AOP-015 event has been completed and the results are below action limits. Exiting TF-AOP-015. CSM."
2/7/2018	An all-employee email was issued on February 7, 2018, at 10:50 a.m., reporting "[a]ccess restored to SY Farm area after report of odors."

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2/7/2018	Hanford Vapors, News from Hanford Tank Vapors published on February 7, 2018, at 4:05 p.m., reported "[a]ccess restored to SY Farm area after report of odors."
2/7/2018	An Industrial Hygiene Communication all-employee email was published February 7, 2018, informing WRPS employees that "WRPS has received multiple reports of a strong "onion like" odor ranging from Richland to the Hanford East area. We have attempted to contact the Benton County Clean Air Agency concerning this odor. It is believed the onion odor is a result of 250,000 lbs of onions being used as compost by a farmer in West Richland."
2/7/2018	An Industrial Hygiene Communication all-employee email was published February 7, 2018, informing WRPS that "WRPS has received a new report from the third party reviewers (Stoneturn Consultants (STC)) and the report recommends that we do not approve the use of FFAPR in AP Farm for SEG-2 work at this time. They also recommend we rescind the approval for the use of FFAPR in AP Farm for SEG-1 work until additional evaluations are completed."
2/12/2018	Solutions, Issue 425, published on February 12, 2018, described a partnership between Washington State University Tri-Cities and WRPS. In addition to a contract to create a high-performance concrete, "WRPS provided a WSU team with an initial contract to procure and program an autonomous vehicle that would be used for measuring vapors, or chemical gases, within the Tank Farms."
2/15/2018	Hanford Tank Vapors, From the Desk of Mark Lindholm, described how "WRPS, in cooperation with HAMTC, continues to take a very conservative approach to protecting workers from potential exposures to chemical vapors." In so doing, WRPS is agreeable to the Stoneturn Consultant's recommendation that "workers halt the use of FFAPRs and continue to use supplied air in AP Farm until additional evaluation is performed." This Vapors Weekly Update was published February 15, 2018. The February 15, 2018, Hanford Tank Vapors, Vapors Weekly Update, also included the invitation to read "[t]wo articles published in the Tri-City Herald relating to chemical vapors." The first article, Helping ill Hanford workers targeted by Senate bill, discusses a Washington state Senate bill to create a task force to examine Hanford worker's vapors concerns. The second article, No fast progress in Hanford vapors lawsuit, reported on the Hanford vapors lawsuit.
2/15/2018	An all-employee email issued on February 15, 2018, reported on the "[u]pcoming weekend DST-to-DST waste transfer," and the vapors controls utilized therein. Furthermore, the email explained that "[t]hese controls have been reviewed with HAMTC Leadership and with the Chemical Vapors Solution Team (CVST)."
3/1/2018	An all-employee email, published March 1, 2018, reported, "The Department of Energy's Office of Enterprise Assessments (EA) conducted an independent oversight assessment of progress on actions taken to address tank vapor concerns at the Hanford Tank Farm Site. This follow-up assessment focused on actions taken to address recommendations from a previous EA Assessment, Office of Enterprise Assessments Follow-up Assessment of Progress on Actions Taken to Address Tank Vapor Concerns at the Hanford Site – January 2017."

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3/1/2018	Vapors Weekly Update, published March 1, 2018, reported that The Department of Energy's Office of Enterprise Assessments (EA) conducted an independent oversight assessment of progress on actions taken to address tank vapor concerns at the Hanford Tank Farm Site. This follow-up assessment focused on actions taken to address recommendations from a previous EA Assessment, Office of Enterprise Assessments Follow-up Assessment of Progress on Actions Taken to Address Tank Vapor Concerns at the Hanford Site – January 2017."
4/2/2018	An all-employee email was distributed on April 2, 2018, announcing the opening of The Hanford Workforce Engagement Center.
4/4/2018	Hanford Tank Vapors, Vapors Weekly Update issued April 4, 2018, announced the opening of the Hanford Workforce Engagement Center (HWEC).
4/9/2018	Solutions, Issue 432, published April 9, 2018, reported on the factory acceptance testing which the Strobic® Air ventilation unit underwent at the Strobic® Air facility in Philadelphia, Pennsylvania.
4/16/2018	Solutions, Issue 433, published April 16, 2018, reported on the second phase of the Vapor Monitoring Detection System testing stating, "[t]he successful completion of testing was the result of many tank farm organizations, including the CVST."
4/18/2018	The success of the VMDS testing was further communicated through the April 18, 2018, Hanford Tank Vapors, Vapors Weekly Update. The weekly update reported that the goal of the VMDS is "to provide a toolbox of equipment that can then be deployed as needed to monitor vapor sources, vapor control boundaries, and targeted work areas in near real-time."
4/18/2018	On April 18, 2018, an all WRPS employees email was distributed detailing the 242-A Evaporator campaign. "Final preparations are underway to commence the next 242-A Evaporator campaign," stated the email. The email detailed at length the vapor control strategy for the Air Lift Circulator (ALC) operation and evaporator campaign.
4/25/2018	On April 25, 2018, an all WRPS employees email was distributed updating the 242-A Evaporator campaign that began last week. "Area direct-reading instrumentation readings in the general work areas during the campaign have been well below action and occupational exposure limits," stated the email. The campaign continues "with approximately 250,000 gallons of waste processed so far."
5/14/2018	An all-employee email distributed on May 14, 2018, described a change to the AP Farm FFAPR rollout. It read, "[i]mplementaton had been planned for tomorrow [May 15], however due to some delays in the administrative process we are putting the transition on a short pause and will not be implementing the use of FFAPRs tomorrow as planned. To clarify, there are no technical issues related to the transition to APR and we don't anticipate the delay being very long."
5/15/2018	Hanford Tank Vapors, Vapors Weekly Update, published May 15, 2018, reported on the first 242-A Evaporator campaign of the year. "Evaporator operations are critical to successfully managing Hanford's tank waste." Hanford Tank Vapors described, "[a] comprehensive industrial hygiene control strategy, reviewed and agreed to by WRPS' Chemical Vapor Solutions Team and HAMTC leadership, was put in place for the

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	campaign. Direct-reading instrumentation readings in the general work areas during the campaign were well below action and occupational exposure limits."
5/17/2018	On May 17, 2018, an all-employee email stated, "Beginning as early as Tuesday, May 22, workers in AP Farm will have the option of using full-face air-purifying respirators (FFAPRs) equipped with filter cartridges for low-hazard non-waste-disturbing work in the AP tank farm rather than supplied-air respirators such as self-contained breathing apparatus (SCBA)."
5/18/2018	On May 18, 2018, Shift Office Event Notification (SOEN) stated, "Stop Work on the use of APR until concern regarding cartridge filter media is addressed."
5/29/2018	On May 29, 2018, Shift Office Event Notification (SOEN) stated, "Lifted Stop Work on use of Scott Carri-Air respiratory equipment and easy-flow regulators/harness." Required reading has been issued.
5/29/2018	An Industrial Hygiene Communication published on May 29, 2018, read, "On Friday May 18, 2018, 4 workers in the SY Tank Farm using Scott 7422-SC1 (Chemical) and/or Scott 7422-SD1 (Combo) cartridges reported the presence of charcoal (from the cartridges) in their face masks. A Stop Work was immediately issued on the use of the above Scott cartridges. Cartridges that had been used by the workers on May 18 had been disposed upon their exit from the work area. When the incidents became known, most of these cartridges were recovered and preserved for further investigation." The communication described the path forward as, "WRPS has decided to return our current in house stock of all 7422-SC1 and 7422-SD1 cartridges to the manufacturer. We will be supplied with and issue 7422-SC1 and SD1 cartridges that were manufactured only after their additional production process and additional quality inspections were implemented by Scott Safety (i.e. May 1, 2018 or later).
6/11/2018	Solutions, Issue 440, published on June 11, 2018, stated, "[t]he Chemical Protection Program Office (CPPO) has published two new notebooks on Nitrous Oxide, a prominent chemical in Hanford's waste tanks." Links to parts 1 and 2 were embedded in the article.
6/11/2018	An all-employee email from Rob Cantwell, Manager ESH&Q, was issued on June 11, 2018. Titled, FFAPRs in AP Farm, it read, "[b]eginning June 12, workers in AP Farm will have the option to use full-face air-purifying respirators (FFAPRs) equipped with filter cartridges for low-hazard non-waste-disturbing work in the AP tank farm."
6/12/2018	On June 12, 2018, Hanford Tank Vapors, Vapors Weekly Update, reported, "[s]starting today, some workers in the AP tank farm will have the option to use full-face air-purifying respirators (FFAPRs) equipped with filter cartridges for low-hazard non-waste disturbing work in the AP tank farm. Workers on other tasks will continue to use self-contained breathing apparatus (SCBA) in the tank farm."
6/15/2018	The Shift Office Event Notification System (SOEN) alerted the workforce to an AOP-015 event on June 15, 2018, at 9:52 PM stating, "[e]ntering AOP-015 access restricted to 242-A pump storage room airlock unless authorized by shift manager."
6/16/2018	On June 16, 2018, a SOEN alerted the workforce to an event investigation stating, "[i]nitiated EIR-2018-020 242-A Pump Storage Room Airlock AOP-015 Entry."

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6/16/2018	Later on June 16, 2018, a SOEN alerted the workforce to the AOP-015 sample analysis stating, "[s]ample analysis for the TF-AOP-015 event has been completed and the results are at or below background levels. Exiting TF-AOP-015."
6/18/2018	An all-employee email was distributed on June 18, 2018, communicating the AOP-015 event over the weekend.
6/19/2018	On June 19, 2018, Kent Smith, Production Operations Manager, described in an all-employee email the "vapor control strategy for the Air Lift Circulator (ALC) operation and campaign" scheduled to begin the weekend of June 29. "The strategy is based on industrial hygiene (IH) monitoring results from recent evaporator campaigns and has been reviewed by the Chemical Vapor Solutions Team and HAMTC leadership. "
6/21/2018	"Entering AOP-015 for 4th and Canton Avenue. All personnel stay clear of the area," was the SOEN communication to the workforce on June 21, 2018, at 8:14 a.m.
6/21/2018	At 9:00 a.m. on June 21, 2018, a SOEN communication to the workforce read, "Initiated Event Investigation for the AW Farm Exterior AOP-015 event."
6/21/2018	An all-employee email was issued on June 21, 2018, stating, " Industrial hygiene technicians are collecting samples in the area using direct-read instruments," outside the AW Farm after odors were reported.
6/21/2018	On June 21, 2018, at 1:59 p.m., a SOEN was published stating, "[s]ample Analysis for TF-AOP-015 event has been completed and results are at or below background levels. Exiting TF-AOP-015."
6/21/2018	"Industrial hygiene technicians collected readings and samples in the area [outside of AW Farm where odors were reported], which were below action levels. Access to the area has been restored," reported an all-employee email issued on June 21, 2018, at 2:59 p.m.
6/21/2018	At 5:59 p.m. on June 21, 2018, Hanford Vapors updated the external website with two posts describing the odors that were reported outside of the AW Farm.
6/21/2018	"Final preparations are underway to start the next 242-A Evaporator campaign this coming weekend," stated the Hanford Tank Vapors, Vapors Weekly Update published on June 21, 2018.
7/23/2018	Solutions, Issue 445, published July 23, 2018, pointed its readers to the four-part CPPO Notebook covering toxicology and IH fundamentals.
8/9/2018	A Shift Office Event Notice was released on Thursday, August 9, 2018, issuing a standing order on VMDS chemical concentration values.
8/13/2018	On August 13, 2018, a SOEN was issued announcing the West area Pubic Address (PA) system testing.
8/14/2018	On August 14, 2018, a SOEN was issued to announce restricted access to the Middle-C Farm Change Tent because strong herbicide odors were reported.
8/16/2018	August 16, 2018, a SOEN was issued restricting access to the Middle-C Farm tent due to strong herbicide odors. Access was restored soon after the SOEN was issued.

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8/13/2018	The 448th Issue of Solutions, which was released August 13, 2018, contained an article summarizing the CPPO Notebook on leading indicators that was released on August 2, 2018.
8/14/2018	The August 2018 Industrial Hygiene Newsletter featured a write-up on ToxiRAE Monitors, which are direct-read instruments for ammonia exposure that will be onsite and in use at the Hanford Tank Farms within the next few weeks.
8/23/2018	Doug Greenwell sent an all-employee message on August 23, 2018. Mr. Greenwell described the "aggressive industrial hygiene (IH) and monitoring plan to protect workers from potential chemical vapors" during the final water rinse in double-shell tank AY-102.
8/29/2018	WRPS Communications & Public Relations sent an all-WRPS-employees email on August 29, 2018, stating, "[b]eginning Sept. 4, workers will have the option to use full-face air-purifying respirators (FFAPRs) equipped with filter cartridges for low-hazard, non-waste-disturbing work in the AN double-shell tank farm."
8/29/2018	On August 29, 2018, an Industrial Hygiene Flash updated the WRPS employees on "Charcoal dusting when using Scott 7422-SC1 and 7422-SD1 cartridges."
8/31/2018	Hanford Vapors posted an announcement on the HanfordVapors.com website reading, Air-purifying respirators approved for AN Farm, on August 30, 2018. An email with a link to the announcement was sent to WRPS employees on August 31, 2018.
9/4/2018	An all-employee email dated September 4, 2018, described the analytical results of the respiratory protective equipment (RPE) testing in July. The results "indicated that there were no instances of chemical (anion) contamination on any of the RPE tested. Likewise, there were no instances of bacterial contamination on the RPE and surfaces that were evaluated."
9/5/2018	IH communicated a major revision to TFC-ESHQ-IH-C-48, Managing Tank Chemical Vapors, intended to "simplify risk classification categories, align terminology with industry standards, and assist in the demarcation and communication of areas with greater potential of tank chemical hazards." Exclusion Zones replaces Vapor Control Zone as the term used to demarcate "the boundary of potential vapor emission source greater than 50 percent of the OEL." The cover of this Weekly Report depicts the new sign as described in the September 5, 2018, all-employee email.
9/6/2018	WRPS is implementing the ToxiRAE personal ammonia monitor. Details on the rollout and implementation phases were communicated to the workforce in an all-employee email, distributed by Industrial Hygiene, on September 6, 2018. "The monitors have been procured and received," stated the email. Furthermore, "WRPS will rollout ToxiRAE use gradually."
9/10/2018	In an all-employee email on September 10, 2018, IH communicated a major revision to TFC-ESHQ-IH-C-48, Managing Tank Chemical Vapors, intended to "simplify risk classification categories, align terminology with industry standards, and assist in the demarcation and communication of areas with greater potential of tank chemical

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	hazards." Exclusion Zones replaces Vapor Control Zone as the term used to demarcate "the boundary of potential vapor emission source greater than 50 percent of the OEL."
9/10/2018	Solutions, Issue 451, published on September 10, 2018, invited readers to investigate the CPPO Weekly Report and provided a link to HanfordVapors.com.
9/17/2018	Solutions, Issue 452, published on September 17, 2018, featured the new 10-wide, Building MO-2563. Solutions reported, "[t]he new 10-wide building in the 200 East Area will soon house about 100 members of the WRPS Industrial Hygiene staff."
9/17/2018	Solutions, Issue 452, published on September 17, 2018, alerted its audience to a new three-part CPPO Notebook, Chemicals in the Tank Headspace, Parts 1-3. A link to the CPPO Notebook was provided.
9/18/2018	A Shift Office Event Notification (SOEN) issued on September 18, 2018, at 11:33 a.m. stated, "Entering AOP-015 for odors causing symptoms in SX Farm."
9/18/2018	An all-employee email, issued on September 18, 2018, at 12:40 p.m. reported, "A Hanford worker reported symptoms and is undergoing precautionary medical evaluation today after smelling odors at the SX Tank Farm. Industrial hygiene technicians were monitoring at the time and are collecting samples in the area. "
9/18/2018	A SOEN issued on September 18, 2018, at 1:04 p.m. stated, "Initiated Event Investigation (EIR-2018-033) for the SX Farm AOP-015 event."
9/18/2018	A SOEN issued on September 18, 2018, at 6:32 p.m. stated, "Sample analysis for the SX TF-AOP-015 event has been completed and the results are below action limits. Exiting TF-AOP-015."
9/18/2018	"Odors reported at SX Farm," read the title of a September 18, 2018, post to the HanfordVapors.com website. Furthermore, it read, "A Hanford worker has been released back to work after undergoing precautionary medical evaluation today for odors reported at the SX Tank Farm."
9/19/2018	News from Hanford Tank Vapors, posted on September 19, 2018, reported that the "Department of Energy (DOE) and Washington River Protection Solutions, LLC (WRPS) are pleased to announce today that a settlement agreement has been signed regarding lawsuits brought by the State of Washington and by Hanford Challenge and Local 598 of the United Association of Plumbers and Steamfitters." The Settlement Agreement was posted to the external website and is available here.

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