Washington River Protection Solutions, LLC
Tank Farm Operations Contract

Report from the Department of Energy
Voluntary Protection Program
Onsite Review
February 4-13, 2014

U.S. Department of Energy
Office of Health, Safety and Security
Office of Health and Safety
Office of Worker Safety and Health Assistance
Washington, DC 20585

Foreword

The Department of Energy (DOE) recognizes that true excellence can be encouraged and guided but not standardized. For this reason, on January 26, 1994, the Department initiated the DOE Voluntary Protection Program (VPP) to encourage and recognize excellence in occupational safety and health protection. This program closely parallels the Occupational Safety and Health Administration (OSHA) VPP. Since its creation by OSHA in 1982, and implementation by DOE in 1994, VPP has demonstrated that cooperative action among Government, industry, and labor can achieve excellence in worker safety and health. The Office of Health, Safety and Security (HSS) assumed responsibility for DOE-VPP in October 2006. HSS is expanding complex-wide contractor participation and coordinating DOE-VPP efforts with other Department functions and initiatives, such as Enforcement, Oversight, and the Integrated Safety Management System.

DOE-VPP outlines areas where DOE contractors and subcontractors can surpass compliance with DOE orders and OSHA standards. The program encourages a *stretch for excellence* through systematic approaches, which emphasize creative solutions through cooperative efforts by managers, employees, and DOE.

Requirements for DOE-VPP participation are based on comprehensive management systems with employees actively involved in assessing, preventing, and controlling the potential health and safety hazards at their sites. DOE-VPP is available to all contractors in the DOE complex and encompasses production facilities, laboratories, and various subcontractors and support organizations.

DOE contractors are not required to apply for participation in DOE-VPP. In keeping with OSHA and DOE-VPP philosophy, participation is strictly voluntary. Additionally, any participant may withdraw from the program at any time. DOE-VPP consists of three programs with names and functions similar to those in OSHA's VPP: Star, Merit, and Demonstration. The Star program is the core of DOE-VPP. This program is aimed at truly outstanding protectors of employee safety and health. The Merit program is a steppingstone for participants that have good safety and health programs, but need time and DOE guidance to achieve true Star status. The Demonstration program, expected to be used rarely, allows DOE to recognize achievements in unusual situations about which DOE needs to learn more before determining approval requirements for the Merit or Star program.

By approving an applicant for participation in DOE-VPP, DOE recognizes that the applicant exceeds the basic elements of ongoing, systematic protection of employees at the site. The symbols of this recognition provided by DOE are certificates of approval and the right to use flags showing the program in which the site is participating. The participant may also choose to use the DOE-VPP logo on letterhead or on award items for employee incentive programs.

This report summarizes the results from the evaluation of Washington River Protection Solutions, LLC (WRPS), the Hanford Tank Farm Operations Contractor, during the period of February 4-13, 2014, and provides the Chief Health, Safety and Security Officer with the necessary information to make the final decision regarding WRPS' continued participation in DOE-VPP.

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ABBREVIATIONS AND ACRONYMS

ALARA	As Low As Reasonably Achievable
ASIS	Automatic Safety Instrument System
BLS	Bureau of Labor Statistics
CHAT	Chemical Hazard Awareness Training
COPC	Chemicals of Potential Concern
CVST	Chemical Vapor Solutions Team
DART	Days Away, Restricted or Transferred
DCS	Distributed Control System
DOE	Department of Energy
DSA	Documented Safety Analysis
EAPC	Employee Accident Prevention Council
EJTA	Employee Job Task Analysis
ELM	Enterprise Learning Management
ESH&Q	Environment, Safety, Health and Quality
EPHA	Emergency Planning Hazard Assessment
GHA	General Hazard Analysis
HAMMER	Volpentest Hazardous Material Management and Emergency Response Training Center
HAMTC	Hanford Atomic Metal Trades Council
HAZWOPER	Hazardous Waste Operations and Emergency Response
HEPA	High Efficiency Particulate Air
HPMC	HPM Corporation
HSS	Office of Health, Safety and Security
HSWET	Hanford Site Worker Eligibility Tool
IH	Industrial Hygiene
ISMS	Integrated Safety Management System
JHA	Job Hazard Analysis
MARS	Mobile Arm Retrieval System
MOP	Management Observation Program
MSA	Mission Support Alliance, LLC
NAICS	North American Industry Classification System
ORP	Office of River Protection
OSHA	Occupational Safety and Health Administration
PAPC	Project Manager’s Accident Prevention Council
PER	Problem Evaluation Report
PM	Preventive Maintenance
PPE	Personal Protective Equipment
PSOP	Peer Safety Observation Program
SME	Subject Matter Expert
SOC	Skill-of-the- Craft
SJHA	Standing JHA
SST	Single Shell Tank
STS	Safety-Trained Supervisor
Team	HSS DOE-VPP ReviewTeam
TOC	Tank Operation Contract
TRC	Total Recordable Case

TVIS	Tank Vapor Information Sheet
VCZ	Vapor Control Zone
VPP	Voluntary Protection Program
WRPS	Washington River Protection Solutions, LLC

EXECUTIVE SUMMARY

The Hanford Site Tank Farms contain approximately 57 million gallons of radioactive and mixed waste stored in 177 large, aging, underground tanks. This nuclear waste is the result of more than four decades of reactor operations and plutonium production for National defense. The systems and infrastructure that support storage of the waste are aging and pose a threat to the environment. The solution to this problem is to safely and cost effectively retrieve, process, and immobilize this waste and to execute the compliant closure of the Tank Farms system so that it no longer poses a threat to the environment.

The Department of Energy's (DOE) Office of River Protection (ORP) manages the cleanup of the Hanford Site tank waste. In July 2008, ORP awarded the Tank Operation Contract (TOC) to Washington River Protection Solutions, LLC (WRPS), replacing the former tank operations contractor. The Office of Health, Safety and Security's (HSS) DOE Voluntary Protection Program (VPP) review team (Team) evaluated WRPS in November 2010 and recommended that WRPS enter DOE-VPP as a Merit participant. The report specified opportunities for improvements that WRPS needed to address in order to attain DOE Star status. Because of collective bargaining agreement and funding uncertainties, HSS delayed planned onsite assessments until collective bargaining negotiations were complete in December 2013. This report documents the results of the assessment conducted February 4-13, 2014.

WRPS workers contend with numerous environmental, industrial, and construction hazards, as well as radiological and chemical hazards (including exposure to potentially hazardous chemical vapors emanating from the tank waste and beryllium). Industrial hazards include electrical, mechanical, scaffold work, and working with overhead loads. In addition, potential nuclear safety hazards are a consideration during tank-to-tank waste transfer activities.

Although injury rates rose in 2013 from the prior year, the rates remain significantly below the comparison industry rate. A review of the accident and injury logs did not identify improper case management, incorrect classification, or underreporting of injuries.

Since 2010, WRPS improvements in Management Leadership have produced significant improvements in its safety programs. Changes in leadership, training managers and supervisors in leadership skills, and a more proactive approach to issues management are building trust and improving communication with workers. Segments of the workforce remain that do not yet share that trust, and WRPS needs to continue its efforts to reach out to those workers.

WRPS employees are involved in their own safety and that of their coworkers. Employees recognize their right to notify their managers of any issues or concerns and often exercise their right to stop work. WRPS employees and managers participate in open forums, such as the Employee Accident Prevention Councils, the Project Manager's Accident Prevention Council, and other committees. However, WRPS should increase its efforts to ensure work schedules and meeting schedules permit regular attendance. Managers should continue to formally recognize, encourage, and reward employees for their participation and contributions.

WRPS has improved its work control process by refining the intent and application of the hazard analysis processes. By redefining the hazard analysis process, WRPS has eliminated many of the subjective elements of the work control process identified in the previous review. WRPS effectively commits resources to the identification and understanding of the vapor hazards in the

Tank Farms and to ensuring controls are effective to protect the workers from the identified hazards.

WRPS uses the hierarchy of controls to reduce worker exposures. The use of engineered controls, improvements in administrative controls, and the expanded use of sensors and wireless systems eliminate or reduce worker time in hazardous environments. WRPS' support of the industrial hygiene department with resources has improved response time to vapor exposures and its characterization, a prevalent issue in the management of the Tank Farms. WRPS should clarify the relatively new policy for using portable safety showers, and ensure it does not neglect permanent shower stations to protect workers from chemical hazards.

WRPS continues to maintain an effective training program that ensures trained and qualified workers can perform their job functions safely. WRPS focuses on the availability of trained and qualified workers at the jobsite. WRPS augments site-wide training with site-specific training to meet the unique demands of work at the Tank Farms. WRPS supports and encourages employees to seek additional safety expertise through the Safety-Trained Supervisor certification program.

Since 2011, WRPS has significantly improved its safety and health program, fostered additional employee involvement, and improved the relationship between managers and workers. Although segments of the workforce remain distrustful of managers' motives, most workers are aware of, and exercise their right to stop work, ask questions, and raise safety issues. Communication between managers and workers is improving, with senior managers training and coaching middle managers in effective leadership techniques. Employee Accident Prevention Councils, the Hanford Atomic Metal Trades Council Safety Representatives, and safety and health staff work cooperatively to address workforce issues and encourage continuous improvement. WRPS is more adept at identifying and responding to tank vapor concerns, which remain a concern for many workers. WRPS can gain additional trust from the workers by ensuring Problem Evaluation Reports are adequately addressed and work is completed (including agreement from the initiator) before issues are closed, quickly and accurately identifying locations of vapor exposures before technicians obtain samples, and encouraging additional workforce participation in work planning. WRPS exhibits continuous improvement in safety and health, and the Team recommends that WRPS continue in the DOE-VPP and be elevated to Star status.

TABLE 1
OPPORTUNITIES FOR IMPROVEMENT

Opportunity for Improvement	Page
WRPS should modify the PER system to default to providing feedback to the initiator on proposed corrective actions, changes to corrective actions status, reiterate the initiator's ability to escalate the issue if the corrective action does not effectively meet the initiator's expectations, and ensure PERs are not closed until associated work actions are complete.	**6**
WRPS should continue to focus on EAPC participation by raising its participation goal to 90 percent or more.	**8**
WRPS should increase efforts in ensuring work schedules and safety committee/council meeting schedules are conducive to nonexempt/bargaining attendance at safety committee/council meetings.	**8**
WRPS should consider an annual rollup of significant accomplishments generated within the EAPCs to share with the workforce.	**9**
WRPS should revise the JHA process to include documentation of the analysis and rationale for control selection in the hazard analysis process.	**13**
WRPS and the IH sampling team should ensure the sampling strategy monitors the effects of varying atmospheric conditions on Tank Farm vapor concentrations.	**14**
WRPS should find simple methods for workers to easily and quickly identify the location of a potential exposure.	**18**
WRPS should reestablish the CVST as a subcommittee to the IH technical committee to provide a solid foundation from which discussions regarding worker concerns, IH efforts on similar exposure group development, and future sampling efforts can be generated and communicated.	**18**
WRPS should ensure work planning leads and SMEs are effectively aware of the requirements specified in procedure TFC-ESHQ-S-STD-19, Rev C-1, *Emergency Shower, Eyewash, and Decontamination Facility Operation Standard.*	**21**

I. INTRODUCTION

The Hanford Site Tank Farms contain approximately 57 million gallons of radioactive and mixed waste stored in 177 large, aging, underground tanks. This nuclear waste is the result of more than four decades of reactor operations and plutonium production for National defense. The systems and infrastructure that support storage of the waste are aging and pose a threat to the environment. The solution to this problem is to safely and cost effectively retrieve, process, and immobilize this waste and to execute the compliant closure of the Tank Farm system so that it no longer poses a threat to the environment.

The Department of Energy's (DOE) Office of River Protection (ORP) manages the cleanup of the Hanford Site tank waste. In July 2008, ORP awarded the Tank Operation Contract (TOC) to Washington River Protection Solutions, LLC (WRPS), replacing the former tank operations contractor. URS Corporation and Energy Solutions jointly own WRPS. After WRPS took over Tank Farm operations it more than doubled its workforce, increasing from 700 to approximately 1,700 employees in 2012. Over the past 2 years, budget reductions have lowered that workforce down to 1,200 employees.

The Office of Health, Safety and Security's (HSS) DOE Voluntary Protection Program (VPP) review team (Team) evaluated WRPS in November 2010 and recommended that WRPS enter DOE-VPP as a Merit participant. The report specified opportunities for improvements that WRPS needed to address in order to attain DOE-VPP Star status. To help WRPS progress from Merit participant to Star status, HSS planned to conduct annual reevaluations. However, in 2011, the Hanford Atomic Metal Trades Council (HAMTC) bargaining agreement expired, and contract negotiations protracted over the ensuing 2 years. Because of collective bargaining agreement and funding uncertainties, HSS delayed its onsite assessment until negotiations were complete and the new bargaining agreement was in place. WRPS and HAMTC finally completed those negotiations in December 2013, and the new agreement was effective in January 2014.

Three organizations within WRPS perform the bulk of the hazardous work on the Tank Farms. Base Operations is responsible for the operation and maintenance of most of the tanks, including operation and maintenance of the evaporator facilities used to reduce the volume of tank waste, and the 222-S Analytical Laboratory. The Single Shell Tank (SST) Retrieval and Closure group performs retrieval operations from the single shell tanks, including operation of necessary equipment to perform waste transfers between tanks. The Tank Farm Projects organization performs construction-related work necessary to install equipment or facilities used by the other organizations. An Environment, Safety, Health and Quality (ESH&Q) department provides the necessary expertise in safety, industrial hygiene (IH), and radiological controls to ensure WRPS performs work safely and compliantly. Other organizations provide the necessary support functions, such as project integration, engineering, human resources, and financial management.

WRPS workers contend with numerous environmental, industrial, and construction hazards, as well as radiological and chemical hazards (including exposure to potentially hazardous chemical vapors emanating from the tank waste and beryllium). Industrial hazards include electrical, mechanical, scaffold work, and working with overhead loads. In addition, potential nuclear safety hazards are considered during tank-to-tank waste transfer activities.

II. INJURY INCIDENCE/LOST WORKDAYS CASE RATE

Injury Incidence/Lost Workdays Case Rate (WRPS)					
Calendar Year	Hours Worked	Total Recordable Cases (TRC)	TRC Incidence Rate	DART* Cases	DART* Case Rate
2011	3,786,242	10	0.53	5	0.26
2012	3,413,735	3	0.18	0	0.00
2013	3,654,240	8	0.44	3	0.16
3-Year Total	10,854,217	21	0.39	8	0.15
Bureau of Labor Statistics (BLS-2012) average for NAICS** # 562 (Waste Management and Remediation Services)			5.4		3.4
Injury Incidence/Lost Workdays Case Rate (WRPS Subcontractors)					
Calendar Year	Hours Worked	TRC	TRC Incidence Rate	DART* Cases	DART* Case Rate
2011	234,109	0	0.00	0	0.00
2012	146,724	0	0.00	0	0.00
2013	107,268	2	3.73	0	0.00
3-Year Total	488,101	2	0.82	0	0.00
Bureau of Labor Statistics (BLS-2012) average for NAICS** # 562 (Waste Management and Remediation Services)			5.4		3.4

* Days Away, Restricted or Transferred
** North American Industry Classification System

TRC Incidence Rate, including subcontractors: 0.41
DART Case Rate, including construction and subcontractors: 0.14

Although injury rates rose in 2013 from the prior year, the rates remain significantly below the comparison industry rate. WRPS continues to encourage workers to report all injuries. A review of the accident and injury logs did not identify improper case management, incorrect classification, or underreporting of injuries. The injury/illness staff also created a pocket guide to provide contact information for personnel dealing with an injury and communicating workers' rights/responsibilities relative to workers compensation claims in the State of Washington. Procedure TFC-ESHQ-S_CMLI-C-01, *Injury and Illness Recordkeeping*, and procedure TFC-BSM-HR_EM-C-04, *Reasonable Accommodations*, provide sufficient programmatic guidance to successfully administer the injury/illness program in accordance with regulations and expectations. Procedure TFC-ESHQ-S_CMLI-C-02, *Injury and Illness Events*, outlines expected actions for employees, supervisors, and response personnel, as well as the subsequent investigation of the event. WRPS injury and illness rates compare favorably with its comparison industry and meet the expectations for participation in DOE-VPP at the Star level.

III. MANAGEMENT LEADERSHIP

Management leadership is a key element of obtaining and sustaining an effective safety culture. The contractor must demonstrate senior-level management commitment to occupational safety and health, in general, and to meeting the requirements of DOE-VPP. Management systems for comprehensive planning must address health and safety requirements and initiatives. As with any other management system, authority and responsibility for employee health and safety must be integrated with the management system of the organization and must involve employees at all levels of the organization. Elements of that management system must include: (1) clearly communicated policies and goals; (2) clear definition and appropriate assignment of responsibility and authority; (3) adequate resources; (4) accountability for both managers and workers; and (5) managers must be visible, accessible, and credible to employees.

In 2010, the Team found that while WRPS managers were firmly committed to establishing a safe and healthy work environment, WRPS had not yet effectively translated that commitment into a mature, effective, working partnership with the workforce. Many changes made in the 2 years prior to the 2010 review did not adequately address worker input and concerns, and the workforce had not effectively committed to those changes. WRPS managers were struggling, in some cases, to overcome many years of workers' previous history at the Tank Farms. Some workers who felt disenfranchised and mistreated over the years had hindered efforts to achieve efficient performance and increased accountability. Some project areas, such as the 222-S Laboratory and the Single-Shell Tank Retrieval and Closure Operations, were functioning much better, but WRPS managers needed to be more proactive in reaching out to the workforce to gain its trust and acceptance in order to achieve DOE-VPP Star status.

Since 2010, WRPS has made extensive improvements in its management processes, program, and people. In particular, WRPS completely revised its work control program to increase employee input and feedback, and to reach a cooperative agreement between managers and employees prior to starting work. Both, an internal WRPS assessment and a URS work control review, identified a mature work control program that met the expectations and requirements of integrated safety management. Similarly, the Team saw significant improvements in work planning and control that included workers' involvement during the planning process, and systematic efforts to solicit worker feedback both during work and after completion of work.

There have been significant stressors since 2010 on the relationship between workers and managers, including protracted collective bargaining negotiations, workforce restructuring, and budget uncertainty. A safety culture survey after the 2010 assessment confirmed that workers' trust and confidence in their managers had eroded. In the wake of that survey, WRPS launched multiple efforts to train, educate, and coach middle managers and supervisors in leadership. For example, the manager for Base Operations initiated a series of leadership seminars based on *The 21 Irrefutable Laws of Leadership* by John Maxwell and *It's Your Ship: Management Techniques from the Best Damn Ship in the Navy* by D. Michael Abrashoff. All managers in Base Operations met with the Base Operations Manager and were required to identify three strengths and three weaknesses in themselves, and then implement personal improvement plans based on those strengths and weaknesses. The ESH&Q Manager established a similar process using *The Five Dysfunctions of a Team: A Leadership Fable* by Patrick Lencioni.

Visibility of managers in the field and to the workforce is greater now than in 2010. In 2012, WRPS launched a process known as the Field Execution Oversight Team (FEOT). This process required managers to spend significant amounts of time observing work, evaluating conduct of operations, and identifying potential improvements. Many managers and supervisors cited this process as an excellent means of increasing manager visibility in addition to helping improve conduct of operations. Although WRPS has only used the process for a few months, managers continue to spend more time in the field observing work. Managers continue to perform frequent observations under the Management Observation Program (MOP). Managers have specific expectations for the number of documented management observations performed on a monthly basis. The company President schedules one day each week specifically to spend time onsite with workers, observing work, and listening to workers' concerns.

WRPS managers have established effective working relationships with the HAMTC safety representatives. The ESH&Q staff meets frequently with the HAMTC safety representatives to discuss issues of concern, potential trends, and keep the lines of communication open. Once a month, the company President, Chief Operating Officer, and the ESH&Q manager take the HAMTC safety representatives to breakfast as a further means of expressing their appreciation, and improving communication.

WRPS is championing improvements in the use of remote monitoring and information technology to gain efficiency and reduce worker exposure to hazards. Investments in infrastructure include use of remote monitored instruments on the Tank Farms, wireless network connections at the Tank Farms, and use of mobile technology. In addition to the ability to send and receive e-mails while in the field, the mobile computers include applications that personnel use to evaluate hazards, take pictures or movies of situations to rapidly share with other personnel, and quickly reference necessary procedures, guides, or other information.

WRPS is working to develop and implement a 3-year strategic plan to help personnel focus not just on immediate tasks or the eventual project completion, but to help determine current priorities that support the outyear milestones. WRPS has engaged a commercial provider to help roll the strategic plan out to the workforce. This process, used by the company President at other locations, trains selected personnel from across the company as small group facilitators. These facilitators lead groups of eight people over the course of a few days in discussions about the strategic plan and generate acceptance and ownership of the plan. The group participants can express concerns about the plan, and have those concerns addressed. WRPS hopes this approach will build broad acceptance from the workforce and help reduce workers concerns about their future.

WRPS strongly supports worker training and development programs, particularly the Board of Certified Safety Professional's Safety-Trained Supervisor (STS) certification. This process involves experience and training that provides supervisors with a broader knowledge of safety requirements, and helps them become more effective in ensuring work is performed safety. WRPS allows nonsupervisory personnel to pursue STS certification, helping them develop a cadre of ready, trained personnel for supervisory positions, as well as give those workers a transferrable skill in the event of workforce restructuring. One hundred of the approximately 700 craft personnel at WRPS have completed STS certification.

Along with the other contractors at the Hanford Site, WRPS recently implemented a new collective bargaining agreement with HAMTC. Unlike the other contractors, WRPS workers

initially voted to reject the initial union proposal accepted by the other Hanford contractors. After two more months of negotiations, WRPS workers accepted the new agreement by a very slim majority. Recognizing the remaining angst among workers for several revised provisions, such as forced overtime and craft alignment, WRPS is being very careful in how it implements those provisions. Managers desiring to implement forced overtime must seek approval from the applicable level 1 manager. In addition, WRPS is not immediately seeking broad use of *craft alignment*, a process whereby HAMTC personnel can augment the activities of the primary classification. WRPS managers are keenly aware of the potential consequences of implementing these approaches, but should also be careful that this considered approach to the new contract provisions does not establish unrealistic expectations from the workers.

In response to an opportunity for improvement in 2010, WRPS significantly improved its annual assessment process. Self-assessments in 2012 and 2013 were self-critical, integrated, and identified many opportunities for improvement. The WRPS VPP Task Team assigned individuals to develop and lead corrective actions. One opportunity identified the need for additional support from mid-level managers to ensure adequate staffing and employee involvement in safety. The company President volunteered to take that task on personally. During the VPP assessment, the company President presented his set of actions to address the issue to the WRPS VPP Task Team and received valuable feedback on additional actions. The company President not only accepted those recommendations, but also immediately began implementing those actions. The actions included forming a supervisory safety committee, creating a new expectation that level 3 and level 4 managers attend at least 50 percent of all employee accident prevention council (EAPC) meetings, and finding ways to increase employee attendance at EAPC meetings.

A recurring message from managers heard by the Team was *let us be hard on ourselves.* WRPS senior managers recognize the value of critical self-assessments and proactive identification of issues. Despite this recognition at the senior management level, WRPS continues to have difficulty ensuring issues raised by workers receive appropriate, timely action and that workers agree with that action. WRPS uses the Problem Evaluation Report (PER) system as its primary method for issue tracking and resolution. The system processes 1,000 to 2,000 issues annually. Workers generally raise issues following an escalating process, first to their supervisors, then the HAMTC safety representatives and PER system, and finally resorting to stop work.

WRPS increased its attention to the PER system after the 2010 assessment to simplify entry and improve accountability for corrective actions. One manager regularly evaluates the entire system for overdue corrective actions and contacts the assigned corrective action manager for updated status. In general, WRPS expects most PERs to be corrected within 45 days. In some cases, managers are not meeting that expectation and are submitting extensions to corrective action due dates. In those cases, workers expressed frustration at waiting months for corrective action and finally resorted to stopping work when they believed the issues should have been resolved in a few hours if given the appropriate attention. Workers did not exercise their option to contact either the assigned corrective action manager or the Contract Assurance Manager as permitted by the PER procedure. Consequently, managers did not recognize the workers' emotions regarding the issue and had not appropriately prioritized their response. Once workers stopped work, the issues received higher attention and were resolved quickly, contributing to workers' belief that managers' highest priority was *production*.

In some cases, WRPS closed PERs initiated by workers when a work order for repair was written and placed on the schedule as backlog work that will be worked if other high-priority work cannot be worked. These backlog work requests often remain on the schedule for months with no progress. The workers that raised the issue then become frustrated that the PER was closed before the action was taken, and they were not consulted about the issue before the issue was closed.

Finally, in many cases the issue identified on the PER was addressed, but the worker did not receive feedback on the action taken that resolved the issue. This lack of feedback was primarily because the worker did not select the box on the PER form that he or she wanted feedback.

To improve workers' confidence in the PER system, WRPS should consider some minor modifications to the PER software. First, the system should default to providing feedback to the PER initiator and require the initiator to specifically request that they do not want feedback. Second, the system should be modified to generate an automatic e-mail notice to the initiator whenever there is a change to the PER status, such as corrective action status, closure due date, or issue closure. The e-mail should notify the initiator of the change, provide them with the name and contact information of the assigned corrective action manager, and reiterate the initiator's ability to escalate the issue if the corrective action does not effectively meet the initiator's expectations. Finally, WRPS should keep PERs open until any associated work orders are complete.

Opportunity for Improvement: WRPS should modify the PER system to default to providing feedback to the initiator on proposed corrective actions, changes to corrective actions status, reiterate the initiator's ability to escalate the issue if the corrective action does not effectively meet the initiator's expectations, and ensure PERs are not closed until associated work actions are complete.

Conclusion

Since 2010, WRPS improvements in Management Leadership have produced significant improvements in its safety programs. Changes in leadership, training managers and supervisors in leadership skills, and a more proactive approach to issue management are building trust and improving communication with workers. Segments of the workforce remain that do not yet share that trust, and WRPS needs to continue its efforts to reach out to those workers. WRPS meets the expectations for participation in DOE-VPP at the Star level.

IV. EMPLOYEE INVOLVEMENT

Employees at all levels must continue to be involved in the structure and operation of the safety and health program and in decisions that affect employee health and safety. Employee involvement is a major pillar of a strong safety culture. Employee participation is in addition to the individual right to notify appropriate managers of hazardous conditions and practices. Managers and employees must work together to establish an environment of trust where employees understand that their participation adds value, is crucial, and welcome. Managers must be proactive in recognizing, encouraging, facilitating, and rewarding workers for their participation and contributions. Both employees and managers must communicate effectively and collaboratively participate in open forums to discuss continuing improvements, recognize and resolve issues, and learn from their experiences.

In 2010, WRPS had retained the primary means of encouraging employee involvement through the transition process. Some EAPCs were functioning very effectively to encourage worker ideas and resolve worker issues, but other EAPCs were not as successful in engaging the workforce. Managers and workers had not yet consistently worked together to share positive lessons learned and experiences between EAPCs. Employees' attendance at EAPC meetings had dropped, particularly among the bargaining unit, and some workers and managers had not developed sufficient mutual trust and respect to form teaming relationships. Overall, direction and guidance to EAPCs had not been effective in developing a consistent teaming approach. Additional recognition and encouragement of workers to raise concerns and proactively assist managers in developing campaigns and initiatives were needed to help raise safety awareness and reverse negative trends. Both managers and workers needed to develop a path forward to communicate and implement a proactive teaming approach to safety that allowed and encouraged employees to take ownership of the safety program.

Since 2010, WRPS has significantly improved employee involvement and ownership of the safety and health program. The Integrated Safety Management System (ISMS) Expectations, posted throughout WRPS, define clear expectations for all employees (managers, supervisors, and workers). Interviews with employees, observations of prejob briefs, postjob As Low As Reasonably Achievable (ALARA) reviews, job walkdowns, EAPC meetings, Tailgate meetings, and document reviews demonstrated that the majority of the workforce is actively involved in the WRPS safety program and accountable to the ISMS Expectations. Numerous interviews revealed many workers' passion for and ownership of their own safety and that of their coworkers. Employees demonstrated a questioning attitude and reported issues and concerns to their immediate supervisor. In one case observed by the Team, workers stopped work when a question arose regarding expiration dates labeled on the High Efficiency Particulate Air (HEPA) filters that were scheduled to be installed in a tank riser. The workers initially asked their supervisor for additional information. The supervisor explained that a "variance" applied that allowed the use of expired HEPA filters, but that explanation did not satisfy the workers without additional documentation or procedures. The workers initiated a stop work and the supervisor contacted the appropriate subject matter experts (SME). A team of SMEs from engineering and quality assurance met with the workers to explain the requirements and showed the workers the applicable procedures and technical basis for the variance. Work resumed once the workers were satisfied with the answer. The workers, the supervisor, and the shift supervisor conducted themselves professionally and with mutual respect. In other cases, the passion and ownership create employee frustration when their issues and concerns have to be elevated to upper

management, through the PER system, or to a final stop work for resolution (see Management Leadership).

WRPS has a well-established structure of safety committees and/or councils. The Project Manager's Accident Prevention Council (PAPC) serves as the WRPS safety leadership council with the WRPS Project Manager and the lead HAMTC safety representative for WRPS serving as Co-Chairpersons. EAPCs, the ALARA Committee, the VPP Task Team, and other safety committees report to the PAPC on a monthly basis. These committees and councils provide a partnership between bargaining unit employees, exempt and nonexempt employees, and managers for the purpose of improving safety performance and reducing injury and illness rates.

Currently there are five EAPCs throughout WRPS. Each EAPC meets monthly. The EAPC Chairs and Co-Chairs also meet monthly and discuss each other's successes, best practices, and issues. EAPCs conduct safety initiatives to reduce and prevent injuries and accidents within their organizations. WRPS encourages the councils to be creative and innovative in their efforts to improve safety performance. At the monthly PAPC meeting, each EAPC Chair presents a Strengths, Weaknesses, Opportunities, and Threats (SWOT) overview of their business unit. These various monthly meetings provide many opportunities to share timely information between the business units.

WRPS considers voluntary membership in safety committees/councils a normal component of the member's duties. WRPS expects managers to support members by ensuring adequate time to attend meetings. WRPS tracks percentage of safety council membership attending each month, with a performance goal of 60 percent. While this is an effective leading indicator, 60 percent attendance on a regular basis would indicate members' disinterest in participating or inability to get away from regular work tasks to attend. Attendance figures for the past several months indicate 70-80 percent attendance, but WRPS should continue to focus on EAPC participation by raising its participation goal to 90 percent or more.

Opportunity for Improvement: WRPS should continue to focus on EAPC participation by raising its participation goal to 90 percent or more.

It was evident, through the review of attendance sheets, that any WRPS employee or subcontractor may attend the meetings and are encouraged to do so. However, discussions with some employees indicated a perception that work schedules and meeting schedules hinder some from attending. WRPS should increase efforts in ensuring work schedules and safety committee/council meeting schedules are conducive to nonexempt/bargaining attendance.

Opportunity for Improvement: WRPS should increase efforts in ensuring work schedules and safety committee/council meeting schedules are conducive to nonexempt/bargaining attendance at safety committee/council meetings.

EAPC members routinely conduct facility safety inspections using the *Workplace Safety Observation Checklist.* These inspections help identify existing or potential safety and health hazards within the workplace and procedural noncompliances. The facility inspection leading indicator shows that the completion of scheduled facility inspections is well over the goal of 90 percent, sometimes exceeding 100 percent performance. Completed *Workplace Safety*

Observation Checklists indicate WRPS uses a diverse, cross-organizational representation for facility inspection teams.

WRPS enters safety deficiencies and other significant issues requiring corrective actions into the PER system. As identified in the December leading indicator, the backlog for closing PERs has slightly increased but WRPS is refocusing its efforts on closure. All WRPS employees have access to the PER system and have been trained to use it. EAPCs also enter safety inspection results into PERs. It was evident that safety leaders and management were well informed of safety issues, concerns, and accomplishments through EAPC and PAPC meetings; however, the rest of the workforce was not as well informed. Tailgates and EAPC newsletters provided good communication to the workforce, but did not include the accomplishments generated by safety inspections and employee-generated PERs. An annual rollup of significant accomplishments resulting from EAPC and employees' efforts would reinforce their importance and credibility. WRPS could showcase such highlights at the annual Hanford Safety Exposition. WRPS should consider an annual rollup of significant accomplishments generated within the EAPCs to share with the workforce.

Opportunity for Improvement: WRPS should consider an annual rollup of significant accomplishments generated within the EAPCs to share with the workforce.

WRPS has created a wide category of healthy and active employee recognition programs to encourage employees to identify hazards and finding solutions for controlling them. These recognition programs assist in ensuring that safe behaviors, demonstrated by individuals or teams, are recognized and positively reinforced. Recipients are sometimes awarded cash or provided with a wide selection of safety items to choose from. The EAPCs play a substantial role in the selection and the award of the recognition.

The President's Life Saving Award recognizes WRPS employees for performing acts of heroism that saved a life. The President's Safety Award Program allows WRPS employees to recognize another WRPS employee for exhibiting an outstanding, long-term commitment to safety. The President's Safety Team Award recognizes a team that has made a significant contribution to safety. The team can be a work team, department or organizational team, or an ad hoc team.

The EAPC Safety Awards Program provides a mechanism for peers to recognize peers for good safety behaviors that are outside their normal job responsibilities. WRPS manages the *Big League Safety* campaign (see below) through the EAPCs. The participants record safe behavior observations using player cards and ballot boxes located across the facilities. The peer player scores their coworker on their positive behavior and decides whether the coworker has scored a single, double, or triple hit. They also have the option of scoring a home run. All home runs are discussed during EAPC meetings and voted on for nomination of a safety award.

The ALARA recognition awards increase the ALARA awareness while reducing or preventing radiological exposure. Peer checking was added recently to the ALARA suggestion/concern card to encourage employees to use peer checking while working in radiological areas. Employees seen demonstrating this behavior are given a gold-colored checkmark lapel pin.

In addition to these structured employee recognition programs, WRPS also runs one or two large safety campaigns per year. These campaigns serve to refocus the employees on safety and often award employees for company-wide safety achievements. During 2013, employees reached 7 million hours without a lost workday. In recognition, employees received a sweatshirt noting the achievement. Also during 2013, in preparation for the upcoming VPP onsite review, the VPP Task Team initiated a *VPP Star…Claim It* campaign. All WRPS employees were given a VPP learner card and a VPP lanyard for their support in the ongoing efforts to earn a VPP Star. The completion of learner cards earned employees four additional levels of awards. By the end of this VPP onsite review, 36 percent of the workforce had completed 1,096 cards.

In 2010, WRPS was using a behavior-based system known as the Peer Safety Observation Program (PSOP). Workers were concerned that PSOP generated a negative connotation when reporting on their peers. WRPS subsequently replaced PSOP with the *Big League Safety* process to encourage peer-to-peer observations. WRPS established a behavior-based safety charter that establishes expectations for all employees to watch out for the safety of others and reinforce positive, safe behaviors. The program recognizes and rewards those employees that perform and document safety observations. The program only records observations of safe behaviors. By focusing on safe behaviors, WRPS hopes to encourage employees to observe and eliminate at-risk or unsafe behaviors. WRPS does not ask workers to document at-risk or unsafe behaviors to avoid the stigma of reporting on their peers or blaming workers. As a result, WRPS cannot collectively evaluate, track, or trend at-risk or unsafe behaviors as inputs for identifying latent weaknesses. WRPS should carefully monitor the quality and quantity of peer observations. As the quality improves, WRPS should encourage workers to reintroduce observation of at-risk behaviors, and consider using an entirely worker-based committee to review and evaluate those at-risk behaviors to avoid any appearance of reporting those behaviors to supervisors or managers. The committee could report collective results and trends to the EAPCs for potential interventions or safety campaigns.

Conclusion

WRPS employees are involved in their own safety and that of their coworkers. Employees recognize their right to notify their management of any issues or concerns and often exercise their right to stop work. WRPS employees and managers participate in open forums, such as EAPCs, the PAPC, and other committees. However, WRPS should increase its efforts to ensure work schedules and meeting schedules permit regular attendance. Managers should continue to formally recognize, encourage, and reward employees for their participation and contributions, but should also remember the value of informal recognition, such as face- to-face dialogue, a handshake, or a pat on the back for a job well done. WRPS meets the Employee Involvement expectations for participation in DOE-VPP at the Star level.

V. WORKSITE ANALYSIS

Management of health and safety programs must begin with a thorough understanding of all hazards that might be encountered during the course of work and the ability to recognize and correct new hazards. There must be a systematic approach to identifying and analyzing all hazards encountered during the course of work, and the results of the analysis must be used in subsequent work planning efforts. Effective safety programs also integrate feedback from workers regarding additional hazards that are encountered and include a system to ensure that new or newly recognized hazards are properly addressed. Successful worksite analysis also involves implementing preventive and/or mitigating measures during work planning to anticipate and minimize the impact of such hazards.

The 2010 report identified that the WRPS work control and hazard analysis processes still exhibited opportunities for improvement and better integration. Specifically, the work planning instructions contained in the procedure, *Tank Operations Contractor Work Control*, required a determination of *Level of Work*. This determination was a graduated system that considered 14 different contributors that ultimately determined the level of work planning. However, the system allowed planners, SMEs, etc., to make subjective judgments on work package complexity, skill of craft, necessity for detailed instruction, or the existence of an applicable General Hazard Analysis (GHA) or Job Hazard Analysis (JHA) rather than defining those determinations. In 2010, WRPS expected a significant amount of work to fall into the Level 3 and Level 4 categories. Therefore, it was essential that the GHA and any JHAs contained sufficient detail to ensure personnel deciding whether work is covered under these analyses could clearly and easily make that decision.

For 2014, WRPS has redefined its work control procedure. WRPS still defines four levels of work planning. Per the procedure, the supervisor or planner must evaluate each work activity separately to ensure they identify the proper overall complexity and risk level. Level 1 work requires the generation of detailed work instructions; Level 2 work involves the use of preapproved procedures or preapproved work instructions; Level 3 work specifies no detailed work instructions required; and Level 4 work is limited to verbal directions and no work control document is generated for that work activity.

Overall, the work control process is similar in structure to the 2010 version. Level 1 work planning applies to tasks where workers need detailed work instructions to accomplish the activity. WRPS routinely uses Level 1 work packages for activities involving safety structures, systems, and components; high/medium complexity, high hazard/consequence; and/or involves implementing complex hazard controls. WRPS uses Level 2 work planning when detailed work instructions already exist in approved procedures or previously approved work instructions. Due to the repetitive nature of these work activities, team-planning meetings are not required. Planners perform field walkdowns as necessary to ensure the scope, hazard controls, and work instructions are appropriate as they assemble the work package.

WRPS uses Level 3 work planning when workers can understand and perform work without detailed work instructions. Tasks are generally routine, low/medium hazard, and skill-of-the-craft (SOC) as described in procedure, TFC-OPS-MAINT-STD-03, *Tank Farm Contractors Skill of the Craft*. In an effort to improve the SOC process, WRPS developed and now maintains a list of approved SOC activities on the Work Planning and Control Web site. The development of the

approved SOC list (based on hazard analysis and worker qualifications) eliminates the need for planning personnel to make subjective determinations that an activity is SOC. WRPS can analyze new activities and add them to the approved SOC list if those activities meet the criteria for SOC.

WRPS uses Level 4 work (verbal direction) for work activities that are considered low hazard, simple, routine, frequently performed, and where facility postings, worker skills, knowledge, training, and standard industrial controls (gloves, safety glasses, hardhats, etc.) are satisfactory for the safe conduct of work. Level 4 work does not affect the safety-related functions critical to Tank Farm operations, and environmental requirements and the GHA or standing JHA (SJHA) must cover all the hazards. Workers may complete these activities without direction from supervisors. For directed activities, the workers and supervisor perform an informal prejob briefing to ensure workers understand the scope and applicable hazards.

WRPS analyzed and developed specific criteria (contained in Attachment A of the work control procedure) that Level 4 work activities must satisfy. In addition, WRPS has analyzed and preapproved authorized Level 4 activities and maintains an authorized Level 4 list on the Work Planning and Control Web site. As with the approved SOC list, this preapproval process for Level 4 work eliminates the subjective element of the previous work planning process and ensures WRPS properly analyzes Level 4 work activities.

Procedure, TFC-ESHQ-S_SAF-C-02, Rev G-5, *Job Hazard Analysis*, documents the revised JHA process. WRPS improved the JHA procedure to redefine the JHA, SJHA, and GHA development and use. JHAs identify and describe only the work task-specific hazards. SJHAs address the locational and/or environmental hazards associated with work in specific locations of the Tank Farms. The GHA contains more detail compared to the previous VPP review. The GHA evaluates standard industrial and workplace hazards, along with employee training and qualifications, to ensure that employees have the proper skills and knowledge and can safely perform routine work activities. If the hazard evaluation for a work activity determines that the GHA covers all hazards, no additional job-specific hazard analysis is required. However, if the GHA-approved work is performed in an area of the Tank Farms that has additional locational hazards (i.e., asbestos, beryllium, chemical vapors, etc.), an SJHA may be required to ensure adequate hazard analysis for the work scope. This unique approach is an extremely effective methodology for addressing hazard analysis for Tank Farm work activities. This approach reduces clutter in JHAs or SJHAs by eliminating redundant analysis and allows the process to focus on unique or special controls required for work in that area.

WRPS uses the WRPS Job Hazard Analysis Checklist to initiate the JHA process related to work task and procedure development. The JHA checklist provides a comprehensive list of potential hazards to assist the walkdown team in identifying potential work task hazards. Based on the walkdown team's identified hazards, the planner selects controls and incorporates them into the work task steps or procedures. The Team reviewed more than 30 work packages. All hazards were adequately controlled, and the work task steps were clear. However, as identified in the 2010 report, the WRPS system still does not effectively capture and document the rationale for the described hazard controls within the JHA.

Opportunity for Improvement: WRPS should revise the JHA process to include documentation of the analysis and rationale for control selection in the hazard analysis process.

WRPS recently rewrote the Documented Safety Analysis (DSA) for the 242-A Evaporator Facility (Rev 3-A, February 1, 2012). The purpose of the rewrite was to bring the 242-A Evaporator DSA up to date with the latest revision of DOE Standard 3009, *Preparation Guide for U.S. Department of Energy Nonreactor Nuclear Facility Documented Safety Analyses.* The DSA originally prepared by the previous Tank Farm contractor considered the radiological consequences to be of the greatest significance in the accident scenarios. WRPS reanalyzed and determined the toxicological consequences were of greater significance overall, particularly to the worker. The WRPS analysis puts the Evaporator consequences more in line with the DSA scenarios described in the Tank Farm DSA. As a result, the controls set in the Evaporator DSA have a greater focus on the toxicological hazards (see Hazard Prevention and Control).

WRPS has a comprehensive and responsive IH program. WRPS IH personnel used the information from the previous Tank Farm contractor's baseline database and developed a strategy for evaluating and sampling for hazardous material throughout the Tank Farm complex. A baseline survey of health and safety hazards documents the chemical, vapor, radiological, nuclear, and industrial safety hazards for all facilities. WRPS routinely assesses and updates that baseline.

The WRPS IH program procedures adequately covered the spectrum of IH activities, including air, noise, light, and thermal stress monitoring, along with asbestos and beryllium exposure controls. Extensive documentation establishes expected tank vapor chemicals in various characterization reports and summary Tank Vapor Information Sheets (TVIS). The TVIS lists the primary chemical hazards and identifies the expected controls. At a minimum, WRPS updates TVIS annually.

As mentioned in the 2010 VPP review, WRPS continues to commit resources to the identification and understanding of the vapor emissions from the storage tanks and the evaporator facility. WRPS continues its efforts to characterize the tank vapors using IH sampling with sophisticated equipment to ensure controls are effective to protect the workers from the identified hazards. Additionally, WRPS increased the expertise of the IH staff to study the complex composition of the tank vapors and to communicate the results of tank vapor analysis to the workforce.

The 2006 *IH Chemical Vapor Technical Basis* report, completed by toxicologists and industrial hygienists, reviewed the vast number of chemicals present in the tank headspace and focused on exposures to Chemicals of Potential Concern (COPC). The current list of COPC contains 59 chemicals. Based on data from years of personal and area monitoring air sampling, WRPS characterized the primary chemicals that may be present in each Tank Farm and identified those chemicals in TVIS. The TVIS for each Tank Farm lists the chemical vapors that may be present from tank contents, communicates to the worker the chemical hazards for that Tank Farm area, and specifies controls associated with those vapor hazards. WRPS posts this information on WRPS IH program's Web page.

WRPS has invested significantly in the IH program, including increased staffing, procurement of sophisticated analytical instrumentation, and extensive sampling. The number and range of IH samples for activities occurring in the Tank Farms reflects the high profile nature of the issues surrounding potential worker exposures to tank vapors.

Field instrumentation and analytical resources available to IH field personnel to sample work areas include the Inficon HAPSITE® gas chromatograph mass spectrometer for analyzing volatile organic compounds; the Miran® infrared gas analyzer for detecting nitrous oxides; the Ohio Lumex® spectrometer for mercury detection; and other personal clip-on sensing devices, detector tubes, and air sampling methods. The acquisition of this diverse array of equipment represents a substantial investment and commitment from WRPS in the IH detection program. The introduction of this sophisticated equipment permits onsite analysis of complex chemicals. IH technicians can quickly sample an area where potential exposures occur, analyze the sample for TVIS chemicals, and communicate results back quickly to the worker.

Along with these equipment resources, the program also employs multiple technical specialists (such as a PhD chemical analyst) to help analyze, and interpret the data. In conjunction with the extensive IH involvement in work planning and execution, the result of this significant investment in equipment and resources is a program that yielded only two events over the last 3 years that resulted in exceeding 50 percent of the occupational exposure limit (and neither of these events involved Tank Farm vapors).

The IH department currently has plans in place to initiate a campaign to resample many of the emission points in the Tank Farms with the sophisticated analytical equipment, plus other sampling trains. The 2006 *IH Chemical Vapor Technical Basis* report listed three factors that affect SST vapor concentration: (1) barometric pressure (slight changes can push air into tank or draw it out); (2) wind (induces pressure differences between connected tanks); and (3) buoyancy (cold air coming into the tank can displace warm, less dense air out of the tank). The influence of any one these three factors may influence the concentrations of vapors coming out of any Tank Farm emission point. WRPS and the IH sampling team should ensure the sampling strategy monitors the effects of varying atmospheric conditions on Tank Farm vapor concentrations.

Opportunity for Improvement: WRPS and the IH sampling team should ensure the sampling strategy monitors the effects of varying atmospheric conditions on Tank Farm vapor concentrations.

WRPS performs general worksite safety and health inspections per the requirements of procedure, TFC-ESHQ-S_SAF-C-12, Rev A-8, *ESHQ Safety Inspections,* (May 21, 2013). The procedure integrates general worksite safety and health inspections that are occurring on a scheduled basis into one overall inspection process. WRPS inspects all areas for general Occupational Safety and Health Administration compliance. Inspections can be general area or facility-focused for special emphasis or in response to recognized trends. Personnel document the results of safety inspections using forms relating to the specific inspection procedure. They forward the completed forms to safety and health for review and then enter the forms into the Integrated Document Management System for retention. For continuous activities, these hazard

assessments must occur no less frequently than monthly and cover the whole worksite at least quarterly.

Safety professionals or inspection teams perform safety inspections. If an inspection is at the request of a manager or due to an employee concern, the requesting employee or manager is given the opportunity to participate in the inspection and given a copy of any reports and PERs generated. Personnel document the results on the *Workplace Safety Observation Checklist* (A-6004-023) or the *Safety and Health Field Surveillance Report Database or Form* (A-6004-156).

WRPS tracks and trends multiple functional areas associated with performance and safety indicators. Functional areas include DART, MOPs, PERs, field surveillances performed, corrective maintenance backlog, delinquent preventive maintenance (PM), and contamination events. The Company-Level Performance Dashboard System compiles all tracked items. The dashboard allows WRPS managers to review the results of the tracked items at two levels: the first provides a quick overview of the progress and milestones for all items on one comprehensive spreadsheet; the second provides an indepth, detailed 12-month breakdown of the progress related to each individual item.

When WRPS identifies trends, it develops safety campaigns highlighting the trend and communicates safety awareness notices to the workforce. Recent awareness campaigns included slips, trips and falls; hand safety; and vehicle safety.

Conclusion

WRPS has improved its work control process by refining the intent and application of the hazard analysis processes. By redefining the hazard analysis process, WRPS has eliminated many of the subjective elements of the work control process identified in the previous review. WRPS effectively commits resources to the identification and understanding of the vapor hazards in the Tank Farms and ensuring controls are effective to protect the workers from the identified hazards. WRPS meets the Worksite Analysis expectations for continued participation in DOE-VPP at the Star level.

VI. HAZARD PREVENTION AND CONTROL

Once hazards have been identified and analyzed, they must be eliminated (by substitution or changing work methods) or addressed by the implementation of effective controls (engineered controls, administrative controls, or personal protective equipment (PPE)). Equipment maintenance processes to ensure compliance with requirements and emergency preparedness must also be implemented where necessary. Safety rules and work procedures must be developed, communicated, and understood by supervisors and employees. These rules/procedures must also be followed by everyone in the workplace to prevent mishaps or control their frequency/severity.

Work at the Tank Farms involves the potential for exposure to many types of industrial, chemical, and radiological environments and materials. Procedure, RPP-MP-003, Rev 6d, *Integrated Environment, Safety, and Health Management System Description for the Tank Operations Contractor*, requires WRPS to provide required PPE to protect workers from hazards that cannot be otherwise eliminated or avoided by substitution, or controlled with engineered and administrative controls. Ensuring that worker exposure to these environments and materials is avoided, or at least minimized, requires adopting and implementing an effective process for applying an effective hierarchy of controls. Based on the Team's review, WRPS is continually evaluating ways to minimize or eliminate hazards, thus reducing the reliance upon the use of PPE. When all other options are exhausted, personnel, procedures, training, work control processes, and facilities are available to ensure that required PPE is accessible and in proper operating condition.

WRPS implemented a number of engineered controls to minimize worker exposures. For example, WRPS uses an automated 50-inch diameter, rotating cutting tool to penetrate the tank dome to allow the installation of the mobile arm retrieval system (MARS) into the tank. The cutting tool is installed on top of the tank and the workers evacuate the area while the unit cuts through the dome, which takes two hours. The rotating cutting tool replaced the water and garnet cutting system that required workers to remain in the area and monitor the progress of the 21-hour long operation. The transition from the garnet cutting system to the rotating cutting tool has significantly reduced worker exposure time during this activity.

Since the 2010 assessment, WRPS has updated MARS based on new parameters. The first version, MARS-S, or sluicing, functions by applying high pressure liquid using an articulating arm that extends to the tank wall and bottom. The liquid produces slurry that flows to the middle of the tank and is pumped out. The updated version (currently in final approval stages) is designated MARS-V, or vacuum, and employs high pressure sprays and suction nozzles at the end of the articulating arm. As the liquid from the spray nozzles develops slurry in the tank, the vacuum nozzles provide suction to remove the slurry and additional liquids (introduced by the MARS) from the Tank Farm system.

WRPS has initiated several improvements to reduce potential worker exposures. When possible, tents are erected over the work area to protect workers from wind and cold in the winter, and from heat and windstorms in the summer. The tents are temporary, and are used when it does not interfere with other work, such as crane rigging or the movement of material. There are additional tents nearby that have air-conditioning so workers can cool down. During high wind conditions, windbreaks made from large sections of plastic protect workers from the effects of

wind chill. During the extreme cold conditions experienced this year, WRPS adopted the use of glycol for decontaminating wet surfaces, which prevented the wetted rags from freezing during use and allowed workers to perform decontamination work during the cold weather conditions.

By changing the focus of the Evaporator DSA to the toxicological hazards (see Worksite Analysis), WRPS identified modifications and engineered controls to reduce unnecessary exposure to toxic hazards associated with facility use. For example, WRPS blanked off the sampler for the feed side of the evaporator. The characterization for the tank waste has improved significantly in the past years, so samples are no longer required from the feed side. Blocking of the sampler eliminates a potential exposure point. WRPS installed an automatic safety instrument system (ASIS), which is independent of the control room and its operators. The ASIS initiates an automatic response to out-of-range readings from abnormal system conditions. The ASIS will automatically manipulate valves and shut down pumps allowing tank waste to drain back into the tanks in the event of system abnormalities.

Based on the 2006 *IH Chemical Vapor Technical Basis* report, procedure, TFC-ESHQ-S_IH-C-48, *Managing Tank Chemical Exposures*, was developed and establishes Vapor Control Zones (VCZ) at identified exposure points. VCZs offer administrative control of emission points that may exceed the action level of the chemicals identified in the TVIS (see Worksite Analysis). VCZ boundaries are set at a minimum of five feet from an emission point or a distance large enough to keep exposures below the action level of the TVIS chemicals. VCZs are posted at emission points within the Tank Farms with the warning to contact IH for entry requirements.

WRPS has hired additional IH professionals to conduct adequate response to Tank Farm exposures and communicate the results of analysis in a timely manner to workers. New workers are required to attend the Chemical Hazards Awareness Training (CHAT) (see Safety and Health Training). The epidemiologist that leads this class provides a common sense approach to the Tank Farm exposure issues. Afterwards, annual refresher CHAT keeps workers informed of any new developments to the tank vapor hazards and controls identified in the Tank Farms.

Prior to this assessment, an individual reported smelling vapors while performing routine surveys in a Tank Farm. Personnel responded by evacuating the area and initiating procedure, TF-AOP-015, *Response to Reported Odors or Unexpected Changes to Vapor Conditions.* The IH team quickly responded by interviewing the individual, performing air sampling in the area of the potential exposure, and communicating the results to the worker. The employee sought medical attention and was released back to duty. WRPS also took a conservative response by restricting access to the area throughout the investigation period, even though all initial data indicated that it was safe to release the area. While the response, investigation, and initial communication were timely, IH technicians mistakenly assumed the location of the area of exposure rather than interviewing the worker for the specific location. Consequently, they did not obtain samples where the potential exposure occurred for nearly two weeks. The significant delay in obtaining a representative sample contributed to a level of skepticism by the employee on the extent of the employee's exposure.

Recognizing that some workers are very concerned about potential tank vapor exposure, WRPS should find simple methods for workers to easily and quickly identify the location of a potential exposure. For example, workers entering the Tank Farm could carry a colored and weighted

flag, similar to a penalty flag used by football referees. A worker smelling tank vapors could immediately drop the flag before they exit the Tank Farm. As IH technicians reenter the farm, they would use the flag location to determine where to conduct sampling.

Opportunity for Improvement: WRPS should find simple methods for workers to easily and quickly identify the location of a potential exposure.

The 2010 review discussed the effectiveness of the Chemical Vapor Solutions Team (CVST), which met periodically to discuss IH sampling results of the Tank Farms and gave workers the opportunity to ask questions about chemical exposures in the Tank Farms. Based on interviews, the CVST was well attended by workers; but several years ago, it was absorbed into the IH technical committee. Discussions with the IH department indicated plans to reestablish it as a subcommittee to the IH technical committee, along with respiratory protection, heat stress, and beryllium subcommittees. Although communication and knowledge of the vapor exposures has increased since the last assessment, workers still encounter potential exposure conditions and some still have concerns regarding those exposures due to their experiences. WRPS should reestablish the CVST as a subcommittee to the IH technical committee to provide a solid foundation from which discussions regarding worker concerns, IH efforts on similar exposure group development, and future sampling efforts can be generated and communicated.

Opportunity for Improvement: WRPS should reestablish the CVST as a subcommittee to the IH technical committee to provide a solid foundation from which discussions regarding worker concerns, IH efforts on similar exposure group development, and future sampling efforts can be generated and communicated.

The 2010 review identified an excessive backlog of PM work. During the current review, the Team observed a significant reduction in delinquent PM backlog and an effectively managed PM program that supports safe facility operations. Because of increased management emphasis and resource commitment, WRPS only had 15 backlogged PM actions compared to the hundreds observed previously. The reduction was accomplished by the emphasis on performance of overdue PMs (i.e., significant fraction completed as part of the Evaporator restart preparations), identification and formal deletion of unnecessary PMs, PM frequency revision, or deferral due to equipment status (i.e., no longer used or out-of-service). Procedure TFC-OPS-MAINT-C-12, *Preventive/Predictive Maintenance Administration*, requires that PM frequencies be established by designated personnel utilizing appropriate technical basis, such as manufacturer recommendations, equipment importance, and applicable regulations/standards. The procedure requires that maintenance and engineering personnel evaluate the justification for all PM deferrals. The technical basis (justification) is required to be documented on form A-6005-840. Facility personnel provided examples of completed justification forms to the Team; however, they acknowledged the frequency for most of the equipment in the database was still based primarily on past practices.

Maintenance program personnel described an ongoing initiative to replace the current electronic maintenance management system (CHAMPS) with a new software package (INFOR). The new system is in the final stages of completion with training of the administrators in process. The

new system should be online by March 2014. This improvement further demonstrates WRPS' commitment to invest resources into improving the maintenance control processes.

During a walkthrough of the maintenance shops, the housekeeping of the carpenter shop was neat and orderly. Tools were noted to be in good condition with appropriate guards in place. The Team observed personnel wearing PPE identified for their tasks. The sign shop was recently renovated. The employees in the sign shop stated they had been involved in establishing the layout of the equipment and were very satisfied with the new work environment. Although not as organized as the carpenters shop, no unsafe conditions were noted in the instrument shop and material fabrication shop.

The WRPS Process Software Engineering group is developing software systems to align processes between the vitrification plant and the Tank Farms. Both missions will be managed by URS after the construction of the vitrification plant. Four control systems currently monitor the Tank Farms: (1) Tank Monitor And Control System (TMACS) for tank levels and temperatures; (2) NovaTech Distributed Control Systems (DCS) for evaporator operations; (3) Tank Farm Monitoring and Control Systems (TFMCS) Real Time Products (RTP) Programmable Logic Center (PLC) for tank ventilation and transfer system monitoring; and (4) MICON Heating Ventilation Air Condition (HVAC) DCS for ventilation monitoring of the AY and AZ farms. By 2015, all monitoring will migrate to a single design DCS and data will be displayed in the building 274 AW monitoring station. A single monitoring system is beneficial since operators need to learn only one system and spare parts are interchangeable. Once the new DCS is operational, the central shift manager will be capable of observing the status of all operations in real-time, further reducing worker time in the farms, reducing potential exposures.

WRPS is testing sensor and wireless systems for maintenance operations. Using sensors for predictive maintenance eliminates redundant time workers spend in the field monitoring or calibrating instruments and reducing the worker's potential exposure to vapors. WRPS is piloting a study to evaluate the use of wireless sensors to monitor instruments in the field. WRPS expects these wireless systems to save money by reducing installation and maintenance costs. Wireless sensors can be checked remotely with test signals, and can be installed more easily along lengthy transfer lines than hard-wired sensors. Additionally, wireless systems support workers recording rounds electronically. Wireless solutions are also being tested by IH to monitor workers' heart rates to evaluate heat stress conditions.

Alarm standardization and rationalization is another human factor area WRPS is seeking to improve. WRPS is testing alarm systems to create better alarm logic. WRPS is using simulators to train operators, and engineers can test the human factors performance of operators as they execute procedures under alarm conditions. Additionally, the evaporator simulator saves resources by not having to conduct cold evaporator runs, which generate waste, and disposal costs.

The radiological control program is well defined and documented. There were no reportable skin or clothing contamination exposures for the past year, and the radiation manager meets weekly with his DOE counterpart to discuss relevant issues. During the month of August 2013, WRPS discovered that several electronic personal dosimeters did not have the correct configuration or alarm settings. WRPS evaluated the condition using the PER system, conducted training for personnel issuing electronic personal dosimeters, and resolved the issue. Based on

interviews, the radiological control program is effective and well maintained. Mission Support Alliance, LLC (MSA), maintains the overall site-wide emergency management program for the Hanford Site. Each contractor implements DOE Order 151.1C, *Comprehensive Emergency Management System*, within its emergency management program and in coordination with MSA. The emergency management program for WRPS is defined in procedure, TFC-ESHQ-EP-C-01, Rev A-13, *Emergency Management*. WRPS develops and revises emergency planning hazard assessments (EPHA) for WRPS areas/facilities. WRPS maintains three EPHAs and the Team reviewed one titled, RPP-23226, Rev 3, *Tank Farms Hazards Assessment*, dated May 2012. This EPHA identifies the numerous hazards associated with the Tank Farms and adequately covers the associated hazards.

In August 2013, WRPS demonstrated its emergency response capability when the Hanford Site issued an emergency alert based on elevated Beta readings in C-Farm. After executing emergency procedures, MSA and WRPS cancelled the alert with the conclusion that the elevated readings were due to a preexisting contamination. An evaluation of the alert event by ORP resulted in the recommendation of three findings and two suggestions to MSA, and one suggestion to WRPS. In response to the ORP suggestion, WRPS is developing guidance to address preexisting contamination conditions to avoid activating the alert system for this type of event.

ORP identified three findings during evaluations of WRPS Emergency Preparedness in December 2012 and January 2013. The Emergency Preparedness Group developed corrective action plans that are tracked in PERs. The Team also observed the pre-drill briefing of a tank deflagration scenario. The briefing was detailed and all questions were answered professionally concerning the scenario. The Team also observed the actions of WRPS during the drill. Based on a review of program documentation and observation of the drill activity, the Team concluded that the WRPS emergency management program is capable of managing and responding to the range of emergencies identified by the Emergency Management Program.

Since the last VPP assessment, DOE Richland Operations Office selected a new occupational medical contractor, HPM Corporation (HPMC), for the entire Hanford medicine support. HPMC conducts initial and annual worker medical surveillance for WRPS workers. WRPS case managers work with HPMC medical staff to resolve medical restrictions for injured individuals, making it easier and clearer for WRPS to correctly classify and report injuries and manage work restrictions. HPMC provides first-aid medical service onsite, and transports patients to Kadlec Hospital for more severe injuries. WRPS is medically supported by HPMC.

In November 2013, MSA electricians deenergized the power to a high voltage transformer in support of a joint MSA/WRPS work activity. The WRPS employee observing the activity requested (per lockout/tagout requirement) to confirm the deenergized switch and location to complete the facility lockout/tagout verification. MSA normally performs this type of isolation work on pole-mounted transformers, so WRPS workers observing the isolation cannot enter the arc flash protection area. This case involved a ground level transformer, and the WRPS employee unknowingly entered the arc flash electrical boundary without proper training or PPE, resulting in a near-miss event. Cause Analysis Report WRPS-PER-2013-2125, captured the event investigation. The investigation identified several corrective actions to improve communication between MSA and WRPS when working on high-voltage transformer work packages.

During this review, workers voiced concerns with the operation of several safety showers in the 222-S Laboratory. Workers reported several rusted shower station valves that were difficult to operate. PERs and work orders identified the malfunctioning showers as far back as May 2012. Based on WRPS' analysis, several of the safety showers required 50 pounds of force on the handle before shower water would release. An engineering change request completed in May 2013 approved the replacement of shower valves that were difficult to operate. However, the pipefitter performing the work order identified rust build up on the valve internals and removed the rust rather than replacing the valves. The repair was ineffective. A PER was initiated in October 2013 that called for the performance review of safety showers and eyewashes in the 222-S Laboratory and their specific locations. Two years have passed since workers reported this concern and the safety showers are still not operating properly. (See Management Leadership for an opportunity for improvement related to PERs closure.)

DOE authorized the purchase of portable shower stations for WRPS to ensure workers have adequate protection from Tank Farm chemical exposures when working in the Tank Farms. Shower stations are permanently located at C, Y, and SY farms, and six additional portable shower stations are available for use throughout the site as needed. Procedure, TFC-ESHQ-S-STD-19, Rev C-1, *Emergency Shower, Eyewash, and Decontamination Facility Operation Standard*, Table 1, lists the tasks that require the use of eyewash, emergency shower, and/or decontamination facilities based on the type of work to be performed. During a work planning session attended by the Team, several workers requested that a portable shower station be installed to support the work activity. The lead planner questioned the need for a portable shower and what WRPS requirements existed that specified the need to provide that control. Neither the lead planner nor the SMEs in attendance referred to the procedure for guidance. Since the procedure was published in September 2013, recognition of its requirements may not be fully understood sufficiently by work planning and SME staff. WRPS should ensure work planning leads and SMEs are effectively aware of the requirements specified in procedure TFC-ESHQ-S-STD-19, Rev C-1, *Emergency Shower, Eyewash, and Decontamination Facility Operation Standard*.

Opportunity for Improvement: WRPS should ensure work planning leads and SMEs are effectively aware of the requirements specified in procedure TFC-ESHQ-S-STD-19, Rev C-1, *Emergency Shower, Eyewash, and Decontamination Facility Operation Standard.*

Conclusion

WRPS uses the hierarchy of controls to reduce worker exposures. The use of engineered controls and improvements in administrative controls, and the expanded use of sensors and wireless systems, eliminate or reduce worker time in hazardous environments. WRPS' support of the IH department with resources has improved response time to vapor exposures and its characterization, a prevalent issue in the management of the Tank Farms. WRPS should clarify the relatively new policy for using portable shower stations and ensure permanent shower stations are not neglected. WRPS meets the Hazard Prevention and Control expectations for continued participation in DOE-VPP at the Star level.

VII. SAFETY AND HEALTH TRAINING

Managers, supervisors, and employees must know and understand the policies, rules, and procedures established to prevent exposure to hazards. Training for health and safety must ensure that responsibilities are understood, personnel recognize hazards they may encounter, and they are capable of acting in accordance with management expectations and approved procedures.

The 2010 assessment found WRPS had a well-established training and qualification program that trained workers to recognize and control hazards. The WRPS training program helps managers, supervisors, and employees understand the established safety and health policies, rules, and procedures to promote safe work practices and minimize exposure to hazards. The 2010 Team found that WRPS employees needed improved training on the PER system.

Since 2010, WRPS has initiated several effective improvements in response to the opportunity for improvement. For example, WRPS developed a less complicated PER input program that increased availability and ease of use for the workers. It also developed the Causal Analysis Instruction Guide to facilitate supervisors/managers assigned to respond to employee-originated PER issues and properly perform the root cause analysis for PER issues raised.

The Team observed three training classes during this assessment. The slip simulator is a training tool used to simulate performing tasks (such as walking, walking and texting, and stepping over obstacles and carrying a load) on slippery surfaces (ice/snow) while in a controlled environment. The instructor briefs employees on the training, and then employees don a five-point harness to prevent injuries. Employees walk through various scenarios, such as walking over an obstacle, carrying a box, or texting while walking on a slippery surface. The instructor then shows participants how to improve their balance and adjust their walking style to safely traverse the slippery surface. The Team also attended an IH technician refresher class that addressed chain of custody practices (assurance that samples are positively controlled) and requirements. The chain of custody class started with a quiz that consisted of questions recently posed by technicians and other issues identified in the workspace. The instructor opened each question on the quiz to discussion and offered clarifications to reinforce the technicians' understanding. The last class attended by the Team was the CHAT refresher. This class covered history, sampling data, chemicals of concern, chemical exposure limits, odors, chemical monitoring equipment, health effects, administrative controls, and PPE at the Tank Farms. The class was thorough, informative, presented in nontechnical language, and easy to follow. The instructor was outstanding in his presentation, depth of knowledge, and responsiveness to employee questions. His responses were positive and always addressed the employees' questions in a nonconfrontational manner. Students interviewed after the class were very positive about the course content and presentation. The CHAT refresher class, as presented by WRPS, is an outstanding training tool.

Since the 2010 assessment, MSA replaced the old training management software, Integrated Training Electronic Matrix (ITEM), with the Enterprise Learning Management (ELM) system. ELM tracks employees training, schedules training, and rolls up training metrics for the training organization to manage. MSA maintains and manages the site ELM system, the Volpentest Hazardous Material Management and Emergency Response (HAMMER) Training Center, and coordinates with other site contractors to meet their training needs. Since ELM is relatively new

to the Hanford Site, training coordinators are providing suggestions to MSA to improve ELM to meet their training and scheduling needs. WRPS participates on a site-wide training committee established by MSA to evaluate suggestions and integrate improvements to meet the needs of site contractors.

Initial indications are that ELM effectively improves WRPS' ability to manage employee training. WRPS is able to tailor its training needs through ELM by customizing the reports requested from the system with less operator input and provide significantly more usable information to the customer. WRPS uses ELM to produce a Web site report that shows projected training for the next 30, 60, and 90-day periods. Each manager, at his or her convenience, can look in their section of the report to see when training is required or identify training delinquencies within their workgroup. This capability permits managers and supervisors to plan job assignments within the workgroup up to 90 days in advance. Training coordinators stated ELM helps them manage qualifications that may lapse due to situations, such as when equipment is out for repair, the equipment is no longer used, the equipment is idle for several months, or other similar situations. With the ELM system, these lapses are not counted against the organization as delinquencies. Discussions with the training manager indicate that WRPS tracks *training no shows*, but the WRPS philosophy centers around providing trained and qualified workers at the worksite. The training manager informed the Team that for the month of January, *no shows* were approximately 1.2 percent. The training manager told the Team that occasionally when a *no show* occurs they try to fill the slot with an individual that needs the training. This condition may cause a worker to attend training on very short notice.

Procedure, TFC-BSM-TQ_ADD-C-01, REV F, *Conduct of Training Administration*, guides the WRPS process to ensure the workforce is trained to work effectively and safely. The procedure describes the process used by the training organization to determine if new training or changes to existing training are necessary, and if so, how to design, develop, deliver, and evaluate the training product(s) generated. Prior to performing work, WRPS requires managers, technicians, operators, instructional staff, maintenance and craft, and scientific staff to meet qualifications established by the company. The training organization ensures that employees' training at the HAMMER facility or at the site fulfill the training needed to meet and maintain those qualifications.

When a new employee arrives at WRPS, an employee job task analysis (EJTA) is developed for that employee. The EJTA defines physical and medical examination requirements, any medical baseline testing, and the employee's training requirements. After the employee satisfies the physical requirements, they meet with their supervisor to discuss their specific training requirements. Every new employee receives Hanford General Employee Training, WRPS General Employee Training, ISMS training, Environmental Management System training, VPP training, universal waste management training, security training, and depending on job classification, specific training on beryllium, radiological hazards, ladder safety, and heat stress. First line supervisors and managers use the Hanford Site Worker Eligibility Tool (HSWET) to validate qualifications and training prior to assigning work to an employee. Examples of employee training and qualifications recorded in HSWET include respirator training qualifications, physicals, hazardous waste operations and emergency response (HAZWOPER) training, Beryllium worker training, and radiation worker training.

MSA provides WRPS employees training on site-wide programs, such as lockout/tagout, confined space entry, beryllium awareness, lead awareness, electrical safety, radiation worker, and HAZWOPER. WRPS trainers provide facility-specific training. Examples of facility-specific training may include facility emergency response, facility-specific criticality requirements, DSA and Technical Safety Requirements, or facility-specific equipment operation and limitations.

WRPS continues to support the STS certification for employees. The STS certification program is active and growing with over 100 individuals having completed the certification since its introduction at WRPS. Currently, 20 employees, ranging from administrative support to craft foreman, are enrolled in the program.

Conclusion

Overall, WRPS continues to maintain an effective training program that ensures trained and qualified workers can perform their job functions safely. WRPS focuses on the availability of trained and qualified workers at the job site. The WRPS augments the site-wide training at the HAMMER facility, with site-specific training to meet the unique demands of work at the Tank Farms. WRPS supports and encourages employees to seek additional safety expertise through the STS certification program. WRPS meets the Safety and Health Training expectations for participation in DOE-VPP at the Star level.

VIII. CONCLUSIONS

Since 2011, WRPS has significantly improved its safety and health program, fostered additional employee involvement, and improved the relationship between managers and workers. Although segments of the workforce remain distrustful of managers' motives, most workers are aware of, and exercise, their right to stop work, ask questions, and raise safety issues. Communications between managers and workers is improving, with senior managers training and coaching middle managers in effective leadership techniques. Employee Zero Accident Councils, the HAMTC Safety Representatives, and safety and health staff work cooperatively to address workforce issues, and encourage continuous improvement. WRPS is more adept at identifying and responding to tank vapor concerns, which remain a concern for many workers. WRPS can gain additional trust from the workers by ensuring PERs are adequately addressed and work is complete (including agreement from the initiator) before issues are closed, quickly and accurately identifying locations of vapor exposures before technicians obtain samples, and encouraging additional workforce participation in work planning. WRPS exhibits continuous improvement in safety and health, and the Team recommends that WRPS continue in the DOE-VPP and be elevated to Star status.

Appendix A: Onsite VPP Assessment Team Roster

Management

Glenn S. Podonsky
Chief Health, Safety and Security Officer
Office of Health, Safety and Security

William A. Eckroade
Principal Deputy Chief for Mission Support Operations
Office of Health, Safety and Security

Patricia R. Worthington, PhD
Director
Office of Health and Safety
Office of Health, Safety and Security

Bradley K. Davy
Director
Office of Worker Safety and Health Assistance
Office of Health and Safety

Review Team

Name	Affiliation/Phone	Project/Review Element
Bradley K. Davy	DOE/HSS (301) 903-2473	Team Lead, Management Leadership
John A. Locklair	DOE/HSS	Employee Involvement, Safety and Health Training
Brian A. Blazicko	DOE/HSS	Hazard Prevention and Control
Michael S. Gilroy	DOE/HSS	Worksite Analysis
Melanie Gibson	Savannah River Remediation, LLC/ Savannah River Site (SRS)	Employee Involvement
Carl Everatt	Parsons Corporation/Salt Waste Processing Facility Construction Project/SRS	Worksite Analysis, Hazard Prevention and Control