Wastren Advantage, Inc.
Transuranic Waste Processing Center

Report from the Department of Energy
Voluntary Protection Program
Onsite Review
September 10-13, 2012

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 Wastren Advantage, Inc. (WAI) at the Transuranic Waste Processing Center in Oak Ridge, Tennessee, during the period of September 10-14, 2012, and provides the Chief Health, Safety and Security Officer with the necessary information to make the final decision regarding WAI's continued participation in DOE-VPP as a Star site.

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ABBREVIATIONS AND ACRONYMS

AHA	Activity Hazard Analysis
BBA	Box Breakdown Area
BLS	Bureau of Labor Statistics
CFR	Code of Federal Regulations
CH	Contact-Handled
CIT	Continuous Improvement Team
CBT	Computer-Based Training
C.O.R.E	Challenging Ourselves to Reach for Excellence
CPE	Cask Processing Enclosure
DART	Days Away, Restricted or Transferred
DOE	Department of Energy
EM	Emergency Management
EMT	Emergency Medical Technician
EnergX	EnergX LLC
EPHA	Emergency Planning Hazard Assessment
FY	Fiscal Year
GET	General Employee Training
HEPA	High-Efficiency Particulate Air
HSS	Office of Health, Safety and Security
ISM	Integrated Safety Management
MSDS	Material Safety Data Sheet
NAICS	North American Industry Classification System
ORNL	Oak Ridge National Laboratory
OSHA	Occupational Safety and Health Administration
PPE	Personal Protective Equipment
RBA	Radiological Buffer Area
RCT	Radiological Control Technician
RH	Remote-Handled
RWP	Radiological Work Permit
SN	Supernate
Team	Office of Health, Safety and Security DOE-VPP Team
TRC	Total Recordable Case
TWPC	Transuranic Waste Processing Center
VHRA	Very High Radiation Area
VPP	Voluntary Protection Program
VPPPA	Voluntary Protection Programs Participants' Association
WAI	Wastren Advantage, Inc.

EXECUTIVE SUMMARY

Wastren Advantage, Inc. (WAI) is the prime contractor for operation of the Transuranic Waste Processing Center (TWPC) adjacent to the Oak Ridge National Laboratory. TWPC initially entered the Department of Energy (DOE) Voluntary Protection Program (VPP) as a Merit participant in 2008, and was subsequently elevated to Star status in 2009. Initially operated by Foster Wheeler Environmental Corporation, the TWPC operating contract transitioned to EnergX, LLC in 2008, and then to the current contract with WAI in 2010.

TWPC, under each of the contractors, has maintained an exceptional safety record. Review of the accident and injury logs, and worker interviews did not reveal any concerns that workers were not reporting injuries or illnesses, nor did WAI improperly classify or categorize reported injuries.

WAI managers understand the value of safety as a prerequisite for accomplishing their mission. They demonstrate effective leadership and commitment by providing resources, and being visible and accessible to the workforce. Managers should work with the safety committees and employees to establish specific actionable goals to drive continued safety improvements, further strengthen the existing safety culture, and ensure safety and health resources align with managers' expectations.

WAI employees are extensively involved in the worker safety and health program at TWPC. WAI encourages them to participate through a wide variety of opportunities. Their broader involvement across all layers of the organization is producing significant gains in productivity while simultaneously maintaining and improving a safe work environment.

WAI significantly improved its work planning and control process by integrating the hazard controls identified in the Activity Hazard Analysis into its work packages. Documenting and capturing the analysis remains an area for improvement. The radiological protection program appropriately evaluates the radiological hazards with some opportunities to improve consistency between technical basis documents, procedures, and postings.

WAI maintains an appropriate balance of elimination, engineered controls, administrative controls, and personal protective equipment to control worker exposure to hazards associated with facility operation. WAI demonstrated a penchant for using "mockups" to ensure effective, low hazard, hands-on training and develop quality procedures for critical operational processes. The Office of Health, Safety and Security DOE-VPP Team (Team) identified some opportunities to improve the medical monitoring program, radiological postings, and integration of controls into procedures.

The WAI training program ensures WAI employees, supervisors, and managers understand their roles and responsibilities related to safety. The program ensures timely completion of training, qualification, and requalification, and provides personnel with the knowledge they need to protect themselves, their coworkers, and the surrounding environs. The continued use of mockups and a balance between the various training delivery options ensures effective training, and workers satisfy the training objectives.

Overall, WAI invests significantly in continuous improvements, and continues to maintain an admirable safety record. The Team observed improved involvement in safety throughout all levels of the organization. WAI's efforts to improve work planning and control processes, improve hazard analysis, integrate controls into procedures, and involve the workforce in all those efforts are paying significant dividends in terms of worker satisfaction and trust. WAI recognizes the value of improved safety, and uses appropriate techniques to further advance the workforce culture. The Team recommends that WAI at TWPC continue to participate in DOE-VPP at the Star level.

TABLE 1
OPPORTUNITIES FOR IMPROVEMENT

Opportunity for Improvement	**Page**
WAI should use the annual VPP self-assessment process to identify specific areas for improvement in the coming year, identify specific goals and objectives to achieve those improvements, and link the safety element of employee performance evaluations to those goals.	4
WAI managers should carefully evaluate the safety and health professional staffing levels to ensure they align with managers' commitments to address continued improvements.	4
WAI should continue to improve its work planning and control processes to document detailed hazard analysis that justifies the identified control set, identifies fundamental assumptions, and documents corporate knowledge.	10
WAI must apply for an exemption from DOE to use the alternative surface contamination values currently in place.	10
WAI should utilize past work control packages and its workers' historical knowledge to document the "SN waste stream" areas and components and incorporate that information into the Radiological Surveillance procedure or to postings throughout the facility.	11
WAI should continue to review its technical basis documents and implementing procedures critically to ensure internal consistency, and appropriately document, review, and approve current practices.	12
WAI should continue its efforts to evaluate and improve its procedures to ensure all hazard controls and hazard warnings are included in the procedure, with the analysis that justified the controls (assumptions, calculations, etc.) documented in the procedure master file.	14
WAI should update its controlled area signs to clearly indicate the required training by its proper title to reduce the opportunity for potential misinterpretations.	15
WAI should document and specify the additional measures to take for VHRAs to better demonstrate compliance with 10 CFR 835.	15
WAI should ensure the Occupational Medicine program recognizes and captures changes in job task assignments that might require changes to medical monitoring requirements.	16

I. INTRODUCTION

Wastren Advantage, Inc. (WAI) is the prime contractor for operation of the Transuranic Waste Processing Center (TWPC) adjacent to the Oak Ridge National Laboratory (ORNL). TWPC initially entered the Department of Energy (DOE) Voluntary Protection Program (VPP) as a Merit participant in 2008, and was subsequently elevated to Star status in 2009. Initially operated by Foster Wheeler Corporation, the TWPC operating contract transitioned to EnergX, LLC (EnergX) in 2008, and then to the current contract in 2010. When WAI first took over the contract, it established an informal partnership with EnergX remaining on as a major subcontractor. Many personnel remained in their existing jobs under WAI as EnergX employees. When WAI applied to retain the DOE-VPP Star, EnergX requested recognition under the same program. Because EnergX remained a significant presence on site, it appeared that both companies were needed for TWPC to meet the DOE-VPP tenets, so the Office of Health, Safety and Security (HSS) agreed to jointly recognize WAI and EnergX under a single program. As of this assessment, WAI has converted many of the positions occupied by EnergX personnel to WAI positions. In December 2012, WAI recompeted the EnergX subcontract, and awarded it to the North Wind Group, effective January 17, 2013. The remaining EnergX employees are transferring to the North Wind Group in a staff augmentation role ending the EnergX presence at TWPC.

The TWPC began operation in 2004. The facility is designed to treat and repackage Transuranic ("Trans" or "beyond" uranium) and low level waste from the Melton Valley area within the DOE Oak Ridge Reservation. Transuranic waste material is generally associated with the human manipulation of fissionable material dating back to the Manhattan Project. The previous waste stream consisted of 430,000 gallons of Supernate (SN) liquid from storage tanks. The current waste stream primarily consists of clothing, tools, rags, residues, soil, and debris. A future planned waste stream will consist of sludge and additional SN from storage tanks.

The facility currently has approximately 315 employees, with WAI and its teaming partners, DOE, and other subcontractors. No organized labor organizations represent WAI employees.

Continued participation in DOE-VPP requires that the HSS DOE-VPP Team (Team) conduct an assessment every three years to ensure WAI continues to demonstrate pursuit of excellence in worker safety and health. The Team conducted the recertification assessment September 10-13, 2012, and this report documents the results of that review.

During the review, the Team had contact (in the form of interviews, work observations, document reviews, and meetings) with approximately 50 employees from all levels of the organization. As a Category 2, Nonreactor Nuclear Facility, TWPC contains radiological, chemical, and industrial hazards. Although some chemical hazards exist from waste processing encapsulation activities, the majority of the potential chemical hazards are associated with waste sorting and characterization activities. Industrial hazards run the gamut from heavy equipment operations, hoisting and rigging, ergonomic hazards, elevated work, and electrical hazards. The radiological hazards run the full spectrum from low-level Contact-Handled (CH) wastes to higher-level Remote-Handled (RH) wastes and mixed wastes, and may be in the form of surface or airborne contamination. Activities observed during the review included glovebox operations, operation of the Box Breakdown Area (BBA), the Cask Processing Enclosure (CPE), Hot Cell operation, maintenance and construction activities, radiological surveys, and daily plan-of-the-day meetings. The Team also observed committee meetings related to safety improvements.

II. INJURY INCIDENCE/LOST WORKDAYS CASE RATE

Injury Incidence/Lost Workdays Case Rate (WAI and all subcontractors)					
Calendar Year	Hours Worked	Total Recordable Cases (TRC)	TRC Incidence Rate	DART* Cases	DART* Case Rate
2009	489,570	2	0.82	0	0.00
2010	644,732	0	0.00	0	0.00
2011	591,634	0	0.00	0	0.00
3-Year Total	1,725,936	2	0.23	0	0.00
Bureau of Labor Statistics (BLS-2010) average for NAICS** Code #562211 Hazardous waste treatment and disposal			3.1		1.9

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

TRC Incidence Rate, including subcontractors: 0.23
DART Case Rate, including subcontractors: 0.00

Conclusion

WAI has an exceptional safety record by any comparison. Review of the accident and injury logs, and worker interviews did not reveal any concerns that workers were not reporting injuries or illnesses, nor did WAI improperly classify or categorize reported injuries. WAI does not link worker incentives TRC or DART case rates. WAI's TRC and DART case rates clearly meet the expectation for continued participation in DOE-VPP.

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.

During the initial DOE-VPP assessment, the Team found that managers demonstrated leadership in their pursuit of DOE-VPP, and were encouraging workers to get involved. Managers were effectively addressing systemic stresses induced by growth of the organization and contract changes, but improvements needed additional time to demonstrate effectiveness. Between 2008 and 2009, TWPC managers, particularly middle managers and supervisors, became significantly more involved in improvement efforts and increased their visibility in the workplace. The fruits of those improvement efforts were evident during this current assessment.

Through the contract transitions from Foster-Wheeler, EnergX, and now WAI, the management team at TWPC has remained relatively stable. Most WAI managers have many years' experience at TWPC, and have effective working relationships with employees. They fully understand the mission and challenges at TWPC, and work in partnership with DOE and the workforce to identify and implement practical solutions.

WAI managers in general support the reward and recognition systems currently employed by WAI. WAI provides the necessary resources to reward employees. Approximately 6 months prior to this assessment, WAI implemented a new process called, "Challenging Ourselves to Reach for Excellence," or C.O.R.E. Identified by an employee that attended the 2010 Voluntary Protection Programs Participants' Association (VPPPA) National Conference, the program rewards employees for performing a variety of safety awareness and improvement activities (see Employee Involvement). Although there is a very high visibility for the "hours worked since our last injury," WAI does not link individual or group recognition to this statistic. The result is an effective reward program that does not discourage workers from reporting near misses, incidents, or injuries.

Managers are visible to workers on a regular basis. Each year, WAI conducts a safety conscious work environment survey in connection with its annual VPP self-assessment. This past year, workers reported a reduction in manager visibility. Although there were a number of reasons for this reduction, the General Manager recognized this as an area that needed additional focus. In the ensuing months, the General Manager has challenged himself and his senior management team to increase their presence and visibility in the work areas.

WAI managers clearly establish their safety policy that "each and every one of us integrates safety into every aspect of the way we think, work, and interact because the health and well-being of each person, the community, and the environment is of utmost importance to all of us." Managers have not yet implemented an effective process to translate that policy statement

into a set of goals and applicable actions that all employees can use. For example, safety and health goals for 2011 identified in the annual report focused on DART case and TRC rates, and maintaining exposure-monitoring results below 50 percent of any applicable Occupational Exposure Limit. There is a general understanding throughout the organization that the ultimate goal is zero accidents and injuries. Numerous continuous improvement efforts are in progress, but WAI has not established specific goals related to those improvement efforts, nor published those goals to workers. The lack of goals related to these efforts may be contributing to a culture that is eager to try many different things, but is unable to determine those efforts that are most effective or successful. In an environment of reducing budgets, WAI managers do not have data to evaluate the most effective use of resources. WAI uses the process for annual performance evaluation to determine employees' raises and bonuses. That process includes a safety element, but the absence of detailed goals and objectives limits the effectiveness of the process in evaluating an individual's contribution. WAI should use the annual VPP self-assessment process to identify specific areas for improvement in the coming year, identify specific goals and objectives to achieve those improvements, and link the safety element of employee performance evaluations to those goals.

Opportunity for Improvement: WAI should use the annual VPP self-assessment process to identify specific areas for improvement in the coming year, identify specific goals and objectives to achieve those improvements, and link the safety element of employee performance evaluations to those goals.

Potentially related to this issue, resources for safety and health staffing may not be sufficient to address some opportunities for improvement. Due to budget reductions in 2011, WAI reduced the safety and health staffing by eliminating an open position for a safety professional, reducing the professional staffing to three safety and health professionals (one certified Industrial Hygienist, one Certified Safety Professional, and one Health and Safety Professional). Since 2006, the DOE independent oversight program and the DOE-VPP Team have identified, in three separate reports, the lack of documented hazard analysis at the activity level. This observation is repeated in this assessment report (see Worksite Analysis). When presented with this observation, safety and health staff reported that they do not have time to document their analysis on activity hazard analyses (AHA) (e.g., quantity of chemical used or expected, how the chemical will be used, who will be using the chemical, assumptions about other controls already in place). WAI has significantly improved its work planning and control process to include hazard analysis at the activity level, but the fundamental assumptions and analysis of hazards remains undocumented. Without a clearly established goal to capture the AHA, including monitoring and tracking of that goal, WAI managers may not get actionable data they can use to determine appropriate safety and health staffing levels. WAI managers should carefully evaluate the safety and health professional staffing levels to ensure they align with actions to address continued improvements.

Opportunity for Improvement: WAI managers should carefully evaluate the safety and health professional staffing levels to ensure they align with managers' commitments to address continued improvements.

Conclusion

WAI managers understand the value of safety as a prerequisite for accomplishing their mission. They demonstrate effective leadership and commitment by providing resources, and being visible and accessible to the workforce. Managers should work with the safety committees and employees to establish specific actionable goals to drive continued safety improvements, further strengthen the existing safety culture, and ensure safety and health resources align with managers' expectations. WAI continues to meet the expectations of the Management Leadership tenet of DOE-VPP.

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 right of an individual 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 is crucial, and welcome. Managers must be proactive in recognizing, encouraging, facilitating, and rewarding workers for their participation and contribution. Both employees and managers must communicate effectively and participate collaboratively in open forums to discuss continuing improvements to recognize and resolve issues and to learn from their experiences.

In the initial 2008 assessment, the Team found that there were multiple processes, procedures, and activities to stimulate and encourage employee involvement and ownership of the safety program, but these needed time to mature and demonstrate effectiveness. In 2009, the Team found those processes and procedures had matured and expanded. During the current assessment, the Team found significantly broader and effective employee involvement in the safety program.

WAI expanded the safety committee structure to afford more participation by managers and supervisors. In addition to the original three committees (Executive Work Safe Council, Operations and Maintenance Safety Committee, and the Office/Administration and Home Safety Committee), WAI has added a Health and Wellness committee, and expanded the VPP committee into a Continuous Improvement Team (CIT). The Executive Work Safe Council acts as an overarching committee for the other four committees. Representatives from each of the committees are members of the Executive Work Safe Council.

In addition to VPP, CIT encompasses a wide variety of improvement efforts, including Human Performance Improvement, Reinforcement-Based Safety (C.O.R.E. process), Integrated Safety Management (ISM), High Reliability Organization, Safety Conscious Work Environment, and work control. Each of these areas has three champions assigned to the work area that include workers and supervisors, as well as a management mentor. The CIT meets every week to discuss improvement efforts in each area, and publishes a monthly newsletter. The CIT has proven to be an excellent means for WAI to coordinate and integrate improvement efforts, as well as stimulate involvement by supervisors, mid-level managers, and workers alike.

In addition to the safety committees, WAI employees can become involved in many different ways. WAI affords workers opportunities to participate in job hazard analysis and work planning, and prejob and postjob briefs. The C.O.R.E process provides the broadest opportunity for worker involvement.

Two employees developed the C.O.R.E process based on a presentation they attended at the 2010 VPPPA National Conference. The program is rooted in Reinforcement-Based Safety, a process that seeks to recognize and reward employees for positive safety actions and currently serve as the process administrators. Employees participate voluntarily, and receive points based on self-reported activities. WAI has a current catalog of over 200 different activities, and makes 80-90 different activities available on a monthly basis. Activities typically take only a few minutes to complete, and are worth 1-5 points, depending on the level of effort required by the employee. Employees that complete 100 points a month are eligible to participate for a prize

drawing. The program began approximately 6 months prior to this assessment, and 60 percent of the plant population is participating with 9 winners in the first quarter (April-June) and 15 winners in the second quarter (July-September). Initially, the prizes have been relatively large with only one winner each month in order to stimulate initial participation. As the program matures, WAI expects to evolve the program to address issues that are more specific, provide broader rewards, and possibly a more stepped reward program where employees can save points over a period of time to purchase safety-related promotional items. Although senior managers' participation has initially been low, the C.O.R.E process team is working to expand senior manager participation and visibility as a means of expanding additional employee participation.

As discussed in Management Leadership, WAI is expanding management assessments as a means of increasing manager visibility in the workplace. Along with those efforts, WAI is encouraging managers to seek workers' participation in those assessments. WAI hopes that this approach will further improve communication between workers and managers, and give managers better insights into workers' viewpoints.

All workers contacted by the Team felt comfortable in their ability to stop work in the event a safety question arises. For example, waste operators recently identified a drum that had, what appeared to be, a lid-restraint installed. The Documented Safety Analysis requires lid-restraints on unvented waste drums to prevent the drum lid blowing off a pressurized drum. Operators cannot move unvented drums without the restraint installed. In this case, operators recognized that the lid restraint was worn, not properly installed, and was probably disposed with the drum rather than installed at TWPC. They, therefore, could not take credit for the installed lid restraint, and immediately stopped work. By recognizing the unsafe situation and taking the correct action to stop work, the workers prevented violation of a Technical Safety Requirement, and what certainly would have been a much longer shutdown, and possibly an event investigation.

Other employee contributions have produced process improvements related to waste handling. For example, most wastes processed at TWPC must have free liquids removed, and there are strict waste acceptance criteria associated with those requirements. Operators remove free liquids by pumping, draining, and treatment with absorbent material. Waste operators identified an improved absorbent material for use in process enclosures, and assisted in subsequent effectiveness evaluations. In another example, waste operators, maintenance technicians, and engineers collaborated to identify significant improvements to the design of a robotic arm within the remote handling enclosure (Hot Cell). These changes improved the reliability and usability of the robotic arm; reduced fabrication, assembly, installation, maintenance and repair costs; and improved the waste processing capability. Employees at TWPC also have extensive opportunities to participate in community mentoring and outreach activities. Many of these activities demonstrate WAI involvement in the community, reinforce teamwork, and help workers act on the WAI corporate commitment to safety and health in all aspects of employees' lives. Community outreach in 2011 included: a Toys for Tots drive that collected over $17,000 in toys and cash; participating in the Healing Outside of a Hospital (HOOAH) program for service men and women who have been injured in combat serving our country; the local Adopt-a -Highway program; and mentoring two other companies in the Oak Ridge area in their pursuit of VPP recognition.

WAI also has encouraged workers to attend both regional and national VPPPA conferences. Prior to attending, WAI personnel review the conference agenda for sessions that may be applicable to issues or concerns at TWPC. WAI asks each employee that attends to provide

feedback, including newsletter articles and briefings on their experiences and ideas they bring home. Returning employees have implemented many improvements, both large and small. For example, the previously discussed C.O.R.E program was an idea implemented as a result of VPPPA conference attendance.

Conclusion

WAI employees are extensively involved in the worker safety and health program at TWPC. WAI encourages them to participate through a wide variety of opportunities. The broader involvement across all layers of the organization is producing significant gains in productivity while simultaneously maintaining and improving a safe work environment. WAI continues to meet the expectations for Employee Involvement in DOE-VPP.

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.

During the 2009 review, the Team identified a continuing weakness in the AHA process relating to analysis of the hazard and validation of control selection. While EnergX (prior to the WAI partnership) had incorporated a new procedure into its work planning process to address a 2006 independent oversight finding and a 2008 DOE-VPP Opportunity for Improvement, the hazards analysis process still needed improvement and time to mature. As a result, EnergX committed to ensuring the AHA process comprehensively identified hazards involved and captured the analysis associated with those hazards in the procedures and work control programs.

The Team review of work control documents demonstrated that WAI has made significant improvements in the past 3 years integrating the hazard controls identified in AHA into maintenance work packages, and to a lesser extent, into operating procedures. WAI integrates the controls into new procedures, but only updates existing procedures if there are significant changes to the processes. Further, much of the detailed analysis remains undocumented, and continues to be an area for improvement as discussed in the 2008 and 2009 reports. Safety and health personnel interviewed by the Team did not believe they had sufficient time to document their analyses and perform their other duties.

Some AHA's reviewed by the Team inappropriately indicated workers should reference the Material Safety Data Sheets (MSDS) as a control for chemical hazards, rather than clearly define the controls for the worker. The *Chemical Product Review and Approval Checklist*, Attachment C to CM-P-EN-003, R6, *Chemical Management*, provides a safety review of all new chemicals prior to purchase and use at TWPC, and documents the specific controls associated with those hazards presented by each particular chemical. The attachment represents an improvement in documenting the analysis for chemical hazards. Since Attachment C only applied to new chemicals prior to purchase, an Attachment C was not included in some AHAs for existing chemical hazards or processes. TWPC is in the process of reviewing and updating older AHAs, but that effort is not yet complete. Older AHAs do include the specific chemical name and refer to MSDS, but do not document the associated analysis related to who, what, when, where, and how personnel use the chemical. In those cases, WAI continues to rely on assumptions, personal knowledge, and expertise of the operators and safety and health personnel. Documenting the analysis provides value to the work planning and control process by providing an effective baseline for work that reduces future analysis needs for repeat work, and provides essential information that may lead to future process improvements. The scope of this observation is not limited to chemical hazards, but includes work methods and other industrial hazards encountered by workers. Processes like the Chemical Product Review can effectively document the analysis. Effective alternatives used elsewhere in the DOE complex include the use of an additional column in the AHA to capture the detailed hazard analysis that justifies the identified control. WAI should continue to improve its work planning and control processes to document detailed

hazard analysis that justifies the identified control set, identifies fundamental assumptions, and documents corporate knowledge.

Opportunity for Improvement: WAI should continue to improve its work planning and control processes to document detailed hazard analysis that justifies the identified control set, identifies fundamental assumptions, and documents corporate knowledge.

The Team reviewed the site process for identifying radiological hazards at the facility. This included review of technical basis documents, the radiation protection program (RPP), selected procedures, and analysis. Overall, the Team found a sound process and program for evaluating radiological hazards. The Team identified one case where the technical basis for surface contamination limits associated with one of the isotopes of plutonium (Pu-241) did not meet the specific requirements of title 10, Code of Federal Regulations, part 835 (10 CFR 835). This exception did not indicate a systemic deficiency in the site's program, nor did the condition expose workers, coworkers, or the environment to an unmitigated exposure to Pu-241, but rather a misunderstanding by site and DOE personnel of the associated requirements.

More specifically, the technical basis documents provide the underlying analysis and assumptions for the implemented radiological controls and limits at TWPC. The technical basis documents identify Pu-241 as the predominant radionuclide in three out of eight waste streams. Pu-241, unlike other plutonium isotopes, is a weak beta emitter. As such, the technical basis documents incorrectly assumed the limits in 10 CFR 835, Appendix D, for other beta emitters applied, rather than the lower transuranic limits. DOE (per 10 CFR 835 and DOE Order 458.1, *Radiation Protection of the Public and the Environment*), considers any plutonium isotope, including Pu-241, as falling within the category of transuranics for meeting the requirements of 10 CFR 835. However, there are several technical difficulties applying the transuranic limit to Pu-241. In recognition of those difficulties, the Waste Isolation Plant Project requested and received an exemption to those limits nearly identical to the practice followed at TWPC. DOE's position is to focus on a risk-based, consensus value for surface contamination values, including Pu-241, and that the use of higher values for Pu-241 does not present an undue risk to the public health and safety, the environment, or facility workers. Accordingly, although not consistent with 10 CFR 835, the site's use of the beta/gamma limits for surface radioactive contamination does protect the workers. WAI has not yet applied for a similar exemption to allow its current practice. WAI must apply for an exemption from DOE to use the alternative surface contamination values currently in place.

Opportunity for Improvement: WAI must apply for an exemption from DOE to use the alternative surface contamination values currently in place.

The Team reviewed site procedure CM-REF-RP-306, RO, *Radiation/Contamination Surveys*, dated August 13, 2012, and selected associated survey records. Generally, the procedure and survey records were thorough and technically valid. However, the Team identified some areas where WAI can make improvements.

The survey procedure requires different contamination monitoring based on the type of waste processed that may have caused the contamination. Specifically, alpha and beta-gamma monitoring is required in areas contaminated as a result of processing CH or RH waste streams, and beta-gamma only (at a minimum) in areas contaminated solely as a result of processing the SN waste stream. This includes personnel monitoring at the Radiological Buffer Area (RBA)

exit point for those areas. "SN waste stream" includes the areas and processes that historically handled SN material from ORNL liquid waste processing facility. However, the survey procedure does not contain a listing of SN waste stream areas or components, nor are these areas marked or labeled within the plant. Discussions with site personnel demonstrated varying degrees of understanding of where SN areas or components are located. Review of work control packages for SN work and discussions with radiation protection personnel demonstrated that, given the historic knowledge of the current staff, the work evaluation and control process has been adequate to identify which monitoring process is required for the planned work activity, but WAI has not systematically captured that knowledge.

Opportunity for Improvement: WAI should utilize past work control packages and its workers' historical knowledge to document the "SN waste stream" areas and components and incorporate that information into the Radiological Surveillance procedure or to postings throughout the facility.

Section 5.3.8.4 of the survey procedure provides direction for the Radiological Control Technician (RCT) performing surveys regarding actions to take if the background counts are too high and identifies specific maximum allowable background counts for the instruments used. However, based on Team interviews and independent calculations, the technical basis for the value listed for the maximum background counts for the LM-2242 detector with the 44-40 probe was more restrictive than the calculated value using the formula in the procedure. The calculation (analysis) to determine the maximum background count for that probe during procedure development had never been recorded in the procedure's master file. Since the original calculations were not retained during the procedure development, there is no way to ascertain how the original value was determined.

CM-X-RP-002, R8 *Technical Basis Document on Contamination Monitoring*, dated August 6, 2012, provides the technical basis for WAI's program to identify and control radioactive contamination. It establishes the types, frequency, and percentage of surface area monitored. As the implementing procedure, Section 5.4.8 of CM-REF-RP-306, discusses surveys for release of material and equipment, and identifies the scan survey, direct measurement, and smear requirements based on the survey class. For some survey classes, the implementing procedure requires the RCT to scan a lower percentage of the item than the percentages discussed in the technical basis. Discussions with radiation protection personnel indicated that RCTs typically survey the entire object rather than perform the minimum survey required. Given the infrequency of conducting surveys for release of material and equipment (there were less than two dozen surveys to date in 2012), and the typical practice of surveying the entire object, the Team concluded that there was not a current concern of material being released with inadequate monitoring. However, WAI should revise the site procedures and practices to be consistent with the governing technical basis document. WAI committed to review the documents and make necessary changes to ensure the documents are internally consistent.

Finally, WAI expects RCTs to determine the survey instrument sensitivity on the survey form. The sensitivity is determined by applying several variables listed on the form, but the form does not explain how to apply those variables. To ensure consistent determinations, WAI should consider providing an explanation of how to apply the variables used in determining the survey instrument sensitivity on the survey form.

Opportunity for Improvement: WAI should continue to review its technical basis documents and implementing procedures critically to ensure internal consistency, and appropriately document, review, and approve current practices.

Overall, the Team concluded that the radiation and contamination survey forms reviewed adequately document and evaluate the radiological conditions, and ensure contamination is properly controlled.

Conclusion

WAI significantly improved its work planning and control process by integrating the hazard controls identified in AHA into its work packages. Documenting the analysis remains an area for improvement. The RPP appropriately evaluates the radiological hazards with some opportunities to improve consistency between technical basis documents, procedures, and postings. WAI continues to meet the expectations for Worksite Analysis in DOE-VPP.

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 and procedures must also be followed by everyone in the workplace to prevent, control the frequency of, and reduce the severity of, mishaps.

WAI uses engineered controls as the primary method to limit employee exposure to hazards. The Process Building utilizes a negative pressure High-Efficiency Particulate Air (HEPA) filtered ventilation system for containment areas. WAI processes some CH waste in gloveboxes. The RH Hot Cell minimizes contact with high-radiation waste through remote handling. The BBA uses high-ventilation flowrates, airlocks, point source local ventilation trunks, and "fixatives" to minimize the spread of contamination. In addition, WAI also employs temporary engineered controls in BBA. Examples include lining walls and floors with disposable coverings to minimize decontamination efforts. For those situations where engineered controls are ineffective for eliminating or controlling the hazard, WAI requires appropriate PPE.

A particularly successful example of identifying new engineered controls is the new CPE. WAI designed CPE to more efficiently process and sort waste from casks. Initially anticipated to contain RH wastes, WAI identified that radiation levels from the wastes in the casks permitted the waste to be CH, producing significant cost and schedule savings without increasing risks. In addition to the wastes, the casks contain significant amounts of groundwater that intruded into the casks before they were excavated and sent to TWPC. The CPE uses a cask tilting system to secure and tilt the cask into position, enabling workers to process the waste safely. In addition, workers sort the waste on a ventilated worktable that continuously pulls contamination away from the operators through HEPA filters as workers sort the waste. WAI designed the sorting table to capture any water contained in the cask prior to the sorting process. Rather than process the captured water as a separate radioactive waste, WAI stores the water in containers for future use in the sludge mobilization campaign. Design is expected to begin in the next year with operations planned for Fiscal Year (FY) 2018. The CPE design was a joint effort by engineering, safety, and experienced TWPC waste operators. In addition, WAI initially assembled the CPE in a clean area for mockup training, procedure development, and testing purposes. The Team spoke with several operators who were involved with CPE mockup and procedure development. All workers interviewed were supportive of the process and satisfied with managers' efforts to encourage the workers' involvement.

In 2010, WAI began using improved air-line-fed plastic suits (bubble suits) in the TWPC BBA. The new suits offered more airflow for more effective cooling, reducing operators' risk for heat exhaustion. WAI tested the suit using a wireless vital sign monitoring system that provided the data to verify the improved performance.

WAI uses its "Crawl, Walk, Run" methodology for new processes or significant process changes. The method uses mockups, similar to CPE described previously, to help designers and operators evaluate new equipment and processes in a clean environment. The mockups serve as an excellent training aid allowing extensive hands-on training, while eliminating any exposure concerns. In addition, the mockup training allows for more detailed and precise procedure

development. WAI has used mockups several times in the past 3 years to familiarize workers with new systems and identify necessary steps for better quality procedures and improved process efficiency.

WAI has effectively addressed issues identified in 2008 and 2009 related to the use of the AHA as a work document. Previously, workers, supervisors, and managers consistently considered the AHA as a work document. That is, all personnel were expected to use AHA as a procedure or work instruction during the conduct of work. Experience throughout DOE has consistently shown that AHAs, when properly detailed and documented, are usually not suitable as work documents. One of the objectives of the ISM process is to ensure the hazard analysis leads to a clearly defined control set for the hazards. Work planners and procedure writers should then implement those controls through work procedures, work instructions, work orders, or worker training, as appropriate. The Team's review of multiple maintenance work packages demonstrated that WAI has made significant improvement in this area leading to more effective work packages. Workers stated that they preferred the new integrated work packages because the packages help workers perform their work rather than add additional complexity and paperwork. With the controls integrated into the work steps, the work packages themselves were less bulky and easier to use because the planners could exclude the analysis portion of the process from the "traveler" package and maintain the full documentation in the file copy.

Interviews with personnel involved in the development of procedures stated that the process to integrate AHA controls more effectively into operating procedures remains an area for additional improvement. Due to the large number of operating procedures in use at TWPC and the limited availability of safety and health personnel, the focus has been to implement the process for newly developed procedures and procedures undergoing significant changes. WAI should continue its efforts to evaluate and improve its procedures to ensure all hazard controls and hazard warnings are included in the procedure, with the analysis that justified the controls (assumptions, calculations, etc.) documented in the procedure master file.

Opportunity for Improvement: WAI should continue its efforts to evaluate and improve its procedures to ensure all hazard controls and hazard warnings are included in the procedure, with the analysis that justified the controls (assumptions, calculations, etc.) documented in the procedure master file.

The Team reviewed several Radiological Work Permits (RWPs) used to control radiological work activities. Twenty-five RWPs were implemented at TWPC this year. The RWPs reviewed appropriately addressed radiological monitoring, RCT job coverage, PPE requirements, and radiological control limiting conditions. Prejob briefings attended by the Team adequately discussed radiological and other hazards and controls.

CM-REF-RP-319, RO, *Radiological Posting and Labeling*, dated April 2, 2012, describes the process for posting in controlled areas, radiological areas, RBAs, radioactive material areas, and labeling radioactive material at TWPC. The Team reviewed the procedure and conducted several facility tours. The procedure and the radiological postings and labeling complied with requirements and provided workers with information on the radiological hazards in the work environment. However, the Team identified some opportunities for improvement in the program.

Section 5.2.3, identifies that the controlled area sign indicates "general training" or an escort is required for entry. General employee training (GET) and general employee radiological training are established training courses, but there is no defined "general training." WAI should update its controlled area signs to clearly indicate the required training by its proper title to reduce the opportunity for potential misinterpretations.

Opportunity for Improvement: WAI should update its controlled area signs to clearly indicate the required training by its proper title to reduce the opportunity for potential misinterpretations.

Section 5.4.2 specifies, "Additional measures are implemented to ensure individuals are not able to gain unauthorized or inadvertent access to Very High Radiation Areas (VHRA)." 10 CFR 835 requires additional measures for VHRAs, but does not specify the additional measures each individual site should take. For example, the nondestructive evaluation trailer (a trailer used to perform x-ray analysis of waste drums) is a VHRA when operating. The procedure does not document or specify the additional measures used for the trailer. In addition, postings in the trailer did not use the specific supplemental wording listed in CM-REF-RP-319, although postings did use comparable alternate wording. WAI should document and specify the additional measures to take for VHRAs to better demonstrate compliance with 10 CFR 835.

Opportunity for Improvement: WAI should document and specify the additional measures to take for VHRAs to better demonstrate compliance with 10 CFR 835.

MMC Healthworks, located at the Methodist Medical Center in Oak Ridge, Tennessee, provides Occupational Medical Services for WAI. Work Instruction, CM-1-0M-001, *Obtaining Occupational Medical Services*, provides direction to the employees regarding the provisions of the program. WAI uses Attachment B, *Job Title and Workplace Stressors Chart*, of that instruction, to identify required occupational medical monitoring based on employee job title. In some cases, this process may not effectively review the stressors when WAI modifies work assignments. For example, WAI is cross-training personnel in several work disciplines to improve efficiency and more fully employ personnel. For example, the lead planner for maintenance is soon to be qualified as a certified weld inspector. The hazards identified for his position in the job stressor chart do not appropriately reflect the new hazards expected in his secondary role as a weld inspector. Similarly, the health and safety technicians and RCTs will soon be cross-trained to duplicate each other's roles to increase their value in the field as well.

The Occupational Medicine support staff and the safety and health professionals are responsible for maintaining the *Job Title and Workplace Stressors Chart*. With the size of the organization, it may not be practical to expect one or two people to be fully aware of each individual's job assignments and titles. A more practical approach might be requiring supervisors and employees to review the hazards for their position annually (during performance reviews). The Oak Ridge Institute for Science Education has such a process, and in its mentoring role to TWPC is prepared to share its process with WAI. WAI should ensure the Occupational Medicine program recognizes and captures changes in job task assignments that might require changes to medical monitoring requirements.

Opportunity for Improvement: WAI should ensure the Occupational Medicine program recognizes and captures changes in job task assignments that might require changes to medical monitoring requirements.

WAI follows CM-P-EM-100, R7, *Emergency Events*, and CM-P-EM-101, Rl0, *Atypical Events*, to implement the requirements of its *Local Emergency Manual* and DOE Order 151.1C, *Comprehensive Emergency Management System*. These procedures assign authorities and responsibilities for any emergency event. The Emergency Management (EM) group performs one drill per quarter. WAI bases its drills on Emergency Planning Hazard Assessments (EPHA), historical experiences, and the potential for those events. For example, a sick worker recently collapsed during a control point meeting at the main processing facility. Several operators working at the process building are former Emergency Medical Technicians (EMT) and they responded very well during this real life event. However, the EM group wondered how a similar event would play out if it occurred "down the hill" where personnel do not have experienced EMT's. Rather than constantly drill on the EPHA-based events, the EM group used this event to develop realistic drill scenarios.

The EM group performs tabletop exercises and simulation drills 4 times per year and an integrated drill with the ORNL fire department once a year. As part of the integrated drill, the ORNL fire department drives its emergency equipment to the site and physically deploys the fire hoses from the trucks into the facility to ensure response capability and identify any potential conflicts to an actual response.

These drills and exercises proved their value in January 2011, when WAI experienced a fire in the RH Hot Cell. Not only did operators react in accordance with their procedures and training, all site personnel reacted properly and promptly, ORNL firefighters responded in a timely and effective manner, and WAI informed personnel about the status of the event as it progressed.

During take-shelter drills, WAI houses employees in the basement of the Process-Building. In past years, the employees assembled in the shelter location randomly and WAI took more than 45 minutes to establish accountability. The EM staff recognized that if they assigned employees to three specific areas of the shelter area alphabetically, they could establish accountability quicker. WAI reduced the accountability process to approximately 15 minutes because of the change.

Conclusion

WAI maintains an appropriate balance of elimination, engineered controls, administrative controls, and PPE to control worker exposure to hazards associated with facility operation. WAI uses "mockups" to ensure effective, low hazard, hands-on training and to develop quality procedures for critical operational processes. While the Team identified some opportunities to improve the medical monitoring program, radiological postings, and integration of controls into procedures, WAI continues to meet the expectations for Hazard Prevention and Control for DOE-VPP.

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 managers' expectations and approved procedures.

During the initial DOE-VPP assessment in 2008, the Team found the training program adequately prepared workers to recognize the hazards associated with their work and implement the associated controls. Managers, supervisors, and employees knew and understood the policies, rules, procedures, and their safety and health roles and responsibilities. The Team observed a heavy reliance on required reading.

Since that assessment, WAI has been working to revise and improve its training program. The course materials are prepared and available through the site's "InTRUnet." WAI maintains training records electronically in a Plateau Training database. The access control system electronically verifies an individual's training is current before allowing access to radiological areas or signing onto the applicable RWP. Near-term planned improvements include a similar linkage to access through the entrance gate to either GET or Site Access Training.

WAI has reduced its reliance on required reading significantly. WAI limits required reading primarily to minor procedure changes or other less significant information. WAI now uses computer-based training (CBT) extensively for many training requirements, including GET and annual refresher training. CBT includes knowledge checks and questions through the process to validate the students' understanding of the material presented. For major procedure changes or new operations, WAI uses instructor-led training and in many cases includes mockups. This allows extensive interaction between students and instructors, as well as the opportunity for operators to recommend improvements or changes before WAI begins new operations. WAI also uses on-the-job training led by subject matter experts for small groups or individuals.

The Plateau Training database is a very powerful tool, but the TWPC training group believes the expense of maintaining the database is not justified for its current needs. The training group is working to identify and evaluate alternative, less expensive learning management tools. A review of the Plateau Training database revealed some minor discrepancies in the training records, mostly associated with personnel no longer assigned to the site or with expired training that was no longer required. The training group is working to update and correct these database discrepancies to make migration to a new learning management system more efficient. A review of select training records for current operators and RCTs did not identify any overdue training and qualification requirements.

WAI plans to start cross training health and safety technicians and RCTs in FY 2013. Both types of technicians have similar backgrounds, making cross-training a natural progression. WAI currently has three health and safety technicians on staff, which limits the amount of work the technicians can support. With approximately 25 RCTs, this training will provide for more extensive monitoring and observation of work by qualified technicians.

In early 2012, in response to an employee survey that identified reduced manager visibility in the workplace, WAI initiated a manager and supervisor training class. This training consisted of

12 sessions at approximately 4 hours each, and covered a variety of topics important for managers and supervisors including leadership styles, communications, decisionmaking, human resources, accountability, goal setting, and others. WAI provided the training to three separate groups of approximately 30 people, concluding with a final review session, and written examination. WAI used positive feedback from the first group that completed the training to allow some personnel with potential for promotion to supervisory positions, to complete the training. Many of the managers and supervisors interviewed during this assessment were already applying lessons they learned in this training class. Because of this training, managers and supervisors were more aware of how their individual management styles, accessibility, and visibility effect workers' perceptions of safety and the managers' commitment to a safe work environment.

Conclusion

The TWPC training program ensures WAI employees, supervisors, and managers understand their roles and responsibilities related to safety. The program ensures timely completion of training, qualification, and requalification, and provides personnel with the knowledge they need to protect themselves, their coworkers, and the surrounding environs. The continued use of mockups and a balance between the various training delivery options ensures training is accomplished effectively, and workers satisfy the training objectives. WAI continues to meet the expectation for Safety and Health Training in DOE-VPP.

VIII. CONCLUSIONS

Overall, WAI is making significant investments in continuous improvements, and continuing to maintain an admirable safety record. The Team observed improved involvement in safety throughout all levels of the organization. WAI's efforts to improve work planning and control processes, improve hazard analysis, integrate controls into procedures, and involve the workforce in all those efforts are paying significant dividends in terms of worker satisfaction and trust. WAI recognizes the benefits of investing in improved safety, and uses appropriate techniques to further advance the workforce culture. The Team recommends that WAI continue to participate in DOE-VPP at the Star level.

APPENDIX A

Onsite VPP Assessment Team Roster

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