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Hanford Tank Vapor Assessment Team (TVAT)

Briefings

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Tank Vapor Assessment Team

- **Assessment Team Charge**

The Hanford Tank Vapors Assessment Team (TVAT) 2014 is charged to determine the adequacy of the established Washington River Protection Solutions (WRPS) program and prevalent site practices to protect workers from adverse health effects of exposure to chemical vapors on the Hanford tank farms.

- **Difference from Previous Assessments**

- Independence to solicit team members, conduct assessment, and determine reporting mechanisms
- Member of Hanford Atomic Metal Trades Council (HAMTC) is a full TVAT member and participant in all TVAT activities
- Review of contractor's Implementation Plan included in scope
- Independent observers from DOE-HQ Office of Enterprise Assessments and the Washington State Department of Health appointed by the Governor

- **Membership**

- 10 TVAT members, including SRNL Chair
- Over 250 years of experience in occupational and environmental health, environmental engineering and science, toxicology, health physics, and industrial hygiene
- 6 Certified Industrial Hygienists
- 2 past Presidents of the American Industrial Hygiene Association (AIHA)
- Former Administrator of the Occupational Safety and Health Administration (OSHA)
- Fellow of the National Institute for Occupational Safety and Health (NIOSH)
- 2 Diplomats of the American Board of Toxicology



Tank Vapor Assessment Process

- Utilized National Research Council approach*
 - 6 Technical Assessment Areas:
 1. **Site Characterization** identifies the chemicals or groups of chemicals, their sources, and the pathways of exposure to workers on the tank farms (the sites).
 2. **Exposure Assessment** establishes the extent to which exposures to hazards intersect with worker activities.
 3. **Dose-Response Assessment** identifies the relationship between the amount of exposure (dose) to a substance and the resulting changes in body function or health (response).
 4. **Risk Characterization** uses toxicological data combined with information regarding the degree of exposure to predict a particular adverse response in a specific exposure population, such as a workforce.
 5. **Risk Management** identifies and institutes effective ways to protect human health under identified conditions, including consideration of control and remediation methods.
 6. **Risk Communication** promotes exchange of information among on-site and off-site stakeholders as to the likelihood and consequences of adverse events at a site and the steps being taken to manage the risks.
 - Aligned expert team across these areas
 - Developed lines of inquiry for each Technical Assessment Area

* "Science and Decisions – Advancing Risk Assessment," National Research Council of the National Academies, The National Academies Press, October 2010

Tank Vapor Assessment Process

- **Collected data and information in each of the Technical Assessment Areas**
 - Conducted fact-finding visit (July 24-29) and verification/validation visit (August 18-22)
 - Studied hundreds of pertinent documents, such as procedures and reports (prior to, during, and following visits)
 - Met with, received briefings from, and/or interviewed many and diverse stakeholders
 - Toured tank farms and observed work planning and execution
 - During tours, experienced vapors first-hand
 - Observed field Industrial Hygiene sampling and event response to vapor exposure
 - Attended pre-job briefings and observed two Tank Farm jobs
- **Major stakeholders from whom input was solicited included**
 - Site leadership (WRPS, DOE Office of River Protection)
 - Hanford Atomic Metals Trade Council
 - Building and Construction Trades Council
 - Hanford Advisory Board (HAB)
 - Hanford Challenge
 - Washington State Governor's Legislative Affairs and Policy Office
 - Prior assessment team
 - Defense Nuclear Facilities Safety Board (DNFSB) site representative
 - Chemical Vapor Solutions Team (internal improvement team)
 - WRPS technical points-of-contact in the six Tank Vapor Technical Assessment Areas
 - Site workers individually and in 12 focus groups
 - Industrial Hygiene Technicians, IH program management, Operators, Health Physics Technicians, Mechanics, Shift Supervisors, etc.
 - Individuals who had experienced exposures and symptoms
 - Worker who had requested interview through Deputy Attorney General



Assessment Team Conclusions

- **The body of data and information examined strongly suggests a causal link between chemical vapor releases and subsequent adverse health effects experienced by tank farm workers.**
 - TVAT applied the principles of Hill's Criteria of Causation developed by Sir Austin Bradford Hill in 1965
 - Available evidence supports all nine Hill criteria.
 - Used only to determine whether there is sufficient weight of testimony and evidence to support linkage, not to establish the mechanism

- **Adverse health effects are likely the result of acute, transitory exposures to relatively high concentrations.**
 - Postulated that vapors coming out of tanks in high concentration (bolus) plumes sporadically intersected with the breathing zones of workers, resulting in brief but intense exposures to workers.
 - This exposure scenario is consistent with the workers' descriptions of field experiences and with the engineering data and computational modeling associated with vapor releases.
 - Testimony and evidence are inconsistent with chronic exposure over the course of a work day.



Assessment Team Conclusions

- **IH programs that emphasize full-shift exposure measurement and compliance with standard occupational exposure limits cannot adequately address the complex and episodic nature of the Hanford tank vapor incidents.**
 - Significantly enhancing and integrating operational, management, and IH programs and processes, as described in the TVAT's recommendations, is needed to address the particular conditions on the Hanford tank farms.
- **Full commitment of the Hanford site leadership will be needed to address the vapor exposure issues.**
 - The formation of TVAT is a sign of site management's degree of commitment.
 - Embrace the team's observations and recommendations.
 - Develop an Implementation Plan, and conduct follow-up to ensure measures are enacted.

TVAT Recommendations

- TVAT developed over 40 Supporting Recommendations for 10 Overarching Recommendations in three categories; examples include

1. Programmatic

- Implement measurable benchmarks to assure operational and cultural parity among chemical vapor, flammability, and radiological control programs
- Augment the Hanford tank farm IH programs to further develop competencies to address the tank vapor exposure issues
- Ensure IH Program and Medical programs are in alignment on use and limitations of IH data for case evaluation and health surveillance
- Investigate and pursue external research opportunities and partnerships to address data and technology gaps related to vapor exposure, effects, and mitigation



TVAT Recommendations

2. Mechanistic Aspect of Exposure Scenario

- Accelerate development and implementation of a revised IH exposure assessment strategy for transient as well as chronic exposures
- Refocus program to examine IH data against excursion exposure levels (OEL-C) to assess worker exposures
- Re-examine Chemical of Potential Concern (COPC) listing to create a second acute COPC list (a-COPC) which brings protection from irritation into program
- Re-examine methodologies applied for estimating “mixture rules” to focus on chemical homologues

3. Abatement

- Take compensatory measures, including respiratory controls to prevent exposures
- Utilize technologies that identify fugitive emission points around tanks and abate the release point
- Implement real time personal detection and protective equipment technologies specifically designed to protect individual employees
- Accelerate implementation of tailored engineering technologies to detect and control vapor exposures experienced in the Hanford tank farms (“tank farm of the future”)
- Re-establish sampling of tank headspaces to validate and enhance chemical characterization

Path Forward

- TVAT report posted on 10/30
- WRPS will utilize the report in formulating their response and will develop an Implementation Plan (~11/14/14)
- TVAT team meeting Nov 19/20th to discuss and develop response to Implementation Plan
- TVAT Chair and Vice-Chair in Hanford for 11/3-4 briefings
 - IH Staff
 - Chemical Vapors Solution Team
 - Hanford Atomic Metal Trades Council and Building Trades representatives
 - Hanford Advisory Board, Public Involvement Committee