

C-67 Event Investigation Reports (Redacted) EIR-2024-046 C-67 (07/11/2024)

(Settlement Agreement Deliverable)

Prepared for the U.S. Department of Energy
Assistant Secretary for Environmental Management

Contractor for the U.S. Department of Energy
Office of River Protection under Contract DE-AC27-08RV14800



**P.O. Box 850
Richland, Washington 99352**

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Washington River Protection Solutions

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WRPS

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APPROVED

By Lynn M Ayers at 3:44 pm, Jul 25, 2024

Release Approval

Date

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EVENT SUMMARY

NOTE: This form provides timely notification to management and documents preliminary information of an event that may require a more formal investigation. Details may change upon further examination and analysis. The following is a current status of available information:

1. **Project:** DFLAW/ETF Operations 2. **Report Date:** 07/15/2024

3. **Investigation Title:** C-67 Response near DFLAW Trailers

4. **Investigation Report Number:** EIR-2024-046

5. **Responsible Manager:** [REDACTED]

6. **Event Investigator:** [REDACTED]

7. **Area / Building / Location:** 200E/Outdoor area around DFLAW Team trailers (MO282, MO283, MO284, MO158, MO159, and MO2294)

8. **Date and Approximate Time of Event:** **Date:** 07/11/2024 **Time (military):** 0603 hours

9. **Associated Action Request (AR) Number:** WRPS-AR-2024-2280

10. **Associated Occurrence Report Number (if applicable):** N/A

11. **Event Investigation Meeting Held:** Yes [] or No [X] **Date:** N/A **Time (military):** N/A

12. Activity in Progress: *(What activity was under way, include procedures and work order numbers, as applicable)*

A worker reported stronger than normal odors when traversing outside the DFLAW Team trailers. Traversing between work locations is considered a Level 4 activity, therefore, procedures and/or work order numbers are not applicable.

13. Personnel Involved: *(Job positions, number of personnel, identify any support organizations or subcontractors)*

1-WRPS Radiological Control Technician (RCT)

14. What Happened: *(Provide a short discussion of what happened)*

On 07/11/2024, at approximately 0603 hours, an individual reported smelling faint "septic, sewer, musty, and non-descript" odors when traversing between the Direct Feed Low Activity Waste (DFLAW) Team trailers. The affected individual indicated they were experiencing headache, dizziness, and nausea symptoms and was therefore directed by the Central Shift Manager (CSM) to report to the on-site medical provider for precautionary medical evaluation. The affected individual was evaluated by the on-site medical provider and released to return-to-work without restriction at approximately 0900 hours.

15. Where Did It Happen: *(Description of work area and working conditions. Include information on weather conditions, PPE, Postings, etc.)*

At the time odors were reported, the individual was wearing standard street clothing and in a work location that is not posted as a radiologically controlled area. The worker was not in an area requiring the use of respiratory protection or a personal ammonia monitor (e.g., VentisPro or ToxiRAE).

The Data Fusion and Advisory System (DFAS) application, powered by SmartSite™, was utilized for outdoor weather details at the time odors were reported. The DFAS dashboard indicated the following weather conditions at 0603 hours on 07/11/2024:

- Wind Speed: 6.4 mph (15-minute average)
- Wind Direction: 250° (from West/Southwest)
- Mixing Height: 400 feet above grade
- Stability Class: F/G (moderately stable/extremely stable conditions)

16. Impact to Facility: *(Caused by the event or a description of known consequences)*

No impacts to facility safety status, operational capabilities, or facility reliability occurred.

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Access was restricted to the DFLAW Team trailers (MO282, MO283, MO284, MO158, MO159, and MO2294) for approximately 1.5 hours. No additional impacts to scheduled 07/11/2024 work evolutions occurred.

17. Immediate Actions Taken: *(List immediate actions taken to stabilize the scene or respond to the event)*

- The CSM directed the worker who reported experiencing symptoms to report to the on-site medical provider for precautionary medical evaluation.
- CSM initiated TFC-OPS-OPER-C-67, *Response to Stronger than Normal Odors*, response actions for reported stronger than normal odors.
- CSM issued a Shift Office Event Notification (SOEN) that directed personnel located in DFLAW Team trailers (MO282, MO283, MO284, MO158, MO159, and MO2294) to remain inside and restrict all other personnel from accessing the DFLAW and Wet Grout area.
- CSM made required TFC-OPS-OPER-C-67 notifications.
- Production Operations shift Industrial Hygiene Technician (IHT) initiated TFC-OPS-OPER-C-67 response actions and monitoring per Industrial Hygiene Sample Plan (IHSP) POE-MULTI-TFCOPSOPER67.
- Event Investigation EIR-2024-046, "C-67 Response near DFLAW Trailers" was initiated.

18. Compensatory Actions Taken:

None.

19. Remedial Actions Taken:

None.

20. Key Elements of the Investigation: *(Key investigation points)*

To summarize the conclusion of IHIR-00099, "TFC-OPS-OPER-C-67 Response at DFLAW trailers", investigation and Direct Reading Instrument (DRI) monitoring could not readily identify a source of the reported odors.

DRI monitoring performed during TFC-OPS-OPER-C-67 response actions did not indicate further action was necessary with regard to a worker safety and health occupational exposure limit standpoint. As a result, the area was released from restricted access.

The following considerations support the IHIR-00099 conclusions:

- 1) The DFAS dashboard provides a Exhauster Potential Exposure Zone (PEZ) Model of exhaust plumes at the reported time of the event based on wind speed, wind direction, mixing height, and atmospheric stability class (Refer to Attachment 1). Evaluation of the weather details determined the cause of the odor event was unlikely to be resultant of Tank Farms exhauster emissions based on the mixing height (400 feet above grade) and atmospheric stability class (moderately stable/extremely stable conditions).
- 2) While the reported odor descriptions are inconsistent with Tank Waste Chemical Vapors, due to the location odors were reported being in proximity to the Tank Farms, monitoring for Tank Waste Chemical Vapors was still conducted during the TFC-OPS-OPER-C-67 response.

Because nitric acid was utilized in nearly all production processes that generated tank waste, and the most common by-product of those processes was reduction of nitrate ion to ammonia during the dissolution (oxidation) of irradiated fuel, ammonia is the most prevalent chemical of potential concern (COPC) found in all tanks. Therefore, ammonia is utilized as a sentinel indicator for Tank Waste Chemical Vapor COPCs and DRIs equipped with an ammonia sensor are utilized at a minimum when monitoring for tank waste chemical vapors/COPCs. Monitoring for VOCs utilizing DRIs equipped with 10.6 eV photoionization detectors provides further indication for Tank Waste Chemical Vapors/COPCs.

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Investigative TFC-OPS-OPER-C-67 DRI area monitoring was performed in the general areas around the MO-284, MO-158, MO-282, MO-283, MO-159, MO-2294, and MO-2522 Shower Trailer as well as along the 2607-E10 SNS Lift Station and Septic Tile Field and portable restrooms/"blue rooms". Investigative TFC-OPS-OPER-C-67 DRI area monitoring indicated less than detectable concentrations for ammonia (< 1 ppm) and VOCs (<0.010 ppm), which are below anticipated background levels. Therefore, providing further indication the cause of the reported odors was unlikely to be resultant of Tank Farm exhauster emissions.

- 3) DRI monitoring for hydrogen sulfide and carbon monoxide was conducted during the TFC-OPS-OPER-C-67 response based on a "sewer" odor descriptor provided by the affected individual and the reported symptoms of "headache" and "dizziness". "Sewer" odors can be indicative of organic sulfur-based compounds (e.g., hydrogen sulfide) resultant of nearby septic related systems or equipment. In addition, the affected area has a long history of similar odors that have been found to be associated with sources other than Tank Farm exhauster emissions, such as septic tank gaseous emissions. Carbon Monoxide is an odorless gas, that at exposures of 35 to 400 ppm (based on length of exposure) are known to cause symptoms of headache and dizziness.

Hydrogen sulfide gas has an offensive distinct rotten egg odor that is perceived by the human olfactory sense at very low concentrations, with the lower range of the odor threshold value being 0.00004 ppm. While the resolution of the DRI is insufficient to detect concentrations at the lower range of the odor threshold value, they are sufficient to detect hydrogen sulfide at concentrations below their established action level and occupational exposure limit (OEL). Investigative TFC-OPS-OPER-C-67 DRI monitoring indicated less than detectable concentrations of hydrogen sulfide (<0.01 ppm) and carbon monoxide (< 1 ppm), therefore, concentrations were below the established action levels and OELs.

- 4) Herbicide was applied directly upwind of the affected area within 24 hours of event initiation. Based on weather conditions during and after application the herbicide should have dried well before event initiation, and therefore airborne concentrations of the volatile product constituents should have been de minimus. During TFC-OPS-OPER-C-67 field response actions, application of herbicide was on-going south of the affected area, however, it could not be determined if herbicide application was ongoing during the initiating event. Nonetheless, based on the weather conditions (specifically wind speed and direction) and the GHS-SDS for Vista® XRT herbicide listing the product odor as "spicy", it was determined herbicide application was an unlikely source for the reported odors.
- 5) Memo WRPS-1904672.1, "TANK FARM EXHAUST STACK CONCENTRATION ALARM/ACTION LEVELS FOR AMMONIA" establishes ammonia concentration stack alarm/action set points for tank farm exhausters based on the predicated ammonia concentration at unspecified ground receptors utilizing the Quantitative Risk Assessment (QRA) model. The exhauster high level alarm was established at concentrations where the predicted ground receptor ammonia concentration of 2.5 ppm (or 10% of the established Occupational Exposure Limit for ammonia) could be observed.

The exhauster high level alarm conservatively established for A Complex (excluding A farm) is 460 ppm. According to the Vapor Monitoring and Detection System (VMDS), the ammonia concentration observed at the time of event occurrence was 10.319 ppm at the 241-AW exhauster, 0 ppm at the POR-126 exhauster, 0 ppm at the POR-127, and 4.669 ppm at 702-AZ exhauster. The AN exhauster VMDS was out-of-service, therefore, alternate readings were acquired once per calendar day in accordance with TF-OPS-IHT-037. The AP exhauster VMDS was operable, however, readings were unable to be readily retrieved from PI Vision or Tank Farm Monitoring and Control System (TFMCS). The highest ammonia concentrations observed between 07/04/2024 and 07/11/2024

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was 26 ppm at the AN Exhauster. Conservatively utilizing the higher ammonia concentration observed in the AN exhauster, a predicted ground receptor ammonia concentration of 0.141 ppm (or 0.56% of the established Occupational Exposure Limit for ammonia) would be expected if AN, AY/AZ, AX, or AW farm exhauster emissions were present.

The exhauster high level alarm conservatively established for A farm is 160 ppm. According to the Vapor Monitoring and Detection System (VMDS), the ammonia concentration observed at the time of event occurrence was 0 ppm at the POR-518 exhauster and 0 ppm at the POR-519 exhauster. Thus, a predicted ground receptor ammonia concentration of 0 ppm (or 0% of the established Occupational Exposure Limit for ammonia) would be expected if A tank farm exhauster emissions were present.

Therefore, providing additional indication the reported odor was unlikely to be resultant of Tank Farms exhauster emissions.

21. Positive Aspects Identified:

Personnel responded promptly to the event, implementing the applicable TFC-OPS-OPER-C-67 procedure and response actions.

22. Key Take Aways / Learning Opportunities:

None.

23. Event Investigation:

- ☐ An Event Investigation will be completed per [TFC-OPS-OPER-C-14](#).
- ☐ This event will be managed by another process, i.e., Operability Evaluation, Engineering Technical Evaluation, etc.
- ☒ This event does not require continuation of the Event Investigation process.

Responsible Manager Approval:

Name (First, Middle Initial, Last)

Digitally signed by _____

Date: 2024.07.17 17:32:59 -07'00'

Signature / Date

CAS Manager Approval:

Name (First, Middle Initial, Last)

Digitally signed by _____

Date: 2024.07.17 18:12:39 -07'00'

Signature / Date

Attachment 1- DFAS Exhauster Potential Exposure Zones and Reported Odor Locations



Washington River Protection Solutions
INDUSTRIAL HYGIENE EVENT INVESTIGATION REPORT (IHIR)

Event Title:		IHIR Number:
TFC-OPS-OPER-C-67 Response at DFLAW trailers.		IHIR-00099
		IHEI Number:
		N/A

Date:	Time:	Location:
07/11/2024	0603	Outside of area in and around MO284, MO158, MO282, and MO283.

Event Summary and Timeline:

Event Summary:

At approximately 0603 on July 11th 2024, 1 worker reported faint “septic/sewer, musty, and non-descript” odors in and around MO284, MO158, MO282, and MO283. Symptoms of “headache, dizziness, and nausea” were reported. The affected employee was transported to the 200W occupational medical provider facility for medical evaluation.

Field Response Timeline:

0622 Central Shift Manager (CSM) contacts Production Operations East (POE) Industrial Hygienist (IH) requesting support for odor related field response actions.

0624 POE IH contacts Shift Industrial Hygiene Technician (IHT) Supervisor to notify that C-67 imminent.

0625 POE IH arrives @ Central Shift Office (CSO) and is briefed of event:

- No odor descriptor,
- symptom “headache”,
- occurring outside of Direct Feed Low Activity Waste Team (DFLAW) trailers @ approximately 0603.

0628 POE IH informs CSM of current weather conditions from Data Fusion Advisory System (DFAS):

- Stability Class F/G
- Wind speed 5.4 mph from 280 degrees (West)
- Mixing height 400 ft above grade

0631 POE IH informs CSM of Vapor Monitoring Detection System (VMDS) Ammonia (NH₃) readings @ 0603 07/11/2024:

- POR-518 - 0 ppm
- POR-519 - 0 ppm
- AN VTP - N/A
- AW VTP - 10.319 ppm
- POR-126 - 0 ppm
- POR-127 - 0 ppm
- 702-AZ VTP - 4.669 ppm
- AP VTP - N/A

0632 POE IH consults TOC-IH-58956 to determine field response actions for non-descript odors with “headache” symptoms.

0633 Affected worker and supervisor arrive at CSO to complete Odor/Vapor Response Cards (OVRCS). Odor Description given: “septic/sewer, musty.” Symptoms: “headache, nausea, dizziness.”

0638 CSM notifies Department of Energy (DOE) Facility Representative of TFC-OPS-OPER-C-67 response and details.

0645 POE Shift IHT Supervisor directs POE Shift IHT to prepare Direct Reading Instrumentation (DRI) for Nitrous Oxide (N₂O), Carbon Monoxide (CO), Hydrogen Sulfide (H₂S), NH₃, and Volatile Organic Compounds 10.6 electron volt (eV) photo ionization detector (PID).

0641 POE Safety and Health (S&H) manager notifies Environmental, Safety, Health and Quality (ESH&Q) management of event.

0657 CSM contacts Issues Management (IM) department manager and requests an Event Investigator Point of Contact (POC). EIR #2024-046 assigned.

0711 POE IH contacts Hanford Weather Station to request expanded weather conditions for time of event.

0711 POE IH contacts IH Records to request Industrial Hygiene Investigation Report (IHIR) number for event.

0711 SOEN: “TFC-OPS-OPER-C-67 Response to stronger than normal odors near DFLAW Team trailers. All personnel located in DFLAW Team trailers (MO282, MO283, MO284, MO158, MO159, and MO2294) should remain inside. All other personnel are restricted from accessing the DFLAW and Wet Grout area. CSM”

0712 TFC-OPS-OPER-C-67 Attachment A Page 1 signed by POE IH and CSM.

0717 POE Shift IHT arrives at CSO for briefing:

- Perform monitoring as per IHSP-POE-MULTI-TFCOPSOPERC67:
 - NH₃ – Action Limit 12 ppm
 - VOCs (10.6 eV PID) – Action Limit 2 ppm
 - H₂S – Action Limit 0.5 ppm
 - CO – Action Limit 12 ppm
 - Collect grab-air sample and perform monitoring for N₂O at 272AW IHT Lab – Action Limit 25ppm.
- Respiratory Protection Equipment (RPE) – voluntary use
- Monitor in and around “Wet-Grout area” including septic-tile field and lift station, area with recent herbicide application, and blooming or otherwise emitting flora species.

NOTE: Field Response Timeline continued on next page:

Washington River Protection Solutions
INDUSTRIAL HYGIENE EVENT INVESTIGATION REPORT (IHIR) (Continued)

Event Summary and Timeline:

Field Response Timeline continued:

0719 POE IH, POE Shift IHT, and POE Shift IHT Supervisor deploy to odor location.
0725 POE IH, POE Shift IHT, and POE Shift IHT Supervisor arrive at odor location.
0728 POE IH reports an abundance of faint green colorant on the ground surrounding Tank Side Cesium Removal facility (TSCR) indicating areas that had been recently treated with herbicide.
0729 POE IH reports that mustard species of flora/fauna are in bloom.
0732 POE IH reports multiple operating vehicles and personnel are present outside of DFLAW trailers in the restricted-access area.
0733 POE IH reports additional green colorant observed in gravel immediately North of Grout Loop on both sides of road.
0735 POE IH reports "No odors detected at 2607-E10 SNS-Lift Station".
0736 POE IH reports that MO2522 Shower trailers are "clean and fresh."
0737 POE IH reports that herbicide application currently ongoing by grout vaults (South of odor location).
0740 Field Response Team completed actions at odor location.
0806 POE Shift IHT contacts CSM and informs CSM that field DRI passed post-use function test. No readings above background were detected.
0809 POE IH reports that N₂O DRI passed post-use function test.
0817 SOEN: "IHTs responded to the area and took DRI readings and a bag sample. DRI instrument readings were below action levels. Bag samples have been analyzed the results allowed the restricted area to be down posted. SWIHD 24-05133. Access to DFLAW Team Trailers is restored. CSM"
0821 CSM and POE IH sign TFC-OPS-OPER-C-67 Attachment A page 2.

Field Response Timeline Acronyms:

CO	Carbon Monoxide
CSM	Central Shift Manager
CSO	Central Shift Office
DFAS	Data Fusion & Advisory System
DFLAW	Direct Feed Low Activity Waste Team
DOE	Department of Energy
DRI	direct reading instrument
ESH&Q	Environmental, Safety, Health, & Quality
eV	electron-volts
HAMTC	Hanford Atomic Metal Trades Council
H ₂ S	Hydrogen Sulfide
IH	Industrial Hygienist
IHIR	Industrial Hygiene Investigation Report
IHT	Industrial Hygiene Technician
IM	Issues Management Organization
mph	miles per hour
NH ₃	Ammonia
N ₂ O	Nitrous Oxide
OVRC	Odor/Vapor Response Card
PID	photoionization detector
POC	Point of Contact
POE	Production Operations-East
ppm	parts per million
S&H	Safety & Health
SOEN	Shift Office Event Notification
SWIHD	Site Wide Industrial Hygiene Database
TSCR	Tank Side Cesium Removal facility
VMDS	Vapor Monitoring Detection System
VOC	Volatile Organic Compound

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INDUSTRIAL HYGIENE EVENT INVESTIGATION REPORT (IHIR) (Continued)

Sampling/Monitoring Results:

Direct Reading Instrument Monitoring Results:

- Monitoring performed in and around Affected Area
- DRI readings acquired during field response:

Location	NH₃	VOCs	H₂S	CO
Herbicide application areas in TSCR facility	< 1 ppm	< 0.010 ppm	< 0.010 ppm	< 1 ppm
At 2607-E10 Septic Tile Field West	< 1 ppm	< 0.010 ppm	< 0.010 ppm	< 1 ppm
At 2607-E10 Septic Tile Field East	< 1 ppm	< 0.010 ppm	< 0.010 ppm	< 1 ppm
At 2607-E10 SNS-Lift Station	< 1 ppm	< 0.010 ppm	< 0.010 ppm	< 1 ppm
Portable toilets South of DFLAW trailers	< 1 ppm	< 0.010 ppm	< 0.010 ppm	< 1 ppm
Outside of MO284	< 1 ppm	< 0.010 ppm	< 0.010 ppm	< 1 ppm
Outside of MO158	< 1 ppm	< 0.010 ppm	< 0.010 ppm	< 1 ppm
Outside of MO282	< 1 ppm	< 0.010 ppm	< 0.010 ppm	< 1 ppm
Outside of MO283	< 1 ppm	< 0.010 ppm	< 0.010 ppm	< 1 ppm
In and around MO2522 shower trailer	< 1 ppm	< 0.010 ppm	< 0.010 ppm	< 1 ppm
Outside of MO159	< 1 ppm	< 0.010 ppm	< 0.010 ppm	< 1 ppm
Outside of MO2294	< 1 ppm	< 0.010 ppm	< 0.010 ppm	< 1 ppm
Herbicide application area North of DFLAW trailers	< 1 ppm	< 0.010 ppm	< 0.010 ppm	< 1 ppm

- DRI readings acquired from grab sample collected during field response (general area):

Location	NH₃	N₂O
General area of DFLAW trailers	< 1 ppm	< 0.2 ppm

Sampling/Monitoring Results Acronyms:

CO	Carbon Monoxide
DFLAW	Direct Feed Low Activity Waste
H ₂ S	Hydrogen Sulfide
NH ₃	Ammonia
N ₂ O	Nitrous Oxide
ppm	Parts Per Million
TSCR	Tank Side Cesium Removal
VOCs	Volatile Organic Compounds

SWIHD References:

Event Response Site Wide Industrial Hygiene Database DRI Survey:

- # 24-05133 "TFC-OPS-OPER-C-67 at Wet Grout area"

Washington River Protection Solutions
INDUSTRIAL HYGIENE EVENT INVESTIGATION REPORT (IHIR) (Continued)

Additional Information:

Respiratory Protection Equipment was not prescribed for the Initiating Event. Accordingly, at the time of the Initiating Event, the Affected Workers were not wearing Respiratory Protection Equipment. Respiratory Protection Equipment was not required, nor worn, for Response Actions.

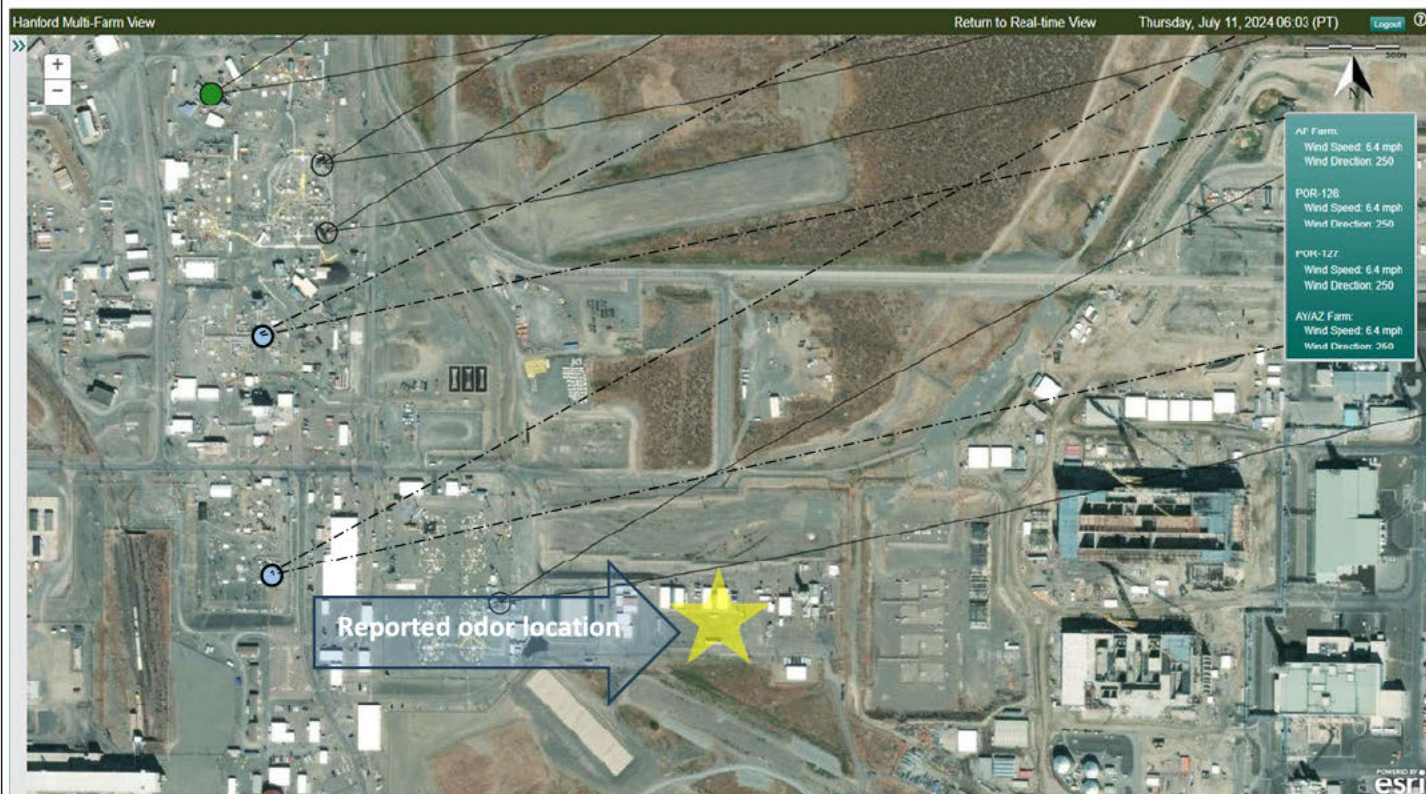
While the odor description is inconsistent with Tank Waste Chemical Vapors, due to the proximity to the Tank Farms, monitoring for Tank Waste Chemical Vapors was performed:

Ammonia is used as a sentinel Tank Waste Chemical Vapor for chemicals of potential concern (COPC). Each Hanford production process had different feedstock chemicals and generated different waste streams. Hanford production processes were also separated temporally, with different processes being performed at different times in the history of Hanford production (1943 – 1986). Some chemicals are common to all processes/waste streams (e.g., nitric acid), while others are specific to particular processes/waste streams. Some in-tank waste treatment processes (e.g., neutralization and de-nitrification) used the same chemical feed stocks (e.g., sodium hydroxide solution) in most, if not all Tank Farms. The chemistry and radiochemistry of these compounds result in waste stream similarities across all tank farms. Because nitric acid was common to nearly all processes that generated tank waste, and the most common result of those processes was reduction of nitrate ion to ammonia during the dissolution (oxidation) of irradiated fuel, ammonia is the most common COPC and is found in all tanks. It is logical to choose ammonia for the sentinel as it is a byproduct of all production processes and found in all tanks.

Therefore, when monitoring for Tank Waste Chemical Vapors/COPCs, DRI equipped with an ammonia sensor is utilized at a minimum. Additional COPC monitoring was conducted concurrently with ammonia during the event response. The COPC with DRI monitoring capabilities readily available at the Tank Farms includes VOCs. As individual agents are not identified when monitoring for VOCs, an Action Limit was developed as an indicator of Tank Farm emissions (mixture of organic vapors) that could impact workers' health and conservatively set at 2 ppm. When monitoring for Tank Waste VOC vapors, DRI equipped with a 10.6 eV PID is utilized to detect multiple VOC COPCs simultaneously.

NOTE: The 2 ppm Action Limit is not applicable to chemical use.

Review of the Data Fusion & Advisory System (DFAS) application, powered by SmartSite™, dashboard for the approximate time of the Event:



NOTE: 241-AW Farm and POR-518/519 Exhausters are not connected to the DFAS; however, an approximate exhauster plume was added based on other modeled plumes.

NOTE: Additional Information continued on next page.

Washington River Protection Solutions
INDUSTRIAL HYGIENE EVENT INVESTIGATION REPORT (IHIR) (Continued)

Additional Information:

Additional Information continued:

07/11/2024 @ 0603 (approximate time of initiating event):

- Wind Speed: 6.4 mph (15-minute average)
- Wind Direction: 250° (out of West-Southwest)
- Mixing Height: 400 feet above grade
- Stability Class: F/G (stable/very stable conditions)

Review of the DFAS application, powered by SmartSite™, dashboard for current conditions during response actions, per TFC-OPS-OPER-C-67 4.2.8:

07/11/2024 @ 0725 (current weather data for Response actions):

- Wind Speed: 10.6 mph (15-minute average)
- Wind Direction: 317° (out of Northwest)
- Mixing Height: 500 feet above grade
- Stability Class: D (neutral conditions)

Meteorological information from the Hanford Weather Station for Station #6 on 07/11/2024 @ 0600:

- Temperature: 72°F
- Relative Humidity: 28%
- Wind Direction: From W
- Wind Speed: 7 mph
- Barometric Pressure: 29.22 inHg (steady)
- Stability Class: G (very stable conditions)
- Mixing Height: 140 meters above grade

Vapor Monitoring Detection System (VMDS) exhaust ammonia readings on 07/11/2024 @ 0603:

- POR518 (241-A): 0.000 ppm
- POR519 (241-A): 0.000 ppm
- 241-AN: N/A
- 241-AW: 10.319 ppm
- POR126 (241-AX): 0.000 ppm
- POR127 (241-AX): 0.000 ppm
- 702AZ (241-AY/AZ): 4.669 ppm
- 241-AP: N/A

Memo WRPS-1904672.1, TANK FARM EXHAUST ~ CK CONCENTRATION ALARM/ ACTION LEVELS FOR AMMONIA establishes stack alarm/action set points for Tank Farm Exhausters. The alarm/action set points are based on a linear extrapolation of the Quantitative Risk Assessment (QRA) model prediction; conservatively established at the ammonia stack concentration that could result in various ammonia concentrations at an unspecified ground receptor:

- High Alarm → ammonia concentration of 2.5 ppm at an unspecified ground receptor
- High High Alarm → ammonia concentration of 5 ppm at an unspecified ground receptor

Memo WRPS-1904672.1, TANK FARM EXHAUST ~ CK CONCENTRATION ALARM/ ACTION LEVELS FOR AMMONIA:

Tank Farm	Exhauster	High Alarm	High High Alarm
241-A	POR518/POR519	160 ppm	320 ppm
241-AN	Primary		
241-AP	Primary		
241-AW	Primary	460 ppm	920 ppm
241-AX	POR126/POR127		
241-AY/AZ	702AZ		
241-SY	Primary	310 ppm	620 ppm

NOTE: Additional Information continued on next page.

Washington River Protection Solutions
INDUSTRIAL HYGIENE EVENT INVESTIGATION REPORT (IHIR) (Continued)

Additional Information:

Additional Information continued:

Vapor Monitoring Detection System (VMDS) 07/04/2024 @ 0000 to 07/11/2024 @ 0603:

Tank Farm	Exhauster	Minimum**A	Maximum**A
241-A	POR518/POR519	0 ppm	0 ppm
241-AN	Primary	N/A	N/A
241-AW	Primary	N/A	27.869 ppm
241-AX	POR126/POR127	N/A	14.762 ppm
241-AY/AZ	702AZ	N/A	7.391 ppm

*A VMDS Alternate Real Time Monitoring performed 07/04/2024 to 07/11/2024 for 241-A (POR518/POR519), 241-AN, 241-AW, 241-AY/AZ, and 241-SY.

The 241-AP Primary Exhauster and 241-SY Primary Exhauster are not currently connected to the VMDS software. When stack monitoring via the VMDS is unavailable, and ventilation is operating, IH will conduct alternate monitoring for ammonia. Report TOC-IH-RPT-50042, Ammonia Monitoring- Rate of Change of Tank Vapor Source Concentration and Monitoring Frequency, recommends measuring the exhaust ventilation systems once every 4 days. Conservatively, stack readings are required once per calendar day, in accordance with ARP-T-041-00002 and are acquired in accordance with TF-OPS-IHT-037.

Vapor Monitoring Detection System (VMDS) Alternate Monitoring 07/04/2024 to 07/11/2024:

Tank Farm	Exhauster	Minimum	Maximum
241-A	POR518/POR519	N/A	N/A
241-AN	Primary	5 ppm	26 ppm
241-AP	Primary	N/A	N/A
241-AW	Primary	2 ppm	2 ppm
241-AX	POR126/POR127	N/A	N/A
241-AY/AZ	702AZ	4 ppm	11 ppm
241-SY	Primary	25 ppm	37 ppm

Odor descriptors provided by Affected Workers are inconsistent with Tank Vapors. Additionally, review of the DFAS application, powered by SmartSite™, Weather Details dashboard and VMDS exhauster ammonia readings for the approximate time of the Event, indicate the cause of the odor is unlikely to be from Tank Farm Exhauster emissions.

Monitoring Selections Based on Information Provided by Affected Workers:

Initial reports indicated that odors were not present, faint, or otherwise non-descript. DRI monitoring selections were initially based on reported symptoms of "headache" and later, "dizziness". Carbon Monoxide is an odorless gas, that at exposures of 35 to 400 ppm (based on length of exposure) are known to cause symptoms of headache and dizziness. Nitrous Oxide is also an odorless gas that with long term exposure at levels as low as 1 ppm have been known to cause headaches.

Based on the odor descriptors provided upon submission of the Odor/Vapor Response Cards DRI monitoring for Hydrogen Sulfide was also requested:

Sewer or Septic gases:

- Based on the odor descriptor "sewer", monitoring for hydrogen sulfide and ammonia vapors was performed:
 - The 200 East, 200 West, and 600 Areas have a long history of odors that have been found to be associated with sources other than tank waste chemical vapors, such as septic tank gaseous emissions. These odors are known to change odor profile across a gradient when diluted by ambient atmosphere with distance from a point source. Additional sources of septic/sewer chemical vapors include the service vehicles that routinely service the septic storage tanks. The major roadways in the 200 East, 200 West, and 600 Areas are often traveled by septic service vehicles in route to the numerous local septic storage tanks and portable toilets.

NOTE: Additional Information continued on next page.

Washington River Protection Solutions
INDUSTRIAL HYGIENE EVENT INVESTIGATION REPORT (IHIR) (Continued)

Additional Information:

Additional Information continued:

The WRPS Chemical Vapor Solutions Team (CVST) chartered a Fugitive Emissions (FE) sub-team. The primary focus of the FE workscope was to identify odor sources around the Tank Farms work areas, characterizing the type and concentration of the odor constituents. The FE sub-team's investigations included characterizing how septic/sewer odors change odor profile across a gradient when diluted by ambient atmosphere with distance from a point source. The major components of sewer gases can include hydrogen sulfide, carbon dioxide, methane, and ammonia. The FE sub-team's investigations found that close to the septic system (within approximately 20 ft) the odor was described as "sewer". Further away from septic system (within approximately 100 ft) the odor was described as "skunk". Even further away from septic system (within approximately 200 ft) the odor was described as "body odor".

When monitoring for septic/sewer chemical vapors, DRI equipped with a hydrogen sulfide sensor should be utilized at a minimum. Additional septic/sewer chemical vapor monitoring may be conducted concurrently with hydrogen sulfide DRI monitoring.

Biodegradation of biota:

- Based on the odor descriptors "sewer" and "propane-like", monitoring for hydrogen sulfide and ammonia vapors was performed:
 - The main constituents to monitor for when the suspected source of an odor event is environmental chemical vapors are ammonia and hydrogen sulfide. Ammonia and hydrogen sulfide biodegradation byproducts that generate malodors. Therefore, when monitoring for environmental chemical vapors, DRI equipped with an ammonia sensor and a hydrogen sulfide sensor should be utilized at a minimum.

Refer to TOC-IH-58956 for more detail on the monitoring strategy for response to odors.

Herbicide application:

Herbicide was applied directly upwind from the affected area within 24 hours of event initiation. Typical herbicide application performed by HMLI involves spraying an aqueous mixture of Corteva Agriscience™ Vista® XRT herbicide (GHS-SDS#074065A) mixed with a visual indicator dye. Based on weather conditions during and after application the herbicide should have dried well before event initiation, and therefore airborne concentrations of the volatile product constituents should have been de minimus. It should be noted that the manufacturer provided instructions recommend prohibiting entry to treated areas for at least 24 hours. The GHS-SDS for Vista® XRT lists the product odor as "spicy" which as a physiological sensory response involving receptors other than olfactory, may be the cause of the "indeterminate" and "musty" odors descriptors provided. During the field response actions application of herbicide was on-going south of the affected area. It has not been determined that herbicide application was ongoing during the initiating event, however weather conditions (specifically wind speed and direction) make it unlikely that ongoing application produced any exposure potential.

Additional Information Acronyms:

ACGIH	American Conference of Governmental Industrial Hygienists
AIHA	American Industrial Hygiene Association
IARC	International Agency for Research on Cancer
CF	correction factor
CFM	cubic feet per minute
COPC	chemicals of potential concern
DFAS	Data Fusion & Advisory System
DRI	direct reading instrument
eV	electron-volts
GHS-SDS	Globally Harmonized System Safety Data Sheet
OSHA	Occupational Safety & Health Administration
OVRC	Odor/Vapor Response Card
PEL	Permissible Exposure Limit
PID	photoionization detector
ppm	parts per million
STEL	Short Term Exposure Limit
TLV	Threshold Limit Value
TWA	Time Weighted Average
VMDS	Vapor Monitoring Detection System
VOC	Volatile Organic Compounds

NOTE: Additional Information continued on next page.

Washington River Protection Solutions
INDUSTRIAL HYGIENE EVENT INVESTIGATION REPORT (IHIR) (Continued)

Additional Information:

Additional Information continued:

References:

- American Conference of Governmental Industrial Hygienists (2016). TLVs® and BEIs® Based on the Documentation of the Threshold Limit Values for Chemicals Substances and Physical Agents & Biological Exposure Indices. Cincinnati, OH: Signature Publications.
- American Industrial Hygiene Association (2013). Odor Thresholds for Chemicals with Established Health Standards, 2nd Edition.
- Honeywell (2018). Technical Note TN-106: A Guideline for PID Instrument Response. Retrieved from https://prod-edam.honeywell.com/content/dam/honeywell-edam/sps/his/en-us/products/gas-and-flame-detection/documents/Technical-Note-106_A-Guideline-for-Pid-Instrument-Response.pdf
- Occupational Safety & Health Administration (n.d.). Permissible Exposure Limits- Annotated Tables, OSHA Annotated Table Z-1. Retrieved from <https://www.osha.gov/annotated-pels/table-z-1>
- TOC-IH-58956. Monitoring Strategy for Response to Odors: Common Odor Sources in the 200 East, 200 West, & 600 Areas.
- Dow AgroSciences Vista® XRT Specimen Label retrieved from: https://fs1.agrian.com/pdfs/Vista_XRT_Specialty_Herbicide_Label.pdf

Recommendations/Conclusions:

Recommendations:

N/A

Conclusions:

As Direct Reading Instrumentation monitoring of possible odor sources did not indicate further action was necessary to protect worker safety and health, the area was released from restricted access and work was allowed to continue.

Odor descriptors provided by Affected Workers are inconsistent with Tank Vapors. Based on a review of the DFAS application, powered by SmartSite™, Weather Details dashboard and VMDS exhaust ammonia readings for the approximate time of the Event, the cause of the odor is unlikely to be from Tank Farm Exhauster emissions. The atmospheric stability at the time of the event was stable conditions and the mixing height was 400 feet above grade.

A survey of possible sources of odors matching the provided odor descriptors did not identify a source. Odors were not encountered during the field responses actions around the vicinity of various septic related areas or structures. Various environmental sources of nuisance odor were present in the form of blooming vegetation. Herbicide had been recently applied near the reported odor location. A definitive source of odors and/or chemical emissions which could result in the symptoms reported could not be identified.

Others:

N/A

Associated Documents:

iCAS Number: N/A

EIR Number: EIR 2024-046

Industrial Hygienist:

Print First and Last Name

Digitally signed by _____
Date: 2024.07.16 16:23:12 -07'00'
Signature / Date

Industrial Hygiene Level 3 Manager

Print First and Last Name

Digitally signed by _____
Date: 2024.07.16 16:04:23 -07'00'
Signature / Date

Industrial Hygiene Level 2 Manager:

Print First and Last Name

Digitally signed by _____
Date: 2024.07.17 05:43:41 -07'00'
Signature / Date

ODOR/VAPOR RESPONSE CARD

1. Complete below information and map (Page 1).

- Date and time of event: 7/11/24 0600
- Check Applicable:
 - ☒ Odor
 - ☐ Ammonia Alarm (6 ppm)
 - ☐ Ammonia Alarm (12 ppm)
 - ☐ Alarm (other - describe): _____
- Your name and the work you were performing:
Radcan Supervisor
- Other Work Underway? Describe:
NO
- Location of event (mark area on map and wind direction):
Trailer village near MO-283
- Name(s) of others in or near the affected area:
[REDACTED]
- Was Industrial Hygiene present, who?
NO
- Describe the odor:
 - ☐ Sweet
 - ☐ Sour
 - ☐ Smoky
 - ☐ Septic/Sewer
 - ☐ Musty
 - ☐ Rotten
 - ☐ Metallic
 - ☐ Onion
 - ☐ Earthy
 - ☐ Ammonia
 - ☐ Citrus
 - ☐ Solvent
 - ☐ Other (describe): _____
- Is source known/likely? Describe: _____
- Your symptoms? ☒ None
 - ☐ Headache
 - ☐ Dizziness
 - ☐ Nausea
 - ☐ Cough
 - ☐ Fatigue
 - ☐ Weakness
 - ☐ Sore Throat
 - ☐ Difficulty Breathing
 - ☐ Eye Irritation
 - ☐ Rash
 - ☐ Itch
 - ☐ Tingling
 - ☐ Numbness
 - ☐ Taste
 - ☐ Other (describe): _____

2. Provide this completed card (Page 1 & 2) to Supervisor, Industrial Hygiene, your Union Safety Representative or the CSM.
If received by Supervisor/IH/U-SR, Supervisor/IH/U-SR will ensure card is provided to the CSM.

ODOR/VAPOR RESPONSE CARD

Instructions:

1. Notify Immediate Supervisor.
2. Contact Central Shift Manager (CSM), at [REDACTED]
3. Complete both pages of this form and include as many details as possible, including:
 - a. Approximate location, see map at right;
 - b. Wind direction, speed and description, such as stable or gusty wind;
 - c. Environmental conditions, such as hot, cold, windy, rainy;
 - d. Other work or contractors in the area;
 - e. Anything else you think is relevant.
4. Provide the completed card to your Supervisor*, Industrial Hygiene*, Union Safety Representative* or the CSM.

* If received by Supervisor, IH, or Union Safety Representative, the Supervisor/IH/ Union-SR will ensure card it is provided to the CSM.

My employee informed me that an unknown odor has caused him migraines and wants to be seen at IHA

ODOR/VAPOR RESPONSE CARD

1. Complete below information and map (Page 1).

- Date and time of event: 7-11-24
- Check Applicable:
 - ☒ Odor
 - ☐ Ammonia Alarm (6 ppm)
 - ☐ Ammonia Alarm (12 ppm)
 - ☐ Alarm (other - describe): _____
- Your name and the work you were performing:
[REDACTED], no work was being performed.
- Other work underway? Describe:
none
- Location of event (mark area on map and wind direction):
AREA SURROUNDING DEFLAW
- Name(s) of others in or near the affected area:
TSC2 RCT TEAM
- Was Industrial Hygiene present, who?
no
- Describe the odor:
 - ☐ Sweet
 - ☐ Sour
 - ☐ Smoky
 - ☒ Septic/Sewer
 - ☒ Musty
 - ☐ Rotten
 - ☐ Metallic
 - ☐ Onion
 - ☐ Earthy
 - ☐ Ammonia
 - ☐ Citrus
 - ☐ Solvent
 - ☐ Other (describe): _____
- Is source known/likely? Describe:
unknown
- Your symptoms? ☐ None
 - ☒ Headache
 - ☒ Dizziness
 - ☒ Nausea
 - ☐ Cough
 - ☐ Fatigue
 - ☐ Weakness
 - ☐ Sore Throat
 - ☐ Difficulty Breathing
 - ☐ Eye Irritation
 - ☐ Rash
 - ☐ Itch
 - ☐ Tingling
 - ☐ Numbness
 - ☐ Taste
 - ☐ Other (describe): _____

2. Provide this completed card (Page 1 & 2) to Supervisor, Industrial Hygiene, your Union Safety Representative or the CSM.
If received by Supervisor/IH/U-SR, Supervisor/IH/U-SR will ensure card is provided to the CSM.

ODOR/VAPOR RESPONSE CARD

Instructions:

1. Notify Immediate Supervisor.
2. Contact Central Shift Manager (CSM), at [REDACTED]
3. Complete both pages of this form and include as many details as possible, including:
 - a. Approximate location, see map at right;
 - b. Wind direction, speed and description, such as stable or gusty wind;
 - c. Environmental conditions, such as hot, cold, windy, rainy;
 - d. Other work or contractors in the area;
 - e. Anything else you think is relevant.
4. Provide the completed card to your Supervisor*, Industrial Hygiene*, Union Safety Representative* or the CSM.

* If received by Supervisor, IH, or Union Safety Representative, the Supervisor/IH/ Union-SR will ensure card it is provided to the CSM.

An odor centralized around the DFLAW Trailers is causing migraine headache symptoms.

