

Washington River Protection Solutions
EVENT SUMMARY

Check PART 1 box to hide that section of the form. Check PART 2 box it will show that section.

PART 1 (hide)* **PART 2 (show)***

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:

Project: ESH&Q Date: 03/06/2023

Area/Building/Location: Near MO-497/200E Approximate Time of Event: 1413 Hours

AR Number: WRPS-AR-2023-0956 Responsible Manager: [REDACTED]

EIR Number: EIR-2023-011 Event Investigator: [REDACTED] under instruction of [REDACTED]

EVENT SUMMARY PART 1

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

2 lineman were performing power line restoration outside of AN Farm, near MO-497, per Work Order (WO) #978036, ERMA HMIS 200E AN TANK FARM - REPLACE FALLEN UTILITY POLES E412 AND E423N Farm.

Personnel Involved (Job positions, number of personnel, identify any support organizations or subcontractors directly involved):

Personnel that reported experiencing stronger than normal odor:
- 2 Lineman (HMIS).

Other workers outside of AN Farm, near MO-497, when stronger than normal odors were reported:
- 5 Lineman (HMIS)
- 1 Health Physics Technician (HMIS)
- 1 Industrial Hygienist (HMIS).

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

On 03/06/2023, at approximately 1413 hours, two lineman reported stronger than normal "sulfur/battery" like odors while working at elevation from a utility truck bucket during power line restoration outside of AN Farm, near MO-497. Six additional workers were on the job with the lineman, however, did not report experiencing stronger than normal odors. The lineman reported the stronger than normal odors to the HMIS Industrial Hygienist supporting the fieldwork evolution, who then notified the WRPS Central Shift Manager (CSM). Although neither of the lineman reported symptoms, they were taken to HMPC for precautionary medical evaluation. At approximately 1651 hours, the two lineman were released to return-to-work without restrictions.

On 03/07/2023, the CSM received the Odor Response Cards from the lineman. On the Odor Response Cards, the lineman described the odor as "sulfur/rotten eggs".

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

Near MO-497 outside of AN Farm.

The 2 lineman were wearing fire retardant/resistant pants, shirts and jackets(which is considered Level D PPE) and were in a work location that is not posted as a radiological controlled area. Lineman were performing work activities that do not require use of respiratory protection. The workers did have a personnel ammonia monitor(VentisPro) in their bucket which did not alarm at the time of the event.

The Hanford Site Meteorological Station #6 and Data Fusion and Advisory System (DFAS) application, powered by SmartSite™, were utilized for outdoor weather details at the time odors were reported. The Hanford Site Meteorological Station #6 and DFAS dashboard indicated the following weather conditions at 1413 hours on 03/06/2023:

- . Wind Speed: 4.3 miles per hour (mph)
- . Wind Direction: 254 ° (out of West-South West)
- . Mixing Height: 1,200 feet above grade
- . Stability Class: F/G (stable conditions)
- . Temperature: 45 ° F
- . Barometric Pressure: 29.358 inches Hg
- . Humidity: 47%

* Depending on which Part of the form is shown, Part 1 or Part 2 can be hidden

Washington River Protection Solutions
EVENT SUMMARY (Continued)

Project: ESH&Q Date: 03/06/2023

Area/Building/Location: Near MO-497/200E Approximate Time of Event: 1413 Hours

AR Number: WRPS-AR-2023-0956 Responsible Manager: [REDACTED]

EIR Number: EIR-2023-011 Event Investigator: [REDACTED] under instruction of [REDACTED]

Impact to Facility (Caused by the event or a description of known consequences):
Access was restricted near MO-497 outside of AN Farm. No additional impacts to scheduled 03/06/2023 work evolutions occurred.

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

- The linemen were transported to HPMC for precautionary medical surveillance.
- CSM initiated TFC-OPS-OPER-C-67, restricted access near MO-497 outside of AN Farm, and issued Shift Office Event Notification (SOEN).
- Production Operations Industrial Hygienist and CSM reviewed the DFAS data and determined no additional access restrictions were required.
- 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 IHSP-POE-MULTI-TFCOPSOPERC67.
- Event Investigation EIR-2023-011, "TFC-OPS-OPER-C-67 Outside AN Farm," was initiated.

Notifications Already Made (Time and personnel notified):

03/06/2023

[1413 hours] - Industrial Hygienist reported 2 linemen smelled a "sulfur/rotten eggs" odor. CSM contacted the on-call DOE Facility Representative and informed them of TFC-OPS-OPER-C-67 event initiation.

[1427 hours] - The CSM initiated TFC-OPS-OPER-C-67, restricted access, provided radio announcement, and issued SOEN "Responding per TFC-OPS-OPER-C-67 for report of odors near MO-497 outside of AN Farm. Personnel stay clear of this area unless authorized by Shift Manager."

[1441 hours] - CSM provided TFC-OPS-OPER-C-67, Attachment B - Initial Communication Summary email to distribution list "DL - WRPS Odor/Vapor Event Notification".

[~1656 hours] - TFC-OPS-OPER-C-67 response were complete and normal access was restored. CSM issued SOEN "TFC-OPS-OPER-C-67 response actions are complete. IHT readings were at or below background levels."

[1707 hours]- CSM provided TFC-OPS-OPER-C-67, Attachment C - Follow-up Event Summary to email to distribution list "DL - WRPS Odor/Vapor Event Notification".

03/07/2023

[~0800 hours] - CSM received Odor Response Cards from the two linemen. On the Odor Response Cards they indicated they had no symptoms and described the odor as "sulfur/rotten eggs".

- This event does not merit an Event Investigation meeting
- This event merits an Event Investigation meeting

Basis for Determination:
Information gathered from interviews and documentation reviews have provided sufficient information regarding this event.

Responsible Manager:

[REDACTED] _____ Digitally signed by [REDACTED]
Print First and Last Name Signature / Date Date: 2023.03.07 14:57:55 -08'00'

CAS Manager:

[REDACTED] _____ Digitally signed by [REDACTED]
Print First and Last Name Signature / Date Date: 2023.03.07 15:06:14 -08'00'

Washington River Protection Solutions
EVENT SUMMARY (Continued)

Project: ESH&Q Date: 03/06/2023

Area/Building/Location: Near MO-497/200E Approximate Time of Event: 1413 Hours

AR Number: WRPS-AR-2023-0956 Responsible Manager: [REDACTED]

EIR Number: EIR-2023-011 Event Investigator: [REDACTED] under instruction of [REDACTED]

EVENT SUMMARY PART 2

Key Elements of the Investigation (Key investigation points):

Additions/corrections to the Event Summary Part 1 information includes the following:

WHERE DID IT HAPPEN:

-The workers did have a personnel ammonia monitor (ToxiRAE) in their bucket which did not alarm at the time of the event.

EVENT SUMMARY PART 2 KEY ELEMENT OF THE INVESTIGATION:

To summarize the conclusions of IHIR-00064, "TFC-OPS-OPER-C-67 West of AN Farm," investigation and direct reading instrument (DRI) monitoring could not readily identify a source. Although, odor descriptors provided by the affected worker are not consistent with Tank Vapor sources. 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 standpoint.

The following considerations support the IHIR-00064 conclusion:

(1) Evaluation of the weather details determined the cause of the odor source was unlikely to be resultant of Tank Farms exhauster emissions based on the wind direction, wind speed, mixing height, and stability class at the reported time of event (Refer to Attachment 1 for DFAS PEZ Model).

(2) The workers did have a personnel ammonia monitor (ToxiRAE) within their utility truck bucket while working at elevations. The ToxiRAE personal ammonia monitor did not alarm or indicate elevated ammonia concentrations, therefore, providing indication the odor was unlikely to be resultant of Tank Farms exhauster emissions.

(3) Quantitative Risk Assessment (QRA) modeling indicates MO-497 would not be within potential tank vapor exposure zones in either a waste disturbing or non-waste disturbing farm status during passive or active ventilation in AN-farm, AY/AZ-farm, AX-farm, A-farm, AW-farm, or AP-farm. Therefore, providing additional indication the source of the odor is highly improbable to be resultant of Tank Farm emissions.

(4) Because nitric acid was utilized in nearly all production processes that generated tank waste, and the most common byproduct 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, thus direct reading instruments (DRIs) equipped with an ammonia sensor are utilized at a minimum when monitoring for tank waste chemical vapors/COPCs. Monitoring for VOCs utilizing a DRI equipped 10.6 eV photoionization detector provides further indication for Tank Waste Chemical Vapors/COPCs.

While the reported odor location and odor descriptions are inconsistent with Tank Waste Chemical Vapors, due to the proximity of MO-497 being outside of AN Farm, monitoring for Tank Waste Chemical Vapors was still conducted during the TFC-OPS-OPER-C-67 response. Investigative TFC-OPS-OPER-C-67 Direct Reading Instrument (DRI) monitoring indicated less than detectable concentrations for ammonia (< 1 ppm) and Volatile Organic Compounds (VOCs) (0.01 ppm) utilizing a DRI equipped 10.6 eV photoionization detector, which is below anticipated background levels. Providing further indication the cause of the personal ammonia alarm was unlikely to be resultant of Tank Farms exhauster emissions.

(5) Further DRI monitoring for Hydrogen Sulfide was conducted during the TFC-OPS-OPER-C-67 response based on the odor descriptors "sulfur" and "rotten eggs" provided by the affected workers. According to the American Industrial Hygiene Association (AIHA) "Odor Threshold for Chemicals with Established Health Standards", 2nd Edition; Hydrogen Sulfide is listed as a compound with an odor

Washington River Protection Solutions
EVENT SUMMARY (Continued)

Project: ESH&Q Date: 03/06/2023

Area/Building/Location: Near MO-497/200E Approximate Time of Event: 1413 Hours

AR Number: WRPS-AR-2023-0956 Responsible Manager: [REDACTED]

EIR Number: EIR-2023-011 Event Investigator: [REDACTED] under instruction of [REDACTED]

Key Elements of the Investigation (Key investigation points):

characteristic of "rotten eggs". Investigative TFC-OPS-OPER-C-67 DRI monitoring indicated Hydrogen Sulfide concentrations of <0.1 ppm, which is below anticipated background levels.

(6) The Tank Farm Exhauster's ammonia concentrations were significantly less than the high level alarm set point at the time odors were reported. 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 0 ppm at the POR-126 exhauster, 26.191 ppm at the POR-127 exhauster, and 0 ppm at the AW exhauster. The AP exhauster is not currently connected to VMDS and issues have been identified with the AN exhauster and 702-AZ exhauster VMDS; therefore, readings are acquired once per calendar day in accordance with TF-OPS-IHT-037 when ammonia stack monitoring via VMDS is unavailable. The highest ammonia concentrations observed between 02/27/2023 and 03/06/2023 was 8 ppm at the AP exhauster, 16 ppm at the 702-AZ exhauster, and 24 ppm at the 702-AZ exhauster. Conservatively utilizing the highest ammonia concentration observed in the POR-127 exhauster, a predicted ground receptor ammonia concentration of 0.142 ppm (or 0.569% of the established Occupational Exposure Limit for ammonia) would be expected if AY/AZ, AN, AW, AP or AX tank farm exhauster emissions were present.

The exhauster high level alarm conservatively established for A farm is 160 ppm. According to VMDS, the ammonia concentration observed at the time of event occurrence was 2.682 ppm at the POR-518 exhauster and 1.968 ppm at the POR-519 exhauster. Conservatively utilizing the higher ammonia concentration observed in the POR-518 exhauster, a predicted ground receptor ammonia concentration of 0.042 ppm (or 0.167% of the established Occupational Exposure Limit for ammonia) would be expected if A tank farm exhauster emissions were present.

The predicated ammonia concentrations at unspecified ground receptors provides further justification the odor source was unlikely to be resultant of Tank Farms exhauster emissions.

Additional Compensatory/Remedial Measures (any additional measures taken if different from immediate actions):

None.

Lessons Learned or Information That the Work Force Needs Immediately:

None.

- 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

Basis for Determination:

This event does not require continuation of the event investigation process under TFC-OPS-OPER-C-14, "Event Investigation Process." The facts, findings, and comprehensive account captured under this Event Summary and the Industrial Hygiene Event Investigation Report, IHIR-00063, "TFC-OPS-OPER-C-67 MO149," form the basis that further investigation will provide no additional information or operational benefit.

Washington River Protection Solutions
EVENT SUMMARY (Continued)

Project: ESH&Q Date: 03/06/2023

Area/Building/Location: Near MO-497/200E Approximate Time of Event: 1413 Hours

AR Number: WRPS-AR-2023-0956 Responsible Manager: [REDACTED]

EIR Number: EIR-2023-011 Event Investigator: [REDACTED] under instruction of [REDACTED]

Responsible Manager:

[REDACTED] [REDACTED] Digitally signed by [REDACTED]
Date: 2023.03.13 15:57:42 -07'00'
Print First and Last Name *Signature / Date*

CAS Manager:

[REDACTED] [REDACTED] Digitally signed by [REDACTED]
Date: 2023.03.13 16:24:35 -07'00'
Print First and Last Name *Signature / Date*

Location Of Reported Odor



AN Exhauster
Estimated Potential Exposure Zone

702-AZ Exhauster

POR-127 Exhauster

POR-126 Exhauster

POR-518/519 Exhauster
Estimated Potential Exposure Zone

AW Exhauster
Estimated Potential Exposure Zone

AP Exhauster

DFAS Exhauster Potential Exposure Zone Model
Actual conditions on 03/06/2023 @ 14:13:
· Wind Speed: 4.3 mph
· Wind Direction: 254 °
· Mixing Height: 1,200"
· Stability Class: F/G (stable conditions)

Washington River Protection Solutions
INDUSTRIAL HYGIENE EVENT INVESTIGATION REPORT

Event Title: <p style="text-align: center;">TFC-OPS-OPER-C-67 West of AN Farm</p>	PER Number: <p style="text-align: center;">N/A</p>
	IHIR Number: <p style="text-align: center;">IHIR-00064</p>

Date: 03/06/2023	Time: 1400	Location: West of AN Farm Change Trailer (MO497)
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Event Summary and Timeline:

Event Summary:
 At approximately 1400 on 03/06/2023 two Hanford Mission Integrations Solutions Linemen encountered a "sulfur, rotten eggs, battery" odor West of the 241-AN change trailer (MO497) while performing elevated work. None of the workers reported symptoms.

Field Response Timeline:

1413 Initiating event reported to Central Shift Manager

1415 Central Shift Manager requests TFC-OPS-OPER-C-67 response support from Production Operations-East Industrial Hygiene Technician Supervisor

1418 Production Operations-East Industrial Hygiene Technician Supervisor notifies Production Operations-East Industrial Hygienist and Production Operations-East Shift Industrial Hygiene Technicians of the Central Shift Manager's request for TFC-OPS-OPER-C-67 response support

1420 Production Operations-East Industrial Hygienist and Production Operations-East Industrial Hygiene Technician Supervisor arrive at Central Shift Office

1420 Production Operations-East Industrial Hygiene Technician Supervisor notifies Production Operations-East Level 3 Safety & Health Manager of TFC-OPS-OPER-C-67 response

1420 Central Shift Manager briefs Production Operations-East Industrial Hygienist:

- West of AN change trailer (MO497) elevated 30 feet
- Sulfur, battery odor
- Personal Ammonia Monitors did not alarm

1422 Central Shift Manager notifies Department of Energy Facility Representative of TFC-OPS-OPER-C-67 response

1426 Production Operations-East Industrial Hygienist contacts Hanford Weather Station to obtain meteorological information for the approximate reported time of the event

- Hanford Meteorological Station 6 @1415:
 - o Barometric Pressure: 29.358" Hg and steady
 - o Wind speed and direction: 5 mph out of West Northwest
 - o Temperature: 45°F
 - o Relative Humidity: 47%

1427 Additional Production Operations-East Industrial Hygienist arrives at Central Shift Office

1427 Production Operations-East Industrial Hygienist notifies Production Operations-East Industrial Hygiene Technician Supervisor to request:

- Direct Reading Instrumentation equipped with the following
 - o Hydrogen sulfide sensor
 - o Ammonia sensor
 - o Volatile Organic Compound 10.6 eV photoionization detector

1429 Shift Office Event Notification (SOEN): "Responding per TFC-OPS-OPER-C-67 for report of odors near MO-497 outside of AN Farm. Personnel stay clear of this area unless authorized by Shift Manager. CSM"

1430 Central Shift Manager briefs Hanford Mission Integrations Solutions Management

1431 Production Operations-East Industrial Hygienists check Data Fusion Advisory System (DFAS), powered Smart Site™, for current weather details:

- Wind Speed: 4.3 mph
- Wind Direction: 254° (out of West Southwest)
- Mixing Height: 1200 feet above grade
- Stability Class: F/G (moderately to extremely stable conditions)

1433 Production Operations-East Level 3 Safety & Health Manager arrives at Central Shift Office

1433 Affected Workers' Industrial Hygienist arrives at Central Shift Office and completes Odor/Vapor Response Card [Odor/Vapor Response Card (A-6007-246)] and submits to Production Operations-East Industrial Hygienists for review

Field Response Timeline continued on next page.

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

Event Summary and Timeline:

Field Response Timeline (continued):

- 1445 Production Operations-East Industrial Hygienists provide Affected Workers' Industrial Hygienist with Odor/Vapor Response Cards [Odor/Vapor Response Card (A-6007-246)] for Affected Workers, then Affected Workers' Industrial Hygienist departs Central Shift Office
- 1451 Production Operations-East Shift Industrial Hygiene Technician arrives at Central Shift Office
- 1454 Production Operations-East Level 3 Safety & Health Manager notifies Industrial Hygiene Level 2 and Level 1 Environmental, Safety, Health, & Quality Manager of TFC-OPS-OPER-C-67 response
- 1457 Central Shift Manager and Production Operations-East Industrial Hygienist discuss Respiratory Protection for response actions
- None required
- 1500 Central Shift Manager and Production Operations-East Industrial Hygienist sign TFC-OPS-OPER-C-67 Attachment A Sheet 1 of 2, Response Plan
- 1501 Production Operations Industrial Hygienist provides Production Operations Industrial Hygiene Technician briefing for response:
- Monitor as per IHSP-POE-MULTI-TFCOPSOPERC67
 - Sweep in and around affected area with Direct Reading Instrument(s) equipped with the following sensors:
 - Hydrogen sulfide sensor
 - Ammonia sensor
 - Volatile Organic Compound 10.6 eV photoionization detector
 - Respiratory Protection Equipment: None required, Voluntary Use offered
 - Map of Affected Area provided
- 1502 Responding Production Operations-East Industrial Hygienist and Production Operations-East Shift Industrial Hygiene Technician depart Central Shift Office to gather response equipment
- 1506 Responding Production Operations-East Industrial Hygienist and Production Operations-East Shift Industrial Hygiene Technician arrive at Affected Area, verify approved monitoring locations near electrical boundaries with Central Shift Manager, and begin response actions
- 1521 Production Operations-East Industrial Hygienists check Vapor Monitoring Detection System (VMDS) for current exhauster ammonia readings:
- POR518 (241-A): 2.682 ppm
 - POR519 (241-A): 1.968 ppm
 - 241-AN: N/A
 - 241-AW: 0 ppm
 - POR126 (241-AX): 0 ppm
 - POR127 (241-AX): 26.191 ppm
 - 702AZ (241-AY/AZ): 0 ppm
 - 241-AP: N/A
- All available readings << High Alarm set point
- 1527 Event Responding Production Operations-East Industrial Hygienist notifies Production Operations-East Industrial Hygienist and Production Operations-East Level 3 Safety & Health Manager on response: Production Operations-East Industrial Hygiene Technician in route to perform Direct Reading Instrument post-use function test
- 1530 Event Responding Production Operations-East Industrial Hygienist returns to Central Shift Office, Response Notes:
- Field response complete
 - AZ156 Mixer Pump Speed Control House and Instrument Technician Shop - No odors
 - Calibration Gas Pad - No odors
 - Central Accumulation Area - No odors
 - MO-497 AN Change Trailer - No odors
 - AN271 Instrument Control House - No odors
 - Perimeter of Affected Area - No odors
 - MO-820 not entered due to closed facility
 - AN273, AN274, and Affected Area not entered due to electrical boundary
 - Peak readings at or below background
 - Hydrogen Sulfide: less than 0.1 ppm
 - Ammonia: less than 1 ppm
 - Volatile Organic Compounds: 0.010 ppm

Field Response Timeline continued on next page.

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

Field Response Timeline (continued):

1542 Production Operations-East Shift Industrial Hygiene Technician notifies Production Operations-East Industrial Hygienists that Direct Reading Instrumentation has passed Post-Use Function Tests

1552 Central Shift Manager and Production Operations-East Industrial Hygienist sign TFC-OPS-OPER-C-67 Attachment A Sheet 2 of 2, Response Plan

1649 Production Operations-East Level 3 Safety & Health Manager confirms that Affected Employees checked in with Central Shift Manager at start of shift

1658 Shift Office Event Notification (SOEN): "TFC-OPS-OPER-C-67 response actions are complete. IHT readings were at or below background levels. CSM"

Sampling/Monitoring Results:

Direct Reading Instrument Monitoring Results:

- AZ156 Mixer Pump Speed Control House and Instrument Technician Shop, MO-497 AN Change Trailer, AN271 Instrument Control House, and various outdoor locations including the calibration gas pad, Central Accumulation Area, perimeter of Affected Area, gas cans, and various waste containers investigated during response
- Peak readings during response at or below background:
 - o Hydrogen Sulfide: less than 0.1 ppm
 - o Ammonia: less than 1 ppm
 - o Volatile Organic Compounds: 0.010 ppm

Refer to IHIR-00064 Attachment A for SmartSite™ Summary, Response Map, and Response Pictures.

SWIHD References:

Event Response Site Wide Industrial Hygiene Database Direct Reading Instrumentation (DRI) Survey:

- #23-01390 "TFC-OPS-OPER-C-67 Outside of AN Farm"

Additional Information:

03/07/2023

0747 Affected Workers' Odor/Vapor Response Cards [Odor/Vapor Response Card (A-6007-246)] received by Central Shift Office

- Information was consistent with verbal information received prior to response.

Respiratory Protective Equipment was not prescribed for the initiating event. Accordingly, at the time of the initiating event the Affected Personnel were not wearing Respiratory Protection Equipment. Respiratory Protection Equipment 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 chemical of potential concern (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/chemicals of potential concern (COPC), Direct Reading Instrumentation (DRI) equipped with an ammonia sensor is utilized at a minimum. Additional chemicals of potential concern (COPC) monitoring was conducted concurrently with ammonia during the event response. The chemicals of potential concern (COPCs) with Direct Reading

Additional Information continued on next page.

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

Additional Information:

Instrument (DRI) monitoring capabilities readily available at the Tank Farms includes volatile organic compounds (VOCs). As individual agents are not identified when monitoring for volatile organic compounds (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 volatile organic compound (VOC) Vapors, Direct Reading Instrument (DRI) equipped with a 10.6 eV photo-ionization detector (PID) was utilized to detect multiple volatile organic compound (VOC) chemicals of potential concern (COPC) simultaneously.

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

Review of the Data Fusion and Advisory System (DFAS) application, powered by SmartSite™, Weather Details dashboard, per TFC-OPS-OPER-C-67 4.2.8, for the approximate time of the Event indicate the cause of the odor is unlikely to be from Tank Farm(s) Exhauster emissions based on:

03/06/2023 @ 1400 (approximate time of Initiating Event):

- Wind Speed: 4.2 mph
- Wind Direction: 219° (out of South Southwest)
- Mixing Height: 800 feet above grade
- Stability Class: F/G (moderately stable conditions to extremely stable)

03/06/2023 @ 1415 (15 minutes after approximate time of Initiating Event):

- Wind Speed: 4.3 mph
- Wind Direction: 254° (out of West Southwest)
- Mixing Height: 1200 feet above grade
- Stability Class: F/G (moderately stable conditions to extremely stable)

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		

Vapor Monitoring Detection System (VMDS) 02/27/2023 to 03/06/2023:

Tank Farm	Exhauster	Minimum	Maximum
241-A	POR518/POR519	0 ppm	10.105 ppm
241-AW	Primary	0 ppm	35.750
241-AX	POR126/POR127	0.236 ppm	38.118 ppm
241-AY/AZ	702AZ	0 ppm	47.191 ppm

The 241-AP Primary Exhauster is not currently connected to Vapor Monitoring Detection System (VMDS). Readings are acquired in accordance with TF-OPS-IHT-037 when Stack Monitoring for Ammonia via the Vapor Monitoring Detection System (VMDS) is unavailable. Stack readings are required once per calendar day in accordance with ARP-T-041-00002.

Additional Information continued on next page.

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

Additional Information (continued):

Vapor Monitoring Detection System (VMDS) Alternate Monitoring 02/27/2023 to 03/06/2023:

Tank Farm	Exhauster	Minimum	Maximum
241-AN	Primary	11 ppm	24 ppm
241-AP	Primary	3 ppm	8 ppm
241-AY/AZ	702AZ	5 ppm	16 ppm

Based on the odor descriptors "sulfur" "rotten [eggs]", monitoring for hydrogen sulfide vapors was performed:

"Rotten Eggs": The American Industrial Hygiene Association (AIHA) Odor Threshold for Chemicals with Established Health Standards, 2nd Edition, lists hydrogen sulfide with the odor character. Therefore, direct reading instrument equipped with a hydrogen sulfide sensor was selected.

Refer to IHEA-POE-MULTI-TFCOPSOPERC67 Attachment A for more detail on the monitoring strategy for response to odors.

Additional information about odor conditions around Tank Farm facilities:

The Hanford Site Tank Operations Contractor, Washington River Protections Solutions, LLC (WRPS), Chemical Vapor Solutions Team (CVST) chartered a Fugitive Emissions (FE) sub-team. The primary focus of the Fugitive Emissions workscope was to identify odor sources around the Tank Farms work areas, characterizing the type and concentration of the odor constituents. The Fugitive Emissions 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 Fugitive Emissions sub-team's investigations found that close to the septic system (within approximately 20 feet) the odor was described as sewer. Further away from septic system (within approximately 100 feet) the odor was described as skunk. Even further away from septic system (within approximately 200 feet) the odor was described as body odor. It should be noted that odors are a perception and can vary between individuals.

The Affected Area has a long history of similar odors or odors that have been found to be associated with sources other than Tank Farm vapor source emissions, such as septic tank gaseous emissions which are known to change odor profile across a gradient when diluted by ambient atmosphere with distance from a point source. The initiating event was a stronger than normal "sulfur" odor. Sulfur odors are indicative of nearby septic related equipment. The Affected Area is directly adjacent to major roads which is often traveled by septic service vehicles en-route to numerous local septic storage tanks, multiple times a day. The closest sewer system located upwind of the Affected Area is the MO-597 Holding Tank (~160' upwind).

10-ESQ-109 Engineering Report for C-Farm Trailer Complex Temporary Sewage Holding Tanks:

The MO-596 and MO-597 Holding Tanks receive wastewater from two 5-wide trailers via gravity flow sanitary sewer lines. These temporary sewage holding tanks are below-grade tanks with a 5,000 gallon capacity. Their service frequency is every three working days for each holding tank. The normal operating volume is consistent with the 3,000 gallon hauling capacity for a typical pump truck.

Meteorological information from the Hanford Weather Station for Station #6:

- 03/06/2023 @ 1400 (approximate time of Initiating Event):
 - o Barometric Pressure: 29.356 inches of mercury and Steady
 - o Wind speed and direction: 7 mph out of Northwest
 - o Temperature: 45°F
 - o Relative Humidity: 48%

Additional Information continued on next page.

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

Additional Information (continued):

The event response Direct Reading Instrument (DRI) results were less than detectable for ammonia and hydrogen sulfide, and were less than or equal to 0.010 ppm for volatile organic compounds (VOC). The Atmospheric Stability at 1400 was moderately stable conditions to extremely stable and the Atmospheric Mixing Height was greater than 100 feet above grade. The Tank Farm Exhausters' ammonia concentrations were significantly less than the High Alarm set point, a concentration that corresponds to 2.5 ppm ammonia at ground level. While ammonia is inconsistent with the odor descriptor, ammonia is the sentinel indicator for Tank Waste Chemical Vapors. These results along and atmospheric conditions around the Affected Area at the approximate time of the event indicate the cause of the odor is unlikely to be from Tank Farm emissions.

At the approximate time of the event, the Barometric Pressure was steady. When the outside air pressure changes, there is a small pressure imbalance between the headspace of a passively ventilated tank and the outside air. This imbalance pushes air into the tank or draws it out (barometric breathing). As the outside air pressure was steady at the time of the event, passively ventilated tanks, such as septic tanks, would neither be drawing air into the tank ("breathing-in") nor pushing air out of the tank ("breathing-out"). Therefore, the cause of the odors is unlikely to be from septic tank gaseous emissions.

Refer to IHIR-00064 Attachment A for SmartSite™ Summary, Response Map, and Response Pictures.

Recommendations/Conclusions:

Recommendations:

N/A

Conclusions:

Direct Reading Instrumentation monitoring performed during response actions did not indicate further action was necessary to protect worker safety and health. As a result the area was released from restricted access and work was allowed to continue. Odor descriptors provided by Affected Workers are consistent with known sources in the area, and not indicative of Tank Vapor sources in the nearby area. Although known nearby sources exist, monitoring performed to support response actions did not readily identify a source, as readings indicated that further response action was not necessary.

Other:

Affected Personnel were offered voluntary medical examination and accepted.

EIR #2023-011

Industrial Hygienist:

Print First and Last Name

Digitally signed by _____
Signature / Date

Industrial Hygiene Level 2 Manager:

Print First and Last Name

Digitally signed by _____
Signature / Date

ODOR/VAPOR RESPONSE CARD - 241 AN FARM

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

- Date and time of event: 3-6-23 2:00pm
- Check Applicable:
 Odor Ammonia Alarm (6 ppm) Ammonia Alarm (12 ppm) Alarm (other - describe): _____
- Your name and the work you were performing:
[REDACTED] work from bucket
- Other Work Underway? Describe:
none
- Location of event (mark area on map and wind direction):
#11 farms Swirling wind
- Name(s) of others in or near the affected area:
[REDACTED]
- Was Industrial Hygiene present, who?
[REDACTED]
- Describe the odor:
 Sweet Sour Smoky Septic/Sewer Musty Rotten
 Metallic Onion Earthy Ammonia Citrus Solvent
 Other (describe):
rotten eggs
- 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):

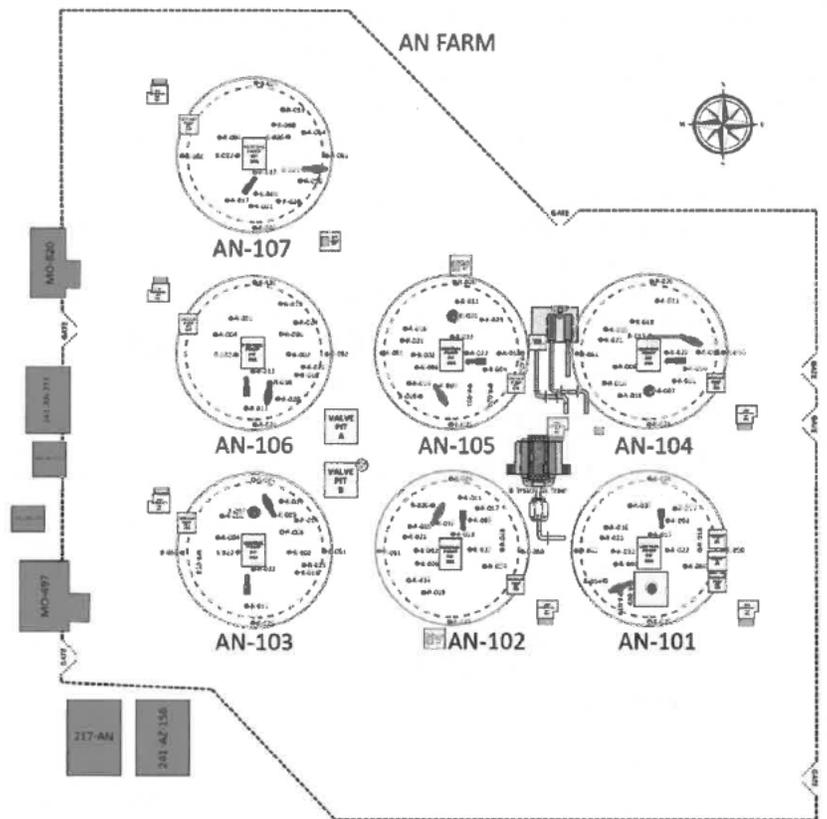
2. Provide this completed card (Page 1 & 2) to Supervisor, Industrial Hygiene, your Union Safety Representative or the CSM. If received by Supervisor/IH/U-SR, Supervisor/IH/U-SR will ensure card is provided to the CSM.

ODOR/VAPOR RESPONSE CARD - 241 AN FARM

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.



ODOR/VAPOR RESPONSE CARD - 241 AN FARM

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

- Date and time of event: 3/6/23 2:00 PM
- Check Applicable:
 Odor Ammonia Alarm (6 ppm) Ammonia Alarm (12 ppm) Alarm (other - describe): _____
- Your name and the work you were performing:
[REDACTED] - Framing pole at the top out of bucket truck.
- Other Work Underway? Describe: _____
- Location of event (mark area on map and wind direction): Swirling Wind
- Name(s) of others in or near the affected area: _____
- Was Industrial Hygiene present, who?
Yes - [REDACTED]
- Describe the odor:
 Sweet Sour Smoky Septic/Sewer Musty Rotten
 Metallic Onion Earthy Ammonia Citrus Solvent
 Other (describe):
Sulfur / Rotten Eggs
- Is source known/likely? Describe: NO
- Your symptoms? None
 Headache Dizziness Nausea Cough Fatigue
 Weakness Sore Throat Difficulty Breathing Eye Irritation Rash
 Itch Tingling Numbness Taste
 Other (describe): _____

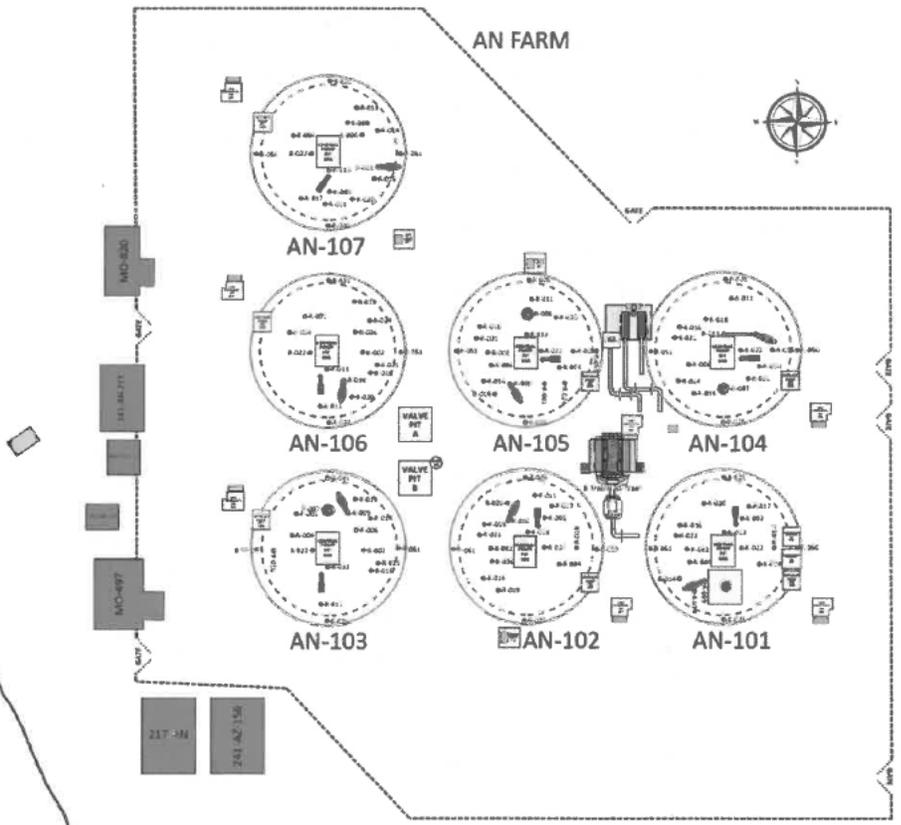
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 - c. Environmental conditions, such as hot, cold, windy, rainy;
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Event Occurrence