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: Tank Farm Projects/Construction **Date:** Apr 6, 2021

Area/Building/Location: 200E/241-AX-Farm/241-AX-103 **Approximate Time of Event:** 1350 hours

AR Number: WRPS-AR-2021-2962 **Responsible Manager:** [redacted]

EIR Number: EIR-2021-023 **Event Investigator:** [redacted]

EVENT SUMMARY PART I

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

Workers were pulling thermocouple wires through conduit on the East side of the dome of tank 241-AX-103, pit 03C at the time of the personal ammonia alarm. This task was in support of Work Order # 608123, "AX-103 Install Sluicer (Electrical) in 03C Pit."

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

Electricians (American Electric): 2

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

Workers were pulling thermocouple wires through conduit on the East side of the dome of tank 241-AX-103 inside of pit 03C at the time of the reported personal ammonia monitor alarm. The ToxiRAE alarmed and peaked at 6 ppm ammonia.

The Central Shift Manager (CSM) entered TF-AOP-015, "Response to Personal Ammonia Monitor Alarm."

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

The alarm occurred at tank 241-AX-103, pit 03C. All workers were wearing respiratory protection.

The Central Shift Manager (CSM) reviewed the Data Fusion and Advisory System (DFAS) which reported at 1411 hours: the mixing height data for AX-Farm and the mixing height data is at 1100 feet elevation. The wind was blowing Northeast/Northwest at approximately 5 mph; and the CSM determined that no additional access restrictions were required.

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

No impact to the facility occurred.

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

The work crew exited the farm and moved to a location upwind. Access to the area around the East side of AX-103 was restricted, however the Field Work Supervisor (FWS) and a worker were allowed to re-enter the area to place the safety significant wiring in to a secure location to ensure that it wouldn't be damaged. An adjacent work crew located upwind and approximately 80 feet away was initially allowed to continue working while the wind direction was being monitored, however, the wind direction shifted (~1454 hours) and the CSM confirmed that the work crew had exited the farm.

The affected workers completed Odor Response Cards. None of the workers smelled odors, no one reported symptoms, and the workers declined precautionary medical evaluation.

Industrial Hygiene Technicians (IHTs) responded to the area and took direct reading instrument (DRI) readings. DRI instrument readings were below action levels. The CSM exited TF-AOP-015 and access to the is no longer restricted.

Notifications Already Made *(Time and personnel notified)*:

FWS notified the CSM (~1356 hours).
CSM entered TF-AOP-015 (~1356 hours) and notified DOE Facility Representative (~1408 hours).

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

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EVENT SUMMARY (Continued)

Project: Tank Farm Projects/Construction Date: Apr 6, 2021

Area/Building/Location: 200E/241-AX-Farm/241-AX-103 Approximate Time of Event: 1350 hours

AR Number: WRPS-AR-2021-2962 Responsible Manager: [redacted]

EIR Number: EIR-2021-023 Event Investigator: [redacted]

Notifications Already Made *(Time and personnel notified)*:

CSM exited TF-AOP-015 (~1537) and notified DOE Facility Representative (~1537 hours).

☒ This event does not merit an Event Investigation meeting

☐ This event merits an Event Investigation meeting

Basis for Determination:

Personnel information provided (odor response card), logbook entries, and Industrial Hygiene sampling plans and results provided.

Responsible Manager:

[redacted] _____

Print First and Last Name *Signature / Date*

CAS Manager:

[redacted] _____

Print First and Last Name *Signature / Date*

EVENT SUMMARY PART II

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

Industrial Hygiene Event Investigation Report (IHIR) number IHIR-00010 reported the following key data about the event

• Field response area readings:
- Ammonia: Less than Detectable
- Volatile Organic Compounds (VOCs): Less than Detectable

• ToxiRAE 002864 (event initiating ToxiRAE) reading:
- Ammonia: Reported alarm of 6 ppm
- Ammonia: Display peak alarm of 6 ppm
- Ammonia: Data log peak alarm of 3 ppm

• ToxiRAE 003821 (present at initiating event) reading:
- Ammonia: Peak of 0 ppm

• All instruments including the MultiRAE PRO and the ToxiRAEs passed the post use function test.

• During the time of the Personal Ammonia Monitor (PAM) alarm, the Vapor Monitoring Detection System (VMDS) was down for Portable Exhauster (POR) POR126, but the VMDS for POR127 had a peak reading of 2.74 ppm between 1300 and 1400. The peak reading for the Hotel Load associated with 241-AX-Farm was 0.6 ppm. This was recorded from an AreaRAE that was placed in between POR126 and POR127.

• The worker that was wearing the PAM that alarmed stated that his posture when pulling thermocouple wires through conduit caused the personal ammonia monitor to be suffocated and that the droplets of moisture that were present on the ammonia sensor were potentially caused by the exhalation port located on the MSA Ultra Elite full-faced air purifying respirator.

• It was observed by IH that moisture saturated into the ammonia sensor of the PAM.

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EVENT SUMMARY (Continued)

Project: Tank Farm Projects/Construction Date: Apr 6, 2021

Area/Building/Location: 200E/241-AX-Farm/241-AX-103 Approximate Time of Event: 1350 hours

AR Number: WRPS-AR-2021-2962 Responsible Manager: [redacted]

EIR Number: EIR-2021-023 Event Investigator: [redacted]

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

None.

Lessons Learned or Information That the Work Force Needs Immediately:

Instruction needs to be provided to workers to be mindful of and adjust their posture if needed when pulling thermocouple wires through conduit (or other similar work) to prevent PAM suffocation. The exhalation port located on the MSA Ultra Elite full-faced air purifying respirator can build up moisture and potentially drip onto the PAM sensor.

☐ 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:

The TF-AOP-015 response plan was initiated and completed, all readings were obtained and were below action limits, and none of the affected workers experienced any symptoms.

The cause of the alarm was determined to be from the combination of moisture build up on the ammonia sensor and the suffocation of the PAM due to the electricians posture while performing work.

Responsible Manager: [redacted] [redacted] 4-12-21

Print First and Last Name *re / Date*

CAS Manager: [redacted] [redacted] 4/12/21

Print First and Last Name *Date*

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

Washington River Protection Solutions

INDUSTRIAL HYGIENE EVENT INVESTIGATION REPORT

Event Title:	PER Number:
TF-AOP-015 Entry at 241-AX Farm, AX-103 area	N/A
	IHIR Number: IHIR-00010

Date:	Time:	Location:
04/06/2021	1345	241-AX-103 area

Event Summary and Timeline:

Event Summary:

When pulling thermocouple wires through conduit located on the East side of 241-AX-103, a personal ammonia monitor (PAM) located in an American Electric Incorporation (AEI) electrician's breathing zone alarmed at approximately 1343. The PAM recorded a peak reading of 6 parts per million (ppm) ammonia. Two AEI electricians were present at the time of PAM alarm. The other electricians PAM had a peak reading of 0 ppm. The electricians notified a nearby AEI field work supervisor (FWS) and exited the area. The AEI FWS then notified an industrial hygiene technician (IHT) at 1344 who immediately responded to the PAM alarm and performed a sweep in the affected area with clearance from the Central Shift Manager (CSM) utilizing a properly functioning direct reading instrument MultiRAE PRO that monitors for both ammonia and volatile organic compounds (VOCs). Readings utilizing the MultiRAE PRO were less than detectable allowing the work crew to place the work in a safe configuration before exiting the farm. The AEI electrician who was working alongside the electrician who was wearing the PAM that alarmed and the responding IHT observed that there was moisture present on the ammonia sensor. When the responding IHT and Retrieval/Closure (R/C) Industrial Hygienist (IH) was interviewing the electrician that was wearing the PAM that alarmed, the electrician stated that his posture when pulling thermocouple wires through conduit caused the personal ammonia monitor to be suffocated and that the droplets of moisture that were present on the ammonia sensor were potentially caused by the exhalation port located on the MSA Ultra Elite full-faced air purifying respirator. After the work was placed in a safe configuration, the two electricians, FWS, and responding IHT reported to Central Shift Office (CSO) so that the two electricians could fill out the Odor/Vapor response cards as well as return their PAMs for further investigation. When investigating the PAM that alarmed, it was observed that the moisture saturated into the ammonia sensor.

Production Operations Shift IHTs and R/C IH were briefed on the appropriate response per TF-AOP-015 and were deployed into 241-AX-Farm to perform further investigation and to complete the response sweep utilizing a MultiRAE PRO that was actively monitoring for both ammonia and VOCs similar to the MultiRAE PRO that was utilized during the initial response. When entering 241-AX-Farm traversing to the East side of 241-AX-103, there were no abnormal conditions observed. All ammonia and VOC readings were less than detectable. The Production Operations Shift IHTs and R/C IH then exited 241-AX-Farm. The IHTs returned to the lab and performed the post use function test for the MultiRAE PRO used and the two PAMs. All three instruments passed their post use function test. The TF-AOP-015 was then exited.

During the time of the PAM alarm, Vapor Monitoring Detection System (VMDS) was down for Portable Exhauster (POR) 126, but VMDS for POR127 had a peak reading of 2.74 ppm between 1300 and 1400. The peak reading for the Hotel Load associated with 241-AX-Farm was 0.6 ppm. This was recorded from an AreaRAE that was placed in between POR126 and POR127.

Field Response Timeline:

1345 Approximate Time of Event - Personal Ammonia Monitor alarm

1354 Central Shift Manager notifies Production Operations Industrial Hygienist of Personal Ammonia Monitor alarm

- Personal Ammonia Monitor alarm at six (6) parts per million
- Affected Personnel reported no odors, no symptoms, and were offered voluntary medical surveillance, but declined

1355 Central Shift Manager and Production Operations Industrial Hygienist discuss placing safety significant equipment in a safe configuration

- R/C IHT who was not assigned to job, but responded to personal ammonia monitor alarm approached the Personnel at the time of the Personal Ammonia Monitor alarm

Event Summary and Timeline:

- Central Shift Manager informed Production Operations Industrial Hygienist the Retrieval/ Closure Industrial Hygiene Technician was available to escort Affected Personnel
- Production Operations Industrial Hygienist informs Central Shift Manager to direct the Retrieval/Closure Industrial Hygiene Technician to:
  - Monitor into 241-AX Farm to location of safety significant equipment
  - Continuously monitor Affected Area
  - Exit 241-AX Farm as soon as the safety significant equipment is placed in a safe configuration
  - Affected Personnel return to Central Shift Office to brief Production Operations Industrial Hygienist and fill out Odor/Vapor Response Cards (Odor/Vapor Response Card - 241-AX Farm A-6006-936)

1357 Production Operations Industrial Hygienists and Production Operations Shift Industrial Hygiene Technician Supervisor arrive at Central Shift Office
1357 Central Shift Manager briefs Production Operations Industrial Hygienists on TF-AOP-015 Entry Conditions
1358 Central Shift Manager contacts Production Operations Shift Industrial Hygiene Technicians to report to Central Shift Office for TF-AOP-015 response
1359 Production Operations Safety & Health Manager contacts Retrieval/Closure Industrial Hygienist Supervisor for Retrieval/Closure Industrial Hygienist response
1403 Production Operations Shift Industrial Hygiene Technicians arrive at Central Shift Office
1405 Central Shift Manager reviews Data Fusion and Advisor System (DFAS) application, powered by SmartSite™, Weather Details dashboard and relays information to work crews in 241-AX:

- Affected area is East Side of 241-AX-103
- Wind Direction and Wind Speed
- High Mixing Height: 1100 feet elevation
- Central Shift Manager determines no additional restricted assess required beyond affected area

1406 Production Operations Industrial Hygienist contacts Hanford Weather Station to acquire record of atmospheric conditions outside of affected area during event:

- At Weather Station 6 1345 04/06/2021
- Temperature: 65 degrees Fahrenheit
- Wind speed and direction: Out of South/South West at twelve (12) miles per hour, gusts up to 19 miles per hour.
- Relative Humidity: 19%
- Barometric Pressure: 29.32 inches of Mercury and rising

1408 Shift Office Event Notification (SOEN): "Entered AOP-015 for ToxiRAE alarm on the East side of AX-103. Access is restricted to area around East side of AX-103 unless authorized by Shift Manager. CSM"
1408 Central Shift Manager contacts Department of Energy Facility Representative about TF-AOP-015
1412 Retrieval/Closure Industrial Hygienist arrives at Central Shift Office
1413 Production Operations Industrial Hygienist contacts the Level 2 (two) Industrial Hygiene Manager
1416 Work crew (4): 2 AEI electricians, 1 AEI FWS, and 1 IHT entered CSO. AEI electricians filled out Odor/Vapor Response Cards
1419 Peak for ToxiRAE confirmed at 6 ppm ammonia. Moisture build up on sensor (observed by crew).
1420 IHT Program Supervisor sends IHT Production Operations Supervisor ToxiRAE service dates.
1422 Production Operations Shift IHTs and Retrieval/Closure Industrial Hygienist are deployed for TF-AOP-015 inside 241-AX-Farm response
1425 Production Operations Industrial Hygiene level 3 Manager arrives at CSO.
1431 EIR initiated 2021-023
1451 IHT contacts IHT Supervisor to notify that the 2 PAMs worn by the AEI electricians passed the post use function test.
1454 CSM contacts FWS for follow-up.
1503 Retrieval/Closure Industrial Hygienist in field reports that all readings are less than detectable.
1521 Retrieval/Closure Industrial Hygienist returns to CSO.
1537 Production Operations Shift IHTs post use function test for the MultiRAE used for the response passes.
1542 Shift Office Event Notification (SOEN): "Response actions for the TF-AOP-015 event have been completed and the results are below personal ammonia monitor response level. Exiting TF-AOP-015. CSM"

Sampling/Monitoring Results:

Field Response area readings:
- Ammonia: Less than Detectable [less than 1 ppm]

ToxiRAE 002864 (event initiating ToxiRAE):
- Ammonia: Reported alarm of 6 ppm
- Ammonia: Display peak alarm of 6 ppm
- Ammonia: Data log peak alarm of 3 ppm

ToxiRAE 003821 (present at initiating event):
- Ammonia: Peak of 0 ppm

SWIHD References:

- Event Response Site Wide Industrial Hygiene Database (SWIHD) Direct Reading Instrument (DRI)Survey # 21-03844 "TF-AOP-015 241-AX-103 Response"
- Personnel Escort Site Wide Industrial Hygiene Database (SWIHD) Direct Reading Instrument (DRI)Survey # 21-03847 "AX-103 TF-AOP-015 Work Area Sweep"
- Management Directed TFC-PLN-173 Site Wide Industrial Hygiene Database (SWIHD) Air Survey # 21-03710 "AX Hotel Load"
- Management Directed TFC-PLN-173 Site Wide Industrial Hygiene Database (SWIHD) Direct Reading Instrument(DRI)Survey # 21-03617 "AX/702-AZ-farm stack readings"
- Management Directed TFC-PLN-173 Site Wide Industrial Hygiene Database (SWIHD) Direct Reading Instrument(DRI)Survey # 21-03607 "A-complex AreaRAEs"

Additional Information:

At the time of the initiating event the two AEI electricians were wearing Respiratory Protection Equipment in accordance with the Management Directed Respiratory Protection Form "MDRPF-PLN-173" Task 1: Full Face Air Purifying Respirator (FF-APR) with Gas/Vapor cartridges (MSA GME Chemical Vapor).

Additional Information on the Personal Ammonia Monitors (ToxiRAEs):

The ToxiRAE response time (t90), the time needed for the ToxiRAE to read 90% full-scale of the true concentration of ammonia, is sixty (60) seconds. Blocking the gas inlet of the ToxiRAE, high humidity, and/or water droplets can disturb diffusion into the sensor, leading to false readings.

ToxiRAE 002864 (event initiating ToxiRAE):
- Put into service on 09/27/2018
- Unit Name: ToxiRAE Pro (PGM-1860)
- Unit Serial Number (SN): 6024009431
- User ID: TOXI2864
- Measure Type: Real
- Datalog Mode: Continuous
- Datalog Type: Auto
- Sample Period: sixty (60) seconds
- Calibration Time: 1/28/2021 1008
- Passed bump test 04/06/2021 @ 1456

ToxiRAE 003821 (present at initiating event):
- Put into service on 01/20/2020
- User ID: TOXI3821
- Calibration Time: 2/23/2021 0842

Atmospheric conditions outside of affected area during event provided by On-Duty Forecaster:

Weather Station six (6) 1345 04/06/2021:
- Temperature: sixty-five (65) degrees Fahrenheit
- Wind speed and direction: Out of South East at twelve (12) miles per hour, gusts up to nineteen (19) miles per hour
- Relative Humidity: nineteen (19) percent

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INDUSTRIAL HYGIENE EVENT INVESTIGATION REPORT(Continued)

Additional Information:

- Barometric Pressure: twenty-nine-point-three-two (29.32) inches of Mercury and falling

The above atmospheric conditions have been provided for background information, because the potential cause of the alarm is related to the suffocation of the PAM and the moisture build up on the ammonia sensor, the atmospheric conditions recorded above were not used to determine the cause of the alarm.

Review of the Data Fusion and Advisor System (DFAS) application, powered by SmartSite™, Weather Details dashboard for the reported time of the Event indicate the cause of the Personal Ammonia Monitor alarm is unlikely to be from POR126 or POR127 Exhauster emissions based on:

- Stability Class
- Atmospheric Mixing Height: 1100 feet above grade
- Wind Direction out of Northeast/Northwest
  - 241-AX-103 is located West of POR126 and POR127 Exhausters
- Wind Speed: Approximately 5 miles per hour

Therefore, there was a very low potential for ground level exposure from 241-AX Farm Exhausters.

Management Directed TFC-PLN-173 Site Wide Industrial Hygiene Database (SWIHD) Direct Reading Instrument(DRI) stack survey readings:

- Survey # 21-03617 "AX/702-AZ-farm stack readings":
  - 04/06/2021 @ 0803 POR126 Source Ammonia Reading: 0 ppm
  - 04/06/2021 @ 0808 POR127 Source Ammonia Reading: 0 ppm
  - 04/06/2021 @ 1202 POR126 Source Ammonia Reading: 0 ppm
  - 04/06/2021 @ 1207 POR127 Source Ammonia Reading: 0 ppm

Recommendations/Conclusions:

Recommendations:

Adjust posture when pulling thermocouple wires through conduit or other similar work to prevent PAM suffocation. Observe that the exhalation port located on the MSA Ultra Elite full-faced air purifying respirator can build up moisture and potentially drip onto the PAM sensor.

Communicate results of the Industrial Hygiene Event Investigation to the two AEI electricians.

Conclusions:

The cause of the alarm was determined to be from the combination of moisture build up on the ammonia sensor and the suffocation of the PAM due to the electricians posture while performing work.

Other:

All Affected Personnel were offered voluntary medical surveillance, but declined.
EIR(Event Investigation Report)# 2021-023.

Industrial Hygienist:

[redacted] — *Print First and Last Name*

[redacted] Digitally signed by [redacted] Date: 2021.04.12 15:51:47 -07'00' — *Signature / Date*

Industrial Hygiene Level 2 Manager:

[redacted] — *Print First and Last Name*

[redacted] Digitally signed by [redacted] Date: 2021.04.12 15:58:05 -07'00' — *Signature / Date*

ODOR/VAPOR RESPONSE CARD - 241-AX FARM

1. **Contact CSM, Complete below bulleted information and map.**

- Date and time of event: 4-6-21 2:00 pm
- Check Applicable: ☐ Odor ☑ Alarm 6 ppm ☐ Alarm 12 ppm ☐ Alarm Other: _____
- Your name and the work your were performing: [redacted] Pulling SIS Thermocouple wire
- Location of event *(mark area on map and wind direction)*: AX 103
- Name(s) of others in or near the affected area: [redacted]
- Was an IHT present? Yes
- Describe the Odor: ☐ Sweet ☐ Sour ☐ Musty ☐ Earthy ☐ Metallic ☐ Smoky ☐ Rotten ☐ Onion ☐ Septic ☐ Ammonia ☐ Cleaning Solution ☑ Other: None
- Possible Source: Handhole underground
- Your Symptoms *(if any)*: ☐ Headache ☐ Dizziness/Light-Headed ☐ Nausea ☐ Cough ☐ Fatigue/Drowsiness/Weakness ☐ Sore/Burning Throat ☐ Difficulty Breathing ☐ Watery/Irritated Eyes/Trouble with Vision ☐ Tingling/Numbness/Paralysis ☐ Rash/Itching ☑ Other: None

2. **Send this card to the Central Shift Office.**

[redacted]

ODOR/VAPOR RESPONSE CARD - 241-AX FARM

ODOR OR VAPOR ALARM EVENT

1. Notify Immediate Supervisor.
2. Contact Central Shift Manager (CSM), [redacted] complete below bulleted information and map.
   - Your name and the work you were performing
   - Your symptoms *(if any)*
   - Date and time of event
   - Location of event *(mark area on map and the wind direction)*
   - Describe the odor, if applicable
   - Name of others in or near the affected area
   - Was an IHT present?
   - Possible source
3. Complete map.
4. Complete the back of card.
5. **Send this card immediately to the Central Shift Office.**

[redacted]

ODOR/VAPOR RESPONSE CARD - 241-AX FARM

1. **Contact CSM, Complete below bulleted information and map.**

- Date and time of event: 4-6-21 2:00
- Check Applicable: ☐ Odor ☑ Alarm 6 ppm ☐ Alarm 12 ppm ☐ Alarm Other: _____
- Your name and the work your were performing: [redacted] Electrical
- Location of event *(mark area on map and wind direction)*: Ax 106
- Name(s) of others in or near the affected area: [redacted]
- Was an IHT present? yes
- Describe the Odor: ☐ Sweet ☐ Sour ☐ Musty ☐ Earthy ☐ Metallic ☐ Smoky ☐ Rotten ☐ Onion ☐ Septic ☐ Ammonia ☐ Cleaning Solution ☑ Other: N/A
- Possible Source: handhole
- Your Symptoms *(if any)*: ☐ Headache ☐ Dizziness/Light-Headed ☐ Nausea ☐ Cough ☐ Fatigue/Drowsiness/Weakness ☐ Sore/Burning Throat ☐ Difficulty Breathing ☐ Watery/Irritated Eyes/Trouble with Vision ☐ Tingling/Numbness/Paralysis ☐ Rash/Itching ☒ Other: N/A

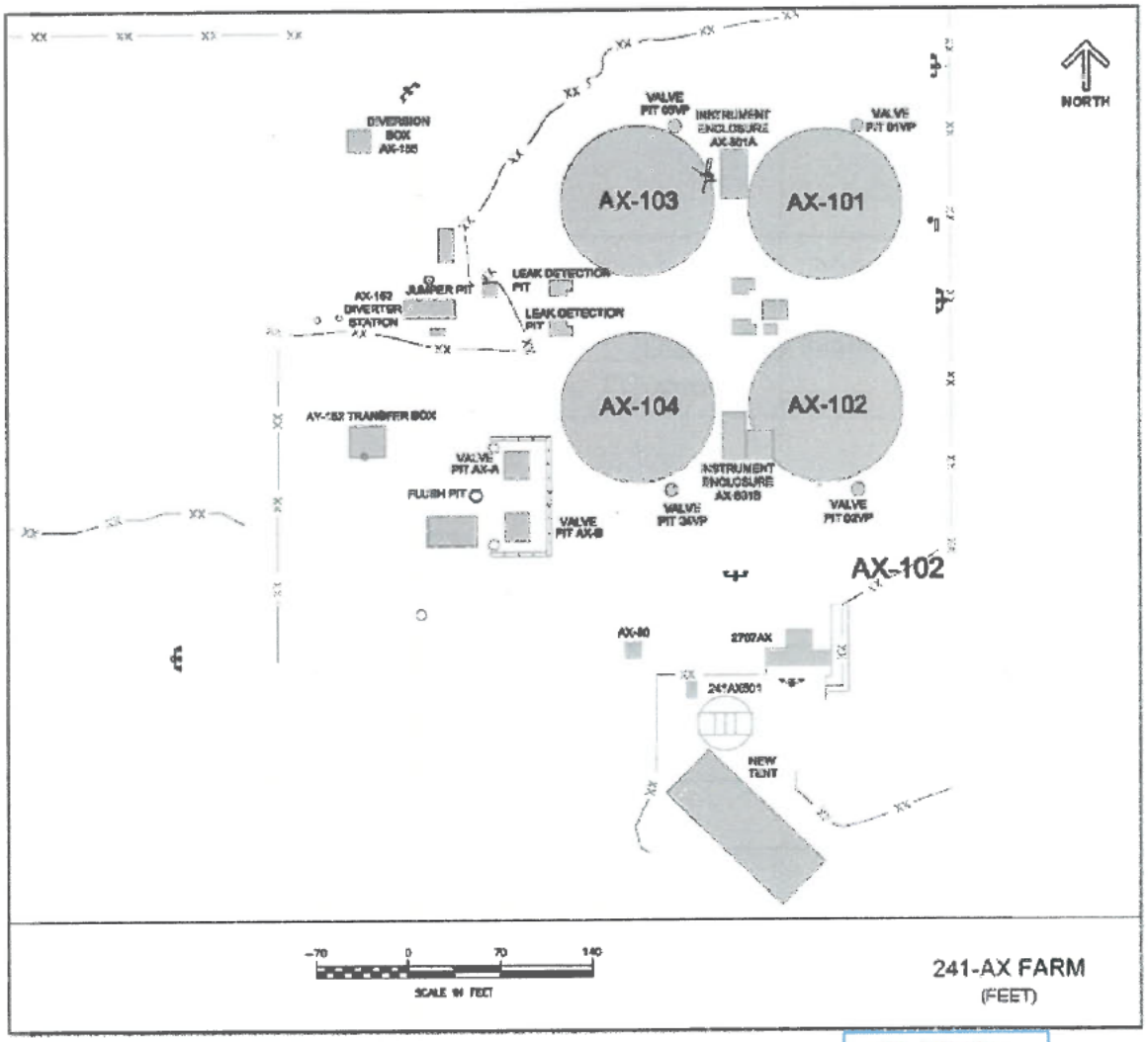
2. **Send this card to the Central Shift Office.**

[redacted]

ODOR/VAPOR RESPONSE CARD - 241-AX FARM

ODOR OR VAPOR ALARM EVENT

1. Notify Immediate Supervisor.
2. Contact Central Shift Manager (CSM), [redacted] complete below bulleted information and map.
   - Your name and the work you were performing
   - Your symptoms *(if any)*
   - Date and time of event
   - Location of event *(mark area on map and the wind direction)*
   - Describe the odor, if applicable
   - Name of others in or near the affected area
   - Was an IHT present?
   - Possible source
3. Complete map.
4. Complete the back of card.
5. **Send this card immediately to the Central Shift Office.**



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