

Hanford Tank Waste Operations & Closure (H2C)  
**EVENT REPORT FORM**

1. Project: Effluent Treatment Facility 2. Report Date: 04/29/2026  
3. Title: TFC-OPS-OPER-C-67 Response at 2025E  
4. Investigation Report Number (if applicable): EIR-2026-032 5. Revision: 0  
6. Responsible Manager: [REDACTED]  
7. Event Investigator: [REDACTED]  
8. Area/Building/Location: 200E/2025E/Process Area  
9. Date and Approximate Time of Event: Date: 04/22/2026 Time: (military) 1935 hours  
10. Associated Action Request (AR) Number: ITDC-AR-2026-1652  
11. Occurrence Report Number (if applicable): N/A  
12. Event Learning Meeting Held: Yes [ ] or No [X] Date: N/A Time: (military) N/A

**13. Brief Summary of Event: What Happened?**

At approximately 1935 hours on April 22nd, 2026, three H2C Nuclear Chemical Operators (NCOs) performing rounds/routines and housekeeping activities on the 2025E Process Floor encountered "musty", "dirty water", "sour", "rotten egg", "septic/sewer" odors. The Effluent Treatment Facility (ETF) Shift Operations Manager (SOM) was notified of the odors, and access to the Process Floor was restricted. The SOM notified the Central Shift Manager (CSM) of the reported odors.

At 1949 hours, a SOEN (Shift Operations Event Notification) message was sent to communicate initiation of TFC-OPS-OPER-C-67, *Response to Stronger than Normal Odors*, for an odor detected on the Process Floor at 2025E. Notification was made to the DOE Facility Representative.

ETF SOM offered Medical Surveillance provided by the Hanford Site medical provider (Inomedic Health Applications) to the employees, collected the odor response cards, and provided the information to the CSM. No symptoms were reported by affected personnel, all affected personnel declined precautionary medical attention, and all affected personnel including the ETF SOM indicated that mixed-waste boxes (Maverick boxes) were the source of the odors.

IHTs (Industrial Hygiene Technicians) performed monitoring of the entire Process Area and found nothing above background. Monitoring results were communicated to the CSM. Response/Recovery actions for C-67 response were completed, and access was restored to the 2025E Process Area at 2230 hours.

Refer to Industrial Hygiene Event Investigation Report (IHIR), IHIR-00135, *TFC-OPS-OPER-C-67 at 2025E on 04/22/2026*, for additional detail (attached to this EIR).

**14. What Should Have Happened?**

Employees are always encouraged to speak up, ask questions, and report unusual or strong odors. As biological processes and their associated odors are a normal part of water treatment plant operations, communication to the workforce about potentially odorous activities and materials, especially if new or moved odor sources could affect facility operations should occur.

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**15. Key Facts from Investigation:**

To summarize the conclusions of Industrial Hygiene Event Investigation Report IHIR-00135, "TFC-OPS-OPER-C-67 at 2025E on 04/22/2026":

A review of the DFAS (Data Fusion and Advisory System) application, powered by SmartSite™, Weather Details dashboard, and VMDS (Vapor Monitoring Detection System) exhausters, ammonia readings for the approximate time of the event indicate the cause of the odor event is unlikely to be from Tank Farm Exhauster emissions.

As suspected by the affected personnel, one of the Mixed Low Level Waste containers "Maverick Box" was confirmed to be the source of the odor by the Field Response Team. Two stainless-steel "Maverick boxes" permanently located on the 2025E Process Floor between the Main and Secondary Treatment Trains serve as 90-day accumulation areas for bagged Mixed Low-Level process waste.

- o According to the inventory sheet, bagged Liquid Effluent Retention Facility (LERF) Basin-44 filters were placed in one of the waste boxes on 04/20/2026. Odorous compounds emitted from the filters accumulated within the relatively airflow-constrained container for about two days, resulting in minor odors detectable near the source.
- o The odorous condition is very likely to be primarily caused by emission from loaded LERF (Liquid Effluent Retention) Basin-44 filters.
- o The gasses responsible for the stronger-than-normal odors were not significant enough in concentration to result in over-exposure as per applicable Occupational Exposure Limits (OELs).

Action(s): As biological processes and their associated odors are a normal part of water treatment plant operations, the following actions will be taken [the actions will be managed within Condition Report ITDC-CR-2026-1652]:

- ⇒ Communicate to the workforce about potentially odorous activities and materials, especially if new or moved odor sources could affect facility operations (as recommended by IH in IHIR-00135).
- ⇒ Dispose of spent LERF Basin 44 filters in a Roll-on/Roll-off container rather than the Maverick boxes in the 2025E Process area (as recommended by SOM in ITDC-AR-2026-1652).

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

Impact of the approximate 3-hour restriction to the facility was minimal as no processes were running on the 2025E Process Floor.

**17. Problem Statement (Who, What, Where, When, and Consequence/Impact):**

N/A

**18. Event Causal Matrix Summary:**

N/A

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26. Signatures

Prepared By: (Event Investigator)

[Redacted]  
Name (First, Middle Initial, Last)

Responsible Manager Approval:

[Redacted]  
Name (First, Middle Initial, Last)

CAS Manager Approval:

[Redacted]  
Name (First, Middle Initial, Last)



# INDUSTRIAL HYGIENE EVENT INVESTIGATION REPORT (IHIR)

Event Title:  
TFC-OPS-OPER-C-67 at 2025E on 04/22/2026

IHIR Number:  
IHIR-00135

IHEI Number:  
N/A

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## INDUSTRIAL HYGIENE EVENT INVESTIGATION REPORT (IHIR) (Continued)

<b>Date:</b> 04/22/2026	<b>Time:</b> Approximately 1935	<b>Location:</b> 2025E Process Floor
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### Event Summary and Response Timeline:

#### Event Summary:

At approximately 1935 on April 22<sup>nd</sup> 2026, three H2C employees encountered “musty”, “dirty water”, “sour”, “rotten egg”, “septic/sewer” odors while performing rounds/routines and housekeeping activities on the 2025E Process Floor. No symptoms were reported and all affected personnel declined precautionary medical attention. All affected personnel indicated that mixed-waste boxes were the source of the odors.

#### Response Timeline:

- 1949 Shift Operations Event Notification (SOEN): “Initiating TFC-OPS-OPER-C-67 Response to Stronger than Normal Odors for an odor detected on the Process Floor at 2025E. Access to the Process Floor is Restricted at this time. CSM”
- 2000 Central Shift manager (CSM) contacts the Direct Feed Low Activity Waste (DFLAW) Industrial Hygiene (IH) Manager to request support for field response actions.
- 2005 DFLAW IH Manager contacts the Production Operations (PO) IH Supervisor to request assignment of shift Industrial Hygiene Technician (IHT) resources to support field response actions, and to begin preparing Direct Reading Instrumentation (DRI) equipment.
- 2014 DFLAW IH Manager notifies CSM: In-route to Central Shift Office (CSO)
- 2033 DFLAW IH Manager provides preliminary briefing to the Level 2 IH Manager and the Environmental, Health, Safety, & Quality (ESH&Q) Deputy Manager
- 2045 DFLAW IH Manager arrives at CSO to support field response actions
- 2052 Data Fusion and Advisory System (DFAS) for current weather condition at time of event:
- Mixing Height: 1500 feet above grade
  - Wind Speed: 14.1 miles per hour
  - Wind Direction: From 277° (West)
  - Stability Class: D (Neutral conditions)
  - Exhauster Ammonia Concentration: DFAS does not indicate that displayed stack concentrations are above alarm limits.
- 2112 TFC-OPS-OPER-C-67 Attachment A: “Response Plan” Page 1 signed by DFLAW IH Manager, CSM, RadCon
- 2118 PO Shift IHTs arrive at CSO and are briefed on field response actions:
- Perform general area monitoring of 2025E Process Floor as per IHSP-PO-MULTI-TFCOPSOPERC67:
    - Ammonia (NH<sub>3</sub>): Action Level – 12 ppm
    - Hydrogen Sulfide (H<sub>2</sub>S): Action Level – 0.5 ppm
    - Volatile Organic Compounds(VOCs) 10.6 eV PID: Action Level – 2 ppm
  - Perform monitoring at waste container location, then perform general area sweep of 2025E Process Floor.
- 2124 Field Response Team (PO Shift IHTs, DFLAW IH Manager) depart CSO in route to 2025E
- 2140 Effluent Treatment Facility (ETF) Shift Operations Manager (SOM) reports that the waste containers contain waste bags.
- 2146 Field Response Team arrives at 2025E and initiate performance of field response actions.
- 2156 Field Response Team completes 2025E survey and performs post-use-function test.
- 2205 DFLAW IH Manager provides event briefing to ETF SOM, ETF Shift Operators, and ETF Radiological Control Technicians (RCTs).
- 2220 DFLAW IH Manager provides results of field response actions to CSM:
- Ammonia (NH<sub>3</sub>): Less than detectable (< 1.0 ppm)
  - Hydrogen Sulfide (H<sub>2</sub>S): Less than detectable (< 0.1 ppm)
  - Volatile Organic Compounds(VOCs) 10.6 eV PID: 0.010 ppm
  - A noticeable “musty”, “sewage” odor present when waste box lid was opened but dissipated quickly when door closed.
- 2220 DFLAW IH Manager and CSM sign TFC-OPS-OPER-C-67 Attachment A: Response Plan Page 2.
- 2228 DFLAW IH Manager provides event update briefing to Level 2 IH Manager and ESH&Q Deputy Manager.
- 2230 SOEN: “Completed TFC-OPS-OPER-C-67 Response at the Process Floor at 2025E. IHT results are at or below background. Access to the Process Floor is restored. CSM”

## INDUSTRIAL HYGIENE EVENT INVESTIGATION REPORT (IHIR) (Continued)

### Event Response Sampling/Monitoring Results:

#### Direct Reading Instrument Monitoring Results:

- DRI readings acquired during field response actions:

Location	Ammonia (NH <sub>3</sub> )	Hydrogen Sulfide (H <sub>2</sub> S)	Volatile Organic Compounds (VOCs) 10.6 eV PID
2025E Process Floor - General Area	< 1 ppm	< 0.1 ppm	< 0.010 ppm
Waste Boxes "Maverick Totes" - Source	< 1 ppm	< 0.1 ppm	0.010 ppm
Sump 1 (20B-TK-1) - Source	< 1 ppm	< 0.1 ppm	< 0.010 ppm

#### Sampling Results:

- Grab samples were not collected for analysis during field response actions

#### SWIHD References:

26-02383: "TFC-OPS-OPER-C-67 Response at 2025E Process Floor"

## INDUSTRIAL HYGIENE EVENT INVESTIGATION REPORT (IHIR) (Continued)

### Additional Information:

#### Odor Source Information:

2 waste boxes are permanently stationed in the 2025E Process Floor, centrally located between the Main Treatment Train (MTT) and Secondary Treatment Train (STT) (See: Figure 1). These boxes, colloquially known as “Maverick boxes”, are used as 90-day accumulation areas for bagged Mixed Low-Level process waste. Each box is constructed of stainless-steel sheet and has hinged access doors on the sides and top.

As indicated by provided Odor/Vapor Response Cards, the likely odor source was the waste container containing Liquid Effluent Retention Facility (LERF) Basin-44 filters. The basin filters are used to remove debris from meteoric water that is periodically pumped from the top of the basin cover into the basin envelope after unspecified periods of accumulation. This waste stream is contaminated with solids from aeolian processes and transient biota accumulation. Microbiological processes use these energy sources for metabolism producing various odorous gases as a bioproduct; as the meteoric water is exposed to atmosphere and sunlight, primary production biologics sequester carbon as organic compounds, which are in-turn digested by decomposer organisms. This results in an abundance of odorous gaseous compounds contained within in the liquid as dissolved gases, or as gas bubbles attached to particle solids. During filtering changes in pressure allow dissolved gasses to accumulate in bubbles, organic and inorganic particulates and gas bubbles are concentrated on the filter surface, and gasses are released to atmosphere.

The Basin 44 filter media was replaced on 04/20/2026 at approximately 0900 due to high filter media loading as indicated by high differential pressure across the media during basin 44 cover pumping. During removal of filter media the Industrial Hygiene Technician indicated significantly odorous conditions: “*There was a horrid smell of sewer, swamp, and cattle feed lot noticed by all*” (SWIHD DRI survey 26-02301 “ETF: Replace Cover Pump Filters at Basin 44”). As spring typically provides abundant meteoric water, strong wind events to deliver nutrient particulate, and mild water temperatures best-suited for aquatic biological processes, it is likely that the filter media contained above average organic material loading and hence very strong odor emission.

According to the waste container inventory sheet the LERF Basin-44 filters were placed (bagged/wrapped) into the waste box on 04/20/2026 (See: Figure 2). Continuous emission of odorous compounds from the filter media through the bag/wrap into the waste box occurred over approximately 2 days. Because the waste container is airflow-constrained from the surrounding atmosphere, on-going emission of odorous compounds resulted in relative concentration due to atmospheric volume for diffusion being limited. As the waste container is not completely sealed, some limited emission does occur, resulting in odors in close-proximity to the source.

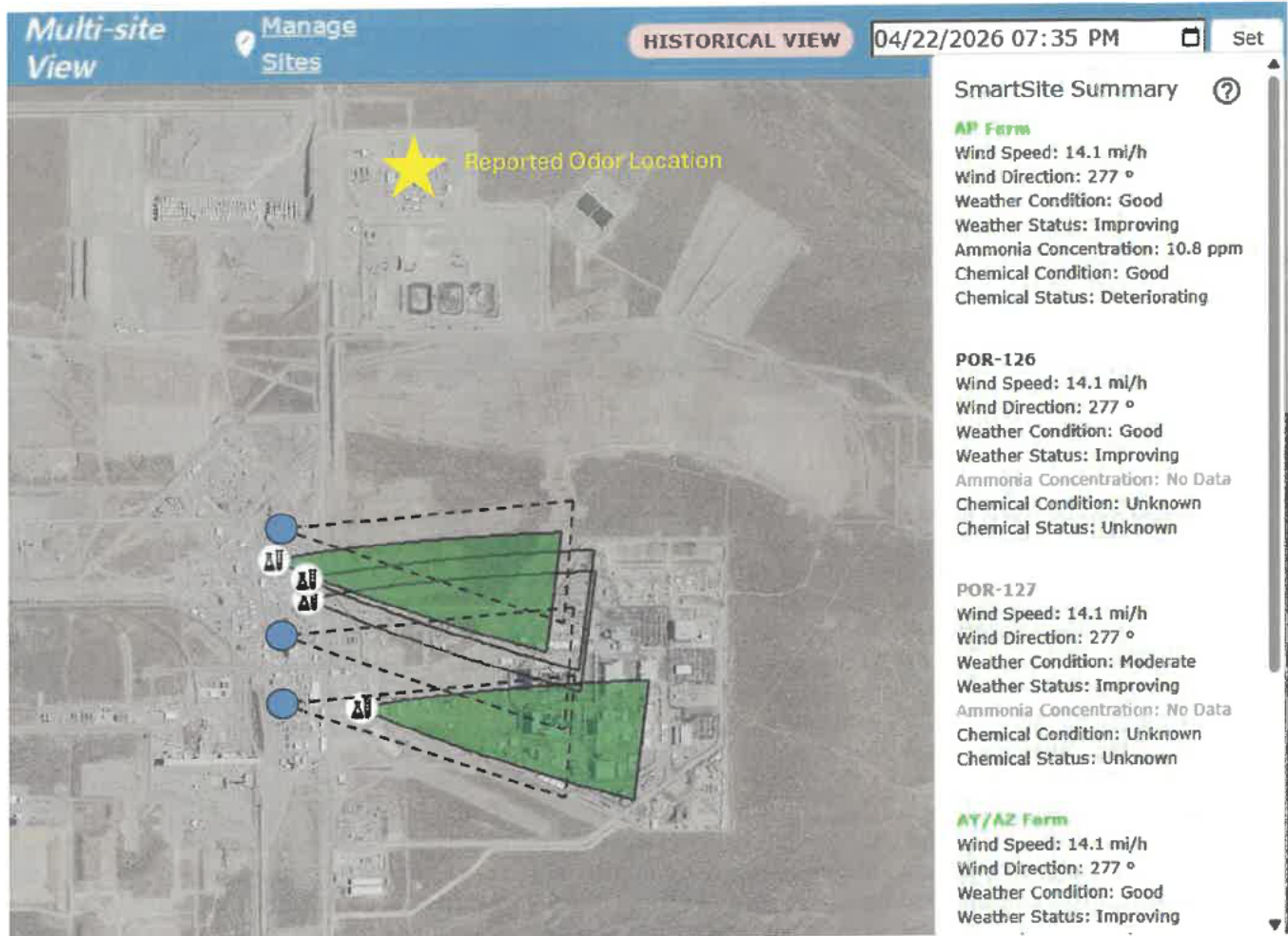
NOTE: Additional Information continued on next page.

# INDUSTRIAL HYGIENE EVENT INVESTIGATION REPORT (IHIR) (Continued)

Additional Information continued:

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

DFAS Multi-Farm View Exhauster Plume Model: 04/22/2026 @ 1935 (approximate time of event):



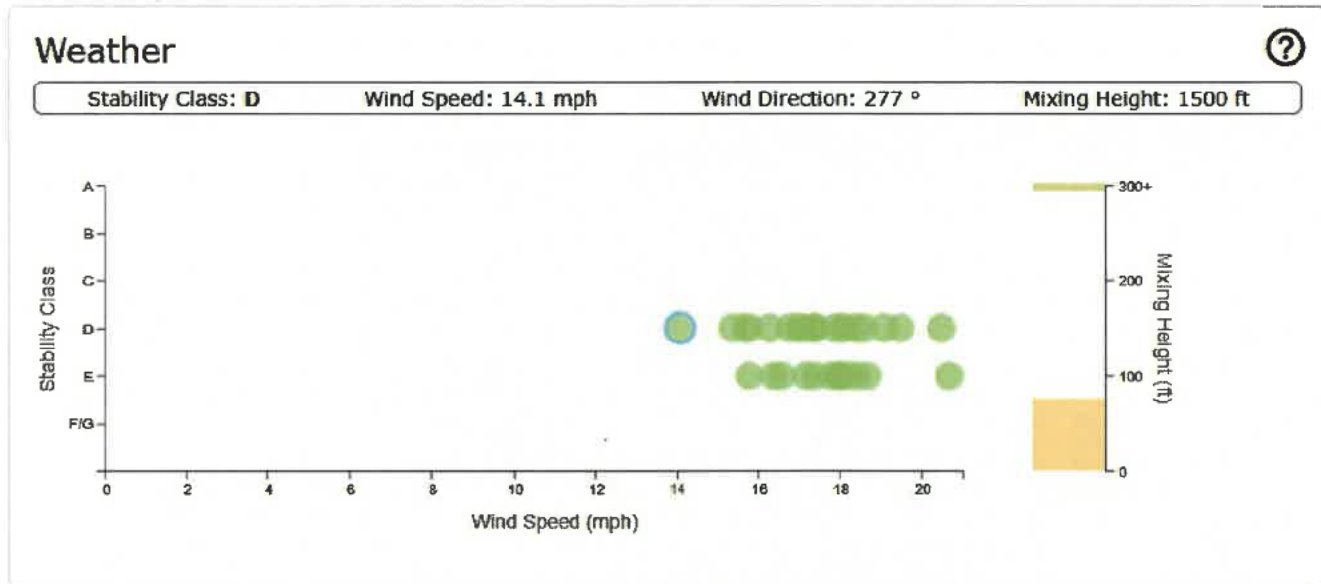
NOTE: 241-AN Farm, 241-AW Farm, and A Farm (POR-518/519) Exhausters are not connected to the DFAS; however, approximate exhauster plumes were added based on other modeled plumes.

NOTE: DFAS Review continued on next page.

## INDUSTRIAL HYGIENE EVENT INVESTIGATION REPORT (IHIR) (Continued)

DFAS Review continued:

DFAS Weather Conditions: 04/22/2026 @ 1935 (approximate time of event):



The atmospheric stability is the tendency of the atmosphere to increase or decrease the vertical displacement of air through mode of force such as the wind. This function is closely related to the ability of the atmosphere to disperse pollutants. Atmospheric stability cannot be measured directly. Rather, it is generally estimated based on the wind velocity and the solar radiation (Casal, 2008). The stability is also impacted by the slope of the temperature relative to altitude (environmental lapse rate) (CushmanRoisin, 2012). The National Oceanic and Atmospheric Administration (NOAA) Pasquill stability classes are denoted by 7 letters ranging from A (extremely unstable conditions) to G (extremely stable conditions). An unstable atmosphere is characterized by significant vertical displacement of air, a negative vertical temperature gradient (the temperature decreases with height), along with frequent fluctuations in wind direction and strong solar radiation. A stable atmosphere has low turbulence, positive vertical temperature (temperature increases with height), little fluctuation in the wind direction, and limited solar radiation (Casal, 2008). Exhauster plumes may move horizontally (stability classes A, B, C, and D) or vertical (stability classes E, F, and G). Horizontal plumes found during unstable and neutral states are further characterized by their pattern: fanning, fumigation, coning, looping, and lofting. At Hanford Tank Farms, exhauster plumes may interact with ground level during stability class A conditions if the Mixing Height constricts plume dispersion at sufficiently low levels (typically less than 100 ft. above grade). The concentration of plume-borne contaminants at the ground level receptor is dependent on the concentration of the emission and the factor of dilution occurring through dispersion as the plume emission moves away from the emission point.

#### References:

- Casal, J. (2008). Chapter 6 Atmospheric dispersion of toxic or flammable clouds. Industrial Safety Series, 8, 195-248. Retrieved from: [https://doi.org/10.1016/S0921-9110\(08\)80008-0](https://doi.org/10.1016/S0921-9110(08)80008-0)
- Cushman-Roisin, B. (2012). Environmental Transport and Fate- Smokestack Plumes (lecture slides). Dartmouth College: Thayer School of Engineering. Retrieved from: <https://cushman.host.dartmouth.edu/courses/engs43/Smokestack-plumes.pdf>

NOTE: Additional Information continued on next page.

## INDUSTRIAL HYGIENE EVENT INVESTIGATION REPORT (IHIR) (Continued)

Additional Information continued:

### Review of Vapor Monitoring and Detection System (VMDS) data:

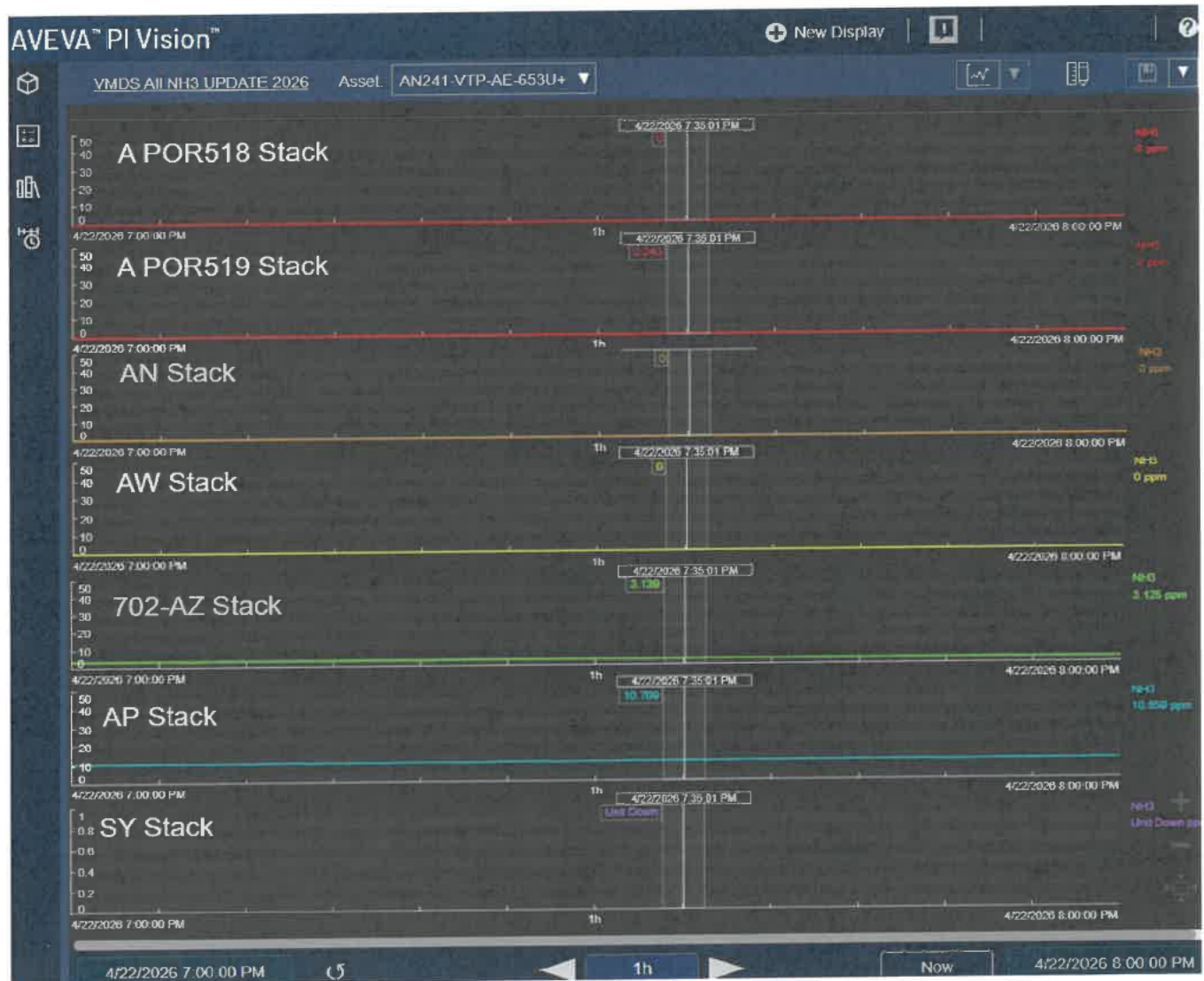
Active ventilation systems exhaust a mixture of all connected tanks with output through a "stack". The emission of exhaust ventilation systems is monitored either continuously by the VMDS or periodically by alternate monitoring.

### VMDS exhauster ammonia readings on 04/22/2026 @ 1937 (approximate time of event):

Farm	Exhauster	Ammonia Concentration
241-A	POR 518	0 ppm
	POR 519	0.243 ppm
241-AN	Primary	0 ppm
241-AW	Primary	0 ppm
241-AY/AZ	702AZ	3.139 ppm
241-AP	Primary	10.769 ppm
241-SY	Primary	N/A <sup>*A</sup>

\*A Null data is provided, however stack monitoring instrumentation is out of service.

### AVEVA™ PI Vision™ Exhauster Stack Ammonia Concentrations @ 04/22/2026 @ 1935 (approximate time of event)



NOTE: VMDS Review continued on next page.

## INDUSTRIAL HYGIENE EVENT INVESTIGATION REPORT (IHIR) (Continued)

VMDS Review continued:

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	460 ppm	920 ppm
241-AW	Primary		
241-AY/AZ	702AZ		
241-SY	Primary	310 ppm	620 ppm

Vapor Monitoring Detection System (VMDS) summary: 04/15/2026 @ 1935 to 04/22/2026 @ 1935:

Tank Farm	Exhauster	Minimum <sup>*B</sup>	Maximum <sup>*B</sup>
241-A	POR518/POR519	0 ppm	18.703 ppm
241-AN	Primary	0 ppm	0 ppm
241-AP	Primary	5.034 ppm	38.124 ppm
241-AW	Primary	0 ppm	0 ppm
241-AY/AZ	702AZ	3.591 ppm	4.303 ppm
241-SY	Primary	0 ppm	28.240 ppm

<sup>\*B</sup> VMDS Alternate Real Time Monitoring performed 04/15/2026 to 04/22/2026 for 241-A, 241-AN, 241-AW and 241-AY/AZ primary exhausters.

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.

Applicable SWIHD surveys:

Survey Number	Title	Date
26-02185	VMDS Alternative Real Time Monitoring	04/15/2026
26-02223	VMDS Alternative Real Time Monitoring	04/16/2026
26-02255	VMDS Alternative Real Time Monitoring	04/17/2026
26-02271	VMDS Alternative Real Time Monitoring	04/18/2026
26-02277	VMDS Alternative Real Time Monitoring	04/19/2026
26-02295	VMDS Alternative Real Time Monitoring	04/20/2026
26-02338	VMDS Alternative Real Time Monitoring	04/21/2026
26-02368	VMDS Alternative Real Time Monitoring	04/22/2026

NOTE: VMDS Review continued on next page.

## INDUSTRIAL HYGIENE EVENT INVESTIGATION REPORT (IHIR) (Continued)

VMDS Review continued:

### Vapor Monitoring Detection System (VMDS) Alternate Monitoring 04/15/2026 to 04/22/2026:

Tank Farm	Exhauster	Minimum	Maximum
241-A	POR518/POR519	0 ppm	3 ppm
241-AN	Primary	0 ppm	9 ppm
241-AP	Primary	N/A	N/A
241-AW	Primary	8 ppm	9 ppm
241-AY/AZ	702AZ	0 ppm	6 ppm
241-SY	Primary	N/A	N/A

A 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 PAM alarm is unlikely to be from Tank Farm Exhauster emissions; as concentrations at emission points was insufficient to allow for the possibility of notable concentrations at the ground receptor, weather conditions presented low likelihood for ground-plume interaction.

### Monitoring Selections Based on Information Provided by Affected Workers:

Based on the odor descriptors provided upon submission of the Odor/Vapor Response Cards DRI monitoring for Ammonia, VOCs (10.6 eV PID), and Hydrogen Sulfide was requested:

#### ETF specific monitoring strategy:

Minimal odors associated with stagnant water is an anticipated occurrence at the Effluent Treatment Facility (ETF). Low levels of Hydrogen Sulfide (H<sub>2</sub>S) gas, Ammonia (NH<sub>3</sub>), and various Volatile Organic Compounds (VOCs) may be produced by the stagnant water at the ETF when within a confined area for an extended period.

Low levels of Hydrogen Sulfide (H<sub>2</sub>S) gas is produced at the ETF when sulfate containing water, low airflow, and sulfur seeking bacteria stagnate within a confined area for an extended period. Hydrogen Sulfide gas has an offensive distinct rotten egg odor that is detectable at very low concentrations. The American Industrial Hygiene Association (AIHA) Odor Threshold for Chemicals with Established Health Standards, 2nd Edition, lists the lower range of odor values for H<sub>2</sub>S as 40 ppt (or 0.04 ppb or 0.00004 ppm). While odors may be readily perceived, concentrations are still well below levels of worker exposure concern. H<sub>2</sub>S gas production rate is a function of sulfate/bacteria/organics concentrations, temperature, and dissolved oxygen. Relatively moderate levels of sulfate ions are both introduced (via sulfuric acid) and inherent in the wastewater treated at the ETF. High source concentrations are not expected as the ETF wastewater streams do not contain the high sulfate/bacteria/organics found with sanitary waste (i.e. sewage). The limiting factor at the ETF is primarily the relatively low bacterial levels, followed by moderate to low levels of sulfate.

The resolution of direct reading instrument (DRI) equipped with a H<sub>2</sub>S sensor (0.1 ppm) is comparatively inadequate as a detection tool at the concentrations perceived by the human olfactory sense. While the resolution of the direct reading instrument (DRI) equipped with a H<sub>2</sub>S sensor is insufficient to detect H<sub>2</sub>S at the lower range of odor threshold values, it is sufficient to detect H<sub>2</sub>S at concentrations that approach the established occupational exposure limits (OELs).

- Action Limit: 0.5 ppm
- ACGIH 8-hour time-weighted-average (TWA) Threshold Limit Value (TLV): 1 ppm
- ACGIH 15-minute short-term-exposure-limit (STEL) TLV: 5 ppm

Low levels of NH<sub>3</sub> gas are produced at the ETF primarily as the result of natural decay of organic material through biological decomposition. The biological decomposition process produces a great number of odors from decomposition of organic material into simpler intermediate chemical compounds which can be re-introduced into the environment in the form of solids (particulates), liquids (volatile organic compounds such as alcohols, organic acids), and gases (H<sub>2</sub>S, sulfur dioxide [SO<sub>2</sub>], ammonia, methane[CH<sub>4</sub>]) (Silva, 2002; Texas A&M, 2009). NH<sub>3</sub> gas has an offensive pungent, irritating odor that is detectable at very low concentrations. The American Industrial Hygiene Association (AIHA) Odor Threshold for Chemicals with Established Health Standards, 2nd Edition, lists the lower range of odor values for H<sub>2</sub>S as 43 ppb (or 0.043 ppm). While odors may be readily perceived, concentrations are still well below levels of worker exposure concern.

NOTE: Monitoring Selections Information continued on next page.

## INDUSTRIAL HYGIENE EVENT INVESTIGATION REPORT (IHIR) (Continued)

### Monitoring Selections Information continued:

The resolution of direct reading instrument (DRI) equipped with a NH<sub>3</sub> sensor (1 ppm) is comparatively inadequate as a detection tool at the concentrations perceived by the human olfactory sense. While the resolution of the direct reading instrument (DRI) equipped with an NH<sub>3</sub> sensor is insufficient to detect NH<sub>3</sub> at the lower range of odor threshold values, it is sufficient to detect NH<sub>3</sub> at concentrations that approach the established occupational exposure limits (OELs).

- Action Limit: 12 ppm
- ACGIH 8-hour time-weighted-average (TWA) Threshold Limit Value (TLV): 25 ppm
- ACGIH 15-minute short-term-exposure-limit (STEL) TLV: 35 ppm

Low levels of volatile organic compounds (VOC) are produced at the ETF primarily as the result of natural decay of organic material through biological decomposition. The biological decomposition process produces a great number of odors from decomposition of organic material into simpler intermediate chemical compounds which can be re-introduced into the environment in the form of solids (particulates), liquids (volatile organic compounds such as alcohols, organic acids), and gases (H<sub>2</sub>S, SO<sub>2</sub>, NH<sub>3</sub>, CH<sub>4</sub>) (Silva, 2002; Texas A&M, 2009). DRI monitoring for VOCs at ETF is utilized for indication purposes only.

### Monitoring Strategy References:

- Refer to [TOC-IH-58956](#) for more detail on the monitoring strategy for response to odors.
- Refer to [SIHEA-DFLAW-ETF-001](#) Attachment F for more detail on the monitoring strategy utilized for routine work at ETF.

### Chemicals associated with Odor Descriptors provided by O/VRCs and Associated Odor Thresholds:

The American Industrial Hygiene Association “Odor Thresholds for Chemicals with Established Health Standards” (2<sup>nd</sup> Edition) and the American Industrial Hygiene Association “Odor Thresholds for Chemicals” (4<sup>th</sup> Edition) provides a reference list of chemicals associated with typical odor descriptors. Below is the reference list of chemicals associated with odor descriptors provided by O/VRCs and their applicable OELs. Chemicals where the odor detection concentration is similar to or greater than the associated OEL are notated in gray.

### Dirty Water:

The American Industrial Hygiene Association “Odor Thresholds for Chemicals with Established Health Standards” (2<sup>nd</sup> Edition) and the American Industrial Hygiene Association “Odor Thresholds for Chemicals” (4<sup>th</sup> Edition) does not reference the odor descriptor “dirty water”. The odor descriptor “earthy” provides for chemical odor thresholds commonly associated with “dirty water” not otherwise provided on submitted Odor/Vapor Response Cards (i.e., “musty”, “sour”, “rotten egg”).

Odor Descriptor	Chemical	Lowest Detection Concentration	Lowest Recognition Concentration	Applicable OEL
Earthy	Ethyl Acrylate (Acrylic acid ethyl ester)	0.0000066 ppm	0.00037 ppm	5 ppm TWA (ACGIH TLV)
	2-Ethylhexyl Acetate	0.073 ppm	0.137 ppm	N/A
	Ethyl Mercaptan (Ethanethiol)	0.000017 ppm	0.00029 ppm	0.5 ppm TWA (ACGIH TLV)
	Hexyl Propionate	0.008 ppm		10 ppm TWA (ACGIH TLV)
	Mesityl Oxide (Methyl Isobutyl Ketone)	0.017 ppm	0.05 ppm	20 ppm TWA (ACGIH TLV)
	Picolines (Methyl Pyridines)	0.0026 ppm	0.0236 ppm	1 ppm TWA (ACGIH TLV)
	Propionaldehyde (Propanal)	0.001 ppm	0.015 ppm	100 ppm TWA (ACGIH TLV)
	Quinoline	0.0057 ppm	0.0095 ppm	N/A
	Turpentine	0.0000003 ppm	4.49 ppm	20 ppm TWA (ACGIH TLV)

NOTE: Chemicals Associated with Odor Descriptors continued on next page.

## INDUSTRIAL HYGIENE EVENT INVESTIGATION REPORT (IHIR) (Continued)

Chemicals Associated with Odor Descriptors continued:

### Musty:

Odor Descriptor	Chemical	Lowest Detection Concentration	Lowest Recognition Concentration	Applicable OEL
Musty	2-Butoxyethanol	0.043 ppm	0.35 ppm	2 ppm TWA (ACGIH TLV)
	2-Ethoxyethanol	0.3 ppm	0.54 ppm	5 ppm TWA (ACGIH TLV)
	2-Ethylhexyl Alcohol (2-Ethyl Hexanol)	0.024 ppm	N/A	N/A
	Acetaldehyde	0.001 ppm	0.015 ppm	25 ppm Ceiling (ACGIH TLV)
	Acetophenone	0.002 ppm	0.59 ppm	10 ppm TWA (ACGIH TLV)
	Benzene Hexachloride (Lindane)	0.00013 ppm	N/A	0.5 mg/m <sup>3</sup> TWA (ACGIH TLV)
	Butyraldehyde (Butanal)	0.00035 ppm	0.004 ppm	N/A
	Diethylamine	0.00076 ppm	0.012 ppm	5 ppm TWA (ACGIH TLV)
	Ethylenediamine	1.3 ppm	4.5 ppm	10 ppm TWA (ACGIH TLV)
	Furfuryl Alcohol (2-furanmethanol)	8 ppm	N/A	10 ppm TWA (ACGIH TLV)
	Hydrogen Cyanide	0.009 ppm	1.99 ppm	4.7 ppm Ceiling (ACGIH TLV)
	Isobutyl Alcohol (Isbutyl Cellosolve)	0.019 ppm	0.11 ppm	50 ppm TWA (ACGIH TLV)
	Isophorone	0.0003 ppm	0.53 ppm	5 ppm Ceiling (ACGIH TLV)
	Isopropyl Alcohol	1.6 ppm	3.2 ppm	400 ppm TWA (NIOSH REL)
	Methyl n-butyl Ketone (2-Hexanone)	0.024 ppm	N/A	1 ppm TWA (NIOSH REL)
	n-Butyl Acrylate	0.00055 ppm	0.0027 ppm	2 ppm TWA (ACGIH TLV)
	Nickel Carbonyl	0.5 ppm	N/A	0.05 ppm Ceiling (ACGIH TLV)
	n-Propyl Alcohol (1-Propanol)	0.03 ppm	0.081 ppm	100 ppm TWA (ACGIH TLV)
	Phosgene	0.12 ppm	0.12 ppm	0.1 ppm TWA (ACGIH TLV)
	Quinoline	0.0057 ppm	0.0095 ppm	N/A

### Rotten Egg:

The odor descriptors "rotten" and "septic/sewer" have been included with "rotten egg" due to the similarities in odor profiles and to accommodate variability in individual response to this specific odor profile.

Odor Descriptor	Chemical	Lowest Detection Concentration	Lowest Recognition Concentration	Applicable OEL
Rotten	Diethanolamine	N/A	0.279 ppm	1 mg/m <sup>3</sup> TWA (ACGIH TLV)
	Dimethylamine	0.00076 ppm	0.012 ppm	5 ppm TWA (ACGIH TLV)
	Ethyl Mercaptan	0.000017 ppm	0.00029 ppm	0.5 ppm TWA (ACGIH TLV)
	Hydrogen Sulfide	0.00007 ppm	0.00046 to 0.00093 ppm	1 ppm TWA (ACGIH TLV)
	Methyl Mercaptan	0.0000002 ppm	0.000071 ppm	0.5 ppm TWA (ACGIH TLV)

Odor Descriptor	Chemical	Lowest Detection Concentration	Lowest Recognition Concentration	Applicable OEL
Rotten Eggs	Hydrogen Sulfide	0.00007 ppm	0.00046 to 0.00093 ppm	1 ppm TWA (ACGIH TLV)

Odor Descriptor	Chemical	Lowest Detection Concentration	Lowest Recognition Concentration	Applicable OEL
Septic/Sewer	Hydrogen Sulfide	0.00007 ppm	0.00046 to 0.00093 ppm	1 ppm TWA (ACGIH TLV)
	Butane (see Propyl Mercaptan)			1000 ppm STEL (ACGIH TLV)
	Ethyl Mercaptan	0.000017 ppm	0.00029 ppm	0.5 ppm TWA (ACGIH TLV)
	Methyl Mercaptan	0.0000002 ppm	0.000071 ppm	0.5 ppm TWA (ACGIH TLV)
	Propane (see Propyl Mercaptan)			1000 ppm STEL (ACGIH TLV)
	Propyl Mercaptan (1-Propanethiol)	0.000013 ppm	0.00074 ppm	0.5 ppm Ceiling (NIOSH REL)

### Sour:

Odor Descriptor	Chemical	Lowest Detection Concentration	Lowest Recognition Concentration	Applicable OEL
Sour	Acetic Acid	0.0004 ppm	0.02 ppm	10 ppm TWA (ACGIH TLV)
	Acetic Anhydride	0.14 ppm	0.36 ppm	1 ppm TWA (ACGIH TLV)
	n-Butylamine	0.08 ppm	0.24 ppm	5 ppm Ceiling (ACGIH TLV)
	Methyl Alcohol	3.05 ppm	7.63 ppm	200 ppm TWA (ACGIH TLV)
	Propionic Acid	0.00099 ppm	0.0083 ppm	10 ppm TWA (ACGIH TLV)
	Pyridine	0.007 ppm	0.021 ppm	1 ppm TWA (ACGIH TLV)
	Toluene	0.089 ppm	0.93 ppm	20 ppm TWA (ACGIH TLV)
	Vinyl Acetate	0.12 ppm	0.4 ppm	10 ppm TWA (ACGIH TLV)
	Isohexanoic Acid	0.0004 ppm		N/A

NOTE: Chemicals Associated with Odor Descriptors continued on next page.

## INDUSTRIAL HYGIENE EVENT INVESTIGATION REPORT (IHIR) (Continued)

Chemicals Associated with Odor Descriptors continued:

### References:

- American Industrial Hygiene Association (2013). Odor Thresholds for Chemicals with Established Health Standards, 2<sup>nd</sup> Edition.
- American Industrial Hygiene Association (2024). Odor Thresholds for Chemicals, 4<sup>th</sup> Edition.
- Agency for Toxic Substances and Disease Registry Environmental Odors Library. Retrieved from: <https://www.atsdr.cdc.gov/odors/php/search/index.html>

### Event Response Pictures:

Figure 1: Mixed Low Level Waste Container (Odor Source):



NOTE: Event Response Pictures continued on next page.



## INDUSTRIAL HYGIENE EVENT INVESTIGATION REPORT (IHIR) (Continued)

Additional Information continued:

### Additional Information Acronyms:

ACGIH	American Conference of Governmental Industrial Hygienists
AIHA	American Industrial Hygiene Association
AL	Action Limit
COPC	chemicals of potential concern
DFAS	Data Fusion & Advisory System
DRI	direct reading instrument
ETF	Effluent Treatment Plant
eV	electron-volts
GHS-SDS	Globally Harmonized System Safety Data Sheet
H <sub>2</sub> S	Hydrogen Sulfide
LERF	Liquid Effluent Retention Facility
NH <sub>3</sub>	Ammonia
NOAA	National Oceanic and Atmospheric Administration
OEL	Occupational Exposure Limit
OSHA	Occupational Safety & Health Administration
O/VRC	Odor/Vapor Response Card
PEL	Permissible Exposure Limit
PID	photoionization detector
ppb	parts per Billion
ppm	parts per million
QRA	Quantitative Risk Assessment
REL	Recommended Exposure Limit
RPE	Respiratory Protection Equipment
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.

## INDUSTRIAL HYGIENE EVENT INVESTIGATION REPORT (IHIR) (Continued)

Additional Information continued:

### Additional Information References:

- Agency for Toxic Substances and Disease Registry Environmental Odors Library. Retrieved from: <https://www.atsdr.cdc.gov/odors/php/search/index.html>
- 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.
- American Industrial Hygiene Association (2024). Odor Thresholds for Chemicals, 4<sup>th</sup> Edition.
- American Industrial Hygiene Association (2013). Odor Thresholds for Chemicals with Established Health Standards, 2<sup>nd</sup> 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](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)
- Memo WRPS-1904672.1, TANK FARM EXHAUST ~ CK CONCENTRATION ALARM/ ACTION LEVELS FOR AMMONIA
- National Institute of Standards and Technology. NIST Chemistry WebBook, SRD#69. Retrieved from: <https://webbook.nist.gov/chemistry/>
- NIOSH Pocket Guide to Chemical Hazards. Dept. of Health and Human Services, Public Health Service, Centers for Disease Control and Prevention, National Institute for Occupational Safety and Health.
- 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>
- [SIHEA-DFLAW-ETF-001](#) "Routine Work Activities at ETF" Attachment F
- [TOC-IH-58956](#). Monitoring Strategy for Response to Odors: Common Odor Sources in the 200 East, 200 West, & 600 Areas.
- Casal, J. (2008). Chapter 6 Atmospheric dispersion of toxic or flammable clouds. Industrial Safety Series, 8, 195-248. Retrieved from [https://doi.org/10.1016/S0921-9110\(08\)80008-0](https://doi.org/10.1016/S0921-9110(08)80008-0)
- Cushman-Roisin, B. (2012). Environmental Transport and Fate- Smokestack Plumes (lecture slides). Dartmouth College: Thayer School of Engineering. Retrieved from <https://cushman.host.dartmouth.edu/courses/engs43/Smokestack-plumes.pdf>

**Conclusions & Recommendations:**

**Conclusions:**

- A 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 event is unlikely to be from Tank Farm Exhauster emissions. Ammonia concentrations at engineered emission points were insufficient to allow for the possibility of notable concentrations at the ground receptor. And weather conditions presented low likelihood for ground-plume interaction.
- As suspected by the affected personnel, the Mixed Low Level Waste container “Maverick Box” was confirmed to be the source of the odor by the Field Response Team. The odorous condition is very likely to be primarily caused by emission from loaded LERF Basin-44 filters. The gasses responsible for the stronger-than-normal odors are not significant enough in concentration to result in over-exposure as per applicable Occupational Exposure Limits.

**Recommendations:**

- Biological processes and associated odors are common and expected in water-treatment-plants. Communication that odors are common and expected for water treatment plant processes should be increased. Pertinent information about potentially odorous activities and materials that have been found to be odorous should be communicated to the general plant workforce when pertinent, especially when the location (or change in location) of emergent odor sources is likely to impact facility operations. Facility culture needs to include knowledge that odors are normal and typical of various operational activities and does not necessarily equate to overexposure.

**Other:**

N/A

**Associated Documents:**


iCAS Number: N/A

EIR Number: EIR-2026-032



**Industrial Hygienist:**

 <i>Print First and Last Name</i>	
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**Industrial Hygiene Level 3 Manager**

 <i>Print First and Last Name</i>	<i>Signature / Date</i>
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**Industrial Hygiene Level 2 Manager:**

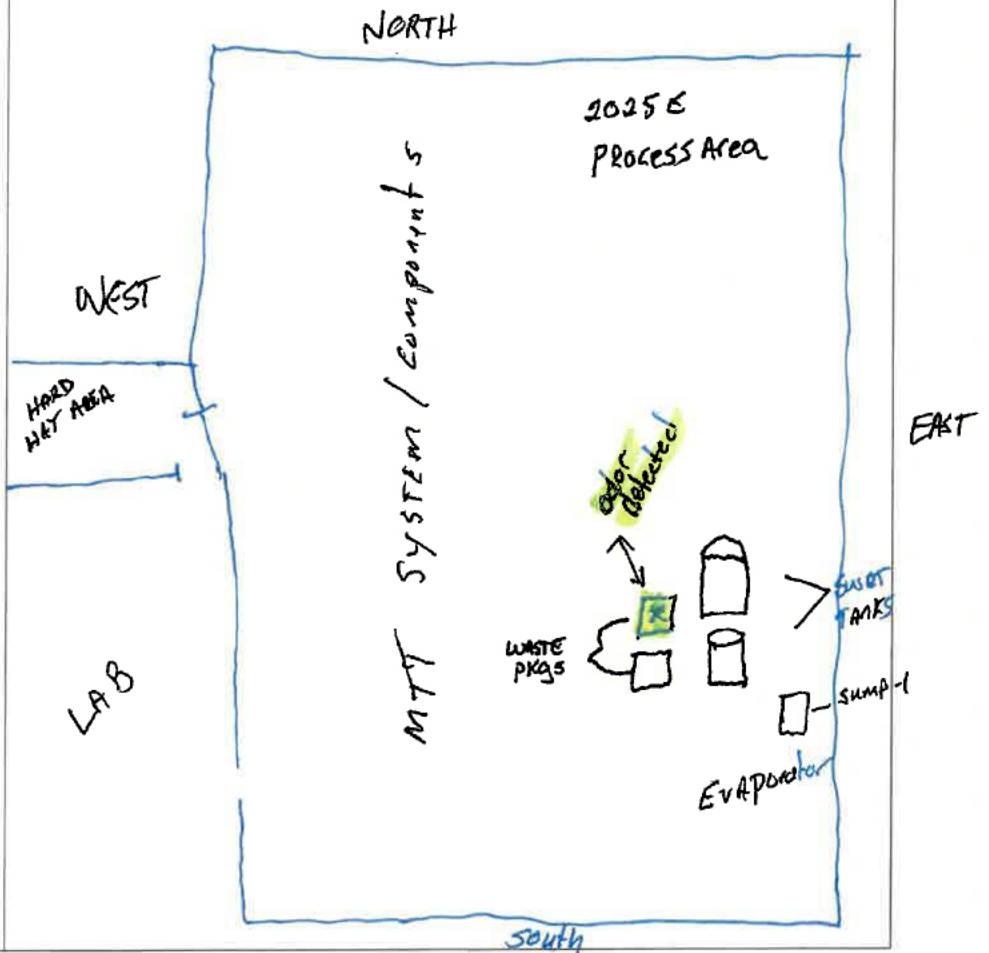
 <i>Print First and Last Name</i>	 <i>Signature / Date</i>
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### ODOR/VAPOR RESPONSE CARD

**Instructions:**

1. Notify Immediate Supervisor.
2. Contact Central Shift Manager (CSM), at (509) 373-2689.
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

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

• Date and time of event: 4-22-26 1935

• Check Applicable:

- Odor     Ammonia Alarm (6 ppm)     Ammonia Alarm (12 ppm)     Alarm (other - describe): \_\_\_\_\_

• Your name and the work you were performing:

[Redacted] STT Round

• Other Work Underway? Describe:

House Keeping

• Location of event (mark area on map and wind direction):

ETF Process floor

• 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): Dirty Water

• Is source known/likely? Describe:

Mixed Waste Maverick

• 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

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

• Date and time of event: 4/22/26 1935

• Check Applicable:

Odor     Ammonia Alarm (6 ppm)     Ammonia Alarm (12 ppm)     Alarm (other - describe):

• Your name and the work you were performing:

[Redacted] performing counts and routines.

• Other Work Underway? Describe:

N/A

• Location of event (mark area on map and wind direction):

ETF process floor

• Name:

[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): Dirty water, rotten eggs

• Is source known/likely? Describe:

Mixed waste material containing used basin 44 filters.

• 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

1. Complete below information and map (Page 1). [REDACTED] 4-22-26

- Date and time of event: 4-22-26 ~~1945~~ 1935
- Check Applicable:  
 Odor     Ammonia Alarm (6 ppm)     Ammonia Alarm (12 ppm)     Alarm (other - describe):
- Your name and the work you were performing:  
[REDACTED] rounds
- Other Work Underway? Describe:  
none
- Location of event (mark area on map and wind direction):  
2025 E process Floor
- 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: mixed waste box
- 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.

