

EVENT INVESTIGATION REPORT

**Investigation of TY Farm AOP-015 Entry
Event Investigation Report 2019-013**

	4/9/2019
 Event Investigation Team Lead	Date
	4/9/2019
 Responsible Manager	Date

Executive Summary

On Tuesday, March 19, 2019 at 1300, near TY Tank Farm, odors were noticed by craft workers. Four electricians driving in two different vehicles, with windows down, along Camden Road between 242T (T Evaporator) and 23rd street, noticed an odor. When they arrived at the TX/TY change trailer, there were able to identify the odor as a “rotten egg smell”. The lead electrician notified their supervisor via cell phone. The Field Work Supervisor (FWS) instructed the group to stop work activities and return to 272WA. The FWS notified the Central Shift Office (CSO). None of the electricians exhibited any signs or symptoms. All were offered evaluation at HPMC. All declined. The CSO made notifications per procedure, and via SOEN, and an Event Investigation was initiated. The results of the investigation were indeterminate. Several *possible* sources were outlined in the APGEMS report; however, tank vapors were considered an *unlikely* source.

Investigation Summary

On Tuesday, March 19, 2019 at 1230, a pre-job brief was held at 272WA for annual routine clean-and-inspect work in TY Farm. In attendance were all the assigned personnel. This included four electricians and the FWS. The brief covered the work order scope, job hazards, required PPE, and response to potential abnormal conditions. It also covered duties and responsibilities of each of the personnel. The brief was concluded at 1250, and four electricians in two trucks (two in each truck) left 272WA and transited to the TX/TY Change trailer. Each vehicle had at least one window partially rolled down.

At 1255, as the vehicles proceeded toward the intersection of 23rd and Camden, one electrician in the lead vehicle indicated that he thought he “smelled something” but was not able to positively identify the odor. The two trucks continued their transit and stopped on the west side of TY Farm, next to the fence. The vehicles pulled up next to each other. The electrician who initially notice a smell told the electricians in the other vehicle that he smelled something, and was now able to identify it as a rotten egg smell. While talking, all four electricians were able to identify a rotten egg smell while seated in their respective vehicles.

At 1300, the lead electrician used his mobile phone, called the FWS, and informed him all four of the electricians detected a rotten egg smell. The FWS instructed the electricians to secure their work activities and return to 272WA.

At 1302, the FWS called the CSO and reported the odors at TY Farm. The CSO proceeded to take actions for an AOP-015, including making required notifications, and requesting assistance from the IH response team. At 1324, a SOEN was sent out: “Entering AOP-015 for NE Corner of TY Farm on Camden Avenue”.

At 1305, the electricians returned to 272WA and gathered in the conference room. They were asked if anyone was exhibiting symptoms and if anyone wanted to be evaluated at HPMC. All declined evaluation and indicated they had no symptoms. The electricians completed Odor Response Cards and submitted them to the FWS. At 1328, the cards were received at the CSO.

At 1326, the Industrial Hygiene Technicians (IHTs) from AN Farm and COMS arrived at the CSO. They were directed to assist in taking readings and samples at TY Farm.

At 1349, IHTs from ST Farm arrive at the CSO. They were briefed and directed to TY Farm to assist in the event response.

At 1355, IHTs at the event site retrieved grab samples; one sample from east of TY farm on Camden Avenue, and one from the service road west of TY Farm. The results of all the grab samples were later determined to be less than detectable.

At 1511, IHTs identified a sinkhole west of TY Farm that was full of water and decaying organic material (brush and tumbleweeds).

At 1536, IHTs briefed the CSO that on the readings of the Direct Reading Instruments (DRIs), no further protective actions are necessary to prevent worker exposure. The IHTs also informed the CSO of the sinkhole full of water and debris west of TY Farm (which was determined to be the catch basin for T Farm) and that the area should be further investigated as a potential source of the odor.

In lieu of an event investigation meeting, because of the quick response and short odor time, individual interviews were conducted with key personnel. They were able to confirm an already detailed timeline of events, which was put together in real time by the responding IHTs and the CSO.

The source of the odors were indeterminate. Several *potential* sources are outlined in the APGEMS report; however, tank vapors were listed as an *unlikely* source.

Event Timeline

3/19/2019

- 1230 Electricians hold a pre-job brief for and annual “clean-and-inspect” at TY Farm. All necessary personnel present
- 1255 Four electricians (in two trucks) leave 272WA and begin transit to TY Farm change trailer
- 1300 Electricians arrive at parking area outside TX/TY change trailer. All four electricians notice an odor of “rotten egg” when the windows are rolled down. Lead Electrician calls FWS to report the Odor. The FWS tells the electricians to return to 272WA
- 1305 Electricians return to 272WA and meet in conference room to fill out Odor Response cards.
- 1324 SOEN “Entering AOP-015 for NE Corner of TY Farm on Camden Avenue”
- 1353 IHTs are briefed and dispatched to TY Farm.
- 1328 Odor Response cards received at CSO
- 1414 Road blocks are in place at 23rd and Camden and dirt access road west of Camden
- 1458 Initiated Event Investigation for TY Farm AOP-015 entry
- 1501 FacRep notified of event investigation initiation
- 1536 IHTs brief CSO on results of DRI surveys

Meteorological Data

Event	Investigation of TY Farm AOP-015 Event					
Date/time of event	March 19, 2019 1300					
Location	Outside TY Farm					
Odor	Sulfur					
Symptoms	None					
DRI results during event	Less than the Level of Detection (LOD) for ammonia (NH ₃) and Volatile Organic Compounds (VOCs) on sweep of reported odor location					
Possible source(s)	Odors from settling pond west of TY Farm					
Weather conditions on March 19, 2019 1300 (data from Weather Station 19)	Time	Wind Dir (From)	Wind Speed	Ave Temp	Bar	RH
	1245	322.0	7.9	52.8F	29.5	41.9
	1300	318.1	7.1	53.4F	29.5	41.4
	1315	314.4	6.1	54.3F	29.5	41.2
Waste disturbing or tank work in adjacent area	No waste disturbing activities or tank work occurring in TY Farm or adjacent areas.					

IH Response Team Sample Results (Adjacent to TY Farm)

Agent	Result*
NH ₃	<IDL
H ₂ S	<IDL
N ₂ O	<IDL
Hg	<IDL
VOC	<IDL

*Instrument Detection Limit

Compensatory Measures

- The electricians called the FWS who had them stop their activities and return to 272WA.

Preliminary Extent of Condition Review

- No extent of condition exists for this investigation.

Discussion of Potential Sources

- There is a settling pond to the west of TY Farm with organic matter floating in water. The settling pond has accumulated a large amount of water from snowmelt.(Deemed Plausible but indeterminate)
- Decaying/thawing of animal carcasses, vehicle catalytic converter production of H₂S and propane releases. (Deemed unlikely)
- The MO-2313/2607-W14 sewers (Deemed unlikely)

Discussion of Barriers That Could Have Impacted the Cause

- There were no barriers identified that could have impacted the cause

Recommendations/Proposed Corrective Actions

- No recommendations or proposed corrective actions.

Positives aspects from the event

- The event response was well coordinated from the CSO.
- Electricians immediately informed their supervisor of the odors and met at the 272WA conference room to collect as much information as possible.
- Industrial Hygiene was very effective in coordinating personnel to assist in the initial odor response.

Figures:

1. CSO logs for Investigation of TY Farm AOP-015 event
2. Aerial views of T, TY, and TX Farms and adjacent settling pond.

Attachments:

1. APGEMS-TF Report
2. Industrial Hygiene Investigation Report (IHIR) (Includes Odor Response cards)

03/19/2019 -- 13:24	Entered TF-AOP-015 Response to Reported Odors or Unexpected Changes to Vapor Conditions. [REDACTED] reports that 4 electricians were heading to TY Farm to perform electrical PMs. While traveling south on Camden Ave from 23rd St, the electricians reported smelling a rotten egg odor near the NE corner of TY Farm. None of the workers are experiencing symptoms and have declined medical evaluation.
03/19/2019 -- 13:31	Odor response cards have been received by the CSO. Review of the Odor response cards reveal that 2 individuals were on the west side of TY farm near the change trailer and the other two were on the east side of the farm on Camden Ave.
03/19/2019 -- 13:53	IHTs have been briefed and dispatched to TY Farm.
03/19/2019 -- 14:14	ER-2 reports that road blocks are in place at 23rd and Camden, and also at 23rd and a dirt access road west of Camden.

Figure 1- CSO Logs for investigation for TY Farm AOP-015 entry



Figure 2 – Aerial views of T, TY, and TX Farms and adjacent settling pond.

Attachment 1
APGEMS-TF Report

APGEMS-TF Plume Modeling for March 11, 2019 AOP-015 Event

An AOP-015 event was reported at 1:00 PM on March 19, 2019 near the TY tank farm. Four electricians in two vehicles (both with windows in the open position) traveling along Camden Ave. between 23rd Ave. and the T Evaporator (242T/242T271) encountered odors (rotten egg, rotten, and metallic “rusty exhaust”). Vehicle 1 (containing two electricians) encountered the odor first along Camden Ave, vehicle 2 (containing two electricians) encountered the odor after arriving at the TX/TY change trailer (MO817). **Error! Reference source not found.** provides a map of the AOP-015 locations, wind direction and potential odor sources.

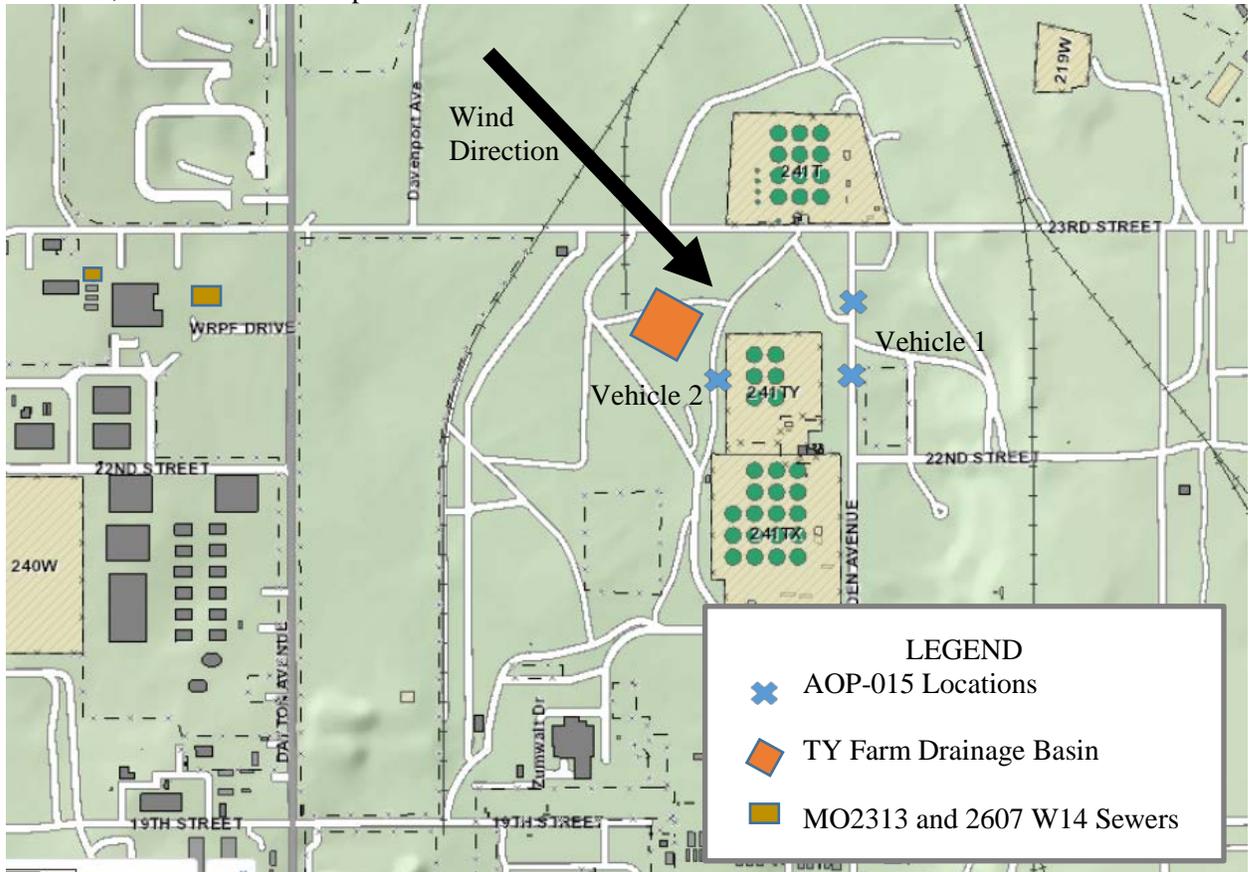


Figure 1. AOP-015 Locations in Relation to Potential Vapor Sources.

TY tank farm is a potential source of interest given that the AOP-015 locations surround the tank farm. Rotten egg smells are typical of H_2S evolution from sewer systems and swamps. Therefore, nearby sewers are also potential sources of interest. The MSA sewer map and pumping log were checked to determine upwind sewers of interest. The MO2313 and 2607-W14 sewers qualified as sewers to be investigated. A drainage basin directly upwind of the AOP-015 locations was observed to have standing water at the time of the AOP-015 event (see Figure 2). Although this basin may not qualify as a ‘swamp’, based on its proximity to the odor events it is a potential source of interest to be investigated.



Figure 2. Photo of Drainage Basin to the West of TY-Farm.

APGEMS-TF Modeling Results Conclusions:

The APGEMS Tank Farm plume model (APGEMS-TF) was used to support investigation of the AOP-015 event and evaluate nearby sources as potential culprits. Results of the modeling are summarized as follows:

- **Tank waste vapors were an unlikely source of the AOP-015 odors.** The reasoning for this conclusion is as follows:
 - Modeling results indicated that odiferous compounds in the tanks were at least three orders of magnitude below their odor thresholds at the AOP-015 locations.
 - Modeling results indicated that all COPCs were $\leq 0.01\%$ of OEL at the AOP-015 locations.
 - The TY, TX T-Farm tanks do not contain H_2S or mercaptans that would lead to a “rotten egg smell”.
 - Meteorological conditions at the time AOP-015 event were consistent with exhaling of the tank vapors through passive breather filters, but these conditions are accounted for by using maximum emission rates as inputs to the models.

- **The drainage basin adjacent to and NW of TY-Farm is a plausible but indeterminate source of the AOP-015 odors.** The reasoning for this conclusion are as follows:
 - The AOP-015 location was directly downwind of the drainage basin.
 - APGEMS-TF modeling indicates that the AOP-015 locations were in the center of the drainage basin plume and in or near the highest concentration region.
 - Hydrogen sulfide - H_2S (rotten egg smell) is often emitted from swampy areas due to the decomposition of plant organic matter.

- The source is indeterminate because IH workers were unsuccessful in observing a smell from the drainage basin on the day following the AOP-015 event, although they were unable to get close to or downwind of the basin.
- **The MO-2313/2607-W14 sewers are an unlikely source of the AOP-015 odors.** The reasoning for this conclusion are as follows:
 - APGEMS-TF modeling indicates that the AOP-015 locations were outside of the sewer system plume.
 - The sewers are judged to be unlikely sources due to the long distance between the sewer systems and the AOP-015 locations (700 to 1000 meters), the modest pumping activities at the sewer on the day of the event (200 gallons) and modeling that put the AOP-015 locations outside the sewer system plume.
- **Other potential but unlikely sources include decaying/thawing of animal carcasses, vehicle catalytic converter production of H₂S and propane releases.**
 - Dead animals (rabbits) are common in the area, but no animal carcasses were reported.
 - With modern vehicles and computer controlled fuel mixtures, rotten egg smells from catalyst convertors are much less common than in the past.
 - No sources of propane were reported in the area of the AOP-015 event.

Selection of Sources to be Modeled:

Two of the workers involved in the AOP-015 event reported a rotten egg smell, one person reported a rotten smell and the fourth worker reported a metallic (rusty exhaust) smell. Rotten egg smells are almost uniquely associated with hydrogen sulfide (H₂S). To a lesser extent, mercaptans can also be associated with rotten egg smells. H₂S and mercaptans are both products of microbial decomposition of organic matter found in swamps and sewers. Mercaptans are also an additive to propane to allow leak detection of an otherwise odorless gas. Cars can sometimes smell like rotten eggs when catalytic converters produces H₂S under fuel rich conditions. Decaying animal carcasses release decarboxylated lysine (cadaverine) that can be extremely pungent and may be associated with a rotten smell. No dumpsters were identified in the region near the AOP-015 event, and no pesticide or herbicide spraying was conducted on the day of the event. Therefore, sewers, swampy areas, automobile vehicles, dead animals and propane sources are all potential odor sources that should be considered and modeled as appropriate.

MSA confirmed that three sewer systems (MO-2313, 2607-W1 and MO906) located within 500 – 1000 meters of the AOP-015 location were serviced on the day of the event and one (2607-W14) that was not. MO-2313 and 2607-W14 were upwind of the receptor locations whereas 2607-S1 and MO906 were downwind or lateral to the receptor locations. Outhouse bathrooms were located at the south end of T-Farm, which was lateral to the receptor locations. While pumping of sewer systems definitely causes an increase to their odor levels, these systems continuously emit odors to varying degrees based on use and atmospheric conditions.

A drainage basin to the West of TY-Farm was full of water on the day of the AOP-015 event. The ambient temperature was relatively warm on the day of the odor event (55 °F) and resulted in a significant snowmelt, potentially leading to accumulation of drainage water.

Passively ventilated tanks as exist in TY Farm periodically emit vapors under certain meteorological conditions. The three mechanisms and corresponding meteorological conditions for vapor emissions from passively ventilated tanks are as follows: 1) equilibration of headspace pressure with outside pressure (falling barometric pressure), 2) buoyancy effect due to differences in headspace gas and outside air density (ambient temperatures cooler than headspace temperatures), and 3) venturi effect around passive breather filters (wind velocity). The barometric pressure was falling at the time of the event, the ambient air temperature was cooler than the tank headspace temperatures and the wind speed was 7.1 mph, which all support a prediction that the tanks were emitting vapors during the time of the AOP-015 event.

TY, TX and T-Farm tanks do not contain H₂S or mercaptans, but they do have some chemicals with pungent odors that were considered. Chemicals of potential concern in the tanks were also modeled to ensure that concentrations were below levels of concern.

Based on the above information and wind conditions at the time, the following sources were investigated using APGEMS-TF modeling to determine likelihood of being the source for the odor event.

- TY-Farm PBFs
- Drainage basin West of TY-Farm
- MO-2313/2607-W16 sewer systems

APGEMS-TF Modeling:

The APGEMS-TF model generates a 3-dimensional wind field utilizing meteorological data from 30 weather stations on the Hanford site. The model then utilizes measured mixing heights and stability classes to estimate mixing and dispersion of contaminants within the wind field. The model estimates dispersion of chemical contaminants from a source and estimated concentrations downwind of the source, but does not estimate a source location based on a receptor location.

Wind speeds during the AOP-015 period were typical of when AOP-015 events are normally reported. At 1:00 PM on 3/19/19, the Hanford meteorological station located in the 200W area (Station 19 near PFP) had a wind speed of 7.1 mph and wind direction from the NW (42 deg. west of north). One would expect relatively moderate to high levels of mixing due to the moderate wind speed, but horizontal plume widths would be relatively narrow due to a steady wind direction. The stability class was neutral, so vertical mixing is expected to be moderate as well.

Modeling of PBFs as Potential Sources:

The most likely tank vapor chemicals to produce a pungent odor comparable to a rotten egg smell are 4-carbon compounds such as butanal and butanol. Table 1. shows the highest levels of butanal and butanol measured in each of the tank headspaces (SWIDS) and a comparison to their reported odor thresholds. Other 4-carbon compounds were evaluated, but were in less significant concentrations than butanal and butanol. Tank TY-105 had significantly higher concentrations of butanal and butanol than the other four tanks. In a worst case comparison (comparing the lower end of the odor threshold range to the maximum headspace concentration), the TY-105 headspace butanal concentration is two orders of magnitude above the odor threshold. All the butanol headspace concentrations were below its odor threshold and therefore are not a potential source of the odors.

Table 1. Odor Causing Chemicals within TY Tank Farm Tanks
(TX Farm is similar but with lower concentrations)

	241-TY-101	241-TY-102	241-TY-103	241-TY-104	241-TY-105	Smell	Odor Threshold	Reference
	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)		(ppm)	
Butanal	0.008	0.002	0.078	0.037	0.470	Pungent, suffocating, nutty, aldehyde	.005 - 9.0	AIHA-WEEL
1-Butanol	0.003	0.003	0.357	0.109	2.800	Rancid alcohol, butter	19.5	Leffingwell

APGEMS-TF modeling was performed to predict the maximum release of butanal from TY-Farm tanks at the time of the AOP-015 event. TX-Farm and T-Farm tanks were not included in the model, since 1) they have significantly less butanal and butanol than the TY-Farm tanks, 2) they are further away from the AOP-015 locations than TY-Farm, and 3) their plumes do not intersect with one or more of the AOP-015 locations. The APGEMS-TF model uses source terms equal to the highest measured headspace concentration for each chemical and each tank and an upper bound emission rate for passive breather filters. Results from APTGEMS-TF modeling for butanal are provided in Figure 3. The image includes predicted butanal concentrations at the time of the AOP-015 event as shown by concentration contour lines with the innermost contour line equal to the highest concentration shown in the right-hand legend. Each successive contour line moving out from the center is 1/10 the concentration of the prior. The highest contour line shown in Figure 3 is 1 ppt, indicating that worker

exposure to butanal was at most 3.5 orders of magnitude below the odor threshold. To corroborate results from APGEMS-TF modeling, the TY-Farm Tank concentrations were compared to summary results from the Kenexis analysis with the fire dynamics simulator (FDS) computational fluid dynamics (CFD) model. Both models yielded the same answer, which is that butanal was below the minimum odor threshold at each of the receptor locations. Therefore, the TY and TX tank farms are an unlikely source of the odors smelled by the workers during the AOP-015 event.

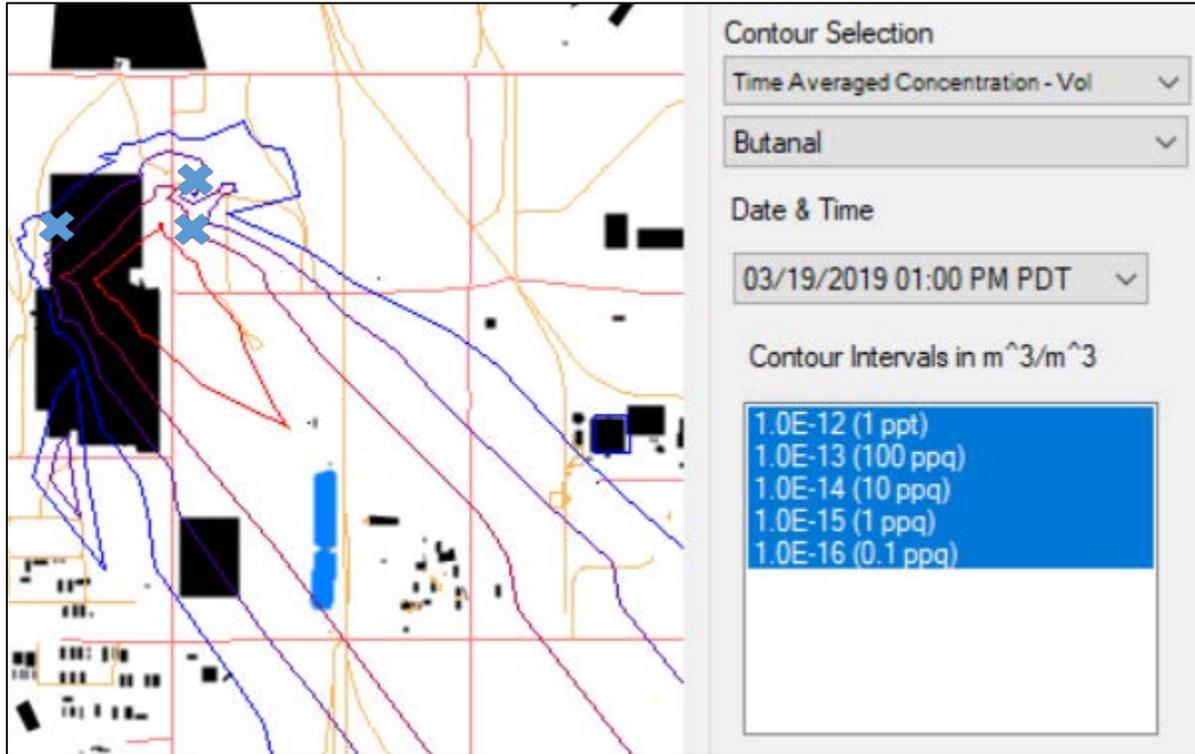


Figure 3. APGEMS Modeling of TY Farm PBFs at time of AOP-015 Event, Butanal Concentrations at AOP-015 Locations (indicated by blue Xs) are 3.5+ orders of magnitude below its Odor Threshold APGEMS-TF modeling was performed for TY-Farm tanks for all COPCs present in the headspace above their occupational exposure limits (OELs). Only two compounds have been observed above their OELs in TY-Farm headspaces as follows: ammonia at 124% of OEL and furan at 650% of OEL (TWINS and SWIDS). Figures 4 and 5 show APGEMS-TF modeling results for TY-Farm passive breather filters (PBF) for ammonia and furan respectively based on emissions corresponding to the maximum observed headspace concentration for each tank and the maximum PBF release rates. Concentrations of ammonia and furan at the AOP-015 locations are estimated at < 0.01% of OEL. Therefore, the breathing spaces at the AOP-015 locations were safe with respect to tank vapors.

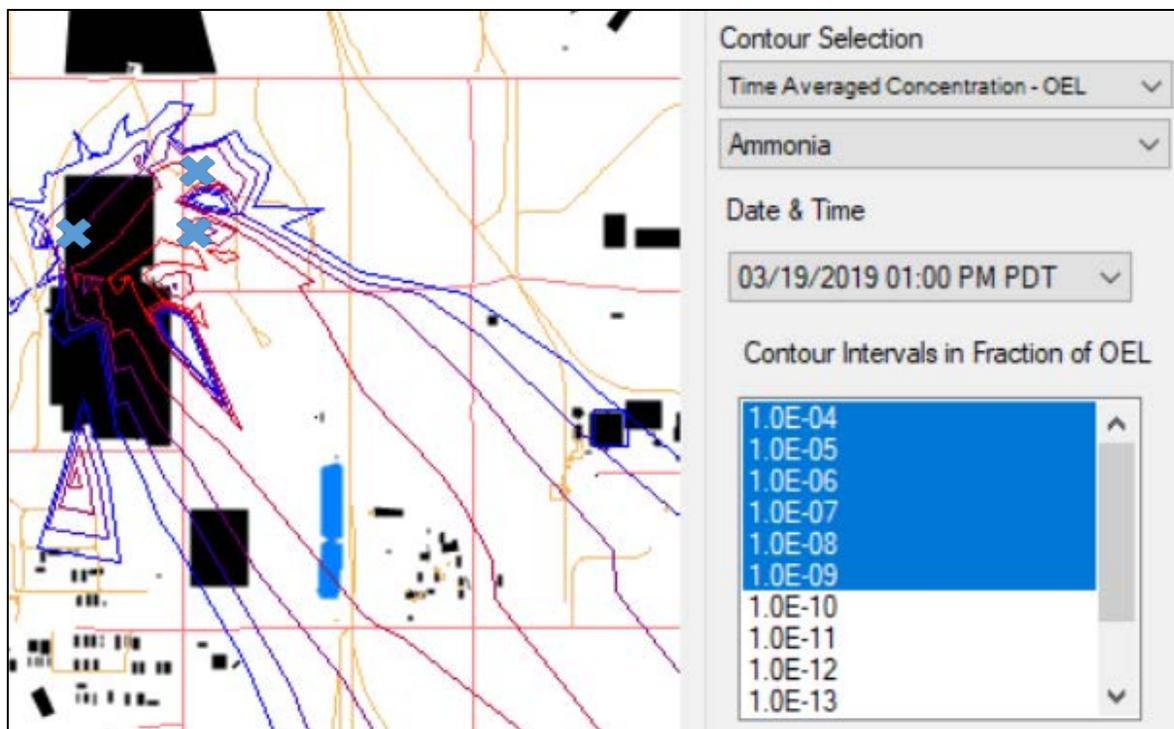


Figure 4. APGEMS Modeling of TY-Farm PBFs at time of AOP-015 Event, Predicted Ammonia Concentrations at AOP-015 locations (indicated by blue Xs) are 4+ orders of magnitude below its OEL

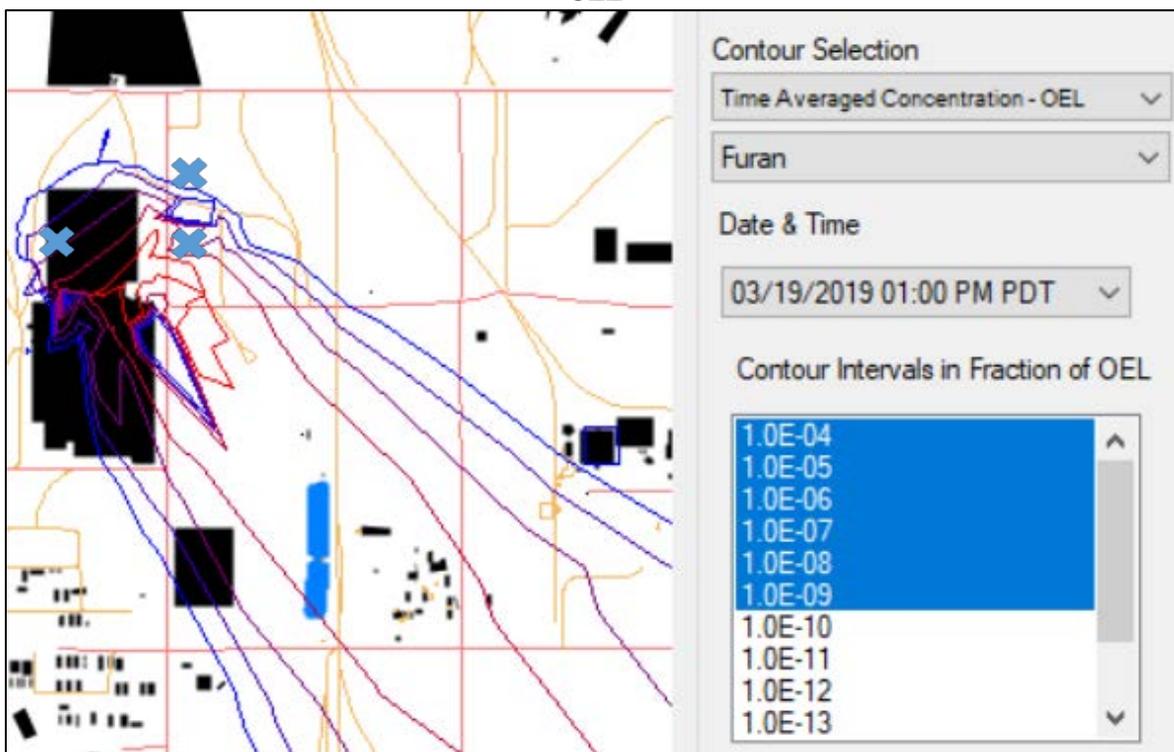


Figure 5. APGEMS Modeling of TY Farm PBFs at time of AOP-015 Event, Predicted Furan Concentration at AOP-015 Locations (indicated by blue Xs) are 4+ orders of magnitude below its OEL

Modeling of TY Farm Drainage Basin:

Figure 6 provides APGEMS-TF modeling of the drainage basin adjacent to and northwest of TY-Farm. Drainage basin vapors were modeled as methyl mercaptan (a common odor causing chemical associated with organic matter decay), but the source term was arbitrarily set at 1 g/s. This is due to the fact there is no data driven source term available (chemical type, concentration, and volumetric gas emission rate) for the drainage basin. The contour lines shown in Figure 6 cannot be attributed to specific methyl mercaptan concentrations, but they do reflect the direction of the drainage basin vapor plume and relative concentrations (each contour line from the center out is 1/10 the concentration of the previous).

The AOP-015 locations were in the center of the drainage basin plume and within or near the highest concentration contour. Modeling indicates that the drainage basin is a plausible source of the AOP-015 odors. However, IH workers at the same location on the following day did not observe odors emanating from the drainage basin. The IH workers were unable to get close to or downwind of the drainage basin, making it a plausible but indeterminate source.

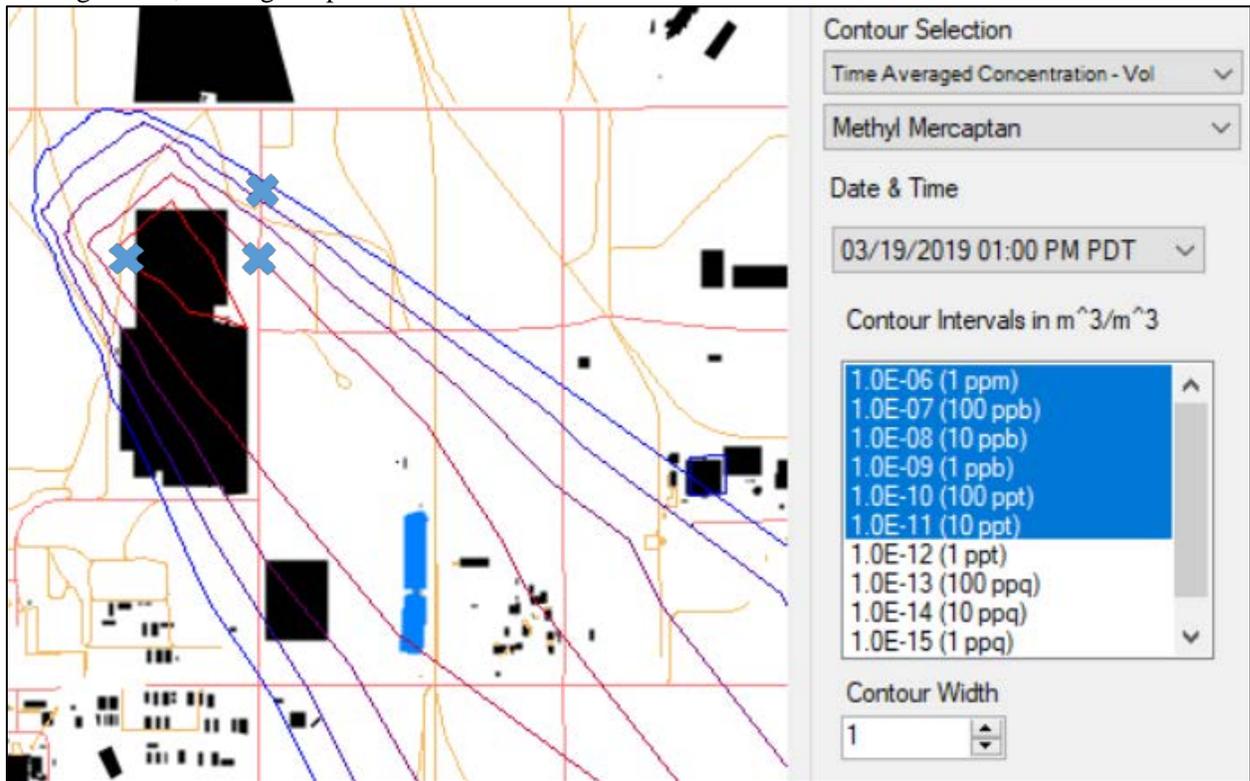


Figure 6. APGEMS Modeling of TY Farm Drainage Basin, Methyl Mercaptan concentrations are arbitrary but the AOP-015 Locations (indicated by blue Xs) are in the Center of the Plume and within or close to the Highest Concentration Contour

Modeling of MO-2313 and 2607-W14 Sewers:

Figure 7 provides APGEMS-TF modeling of the MO-2313 and 2607-W14 Sewers. The sewer vapors were modeled as methyl mercaptan (a common odor causing chemical in sewer gases), but the source term was arbitrarily set at 1 g/s. This is due to the fact there is no data driven source term (chemical type, concentration, and volumetric gas emission rate) for sewer systems around the Hanford site. The contour lines shown in Figure 7 cannot be attributed to specific methyl mercaptan concentrations, but they do reflect the direction of the sewer vapor plume and relative concentrations (each contour line from the center out is 1/10 the concentration of the previous).

The AOP-015 locations are outside of the MO-2313/2607-W14 sewer plume, and a long distance from the source. The APGEMS-TF model is designed for light to moderate weight vapors. Many

sewer gases are large, heavy molecules that do not disperse as easily as lighter gas molecules. Thus, the APGEMS-TF model may over-predict dispersion of heavy sewer gases. Heavy sewer gases are known to migrate along the ground and resist dilution for significant distances. MSA personnel indicated that only a few hundred gallons of sewage were pumped from MO-2313 sewer on the day of the AOP-015 event and that the 2607-W14 sewer did not smell when inspected on the day after the event. Even though the APGEMS-TF model may be non-conservative for sewer gases, the direction of the plume and the large distance between the sources and AOP-015 locations leads to a conclusion that the MO-2313/2607-W14 sewers are an unlikely source of the AOP-015 event.

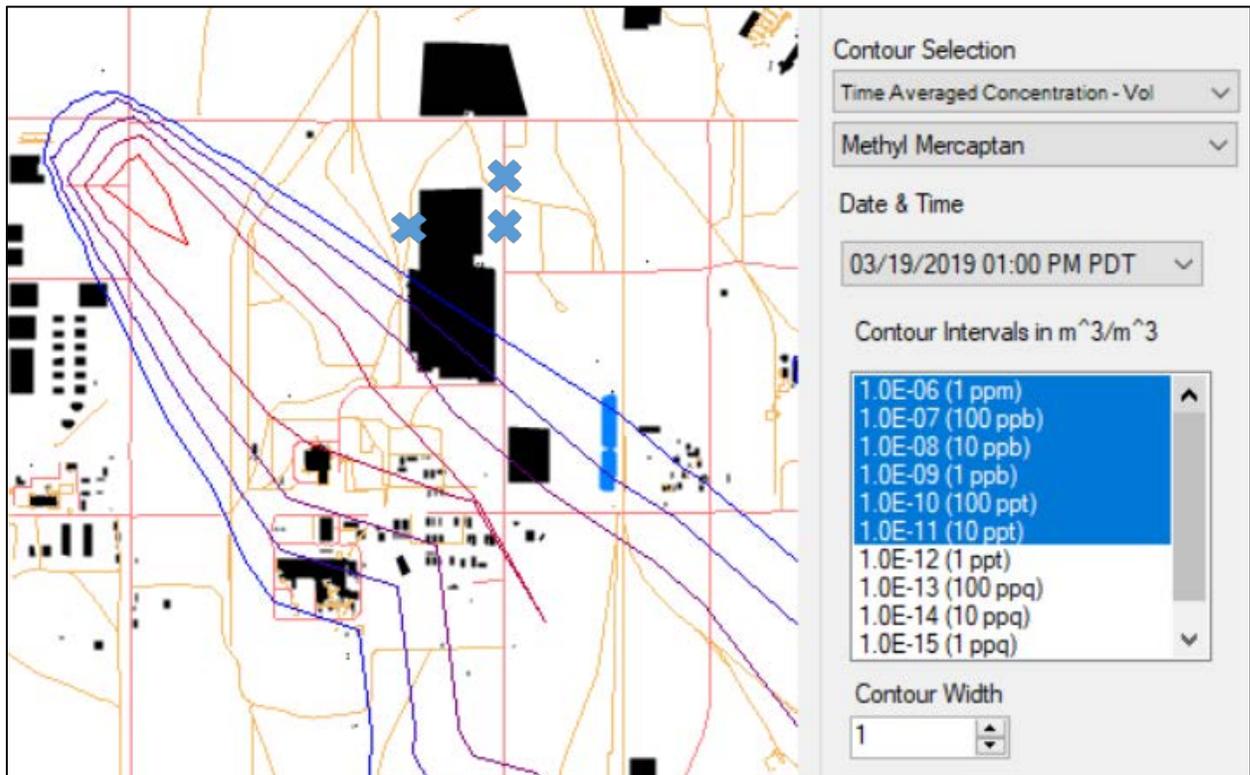


Figure 7. APGEMS Modeling of 2607-W14 Sewer with Methyl Mercaptan - AOP-015 Locations (indicated by blue Xs) are outside of the Sewer System Plume

Attachment 2
Industrial Hygiene Investigation Report

TF-AOP-015 INDUSTRIAL HYGIENE INVESTIGATION REPORT**PER Number:**
WRPS-PER-2019-0526**Time/Date & Event location:**

1300 03/19/2019 NE of TY farm

EIR Number:

EIR-2019-013

1. Event Summary (including number of workers involved and activity in progress):

4 electricians in 2 vehicles (both with windows in the open position) traveling W along Camden Ave. between 23rd Ave. and the T Evaporator (242T/242T271) encountered odors (rotten egg, metallic "rusty exhaust"). Vehicle 1 (containing 2 electricians) encountered the odor first along Camden Ave, vehicle 2 (containing 2 electricians) encountered the odor after arriving at the TX/TY change trailer (MO817).

- Was an IHT Present during initiating event? [] Yes [X] No

IH Monitoring/ Sample Survey Reports:

19-01750 "TF-AOP-015 Response- Outside TY Farm"

Weather Conditions at Time of Event:**Ambient outside conditions:**

- Weather station: 19 @1300
- Wind Direction and Speed: NW @ 7mph
- Barometric Pressure (*steady/rising/falling*): 29.50" and falling
- Temperature (F°): 53
- Humidity: 41%

Washington River Protection Solutions
TF-AOP-015 INDUSTRIAL HYGIENE INVESTIGATION REPORT

PER Number:
WRPS-PER-2019-0526

Time/Date & Event location:
1300 03/19/2019 NE of TY farm

EIR Number:
EIR-2019-013

Field Response Timeline:

- 1324: SOEN: "Entering AOP-015 for NE Corner of TY farm on Camden Avenue. All personnel stay clear of TY farm."
- 1326: ST Field IH, ST IHT Supervisor, AN Field IH, COMs Field IH, PO Field IH arrive at CSO
- 1327: ST IHT Supervisor contacts ST IHTs to report to CSO to support response actions
- 1328: Odor response cards received at CSO
- 1330: ST IHT Supervisor reports to AN IH that ST IHTs are in route to CSO
- 1331: CSM contacts ST FWS to clarify if odors were encountered inside of TY farm as indicated on one of the odor response cards
- 1333: COMs Field IH contacts PO Shift IHT supervisor request acquisition of H₂S sensor from ETF to support analysis of grab samples
- 1340: COMs Field IH contacts PO Shift IHT supervisor to request Tedlar bags be brought to the shift office to support response actions
- 1347: PO ETF IHT arrives at CSO with MultiRAE to support field response
- 1349: ST IHTs and ST IHT Lead arrive at CSO
- 1350: COMs Field IH briefs ST IHTs on response actions:
 - RPE from RPF TF-AOP-015 Task 2
 - NH₃ and VOC DRI
 - 2 grab samples. 1 from Camden Ave., 1 from area near TX/TY change trailer (MO817)
 - Analyze grab samples with MultiRAE (NH₃, VOC, H₂S) MIRAN SapphiRe (N₂O), Ohio Lumex (Hg), HAPSITE (VOC)
- 1353: ST IHTs leave CSO to acquire RPE and to perform response actions
- 1354: COMs Field IH inquires update on odor response card clarification from CSM
- 1355: COMs Field IH contacts ST IHT Lead with update on grab sampling locations
 - 2 grab samples. 1 from Camden Ave. (East of TY Farm), 1 from Service Road (West of TY Farm)
- 1409: ST IHT Supervisor contacts PO Shift IHT Supervisor to have a MIRAN SapphiRe and Ohio lumex "warmed up".
- 1410: COMs Field IH contacts ST IHT Lead to request grab samples be delivered to MO511 (temporary PO E IHT Lab) for analysis by MIRAN SapphiRe and Ohio Lumex.
- 1410: PO IH Manager briefs DOE IH Rep.
- 1414: PO Shift NCO contacts CSM to verify access restriction is in place.
- 1507: AN Field IH sends preliminary draft IHIR to IH Programs to support updating interested parties on progress
- 1511: ST IHT contacts COMs Field IH and reports that there is a sinkhole or drainage basin full of organic material West of 241-TY
- 1536: AN Field IH briefs CSM with initial field findings:
 - All DRI readings indicate no further protective actions are necessary to prevent worker exposure to unknown vapor hazard
 - IHTs indicated that the drainage basin for TY farm was almost completely full of water and floating organic material, and they thought this area could use further investigation as possible source of odors.

Field IH Author:


Print First and Last Name


Signature


Phone No.

3/20/19
Date

Washington River Protection Solutions
TF-AOP-015 INDUSTRIAL HYGIENE INVESTIGATION REPORT

PER Number:
WRPS-PER-2019-0526

Time/Date & Event location:
1300 03/19/2019 NE of TY farm

EIR Number:
EIR-2019-013

2. GCMS Sample Results:

See Attachment A for HAPSITE (GCMS) results

HAPSITE Chromatogram is located in SWIHD Survey 19-01750

Washington River Protection Solutions
TF-AOP-015 INDUSTRIAL HYGIENE INVESTIGATION REPORT

PER Number:
 WRPS-PER-2019-0526

Time/Date & Event location:
 1300 03/19/2019 NE of TY farm

EIR Number:
 EIR-2019-013

3. Additional Information:

- Odor Response Cards received:

ODOR RESPONSE CARD - 241-TY FARM

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

- Date and time odor was noticed March 19/2019 1:00 pm.
- Your name and the work you were performing [REDACTED]
- Location of odors (mark area on map and wind direction)
- Name(s) of others in or near the affected area [REDACTED]
- Was an IHT present? No
- Describe the odor Sweet Sour Musty Earthy Metallic Smoky Rotten Onion
 Cleaning Solution Ammonia Other: Eggs
- Possible Source Tank Bump
- 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: _____

2. Send this card to the Central Shift Office.

Page 2 of 2 OFFICIAL USE ONLY (when filled in) A-6005-942 (REV 11)

ODOR RESPONSE CARD - 241-TY FARM

Odors Detected with NO Immediate symptoms

1. Notify Immediate Supervisor.
2. Contact Central Shift Manager, [REDACTED]. Provide the bulleted information below.
3. Complete map, return to Central Shift Office as soon as practicable.

Odors Detected WITH Symptoms

4. Notify Immediate Supervisor.
5. Contact CSM, [REDACTED] complete below bulleted information and map.
 - Your name and the work you were performing
 - Your symptoms (if any)
 - Date and time odor was noticed
 - Location of odors (mark area on map and the wind direction)
 - Describe the odor
 - Name of other in or near the affected area
 - Was an IHT present?
 - Possible source
6. Provide information on the back of card.
7. Send this card immediately to the Central Shift Office

241-TY FARM

Page 1 of 2 OFFICIAL USE ONLY (when filled in) A-6005-942 (REV 11)

Washington River Protection Solutions
TF-AOP-015 INDUSTRIAL HYGIENE INVESTIGATION REPORT

PER Number:
 WRPS-PER-2019-0526

Time/Date & Event location:
 1300 03/19/2019 NE of TY farm

EIR Number:
 EIR-2019-013

ODOR RESPONSE CARD - 241-TY FARM

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

- Date and time odor was noticed 3/19/19 1300
- Your name and the work you were performing _____
- Location of odors (mark area on map and wind direction) _____
- Name(s) of others in or near the affected area _____
- Was an IHT present? No
- Describe the odor Sweet Sour Musty Earthy Metallic Smoky Rotten Onion
 Cleaning Solution Ammonia Other: Rusty
- Possible Source ?
- 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.

Page 2 of 2

OFFICIAL USE ONLY (when filled in)

A-6005-942 (REV 1)

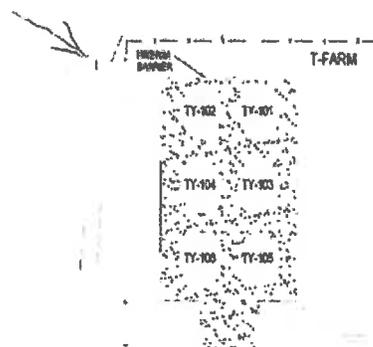
ODOR RESPONSE CARD - 241-TY FARM

Odors Detected with NO Immediate symptoms

1. Notify Immediate Supervisor.
2. Contact Central Shift Manager _____ Provide the bulleted information below.
3. Complete map, return to Central Shift Office as soon as practicable.

Odors Detected WITH Symptoms

4. Notify Immediate Supervisor.
5. Contact CSM, _____ complete below bulleted information and map.
 - Your name and the work you were performing
 - Your symptoms (if any)
 - Date and time odor was noticed
 - Location of odors (mark area on map and the wind direction)
 - Describe the odor
 - Name of other in or near the affected area
 - Was an IHT present?
 - Possible source
6. Provide information on the back of card.
7. Send this card immediately to the Central Shift Office.



241-TY FARM

Page 1 of 2

OFFICIAL USE ONLY (when filled in)

A-6005-942 (REV 1)

Washington River Protection Solutions
TF-AOP-015 INDUSTRIAL HYGIENE INVESTIGATION REPORT

PER Number:
 WRPS-PER-2019-0526

Time/Date & Event location:
 1300 03/19/2019 NE of TY farm

EIR Number:
 EIR-2019-013

ODOR RESPONSE CARD - 241-TY FARM

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

- Date and time odor was noticed 3/19/19 13:00
- Your name and the work you were performing [REDACTED]
- Location of odors (mark area on map and wind direction)
- 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
 Cleaning Solution Ammonia Other: _____
- Possible Source _____
- 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: _____

2. Send this card to the Central Shift Office.

Page 2 of 2

OFFICIAL USE ONLY (when filled in)

A-6005-942 (REV 1)

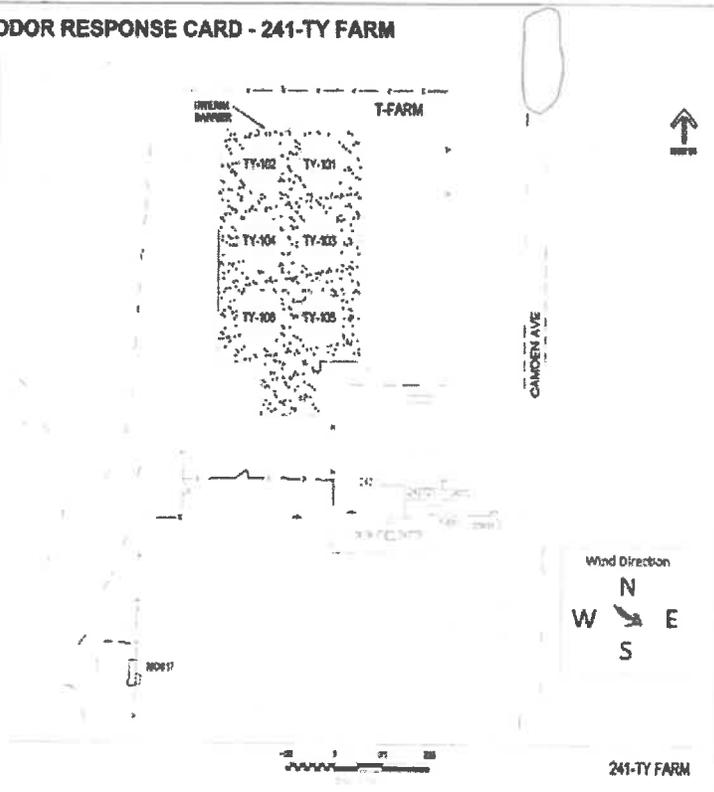
ODOR RESPONSE CARD - 241-TY FARM

Odors Detected with *NO*
 Immediate symptoms

1. Notify Immediate Supervisor.
2. Contact Central Shift Manager, [REDACTED].
 Provide the bulleted information below.
3. Complete map, return to Central Shift Office as soon as practicable.

Odors Detected *WITH* Symptoms

4. Notify Immediate Supervisor.
5. Contact CSM, [REDACTED], complete below bulleted information and map.
 - Your name and the work you were performing
 - Your symptoms (if any)
 - Date and time odor was noticed
 - Location of odors (mark area on map and the wind direction)
 - Describe the odor
 - Name of other in or near the affected area
 - Was an IHT present?
 - Possible source
6. Provide information on the back of card.
7. Send this card immediately to the Central Shift Office.



Page 1 of 2

OFFICIAL USE ONLY (when filled in)

A-6005-942 (REV 1)

Washington River Protection Solutions
TF-AOP-015 INDUSTRIAL HYGIENE INVESTIGATION REPORT

PER Number:
 WRPS-PER-2019-0526

Time/Date & Event location:
 1300 03/19/2019 NE of TY farm

EIR Number:
 EIR-2019-013

Amended Odor Response Card:

ODOR RESPONSE CARD - 241-TY FARM

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

- Date and time odor was noticed 3/19 1:00 PM
- Your name and the work you were performing [REDACTED]
- Location of odors (mark area on map and wind direction)
- Name(s) of others in or near the affected area [REDACTED]
- Was an IHT present? N/O
- Describe the odor Sweet Sour Musty Earthy Metallic Smoky Rotten Onion
 Cleaning Solution Ammonia Other: Egg smell
- Possible Source fant
- 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: Not at this time.

2. Send this card to the Central Shift Office.

Page 2 of 2

OFFICIAL USE ONLY (when filled in)

A-6005-942 (REV 1)

ODOR RESPONSE CARD - 241-TY FARM

**Odors Detected with N/O
 Immediate symptoms**

1. Notify Immediate Supervisor.
2. Contact Central Shift Manager, [REDACTED].
 Provide the bulleted information below.
3. Complete map, return to Central Shift Office
 as soon as practicable.

Odors Detected WITH Symptoms

4. Notify Immediate Supervisor.
5. Contact CSM, [REDACTED],
 complete below bulleted information and
 map.
 - Your name and the work you were performing
 - Your symptoms (if any)
 - Date and time odor was noticed
 - Location of odors (mark area on map
 and the wind direction)
 - Describe the odor
 - Name of other in or near the affected
 area
 - Was an IHT present?
 - Possible source
6. Provide information on the back
 of card.
7. Send this card immediately to the
 Central Shift Office.



Page 1 of 2

OFFICIAL USE ONLY (when filled in)

A-6005-942 (REV 1)

Washington River Protection Solutions
TF-AOP-015 INDUSTRIAL HYGIENE INVESTIGATION REPORT

PER Number:
 WRPS-PER-2019-0526

Time/Date & Event location:
 1300 03/19/2019 NE of TY farm

EIR Number:
 EIR-2019-013

Original Odor Response Card:

ODOR RESPONSE CARD - 241-TY FARM

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

- Date and time odor was noticed 3/19 1:00pm
- Your name and the work you were performing [REDACTED]
- Location of odors (mark area on map and wind direction)
- Name(s) of others in or near the affected area [REDACTED]
- Was an IHT present? NO
- Describe the odor Sweet Sour Musty Earthy Metallic Smoky Rotten Onion
 Cleaning Solution Ammonia Other: Egg smell
- Possible Source Farm
- 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: Not at this time.

2. Send this card to the Central Shift Office.

Page 2 of 2

OFFICIAL USE ONLY (when filled in)

A-6005-942 (REV 1)

ODOR RESPONSE CARD - 241-TY FARM

Odors Detected with NO Immediate symptoms

- Notify Immediate Supervisor.
- Contact Central Shift Manager, [REDACTED]. Provide the bulleted information below.
- Complete map, return to Central Shift Office as soon as practicable.

Odors Detected WITH Symptoms

- Notify Immediate Supervisor.
- Contact CSM, [REDACTED], complete below bulleted information and map.
 - Your name and the work you were performing [REDACTED]
 - Your symptoms (if any) NO
 - Date and time odor was noticed 3/19 1:00pm
 - Location of odors (mark area on map and the wind direction) W
 - Describe the odor Egg smell
 - Name of other in or near the affected area
 - Was an IHT present? NO
 - Possible source Farm
- Provide information on the back of card.
- Send this card immediately to the Central Shift Office.

Page 1 of 2

OFFICIAL USE ONLY (when filled in)

A-6005-942 (REV 1)

Washington River Protection Solutions
TF-AOP-015 INDUSTRIAL HYGIENE INVESTIGATION REPORT

PER Number:
WRPS-PER-2019-0526

Time/Date & Event location:
1300 03/19/2019 NE of TY farm

EIR Number:
EIR-2019-013

- **Summary of IH Monitoring and Sampling Data:**

- a. **Monitoring:**

Event Response: 19-01750 "TF-AOP-015 Response- Outside TY Farm"
DRI field readings:

VOC: <IDL
NH3: <IDL

Grab samples:

VOC: <IDL
NH3: <IDL
H2S: <IDL
N2O: <IDL
Hg: <IDL

- b. **Sampling:**
N/A

4. Summary of Employee Reported Information (e.g., symptoms)

No symptoms were reported. Voluntary medical evaluation was declined.

5. Recommendations/Conclusions:

Identification of Source of the Concern: [] Yes [X] No

No recommendations at this time.

6. Other:

N/A

S&H Program Management:

[Redacted]

Print First and Last Name

[Redacted]

Signature

[Redacted]

Phone No.

3/26/19
Date

Attachment A
GCMS Laboratory Results

HAPSITE GC-MS Bag Sample Results Survey 19-01750: AOP-15 at 241-TY Tank Farm

Two bag samples were collected in response to an odor reported at TY Tank Farm on March 19 2019. These samples were analyzed using an Inficon HAPSITE GC-MS on March 20, 2019. Data was interpreted on March 20 2019, and reported the same day. Results for the Air Blank Sample were satisfactory. Compounds found in TY West Side and TY Camden samples were at concentrations consistent with sample bag contaminants. **No compounds were found at concentrations of concern. No compounds were found at concentrations above background.**

Compounds Found in Samples

Compound	Clean Air Blank	TY West Side	TY Camden	Sample Bag Contaminant	Comments
Internal Standard #1	X	X	X		Added by instrument during analysis
Toluene		X	X	X	Not found above background
Internal Standard #2	X	X	X		Added by instrument during analysis
C9 Alkane Hydrocarbon			X	X	Not found above background
Substituted Benzene Compound		X	X	X	Not found above background
D-Limonene		X	X	X	Not found above background
Silane Compound		X	X	X	Not found above background
C11-15 Alkane Hydrocarbons		X	X	X	Not found above background

If you have questions contact

