

**EVENT INVESTIGATION REPORT**

**AOP-015 Unusual Odor Detected in 241-AP, Along the West Fence  
Line, Inside and Outside of the Farm**

**Event Investigation Report Number EIR-2014-017**

Event Investigation Team Lead

6-9-2014  
Date

PER Responsible Manager

6-9-2014  
Date

## **AOP-015 Unusual Odor Detected in 241-AP, Along the West Fence Line, Inside and Outside of the Farm, Investigation Summary**

On May 29, 2014, while preparing to execute a job task, four employees experienced odors in AP-farm described as a burned, metallic odor or dirty socks. The four employees also described a metallic taste. One employee reported a symptom of a headache. These four employees were taken to the medical provider for evaluation. A fifth employee was present but had no symptoms and elected to not seek medical attention.

A waste transfer had occurred on May 28, 2014, between AN-farm and AP-farm. The work team was tasked to flush the transfer lines. At the start of the work evolution, a first Nuclear Chemical Operator (NCO-1) walked outside the perimeter of the farm on the west side headed north. At the northwest corner, NCO-1 reported encountering a brief odor described as the "familiar dirty sock smell" that they normally encounter within the Tank Farms. NCO-1 then walked east along the northern boundary of AP-farm where he met a second NCO (NCO-2) in a vehicle near the AP-farm change trailer. At this point, both NCOs reported a brief odor once again. Wind was blowing from the east toward the west but oscillating north to south. Wind speed was estimated to be between 8 and 12 miles per hour.

Upon entering AP-farm, NCO-1 walked a diagonal path from the northeast toward the southwest to the work location near the 241AP Valve Pit. NCO-1 reported encountering the odor in two more locations. NCO-2 was beginning to set up for work outside the fence line near the valve pit. NCO-2 was joined by a pipefitter. As the three workers gathered, they discussed the odor and strength of the smell. A third NCO, the Material Balance Discrepancy (MBD) NCO, was called in to consult with the work team. The work team decided that the odor was not what was normally experienced, and seemed to be stronger than normal.

NCO-2 called in to the Central Shift Office (CSO) Manager and reported the Odor. The CSO Manager questioned the employees then initiated actions to institute Abnormal Operating Procedure TF-AOP-015 *Response to Reported Odors or Unexpected Changes to Vapor Conditions*.

Three NCOs and the pipefitter were taken to West Area Medical facility for evaluation. The Health Physics technician, covering the job, did not request a medical evaluation. All employees returned to work without medical restriction. Blood sample analysis is pending.

The AP-farm was released from restricted access under AOP-015 On June 6, 2014. The detailed analyses were performed late evening on May 29, 2014 and a draft report was issued. The Industrial hygiene (IH) sample report was finalized on June 6, 2014 with no indication of chemicals above Hanford action levels.

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The *preliminary* information:

- **AP Farm**: Three bags samples were analyzed:
  1. Taken outside the farm from the southwest corner to the north side by the change trailer; ~41 ppb of \*chemicals.
  2. Taken upon entry into the farm continuing to the AP Valve Pit and inside the tent at the AP Valve Pit to AP-104 pit; ~45 ppb of \*chemicals.
  3. Taken from the primary exhauster; ~<10 ppm of \*chemicals.

Following the release of the farms from AOP-015, a compensatory measure will be initiated with a Red Arrow restricting access to the farms with the required use of respiratory protection until the full Event Investigation information is obtained and appropriate changes to General Industrial Hazards Analysis (GHA) controls are established, if appropriate.

A Fact Finding meeting was held on May 29, 2014.

### Event Timeline

#### 05/29/2014

- 0800 – 0830      Pre-Job Briefing held.  
Went through the GHA and asked if anyone on the crew wanted to upgrade.
- 0902              First odor was detected in the NW corner outside the AP-farm fence line.  
The NCO who detected the first odor was walking toward the east in the direction of the change trailer. Approximately half way between the area where the first odor was detected and the change trailer, the NCO (NCO-1) met another NCO (NCO-2) where the two discussed the odors they were smelling (location described on map as #2)  
NCO-1 noted vapor odors at location 3, 4 and 5 walking diagonally from the change trailer AP-102 to AP-103.  
Odors were described as “burnt metallic taste, like how burning galvanized steel smells.” It left a taste in their mouth.  
Odors seemed to be more concentrated by the Temporary Step-off pad location.  
NOTE: “Red X” on map indicates the location of the Ultrasonic Testing (UT) crew.
- 0907              NCO contacted the MBD Operator.

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- 0908 NCO-2 contacted Central Shift Office (CSO). CSO questioned them about the odor and asked if they were smelling “sewer” smells.
- 0915 NCO-2 used the radio to call on the CSO channel to notify the personnel located in the change trailer about the odors.
- 0918 CSO called the NCOs to confirm smells and again asked if it could be “sewer” smells.
- 0923 CSO entered AOP-015.  
Shift Office Event Notification (SOEN) notification issued.  
Radio calls sent.
- 0929 Production Ops (AN Team) IH reported to Shift Office
- 0936 Pre-Job for Production Operations IH held for sampling plan.
- 0941 Industrial Hygiene Technicians (IHTs) went to 278-AW to get self-contained breathing apparatus (SCBA) for farm entry.
- 0942 Production Ops (EV Team) IH called IH Program PhD Analytical Chemist to notify him of AOP-015 entry and prepare for Hapsite Gas chromatograph mass spectrometer (GCMS) analysis.
- 0943 CSO made Facility Representative and Senior Management notifications.
- 0944 Three employees were sent to HPMC Occupational Health Services (HPMC) for persistent metallic taste and one employee reported a headache. All four went to HPMC.
- 0945 Shift supervisor reported that employees initially reported odor outside of the farm in the northwest corner.
- 0952 Three NCOs and one Pipefitter going to HPMC (reported by Shift Operations Manager).
- 0954 Production Operations Safety and Health Manager reported that two IHTs were en-route to AP-farm to take bag samples and stack sample (see 1040 entry for locations).
- 0956 (IH observation) Wind has shifted to NE and picked up speed (1000 meteorological data indicated an 11 mph wind speed, 200°SSW; 0900 meteorological data indicated a 5 mph wind speed from the same direction)  
NOTE: wind was described to be swirling in the area of the event.
- 0958 IHTs arrived and began taking samples at AP-farm perimeter (southwest corner).  
IHT described a “cigar” smell near the northwest corner of the AP Farm. IHT encountered an employee smoking a cigar on the northwest side of the tank farm.

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- 1000 Four Washington River Protection Solutions LLC (WRPS) personnel arrived at HPMC for evaluation and blood work.
- 1003 IHT described the first odors as “stinky sock” at location #1 on the map. (There were no hits on the instrumentation.)  
Proceeded to the change trailer to don the SCBA.
- 1013 IHTs entered farm moving towards the Flush Pit.  
NOTES:  
Went to AP-104, where the transfer occurred the previous day, taking a “Bag Sample” continually.  
Attached a direct read instrument to the stack and determined all readings to be below threshold limits.  
IHT made the following observation, “Windsock appeared to be hung up and not indicating well.”  
NCOs confirmed this observation stating, “they used little indicator flags at ground level to identify the wind was changing directions in the area.”
- 1019 CSO sent SOEN notification:  
“Four employees were taken to HPMC.”
- 1029 IHTs exited farm through the change trailer.
- 1038 IHT Supervisor contacted the IHTs for status of sampling evolution in AP-farm and requested them to report to the CSO.
- 1040 IHTs reported to Cognizant System Manager (CSM) in the Shift Office the results of sampling plan.
- 1043 IHT left the Shift Office to deliver the bag samples to 2704-HV IH Lab.
- 1049 IHTs arrived at IH Lab.
- 1100 WRPS personnel were seen by HPMC provider.
- 1255 Analytical Chemist called and relayed that preliminary review of the GCMS analysis did not indicate that any constituent is present in higher than normal concentrations.
- 1300 WRPS personnel blood work was drawn.  
NOTE: Other Hanford workers were taken back for “scheduled/routine” physicals at 1255 hrs.
- 1303 Event Investigation initiated.
- 1500 Fact Finding Meeting Held.

**5/30/2014**

## **AOP-015 Unusual Odor Detected in 241-AP, Along the West Fence Line, Inside and Outside of the Farm, Investigation Summary**

1155

AOP-015 restrictions lifted for AP farm

### **Positives**

1. Immediate calls to CSO & MBD
2. Immediate radio notification made to personnel located in change trailer
3. Immediate radio announcements to UT Staff (collocated work team)
4. IH Response

### **Compensatory Measures**

- Entered AOP-015
- Planned and executed IH Sample Plan
- Transported affect personnel (4) to HPMC
- Farm access was restricted by entering AOP-015
- Red Arrow was entered into the CSO Logbook

### **Preliminary Extent of Condition Review**

Extent of condition is the focus of the Chemical Vapor Solution Team (CVST). This report will provide for process improvement and details to the CVST of the incident.

### **Discussion of Potential Causes**

WRPS has several efforts ongoing to address chemical vapors. This report is a synopsis of one response.

### **Discussion of Barriers That Could Have Impacted the Cause**

*(This section discusses engineering and administrative barriers that were in place that failed or should have been in place)*

Unknown.

### **Recommendations/Proposed Corrective Actions**

*(This section provides any recommendations discussed and provided during meeting for further consideration for the responsible manager)*

Action 1: Identify isolation boundary around farms during a “vapor” related event.  
Actionee: - Complete

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Response: The current isolation boundary (i.e. individual farm fence line) around the tank farms during a vapor (AOP-015) event has been evaluated as the appropriate isolation boundary at this time. It should be noted that the CVST Team has an action to determining if the tank farm boundary (i.e. individual farm fence line) is adequate or if there is technical data that would support extending the distance outside the farm fence line.

Action 2: Communicate to Level 2 management “restrictions” of exposed personnel in order to facilitate adequate job assignments. (NOTE: The issue is that some of the affected workers were not within the farm fence line at the time and the current process to “restrict” personnel is to disallow “ACEing” into certain types of work. If the affected personnel are working “outside” the fence, they potentially are still at risk to exposure to vapors.)

Actionee: Action completed June 2, 2014. A Briefing was provided in the shift turnover meeting to all management.

Action 3: Lift AP-015 based upon the results IH Sample Plan, but in place enter a “Red Arrow” to restrict access to AP farm.

Actionee: Action completed

Action 4: Review the Preventative Maintenance records for the “windsocks” and evaluate whether there is potentially a newer/better sock that can be used.

Actionee: Complete

Response: Met with the COMS Maintenance Manager on May 30, 2014 who identified that the AP-farm wind flag was recently changed out. It is his understanding that the PM that performed an inspection of the tank farm flags had been canceled and the change out of the flags is performed under a corrective maintenance work package. Initiated a PER (WRPS-PER-2014-0999) to evaluate the current flag design vs. a wind sock, number of flags at each farm location and re-activating the PM that would perform an inspection on a set periodicity to inspect the flags.

Action 5: Communicate concerns to HPMC from WRPS personnel how they were triaged and evaluated under HPMC’s care. (NOTE: Personnel were made to wait for “scheduled” patient’s annual blood work before blood work was drawn on exposed personnel.) Two of the employees reported being at HPMC for three hours waiting for blood sampling.

Actionee:

Recommendation from a worker to incorporate personal real time sampling if possible.

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**Lessons Learned**

None.

**Attachments (as they apply):**

1. List of personnel contacted
2. Attendance Rosters
3. Photos/Sketches
4. Log Book Entries
5. IH Sample Analysis Reports

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Attachment 1  
List of Personnel Contacted

1. Health Physics Technician, AP-farm

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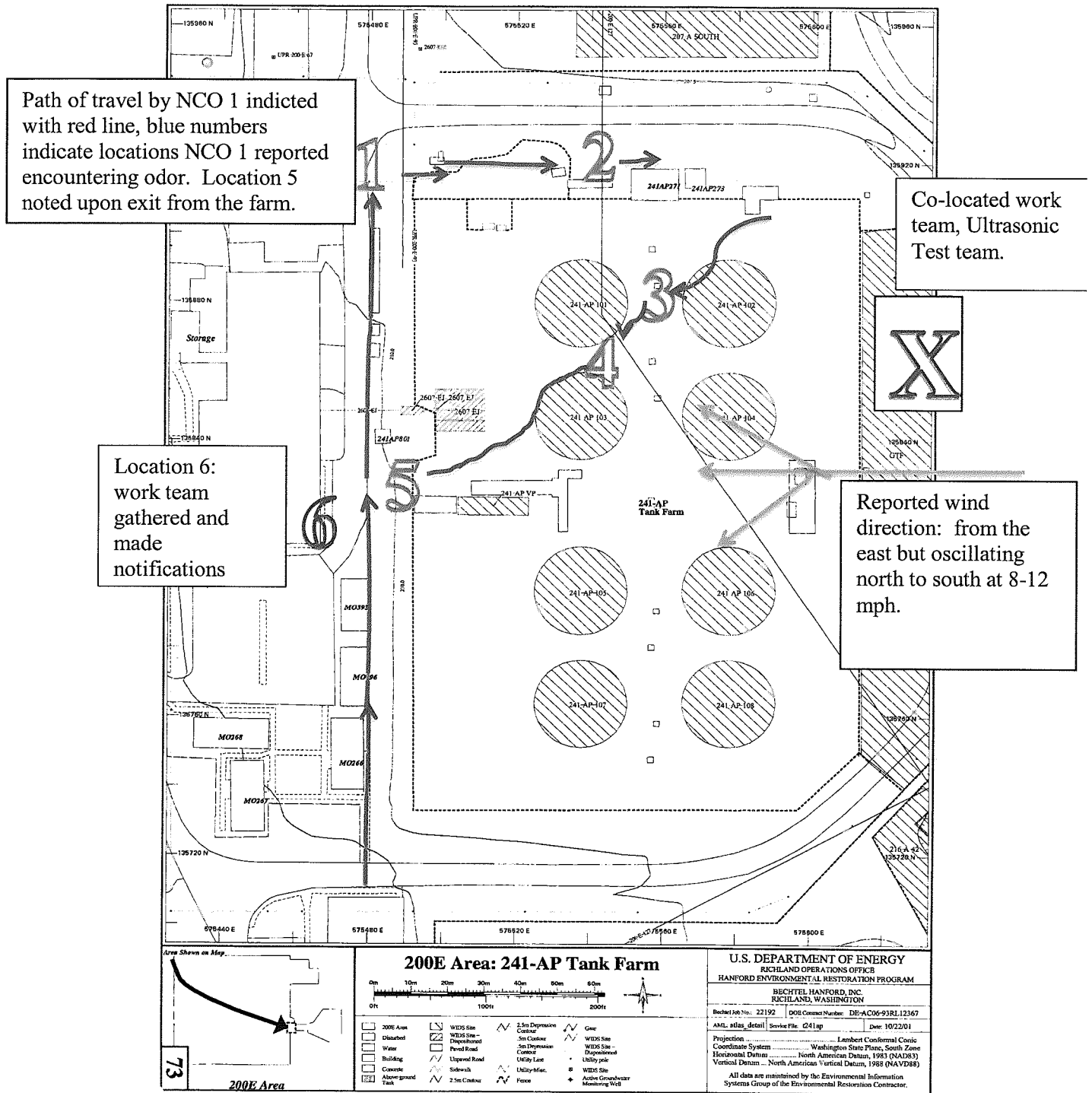
## Attachment 2 Attendance Roster

Date: 5-29-2014	<b>EVENT INVESTIGATION/CRITIQUE ATTENDANCE FORM</b>		
Critique Title: <u>AP-015 RESPONSE AT AP-FARM</u>			
Critique Number: <u>EIR-2014-017</u>			
Print Name	Signature	Payroll Number/ SSN	Organization
			P.O. TECH SUP.
			SBT
			IHT
			IHT BO
			IH
			PO
			P.F.H.
			BO
			BO
			PO
			ES&A
			ESTR+C
			DNFSB
			OSP
			OPS
			OPS
			ops
			S+H Manag
			ops
			Cambridge Assurance

A-6003-100 (05/01)

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## Attachment 3 Area Diagram



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Attachment 4

Log Book Entries

1355 - Entered AOP-014 for lightning within 10 miles of tank farms. SOEN sent Notified DEERS

1440 - Employee from entry 1240 released to work with "zone" restrictions. Notified Safety. Left message. Notified DEERS

1547 - AT/AZ Farm VCZ post maintenance, exhaustor running & operable

1600 - Exited to greater than 10 miles & reentered for lightning strikes within 10 miles radius, SOEN seen

1621 - IHT completed flammable gas readings for AT/AZ. All readings 0% LFL. Next AT/AZ Farms SR 3.7.1 due NLT 5/29/14 @ 1240

1659 - Relieved as CSU

1659 - Relieved as CSU

1748 - APOA to APIA admin condition re-established

1750 - Exiting AOP-014. Lightning greater than 50 miles. Radio announcement & SOGO complete.

1947 - TMACS reports that APO Farm tank temps are reporting

2237 - IHT & HPT farm sweeps complete for AT/AZ and VCZ has been downpested.

2252 - reports POROS exhaustor was discovered shutdown. were unable to retrieve alarm history & have no indications of when & why exhaustor shutdown. Will leave shutdown until further investigation occurs.

2253 - Notified Env. Dir. Call

5/29/14 D-Shift

0439 - Relieved as CSU by

0439 - Assumed duties as CSU

0937 - Entered AOP-015 for AP-Farm for odors & NW of AP-Farm. SOEN sent Radio Announcement.

0943

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0955 - Sent 4 employees to HPMC for symptoms  
all 4 for metallic smell & taste and 1 of  
the 4 reported having headache, 3 NCOs, 1 per  
D.Hor. Notified DOEER impact

SOEW sent,

Individuals reporting to HPMC where,

fifth employee

PT) no symptoms.

All people were involved in prep for transfer  
route. All taken to HPMC by

0959 - Radio announcement made to stay clear of  
AR Farm and its perimeter for 1430 stop  
@ 0923

1046 -

report Odors in SY-Farm, three

employees reported on in type smell, no  
symptoms, VOCs reported at 58 ppb, monamine.  
Cleared SY-Farm as precaution.

1053 - AT-Farm Environmental equipment PS  
AT101 - STA-101-151 changed required date  
to 7/1/14 per

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all 4 for metallic smell or taste and 1 of them reported having headache. 3 HCs, 1 fire fighter. Notified DDETR

SOEN sent, individuals reporting to HPTA

400. fifth employee (HPT) no symptoms. involved in prep for transfer route. All taken to HPTA by

0958 Radio announcement made to stay clear of AR Farm and its perimeter for pg 143 entry @ 0923

1046 report Odors in SY Farm, three employees reported on in type smell, no symptoms, VOCs reported at 58 pp. Cleared SY Farm as precaution. winds out of SSW

1053 AT Farm Environmental equipment AS AT101 - STA - LST - ST1 changed required date to 7/1/14 per

1106 Entered AOP-015 for Odors in SY Farm. 8 individuals report smell of odors from entry @ 1046. 2 employees taken to HPTA for evaluation they were with symptoms of Dry Heaves, second individual with no symptoms. FWS was making 9 people. Notified DDETR

SOEN sent, Radio announcement made, SKIM performed  
 1150 - Entry 1146 winds out of SSW 6-16 mph resulting in blowing across exhauster toward the Field crew located at SY101 while perform LOTO for ball valve replacement

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1150 - east on the road ST 101 - west - LT 101.  
 transported the two individuals  
 to HPRC both side filters. stayed on  
 site HPRC; taken to HPRC down  
 town due to proximity to affected worker. People on work  
 crews were, (PC),  
 (HPT), (Elec), (Elec),  
 (FWS), (HHA), (New),

and  
 1200 - Notified by that  
 was taken to HPRC for personal medical  
 for light headedness. HPRC directed him to report  
 to his medical provider. Notified DDEFR

1444 - Notified by that the  
 employee from the ST-Farm AOP-015 entry  
 pg 144 @ 1126 is being transport via ambulance  
 to Kadlec DDEFR, Sergeant

EOC notified, SOEN sent  
 1303 Event Investigation initiation for AP and ST  
 AOP-015 odor response. Notified DDEFR  
 SOEN sent. AP odor Report # 2014-017 POC  
 ST odor Report # 2014-018 POC  
 PER owner for PEI for  
 ST

1355 - Notified by that 4 employees from  
 entry pg 144 @ 0955 returned to work no restrictions but  
 with ace administrative restrictions awaiting  
 blood results. SOEN sent

1443 - Late entry 1350 Employee from ST AOP-015  
 elected to go to Kadlec for  
 blood analysis, also notified by  
 that employee released with no restrictions with  
 ACE administrative restriction SOEN sent for entry  
 and Notified DDEFR

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(cont.) beta/gamma no alpha contamination.  
emailed the information for  
the occurrence report. was verbally  
notified as well. The contamination was  
~~collected and disposed of~~

1147 - New red arrow SY and AP farms will remain  
on restricted access until AOP-015 event  
investigations are completed. while  
restricted access remains in effect, all work  
will be considered low threshold vapors/odors  
as defined in the GHA which requires  
respiratory protection using the GHA RPE Task 1.

1228 - Notified (Sr. Manager) and  
(FACEP). SOEN sent.

1433 - reports that  
had swelling in his calf muscle, unknown  
why it occurred. He was training all  
day and was sitting at his desk at  
mo-590 when he noticed it.  
is transporting him to HPMC.  
is a projects electrician for

1500 - Notified (FACEP) and  
(Safety). SOEN sent.

1635 - C Farm ARA evaluation is complete, ARA  
may be downposted and normal access restored.  
SOEN sent.

1646 - C Farm ARA has been downposted per

1654 - was returned to work from HPMC  
with no restriction. Non-work related per  
incl. SOEN  
sent.

1721 - Relieved as CSM by

1721. Assumed duties as CSM.

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6/2/14

B-Sh, F

0001 - Forwarding Red Arrows from previous week:

- ➔ • Stop Work on entry to Tank Farms post unplanned primary exhausters shut downs without simultaneous IHT and HPT monitoring and clearance of farm per AOP-021. (POC: (BOSO-013 pg. 46 @ 1602)
- ➔ • Stop Work restricting access to all TOC hazardous waste areas for employees awaiting medical lab results associated with potential vapor/chemical exposure incidents. (POC: 'ER-2014-0572) (BOSO-013 pg. 62 @ 1031)
- ➔ • Do not change to Operation Mode at 242-A until resolution of WRPS-PER-2014-0550 "242-A Credible Fire Scenario Equipment Failure". (POC: (BOSO-013 pg. 62 @ 1600)
- ➔ • AOP-015 response inside tank farm boundaries require respiratory protection (SCBA) pending review and update of the procedure. A copy of the AOP-015 Respiratory Protection Form is located in the Central Shift Office & Mask Station. (POC: (BOSO-013 pg. 66 @ 1105)
- ➔ • Stop Work initiated on the disturbance and handling of all lead bricks until Industrial Hygiene can perform hazard evaluation. (POC PER-2014-0635) (BOSO-013 pg. 81 @ 1546)
- ➔ • Stop Work: IHT monitoring is required for carbon monoxide on occupied vehicles that have auxiliary internal combustion engines operating until hazard assessment is performed. (POC: ; PER-2014-0689) (BOSO-013, pg 91 @ 1316)
- ➔ • Stop Work initiated regarding the use of respiratory protection equipment used within arc flash protection boundaries may be used, after the work scope has been evaluated and documented on the work record by the electrical AHJ. Management has committed to have the respiratory protection tested and the results of the test documented and given to the Stop Work POC as per schedule and revise TFC-ESHQ-IH-C-05 to include appropriate respiratory configuration. (POC: PER-2013-1673) (BOSO-013 pg. 75 @ 1510)
- ➔ • Prior to completion of the evaluation, air purge or air blow activities using compressed air should be restricted to configurations that do not pass through magnetic flow sensing elements (like the ABB flow meter) on waste transfer systems. (POC: BOSO-013 pg. 108 @ 1535)
- ➔ • Entered LCO 3.1.B on 5/17/14 @ 0505 hours for SY Farm Standby VTP O/S. LCO 3.1.B.1 due 6/07/14 OR LCO 3.1.B.2.1 due 06/17/14 (BOSO-013 pg. 114 @ 1524)
- ➔ • Transfers into or out of East Area DST's are suspended until additional water hammer calculations on the flush system are completed. The Cold Run of the 242-A Evaporator, AN-101 to AP-104, AN-106 to AP-104 and associated flushes, and C Farm Retrieval, are exempted from this suspension. (POC: (BOSO-013 pg. 112 @ 1614)
- ➔ • SY and AP Farms will remain on restricted access until AOP-015 event investigations are completed. While restricted access remains in effect, all work will be considered low threshold vapors/odors as defined in the CHA RDC Task 1. (BOSO-013 pg. 147 @ 1147)

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## Attachment 5 IH Sample Analysis Reports

