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November 17, 2022

SUBJECT: UNITED STATES V. SHELL CHEMICAL LP
CIVIL ACTION NUMBER 2:18-CV-1404-EEF-JVM
FENCELINE MONITORING – CORRECTIVE ACTION PLAN
LDEQ AGENCY INTEREST NUMBER 26336

Dear Madam or Sir:

In accordance with the requirements in Section V, Paragraph 18 of Civil Action Number 2:18-cv-1404-EEF-JVM which became effective on February 6, 2019, Shell Chemical LP (Shell) hereby submits the enclosed Corrective Action Plan. This plan reflects the benzene fenceline monitoring data for the 14-day sampling period beginning August 17, 2022 through October 12, 2022.

If you have any questions related to this submittal, please contact Renee Toups at (504) 465-6058.

I certify to the best of my knowledge and belief that the information submitted is true, accurate, and complete.

Sincerely,

Jack Holden
Production Manager – Norco Manufacturing Complex
Attorney in Fact – Shell Chemical LP

RAT/mlc

Enclosure

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Appendix A
Corrective Action Plan

SHELL NORCO MANUFACTURING COMPLEX

CORRECTIVE ACTION PLAN

Benzene Fenceline Monitoring
40 CFR 63 Subpart CC
Reporting Periods:

August 17 – August 31, 2022;
August 31 – September 14, 2022;
September 14 – September 28, 2022; and
September 28 – October 12, 2022

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I. EXECUTIVE SUMMARY

The Shell Norco Manufacturing Complex (Shell) consists of the refinery owned by Equilon Enterprises d/b/a Shell Oil Products US (SOPUS), the chemical manufacturing plant owned by Shell Chemical LP (Shell Chemical), and the logistics unit owned by Shell Pipeline Company, LP (SPC).

As part of the Fenceline Monitoring Program required under 40 CFR 63 Subpart CC – National Emission Standards for Hazardous Air Pollutants from Petroleum Refineries, Shell is required to complete a Root Cause Analysis (RCA) per 40 CFR 63.658(g) and a Corrective Action Plan (CAP) per 40 CFR 63.658(h) for the sample periods from August 17, 2022 through October 12, 2022.

Additionally, as part of the Shell Chemical Consent Decree, Civil Action No. 2:18-cv-1404-EEF-JVM, Shell is required to complete an RCA and a CAP in accordance with Paragraph 18 and Appendix 1.8, Paragraphs 3(g) and (h) for the 14-day sample periods identified above.

For clarity and completeness, this report is broken out into a timeline of the affected monitoring periods with the periods' respective root cause analyses and corrective actions. The conclusion of this document includes the CAP requirements.

II. REGULATORY BACKGROUND

As required in 40 CFR 63.658(g) and Paragraph 18 and Appendix 1.8, Paragraphs 3(g) of the Shell Chemical Consent Decree, the RCAs discussed herein commenced within five (5) days of determining the action level had been exceeded, and the RCAs and initial corrective action analyses were completed, and initial corrective actions were taken within 45 days after determining the exceedance.

For the period from August 17 through August 31, 2022, the period Δc for the next full two-week sampling period after completion of the corrective actions was greater than the benzene action level of 9 $\mu g/m^3$. As such, a CAP was required to be developed per 40 CFR 63.658(h) and Paragraph 18 and Appendix 1.8, Paragraphs 3(h) of the Shell Chemical Consent Decree and submitted to the Administrator within 60 days after receiving the analytical results indicated that the Δc value for the 14-day sampling period following completion of the initial corrective action(s) was greater than 9 $\mu g/m^3$. This document serves to meet the CAP submittal requirements and includes the following:

- Corrective actions completed to date;
- Additional measures proposed to reduce benzene fenceline emissions; and,
- A schedule of implementation for such measures.

III. MONITORING RESULTS AND TIMELINE

The following section provides an overview of the monitoring periods reviewed in this CAP.

Table III-1: Period and Annual Rolling Average Delta C

Sample Period	Refinery RMACT		Chemical CD		Comments
	Period Δc [µg/m³]	Annual Rolling Average Δc [µg/m³]	Period Δc [µg/m³]	Annual Rolling Average Δc [µg/m³]	
8/17 - 8/31	16.49	15.52	16.49	15.52	Initial period in which the Δc and annual rolling average Δc were both above the action level.
8/31 - 9/14	18.53	16.04	18.53	16.04	Period Δc and annual rolling Δc were above the action level after initial corrective actions were implemented for the period of 8/17-8/31. Root cause for this period was different than previous.
9/14 - 9/28	9.59	16.19	9.59	16.19	Period Δc and annual rolling Δc were above the action level after initial corrective actions were implemented for the period of 8/31-9/14. Root cause for this period was different than previous.
9/28 - 10/12	9.21	16.17	9.21	16.17	Period Δc and annual rolling Δc were above the action level after initial corrective actions were implemented for the period of 9/14-9/28. Root cause for this period was the same as previous period.
10/12 - 10/26	4.19	16.16	4.19	16.16	Period Δc was under action level.

Table III-2: Individual Sample Points Above Action Level

Sample Period	Sample Point Above Action Level	Benzene Result (µg/m³)
8/17 - 8/31	R-04 (Refinery Only)	15.0
	B-05	17.0
8/31 - 9/14	R-04 (Refinery Only)	14.0
	B-05	19.0
9/14 - 9/28	B-05	10.0
9/28 - 10/12	B-05	9.5
10/12 - 10/26	None	–

Table III-3: Timeline and Regulatory Dates					
Sample Day Period	Date Sample Results Received	RCA Start Date *(Regulatory Req't Date)*	RCA Complete Date *(Regulatory Req't Date)*	Corrective Action(s) Completion Date	CAP Required & Due Date
8/17/22 - 8/31/22	9/9/22	9/12/22 *(9/14/22)*	9/19/22 *(10/24/22)*	8/25/22	Yes – 1st sample period after initial corrective actions were completed (8/31-9/14) was above the action level. *(Due 11/21/22)*
8/31/22 - 9/14/22	9/22/22	9/26/22 *(9/27/22)*	10/18/22 *(11/6/22)*	9/5/22	Yes – same as previous period. *(Due 11/21/22)*
9/14/22 - 9/28/22	10/7/22	10/10/22 *(10/12/22)*	11/11/22 *(11/21/22)*	9/29/22	Yes – same as previous period. *(Due 11/21/22)*
9/28/22 - 10/12/22	10/21/22	10/25/22 *(10/26/22)*	11/11/22 *(12/5/22)*	9/29/22	Yes – same as previous period. *(Due 11/21/22)*
10/12/22 - 10/26/22	11/4/22	Period Δc below action level.			

IV. ROOT CAUSE ANALYSIS

The Root Cause Analyses for the monitoring periods identified above, 8/17/22 – 10/12/22, were combined due to the proximity of the affected monitors and timing of the affected periods. A wind rose for each of the monitoring points and map of the monitoring locations is provided below wherein the red points show the monitors above the action level.

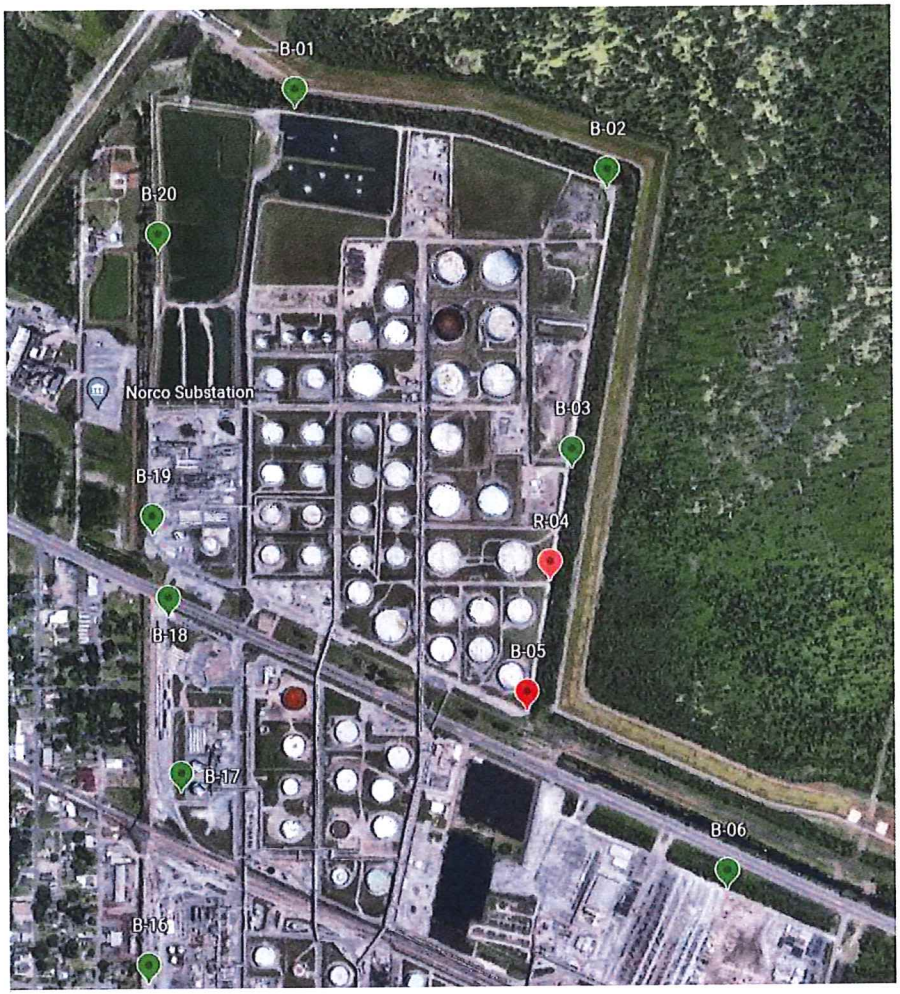


Figure IV-1: Monitors Above Action Level

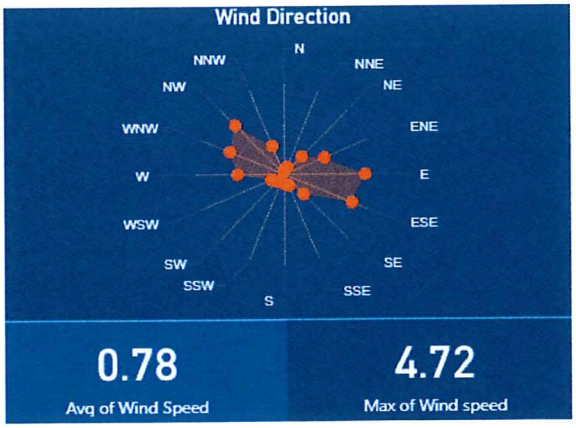


Figure IV-2: Wind Rose for 8/17-8/31/22

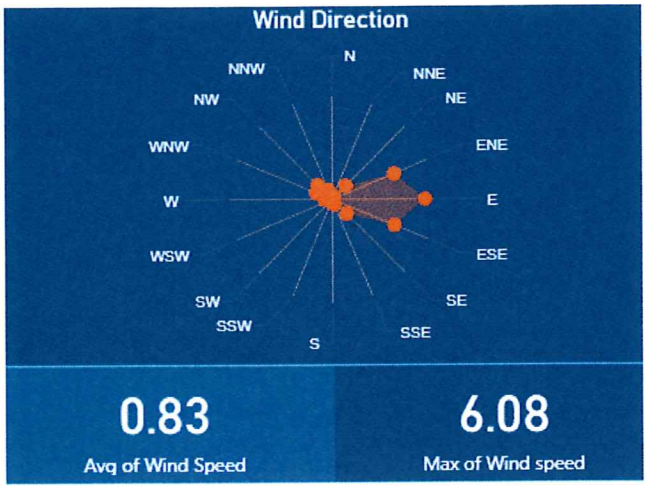


Figure IV-3: Wind Rose for 8/31-9/14/22

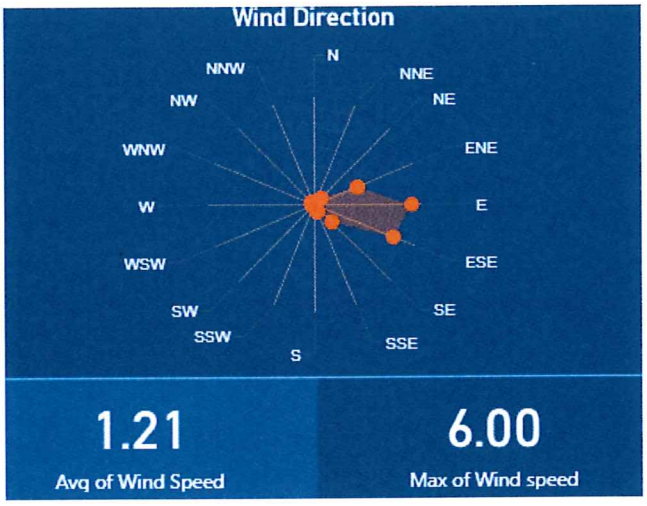


Figure IV-4: Wind Rose for 9/14-9/28/22

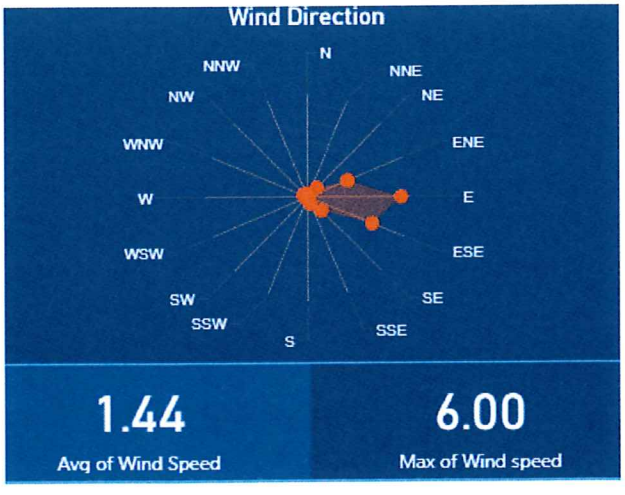


Figure IV-5: Wind Rose for 9/28-10/12/22

A. Source Description

For the purposes of the root cause analysis for the aforementioned periods, emissions sources within 500 feet of the affected monitors were investigated. Figure IV-6 shows the area within a 500-foot radius around Monitors R-04 and B-05. Note that Monitor B-03 averaged a result of 1.3 µg/m^3 during these periods with a maximum result of 2.3 µg/m^3.

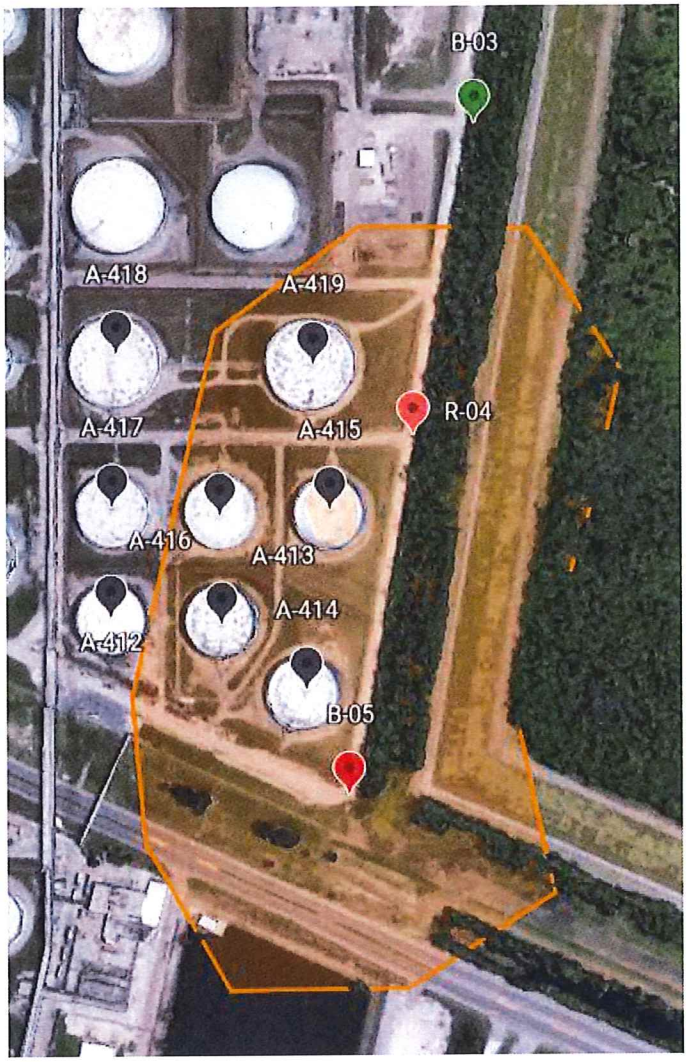


Figure IV-6: Emissions Sources within 500 feet of Affected Monitors

The nearest emissions sources to R-04 and B-05 are the North Property Crude Tanks, A-414, A-413, A-415, A-416, and A-419, as shown in Figure IV-6. These external floating roof tanks receive crude oil from the supply pipeline and provide crude oil feed to the distilling unit. Tank A-414 can also receive material from the off-spec header during unit upset conditions. Currently Tank A-415 is out of service for tank cleaning and inspection.

Except for pumps and piping components, there are no other emissions source with 500 feet of the affected monitors.

B. Immediate Data Gathering and Investigation Actions

Upon receipt of the August 17 – August 31 results (received September 9), site shift reports and monitoring data were reviewed for any abnormal operations during this period near the affected monitors. Leak inspection data and tank inspection data was reviewed for the crude tanks for any deficiencies. During several field inspections throughout September, October, and November, leak inspection tools including a Phoenix LDAR probe and drone-mounted FLIR were used as well as a Tiger Handheld benzene monitor to identify sources of elevated emissions.

Two eGCs trailer-mounted benzene monitors are currently deployed in the North Property Tank Farm near the crude tanks. eGC #8 was deployed in early August in preparation of the tank turnaround activities. eGC #6 was moved to the southeast corner of North Property on October 12 due to elevated results from the passive monitor B-05. Figure IV-7 shows the locations of the eGC monitors.

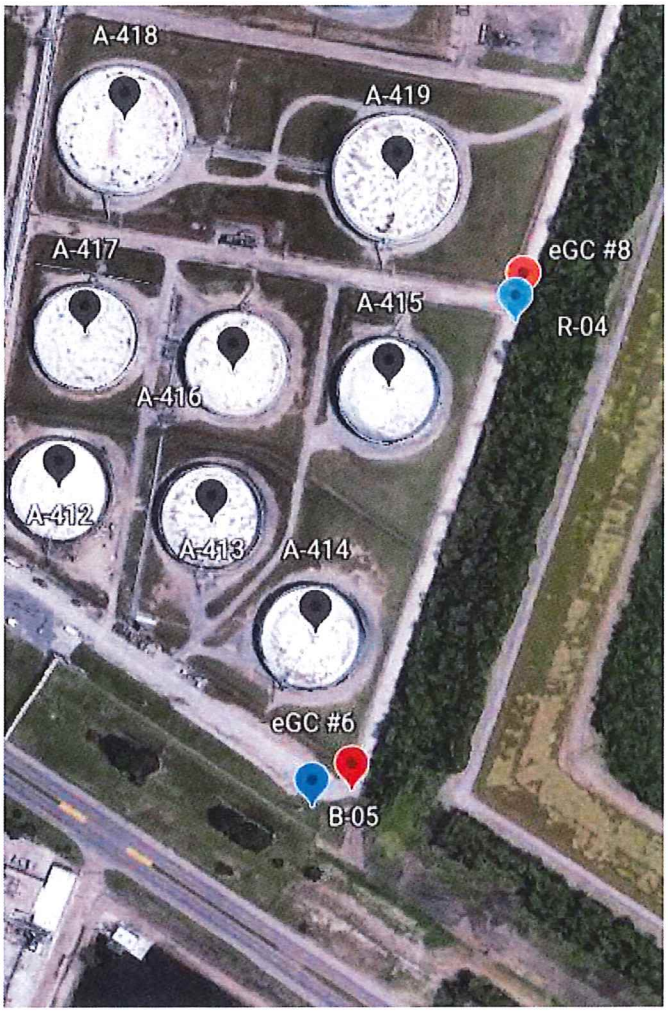


Figure IV-7: eGC Trailers

C. Investigation Results and Root Cause(s) – August 17 through 31, 2022

Monitor B-05 – Period 1 Cause #1:

On August 20, 2022, Norco Refinery's Hydrocracking Unit (HCU) experienced a power dip caused by a third-party provider resulting in the trip of the unit's 2nd Stage Charge Pump's (P-1940) variable frequency drive (VFD). This caused the loss of feed to the 2nd Stage section resulting in a unit shutdown until the pump could be restarted. During startup of the HCU on August 25, a second Instrumented Protective Function (IPF) activation for the same condition occurred. The shutdown and reduced rates at other refining units caused an increase in off-spec material flow to Tank A-414. The off-spec rundown was at a higher-than-normal temperature which caused elevated emissions near the affected monitoring points.

Monitor B-05 – Period 1 Cause #2

During the HCU upset conditions described in Cause #1 above, sour water flow from HCU was also elevated due to the HCU recycle water pumps being out of service from seal failures. While HCU was producing more sour water flow, which is routed to the DU-4 sour water drum, the DU-4 sour water drum level transmitter malfunctioned. This caused sour water to overflow to the off-spec header system instead of the slop system. The off-spec rundown was at a higher-than-normal temperature which caused elevated emissions near the affected monitoring points. Once the recycle water pumps were returned to service, operations were able to line the sour water back into the slop system and out of the off-spec system away from Tank A-414.

Monitor R-04 Period 1 Cause

In addition to the impacts described in the B-05 section above, Tank A-415, an external floating roof tank storing crude oil, began planned turnaround maintenance activities in mid-August. The turnaround activities included draining the material from the tank; circulating a portion of the crude to break up the solid sludge layer that remained on the bottom of the tank; introducing nitrogen to create an inert atmosphere; and subsequent tank degassing utilizing a thermal oxidizer for emissions control. The tank roof was landed on August 18, 2022, to complete the de-inventorying phase and begin the sludge circulation. It is believed that this resulted in the elevated emissions near the compliance monitor R-04. Please note that compliance monitor R-04 is subject to the Fenceline Monitoring Program required under 40 CFR 63 Subpart CC and is not a monitoring point included in the Shell Chemical Consent Decree.

D. Investigation Results and Root Cause(s) – August 31 through September 14, 2022

Monitor B-05 – Period 2 Cause

On September 3, 2022, the site experienced a loss of energy from a 3rd Party Supplier resulting in an unplanned shutdown of the DU-5 Unit and the Coker Unit. The shutdown of DU-5 Unit led to the routing of off-spec rundown material to the crude tanks, A-412 and A-414. The off-spec material was at an elevated temperature which resulted in impacts to the affected monitoring points. Through investigation it was determined that a racoon was able to gain entry into the Norco Substation that provides power to these units. It was found that temporary toolboxes were stored near the cable tray racks outside of the fenced substation which allowed the racoon to bypass the

critter intrusion measures that were in place. The 3rd party has since removed all equipment in the area and is adding signage to make onsite personnel aware that parking of vehicles or storing of equipment is not allowed near the fence.

Monitor R-04 Period 2 Cause

The root cause identified in the period August 17 through 31, 2022 was found to be the same root cause for this period as well as impacts described in the section above during the September 3 power loss.

E. Investigation Results and Root Cause(s) – September 14 through September 28, 2022

Monitor B-05 – Period 3 Cause #1

On September 28, 2022, the HCU, Sulfur Plants and the Olefins Unit (GO-1) were impacted by a regional power failure caused by a 3rd party electrical supplier resulting in subsequent unit upsets and shutdowns. The HCU shutdown as well as the reduced rates at other refining units caused an unexpected increase in off-spec material flow to Tank A-414. The off-spec rundown was at a higher-than-normal temperature which caused elevated emissions near the affected monitoring point.

The 3rd Party electrical supplier experienced a Line-to Line fault trip on their 230 kV line and a Line-to-Ground fault trip on their 500kV line which were both repaired by September 29.

Monitor B-05 – Period 3 Cause #2

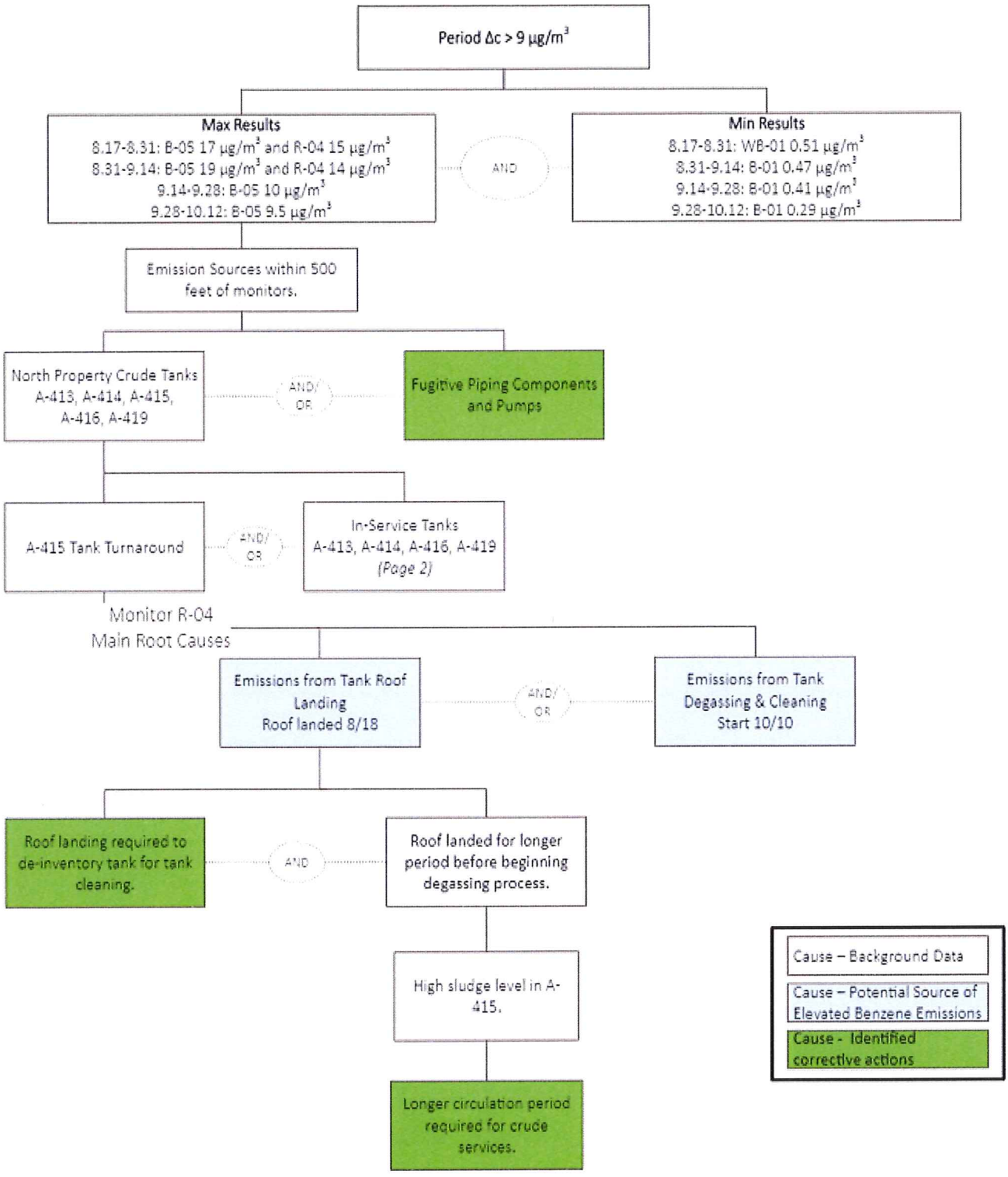
As a result of the shutdown described in Cause #1 above, the HCU second stage coalescer level dropped below target causing a level indicator to erroneously show a "bad" level reading. The "bad" level triggered a valve to the sour water system/drum to its failed position (open) and the valve to the HCU second stage main fractionator to its failed position (closed). As feed was introduced to the HCU during restart, hot hydrocarbons were sent to the sour water system/drum through the open valve on the HCU second stage coalescer. The hot hydrocarbons overwhelmed the sour water system/drum and were routed to the off-spec header thus contributing to the increase in off-spec material flow and temperature to Tank A-414 described in Cause #1 above.

F. Investigation Results and Root Cause(s) – September 28 through October 12, 2022

The root causes identified in the period above, September 14 through September 28, 2022, were found to be the same root cause for this period as well as impacts described in the section above during the September 28 power loss.

G. Cause Tree

The Cause Tree below in Figure IV-8 depicts the root cause(s) identified for this period. The green boxes represent a root cause that was directly addressed with a corrective action identified in Table IV-2. Note that not every cause must be addressed to break the tree and prevent recurrence. Specific causes were chosen to address with actions as marked in the green boxes on the tree.


Period Δc > 9 µg/m³
Max Results
8.17-8.31: B-05 17 µg/m³ and R-04 15 µg/m³
8.31-9.14: B-05 19 µg/m³ and R-04 14 µg/m³
9.14-9.28: B-05 10 µg/m³
9.28-10.12: B-05 9.5 µg/m³
AND
Min Results
8.17-8.31: WB-01 0.51 µg/m³
8.31-9.14: B-01 0.47 µg/m³
9.14-9.28: B-01 0.41 µg/m³
9.28-10.12: B-01 0.29 µg/m³
Emission Sources within 500 feet of monitors.
North Property Crude Tanks A-413, A-414, A-415, A-416, A-419
AND/OR
Fugitive Piping Components and Pumps
A-415 Tank Turnaround
AND/OR
In-Service Tanks A-413, A-414, A-416, A-419 (Page 2)
Monitor R-04 Main Root Causes
Emissions from Tank Roof Landing Roof landed 8/18
AND/OR
Emissions from Tank Degassing & Cleaning Start 10/10
Roof landing required to de-inventory tank for tank cleaning.
AND
Roof landed for longer period before beginning degassing process.
High sludge level in A-415.
Longer circulation period required for crude services.
Cause – Background Data
Cause – Potential Source of Elevated Benzene Emissions
Cause - Identified corrective actions

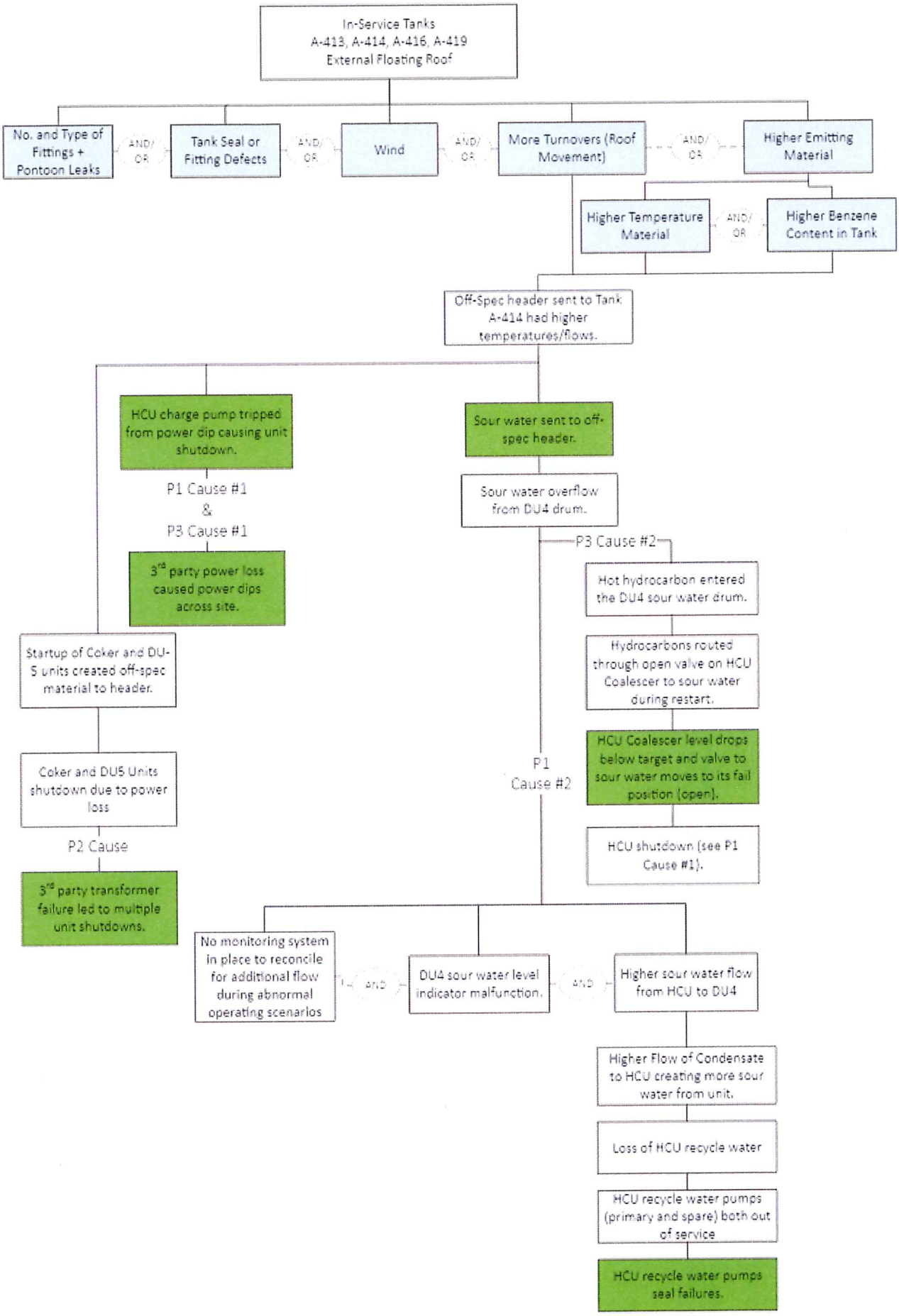


Figure IV-8: Cause Tree Analysis

H. Corrective Actions

Table IV-2: Corrective Actions		
Corrective Actions	**Completion Date**	**Comments**
Sample Period: 8/17/22- 8/31/22		
Identify any and all activities which took place in the affected area during this time.	9/14/22	Tank A-415 turnaround activities occurred during this period.
Identify any process abnormalities as potential contributing factors to the elevated readings on the #8 eGC and the fenceline monitors (B-05 and R-04).	9/20/22	HCU shutdown unexpectedly on 8/20 due to a power dip from a 3rd party provider resulting in routing of material into Tank A-414
HCU 2nd Stage was restarted following power dip	8/22/22	The routing of off spec material to tank A-414 ceased
Return the HCU recycle water pumps to service	8/25/22	The Sour water was routed back into the slop system away from tank A-414
Sample Period: 8/31/22 – 9/14/22		
Identify any and all activities which took place in the affected area during this time.	9/14/22	Tank A-415 turnaround activities occurred during this period. Work activities in this area include contractor vehicles, hoses, and a fuel storage vessel used for tank cleaning.
Identify any process abnormalities as potential contributing factors to the elevated readings on the #8 eGC and the fenceline monitors (B-05 and R-04).	9/3/22	Unplanned shutdown of DU5 and Coker Units due to a loss of energy from 3rd Party Supplier on 9/3/22
Make repairs to the damaged cable and perform equipment testing on the transformer prior to startup	9/5/22	3rd Party and Shell personnel responded immediately to the incident; repairs were made to the damaged equipment and the units were able to restart shortly thereafter.
Remove all equipment near the substation fencing that could provide access to the substation by wildlife.	9/5/22	The 3rd party removed all equipment in that area and is in the process of adding more signage to make onsite personnel aware that parking of vehicles or storing of equipment in those areas are not allowed
DU5 Unit was restarted following loss of energy	9/6/22	The routing of off spec material to tank A-414 ceased
Sample Period: 9/14/22 - 9/28/22		
Identify any and all activities which took place in the affected area during this time.	10/11/22	Tank A-415 turnaround activities occurred during this period. Work activities in this area include contractor vehicles, hoses, a fuel storage vessel used for tank cleaning.

Table IV-2: Corrective Actions		
Corrective Actions	**Completion Date**	**Comments**
Identify any process abnormalities as potential contributing factors to the elevated readings on the #8 eGC and the fenceline monitor (B-05).	10/11/22	Site experienced loss of power from 3rd party supplier on 9/28 resulting in the HCU to shut down
3rd party utility supplier inspected their equipment trips, made repairs, cleared the failed shield wire and restored normal electrical power to the site	9/29/22	
HCU was restarted following power dip	9/29/22	The routing of off spec material to tank A-414 ceased
Review tank integrity inspection reports for deficiencies	10/11/22	No deficiencies were noted, no changes in fittings, no pontoon leaks detected. Field walks with FLIR, LSAR probes and TIGER confirmed results
Deploy additional eGC monitor near Fenceline monitor B-05	10/12/22	
Utilize monitoring devices for VOC and Benzene detection	10/18/22 - 10/21/22	LDAR monitoring data did not note any leaks on or around the vicinity of the monitor. Drone flyovers did not note any leaks near the monitor
Perform 3rd party mobile air monitoring near affected Fenceline monitors, B-05 and R-04	10/19/22	Benzene concentrations ranging from 0-8.5 ppb were found isolated near monitor B-05, believed to be from Tank A-414
Sample Period: 9/28/22 - 10/12/22		
Identify any and all activities which took place in the affected area during this time.	10/25/22	Tank A-415 turnaround activities continued during this period. Work activities in this area include contractor vehicles, hoses, a fuel storage vessel used for tank cleaning.
Identify any process abnormalities as potential contributing factors to the elevated readings on the #8 eGC and #8 eGC and the fenceline monitor (B-05).	10/25/22	No known process abnormalities occurred during this 2-week sample period that impacted the surrounding emission sources.
Perform additional LDAR monitoring for leaking fugitive components	11/11/22	Multiple field visits were conducted throughout this period utilizing drones, FLIR cameras, Tiger Handheld and LDAR probes. First repair attempts were conducted on leaking Shell components. 3rd party pipeline operator notified of leaks and conducted first attempt repairs.

I. Conclusion

The corrective actions for the 8/17/22 - 8/31/22 sampling period were completed by 8/25/22. Due to multiple unrelated process upsets, the period ΔC for the next three sample periods following these results (8/31/22 - 9/14/22, 9/14/22 - 9/28/22 and 9/28/22 - 10/12/22) were above the action level. The period ΔC for the first full sample period following completion of corrective actions (10/21/22 - 10/26/22) was below the action limit.

V. CORRECTIVE ACTION PLAN

As required in 40 CFR 63.658(h) and Appendix 1.8 Paragraphs 3(h) of the Shell Chemical Consent Decree, the following sections address the CAP requirements.

A. Corrective Actions Completed to Date

All corrective actions completed thus far have been identified in the respective periods' sections and included in Table IV-2.

B. Additional Measures

In addition to the immediate corrective actions identified in the RCA periods above, additional measures have been identified to address the elevated benzene near the North Property Tanks.

Upon review of A-415 Tank Turnaround activities during the affected periods, several additional measures were identified to improve the existing work practices. Specifically, Shell has hired a dedicated process engineer to support tank turnarounds which will aid in the design, preplanning and execution phases of tank cleanings and turnaround projects resulting in greater efficiency. For this tank turnaround, a new 3rd party vendor was utilized to support the tank cleaning which caused additional delays during equipment set up. Going forward, Shell will utilize an existing vendor that is more familiar with the facility and procedures. Additionally, the turnaround MOC process will be updated to include evaluating alternative cutter stock during the circulation phase to minimize benzene emissions. Additional benzene monitoring before tank turnarounds begin will also be incorporated into existing work processes to gather benchmarking data of the affected areas.

In addition, the HCU has identified measures that will be evaluated to prevent excess sour water flow into the off-spec header during upset conditions. Options to be considered include upgrading the seals on the HCU recycle water pumps, installing more robust level detection on the coalescer, and changing the logic on the charge pump. These options will require longer evaluation and planning times as well as a unit turnarounds to implement.

C. Schedule of Implementation

The following outlines the proposed schedule for implementation of these additional measures:

Table V-1

Task	Target Date	Status
Hire a dedicated process engineer supporting tank Turnarounds, MOC and preplanning. This will aid in less rework of MOC actions and prevent delays in the turnaround process.	3Q22	Complete
Use more experienced 3rd party for future tank turnarounds.	4Q22	Complete

Table V-1		
Task	Target Date	Status
Utilize additional eGC trailers or 3rd party monitoring to conduct benchmark benzene readings prior to tank turnaround activities. Incorporate into existing turnaround procedures.	1Q23	In progress
Evaluate need to use a different cutter stock during tank circulation to minimize benzene emissions.	**2Q23**	Not Started
Evaluate changing the fail position and/or installing a more robust level detection on the HCU 2nd Stage Coalescer during the next unit turnaround.	**4Q23**	In Progress
Evaluate upgrading HCU recycle water pump to seal system.	**TBD**	Not Started- this will be evaluated as part of a larger capital project
Evaluate changing the VFD logic to power failure auto-restart such that the HCU charge pump is more resistant to power dips. This would require a unit turnaround to implement.	**3Q23**	In Progress