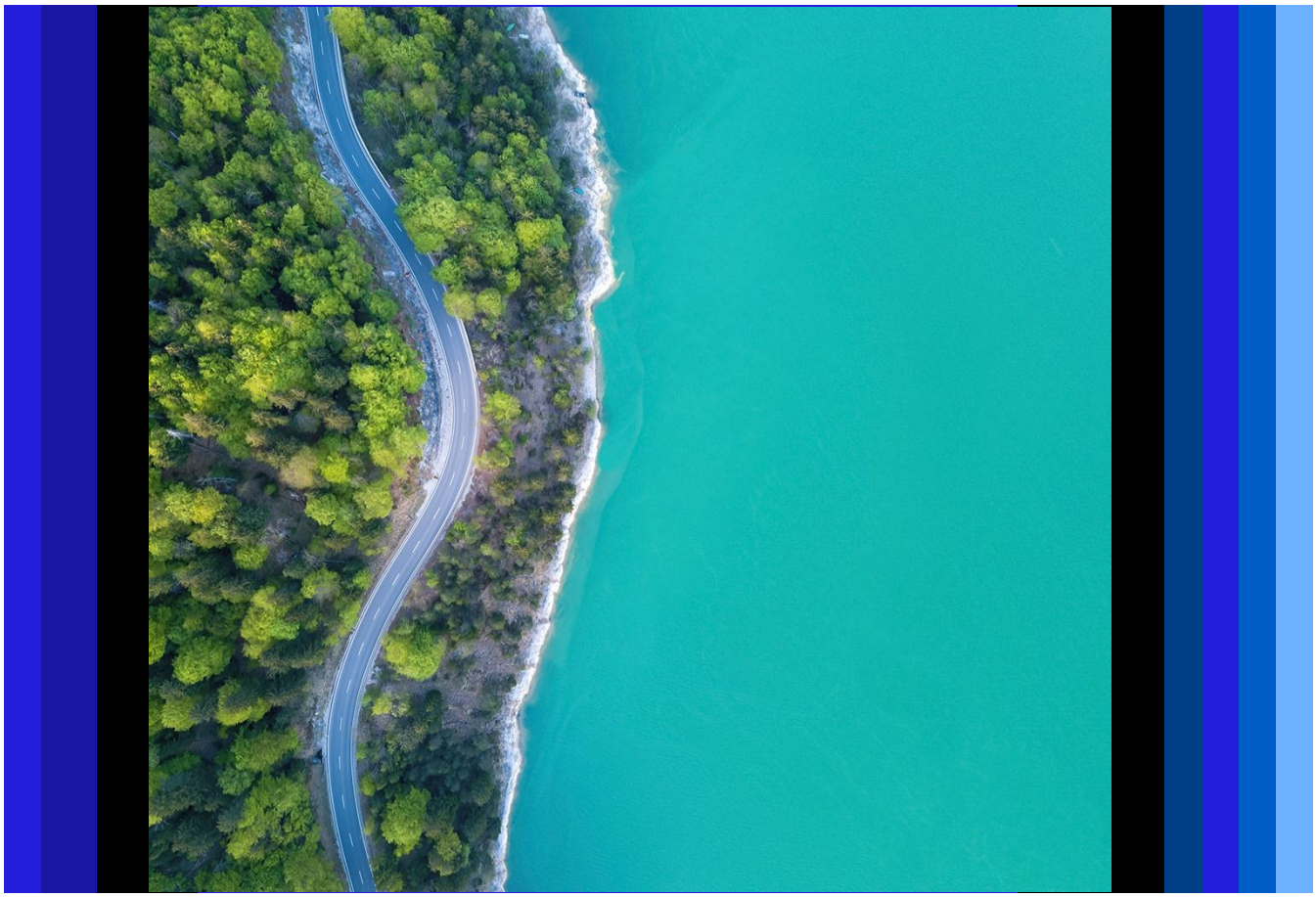
Air Quality Monitoring Annual Report 2025

Document no: IW272400-1-NN-PRT-25
Version: 0

Crowley Australia Pty Ltd

Project Caymus
March 3, 2026



Air Quality Monitoring Annual Report 2025

Client name:	Crowley Australia Pty Ltd		
Project name:	Project Caymus		
Project no:	IW272400		
Document no:	IW272400-1-NN-PRT-25	Project manager:	Daniel Coffey
Version:	0	Prepared by:	Daniel Coffey
Date:	March 3, 2026	File name:	IW272400-1-NN-PRT-024 Air Monitoring Progress Report 24

Document history and status

Version	Date	Description	Author	Checked	Reviewed	Approved
0	6/2/26	First issue	DC	GS	GS	DC

Jacobs Group (Australia) Pty Limited

Level 2, Unit 10
25 Parap Road
Parap, NT 0820
PO Box 2145
Parap, NT 0804
Australia

T +61 8 8982 480
ww.jacobs.com

Executive Summary

Baseline air quality monitoring has been conducted in accordance with the Air Quality Monitoring Program (Jacobs, 2022). Two annual air quality monitoring reports were submitted during the baseline period (Air Quality Monitoring Annual Report – 2023 and Air Quality Monitoring Annual Report – 2024). After the completion of two years of baseline monitoring annual air quality monitoring was suspended due to sufficient baseline data being collected. Annual air quality monitoring recommenced in September 2025, when fuel was first brought to site. As a result, there is limited 5 months of data for the 2025 calendar year. This is not sufficient data to make a conclusive interpretation of the air quality for the calendar year. This report will act solely to highlight the data gathered during the period.

No substances exceeded assessment criteria during the 2025 calendar year. All results are within an order of magnitude of previously collected baseline results. Notable peaks are evident in September 2025; this coincides with the first JET A-1 filling event. In depth monitoring conducted in this period are further discussed in Air Quality Monitoring - Tank Filling Event Report (Jacobs, 2025). These identified peaks are an order of magnitude below the adopted assessment criteria. Due to the pause in the monitoring program data capture completeness cannot be accessed

Contents

Executive Summary **3**
Contents **1**
1. Introduction **2**
2. Methodology **4**
2.1 Pollutants 4
2.2 Assessment Criteria 4
2.3 Monitoring Location 6
3. Results **9**
4. Conclusion **10**

Appendices

Appendix A. Site photolog **11**
Appendix B. Time Series Plots **12**

Tables

Table 2-1 Air Monitoring Assessment Criteria 5
Table 2-2 Sampling dates 8
Table 3-1 Summary of Results 9

Figures

Figure 1-1 Crowley BFSF under construction at East Arm Wharf (Crowley) 2
Figure 2-1 Diffuse sampler monitoring location 7
Figure 3-1 Benzene time series plot 12
Figure 3-2 Ethylbenzene time series plot 12
Figure 3-3 Toluene time series plot 13
Figure 3-4 Xylenes time series plot 13
Figure 3-5 Hexane time series plot 14
Figure 3-6 Cumene time series plot 14
Figure 3-7 Cyclohexane time series plot 15
Figure 3-8 Total Volatile Organic Compounds (TVOC) time series plot 15

1. Introduction

A U.S. Defence Bulk Fuel Storage Facility (BFSF) is located on Lot 5720 west of the Railway Terminal on East Arm District, Northern Territory, near Darwin. The 300 ML-capacity BFSF comprises eleven fuel tanks: four vertical floating-roof tanks for F-35 (Jet A-1); and seven vertical fixed-roof tanks for F-44 (JP-5). On 29 November 2021 the Northern Territory Government approved construction and operation of the BFSF and ancillary infrastructure for the transfer and storage of jet fuel – Environmental Approval Number EP2021/008 – 001.

Figure 1-1 Crowley BFSF under construction at East Arm Wharf (Crowley)

Air quality monitoring is required as part of Northern Territory Government (NTG) Environmental Approval EP2021/008 – 002 under Section 65 of the Environment Protection Act 2019 (NTG, 2021). Condition 11 of the approval outlines the requirements in regard to air quality, with condition 11 g) detailing the annual monitoring requirements which are the focus of this report.

Condition 11. Air Quality

The approval holder must ensure there are no attributable impacts from the action on the following environmental outcome:

Protect air quality and minimise emissions and their impacts on the Darwin airshed so that environmental values are maintained.

To demonstrate that the outcome in condition 11 is met, the approval holder must:

g) Undertake annual monitoring for total volatile organic compounds and BTEX at the boundary of the operating premises in accordance with approved air emission monitoring techniques in the

Approved Methods for the Sampling and Analysis of Air Pollutants in New South Wales (EPA 2016), or latest version, to the satisfaction of the CEO. The results from the annual monitoring must be evaluated as part of the Compliance Assessment Reporting process under condition 6.

2. Methodology

The Air Quality Monitoring Plan (Jacobs, 2022) outlines the methodology selection process in relation to the conditions in the Environmental Approval.

Radiello diffusive samplers for volatile organic compound (VOC) with analysis by thermal desorption and GC-MS was the method selected for annual VOC monitoring. A description of the passive samplers and other information is provided by Radiello (2024). Laboratory analysis for this project is sub-contracted to Envirolab Pty Ltd.

Following the submission of the previous annual air quality report, sampling was put on hold (it was determined that two years of baseline data would be sufficient) and would be restarted at the time of the first tank filling.

Fuel was first received at the facility on 26 September 2025 with the delivery of approximately 54 ML of jet A-1, comprising approximately 50% of the facility storage capacity of Jet 1-A fuel. Since that initial shipment, a further delivery occurred in November 2025and by the end of the calendar year the facility was at approximately 75% capacity of jet A-1 fuel. The firsts deliveries of JP-5 are scheduled in early 2026.

2.1 Pollutants

The identification of air pollutants was determined by the Jacobs (2022b) air quality impact assessment. These pollutants were included in the annual monitoring plan with monitoring methodology selected to ensure all identified pollutants could be measured with appropriate analytical sensitivities, and with reference to the NSW Environment Protection Authority (NSW EPA) Approved Methods for the Sampling and Analysis of Air Pollutants in New South Wales (NSW EPA, 2022a).

The following pollutants were identified for inclusion in the air quality monitoring program:

- Total volatile organic compounds (TVOC)
- Benzene, toluene, ethylbenzene, and xylenes (BTEX)
- Cumene
- Cyclohexane
- n-hexane.

2.2 Assessment Criteria

The NSW EPA Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales (NSW EPA, 2022b), provides air impact criteria (AIC) adopted for this assessment (Jacobs 2022b). NSW EPA (2022b) clearly states, '*Assessment criteria must not be used as limit conditions in environment protection licences. Compliance with assessment criteria (i.e. in the ambient air at the boundary of the premises or nearest sensitive receptor) cannot be readily determined for regulatory purposes. For point sources, a site-specific stack emission limit can be calculated (see Sections 10 and 11.1) so that the assessment criteria will not be exceeded at and beyond the boundary of a premises because of emissions from those sources*'.

The phrase, '*Compliance with assessment criteria (i.e. in the ambient air at the boundary of the premises or nearest sensitive receptor) cannot be readily determined for regulatory purposes*', acknowledges the difficulty in monitoring individual pollutants at the analytical sensitivity necessary and at the temporal resolution adopted in modelling assessments. Therefore, alternative assessment criteria have been identified and adopted to better align with the temporal resolution of monitoring results.

The monitoring results are reported as 2-week average concentrations and are continuously monitored over the year, which means that direct comparisons can be made against annual assessment criteria.

Sources of assessment criteria for interpretation of monitoring results have been summarised in **Error! Not a valid bookmark self-reference.**. There are three sources referred in the table, the National Environment Protection (Air Toxics) Measure (Air Toxics NEPM) (NEPC 2011) is a national regulatory document and has been adopted as the primary reference for assessing monitoring results. For compounds which are not included in the NEPM or for alternative averaging times, the EPA Victoria Guideline for Assessing and Minimising Air Pollution in Victoria (EPA Vic, 2022), has been used. The Impact Assessment Criteria (AIC) adopted in the impact assessment (Jacobs 2022) have been included for completeness – noting these are hourly criteria and not to be used for regulatory purposes.

The Air Toxics NEPM (NEPC 2011) sets national environment protection goal and monitoring investigation levels for benzene, toluene and xylenes that are applicable to States and Territories. Whilst the air toxics NEPM is not directly applicable to State or Territory air quality assessments, the monitoring investigation levels are routinely referenced when interpreting air quality monitoring data in jurisdictions where there are no established air quality standards applicable to monitoring data. Examples where NEPM air toxics monitoring investigation levels have been applied in such circumstances include: INPEX Annual Environmental Monitoring Report 2019-2020 (INPEX 2020), EPA Victoria Tullamarine Landfill VOC monitoring study (EPC Vic 2012), and West Gate Tunnel Project (Golder 2022).

Relevant air quality objectives for monitored pollutants sourced from the *National Environment Protection (Air Toxics) Measure (2011)* 'Air Toxics NEPM', are presented in **Error! Not a valid bookmark self-reference.**. The Air Toxics NEPM criteria limits are presented in units of ppm; however, as diffusion tubes results are reported as a mass concentration, converted criteria limits have also been presented.

The EPA Victoria Guideline for Assessing and Minimising Air Pollution in Victoria (EPA Vic, 2022) published air pollution assessment criteria (APAC) and are intended to "enable an understanding of the current condition of the environment and a basis for assessing actual and potential risks to environmental values". APACs with averaging times of 24 hours of more are included in **Error! Not a valid bookmark self-reference.**. The NSW criteria adopted by the impact assessment are included. However, they are not intended for regulatory purposes and are included here for completeness only.

Table 2-1 Air Monitoring Assessment Criteria

Pollutant	Averaging period	NEPM Investigation Level		EPA Victoria APAC		NSW IAC
		ppm	µg/m³ (25ºC, 1 atm)	ppm	µg/m³ (25ºC, 1 atm)	µg/m³ (25ºC, 1 atm)
Benzene	1 hour					29
	24 hours	-	-	0.009	29	
	Annual	0.003	10.5	-	-	
Toluene	1 hour					360*
	24 hours	1	3767	-	-	
	7 days	-	-	0.07	260	
	Annual	0.1	377	-	-	
Ethylbenzene	1 hour					8,000
	24 hours	-	-	5	21,712	
	Annual	-	-	0.06	261	

Pollutant	Averaging period	NEPM Investigation Level		EPA Victoria APAC		NSW IAC
		ppm	µg/m³ (25ºC, 1 atm)	ppm	µg/m³ (25ºC, 1 atm)	µg/m³ (25ºC, 1 atm)
Xylenes (as total of ortho, meta and para isomers)	1 hour					190*
	24 hours	0.25	1085	2	8,685	
	Annual	0.2	868	0.02	100	
Cumene	1 hour					21*
	Annual			0.08	400	
Cyclohexane	1 hour					19,000
	Annual			1.7	6,000	
n-hexane	1 hour					3,200
	Annual			0.2	700	

* Odour based AIC

AIC values published in the NSW guidance (NSW EPA, 2022b) are sourced from EPA Victoria 'State Environment Protection Policy (Air Quality Management)' (SEPP(AQM)) (Victoria Government, 2001), which is no longer enforced in Victoria, having been replaced by an Environmental Reference Standard and supporting documentation including EPA Vic (2022), from which the APAC listed in **Error! Not a valid bookmark self-reference.** are sourced. The odour-based AIC, (based on the SEPP AQM), adopted in the impact assessment are no longer included in any regulatory documentation in Victoria, with all current APAC based on health-based criteria only. Odour assessments in Victoria are now assessed by other methods and no longer include concentration-based criteria for assessment of individual odorous compounds.

For assessment criteria with averaging time less than the sampling time, the conservative maximum possible concentration is reported. In the case of 24-hr average assessment criteria, a conservative maximum possible 24-hr concentration was calculated by assuming the sampler was only deployed for 24-hours, rather than the nominal 14-day exposure. This is an overly conservative method of interpretation, however for monitoring results which are low, it provides a simple and conservative interpretation method.

For VOCs results with results below the limits of detection reported by the laboratory, the limit of detection was used as a conservative (high) estimate of the pollutant concentrations.

2.3 Monitoring Location

The Radiello diffuse sampler was deployed at a location between the facility boundary and the nearest sensitive receptor (Darwin Passenger Rail Terminal).

Figure 2-1 below shows the monitoring station location. The location is approximately 70m from the site boundary, 120m from the nearest tank and 55m from the Darwin Passenger Rail terminal.

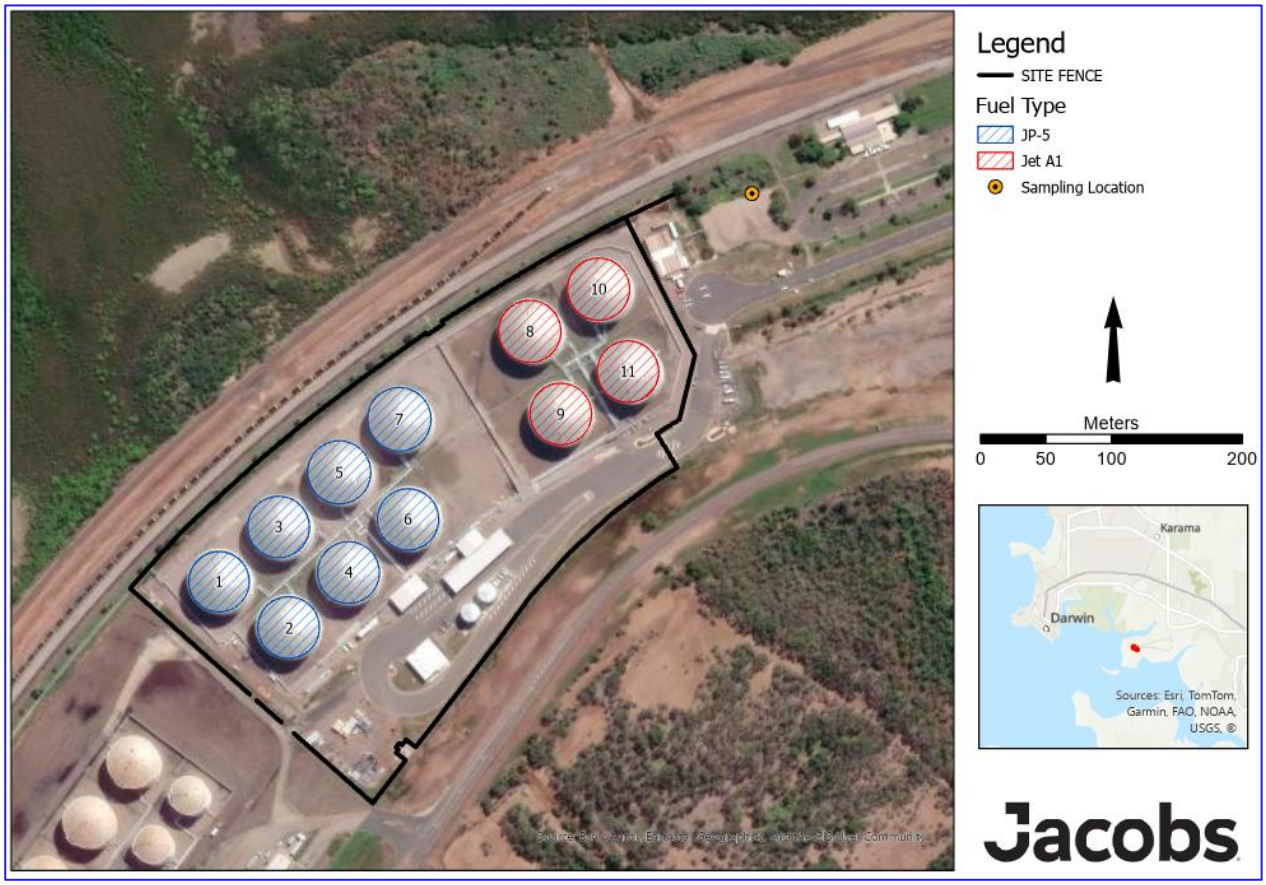


Figure 2-1 Diffuse sampler monitoring location

This site was selected for the following reasons:

- The location is easily accessible for sample deployment and collection.
- The location is between the nearest sensitive receptor and the pollutant source.
- The location is away from any potential underground services; allowing the star-pickets supporting the sampler to be safely hammered into the ground.
- The location is far enough away from the nearby sewage pump station that any VOCs released would not be identified by the sampler.
- The location is far enough distant from the emission source that the sampling location should be representative of the nearest sensitive receptor location conditions i.e. vertical dispersion of tank roof vent emissions should result in similar exposures at both the monitoring location and the nearest sensitive receptor. (A sample location too close to the tank may result in emissions being missed given the height of the tank vents).

2.3.1 Frequency and timing

The Radiello sampling was put on hold on the on 7 March 2025 (due to the completion of baseline data collection) and was recommenced on 22 September 2025 prior to the first filling event. The deployment and retrieval dates of the cartridges are shown in Table 2-2 Sampling dates**Table 2-2.**

Table 2-2 Sampling dates

Sample ID	Deployment Date	Retrieval Date
U642V	13/12/24	09/01/25
U643V	09/01/25	22/01/25
U644V	22/01/25	19/02/25
U645V	19/02/25	07/03/25
RAD-137[1]	22/9/25	29/9/25
RAD-138[1]	22/9/25	29/9/25
RAD-139[1]	22/9/25	29/9/25
RAD-103[2]	29/9/25	15/10/25
RAD-108[2]	15/10/25	5/11/25
RAD-107	5/11/25	19/11/25
RAD-94	19/11/25	10/12/25
RAD-134	10/12/25	5/1/25

Notes:

1- Collected as part of the Air Quality Monitoring – Tank Filling Event

2- Samples misplaced by laboratory – No data available

3. Results

Table 3-1 Summary of Results

Date Diffusive Sampler Deployed	Hexane		Benzene		Cyclohexane		Toluene		Ethylbenzene		Xylenes (m+p+o)		Cumene (Isopropylbenzene)		TVOC	
	µg/m3		µg/m3		µg/m3		µg/m3		µg/m3		µg/m3		µg/m3		µg/m3	
Annual Monitoring Criteria[1]	700		10.5		6000		377		261		868		400		NA	
24 hr Monitoring Criteria		NA		29		NA		3,767		21,712		1,085		NA		NA
PQL	0.002		0.002		0.002		0.002		0.002		0.002		1.000		0.008	
13/12/2024	0.07	0.98	0.03	0.42	0.002	0.028	0.31	4.34	0.06	0.84	0.14	1.96	0.002	0.0266	3.0	42
9/01/2025	0.10	1.4	0.08	1.12	0.002	0.028	0.25	3.5	0.05	0.7	0.12	1.68	0.001	0.0196	7.0	98
22/01/2025	0.06	0.84	0.04	0.56	0.001	0.014	0.26	3.64	0.05	0.7	0.12	1.68	0.001	0.0196	2.0	28
19/2/2025	0.08	1.12	0.05	0.7	0.001	0.014	0.26	3.64	0.06	0.84	0.14	1.96	0.002	0.0266	3.0	42
22/09/2025[2]	0.76	10.64	0.30	4.2	0.004	0.056	0.87	12.18	0.30	4.2	0.60	8.4	0.020	0.28	20	280
5/11/2025	0.10	1.4	0.05	0.7	0.001	0.014	0.43	6.02	0.07	0.98	0.16	2.24	0.002	0.0336	3.0	42
19/11/2025	0.06	0.84	0.02	0.28	0.001	0.014	0.24	3.36	0.05	0.7	0.14	1.96	0.002	0.0308	3.0	42
10/12/2025	0.05	0.7	0.01	0.14	0.001	0.014	0.20	4.06	0.03	0.42	0.08	1.12	0.002	0.0238	3.0	28

Notes:

1- This displays a combination of the annual NEPM Investigation Levels and EPA Victoria APAC guideline values.

2- Only the maximum results displayed from the samples collected during the tank filling event

NA- No applicable criteria

4. Conclusion

No substances exceeded assessment criteria during the 2025 calendar year. Time plot graphs are seen in **Appendix B**. All results are within an order of magnitude of previously collected baseline results. Notable peaks are evident in September 2025; this coincides with the first JET A-1 filling event. In depth monitoring conducted in this period are further discussed in Air Quality Monitoring - Tank Filling Event Report (Jacobs, 2025). These identified peaks are an order of magnitude below the adopted assessment criteria.

Due to the pause in the monitoring program data capture completeness cannot be accessed.

Appendix A. Site photolog

Description	Image
Radiello diffusive sampler location	

Appendix B. Time Series Plots

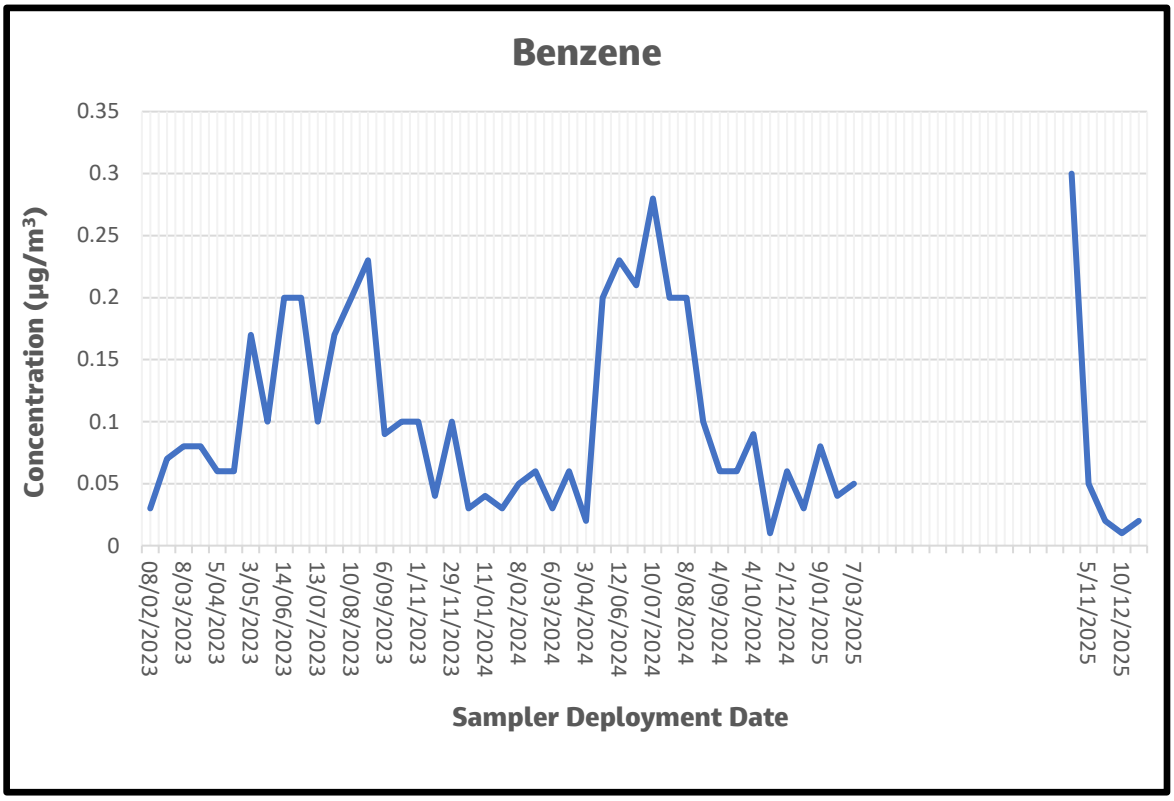


Figure 4-1 Benzene time series plot

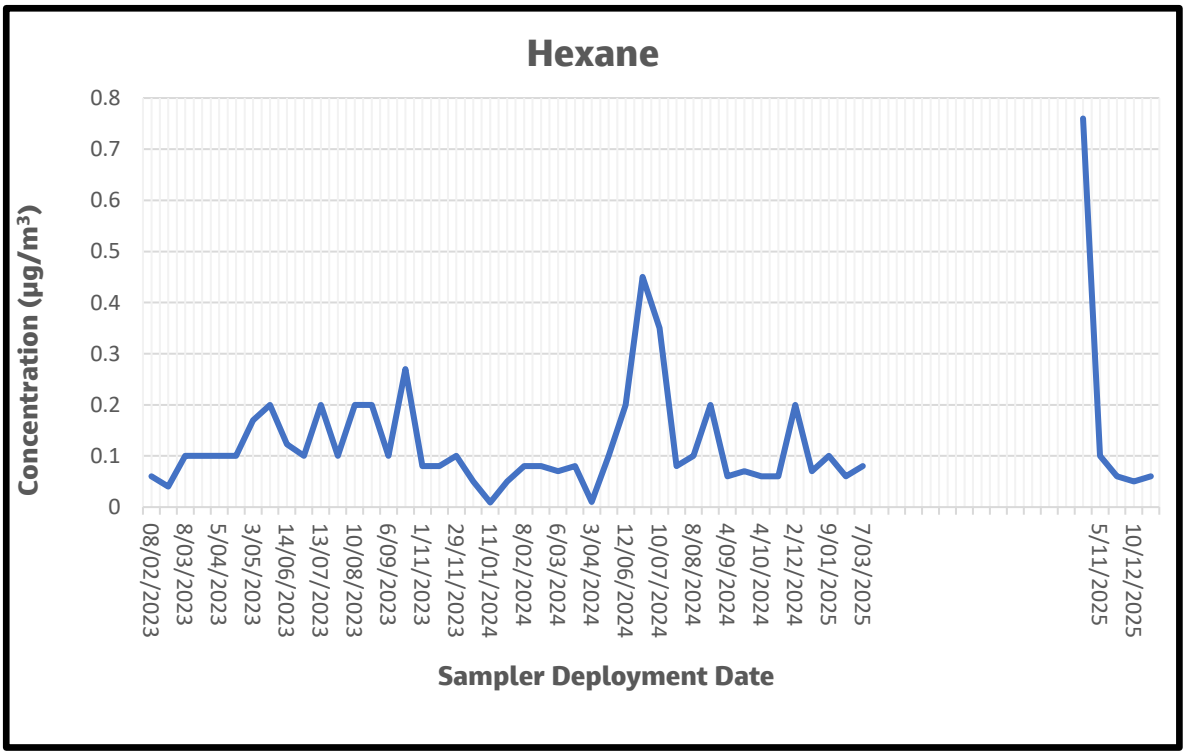


Figure 4-2 Ethylbenzene time series plot

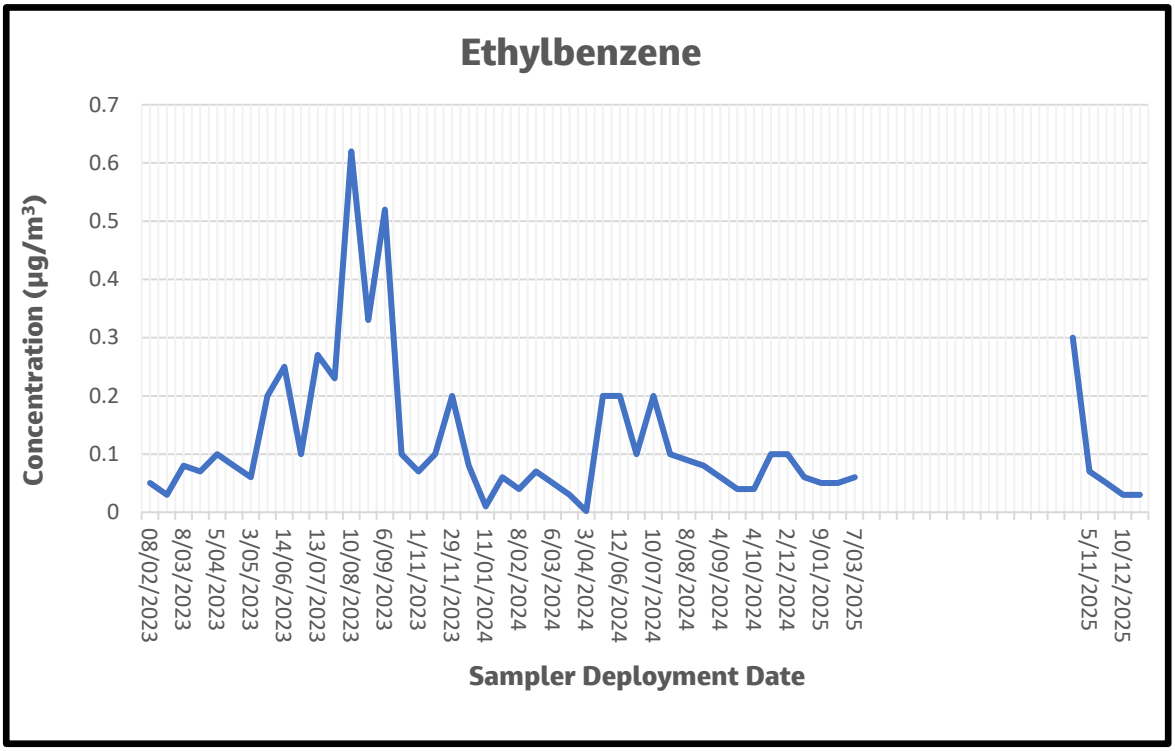


Figure 4-3 Toluene time series plot

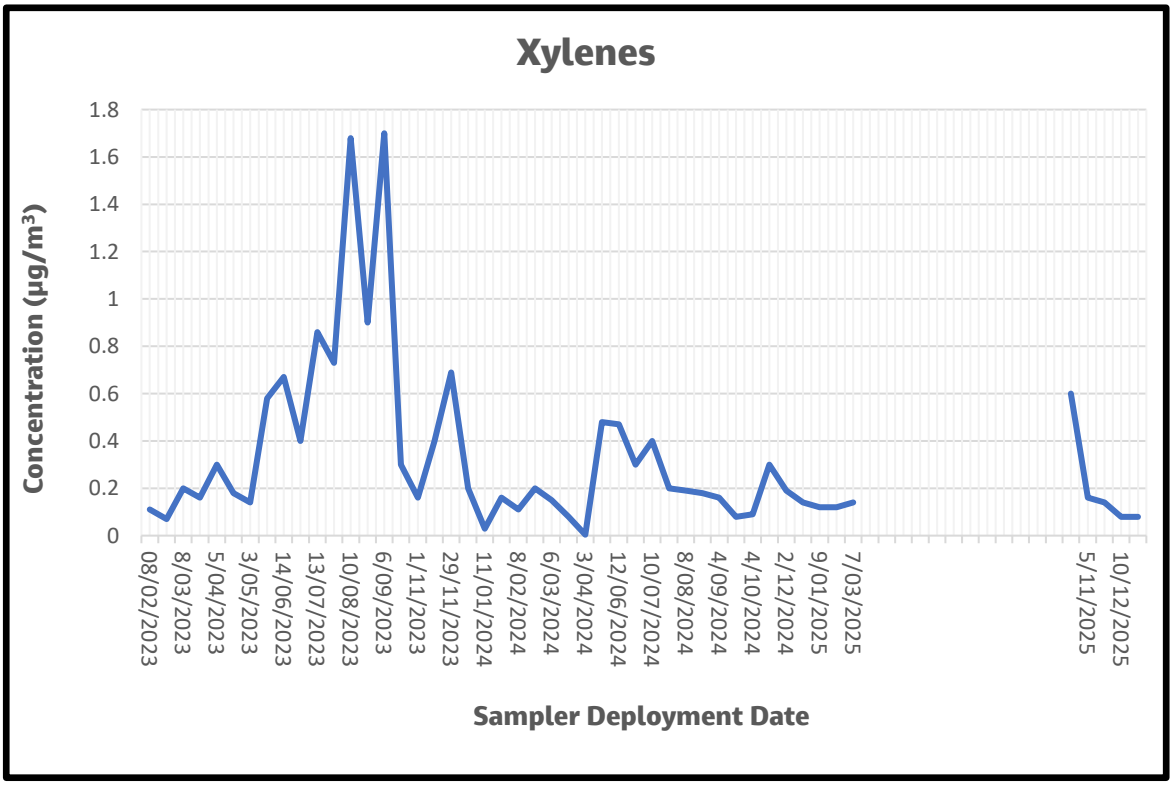


Figure 4-4 Xylenes time series plot

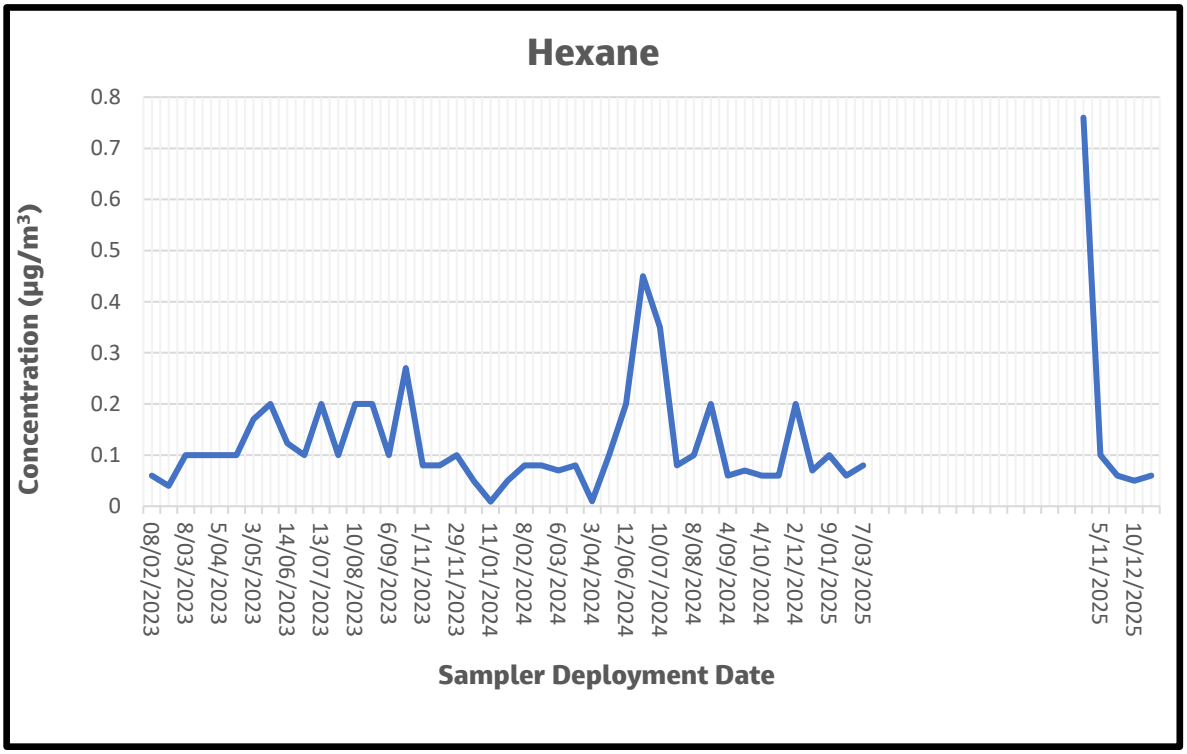


Figure 4-5 Hexane time series plot

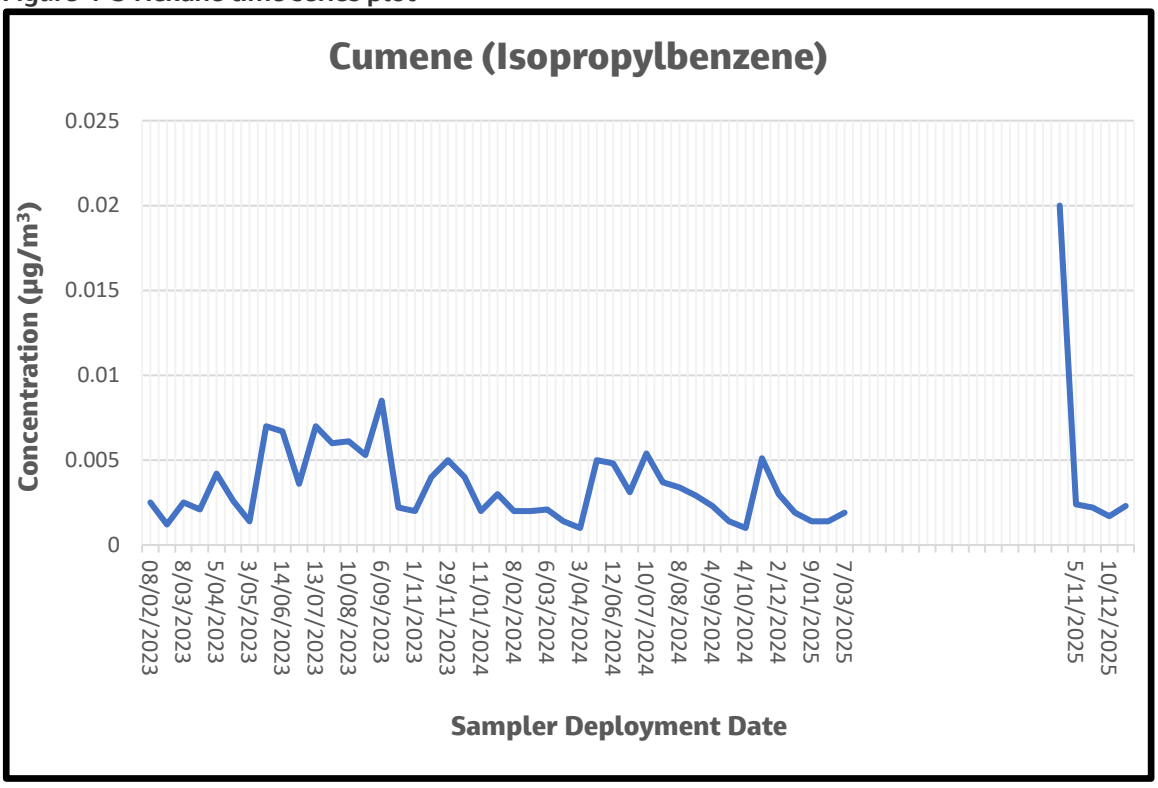


Figure 4-6 Cumene time series plot

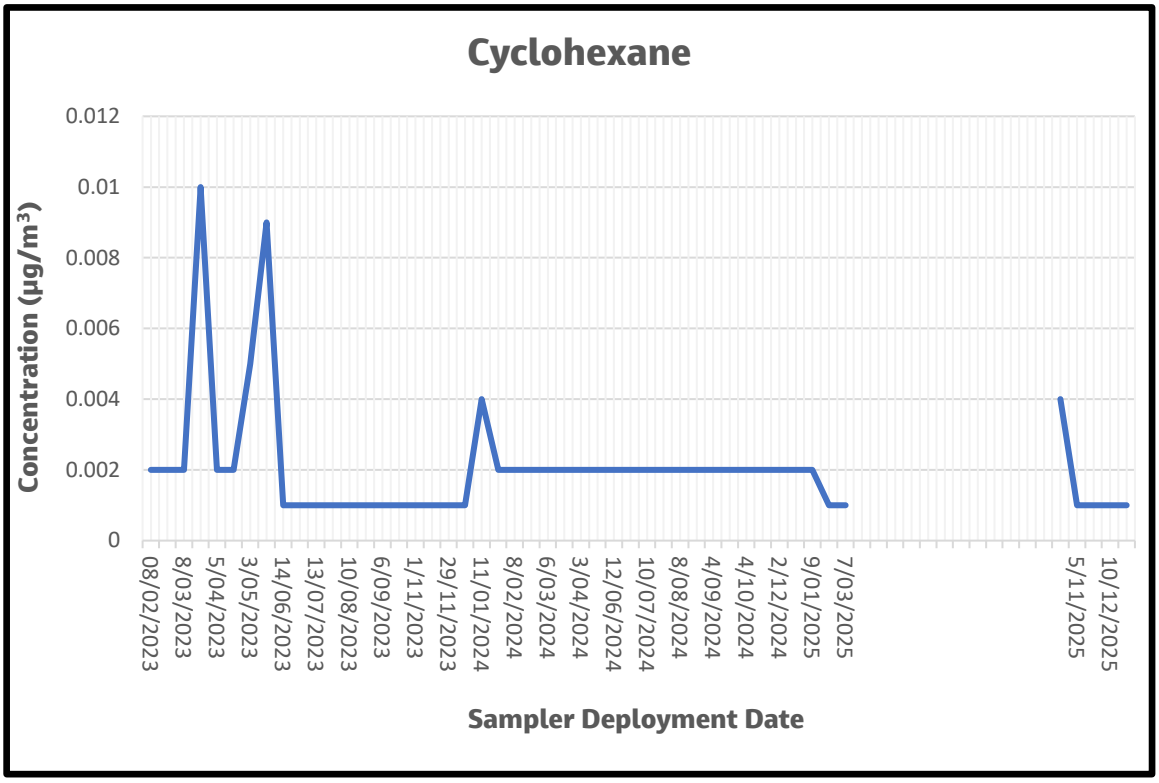


Figure 4-7 Cyclohexane time series plot

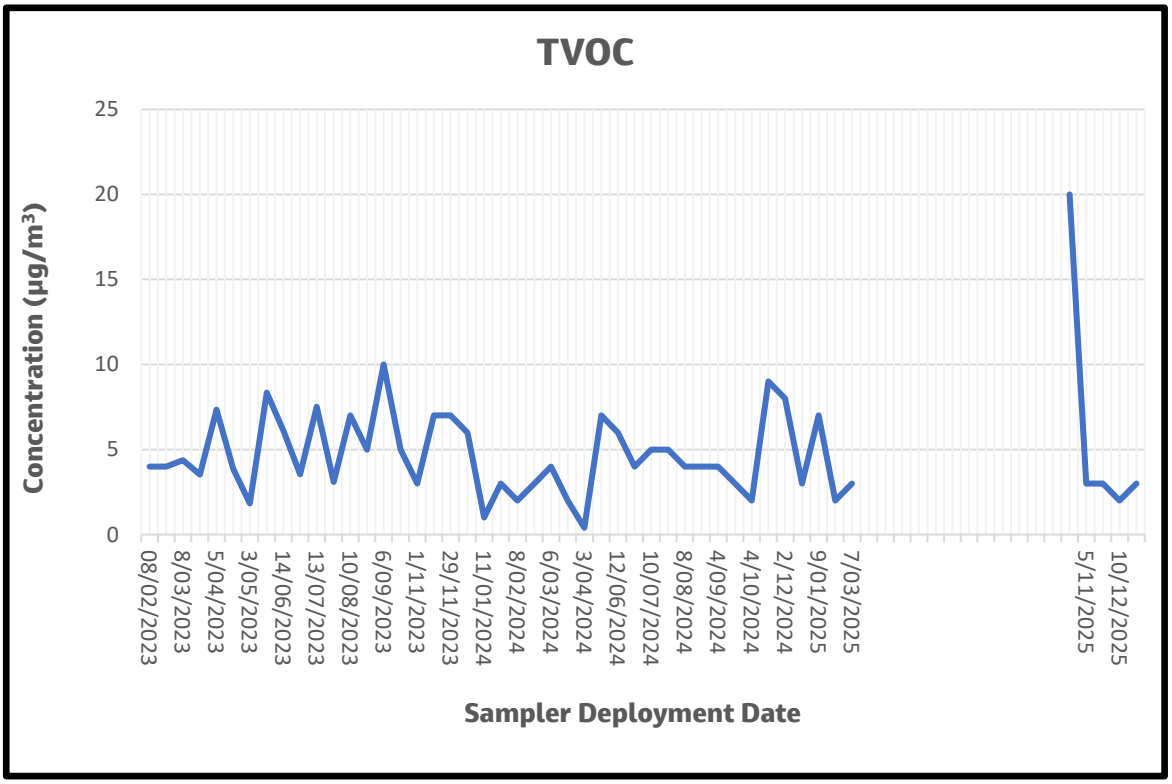


Figure 4-8 Total Volatile Organic Compounds (TVOC) time series plot