



## Annual Report Fence line Monitoring Report for the Bazan Fence line Monitoring System 2022





January 23, 2023  
Bazan Group  
Haifa, Israel

**Subject:** Annual Report for Open-Path UV Air Monitoring

This report summarizes the data collected by the four open-path UV air monitoring systems that were installed at the Bazan refinery during the time period of January to December 2022. During this time, the four systems continuously collected and quantified the concentration of Benzene, Toluene, Ethyl Benzene and Xylene (BTEX) gas in the ambient air. Information from the analyzers was reported along with meteorological data to a secured website, and alarm notifications were generated in the event target gases were detected above preset levels. Summary information is included for each beam path. The following report presents the summary results of the measurements.

**Operational Performance Events**

As of the end of 2022 the year-to-date onstream efficiency for the systems was 98.04%.

**Summary Findings**

From the results in Section 3 above the following were noted:

- The sample paths detected compounds at different times. This was expected as the paths (due to their orientation) were affected by sources from the refinery under different weather conditions.
- UV1 had the highest annual average for benzene of  $0.71 \mu\text{g}/\text{m}^3$ .
- The most daily average exceedances of the  $3.9 \mu\text{g}/\text{m}^3$  benzene alarm value was at UV1 and UV5 (4 days each)

Please do not hesitate to contact me if you have questions or need additional information regarding the report.

## Report Details

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Status	Signed
ISRAC ISO/IEC 17025 accreditation	<p>The use of ISRAC symbol relates to tests/calibrations which are included in the organization scope of accreditation, and performed according to the accreditation rules as detailed in the accreditation certificate. <b><u>The scope of accreditation is for Benzene results only</u></b>, any other information is not part of the accreditation.</p> <p>ISRAC is not responsible for the testing results conducted by the CAB and the CAB's accreditation is not considered as an approval of ISRAC or a different party related to the assessed. ISRAC accreditation is not considered as an approval of either the CAB's procedures or its personnel.</p> <p>This document must be referred to entirely and copying of any part of it to other documents is forbidden.</p>
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## Section 1 – Introduction

The purpose of the Argos open-path UV air monitoring project at the Bazan Refinery in Haifa, Israel is to measure Benzene, Toluene, Ethylbenzene and Xylene (BTEX) gases on a real-time basis and to present this information via a secured website. The system also send alerts for detection levels defined by Israeli authorities. The fence-line monitoring equipment is installed along four portions of the fence line at the Bazan refinery, these locations are shown in Figure 1.1. The beam paths covered are referenced as: Refinery Northeastern line 867 meters (UV1); Gadiv Eastern line 428 meters (UV2); Western Line (UV5) 311 m and Refinery Southwestern line (UV4) 822 meters.

**Figure 1.1 - Location Map Showing Fence Lines Covered by Argos Open-path UV Air Monitoring Systems**





Each site is equipped with a meteorological station measuring the following parameters:

- Wind speed
- Wind direction
- Temperature
- Relative humidity

The purpose of meteorological station is to help locate pollution source direction only on the Fenceline system height.

The annual summary of the measurements performed by the system for 2022, are presented in the sections that follow. The ISO/IEC 17025 credited measurements for Benzene were performed using an in-house method FLM-QLT-MET-001 Determination of BTEX by UV DOAS based on TO-16 and fully validated by EPA 301 method.



## Section 2 - Quality Assurance Quality Control Checks

The method for analysis of benzene was validated against the requirements of US EPA Method 301. These requirements are shown in Table 2.1 below.

**Table 2.1 – Validation Parameters for UV Systems**

Parameter	Method Acceptable	Site specific Method Acceptable	Unacceptable
Relative Bias	$\leq 10\%$	Between 10 % and 30 %	$> 30\%$
Precision	Relative Standard Deviation (RSD) $\leq 20\%$		RSD $> 20\%$
MDL	N/A	N/A	N/A
Accuracy	$\leq 15\%$		$> 15\%$
Linearity	$R^2 \geq 0.9$		$R^2 < 0.9$
Robustness Temperature	$\leq 15\%$		$> 15\%$
Robustness Signal Strength	$\leq 15\%$		$> 15\%$
Robustness Sample Time	$\leq 15\%$		$> 15\%$

Table 2.2 shows the overall results of the validation checks as a summary of all the systems.

**Table 2.2 – Results of Validation for all UV Systems**

<b>Parameter</b>	<b>Value</b>	<b>Status</b>
Relative Bias	7.97%	Method acceptable
Precision	1.29%	Method acceptable
MDL	0.86 ppb	N/A
Accuracy	14.04%	Method acceptable
Linearity	R <sup>2</sup> = 0.9991	Method acceptable
Robustness Temperature	3.4%	Method acceptable
Robustness Signal Strength	3.7%	Method acceptable
Robustness Sample Time	10.64%	Method acceptable

## Section 3 - Summary of Field Data

As mentioned in Section 1, the air monitoring equipment operated continuously during 2022. The following figures and tables summarize the data collected during this time period for BTEX gases. Each system collected data at five-minute averages. Table 3.1 lists the time periods that valid data was collected at each location.

**Table 3.1 – Summary of Onstream Efficiency for 2022**

Location	Q1 (%)	Q2 (%)	Q3 (%)	Q4 (%)	Annual (%)
UV_1	96.77	99.13	99.14	96.89	97.98
UV_2	97.97	98.50	98.43	96.18	97.77
UV_4	95.90	98.04	98.96	97.64	97.64
UV_5	98.31	99.08	98.95	98.72	98.77

A summary of the 2022 data is shown in Tables 3.2 and 3.3 below:

**Table 3.2 – Annual Average Benzene Concentrations per Site for 2022**

Location	Benzene ( $\mu\text{g}/\text{m}^3$ )	Uncertainty of Measurement (%)
UV_1	0.71	6.27
UV_2	0.35	10.38
UV_4	0.36	6.74
UV_5	0.48	2.37

**Table 3.3 – Annual Average Toluene, Xylene and Ethyl Benzene Concentrations per Site for 2022**

Location	Toluene ( $\mu\text{g}/\text{m}^3$ )	Xylene ( $\mu\text{g}/\text{m}^3$ )	Ethyl Benzene ( $\mu\text{g}/\text{m}^3$ )
UV_1	1.68	2.86	0.06
UV_2	0.79	4.92	2.51
UV_4	0.34	0.84	0.64
UV_5	0.53	1.50	1.76



The table below shows the number of daily average exceedances in 2022 of the following:

- Benzene: 3.9 microgram/m<sup>3</sup> daily average. (24 hr alarm)
- Toluene: 3,770 microgram/m<sup>3</sup> daily average.
- Total Xylenes: 4,800 microgram/m<sup>3</sup> daily average (Almog value).

**Table 3.3 – Number of Daily Average Exceedances Average Benzene Concentrations per Site for 2022**

Location	Benzene (Days)	Toluene (Days)	Xylene (Days)
UV_1	4	0	0
UV_2	0	0	0
UV_4	0	0	0
UV_5	4	0	0

Figures 3.1 to 3.4 show the annual wind roses at each of the paths for 2022.

Figure 3.1 – Wind Speed and Wind Direction for UV1 for 2022

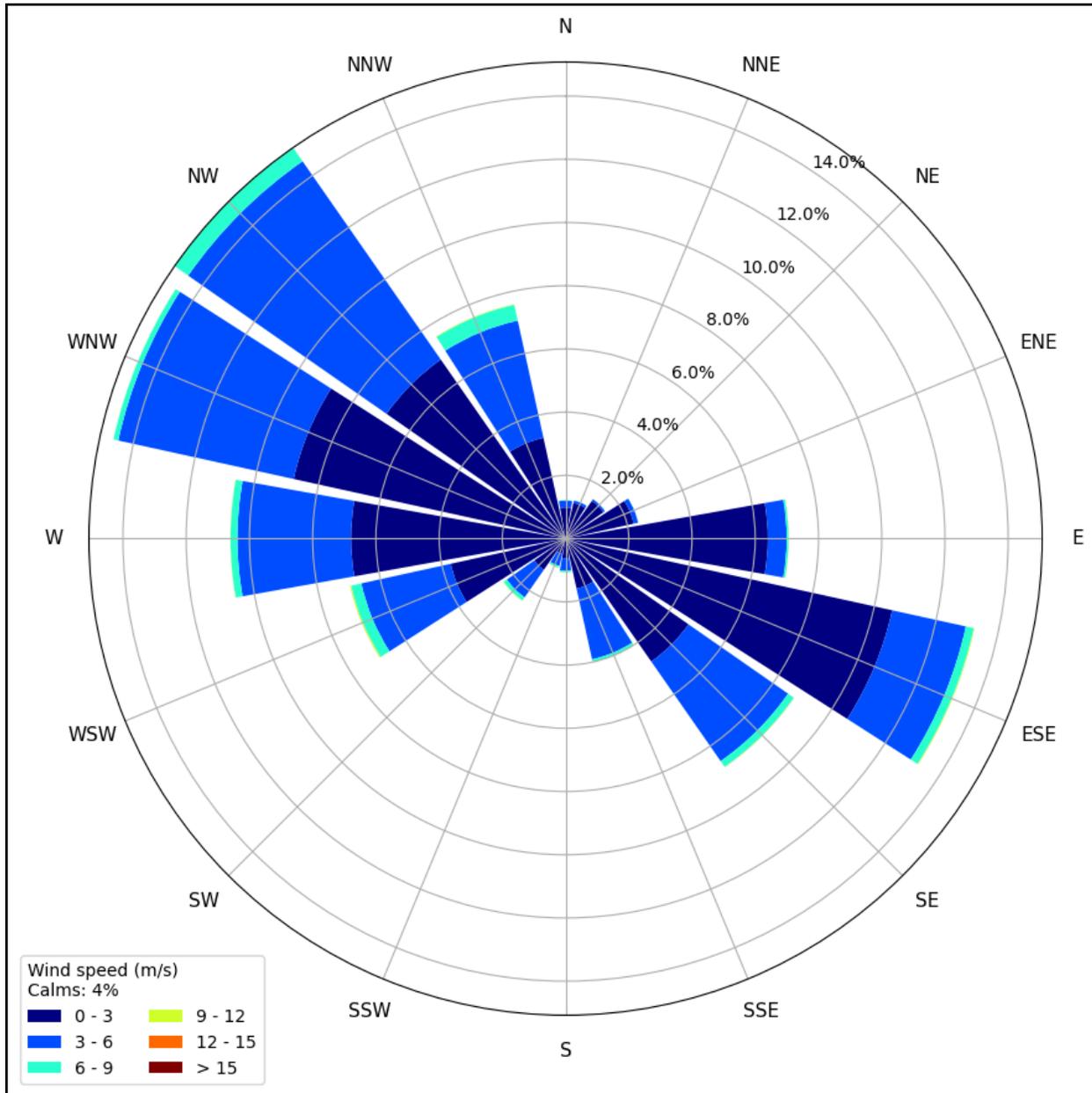




Figure 3.2 – Wind Speed and Wind Direction for UV2 for 2022

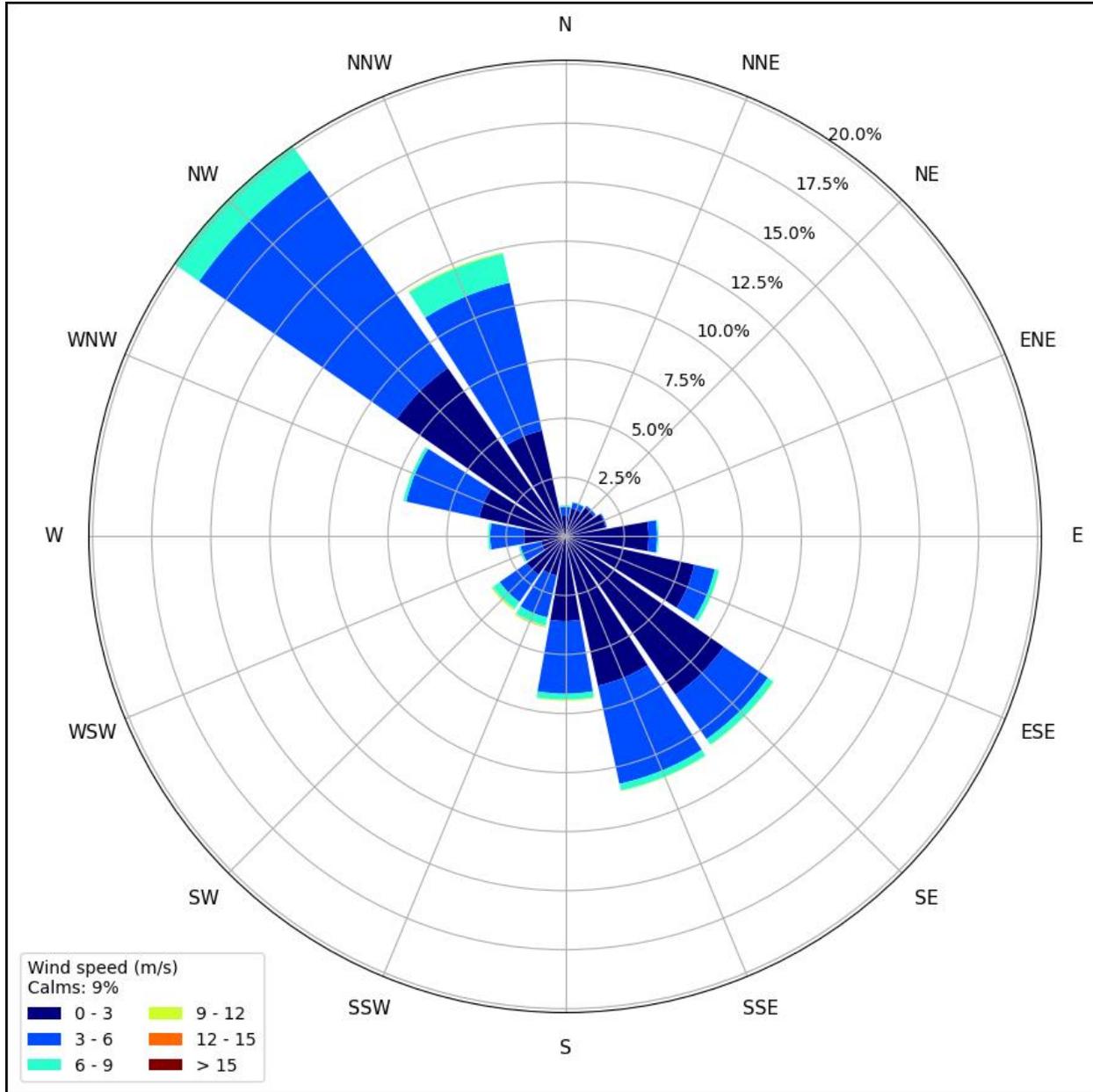




Figure 3.3 – Wind Speed and Wind Direction for UV4 for 2022

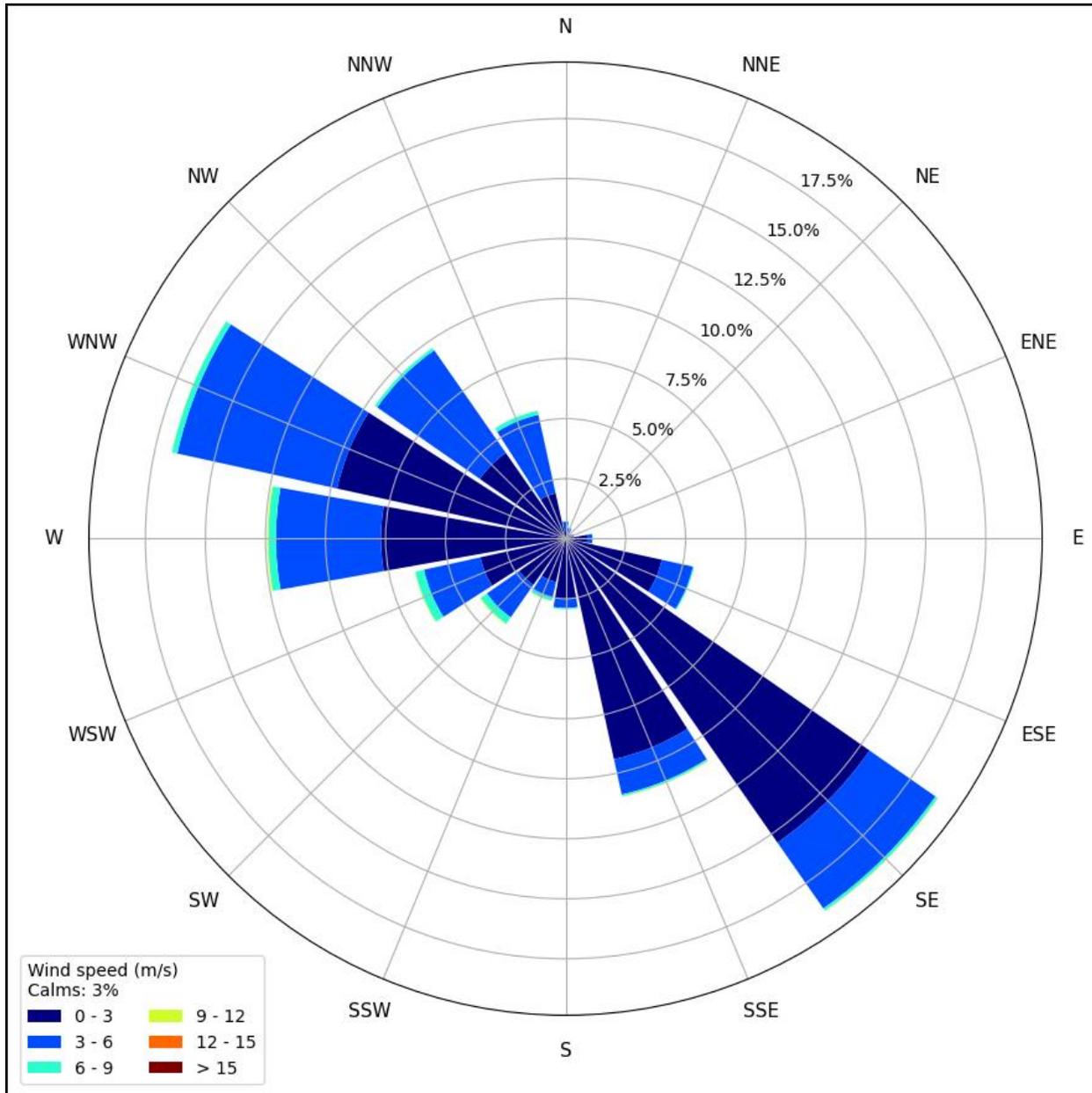
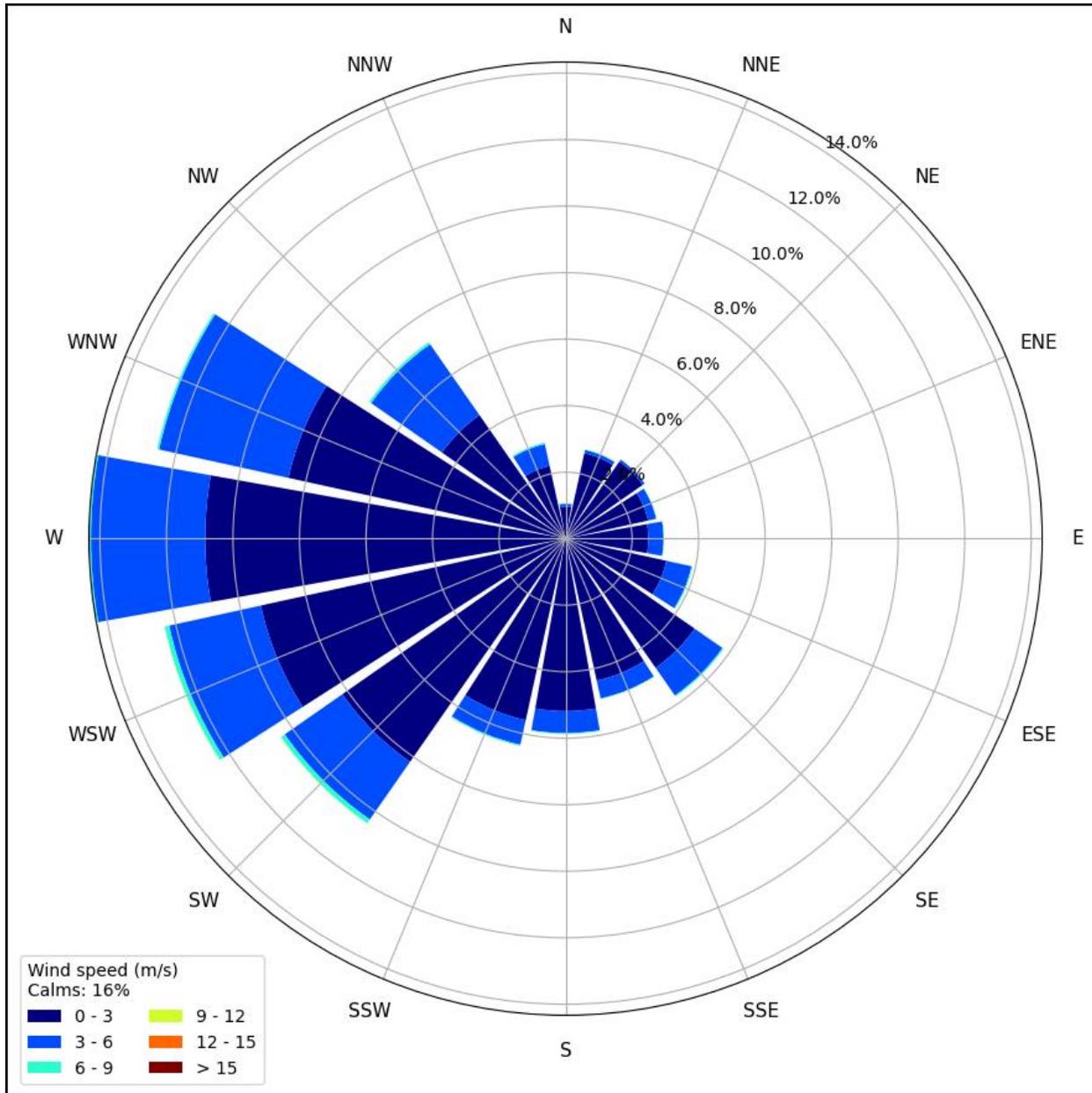




Figure 3.4 – Wind Speed and Wind Direction Data for UV5 for 2022



#### Section 4 – Summary notes

From the results in Section 3 above the following were noted:

- The sample paths detected compounds at different times. This was expected as the paths (due to their orientation) were affected by sources from the refinery under different weather conditions.
- UV1 had the highest annual average for benzene of  $0.71 \mu\text{g}/\text{m}^3$ .
- The most daily average exceedances of the  $3.9 \mu\text{g}/\text{m}^3$  benzene alarm value was at UV1 and UV5 (4 days each)



## Section 5 – Annexes

### Bias results

Bias	-6.411			
SDd	1.854			
t-test	9.782	< 2.571 means statistically insignificant		
Relative Bias UV1	8.409	<=10%		
Relative Bias UV2	8.240	<=10%		
Relative Bias UV4	8.842	<=10%		
Relative Bias UV5	6.390	<=10%		
Average Relative Bias	7.970	<=10%		

Date	File number	Background File no.	System	Concentration (ppb)	Expected Conc (ppb)	Difference between spiked and unspiked samples
09/30/2022 21:23	138796	Argosqa-9/30/2022 9:23:22 PM-138795	UV1	0.10	0	
09/30/2022 21:24	138797	Argosqa-9/30/2022 9:23:53 PM-138796	UV1	0.44	0	
09/30/2022 21:32	138804	Argosqa-9/30/2022 9:24:55 PM-138798	UV1	73.78	76.24	
09/30/2022 21:33	138805	Argosqa-9/30/2022 9:24:55 PM-138798	UV1	73.30	76.24	-2.9664
12/29/2022 13:23	165545	Argosqa-12/29/2022 1:23:23 PM-165544	UV1	0.00	0	
12/29/2022 13:24	165546	Argosqa-12/29/2022 1:23:54 PM-165545	UV1	0.20	0	
12/29/2022 13:35	165556	Argosqa-12/29/2022 1:24:25 PM-165546	UV1	70.18	76.24	
12/29/2022 13:36	165557	Argosqa-12/29/2022 1:24:25 PM-165546	UV1	70.27	76.24	-6.1158
10/23/2022 22:58	192978	Argosqa-10/23/2022 10:57:39 PM-192977	UV2	0.00	0	
10/23/2022 22:58	192979	Argosqa-10/23/2022 10:58:09 PM-192978	UV2	0.00	0	
10/23/2022 23:10	192983	Argosqa-10/23/2022 10:58:40 PM-192979	UV2	71.86	77.80	
10/23/2022 23:11	192984	Argosqa-10/23/2022 10:58:40 PM-192979	UV2	72.98	77.80	-5.3820
12/26/2022 16:02	211098	Argosqa-12/26/2022 4:02:09 PM-211097	UV2	0.00	0	
12/26/2022 16:03	211099	Argosqa-12/26/2022 4:02:09 PM-211097	UV2	0.00	0	
12/26/2022 16:04	211100	Argosqa-12/26/2022 4:03:10 PM-211099	UV2	69.10	77.80	
12/26/2022 16:05	211101	Argosqa-12/26/2022 4:03:10 PM-211099	UV2	69.13	77.80	-8.6891
09/22/2022 14:54	254358	argosqa-9/22/2022 2:54:18 PM-254357	UV4	0.12	0	
09/22/2022 14:55	254359	argosqa-9/22/2022 2:54:49 PM-254358	UV4	0.00	0	
09/22/2022 15:04	254363	argosqa-9/22/2022 2:55:20 PM-254359	UV4	65.79	72.51	
09/22/2022 15:05	254364	argosqa-9/22/2022 2:55:20 PM-254359	UV4	65.97	72.51	-6.6843
10/31/2022 13:53	265529	argosqa-10/31/2022 1:53:01 PM-265528	UV4	0.23	0	
10/31/2022 13:54	265530	argosqa-10/31/2022 1:53:32 PM-265529	UV4	1.07	0	
10/31/2022 14:05	265538	argosqa-10/31/2022 1:54:34 PM-265531	UV4	65.47	72.51	
10/31/2022 14:06	265539	argosqa-10/31/2022 1:54:34 PM-265531	UV4	69.64	72.51	-5.6054
09/28/2022 23:14	434364	Argosqa-9/28/2022 11:14:24 PM-434363	UV5	1.03	0	
09/28/2022 23:15	434365	Argosqa-9/28/2022 11:14:55 PM-434364	UV5	0.00	0	
09/28/2022 23:24	434371	Argosqa-9/28/2022 11:15:25 PM-434365	UV5	92.70	100.32	
09/28/2022 23:25	434372	Argosqa-9/28/2022 11:15:25 PM-434365	UV5	92.07	100.32	-8.4528
12/31/2022 23:14	461362	Argosqa-12/31/2022 11:14:04 PM-461361	UV5	0.00	0	
12/31/2022 23:15	461363	Argosqa-12/31/2022 11:14:04 PM-461361	UV5	0.00	0	
12/31/2022 23:18	461369	Argosqa-12/31/2022 11:16:36 PM-461366	UV5	93.66	100.32	
12/31/2022 23:19	461370	Argosqa-12/31/2022 11:16:36 PM-461366	UV5	92.21	100.32	-7.3896



### Precision results

	UV1	UV2	UV4	UV5	Total
Average	65.61	68.65	61.02	94.26	72.39
Stdev	0.46	0.54	1.88	0.57	0.86
RSD (%)	0.70	0.79	3.08	0.60	1.29
No. of Samples	25	25	25	25	



Date	File number	Background File no.	System	Concentration (ppb)
12/29/2022 1:57:59 PM	165565	Argosqa-12/29/2022 1:56:01 PM-165564	UV1	65.20176
12/29/2022 1:58:30 PM	165566	Argosqa-12/29/2022 1:56:01 PM-165564	UV1	65.15048
12/29/2022 1:59:01 PM	165567	Argosqa-12/29/2022 1:56:01 PM-165564	UV1	66.19434
12/29/2022 1:59:32 PM	165568	Argosqa-12/29/2022 1:56:01 PM-165564	UV1	65.21211
12/29/2022 2:00:03 PM	165569	Argosqa-12/29/2022 1:56:01 PM-165564	UV1	66.04182
12/29/2022 2:00:34 PM	165570	Argosqa-12/29/2022 1:56:01 PM-165564	UV1	65.50301
12/29/2022 2:01:05 PM	165571	Argosqa-12/29/2022 1:56:01 PM-165564	UV1	65.11877
12/29/2022 2:01:36 PM	165572	Argosqa-12/29/2022 1:56:01 PM-165564	UV1	66.08412
12/29/2022 2:02:07 PM	165573	Argosqa-12/29/2022 1:56:01 PM-165564	UV1	65.52361
12/29/2022 2:02:38 PM	165574	Argosqa-12/29/2022 1:56:01 PM-165564	UV1	65.56888
12/29/2022 2:03:09 PM	165575	Argosqa-12/29/2022 1:56:01 PM-165564	UV1	65.53422
12/29/2022 2:03:40 PM	165576	Argosqa-12/29/2022 1:56:01 PM-165564	UV1	65.93346
12/29/2022 2:04:11 PM	165577	Argosqa-12/29/2022 1:56:01 PM-165564	UV1	66.15164
12/29/2022 2:04:42 PM	165578	Argosqa-12/29/2022 1:56:01 PM-165564	UV1	64.97411
12/29/2022 2:05:13 PM	165579	Argosqa-12/29/2022 1:56:01 PM-165564	UV1	65.55495
12/29/2022 2:05:44 PM	165580	Argosqa-12/29/2022 1:56:01 PM-165564	UV1	64.91465
12/29/2022 2:06:15 PM	165581	Argosqa-12/29/2022 1:56:01 PM-165564	UV1	65.43837
12/29/2022 2:06:46 PM	165582	Argosqa-12/29/2022 1:56:01 PM-165564	UV1	65.80077
12/29/2022 2:07:17 PM	165583	Argosqa-12/29/2022 1:56:01 PM-165564	UV1	66.3363
12/29/2022 2:07:48 PM	165584	Argosqa-12/29/2022 1:56:01 PM-165564	UV1	66.64003
12/29/2022 2:08:19 PM	165585	Argosqa-12/29/2022 1:56:01 PM-165564	UV1	65.12832
12/29/2022 2:08:50 PM	165586	Argosqa-12/29/2022 1:56:01 PM-165564	UV1	65.64934
12/29/2022 2:09:21 PM	165587	Argosqa-12/29/2022 1:56:01 PM-165564	UV1	65.05754
12/29/2022 2:09:52 PM	165588	Argosqa-12/29/2022 1:56:01 PM-165564	UV1	66.04598
12/29/2022 2:10:23 PM	165589	Argosqa-12/29/2022 1:56:01 PM-165564	UV1	65.60865
12/26/2022 3:32:45 PM	211068	Argosqa-12/26/2022 3:31:41 PM-211067	UV2	68.73233
12/26/2022 3:33:15 PM	211069	Argosqa-12/26/2022 3:31:41 PM-211067	UV2	68.58969
12/26/2022 3:33:45 PM	211070	Argosqa-12/26/2022 3:31:41 PM-211067	UV2	68.77276
12/26/2022 3:34:16 PM	211071	Argosqa-12/26/2022 3:31:41 PM-211067	UV2	68.42871
12/26/2022 3:34:46 PM	211072	Argosqa-12/26/2022 3:31:41 PM-211067	UV2	68.9191
12/26/2022 3:35:17 PM	211073	Argosqa-12/26/2022 3:31:41 PM-211067	UV2	67.81276
12/26/2022 3:35:47 PM	211074	Argosqa-12/26/2022 3:31:41 PM-211067	UV2	68.76226
12/26/2022 3:36:17 PM	211075	Argosqa-12/26/2022 3:31:41 PM-211067	UV2	67.90238
12/26/2022 3:36:48 PM	211076	Argosqa-12/26/2022 3:31:41 PM-211067	UV2	67.7834
12/26/2022 3:37:18 PM	211077	Argosqa-12/26/2022 3:31:41 PM-211067	UV2	67.95692
12/26/2022 3:37:49 PM	211078	Argosqa-12/26/2022 3:31:41 PM-211067	UV2	68.25233
12/26/2022 3:38:19 PM	211079	Argosqa-12/26/2022 3:31:41 PM-211067	UV2	69.19036
12/26/2022 3:38:49 PM	211080	Argosqa-12/26/2022 3:31:41 PM-211067	UV2	68.46026
12/26/2022 3:39:20 PM	211081	Argosqa-12/26/2022 3:31:41 PM-211067	UV2	69.31988
12/26/2022 3:39:50 PM	211082	Argosqa-12/26/2022 3:31:41 PM-211067	UV2	68.80656
12/26/2022 3:40:21 PM	211083	Argosqa-12/26/2022 3:31:41 PM-211067	UV2	69.53353
12/26/2022 3:40:51 PM	211084	Argosqa-12/26/2022 3:31:41 PM-211067	UV2	69.95209
12/26/2022 3:41:21 PM	211085	Argosqa-12/26/2022 3:31:41 PM-211067	UV2	67.90909
12/26/2022 3:41:52 PM	211086	Argosqa-12/26/2022 3:31:41 PM-211067	UV2	68.56852
12/26/2022 3:42:22 PM	211087	Argosqa-12/26/2022 3:31:41 PM-211067	UV2	68.55604
12/26/2022 3:42:53 PM	211088	Argosqa-12/26/2022 3:31:41 PM-211067	UV2	68.68849
12/26/2022 3:43:23 PM	211089	Argosqa-12/26/2022 3:31:41 PM-211067	UV2	68.67587
12/26/2022 3:43:53 PM	211090	Argosqa-12/26/2022 3:31:41 PM-211067	UV2	69.12874
12/26/2022 3:44:24 PM	211091	Argosqa-12/26/2022 3:31:41 PM-211067	UV2	68.41178
12/26/2022 3:44:54 PM	211092	Argosqa-12/26/2022 3:31:41 PM-211067	UV2	69.01351



12/31/2022 22:12	283014	PRE_31122022-12/31/2022 10:10:38 PM-283011	UV4	61.09865
12/31/2022 22:13	283015	PRE_31122022-12/31/2022 10:10:38 PM-283011	UV4	65.23515
12/31/2022 22:13	283016	PRE_31122022-12/31/2022 10:10:38 PM-283011	UV4	61.17955
12/31/2022 22:14	283017	PRE_31122022-12/31/2022 10:10:38 PM-283011	UV4	60.37361
12/31/2022 22:14	283018	PRE_31122022-12/31/2022 10:10:38 PM-283011	UV4	62.00672
12/31/2022 22:15	283019	PRE_31122022-12/31/2022 10:10:38 PM-283011	UV4	60.75556
12/31/2022 22:15	283020	PRE_31122022-12/31/2022 10:10:38 PM-283011	UV4	61.61913
12/31/2022 22:16	283021	PRE_31122022-12/31/2022 10:10:38 PM-283011	UV4	60.69235
12/31/2022 22:17	283022	PRE_31122022-12/31/2022 10:10:38 PM-283011	UV4	60.83869
12/31/2022 22:17	283023	PRE_31122022-12/31/2022 10:10:38 PM-283011	UV4	61.75599
12/31/2022 22:18	283024	PRE_31122022-12/31/2022 10:10:38 PM-283011	UV4	59.74938
12/31/2022 22:18	283025	PRE_31122022-12/31/2022 10:10:38 PM-283011	UV4	58.14361
12/31/2022 22:19	283026	PRE_31122022-12/31/2022 10:10:38 PM-283011	UV4	57.50071
12/31/2022 22:19	283027	PRE_31122022-12/31/2022 10:10:38 PM-283011	UV4	59.05837
12/31/2022 22:20	283028	PRE_31122022-12/31/2022 10:10:38 PM-283011	UV4	61.8618
12/31/2022 22:20	283029	PRE_31122022-12/31/2022 10:10:38 PM-283011	UV4	60.98594
12/31/2022 22:21	283030	PRE_31122022-12/31/2022 10:10:38 PM-283011	UV4	59.49415
12/31/2022 22:21	283031	PRE_31122022-12/31/2022 10:10:38 PM-283011	UV4	61.04211
12/31/2022 22:22	283032	PRE_31122022-12/31/2022 10:10:38 PM-283011	UV4	63.42148
12/31/2022 22:22	283033	PRE_31122022-12/31/2022 10:10:38 PM-283011	UV4	63.69768
12/31/2022 22:23	283034	PRE_31122022-12/31/2022 10:10:38 PM-283011	UV4	60.80192
12/31/2022 22:23	283035	PRE_31122022-12/31/2022 10:10:38 PM-283011	UV4	63.29303
12/31/2022 22:24	283036	PRE_31122022-12/31/2022 10:10:38 PM-283011	UV4	60.2833
12/31/2022 22:24	283037	PRE_31122022-12/31/2022 10:10:38 PM-283011	UV4	57.50018
12/31/2022 22:25	283038	PRE_31122022-12/31/2022 10:10:38 PM-283011	UV4	63.11335
12/31/2022 23:00	461336	PRE_31122022-12/31/2022 10:55:42 PM-461327	UV5	94.50881
12/31/2022 23:01	461337	PRE_31122022-12/31/2022 10:55:42 PM-461327	UV5	95.34465
12/31/2022 23:01	461338	PRE_31122022-12/31/2022 10:55:42 PM-461327	UV5	94.85602
12/31/2022 23:02	461339	PRE_31122022-12/31/2022 10:55:42 PM-461327	UV5	94.41757
12/31/2022 23:02	461340	PRE_31122022-12/31/2022 10:55:42 PM-461327	UV5	94.86539
12/31/2022 23:03	461341	PRE_31122022-12/31/2022 10:55:42 PM-461327	UV5	94.54199
12/31/2022 23:03	461342	PRE_31122022-12/31/2022 10:55:42 PM-461327	UV5	94.80922
12/31/2022 23:04	461343	PRE_31122022-12/31/2022 10:55:42 PM-461327	UV5	94.83439
12/31/2022 23:04	461344	PRE_31122022-12/31/2022 10:55:42 PM-461327	UV5	93.47817
12/31/2022 23:05	461345	PRE_31122022-12/31/2022 10:55:42 PM-461327	UV5	94.75871
12/31/2022 23:05	461346	PRE_31122022-12/31/2022 10:55:42 PM-461327	UV5	93.7116
12/31/2022 23:06	461347	PRE_31122022-12/31/2022 10:55:42 PM-461327	UV5	93.68575
12/31/2022 23:06	461348	PRE_31122022-12/31/2022 10:55:42 PM-461327	UV5	93.79662
12/31/2022 23:07	461349	PRE_31122022-12/31/2022 10:55:42 PM-461327	UV5	93.81799
12/31/2022 23:07	461350	PRE_31122022-12/31/2022 10:55:42 PM-461327	UV5	93.99871
12/31/2022 23:08	461351	PRE_31122022-12/31/2022 10:55:42 PM-461327	UV5	94.93965
12/31/2022 23:08	461352	PRE_31122022-12/31/2022 10:55:42 PM-461327	UV5	94.3749
12/31/2022 23:09	461353	PRE_31122022-12/31/2022 10:55:42 PM-461327	UV5	93.78699
12/31/2022 23:09	461354	PRE_31122022-12/31/2022 10:55:42 PM-461327	UV5	94.8009
12/31/2022 23:10	461355	PRE_31122022-12/31/2022 10:55:42 PM-461327	UV5	93.98508
12/31/2022 23:10	461356	PRE_31122022-12/31/2022 10:55:42 PM-461327	UV5	93.98103
12/31/2022 23:11	461357	PRE_31122022-12/31/2022 10:55:42 PM-461327	UV5	93.46456
12/31/2022 23:11	461358	PRE_31122022-12/31/2022 10:55:42 PM-461327	UV5	93.40902
12/31/2022 23:12	461359	PRE_31122022-12/31/2022 10:55:42 PM-461327	UV5	94.6774
12/31/2022 23:12	461360	PRE_31122022-12/31/2022 10:55:42 PM-461327	UV5	93.68439

## MDL results

### Q1

Location	January MDL (ppb)	February MDL (ppb)	March MDL (ppb)
UV_1	0.56	0.35	0.79
UV_2	0.69	0.62	0.33
UV_4	0.61	0.64	0.32
UV_5	0.75	0.76	0.52

### Q2

Location	April MDL (ppb)	May MDL (ppb)	June MDL (ppb)
UV_1	0.25	0.43	0.28
UV_2	0.51	0.41	0.65
UV_4	0.23	0.37	0.56
UV_5	0.77	0.36	0.72

### Q3

Location	July MDL (ppb)	August MDL (ppb)	September MDL (ppb)
UV_1	0.61	0.71	0.40
UV_2	0.17	0.20	0.85
UV_4	0.80	0.55	0.44
UV_5	0.26	0.43	0.89

### Q4

Location	October MDL (ppb)	November MDL (ppb)	December MDL (ppb)
UV_1	0.67	0.38	0.67
UV_2	0.94	0.36	0.39
UV_4	0.57	0.75	0.70
UV_5	0.50	0.51	0.38



### Accuracy results

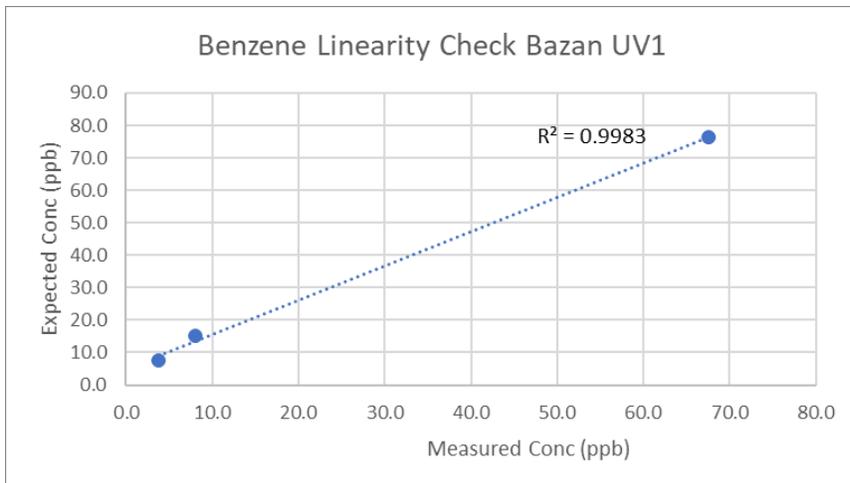
Average Conc of Ref Gas (ppb)	35.41
Average Conc of Measurements (ppb)	30.44
Accuracy (%)	14.04

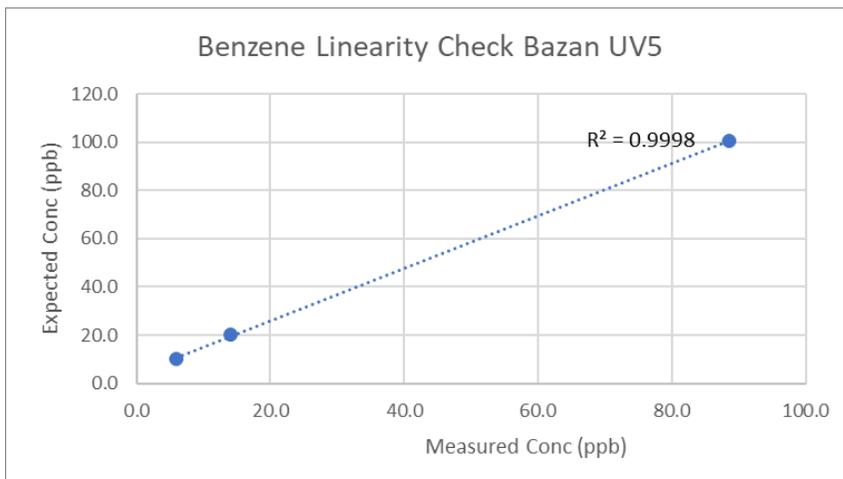
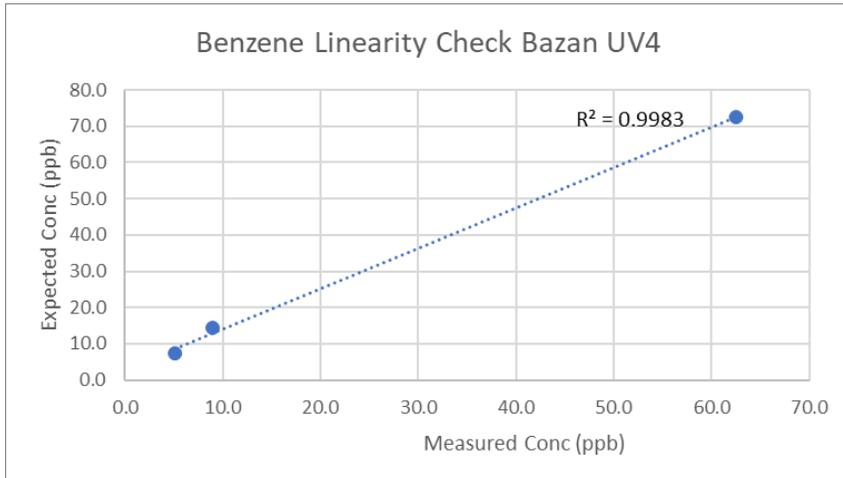
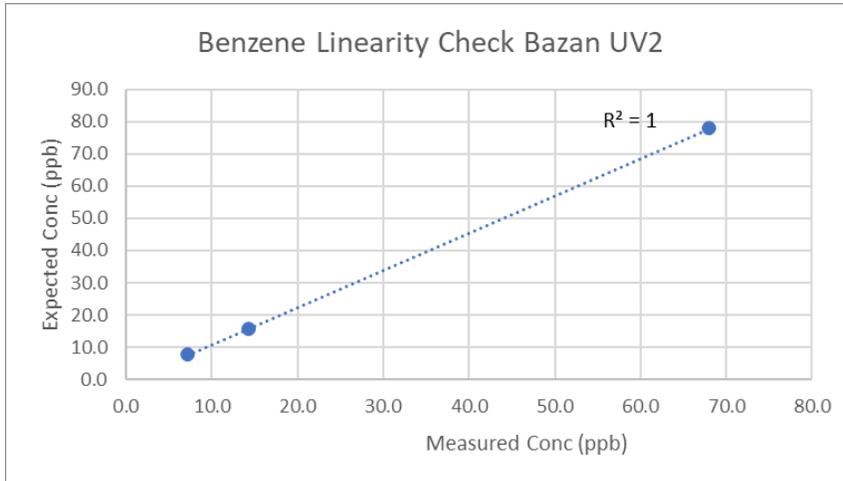
Date	File number	Background File no.	System	Concentration (ppb)	Expected Conc (ppb)	Collection time (min)
09/30/2022 21:38	138806	138798	UV1	73.16	76.24	5
09/30/2022 21:38	138806	138796	UV1	76.29	76.24	5
09/28/2022 15:07	138146	138139	UV1	70.29	76.24	5
09/28/2022 15:07	138146	138137	UV1	81.72	76.24	5
09/30/2022 21:43	138807	138798	UV1	11.02	15.25	5
09/30/2022 21:43	138807	138796	UV1	10.34	15.25	5
09/28/2022 15:19	138148	138139	UV1	10.57	15.25	5
09/28/2022 15:19	138148	138137	UV1	12.57	15.25	5
09/30/2022 21:49	138808	138798	UV1	6.10	7.62	5
09/30/2022 21:49	138808	138796	UV1	5.03	7.62	5
09/28/2022 15:13	138147	138139	UV1	5.01	7.62	5
09/28/2022 15:13	138147	138137	UV1	6.14	7.62	5
12/16/2022 18:16	208221	208214	UV2	67.98	77.80	5
12/16/2022 18:16	208221	208213	UV2	67.64	77.80	5
12/29/2022 15:48	211967	211960	UV2	67.96	77.80	5
12/29/2022 15:48	211967	211957	UV2	67.85	77.80	5
12/16/2022 18:21	208222	208214	UV2	10.11	15.56	5
12/16/2022 18:21	208222	208213	UV2	9.78	15.56	5
12/29/2022 15:54	211968	211960	UV2	14.32	15.56	5
12/29/2022 15:54	211968	211957	UV2	14.21	15.56	5
12/16/2022 18:26	208223	208214	UV2	5.63	7.78	5
12/16/2022 18:26	208223	208213	UV2	5.29	7.78	5
12/29/2022 15:59	211969	211960	UV2	7.15	7.78	5
12/29/2022 15:59	211969	211957	UV2	7.04	7.78	5
08/31/2022 20:28	248111	248104	UV4	63.13	72.51	5
08/31/2022 20:28	248111	248102	UV4	67.08	72.51	5
11/24/2022 15:21	272418	272409	UV4	60.14	72.51	5
11/24/2022 15:21	272418	272408	UV4	54.97	72.51	5
08/31/2022 20:33	248112	248104	UV4	10.41	14.50	5
08/31/2022 20:33	248112	248102	UV4	10.99	14.50	5
11/24/2022 15:28	272419	272409	UV4	13.83	14.50	5
11/24/2022 15:28	272419	272408	UV4	12.68	14.50	5
08/31/2022 20:38	248113	248104	UV4	5.36	7.25	5
08/31/2022 20:38	248113	248102	UV4	5.62	7.25	5
11/24/2022 15:38	272420	272409	UV4	6.16	7.25	5
11/24/2022 15:38	272420	272408	UV4	5.68	7.25	5
11/22/2022 17:19	450037	450030	UV5	88.19	100.32	5
11/22/2022 17:19	450037	450029	UV5	88.14	100.32	5
11/30/2022 09:39	452250	452238	UV5	88.61	100.32	5
11/30/2022 09:39	452250	452241	UV5	88.51	100.32	5
11/22/2022 17:24	450038	450030	UV5	13.10	20.06	5
11/22/2022 17:24	450038	450029	UV5	13.05	20.06	5
11/30/2022 09:44	452251	452238	UV5	14.04	20.06	5
11/30/2022 09:44	452251	452241	UV5	13.94	20.06	5
11/22/2022 17:30	450039	450030	UV5	6.15	10.03	5
11/22/2022 17:30	450039	450029	UV5	6.10	10.03	5
11/30/2022 09:49	452252	452238	UV5	6.00	10.03	5
11/30/2022 09:49	452252	452241	UV5	5.90	10.03	5



## Linearity results

Date	File number	Background File no.	System	Concentration (ppb)	Expected Conc (ppb)
12/29/2022 20:38	165671	Argosqa-12/29/2022 8:18:55 PM-165662	UV1	67.6	76.2
12/29/2022 20:43	165672	Argosqa-12/29/2022 8:18:55 PM-165662	UV1	8.1	15.2
12/29/2022 20:48	165673	Argosqa-12/29/2022 8:18:55 PM-165662	UV1	3.8	7.6
12/29/2022 15:48	211967	Argosqa-12/29/2022 3:31:11 PM-211960	UV2	68.0	77.8
12/29/2022 15:54	211968	Argosqa-12/29/2022 3:31:11 PM-211960	UV2	14.3	15.6
12/29/2022 15:59	211969	Argosqa-12/29/2022 3:31:11 PM-211960	UV2	7.2	7.8
12/16/2022 19:07	278674	argosqa-12/16/2022 6:45:14 PM-278662	UV4	62.5	72.5
12/16/2022 19:12	278675	argosqa-12/16/2022 6:45:14 PM-278662	UV4	9.0	14.5
12/16/2022 19:17	278676	argosqa-12/16/2022 6:45:14 PM-278662	UV4	5.2	7.3
11/30/2022 09:39	452250	Argosqa-11/30/2022 9:17:40 AM-452238	UV5	88.6	100.3
11/30/2022 09:44	452251	Argosqa-11/30/2022 9:17:40 AM-452238	UV5	14.0	20.1
11/30/2022 09:49	452252	Argosqa-11/30/2022 9:17:40 AM-452238	UV5	6.0	10.0







## Robustness Temperature

	UV1	UV2	UV4	UV5	Total
Average Abs	67.3	71.4	64.4	91.4	73.6
STDDEV	0.8	2.5	3.4	3.4	2.5
RSD (%)	1.3	3.6	5.2	3.7	3.4
Min Temp	14.9	14.6	14.1	16.1	
Max Temp	29.9	25.4	28.1	30.4	

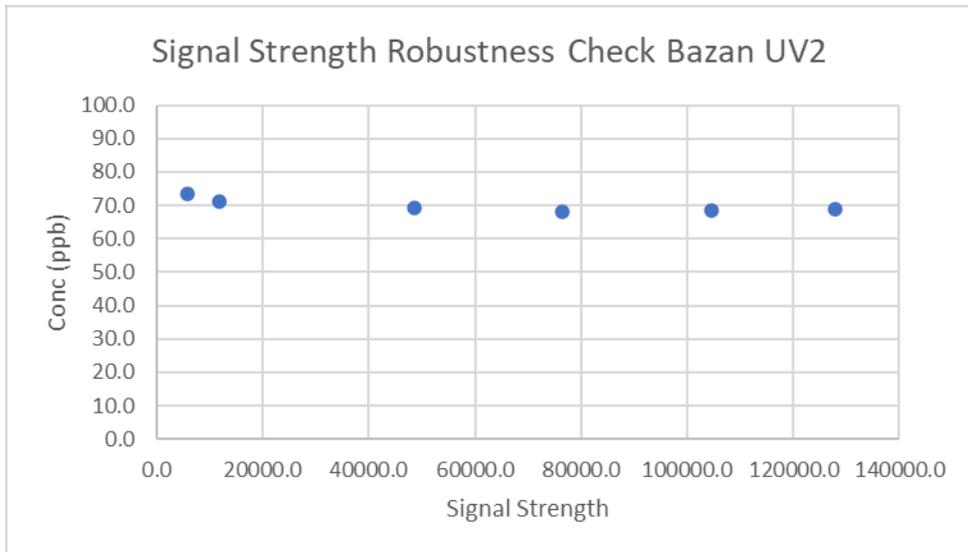
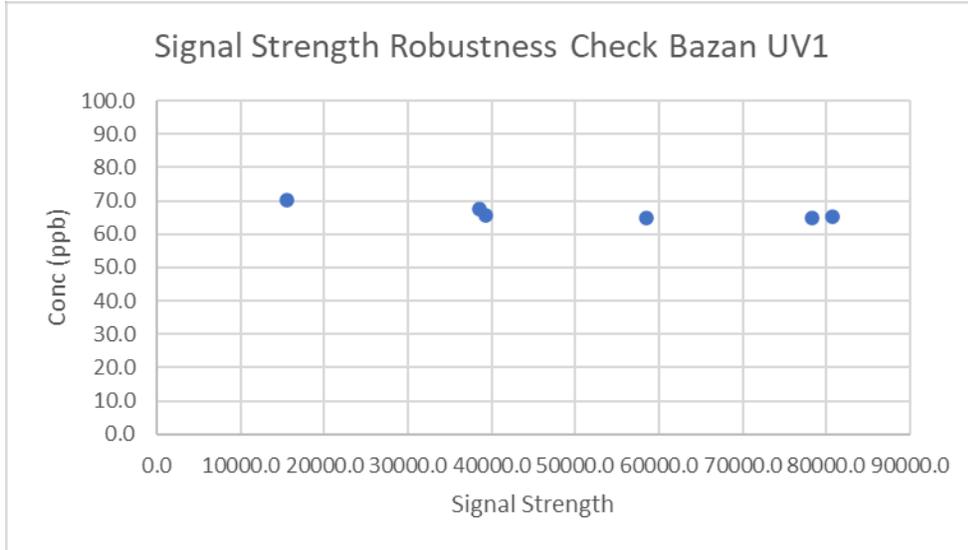
Date	System	Concentration (ppb)	Temperature °C
10/25/2022 16:06	UV1	67.5	29.9
12/21/2022 11:52	UV1	68.0	20.7
12/29/2022 14:09	UV1	66.0	19.4
12/29/2022 20:30	UV1	67.6	14.9
10/18/2022 10:39	UV2	74.1	25.4
10/23/2022 23:11	UV2	73.0	20.8
11/30/2022 08:13	UV2	69.4	16.1
12/26/2022 16:22	UV2	69.1	14.6
08/12/2022 20:03	UV4	69.3	28.1
11/24/2022 15:05	UV4	62.0	22.0
12/16/2022 18:59	UV4	62.7	18.8
12/31/2022 22:28	UV4	63.4	14.1
08/25/2022 15:06	UV5	95.8	30.4
06/30/2022 19:44	UV5	91.5	27.4
09/28/2022 23:24	UV5	92.7	25.5
11/22/2022 17:12	UV5	88.6	21.9
12/29/2022 16:20	UV5	86.6	18.1
12/31/2022 23:22	UV5	93.4	16.1

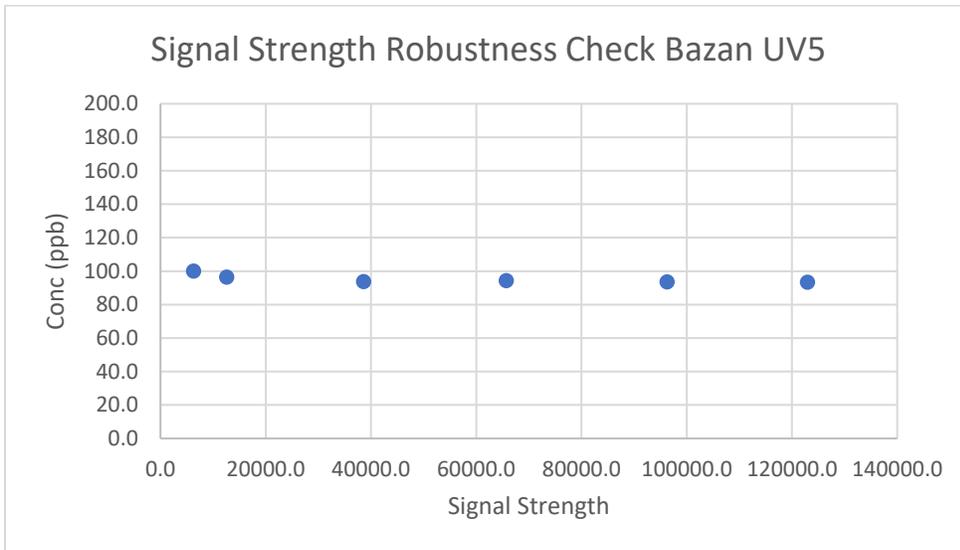
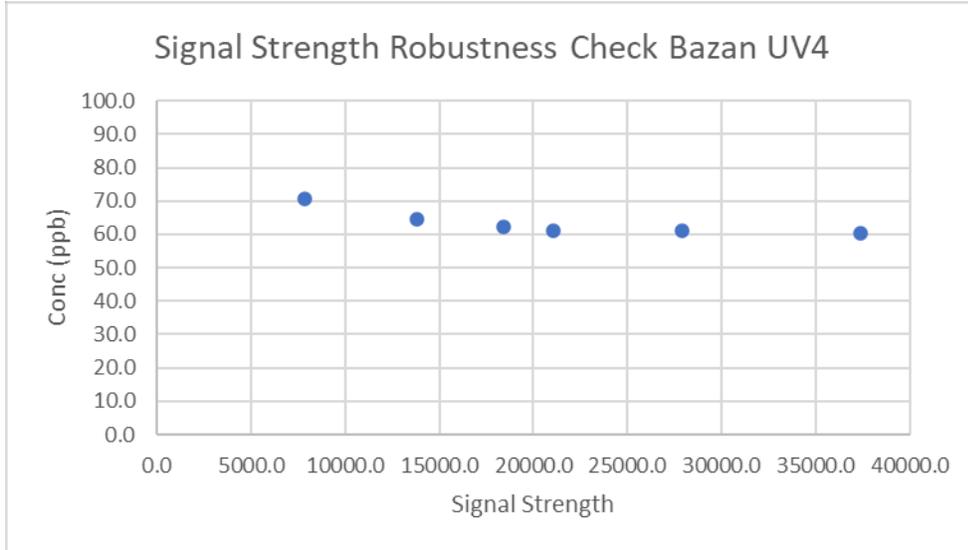


## Robustness Signal Strength

	UV1	UV2	UV4	UV5	Total
Average (ppb)	66.4	69.8	63.3	95.3	73.7
Stddev	2.1	2.0	3.9	2.6	2.7
RSD (%)	3.2	2.9	6.2	2.7	3.7
Min Signal	15466.4	5911.2	7830.4	6260.1	
Max Signal	80808.8	127981.5	37380.2	122962.5	
Number of Sample Points	6	6	6	6	

Sample Date	Site Name	File Number	Path Length	Signal Strength	Benzene
12/29/2022 1:28:42 PM	UV1	165547	867	80808.8	65.3
12/29/2022 1:29:13 PM	UV1	165548	867	78258.4	64.9
12/29/2022 1:31:25 PM	UV1	165551	867	58556.3	64.9
12/29/2022 1:33:40 PM	UV1	165553	867	39350.7	65.5
12/29/2022 1:34:11 PM	UV1	165554	867	38483.6	67.6
12/29/2022 1:35:41 PM	UV1	165556	867	15466.4	70.2
12/26/2022 4:19:30 PM	UV2	211107	428	127981.5	68.7
12/26/2022 4:21:34 PM	UV2	211108	428	104524.3	68.5
12/26/2022 4:22:15 PM	UV2	211109	428	76406.3	68.1
12/26/2022 4:22:58 PM	UV2	211110	428	48653.1	69.1
12/26/2022 4:24:31 PM	UV2	211112	428	11698.2	71.1
12/26/2022 4:25:15 PM	UV2	211113	428	5911.2	73.3
12/16/2022 18:56	UV4	278670	822	37380.2	60.2
11/24/2022 15:09	UV4	272416	822	27864.8	60.9
12/31/2022 22:27	UV4	283041	822	21053.2	61.1
12/31/2022 22:46	UV4	283053	822	18427.6	62.1
12/31/2022 22:48	UV4	283055	822	13812.8	64.6
12/31/2022 22:50	UV4	283058	822	7830.4	70.6
12/31/2022 23:37	UV5	461379	311	122962.5	93.4
12/31/2022 23:39	UV5	461382	311	96289.2	93.6
12/31/2022 23:41	UV5	461384	311	65722.6	94.4
12/31/2022 23:44	UV5	461388	311	38595.4	93.9
12/31/2022 23:45	UV5	461390	311	12575.3	96.5
12/31/2022 23:46	UV5	461391	311	6260.1	100.2







## Robustness Sample Time

Average Conc of Ref Gas (ppb)	84.73
Average Conc of Measurements (ppb)	75.72
Accuracy (%)	10.64

Date	File number	Background File no.	System	Concentration (ppb)	Expected Conc (ppb)	Collection time (min)
12/29/2022 1:40:37 PM	165559	Argosqa-12/29/2022 1:24:25 PM-165546	UV1	66.29355	76.24	0.5
12/29/2022 1:41:08 PM	165560	Argosqa-12/29/2022 1:24:25 PM-165546	UV1	65.32118	76.24	0.5
12/29/2022 1:42:27 PM	165561	Argosqa-12/29/2022 1:24:25 PM-165546	UV1	65.12935	76.24	1
12/29/2022 1:48:03 PM	165562	Argosqa-12/29/2022 1:24:25 PM-165546	UV1	65.53151	76.24	5
12/26/2022 4:04:09 PM	211100	Argosqa-12/26/2022 4:03:10 PM-211099	UV2	69.09563	77.8	0.5
12/26/2022 4:05:22 PM	211101	Argosqa-12/26/2022 4:03:10 PM-211099	UV2	69.13355	77.8	1
12/26/2022 4:10:37 PM	211102	Argosqa-12/26/2022 4:03:10 PM-211099	UV2	68.74637	77.8	5
12/31/2022 22:27	283041	argosqa-12/31/2022 10:26:54 PM-283040	UV4	61.12559	72.51	0.5
12/31/2022 22:28	283042	argosqa-12/31/2022 10:26:54 PM-283040	UV4	61.76735	72.51	0.5
12/31/2022 22:28	283043	argosqa-12/31/2022 10:26:54 PM-283040	UV4	63.36502	72.51	0.5
12/31/2022 22:30	283044	argosqa-12/31/2022 10:26:54 PM-283040	UV4	61.31372	72.51	1
12/31/2022 22:31	283045	argosqa-12/31/2022 10:26:54 PM-283040	UV4	63.02545	72.51	1
12/31/2022 22:36	283046	argosqa-12/31/2022 10:26:54 PM-283040	UV4	61.78495	72.51	5
12/31/2022 22:41	283047	argosqa-12/31/2022 10:26:54 PM-283040	UV4	61.69383	72.51	5
12/31/2022 23:17	461367	Argosqa-12/31/2022 11:16:36 PM-461366	UV5	94.08329	100.32	0.5
12/31/2022 23:18	461368	Argosqa-12/31/2022 11:16:36 PM-461366	UV5	92.96484	100.32	0.5
12/31/2022 23:18	461369	Argosqa-12/31/2022 11:16:36 PM-461366	UV5	93.65763	100.32	0.5
12/31/2022 23:19	461370	Argosqa-12/31/2022 11:16:36 PM-461366	UV5	92.20626	100.32	1
12/31/2022 23:20	461371	Argosqa-12/31/2022 11:16:36 PM-461366	UV5	92.23377	100.32	1
12/31/2022 23:21	461372	Argosqa-12/31/2022 11:16:36 PM-461366	UV5	92.55867	100.32	1
12/31/2022 23:22	461373	Argosqa-12/31/2022 11:16:36 PM-461366	UV5	93.37271	100.32	5
12/31/2022 23:27	461374	Argosqa-12/31/2022 11:16:36 PM-461366	UV5	93.55441	100.32	5
12/31/2022 23:32	461375	Argosqa-12/31/2022 11:16:36 PM-461366	UV5	93.56546	100.32	5

## Validated 24 hours average Fenceline results

Attached files:

1. Bazan\_Site\_#1\_24H\_validated\_20220101\_to\_20230101
2. Bazan\_Site\_#2\_24H\_validated\_20220101\_to\_20230101
3. Bazan\_Site\_#4\_24H\_validated\_20220101\_to\_20230101
4. Bazan\_Site\_#5\_24H\_validated\_20220101\_to\_20230101