



SYDNEY GATEWAY

A Joint Venture Project



# Construction Monitoring Report - Landfill Leachate Gas and Odour

September 2021

Project: Sydney Gateway Road Project

Document No: SGWPW-JHSW-NWW-EN-RPT-059139

## DOCUMENT APPROVAL

REVISION	DATE	PREPARED BY	REVIEWED BY	APPROVED BY	REMARKS
00	11/11/21	David Windnagel	Maulik Bapodara	Rob Muir	For Issue
					

## Table of Contents

1.0 Introduction.....	3
2.0 Leachate Monitoring .....	3
2.1 Leachate Seep Sampling.....	3
2.2 Leachate Monitoring Well Program .....	3
3.0 Landfill Gas Monitoring .....	6
3.1 Daily/regular monitoring of pits, excavations, and boring/piling operations.....	6
3.1 Monthly Landfill gas monitoring .....	9
3.3 Odour Monitoring .....	14
<b>4.0 Conclusions .....</b>	<b>17</b>

## 1.0 Introduction

The purpose of this report is to summarise the findings of the monthly construction monitoring program detailed within the Landfill Leachate, Gas, and Odour Management Plan (LLGOMP).

Note – this report has been developed specifically for monitoring conducted within NSW State owned land under approval SSI 9737, which is administered by the NSW Department of Planning, Industry and Environment (DPIE).

The monitoring period of this report is 30<sup>th</sup> August 2021 to 30<sup>th</sup> September 2021.

## 2.0 Leachate Monitoring

Results from monitoring have been compared against the criteria stipulated within the LLGOMP.

There are two elements to landfill leachate monitoring:

- Leachate seep sampling
- Leachate monitoring well program

### 2.1 Leachate Seep Sampling

Where a leachate seep or discharge is identified with the potential to leave the site, and there is sufficient volume being generated that has the potential to migrate off site and the location is safe to access (and there is not an immediate risk to human health or the environment), it is to be sampled by an appropriately qualified person and that sample submitted under chain of custody documentation to a NATA accredited laboratory.

During the reporting period, regular site inspections were undertaken in accordance with the Landfill Leachate Monitoring Program. There were no instances where leachate was noted as seeping from the walls or pooling at the base of excavations onsite. Therefore, no samples could be obtained under the leachate seep sampling protocol.

### 2.2 Leachate Monitoring Well Program

The leachate monitoring wells were sampled in accordance with the leachate analyte criteria detailed in Appendix B of the GWMP. The adopted analyte suite is listed in Table 1. Data captured during monitoring was assessed against the baseline groundwater quality maxima as detailed in Table 2.

Table 1 Adopted Analyte Suite from GWMP

Program	Analysis suites
Leachate	Nutrients – ammonia, nitrate, nitrite, total nitrogen & total phosphorus.
	Filtered heavy metals - arsenic, barium, boron, cadmium, chromium, cobalt copper, lead, manganese, mercury, nickel & zinc.

Table 2 Leachate Monitoring Results

Analyte	Units	Trigger	MPE_2	MPE_4	MPE_5	MPE_5A	MPE_7	MPE_11	MPE_21
<b>Nutrients</b>									
Ammonia as N	mg/L	94	8.12	11.4	82	0.07	50.2	46.9	51.3
Nitrite (as N)	mg/L	0.27	<0.01	0.02	<0.01	<0.01	0.13	0.03	0.06
Nitrate (as N)	mg/L	24	<0.01	0.18	0.03	0.23	<0.01	0.11	<0.01
Nitrogen (Total)	mg/L	360	11.8	16.4	98.2	4.1	58.9	66.6	66.7
Total Phosphorus	mg/L	28	1.3	2.06	0.39	5.7	0.89	3.04	26.5
<b>Heavy Metals</b>									
Arsenic	mg/L	1.4	<0.01	0.002	0.002	<0.01	0.004	0.003	0.013
Barium	mg/L	1.5	0.028	0.15	0.04	0.091	0.453	0.946	0.606
Boron (Filtered)	mg/L	10	2.93	3.52	4.2	3.11	1.64	1.09	1.78
Cadmium (Filtered)	mg/L	0.013	<0.001	0.0006	<0.0001	0.0048	<0.0001	<0.0001	<0.0001
Chromium (III+VI) (Filtered)	mg/L	0.14	<0.01	<0.001	0.004	0.028	0.002	0.002	0.002
Cobalt (Filtered)	mg/L	0.59	<0.01	<0.001	0.004	<0.01	<0.001	<0.001	<0.001
Copper (Filtered)	mg/L	0.27	<0.01	<0.001	<0.001	0.054	<0.001	0.002	<0.001
Lead (Filtered)	mg/L	0.41	<0.01	<0.001	<0.001	<0.01	<0.001	<0.001	<0.001
Manganese (Filtered)	mg/L	10	<0.01	0.135	0.01	<0.01	0.195	0.337	0.296
Mercury (Filtered)	mg/L	0.0066	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Nickel (Filtered)	mg/L	0.75	<0.01	0.015	<0.001	0.082	0.002	<0.001	0.008
Zinc (Filtered)	mg/L	2	<0.05	0.369	<0.005	0.582	0.006	0.009	0.014

All analytes were recorded at concentrations below the historic maximum.

Wells GW7 and GW8 were not sampled during the reporting period as they were either lost or destroyed as part of earthworks within Tempe tip, both wells are located within the new road alignment. JHSW is currently trying to determine the necessary course of action regarding the sampling of alternative wells or the installation of new wells.

### 3.0 Landfill Gas Monitoring

Two forms of landfill gas monitoring are undertaken during the works on site to review potential impacts from landfill gas generation on surrounding receivers and onsite workers. These include the following:

- Daily/regular monitoring of pits, excavations and boring/piling operations.
- Monthly sub-surface, structure/enclosed space monitoring.

#### 3.1 Daily/regular monitoring of pits, excavations, and boring/piling operations

This monitoring takes place while ground-breaking, excavation, boring or piling works are taking place across the works area within the former Tempe Landfill. Results of gas monitoring are displayed in Table 3. All results were recorded below the adopted trigger levels. No reportable concentrations of methane were identified.

Table 3 Monitoring of site excavations, pits and piling

Date	Time (24 hour)	Wind Direction & Speed (km/h)	Location	CH4/Flammable Gases (%v/v)	OXY Vol %	PID - IBL (ppm)	CO2 (%v/v)	CO (ppm)	H2S (ppm)	Comments
30/08/2021	7:30	SW 20	General site inspection	0	20.9	0	0	0	0	Gas levels compliant, No Odour
03/09/2021	7:30	SW 18	General site inspection,	0	20.9	0	0	0	0	Gas levels compliant, No Odour
08/09/2021	7:30	WNW 13	General site inspection, Cut 1	0	20.9	0	0	0	0	Gas levels compliant, No Odour
16/09/2021	8:00	NW 7	Driving Range, trench	0	20.9	0	0	0	0	Gas levels compliant, Organic odour
20/09/2021	9:30	NNW 21	General site inspection, Cut 1	0	20.9	0	0	0	0	Gas levels compliant, No Odour
21/09/2021	7:05	NNW 19	Cut 1	0	20.8	0	0	0	0	Gas levels compliant, No Odour
22/09/2021	7:00	WSW 20	Cut 1	0	20.9	0	0	0	0	Gas levels compliant, No Odour
23/09/2021	7:10	WNW 24	Cut 1	0	20.8	0	0	0	0	Gas levels compliant, No Odour
24/09/2021	7:00	NW 18	Cut 1	0	20.9	0	0	0	0	Gas levels compliant, No Odour
27/09/2021	9:00	WNW 9	Cut 1	0	20.9	0	0	0	0	Gas levels compliant, No Odour
28/09/2021	7:30	NNW 10	Cut 1	0	20.8	0	0	0	0	Gas levels compliant, No Odour
29/09/2021	7:15	NNE 20	Cut 1	0	20.9	0	0	0	0	Gas levels compliant, No Odour

Date	Time (24 hour)	Wind Direction & Speed (km/h)	Location	CH4/Flammable Gases (%v/v)	OXY Vol %	PID - IBL (ppm)	CO2 (%v/v)	CO (ppm)	H2S (ppm)	Comments
30/09/2021	7:30	NNW 12	Cut 1	0	20.9	0	0	0	0	Gas levels compliant, No Odour

### 3.1 Monthly Landfill gas monitoring

Monthly gas monitoring of the sub-surface wells including gas accumulation monitoring in offsite buildings was undertaken at locations shown in Figure 1. Results of monitoring are detailed in Table 4.

Results indicate notable methane concentrations in wells GW9A and GW14 which are known to be inside the landfill boundary and as such do not have a maximum concentration level. Carbon Dioxide levels were recorded above the trigger level in gas wells GW1A, GW2, GW3, GW11A, and GW14, however the results were comparable to historic sampling results.

In accordance with the Landfill Gas Risk Assessment (LFGRA) and LLGOMP, a comparison of the flow, methane, and carbon dioxide ranges and corresponding gas situation between the LFGRA and current datasets was undertaken. Gas readings collected from each well was compared against the gas screening criteria for each representative Monitoring Zones depicted in Figure 2. Results are presented in Table 5. The results demonstrate that the September 2021 data is within the flow and concentrations ranges identified within the historical dataset and therefore considered to present minimal risk to the targeted receptors. Updated Risk Classifications and concentrations are also presented in Table 5, the updated risk classification and concentrations will be used as trigger levels in future monitoring rounds.

Gas accumulation monitoring was also undertaken within onsite buildings and the three nominated offsite assessment locations shown in Figure 1 during the reporting period. All readings were compliant with the adopted assessment criteria.



Figure 1: Monthly offsite landfill gas monitoring locations

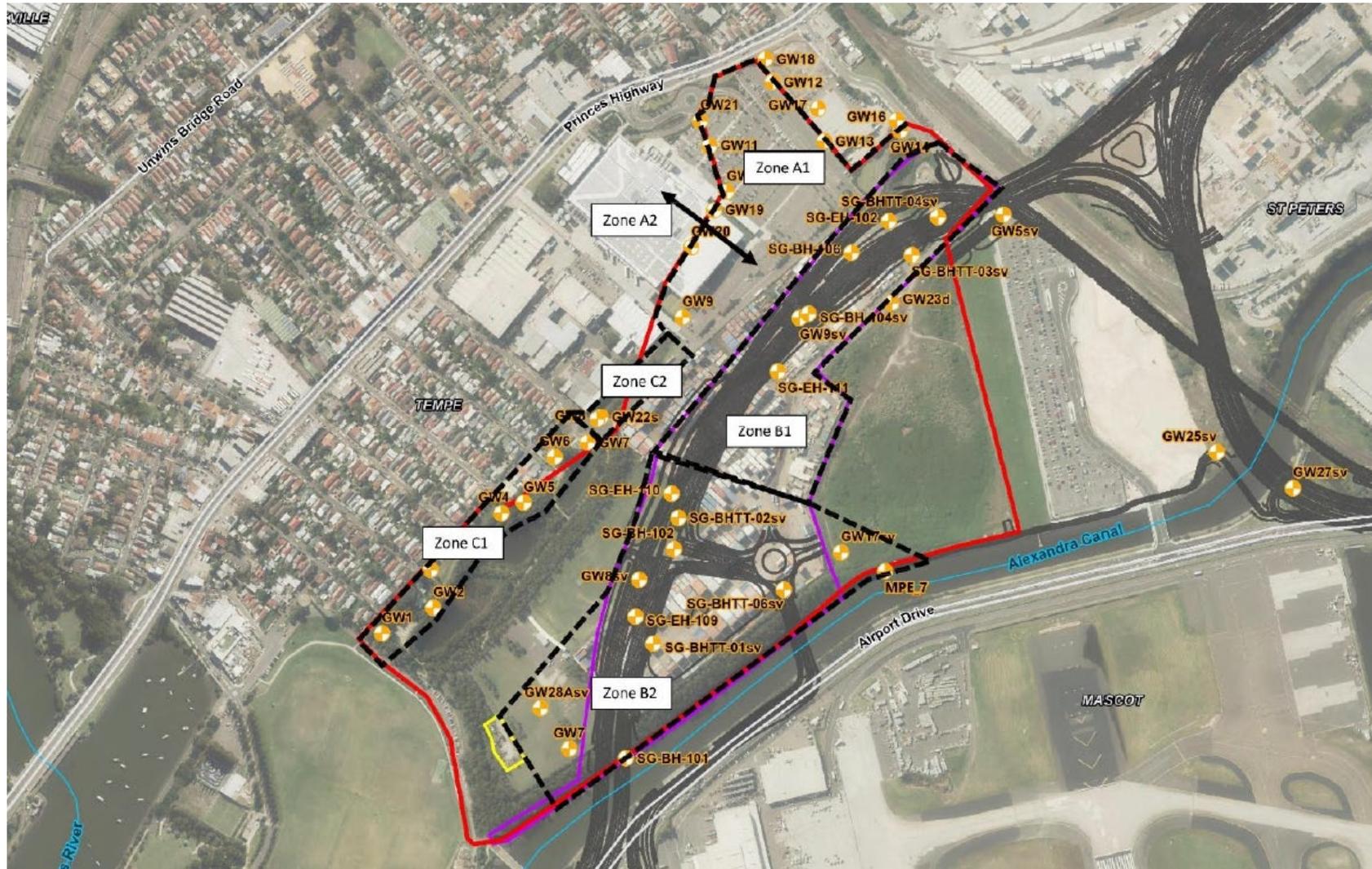


Figure 2 – Gas Monitoring Zones

Table 4 Monthly offsite subsurface gas monitoring results

			Flow (Stabilised)	Relative Pressure (Stabilised)	Methane (Stabilised)	Carbon Dioxide (Stabilised)	Oxygen (Stabilised)	Carbon Monoxide (Stabilised)	Hydrogen Sulphide (Stabilised)	Barometer
			L/hr	mb	%	%	%	ppm	ppm	mb
LLGOMP gas assessment criteria					1	5.0		30	10	
Sample Location	Date	Zone								
GW1A	30-09-21	C1	0	0	0	7.6	14.8	0	0	1013
GW2	30-09-21	C1	0	0	0	6.5	11.1	0	0	1013
GW3	30-09-21	C1	0	0	0	6.8	15.4	0	0	1013
GW4A	30-09-21	C1	0	0	0	2.2	19.4	0	0	1013
GW5A	30-09-21	C1	0	0	0	4.1	17.2	0	0	1013
GW6A	30-09-21	C1	0	0	0	4.9	16.8	0	0	1013
GW9	30-09-21	A2	2.6	4.24	0	0	20	0	0	1012
GW9A	30-09-21	A1	6.4	13.1	19.3	4.1	6.5	0	0	1012
GW11A	30-09-21	A2	0	0	0	7.6	8.8	0	0	1013
GW14	30-09-21	A1	0	0	4.1	10.4	5	0	0	1012
GW16	30-09-21	A2	0	0	0	2.3	16.6	0	0	1012
GW17	30-09-21	A2	0	0	0	0.3	21	0	0	1012
GW19A	30-09-21	A2	0	0	0	0.2	20.4	0	0	1013
GW22s	30-09-21	C2	0	0.14	0	0.8	20.2	0	0	1013

Table 5 Data comparison between LFGRA and September 2021 sampling results

Zone	Max Flow (L/Hr)	Max CH4 (%v/v)	Max CO2 (%v/v)	GSV CH4	GSV CO2	CS	Risk Class (NSW EPA 2020)
A1 LFGRA	5.8	54.7	22.0	3.17	1.28	3	Moderate
A1 Sept 21	6.4	43.3	22.7	2.77	1.45	3	Moderate
A2 LFGRA	1.8	5.6	19.8	0.10	0.36	2	Low
A2 Sept 21	0.0	0.0	7.6	0.00	0.01	2	Low
C1 LFGRA	0.1	0.2	17.4	0.0002	0.002	1 (CH4) 2 (CO2)	Very Low (CH4) Low (CO2)
C1 Sept 21	0.0	0.0	7.6	0.00	0.01	1 (CH4) 2 (CO2)	Very Low (CH4) Low (CO2)
C2 LFGRA	0.9	1.9	20.6	0.02	0.19	2	Low
C2 Sept 21	0.0	0.0	0.8	0.00	0.00	1	Very Low

Table 6 Monthly gas accumulation monitoring

Location	Type of Monitoring Point	Methane Limit	Results (Stabilised)
C3 compound office <sup>1</sup>	Gas Accumulation Monitoring	500ppm	0
C3 lunchroom <sup>1</sup>	Gas Accumulation Monitoring	500ppm	0
OSA1 <sup>2</sup>	Gas Accumulation Monitoring	500ppm	0
OSA2 <sup>2</sup>	Gas Accumulation Monitoring	500ppm	0
OSA3 <sup>2</sup>	Gas Accumulation Monitoring	500ppm	0

- 1 Monitoring location within project site on the Former Tempe Landfill
- 2 Monitoring location outside the project site

### 3.3 Odour Monitoring

Odour monitoring was undertaken during the reporting period. All work areas onsite were inspected as well as the site boundary. Odour monitoring results are detailed within Table 7. Generally, no odours were detected on site or offsite during monitoring.

On the 16 September 2021, an organic odour registering 2 odour units (OU) was identified coming from stockpiled topsoil and service investigation works occurring on the driving range. In accordance with the odour response procedure, odour was subsequently inspected at the project boundary and offsite at sensitive receivers located on Smith Street in Tempe. Although odour was recorded at less than 2OU at the site boundary it was faintly noticeable, additional readings were also undertaken at the closest sensitive receiver where no odour was detected. Subsequent odour monitoring undertaken in the afternoon on the same day did not identify any odour originating from the worksite or boundary. Works were therefore considered compliant with adopted trigger levels.

Table 7 Odour monitoring undertaken during the September reporting period

Date	Time	Location	Wind Direction	Wind Speed (kph)	Odour (OU)	Works Assessed Onsite
30/08/2021	07:30	All Areas (1-11)	SW	20	ND	Minor surface works (excavator/grader)
30/08/2021	16:30	All Areas (1-11)	E	15	ND	Minor surface works (excavator/grader)
31/08/2021	07:30	All Areas (1-11)	WNW	15	ND	Minor surface works (excavator/grader)
31/08/2021	16:45	All Areas (1-11)	E	19	ND	Minor surface works (excavator/grader)
01/09/2021	07:30	All Areas (1-11)	WNW	11	ND	Minor surface works (excavator/grader)
01/09/2021	17:00	All Areas (1-11)	ENE	13	ND	Minor surface works (excavator/grader)
02/09/2021	7:30	All Areas (1-11)	NW	9	ND	Minor surface works (excavator/grader)
02/09/2021	017:00	All Areas (1-11)	NE	30	ND	Minor surface works (excavator/grader)
03/09/2021	07:30	All Areas (1-11)	SW	18	ND	Excavator hammering Cut 1, minor surface works
03/09/2021	16:30	All Areas (1-11)	NE	28	ND	Excavator hammering Cut 1, minor surface works
06/09/2021	08:30	All Areas (1-11)	W	22	ND	Minor earthworks, concrete breaking in Cut 1
06/09/2021	17:00	All Areas (1-11)	SSW	32	ND	Minor earthworks, concrete breaking in Cut 1
07/09/2021	08:30	All Areas (1-11)	WNW	9	ND	Minor earthworks, concrete breaking in Cut 1
07/09/2021	16:45	All Areas (1-11)	S	15	ND	Minor earthworks, concrete breaking in Cut 1
08/09/2021	07:30	All Areas (1-11)	WNW	13	ND	Minor earthworks, concrete breaking in Cut 1
08/09/2021	16:30	All Areas (1-11)	ENE	15	ND	Minor earthworks, concrete breaking in Cut 1
09/09/2021	10:00am	All Areas (1-11)	WNW	22	ND	Minor earthworks, concrete breaking in Cut 1
09/09/2021	16:30	All Areas (1-11)	WNW	15	ND	Minor earthworks, concrete breaking in Cut 1
10/09/2021	09:30	All Areas (1-11)	SSW	6	ND	Minor earthworks, concrete breaking in Cut 1
10/09/2021	16:30	All Areas (1-11)	SE	17	ND	Minor earthworks, concrete breaking in Cut 1
13/09/2021	09:00	All Areas (1-11)	SW	13	ND	Minor earthworks, concrete breaking in Cut 1
13/09/2021	16:45	All Areas (1-11)	SSE	22	ND	Minor earthworks, concrete breaking in Cut 1
14/09/2021	10:00	All Areas (1-11)	SSW	40	ND	Minor earthworks, concrete breaking in Cut 1
14/09/2021	17:00	All Areas (1-11)	SSW	20	ND	Minor earthworks, concrete breaking in Cut 1
15/09/2021	10:00	All Areas (1-11)	SSW	35	ND	Vac Truck on driving range, excavator near ARTC

15/09/2021	16:30	All Areas (1-11)	SSW	21	ND	Minor earthworks, concrete breaking in Cut 1
16/09/2021	08:00	All Areas (1-11)	NW	7	2	Stockpiled topsoil, Vac Truck and excavator on driving range, Odour only detected onsite near sewer works
16/09/2021	17:00	All Areas (1-11)	S	10	ND	Vac Truck and excavator on driving range,
17/09/2021	09:00	All Areas (1-11)	NNW	13	ND	Minor earthworks, concrete breaking in Cut 1
17/09/2021	17:00	All Areas (1-11)	NE	24	ND	Minor earthworks, concrete breaking in Cut 1
20/09/2021	09:30	All Areas (1-11)	NNW	21	ND	Minor earthworks, concrete breaking in Cut 1
20/09/2021	16:30	All Areas (1-11)	WNW	34	ND	Minor earthworks, concrete breaking in Cut 1
21/09/2021	09:00	All Areas (1-11)	NNW	22	ND	Minor earthworks, concrete breaking in Cut 1
21/09/2021	16:30	All Areas (1-11)	SSW	45	ND	Minor earthworks, concrete breaking in Cut 1
22/09/2021	10:15	All Areas (1-11)	WSW	20	ND	Minor earthworks, concrete breaking in Cut 1
22/09/2021	16:45	All Areas (1-11)	S	27	ND	Minor earthworks, concrete breaking in Cut 1
23/09/2021	13:30	All Areas (1-11)	WNW	24	ND	Minor earthworks, concrete breaking in Cut 1
23/09/2021	17:00	All Areas (1-11)	NNE	19	ND	Minor earthworks, concrete breaking in Cut 1
24/09/2021	09:00	All Areas (1-11)	NW	17	ND	Minor earthworks, concrete breaking in Cut 1
24/09/2021	16:30	All Areas (1-11)	NW	27	ND	Minor earthworks, concrete breaking in Cut 1
27/09/2021	09:00	All Areas (1-11)	WNW	9	ND	Minor earthworks, concrete breaking in Cut 1
27/09/2021	16:45	All Areas (1-11)	ENE	23	ND	Minor earthworks, concrete breaking in Cut 1
28/09/2021	10:00	All Areas (1-11)	NNW	15	ND	Minor earthworks, concrete breaking in Cut 1
28/09/2021	17:00	All Areas (1-11)	NE	26	ND	Minor earthworks, concrete breaking in Cut 1
29/09/2021	09:30	All Areas (1-11)	NNE	22	ND	Minor earthworks, concrete breaking in Cut 1
29/09/2021	16:30	All Areas (1-11)	NNE	23	ND	Minor earthworks, concrete breaking in Cut 1
30/09/2021	09:00	All Areas (1-11)	NNW	13	ND	Minor earthworks, concrete breaking in Cut 1
30/09/2021	16:45	All Areas (1-11)	NE	22	ND	Minor earthworks, concrete breaking in Cut 1

## 4.0 Conclusions

Monitoring was conducted during the 30<sup>th</sup> August and 30<sup>th</sup> September 2021 reporting period in accordance with the LLGOMP. In general, results have been found to be compliant with historic sampling events. It should be noted that the works occurring onsite during the reporting period mostly constituted early works and site establishment. Therefore, surface gas monitoring events will become more frequent once bulk earthworks begin.