

Blaenau Gwent County Borough Council

Silent Valley Landfill

2023 Second Quarter Monitoring Report

Reference: 4-50

Issue | 31 July 2023



This report takes into account the particular instructions and requirements of our client. It is not intended for and should not be relied upon by any third party and no responsibility is undertaken to any third party.

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1. Introduction

This 2023 Second Quarter Monitoring Report is a consolidated report detailing the findings of this quarter's results from the surface water, groundwater, landfill gas and leachate results for the monitoring undertaken in the period April to June 2023 in accordance with the Silent Valley Environmental Permit^[1] (Permit no. MP3835SV) and the Aftercare Phase Environmental and Infrastructure Monitoring Program^[6].

The data has been collected as referenced in Schedule 3 of the Consolidated Permit^[1]. This report refers to the 2023 First Quarter Monitoring Report^[3].

1.1 Monitoring Regime

The monitoring regime is undertaken in accordance with the Aftercare Phase Environmental and Infrastructure Monitoring Program^[6] and in line with the Consolidated Permit^[1], which is fully detailed within the 2019 Annual Report^[2].

2. Discussion of Monitoring Results

2.1 Rainfall

Measured rainfall data is illustrated in **Appendix A1, Figures A1 to A3**.

Based on the available data the following summary has been provided:

- April recorded the highest monthly rainfall of the quarter (100.6mm) and the highest daily rainfall total (21.3mm on 14th April).
- June recorded the lowest monthly rainfall of the quarter (14.8mm) and recorded 23 days with no rainfall. This is the lowest rainfall for June since records began in 2008.
- From 11th May to 10th June no rainfall was recorded for 31 days. This is the longest consecutive period without rainfall since recording began in 2008.

2.2 Leachate

2.2.1 Leachate Quality Monitoring

Leachate quality monitoring results from within the waste body and from leachate standpipes are presented in **Appendix A2, Table B1**.

The Acceptable Maximum Concentrations (AMC) have been compared with the overall average (mean) concentrations from the wells. Exceedance of an AMC will trigger contingency actions.

No quarterly average leachate levels were above the AMC. Individual well trends are discussed below;

- LC2A well continues to exceed the AMC for nickel (0.0681mg/l) with a concentration of 0.102mg/l, this has decreased from the previous quarter (0.13mg/l). This exceedance has been recorded continuously throughout 2021 and 2022.
- LC2A exhibits the highest ammoniacal nitrogen result (802mg/l), although last quarter it was 0.4mg/l. However, the average of all the leachate monitoring wells is below the applicable AMC.

2.2.2 Leachate Level Monitoring

Leachate head level monitoring results are presented in **Appendix A2, Table B2**. The monthly average level for all the wells remains below the required 3.0m, as per the Permit^[1].

2.2.3 BSC Pipe

Leachate head measurements are undertaken in BH1 to BH4 which are located along the alignment of the BSC pipe. Leachate levels have remained relatively consistent indicating no rise in leachate levels therefore the pipe is working as required. Results are included **Appendix A.1 Figure A8 and Appendix A.2 Table B6**.

2.3 Surface Water

The surface water quality monitoring results are presented in **Appendix A2, Table B3**, and graphically in **Appendix A1, Figure A4**.

Commentaries are provided for upstream and downstream monitoring points in the Nant Merddog, including locations SW1 to SW10 located downstream of the landfill, as discussed below.

2.3.1 Upstream Surface Water

Surface water monitoring locations, SWU, SW2A1, SWW4, SWW1 and SWW2 are located downstream of the landfill and monitored on a six-monthly basis in accordance with the Permit requirements.

All upstream surface water monitoring wells remain compliant this quarter.

2.3.2 Downstream Surface Water

SWD and SWD1

Results show both SWD and SWD1 are compliant this quarter. Ammoniacal nitrogen at these locations is once again compliant, after changing to a new laboratory after receiving numerous exceedances from the previous laboratory.

2.4 Groundwater

2.4.1 Groundwater Quality Monitoring

Groundwater quality monitoring results are presented in **Appendix A1, Figures A5 and A6** and in **Appendix A2, Table B4**.

Any non-compliances for both upstream and downstream wells are discussed in the following sections.

2.4.1.1 Upstream Groundwater Wells

Well GW3A and GW4

GW3A and GW4 monitor the sandstone strata classified as S3-East, and GW11B are installed in the sandstone strata classified as S2-West.

GW4 continues to exceed manganese assessment level concentrations and has increased from the previous quarter (from 1.7mg/l to 1.9mg/l). These exceedances have continued to fluctuate above assessment level of downstream wells throughout all of 2021 and 2022. The elevated concentrations recorded upstream are likely to be from steel works waste deposited to the north of the landfill and old mine workings in the area. Manganese is also a typical contaminant of mine drainage, which is considered to be impacting the groundwater in the locale of the landfill.

2.4.1.2 Downstream Groundwater Wells

The results from the compliance wells indicate that generally the pumping system at the toe of the landfill is continuing to successfully control the potential egress of leachate from the landfill. No issues associated with pump failure within the cut-off system have been recorded during 2023.

Wells GW6 and GW7

GW6 and GW7 have been installed in the centre of the valley in the sandstone strata classified as S1. Both wells remain compliant this quarter.

Well GW9

GW9 is installed in the sandstone strata classified as S2-East.

GW9 has again exceeded the trigger level for ammoniacal nitrogen but significantly decreased from the previous quarter from a value of 16mg/l to 3.6mg/l. The concentration this quarter is similar to the results throughout 2022 concentrations, and therefore it is assumed the first quarter 2023 recording was an anomaly.

Well GW10

GW10 has been installed in the sandstone strata classified as S3-East and exceeds assessment level for manganese with a concentration of 7.18mg/l. The concentrations of manganese have continued to fluctuate in this well from 2022.

Well GW12

GW12 has been installed in the sandstone strata classified as S2-West and has remained compliant this quarter.

2.4.2 Groundwater Levels Monitoring

Groundwater levels are monitored on a quarterly basis in the compliance and upstream wells. The monitoring results are illustrated graphically in **Appendix A1, Figure A7**. Water levels have remained relatively consistent this quarter with no significant differences from the 2022 readings ^[3].

2.5 Landfill Gas

2.5.1 Methane

The landfill gas monitoring results are presented in **Appendix A2, Table B5**.

Methane concentrations continue to be recorded below the respective control and trigger levels (where available) in all monitoring locations. An error in the reported data last quarter did not highlight GMW14/14A which exceeded trigger levels for all red, yellow and while valves in March only however, this has now returned to 0.0% this quarter.

2.5.2 Carbon Dioxide

All monitoring wells remained compliant this quarter with exception of GMW2, GMW3, GMW6 and GMW14/14A

There were several exceedances throughout this quarter of both control and trigger levels including:

- GMW2 red valve (5.3%) exceeded trigger level 1.5% in June. This is the first exceedance of this valve in 2023.
- GMW3 yellow valve (3.1%) exceeded control level 2.17% in May only. These levels have reduced from the single exceedance in February of 3.1%.
- GMW6 red valve (4.2%) exceeded control level 3.8% in June only. This is the first exceedance of this well in 2023.
- Further to the last quarterly report it has been noted that the first quarter data for GMW14/14A was reported was inaccurately and therefore has been corrected in this quarter's report.
 - The red valve concentration has gradually decreased throughout Quarter 2 of 2023 after exceeding trigger levels all of the first quarter.
 - The red valve in April recorded a value of 1.3% exceeding control levels (1.0%) while May recorded compliant concentrations. It is noted no data was monitored in June due to the presence of cattle surrounding the borehole.
 - Both the yellow and white valve exceeded trigger levels in March in the first quarter however both have decreased below control levels in April. It is noted no data was monitored in June due to the presence of cattle.

3. Conclusion

The monitoring data and interpretation produced in this report has not identified any significant issues relating to contaminant levels recorded above the screening criteria within the leachate and groundwater. Where limited minor exceedances have been identified there is no evidence to suggest they are having a discernible impact on the surrounding environment and the landfill continues to comply with the requirements of the permit.

The second quarterly report of 2023 has noted the following:

- The quality control issues surrounding ammoniacal nitrogen were investigated by trailing a new laboratory this quarter. Results highlighted concentrations of ammoniacal nitrogen to be reporting similar to the historic 2021 results with the majority returning to compliant concentrations. This suggests the high ammoniacal nitrogen concentrations from 2022 and the first quarter of 2023 were due to an error with the previous laboratory analytical technique and not an issue with the landfill.
- GW9 continues to be non-compliant for ammoniacal nitrogen concentrations, however this has historically been investigated, and these have concluded that the exceedances at GW9 do not have a discernible impact on downstream receptors.
- GW10 will continue to fluctuate and exceed assessment level for manganese. These concentrations are being monitored closely.
- It was previously recommended a study was undertaken into the ammoniacal nitrogen non-compliance in SWD, however the change in laboratory has made this sample point compliant. Therefore, this recommendation will be reviewed on completion of the next quarter's reporting.
- GMW14/14A continues to exceed the trigger Levels for carbon dioxide however has decreased in concentration. On receipt of the next quarter's monitoring results a review of actions required will be undertaken.

References

- [1] Environment Agency, Silent Valley Landfill Site, Pollution Prevention and Control (England and Wales) Regulations 2000, Landfill (England and Wales) Regulations 2002, Permit number MP3835SV, November 2005, Permit amended as of 04/03/16.
- [2] Arup, Silent Valley Landfill, 2019 Annual Monitoring Report, 31st January 2020.
- [3] Arup, Silent Valley Landfill, 2023 First Quarter Monitoring Report, Issue 28th April 2023.
- [4] Arup, Silent Valley Landfill, 2021 Annual and Fourth Quarter Monitoring Report, Issue 31st January 2022.
- [5] Arup, Silent Valley Landfill, Interim GW9 and Nant Merddog W, Issue May 2015.
- [6] Arup, Silent Valley Landfill, Aftercare Phase Environmental and Infrastructure Monitoring Program, Issue June 2013.
- [7] Arup, Silent Valley Landfill, Hydrogeological Risk Assessment, document reference 04/6363, November 2004.
- [8] Arup, Silent Valley Landfill, Investigation into the Western Flank of the Cut-off System. Compliance Well GW9 and GW10, document reference 115825, August 2011.
- [9] Environment Agency, Guidance on Monitoring of Landfill Leachate, Groundwater and Surface Water, report reference LFTGN02, June 2014.
- [10] Arup, Silent Valley Landfill, Hydrogeological Risk Assessment (Supplementary Revision May 2009), document reference 09/7543, June 2009.
- [11] Environment Agency, Guidance on the management of landfill gas, document reference LFTGN03, June 2014.
- [12] The Water Framework Directive (Standards and Classification) Directions (England and Wales) 2015.
- [13] Water Framework Directive - United Kingdom Technical Advisory Group (WFD-UKTAG), "Metal Bioavailability Assessment Tool (M-BAT)," 2014.
- [14] Arup, Silent Valley Landfill, Hydrogeological Risk assessment, document reference 2019/9559, July 2019.

A.1 Monitoring Results - Graphs

Figure A1
Daily rainfall totals and sampling events (April 2018 - June 2023)

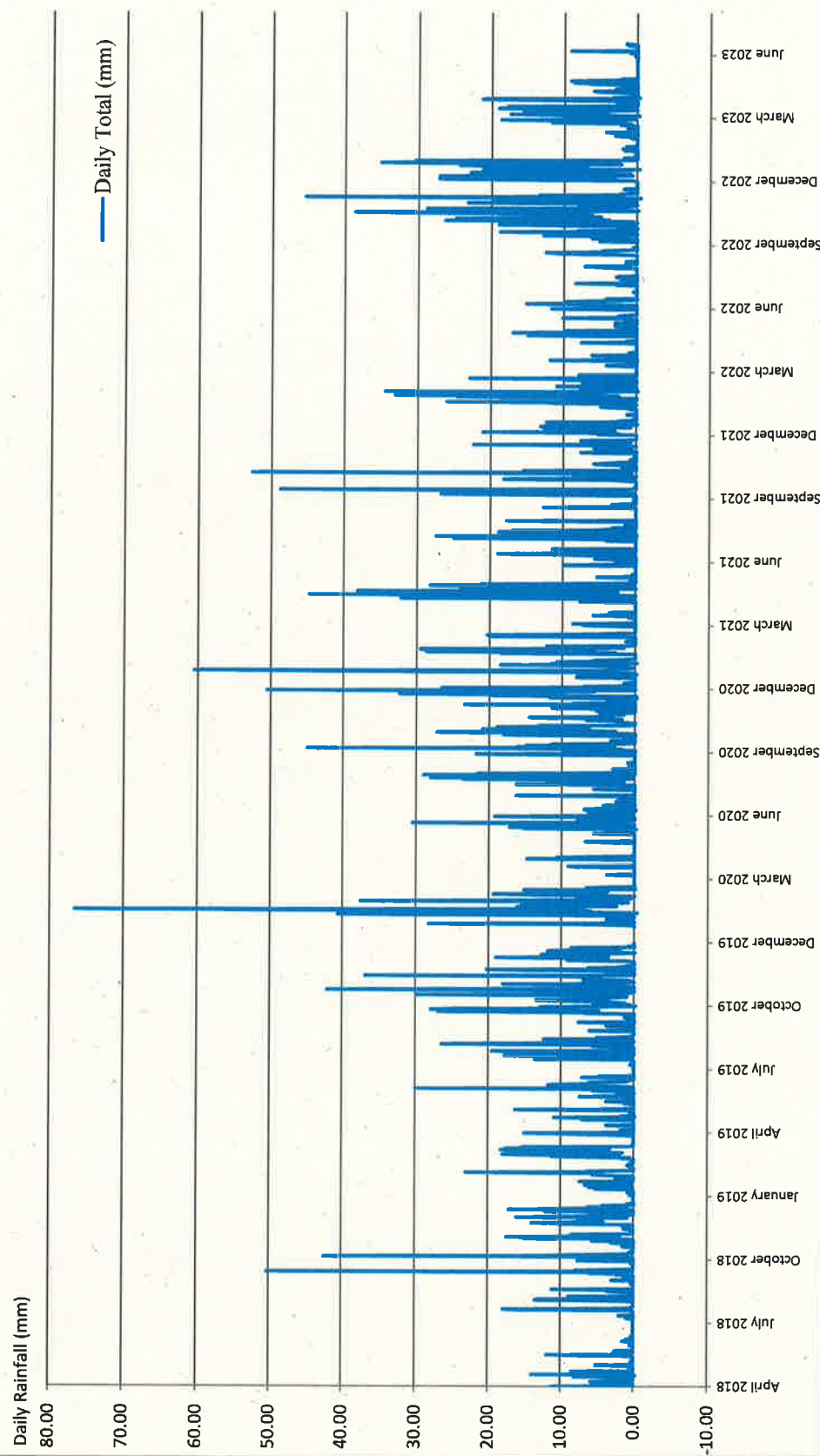


Figure A2
Monthly rainfall totals (April 2018- July 2023)

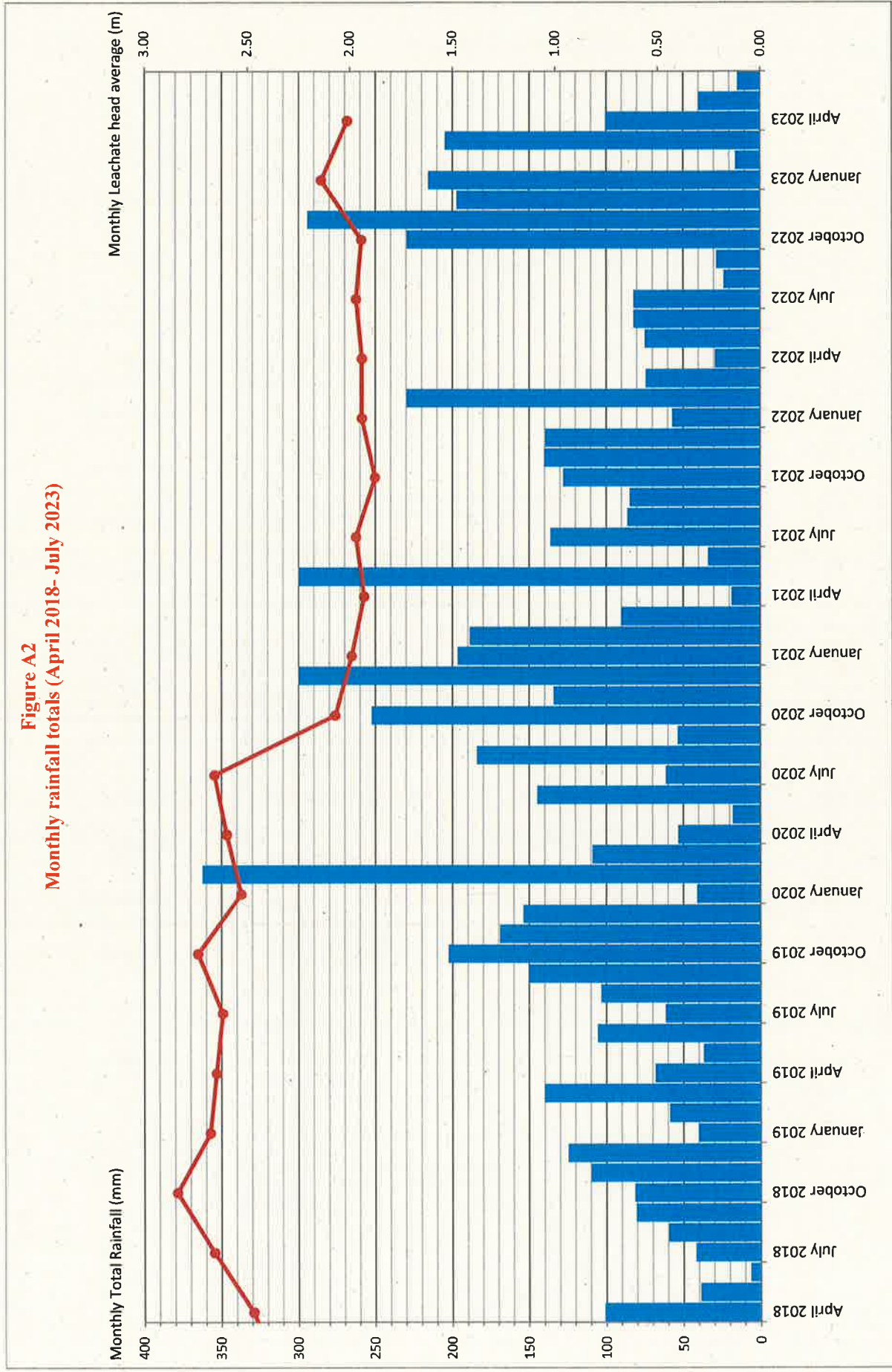


Figure A3
Monthly total rainfall April 2018 - June 2023)

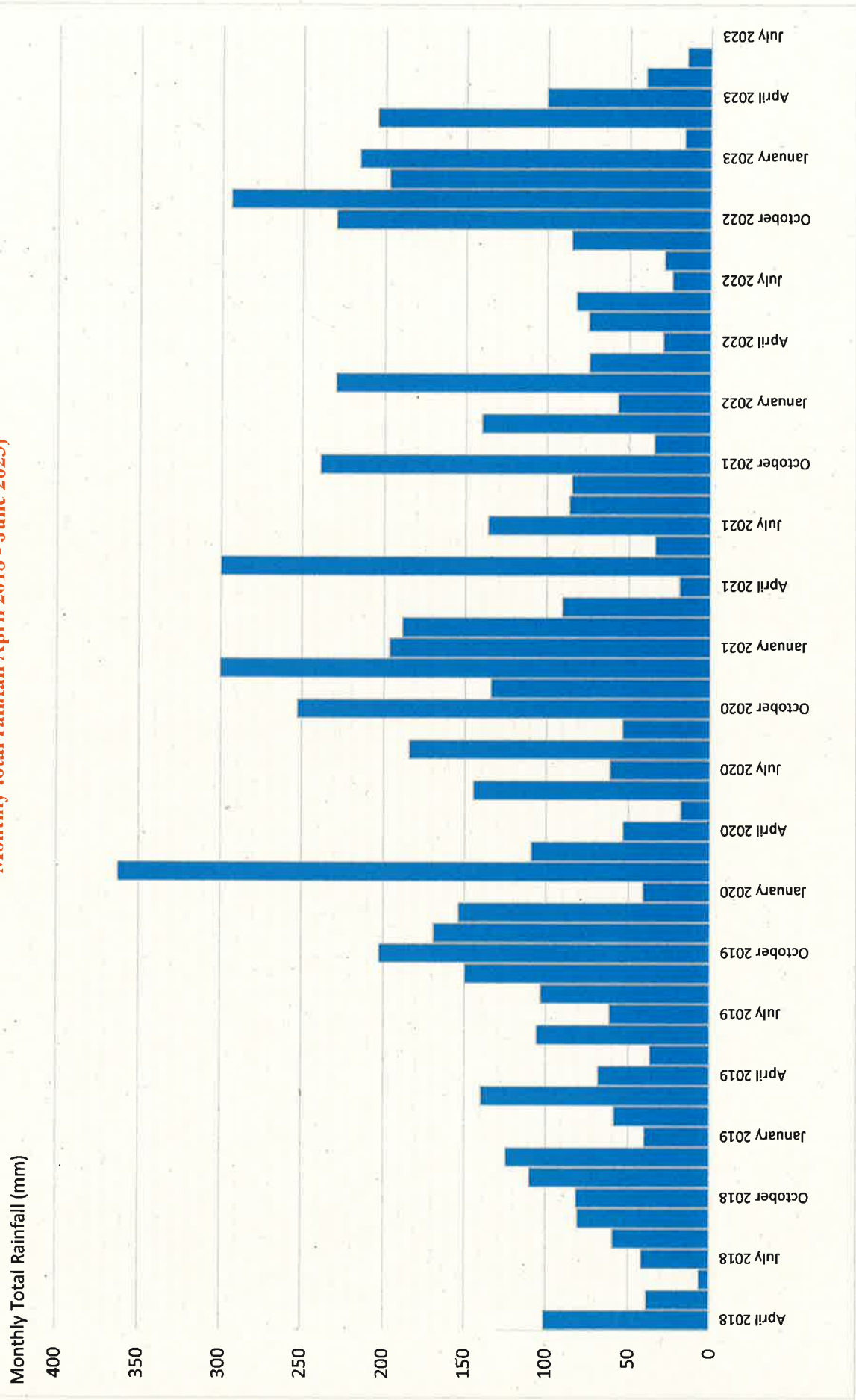


Figure A4
Surface water monitoring graphs

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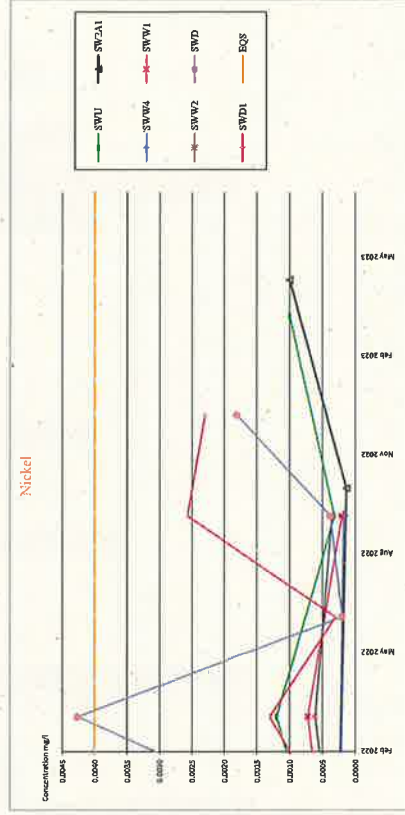
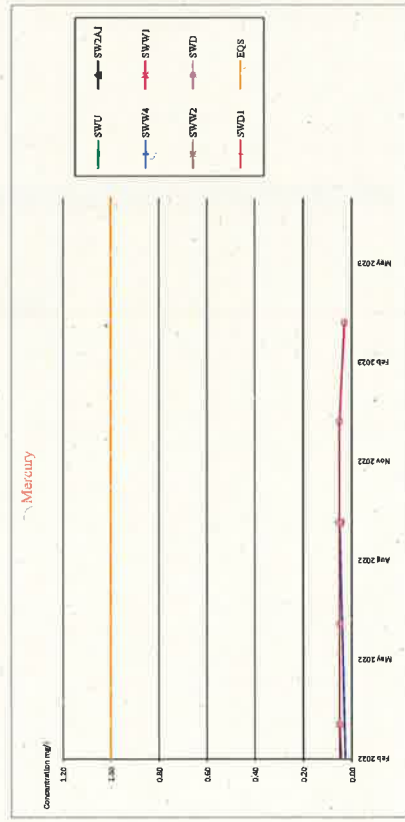
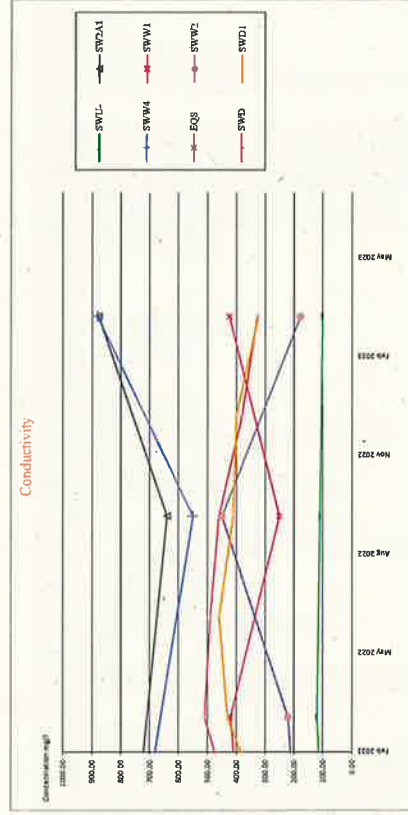
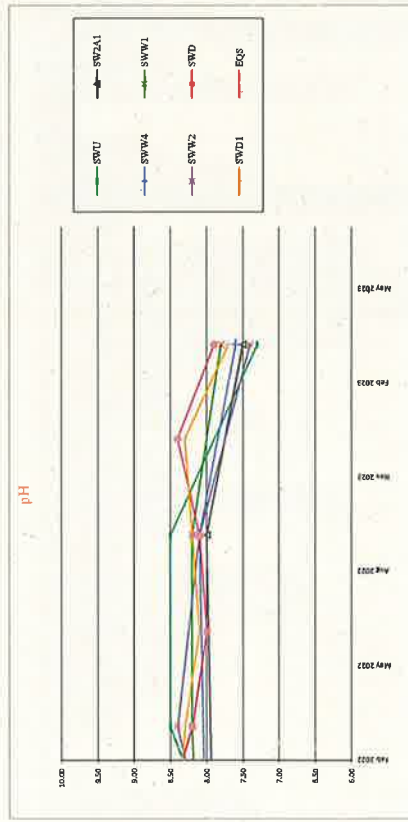
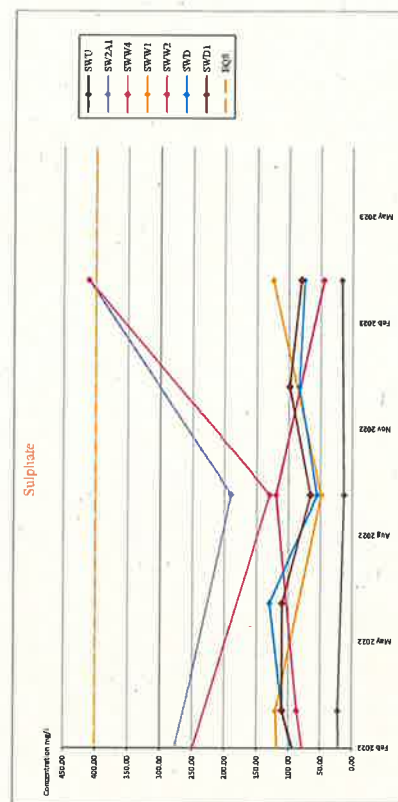
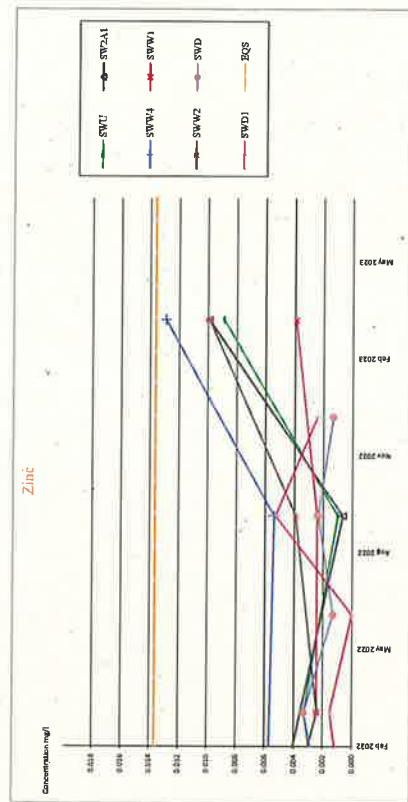
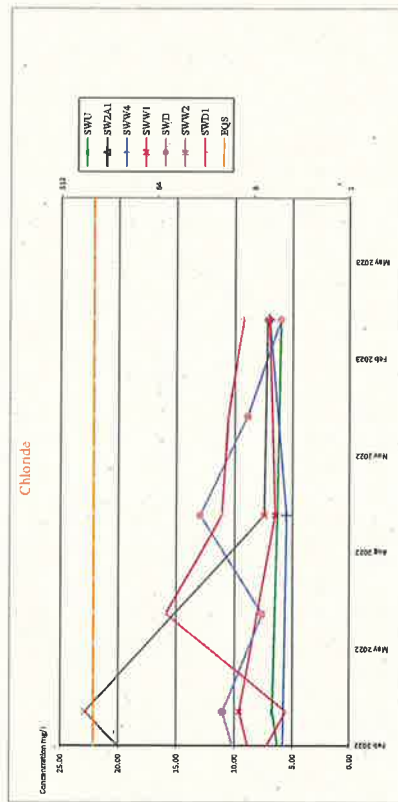
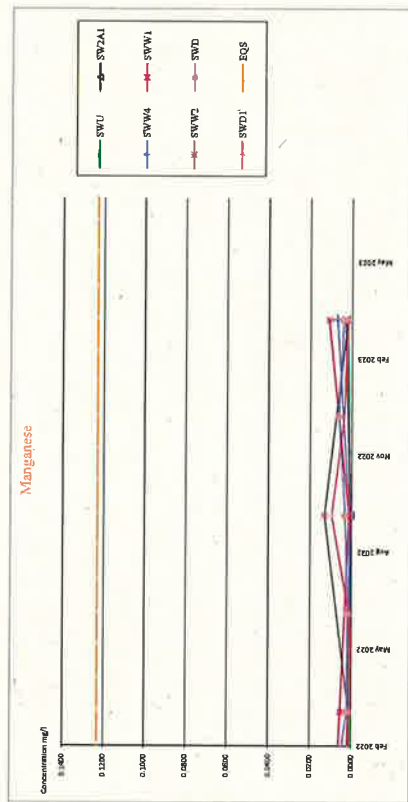
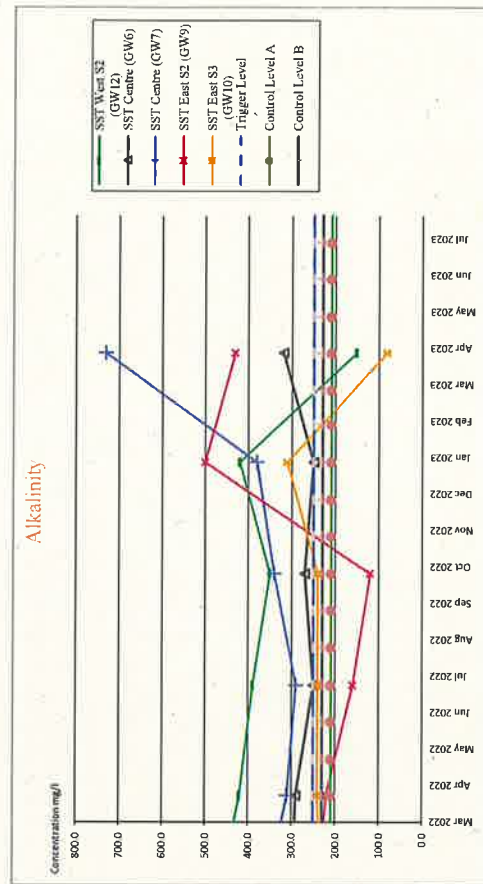
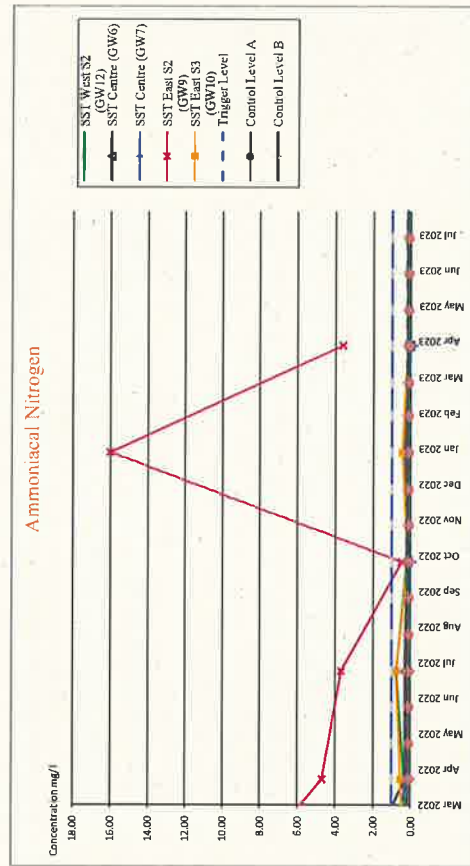
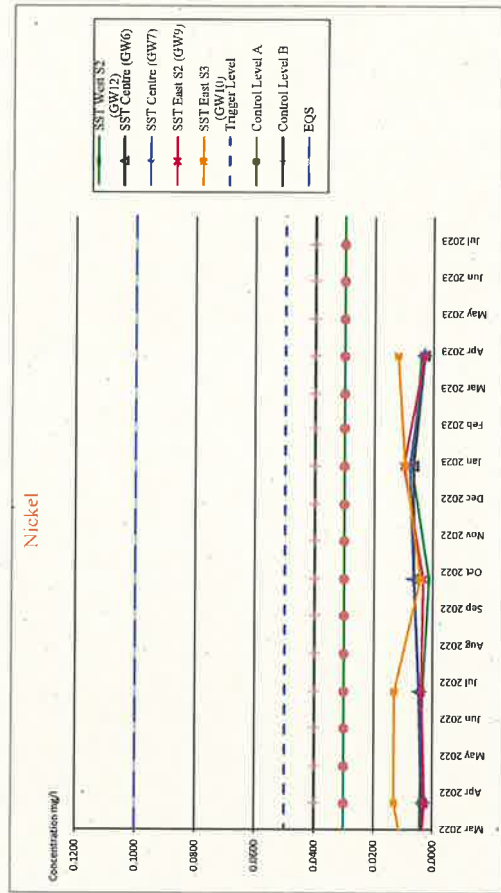
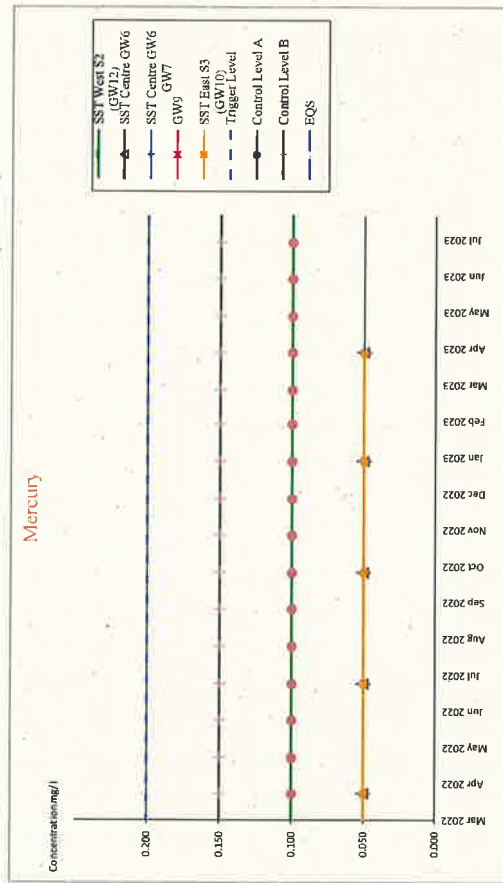


Figure A4
Surface water monitoring graphs

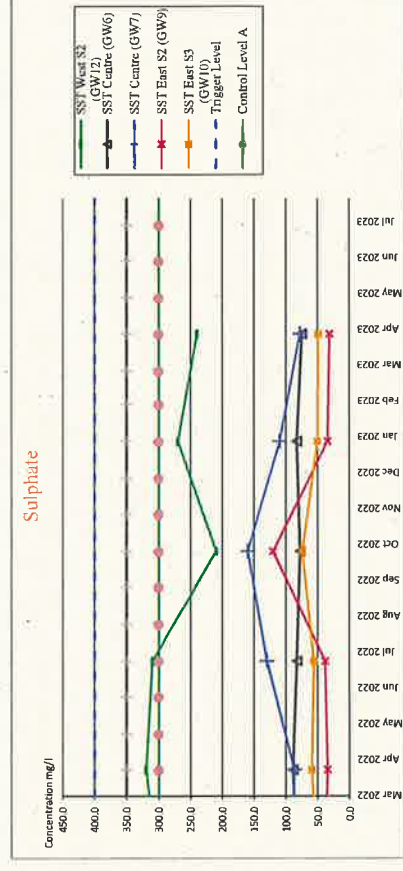
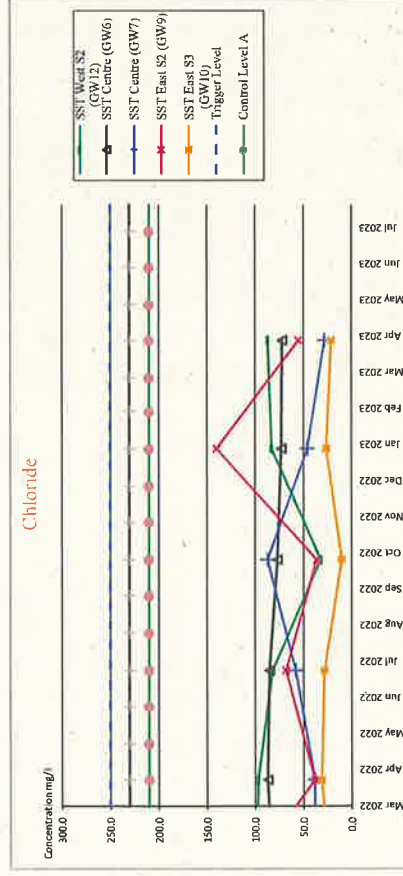
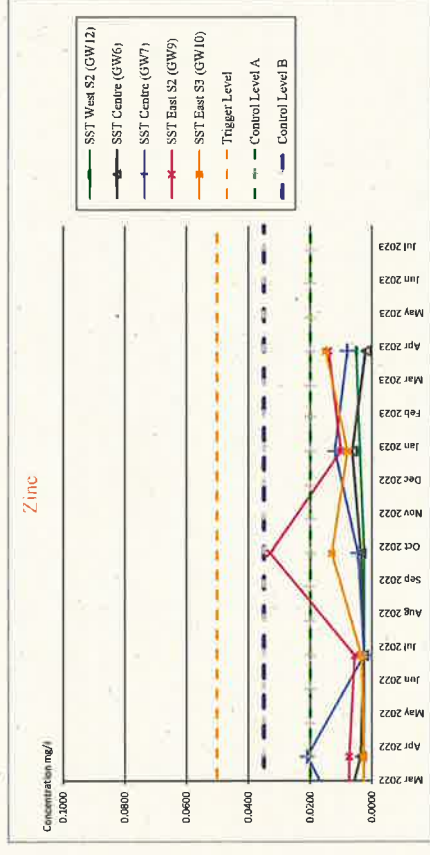
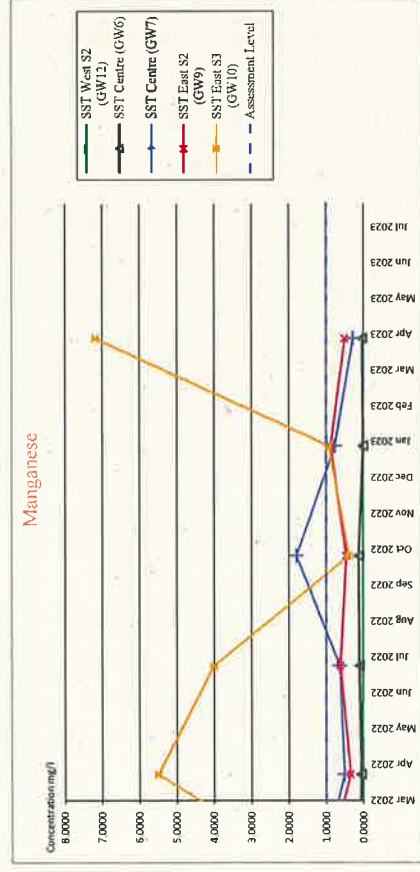
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Compliance wells graphs



Compliance wells graphs



Compliance wells graphs

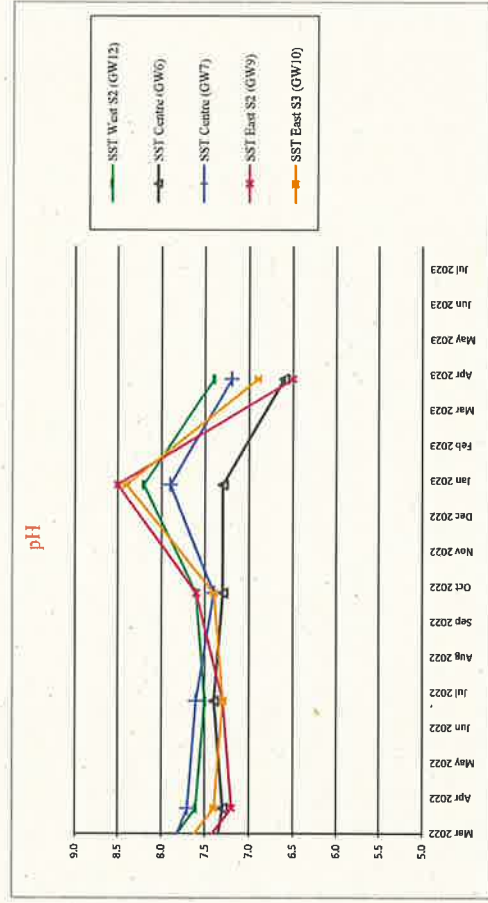


Figure A6
Groundwater quality monitoring results - Upstream wells graphs

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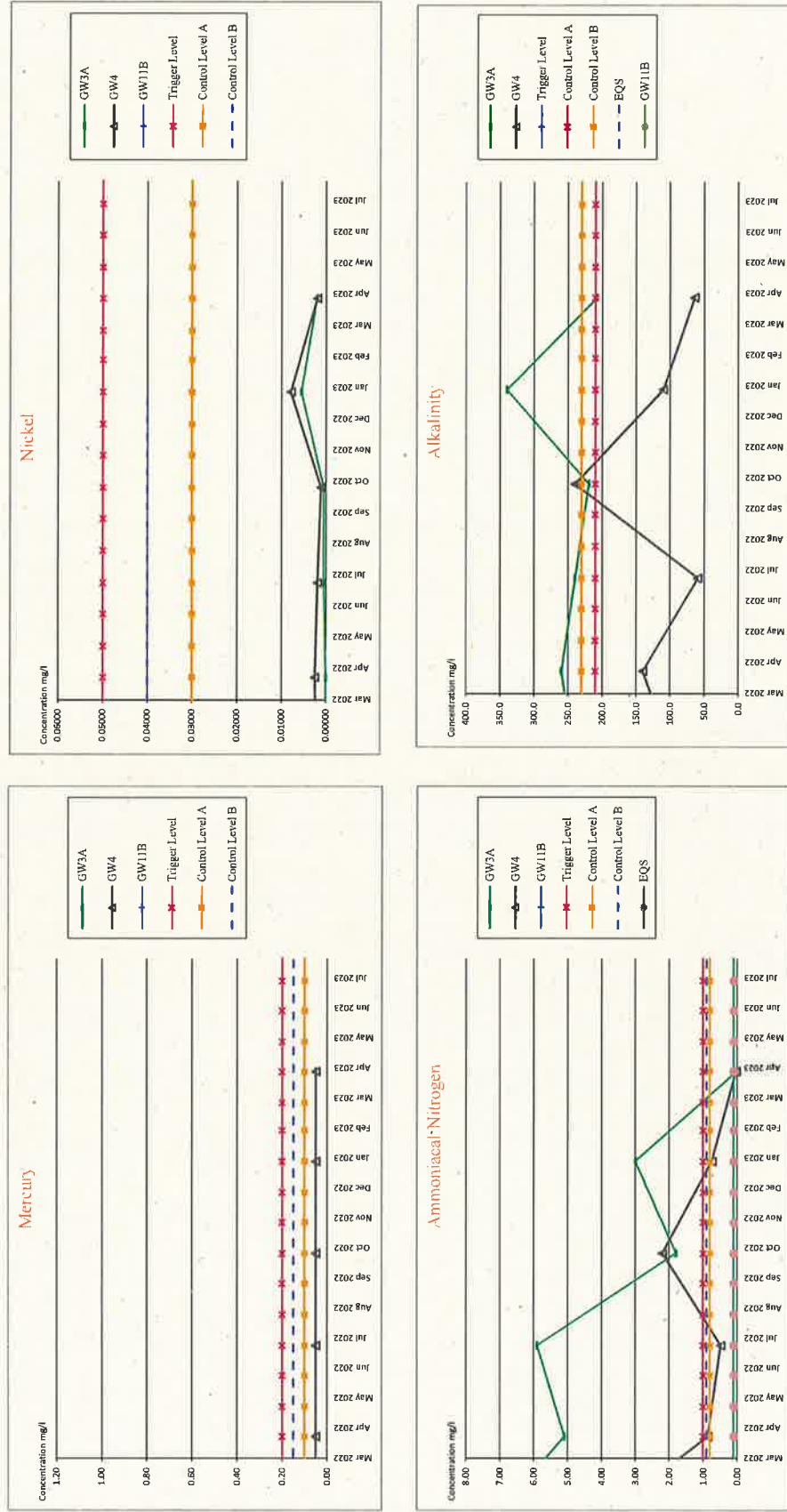


Figure A6
Groundwater quality monitoring results - Upstream wells graphs

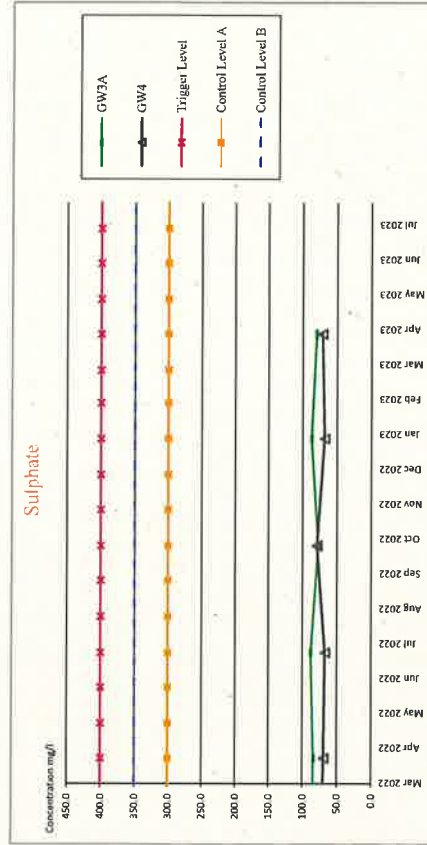
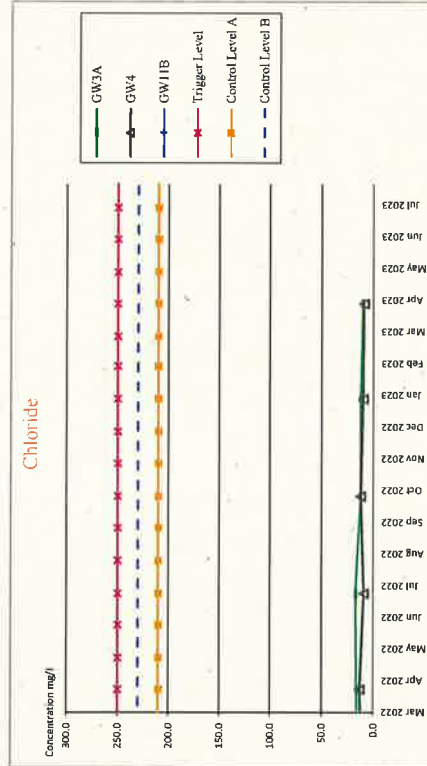
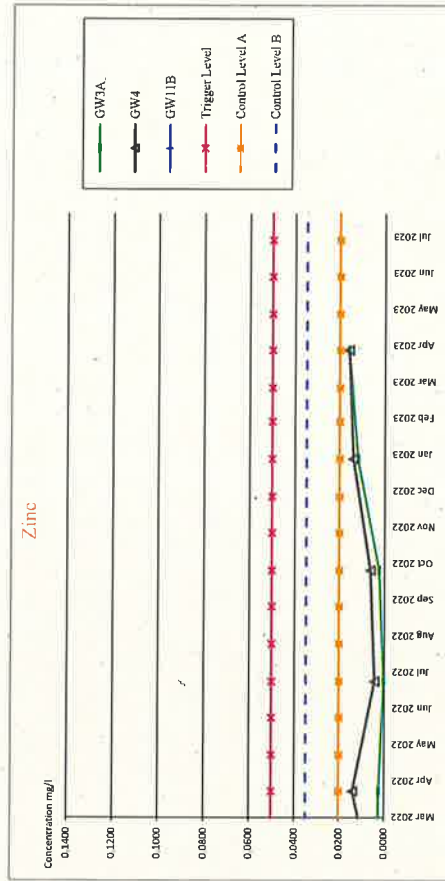
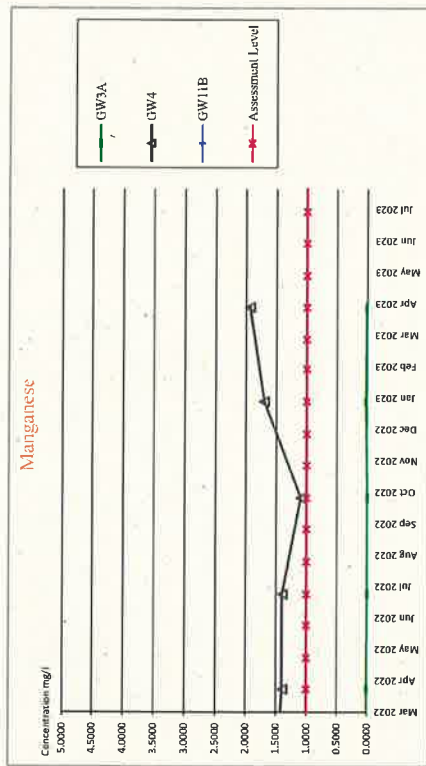


Figure A6
Groundwater quality monitoring results - Upstream wells graphs

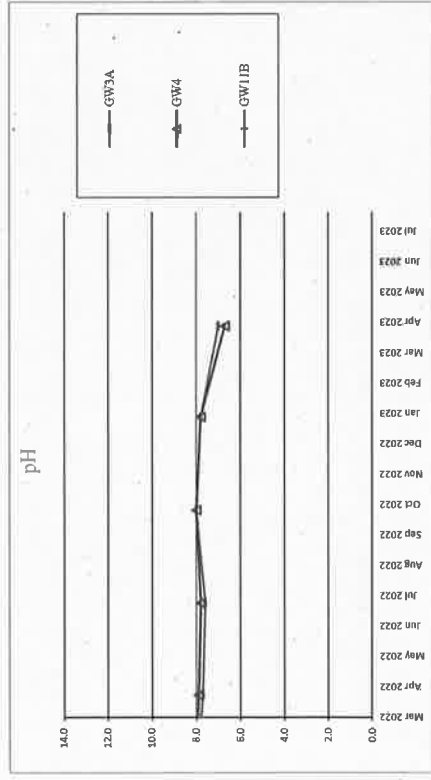


Figure A7
Groundwater monitoring levels downstream of compliance wells

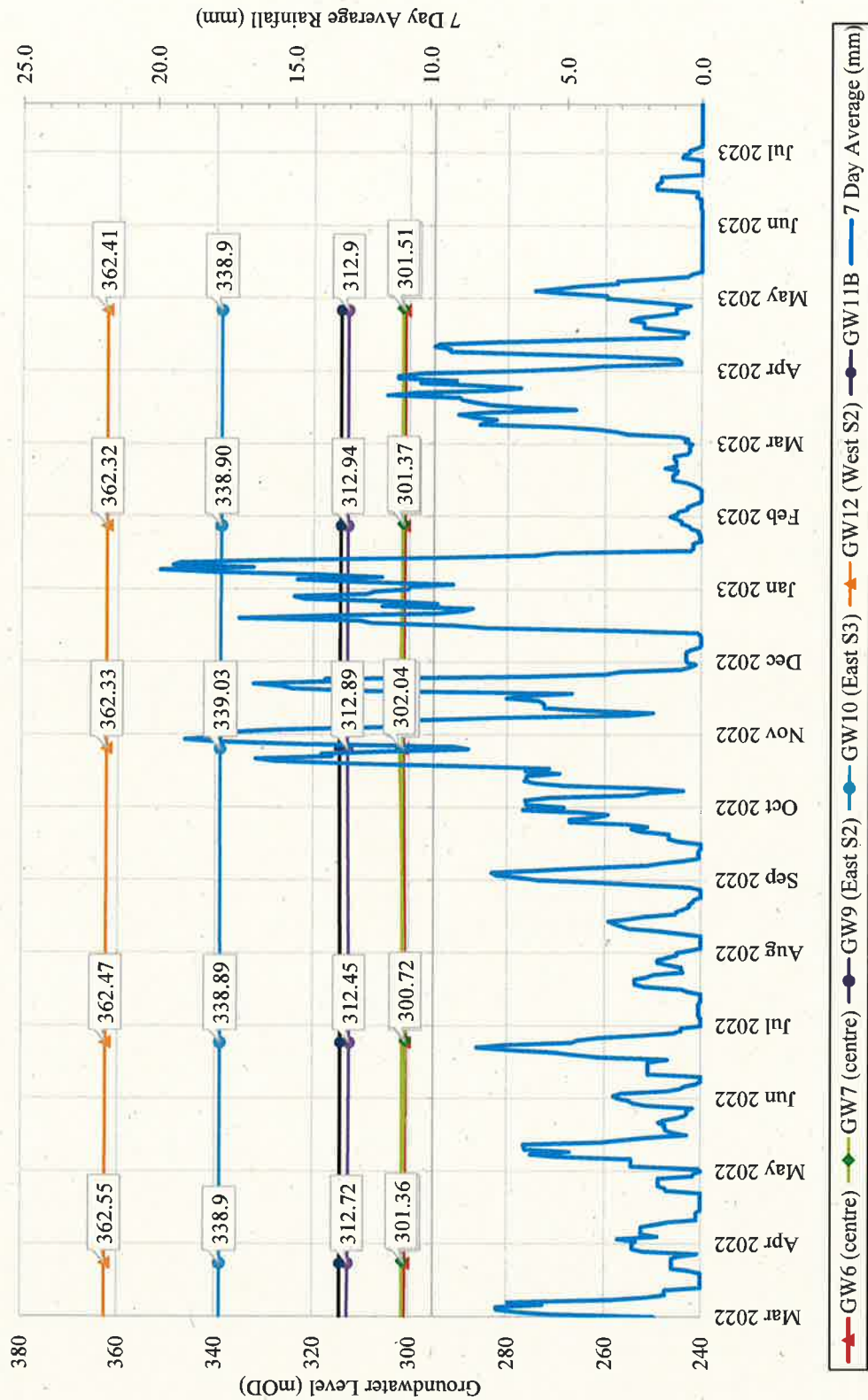
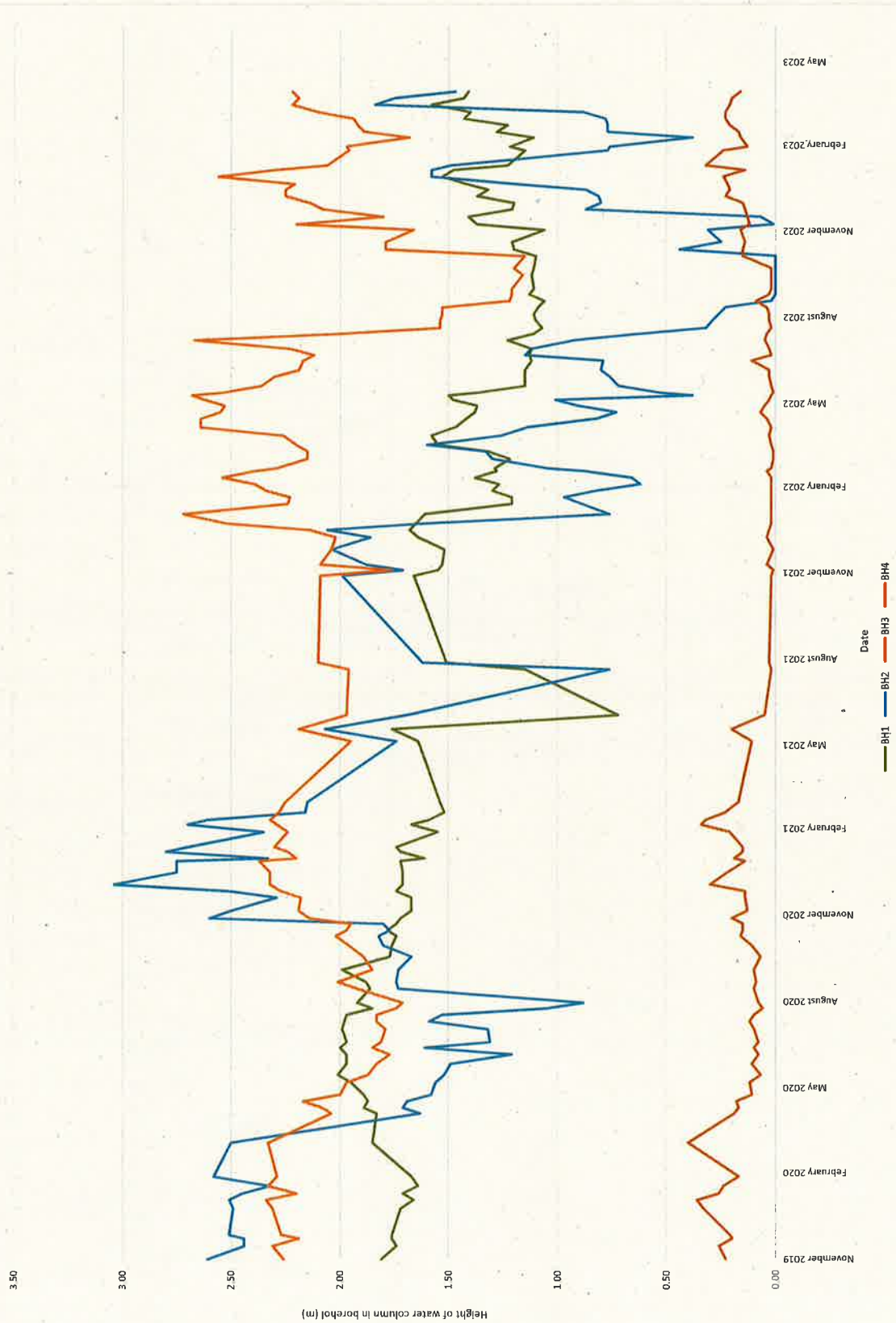


Figure A8
Height of water column (m) from base of well in boreholes BH1 to BH 4



A.2 Monitoring Results - Table

Table B1 May 2023

LOCATION	Units	L1A	L1B	LC1A	LC2A	LC4A	LC5A	Maximum concentration (mg/l)	Monthly Average (mg/l)	Acceptable Maximum Concentration (AMC) (mg/l)	LP3A	LP4
Date Sampled												
Manganese in filtrate as Mn	mg/l	N/S	0.588	N/S	0.107	0.723	N/S	0.723	0.47	--	0.004	0.083
Mercury, filt trace as Hg	mg/l	N/S	< 0.00003	N/S	0.00003	< 0.00003	N/S	0.00003	0.00003	0.00056	0.00003	< 0.00003
Nickel in filtrate as Ni	mg/l	N/S	0.005	N/S	0.102	0.008	N/S	0.102	0.04	0.0681	0.005	0.006
Zinc, ultra-low filtered as Zn	mg/l	N/S	0.021	N/S	0.03	0.014	N/S	0.03	0.02	1.38	0.011	0.024
pH	pH Units	N/S	7.4	N/S	8.3	7.3	N/S	8.3	7.67	--	8.2	7.9
Conductivity- Electrical 20C	uS/cm	N/S	1700	N/S	11900	3900	N/S	11900	5833	--	1600	1810
Alkalinity as CaCO3	mg/l	N/S	484	N/S	4740	3860	N/S	4740	3028	--	501	630
Ammoniacal Nitrogen as N	mg/l	N/S	0.02	N/S	802	232	N/S	802	345	526	< 0.01	11.5
Chloride as Cl	mg/l	N/S	98	N/S	808	149	N/S	808	352	1408	103	110
Sulphate as SO4	mg/l	N/S	296	N/S	664	9	N/S	664	323	999	198	199
Redox Potential (see note 4)	mV	N/S	243.6	N/S	-127	-58	N/S	243.6	20	--	224.8	206.8
Total Suspended Solids	mg/l	N/S	5	N/S	1320	944	N/S	1320	756	--	< 5	5
Solids, Total Dissolved 180 deg C	mg/l	N/S	1170	N/S	5370	1630	N/S	5370	2723	--	1090	1210
Dissolved Oxygen, Fixed*	mg/l	N/S	8.9	N/S	0.5	2.2	N/S	0.5	--	--	10.1	9.9
TOC (filtered)	mg/l	N/S	12.3	N/S	453	102	N/S	453	189.1	--	10.9	13.5

Notes

1. < denotes 'less than'.
2. L1A, L1B, LC1A, LC2A, LC4A, LC5A: Wells in Waste.
3. -- denotes 'no acceptable maximum concentration available'.
4. The redox potential was not measured on site and there is a possibility that it has changed between sampling and analysis
5. LC5A is a replacement for LC5 well.
6. N/S denotes 'not sampled'.

Exceedance of AMC (per well)

Exceedance of AMC (monthly average)

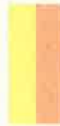


Table B2
Leachate Head Levels

	Jan-23	Feb-23	Mar-23	Apr-23	May-23	Jun-23	Jul-23	Aug-23	Sep-23	Oct-23	Nov-23	Dec-23
LC1A	Elevation of base of landfill mAOD	357.62		357.62								
	Elevation at top of casing mAOD	398.85		398.85								
	Depth to leachate from top of casing (m)	40.30		40.30								
	Leachate elevation (mAOD)	358.55		358.55								
LC2A	Calculated leachate head (m)	0.93		0.94								
	Elevation of base of landfill mAOD	362.49		362.49								
	Elevation at top of casing mAOD	401.12		401.12								
	Depth to leachate from top of casing (m)	35.20		35.20								
LC4A	Leachate elevation (mAOD)	365.92		365.92								
	Calculated leachate head (m)	3.43		3.03								
	Elevation of base of landfill mAOD	372.27		372.27								
	Elevation at top of casing mAOD	401.14		401.14								
LC5A	Depth to leachate from top of casing (m)	26.81		26.80								
	Leachate elevation (mAOD)	374.33		374.34								
	Calculated leachate head (m)	2.06		2.07								
	Elevation of base of landfill mAOD	350.14		350.14								
L1	Elevation at top of casing mAOD	380.75		380.75								
	Depth to leachate from top of casing (m)	DAMAGED		DAMAGED								
	Leachate elevation (mAOD)											
	Calculated leachate head (m)											
L1A*	Casing height (mAOD)	357.00		357.00								
	Leachate (mbl)	DRY		DRY								
	Leachate (m AOD)	-		-								
	Base of landfill (m AOD)	336.80		336.80								
L1B*	Depth of well from top of casing (m)	21.03		21.03								
	Base of well (m AOD)	335.97		335.97								
	Calculated leachate head (m)											
	Casing height (mAOD)	355.79		355.79								
L1A*	Leachate (mbl)	DRY		DRY								
	Leachate (m AOD)	-		-								
	Base of landfill (m AOD)	316.64		316.64								
	Depth of well from top of casing (m)	20.89		20.90								
L1B*	Base of well (m AOD)	334.90		334.89								
	Calculated leachate head (m)											
	Casing height (mAOD)	354.80		354.80								
	Leachate (mbl)	25.77		25.57								
L1B*	Leachate (m AOD)	329.03		329.23								
	Base of landfill (m AOD)	319.60		319.69								
	Depth of well from top of casing (m)	34.84		34.80								
	Base of well (m AOD)	319.26		320.00								
L1B*	Calculated leachate head (m)	9.43		9.63								

2023	Quarterly Leachate Head Averages (m)											
January	2.14											
February												
March												
April	2.01											
May												
June												
July												
August												
September												
October												
November												
December												

Minimum monthly leachate head average
Maximum monthly leachate head average

Notes:

Top of casings were re-surveyed in August 2019

1. LC1A top of casing is 1710mm above ground level.

2. LC2A top of casing is 820mm above GL.

3. LC4A top of casing is 1040mm above GL.

4. LC5A top of casing is 1050mm above GL.

* Well not included in monthly average

Note: L1 is generally dry or with very little water in it.

Table B3
Surface Water Monitoring Results

Month	Location	Date	Mercury, ultra-low (total as Hg)	Manganese in filtrate as Mn	Nickel in filtrate as Ni	Bioavailable Ni	Zinc, ultra-low total as Zn	Bioavailable Zn	pH	Conductivity-Electrical (EC)	Ammoniacal Nitrogen as N based on measured Temperature	Unfiltered Ammoniacal Nitrogen based on measured Temperature	Measured surface water temperature	Chloride as Cl	Sulfate as SO ₄	Total Suspended Solids	Dissolved Oxygen, fixed	TOC, filtered	Redox Potential	Alkalinity as CaCO ₃	Calcium
Periodic Data																					
J	Upstream of Landfill	SW1 SW2A1 SW4 SWW4	Six-monthly																		
F	NW Dish System	SWW1 SWW2 SWW3	Six-monthly																		
M	Downstream of Landfill	SW1 SW2A1 SW4 SWW4	Quarterly																		
A	Upstream of Landfill	SW1 SW2A1 SW4 SWW4	Six-monthly																		
M	NW Dish System	SWW1 SWW2 SWW3	Six-monthly																		
J	Downstream of Landfill	SW1 SW2A1 SW4 SWW4	Quarterly																		
J	Upstream of Landfill	SW1 SW2A1 SW4 SWW4	Six-monthly																		
A	NW Dish System	SWW1 SWW2 SWW3	Six-monthly																		
S	Downstream of Landfill	SW1 SW2A1 SW4 SWW4	Quarterly																		
O	Upstream of Landfill	SW1 SW2A1 SW4 SWW4	Six-monthly																		
N	NW Dish System	SWW1 SWW2 SWW3	Six-monthly																		
D	Downstream of Landfill	SW1 SW2A1 SW4 SWW4	Quarterly																		
			Minimum	0.0020	0.0010	0.0002	0.0040	0.0009	7.9	137		0.0001	7.9	0.0	17.0	7.0	9.5	1.0	-83.0	13,500	2,000
			Maximum	0.0110	0.0075	0.0023	0.0040	0.0020	8.4	41		0.0001	8.4	0.0	41	0	11.0	8.0	-50	140	140
			Count	5	5	5	5	5	5	5		5	5	5	5	5	5	5	5	5	5

Notes
 1. The redox potential was not measured on site and there is a possibility that it has changed between sampling and analysis.
 2. NIS - Not analyzed.
 3. Unfiltered ammoniacal nitrogen based on measured temperature.
 4. Unfiltered ammoniacal nitrogen based on measured temperature. If raw water is derived to protect the most sensitive aquatic life.
 5. NW Dish - North Western (dish system)

Periodic Data
 Upstream of Landfill
 NW Dish System
 Downstream of Landfill

Table B5
Landfill Gas Monitoring Results[illegible]

ACETYLENE (% by Volume)

Location	Valve	Jan-23	Feb-23	Mar-23	Apr-23	May-23	Jun-23	Jul-23	Aug-23	Sep-23	Oct-23	Nov-23	Dec-23	Comments
GMW7	Yellow Valve	0	0	0	0	0	0	0	0	0	0	0	0	Yellow Valve 12 depth
	White Valve	0	0	0	0	0	0	0	0	0	0	0	0	White Valve 5m depth
	Trigger Level Yellow	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	Trigger Level Yellow
	Trigger Level White	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	Trigger Level White
	Control Level Yellow	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	Control Level Yellow
GMW12	Yellow Valve	0	0	0	0	0	0	0	0	0	0	0	0	Yellow Valve 12 depth
	White Valve	0	0	0	0	0	0	0	0	0	0	0	0	White Valve 5m depth
	Trigger Level Yellow	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	Trigger Level Yellow
	Trigger Level White	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	Trigger Level White
	Control Level Yellow	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	Control Level Yellow
GMW13	Yellow Valve	0	0	0	0	0	0	0	0	0	0	0	0	Yellow Valve 12 depth
	White Valve	0	0	0	0	0	0	0	0	0	0	0	0	White Valve 5m depth
	Trigger Level Yellow	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	Trigger Level Yellow
	Trigger Level White	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	Trigger Level White
	Control Level Yellow	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	Control Level Yellow
GMW14	Yellow Valve	0	0	0	0	0	0	0	0	0	0	0	0	Yellow Valve 12 depth
	White Valve	0	0	0	0	0	0	0	0	0	0	0	0	White Valve 5m depth
	Trigger Level Yellow	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	Trigger Level Yellow
	Trigger Level White	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	Trigger Level White
	Control Level Yellow	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	Control Level Yellow
GMW15	Yellow Valve	0	0	0	0	0	0	0	0	0	0	0	0	Yellow Valve 12 depth
	White Valve	0	0	0	0	0	0	0	0	0	0	0	0	White Valve 5m depth
	Trigger Level Yellow	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	Trigger Level Yellow
	Trigger Level White	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	Trigger Level White
	Control Level Yellow	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	Control Level Yellow
GMW16	Yellow Valve	0	0	0	0	0	0	0	0	0	0	0	0	Yellow Valve 12 depth
	White Valve	0	0	0	0	0	0	0	0	0	0	0	0	White Valve 5m depth
	Trigger Level Yellow	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	Trigger Level Yellow
	Trigger Level White	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	Trigger Level White
	Control Level Yellow	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	Control Level Yellow
GMW17	Yellow Valve	0	0	0	0	0	0	0	0	0	0	0	0	Yellow Valve 12 depth
	White Valve	0	0	0	0	0	0	0	0	0	0	0	0	White Valve 5m depth
	Trigger Level Yellow	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	Trigger Level Yellow
	Trigger Level White	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	Trigger Level White
	Control Level Yellow	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	Control Level Yellow
GMW18	Yellow Valve	0	0	0	0	0	0	0	0	0	0	0	0	Yellow Valve 12 depth
	White Valve	0	0	0	0	0	0	0	0	0	0	0	0	White Valve 5m depth
	Trigger Level Yellow	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	Trigger Level Yellow
	Trigger Level White	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	Trigger Level White
	Control Level Yellow	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	Control Level Yellow

Notes:

1. Water damper/water in well - reading abandoned?
2. NT in GMW14 is due to cattle manure/gaslock around well location
3. NT in GMW14 is due to cattle manure/gaslock around well location
4. Where the asterisk (*) is present, no trigger levels have been set, as high levels of methane and carbon dioxide gas are recorded. This is likely to be associated with the presence of bog/marshland.
5. Where two asterisks (**) are present, no trigger levels have been set, as not required by the Permit (Reference [2]).

Site - reading not taken due to satellite proximity at location of the well

Exceedance of Trigger

Exceedance of Control

Table B6 BSC Pipe Monitoring

Date	BH1		BH2		BH3		BH4		Water column (m)			
	Water level depth (m)	Well depth to base (m)	Water level depth (m)	Well depth to base (m)	Water level depth (m)	Well depth to base (m)	Water level depth (m)	Well depth to base (m)	BH1	BH2	BH3	BH4
21/11/2019	18.24	20.05	6.11	8.72	4.51	6.77	9.89	10.12	1.81	2.61	2.26	0.23
05/12/2019	18.31	20.05	6.26	8.70	4.44	6.75	9.86	10.12	1.74	2.44	2.31	0.26
13/12/2019	18.28	20.04	6.26	8.70	4.57	6.76	9.91	10.11	1.76	2.44	2.19	0.20
17/12/2019	18.28	20.04	6.19	8.70	4.49	6.76	9.90	10.11	1.76	2.51	2.27	0.21
14/01/2020	18.32	20.04	6.21	8.70	4.45	6.76	9.79	10.12	1.72	2.49	2.31	0.33
23/01/2020	18.38	20.04	6.19	8.70	4.42	6.76	9.76	10.12	1.66	2.51	2.34	0.36
30/01/2020	18.33	20.04	6.27	8.72	4.57	6.77	9.86	10.12	1.71	2.45	2.20	0.26
07/02/2020	18.40	20.04	6.40	8.72	4.44	6.77	9.88	10.12	1.64	2.32	2.33	0.24
17/02/2020	18.37	20.04	6.14	8.72	4.48	6.77	9.95	10.12	1.67	2.58	2.29	0.17
24/03/2020	18.19	20.04	6.22	8.72	4.44	6.77	9.72	10.12	1.85	2.50	2.33	0.40
24/04/2020	18.20	20.03	7.08	8.71	4.73	6.77	9.93	10.12	1.83	1.63	2.04	0.19
30/04/2020	18.14	20.03	7.00	8.71	4.69	6.77	9.95	10.12	1.89	1.71	2.08	0.17
07/05/2020	18.16	20.03	7.02	8.71	4.60	6.77	9.94	10.12	1.87	1.69	2.17	0.18
14/05/2020	18.14	20.03	7.13	8.71	4.77	6.77	10.01	10.12	1.89	1.58	2.00	0.11
27/05/2020	18.08	20.03	7.15	8.71	4.80	6.77	10.00	10.12	1.95	1.56	1.97	0.12
04/06/2020	18.08	20.09	7.20	8.72	4.90	6.77	10.05	10.12	2.01	1.52	1.87	0.07
16/06/2020	18.07	20.04	7.24	8.73	4.94	6.77	10.02	10.13	1.97	1.49	1.83	0.11
26/06/2020	18.12	20.09	7.51	8.72	5.00	6.77	10.04	10.12	1.97	1.21	1.77	0.08
03/07/2020	18.09	20.09	7.10	8.71	4.92	6.77	10.02	10.12	2.00	1.61	1.85	0.10
09/07/2020	18.07	20.04	7.41	8.72	4.96	6.77	10.04	10.12	1.97	1.31	1.81	0.08
23/07/2020	18.05	20.04	7.40	8.72	4.98	6.77	10.02	10.12	1.99	1.32	1.79	0.10
31/07/2020	18.06	20.04	7.13	8.72	4.94	6.77	10.02	10.14	1.98	1.59	1.83	0.12
07/08/2020	18.07	20.04	7.19	8.72	4.94	6.77	10.02	10.12	1.97	1.53	1.83	0.10
14/08/2020	18.19	20.04	7.67	8.72	5.03	6.77	10.06	10.12	1.85	1.05	1.74	0.06
20/08/2020	18.17	20.09	7.83	8.71	5.06	6.77	10.05	10.13	1.92	0.88	1.71	0.08
04/09/2020	18.18	20.04	6.99	8.72	4.85	6.77	10.02	10.12	1.86	1.73	1.92	0.10
11/09/2020	18.21	20.09	6.97	8.71	4.76	6.77	10.03	10.12	1.88	1.74	2.01	0.09
24/09/2020	18.10	20.09	6.98	8.71	4.92	6.77	10.02	10.12	1.99	1.73	1.85	0.10

Table B6 BSC Pipe Monitoring

Date	BH1		BH2		BH3		BH4		Water column (m)			
	Water level depth (m)	Well depth to base (m)	Water level depth (m)	Well depth to base (m)	Water level depth (m)	Well depth to base (m)	Water level depth (m)	Well depth to base (m)	BH1	BH2	BH3	BH4
08/10/2020	18.28	20.05	7.05	8.72	4.88	6.77	10.06	10.13	1.77	1.67	1.89	0.07
20/10/2020	18.29	20.05	6.92	8.72	4.81	6.77	10.01	10.12	1.76	1.80	1.96	0.11
30/10/2020	18.30	20.04	6.90	8.72	4.75	6.77	9.96	10.12	1.74	1.82	2.02	0.16
05/11/2020	18.26	20.04	6.94	8.71	4.80	6.77	9.97	10.12	1.78	1.77	1.97	0.15
12/11/2020	18.30	20.04	6.92	8.72	4.82	6.77	9.98	10.13	1.74	1.80	1.95	0.15
18/11/2020	18.32	20.04	6.12	8.72	4.63	6.77	9.93	10.13	1.72	2.60	2.14	0.20
26/11/2020	18.37	20.04	6.22	8.72	4.58	6.77	9.99	10.12	1.67	2.50	2.19	0.13
10/12/2020	18.37	20.04	6.43	8.72	4.59	6.77	9.98	10.12	1.67	2.29	2.18	0.14
17/12/2020	18.30	20.04	6.21	8.72	4.50	6.77	9.98	10.12	1.74	2.51	2.27	0.14
24/12/2020	18.33	20.04	5.68	8.72	4.45	6.77	9.82	10.12	1.71	3.04	2.32	0.30
06/01/2021	18.35	20.06	5.97	8.72	4.45	6.77	9.90	10.12	1.71	2.75	2.32	0.22
18/01/2021	18.30	20.02	5.97	8.72	4.40	6.77	9.98	10.12	1.72	2.75	2.37	0.14
21/01/2021	18.42	20.03	6.37	8.70	4.56	6.76	9.93	10.12	1.61	2.33	2.20	0.19
28/01/2021	18.32	20.04	5.90	8.70	4.53	6.77	9.97	10.12	1.72	2.80	2.24	0.15
02/02/2021	18.30	20.04	6.00	8.70	4.47	6.77	9.97	10.12	1.74	2.70	2.30	0.15
18/02/2021	18.49	20.04	6.37	8.72	4.53	6.77	9.92	10.13	1.55	2.35	2.24	0.21
26/02/2021	18.35	20.02	6.00	8.70	4.48	6.77	9.77	10.11	1.67	2.70	2.29	0.34
03/03/2021	18.43	20.02	6.09	8.70	4.45	6.77	9.79	10.11	1.59	2.61	2.32	0.32
11/03/2021	18.50	20.02	6.55	8.71	4.49	6.77	9.89	10.12	1.52	2.16	2.28	0.23
22/03/2021	18.49	20.03	6.55	8.70	4.52	6.77	9.94	10.11	1.54	2.15	2.25	0.17
26/05/2021	18.40	20.04	6.98	8.72	4.82	6.77	10.02	10.13	1.64	1.74	1.95	0.11
08/06/2021	18.28	20.04	6.64	8.71	4.58	6.77	9.92	10.12	1.76	2.07	2.19	0.20
23/06/2021	19.32	20.04	7.02	8.71	4.80	6.77	10.07	10.12	0.72	1.69	1.97	0.05
11/08/2021	18.87	20.02	7.92	8.68	4.79	6.75	10.09	10.11	1.15	0.76	1.96	0.02
18/08/2021	18.51	20.02	7.10	8.72	4.65	6.75	10.09	10.12	1.51	1.62	2.10	0.03
19/11/2021	18.37	20.03	6.70	8.69	4.67	6.76	10.09	10.11	1.66	1.99	2.09	0.02
25/11/2021	18.48	20.03	7.01	8.72	4.98	6.74	10.11	10.12	1.55	1.71	1.76	0.01
01/12/2021	18.49	20.02	6.79	8.67	4.65	6.74	10.08	10.12	1.53	1.88	2.09	0.04

Table B6 BSC Pipe Monitoring

Date	BH1		BH2		BH3		BH4		Water column (m)			
	Water level depth (m)	Well depth to base (m)	Water level depth (m)	Well depth to base (m)	Water level depth (m)	Well depth to base (m)	Water level depth (m)	Well depth to base (m)	BH1	BH2	BH3	BH4
17/12/2021	18.50	20.02	6.64	8.68	4.70	6.74	10.11	10.12	1.52	2.04	2.04	0.01
30/12/2021	18.39	20.03	6.85	8.71	4.71	6.73	10.09	10.13	1.64	1.86	2.02	0.04
07/01/2022	18.35	20.03	6.65	8.71	4.59	6.73	10.09	10.12	1.68	2.06	2.14	0.03
14/01/2022	18.38	20.03	7.10	8.71	4.21	6.73	10.10	10.12	1.65	1.61	2.52	0.02
24/01/2022	18.41	20.02	7.95	8.71	4.01	6.73	10.10	10.12	1.61	0.76	2.72	0.02
04/02/2022	18.81	20.02	7.83	8.72	4.50	6.74	10.10	10.12	1.21	0.89	2.24	0.02
11/02/2022	18.82	20.03	7.75	8.72	4.51	6.74	10.10	10.12	1.21	0.97	2.23	0.02
18/02/2022	18.73	20.03	7.90	8.72	4.40	6.74	10.10	10.12	1.30	0.82	2.34	0.02
25/02/2022	18.75	20.02	8.10	8.72	4.35	6.74	10.1	10.12	1.27	0.62	2.39	0.02
04/03/2022	18.65	20.03	8.06	8.72	4.20	6.74	10.11	10.13	1.38	0.66	2.54	0.02
11/03/2022	18.75	20.03	7.84	8.72	4.35	6.74	10.09	10.13	1.28	0.88	2.39	0.04
14/03/2022	18.73	20.02	7.68	8.73	4.45	6.74	10.09	10.11	1.29	1.05	2.29	0.02
24/03/2022	18.81	20.03	7.41	8.71	4.61	6.76	10.11	10.12	1.22	1.30	2.15	0.01
01/04/2022	18.71	20.03	7.38	8.71	4.60	6.75	10.11	10.12	1.32	1.33	2.15	0.01
08/04/2022	18.48	20.03	7.10	8.7	4.54	6.74	10.1	10.12	1.55	1.60	2.20	0.02
18/04/2022	18.44	20.02	7.45	8.71	4.48	6.74	10.09	10.12	1.58	1.26	2.26	0.03
27/04/2022	18.55	20.02	7.58	8.72	4.10	6.74	10.09	10.11	1.47	1.14	2.64	0.02
06/05/2022	18.60	20.02	7.90	8.72	4.11	6.75	10.07	10.11	1.42	0.82	2.64	0.04
13/05/2022	18.65	20.03	7.99	8.72	4.20	6.75	10.05	10.12	1.38	0.73	2.55	0.07
20/05/2022	18.66	20.03	7.81	8.72	4.21	6.74	10.07	10.12	1.37	0.91	2.53	0.05
26/05/2022	18.55	20.03	7.71	8.72	4.12	6.74	10.09	10.12	1.48	1.01	2.62	0.03
31/05/2022	18.53	20.03	8.34	8.72	4.06	6.74	10.11	10.13	1.50	0.38	2.68	0.02
03/06/2022	18.65	20.02	8.19	8.72	4.20	6.74	10.11	10.12	1.37	0.53	2.54	0.01
10/06/2022	18.88	20.03	7.99	8.71	4.40	6.76	10.11	10.13	1.15	0.72	2.36	0.02
20/06/2022	18.88	20.03	7.95	8.71	4.45	6.75	10.09	10.12	1.15	0.76	2.30	0.03
27/06/2022	18.87	20.02	7.90	8.70	4.55	6.74	10.09	10.12	1.15	0.80	2.19	0.03
07/07/2022	18.91	20.03	7.91	8.70	4.57	6.74	10.01	10.12	1.12	0.79	2.17	0.11
13/07/2022	18.90	20.03	7.57	8.72	4.62	6.74	10.11	10.13	1.13	1.15	2.12	0.02

Table B6 BSC Pipe Monitoring

Date	BH1		BH2		BH3		BH4		Water column (m)			
	Water level depth (m)	Well depth to base (m)	Water level depth (m)	Well depth to base (m)	Water level depth (m)	Well depth to base (m)	Water level depth (m)	Well depth to base (m)	BH1	BH2	BH3	BH4
20/07/2022	18.91	20.03	7.60	8.72	4.51	6.74	10.10	10.13	1.12	1.12	2.23	0.03
29/07/2022	18.80	20.03	7.80	8.72	4.07	6.74	10.08	10.13	1.23	0.92	2.67	0.05
05/08/2022	18.92	20.03	8.10	8.72	4.75	6.74	10.09	10.13	1.11	0.62	1.99	0.04
11/08/2022	18.95	20.02	8.39	8.71	5.20	6.74	10.11	10.13	1.07	0.32	1.54	0.02
19/08/2022	18.92	20.02	8.42	8.71	5.20	6.74	10.10	10.13	1.10	0.29	1.54	0.03
26/08/2022	18.91	20.02	8.46	8.72	5.21	6.74	10.09	10.12	1.11	0.26	1.53	0.03
02/09/2022	18.93	20.02	8.49	8.72	5.21	6.74	10.09	10.13	1.09	0.23	1.53	0.04
09/09/2022	18.97	20.03	8.69	8.71	5.52	6.74	10.09	10.18	1.06	0.02	1.22	0.09
16/09/2022	18.90	20.03	8.71	8.71	5.53	6.74	10.11	10.14	1.13	0.00	1.21	0.03
22/09/2022	18.91	20.02	8.71	8.71	5.53	6.74	10.10	10.12	1.11	0.00	1.21	0.02
07/10/2022	18.90	20.02	8.71	8.71	5.58	6.74	10.10	10.12	1.12	0.00	1.16	0.02
14/10/2022	18.92	20.03	8.68	8.68	5.56	6.76	10.11	10.13	1.11	0.00	1.20	0.02
27/10/2022	18.92	20.02	8.68	8.68	5.61	6.76	9.98	10.13	1.10	0.00	1.15	0.15
03/11/2022	18.82	20.02	8.24	8.68	4.97	6.76	9.97	10.12	1.20	0.44	1.79	0.15
11/11/2022	18.80	20.01	8.40	8.65	4.97	6.76	9.98	10.12	1.21	0.25	1.79	0.14
24/11/2022	18.95	20.01	8.36	8.67	5.10	6.76	9.97	10.13	1.06	0.31	1.66	0.16
30/11/2022	18.64	20.01	8.69	8.70	4.56	6.76	10.01	10.13	1.37	0.01	2.20	0.12
08/12/2022	18.60	20.01	8.61	8.68	4.97	6.77	9.99	10.12	1.41	0.07	1.80	0.13
16/12/2022	18.82	20.03	7.80	8.67	4.67	6.75	9.98	10.12	1.21	0.87	2.08	0.14
23/12/2022	18.82	20.02	7.87	8.67	4.63	6.77	9.97	10.12	1.20	0.80	2.14	0.15
30/12/2022	18.65	20.02	7.81	8.62	4.51	6.76	9.90	10.13	1.37	0.81	2.25	0.23
06/01/2023	18.70	20.02	7.81	8.68	4.51	6.76	9.91	10.12	1.32	0.87	2.25	0.21
12/01/2023	18.60	20.02	7.50	8.68	4.55	6.76	9.90	10.12	1.42	1.18	2.21	0.22
20/01/2023	18.50	20.03	7.10	8.68	4.20	6.76	9.89	10.13	1.53	1.58	2.56	0.24
27/01/2023	18.55	20.03	7.10	8.68	4.46	6.76	9.98	10.12	1.48	1.58	2.30	0.14
01/02/2023	18.80	20.03	7.19	8.68	4.70	6.76	9.80	10.12	1.23	1.49	2.06	0.32
17/02/2023	18.87	20.02	7.91	8.68	4.80	6.76	9.88	10.12	1.15	0.77	1.96	0.24
21/02/2023	18.81	20.03	7.90	8.66	4.80	6.77	9.99	10.12	1.22	0.76	1.97	0.13

Table B6 BSC Pipe Monitoring

Date	BH1		BH2		BH3		BH4		Water column (m)			
	Water level depth (m)	Well depth to base (m)	Water level depth (m)	Well depth to base (m)	Water level depth (m)	Well depth to base (m)	Water level depth (m)	Well depth to base (m)	BH1	BH2	BH3	BH4
03/03/2023	18.91	20.02	8.30	8.68	5.08	6.76	9.95	10.11	1.11	0.38	1.68	0.16
09/03/2023	18.75	20.03	7.90	8.67	4.88	6.77	9.94	10.11	1.28	0.77	1.89	0.17
16/03/2023	18.80	20.03	7.90	8.67	4.85	6.77	9.91	10.12	1.23	0.77	1.92	0.21
23/03/2023	18.60	20.03	7.90	8.68	4.80	6.74	9.90	10.13	1.43	0.78	1.94	0.23
30/03/2023	18.62	20.02	7.80	8.68	4.64	6.74	9.89	10.12	1.40	0.88	2.10	0.23
07/04/2023	18.45	20.03	6.83	8.67	4.52	6.74	9.92	10.13	1.58	1.84	2.22	0.21
14/04/2023	18.59	20.02	6.92	8.67	4.55	6.74	9.92	10.12	1.43	1.75	2.19	0.20
21/04/2023	18.61	20.02	7.15	8.62	4.52	6.74	9.96	10.12	1.41	1.47	2.22	0.16
12/05/2023	18.56	20.08	7.96	8.66	4.70	6.74	9.99	10.12	1.52	0.70	2.04	0.13
19/05/2023	18.51	19.98	7.80	8.69	4.71	6.74	9.99	10.95	1.47	0.89	2.03	0.96
26/05/2023	18.53	20.02	7.85	8.68	4.83	6.74	9.90	10.13	1.49	0.83	1.91	0.23
02/06/2023	18.48	20.03	7.91	8.68	4.86	6.76	9.93	10.13	1.55	0.77	1.90	0.20
09/06/2023	18.59	20.02	7.98	8.77	4.84	6.74	9.95	10.12	1.43	0.79	1.90	0.17
16/06/2023	18.62	20.02	7.98	8.77	4.84	6.74	9.95	10.12	1.40	0.79	1.90	0.17
21/06/2023	18.60	20.03	7.86	8.68	4.89	6.74	9.90	10.12	1.43	0.82	1.85	0.22
30/06/2023	18.65	20.02	7.85	8.69	4.85	6.74	9.94	10.13	1.37	0.84	1.89	0.19
Averages	18.53		7.36		4.68		10.00		1.50	1.35	2.07	0.13
Max	19.32		8.71		5.61		10.11		2.01	3.04	2.72	0.96
Min	18.05		5.68		4.01		9.72		0.72	0.00	1.15	0.01

