



Hendy Quarry Landfill

Annual Report

Permit Reference BT1088ID

01 January to 31 December 2023

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1.0 Introduction

1.1 Background

This report has been compiled in compliance with condition 4.2.1 of the Environmental Permit EPR/BT1088ID for Hendy Quarry Landfill.

The Permit was originally issued to Tarmac on 17 September 2002. The EP was varied by Tarmac in December 2005 in order to remove a daily limit for the importation of waste. A further variation reference XP3933MR was issued on 22 June 2007 by the Regulator to introduce the standard Permit template and conditions for landfills, combine the separate discharge consent into the single permit, introduce trigger levels for groundwater and increase the monitoring frequency.

As a result of changes to the conditions of the new EP, Tarmac submitted an application to vary the Permit further to revise the groundwater trigger levels, and also to increase the annual permitted tonnage from 200,000t to 450,000t. Before the trigger levels could be amended, Tarmac installed a further 8 perimeter monitoring boreholes at the request of the Regulator. The monitoring frequency of groundwater at the site was increased to obtain enough data for a detailed review of the hydrogeology to be undertaken. The independent hydrogeological assessment identified contaminants in the groundwater which were arising from an up-stream source. As a result of this contamination in the locality, the site could not comply with groundwater trigger levels, even in up-stream boreholes. This was accepted by the Regulator following extensive investigation and sampling and a varied EP establishing revised site trigger levels was issued on 09 October 2009, reference PP3738XM. The varied Permit contained a number of Improvement Conditions which have been discharged.

A further variation was accepted in May 2019, to increase the surface water discharge limits, and change the waste types to be accepted.

Section 4.2.1 of the Permit, requires that a report on the performance of the activities over the previous year shall be submitted to the Regulator by 31 January.

The report shall include as a minimum:

- a) A review of the monitoring and assessment carried out in accordance with the Permit against the relevant assumptions, parameters and results in the risk assessments submitted with the Application;
- b) Where the operator's management system encompasses annual improvement targets, a summary report of the previous year's progress against such targets;
- c) The energy consumed at the Site, reported in the format set out in Schedule 5 Table S5.3;
- d) The water consumed at the Site, reported in the format set out in Schedule 5 Table S5.3;
- e) The annual production/treatment set out in Schedule 5 Table S5.2;
- f) Details of any contamination or decontamination of the site which has occurred;
- g) The topographical surveys required by condition 3.6.3 other than those submitted as part of a CQA validation report;
- h) The volumetric difference (reported in cubic metres) between the most recent topographical survey and the previous annual topographical survey i.e. the additional volume of the landfill void that is occupied by waste;
- i) An assessment of the settlement behaviour of the landfill body based on the difference between the most recent topographical survey and previous annual

topographical survey for the areas of the landfill which did not receive waste between the surveys;

- j) A calculation of the remaining capacity (reported in cubic metres) derived from the pre-settlement contours and the most recent topographical survey;
- k) The compliance testing undertaken in the period.

The review period consists of 12 months of monitoring, from 1 January to 31 December 2023.

1.2 Site Location and Surrounding Land-use

Hendy Quarry Landfill is located at Grid Reference ST 05423 81045.

The site is located to the east of Miskin in Rhondda Cynon Taf, Wales. To the east of the site is the A4119 road. To the south of the site is Glyn Park, which comprises of the Miskin Wood and Mill Wood. The B4264 (School Road) is situated to the north of the site.

2.0 Landfill Gas

2.1 Introduction

The Permit requires monitoring for landfill gas at “All Landfill Gas Monitoring points”, the specific monitoring requirements are outlined in the approved Gas Management Plan¹ GMP (as required in CAR_NRW0038704).

Following the submission of the 2008 Gas Management Plan it was proposed to progressively install 18 in-waste gas monitoring points at a frequency of 2 per hectare. In 2008 eleven monitoring points were drilled within the existing waste mass at the site. As the monitoring points were installed within areas of the site that were still operational over time a number of these boreholes have been lost due to vehicle movements and waste placement activities and only five now remain (BH02, 05, 07, 08 and 09). Following discussions with the Regulator, Tarmac proposed to install replacement in-waste gas monitoring points and future in-waste gas monitoring points once area of the site were restored. In addition, it was agreed to undertake FID walkover surveys and update the GMP to reflect the changes; this was completed in 2019.

The approved GMP sets out the monitoring requirements as follows:

Table 1: LFG monitoring schedule

Location	Frequency	Determinands
External Boreholes		
B, H, PZ01/08, PZ02/08, PZ03/08, PZ05/08, PZ06/08, PZ07/08 and PZ08/08	Quarterly	Methane (%v/v), carbon dioxide (%v/v), oxygen (%v/v), Atmospheric pressure (Mb), Other meteorological data.
Internal Boreholes		
BH2, 5, 7, 8 and 9.	Quarterly	Methane (%v/v), carbon dioxide (%v/v), oxygen (%v/v), Atmospheric pressure (Mb), relative pressure, Other meteorological data.
In-waste boreholes installed following completion to restoration levels.		
Walk over gas survey (FID or Leak Dectector)	Six Monthly	Flammable gas (ppm)

¹ Plan Reference: HNDY/GMP April 2019 Version 2.0

Gas monitoring borehole locations are shown on the Monitoring Plan in Appendix A. Landfill gas data is presented in Appendix B.

BHB has been lost, BH07 is unsafe to access for the whole period, and BH02 was destroyed prior to the October monitoring round.

Compliance limits are set for perimeter wells as per Table S4.3 of the Permit; these are reproduced in Table 2.

Table 2: EP Limits for Landfill Gas in external wells

LFG parameter	EP Limit
Methane (CH ₄)	1.0 % v/v
Carbon dioxide (CO ₂)	1.5 % v/v

2.2 Landfill Gas Data

The following general points can be made with regard to the gas data from the gas wells over the review period:

In Waste Boreholes

Zero to negligible (0.1%) methane concentrations were detected in the in-waste monitoring boreholes during the review period.

Carbon dioxide concentrations ranged from 0% to a maximum of 0.9% v/v in the in-waste boreholes.

Perimeter Boreholes

Zero to negligible (0.1%) was recorded in any of the perimeter monitoring locations during the review period. As such the compliance limit was not exceeded.

Carbon dioxide concentrations ranged from 0.1% to a maximum of 1.8%. The 1.5% compliance limit was breached on two occasions during the period.

FID Walkover survey

FID walkovers were conducted and submitted in quarters 2 and 4 and found flammable gas concentrations at 0ppm at all locations.

2.3 Groundwater

Four boreholes are specified in Table S4.4 of the Permit as requiring sampling on a quarterly basis these are PZ2/08 and PZ3/08 which are considered to be up hydraulic gradient locations and PZ07/08 and PZ08/08 which are considered down gradient (see graph below) and as such have quality compliance limits as presented in Table S4.2 of the Permit. These limits have been reviewed in the 2018 HRA review² and the compliance limit for Nickel reduced; limits are presented in Table 3, and groundwater quality during the study period is reviewed on this basis. During May 2021, 2 new boreholes were drilled to replace down gradient locations PZ07/08 & PZ08/08, these have been labelled PZ07/08R & PZ08/08R.

² 3145-CAU-XX-XX-RP-O-0301: HENDY LANDFILL SITE HYDROGEOLOGICAL RISK ASSESSMENT REVIEW 2017. CAULMERT LTD 12 JANUARY 2018.

Table 3: Groundwater Compliance Limits (PZ07/08 & PZ08/08)

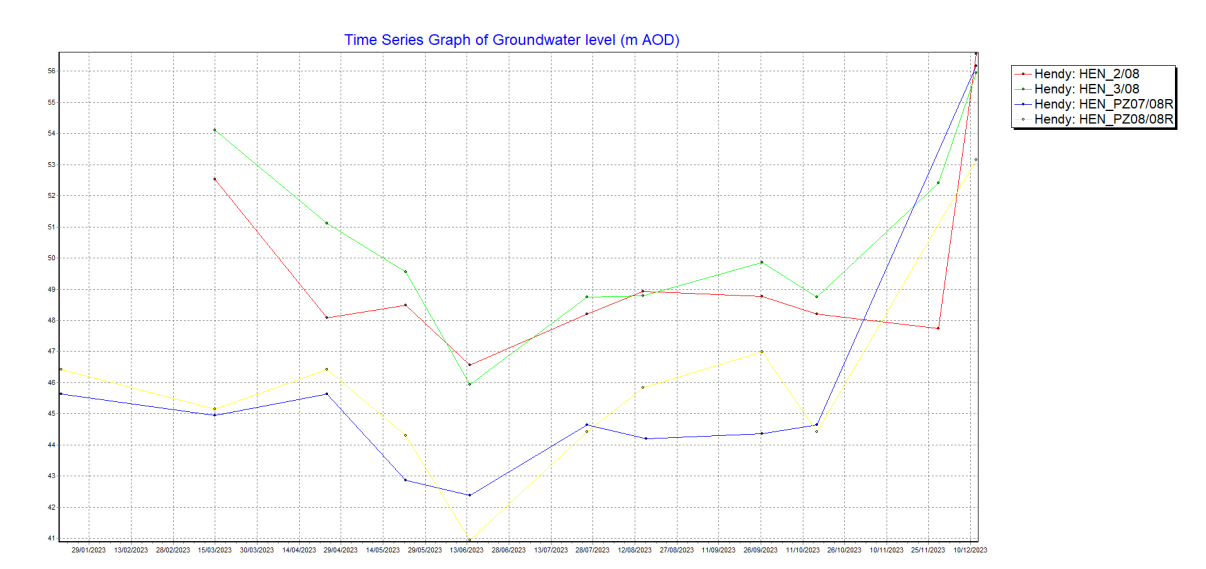
Parameter	Permit Limits	HRA Review Limits
Chloride (mg/l)	150	150
Ammoniacal Nitrogen (mg/l)	0.5	0.5
Cadmium (mg/l)	0.001	0.001
Nickel (mg/l)	0.2	0.034
Sulphate (mg/l)	200	200
Napthalene (mg/l)	0.01	0.01

The locations of the boreholes are shown on the Monitoring Plan in Appendix A.

Tables of groundwater quality and time series graphs are presented in Appendix C

2.4 Groundwater Level

Groundwater levels recorded seasonal lows towards the summer months and highs in winter months, the graph below validates the groundwater flow direction and the choice of compliance boreholes. The December round does not however follow the usual pattern; it was extremely wet during this period, but technician error can not be ruled out.



2.5 Groundwater Quality

Groundwater quality data was collected on a monthly frequency (in excess of the permit minimum) in order to gather a suitable dataset for the re-drilled wells.

The data shows the following:

- Ammoniacal nitrogen concentrations ranged from below the laboratory LOD to a maximum of 0.08mg/l in PZ08/08R, and so were below the compliance limit throughout the study period.
- Chloride concentrations were low ranging from 7mg/l at PZ03/08 to a maximum of 67mg/l also at PZ03/08 and so were below the compliance limit throughout the study period.
- Sulphate concentrations ranged from 3mg/l to 72mg/l with the maximum at PZ08/08R in September 2023. The compliance limit was not breached in the study period.

- Cadmium concentrations ranged from <0.00002mg/l to 0.00062mg/l at upgradient location PZ03/08. The compliance limit was not breached in the study period.
- Nickel concentrations ranged from below detection limits to a maximum of 0.003mg/l, and so below the compliance limit.
- Naphthalene concentrations recorded ≤ 0.01 ug/l at both downgradient locations on all occasions with the exception of PZ07/08R and PZ08/08R during December 2023, when a concentration of 0.01mg/l was detected, however, these fall well below the 10ug/l trigger.
- Concentrations of total petroleum hydrocarbons (TPH in the range C8 to C40) were recorded, ranging between <0.01 and 0.06mg/l; the maximum concentration was detected at PZ08/08R in June 2023.

3.0 Surface Water

The permit requires the collection of samples quarterly from the discharge to determine the quality of point source emissions to soak-away from the site.

The discharge has limits for pH, suspended solids, and mineral oil. In addition, there are limits on discharge volumes and rates. Surface water limits are set out in Table 4 below and presented in Appendix D.

Table 4: Point Source emissions to water; emission limits and monitoring requirements

Monitoring point	Parameter	Limit	Monitoring frequency
Discharge to soakaway at NGR ST 0538 8136	Volume	5,000 m ³ /day	Daily
	Rate of discharge	58 l/s	Weekly
	Suspended solids	100mg/l	Quarterly
	Mineral Oil	5 mg/l	Quarterly
	pH	6-9	Quarterly

There was no discharge during the Q1 monitoring visit, however, a sample was obtained from the source of the discharge water at the quarry base. The following can be noted:

- Suspended solids recorded low ranging from below laboratory LOD at the discharge point to <10mg/l in the quarry base
- pH recorded within the consented limits on all occasions.
- TPH recorded a maximum of 0.03mg/l against a trigger of 5mg/l.

These parameters were therefore within consented limits.

The site flow meter is not able to monitor discharge rate. The site is currently unmanned, and as such obtaining daily meter readings is not possible. Monthly readings are taken, however, during 2023 readings were only taken from September to December. Averages are presented in Table 6 below.

Table 5: Discharge volumes (m³)

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Meter Reading	-	-	-	-	-	-	-	-	141139	142131	145145	153427
Monthly Volume	-	-	-	-	-	-	-	-		992	3,023	8,282
Daily Average	-	-	-	-	-	-	-	-		32	100.7	267.16

With the records available the maximum monthly volume was in December, assuming that the pump was running full time in this month, the daily average was 267.16m³, meaning that the compliance limit of 5,000m³/day was not exceeded.

4.0 Annual Performance Data

Annual production/treatment at Hendy Quarry Landfill during the period 01 January to December 2023 is reported in accordance with the Permit for the site. Information required by Table S5.2 and 5.3 of the Permit is presented as Table 7 below.

Table 6: Annual Production/Treatment and performance parameters

Surface water and/or groundwater	Cubic metres/year
Disposed of offsite:	Unable to calculate
Disposed of to any onsite effluent treatment plant:	0
Parameter	Annual total
Total Energy Consumption:	No data available

5.0 Management improvements

The following management improvements are required in 2024:

1. Install a suitable meter to allow the monitoring and recording discharge flow rate and monitor on a weekly basis.
2. Report daily discharge readings.
3. Maintain access to all permit monitoring points.

6.0 Annual Topographical Surveys and Waste Volumes.

6.1 Annual Topographical Survey

The annual topographical survey was completed on 04 January 2024 and is presented in Appendix A, drawing reference H074 HENDY 2024-01-04 QU SETTLEMENT_A3L.

6.2 Annual Waste Volume

No waste was accepted in between surveys.

6.3 Settlement Behaviour

Drawing H074 HENDY 2024-01-04 QU SETTLEMENT_A3L shows settlement between January 2023 and January 2024, it appears that settlement is negligible.

6.4 Remaining Void Capacity

The calculated remaining void from the survey undertaken in January 2024 is 1,300,054m³.

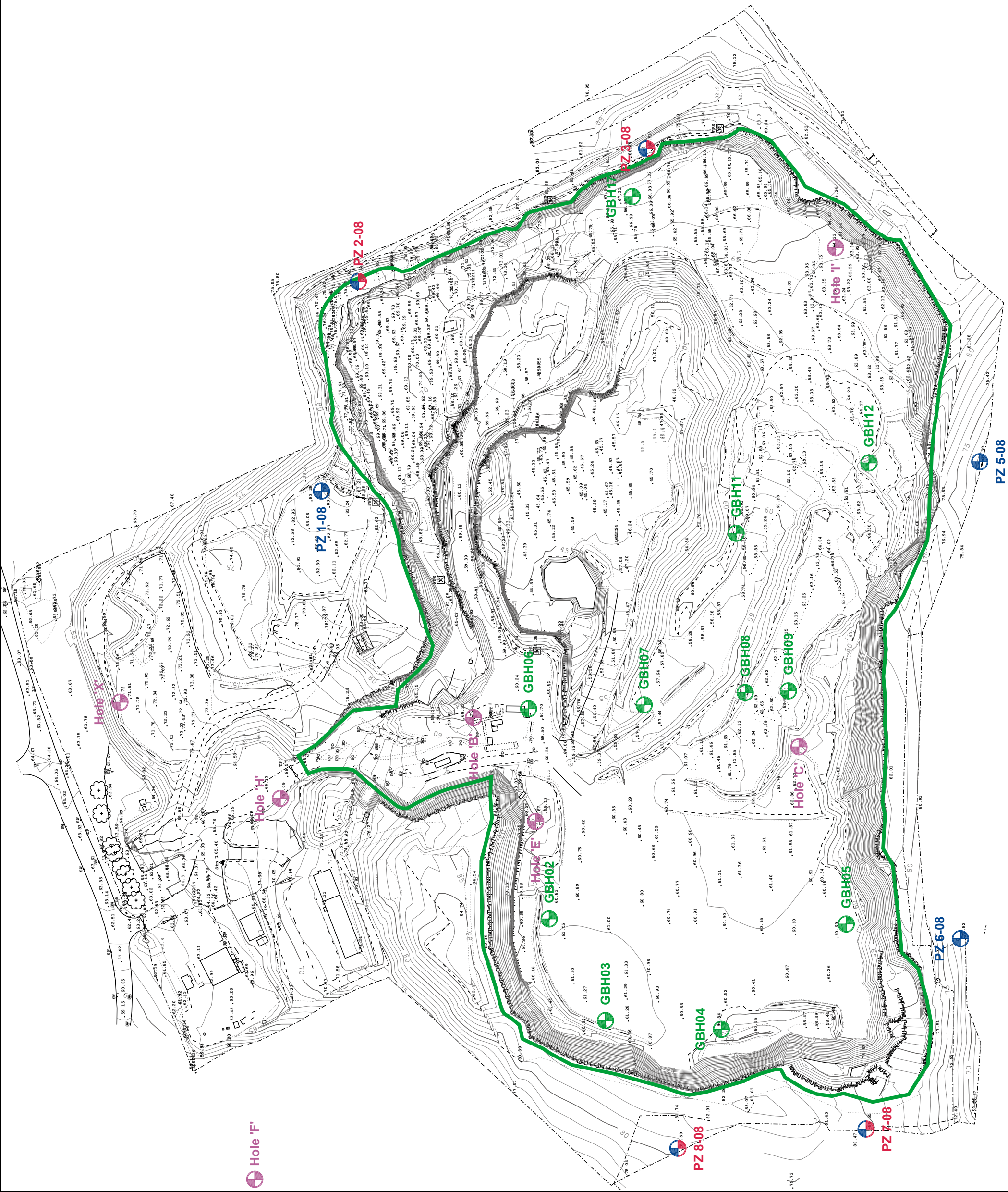
7.0 Compliance Testing

Compliance testing has not been undertaken in the reporting period as no waste was accepted.

Appendix A

Monitoring Plan (CE/HNDY/08)

H074 HENDY 2024-01-04 QU SETTLEMENT_A3L



Appendix B

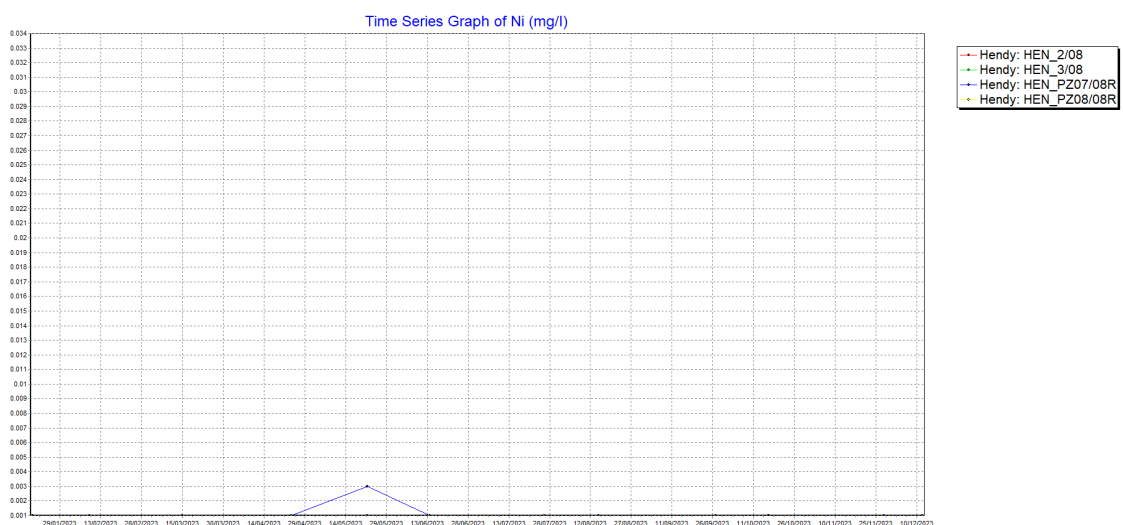
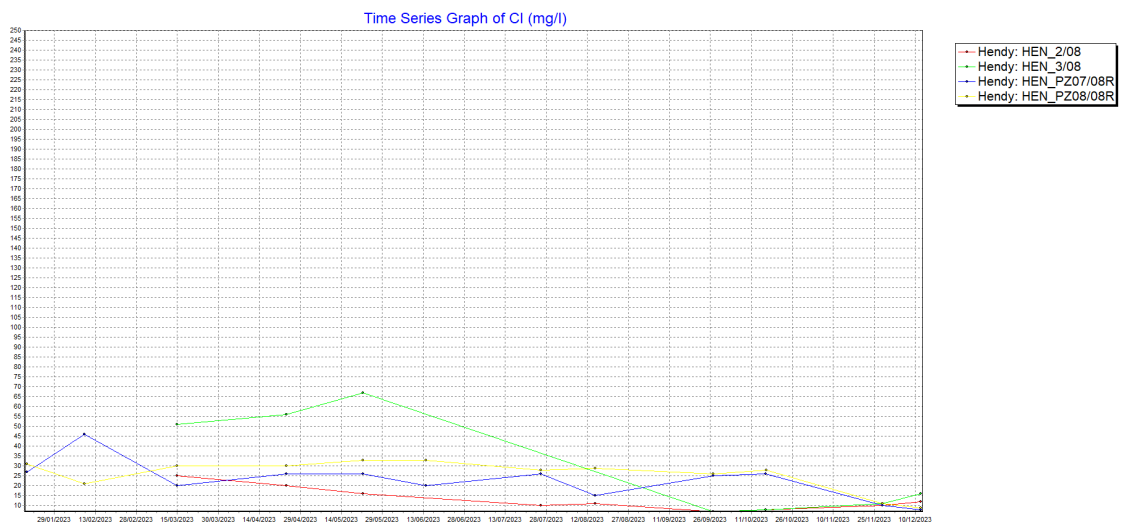
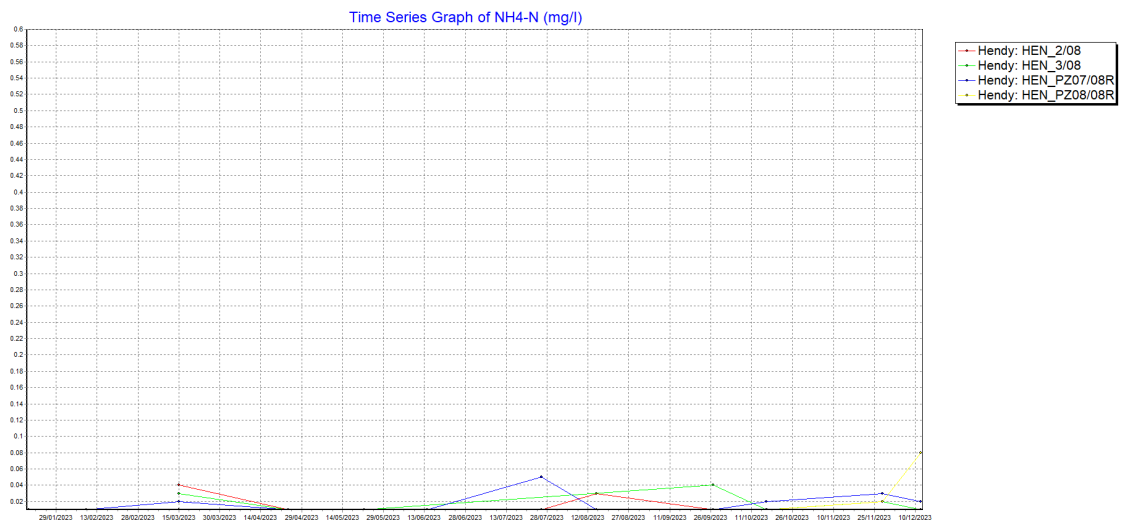
Landfill Gas Data

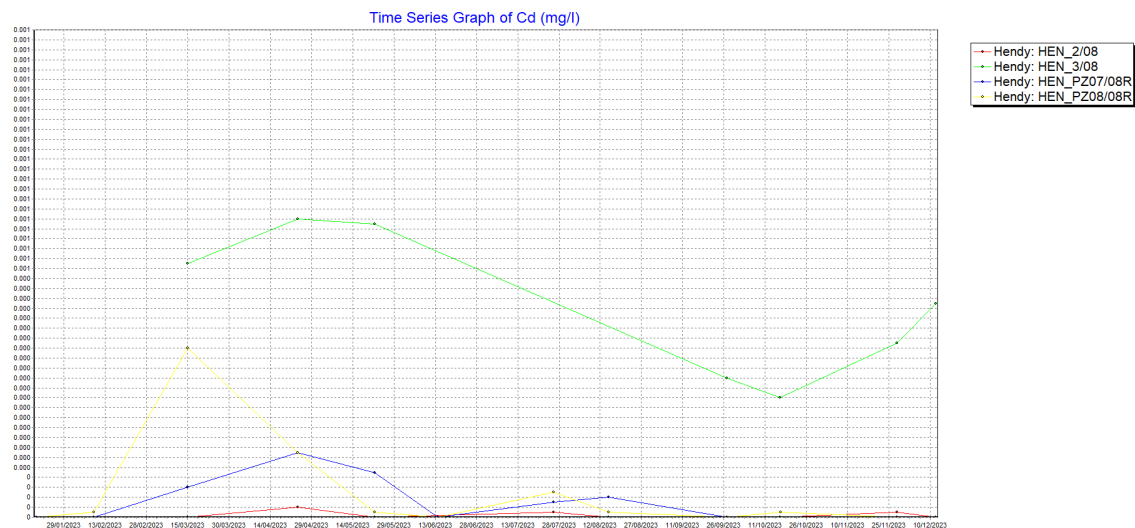
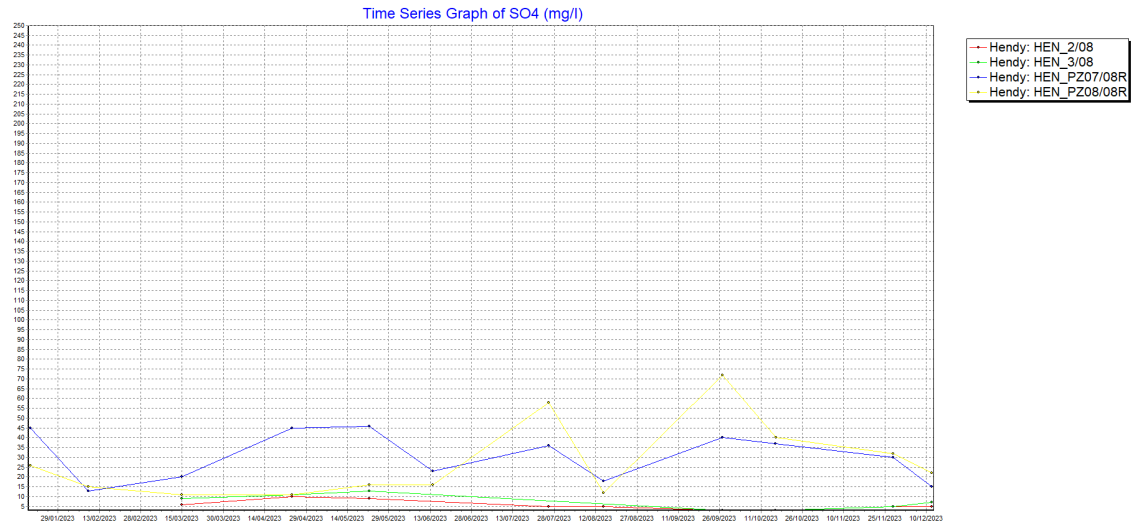
Sample Point	Date	Methane (%Vol)	Carbon Dioxide (%Vol)	Oxygen (%Vol)	Atmospheric pressure (mb)	Relative Pressure (mb)	Flow (lts/hr)	Data Comments
HEN_BH0Y	19/07/2023							Cannot be located
HEN_BH0Y	17/10/2023							Cannot be located
HEN_BH10	19/01/2023							Borehole lost
HEN_BH10	25/04/2023							Borehole lost
HEN_BH10	19/07/2023							Borehole lost.
HEN_BH10	17/10/2023							Borehole lost.
HEN_BH11	19/01/2023							Borehole lost
HEN_BH11	25/04/2023							Borehole lost
HEN_BH11	19/07/2023							Borehole lost.
HEN_BH11	17/10/2023							Borehole lost.
HEN_BH12	19/01/2023							Borehole lost
HEN_BH12	25/04/2023							Borehole lost
HEN_BH12	19/07/2023							Borehole lost.
HEN_BH12	17/10/2023							Borehole lost.
HEN_PZ01/08	19/01/2023							Inaccessible
HEN_PZ01/08	25/04/2023	0	0.9	19.9	1011	0.35	0.3	
HEN_PZ01/08	19/07/2023	0	0	19.2	1011	0.22	0.2	
HEN_PZ01/08	17/10/2023	0.2	0.1	21.6	1008	0.12	0.1	
HEN_PZ02/08	19/01/2023							Inaccessible
HEN_PZ02/08	25/04/2023	0	0.1	20.8	1012	0.44	0.1	
HEN_PZ02/08	19/07/2023	0	0	20.8	1010	0.09	0.2	
HEN_PZ02/08	17/10/2023	0.2	0.1	21.3	1007	0.23	0.1	
HEN_PZ03/08	19/01/2023							Inaccessible
HEN_PZ03/08	25/04/2023	0	0.1	20.7	1012	0.41	0	
HEN_PZ03/08	19/07/2023	0	0	20.9	1010	0.09	0.2	
HEN_PZ03/08	17/10/2023	0.2	0.2	21.3	1007	0.18	0.1	
HEN_PZ05/08	19/01/2023	0	0	20.8	1002	-0.78		
HEN_PZ05/08	25/04/2023	0	0.6	18.3	1013	-1.33	0.3	
HEN_PZ05/08	19/07/2023	0	0	20.6	1010	0.17	0.1	
HEN_PZ05/08	17/10/2023	0.3	0.1	22.4	1007	0.16	0.1	
HEN_PZ06/08	19/01/2023	0	0.6	20	1002	-0.44		
HEN_PZ06/08	25/04/2023	0	1	19.4	1013	1.27	0.3	
HEN_PZ06/08	19/07/2023	0	1.2	19.7	1011	-1.13	0.2	
HEN_PZ06/08	17/10/2023	0.2	1.8	20.9	1008	0.09	0.1	
HEN_PZ07/08R	19/01/2023	0	0.5	20.4	1001	-0.8		
HEN_PZ07/08R	25/04/2023	0	1.7	18.5	1012	0.37	0.3	
HEN_PZ07/08R	19/07/2023	0	0	20.6	1010	0.1	0.2	
HEN_PZ07/08R	17/10/2023	0.2	0.1	22.2	1008	0.16	0.1	
HEN_PZ08/08R	19/01/2023	0	0.1	20.8	1001	-0.87		
HEN_PZ08/08R	25/04/2023	0	0	21.1	1012	0.35	0.3	
HEN_PZ08/08R	19/07/2023	0	0	20.5	1010	3.66	0.2	
HEN_PZ08/08R	17/10/2023	0.2	0.1	22.2	1007	0.14	0	
	Min	0	0	6.2	1001	-17.76	-6.4	
	Max	0.3	1.8	22.4	1015	21.3	6	
	Trigger	1	1.5					

Appendix C

Groundwater Data

Sample Point	Date	Data Comments (Unit not Set)	Ammoniacal Nitrogen (mg/l)	Alkalinity (mg/l)	Calcium (mg/l)	Cadmium (mg/l)	Chloride (mg/l)	Chromium (mg/l)	Copper (mg/l)	DO (mg O2/l)	Iron (mg/l)	Potassium (mg/l)	Magnesium (mg/l)	Manganese (mg/l)	Sodium (mg/l)	Nickel (mg/l)	Lead (mg/l)	Sulphate (mg/l)	TOC (mg/l)	TON (mg/l)	Zinc (mg/l)	EC(us/cm)	pH (liquid)	Naphthalene (UG/L)	Total PAH's (UG/L)	Total TPH (mg/l)
HEN_PZ02/08	19/01/2023	Inaccessible																								
HEN_PZ02/08	09/02/2023	Inaccessible																								
HEN_PZ02/08	15/03/2023		0.04	175	72	<0.00002	25	0.001	<0.001	12.1	<0.01	<1	8	0.006	13	<0.001	<0.001	6	0.46	<0.2	0.004	412	7.7	<0.01	0.17	<0.01
HEN_PZ02/08	24/04/2023		<0.01	155	61	0.00004	20	0.002	<0.001	11.7	<0.01	<1	9	<0.002	11	<0.001	<0.001	10	0.44	<0.2	0.002	378	7.8	<0.01	<0.16	0.01
HEN_PZ02/08	22/05/2023		<0.01	160	67	<0.00002	16	<0.001	<0.001	11.5	<0.01	<1	10	<0.002	10	<0.001	<0.001	9	0.74	0.4	0.003	372	8.6	<0.01	0.17	0.01
HEN_PZ02/08	14/06/2023	Waterra snapped and dropped down borehole																								
HEN_PZ02/08	26/07/2023		0.01	155	63	0.00003	10	<0.001	0.003	11.7	<0.01	<1	7	<0.002	6	<0.001	<0.001	5	0.65	<0.2	0.006	345	7.3	<0.01	<0.16	<0.01
HEN_PZ02/08	15/08/2023		0.03	157	61	<0.00002	11	<0.001	0.001	10.5	<0.01	<1	7	<0.002	6	<0.001	<0.001	5	2.88	<0.2	0.002	348	7.6	<0.01	<0.16	0.03
HEN_PZ02/08	27/09/2023		0.01	187	74	<0.00002	7	<0.001	<0.001	12.1	<0.01	<1	7	<0.002	5	<0.001	<0.001	3	0.59	<0.2	0.004	385	7.7	<0.01	<0.16	0.01
HEN_PZ02/08	16/10/2023		<0.01	191	70	<0.00002	8	<0.001	<0.001	10.4	<0.01	<1	7	0.027	5	<0.001	<0.001	<3	7.61	<0.2	0.002	381	7.6	0.02	0.17	0.03
HEN_PZ02/08	28/11/2023		0.02	188	73	0.00003	10	<0.001	<0.001	11.1	<0.01	<1	8	0.024	7	<0.001	<0.001	5	2.44	0.3	<0.002	388	7.4	<0.01	<0.16	<0.01
HEN_PZ02/08	12/12/2023		<0.01	174	67	<0.00002	12	<0.001	<0.001	11.2	<0.01	<1	9	<0.002	7	<0.001	<0.001	5	<0.40	<0.2	0.005	369	7.5	<0.01	0.18	<0.01
HEN_PZ03/08	19/01/2023	Inaccessible																								
HEN_PZ03/08	09/02/2023	Inaccessible																								
HEN_PZ03/08	15/03/2023		0.03	320	95	0.00053	51	0.002	0.002	11.1	<0.01	2	29	<0.002	28	0.001	0.005	9	2.68	0.5	0.114	738	7.4	<0.01	<0.16	0.01
HEN_PZ03/08	24/04/2023		<0.01	326	100	0.00062	56	0.003	<0.001	12.5	<0.01	2	31	<0.002	33	<0.001	0.004	11	0.9	1.3	0.049	784	7.4	<0.01	<0.16	0.04
HEN_PZ03/08	22/05/2023		0.01	333	111	0.00061	67	<0.001	0.001	10.5	<0.01	3	33	<0.002	41	<0.001	0.006	13	0.79	1.3	0.121	839	7.6	<0.01	<0.16	<0.01
HEN_PZ03/08	14/06/2023	Waterra snapped and dropped down borehole																								
HEN_PZ03/08	26/07/2023	Waterra snapped and dropped down borehole																								
HEN_PZ03/08	15/08/2023	Waterra pump malfunction																								
HEN_PZ03/08	27/09/2023		0.04	252	72	0.0003	7	<0.001	<0.001	11.1	<0.01	<1	25	<0.002	5	<0.001	0.002	<3	2.61	1.4	0.082	488	7.6	<0.01	<0.16	<0.01
HEN_PZ03/08	16/10/2023		0.01	253	70	0.00026	8	<0.001	<0.001	11.2	<0.01	<1	25	<0.002	5	<0.001	0.002	<3	3.02	<0.2	0.081	497	7.6	0.02	0.17	0.02
HEN_PZ03/08	28/11/2023		0.02	273	81	0.00037	11	<0.001	<0.001	10.2	<0.01	<1	28	0.011	7	<0.001	0.002	5	2.65	0.3	0.083	534	7.3	<0.01	0.16	0.02
HEN_PZ03/08	12/12/2023		<0.01	308	92	0.00045	16	<0.001	<0.001	11.5	<0.01	<1	31	<0.002	8	<0.001	0.002	7	0.43	<0.2	0.129	596	7.4	<0.01	<0.16	0.02
HEN_PZ07/08R	19/01/2023		<0.01	308	107	<0.00002	27	0.002	<0.001	10	<0.01	4	35	0.008	17	<0.001	<0.001	45	2.01	0.4	0.047	768	7.4	<0.01	0.16	0.02
HEN_PZ07/08R	09/02/2023		<0.01	285	103	<0.00002	46	<0.001	<0.001	11.1	<0.01	2	27	<0.002	21	<0.001	<0.001	13	1.75	1.8	0.004	728	7.7	<0.01	<0.16	0.02
HEN_PZ07/08R	15/03/2023		0.02	106	38	0.00008	20	0.001	0.002	12.7	<0.01	2	11	<0.002	11	<0.001	<0.001	20	3.54	<0.2	0.003	313	8.6	<0.01	<0.16	0.01
HEN_PZ07/08R	24/04/2023		0.01	343	104	0.00015	26	0.002	<0.001	9.9	<0.01	4	36	0.166	16	0.001	0.002	45	2.11	<0.2	0.004	754	7.4	<0.01	0.17	0.03
HEN_PZ07/08R	22/05/2023		<0.01	305	111	0.00011	26	<0.001	0.002	9.8	<0.01	4	38	0.236	16	0.003	0.025	46	1.96	<0.2	0.013	741	7.4	<0.01	<0.16	0.01
HEN_PZ07/08R	14/06/2023		0.01	289	94	<0.00002	20	<0.001	<0.001	10.9	<0.01	2	28	<0.002	11	<0.001	<0.001	23	1.25	0.4	<0.002	629	7.4	<0.01	0.22	0.04
HEN_PZ07/08R	26/07/2023		0.05	293	95	0.00005	26	<0.001	0.001	8.9	<0.01	4	36	0.672	14	0.001	0.001	36	1.92	<0.2	0.008	698	7.2	<0.01	<0.16	0.02
HEN_PZ07/08R	15/08/2023		<0.01	285	89	0.00006	15	<0.001	<0.001	10.4	<0.01	1	25	<0.002	8	<0.001	<0.001	18	0.57	0.3	0.007	581	7.4	<0.01	0.19	0.02
HEN_PZ07/08R	27/09/2023		0.01	300	94	<0.00002	25	<0.001	<0.001	9.6	<0.01	4	34	0.017	14	<0.001	<0.001	40	1.76	<0.2	0.002	695	7.4	<0.01	<0.16	0.01
HEN_PZ07/08R	16/10/2023		0.02	301	93	<0.00002	26	<0.001	<0.001	10.2	<0.01	3	35	0.023	13	<0.001	<0.001	37	1.98	<0.2	0.005	700	7.5	<0.01	0.17	0.02
HEN_PZ07/08R	28/11/2023		0.03	166	60	<0.00002	10	<0.001	0.002	12.2	0.01	4	15	<0.002	8	<0.001	<0.001	30	7.15	0.2	0.004	392	7.9	<0.10	3.79	<0.10
HEN_PZ07/08R	12/12/2023		0.02	122	48	<0.00002	8	<0.001	0.001	11.8	<0.01	2	8	<0.002	4	<0.001	<0.001	15	2.92	<0.2	<0.002	290	7.7	0.01	6.17	0.05
HEN_PZ08/08R	19/01/2023		<0.01	315	111	<0.00002	31	0.001	<0.001	11.1	<0.01	3	31	<0.002	15	<0.001	<0.001	26	2.76	1.7	0.041	749	7.4	<0.01	<0.16	0.02
HEN_PZ08/08R	09/02/2023		<0.01	265	100	0.00003	21	<0.001	<0.001	11.7	<0.01	1	27	<0.002	11	<0.001	<0.001	15	0.63	0.4	0.008	617	7.6	<0.01	<0.16	0.02
HEN_PZ08/08R	15/03/2023		0.01	299	97	0.00036	30	0.002	<0.001	12.1	<0.01	2	26	0.011	15	<0.001	<0.001	11	0.76	1.3	0.008	665	7.4	<0.01	0.23	0.02
HEN_PZ08/08R	24/04/2023		<0.01	297	99	0.00015	30	0.003	<0.001	11.7	<0.01	2	26	<0.002	16	<0.001	<0.001	11	0.99	1.7	<0.002	663	7.4	<0.01	<0.16	0.02
HEN_PZ08/08R	22/05/2023		<0.01	264	108	0.00003	33	<0.001	<0.001	10.3	<0.01	2	29	0.004	18	<0.001	<0.001	16	1.28	0.6	0.004	684	7.4	<0.01	<0.16	<0.01
HEN_PZ08/08R	14/06/2023		<0.01	308	100	<0.00002	33	<0.001	<0.001	11.1	<0.01	2	28	<0.002	18	<0.001	<0.001	16	0.96	3	<0.002	691	7.3	<0.01	0.17	0.04
HEN_PZ08/08R	26/07/2023		<0.01	319	119	0.00007	28	<0.001	0.001	8.9	<0.01	3	36	0.013	19	<0.001	<0.001	58	2.26	1	0.013	804	7.2	<0.01	0.17	0.06
HEN_PZ08/08R	15/08/2023		<0.01	306	96	0.00003	29	<0.001	0.001	9.9	<0.01	1	27	<0.002	16	<0.001	<0.001	12	1.06	0.9	0.006	658	7.4	<0.01	0.16	0.01
HEN_PZ08/08R	27/09/2023		<0.01	351	123	<0.00002	26	<0.001	<0.001	10.3	<0.01	4	37	<0.002	19	<0.001	<0.001	72	3.85	1.6	0.008	835	7.4	<0.01	<0.16	0.02
HEN_PZ08/08R	16/10/2023		0.01	338	110	0.00003	28	<0.001	<0.001	11.9	<0.01	2	32	<0.002	17	<0.001	<0.001	40	2.56	1.1	0.007	763	7.4	<0.01	<0.16	0.04
HEN_PZ08/08R	28/11/2023		0.02	191	70	<0.00002	11	<0.001	0.003	12.5	0.01	5	16	0.004	8	<0.001	<0.001	32	8.44	<0.2	<0.002	441	8.2	<0.10	<1.60	<0.10
HEN_PZ08/08R	12/12/2023		0.08	164	64	<0.00002	9	<0.001	0.002	11.5	<0.01	3	11	<0.002	5	<0.001	<0.001	22	4.45	0.3	0.004	381	7.6	0.01	5.37	0.05
		Min	0.01	106	38	<0.00002	7	<0.002	0.001	8.9	<0.02	1	7	<0.002	4	<0.001	<0.001	3	0.43	<0.2	0.002	290	7.2	<0.1	<0.16	<0.1
		Max	0.08	351	123	0.00062	67	0.003	0.003	12.7	0.01	5	38	0.672	41	0.003	0.025	72	8.44	3	0.129	839	8.6	0.02	6.17	0.06
		Limit (PZ07/08 & PZ08/08)	0.5		</																					





Appendix D

Surface Water Quality

Sample Point	Date	Alkalinity (mg/l)	Calcium (mg/l)	Cadmium (mg/l)	Chloride (mg/l)	Chromium (mg/l)	Copper (mg/l)	Dissolved Oxygen (mg O2/l)	Iron (mg/l)	Potassium (mg/l)	Magnesium (mg/l)	Manganese (mg/l)	Sodium (mg/l)	Ammoniacal Nitrogen (mg/l)	Nickel (mg/l)	Lead (mg/l)	Sulphate (mg/l)	Suspended Solids (mg/l)	Total Organic Carbon (mg/l)	Total Oxidised Nitrogen (mg/l)	Zinc (mg/l)	Electrical conductivity (us/cm)	pH (liquid) (pH units)	Naphthalene (UG/L)	Total (USEPAH16) PAH's (UG/L)	Total TPH >C8- C40 (Aromatic) (mg/l)	Data Comments (Unit not Set)
HEN_Quarry Sump	19/01/2023	173	66	0.00004	15	0.001	<0.001	11	<0.01	3	14	<0.002	9	<0.01	<0.001	<0.001	30	<5	2.73	0.4	0.021	431	8.2	<0.01	<0.16	0.01	Sample is clear
HEN_Quarry Sump	24/04/2023	130	44	0.0001	16	<0.001	0.002	11.9	0.01	2	12	<0.002	10	0.04	<0.001	<0.001	20	5	3.93	0.3	0.003	334	7.8	<0.01	0.21	0.03	Sample is clear
HEN_Quarry Sump	18/07/2023	165	58	<0.00002	43	<0.001	0.001	10.4	0.02	3	19	0.007	21	0.03	<0.001	<0.001	28	<10	3.78	<0.2	0.005	491	7.4	<0.01	<0.16	0.02	Sample is clear colourless, thick green carpet surface vegetation.
HEN_Quarry Sump	16/10/2023	239	85	<0.00002	24	<0.001	<0.001	10.8	0.03	3	23	0.256	14	0.02	0.002	<0.001	32	<5	3.68	<0.2	0.017	601	7.6	0.01	0.16	0.02	Sample is clear colourless.
HEN_Discharge	19/01/2023	215	84	<0.00002	20	0.001	<0.001	11.2	<0.01	4	19	0.003	12	<0.01	<0.001	<0.001	38	<5	2.66	0.8	0.011	553	7.7	<0.01	<0.16	0.02	Sample is clear
HEN_Discharge	24/04/2023	281	94	0.00009	31	0.002	0.001	12.4	0.02	4	26	0.004	18	0.02	<0.001	<0.001	36	<5	3.16	0.8	0.003	671	7.6	<0.01	<0.16	0.02	Sampled
HEN_Discharge	19/07/2023																										No flow / discharge through sampling point.
HEN_Discharge	16/10/2023	316	105	<0.00002	23	<0.001	0.001	11.4	0.01	4	25	0.028	13	0.02	0.001	<0.001	35	<5	3.91	0.4	0.008	705	7.4	<0.01	<0.16	0.01	Sample is clear colourless.
	Min	130	44	<0.00002	15	<0.001	0.001	10.4	0.01	2	12	0.003	9	0.02	<0.001	<0.001	20	<5	2.66	0.3	0.003	334	7.4	<0.01	<0.16	0.01	
	Max	316	105	0.0001	43	0.002	0.002	12.4	0.03	4	26	0.256	21	0.04	0.002	<0.001	38	5	3.93	0.8	0.021	705	8.2	0.01	0.21	0.03	
Trigger Discharge																		100					6 to 9			5	