012/4386/JR/wn

1st March 2023

Mr L Foxon
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[redacted]

Dear Lee

Darton Lane, Barnsley – gas risk assessment

Further to issue of our Geoenvironmental Appraisal Report (No. 4386/1, dated August 2022), gas monitoring at the above site has now been completed and we are able to issue this supplementary letter report, together with copies of the monitoring results. This letter, which should be read in conjunction with Report No. 4386/1, reviews soil-gas conditions, assesses risks and details any mitigation measures required to render the site suitable for the proposed development.

Background

The site is located approximately 4.5 km northwest of Barnsley town centre at NGR SE 319 098. It comprises three overgrown grassed fields featuring an area of saturated marsh and a gravel track and covers an area of approximately 3.6 hectares (8.90 acres).

In relation to hazardous gas, the above-mentioned report found:

- Former known and likely unrecorded underground shallow coal workings underlie the site
- Numerous infilled opencast mines are recorded within 500m, including one located 20m to the southwest
- Areas of made ground over 2.8m in thickness were identified during the site investigation

Based on the above, it was considered that the site might be at risk from hazardous gas and therefore monitoring wells were installed in 7 boreholes. Details of the individual installations are provided in Appendix E of this letter report.

The proposed residential development comprises 46 two-storey domestic dwellings, associated gardens, POS, adoptable roads and sewers, as shown on Drawing 4386/2 in Report No. 4386/1. The houses will be founded on traditional strip footings seated in Cohesive Residual Soils or Granular Residual Soils.

Scope of works

The generation potential of the gas source was initially considered to be **Low**. Consequently, in accordance with CIRIA Report C665, given the proposed residential end use, 9 visits have been completed over a 6-month period, between August 2022 and February 2023.

A standard procedure was followed in accordance with CIRIA guidance; this procedure involved measurement, in the following order of:

- Atmospheric temperature, pressure and ambient oxygen concentration on site immediately prior to and on completion of monitoring
- Methane, oxygen and carbon dioxide concentrations and flow rates using a Gas Data GFM436 infra-red gas analyser

APPROACHABLE REGISTERED ac UKAS MANAGEMENT SYSTEMS 8320
CHAS Accredited Contractor CHAS.co.uk
CQMS Safety Scheme
Constructionline A UK GOVERNMENT CERTIFICATION SERVICE
AGS Association of Geotechnical & Geoenvironmental Specialists

- Standing water level using a dipmeter

Gas monitoring results

The monitoring results are provided in Appendix C and summarised below:

Well	Response zone	Range of methane concentrations (% v/v)	Range of carbon dioxide concentrations (% v/v)	Range of steady flow rates (litre/hour)
PH101	1.0m – 4.0m (Granular Residual Soil and Coal Measures bedrock)	None detected.	N.D – 4.5	N.D – 2.4
PH102	2.0m – 4.0m (Coal Measures bedrock – Siltstone)		0.1 – 2.2	N.D – 22.2*
PH104A	1.0m – 2.0m (Granular Residual Soils)		N.D – 0.9	N.D
PH107	1.0m – 3.0m (Coal Measures bedrock – Sandstone)		N.D – 0.8	N.D
PH108	1.0m – 3.0m (Granular Residual Soils – Coal Measures bedrock – Siltstone)		N.D – 4.7	N.D
PH110	1.0m – 2.0m (Granular Residual Soils)		N.D – 0.7	N.D
PH112	2.0m – 4.0m (Coal Measures bedrock – Siltstone)		0.3 – 1.1	N.D – 1.8

Note: Atmospheric pressures varied between 986mb and 1038mb. N.D – Not detected. * Recorded following bailing.

During 4 of the 9 monitoring visits, atmospheric pressure was falling for the duration of the visit. Plots of atmospheric pressure versus time, with the monitoring visits indicated, are presented in Appendix D of this letter report.

In accordance with the DETR approach, a gas flow rate of 22.2 litres/hour has been used to calculate gas screening values as the highest recorded sustained flow.

Current guidance

Generic Notes (01 Site Characterisation) outlining how monitoring results are interpreted are enclosed.

Current gas regime

The proposed residential development comprises 46 two-storey domestic dwellings, associated gardens, POS, adoptable roads and sewers. Consequently, the gas regime has been characterised in accordance with the Situation A (Wilson & Card) methodology outlined in CIRIA Report C665 and BS8485:2015+A1:2019[1].

No methane was recorded during any of the monitoring visits.

Based on worst-case (peak) gas concentrations and steady flows, a Gas Screening Value (GSV)[2] for carbon dioxide of 1.04 has been calculated. This GSV equates to Characteristic Situation CS3.

[1] *Code of Practice for the characterisation & remediation from ground gas in affected developments.*

[2] *Gas Screening Values (GSVs) are calculated by the equation: GSV = flow x (gas concentration / 100).*

Rare occurrences of depleted oxygen concentrations (<10%) were recorded at two locations during the monitoring period. Given the complete absence of methane and the low concentrations of carbon dioxide recorded the occasionally depleted oxygen concentrations are likely to be the result of aerobic microbial activity within the typically cohesive substrata.

Elevated peak flows were recorded at several monitoring locations, with the most elevated flows being recorded after bailing was undertaken. In all cases flows were short lived and highly likely to be the result of the movement of groundwater, either fluctuating between monitoring visits leading to a build up of pressure within the sealed well, or immediately after bailing as the groundwater moved from the saturated substrata into the unsaturated void space within the well and soil pore space surrounding the well, which is known as the "piston effect".

The initial GSV was calculated using the highest recorded steady flow of 22.2l/hr. Review of the monitoring data suggests this is not representative of site conditions and is simply the result of groundwater movement. Had monitoring continued it is highly likely the elevated flow would have continued to fall and eventually disappeared. Using the highest recorded steady flow (2.4l/hr) obtained from a well with an unsaturated response zone a further GSV of 0.1l/hr has been calculated. This GSV equates to Characteristic Situation CS2, which is considered to be representative of the true gas regime at the site.

Scope of protection measures

Based on the site characterisation discussed above, the proposed foundation solution, and with reference to the gas protection "scoring" system outlined in BS8485:2015+A1:2019, Lithos consider that the following protective measures should be incorporated in all new buildings:

Charac. situation (Wilson & Card, '99)	Gas "score" req'd by BS8485	Protective measures (Residential, low-rise housing)		
		Floor slab (BS8485 "score")	Sub-floor ventilation (BS8485 "score")	Membrane Type (BS8485 score")
2	3.5	*Select one from:* Block & Beam – (0). Reinforced ground bearing slab – (0.5). Reinforced cast in-situ suspended slab (with minimal and suitably sealed service penetrations & joints) – (1.5). Reinforced ground bearing raft (with limited service penetrations cast into slab). Note: the venting area through any downstand beam should be 3 times greater than that provided by the side ventilation (air bricks) – (1.5).	*Select one from:* Passive sub-floor ventilation venting layer could be: A min. 150mm clear void (2.5) or A proprietary void former providing an equivalent clear void depth of 60mm see Section B7 in BS8485 (2.5) or Min. 300mm thick blanket of min. 20mm single size rounded or sub-angular gravel (1.0). Min. ventilation = 1 500 mm²/m run of external wall (via air bricks on each of 2 opposite sides) with 100mm pipes at 1.75m centres or honeycombing of any sub-floor sleeper walls.	Gas resistant membrane meeting all of the following criteria: • sufficiently impervious to gases with a methane gas transmission rate <40.0 ml/day/m²/atm (average) for sheet and joints (tested in accordance with BS ISO 15105-1 manometric method) • sufficiently durable to remain serviceable for the anticipated life of the building and duration of gas emissions • sufficiently strong to withstand in-service stresses (e.g. settlement if placed below a floor slab) • sufficiently strong to withstand the installation process and following trades until covered (e.g. penetration from steel fibres in fibre reinforced concrete penetration of reinforcement ties tearing due to working above it dropping tools etc) • capable after installation of providing a complete barrier to the entry of the relevant gas • a minimum 0.4 mm thickness (1600g polyethylene) reinforced membrane (virgin polymer) and • verified in accordance with CIRIA C735∞ (2.0)

Footnotes:

∞ In accordance with CIRIA C735 a Verification Plan should be prepared which outlines the activities (inspection and testing) the relevant personnel and the type of records to be collected. Gas membranes need to be visually inspected to establish possible damage. Whilst conflicts of interest in verification should be avoided the Developer's staff on site could undertake inspection & verification on CS2 sites. In all circumstances the verifier should be competent experienced and suitably trained.

1. Building Type A is defined in Table 3 and Section 7 of BS8485:2015+A1:2019 as: private ownership with no building management controls on alterations to the internal structure the use of rooms the ventilation of rooms or the structural fabric of the building. Examples include private housing and some retail premises
2. A combination of two or more of the three types of protection measures (slab ventilation & membrane) should be used to achieve the BS8485 score.
3. The membrane should always be lapped and sealed in accordance with BRE\Environment Agency Report BR 414 (2001) – "Protective Measures for housing on gas-contaminated land". The membrane should be continuous across internal walls & the cavity and there should be a cavity tray in external walls.
4. In all cases there should be minimum penetration of floor slab by services any penetrations should be suitably sealed.

In accordance with recent YALPAG guidance[3], a detailed verification method statement should be issued to Barnsley Metropolitan Borough Council in advance of the construction phase. This should address how the gas protection measures will be installed and what verification information will be provided to demonstrate the installation has been carried out in accordance with the appropriate guidance. As a minimum the report should include (but not be limited to):

- A summary of the gas risk assessment.
- The gas protection measures proposed and confirmation they will meet the gas protection requirements for the lifetime of the development.
- Technical drawings showing how the gas protection measures will be incorporated.
- Formal qualifications/experience/training of the person carrying out the installation.
- Formal qualifications/experience/training of the person carrying out the verification.
- Clear demonstration of the independence of the person carrying out the verification.
- The manufacturer's specification of the gas protection membrane to be used.
- Full details of what the verification process will comprise and at what stage verification will be carried out.
- Details of how any non-conformance will be dealt with.
- Details of the number of plots to be validated.
- Timeline of when during the build, each of the gas protection measures will be installed.
- Details of management measures proposed to ensure how damage to the membrane will be prevented prior to the floor being installed, post installation.
- Details of how all site personnel (including follow-on trades) will be made aware of the presence of the membrane and that damage to the membrane must be prevented.
- Details of the extent of overlap and method of sealing.

BRE\Environment Agency Report BR 414 (2001) – "*Protective Measures for housing on gas-contaminated land*" provides a practical guide to good practice for the detailing and construction of passive soil gas protection measures for new residential development. Of particular relevance are a list of 'Watchpoints', which offer practical information for installation and buildability.

Radon

On 1st December 2022 the British Geological Society (BGS) and the UK Health Protection Agency (UKHPA) published an updated radon potential map for Great Britain. Based on the updated radon map, the site is in an area where **5-10%** of properties are estimated to be above the action level, and basic radon protection measures are required in new dwellings. The CS2 measures required will be sufficient to provide basic radon protection.

[3] *Verification Requirements for Gas Protection Systems - Technical Guidance for Developers, Landowners and Consultants. Yorkshire and Lincolnshire Pollution Advisory Group, December 2016.*

We trust the above is sufficient for your present needs, but should you have any queries please contact the undersigned.

Yours sincerely

Julia Reynolds
Principal Engineer
for and on behalf of
LITHOS CONSULTING LIMITED

Enclosures:

Appendix A – General Notes
Appendix B – Drawings
Appendix C – Gas monitoring results
Appendix D – Atmospheric pressure graphs
Appendix E – Monitoring well installations

APPENDIX A
General notes

Current guidance

CIRIA Report 151 (1995)[i] identified that there was inadequate guidance on trigger concentrations for ground gases. CIRIA concluded that the most important aspect of a gas regime below or adjacent to a site was the surface emission rate, i.e. how quickly the gas is coming out of the ground. The lower the surface emission rate the lower the risk. CIRIA Report C665 (2006)[ii] advocates two methodologies (both refer to Gas Screening Values - GSV) for characterising sites:

A – All developments except low rise housing. The advocated methodology is that proposed by Wilson & Card, 1999[iii]

B – Low rise housing. An alternative (traffic light) methodology, derived by Boyle and Witherington, 2006[iv] for NHBC

Other relevant UK guidance includes:

- BS8485:2015+A1:2019 – Code of Practice for the characterisation & remediation from ground gas in affected developments.
- BS8576:2013 Guidance on investigations for ground gas – permanent gases and volatile organic compounds
- Boyle & Witherington (2007) – Guidance on evaluation on development proposals on sites where methane and carbon dioxide are present incorporating "traffic lights". Report Ref. 10627-R01-(02) for NHBC
- Wilson Card & Haines (CIEH 208) The Local Authority Guide to Ground Gas
- CL:AIRE Research Bulletin RB17 (November 2012) A Pragmatic Approach to Ground Gas Risk Assessment
- CL:AIRE Research Bulletin RB13 (February 2011) The Utility of Continuous Monitoring in Detection & Prediction of 'Worst-Case' Ground Gas Concentration
- BRE\Environment Agency Report BR 414 (2001) – "Protective Measures for housing on gas-contaminated land".
- YALPAG (December 2016) - Verification Requirements for Gas Protection Systems - Technical Guidance for Developers Landowners and Consultants.
- Environment Agency Report LFTGN 03 - Guidance on the management of landfill gas June 2014

A – All developments except low rise housing. (Wilson & Card, 1999)[v] revised Table 28 of CIRIA 149[v] in terms of borehole gas volume flow rate (now GSV) in order to achieve a more consistent design of protection measures. This was done to reflect the importance of recognising the gas surface emission rate. Wilson & Card then developed a method for classifying gassing sites (Table 1 below), which took into account the combined gas concentration and GSV.

Table 1 – Site classification (Wilson & Card)

Characteristic Situation (W&C, 1999)	Gas Screening Value, CH_4 or CO_2 (l/hr)	Additional limiting factors	Typical source of generation
1	<0.07	Methane not to exceed 1% v/v and carbon dioxide not to exceed 5% v/v	Natural soils with low organic content
2	<0.7	Borehole air flow rate not to exceed 70 litre/hr otherwise increase to Characteristic Situation 3	Natural soil high peat/organic content
3	<3 5		Old landfill inert waste mineworking flooded.
4	<15	Quantitative Risk Assessment required to evaluate scope of protection measures.	Mineworking – susceptible to flooding completed landfill inert waste (WMP 26B criteria)
5	<70		Mineworking unflooded inactive
6	>70		Recent landfill site

Notes:

Borehole flow rate = volume of gas (regardless of composition) which is escaping from well (l/hr)

Gas Screening Value (litre/hour) = gas concentration (%) / 100 x borehole flow rate (l/hr)

To facilitate design implementation the limiting values for both methane and carbon dioxide are identical

B – Low rise housing. NHBC have developed a characterisation system similar to that of Wilson & Card above, but specific to low-rise housing development (Boyle and Witherington) (Table 8.7). This approach compares measured gas emission rates with generic "Traffic Lights". The Traffic Lights include "Typical Maximum Concentrations" for initial screening, and risk-based Gas Screening Values (GSVs) for consideration of situations where the Typical Maximum Concentrations are exceeded. Calculations are carried out for both methane and carbon dioxide and the worst case adopted in order to establish the appropriate protection measures.

Table 8.7 NHBC Traffic light system for 150 mm void

Traffic Light Classification	Methane [1]		Carbon Dioxide [1]	
	Typical Maximum Concentration [5] (%v/v)	Gas Screening Value [2,4,6] (l/hr)	Typical Maximum Concentration [5] (%v/v)	Gas Screening Value [2,3,4,6] (l/hr)
Green	1	0.16	5	0.78
Amber 1	5	0.63	10	1.56
Amber 2	20	1.56	30	3.13
Red				

Notes:

1. The worst gas-regime identified at the site, either methane or carbon dioxide, recorded from monitoring in the worst temporal conditions, will be the decider for which Traffic Light and GSV is allocated.
2. Generic GSVs are based on guidance contained within "The Building Regulations: Approved Document C" (2004) and assume a sub-floor void of 150 mm thickness.
3. The small room is considered to be a downstairs toilet, with dimensions of 1.50 × 1.50 × 2.50 m, with a soil pipe passing into the sub-floor void.
4. The GSV, in litres per hour, is as defined in Wilson and Card (1999) as the borehole flow rate multiplied by the concentration in the air stream of the particular gas being considered.
5. The Typical Maximum Concentrations can be exceeded in certain circumstances should the conceptual site model indicate it is safe to do so. This is where professional judgment will be required, based on a thorough understanding of the gas regime identified at the site where monitoring in the worst temporal conditions has occurred.
6. The GSV thresholds should not generally be exceeded without completion of a detailed gas risk assessment taking into account site-specific conditions.

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i *Harries CR, Witherington PJ and McEntee JM (1995). Interpreting measurements of gas in the ground. CIRIA Report 151*

ii *CIRIA (2006) – Assessing risks posed by hazardous ground gases to buildings.*

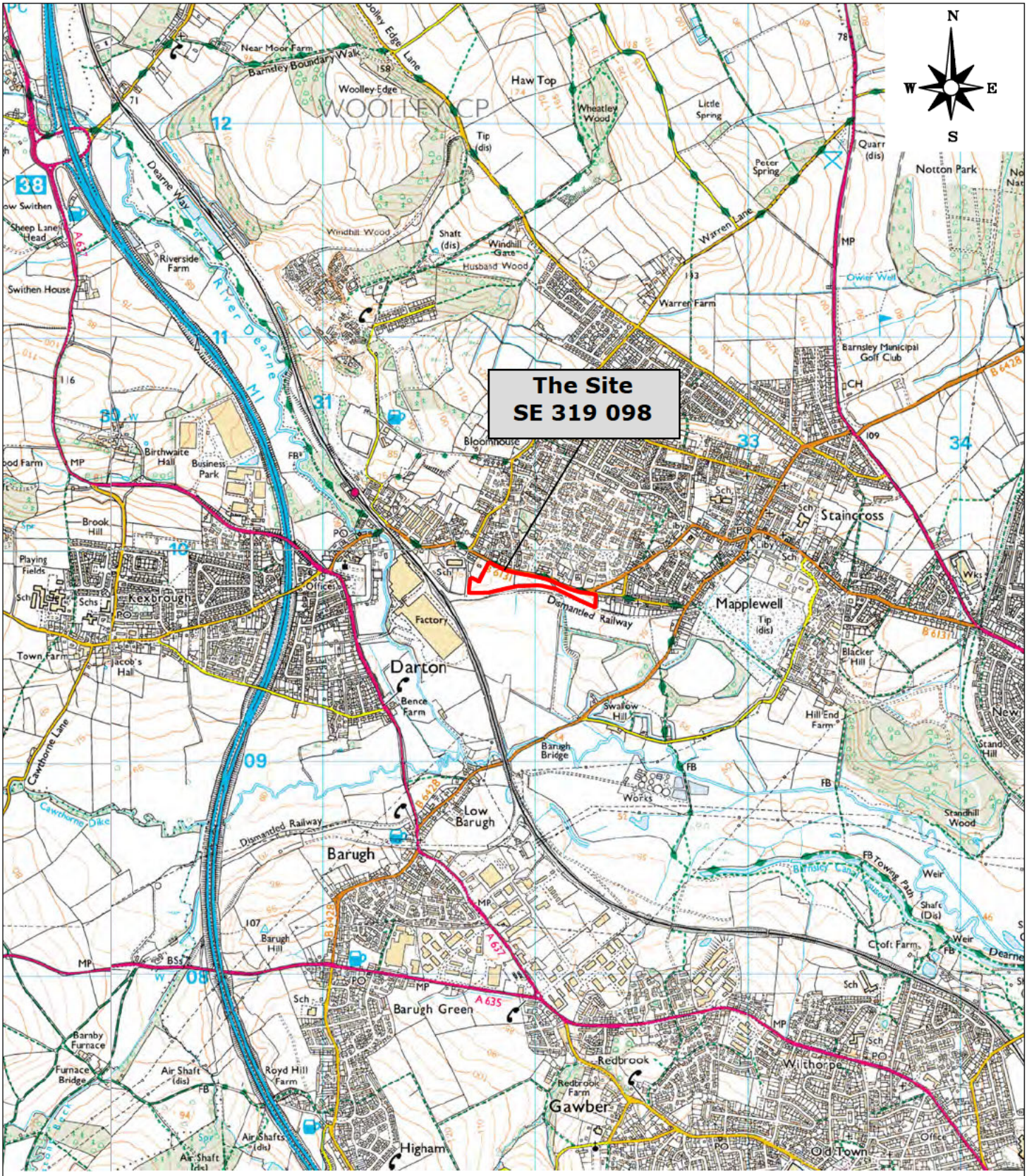
iii *Wilson SA and Card GB (February 1999). Reliability and Risk in Gas Protection Design. Ground Engineering.*

iv *Boyle & Witherington (2006) – Guidance on evaluation on development proposals on sites where methane and carbon dioxide are present, incorporating "traffic lights". Report Ref. 10627-R01-(02), for NHBC.*

v *Wilson SA and Card GB (February 1999). Reliability and Risk in Gas Protection Design. Ground Engineering.*

APPENDIX B

Drawings



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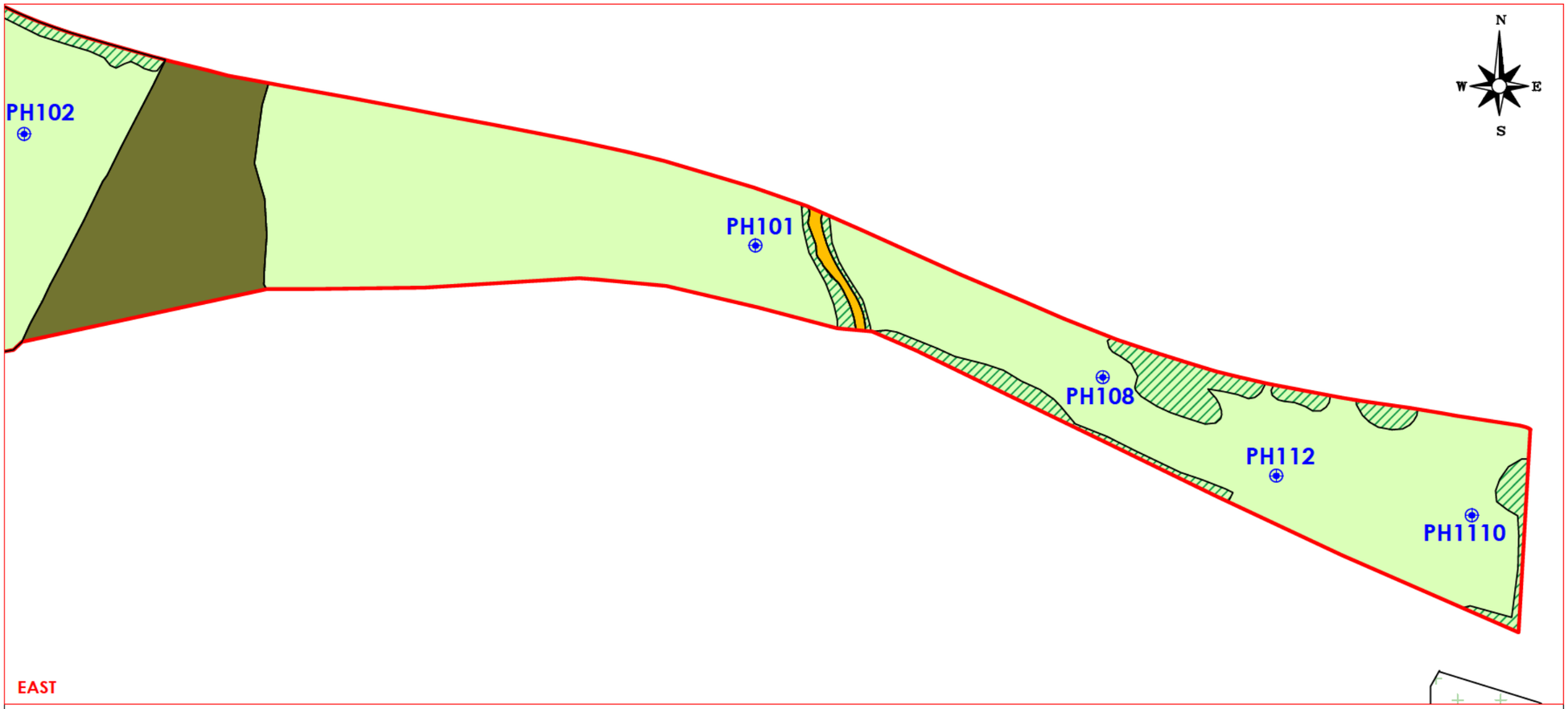
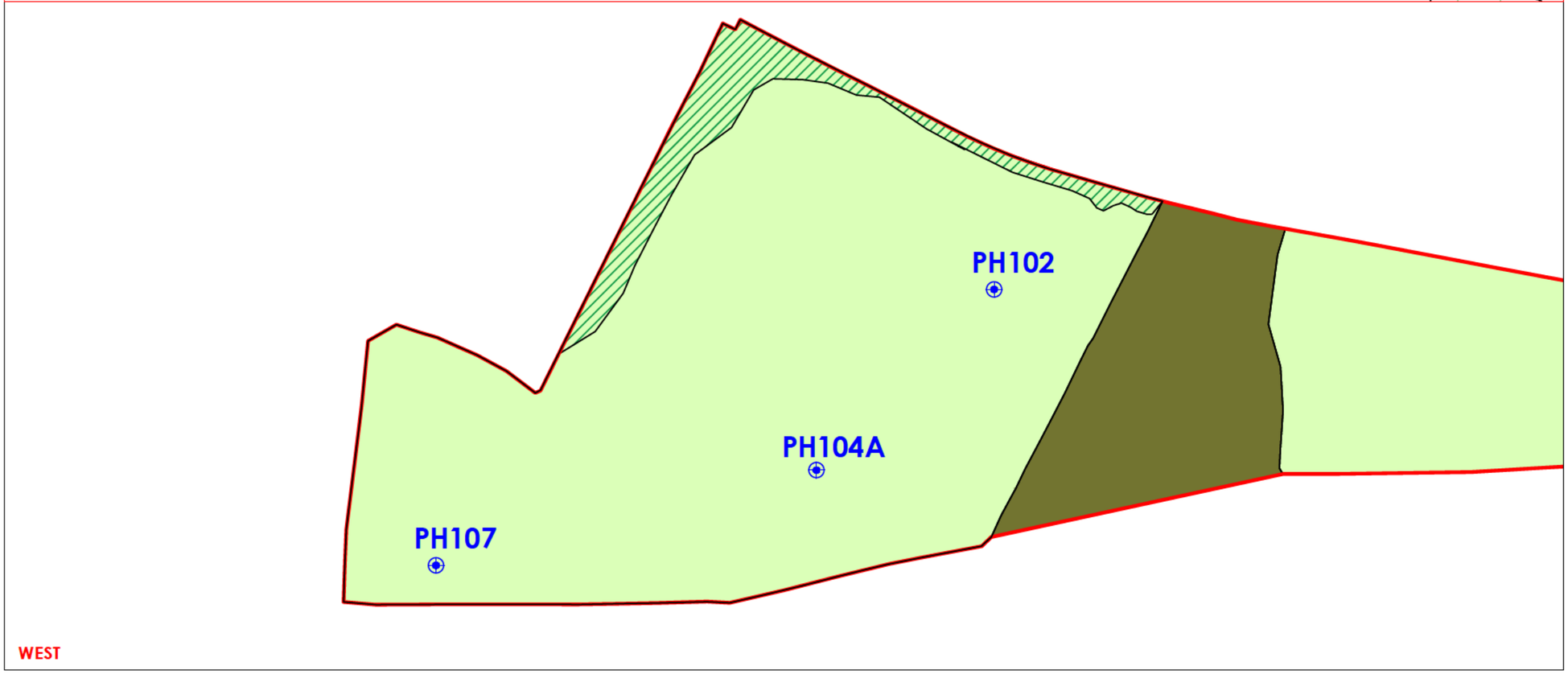
Tel 01937 545330

CLIENT	DUCHY HOMES
JOB TITLE	DARTON LANE, BARNSLEY
DRAWING TITLE	SITE LOCATION PLAN
DRAWN	AT
DATE	10 06 22
CHECKED	AG
DATE	10 06 22
STATUS	FOR COMMENT ☐ FOR APPROVAL ☐ DRAFT ☐ FINAL ☑
SCALE	1:25 000
SHEET	A4
DRAWING NO.	4386/1
REVIS ON	





NOTES

- MONITORING WELL LOCATION
- GRASS & OVERGROWN AREAS
- GRAVEL HARDCORE SURFACING
- SWAMP & V.DENSE VEGETATION
- V. DENSE VEGETATION
- APPROXIMATE SITE BOUNDARY

REV.	DESCRIPTION	DATE

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CLIENT

DUCHY HOMES

JOB TITLE

DARTON LANE,
BARNSLEY

DRAWING TITLE

MONITORING WELL LOCATIONS

DRAWN	DATE	STATUS
AT	27 07 22	FOR COMMENT ☐
CHECKED	DATE	FOR APPROVAL ☐
AG	27 07 22	DRAFT ☐
		FINAL ☑

SCALE	SHEET	DRAWING NO.	REVISION
1:1250	A3	4386/MW	

APPENDIX C

Gas monitoring results

Visit 1											
Job Title:										**Job No:**	
Darton Lane, Barnsley										**4386**	
Client:										**Sheet :**	
Duchy Homes										1 of 17	
Date:		**Arrival Time:**		**Depart Time:**		**Operator:**					
04/08/2022		15:30		17:05		Cameron Daniel					

Gas Monitoring Results:

Ambient Concentration (% Volume):	**CH_4:**	ND	**CO_2:**	ND	**O_2:**	21.0

Monitoring Point	**Groundwater level**	**Concentrations**					**Gas Flow Rates**			**Bottom of well**	**Remarks**
		Initial / Highest		**Steady concentrations**		**Lowest concn**	**Initial / Maximum**	**Steady**	**Time to fall from highest to steady**		
		CH_4	**CO_2**	**CH_4**	**CO_2**	**O_2**					
	(m) bgl	**% v/v**	**(%)**	**% v/v**	**(%)**	**(%)**	**litre/hr**	**litre/hr**	**secs**	**m**	
PH101	ND	ND	1.0	ND	1.0	19.6	1.9	0.6	90.0	3.96	Flow fluctuating 0 3 to 0.6.
PH102	0.50	ND	1.5	ND	1.5	19.6	ND	ND	ND	3.91	
PH104A	ND	ND	0.1	ND	0.1	20.8	ND	ND	ND	2.05	
PH107	ND	ND	0.8	ND	0.8	19.4	0.1	ND	5.0	2.92	
PH108	ND	ND	0.5	ND	0.5	20.7	ND	ND	ND	3.00	
PH110	1.27	ND	ND	ND	ND	21.1	ND	ND	ND	2.22	
PH112	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	Could not unfasten bolt on first visit - will attempt on 2nd visit.

Equipment Used:	**Next Calibration Date**
Gas Data GFM436 Infrared Gas Analyser Geotechnical Instruments Dipmeter	08/03/2023

Key	
ND	None Detected
NR	Not Recorded
1 0	Recorded value does not breach trigger levels
5.0	Recorded value breaches trigger level 1
10.0	Recorded value breaches trigger level 2

	Site Data:			**Weather Station Data (Brettas Park Station)**							**CH_4**	**CO_2**	**O_2**
	Temp (°C):	18 to 19		**Barometric Pressure Trend:**			Rising						
Time:	15:46	16:18	17:01	01:02	12:59	15:45	16:18	17:00	18:59	Trigger level 1	1 0	5.0	16 0
Pressure (mb):	1007	1007	1007	1015	1018	1019	1019	1019	1020	Trigger level 2	5 0	10.0	10 0
	Weather Conditions:		Light cloud/ Moderate breeze										
	Surface Ground Conditions:		Dry										

Remarks:	

Job Title:	Job No:
Darton Lane, Barnsley	4386
Client:	**Sheet :**
Duchy Homes	2 of 17

Date:	Arrival Time:	Depart Time:	Operator:
31/08/2022	10:15	12:30	Toby Tapp

Gas Monitoring Results:

Ambient Concentration (% Volume):	CH_4:	ND	CO_2:	ND	O_2:	20.7

Monitoring Point	Groundwater level	Concentrations					Gas Flow Rates			Bottom of well	Remarks
		Initial / Highest		Steady concentrations		Lowest concn	Initial / Maximum	Steady	Time to fall from highest to steady		
		CH_4	CO_2	CH_4	CO_2	O_2					
	(m) bgl	% v/v	(%)	% v/v	(%)	(%)	litre/hr	litre/hr	secs	m	
PH101	ND	ND	1.8	ND	1.8	19.2	ND	ND	ND	3.96	
PH102	0.65	ND	0.5	ND	0.5	20.3	0.1	ND	15.0	3.87	Bailed. Bailer broke and is stuck in well.
PH104A	ND	ND	0.1	ND	0.1	20.7	0.1	ND	20.0	2.05	
PH107	ND	ND	0.8	ND	0.8	20.2	0.3	ND	30.0	2.92	
PH108	2.74	ND	0.7	ND	0.7	20.3	ND	ND	ND	3.00	
PH110	1.40	ND	ND	ND	ND	20.8	ND	ND	ND	2.20	Bailed 10:45 - 10:47 to 2 21m (2L). Remonitored 12:03.
PH112	2.06	ND	0.5	ND	0.5	20.6	ND	ND	ND	3.75	Bailed 11:01 - 11:04 to 3.75m (5L). Remonitored 12:10.

Equipment Used:

Gas Data GFM436 Infrared Gas Analyser
Geotechnical Instruments Dipmeter

Next Calibration Date

08/03/2023

Key

ND	None Detected
NR	Not Recorded
1 0	Recorded value does not breach trigger levels
5.0	Recorded value breaches trigger level 1
10.0	Recorded value breaches trigger level 2

Site Data:			Weather Station Data (Brettas Park Station)					
Temp (°C):	15 to 19		Barometric Pressure Trend:			Steady		
Time:	10:23	11:57	12:16	01:01	08:20	10:22	11:58	12:14	14:11
Pressure (mb):	1019	1017	1016	1030	1031	1030	1030	1030	1029

Weather Conditions:	Light Cloud / Gentle breeze
Surface Ground Conditions:	Dry

	CH_4	CO_2	O_2
Trigger level 1	1 0	5.0	16 0
Trigger level 2	5 0	10.0	10 0

Remarks:

Job Title:	Job No:
Darton Lane, Barnsley	4386
Client:	**Sheet :**
Duchy Homes	3 of 17

Date:	Arrival Time:	Depart Time:	Operator:
31/08/2022	10:15	12:30	Toby Tapp

Gas Monitoring Results:

Ambient Concentration (% Volume):	CH_4:	ND	CO_2:	ND	O_2:	20.7

Monitoring Point	Groundwater level	Concentrations: Initial / Highest		Concentrations: Steady concentrations		Concentrations: Lowest concn	Gas Flow Rates: Initial / Maximum	Gas Flow Rates: Steady	Gas Flow Rates: Time to fall from highest to steady	Bottom of well	Remarks
		CH_4	CO_2	CH_4	CO_2	O_2					
	(m) bgl	% v/v	(%)	% v/v	(%)	(%)	litre/hr	litre/hr	secs	m	
PH101	-	-	-	-	-	-	-	-	-	-	
PH102	-	-	-	-	-	-	-	-	-	-	Bailed. Bailer broke and is stuck in well.
PH104A	-	-	-	-	-	-	-	-	-	-	
PH107	-	-	-	-	-	-	-	-	-	-	
PH108	-	-	-	-	-	-	-	-	-	-	
PH110	2.19	ND	0.1	ND	0.1	21.1	0.3	ND	15.0	2.25	Bailed 10:45 - 10:47 to 2 21m (2L). Remonitored 12:03.
PH112	3.35	ND	0.1	ND	0.1	21.1	6.0	ND	60.0	3.82	Bailed 11:01 - 11:04 to 3.75m (5L). Remonitored 12:10.

Equipment Used:	Next Calibration Date
Gas Data GFM436 Infrared Gas Analyser Geotechnical Instruments Dipmeter	08/03/2023

Key	
ND	None Detected
NR	Not Recorded
1 0	Recorded value does not breach trigger levels
5.0	Recorded value breaches trigger level 1
10.0	Recorded value breaches trigger level 2

	Site Data:			Weather Station Data (Brettas Park Station)					
	Temp (°C):	15 to 19		Barometric Pressure Trend:			Steady		
Time:	10:23	11:57	12:16	01:01	08:20	10:22	11:58	12:14	14:11
Pressure (mb):	1019	1017	1016	1030	1031	1030	1030	1030	1029
	Weather Conditions:	Light Cloud / Gentle breeze							
	Surface Ground Conditions:	Dry							

	CH_4	CO_2	O_2
Trigger level 1	1 0	5.0	16 0
Trigger level 2	5 0	10.0	10 0

Remarks:

Job Title:	Job No:
Darton Lane, Barnsley	4386
Client:	**Sheet :**
Duchy Homes	4 of 17

Date:	Arrival Time:	Depart Time:	Operator:
23/09/2022	08:10	10:20	Toby Tapp

Gas Monitoring Results:

Ambient Concentration (% Volume):	CH_4:	ND	CO_2:	ND	O_2:	20.3

Monitoring Point	Groundwater level	Concentrations					Gas Flow Rates			Bottom of well	Remarks
		Initial / Highest		Steady concentrations		Lowest concn	Initial / Maximum	Steady	Time to fall from highest to steady		
		CH_4	CO_2	CH_4	CO_2	O_2					
	(m) bgl	% v/v	(%)	% v/v	(%)	(%)	litre/hr	litre/hr	secs	m	
PH101	ND	ND	2.4	ND	2.4	18.5	ND	ND	ND	3.96	
PH102	0.79	ND	0.1	ND	0.1	20.4	25 5	0.6	240.0	4.28	Bung briefly removed before monitoring. Bailed 09:21 - 09:32 to 3.92m (22L). Remonitored 09:55.
PH104A	ND	ND	0.9	ND	0.9	19.2	0.2	ND	20.0	2.04	Valve not opening. Bung replaced before monitoring.
PH107	ND	ND	0.8	ND	0.8	20.0	0.2	ND	30.0	2.91	
PH108	2.75	ND	0.6	ND	0.6	19.9	ND	ND	ND	3.00	
PH110	2.10	ND	0.7	ND	0.7	19.9	ND	ND	ND	2.24	
PH112	2.74	ND	1.1	ND	0.9	19.7	0.3	ND	5 0	3.80	

Equipment Used:	Next Calibration Date
Gas Data GFM436 Infrared Gas Analyser Geotechnical Instruments Dipmeter	08/03/2023

Key	
ND	None Detected
NR	Not Recorded
1 0	Recorded value does not breach trigger levels
5.0	Recorded value breaches trigger level 1
10.0	Recorded value breaches trigger level 2

	Site Data:			Weather Station Data (Brettas Park Station)							CH_4	CO_2	O_2
	Temp (°C):	10 to 14		Barometric Pressure Trend:			Rising then falling						
Time:	08:39	09:13	10:13	01:03	07:03	08:39	09:12	10:11	12:10	Trigger level 1	1 0	5.0	16 0
Pressure (mb):	1008	1008	1007	1017	1018	1018	1019	1019	1018	Trigger level 2	5 0	10.0	10 0
	Weather Conditions:	Clear / Still											
	Surface Ground Conditions:	Wet											

Remarks:

Job Title:	Job No:
Darton Lane, Barnsley	4386
Client:	**Sheet :**
Duchy Homes	5 of 17

Date:	Arrival Time:	Depart Time:	Operator:
23/09/2022	08:10	10:20	Toby Tapp

Gas Monitoring Results:

Ambient Concentration (% Volume):	CH_4:	ND	CO_2:	ND	O_2:	20.3

Monitoring Point	Groundwater level	Concentrations					Gas Flow Rates			Bottom of well	Remarks
		Initial / Highest		Steady concentrations		Lowest concn	Initial / Maximum	Steady	Time to fall from highest to steady		
		CH_4	CO_2	CH_4	CO_2	O_2					
	(m) bgl	% v/v	(%)	% v/v	(%)	(%)	litre/hr	litre/hr	secs	m	
PH101	-	-	-	-	-	-	-	-	-	-	
PH102	2.34	ND	1.1	ND	1.1	19.2	120.0	14.6	510.0	4.26	Bailed 09:21 - 09:32 to 3.92m (22L). Remonitored 09:55. Flow maxed out at 120 litre/hr, actual peak flow probably higher
PH104A	-	-	-	-	-	-	-	-	-	-	
PH107	-	-	-	-	-	-	-	-	-	-	
PH108	-	-	-	-	-	-	-	-	-	-	
PH110	-	-	-	-	-	-	-	-	-	-	
PH112	-	-	-	-	-	-	-	-	-	-	

Equipment Used:	Next Calibration Date
Gas Data GFM436 Infrared Gas Analyser Geotechnical Instruments Dipmeter	08/03/2023

Key	
ND	None Detected
NR	Not Recorded
1 0	Recorded value does not breach trigger levels
5.0	Recorded value breaches trigger level 1
10.0	Recorded value breaches trigger level 2

	Site Data:			Weather Station Data (Brettas Park Station)					
	Temp (°C):	10 to 14		Barometric Pressure Trend:			Rising then falling		
Time:	08:39	09:13	10:13	01:03	07:03	08:39	09:12	10:11	12:10
Pressure (mb):	1008	1008	1007	1017	1018	1018	1019	1019	1018
	Weather Conditions:		Clear / Still						
	Surface Ground Conditions:		Wet						

	CH_4	CO_2	O_2
Trigger level 1	1 0	5.0	16 0
Trigger level 2	5 0	10.0	10 0

Remarks:

Job Title:	Job No:
Darton Lane, Barnsley	4386
Client:	**Sheet :**
Duchy Homes	6 of 17

Date:	Arrival Time:	Depart Time:	Operator:
24/10/2022	10:35	12:55	Toby Tapp

Gas Monitoring Results:

Ambient Concentration (% Volume):	CH_4:	ND	CO_2:	ND	O_2:	20.5

Monitoring Point	Groundwater level	Concentrations					Gas Flow Rates			Bottom of well	Remarks
		Initial / Highest		Steady concentrations		Lowest concn	Initial / Maximum	Steady	Time to fall from highest to steady		
		CH_4	CO_2	CH_4	CO_2	O_2					
	(m) bgl	% v/v	(%)	% v/v	(%)	(%)	litre/hr	litre/hr	secs	m	
PH101	ND	ND	2.3	ND	2.3	18.8	ND	ND	ND	3.96	
PH102	0.86	ND	1.9	ND	1.7	19.6	ND	ND	ND	4.19	Bailed 10:58 - 11:07 to 3 66m (18L). Remonitored at 12:06.
PH104A	ND	ND	0.1	ND	0.1	20.4	0.1	ND	5.0	2.05	
PH107	1.20	ND	0.7	ND	0.7	19.6	0.1	ND	5.0	2.92	Bailed 11:18 - 11:22 to 2 32m (8L). Remonitored at 12:15.
PH108	ND	ND	ND	ND	ND	20.5	0.1	ND	5.0	3.00	
PH110	2.13	ND	0.6	ND	0.6	20.1	0.1	ND	10.0	2.25	
PH112	1.28	ND	0.9	ND	0.7	20.1	0.9	ND	5 0	3.84	Bailed 11:47 - 11:50 to 3 60m (7L). Remonitored at 12:26.

Equipment Used:

Gas Data GFM436 Infrared Gas Analyser
Geotechnical Instruments Dipmeter

Next Calibration Date

08/03/2023

Key

ND	None Detected
NR	Not Recorded
1 0	Recorded value does not breach trigger levels
5.0	Recorded value breaches trigger level 1
10.0	Recorded value breaches trigger level 2

	Site Data:			Weather Station Data (Brettas Park Station)					
	Temp (°C):	12 to 14		Barometric Pressure Trend:			Rising		
Time:	10:44	11:39	12:31	01:03	08:44	10:44	11:37	12:31	14:31
Pressure (mb):	989	990	990	995	999	1001	1001	1001	1002

	CH_4	CO_2	O_2
Trigger level 1	1 0	5.0	16 0
Trigger level 2	5 0	10.0	10 0

Weather Conditions:	Light cloud / Gentle breeze
Surface Ground Conditions:	Damp

Remarks:

Large amount of standing water between PH108 and PH112 and between PH112 and PH110.

Job Title:	Job No:
Darton Lane, Barnsley	4386
Client:	**Sheet :**
Duchy Homes	7 of 17

Date:	Arrival Time:	Depart Time:	Operator:
24/10/2022	10:35	12:55	Toby Tapp

Gas Monitoring Results:

Ambient Concentration (% Volume):	CH_4:	ND	CO_2:	ND	O_2:	20.5

Monitoring Point	Groundwater level	Concentrations					Gas Flow Rates			Bottom of well	Remarks
		Initial / Highest		Steady concentrations		Lowest concn	Initial / Maximum	Steady	Time to fall from highest to steady		
		CH_4	CO_2	CH_4	CO_2	O_2					
	(m) bgl	% v/v	(%)	% v/v	(%)	(%)	litre/hr	litre/hr	secs	m	
PH101	-	-	-	-	-	-	-	-	-	-	
PH102	1.42	ND	2.2	ND	2.2	17.3	7.1	1.2	180.0	4.19	Bailed 10:58 - 11:07 to 3 66m (18L). Remonitored at 12:06.
PH104A	-	-	-	-	-	-	-	-	-	-	
PH107	2.20	ND	ND	ND	ND	20.6	0.1	ND	5.0	2.92	Bailed 11:18 - 11:22 to 2 32m (8L). Remonitored at 12:15.
PH108	-	-	-	-	-	-	-	-	-	-	
PH110	-	-	-	-	-	-	-	-	-	-	
PH112	2.05	ND	0.6	ND	0.5	20.0	0.6	0.4	150 0	3.84	Bailed 11:47 - 11:50 to 3 60m (7L). Remonitored at 12:26.

Equipment Used:	Next Calibration Date
Gas Data GFM436 Infrared Gas Analyser Geotechnical Instruments Dipmeter	08/03/2023

Key	
ND	None Detected
NR	Not Recorded
1 0	Recorded value does not breach trigger levels
5.0	Recorded value breaches trigger level 1
10.0	Recorded value breaches trigger level 2

	Site Data:			Weather Station Data (Brettas Park Station)					
	Temp (°C):	12 to 14		Barometric Pressure Trend:			Rising		
Time:	10:44	11:39	12:31	01:03	08:44	10:44	11:37	12:31	14:31
Pressure (mb):	989	990	990	995	999	1001	1001	1001	1002

	CH_4	CO_2	O_2
Trigger level 1	1 0	5.0	16 0
Trigger level 2	5 0	10.0	10 0

Weather Conditions:	Light cloud / Gentle breeze
Surface Ground Conditions:	Damp

Remarks:

Large amount of standing water between PH108 and PH112 and between PH112 and PH110.

Job Title:	Job No:
Darton Lane, Barnsley	4386
Client:	**Sheet :**
Duchy Homes	8 of 17

Date:	Arrival Time:	Depart Time:	Operator:
08/12/2022	08:55	10:45	Toby Tapp

Gas Monitoring Results:

Ambient Concentration (% Volume):	CH_4:	ND	CO_2:	ND	O_2:	20.4

Monitoring Point	Groundwater level	Concentrations					Gas Flow Rates			Bottom of well	Remarks
		Initial / Highest		Steady concentrations		Lowest concn	Initial / Maximum	Steady	Time to fall from highest to steady		
		CH_4	CO_2	CH_4	CO_2	O_2					
	(m) bgl	% v/v	(%)	% v/v	(%)	(%)	litre/hr	litre/hr	secs	m	
PH101	3.16	ND	ND	ND	ND	19.8	ND	ND	ND	3.96	
PH102	0.50	NR	NR	NR	NR	NR	NR	NR	NR	4.16	Dipped straight away. Bailed 09:46 - 09:54 to 3.62m (20L). Remonitored at 10:16.
PH104A	ND	ND	ND	ND	ND	20.0	ND	ND	ND	2.06	Bung briefly removed before monitoring.
PH107	1.59	ND	ND	ND	ND	19.8	ND	ND	ND	2.91	Bung briefly removed before monitoring.
PH108	2.94	ND	2.4	ND	2.4	**2.2**	ND	ND	ND	2.97	
PH110	1.69	ND	0.5	ND	0.5	20.0	ND	ND	ND	2.26	
PH112	1.95	ND	0.3	ND	0.3	20.2	ND	ND	ND	3.83	Bailed 09:17 - 09:23 to 3 37m (8L). Remonitored at 10:30.

Equipment Used:

Gas Data GFM436 Infrared Gas Analyser
Geotechnical Instruments Dipmeter

Next Calibration Date

08/03/2023

Key

ND	None Detected
NR	Not Recorded
1 0	Recorded value does not breach trigger levels
5.0	Recorded value breaches trigger level 1
10.0	Recorded value breaches trigger level 2

Site Data:			Weather Station Data (Brettas Park Station)					
Temp (°C):	-3 to -1		Barometric Pressure Trend:			Falling		
Time:	09:01	09:47	10:36	01:00	07:00	09:03	09:46	10:35	12:33
Pressure (mb):	1003	1001	1000	1016	1014	1014	1014	1013	1012

Weather Conditions:	Clear / Gentle breeze
Surface Ground Conditions:	Frozen

	CH_4	CO_2	O_2
Trigger level 1	1 0	5.0	16 0
Trigger level 2	5 0	10.0	10 0

Remarks:

Job Title:				Job No:
Darton Lane, Barnsley				4386
Client:				Sheet :
Duchy Homes				9 of 17
Date:	Arrival Time:	Depart Time:	Operator:	
08/12/2022	08:55	10:45	Toby Tapp	

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Gas Monitoring Results:

Ambient Concentration (% Volume):	CH_4:	ND	CO_2:	ND	O_2:	20.4

Monitoring Point	Groundwater level	Concentrations					Gas Flow Rates			Bottom of well	Remarks
		Initial / Highest		Steady concentrations		Lowest concn	Initial / Maximum	Steady	Time to fall from highest to steady		
		CH_4	CO_2	CH_4	CO_2	O_2					
	(m) bgl	% v/v	(%)	% v/v	(%)	(%)	litre/hr	litre/hr	secs	m	
PH101	-	-	-	-	-	-	-	-	-	-	
PH102	2.20	ND	1.7	ND	1.7	18.9	120.0	20.4	300.0	4.16	Bailed 09:46 - 09:54 to 3 62m (20L). Remonitored at 10:16. Flow maxed out, actual peak flow possibly higher. Bailing not e
PH104A	-	-	-	-	-	-	-	-	-	-	
PH107	-	-	-	-	-	-	-	-	-	-	
PH108	-	-	-	-	-	-	-	-	-	-	
PH110	-	-	-	-	-	-	-	-	-	-	
PH112	2.13	ND	0.6	ND	0 6	19.6	3.1	ND	5.0	3.83	Bailed 09:17 - 09:23 to 3 37m (8L). Remonitored at 10:30. Bailing not effective.

Equipment Used:

Gas Data GFM436 Infrared Gas Analyser
Geotechnical Instruments Dipmeter

Next Calibration Date

08/03/2023

Key

ND	None Detected
NR	Not Recorded
1 0	Recorded value does not breach trigger levels
5.0	Recorded value breaches trigger level 1
10.0	Recorded value breaches trigger level 2

Site Data:			Weather Station Data (Brettas Park Station)					
Temp (°C):	-3 to -1		Barometric Pressure Trend:			Falling		
Time:	09:01	09:47	10:36	01:00	07:00	09:03	09:46	10:35	12:33
Pressure (mb):	1003	1001	1000	1016	1014	1014	1014	1013	1012
Weather Conditions:	Clear / Gentle breeze								
Surface Ground Conditions:	Frozen								

	CH_4	CO_2	O_2
Trigger level 1	1 0	5.0	16 0
Trigger level 2	5 0	10.0	10 0

Remarks:

Job Title:	Job No:
Darton Lane, Barnsley	4386
Client:	**Sheet :**
Duchy Homes	10 of 17

Date:	Arrival Time:	Depart Time:	Operator:
19/12/2022	11:30	13:00	Toby Tapp

Gas Monitoring Results:

Ambient Concentration (% Volume):	CH_4:	ND	CO_2:	ND	O_2:	20.4

Monitoring Point	Groundwater level	Concentrations					Gas Flow Rates			Bottom of well	Remarks
		Initial / Highest		Steady concentrations		Lowest concn	Initial / Maximum	Steady	Time to fall from highest to steady		
		CH_4	CO_2	CH_4	CO_2	O_2					
	(m) bgl	% v/v	(%)	% v/v	(%)	(%)	litre/hr	litre/hr	secs	m	
PH101	3.55	ND	0.8	ND	0.8	18.0	41.2	0.6	240.0	3.97	
PH102	0.66	NR	NR	NR	NR	NR	NR	NR	NR	4.17	Dipped and bailed straight away. Bailed 12:13 - 12:20 to 3.48m (16L). Remonitored at 12:43.
PH104A	ND	ND	0.7	ND	0.7	17.7	ND	ND	ND	2.07	Bung briefly removed before monitoring.
PH107	ND	ND	0.5	ND	0.5	20.0	0.3	ND	5.0	2.91	Bung briefly removed before monitoring.
PH108	2.91	ND	2.3	ND	2.3	**6.7**	ND	ND	ND	3.00	
PH110	1.65	ND	0.1	ND	0.1	20.4	ND	ND	ND	2.26	
PH112	2.69	ND	0.7	ND	0.7	19.5	0.9	ND	10.0	3.87	Bung briefly removed before monitoring.

Equipment Used:

Gas Data GFM436 Infrared Gas Analyser
Geotechnical Instruments Dipmeter

Next Calibration Date

08/03/2023

Key

ND	None Detected
NR	Not Recorded
1 0	Recorded value does not breach trigger levels
5.0	Recorded value breaches trigger level 1
10.0	Recorded value breaches trigger level 2

	Site Data:			Weather Station Data (Brettas Park Station)					
	Temp (°C):	13		Barometric Pressure Trend:			Falling		
Time:	11:39	12:25	12:50	01:00	09:04	11:40	12:23	12:50	14:53
Pressure (mb):	988	988	987	1003	1001	1001	1000	1000	999

	CH_4	CO_2	O_2
Trigger level 1	1 0	5.0	16 0
Trigger level 2	5 0	10.0	10 0

Weather Conditions:	Light rain / Gentle breeze
Surface Ground Conditions:	Damp

Remarks:

Job Title:	Job No:
Darton Lane, Barnsley	4386
Client:	**Sheet :**
Duchy Homes	11 of 17

Date:	Arrival Time:	Depart Time:	Operator:
19/12/2022	11:30	13:00	Toby Tapp

Gas Monitoring Results:

Ambient Concentration (% Volume):	CH_4:	ND	CO_2:	ND	O_2:	20.4

Monitoring Point	Groundwater level	Concentrations: Initial / Highest		Concentrations: Steady concentrations		Concentrations: Lowest concn	Gas Flow Rates: Initial / Maximum	Gas Flow Rates: Steady	Gas Flow Rates: Time to fall from highest to steady	Bottom of well	Remarks
		CH_4	CO_2	CH_4	CO_2	O_2					
	(m) bgl	% v/v	(%)	% v/v	(%)	(%)	litre/hr	litre/hr	secs	m	
PH101	-	-	-	-	-	-	-	-	-	-	
PH102	2.42	ND	0.8	ND	0.8	20.0	120.0	22.2	300.0	4.17	Bailed 12:13 - 12:20 to 3.48m (16L). Remonitored at 12:43. Flow maxed out, actuual flow possibly higher. Bailing not effec
PH104A	-	-	-	-	-	-	-	-	-	-	
PH107	-	-	-	-	-	-	-	-	-	-	
PH108	-	-	-	-	-	-	-	-	-	-	
PH110	-	-	-	-	-	-	-	-	-	-	
PH112	-	-	-	-	-	-	-	-	-	-	

Equipment Used:

Gas Data GFM436 Infrared Gas Analyser
Geotechnical Instruments Dipmeter

Next Calibration Date

08/03/2023

Key

ND	None Detected
NR	Not Recorded
1 0	Recorded value does not breach trigger levels
5.0	Recorded value breaches trigger level 1
10.0	Recorded value breaches trigger level 2

	Site Data:			Weather Station Data (Brettas Park Station)					
	Temp (°C):	13		Barometric Pressure Trend:			Falling		
Time:	11:39	12:25	12:50	01:00	09:04	11:40	12:23	12:50	14:53
Pressure (mb):	988	988	987	1003	1001	1001	1000	1000	999

	CH_4	CO_2	O_2
Trigger level 1	1 0	5.0	16 0
Trigger level 2	5 0	10.0	10 0

Weather Conditions:	Light rain / Gentle breeze
Surface Ground Conditions:	Damp

Remarks:

Job Title:	Job No:
Darton Lane, Barnsley	4386
Client:	**Sheet :**
Duchy Homes	12 of 17

Date:	Arrival Time:	Depart Time:	Operator:
09/01/2023	11:30	13:40	Toby Tapp

Gas Monitoring Results:

Ambient Concentration (% Volume):	CH_4:	ND	CO_2:	ND	O_2:	20.0

Monitoring Point	Groundwater level	Concentrations					Gas Flow Rates			Bottom of well	Remarks
		Initial / Highest		Steady concentrations		Lowest concn	Initial / Maximum	Steady	Time to fall from highest to steady		
		CH_4	CO_2	CH_4	CO_2	O_2					
	(m) bgl	% v/v	(%)	% v/v	(%)	(%)	litre/hr	litre/hr	secs	m	
PH101	ND	ND	0.7	ND	0.7	17.4	ND	ND	ND	3.96	
PH102	0.10	NR	NR	NR	NR	NR	NR	NR	NR	4.08	Dipped and bailed straight away. Bailed 12:34 - 12:43 to 3.53m (24L). Remonitored at 13:04.
PH104A	ND	ND	ND	ND	ND	20.0	ND	ND	ND	2.06	
PH107	0.84	ND	0.3	ND	0.3	19.9	ND	ND	ND	2.92	Bailed 12:49 - 12:54 to 2 37m (10L). Remonitored at 13:19.
PH108	2.69	ND	1.9	ND	1.9	**3.7**	ND	ND	ND	2.97	
PH110	1.51	ND	0.2	ND	0.2	19.7	0.4	ND	5.0	2.25	
PH112	1.70	ND	0.6	ND	0.6	19.8	ND	ND	ND	3.88	Bailed 12:11 - 12:16 to 3.45m (10L). Remonitored at 13:26.

Equipment Used:

Gas Data GFM436 Infrared Gas Analyser
Geotechnical Instruments Dipmeter

Next Calibration Date

08/03/2023

Key

ND	None Detected
NR	Not Recorded
1 0	Recorded value does not breach trigger levels
5.0	Recorded value breaches trigger level 1
10.0	Recorded value breaches trigger level 2

	Site Data:			Weather Station Data (Brettas Park Station)					
	Temp (°C):	6 to 7		Barometric Pressure Trend:			Rising		
Time:	11:59	12:46	13:36	01:00	10:01	11:59	12:44	13:38	15:36
Pressure (mb):	987	989	990	986	988	1000	1000	1001	1003

	CH_4	CO_2	O_2
Trigger level 1	1 0	5.0	16 0
Trigger level 2	5 0	10.0	10 0

Weather Conditions:	Moderate cloud / Moderate breeze
Surface Ground Conditions:	Damp

Remarks:

Job Title:	Job No:
Darton Lane, Barnsley	4386
Client:	**Sheet :**
Duchy Homes	13 of 17

Date:	Arrival Time:	Depart Time:	Operator:
09/01/2023	11:30	13:40	Toby Tapp

Gas Monitoring Results:

Ambient Concentration (% Volume):	CH_4:	ND	CO_2:	ND	O_2:	20.0

Monitoring Point	Groundwater level	Concentrations: Initial / Highest		Concentrations: Steady concentrations		Concentrations: Lowest concn	Gas Flow Rates: Initial / Maximum	Gas Flow Rates: Steady	Gas Flow Rates: Time to fall from highest to steady	Bottom of well	Remarks
		CH_4	CO_2	CH_4	CO_2	O_2					
	(m) bgl	% v/v	(%)	% v/v	(%)	(%)	litre/hr	litre/hr	secs	m	
PH101	-	-	-	-	-	-	-	-	-	-	
PH102	2.10	ND	1.7	ND	1.7	19.2	120.0	20.7	360.0	4.08	Bailed 12:34 - 12:43 to 3 53m (24L). Remonitored at 13:04. Flow maxed out, actual flow possibly higher. Bailing not effecti
PH104A	-	-	-	-	-	-	-	-	-	-	
PH107	2.27	ND	ND	ND	ND	20.1	ND	ND	ND	2.92	Bailed 12:49 - 12:54 to 2 37m (10L). Remonitored at 13:19.
PH108	-	-	-	-	-	-	-	-	-	-	
PH110	-	-	-	-	-	-	-	-	-	-	
PH112	1.87	ND	0.7	ND	0.7	19.3	33.7	ND	240 0	3.88	Bailed 12:11 - 12:16 to 3.45m (10L). Remonitored at 13:26. Bailing not effective.

Equipment Used:

Gas Data GFM436 Infrared Gas Analyser
Geotechnical Instruments Dipmeter

Next Calibration Date

08/03/2023

Key

ND	None Detected
NR	Not Recorded
1 0	Recorded value does not breach trigger levels
5.0	Recorded value breaches trigger level 1
10.0	Recorded value breaches trigger level 2

Site Data:			Weather Station Data (Brettas Park Station)					
Temp (°C):	6 to 7		Barometric Pressure Trend:			Rising		
Time:	11:59	12:46	13:36	01:00	10:01	11:59	12:44	13:38	15:36
Pressure (mb):	987	989	990	986	988	1000	1000	1001	1003

	CH_4	CO_2	O_2
Trigger level 1	1 0	5.0	16 0
Trigger level 2	5 0	10.0	10 0

Weather Conditions:	Moderate cloud / Moderate breeze
Surface Ground Conditions:	Damp

Remarks:

Job Title:	Job No:
Darton Lane, Barnsley	4386
Client:	**Sheet :**
Duchy Homes	14 of 17

Date:	Arrival Time:	Depart Time:	Operator:
25/01/2023	12:20	14:00	Toby Tapp

Gas Monitoring Results:

Ambient Concentration (% Volume):	CH_4:	ND	CO_2:	ND	O_2:	20.2

Monitoring Point	Groundwater level	Concentrations					Gas Flow Rates			Bottom of well	Remarks
		Initial / Highest		Steady concentrations		Lowest concn	Initial / Maximum	Steady	Time to fall from highest to steady		
		CH_4	CO_2	CH_4	CO_2	O_2					
	(m) bgl	% v/v	(%)	% v/v	(%)	(%)	litre/hr	litre/hr	secs	m	
PH101	ND	ND	4.5	ND	4.5	**7.9**	65.1	2.4	240.0	3.95	
PH102	0.34	NR	NR	NR	NR	NR	NR	NR	NR	4.06	Just dipped.
PH104A	ND	ND	0.4	ND	0.4	19.1	ND	ND	ND	2.06	Bung blocked, monitored without a bung.
PH107	1.68	ND	0.5	ND	0.5	19.6	ND	ND	ND	2.92	
PH108	2.93	ND	1.8	ND	1.8	**12.2**	ND	ND	ND	2.97	Valve left open.
PH110	1.37	ND	0.3	ND	0.3	20.1	ND	ND	ND	2.25	Bailed 13:04 pm - 13:05 pm to 2.19 (2L). Remonitored at 13:48 pm.
PH112	2.03	ND	1.1	ND	1.1	19.6	ND	ND	ND	3.89	Bailed 12:52 pm - 12:58 pm to 3.66 (10L). Remonitored at 13:42 pm.

Equipment Used:	Next Calibration Date
Gas Data GFM436 Infrared Gas Analyser Geotechnical Instruments Dipmeter	08/03/2023

Key	
ND	None Detected
NR	Not Recorded
1 0	Recorded value does not breach trigger levels
5.0	Recorded value breaches trigger level 1
10.0	Recorded value breaches trigger level 2

Site Data:			Weather Station Data (Brettas Park Station)					
Temp (°C):	8 to 9		Barometric Pressure Trend:			Falling		
Time:	12:40	13:24	13:54	01:00	10:04	12:40	13:24	13:56	15:54
Pressure (mb):	1020	1019	1019	1037	1032	1031	1030	1030	1030

	CH_4	CO_2	O_2
Trigger level 1	1 0	5.0	16 0
Trigger level 2	5 0	10.0	10 0

Weather Conditions:	Overcast / Moderate breeze
Surface Ground Conditions:	Damp

Remarks:

Job Title:	Job No:
Darton Lane, Barnsley	4386
Client:	**Sheet :**
Duchy Homes	15 of 17

Date:	Arrival Time:	Depart Time:	Operator:
25/01/2023	12:20	14:00	Toby Tapp

Gas Monitoring Results:

Ambient Concentration (% Volume):	CH_4:	ND	CO_2:	ND	O_2:	20.2

Monitoring Point	Groundwater level	Concentrations					Gas Flow Rates			Bottom of well	Remarks
		Initial / Highest		Steady concentrations		Lowest concn	Initial / Maximum	Steady	Time to fall from highest to steady		
		CH_4	CO_2	CH_4	CO_2	O_2					
	(m) bgl	% v/v	(%)	% v/v	(%)	(%)	litre/hr	litre/hr	secs	m	
PH101	-	-	-	-	-	-	-	-	-	-	
PH102	-	-	-	-	-	-	-	-	-	-	
PH104A	-	-	-	-	-	-	-	-	-	-	
PH107	-	-	-	-	-	-	-	-	-	-	
PH108	-	-	-	-	-	-	-	-	-	-	
PH110	2.16	ND	ND	ND	ND	20.3	ND	ND	ND	2.25	Bailed 13:04 pm - 13:05 pm to 2.19 (2L). Remonitored at 13:48 pm.
PH112	2.31	ND	0.5	ND	0 5	20.1	23.7	1.8	180 0	3.89	Bailed 12:52 pm - 12:58 pm to 3.66 (10L). Remonitored at 13:42 pm.

Equipment Used:

Gas Data GFM436 Infrared Gas Analyser
Geotechnical Instruments Dipmeter

Next Calibration Date

08/03/2023

Key

ND	None Detected
NR	Not Recorded
1 0	Recorded value does not breach trigger levels
5.0	Recorded value breaches trigger level 1
10.0	Recorded value breaches trigger level 2

Site Data:			Weather Station Data (Brettas Park Station)					
Temp (°C):	8 to 9		Barometric Pressure Trend:			Falling		
Time:	12:40	13:24	13:54	01:00	10:04	12:40	13:24	13:56	15:54
Pressure (mb):	1020	1019	1019	1037	1032	1031	1030	1030	1030

	CH_4	CO_2	O_2
Trigger level 1	1 0	5.0	16 0
Trigger level 2	5 0	10.0	10 0

Weather Conditions:	Overcast / Moderate breeze
Surface Ground Conditions:	Damp

Remarks:

Job Title:	Job No:
Darton Lane, Barnsley	4386
Client:	**Sheet :**
Duchy Homes	16 of 17

Date:	Arrival Time:	Depart Time:	Operator:
08/02/2023	12:55	14:10	Toby Tapp

Gas Monitoring Results:

Ambient Concentration (% Volume):	CH_4:	ND	CO_2:	ND	O_2:	20.3

Monitoring Point	Groundwater level	Concentrations: Initial / Highest		Concentrations: Steady concentrations		Concentrations: Lowest concn	Gas Flow Rates: Initial / Maximum	Gas Flow Rates: Steady	Gas Flow Rates: Time to fall from highest to steady	Bottom of well	Remarks
		CH_4	CO_2	CH_4	CO_2	O_2					
	(m) bgl	% v/v	(%)	% v/v	(%)	(%)	litre/hr	litre/hr	secs	m	
PH101	ND	ND	4.3	ND	4.3	**10.0**	1.8	ND	30.0	3.95	
PH102	0.46	NR	NR	NR	NR	NR	NR	NR	NR	4.07	Checked for high GW, too high to gas monitor. Response zone flooded. Bailing not effective.
PH104A	ND	ND	0.6	ND	0.6	18.5	ND	ND	ND	2.07	Bung blocked. Replaced before monitoring.
PH107	1.55	ND	0.5	ND	0.5	20.1	ND	ND	ND	2.92	
PH108	ND	ND	4.7	ND	4.7	**0.8**	ND	ND	ND	2.95	
PH110	1.87	ND	0.2	ND	0.2	20.2	ND	ND	ND	2.25	
PH112	2.26	ND	0.9	ND	0.9	18.8	ND	ND	ND	3.95	Bailed 13:13 pm - 13:16 pm to 3.66m (8L). Remonitored at 13:55 pm.

Equipment Used:

Gas Data GFM436 Infrared Gas Analyser
Geotechnical Instruments Dipmeter

Next Calibration Date

08/03/2023

Key

ND	None Detected
NR	Not Recorded
1 0	Recorded value does not breach trigger levels
5.0	Recorded value breaches trigger level 1
10.0	Recorded value breaches trigger level 2

Site Data:			Weather Station Data (Brettas Park Station)					
Temp (°C):	9 to 10		Barometric Pressure Trend:			Falling		
Time:	13:02	13:39	14:00	01:01	10:59	13:03	13:41	14:02	16:11
Pressure (mb):	1020	1020	1019	1038	1033	1031	1031	1030	1029

Weather Conditions:	Clear / Still
Surface Ground Conditions:	Damp

	CH_4	CO_2	O_2
Trigger level 1	1 0	5.0	16 0
Trigger level 2	5 0	10.0	10 0

Remarks:

Job Title:	Job No:
Darton Lane, Barnsley	4386
Client:	**Sheet :**
Duchy Homes	17 of 17

Date:	Arrival Time:	Depart Time:	Operator:
08/02/2023	12:55	14:10	Toby Tapp

Gas Monitoring Results:

Ambient Concentration (% Volume):	CH_4:	ND	CO_2:	ND	O_2:	20.3

Monitoring Point	Groundwater level	Concentrations					Gas Flow Rates			Bottom of well	Remarks
		Initial / Highest		Steady concentrations		Lowest concn	Initial / Maximum	Steady	Time to fall from highest to steady		
		CH_4	CO_2	CH_4	CO_2	O_2					
	(m) bgl	% v/v	(%)	% v/v	(%)	(%)	litre/hr	litre/hr	secs	m	
PH101	-	-	-	-	-	-	-	-	-	-	
PH102	-	-	-	-	-	-	-	-	-	-	
PH104A	-	-	-	-	-	-	-	-	-	-	
PH107	-	-	-	-	-	-	-	-	-	-	
PH108	-	-	-	-	-	-	-	-	-	-	
PH110	-	-	-	-	-	-	-	-	-	-	
PH112	2.43	ND	0.4	ND	0.4	20.1	ND	ND	ND	3.95	Bailed 13:13 pm - 13:16 pm to 3.66m (8L). Remonitored at 13:55 pm. Recharge too quick.

Equipment Used:

Gas Data GFM436 Infrared Gas Analyser
Geotechnical Instruments Dipmeter

Next Calibration Date

08/03/2023

Key

ND	None Detected
NR	Not Recorded
1 0	Recorded value does not breach trigger levels
5.0	Recorded value breaches trigger level 1
10.0	Recorded value breaches trigger level 2

Site Data:			Weather Station Data (Brettas Park Station)					
Temp (°C):	9 to 10		Barometric Pressure Trend:			Falling		
Time:	13:02	13:39	14:00	01:01	10:59	13:03	13:41	14:02	16:11
Pressure (mb):	1020	1020	1019	1038	1033	1031	1031	1030	1029

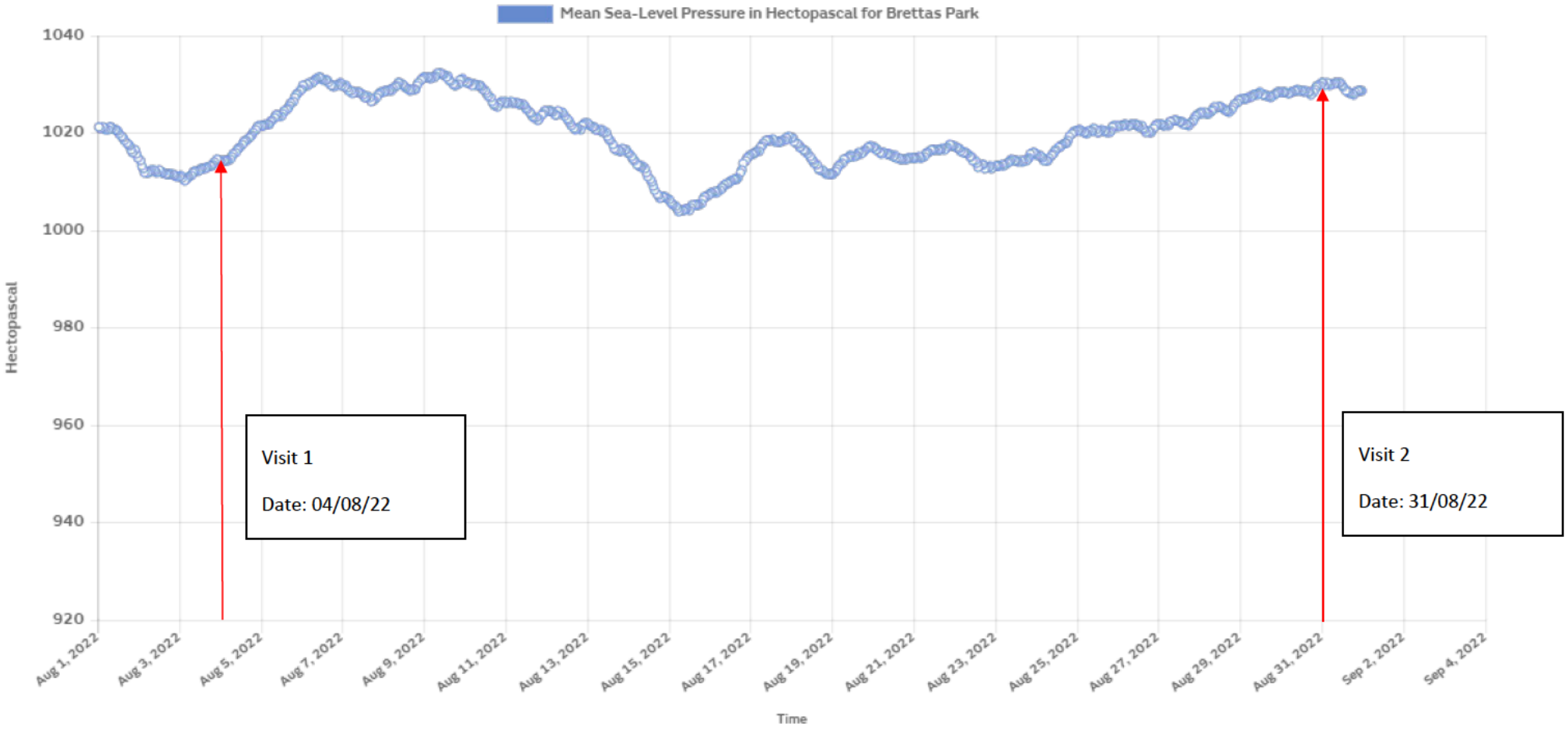
Weather Conditions:	Clear / Still
Surface Ground Conditions:	Damp

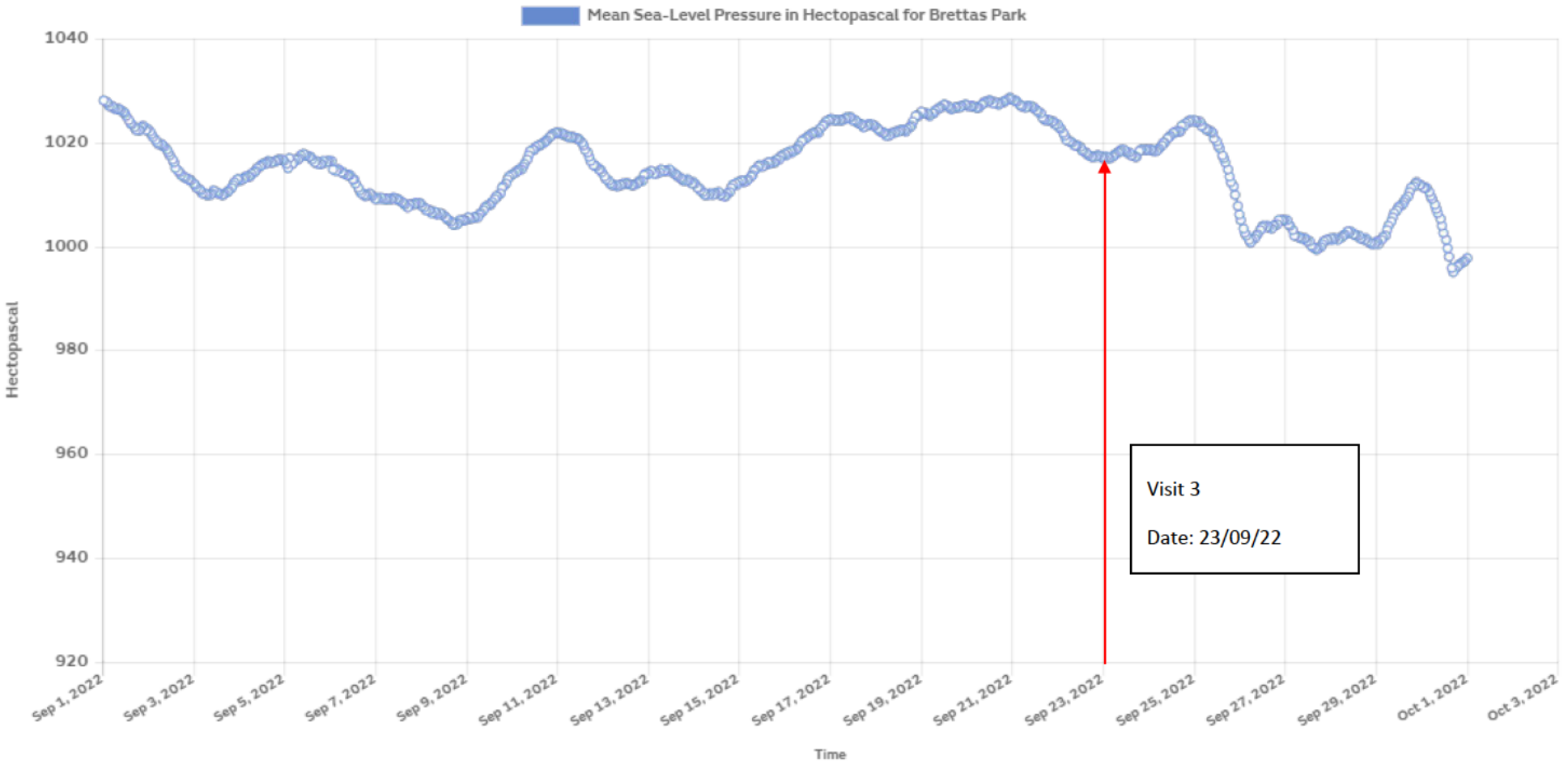
	CH_4	CO_2	O_2
Trigger level 1	1 0	5.0	16 0
Trigger level 2	5 0	10.0	10 0

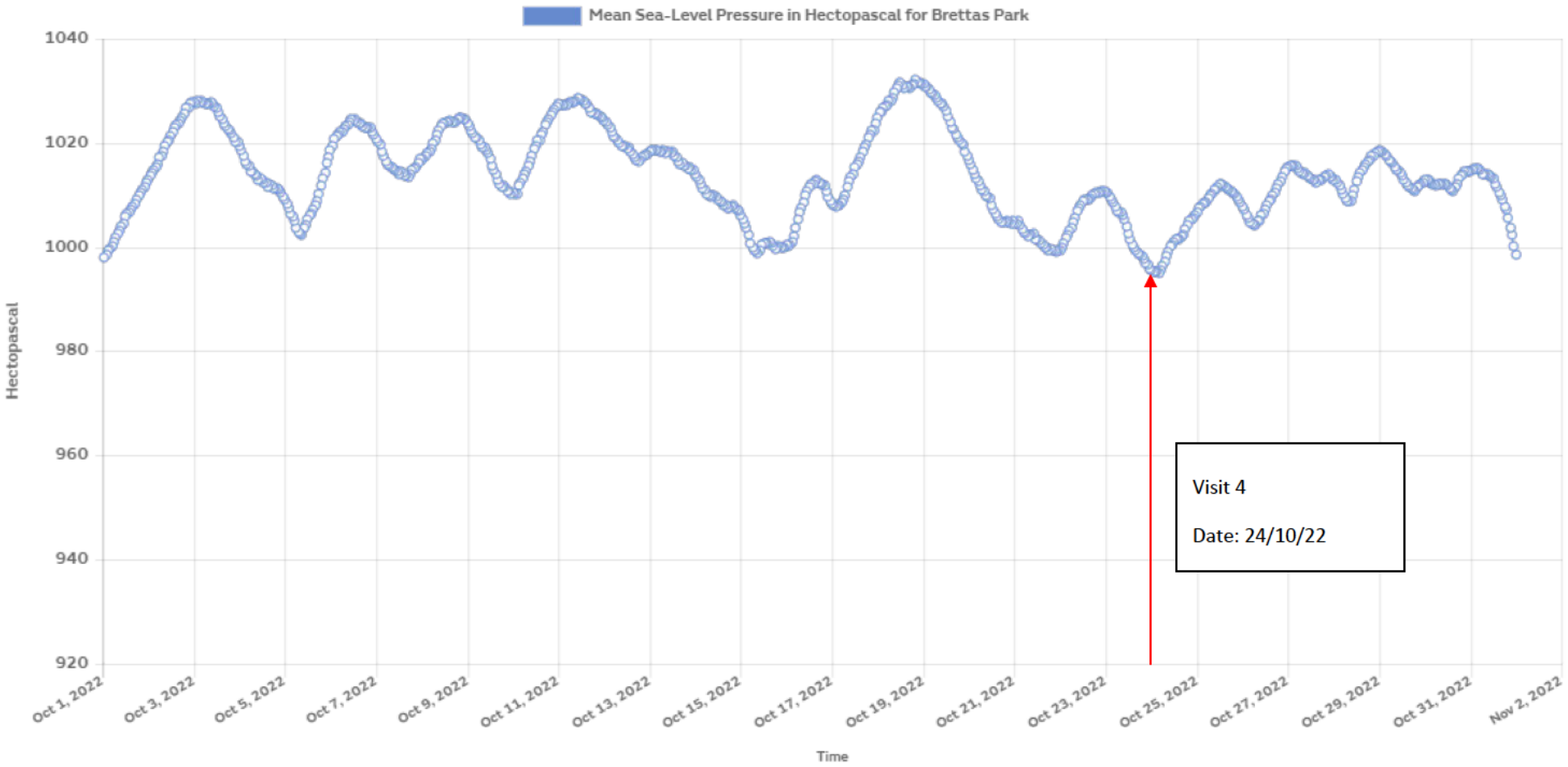
Remarks:

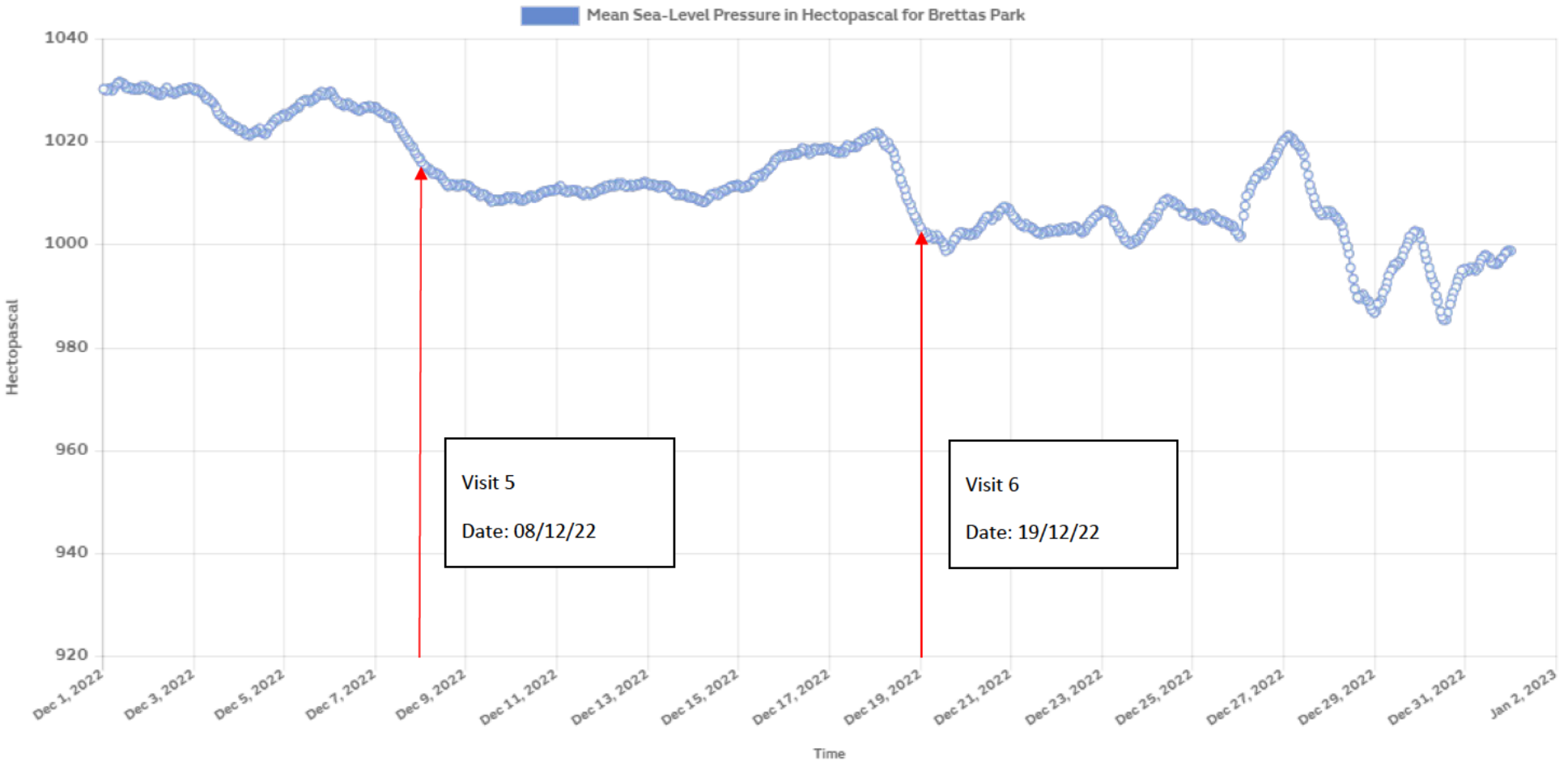
APPENDIX D

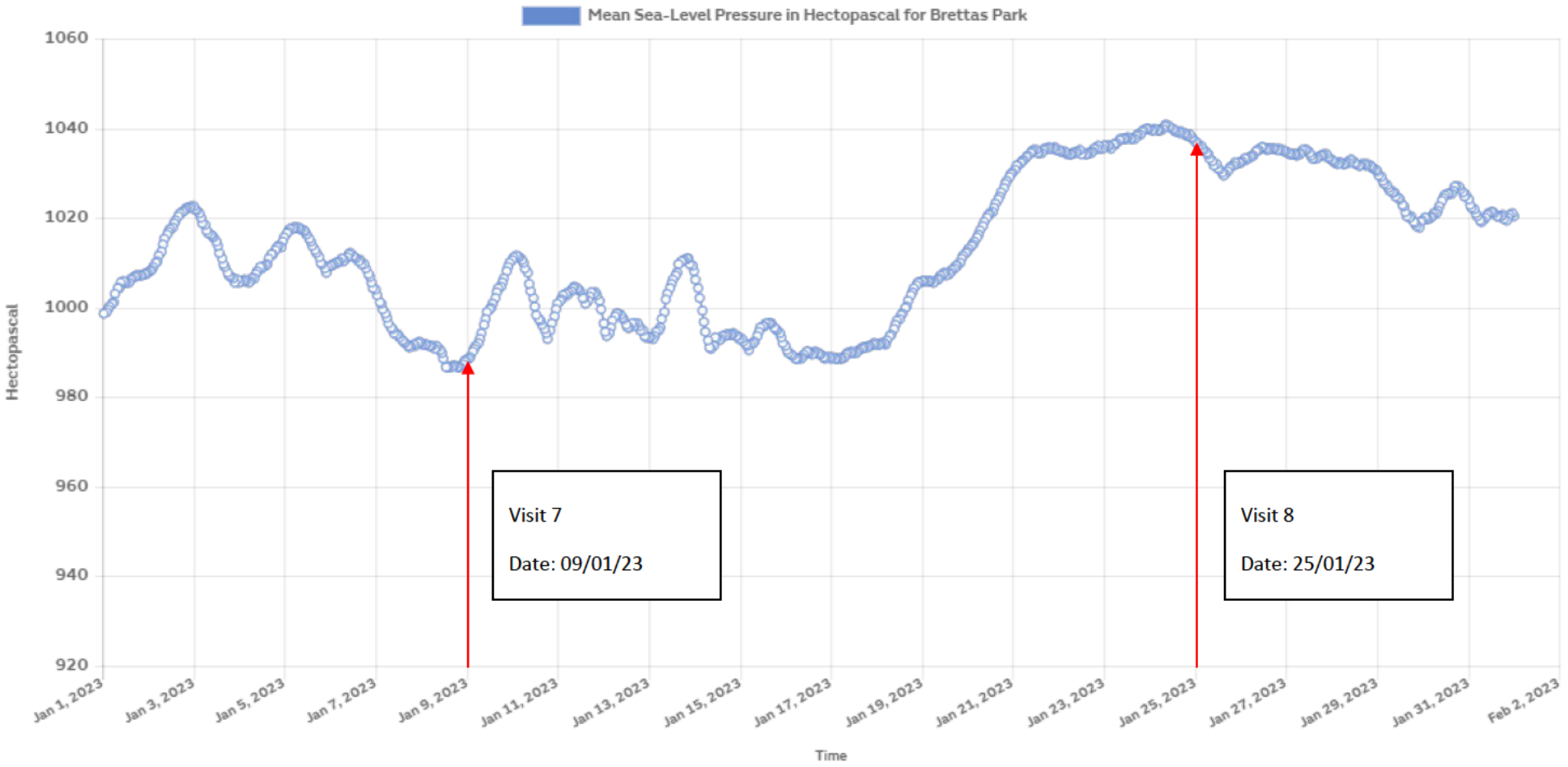
Atmospheric Pressure Graphs

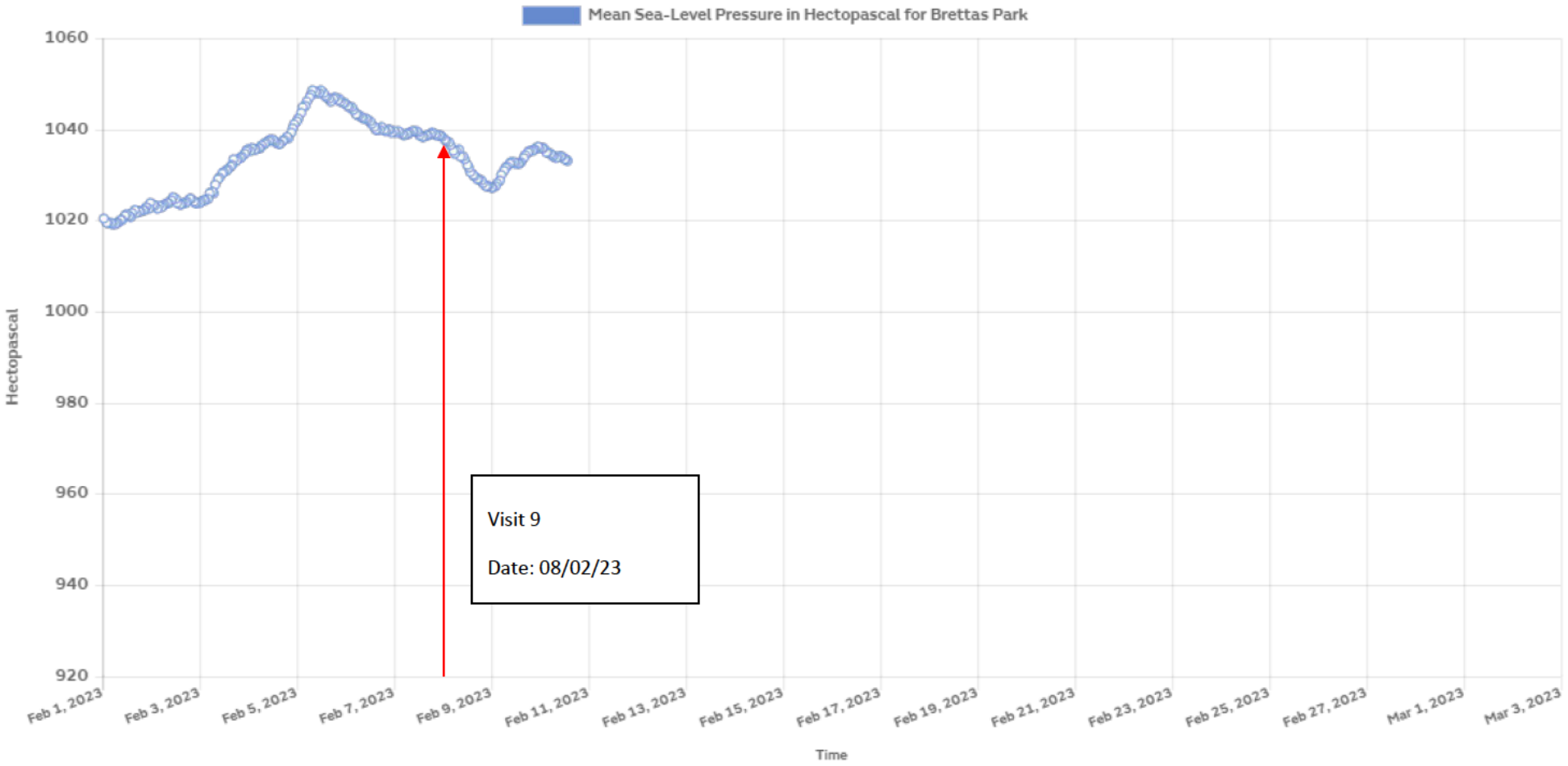

Mean Sea-Level Pressure in Hectopascal for Brettas Park
Hectopascal
1040
1020
1000
980
960
940
920
Aug 1, 2022
Aug 3, 2022
Aug 5, 2022
Aug 7, 2022
Aug 9, 2022
Aug 11, 2022
Aug 13, 2022
Aug 15, 2022
Aug 17, 2022
Aug 19, 2022
Aug 21, 2022
Aug 23, 2022
Aug 25, 2022
Aug 27, 2022
Aug 29, 2022
Aug 31, 2022
Sep 2, 2022
Sep 4, 2022
Time
Visit 1
Date: 04/08/22
Visit 2
Date: 31/08/22


Mean Sea-Level Pressure in Hectopascal for Brettas Park
1040
1020
1000
980
960
940
920
Hectopascal
Sep 1, 2022
Sep 3, 2022
Sep 5, 2022
Sep 7, 2022
Sep 9, 2022
Sep 11, 2022
Sep 13, 2022
Sep 15, 2022
Sep 17, 2022
Sep 19, 2022
Sep 21, 2022
Sep 23, 2022
Sep 25, 2022
Sep 27, 2022
Sep 29, 2022
Oct 1, 2022
Oct 3, 2022
Time
Visit 3
Date: 23/09/22


Mean Sea-Level Pressure in Hectopascal for Brettas Park
1040
1020
1000
980
960
940
920
Hectopascal
Oct 1, 2022
Oct 3, 2022
Oct 5, 2022
Oct 7, 2022
Oct 9, 2022
Oct 11, 2022
Oct 13, 2022
Oct 15, 2022
Oct 17, 2022
Oct 19, 2022
Oct 21, 2022
Oct 23, 2022
Oct 25, 2022
Oct 27, 2022
Oct 29, 2022
Oct 31, 2022
Nov 2, 2022
Time
Visit 4
Date: 24/10/22


Mean Sea-Level Pressure in Hectopascal for Brettas Park
1040
1020
1000
980
960
940
920
Hectopascal
Visit 5
Date: 08/12/22
Visit 6
Date: 19/12/22
Dec 1, 2022
Dec 3, 2022
Dec 5, 2022
Dec 7, 2022
Dec 9, 2022
Dec 11, 2022
Dec 13, 2022
Dec 15, 2022
Dec 17, 2022
Dec 19, 2022
Dec 21, 2022
Dec 23, 2022
Dec 25, 2022
Dec 27, 2022
Dec 29, 2022
Dec 31, 2022
Jan 2, 2023
Time


Mean Sea-Level Pressure in Hectopascal for Brettas Park
1060
1040
1020
1000
980
960
940
920
Hectopascal
Jan 1, 2023
Jan 3, 2023
Jan 5, 2023
Jan 7, 2023
Jan 9, 2023
Jan 11, 2023
Jan 13, 2023
Jan 15, 2023
Jan 17, 2023
Jan 19, 2023
Jan 21, 2023
Jan 23, 2023
Jan 25, 2023
Jan 27, 2023
Jan 29, 2023
Jan 31, 2023
Feb 2, 2023
Time
Visit 7
Date: 09/01/23
Visit 8
Date: 25/01/23


Mean Sea-Level Pressure in Hectopascal for Brettas Park
1060
1040
1020
1000
980
960
940
920
Hectopascal
Visit 9
Date: 08/02/23
Feb 1, 2023
Feb 3, 2023
Feb 5, 2023
Feb 7, 2023
Feb 9, 2023
Feb 11, 2023
Feb 13, 2023
Feb 15, 2023
Feb 17, 2023
Feb 19, 2023
Feb 21, 2023
Feb 23, 2023
Feb 25, 2023
Feb 27, 2023
Mar 1, 2023
Mar 3, 2023
Time

APPENDIX E
Monitoring Well Installations

LITHOS CONSULTING

Borehole Log

Borehole No. **PH101**

Sheet 1 of 3

Project Name: Darton Lane, Barnsley	Project No. 4386	Co-ords: 432057.00 - 409839.00	Hole Type PH
Location: Darton Lane, Barnsley		Level: 73.80	Scale 1:50
Client: Duchy Homes		Dates: 12/07/2022 - 12/07/2022	Logged By AT

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
								Overburden - Residual Soils (OVERBURDEN)
					2.70	71.10		Orangish brown SILTSTONE (COAL MEASURES)
					5.00	68.80		Black Carbonaceous MUDSTONE (COAL MEASURES)
					6.50	67.30		Black Coal (THIN COAL)
					6.90	66.90		Whitish grey MUDSTONE (COAL MEASURES)
								Continued on next sheet

Remarks

1. Prior to drilling a Cable Avoidance Tool (CAT) survey was carried out. 2. Groundwater was not apparent during drilling. 3. Flush returns were lost temporarily at 25.8, quickly returning to almost full flush shortly after. 4. Co-ordinates from hand held GPS, hole not surveyed in on completion. 5. Approximate ground level (mAOD) taken from topographical survey.

AGS

LITHOS CONSULTING

Borehole Log

Borehole No.
PH101
Sheet 2 of 3

Project Name: Darton Lane, Barnsley	Project No. 4386	Co-ords: 432057.00 - 409839.00	Hole Type PH
Location: Darton Lane, Barnsley		Level: 73.80	Scale 1:50
Client: Duchy Homes		Dates: 12/07/2022 - 12/07/2022	Logged By AT

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
					12.50	61.30		Black COAL (DUNSIL COAL)
					13.00	60.80		Whitish grey MUDSTONE (COAL MEASURES)
					16.80	57.00		Carbonaceous MUDSTONE (COAL MEASURES)
					18.00	55.80		Dark grey MUDSTONE (COAL MEASURES)
								Continued on next sheet

11 12 13 14 15 16 17 18 19 20

Remarks
1. Prior to drilling a Cable Avoidance Tool (CAT) survey was carried out. 2. Groundwater was not apparent during drilling. 3. Flush returns were lost temporarily at 25.8, quickly returning to almost full flush shortly after. 4. Co-ordinates from hand held GPS, hole not surveyed in on completion. 5. Approximate ground level (mAOD) taken from topographical survey.

AGS

LITHOS CONSULTING

Borehole Log

Borehole No.
PH101
Sheet 3 of 3

Project Name:	Darton Lane, Barnsley	Project No. 4386	Co-ords:	432057.00 - 409839.00	Hole Type PH
Location:	Darton Lane, Barnsley		Level:	73.80	Scale 1:50
Client:	Duchy Homes		Dates:	12/07/2022 - 12/07/2022	Logged By AT

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
					24.50	49.30		Whiteish grey MUDSTONE (COAL MEASURES)
								At 25.8m; spontaneous full loss of flush, quickly returning to paretial flush once rods pulled up slightly. Solid Ground maintained throughout flush loss. Some water being continuously lost to ground (approximatley maintaining 95% flush).
					29.70	44.10		End of borehole at 29.70 m

21 22 23 24 25 26 27 28 29 30

Remarks
1. Prior to drilling a Cable Avoidance Tool (CAT) survey was carried out. 2. Groundwater was not apparent during drilling. 3. Flush returns were lost temporarily at 25.8, quickly returning to almost full flush shortly after. 4. Co-ordinates from hand held GPS, hole not surveyed in on completion. 5. Approximate ground level (mAOD) taken from topographical survey.

AGS

LITHOS CONSULTING

Borehole Log

Borehole No. **PH102**

Sheet 1 of 3

Project Name:	Darton Lane, Barnsley	Project No. 4386	Co-ords:	431843.00 - 409872.00	Hole Type PH
Location:	Darton Lane, Barnsley		Level:	68.60	Scale 1:50
Client:	Duchy Homes		Dates:	13/07/2022 - 13/07/2022	Logged By AT

Well	Water Strikes	Samples and In Situ Testing: Depth (m)	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
								Overburden - Residual Soils (OVERBURDEN)
					2.00	66.60		Brown SILTSTONE (COAL MEASURES)
					4.80	63.80		Grey MUDSTONE (COAL MEASURES)
					6.20	62.40		Black vitreous COAL (GAWBER COAL)
					6.60	62.00		Grey MUDSTONE (COAL MEASURES)
								At 9.8m; temporary loss of flush for 60 seconds, returning to
								Continued on next sheet

1 2 3 4 5 6 7 8 9 10

Remarks

1. Prior to drilling a Cable Avoidance Tool (CAT) survey was carried out. 2. Groundwater was not apparent during drilling. 3. Flush returns were lost temporarily at 9.8m, quickly returning to full flush shortly after. 4. Co-ordinates from hand held GPS, hole not surveyed in on completion. 5. Approximate ground level (mAOD) taken from topographical survey.

AGS

Borehole Log

Borehole No. **PH102**

Sheet 2 of 3

Project Name: Darton Lane, Barnsley	Project No. 4386	Co-ords: 431843.00 - 409872.00	Hole Type PH
Location: Darton Lane, Barnsley		Level: 68.60	Scale 1:50
Client: Duchy Homes		Dates: 13/07/2022 - 13/07/2022	Logged By AT

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
								full flush. Solid ground encountered during temporary flush loss.
					13.60	55.00		Black COAL (THIN COAL)
					13.90	54.70		Grey MUDSTONE (COAL MEASURES)
								Continued on next sheet

11 12 13 14 15 16 17 18 19 20

Remarks

1. Prior to drilling a Cable Avoidance Tool (CAT) survey was carried out. 2. Groundwater was not apparent during drilling. 3. Flush returns were lost temporarily at 9.8m, quickly returning to full flush shortly after. 4. Co-ordinates from hand held GPS, hole not surveyed in on completion. 5. Approximate ground level (mAOD) taken from topographical survey.

LITHOS CONSULTING

Borehole Log

Borehole No.
PH102
Sheet 3 of 3

Project Name:	Darton Lane, Barnsley	Project No. 4386	Co-ords:	431843.00 - 409872.00	Hole Type PH
Location:	Darton Lane, Barnsley		Level:	68.60	Scale 1:50
Client:	Duchy Homes		Dates:	13/07/2022 - 13/07/2022	Logged By AT

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
					22.00	46.60		Black carbonaceous MUDSTONE (COAL MEASURES)
					22.70	45.90		Grey MUDSTONE (COAL MEASURES)
					23.20	45.40		Black carbonaceous MUDSTONE (COAL MEASURES)
					23.60	45.00		Grey MUDSTONE (COAL MEASURES)
					30.00	38.60		End of borehole at 30.00 m

21 22 23 24 25 26 27 28 29 30

Remarks
1. Prior to drilling a Cable Avoidance Tool (CAT) survey was carried out. 2. Groundwater was not apparent during drilling. 3. Flush returns were lost temporarily at 9.8m, quickly returning to full flush shortly after. 4. Co-ordinates from hand held GPS, hole not surveyed in on completion. 5. Approximate ground level (mAOD) taken from topographical survey.

AGS

LITHOS CONSULTING

Borehole Log

Borehole No.
PH104A
Sheet 1 of 1

Project Name:	Darton Lane, Barnsley	Project No. 4386	Co-ords:	431799.00 - 409827.00	Hole Type PH
Location:	Darton Lane, Barnsley		Level:	69.20	Scale 1:50
Client:	Duchy Homes		Dates:	14/07/2022 - 14/07/2022	Logged By AT

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
								Overburden - Residual Soils (OVERBURDEN)
					2.00	67.20		End of borehole at 2.00 m

Remarks
1. Prior to drilling a Cable Avoidance Tool (CAT) survey was carried out. 2. Groundwater was not apparent during drilling. 3. Co-ordinates from hand held GPS, hole not surveyed in. 4. Approximate ground level (mAOD) taken from topographical survey.

AGS

LITHOS CONSULTING

Borehole Log

Borehole No. **PH107**

Sheet 1 of 3

Project Name:	Darton Lane, Barnsley	Project No. 4386	Co-ords:	431705.00 - 409804.00	Hole Type PH
Location:	Darton Lane, Barnsley		Level:	69.41	Scale 1:50
Client:	Duchy Homes		Dates:	15/07/2022 - 15/07/2022	Logged By AT

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
								Overburden - Residual Soils (OVERBURDEN)
					1.00	68.41		Orangish brown SANDSTONE (COAL MEASURES)
					4.00	65.41		Grey MUDSTONE (COAL MEASURES)
								At 4.4m; loss of flush returns - still in solid ground. Casing taken to 4.5m - full flush returned.
								Continued on next sheet

1 2 3 4 5 6 7 8 9 10

Remarks

1. Prior to drilling a Cable Avoidance Tool (CAT) survey was carried out. 2. Groundwater was not apparent during drilling. 3. Full loss of flush returns at from 12.6m to 15.0m. 4. Co-ordinates from hand held GPS, hole not surveyed in on completion. 5. Approximate ground level (mAOD) taken from topographical survey.

AGS

Borehole Log

Borehole No. **PH107**

Sheet 2 of 3

Project Name:	Darton Lane, Barnsley	Project No. 4386	Co-ords:	431705.00 - 409804.00	Hole Type PH
Location:	Darton Lane, Barnsley		Level:	69.41	Scale 1:50
Client:	Duchy Homes		Dates:	15/07/2022 - 15/07/2022	Logged By AT

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
					12.60	56.81		Broken GROUND (WORKINGS - BARNSLEY COAL) *At 12.6m; full loss of flush returns. Drilling noted to be of increased speed and not steady, although hole still required drilling rather than soft push.* *At 13.8m; drilling speed reduced - although noticeably faster than drilling mudstone.*
					15.00	54.41		Black COAL (BARNSLEY COAL) *At 15.0m; flush returned and black coal flush arisings.*
					15.80	53.61		Grey MUDSTONE (COAL MEASURES) *At 16.8m; drilling stopped to fill water tanks. Upon resuming, hole has become blocked from 15.0m likely due to soft ground from workings. Intermittant flush returns as a result.*

Continued on next sheet

Remarks

1. Prior to drilling a Cable Avoidance Tool (CAT) survey was carried out. 2. Groundwater was not apparent during drilling. 3. Full loss of flush returns at from 12.6m to 15.0m. 4. Co-ordinates from hand held GPS, hole not surveyed in on completion. 5. Approximate ground level (mAOD) taken from topographical survey.

LITHOS CONSULTING

Borehole Log

Borehole No.
PH107
Sheet 3 of 3

Project Name:	Darton Lane, Barnsley	Project No. 4386	Co-ords:	431705.00 - 409804.00	Hole Type PH
Location:	Darton Lane, Barnsley		Level:	69.41	Scale 1:50
Client:	Duchy Homes		Dates:	15/07/2022 - 15/07/2022	Logged By AT

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
					21.00	48.41		End of borehole at 21 00 m

Remarks
1. Prior to drilling a Cable Avoidance Tool (CAT) survey was carried out. 2. Groundwater was not apparent during drilling. 3. Full loss of flush returns at from 12.6m to 15.0m. 4. Co-ordinates from hand held GPS, hole not surveyed in on completion. 5. Approximate ground level (mAOD) taken from topographical survey.

AGS

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Borehole Log

Borehole No.
PH108
Sheet 1 of 3

Project Name:	Darton Lane, Barnsley	Project No. 4386	Co-ords:	432159.00 - 409800.00	Hole Type PH
Location:	Darton Lane, Barnsley		Level:	74.45	Scale 1:50
Client:	Duchy Homes		Dates:	18/07/2022 - 18/07/2022	Logged By AT

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
								Overburden - Residual Soils (OVERBURDEN)
					2.00	72.45		Brown SILTSTONE (COAL MEASURES)
					3.00	71.45		Grey MUDSTONE (COAL MEASURES)
								At 6.9m; a possible thin coal seam.
								Continued on next sheet

Remarks

1. Prior to drilling a Cable Avoidance Tool (CAT) survey was carried out. 2. Groundwater was not apparent during drilling. 3. Partial loss of flush returns at from 28.0m. 4. Co-ordinates from hand held GPS, hole not surveyed in on completion. 5. Approximate ground level (mAOD) taken from topographical survey.

AGS

Borehole Log

Borehole No. **PH108**

Sheet 2 of 3

Project Name:	Darton Lane, Barnsley	Project No. 4386	Co-ords:	432159.00 - 409800.00	Hole Type PH
Location:	Darton Lane, Barnsley		Level:	74.45	Scale 1:50
Client:	Duchy Homes		Dates:	18/07/2022 - 18/07/2022	Logged By AT

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
					16.60	57.85		Carbonaceous MUDSTONE (COAL MEASURES)
					18.50	55.95		Grey MUDSTONE (COAL MEASURES)
								Continued on next sheet

Remarks

1. Prior to drilling a Cable Avoidance Tool (CAT) survey was carried out. 2. Groundwater was not apparent during drilling. 3. Partial loss of flush returns at from 28.0m. 4. Co-ordinates from hand held GPS, hole not surveyed in on completion. 5. Approximate ground level (mAOD) taken from topographical survey.

Borehole Log

Borehole No. **PH108**

Sheet 3 of 3

Project Name:	Darton Lane, Barnsley	Project No. 4386	Co-ords:	432159.00 - 409800.00	Hole Type PH
Location:	Darton Lane, Barnsley		Level:	74.45	Scale 1:50
Client:	Duchy Homes		Dates:	18/07/2022 - 18/07/2022	Logged By AT

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
					22.00	52.45		Black carbonaceous MUDSTONE (COAL MEASURES)
					22.20	52.25		Grey MUDSTONE (COAL MEASURES)
					28.10	46.35		*At 28.0m; partial loss of flush returns (approx 50%).* Black COAL (DUNSIL COAL)
					28.80	45.65		Grey MUDSTONE (COAL MEASURES)
					30.00	44.45		End of borehole at 30.00 m

Remarks

1. Prior to drilling a Cable Avoidance Tool (CAT) survey was carried out. 2. Groundwater was not apparent during drilling. 3. Partial loss of flush returns at from 28.0m. 4. Co-ordinates from hand held GPS, hole not surveyed in on completion. 5. Approximate ground level (mAOD) taken from topographical survey.

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Borehole Log

Borehole No.
PH110
Sheet 1 of 1

Project Name:	Darton Lane, Barnsley	Project No. 4386	Co-ords:	432267.00 - 409760.00	Hole Type PH
Location:	Darton Lane, Barnsley		Level:	76.05	Scale 1:50
Client:	Duchy Homes		Dates:	20/07/2022 - 20/07/2022	Logged By AT

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
								Overburden - Residual Soils (OVERBURDEN)
					2.00	74.05		Brownish SILTSTONE (COAL MEASURES)
					2.30	73.75		Black vitreous COAL (BARNSLEY COAL)
					5.30	70.75		Grey MUDSTONE (COAL MEASURES)
					9.00	67.05		End of borehole at 9.00 m

Remarks

1. Prior to drilling a Cable Avoidance Tool (CAT) survey was carried out. 2. Groundwater was not apparent during drilling. 3. No loss of flush returns during drilling. 4. Co-ordinates from hand held GPS, hole not surveyed in. 5. Approximate ground level (mAOD) taken from topographical survey.

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Borehole Log

Borehole No.
PH112
Sheet 1 of 1

Project Name:	Darton Lane, Barnsley	Project No. 4386	Co-ords:	432210.00 - 409772.00	Hole Type PH
Location:	Darton Lane, Barnsley		Level:	74.50	Scale 1:50
Client:	Duchy Homes		Dates:	21/07/2022 - 21/07/2022	Logged By AT

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
								Overburden - Residual Soils (OVERBURDEN)
					2.00	72.50		Brown SILTSTONE (COAL MEASURES)
					6.20	68.30		Grey MUDSTONE (COAL MEASURES)
					9.00	65.50		End of borehole at 9.00 m

Remarks

1. Prior to drilling a Cable Avoidance Tool (CAT) survey was carried out. 2. Groundwater was not apparent during drilling. 3. No loss of flush returns during drilling. 4. Co-ordinates from hand held GPS, hole not surveyed in. 5. Approximate ground level (mAOD) taken from topographical survey.

AGS