023/1792/ASw/REG

6th June 2014

Mr B Reynolds
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Dear Brian

Moorthorpe Way, Owlthorpe – Gas Risk assessment

Further to our Geoenvironmental Appraisal Report (No. 1792/2, dated March 2014), 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 1792/2, reviews soil-gas conditions, assesses risks and details any mitigation measures required to render the site suitable for the proposed development.

1. Background

The site is located off Moorthorpe Gate, approximately 7.5km south-east of Sheffield city centre (NGR SK418 827), and occupies an area of approximately 6.8 hectares (16.8 acres).

In relation to hazardous gas, the above-mentioned report found that whilst there are no former landfill sites within 250m, the site is underlain by shallow coal seams, and might be at risk from mines gas.

Based on the above, it was considered that the site might be at risk from hazardous gas and therefore monitoring wells were installed in ten boreholes. Details of the individual installations are provided in Report No 1792/2.

The proposed development comprises two to three storey domestic dwellings, associated gardens, POS and adoptable roads and sewers. No site layout has been provided at this stage. The houses will be founded on conventional strip/trenchfill footings.

2. Scope of Works

The generation potential of the gas source was initially considered to be Very Low and this has been confirmed by the monitoring results obtained. Consequently, in general accordance with CIRIA Report C665, given the proposed residential end use, six visits have been completed over a three month period, between January and April 2014.

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 GFM430 infra-red gas analyser
- Standing water level using a dipmeter

3. Gas Monitoring Results

The monitoring results are enclosed and summarised below:

Monitoring Well	Response Zone	Range of Methane Concentrations (% v/v)	Range of Carbon Dioxide Concentrations (% v/v)	Range of Steady Flow Rates (litre/hour)
PH01A	2.0m to 5.0m (Coal Measures)	ND	1.5 to 2.0	ND to 0.3
PH02A	2.3m to 4.0m (Coal Measures)	NR	NR	NR
PH03A	1.4m to 3.0m (Coal Measures)	ND	0.6 to 2.3	ND to 0.1
PH04A	1.4m to 3.0m (Coal Measures)	ND	ND to 0.9	ND
PH05A	1.5m to 4.0m (Coal Measures)	ND	ND to 0.8	ND to 0.1
PH06A	2.0m to 6.0m (Coal Measures)	ND	0.8 to 3.2	ND to 0.1
PH07A	2.0m to 6.0m (Coal Measures)	ND	0.4 to 1.8	ND to 0.3
PH08A	2.0m to 6.0m (Coal Measures)	ND	ND to 0.9	ND to 0.7
PH09A	1.5m to 7.0m (Coal Measures)	ND	0.1 to 4.2	ND to 0.1
PH10A	2.0m to 6.0m (Coal Measures)	ND	ND to 0.7	ND to 0.7

ND = None Detected, NR = Not Recorded

Note: Atmospheric pressures varied between 970mb and 1019mb.
In accordance with the DETR approach, a default value of 0.1 litres/hour has been used in the absence of any recorded flows; i.e. the limit of detection of the flow rate equipment.

During two of the six monitoring visits, atmospheric pressure was falling, both where the pressure was below 1000mb. Plots of atmospheric pressure versus time, with the monitoring visits indicated, are appended to this letter report.

The installation within PH02a was vandalised and therefore could not be monitored.

An initial peak of 69 litres/second was recorded in PH10A during visit 5, but this flow is almost certainly associated with a rise of groundwater in the monitoring well. Where water rises into the plain casing, above the slotted pipe, a positive pressure is created within the casing - groundwater was recorded at 0.83m bgl in PH10A during the 5th monitoring visit (the plain well casing extends to 1.0m bgl, and this well had been bailed to remove some water during Visit 4).

This "trapped" air is released when the well valve is opened resulting in short-lived, but high flow, and consequently represents release of a positive pressure rather than significant generation of gas. A steady flow rate of 0.0 litres/hour was recorded 33 seconds after the initial high flow.

By definition peak flows are short-lived (typically <30 seconds), so their contribution to hazardous gas concentrations within a large sub-floor void is negligible. Where "peak flows" are maintained for longer than 30 seconds, they should generally be regarded as steady flows. Consequently, we believe steady flows should be used to derive GSVs.

It is worth noting that very shallow groundwater (<1m bgl) was encountered throughout in PHs 01A, 02A & 10A. Groundwater in the other wells was typically in excess of 2m, although shallower than this on occasion in PHs 3A, 4A & 5A. The very shallow groundwater in PHs 01A, 02A & 10A might indicate sub-artesian conditions which are only evident where a borehole intercepts more permeable strata (e.g. sandstone or coal rather than mudstone, and\or fractured\thinly bedded bedrock).

4. Current Guidance

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

5. Current Gas Regime

The proposed residential development comprises low rise residential housing. Consequently, the gas regime has been characterised in accordance with the Situation B (traffic light) methodology outlined in CIRIA Report C665.

Based on worst-case (peak) gas concentrations and steady flows, Gas Screening Values (GSVs) for Methane and Carbon Dioxide are 0.0 litre/hour and 0.03 litre/hour respectively. These GSVs equate to Green gas regime (traffic light) for this site.

Where Green, Lithos also consider the site in accordance with Situation A methodology (which does not assume a ventilated sub-floor) to check whether or not it lies within Characteristic Situation 1 (in which case no measures would be appropriate), or Characteristic Situation 2 (in which case a ventilated sub-floor void and membrane should be required). The GSV of 0.03 litres/hour classes the site as Characteristic Situation 1.

6. Scope of Protection Measures

Based on the site characterisation (Traffic Light) discussed above, the proposed foundation solution, and with reference to the gas protection "scoring" system outlined in BS 8485:2007, Lithos consider that no special protective measures are required in any new dwellings.

The Table below summarises available options for the floor slab and DPM:

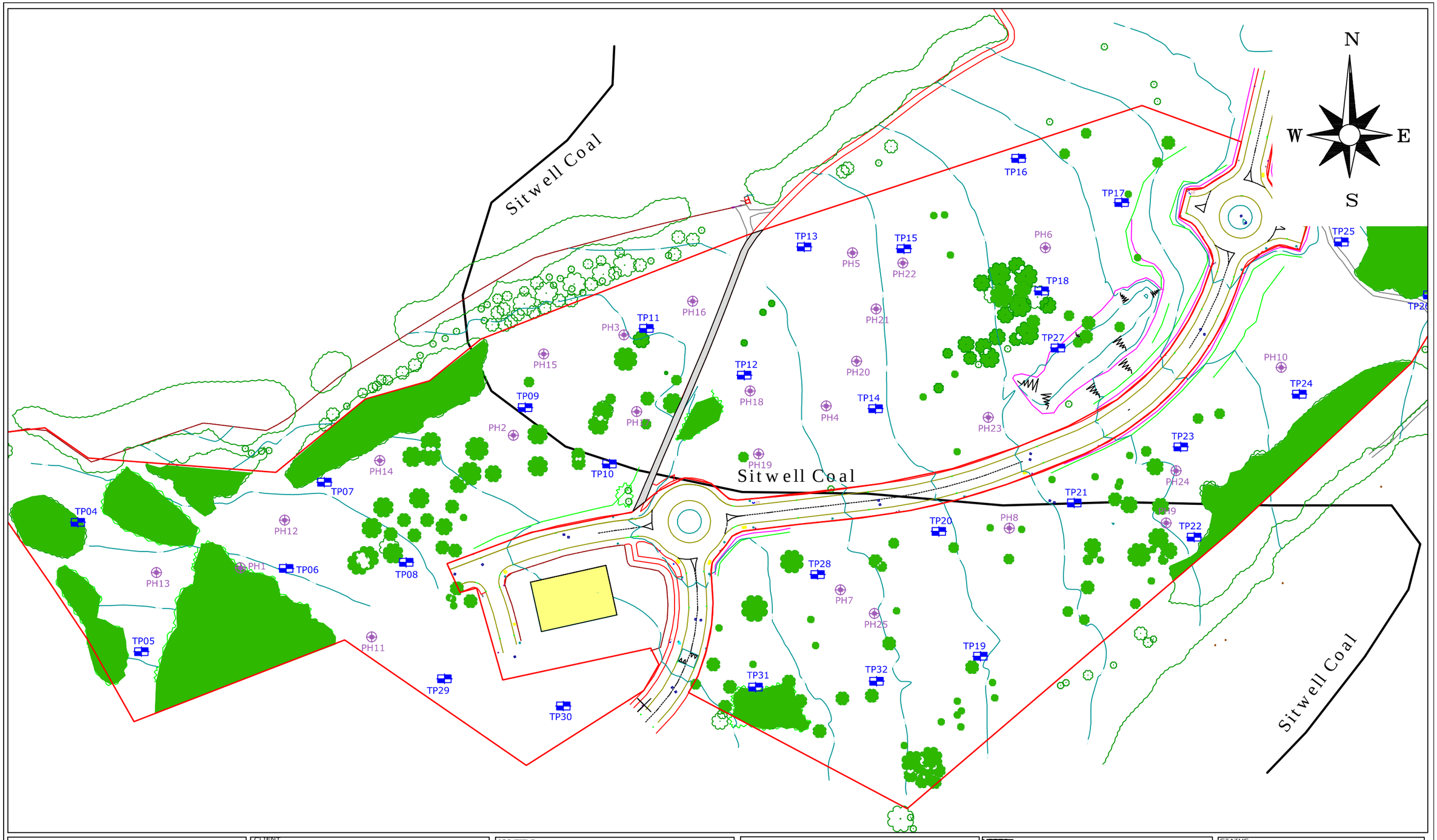
Traffic Light Classificn	Gas "score" req'd by BS 8485	Floor Slab (BS8485 "score")	Protective Measures	
			Sub-floor ventilation (BS8485 "score")	Membrane Type (BS8485 "score")
Green & **CS1** (Wilson & Card)	**0**	Well constructed ground-bearing or suspended	Not required for ground bearing slab, otherwise to comply with Building Regulations (Part C).	Waterproof DPM (1200g polyethylene)

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

Yours sincerely

Alan Swales
Principal Engineer
for and on behalf of
LITHOS CONSULTING LIMITED

Enclosures:
Drawing 1792/6 – Borehole Location Plan
Gas Monitoring Results
Borehole Logs
Atmospheric pressure trend



LITHOS CONSULTING

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Tel 0845 680 9781

CLIENT

KIER SERVICES

JOB TITLE

MOORTHORPE WAY,
OWLTHORPE

DRAWING TITLE

EXPLORATORY HOLE
LOCATION PLAN

NOTES

AREAS WHERE ROCK COVER OVER COAL IS LESS THAN 10 x SEAM THICKNESS

TRIAL PIT LOCATION

PROBEHOLE LOCATION

APPROXIMATE SITE BOUNDARY

APPROXIMATE OUTCROP OF SITWELL COAL

REV.	DESCRIPTION	DATE

STATUS

FOR COMMENT ☐ FOR APPROVAL ☐ DRAFT ☐ FINAL ☑

DRAWN	DATE
ASw	15 01 14
APPROVED	DATE
REG	15 01 14

SCALE	SHEET
1:2,000	A3

DRAWING NO.	REVISION
1792/6	

PROBEHOLE LOG

CLIENT Kier Services

SITE Moorthorpe Way, Owlthorpe

PH1A

DATE 07/01/2014 to 07/01/2014

Co-ords -

Ground Level -

Sheet 1 of 1

Scale 1:100

sample no & type	depth (m)	casing depth (m)	well/ backfill	description	depth (m)	level (m)	ground water	legend
				Clay (OVERBURDEN)				
				MUDSTONE (LOWER COAL MEASURES)	1.90			
				COAL (THIN COAL)	4.10			
				End of probehole at 5.00 m	5.00			

Remarks

1. Prior to drilling a Cable Avoidance Tool (CAT) survey was carried out.
2. Groundwater was not apparent during drilling.
3. Gas/groundwater monitoring well installed on completion.

Equipment/Methods	Logged by	JOB	FIGURE
Casagrande C6 tracked drilling rig equipped with 100mm tri-cone bit and air flush.	ASw	1792	

PROBEHOLE LOG

CLIENT Kier Services

SITE Moorthorpe Way, Owlthorpe

PH2A

DATE 07/01/2014 to 07/01/2014

Co-ords -

Ground Level -

Sheet 1 of 1

Scale 1:100

sample no & type	depth (m)	casing depth (m)	well/ backfill	description	depth (m)	level (m)	ground water	legend
				Clay (OVERBURDEN)				
				MUDSTONE (LOWER COAL MEASURES)	2.30			
				End of probehole at 4.00 m	4.00			

Remarks

1. Prior to drilling a Cable Avoidance Tool (CAT) survey was carried out.
2. Groundwater was not apparent during drilling.
3. Gas/groundwater monitoring well installed on completion.

Equipment/Methods	Logged by	JOB	FIGURE
Casagrande C6 tracked drilling rig equipped with 100mm tri-cone bit and air flush.	ASw	1792	

PROBEHOLE LOG

CLIENT Kier Services

SITE Moorthorpe Way, Owlthorpe

PH3A

DATE 07/01/2014 to 07/01/2014

Co-ords -

Ground Level -

Sheet 1 of 1

Scale 1:100

sample no & type	depth (m)	casing depth (m)	well/ backfill	description	depth (m)	level (m)	ground water	legend
				Clay (OVERBURDEN)				
				MUDSTONE (LOWER COAL MEASURES)	1.40			
				End of probehole at 3.00 m	3.00			

Remarks

1. Prior to drilling a Cable Avoidance Tool (CAT) survey was carried out.
2. Groundwater was not apparent during drilling.
3. Gas/groundwater monitoring well installed on completion.

Equipment/Methods	Logged by	JOB	FIGURE
Casagrande C6 tracked drilling rig equipped with 100mm tri-cone bit and air flush.	ASw	1792	

PROBEHOLE LOG

CLIENT Kier Services

SITE Moorthorpe Way, Owlthorpe

PH4A

DATE 07/01/2014 to 07/01/2014

Co-ords -

Ground Level -

Sheet 1 of 1

Scale 1:100

sample no & type	depth (m)	casing depth (m)	well/ backfill	description	depth (m)	level (m)	ground water	legend
				Clay (OVERBURDEN)				
				MUDSTONE (LOWER COAL MEASURES)	1.40			
				End of probehole at 3.00 m	3.00			

Remarks

1. Prior to drilling a Cable Avoidance Tool (CAT) survey was carried out.
2. Groundwater was not apparent during drilling.
3. Gas/groundwater monitoring well installed on completion.

Equipment/Methods	Logged by	JOB	FIGURE
Casagrande C6 tracked drilling rig equipped with 100mm tri-cone bit and air flush.	ASw	1792	

PROBEHOLE LOG

CLIENT Kier Services

SITE Moorthorpe Way, Owlthorpe

PH5A

DATE 07/01/2014 to 07/01/2014

Co-ords -

Ground Level -

Sheet 1 of 1

Scale 1:100

sample no & type	depth (m)	casing depth (m)	well/ backfill	description	depth (m)	level (m)	ground water	legend
				Clay (OVERBURDEN)				
				MUDSTONE (LOWER COAL MEASURES)	1.40			
				End of probehole at 4.00 m	4.00			

Remarks

1. Prior to drilling a Cable Avoidance Tool (CAT) survey was carried out.
2. Groundwater was not apparent during drilling.
3. Gas/groundwater monitoring well installed on completion.

Equipment/Methods	Logged by	JOB	FIGURE
Casagrande C6 tracked drilling rig equipped with 100mm tri-cone bit and air flush.	ASw	1792	

PROBEHOLE LOG

CLIENT Kier Services

SITE Moorthorpe Way, Owlthorpe

PH6A

DATE 09/01/2014 to 09/01/2014

Co-ords -

Ground Level -

Sheet 1 of 1

Scale 1:100

sample no & type	depth (m)	casing depth (m)	well/ backfill	description	depth (m)	level (m)	ground water	legend
				Clay (OVERBURDEN)				
				MUDSTONE with SANDSTONE bands (LOWER COAL MEASURES)	1.80			
				End of probehole at 6.00 m	6.00			

Remarks

1. Prior to drilling a Cable Avoidance Tool (CAT) survey was carried out.
2. Groundwater was not apparent during drilling.
3. Gas/groundwater monitoring well installed on completion.

Equipment/Methods	Logged by	JOB	FIGURE
Casagrande C6 tracked drilling rig equipped with 100mm tri-cone bit and air flush.	ASw	1792	

PROBEHOLE LOG

CLIENT Kier Services

SITE Moorthorpe Way, Owlthorpe

PH7A

DATE 09/01/2014 to 09/01/2014

Co-ords -

Ground Level -

Sheet 1 of 1

Scale 1:100

sample no & type	depth (m)	casing depth (m)	well/ backfill	description	depth (m)	level (m)	ground water	legend
				Clay (OVERBURDEN)				
				MUDSTONE (LOWER COAL MEASURES)	2.00			
				End of probehole at 6.00 m	6.00			

Remarks

1. Prior to drilling a Cable Avoidance Tool (CAT) survey was carried out.
2. Groundwater was not apparent during drilling.
3. Gas/groundwater monitoring well installed on completion.

Equipment/Methods	Logged by	JOB	FIGURE
Casagrande C6 tracked drilling rig equipped with 100mm tri-cone bit and air flush.	ASw	1792	

PROBEHOLE LOG

CLIENT Kier Services

SITE Moorthorpe Way, Owlthorpe

PH8A

DATE 09/01/2014 to 09/01/2014

Co-ords -

Ground Level -

Sheet 1 of 1

Scale 1:100

sample no & type	depth (m)	casing depth (m)	well/ backfill	description	depth (m)	level (m)	ground water	legend
				Clay (OVERBURDEN)				
				MUDSTONE with SANDSTONE bands (LOWER COAL MEASURES)	1.40			
				End of probehole at 6.00 m	6.00			

Remarks

1. Prior to drilling a Cable Avoidance Tool (CAT) survey was carried out.
2. Groundwater was not apparent during drilling.
3. Gas/groundwater monitoring well installed on completion.

Equipment/Methods	Logged by	JOB	FIGURE
Casagrande C6 tracked drilling rig equipped with 100mm tri-cone bit and air flush.	ASw	1792	

PROBEHOLE LOG

CLIENT Kier Services

SITE Moorthorpe Way, Owlthorpe

PH9A

DATE 09/01/2014 to 09/01/2014

Co-ords -

Ground Level -

Sheet 1 of 1

Scale 1:100

sample no & type	depth (m)	casing depth (m)	well/ backfill	description	depth (m)	level (m)	ground water	legend
				Clay (OVERBURDEN)				
				MUDSTONE with SANDSTONE bands (LOWER COAL MEASURES)	1.40			
				End of probehole at 7.00 m	7.00			

Remarks

1. Prior to drilling a Cable Avoidance Tool (CAT) survey was carried out.
2. Groundwater was not apparent during drilling.
3. Gas/groundwater monitoring well installed on completion.

Equipment/Methods	Logged by	JOB	FIGURE
Casagrande C6 tracked drilling rig equipped with 100mm tri-cone bit and air flush.	ASw	1792	

PROBEHOLE LOG

CLIENT Kier Services

SITE Moorthorpe Way, Owlthorpe

PH10A

DATE 09/01/2014 to 09/01/2014

Co-ords -

Ground Level -

Sheet 1 of 1

Scale 1:100

sample no & type	depth (m)	casing depth (m)	well/ backfill	description	depth (m)	level (m)	ground water	legend
				Clay (OVERBURDEN)				
				MUDSTONE with SANDSTONE bands (LOWER COAL MEASURES)	1.60			
				End of probehole at 6.00 m	6.00			

Remarks

1. Prior to drilling a Cable Avoidance Tool (CAT) survey was carried out.
2. Groundwater was not apparent during drilling.
3. Gas/groundwater monitoring well installed on completion.

Equipment/Methods	Logged by	JOB	FIGURE
Casagrande C6 tracked drilling rig equipped with 100mm tri-cone bit and air flush.	ASw	1792	

Job Title:				Job No:
Moorthorpe Way, Owlthorpe				1792
Client:				Sheet :
Kier Services				1 of 1
Date:	Arrival Time:	Depart Time:	Operator:	
28/01/2014	15:10	17:30	Martin Thompson	

LITHOS CONSULTING

Gas Monitoring Results:

Ambient Concentration (% Volume):	CH_4:	0.0	CO_2:	0.0	O_2:	20.9

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	
PH01a	0.75	ND	2.0	ND	2.0	19.7	0.1	0.1	30.0	4.87	
PH02a	0.00	NR	NR	NR	NR	NR	ND	ND	ND	3.51	
PH03a	0.62	ND	0.6	ND	0.6	20.2	ND	ND	ND	2.72	
PH04a	0.96	ND	ND	ND	ND	20.9	ND	ND	ND	2.92	
PH05a	1.56	ND	ND	ND	ND	20.6	ND	ND	ND	3.68	
PH06a	2.88	ND	1.4	ND	1.4	19.0	ND	ND	ND	2.87	
PH07a	2.96	ND	1.8	ND	1.8	18.4	0.3	0.3	30.0	5.87	
PH08a	3.63	ND	ND	ND	ND	**15.1**	ND	ND	ND	4.85	
PH09a	1.98	ND	0.2	ND	0.2	**15.9**	-12.4	0.0	14.0	6.47	
PH10a	0.37	ND	ND	ND	ND	20.4	3.7	0.0	45.0	3.93	

Notes

Equipment Used:

Gas Data GFM430 Infrared Gas Analyser
Geotechnical Instruments Dipmeter

Next Calibration Date

24/07/2014

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 (Meadowhead Station)									
	Temp (°C):	5		Barometric Pressure Trend:			Increasing				CH_4	CO_2	O_2
Time:	15:25	16:37	17:18	00:29	07:02	12:04	16:10	20:22	23:43	Trigger level 1	1.0	5.0	16.0
Pressure (mb):	970	971	971	982	978	979	981	984	987	Trigger level 2	5.0	10.0	10.0
	Weather Conditions:	Overcast, rainy											
	Surface Ground Conditions:	Wet											

Remarks:

Job Title:				Job No:
Moorthorpe Way, Owlthorpe				1792
Client:				Sheet :
Kier Services				1 of 1
Date:	Arrival Time:	Depart Time:	Operator:	
04/02/2014	11:20	12:40	Martin Thompson	

LITHOS CONSULTING

Gas Monitoring Results:

Ambient Concentration (% Volume):	CH_4:	0.0	CO_2:	0.0	O_2:	21.1

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	
PH01a	0.73	ND	1.5	ND	1.5	20.3	ND	ND	ND	4.89	Well bailed.
PH02a	0.03	NR	NR	NR	NR	NR	ND	ND	ND	3.50	Well flooded therefore gas composition could not be recorded.
PH03a	1.94	ND	1.2	ND	1.2	19.4	ND	ND	ND	2.72	
PH04a	1.11	ND	ND	ND	ND	20.9	ND	ND	ND	2.92	Well bailed.
PH05a	1.96	ND	ND	ND	ND	20.7	ND	ND	ND	3.68	
PH06a	3.17	ND	1.3	ND	1.3	19.5	ND	ND	ND	4.86	
PH07a	3.16	ND	0.9	ND	0.9	20.1	ND	ND	ND	5.87	
PH08a	3.89	ND	0.3	ND	0.3	**13.0**	0.3	0.2	20.0	4.87	
PH09a	2.13	ND	0.1	ND	0.1	21.2	ND	ND	ND	6.42	
PH10a	0.51	ND	0.1	ND	0.1	20.6	-0.3	-0.3	30.0	3.92	Well bailed.

Notes

Equipment Used:
Gas Data GFM430 Infrared Gas Analyser
Geotechnical Instruments Dipmeter

Next Calibration Date
24/07/2014

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 (Norton Lees Station)									
	Temp (°C):	6		Barometric Pressure Trend:			Decreasing				CH_4	CO_2	O_2
Time:	11:29	12:11	12:32	00:06	07:03	11:49	14:04	18:04	23:02	Trigger level 1	1.0	5.0	16.0
Pressure (mb):	988	985	986	995	995	996	995	991	985	Trigger level 2	5.0	10.0	10.0
	Weather Conditions:		Sunny intervals, light breeze										
	Surface Ground Conditions:		Wet										

Remarks:

Job Title:				Job No:
Moorthorpe Way, Owlthorpe				1792
Client:				Sheet :
Kier Services				1 of 1
Date:	Arrival Time:	Depart Time:	Operator:	
14/02/2014	11:10	12:10	Martin Thompson	

LITHOS CONSULTING

Gas Monitoring Results:

Ambient Concentration (% Volume):	CH_4:	0.0	CO_2:	0.0	O_2:	20.8

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	
PH01a	0.67	ND	1.7	ND	1.7	20.1	1.6	0.3	11.0	4.88	
PH02a	0.00	NR	NR	NR	NR	NR	NR	NR	NR	**3.5**	
PH03a	0.90	ND	0.9	ND	0.9	19.4	ND	ND	ND	2.72	
PH04a	0.99	ND	ND	ND	ND	20.7	ND	ND	ND	2.93	
PH05a	1.44	ND	ND	ND	ND	20.4	0.1	0.1	30.0	3.69	
PH06a	2.95	ND	0.8	ND	0.8	19.9	ND	ND	ND	4.86	
PH07a	2.77	ND	0.5	ND	0.5	20.4	ND	ND	ND	5.87	
PH08a	3.78	ND	0.5	ND	0.5	**13.3**	7.8	0.7	30.0	4.85	
PH09a	2.08	ND	1.0	ND	1.0	18.6	10.2	0.0	13.0	6.48	
PH10a	0.47	ND	0.2	ND	0.2	20.3	5.6	0.7	30.0	3.93	

Notes

Equipment Used:
Gas Data GFM430 Infrared Gas Analyser
Geotechnical Instruments Dipmeter

Next Calibration Date
24/07/2014

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 (Norton Lees Station)						
	Temp (°C):	3		Barometric Pressure Trend:			Decreasing			
Time:	11:20	11:40	12:01	00:02	04:13	09:03	13:04	16:04	19:00	
Pressure (mb):	981	980	978	993	994	992	985	975	970	
	Weather Conditions:	Overcast, light breeze								
	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:
Moorthorpe Way, Owlthorpe				1792
Client:				Sheet :
Kier Services				1 of 1
Date:	Arrival Time:	Depart Time:	Operator:	
26/02/2014	12:40	13:30	Martin Thompson	

LITHOS CONSULTING

Gas Monitoring Results:

Ambient Concentration (% Volume):	CH_4:	0.0	CO_2:	0.0	O_2:	21.3

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	
PH01a	0.65	ND	1.8	ND	1.8	20.1	1.6	0.2	16.0	4.37	Well bailed
PH02a	0.00	NR	NR	NR	NR	NR	NR	NR	NR	3.50	
PH03a	2.66	ND	1.0	ND	1.0	20.1	0.2	0.1	4.0	2.72	
PH04a	1.66	ND	0.3	ND	0.3	20.9	ND	ND	ND	2.93	Well bailed
PH05a	2.81	ND	ND	ND	ND	18.2	ND	ND	ND	3.69	
PH06a	3.71	ND	1.8	ND	1.8	19.3	ND	ND	ND	4.86	
PH07a	3.51	ND	0.4	ND	0.4	20.8	ND	ND	ND	5.88	Well bailed
PH08a	4.52	ND	0.5	ND	0.5	**11.6**	0.3	0.1	8.0	4.87	
PH09a	2.51	ND	1.1	ND	1.1	19.7	-0.6	0.0	2.0	6.48	Well bailed
PH10a	0.73	ND	0.4	ND	0.4	20.5	-63.3	0.0	73.0	3.93	Well bailed

Notes

Equipment Used:
Gas Data GFM430 Infrared Gas Analyser
Geotechnical Instruments Dipmeter

Next Calibration Date
24/07/2014

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 (Norton Lees Station)									
	Temp (°C):	9		Barometric Pressure Trend:							CH_4	CO_2	O_2
Time:	12:50	13:10	13:25	05:01	10:04	14:00	15:50	18:41	23:57	Trigger level 1	1.0	5.0	16.0
Pressure (mb):	999	1000	998	1004	1007	1010	1010	1012	1008	Trigger level 2	5.0	10.0	10.0
	Weather Conditions:		Cloudy, light wind										
	Surface Ground Conditions:		Wet										

Remarks:

Job Title:				Job No:
Moorthorpe Way, Owlthorpe				1792
Client:				Sheet :
Kier Services				1 of 1
Date:	Arrival Time:	Depart Time:	Operator:	
05/03/2014	10:10	11:00	Martin Thompson	

LITHOS CONSULTING

Gas Monitoring Results:

Ambient Concentration (% Volume):	CH_4:	0.0	CO_2:	0.0	O_2:	20.9

Monitoring Point	Groundwater level	Concentrations: Initial / Highest CH_4	Initial / Highest CO_2	Steady concentrations CH_4	Steady concentrations CO_2	Lowest concn O_2	Gas Flow Rates: Initial / Maximum	Steady	Time to fall from highest to steady	Bottom of well	Remarks
	(m) bgl	% v/v	(%)	% v/v	(%)	(%)	litre/hr	litre/hr	secs	m	
PH01a	0.80	ND	1.7	ND	1.7	20.8	ND	ND	ND	4.88	
PH02a	0.15	NR	NR	NR	NR	NR	NR	NR	NR	3.48	
PH03a	2.21	ND	1.4	ND	1.4	19.2	ND	ND	ND	2.72	
PH04a	1.44	ND	0.5	ND	0.5	20.2	ND	ND	ND	2.93	
PH05a	2.26	ND	ND	ND	ND	18.1	ND	ND	ND	3.68	
PH06a	3.83	ND	2.1	ND	2.1	18.8	ND	ND	ND	4.87	
PH07a	3.47	ND	0.8	ND	0.8	20.1	ND	ND	ND	5.88	
PH08a	4.41	ND	0.5	ND	0.5	**11.8**	-0.3	0.0	13.0	4.86	
PH09a	2.43	ND	2.5	ND	2.5	**15.6**	ND	ND	ND	6.46	
PH10a	0.83	ND	0.5	ND	0.5	20.3	69.6	0.0	33.0	3.92	

Notes

Equipment Used:
Gas Data GFM430 Infrared Gas Analyser
Geotechnical Instruments Dipmeter

Next Calibration Date
24/07/2014

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 (Norton Lees Station)									
	Temp (°C):	8		Barometric Pressure Trend:			Increasing				CH_4	CO_2	O_2
Time:	10:18	10:39	10:56	00:29	04:00	07:02	08:13	10:28	13:04	Trigger level 1	1.0	5.0	16.0
Pressure (mb):	1007	1009	1008	1011	1014	1016	1017	1018	1019	Trigger level 2	5.0	10.0	10.0
	Weather Conditions:		Overcast, still										
	Surface Ground Conditions:		Wet										

Remarks:

Job Title:				Job No:
Moorthorpe Way, Owlthorpe				1792
Client:				Sheet :
Kier Services				1 of 1
Date:	Arrival Time:	Depart Time:	Operator:	
22/04/2014	12:00	12:55	Martin Thompson	

Gas Monitoring Results:

Ambient Concentration (% Volume):	CH_4:	0.0	CO_2:	0.0	O_2:	21.1

Monitoring Point	Groundwater level	Concentrations: Initial / Highest CH_4	Initial / Highest CO_2	Steady concentrations CH_4	Steady concentrations CO_2	Lowest concn O_2	Gas Flow Rates: Initial / Maximum	Steady	Time to fall from highest to steady	Bottom of well	Remarks
	(m) bgl	% v/v	(%)	% v/v	(%)	(%)	litre/hr	litre/hr	secs	m	
PH01a	0.96	ND	1.7	ND	1.7	18.8	ND	ND	ND	4.86	
PH02a	0.04	NR	NR	NR	NR	NR	NR	NR	NR	3.49	
PH03a	2.66	ND	2.3	ND	2.3	18.9	ND	ND	ND	2.71	
PH04a	1.98	ND	0.9	ND	0.9	20.1	ND	ND	ND	2.95	
PH05a	3.07	ND	0.8	ND	0.8	17.6	0.1	0.0	9.0	3.69	
PH06a	4.23	ND	3.2	ND	3.2	17.4	0.1	0.0	12.0	4.87	
PH07a	3.61	ND	0.6	ND	0.6	20.6	ND	ND	ND	5.86	
PH08a	4.72	ND	0.9	ND	0.9	**8.4**	ND	ND	ND	4.88	
PH09a	2.88	ND	4.2	ND	4.2	**10.4**	ND	ND	ND	6.48	
PH10a	0.61	ND	0.7	ND	0.7	20.3	ND	ND	ND	3.92	

Notes

Equipment Used:
Gas Data GFM430 Infrared Gas Analyser
Geotechnical Instruments Dipmeter

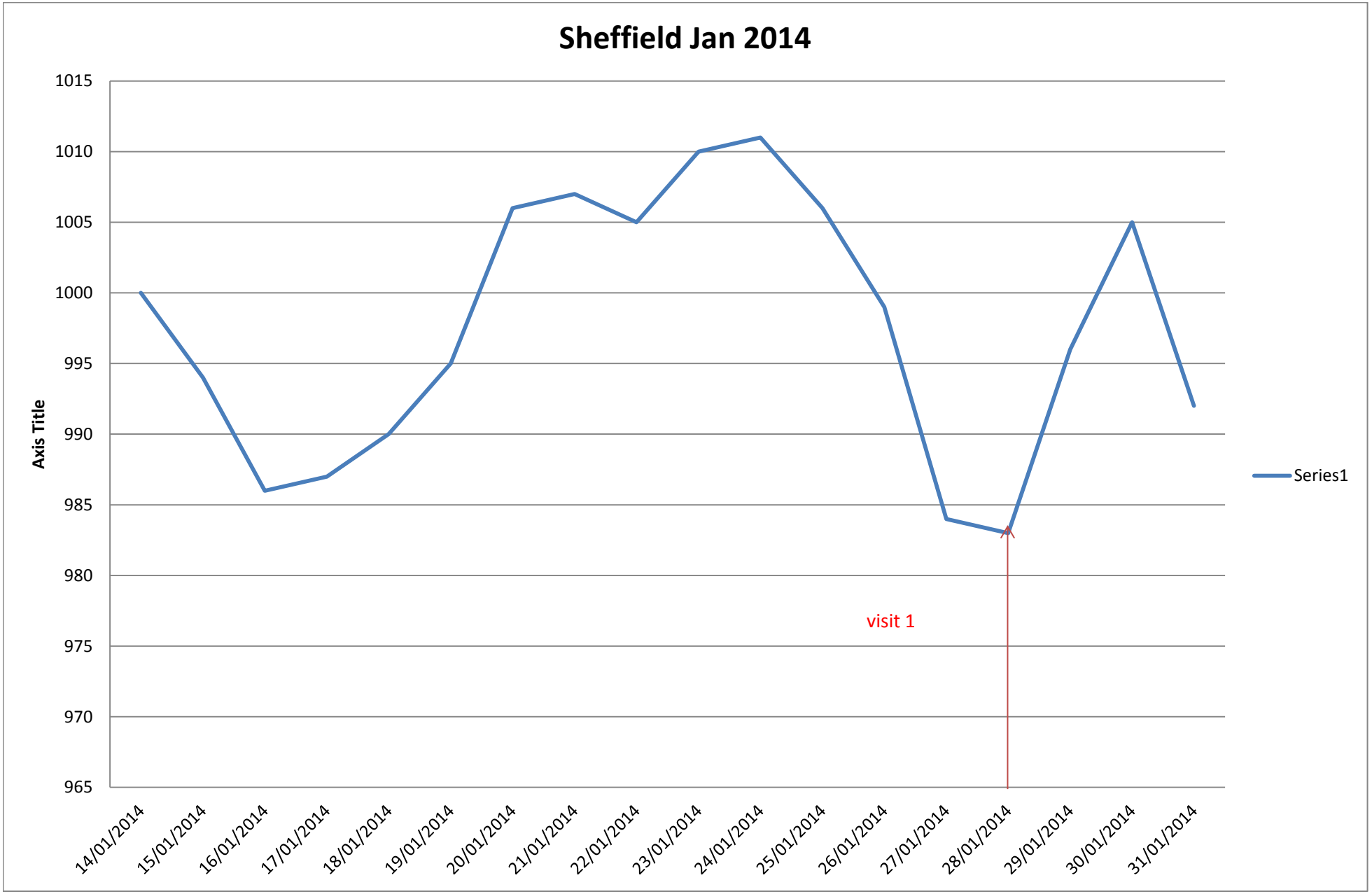
Next Calibration Date
24/07/2014

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 (Norton Lees Station)							CH_4	CO_2	O_2
	Temp (°C):	10		Barometric Pressure Trend:			Steady						
Time:	12:10	12:27	12:51	00:32	03:13	06:02	09:30	11:24	15:00	Trigger level 1	1.0	5.0	16.0
Pressure (mb):	995	996	997	1007	1006	1006	1006	1006	1007	Trigger level 2	5.0	10.0	10.0
	Weather Conditions:	Overcast, light breeze											
	Surface Ground Conditions:	Wet											

Remarks:


Sheffield Jan 2014
1015
1010
1005
1000
995
990
985
980
975
970
965
Axis Title
visit 1
Series1
14/01/2014
15/01/2014
16/01/2014
17/01/2014
18/01/2014
19/01/2014
20/01/2014
21/01/2014
22/01/2014
23/01/2014
24/01/2014
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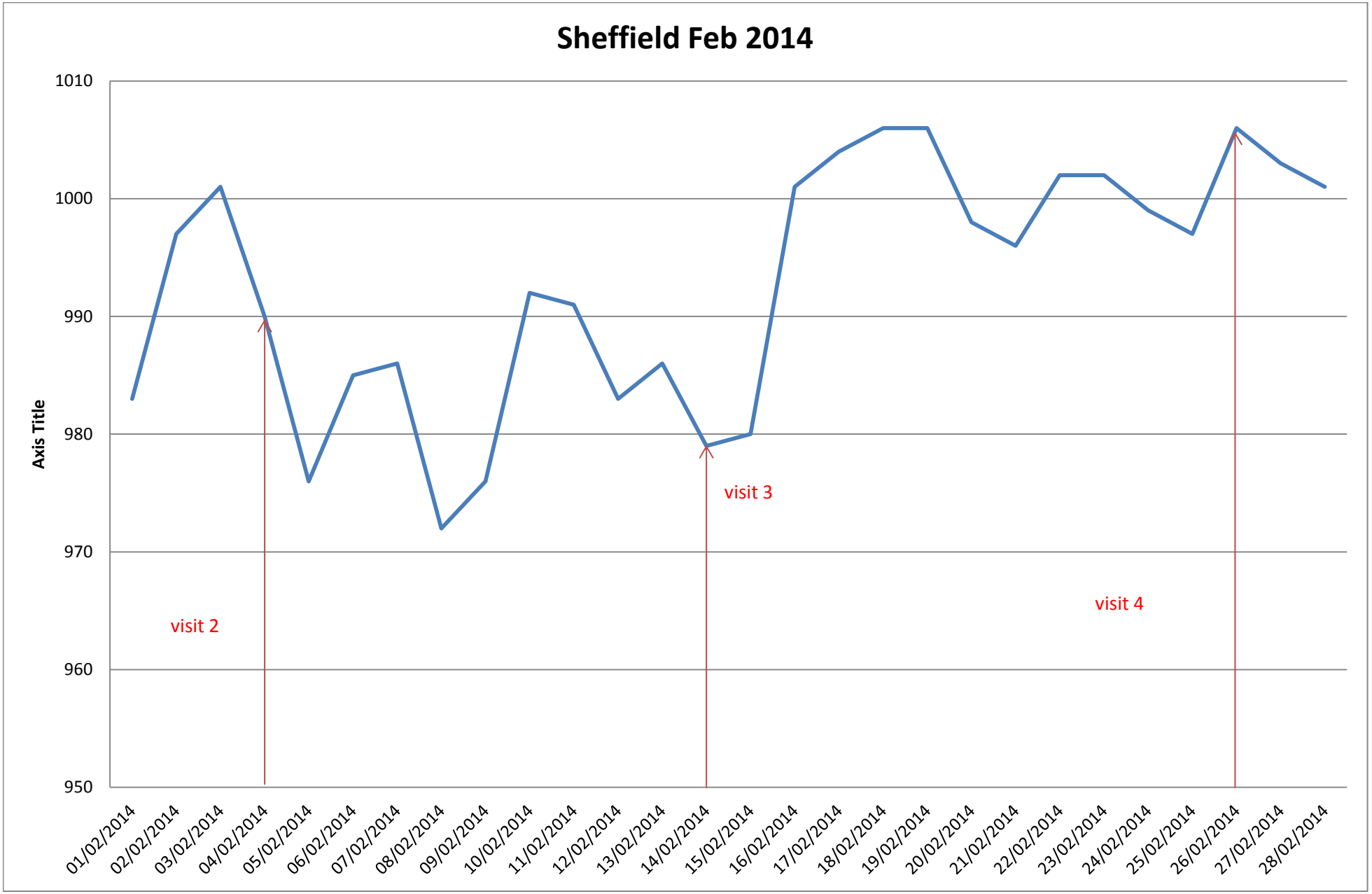
Sheffield Feb 2014
Axis Title
1010
1000
990
980
970
960
950
visit 2
visit 3
visit 4
01/02/2014
02/02/2014
03/02/2014
04/02/2014
05/02/2014
06/02/2014
07/02/2014
08/02/2014
09/02/2014
10/02/2014
11/02/2014
12/02/2014
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14/02/2014
15/02/2014
16/02/2014
17/02/2014
18/02/2014
19/02/2014
20/02/2014
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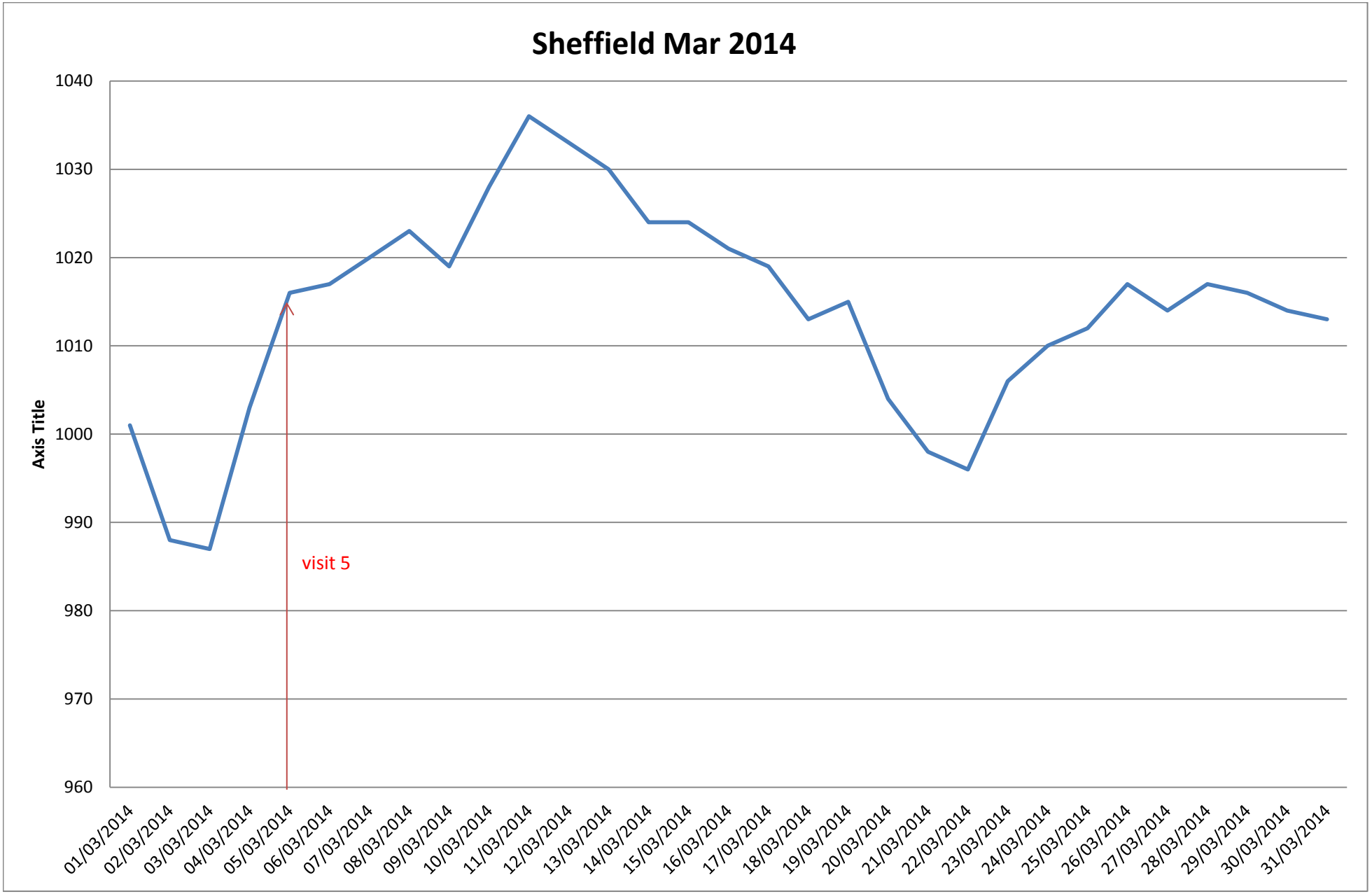
28/02/2014


Sheffield Mar 2014
Axis Title
1040
1030
1020
1010
1000
990
980
970
960
visit 5
01/03/2014
02/03/2014
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04/03/2014
05/03/2014
06/03/2014
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08/03/2014
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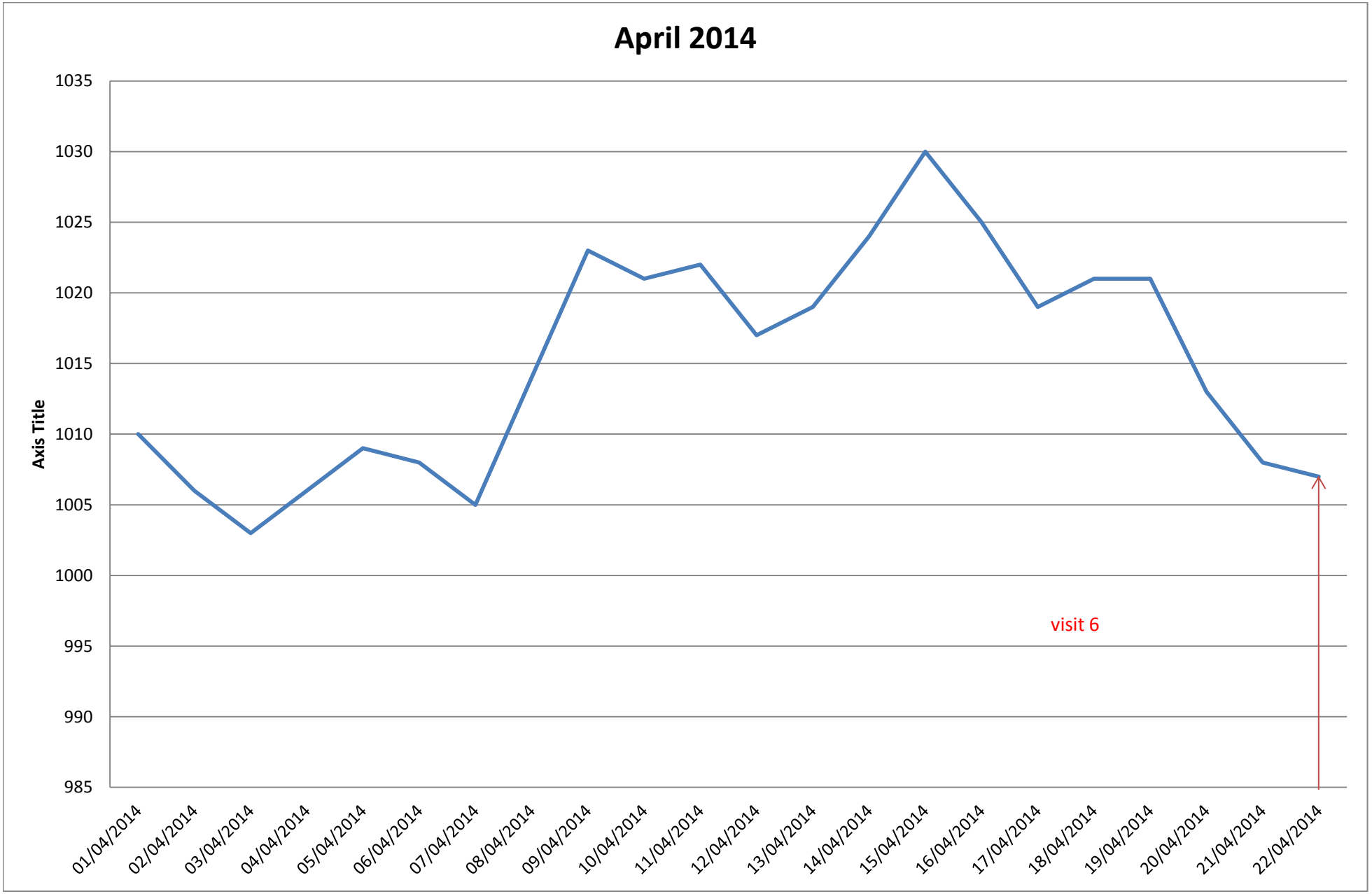
31/03/2014


April 2014
Axis Title
1035
1030
1025
1020
1015
1010
1005
1000
995
990
985
visit 6
01/04/2014
02/04/2014
03/04/2014
04/04/2014
05/04/2014
06/04/2014
07/04/2014
08/04/2014
09/04/2014
10/04/2014
11/04/2014
12/04/2014
13/04/2014
14/04/2014
15/04/2014
16/04/2014
17/04/2014
18/04/2014
19/04/2014
20/04/2014
21/04/2014
22/04/2014