



GeoEnviro Solutions Ltd,
Unit 7, Springvale Works,
Brookfoot Lane,
Brighouse,
West Yorkshire,
HD6 2RA

Mr. A Radcliffe
AR Broadleaf
8c Cross Crown Street
Cleckheaton
BD19 3HW

18th November 2021
Updated: 13th July 2022

Dear Mr. Radcliffe

GES Project Reference 1592-21

**RE: Egypt Farm, Cliffe Lane, Gomersal, Cleckheaton
Report on additional internal hazardous ground gas monitoring**

Following a Teams meeting with members of Kirklees Council Planning and Environmental Protection teams regarding the validation of the installation of the gas membrane at the above site it was agreed that GES would undertake a programme of internal ground gas monitoring for a period of one month (4 working weeks), regularly moving the monitor between rooms to ensure that a full assessment can be undertaken.

A G7 EXO portable gas monitor was initially hired from ESS for the four-week period 21st September 2021 to the 19th October 2021. A copy of the data sheet relating to the gas monitor is appended to this letter. The unit was confirmed to be within calibration, being calibrated on a six-monthly rolling cycle and the calibration certificate for the period encompassing the monitoring period is attached to this letter.

The unit continuously monitors Oxygen, Carbon Dioxide, Carbon Monoxide, Methane (as LEL) and Hydrogen Sulphide.

The building under investigation comprises of two properties, numbered 58A and 58B. As such both properties contain two living areas: a living room and a kitchen/diner. The original programme was to monitor each of the four living spaces for a period of one week, such that both properties would be monitored for a total of two weeks, a week in each living area.

Although the gas monitor had sufficient battery life to cover the whole of the monitoring period, it could also operate on a trickle charge from mains power. As such it was decided to remove any potential power consumption issues by running the unit throughout the monitoring period on trickle charge; the unit would however remain operational throughout due to the internal battery, even during relocation.

GES were provided with an APP to allow remote viewing of the data collected in real time, which also provide a location accurate to 1.00 m. The APP was viewed on a daily basis throughout the monitoring period.

The gas monitor was installed in the following rooms, with associated dates:

Room	Date From:	Date To:
58A – Kitchen / Dining	21 st September 2021	29 th September 2021
58A – Living Room – location 1	29 th September 2021	4 th October 2021
58A – Living Room – location 2	4 th October 2021	6 th October 2021
58B – Kitchen / Dining	6 th October 2021	11 th October 2021
58B – Living Room	11 th October 2021	30 th October 2021

A monitoring location plan is provided along with two location print-offs, available from the App have also been appended to this letter, these have been included to show the location of the monitor had been moved during the monitoring process.

On the 19th October 2021 you were advised that an open window has been observed in 58B. Upon investigation the tenant indicated that the window was open during the operation of the tumble dryer to allow the hot exhaust to dissipate. The tenant further confirmed that, immediately following the incident, they were due to be away from the property on holiday, encompassing the remainder of the month and that all doors and windows would be shut for the duration.

At the time of the reported incident the monitor was located in the rear living room of 58B. Although the reported open window was in the kitchen/dining room of 58B, as the open window was in the same property it could have had an adverse impact on the monitoring, you instructed us to extend the monitoring programme. As such the monitoring period was extended for a further two weeks to compensate for any possible discrepancies that may arise.

Similarly, it was confirmed that 58A was unoccupied during the monitoring period for that property and that all doors and windows were closed.

As gas transmission and release by surface emissions can be a function of the atmospheric pressure and traditional gas monitoring ethos requires monitoring at low pressure and falling pressure the local atmospheric pressure conditions needs to be understood. The average daily locally measured barometric pressure between the 19th September and the 31st October 2021 ranged between 895mBar and 1031 mBar. A graph of pressure against date is appended to this report. According to Met Office advice in the UK, low barometric pressure is considered to be anything below 1009 mbar. The barometric pressure fell on 10 occasions during the monitoring period and based on this trigger value was under low pressure conditions on four occasions of at least two days duration. Combined low and falling pressure occurred on six occasions during the monitoring period.

It should be noted that the lowest and steepest fall in barometric pressure occurred at the very end of the monitoring period, after 58B had been confirmed as unoccupied.

The data sets produced from the gas monitoring are in an Excel Spreadsheet format and are therefore difficult to reproduce in a written report such as this. Therefore, the two data sets have been submitted under separate cover and are summarized below:

Gas	Minimum (%)	Maximum (%)
Oxygen	20.5	20.9
Methane (as LEL)	0.0	0.0
Carbon Dioxide	0.0	0.0
Carbon Monoxide	0.0	0.0
Hydrogen Sulphide	0.0	0.0

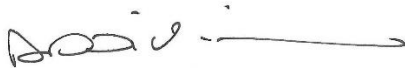
The results above indicate that no hazardous ground gases entered the properties during the test period, including those periods containing combined low and falling pressure conditions.

It is the opinion of GES that on the basis of the above results, on the assumption that hazardous ground gases are present underlying the properties, the gas membrane, as installed, is providing the necessary level of protection as designed.

As such, no further action is necessary.

I trust this report is helpful and we would advise it is submitted to the LPA in conjunction with any other information you have relating to your endeavours to discharge this condition.

Yours sincerely

A handwritten signature in black ink, appearing to read 'A Dickinson', followed by a horizontal line.

Andrew D Dickinson

Associate Director

GeoEnviro Solutions Ltd

58A

Living Room – 2 locations
within the room
From 29/09/2021
to 06/10/2021

58A

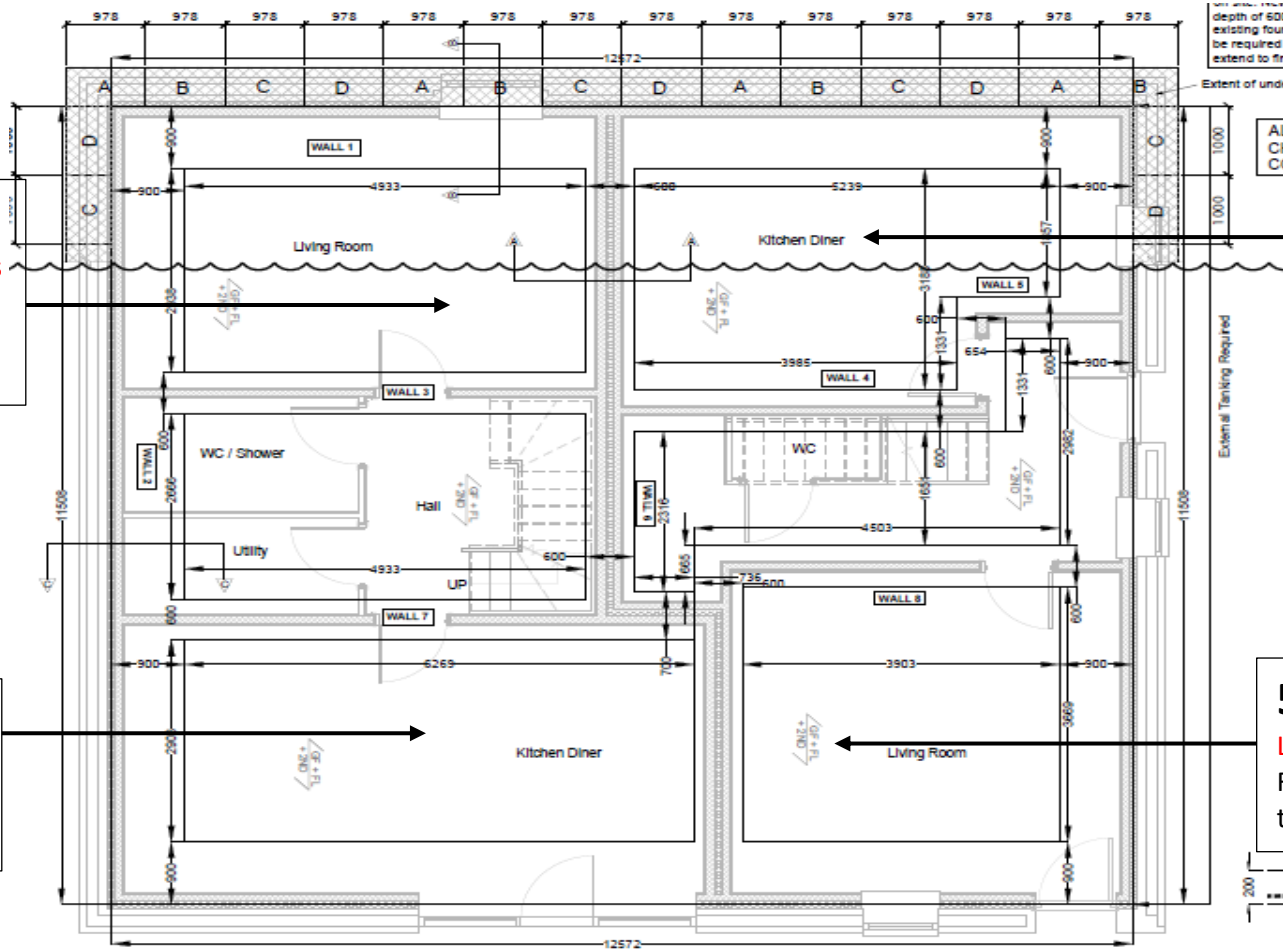
Kitchen / Dining Room
From 21/09/2021
to 29/09/2021

58B

Kitchen / Dining Room
From 06/10/2021
to 11/10/2021

58B

Living Room
From 11/10/2021
to 30/10/2021



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PROJECT NAME

Egypt Farm, Cleckheaton

PROJECT NUMBER

1592-22

TITLE

Gas Monitor Location Plan with Times

DRAWING NO.

1592-21/01

SCALE

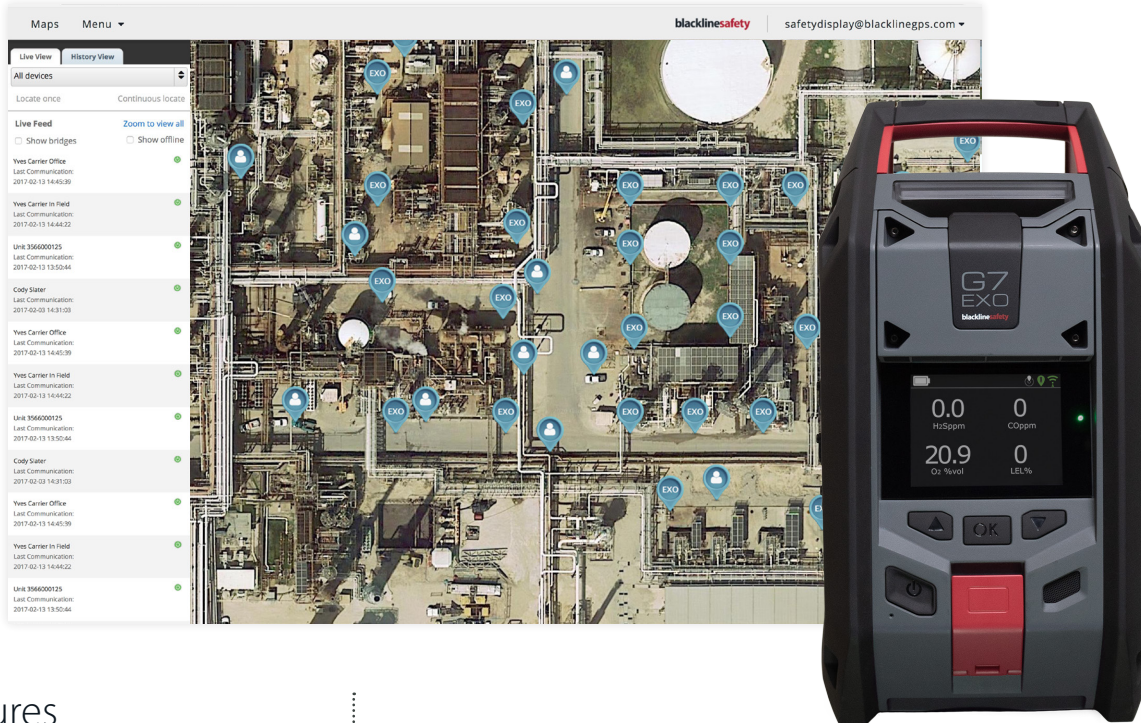
N.T.S

DATE

July 2022

DRAWN BY

ADD



Features

- Up to 100-day battery life
- 360° diffusion gas detection
- Optional four-channel pump module
- Internal 3G/4G wireless works in 100+ countries
- Optional Iridium global satellite module
- Call for help using the SOS latch
- Works seamlessly with Blackline Live cloud-hosted software
- Communicates all data to the Blackline Safety Cloud — no need to collect data from the field
- Blackline Live automates configuration changes, plus firmware updates automatically
- Leverages the same plug-and-play gas sensor cartridges as G7
- Blackline Analytics automates compliance reporting
- Internal GPS and beacon location technology
- Manage G7 EXO area monitors in Blackline Live alongside G7 personal monitors

G7 EXO

MOVE YOUR AREA MONITORING PROGRAM INTO THE CLOUD

Until now, conventional area monitors have suffered short battery life, limited configurability and complicated or inadequate connectivity while also being challenging to configure into a seamless network.

G7 EXO is intelligence and versatility wrapped into one game-changing solution. Inside rugged aluminum casing, EXO boasts industry-leading battery life of over 100 days and features a large, full-color display for easy visibility in any condition.

4G cellular connectivity is built-in, with the option to add a satellite module. All you have to do is turn G7 EXO on and it goes to work streaming environmental data to the Blackline Safety Cloud. Advanced analytics capabilities summarize data so you can address safety hazards or facility risks before they become a problem.

Unlike mesh networks, EXO does not require any network configuration — at all. Since each G7 EXO connect directly to the cloud, there's no need for smartphones, Wi-Fi or radio links to connect personnel and area monitors to a central network. This also means there is no limit to the number of devices that can connect to one another on a network.

Area monitoring has never been more straightforward or considerate of your needs.

SPECIFICATIONS

Gas cartridge features

High Gas Alert, Low Gas Warning
Under limit, Over limit
Time-weighted average (TWA)
Short-term exposure limit (STEL)
High gas alert, Low gas alert
Bump test and calibration notification
Bump test and calibration failure

Safety features

SOS latch: Pull latch to trigger SOS alert
Low-battery: Configurable threshold
Connection lost: Configurable threshold
Two-way voice calls: Receive voice calls from monitoring personnel
Text messages: Send and receive messages with monitoring personnel

Convenience features

Set-up Wizard
Connection lost alarm: Configurable time period
Siren volume setting: Three levels available
Text messaging: Custom messages and 10 pre-configured
Maintenance code: Configurable 4 digits
Push to Talk Communication

User interface

Display: 4.4 inch diagonal, 480 by 640 pixel, eight-color active matrix liquid crystal display
Menu system: driven by three-button keypad
Power button: On/off
SOS latch: Send SOS alert
Multi-language support: (EN, FR, ES, DE, IT, NL, PT)

User notification

Green connectivity light: Blinking (powered), continuous (connected)
360° visible yellow and red lights
Yellow light: pending and warning alarms
Red light: Red alerts
Blue LiveResponse light: Confirmation that a monitoring team has acknowledged the alert
Siren sound: High-volume alarm siren. Optional siren accessory available through interface ports.

Four-channel pump module*

Optional module: Yes
Number of pump channels: 4
Sampling period per channel: Adjustable
Tubing length per channel: Up to 100 ft (30 m)

Interface ports

Intrinsically safe, configurable external signal ports designed to integrate with external alarms and electrical systems.

Power & battery

Rechargeable battery capacity: 144 Ah (LiFePO₄)
Battery life in diffusion mode:
100 days at 20°C (68°F), LEL-IR, H₂S, CO and O₂ config.
Battery life in pump mode:
30 days at 20°C (68°F)
Charge time: 8-12 hrs
Charge temp.: 0°C to 45°C (32°F to 113°F)

IS trickle charge port

Can be used to hard-wire an IS power supply to run EXO indefinitely.

Size & weight

Size: 385 mm x 188 mm x 220 mm (15.1"x 7.4"x 8.7")
Weight: 12.25kg/27 lbs
Material: Rugged housing built from cast aluminum, plastic and rubberized bumpers

Cellular wireless radio

Wireless coverage: 100 countries, 200 wireless carriers
North America: 3G/4G radio; 3G UMTS bands 2 and 5; 4G bands 2, 4 and 5
International: 2G/4G radio; 2G GSM bands E-GSM and PCS; 4G bands 3, 7 and 20
Asia Pacific: 3G/4G radio; 3G UMTS band 1; 4G bands 3, 8 and 28
Antenna: Internal

Satellite module

User-upgradeable add-on: User-upgradeable satellite module allows EXO to connect to the Iridium satellite network for remote areas outside of cellular connectivity.
Network: Iridium, global coverage
Radio: 1621 MHz, 2 Watts
Antenna: Internal

Wireless updates

Device configuration changes: Yes
Device firmware upgrade OTA: Yes

Location technology

Multi-constellation: GPS/QZSS, Galileo, Beidou
Receiver type: 72-channel
Assisted-GNSS: Yes
GNSS Accuracy: 5m (16feet), CEP 50%, 24 hours static

Environmental

Storage temp.: -40°C to 60°C (-40°F to 140°F)
Operating temp.: -20°C to 50°C (-4°F to 122°F)
Ingress protection: Designed to meet IP65

Approvals

RoHS, CE, RCM
Canada & USA: Class I Division 1 Group A,B,C,D T3; Class I Zone 0 AEx ia IIC T3; Ex ia IIC T3 Ga
IECEx: Ex ia IIC T3 Ga
ATEX: Ex ia IIC T3 Ga

LEL: CSA C22.2 No.152; ISA 12.13.01

FCC ID: W77EXO

IC: 8255A-EXO

Contains: FCC ID: XPY1EIQ24NN, Q639603N

IC: 8585A-1EIQ24NN, 4629A-9603N

Blackline Live web application

Cloud-hosted safety monitoring web application is highly customizable for every customer requirement. Includes live map, employee address book, user roles, alert management, device configurations, alert setups and reporting.

Accessories

IS solar panel, IS trickle charger, low tripod and tall survey tripod, universal mount, carrying case

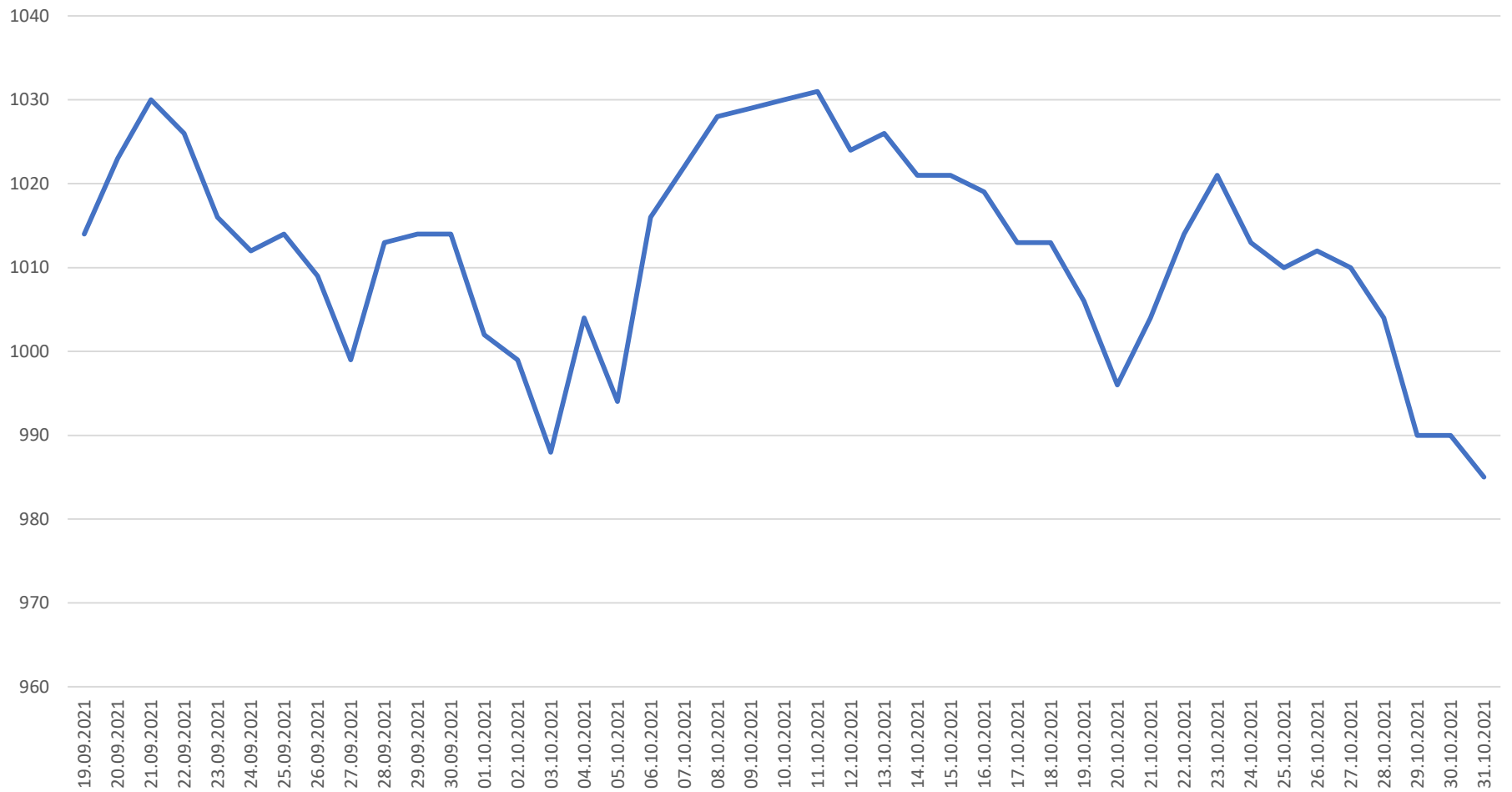
Warranty

Three-year hardware warranty
Extended warranty available

Gas sensors

Gas	Sensor type	Sensor model	Range	Resolution
Ammonia (NH ₃)	Electrochemical	Citytech, Sensoric NH3 3E 100 SE	0–100 ppm	0.1 ppm
High-range ammonia (NH ₃)	Electrochemical	Sensoric NH3 E3 500 SE	0–500 ppm	1 ppm
Carbon monoxide (CO)	Electrochemical	Citytech, 4CF+	0–500 ppm	1 ppm
High-range carbon monoxide (CO)	Electrochemical	Citytech 4CM	0–2000 ppm	5 ppm
Hydrogen resistant carbon monoxide (CO-H)	Electrochemical	Citytech 2CF3	0–500 ppm	1 ppm
Carbon dioxide (CO ₂)	NDIR	Gas Sensing Solutions, ExplorIR-M	0–50,000 ppm	50 ppm
Chlorine (Cl ₂)	Electrochemical	Citytech, Sensoric Cl2 3E 50	0–20 ppm	0.1 ppm
Chlorine dioxide (ClO ₂)	Electrochemical	Sensoric ClO2 3E 1 O	0–2 ppm	0.01 ppm
Carbon monoxide + hydrogen sulfide (COSH)	Electrochemical	Citytech, 4COSH Dual Gas CO/H ₂ S Sensor	0–500 ppm CO, 0–100 ppm H ₂ S	1 ppm CO, 0.1 ppm H ₂ S
Hydrogen cyanide (HCN)	Electrochemical	Sensoric HCN 3E 30 F	0–30 ppm	0.1 ppm
Hydrogen sulfide (H ₂ S)	Electrochemical	City Technology, 4HS+ Hydrogen Sulfide CiTiceL	0–100 ppm	0.1 ppm
High-range hydrogen sulfide (H ₂ S)	Electrochemical	City Technology, 4HS+ Hydrogen Sulfide CiTiceL	0–500 ppm	0.5 ppm
LEL-MPS (LEL-M)	Molecular property spectrometer	NevadaNano LEL-MPS	0–100% LEL	0.1% LEL
Nitrogen dioxide (NO ₂)	Electrochemical	City Technology, 4ND	0–50 ppm	0.1 ppm
Oxygen (O ₂)	Pumped electrochemical	City Technology, 4OxLL Longlife Oxygen CiTiceL	0–25% vol	0.1% vol
Photoionization (PID) ppm	PID	Ion Science, MiniPID 2	0–4,000 ppm	Dynamic resolution**, 0.1 ppm
Sulfur dioxide (SO ₂)	Electrochemical	City Technology, 4S Rev. 2 Sulfur Dioxide CiTiceL	0–100 ppm	0.1 ppm

Barometric Pressure over Time



**ESS**

Safety, Survey, Test & Measurement

Head Office: Essential House, Vaux Road, Finedon Road Industrial
Wellingborough, NN8 4TG, United Kingdom
T: 0800 000 346 **E:** info@ess-safeforce.com

6 Month Certificate

Reference: SF114358200921INS06SS

Item: HPGD.200 - Blackline EXO Area Gas Monitor

Fleet Number: SF114358

Serial Number: 3588200251

Test Date: 20/09/2021

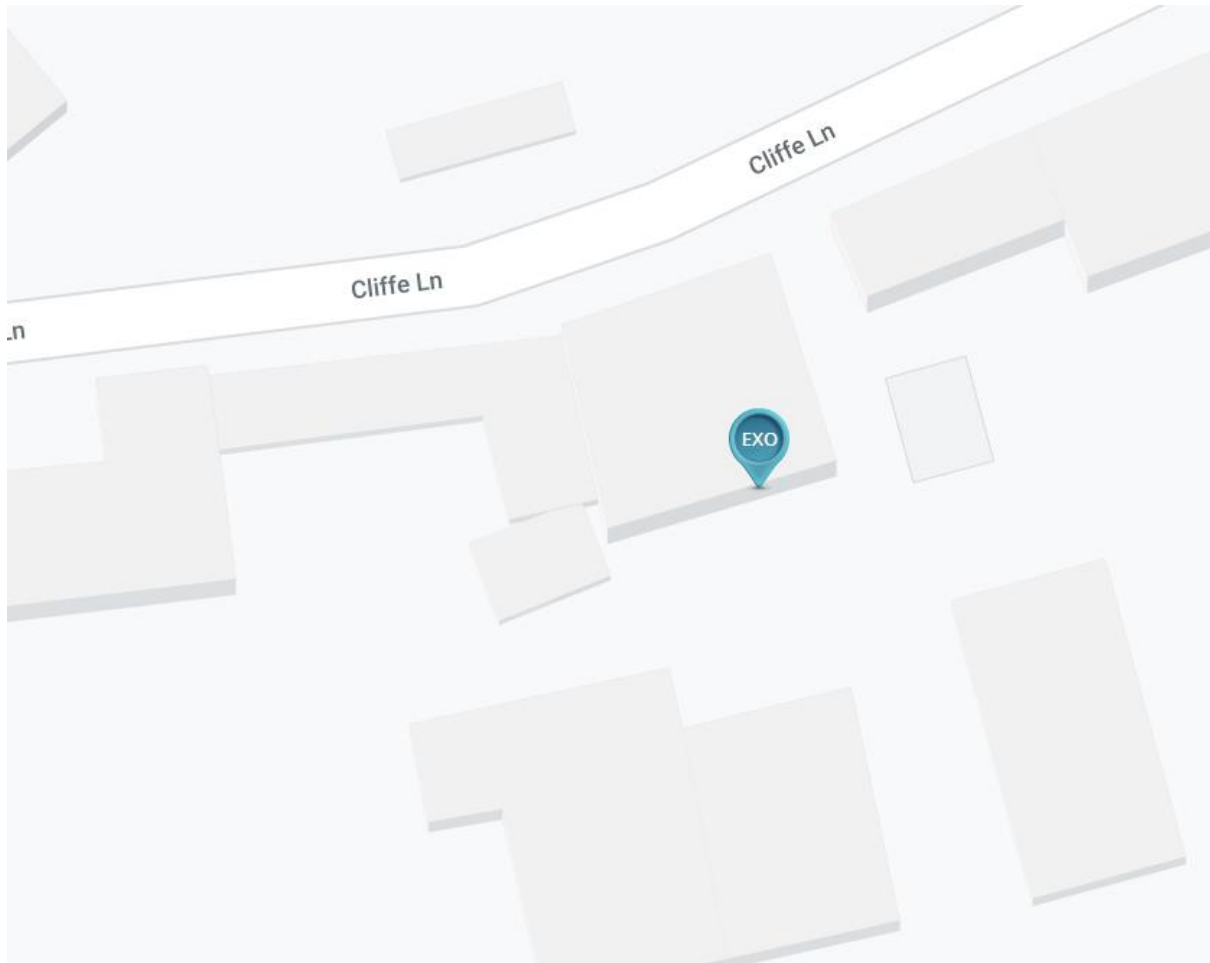
Next Due 20/03/2022

Performed by: Martin Scott

Full inspection, calibration and service information is available upon request.

This equipment has been tested and calibrated in accordance with manufacturers specifications, and all test equipment used has been calibrated using identified and certified equipment with a valid relationship to nationally recognised standards, where these exist.

House No 2



House 1

