

7 April 2022

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Ref: EPG/2022/TFW/CSS/Q002/01

Dear Ruth

### **Coelbren Health Centre, SA10 9PE, Mine and Landfill Gas Risk Assessment**

Please find below our review of the mine and landfill gas risk at the above site.

#### **Author Competence**

This report has been prepared by Steve Wilson. Steve is a Chartered Engineer, Member of the Institution of Civil Engineers and Registered Ground Engineering Advisor with over 30 years experience in geotechnical design and the investigation and assessment of ground gas (including mitigation design). He is a Society of Brownfield Risk Assessment accredited risk assessor (ASoBRA) for ground gas and vapour intrusion. Steve is one of the authors of the CL:AIRE guide to Good Practice for Risk Assessment for Coal Mine Gas Emissions.

#### **BS8485 and existing buildings**

The foreword to BS8485: 2015 + A1: 2019 specifically states that it does not cover the retrospective design of protection measures for completed buildings. Therefore, it is not appropriate to state that gas monitoring shows the site is CS2 or above and require the level of protection suggested by the gas screening value and points approach in the standard. This is because that approach is a generic screening level approach that is highly conservative for new build where gas protection is easy to incorporate in the construction. However, CIRIA Report C795 *Retrofitting hazardous ground gas protection measures in existing or refurbished buildings*, does suggest that the screening approach can be used to identify if there is a potential risk (ie Characteristic Situation CS2 or above) or not (Characteristic CS1).

If a site is identified as CS1 then there is minimal risk and no further action is necessary and protection is not required. If a potential risk from ground gas is identified then more rigorous assessment is required to determine whether or not specific protection measures are needed.

## Information

EPG has been provided with the following reports/information:

- Phase 1 Desk Study Report, Coelbren Health Centre. Reference 17059-1, January 2022.
- Powys, Letter from Environmental Health Service to Mr R Davies dated 2 March 2022.
- Earth Science Partnership (ESP) 2010. Proposed New Branch Surgery, Coelbren, Neath. Geo-Environmental Assessment. Final. Reference: 4715e/1681REV1
- Earth Science Partnership, Proposed Branch Surgery, Coelbren, Ground Gas Risk Assessment, Letter to NJP dated 15<sup>th</sup> December 2011, Reference hd/4715ePh2.1805.

The client, Mr R Davies has confirmed with Earth Science Partnership that the reports are final versions.

## Geology

The 1:50,000 scale geological map of the area (Sheet 231) shows the site to be underlain by rocks of the South Wales Coal Measures, which comprise grey, (productive) coal-bearing mudstones/siltstones, with seatearths and minor sandstones. Bedrock dips to the south at between 7° to 10°. A series of north to south orientated faults are located around Coelbren, although none are located within approximately 500m of the site. The conjectured outcrop of the Astell, and Bryn coal seams are located to the west and northwest of the site, although they terminate to the west of the site so are unlikely to underlie it.

Glacial Till deposits are shown across the entire site. These are a group of sediments laid down by the direct action of glacial ice. They have a variable lithology, usually sandy, silty clay with gravel, cobbles and boulders, but can contain gravel-rich, or laminated sand layers; varied colour and consistency.

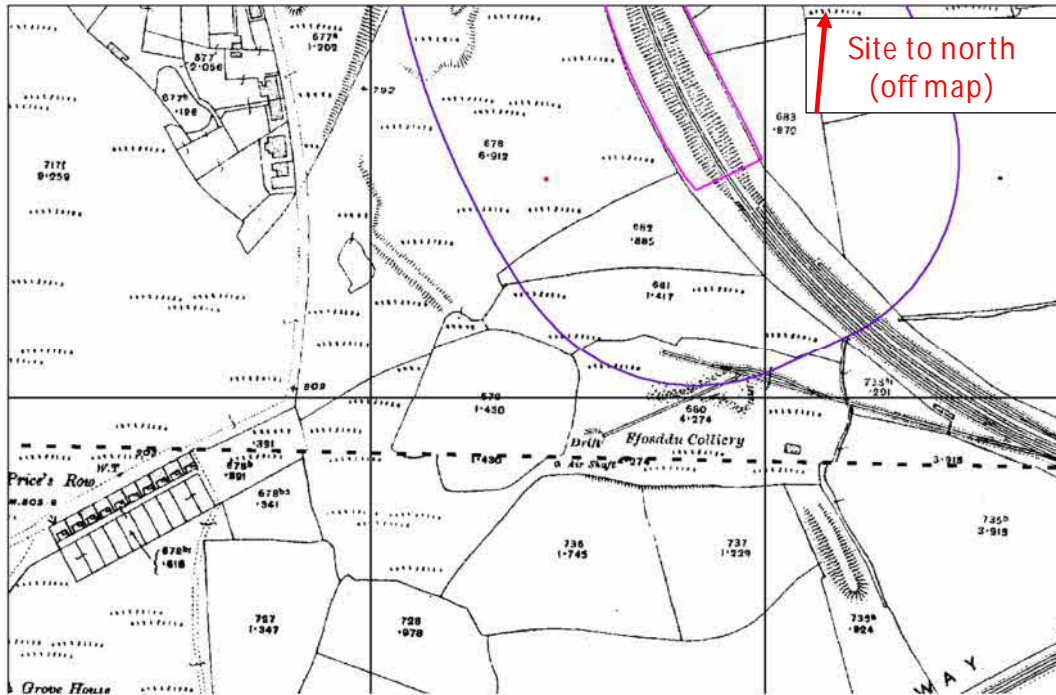
Peat is recorded in the surrounding area, however no peat is recorded on site or within 100m of the site. Lateral gas migration from off site peat will not occur and does not pose a risk to the site.

## Mine gas risk

The Terra Firma Report includes a Consultants Coal Mining Report from the Coal Authority. The site is within a Coal Mining Reporting Area. The report indicates the following:

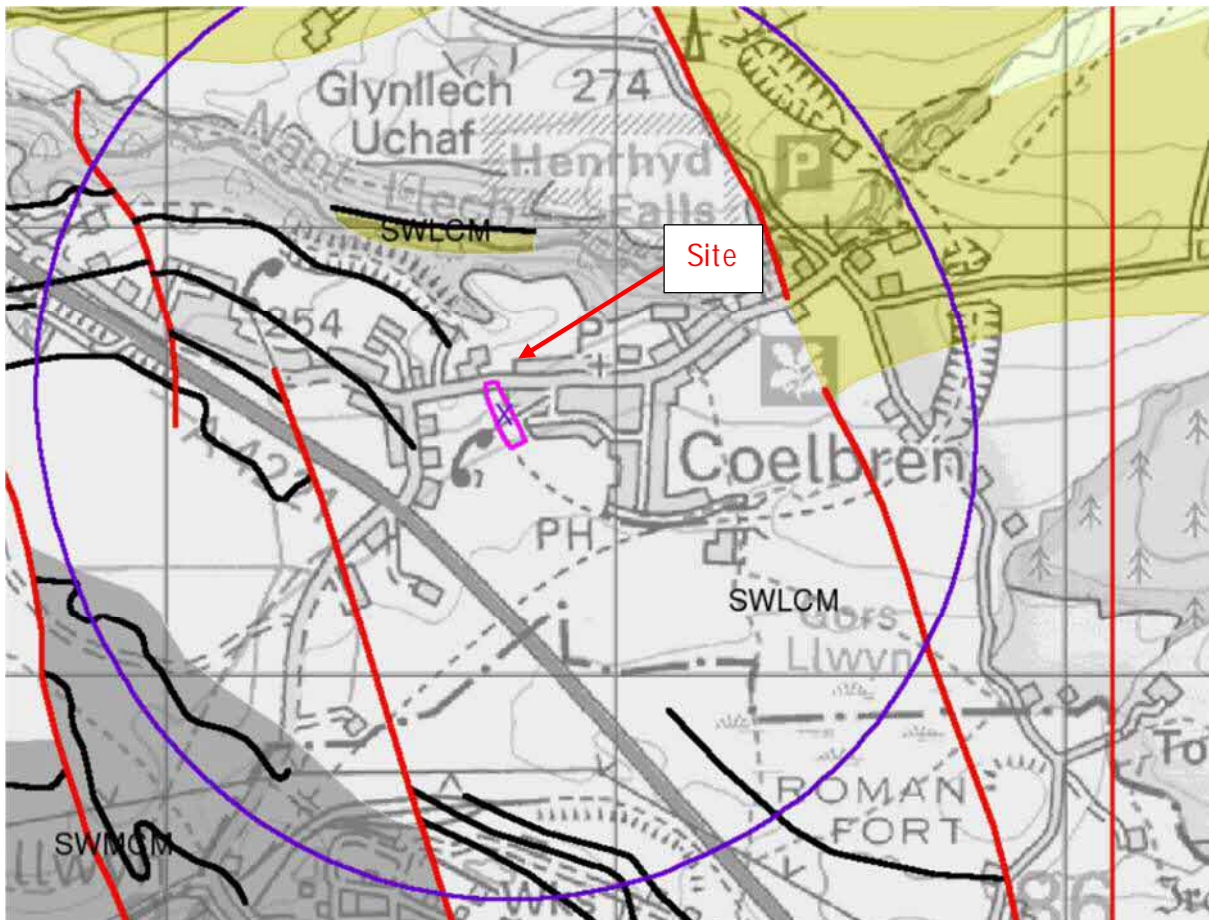
- There are no mine entries within 50m of the site boundary. The nearest entry will be the Ffoddu Colliery drifts and air shafts are shown on the 1919 Edition map which are located 105 m or more to the south of the site. This is down dip of the site and

therefore will not influence the site. The colliery is in the same area as a series of coal seams that terminate west of the site. The map (extract below) shows the drift enters the ground heading south west and there an air shaft further south. Thus it does not pose a risk of mine gas migration towards the site.



**Extract from 1919 map**

- The geological maps show that there are not likely to be shallow worked coal seams below the site. Coal seams outcrop to the north west of the site but appear to dip to the south west, ie away from the site (see extract below). The outcrop also terminates west of the site, probably as a result of faulting (there is a fault shown to the west as a single line but faulting more usually covers a wide zone and may not be shown on the map).



### Extract from geological map in Envirocheck Report

- The Coal Authority Report and viewer shows the site is not close to any mine entries (>50m), is not within a Development High Risk Area and is not underlain by shallow or probable shallow coal mine workings. There are no deep underground workings below the site. Given the geology and absence of mine entries and shallow workings it is not likely that there is any credible connection that would allow gas migration from the deep workings that are off site.
- It is very unlikely that any ironstone workings will have impacted the site. Historical maps show extensive ironstone mining around the site; predominately surface mining to the west of the site. The Coal Authority have no records of ironstone workings beneath or at the surface the site. Further to this the ironstone workings appear to be limited to the west of the site; with no indication of workings on site. As the site has been underlain by a railway line throughout the years researched, it is unlikely that any mining throughout the age of the railway line would have taken place as undermining of railways was in general prohibited. The ironstone workings were also generally surface pits.
- The Earth Science Partnership site investigation in 2010 included three rotary drilled holes to 20m depth. There was no evidence of coal or broken ground in the boreholes.



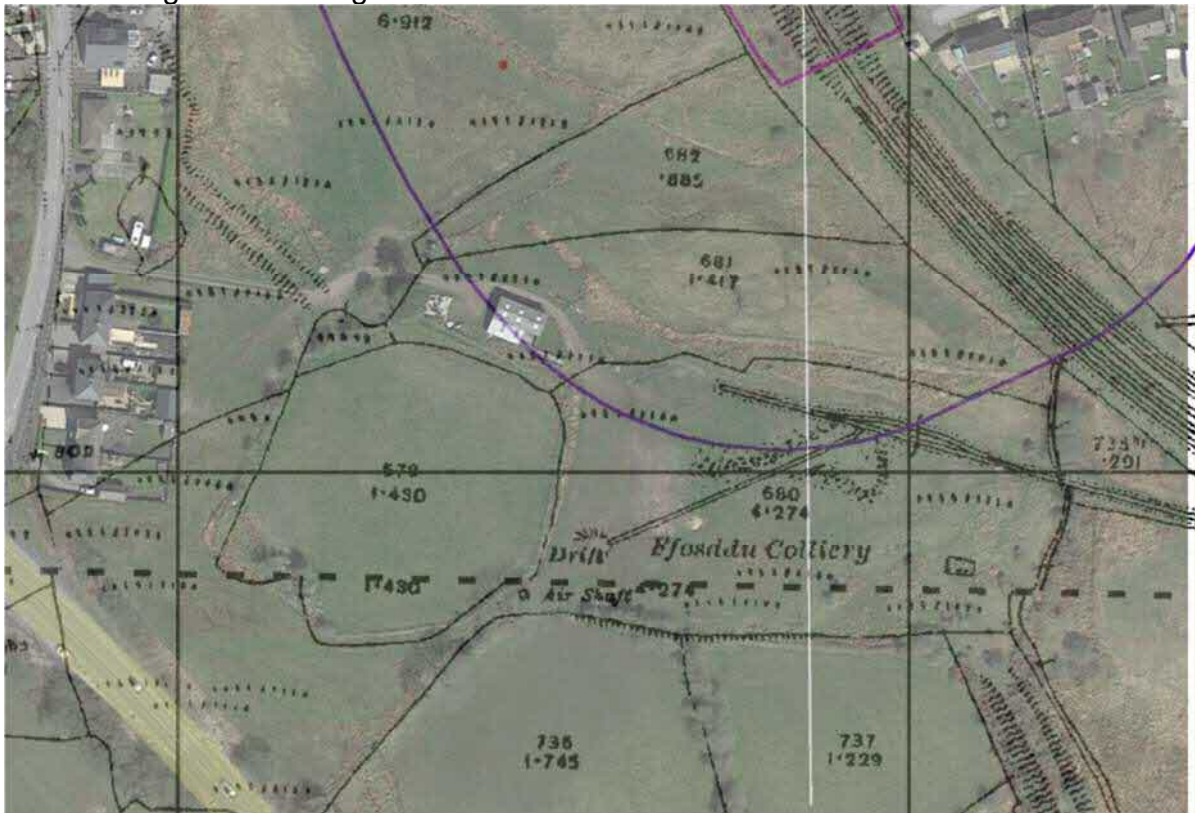
Following CL:AIRE guidance on mine gas risk assessment (2021) the evidence above shows that the mine gas risk is negligible and mitigation or any other further action is not required. There is no requirement for a gas membrane in the property to deal with mine gas and no requirement for any further investigation.

## Landfill and Ground Gas Risk

From the data review, other potential ground gas sources have been identified and assessed comprising the thin mantle of Made Ground under the site and nearby former landfills. The site is not likely to be at significant risk from ground or landfill gas from these sources. The reasoning for this is outlined below:

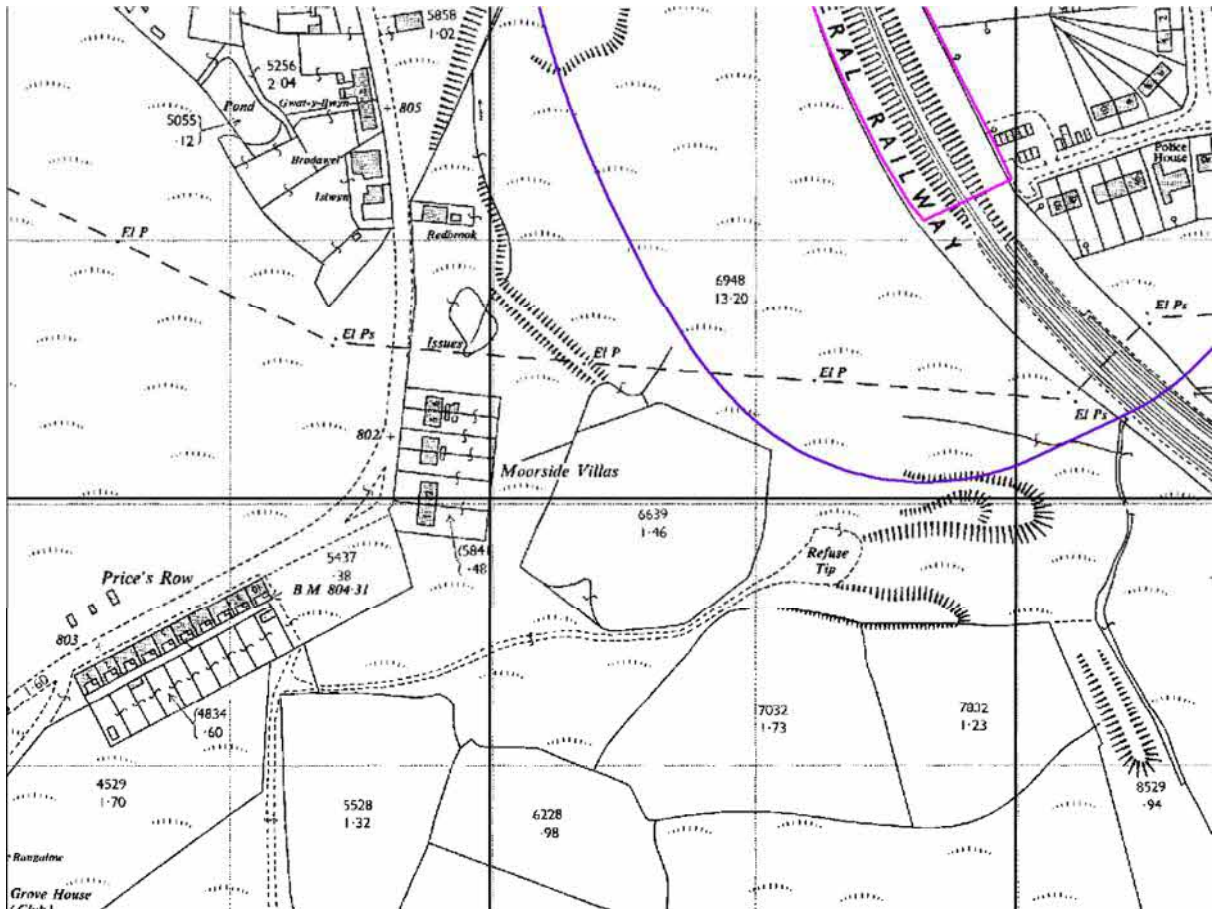
- There is a former landfill site 37m southwest of the site (Coelbren CS11/43). This is located in an old infilled railway cutting. The Swansea branch to Ynys-y-Geinon ceased carrying local freight in 1967 ([https://en.wikipedia.org/wiki/Colbren\\_Junction\\_railway\\_station](https://en.wikipedia.org/wiki/Colbren_Junction_railway_station)) and is shown as disused on the 1979 map. The cutting was infilled on the 1989 map and a playground had been constructed over it at the northern end of the site. A trial pit investigation by Terra Firma Wales within that site has demonstrated that the Made Ground within the cutting comprises either firm grey and yellowish brown mottled orangish brown slightly sandy slightly gravelly clay or medium dense to dense grey clayey sandy gravel/stiff grey mottled orangish brown slightly sandy slightly gravelly clay/medium dense dark grey gravelly sand (this is representative of quarry waste and colliery spoil). Despite it apparently having been licensed to accept domestic waste there is no evidence of this in the ground. There is no evidence of significant inclusions of degradable material that could cause hazardous ground gas migration and emissions into buildings built on this site. There has never been a recorded incident caused by landfill gas migration off site from material such as this.
- The fill has been in place over 30 years and therefore, even if there was degradable material present in sufficient quantities to pose a migration risk, after such a period of time in the ground it would be fully decomposed and it would not pose a risk of lateral gas migration to this site. The risk is further reduced by the presence of Glacial Till geology which means any migration would only occur at depth below the Till.
- There is no risk of landfill gas migration from the former refuse tip at Moorside Villas which is situated about 241m to the south of the southern site boundary. This is due to the tip being a land raise, rather than a filling operation, the age and likely composition of the waste, and the topography, meaning that there is no pathway for ground gas to impact the site through the ground. Further detailed evidence is provided below:
  - Inspection of the old maps shows this is an old ironstone quarrying area which was extensive across the area on the 1888 map. The area of the refuse tip is shown as an old shallow quarry on the 1888 map. The 1919 map shows it is level with the surrounding area and the quarry excavations are no longer shown. Ffonddu Colliery is now present. The evidence shows that prior to deposition of waste the area of the tip was leveled with colliery spoil to

surrounding ground levels. An extract of the 1919 map overlain by the current Google Earth image is shown below.



**1919 map overlain by current Google Earth image**

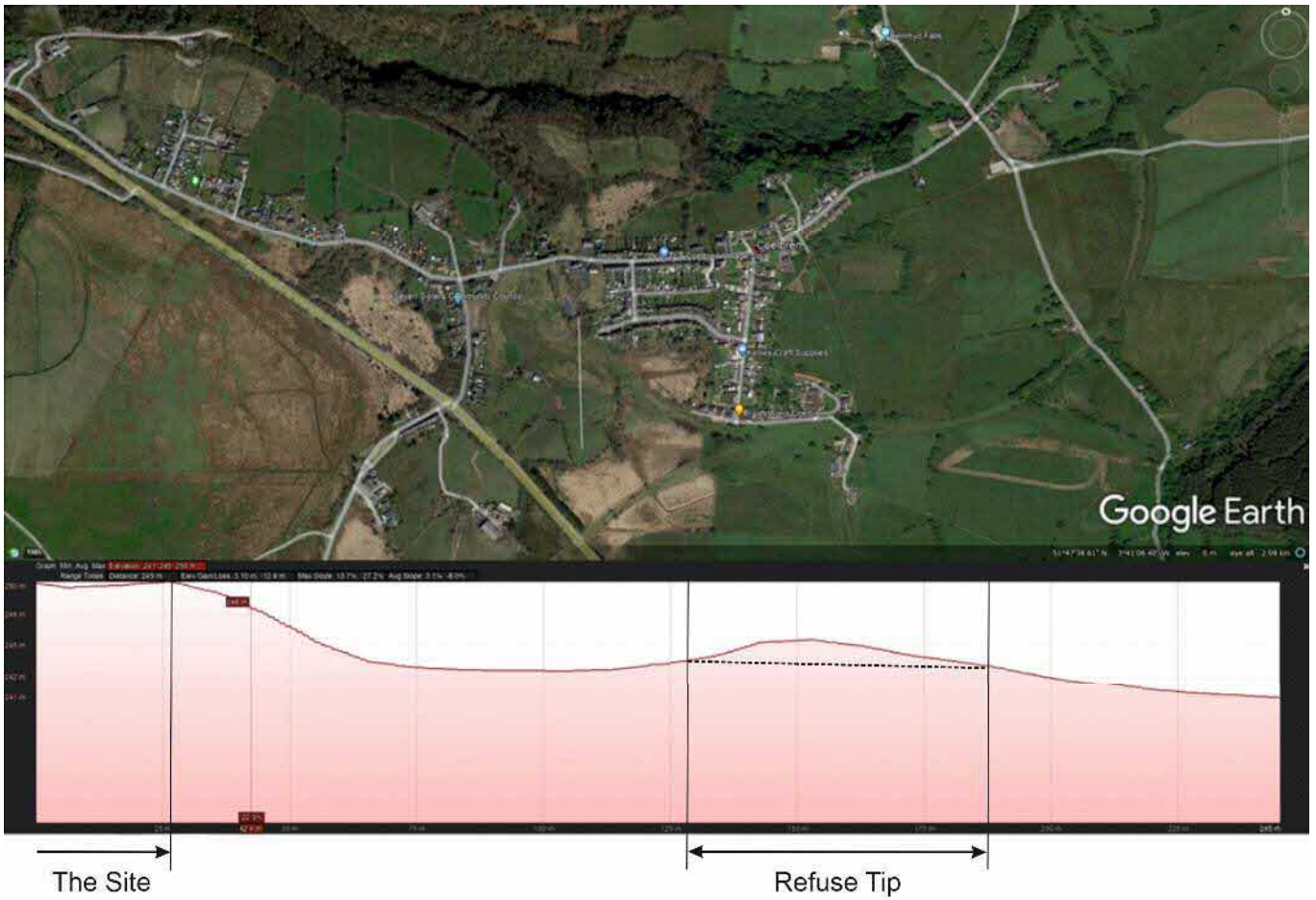
- The refuse tip is first shown on the 1962 map (extract below). At such time there would be limited degradable material in any domestic refuse and it would mainly be ash, glass, etc. The tip is last shown on the 1993 map although it appears that filling was complete by the 1987 map. Later waste may have a higher degradable content.



**Extract from 1962 map**

- There is no evidence on the maps of any deep excavations in the area of the refuse tip after the Ffonddu colliery was shown. Therefore, the refuse tip is a land raise. This is suggested by the historical maps which show the tip as an embankment. Furthermore the cross section of ground levels shown below shows the refuse site is above surrounding ground. It also shows that the development site it is at a significantly higher elevation.





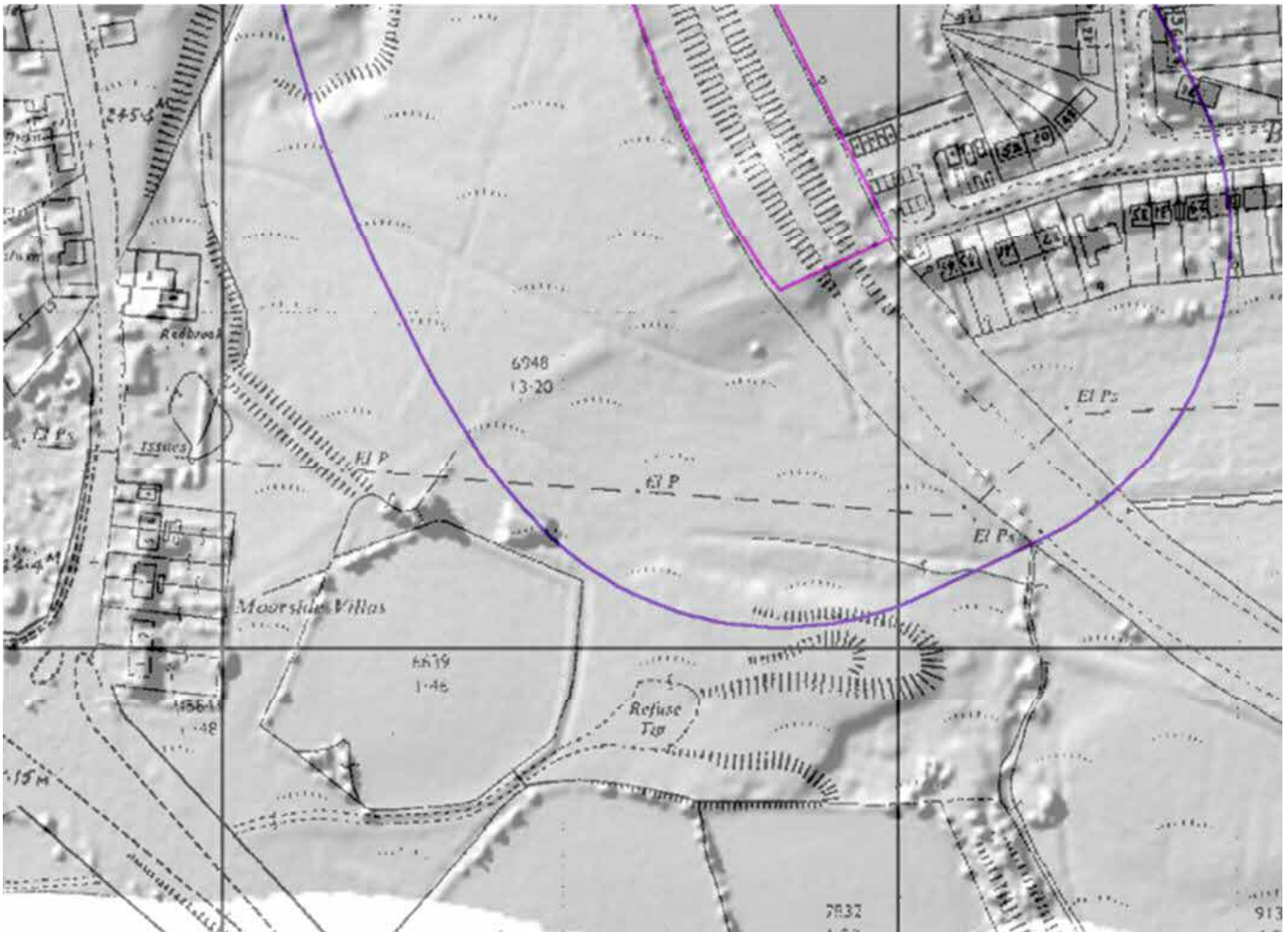
**Google section showing ground levels**

- The LIDAR map of the site provided below confirms that the landfill is a land raise (and it corresponds to the position shown on the maps as demonstrated by the overlay). It also shows that the former cutting below the site has not been completely filled and the site is lower than the surrounding ground.





Lidar map



**Historical map overlain onto Lidar map**

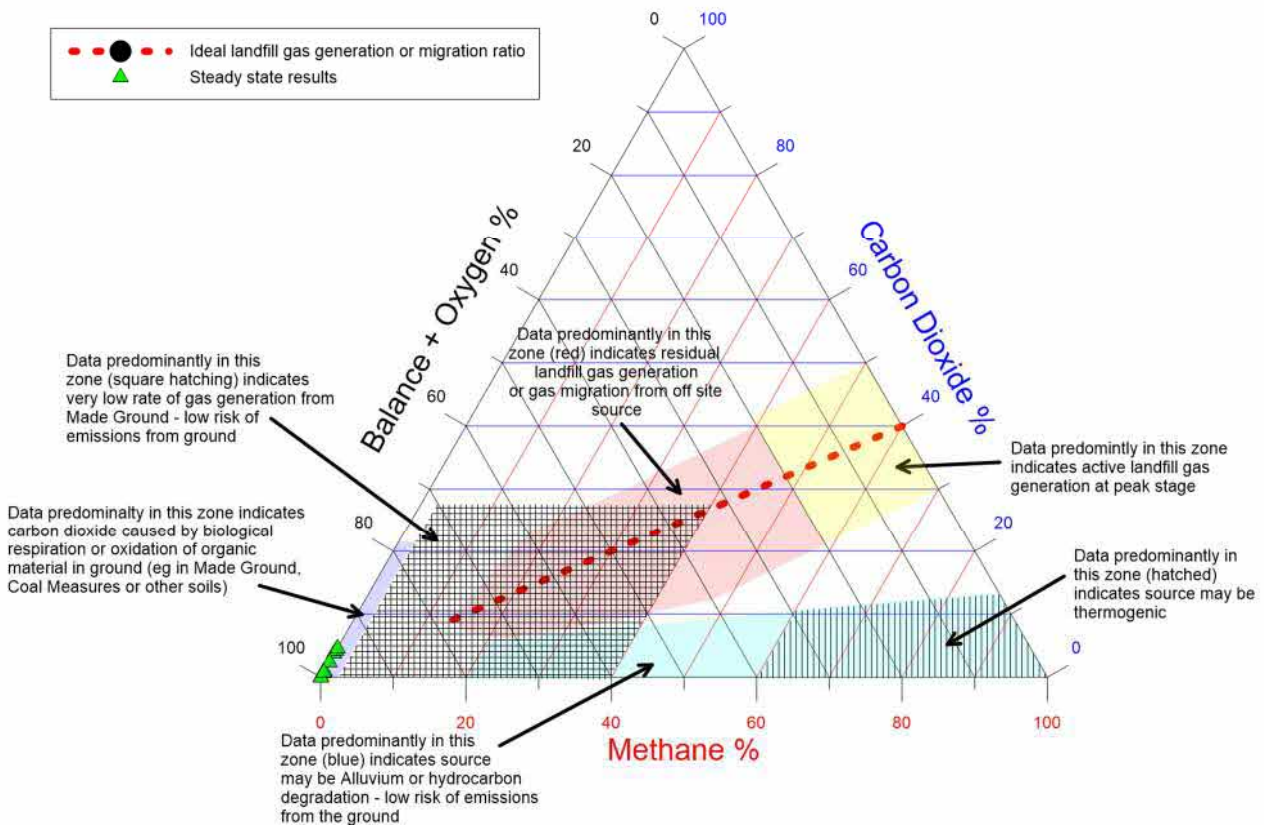
Therefore even if the landfill was filled with domestic refuse, because it is above ground it would not cause landfill gas migration to this site. Furthermore the Glacial Till would also limit the potential for gas migration over 241m because of its low permeability.

There is less than 1m of Made Ground below the site which is essentially soil based and represents material used to change ground levels during previous developments. Following the guidance in CL:AIRE RB17 it is not considered a source of ground gas and does not pose a risk to the development.

### **Ground gas from Made Ground below the site**

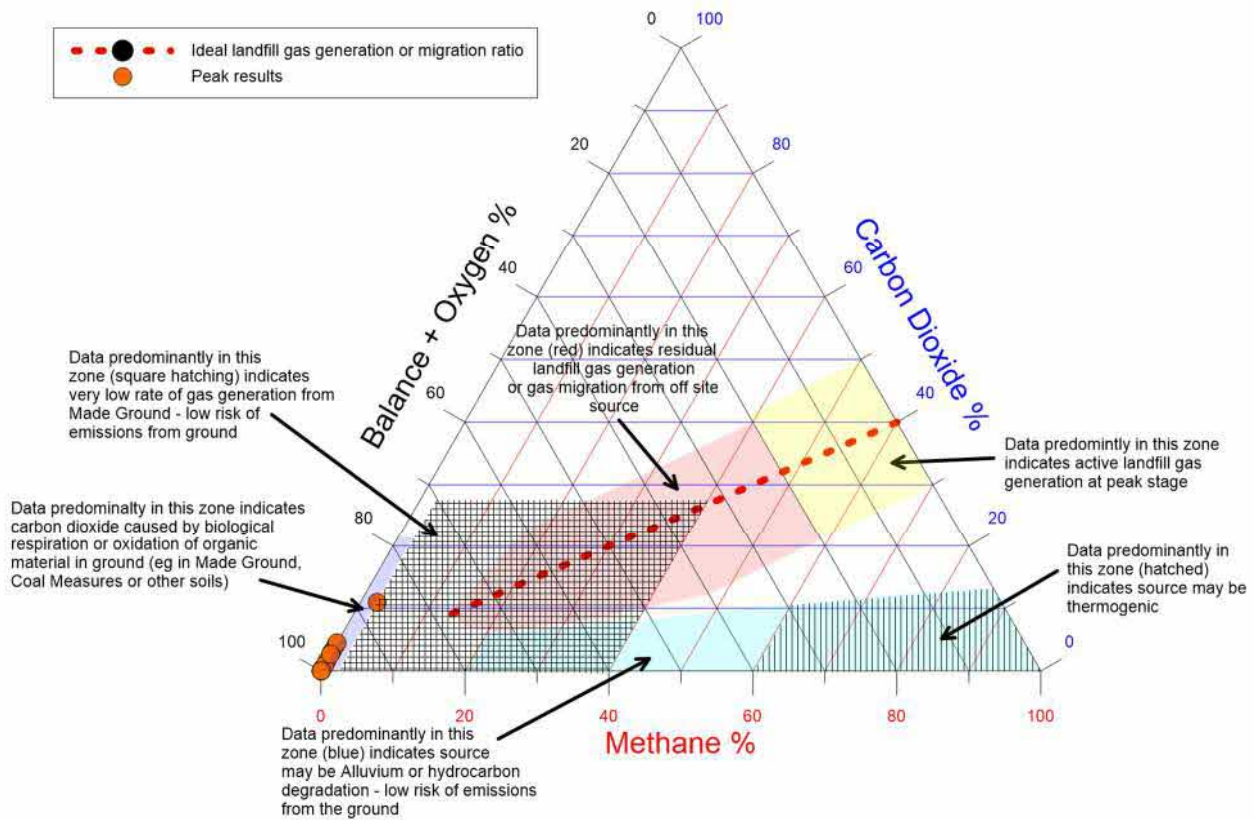
The ESP Ground Gas Risk Assessment includes gas monitoring results from gas monitoring in four monitoring wells at the site. Two wells were monitored on 6 visits, one on five and one on two visits. Four of the visits were at low atmospheric pressure.

BS8485 and BS8756 indicate that steady state values of gas monitoring data should be used in a risk assessment. In particular peak flow rates on opening a gas tap are not representative of the surrounding gas regime. Steady state results show methane <0.1%, carbon dioxide up to 4.6% and flow rates up to 0.4l/h. The slightly elevated carbon dioxide concentrations are caused by biological respiration of organic material in the Glacial Till as shown in the Ternary plot in the Figure below. All the hazardous gas flow rates are less than 0.7l/h and the site is characterized as Characteristic Situation CS1 in accordance with BS8485: 2015 + A1: 2019.



**Ternary Plot Steady State Data**





**Ternary Plot Peak Data**

Even plotting the peak data which is not representative of site conditions shows the gas concentrations recorded are not indicative of hazardous emissions. Again all the hazardous gas flow rates are less than the limit for Characteristic Situation CS1. Even a worse case check gives a GSV of 0.0138l/h which again indicates CS1. Given the CSM discussed above and absence of any significant high risk source of gas, plus the ternary plots it is reasonable to leave the classification at CS1 even though one reading recorded above 1% methane and two results were above 5% carbon dioxide. This is in line with the guidance in BS8485.

Furthermore the gas monitoring data in the site as plotted above shows that there is no landfill gas migration from off site landfill sites.

### Summary of Mine/Landfill Gas Risk

Following the CL:AIRE guidance the site is classified negligible risk with respect to mine gas and gas protection measures are not required and no further investigation (including gas monitoring) is required on the basis that:

- Mine entries are >50m from the site boundary;
- There are no workings below the site;



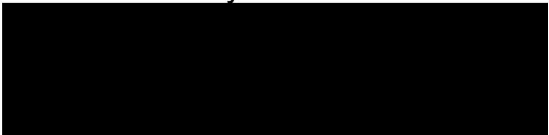
- There are no faults or other potential pathways connecting surface to deeper unflooded workings; and
- It is outside the area of past or probable shallow workings on the Coal Authority viewer.

The landfill sites to the south pose no risk of landfill gas migration towards this site. There is no ground gas risk from Made Ground below the site.

The site is classified as Characteristic Situation CS1 and gas protection measures are not required in the building when it is changed to residential use.

Please do not hesitate to contact me if you have any questions.

Yours sincerely



Steve Wilson

Technical Director

On behalf of The Environmental Protection Group Limited

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