



ROBERTS
ENVIRONMENTAL LTD

1 Croft Stairs
Newcastle Upon Tyne, NE1 2HG

Reference: 230615.R.001

20 June 2023

Mr R Marland
54 Tonacliffe Rd
Whitworth
Rochdale
OL12 8SS

Dear Robert,

RE: Soil Sampling and Gas Protection Strategy: 54 Tonacliffe Rd, Whitworth, Rochdale OL12 8SS

Further to our recent discussions regarding the above-mentioned site, please find outlined in this report our proposed strategy of soil sampling and gas protection, aimed to allow for the potential risks posed by contamination and ground gas (if present) at the site to be more confidently assessed and residual risks mitigated to the required standard.

This report has been produced with reference to the following documents made available to Roberts Environmental Limited (REL):

- EnviroSolutions Limited, Phase 1 Environmental Site Assessment Report, Dated 2 December 2021 (Ref: CL101);
- EnviroSolutions Limited, Coal Mining Risk Assessment, Dated 2 December 2021, (Ref: CL101); and
- Rossendale Borough Council, Grant of Planning Permission, Dated 10 March 2022.

1. Background

It is understood that you are proposing to construct a new build residential dwelling with associated external hardstanding and garden areas at the subject site which currently comprises a garden area associated with 54 Tonacliffe Road.

As part of the planning submission, it is understood a Phase 1 Environmental Site Assessment Report was commissioned from EnviroSolutions to provide a preliminary environmental risk assessment.

Based on the findings of the Phase 1 report, it is understood a ground investigation is required to better assess the risks posed by potential contamination and ground gas on future end users due to the potential for Made Ground comprising quarry infill of an unknown origin and nature being present on site. In addition, the site is located in a Coal Mining reporting Area and an area of Moderate Radon risk.

As such, REL have developed this strategy report detailing how those risks are to be more confidently assessed and suitable mitigation provided to provide the necessary reassurance to the Local Authority.

2. Proposed Soil Sampling Strategy

The following section presents the proposed soil sampling strategy developed by REL, which takes into consideration information presented within the previous third-party report, site characteristics as well as the proposed development.

Within the previous report, EnviroSolutions considered contamination may exist associated with previous quarry related activities and associated infilling which may have resulted in the placement of Made Ground beneath the site of an unknown origin and nature.

The subject site is to be redeveloped to create a single residential dwelling with associated external garden areas.

As such, REL consider the greatest anticipated risk relates to the potential for contaminants to exist in future garden areas where direct contact, ingestion and inhalation of soils, dusts and fibres could occur. In addition, contaminants may exist on site which have the potential to generate vapour which may enter confined spaces i.e. the proposed residential dwelling.

Non-volatile contaminants beneath buildings and hardstanding would not represent an unacceptable risk with regard direct contact, ingestion or inhalation of soils, dusts or fibres. As such, where such contaminants are present beneath hardstanding and buildings, the risk would be addressed although groundworkers must be subject to a suitable and sufficient risk assessment.

Based on the above, REL propose to undertake a programme of shallow soil sampling across the site, focussing on future garden areas as well as beneath the building footprint with testing selected to cover the common contaminants of concern including:

- Heavy Metals;
- Inorganics;
- Organics; and
- Asbestos.

Organics testing will include for Polycyclic Aromatic Hydrocarbons (PAH's) and Speciated Aliphatic/Aromatic Hydrocarbons, both of which will allow for the risks from vapour generation to be better assessed.

When considering the time since any quarry infilling is likely to have been undertaken i.e. circa 50 years at the latest (based on a review of historic mapping), should hydrocarbon impacted soils have been present, natural attenuation via, physico-chemical and biological degradation would have been expected to have reduced the contaminant load thereby limiting residual contaminants remaining.

During the progression of shallow soil sampling pits, soils will be inspected by an experienced engineer from REL who will undertake a dynamic risk assessment at the site, allowing for the soil sampling approach detailed in this report to be validated.

Should evidence of more extensive and/or the potential for more significant deeper contaminant impact be identified during these works, the Local Authority will be notified and additional works undertaken to allow for risks to be robustly characterised.

Furthermore, during the excavation of foundations, should unexpected contamination be encountered, this will be reported to the council and proposals presented to address any residual associated risks.

Should contamination be encountered which is considered to represent an unacceptable risk to future site users, remedial measures would need to be implemented. The scope of any such measures would be dependent upon the contaminant and exposure characteristics, with details presented within a Remediation Strategy report for Local Authority approval.

At this stage, it is envisaged that potential remedial measures (should they be required) may include for the removal of impacted soils, provision of a clean cover layer and the upgrading of any gas membrane to a gas and vapour membrane.

On completion of the shallow soil sampling exercise, the results and findings along with any recommendations will be presented to the Local Authority within a stand-alone report for review and consideration.

Soil Sampling Strategy Summary

REL therefore propose the following scope of works:

- Progression of 8 No. Shallow to depths up to 0.60m (standard clean cover layer thickness) to confirm the continuation of ground conditions.
- Undertaking a visual and olfactory assessment of soils encountered and logging soils to BS5930.
- Recovery of 6 No. soil samples for laboratory analysis which would achieve a sampling rate of one per eight-meter centre which is consistent with a detailed investigation as defined in BS10175. Analysis to comprise:-
 - Metals (Ar, Cd, Cr(III/VI), Cu, Pb, Hg, Ni, Se, Zn);
 - Inorganics (SO₄, Cyanide);
 - Speciated Aliphatic and Aromatic Hydrocarbons;
 - USEPA 16 Polycyclic Aromatic Hydrocarbons (PAH's); and
 - Asbestos fibres.
- Samples will be sent to a UKAS Accredited Laboratory under a chain of custody.
- Photo-Ionisation Detector Screening will be undertaken on soils encountered from beneath the site to further assess vapour generation potential.

By adopting the above approach, REL consider the uncertainties remaining from the previous Phase 1 report produced EnviroSolutions would be suitably addressed and sufficient data would be obtained to allow for a robust assessment of risk, whilst at the same time ensuring that works are undertaken to a reasonable and proportionate standard in consideration of the scale of the proposed development.

3. Ground Gas Protection Strategy

REL provide this proposed ground gas protection strategy to provide reassurance to the Local Authority with regard the risk posed by ground gas. Based on a review of the EnviroSolutions Phase I report, it is understood that concerns have been raised as to the potential for ground gas arising from infilled ground (backfilled quarry) and historic coal workings. In addition, EnviroSolutions indicate that the site is located within an area in which it is estimated that between 3 - 5% of the properties are above the action level (medium probability), radon area.

REL would note that a Coal Authority Risk Assessment produced by EnviroSolutions has been produced and submitted to the Local Authority which does not consider the site to be at risk from shallow worked coal seams and indicated that no further investigation or remedial works are required in this regard. It is understood this risk assessment has been accepted by the Coal Authority. As such, a significant direct risk from gas arising from worked coal seams is not considered to exist. The Coal Authority report no previous mine gas issues at the site.

With regard potential quarry infill, based on a review of historic maps, it would appear the any infill would have been in place for circa 50 years, during which time gas generation rates are likely to have decreased. The potential to generate ground gas from fill materials is influenced by numerous factors such as: organic matter content size, age, moisture content etc. As the primary mechanism for the generation of ground gas is the biodegradation of organic matter, any organic matter remaining will likely be greatly reduced after this prolonged period of time.

This is consistent with the findings of CIRIA C665 – Assessing Risks Posed by Hazardous Gases to Buildings. Section 7.2.5 (Figure 7.1), which details that landfill gas generation rates significantly reduces with the age of the waste. By 30 years, the rate of gas generation is likely to be insignificant, and by 50 years, the rate is likely to be minimal. It is currently considered therefore that the potential for ground gas generation is low.

No evidence of gas issues have been noted at the site or within surrounding properties based on available information, and ground works during the construction of the property would involve the excavation of soils. During such works and during the shallow soil sampling exercise discussed in the previous section the presence of potentially significant ground gas generating materials would be assessed by visual and olfactory assessment.

However, even where no such evidence of potentially significant gas generating materials is noted, as a precaution, the client has indicated their willingness to install ground gas protection within the proposed residential property in line with Characteristic Situation 2 as detailed within British Standard 8485:2015+A1:2019 - Code of Practice for the Design of Protective Measures for Methane and Carbon Dioxide Ground Gases for New Buildings.

Any such gas protection would need to be designed so as to provide protection against Radon. In addition, depending on the results of the soil sampling exercise, should a potential vapour ingress risk be identified and should source materials remain on site, gas protection may need to be upgraded to provide protection against volatile organics. As such, REL provided the following ground gas protection strategy aimed at providing precautionary gas protection to the proposed residential property and its occupants.

Gas Protection Score Requirements

Based on the proposed development and in accordance with BS8485:2015+A1:2019 and CIRIA C665, it is understood that the development will comprise a Type A building. Based on a Characteristic Situation (CS) classification, the minimum gas protection score (points) for the site is 3.5 points, as detailed in BS8485:2015+A1:2019.

Ground Gas Protective Measures

In order to achieve a Characteristic Situation 2 level of protection (3.5 points), the proposed ground gas protection system must comprise a combination of two or more of the following types of protection:

1. The structural barrier provided by the floor slab;
2. Passive ventilation measures; and
3. A dedicated gas resistant membrane.

Further details relating to each protective element is provided in the following sections.

➤ Structural Barrier and Ventilation Measures

It is considered that suitable structural barrier would comprise a reinforced, monolithic concrete floor slab. Reinforcement in the floor slab can comprise one sheet of mesh within the bottom and one within the top of the slab would be sufficient to obtain the final **1.5 points** required.

Alternatively, some independently certified proprietary systems now utilize fibre reinforced concrete instead of traditional reinforcing bars. Raft foundation may incorporate insulation above or below the slab or use proprietary insulation pods.

The floor slab must be suitably sealed at the edges where adjoining the existing external walls of the barn.

➤ Gas Membrane

It has been determined that a dedicated gas membrane would be required which provides protection against, Methane, Carbon Dioxide and Radon. In addition, depending on the findings of the Soil Sampling exercise, consideration may need to be given to hydrocarbon vapours. The gas membrane would need to pass across the full floor space and cross and external walls. The membrane must be effectively sealed and joined by approved materials and methods.

The gas resistant membrane (such as SOLCO SOLSHIELD Ultra Gas Barrier or a similar Visqueen product) is expected to meet the requirements of BS:8485, Table 7, providing protection against Radon, Carbon, Dioxide and Methane. Final membrane selection would be confirmed following completion of soil sampling.

The membrane will need to be installed by experienced contractors and independently validated, in accordance with BS:8485. Once installed to the required standard this membrane will provide **2 points** which along with the structural barrier would provide the full **3.5 points** required for Characteristic Situation 2.

Installation Requirements

Gas protection measures must be installed by an appropriately experienced and competent contractor. The slab, gas membrane and system components shall be installed/sealed in accordance with the manufacturer's guidelines. Any repairs or damage caused to the membrane during or post-installation shall be carried out in accordance with CIRIA C735 and the manufacturer's requirements. The following should be taken into consideration with regard to the gas membrane:

- The surface onto which the gas membrane is to be placed must be prepared by cleaning away debris which could result in punctures and levelling (where necessary);
- Once the surface onto which the membrane is to be placed is considered suitable, the membrane can then be placed and appropriately sealed;
- The gas protection should be produced using virgin materials and conform to the requirements as detailed in BS8485:2015+A1:2019;
- The gas membrane must be installed to the manufacturer's specifications by an appropriately qualified/experienced installer;
- The gas membrane must be laid with care, by suitably experienced contractors, and must pass across the floor space of the property, through external walls and cavities;
- Joints and penetrations must be suitably sealed using approved materials and techniques, which may include for either taping or heat welding, with the latter providing greater confidence, although typically requiring specialist installation contractors;

- Joints and penetrations must be sealed using approved materials and techniques (refer to manufacturer's specifications);
- FiloSeal (or alternative gas proof closed cell expandable foam) must be used to seal the annulus of any service ducts which penetrate through the membrane, with inspections undertaken to confirm this (normally after completion of the build);
- Following installation, consideration should be given to ensure the membrane is not damaged by follow-on works which may include informing other trades of the nature of the membrane and the importance of maintaining the membrane integrity;
- Where necessary, a temporary protective cover should be placed to protect the membrane. Additional care should be given in areas where follow-on works would result in the membrane becoming inaccessible and therefore un-repairable. The membrane should not be left exposed to sunlight for prolonged periods of time. This would include during storage, placement and post-placement;
- Heavy winds and rain can result in damage to the membrane, as such, weather conditions should be considered when programming in membrane installation works.

4. Conclusions

REL have provided this report with the aim of providing an outline strategy aimed at allowing for the risks posed by potential contamination and ground gas generation beneath the site to be more confidently assessed and measures adopted to mitigate against any residual risks following redevelopment. Details of a proposed ground gas protection strategy which is intended to provide precautionary gas protection to future site occupants is also included.

The report also provides confirmation that should unexpected contamination be encountered during soil sampling and/or groundworks, further works may be required to further characterise the risks. Any such works would need to be agreed with the Local Authority. REL consider the approach set out in this report, is reasonable and proportionate with respect to the development proposals whilst ensuring the health and wellbeing of future residents are fully considered.

Yours sincerely,



Andrew Cuthbert BSc (Hons), MSc, MIEMA, CEnv, CL:AIRE Qualified Person (QP475)
Principal Consultant
For and on behalf of Roberts Environmental
Tel: 0191 230 4521
Mob: 0777355224