Remediation Strategy and Verification Plan

The Byrons Housing Care
Bank House Road
Higher Blackley
Manchester
M9 8LY

Date: 2nd November 2026

Version 1

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EnviroSolution Ltd
Document Verification

Site Address	The Byrons Housing Care, Bank House Road, Higher Blackley, Manchester, M9 8LY		
Report Title	Remediation Strategy and Verification Plan		
Job Number	ES04324	**Document Ref.**	ES04324
Date Issued	2nd November 2026	**Report Version**	1
Prepared by	Tom Craig	**Signature**	
Checked by	Gemma Lucas	**Signature**	

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1 Introduction

1.1 Background

This report presents the Remediation Strategy and Verification Plan associated with the development of a plant room at The Byrons Housing Care in Manchester.

1.2 Supporting Information

The following reports have been completed for the site:

- EnviroSolution, Phase 1 Environmental Assessment Report, The Byrons, ES04316, 27th October 2026.

This report provides the basis for the conceptual understanding of the site.

1.3 Requirement for Remediation

The Phase 1 report included a review of publicly available third-party investigation reports which included the following list:

- HSP Consulting Engineers Ltd, Hillside Centre, Phase I Geo-Environmental Desk Study Report, C2729/PI, February 2018.
- HSP Consulting Engineers Ltd, Hillside Centre, Phase II Geo-Environmental Assessment Report, C2729/PII, April 2018.
- Sutcliffe Investigations, Prospect House Primary School, Phase II Interpretive Ground Assessment, 30186LG, April 2020.
- Sutcliffe Investigations, Prospect House Primary School, Phase III Remediation and Validation Proposals, 30186LG-R03 Rev A, April 2020.
- Sutcliffe Investigations, Prospect House Primary School, Phase IV Validation Completion Report, 30186-SUT-ZZ-00-RP-G-704-0001, January 2022.
- Sinclair Knight Merz (SKM), Co-Operative Academy, Geo-Environmental Investigation, November 2008.

The preliminary environmental site assessment indicates that the site can be classified as moderate-high risk in terms of contamination and the risks to the identified receptors (e.g., human health, buildings) following redevelopment is considered to be moderate high. This classification is due to well-established ground gas risks from an adjacent historic landfill. A number of ground investigations with monitoring data from nearby development sites have classified the site as Characteristic Situation 4 (CS4 – moderate to high risk). Ingress into the plant room is feasible and inhalation/ asphyxiation to future maintenance workers is possible. Ingress into an enclosed space could also present a risk of explosion. Given the limited development proposed, a Phase 2 ground investigation is not deemed necessary. It would be prudent to assume the worst-case scenario and recommend the installation of CS4 gas protection measures.

2 Remediation Options

2.1 Remediation Options

2.1.1 Ground Gas Protection

The remedial objectives are to ensure that a safe and suitable development platform is provided for the proposed land use, by removing all identified potential human health pollutant linkages.

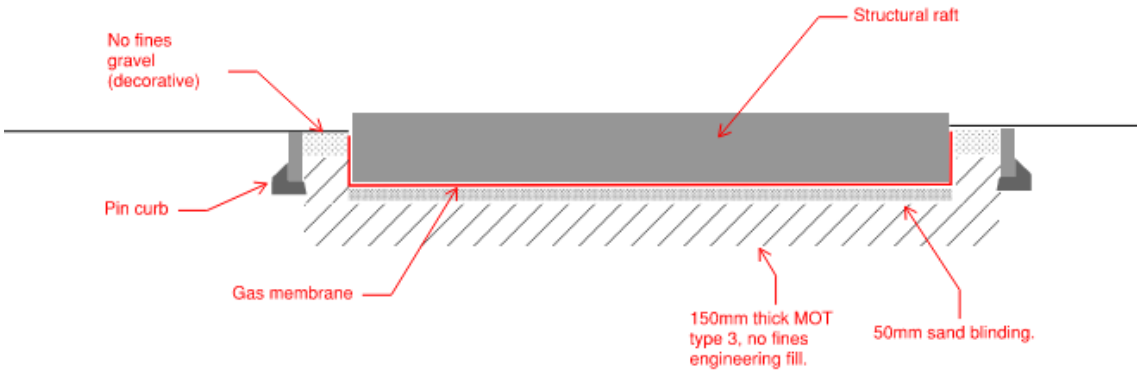
Development should be in accordance with the CS4 standard specified in BS8485:2015+A1:2019 (Code of Practice for the design of protective measures for Methane and Carbon Dioxide ground gases for new buildings).

In accordance with BS8485, the proposed development the proposed building falls into 'Type C' (Table 3 of BS8485) and therefore, the gas protection measures should achieve a score of 4.5. The gas protection measures should comprise an element or a combination of elements from Tables 5 – 7 of BS8485 and no more than one element per table should be combined to achieve the gas protection score.

A combination of two or more of the following protection measures should be used to achieve the Gas Protection Score:

- **Structural Barrier / Floor Slab**
  Cast in situ monolithic reinforced ground bearing raft or reinforced cast in situ suspended floor slab with minimal penetrations - **1.5 points**.
- **Ventilation Protection Measures**
  Passive sub floor dispersal layer of good performance and minimum thickness of 150mm - **1.5 points**.
- **Gas Resistant Membrane**
  Gas resistant membrane (including carbon dioxide) meeting the criteria outlined in Table 7 of BS 8485:2015 - **2 points**.

Plans showing the slab layout and service entry points are included in **Appendix A**.



2.2 Unexpected Ground Conditions

If any materials containing unexpected visual or olfactory evidence of contamination is encountered then groundwork should cease and the Local Planning Authority be informed, so that a suitable way forward can be agreed.

2.3 Health and Safety Considerations

During the redevelopment of the site, it will be necessary to implement measures to protect construction workers, and adjacent site users.

Construction workers and site visitors will be required to wear appropriate personal protective equipment (PPE). Health and safety procedures should ensure that ingestion of soils and groundwater is avoided (e.g. by washing hands prior to eating, drinking and smoking).

As a minimum, the works should be undertaken in accordance with best practice guidance and the following measures undertaken to assist with control of dust generation:

- Regularly damping down with water of access roads and stockpiles.
- A wheel washing facility for vehicles entering and leaving the site during the construction period to pass through.
- Use of enclosed or tarpaulined vehicles to transport materials and aggregates.
- Regular cleaning of local roads.
- Vehicle movements kept to a minimum and vehicle speeds within the site limited.
- Location of dust generating equipment (e.g. mobile crushing and screening equipment) to be positioned such that potential nuisance impacts to receptors are minimised, as far as practicable.

3 Validation and Verification

3.1 Validation Testing

3.1.1 Site Won Materials

Validation for site won materials is not required, except where unexpected contamination is encountered. This should be undertaken to ensure that the materials are suitable for re-use on site. It is recommended that sampling is undertaken at a frequency of one sample per 50m^3. Results should be compared to the respective soil quality criteria (see Section 3.2).

3.1.2 Imported Materials

If any soil is to be imported to site, then than validation of imported materials will be required. This should be undertaken at a frequency of one sample per 50m^3 for brownfield sourced or one sample per 100m^3 for greenfield sourced material. A minimum of 3 no. samples should be taken for any one source of imported materials.

The material should be compliant with BS3882:2015 *"Specification for Topsoil"* and the soil quality criteria presented in Section 3.2 in order to protect the rooting zone and human health.

Comparison of the results should be made with the soil quality criteria (see Section 3.2). If any exceedances are found, then the material should not be used on the site.

It is recommended that validation of imported soils is undertaken at the source of the material to ensure that the material is suitable for use prior to importation to site. If the sampling of the imported materials is to be undertaken prior to importation to site, the respective quantity of materials should be stockpiled/isolated at source whilst the laboratory testing is being undertaken. This should ensure that the laboratory test results remain representative of the materials to be imported. Delivery certificates should be retained.

Validation certificates and documentation will be retained and included within the verification / completion report for all imported materials. Where validation is undertaken at source subsequent delivery notes should be retained for all imported material and copies included in the completion report to ensure corroboration of site delivered materials with those sampled.

3.1.3 Testing Requirements

Sufficient time should be allowed for sampling, analysis and the decision-making process required to meet the remediation objectives. Sampling must be undertaken by a suitably qualified environmental professional (i.e. Environmental Scientist/Engineer) or experienced chemist.

The Laboratory analysis should be undertaken by a UKAS accredited analytical laboratory to MCERTS standards where applicable. All soil samples should be analysed for the following parameters: Toxic 9 metals, pH, asbestos, TPHCWG, SVOCs and VOCs.

3.1.4 Validation of Gas Protection Measures

Following the installation of gas protection measures, this work should be validated and verified by a suitably qualified and independent contractor in accordance with CIRIA C735 (Good practice on the testing and verification of protection systems for buildings against hazardous ground gases, August 2014), defined as below:

1. NVQ Level 4 "Gas Protection Verification"
2. CL:AIRE TGPV Accredited Surveyor

A verification plan is included in **Appendix B.**

Gas protection measures design plans and specifications of the selected gas membrane should be provided to the verifier prior inspection.

3.2 Soil Quality Criteria

Any materials to be utilised on site should meet the Soil Quality Criteria in **Appendix C**. As the controlled waters risk assessment has concluded that the risks to groundwater and surface water bodies are low, the quality criteria for the site are based on mitigating risks to human health rather than leachability criteria.

The soil quality criteria comprise a combination of:

- CLEA SGVs
- LQM 'Suitable for Use Levels'
- LQM 'Category 4 Screening Levels'

All materials to be used in areas of soft landscaping must meet the soil quality criteria for residential land use without plant uptake.

Any material imported to site must not contain contaminant levels that exceed the existing site conditions, regardless of whether they meet the assessment criteria. This is to ensure minimal risk levels are achieved.

If asbestos is identified, then the contaminated material must not be re-used unless it is buried at depth beneath a clean cover system. If widespread asbestos containing materials (ACM) are identified during the groundworks the procedure outlined in Section 2.2 for unexpected contamination should be followed.

3.3 Verification Report

Following completion of the remedial works, verification of the works must be included in the Verification Report.

On completion, a set of as-built drawings should be produced along with relevant information to show that the site is suitable for its intended use.

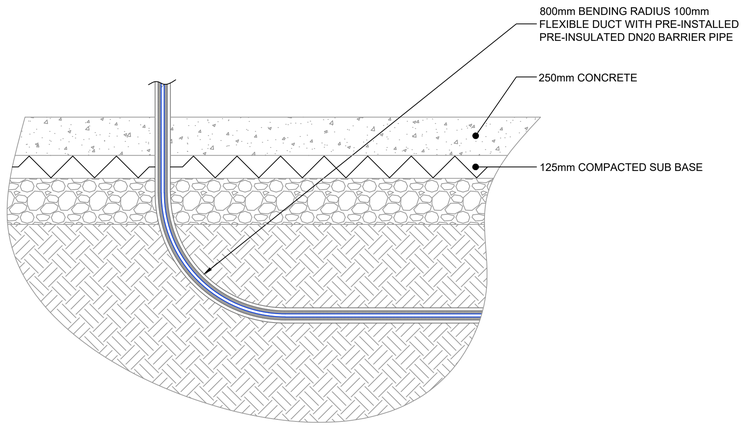
All the information shall be collected by the contractor, and issued to the Client or the Client's representative, who on completion should complete an independent assessment of the results and produce a final verification report. The verification report should form part of the

operations and maintenance manual and health and safety file for the site to be held by future site operators and to be used for any future development.

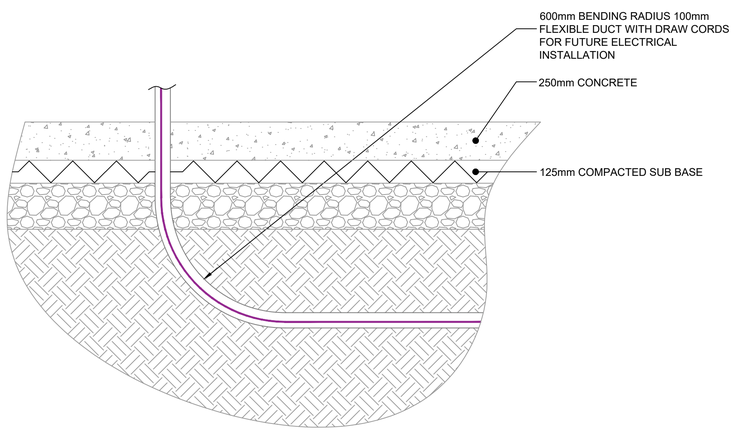
APPENDIX A

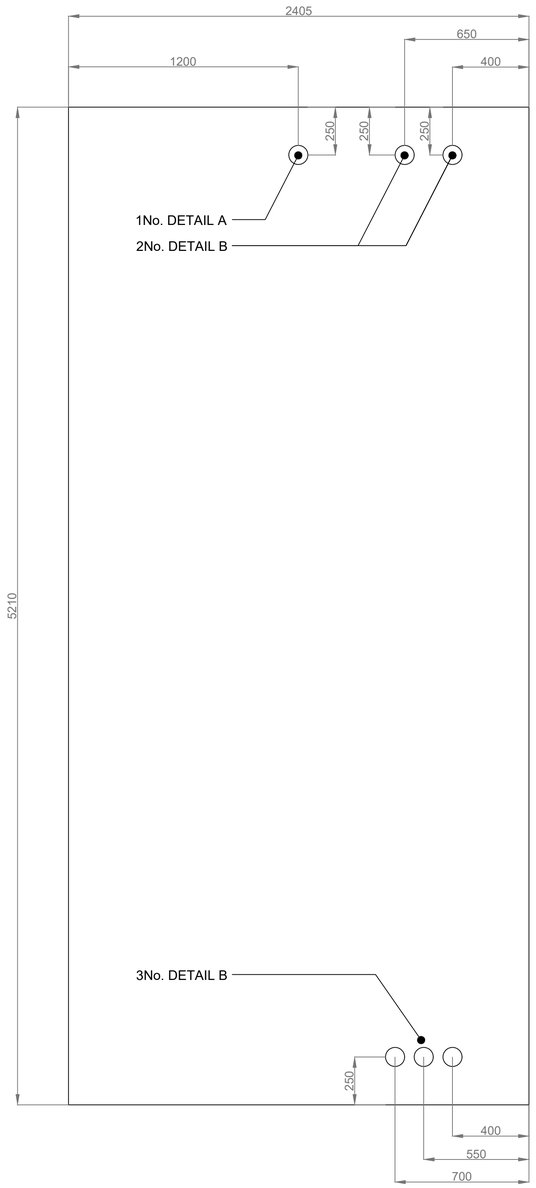
Notes:

DETAIL A
Scale:NTS@A1



DETAIL B
Scale:NTS@A1





Rev	Description	Date	By	Chk	App
C02.2	ISSUE FOR CONSTRUCTION	03/09/26	JAT	JQA	JKF
C02.1	ISSUE FOR CONSTRUCTION	24/08/26	JAT	JQA	JKF
C02	ISSUE FOR CONSTRUCTION	18/05/26	JAT	JQA	JKF

FairHeat

FairHeat Limited
Unit 101, Trowbray House, 108 Weston St, London SE1 3QB
Tel:020 7042 9270 Web: www.fairheat.com
ISO 9001:2015 and ISO 14001:2015 certified

Client
great places HOUSING GROUP

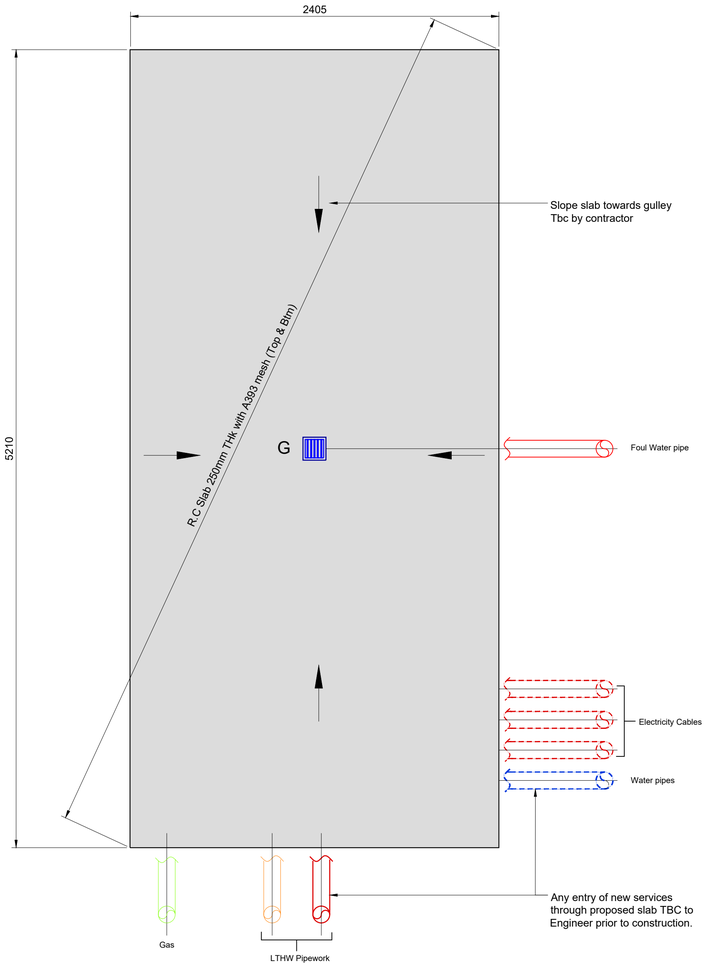
Project
THE BYRONS

Title
BELOW GROUND
EXTERNAL SERVICES

Suitability: D4 - Suitable for Construction/Procurement

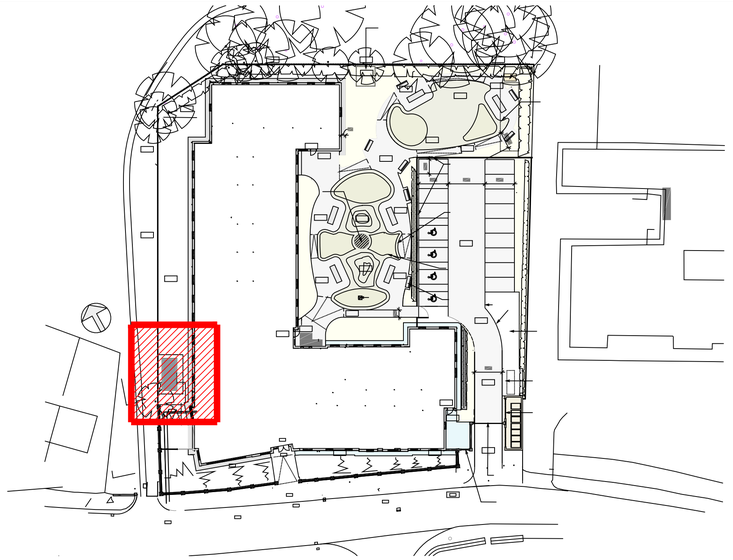
Scale	Size	Date	Project No.
1:16	A1	18/05/26	GR02

GR02-FRHT-00-GF-DR-M-0010-D4-C02.2
Project Code Originator Volume Level Type Role Number S.Status Revision



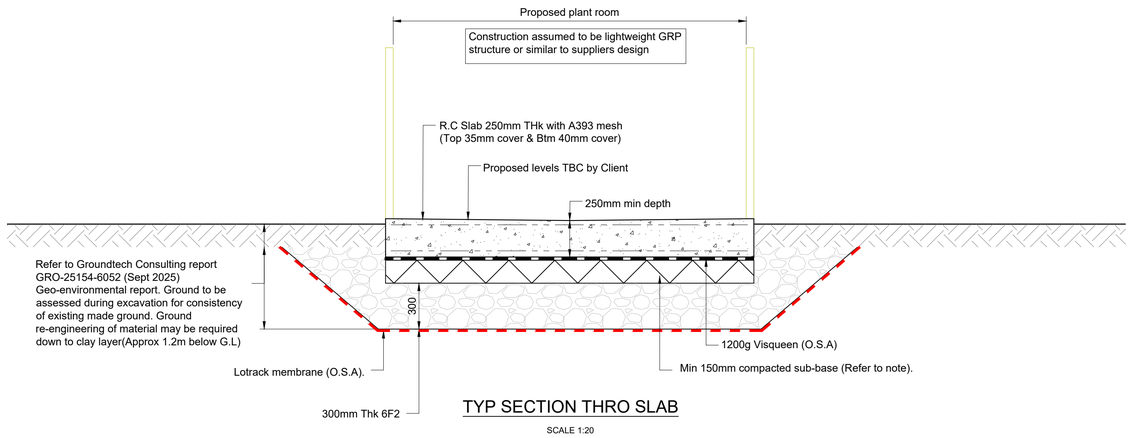
SLAB LAYOUT

SCALE 1:20



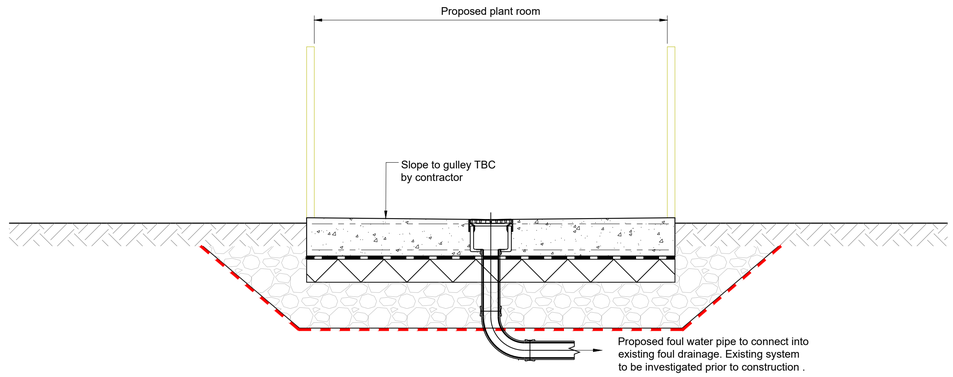
INDICATES AREA OF WORKS

(Scale 1:500)



TYP SECTION THRO SLAB

SCALE 1:20



SECTION THRO SLAB @ GULLEY LOCATION

SCALE 1:20

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GENERAL NOTES

1. DRAWINGS ARE TO BE READ IN CONJUNCTION WITH ALL RELEVANT SPECIFICATIONS, ENGINEERS, ARCHITECTS & SERVICES DRAWINGS, INCLUDING APPROVED BUILDERS WORK DRAWINGS. CONTRACTOR TO NOTIFY ENGINEER OF DISCREPANCIES BETWEEN STRUCTURAL DRAWINGS AND SPECIFICATIONS OR OTHER DRAWINGS.
2. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS NOTED OTHERWISE.
3. DO NOT SCALE FROM THE DRAWINGS OR THE COMPUTER DIGITAL DATA, ONLY FIGURED DIMENSIONS ARE TO BE USED.
4. THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE DESIGN, FABRICATION, ERECTION AND REMOVAL OF ALL TEMPORARY WORKS AND SHALL PROVIDE ALL TEMPORARY BRACING AS NECESSARY TO MAINTAIN STRUCTURAL STABILITY DURING CONSTRUCTION.
5. IF THE CONTRACTOR CONSIDERS THAT HE DOES NOT HAVE SUFFICIENT INFORMATION TO SAFELY COMPLETE THE WORKS DETAILED ON THIS DRAWING, HE SHOULD CONTACT THE ENGINEER.

CDM DESIGNER'S RISK ASSESSMENT

THOMASONS ASSUME THAT THE CONTRACTOR IS COMPETENT IN MATTERS OF HEALTH & SAFETY AND IS AWARE OF ALL THE NORMAL RISKS ASSOCIATED WITH CONSTRUCTION OF THE TYPE SHOWN ON THIS DRAWING. REMAINING UNUSUAL RISKS ARE :-

	CHK'D
CONSTRUCTION	
1. Live drainage & below ground services around location of proposed slab. TBC by the contractor prior to construction.	MP
MAINTENANCE / CLEANING	
1. No unusual risks	MP
DECOMMISSIONING / DEMOLITION	
1. No unusual risks	MP

EXTERNAL CONCRETE SLAB

GENERAL

1. All materials and workmanship shall comply with the engineers specifications.
2. All threshold details shall be in accordance with the proprietary floor finish suppliers recommendations.
3. All existing services shall be identified by the contractor and dealt with as directed by the contract administrator prior to any excavation work.
4. Prior to placing granular bed the ground formation beneath the area of ground floor slab is to be inspected and any soft, deleterious or frost susceptible material is to be removed and replaced with approved compacted granular material.
5. The formation is to be compacted with a vibrating roller in accordance with the D.O.T. specification Table 8/1 assuming a 300mm bed thickness. any depressions in the formation after compaction are to be filled with approved granular material and recompacted. This process should be repeated until a level formation is achieved.
6. Where required additional layers of compacted D.O.T. Type 1 granular material should be provided in maximum of 300mm thick layers compacted in accordance with Table 8/1 of the D.O.T. specification.

CONCRETE

7. Concrete mix is to be C35/45.
8. Slab finishes shall be in accordance with the architects requirements and compatible with direction of fall.

Rev	Description	By	Date	Chkd
P1	ISSUED FOR INFORMATION	MT	24.10.25	MP

THOMASONS
3 Brewery Yard, Deva City Office Park, Trinity Way,
Manchester M3 7BB | Tel : 0161 839 3993

THE BYRONS,
HIGHER BLACKLEY, MANCHESTER

PROPOSED EXTERNAL PLANT SLAB LAYOUT

Status: INFORMATION

Drawing No.	Revision
12924 - 001	P1

Scale	Size	Drawn	Date	Passed (Tender)	Passed (Construction)
NTD	A1	MT	OCT 25	-	-

APPENDIX B

GeoEnginSeer Ltd
Geological Services
Gas Protection Verification
Site Supervision
Ground Gas Sampling

GeoEnginSeer Ltd Geological Services

10 School Street, Wheldon Road, Castleford, West Yorkshire, WF10 2FD

Ground Gas Protection System Verification Plan

Building Warrant Application

Prepared for

The Client: EnviroSolution, Suite 53, 3a Bridgewater Street, Liverpool, L1 0AB

Publish Date: 1.11.2026

Version Number: GESL Ref: 2066 V1

Project: Erection of Plant Room

Planning application reference: 144175/FO/2025 – Manchester City Council

Client: EnviroSolution

Main Contact: Tom Craig

Contact number: 07776152182

Installer: TBC

Verification Plan Created by: Ben Crowther B.Sc, M.Sc, PGCE, FGS, CIEH, PCA QT, SGPV

Email: GeoEnginSeer@gmail.com **Telephone:** 07817 108 921

Web: www.GeoEnginSeerLtd.co.uk

This document has been created in accordance with British Standards 8485:2015+A1:2019 & Construction Industry Research and Information Association
CIRIA 735 – Good Practice on the testing and verification of ground gas protection systems for buildings against hazardous ground gases

Erection of Plant Room

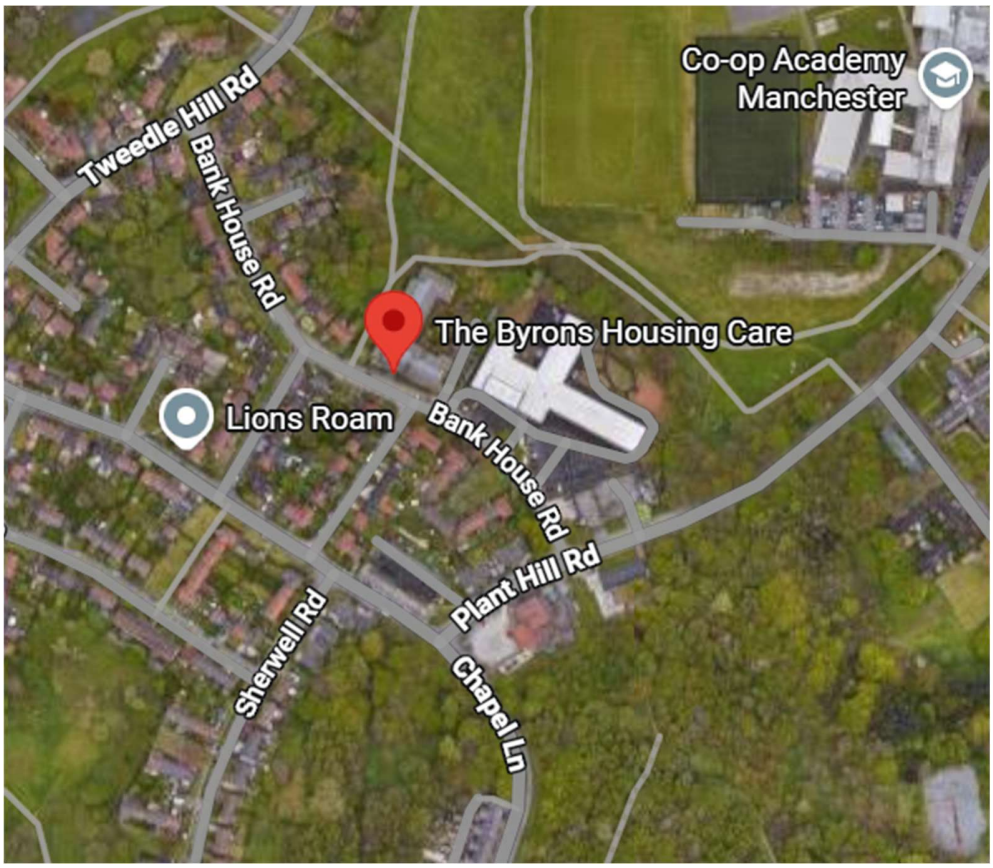


Image courtesy of Google Maps 2026

This document has been created in accordance with British Standards 8485:2015+A1:2019 & Construction Industry Research and Information Association
CIRIA 735 – Good Practice on the testing and verification of ground gas protection systems for buildings against hazardous ground gases

Executive Summary

Site Address:	The Byrons Housing Care, Bank House Road, Higher Blackley, Manchester, M9 8LY
Relevant Site Investigation Report extract:	For this site EnviroSolution have undertaken a Phase 1 Environmental Assessment Report, reference ES4316_V1, dated 27th October 2026. This is in addition to a number of off-site reports on nearby properties including: • HSP Consulting Engineers Ltd, Hillside Centre, Phase I Geo-Environmental Desk Study Report, C2729/PI, February 2018. • HSP Consulting Engineers Ltd, Hillside Centre, Phase II Geo-Environmental Assessment Report, C2729/PII, April 2018. • Sutcliffe Investigations, Prospect House Primary School, Phase II Interpretive Ground Assessment, 30186LG, April 2020. • Sutcliffe Investigations, Prospect House Primary School, Phase III Remediation and Validation Proposals, 30186LG-R03 Rev A, April 2020. •Sutcliffe Investigations, Prospect House Primary School, Phase IV Validation Completion Report, 30186-SUT-ZZ-00-RP-G-704-0001, January 2022. • Sinclair Knight Merz (SKM), Co-Operative Academy, Geo-Environmental Investigation, November 2008. The following extract has been taken from the Phase 1 Report by EnviroSolution: *"The preliminary environmental site assessment indicates that the site can be classified as moderate-high risk in terms of contamination and the risks to the identified receptors (e.g., human health, buildings) following redevelopment is considered to be moderate-high. This classification is due to well-established ground gas risks from an adjacent historic landfill. A number of ground investigations with monitoring data from nearby development sites have classified the site as Characteristic Situation 4 (CS4 – moderate to high risk). Ingress into the plant room is feasible and inhalation/ asphyxiation to future maintenance workers is possible. Ingress into an enclosed space could also present a risk of explosion. Given the limited development proposed, a Phase 2 ground investigation is not deemed necessary. It would be prudent to assume the worst-case scenario and recommend the installation of CS4 gas protection measures."*
Site description and context:	The site is located at The Byrons Housing Care, Bank House Road, Higher Blackley, Manchester, M9 8LY. The British National Grid Reference for the approximate site centre is GR: 385050 403550. The site is roughly rectangular in shape and covers an approximate total area of 4,000 square metres. The footprint of the proposed development covers a much smaller area of approximately 30 square metres, located on the western flank of the existing building.

	The site is currently occupied by a mix of 2 and 3-storey apartments arranged in an L-shape used as social housing. A car park and landscaped area are located in the eastern half of the site. The site is accessed via a driveway along the southern boundary. The site is generally flat with little change in elevation at approximately 84m aOD. The site is bounded by a primary school to the east, high school to the north and residential houses to the west and south. No petrol filling stations have been identified within a 250m radius of the site.
Planning Permission:	144175/FO/2025 – Manchester City Council
Geology and Aquifer Designations:	Geological maps of the area indicate that the site is directly underlain by superficial diamicton deposits. Diamicton deposits generally consist of unsorted clays, silts, sands and gravels. The underlying bedrock is the Manchester Marls Formation, deposited during the Permian Period. It mainly consists of red marl (calcareous mudstone and siltstone) with thin beds of fossiliferous marine limestone and dolomite. The nearest geological fault is located approximately 60m north of the site. A borehole log (Ref: SD80SW930) was obtained from BGS online records 270m northwest of the site. The borehole shows 0.40m of topsoil overlying loose slightly silt sand. The superficial diamicton deposits are designated as a Secondary Undifferentiated Aquifer, defined as; cases where it has not been possible to assign either Category A or B to a soil type. The underlying Manchester Marl Formation is designated as a Secondary B Aquifer, defined as; a geological layer with predominantly lower permeability that stores and yields limited amounts of groundwater due to localized features such as fissures, thin permeable horizons, and weathering.
Ground Gas and Summary of Gas Risk Assessment	The site lies within the lowest band of radon potential where it is estimated that less than 1% of the properties are above the action level (low probability). Radon protective measures are not deemed necessary for the development. There are 5 no. records of historic landfill sites located within a 1km radius of the site. A review of HSPs Consulting Reports for the nearby Hillside Centre revealed a classification of Characteristic Situation 4, based on the GSV calculation with carbon dioxide at 15.4% and a maximum flow rate of 25.5 l/hr. A review of Sutcliffe's report for Prospect House Primary School showed a classification of Characteristic Situation 2, based on the GSV calculation with carbon dioxide at 11.6% and a maximum flow rate of 0.7 l/hr. Sutcliffe additionally make reference to an SKM report completed at the Co-Operative Academy concluding Characteristic Situation 4. Given the limited development proposed, a Phase 2 ground investigation is not deemed necessary. It would be prudent to assume the worst-case scenario and recommend the installation of CS4 gas protection measures. Therefore, CS4 gas protection measures should be implemented for this Type C development.

Remediation Strategy and Gas Protection Measures Required	The proposed construction is classified as a Building Type C in accordance with BS8485:2015 and the site falls in CS4 in accordance with Table 2 of CIRIA C665 and as such, a minimum gas protection score of 4.5 points for a Type C building will be required from the following: **Structural Barrier / Floor Slab** Cast in situ monolithic reinforced ground bearing raft or reinforced cast in situ suspended floor slab with minimal penetrations - 1.5 points. **Ventilation Protection Measures** Passive sub floor dispersal layer of good performance - 1.5 points. **Gas Resistant Membrane** Gas resistant membrane (including carbon dioxide) meeting the criteria outlined in Table 7 of BS 8485:2015 - 2 points.

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Annex
A - Example of an appropriate verifier
B - Detailed Drawings of the location of gas protection measures in the build
C - Web Links to Example Materials

Purpose of the Verification Plan

This report has been prepared in general accordance with UK guidance and good practice documents, including (but not limited to):

- BS8485: 2015 + A1: 2019 - Code of Practice for the Design of Protective Measures for Methane & Carbon Dioxide Ground Gases for New Buildings (BSI, 2019).
- CIRIA 665 Assessing risks posed by hazardous ground gases to buildings.
- CIRIA Report C735 - Good Practice on the Testing and Verification of Protection Systems for Buildings Against Hazardous Ground Gases (CIRIA, 2014).
- Land Contamination: Risk Management (https://www.gov.uk/government/publications/land contamination-risk-management-lcrm) (Environment Agency, October 2020); and
- BS EN ISO 21365 - Soil quality – Conceptual Site Models for Potentially Contaminated Sites (BSI, 2020).
- Radon: Guidance on protective measures for new buildings (including supplementary advice for extensions, conversions and refurbishment projects) 2023 edition.

A copy of this report should be submitted to relevant Regulators / stakeholders for their review, comment and approval.

Limitations of the Verification Plan

This report is based on the information that has been made available to GeoEnginSeer Ltd by the client, contractor and architect regarding the site. The conclusions drawn in the report are considered correct although any subsequent additional information or actions may allow for refinement of the conclusions. It should be noted that: The report has been prepared under the express instruction and is solely for the use of the Client.

The findings of this report represent the professional opinion of experienced Ground Gas System Surveyors. GeoEnginSeer Ltd. does not provide legal advice. The advice of lawyers may also be required.

All work carried out in the preparation of this report has utilised, and is based upon understanding of current relevant UK standards and codes, technology, and legislation. (BS8485:2015+A1:2019 & CIRIA 735).

Changes in the aforementioned legislation and guidance may occur at any time and could render conclusions null.

This report is limited to the boundaries identified by the client on this site and confirmed within this document.

A retrospective fit may be required if additional services are introduced, or if service conduits are not sealed, or if service conduits have services provided through them at a later date and are not sealed to the conduit and or gas protection system. If a site is left open for prolonged periods following verification or works are conducted that may damage the integrity of the installation by follow-on trades, repairs may be needed, the standards observed in a positive verification report may be compromised. Intellectual rights to this document may be rescinded.

The report is limited to the boundaries identified by GeoEnginSeer Ltd on this site and confirmed within this document.

Principals of The Byrons Housing Care Verification Plan

GeoEnginSeer Ltd, an independent specialist, has been appointed by the client to create this Verification Plan, conduct Verification visits and to produce a Verification Report for the installation of gas protection measures at The Byrons Housing Care.

Verifier Experience

GeoEnginSeer Ltd staff collectively have a 47-year history in the industry dealing with gas barriers and containment. Ben Crowther – Director details appended below.

GeoEnginSeer Ltd has been a verification specialist company for 5 years and has experience with gas and water protective systems ranging from multistory apartment blocks, residential housing, commercial developments and industrial heavy machinery floors as well as HS2 tunnels and shafts.

Verification Testing

A non-destructive testing regime is used to verify installed gas protective measures. GeoEnginSeer Ltd can and will conduct the following methods for testing the integrity of the installed materials.
Visual examination, pick testing, Air Lance testing and air flow testing to sub floor void.

Examination of startup test welds by destructive testing shall also occur if heated hand welding is conducted.

Some of these tests adhere to ASTM D4437, 2008 Edition, April 1, 2008, others are novel and are described in the CIRIA C735 code of practice documentation and BS 8485+2015+A1:2019.

Professionally Designed System:

A Structural Engineer designed system has been produced, in conjunction with the Architects' plans with close attentive reference to standard installation principles from manufacturers.

These plans are reproduced in this document but refer to latest editions for scaling or build program.

The wording on the plans details the buildup of layers and placement of the Passive Ventilation Layer and Gas Resistant membrane and other components of this gas protection plan.

Much of the wording is drawn from manufacturers' recommendations, which can be found on their websites, under installation details. Links provided in the Appendix.

Assured Professionalism

Guidance and professional bodies such as member of the British Verification Council (Ben Crowther was a founding member) and quality assurance peer review organisations such as CL:AIRE with their TGVP/SGVP system all suggest several key elements are required for the action of verification which are all included in this plan. There is a small additional fee for a declared site through the CL:AIRE system, which is optional.

Professional Installers:

As the installation may be conducted by professional staff qualified with the NVQL2 diploma in substructure occupations (installation of Gas Membranes) a professionally qualified person is not necessary in this case, with approval from the membrane manufacturer, the materials manufacturer and so experienced ground workers can create an excellent installation as long as manufacturers guidelines are followed.

Frequency of Inspection:

Verification is required for all installation events, prior to any covering of the gas barrier on the new build properties.

The plan for The Byrons Housing Care site will be 100% inspection of membrane and evidential reporting on Covering of the membrane, and inspection during installation of insulation for protection of the installed membrane. This is especially the case if experienced ground workers conduct the installation. Immediately post installation is the Key time that damage can occur and must be dealt with appropriately.

Subgrade

Subgrade quality is key to a successful install, subgrade inspection forms shall be submitted by site management or acceptance forms from professional installers to GeoEnginSeer Ltd.

With The Byrons Housing Care the subfloor build-up of floor will involve a smoothly rolled subgrade installed Membrane Gas Barrier, with independent verification, which is required, insulation and floor screed will then be protected with the rapid installation of insulation or screeding.

Additional Important Considerations:

Follow on trades taking care and avoiding damage to the installed material is crucial and all levels of Management must pay heed to this to prevent damage as detailed above.

Toolbox talks detailing the above and the importance of reporting damage so it can be repaired is critical.

Individual or Daily Verification Event Recording

Each verification event will photographically document any repairs. These records may include subgrade sign off forms and each report will evidence all non-destructive testing conducted. A report of the event detailing any issues, concerns and all testing will be produced each time verification is required. This will usually be close to the end of each stage of installation, so that repairs can be affected. Air flow testing will occur to any ventilation duct work installed. Confirmation of appropriate products used over 100% of the installed system will be conducted on each and every verification event.

Communication

Communication is crucial to a successful project. Appropriately timed verification event coordination will occur just before the completion of each section of gas protection measure installation, especially of the gas resistant barrier membrane.

British Standard 8485:2015+A1:2019 Calculated Points System

This has been outlined in the Remedial Strategy document.

The Architect and Manufacturer of gas protection designed solutions for this development provides a system that achieves the points that are required to ensure protection of this property and the occupants. 4.5 points are required for this Type C building, with the precautionary adoption of Characteristic Situation 4, High Risk is in effect at this site. The installation of an appropriate gas barrier membrane (example link in appendices), and subsequent independent verification testing provides 2.0 points.
In addition, a subfloor void of minimum 150mm, scores an additional 1.5 points depending on Number of air bricks in the surround of the building which should be roughly 1 per 1.5 m and sleeper wall gaps on an equivalent ratio. An underfloor passive ventilation layer (min. 150mm) with natural cross-ventilation, or a geocomposite/polystyrene void-former blanket would provide an additional 1.5 points. This gives a total score of 5 points in the British Standard ref; above.

Conclusive Reporting

A final Gas Protection Verification Report for the project will be supplied to the client which will summarise and document all the above testing, materials deployed and as built effectiveness of the passive ventilation system. Any damage, repairs and variations necessary, if any, to this plan will be documented.

Conclusion - Statement

This system provides the minimum of two elements required by the British Standard guidance for a minimum gas protection score of 5 points for this high risk (requiring 4.5 points) for a Type C building.

The gas protection measures above constitute a satisfactory solution for this system, given the level of risk and allows for structural stability of the development.

Ben Crowther SGPV 004

09.10.2026

Product Specification

The following pages detail the range of required gas resistant materials available for The Byrons Housing Care site, appropriately fitted to the manufacturer's standards.

The materials have been chosen to protect different areas of the designed build. The design of protective layers has included a two-tier system to protect this development by placing a lightly reinforced concrete slab to prevent movement and a sealed DPM from out leaf to outer leaf of the building.

The following specification is specific to this development – to encompass a minimum standard material to meet the BS8485:2015+A1:2019 characteristic situation 4 – Gas Barrier requirement.

Verification of the installed gas protection scheme is a strict requirement.

Seals between the outer service pipes placed through conduits and the internal face, and possible external face of such conduits also needs careful addressing. In the UK area an accepted suggested material to fit this purpose is Filo Seal, or Stop Aq, last accessed October 2026).

It is the recommendation of GeoEnginSeer Ltd that, wherever possible, welded seams should be implemented in place of taped seams. There is a tendency of taped and self-adhesive seems to perform to a lesser standard than that of welded seams when installed in adverse weather conditions. Welded seams have been found to be more withstanding of previously conducted destructive testing

Product	Description	Installation & Testing
Solco Solshield Ultra Gas Barrier (example material) or Solsheet GR High Performance Gas Barrier.	Solshield Ultra Gas Barrier is a multi-layer low density polyethylene (LDPE) gas barrier and damp-proof membrane reinforced with a polypropylene grid with an aluminium foil and bitumen base. The membrane is designed for use in concrete ground floors, above and below slab not subject to hydrostatic pressure. Solshield Ultra protects buildings against Moisture, Radon, Carbon Dioxide, and Methane from the ground.	These elements also need to be in line with manufacturers guidance & BBA Cert Annex C - Testing in accordance with CIRIA 735 & BS8485:2015+A12019
Gas Resistant Self-Adhesive Membrane	Gas Resistant (GR) Self Adhesive Membrane (SAM) is a material designed to prevent the transmission of carbon dioxide, radon and methane gases in tanking applications or where hydrostatic pressure is present. Resistance to gas is achieved by an integral aluminum film. Substrates should be primed with a Tanking Primer prior to application.	Installation as per manufacturers guidance & BBA Cert Annex C - Testing in accordance with CIRIA 735 & BS8485:2015+A12019
Preformed Corners or Top hats	Manufacturers can produce formed shapes to fit round difficult corners or pipe joins. These need to be sized correctly for pipe or service entry fittings used in welded/GR-SAM fitted situations	These elements also need to be in line with manufacturers guidance & BBA Cert Annex C - Testing in accordance with CIRIA 735 & BS8485:2015+A12019
Seal between inner of conduits for serves and outer of conduit	Filo seal, or similar or better performance material: https://www.filoform.co.uk/filoseal-hd-re-enterable-duct-sealing	No BBA exists so an appropriate gas resistant self-adhesive should be used to ensure gas resistance is achieved.
Liquid Membrane and close sealed foam (e.g. Filoseal or StopAq)	Sealing the gap between service conduits internal face and external surface of the service	Physical and visual checks of the integrity of the seals

Verification Process

Verification is accordance with the Construction Industry Research and Information Association (CIRIA 735) & British Standards 8485:2015+A1:2019.

The following tests will be conducted during the Verification process.

1. Pick & Probe testing on minimum of 100% of all seams
2. Non-Destructive Air Lance testing on a minimum of 100% of all seams to ASTM D4437 (2008)
3. Visual Inspections on minimum of 100% of all seams
4. Destructive Testing on selected seam test welds or field tests where appropriate
5. Verification reporting prior to each major concrete pour, or built wall section, shall be conducted and will include written records, photographic evidence and subgrade sign off records.
6. Visual inspection of Subgrades and subgrade hand over forms where available.
7. Trace gas testing on appropriate locations can be conducted post construction.
8. Air flow testing on passive ventilation to check flow potential in the subfloor voids.

In addition, where possible a quality control regime conducted by a named installer shall be recorded and added to verification reporting upon each verification reporting event.

Risk – Based Approach to Verification

A risk-based system takes account of various factors that will influence the consideration of the scope of verification activities, including integrity testing. The verification specialist will consider the following:

1. Site – specific gas regime.
2. Number of buildings/plots to be inspected and over the period this will take place.
3. Complexity of the design and installation.
4. Qualifications and or experience of the workforce.
5. Additional gas resistance protection.

Elements that have been considered in the generation of this Verification Plan

Gas Regime:

Low Risk	CS2
Intermediate Risk	CS3/4
High Risk	CS4 an above

Design complexity:

Simple	Few service entries/penetrations, gas membrane and sub floor void
Complex	Variety of gas protection measures, numerous columns/penetrations/service entries, corners and small spaces

Number of plots/buildings:

Small	<5
Medium	5-15
Large	>10

Installation workforce: To be confirmed

Non-Specialist	General builder/ground worker
Skilled	Qualified and experienced installer (NVQ 2 qualification in gas protection installation)

:

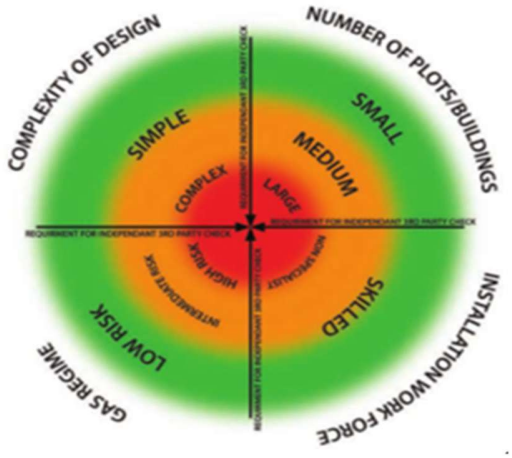


Diagram of risk from Ciria 735

Conclusion: The Gas Regime for this development is a Characteristic Situation 4 = High Risk

This document has been created in accordance with British Standards 8485:2015+A1:2019 & Construction Industry Research and Information Association
CIRIA 735 – Good Practice on the testing and verification of ground gas protection systems for buildings against hazardous ground gases

Annex

A – Ben Crowther: GeoEnginSeer Ltd: Verification Specialist: Person Specification.

B – Building Plans, elevations, location plan and setting out of plots

C – Product Specification: Gas Membrane and associated jointing and sealing products.

Geological Services: Verification Specialist: Freelance Geologist



Ben Crowther trading as GeoEnginSeer Ltd; Independent Geological Services.

CSCS MAP: 06010225 exp 09/2022

Telephone: 07817 108921

Email: geoenginseer@gmail.com Website: www.GeoEnginSeerLtd.com

Qualifications: B.Sc, M.Sc, PGCE, FGS, CIEH, PCA QT (CSSW) SGVP (CL:AIRE)

NVQL3 Assessor of: Verification of Gas Protection Measures (NVQL4)

Confined Spaces L1, IPAF Harness Training, Cradle Safety.

PCA Qualified Technician in structural waterproofing. October 2020

Experience Summary:

15 years local authority regulation

14 years site investigation, site supervision, construction quality assurance and verification

Previous Secretary of, and founder member of the British Verification Council

Attendee of CIRIA Research Group 'Remedial Measures for Proprietary Gas Protection Measures'

Assessor for: NVQL4 Verification of Gas Protection Systems

CL:AIRE GPVS Assessor, SGVP certificate holder No.004

Climber, Fell Runner, Wild Swimmer, Ex Royal Marine Diver.

Recent CPD Summary:

GGS 2 Day A-Z of Ground Gas August 2017

CIRIA Verification Training Event October 2017

PCA Structural Waterproofing Conference 2018, 2019

CIRIA Technical Meeting for Retrospective Fitting of Gas Resistant Membranes 2019

Brownfield Summit Attendance 2018, 2019, 2020, 2021, 2022

DoWCoP CL:AIRE Training March 2021

PCA CSSW Qualified Technician Training 2021, working towards CSSW qualification.

Appeared on: Gassing On! with Neil Salvidge.

HS2 Align Training for Tunnel Shaft H&S Green Tunnels and Shaft Work: C1 and C2,

2022 Cradle safety and IPAF harness use trained: Operator Licence: OP/2157339

Signature:

Annex B

Building Plans



Figure 1: Site Location Plan



Figure 2: Existing Site Plan

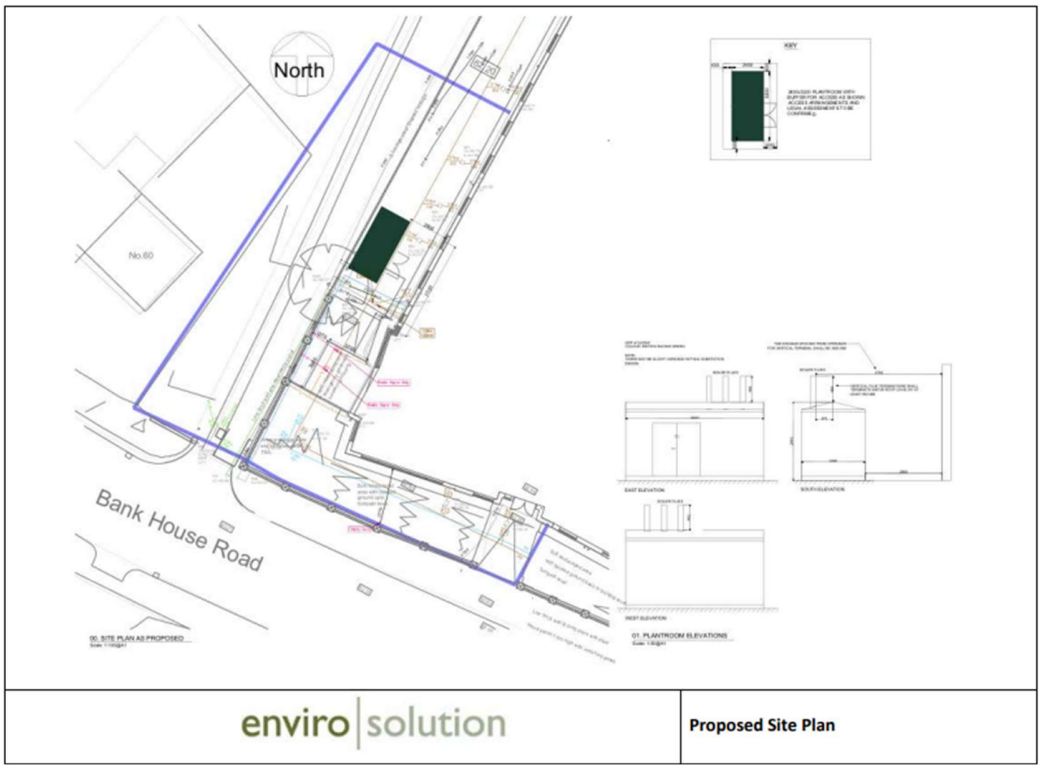


Figure 3: Proposed Site Plan

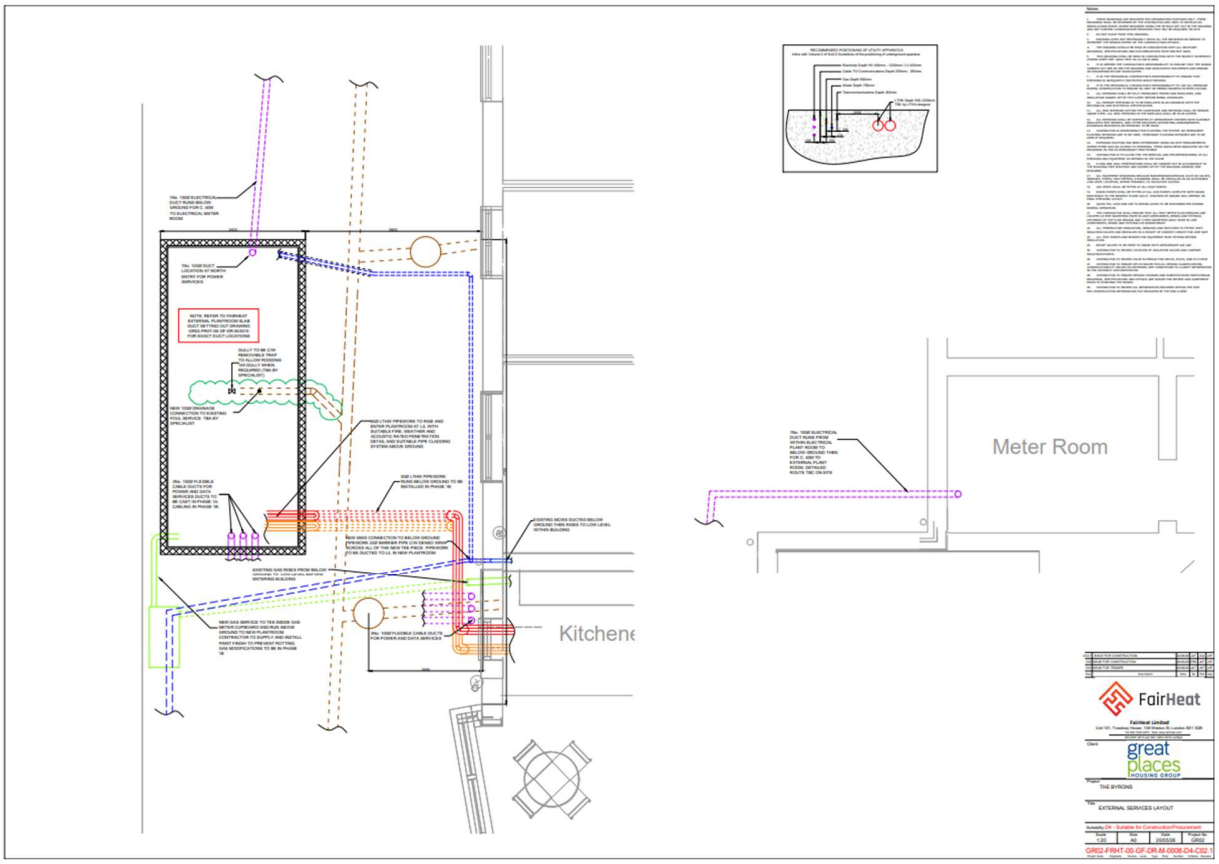


Figure 4: External Services Layout

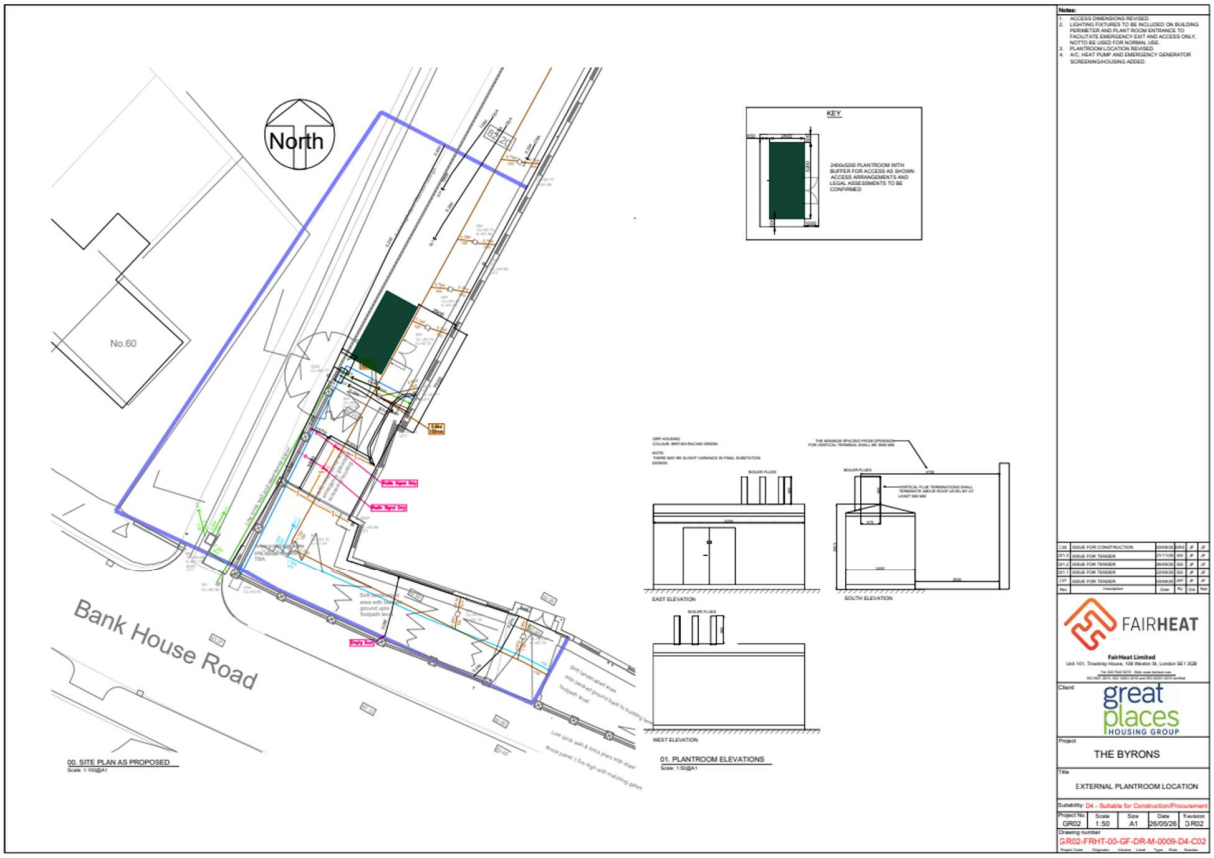


Figure 4: External Plantroom Location

Annex C

Example materials website to use as reference for installation guides.

Links provided to save space:

https://solco.co.uk/

Last accessed October 2026

APPENDIX C

Soil Quality Criteria

Substance	Residential without Homegrown Produce (mg/kg)
Asbestos	Present
Arsenic	40
Cadmium	85
Chromium	910
Copper	200**
Lead	310
Mercury	56
Nickel	110**
Selenium	430
Zinc	300**
Aliphatics >C5-C6	42
Aliphatics >C6-C8	100
Aliphatics >C8-C10	27
Aliphatics >C10-C12	130
Aliphatics >C12-C16	1,100
Aliphatics >C16-C21	65,000
Aliphatics >C21-C35	65,000
Aliphatics >C35-C44	65,000
Aromatics >EC5-EC7	370
Aromatics >EC7-EC8	860
Aromatics >EC8-EC10	47
Aromatics >EC10-EC12	250
Aromatics >EC12-EC16	1,800
Aromatics >EC16-EC21	1,900
Aromatics >EC21-EC35	1,900
Aromatics >EC35-EC44	1,900
Aromatics >EC40-EC44	1,900
Acenaphthene	3,000
Anthracene	31,000
Benz(a)anthracene	11
Benzo(b)fluoranthene	3.9
Benzo(k)fluoranthene	110
Benzo(a)pyrene	3.2
Benzo(g,h,i)perylene	360
Chrysene	30
Fluoranthene	1,500
Fluorene	2,800
Indeno(1,2,3-cd)pyrene	45
Phenanthrene	1,300
Pyrene	3,700
Naphthalene	2.3
Dibenzo(a,h)anthracene	0.31

Notes

Soil Quality Criteria = LQM 'Suitable for Use Levels', LQM 'Category 4 Screening Levels'.

**BS3882:2015