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Our Ref: P10147/GRA

Date: 17th August 2023

Chris Howard
Day Project Management Ltd
By Email Only

RE: Fairfield General Hospital Emergency Department – Additional Gas Risk Assessment

Dear Chris,

GRM have been asked to undertake further investigation and produce an additional gas risk assessment for the site at Fairfield General Hospital's Emergency Department. This letter should be read in conjunction with the following previous reports:

- GRM Site Appraisal Report (ref. GRM/P10147/LetRep.1, dated 17th November 2022).
- GRM Gas Addendum Letter (ref. GRM/P10147/GAL.1, dated 19th January 2023).

Background

A summary desk study report included within the GRM Site Appraisal Report referenced above, confirmed the site was not within an area requiring radon protection and identified two potential sources of ground gas:

- Made ground associated with the sites past development.
- Mine workings associated with the wider areas mining legacy.

Following submission of the planning documents, the Local Authority (LA) raised queries over the previous gas assessment and following liaison, further investigation and gas monitoring works were agreed upon.

GRMs Standard Limitations of Reporting are presented in Appendix A.

Original Ground Investigation

Ground investigation works were undertaken along the north frontage of Fairfield General Hospital's Emergency Department to inform on ground conditions for future development and included the advancement of two windowless sample boreholes (WS01 and WS02) to depths of 2.0m and 4.0m below existing ground level (begl) respectively. No significant thicknesses of made ground were encountered during the ground investigation (maximum 0.7m) and the monitoring installations were



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emplaced into the natural strata, which comprised the weathered Woodhead Hill Rock, found to vary between sand and clay. The natural strata were proven to a maximum depth of 4.0m below existing ground level (begl). SPT 'N' Values undertaken at the base of each window sample hole recorded blow counts of 50, or refusal, indicating rock quality strata.

Deep boreholes to assess the coal mining legacy were beyond the scope of the investigation; however, the installations within the window sample boreholes were considered sufficient to determine whether ground gas, with the potential to affect end users of the proposed development, was migrating from any deep mining source into the shallow soils.

Original Gas Assessment

The original gas assessment referenced above was based on four weekly monitoring visits conducted between the 18th of October and the 11th of November 2022.

The assessment determined that based on the recorded concentrations of methane (0.0%v/v), carbon dioxide (maximum 1.5%v/v) and a GSV of 0.0015l/hr the site should be assessed as Characteristic Situation 1, for which gas protection measure are not required.

In the intervening period the initial monitoring points (WS01 and WS02) have been destroyed and so it has been agreed with the Local Authority that GRM would undertake some limited further investigation, including installation of two further gas monitoring locations and subsequent further monitoring visits.

A plan showing the locations of both sets of monitoring points is presented in Appendix B.

GRM have also obtained confidential borehole records from the British Geological Survey (BGS), which have been used to better assess the risk posed to end users from the areas mining legacy.

Following a nationwide re-assessment of the radon risk undertaken by Public Health England in December 2022, a BGS Radon Report has also been obtained to confirm the risk posed to end users from radon. A copy of the BGS Radon Report for the site is presented in Appendix C.

Additional Gas Monitoring Installations

Two 35mm gas and groundwater monitoring points were installed into window sample boreholes (FGH-ED WS01 and WS02) to depths ranging between 1.0m and 2.0m. Similar to the original investigation the works encountered no significant thicknesses of made ground (maximum 1.0m) and accordingly, the installations targeted the natural strata. The natural strata were confirmed initially as weathered Woodhead Hill Rock (sand and clay) with rockhead present at depths of between 0.8m and 2m begl.

To date three rounds of monitoring have been conducted with one remaining, two during periods of falling atmospheric pressure (969mb and 983mb). No elevated concentrations of methane, a maximum carbon dioxide concentration of 1.9%v/v and a maximum flow rate on 0.1l/hr have been recorded. Based on the maximum concentrations of ground gas recorded and a GSV of 0.0019l/hr a designation of Characteristic Situation 1 is considered appropriate.

A copy of both sets of Gas Monitoring Data is presented in Appendix D. Barometric pressure data during the monitoring period has been plotted onto graphs, which demonstrate the periods of fall pressure. These are also presented in Appendix D.

Confidential Boreholes Records

The BGS hold confidential records of six cable percussive and two rotary openhole boreholes conducted prior to construction of the hospital's current Emergency Department building. The boreholes record a variable thickness of made ground (0.6m to 2.7m), which was generally thickest in the south (remote from the area under consideration), overlying strata consistent with that of the weathered Woodhead Hill Rock (clay and sand). Rockhead was recorded at depths of between 2.9m and 11.0m begl and was generally deepest in the south.

The two rotary boreholes (BHRB1 and BHRB2) were advanced to depths of between 35.0m and 38.0m begl and recorded a sequence of mudstone, siltstone and sandstone consistent with the recorded geology. Two seams of coal were recorded in BHRB1 at 24.95m - 25.24m and 31.8m – 32.41m. There are no comments on the drilling logs suggesting any loss of flush due to mining or the presence of broken ground; accordingly, the coal seams are considered not to be worked.

A copy of the borehole logs is presented in Appendix E.

Conclusions

The recent works undertaken on the FGH-ED project have encountered ground conditions similar to those within the original area. The latest gas monitoring data shows a strong correlation with the original data set and confirms a lack of significant concentrations of ground gas.

The confidential BGS boreholes did not encounter old coal workings and accordingly, the risk to end users from mine gas is considered to be very low.

The recently obtained BGS radon report confirms that no radon protection measures are required.

Accordingly, after combining the two data sets to achieve a more robust assessment, it is considered that the original designation of Characteristic Situation 1 is suitable and gas protection measures are not required.

We trust this is suitable for your current requirements, should you require any further information or would like any clarification of the points raised please do not hesitate to contact us.

Yours sincerely,
for GRM Development Solutions Ltd

Project Manager:
Richard Hodgkinson BSc FGS
Senior Geotechnical Engineer

Reviewed by:
Paul Wardle BSc MA FGS
Acting Principal Geologist

Approved by:
Geoff Beckett BSc CGeol
Director

Appendices

- Appendix A - GRMs Standard Limitations of Reporting
- Appendix B - Combined Gas Monitoring Plan
- Appendix C - BGS Radon Report
- Appendix D - Combined Gas Monitoring Data and Barometric Pressure Graphs
- Appendix E - BGS Borehole Logs



A P P E N D I X A

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GENERAL APPRAISAL COMMENTS

i INFORMATION SOURCES

Where available the following sources have been used for the identification and assessment of potential ground hazards:

- Relevant British Standards
- British Geological Survey (BGS) Geology Map Scale 1:10,000 for local area
- British Geological Survey (BGS) Geology Map Scale 1:50,000/1:63,320
- BGS Memoir
- BGS Borehole Records
- BGS online viewer: <http://www.bgs.ac.uk/data/mapViewers/home.html>
- Environment Agency Groundwater Vulnerability Maps
- Historical Ordnance Survey (OS) Maps
- Environmental Data Report
- Environment Agency Website: <http://www.environment-agency.gov.uk/>
- Guidance for the Selection of Water Supply Pipes to be used in Brownfield Sites, UKWIR, 2010.
- Coal Authority Records / Coal Mining Report
- DEFRA/Environment Agency Contaminated Land publications and DoE Industry Profiles
- BRE Guide BR211 (2023), 'Radon: Guidance on protective measures for new buildings (including supplementary advice for extensions, conversions and refurbishment projects)'
- HPA-RPD-033 (2007), 'Indicative Atlas of Radon in England and Wales'
- PHE-CRCE-032 (PHE, 2017), Radon in Homes in England: 2016 Data Report
- CIRIA C665 'Assessing risks posed by hazardous ground gases to buildings'
- BS8485:2015, 'Code of Practice for the design of protective measures for methane and carbon dioxide ground gases for new buildings'
- Other technical references used throughout this document are detailed in the text.

ii CONTAMINANTS OF CONCERN

The DoE Industry Profiles are normally used to assess likely contaminants from past land use and potential nearby industrial sources. For land uses where no profile is available, likely contaminants of concern are selected by GRM based on past experience of similar sites, a general screening suite of contaminants covered by CLEA and common contaminants from the Industry Profiles.

- | | | |
|------------|-------------------|--|
| · Arsenic | · Copper | · Water soluble sulphate |
| · Cadmium | · Nickel | · PAH (polycyclic aromatic hydrocarbons) |
| · Chromium | · Zinc | |
| · Lead | · Phenols | |
| · Mercury | · cyanide (total) | |
| · Selenium | · pH | |

Asbestos and PCBs are listed in the vast majority of profiles. PCBs are listed as the profiles expect electricity substations and switch boxes on all industrial sites. There is the potential for asbestos containing material to be mixed up with made ground, following any demolition works.

iii CONCEPTUAL MODEL METHODOLOGY

The consideration of contamination is based upon the principles of risk assessment, using the 'source-pathway-receptor' model in order to establish the presence, or potential presence, of a pollutant linkage.

To create a risk, contamination must have the potential to cause harm to susceptible targets or receptors such as humans, the water environment or the built environment. The potential for harm to occur requires three conditions to be satisfied to form a pollutant linkage:

- The presence of substances that may cause harm (SOURCE).
- The presence of a target which may be harmed (RECEPTOR).
- The existence of a plausible migration route between the source and the receptor (PATHWAY).

In the absence of a plausible pollutant linkage there is no risk. Where a potential linkage is identified in order for it not to pose a risk to the identified receptor it must be broken.

iv INTRUSIVE INVESTIGATION SAMPLING METHODOLOGY

The ground investigation (including fieldwork, sampling, monitoring and laboratory analyses) has been designed to identify and assess potential ground related problems and to allow cost effective solutions to be advised. It has been planned on the basis of the desk study, site inspection and the proposed development layout (where available). All fieldwork and soil descriptions were carried out in general accordance with relevant British Standards.

The exploratory holes have been positioned and advanced to depths to determine the general ground/groundwater/gas conditions below the site. A general grid pattern has been adopted, where possible, to provide sufficient information based on the current proposed layout scheme. Some holes have been targeted at particular hazards identified in the Phase I assessment. The resultant exploratory hole density is considered to be commensurate with the complexity of the site conditions and detail of information required for this phase of the investigation.

v GROUND GAS RISK ASSESSMENT METHODOLOGY

Gas monitoring programmes undertaken by GRM are designed to broadly comply with the recommendations outlined in CIRIA Report C665 'Assessing risks posed by hazardous ground gas to buildings' (2007) and BS8576 'Guidance on Investigations for ground gas – Permanent gases and Volatile Organic Compounds (VOCs) (2013).

To assess the risks posed by ground gases such as radon, carbon dioxide and methane, the relevant current guidance has been used. For radon the site has been assessed following the guidelines in 'Radon: guidance on protective measures for new dwellings (including supplementary advice for extensions, conversions and refurbishment projects) (BR211: 2023)'. For methane and carbon dioxide the primary guidance document used to determine if protection measures are required is *BS8485:2015 Code of practice for the design of protective measures from methane and carbon dioxide ground gases for new buildings*. This uses hazardous gas flow rates (Q_{hg}), which are gas concentrations multiplied by borehole flow rates, to derive a Gas Flow Rate (GSV) for the site. The gas regime is then determined based on the GSV and other limiting factors such as gas concentrations.

Where flow is not recorded during the monitoring a default flow rate of 0.1l/hr will be used in the assessment to produce a positive result.

vi HUMAN HEALTH RISK ASSESSMENT METHODOLOGY

Guidance contained in the Environment Agency's CLEA Reports has been used to assess the risks posed to human health.

For residential developments that include domestic gardens the default Tier 1 Assessment Criteria (TAC) for 'residential land with plant uptake' are used, i.e. a female with a start age class of one and an end age class of six. All pathways are considered including the consumption of home-grown vegetables.

For residential developments that do not include domestic gardens the default Tier 1 Assessment Criteria (TAC) for 'residential land without plant uptake' are used, i.e. a female with a start age class of one and an end age class of six. All pathways are considered except the consumption of home-grown vegetables. For commercial/industrial developments the default Tier 1 Assessment Criteria (TAC) for 'commercial/industrial' are used, i.e. a female with a start age class of sixteen and an end age class of eighteen. All pathways are considered except the consumption of home-grown vegetables.

The TAC used by GRM include Category 4 Screening Levels (C4SLs) published by DEFRA, values calculated by GRM using the CLEA v1.071 risk assessment, and values and Suitable for Use Levels (S4UL) developed by LQM/CIEH. The TAC used in the assessment are selected based on the lowest site specific SOM values returned as part of the chemical analysis.

Where soil chemical analysis results are found to exceed the TAC, Site-Specific Risk Assessments may be undertaken using the CLEA v1.071 risk assessment software using the age classes and pathways described above.

vii RISK TO SITE WORKERS – GENERAL COMMENTS

The risks to site workers are similar to those posed to site end users, although likely to be less severe due to the site workers' shorter exposure to the identified contamination. However, site workers (particularly groundworkers) are more likely to come into direct contact with contaminated soils due to the nature of their work. On this basis ground and construction workers should be provided with basic Personal Protective Equipment based on the site's general health and safety risk assessment, but including as a minimum safety footwear, gloves and overalls.

A site specific risk assessment should be carried out for all hazards identified within the ground investigation in accordance with current health and safety legislation. This assessment should identify any measures required to further reduce risks i.e. providing further Personal Protective Equipment, welfare facilities and if necessary preventing access to certain areas.

Demolition and dismantling of existing structures on the site must be carried out to a safe and acceptable standard, in accordance with current UK guidance and best practice. Whilst not ground related, asbestos and hazardous substances surveys should be conducted prior to any demolition.

Any unusual colours, odours and suspicious ground should be reported immediately to site management and then GRM.

Whilst this appraisal has considered the long-term effects of contamination, GRM can also help during the formulation of Health and Safety documentation, if required.

viii CONTROLLED WATERS RISK ASSESSMENT METHODOLOGY

Where the desk study and fieldwork do not reveal a potential source of contamination no leachate or groundwater testing will be performed. Where a potential source is identified the testing will comprise leachate testing on the material considered most likely to pose a risk, groundwater testing will be undertaken if water is present at shallow depth.

The UK Drinking Water Standards (UKDWS) or Environmental Quality Standards (EQS) are usually adopted for comparison with the leachate/groundwater test results. When the most sensitive receptor is considered to be the aquifer (groundwater) UKDWS will be adopted as the Initial Tier 1 screening values.

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Where the most sensitive receptor is a surface water feature the EQS values will be used as Initial Tier I Screening values.

ix CONSTRUCTION MATERIALS RISK ASSESSMENT METHODOLOGY

The 'screening levels' adopted for the assessment of risk to construction materials are taken from the following documents:

- UK Water Industry Research (UKWIR) Contamination thresholds for sub-surface water pipes, for the protection of buried pipes.
- Building Research Establishment (BRE) Special Digest SD1 (2005), 'Concrete in Aggressive Ground', for the protection of buried concrete.

x WASTE DISPOSAL, SITE WASTE MANAGEMENT PLANS AND MATERIAL MANAGEMENT PLANS

Under current Waste Management Regulations, waste soil materials produced from the site will require characterisation to enable it to be disposed of correctly.

The chemical analysis results included in this report should be provided to the relevant landfill operators to establish the characterisation of the waste, confirm its suitability for landfill disposal and provide estimated costings. If material is classified as hazardous, then the site will need to be registered with the Environment Agency prior to the movement of the waste. Depending on the receiving landfill's current permit, further chemical analysis, incorporating Waste Acceptance Criteria (WAC) leachate analysis, may be required.

All materials removed from the site will be classified as 'waste' and therefore must be removed by a suitably licensed carrier of waste. This applies whether or not the waste is contaminated. All waste removed to landfill will attract Landfill Tax.

The developer/builder is likely to be classed as the waste producer and therefore, has a duty of care to ensure that all waste is disposed of appropriately. This includes ensuring the waste carrier is licensed and disposes of the waste to a suitably licensed landfill site. They are also required to keep a paper trail from 'cradle to grave' including copies of the waste disposal tickets.

Efficient materials management on site is recommended as it can lead to significant cost savings when compared to the traditional side casting or single stockpile of arisings. GRM can assist in the production of Material Management Plans under the CL:AIRE Definition of Waste: Code of Practice. The DoWCoP enables:

- The direct transfer and re-use of clean naturally occurring soil materials between sites, and
- The re-use of both contaminated and uncontaminated materials on their site of origin and between sites within defined Cluster projects.

GRM can also undertake the role of Qualified Person and submit the DoW CoP project Declaration.

Likewise making the site as volume neutral as possible will reduce the costs of development. Whilst not a statutory requirement, Site Waste Management Plans allow better waste management practices, help to reduce the amount of waste produced and identify best environmental disposal options. Implementing a Site Waste Management Plan (SWMP) can reduce costs (increasing business profits) and maximise resource efficiency.

xi GEOTECHNICAL ASSESSMENT GENERAL COMMENTS

Where finished floor levels of proposed structures have not been provided by the Client, then for the purposes of initial assessment, GRM will assume that finished levels will not vary appreciably from the existing ground levels. If the depths of any underground engineering works (i.e. sewers, pumping stations etc.) are unknown they will not be taken in to account in the assessment and it will be assumed that any such works will not compromise foundation or ground stability.

Should the development proposals or finished levels be different from these assumptions then the comments/recommendations in the Geotechnical Assessment may require revising.

It should be noted that the results of window sampling and/or cable percussive boreholes may not give a true indication of a soils actual engineering properties (i.e. stability, mass structure etc). GRM consider that that prior to development trial pitting should be undertaken to confirm the recommendations in the Geotechnical Assessment.

xii GEOTECHNICAL ASSESSMENT – ENGINEERING GROUND TREATMENT

Near surface soils have the potential to be disturbed by weathering and site traffic. Precautions should always be taken to avoid this, as excessive disturbance may leads to more onerous floor slab designs, road cap thickness and increased amounts of off-site disposal etc.

Near surface soils may need treatment or reinforcing to allow safe movement of construction plant and labour. An assessment by the contractor should be undertaken once the type of machinery/plant needed to complete the development is known.

xiii GEOTECHNICAL ASSESSMENT – EXCAVATIONS

Excavation instability (over-break) can result in damage to existing services or structures (e.g. foundations, roads or boundary walls/fences) both on and off-site, as well as increased foundation concrete costs. In order to minimise this, all excavations deeper than 1.2m deep (or any excavation within 1.5m of any existing structure or service) should be supported. Full support should be provided to the full depth of all near vertically sided excavations in made ground, soft and very soft clays and granular soils. A reduction to intermediate support should be acceptable within firm and stiffer natural clays.

Wherever possible, man entry into excavations should be prevented; however, where this is not possible, entry to, and time spent in, excavations should be kept to a minimum.

The build program should be tailored to reflect the impact that deep excavations through potentially unstable strata can have on adjacent properties, so that they are not undermined.

All excavations on site should be in accordance with HSE guidelines and stability should be practically maintained at all times. Reference should be made to HSE construction information sheet No. 8 (Revision 1) 'Safety in Excavations'.

Care should be taken to ensure that falls from excavation faces do not adversely affect the integrity of foundation concrete.

If contaminated water enters excavations it should be removed and transported to an appropriate treatment facility by a suitably licensed carrier before construction begins.

xiv GEOTECHNICAL ASSESSMENT – SUBSTRUCTURES

Where practicable, existing buried construction should be fully removed; however, if this is not practicable all new foundations should be carried down to fully penetrate it and it should be broken well away from all new structures.

There may be existing structures and/or infrastructure in close proximity to the proposed development. New build foundations may be constructed next to pavements with existing underground services beneath them, or excavations may be required near existing footings associated with adjacent properties. These potential hazards need to be taken into consideration when designing foundations and the groundworker needs to be made aware of their potential impact during the redevelopment works. Foundations close to existing underground services or buildings may require alternative foundation techniques (such as piling) to protect the integrity of these structures.

The contractor for the works should carry them out in such a fashion so as to not cause excessive overbreak, concrete usage or undermine existing buildings/roads/ services that are to be retained.

xv **GEOTECHNICAL ASSESSMENT – SOAKAWAYS**

Soakaway testing in trial pits by GRM is broadly carried out in accordance with BRE DG 365 (2016). The testing comprises the excavation of a test pit to a suitable depth, and the placement of water into the pit. The level of water present is then monitored over time. For borehole installations, the permeability testing (falling head/rising head) is undertaken in accordance with BS5930.

If it is decided to proceed with the use of soakaway drainage, then the following general points should be noted:

- Soakaways should not be placed so that water can be discharged through potentially contaminated made ground.
- The Environment Agency may require soakaways to be sealed systems such that only roof run off falls to soakaway.
- Interceptors are likely to be required for soakaways for highway drainage. The adopting authority for the highways should be consulted at the earliest opportunity regarding the use of soakaways for highways drainage.
- Consideration of site levels and slopes should be taken into account during the design.
- The construction of all soakaways should be in accordance with the current building regulations.
- Soakaways should not be placed within 5m of a proposed building.
- Placement of soakaways needs to be considered so as to avoid ponding of water down slope.
- The base of a soakaway should not be below the highest recorded water level.
- The Environment Agency prefer 1m of dry soil to be present between the base of a soakaway and the water table to provide attenuation for contamination.

xvi **GEOTECHNICAL ASSESSMENT – FOUNDATIONS**

If soft or hard spots are encountered during foundation excavation then they should be replaced with suitably compacted material or the footings deepened to suitable strata, to avoid differential settlement.

If strata of differing bearing character (e.g. sand and clay) are encountered at foundation levels within the excavations for a single plot then the excavation depths should be altered as appropriate to ensure the foundations rest on a single stratum, or strata that will not induce differential settlement. Where this is impractical then GRM should be contacted to assess a reinforced concrete detail or an alternative foundation solution (e.g. piles or vibro-replacement).

NOTES ON LIMITATIONS

General

GRM Development Solutions Limited has prepared this report solely for the use of the Client and those parties with whom a warranty agreement had been executed, or with whom an assignment had been agreed. Should any third party wish to use or rely upon the contents of the report, written approval must be sought from GRM Development Solutions Limited; a charge may be levied against such approval.

GRM Development Solutions Limited accepts no responsibility or liability for:

- a) the consequences of this document being used for any purpose or project other than for which it was commissioned, and
- b) the consequences of this document being used by any third party with whom an agreement has not been executed.

Phase I Environmental Audits/ Desk Studies

The work undertaken to provide the basis of this report comprised a study of available documented information from a variety of sources (including the Client), together with (where appropriate) a brief walk over inspection of the site and meetings and discussions with relevant authorities and other interested parties. The opinions given in this report have been dictated by the finite data on which they are based and are relevant only to the purpose for which the report was commissioned. The information reviewed should not be considered exhaustive and has been accepted in good faith as providing true and representative data pertaining to site conditions. Should additional information become available which may affect the opinions expressed in this report, GRM Development Solutions Limited reserves the right to review such information and as considered necessary and appropriate to modify the opinions accordingly. It should be noted that any risks identified in a Phase 1 report are perceived risks based on the information reviewed; actual risks can only be assessed following a physical investigation of the site.

Phase II Environmental Audits (Contamination Investigations)

The investigation of the site has been carried out to provide sufficient information concerning the type and degree of contamination, ground and groundwater conditions to allow a reasonable risk assessment to be made. The objectives of the investigation have been limited to establishing the risks associated with potential human targets, building materials, and controlled waters.

The amount of exploratory work and chemical testing undertaken has necessarily been restricted by the short timescale available, and the locations of exploratory holes have been restricted to the areas unoccupied by the building(s) on the site and by buried services. A more comprehensive investigation may be required if the site is to be redeveloped as, in addition to risk assessment, a number of important engineering and environmental issues need to be resolved.

For these reasons if costs have been included in relation to site remediation these must be considered as provisional only and must, in any event, be confirmed by a commercial adviser.

The exploratory holes undertaken, which investigate only a small volume of the ground in relation to the size of the site, can only provide a general indication of site conditions. Whilst exploratory testing is intended to gain an accurate representation of the site, the very nature of sampling and testing is such that it cannot ensure that all localised conditions are detected.

The risk assessment and opinions provided take in to consideration, inter alia, currently available guidance relating to acceptable contamination concentrations; no liability can be accepted for the retrospective effects of any future changes or amendments to these values.

Phase II Geo-environmental Investigations (Combined Geotechnical and Contamination Investigations)

The investigation of the site has been carried out to provide sufficient information concerning the type and degree of contamination, geotechnical characteristics, and ground and groundwater conditions to provide a reasonable assessment of the environment risks together with engineering and development implications. If costs have been included in relation to site development a commercial adviser must confirm these.

The exploratory holes undertaken, which investigate only a small volume of the ground in relation to the size of the site, can only provide a general indication of site conditions. The opinions provided and recommendations given in this report are based on the ground conditions apparent at the site for each of the exploratory holes. There may be exceptional ground conditions elsewhere on the site which have not been disclosed by this investigation and which have therefore not been taken into account in this report.

The comments made on groundwater conditions are based on observations made at the time the site work was conducted. It should be noted that groundwater levels will vary owing to seasonal, tidal and weather related effects. The scope of the investigation was selected on the basis of the specific development proposed by the Client and may be inappropriate to another form of development or scheme.



The risk assessment and opinions provided take in to consideration, inter alia, currently available guidance relating to acceptable contamination concentrations; no liability can be accepted for the retrospective effects of any future changes or amendments to these values.

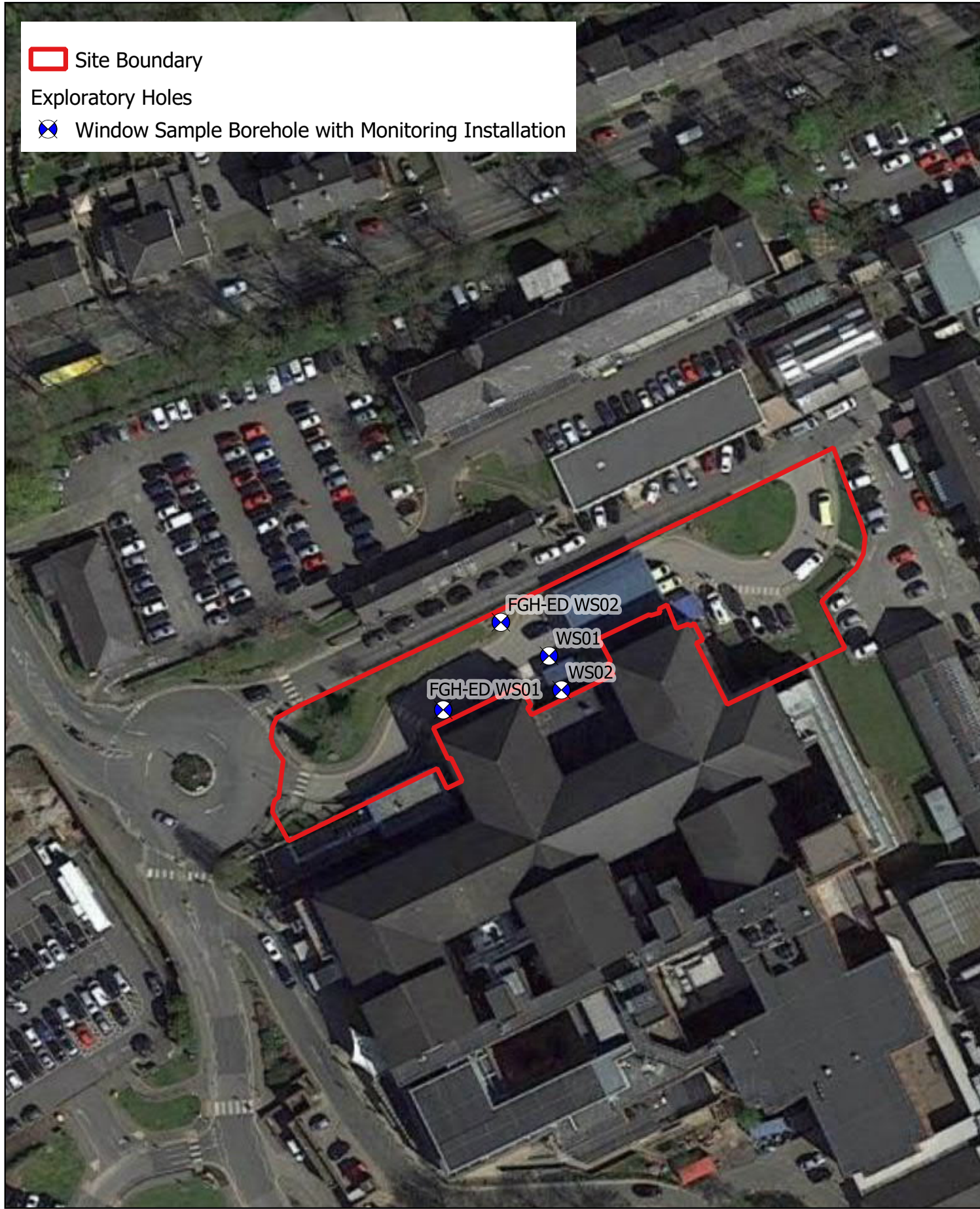


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- Site Boundary
- Exploratory Holes
- Window Sample Borehole with Monitoring Installation



NOTES:

CLIENT:
DAY PROJECT MANAGEMENT LTD

PROJECT:
FAIRFIELD GENERAL HOSPITAL ED

TITLE:
COMBINED GAS MONITORING PLAN

PROJECT No:
P10147

DATE:
August 2023

DESIGN/DRAWN:
PW

DRAWING NUMBER:

ISSUE:
FINAL

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Radon Report

Advisory report on the requirement for radon protective measures in new buildings, conversions and extensions to existing buildings. The report also indicates whether a site is located within a radon Affected Area

Report Id: *BGS_331859/43571*

Client reference: P10147

Search location



Contains OS data © Crown Copyright and database right 2023. OS OpenMap Local: Scale: 1:5 000 (1cm = 50 m)

Search location indicated in red

Area centred at: 383178,411631

Radius of site area: 127 metres

Radon Report: UK

When extensions are made to existing buildings in high radon areas, or new buildings are constructed in these areas, the Building Regulations for England, Wales, Scotland and Northern Ireland require that protective measures are taken against radon entering the building.

This report provides information on whether radon protective measures are required. Depending on the probability of buildings having high radon levels, the Regulations may require either:

1. No protective measures
2. Basic protective measures
3. Full protective measures

This is an advisory report on the requirement for radon protective measures in new buildings, conversions and extensions. The report also indicates whether a site is located within a radon Affected Area

Requirement for radon protective measures

The determination below follows advice in *BR211 Radon: Guidance on protective measures for new buildings (2015 edition)*, which also provides guidance on what to do if the result indicates that protective measures are required.

Is the property in an area where radon protective measures are required for new buildings or extensions to existing ones as described in publication BR211 (2015 edition) Radon: Guidance on protective measures for new buildings?

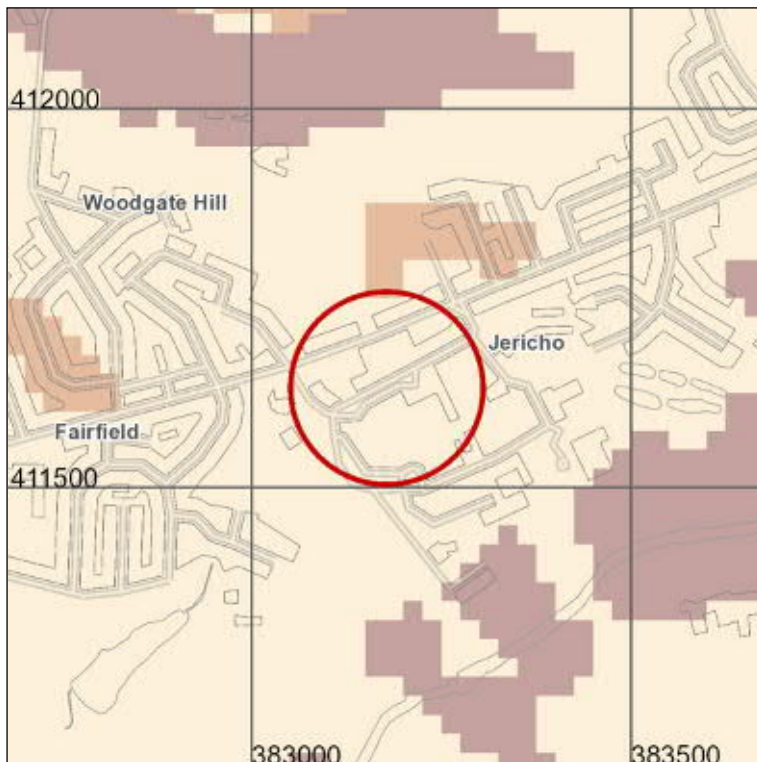
NO RADON PROTECTIVE MEASURES ARE REQUIRED FOR THE REPORT AREA.

More details of the protective measures required are available in *BR211 Radon: Guidance on protective measures for new buildings (2015 Edition)*. Additional information and guidance is available from the Building Research Establishment website (<http://www.bre.co.uk/radon/>).

Whether or not the radon level in a building is above or below the radon Action Level can only be established by having the building tested. The UKHSA provides a radon testing service which can be accessed at www.ukradon.org or by telephone (01235 822622).

If you require further information or guidance, you should contact your local authority building control officer or approved inspector.

Radon Affected Area



% Homes estimated to be at or above the action level
0-1%
1-3%
3-5%
5-10%
10-30%
30-100%

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Scale: 1:10 000 (1cm = 100 m)

Search area indicated in red

Is the property in a radon Affected Area as defined by the UK Health Security Agency (UKHSA) and if so what percentage of homes are estimated to be at or above the Action Level? YES

Additional Information

THE PROPERTY IS IN A RADON AFFECTED AREAS WHERE 1 TO 3% OF HOMES ARE ESTIMATED TO BE AT OR ABOVE THE ACTION LEVEL.

The UKHSA recommends a radon 'Action Level' of 200 Becquerels per cubic metre of air (Bq m^{-3}) for the annual average of the radon gas concentration in a home. Where 1% or more of homes are estimated to be at or above the Action Level the area should be regarded as a radon Affected Area.

This report informs you whether the property is in a radon Affected Area and the percentage of homes that are estimated to be at or above the radon Action Level at this location. Being in an Affected Area does not necessarily mean there is a high radon level within the property; the only way to determine the radon level is to carry out a radon measurement.

The UKHSA advises that radon gas should be measured in all properties within radon Affected Areas and that homes with radon levels at or above the Action Level (200 Bq m⁻³) should be remediated. Householders with levels between the Target Level (100 Bq m⁻³) and Action Level should seriously consider reducing their radon level, especially if they are at greater risk, such as if they are current or ex smokers. Whether or not a home is in fact above or below the Action Level or Target Level can only be established by having the building tested. The UKHSA provides a validated radon testing service which can be accessed at www.ukradon.org.

The information in this report provides an answer to one of the standard legal enquiries on house purchase in England and Wales, known as Law Society CON29 Enquiries of the Local Authority (2016); 3.14 Radon Gas: Do records indicate that the property is in a “Radon Affected Area” as identified by the UKHSA. The data can also be used to advise house buyers and sellers in Scotland and Northern Ireland.

If you are buying a new build property in a Radon Affected Area, you should ask the builder whether radon protective measures were incorporated in the construction of the property.

If you are buying a currently occupied property in a radon Affected Area, you should ask the present owner whether radon levels have been measured in the property. If they have, ask whether the results were at or above the radon Action Level and if so, whether remedial measures were installed, radon levels were re-tested, and if the results of re-testing confirmed the effectiveness of the measures.

Further information on radon is available from the UKHSA at www.ukradon.org.

What is radon?

Radon is a naturally occurring radioactive gas, which is produced by the radioactive decay of radium which, in turn, is derived from the radioactive decay of uranium. Uranium is found in small quantities in all soils and rocks, although the amount varies from place to place. Radon released from rocks and soils is quickly diluted in the atmosphere. Concentrations in the open air are normally very low and do not present a hazard. Radon that enters enclosed spaces such as some buildings (particularly basements), caves, mines, and tunnels may reach high concentrations in some circumstances. The construction method and degree of ventilation will influence radon levels in individual buildings. A person's exposure to radon will also vary according to how particular buildings and spaces are used.

Inhalation of the radioactive decay products of radon gas increases the chance of developing lung cancer. If individuals are exposed to high concentrations for significant periods of time, there may be cause for concern. In order to limit the risk to individuals, the Government has adopted an Action Level for radon in homes of 200 becquerels per cubic metre (Bq m^{-3}). The Government advises householders that, where the radon level is at or above the Action Level, measures should be taken to reduce the concentration.

Radon in workplaces

The Ionising Radiation Regulations 2017 require employers to take action when radon is present above a defined level in the workplace. Advice may be obtained from your local Health and Safety Executive Area Office or the Environmental Health Department of your local authority. The BRE publishes a guide (BR293): **Radon in the workplace**. BRE publications may be obtained from the BRE Bookshop, Tel: 01923 664262, email: bookshop@bre.co.uk website: www.brebookshop.com

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A P P E N D I X D

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In-Situ Gas Monitoring Results

Project Name	Fairfield General Hospital.
Project Number	10147
Client	DAY Project Management Ltd
Date	18/10/2022
Weather	Cold
Atmospheric Pressure (mb)	1006
Pressure Trend	Rising
Equipment	Gas Data GFM436
Operator	James Wardle

Ground Gas													
Well ID	Response Zone			Methane		CO2		Oxygen		Gas Flow		PID Reading	
	mbegl			%v/v		%v/v		%v/v		l/h		ppm	
ID	Top	Base	Strata	Peak	Steady	Peak	Steady	Low	Steady	Peak	Steady	Peak	Steady
WS01	1.0	2.0	NS	0.0	0.0	0.6	0.6	19.8	19.8	0.0	0.0	Not Recorded	
WS02	1.0	4.0	NS	0.0	0.0	0.8	0.8	19.8	19.8	0.0	0.0	Not Recorded	

Groundwater	
Depth to Groundwater	Total Well Depth
mbegl	mbegl
Not Detected	1.9
1.9	3.7

Notes

L.E.L.	Lower Explosive Limit (100% L.E.L.= 5% Flammable Gas)
N.D.	Not Detected
N.R.	Not Recorded
PID	Photo-Ionising Detector
%	By volume

Ground Material Key

NS	Natural Strata
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In-Situ Gas Monitoring Results

Project Name	Fairfield General Hospital.
Project Number	10147
Client	DAY Project Management Ltd
Date	28/10/2022
Weather	Mostly Sunny
Atmospheric Pressure (mb)	1009
Pressure Trend	Rising
Equipment	Gas Data GFM436
Operator	Liam Press

Ground Gas													
Well ID	Response Zone			Methane		CO2		Oxygen		Gas Flow		PID Reading	
	mbegl			%v/v		%v/v		%v/v		l/h		ppm	
ID	Top	Base	Strata	Peak	Steady	Peak	Steady	Low	Steady	Peak	Steady	Peak	Steady
WS01	1.0	2.0	NS	0.0	0.0	0.2	0.2	19.7	19.7	0.0	0.0	Not Recorded	
WS02	1.0	4.0	NS	0.0	0.0	1.5	1.5	18.3	18.3	0.0	0.0	Not Recorded	

Groundwater	
Depth to Groundwater	Total Well Depth
mbegl	mbegl
Not Detected	1.9
1.8	3.7

Notes

L.E.L.	Lower Explosive Limit (100% L.E.L.= 5% Flammable Gas)		NS	Natural Strata
N.D.	Not Detected	a	Methane => 1% v/v	
N.R.	Not Recorded	b	Carbon Dioxide =>5% v/v	
PID	Photo-Ionising Detector	MG	Made Ground	
%	By volume	NS	Natural Strata	

Ground Material Key



In-Situ Gas Monitoring Results

Project Name	Fairfield General Hospital.
Project Number	10147
Client	DAY Project Management Ltd
Date	31/10/2022
Weather	Cloudy
Atmospheric Pressure (mb)	1011
Pressure Trend	Steady
Equipment	Gas Data GFM436
Operator	James Wardle

Ground Gas													
Well ID	Response Zone			Methane		CO2		Oxygen		Gas Flow		PID Reading	
	mbegl			%v/v		%v/v		%v/v		l/h		ppm	
ID	Top	Base	Strata	Peak	Steady	Peak	Steady	Low	Steady	Peak	Steady	Peak	Steady
WS01	1.0	2.0	NS	0.0	0.0	0.5	0.5	19.3	19.3	0.0	0.0	Not Recorded	
WS02	1.0	4.0	NS	0.0	0.0	1.3	1.3	19.0	19.0	0.0	0.0	Not Recorded	

Groundwater	
Depth to Groundwater	Total Well Depth
mbegl	mbegl
Not Detected	1.9
1.8	3.7

Notes

Ground Material Key

L.E.L.	Lower Explosive Limit (100% L.E.L.= 5% Flammable Gas)	NS	Natural Strata
N.D.	Not Detected	a	Methane => 1% v/v
N.R.	Not Recorded	b	Carbon Dioxide =>5% v/v
PID	Photo-Ionising Detector	MG	Made Ground
%	By volume	NS	Natural Strata



In-Situ Gas Monitoring Results

Project Name	Fairfield General Hospital.
Project Number	10147
Client	DAY Project Management Ltd
Date	11/11/2022
Weather	Cloudy
Atmospheric Pressure (mb)	1003
Pressure Trend	Rising
Equipment	Gas Data GFM436
Operator	Liam Press

Ground Gas													
Well ID	Response Zone			Methane		CO2		Oxygen		Gas Flow		PID Reading	
	mbegl			%v/v		%v/v		%v/v		l/h		ppm	
ID	Top	Base	Strata	Peak	Steady	Peak	Steady	Low	Steady	Peak	Steady	Peak	Steady
WS01	1.0	2.0	NS	0.0	0.0	1.5	1.5	17.3	17.3	0.0	0.0	Not Recorded	
WS02	1.0	4.0	NS	0.0	0.0	0.2	0.2	19.8	19.8	0.0	0.0	Not Recorded	

Groundwater	
Depth to Groundwater	Total Well Depth
mbegl	mbegl
Not Detected	1.9
1.9	3.7

Notes

Ground Material Key

L.E.L.	Lower Explosive Limit (100% L.E.L.= 5% Flammable Gas)	NS	Natural Strata
N.D.	Not Detected	a	Methane => 1% v/v
N.R.	Not Recorded	b	Carbon Dioxide =>5% v/v
PID	Photo-Ionising Detector	MG	Made Ground
%	By volume	NS	Natural Strata



In-Situ Gas Monitoring Results

Project Name Fairfield General Hospital.
 Project Number 10147
 Client DAY Project Management Ltd

Pressure Range 1003mb-1011mb
 Reading Below 1000 mb: 0

Summary of Results for period: 18/10/2022 to 11/11/2022

				Methane		CO2		Oxygen		Gas Flow		PID Reading	
				%v/v		%v/v		%v/v		l/h		ppm	
ID	Top	Base	Strata	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
WS01	1.0	2.0	NS	0.0	0.0	0.2	1.5	17.3	19.8	0.0	0.0		
WS02	1.0	4.0	NS	0.0	0.0	0.2	1.5	18.3	19.8	0.0	0.0		

Depth to Groundwater	
mbegl	
Min	Max
0	Non Detected
1.8	1.9

BS8485:2015 Suggested Worse Case Site Classification:

Notes

L.E.L. Lower Explosive Limit (100% L.E.L.= 5% Flammable Gas)
 N.D. Not Detected
 N.R. Not Recorded
 PID Photo-Ionising Detector
 % By volume

Highlighted cell for following conditions
 a Methane => 1% v/v
 b Carbon Dioxide =>5% v/v
 MG Made Ground
 NS Natural Strata

Site Summary:

	GSV (l/h)	Max Values
Methane		
CO2	0.0000	1.5
Maximum Flow (l/h)	0.00	



In-Situ Gas Monitoring Results

Project Name	Fairfield General Hospital (FGH) ED
Project Number	10351
Client	DAY Project Management Ltd
Date	18/07/2023
Weather	Cloudy
Atmospheric Pressure (mb)	1012
Pressure Trend	Steady
Equipment	Gas Data GFM436
Operator	James Wardle

Ground Gas													
Well ID	Response Zone			Methane		CO2		Oxygen		Gas Flow		PID Reading	
	mbegl			%v/v		%v/v		%v/v		l/h		ppm	
ID	Top	Base	Strata	Peak	Steady	Peak	Steady	Low	Steady	Peak	Steady	Peak	Steady
WS01	1.0	2.0	NS	0.0	0.0	0.9	0.9	18.7	18.7	0.0	0.0	Not Recorded	
WS02	0.8	1.0	NS	0.0	0.0	0.4	0.4	20.0	20.0	0.0	0.0	Not Recorded	

Groundwater	
Depth to Groundwater	Total Well Depth
mbegl	mbegl
Not Detected	2.1
Not Detected	1.0

Notes

L.E.L.	Lower Explosive Limit (100% L.E.L.= 5% Flammable Gas)
N.D.	Not Detected
N.R.	Not Recorded
PID	Photo-Ionising Detector
%	By volume

Ground Material Key

NS	Natural Strata
----	----------------



In-Situ Gas Monitoring Results

Project Name	Fairfield General Hospital (FGH) ED
Project Number	10351
Client	DAY Project Management Ltd
Date	27/07/2023
Weather	Mostly Cloudy
Atmospheric Pressure (mb)	983
Pressure Trend	Falling
Equipment	Gas Data GFM436
Operator	Liam Press

Ground Gas													
Well ID	Response Zone			Methane		CO2		Oxygen		Gas Flow		PID Reading	
	mbegl			%v/v		%v/v		%v/v		l/h		ppm	
ID	Top	Base	Strata	Peak	Steady	Peak	Steady	Low	Steady	Peak	Steady	Peak	Steady
WS01	1.0	2.0	NS	0.0	0.0	1.4	1.4	16.8	16.8	0.0	0.0	Not Recorded	
WS02	0.8	1.0	NS	0.0	0.0	0.0	0.0	19.3	19.3	0.0	0.0	Not Recorded	

Groundwater	
Depth to Groundwater	Total Well Depth
mbegl	mbegl
Not Detected	2.2
Not Detected	1.1

Notes

L.E.L.	Lower Explosive Limit (100% L.E.L.= 5% Flammable Gas)
N.D.	Not Detected
N.R.	Not Recorded
PID	Photo-Ionising Detector
%	By volume

Ground Material Key

NS	Natural Strata
----	----------------



In-Situ Gas Monitoring Results

Project Name	Fairfield General Hospital (FGH) ED
Project Number	10351
Client	DAY Project Management Ltd
Date	02/08/2023
Weather	Raining
Atmospheric Pressure (mb)	969
Pressure Trend	Falling
Equipment	Gas Data GFM436
Operator	Liam Press

Ground Gas													
Well ID	Response Zone			Methane		CO2		Oxygen		Gas Flow		PID Reading	
	mbegl			%v/v		%v/v		%v/v		l/h		ppm	
ID	Top	Base	Strata	Peak	Steady	Peak	Steady	Low	Steady	Peak	Steady	Peak	Steady
WS01	1.0	2.0	NS	0.0	0.0	1.9	1.9	14.9	14.9	0.1	0.1	Not Recorded	
WS02	0.8	1.0	NS	0.0	0.0	0.0	0.0	19.6	19.6	0.0	0.0	Not Recorded	

Groundwater	
Depth to Groundwater	Total Well Depth
mbegl	mbegl
Not Detected	2.1
Not Detected	1.1

Notes

L.E.L.	Lower Explosive Limit (100% L.E.L.= 5% Flammable Gas)
N.D.	Not Detected
N.R.	Not Recorded
PID	Photo-Ionising Detector
%	By volume

Ground Material Key

NS	Natural Strata
----	----------------



In-Situ Gas Monitoring Results

Project Name Fairfield General Hospital (FGH) ED
 Project Number 10351
 Client DAY Project Management Ltd

Pressure Range 969mb-1012mb
 Reading Below 1000 mb: 2

Summary of Results for period: 18/07/2023 to 02/08/2023

				Methane		CO2		Oxygen		Gas Flow		PID Reading	
				%v/v		%v/v		%v/v		l/h		ppm	
ID	Top	Base	Strata	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
WS01	1.0	2.0	NS	0.0	0.0	0.9	1.9	14.9	18.7	0.0	0.1		
WS02	0.8	1.0	NS	0.0	0.0	0.0	0.4	19.3	20.0	0.0	0.0		

Depth to Groundwater	
mbegl	
Min	Max
0	Non Detected
0	Non Detected

BS8485:2015 Suggested Worse Case Site Classification:

Notes

L.E.L. Lower Explosive Limit (100% L.E.L.= 5% Flammable Gas)
 N.D. Not Detected
 N.R. Not Recorded
 PID Photo-Ionising Detector
 % By volume

Highlighted cell for following conditions
 a Methane => 1% v/v
 b Carbon Dioxide =>5% v/v
 MG Made Ground
 NS Natural Strata

Site Summary:

	GSV (l/h)	Max Values
Methane		
CO2	0.0019	1.9
Maximum Flow (l/h)	0.10	



A P P E N D I X E

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Sampling					Strata			
Depth	Type	Casing Depth	Date/ Water	SPT N (Cu)	Description	Depth (Thickness)	Level	Legend
0.15-0.35	B		03/05 1995		Grass onto TOPSOIL**	0.15	52.15	
0.35-0.60	B				MADE GROUND: Dark grey-brown fine, medium and coarse sand and angular fragments of brick, concrete, ash and cinders.	0.35	51.95	
0.60-1.20	B				MADE GROUND: Brown fine, medium and coarse sand and angular fragments of stone, sandstone, occasionally brick and cinders.	0.60	51.70	
1.20-1.65	U(65)	MTL	DRY		Stiff to very stiff fissured brown mottled gray silty sandy CLAY with a little angular to subrounded fine, medium and coarse gravel.	(0.90)		
1.65	D				Stiff brown clayey sandy SILT with a little subrounded to subangular fine, medium and coarse gravel.	1.50	50.80	
2.20-2.65	U(40)P	2.20	DRY	(44)	Soft to firm brown sandy silty CLAY with a little angular to subrounded fine, medium and coarse gravel. Occasional silty fine sand layers.	1.70	50.60	
2.80	D				Very dense grey-brown, orange-brown and grey-brown mottled very silty fine SAND and angular to subrounded fine and medium GRAVEL of mudstone and sandstone.	(1.10)		
2.80	U(50)F	2.80	DRY	50/100	Yellow-brown and grey-brown coarse grained weathered SANDSTONE. Recovered as weak to moderately weak angular gravel sized fragments with much sand.	2.80	49.50	
2.90-3.12	C	2.80	DRY	50/100	End of Borehole.	2.90	49.40	
3.30-3.50	C	3.30	DRY	50/100		3.50	48.80	
3.50								
Equipment: Cable Percussive Boring Rig (Pilon 1500) Borehole Dia (mm): 150 to 3.50m Casing Dia (mm): 150 to 3.30m					Groundwater No. Struck Behaviour Sealed Groundwater not encountered		Ground Level 52.30 m OD Drilled by PB Logged by DPC Checked by <i>[Signature]</i>	
Remarks 1. Service inspection pit excavated to 0.70m, obstruction encountered. Inspection pit terminated and rig relocated 2.00m to position A1A. Inspection pit re-excavated to 0.70m, obstruction encountered. Inspection pit terminated and rig relocated 9.00m to position A1B. 2. Service inspection pit excavated to 1.20m (1 hour). 3. Hard strata 2.90m to 3.30m (1 hour). 4. Borehole backfilled with arisings and pit reinstated. See key sheet and appendices for explanations.								
Borehole Record Exploration Associates					Project Fairfield General Hospital, Bury Phase 11A Development Bury Health Care NHS Trust		Contract 125085 Borehole A1B(1 of 1)	

Form 1/0

Sampling					Strata		OD = +142.3		
Depth	Type	Casing Depth	Date/ Water	SPT N (Cu)	Description	Depth (Thickness)	Level	Legend	
0.00-0.60	B		02/05 1995		MADE GROUND: Tarmac** onto dark grey-brown very sandy angular gravel occasionally cobble sized fragments of brick, concrete and stone. Occasional ash and cinders.	0.60	51.70		
0.60-1.20	B				Very stiff fissured brown occasionally mottled grey and orange-brown slightly sandy silty CLAY with a little angular to subrounded fine, medium and coarse gravel. At top of stratum: - grey gleyed fissures.	0.60	51.70		
1.20-1.65	U(60)	NIL	DRY	(228)					
1.65-2.20	B				Below 1.65m: firm, brown, sand absent, occasional gravel.	(2.05)			
2.20-2.65	U(58)P	2.20	DRY	(65)	Below 2.20m: very sandy.				
2.65-3.20	D				Grey-brown mottled brown, grey and light grey slightly clayey silty to very silty fine, medium and coarse SAND with some subrounded fine, medium and coarse gravel.	2.65	49.65		
3.20	D	3.20	DRY			(0.55)			
3.20-3.65	U(50)	3.20	DRY		Firm brown-grey sandy very silty CLAY with a little angular to subrounded fine, medium and coarse gravel.	3.20	49.10		
3.65	D								
4.20-4.65	U(44)	4.20	DRY						
4.65-4.80	D				Below 4.65m: stiff.	(2.80)			
5.20-5.65	U(49)P	5.20	DRY	(115)					
6.00-6.45	D				Dense yellow-brown and grey-brown angular GRAVEL sized fragments of coarse grained sandstone with a matrix of grey-brown very clayey very silty sand. Some cobble sized sandstone fragments. (highly to completely weathered SANDSTONE).	6.00	46.30		
6.45-7.50	D					(1.80)			
7.50-7.84	C	7.50	DRY	50/ 190	Below 7.50m: very dense.				
7.80-8.20	B					7.80	44.50		
8.20-8.40	C	8.20	DRY	50/ 110	Yellow-brown and yellow-grey coarse grained weathered SANDSTONE. Recovered as weak and moderately weak angular gravel occasionally cobble sized fragments.				
8.41		8.20	DRY			8.41	43.89		
					End of Borehole.				
Equipment: Cable Percussive Boring Rig (Pillon 1500)					Groundwater		Ground Level 50.230m OD		
Borehole Dia (mm) 150 to 8.41m					No. Struck Behaviour Sealed		Groundwater not encountered		
Casing Dia (mm) 150 to 8.20m							Drilled by PB Logged by DPC Checked by JZ		
Remarks 1. Service inspection pit excavated to 0.60m, obstruction encountered. Pit extended and re-excavated to 0.60m. Obstruction encountered. Inspection pit terminated and rig relocated to 2.00m (2 hours) 2. Service inspection pit excavated to 1.20m (1 hour 15 minutes). 3. Hard strata at 0.60m (45 minutes) and 7.80m to 8.20m (1 hour). 4. Borehole backfilled with arisings and pit reinstated.									
See key sheet and appendices for explanations.									
Borehole Record					Project		Contract		
 Exploration Associates					Fairfield General Hospital, Bury Phase 1A Development Bury Health Care NHS Trust		125085		
					Borehole		A2(1 of 1)		

Form 1/D

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Sampling					Strata				OD = +142.3m		
Depth	Type	Casing Depth	Date/ Water	SPT N (Cu)	Description	Depth (Thickness)	Level	Legend			
0.30-1.20	B		05/05 1995		Turf onto TOPSOIL**	G.L.	52.50				
1.20-1.65	SB	NIL	DRY	4	MADE GROUND: soft grey-brown and brown sandy silty clay, dark grey silty ash and cinder sand, and angular and subangular fragments of stone, brick, pottery, wood, glass, coal and mudstone.	0.15	52.15				
1.65-2.20	D					(2.35)					
2.20-2.65	U(45)P	2.20	DRY			2.50	49.80				
2.65	D				Grey-brown and brown-grey clayey silty fine, medium and coarse SAND and angular to subrounded fine, medium and coarse GRAVEL, predominately of mudstone and sandstone.	(1.30)					
3.20-3.65	U(39)P	3.20	DRY		Below 3.35m: grading to clayey silty sand with much gravel. Below 3.65m: gravel absent.	3.80	48.50				
3.65	D					(0.60)					
4.20-4.65	U(37)	4.20	DRY	(58)	Firm laminated grey-brown and grey silty and very silty CLAY. Occasional laminae of clayey silt and silty fine sand. Occasional subrounded fine gravel.	4.40	47.90				
4.65	D				Firm poorly laminated grey-brown slightly sandy very silty CLAY. Occasional subrounded fine gravel.	(2.30)					
5.20-5.65	U(36)P	5.20	DRY	(63)		6.70	45.60				
6.70	D					6.90	45.40				
6.70-7.10	U(80)PB	6.70	DRY		Stiff brown slightly silty very sandy CLAY with a little subangular fine and medium gravel. Layers of yellow-brown fine, medium and coarse sand.	7.10	45.20				
7.10-7.22	C	7.10	DRY	50/55							
7.22-7.40	D										
7.40-7.56	C	7.40	DRY	50/90	Light grey-brown slightly silty fine, medium and coarse SAND.	7.56	44.74				
7.56			7.40	DRY	Yellow-brown and yellow-grey coarse grained weathered SANDSTONE. Recovered as weak and moderately weak angular coarse gravel fragments. End of Borehole.						
Equipment: Cable Percussive Boring Rig (P/Con 1506)					Groundwater No. Struck Behaviour		Sealed		Ground Level 52.50m OD		
Borehole Dia (mm) 150 to 7.56m		Casing Dia (mm) 150 to 7.40m		Groundwater not encountered				Drilled by FB Logged by DPC Checked by JE			
Remarks		1. Service inspection pit excavated to 1.20m (1 hour). 2. Hard strata 7.10m to 7.40m (1 hour). 3. Borehole backfilled with arisings and pit reinstated.									
See key sheet and appendices for explanations.		Form 1/a									
Borehole Record					Project		Contract		125085		
Exploration Associates					Fairfield General Hospital, Bury Phase 11A Development Bury Health Care NHS Trust		Borehole		A3(1 of 1)		

Sampling					Strata				OD = 141.6m		
Depth	Type	Casing Depth	Date/ Water	SPT N (Cu)	Description	Depth (Thickness)	Level	Legend			
0.10-0.30	B		01/05 1995		MADE GROUND: Hardcore**	G.L. 0.10	84.85-91.45				
0.30-0.60	B				MADE GROUND: Brown-grey slightly silty sand and angular gravel fragments of stone, occasionally brick and concrete.	(0.50)					
0.60-1.20	B				Between 0.10m and 0.30m: sandstone cobbles and clay pockets.	0.60	50.95				
1.20-1.65	U(42)	NIL	DRY	(18)	MADE GROUND: Very soft and soft fissured brown and grey-brown silty clay with a little angular to subrounded fine, medium and coarse gravel including brick and cinder fragments.	(1.10)					
1.65	D				Below 1.30m: brown mottled orange-brown, light grey and grey-brown, with partings and fissures and clayey silty sand with ash and cinder fragments.	1.70	49.85				
2.20-2.65	U(50)P	2.20	DRY	(32)	Stiff fissured brown mottled orange-brown silty sandy CLAY with a little angular to subrounded fine, medium and coarse gravel. Occasional grey clayey fissures.	(2.30)					
2.65	D				At 2.20m: firm.						
2.80	D										
3.20-3.65	U(54)	3.20	DRY	(142)							
3.65			DRY								
4.00	D	3.20	DRY			4.00	47.55				
4.00-4.45	CB	4.00	DRY	9	Loose grey-brown slightly clayey silty very sandy angular to subrounded fine, medium occasionally coarse GRAVEL.	(0.80)					
4.80	D					4.80	46.75				
4.80-5.25	U(50)P	4.80	DRY	(63)	Firm brown-grey silty CLAY.						
5.25-6.30	B										
6.30-6.75	U(47)	6.20	DRY								
6.75	D										
7.80-8.25	U(50)P	7.80	DRY	(96)	Below 7.80m: firm to stiff.	(7.10)					
8.25	D										
8.40	D										
9.30-9.75	U(53)P	9.20	DRY								
9.75	D										
9.90	D										
Equipment: Cable Percussive Boring Rig (Pifcon 1500)					Groundwater		Ground Level 84.85 m OD				
Borehole Dia (mm) 150 to 12.37m Casing Dia (mm) 150 to 12.20m					No. Struck Behaviour Sealed		Groundwater not encountered				
							Drilled by PB Logged by DPC Checked by R				
Remarks											
1. Service inspection pit excavated to 1.20m (1 hour).											
2. Hard strata 11.90m to 12.20m (1 hour).											
3. Borehole backfilled with arisings and pit reinstated.											
See key sheet and appendices for explanations.											
Borehole Record					Project		Contract				
Exploration Associates					Fairfield General Hospital, Bury Phase 11A Development Bury Health Care NHS Trust		125085				
					Borehole		A4(1 of 2)				

Form 1/D

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Sampling					Strata			
Depth	Type	Casing Depth	Date/Time	SPT N (Cu)	Description	Depth (Thickness)	Level	Legend
			02/05		(See previous sheet - CLAY)			
10.80-11.25	UC54)	10.70	DRY	(85)				
11.90-12.09	C	11.90	DRY	50/		11.90	39.65	
11.90-12.20	D			95/	Yellow-brown and yellow-grey coarse grained weathered SANDSTONE. Recovered as weak and moderately weak angular gravel fragments.			
12.20-12.37	C	11.20	DRY	50/		12.37	39.18	
		12.20	DRY	85/				
12.37					End of Borehole.			
Equipment: Cable Percussive Boring Rig (Pilson 1500)					Groundwater No. Struck Behaviour	Sealed	Ground Level	39.65 m OD
Borehole Dia (mm) 150 to 12.37m					Casing Dia (mm) 150 to 12.20m		Drilled by PB	
							Logged by DPC	
							Checked by J.	
Remarks								
See key sheet and appendices for explanations.								
Borehole Record					Project		Contract	
					Fairfield General Hospital, Bury Phase 11A Development Bury Health Care NHS Trust		125085	
Exploration Associates							Borehole	
							A4(2 of 2)	

Sampling					Strata				OD on 4 14.2.2	
Depth	Type	Casing Depth	Date/Water	SPT N (Cu)	Description	Depth (Thickness)	Level	Legend		
0.15-0.50	B		04/05 1995		Turf onto TOPSOIL**	0.15	52.00			
0.50-0.80	B				MADE GROUND: Dark grey-brown slightly clayey very silty fine, medium and coarse sand with some angular gravel fragments of ash, cinders and bricks. Occasional roots.	0.50	51.65			
0.80-1.20	B				MADE GROUND: Soft to firm fissured brown and grey-brown silty clay with a little angular to subrounded fine, medium and coarse gravel including brick and cinder fragments.	0.80	51.35			
1.20-1.65	U(35)P	Nil	DRY		MADE GROUND: Gray and dark gray sandy angular gravel fragments of mudstone and siltstone.	(0.50)	50.85			
1.65	D									
1.80	D									
2.20-2.65	U(40)	2.20	DRY	(44)	Soft to firm grey-brown silty CLAY with a little to some angular to subrounded fine and medium gravel of mudstone and sandstone.					
2.65	D									
3.20-3.65	U(54)	3.20	DRY	(30)		(3.20)				
3.65	D				Below 3.65m: soft, brown-grey, slightly sandy, very silty, occasional gravel.					
4.20-4.65	U(39)P	4.20	DRY							
4.65	D									
4.80	D				Firm to stiff and stiff grey-brown slightly sandy silty CLAY with a little subangular to subrounded fine and medium gravel.	4.50	47.65			
5.20-5.65	U(50)	5.20	DRY	(106)						
5.65	D									
6.70-7.15	U(48)P	6.70	DRY							
7.15	D					(5.00)				
8.20-8.65	U(56)P	8.20	DRY	(73)	At 8.20m: firm.					
8.65	D									
9.50		9.50	DRY							
9.50-9.77	CB	9.50	DRY	50/120	very dense grey-brown and grey-brown slightly clayey very silty fine, medium and coarse SAND and angular to subrounded fine, medium and coarse GRAVEL of mudstone and sandstone.	9.50	42.65			
9.77-10.00	D					9.70	42.45			
Equipment: Cable Percussive Boring Rig (Pilon 1500)					Groundwater No. Struck Behaviour Sealed		Ground Level 52.45 m OD			
Borehole Dia (mm) 150 to 10.13m Casing Dia (mm) 150 to 10.00m					Groundwater not encountered		Drilled by PB Logged by DPC Checked by R			
Remarks 1. Service inspection pit excavated to 1.20m (1 hour). Bulk sample taken of material encountered. Hard strata at 1.20m (1 hour). Borehole terminated and rig relocated to position ASA. 2. Service inspection pit excavated to 1.20m (1 hour). 3. Hard strata 9.70m to 10.00m (1 hour). 4. Borehole backfilled with arisings and pit reinstated. See key sheet and appendices for explanations.										
Borehole Record					Project Fairfield General Hospital, Bury Phase 11A Development Bury Health Care NHS Trust		Contract 125085			
 Exploration Associates							Borehole ASA(1 of 2)			

Form 1/0

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SD 81 SW /
NGR: 83196 11576

Sampling					Strata			
Depth	Type	Casing Depth	Date/Water	SPT N (Cu)	Description	Depth (Thickness)	Level	Legend
10.00-10.13	c	10.00	05/05 DRY	50/40	Yellow-brown and yellow-grey coarse grained weathered SANDSTONE. Recovered as weak and moderately weak angular gravel fragments. End of Borehole.	10.13	4.02	
10.13		10.00	DRY					
Equipment: Cable Percussive Boring Rig (Pitcon 1500) Borehole Dia (mm) 150 to 10.13m Casing Dia (mm) 150 to 10.00m					Groundwater No. Struck Behaviour Sealed		Ground Level 52.75 m OD Drilled by PB Logged by DPC Checked by A	
Remarks See key sheet and appendices for explanations.								
Borehole Record  Exploration Associates					Project Fairfield General Hospital, Bury Phase 11A Development Bury Health care NHS Trust		Contract 125085 Borehole A5A(2 of 2)	

Form 1/0

329

Sampling					Strata				OD = +1423	
Depth	Type	Casing Depth	Date/ Water	SPT N (Cu)	Description	Depth (Thickness)	Level	Legend		
			15/05 1995		MADE GROUND**	G.L.	52.39			
						(1.80)				
2.00	D				Sandy boulder CLAY**	1.80	50.45			
2.00										
2.50	D					(2.20)				
4.00					SAND**	4.00	48.25			
						(0.50)				
4.50					Sandy boulder CLAY**	4.50	47.75			
5.00	D									
7.00	D					(6.50)				
9.50	D									
Equipment: Truck Mounted Rotary Rig Air Flush					Groundwater No. Struck Behaviour		Sealed	Ground Level 52.39m OD		
Borehole Dia. (mm) P to 11.00m B to 41.00m					Casing Dia. (mm) PU to 11.00m		Groundwater not observed			
Remarks					COMMERCIAL IN CONFIDENCE					
1. Service inspection pit excavated to 1.20m. 2. 100% flush returns throughout open hole drilling. 3. Borehole grouted upon completion.										
See key sheet and appendices for explanations.					Form 1/0					
Borehole Record					Project		Contract			
					Fairfield General Hospital, Bury Phase 11A Development Bury Health Care NHS Trust		125085			
Exploration Associates							Borehole			
							RB1(1 of 5)			

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Sampling					Strata				
Depth	Type	Casing Depth	Date/ Water	SPT N (Cv)	Description	Depth (Thickness)	Level	Legend	
					(See previous sheet - CLAY**)				
10.70	D								
11.00						11.00	41.25		
11.10	D				Yellow SANDSTONE**	(0.50)			
11.50						11.50	40.75		
11.60	D				Gray MUDSTONE/SILTSTONE**				
12.10	D								
12.70	D								
16.00	D								
						(11.90)			
19.00	D								
Equipment: Truck Mounted Rotary Rig Air Flush Borehole Dia (mm) P to 11.00m N to 41.00m Casing Dia (mm) PM to 11.00m					Groundwater No. Struck Behaviour Sealed		Ground Level 42.25 m OD Drilled by PS Logged by DPC Checked by		
Remarks See key sheet and appendices for explanations.									
Borehole Record  Exploration Associates					Project Fairfield General Hospital, Bury Phase 11A Development Bury Health Care NHS Trust			Contract 125085 Borehole RB1(2 of 5)	

Form 1/0

329

NGR: 83AS 11575
OD = +142.3m

Sampling					Strata			
Depth	Type	Casing Depth	Date/ Water	SPT N (Cu)	Description	Depth (Thickness)	Level	Legend
21.00	D				(See previous sheet - MUDSTONE/SILTSTONE**)			
23.00	D							
23.40					Dark grey MUDSTONE**	23.40 (1.35)	28.85	
24.95					COAL**	24.95	27.30	
25.00	D				MUDSTONE/SILTSTONE**	25.24	27.01	
25.24								
27.50	D					(6.56)		
Equipment: Truck Mounted Rotary Rig Air Flush Borehole Dia (mm) P to 11.00m K to 41.00m Casing Dia (mm) PW to 11.00m					Groundwater No. Struck Behaviour Sealed		Ground Level 52.28 m OD Drilled by PS Logged by DPC Checked by <i>PS</i>	
Remarks See key sheet and appendices for explanations.								
Borehole Record  Exploration Associates					Project Fairfield General Hospital, Bury Phase 11A Development Bury Health Care NHS Trust		Contract 125085 Borehole RB1 (3 of 5)	

Form 1/3

329

SD81SW/
NGR: 83195 11575
OD = +142.3

Sampling					Strata			
Depth	Type	Casing Depth	Date/Water	SPT N (Cu)	Description	Depth (Thickness)	Level	Legend
31.00	D				(See previous sheet - MUDSTONE/SILTSTONE**)			
31.80						31.80	20.45	
32.00	D				COAL**	(0.61)		
32.41						32.41	19.84	
33.00	D				SANDSTONE**			
38.00	D							
Equipment: Truck Mounted Rotary Rig Air Flush Borehole Dia (mm) P to 11.00m H to 41.00m Casing Dia (mm) PW to 11.00m					Groundwater No. Struck Behaviour Scaled Ground Level 142.3m OD Filled by PS Logged by OPC Checked by 27			
Remarks See key sheet and appendices for explanations.					IN CONFIDENCE			
Borehole Record					Project		Contract	
 Exploration Associates					Fairfield General Hospital, Bury Phase 11A Development Bury Health Care NHS Trust		125085 Borehole RB1 (4 of 5)	

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SD 81 SW /
NGR. 83195 11575
QD xx + 142.3

Sampling					Strata			
Depth	Type	Casing Depth	Data/Water	SPT N (Cu)	Description	Depth (Thickness)	Level	Legend
41.00		11.00	DRY		(See previous sheet - SANDSTONE**)	41.00	11.25	
					End of Borehole.			
Equipment: Truck Mounted Rotary Rig Air Flush Borehole Dia (mm) Casing Dia (mm) P to 11.00m PW to 11.00m H to 41.00m					Groundwater No. Struck Behaviour Sealed	Ground Level 92.85m OD Drilled by PS Logged by DPC Checked by <i>He</i>		
Remarks See key sheet and appendices for explanations.								
Borehole Record  Exploration Associates					Project Fairfield General Hospital, Bury Phase 11A Development Bury Health Care NHS Trust		Contract 125085 Borehole RB1 (5 of 5)	

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Sampling					Strata			
Depth	Type	Casing Depth	Date/ Water	SPT N (Cu)	Description	Depth (Thickness)	Level	Legend
			16/03 1995		MADE GROUND**	G.L.	52.35	
1.20						(1.20)		
					Sandy boulder CLAY**	1.20	51.15	
3.00	D					(1.90)		
3.00					Yellow SANDSTONE**	3.10	49.25	
						(6.90)		
7.00	D							
						10.00	42.35	
Equipment: Truck Mounted Rotary Rig Mist Flush 412 Barrel Borehole Dia. (mm) P to 3.50m 412 to 35.00m Casing Dia. (mm) PM to 3.50m					Groundwater No. Struck Behaviour Groundwater not observed		Sealed Ground Level 52.35 m OD	Drilled by PS Logged by DFC Checked by L
Remarks 1. Service inspection pit excavated to 1.20m. 2. Loss of flush returns between 28.00m and 35.00m. 3. Borehole grouted upon completion. See key sheet and appendices for explanations.								
Borehole Record					Project Fairfield General Hospital, Bury Phase 11A Development Bury Health Care NHS Trust		Contract 125085	
Exploration Associates							Borehole RB2(1 of 4)	

Form 1/D

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Sampling					Strata			
Depth	Type	Casing Depth	Date/ Water	SPT N (Cu)	Description	Depth (Thickness)	Level	Legend
10.00	D				MUDSTONE/SILTSTONE**			
10.00								
12.00	D							
17.00	D					(10.50)		
Equipment: Truck Mounted Rotary Rig Mist Flush 412 Barrel Borehole Dia (mm) P to 3.50m 412 to 35.00m Casing Dia (mm) PM to 3.50m					Groundwater No. Struck Behaviour Sealed		Ground Level 42.35m OD Drilled by PS Logged by DPC Checked by	
Remarks See key sheet and appendices for explanations.					CONFIDENTIAL IN CONFIDENCE			
Borehole Record					Project		Contract	
 Exploration Associates					Fairfield General Hospital, Bury Phase 11A Development Bury Health Care NHS Trust		125085 Borehole RB2(2 of 4)	

Form 1/3

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Sampling					Strata			
Depth / Drill Run	Type / TCR/SCM	Casing (RQD)	Date/ Water	(Cu)/F1	Description	Depth (Thickness)	Level	Legend
20.50		3.50		18	(See previous sheet - MUDSTONE/SILTSTONE**)	20.50	31.85	
	67% (22%)	(0%)		NR	Dark grey thickly laminated slightly weathered carbonaceous fossiliferous MUDSTONE, weak. Very closely to closely spaced subhorizontal (<10°) planar smooth occasionally stepped discontinuities. Occasional non intact zones (<0.1m thick)	(1.20)		
				NR	Grey and light grey thickly laminated moderately weathered clayey and sandy SILTSTONE (seatearth), weak. Very closely occasionally closely spaced clayey irregular subhorizontal (<10°) discontinuities and non intact zones.	21.70	30.65	
				NR	Grey, medium and coarse grained thinly bedded slightly weathered SANDSTONE, moderately weak. Closely spaced subhorizontal planar rough discontinuities.	(1.60)		
23.50					Grey MUDSTONE**	23.30 23.50	29.05 28.85	
						(4.00)		
27.50	67% (13%)	(0%)		NI	Grey highly to completely weathered silty MUDSTONE, very weak. Recovered as soft very silty clay with many angular fine and medium gravel sized lithorelicts.	27.50	24.85	
28.20		3.50		NR	Below 28.00m slightly weathered, weak.	28.05 28.25	24.30 24.10	
	100% (60%)	(50%)		4	Grey thickly laminated slightly weathered fine sandy SILTSTONE, moderately weak. Closely spaced subhorizontal (<10°) planar rough discontinuities.	(2.95)		
					Light grey and grey very thinly to medium bedded coarse grained slightly weathered SANDSTONE, moderately strong to strong. Closely to medium spaced subhorizontal (<10°) to horizontal planar, rough ironstained sandy discontinuities.			
					28.95m to 29.70m: Vertical to 70° rough irregular ironstained discontinuity.			
Equipment: Truck Mounted Rotary Rig Mist Flush 412 Barrel					Groundwater No. Struck Behaviour		Sealed Ground Level 82.85m OD	
Borehole Dia (mm) P to 3.50m 412 to 35.00m					Casing Dia (mm) PW to 3.50m		Drilled by PS Logged by DPC Checked by JZ	
Remarks								
See key sheet and appendices for explanations.								
Borehole Record			Project			Contract		
Exploration Associates			Fairfield General Hospital, Bury Phase 11A Development Bury Health Care NHS Trust			125085		
						Borehole		
						RB2(3 of 4)		

Form 1/0

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SD 81SW/

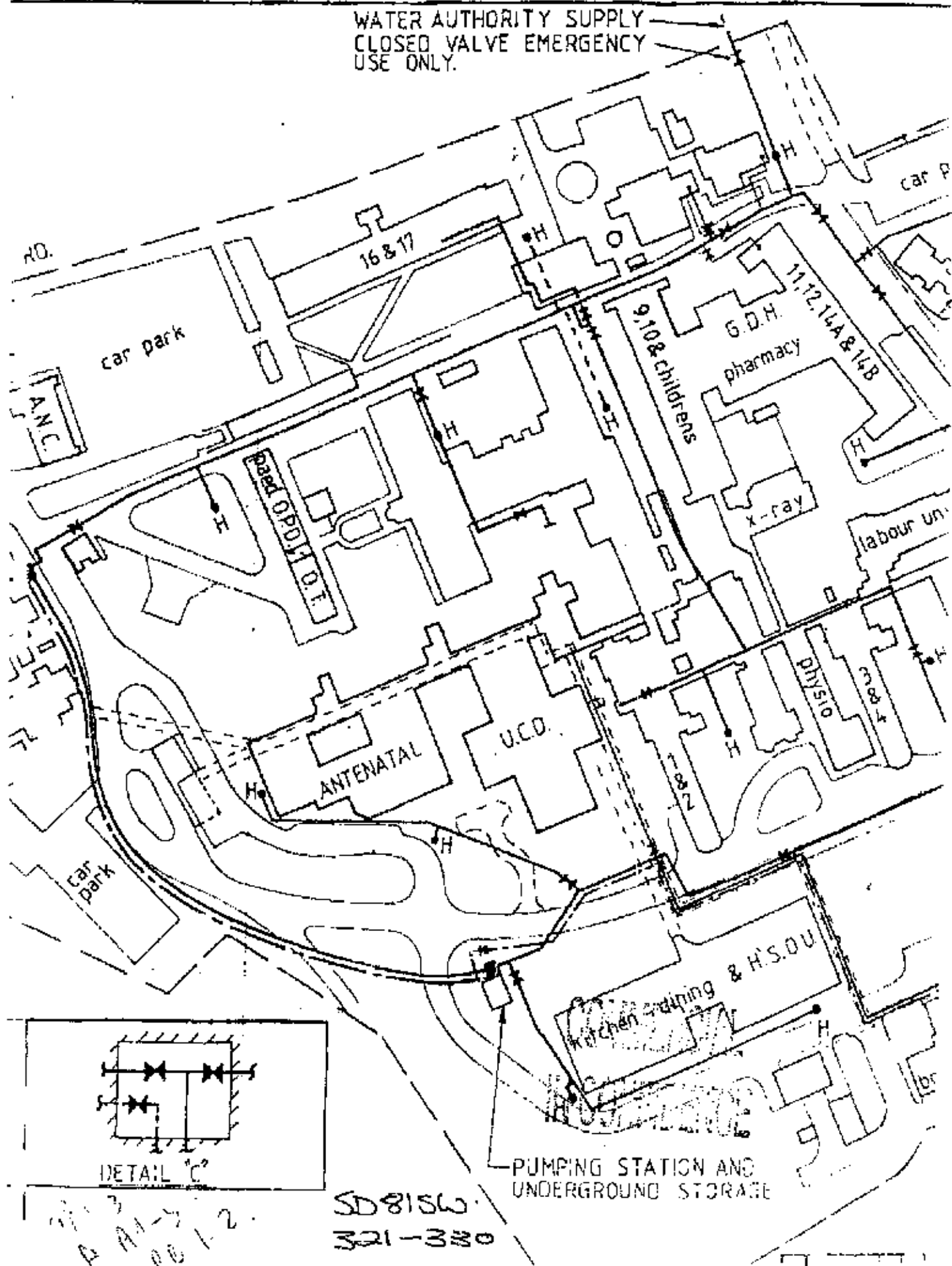
WGR: 8320411619

OD = 142.4 m

Sampling					Strata			
Drill Run	YCR (SCF)	Casing (ROD)	Date/ Water	FI	Description	Depth (Thickness)	Level	Legend
31.20					(See previous sheet: SANDSTONE) 30.20m to 30.40m: 70° planar (unstained tight discontinuity). 30.80m to 31.20m: vertical to 70° rough irregular (unstained discontinuity).	31.20	21.15'	
					SANDSTONE**	(3.80)		
35.00					End of Borehole.	35.00	17.35	
Equipment: Truck Mounted Rotary Rig Mist Flush 412 Barrel Borehole Dia (mm) P to 3.50m 412 to 35.00m Casing Dia (mm) PW to 3.50m					Groundwater No. Struck Behaviour Sealed		Ground Level 122.35 m-OD Drilled by PS Logged by DPC Checked by <i>KL</i>	
Remarks See key sheet and appendices for explanations.								
Borehole Record  Exploration Associates					Project Fairfield General Hospital, Bury Phase 11A Development Bury Health Care NHS Trust		Contract 125085 Borehole RB2(4 of 4)	

Form 1/3

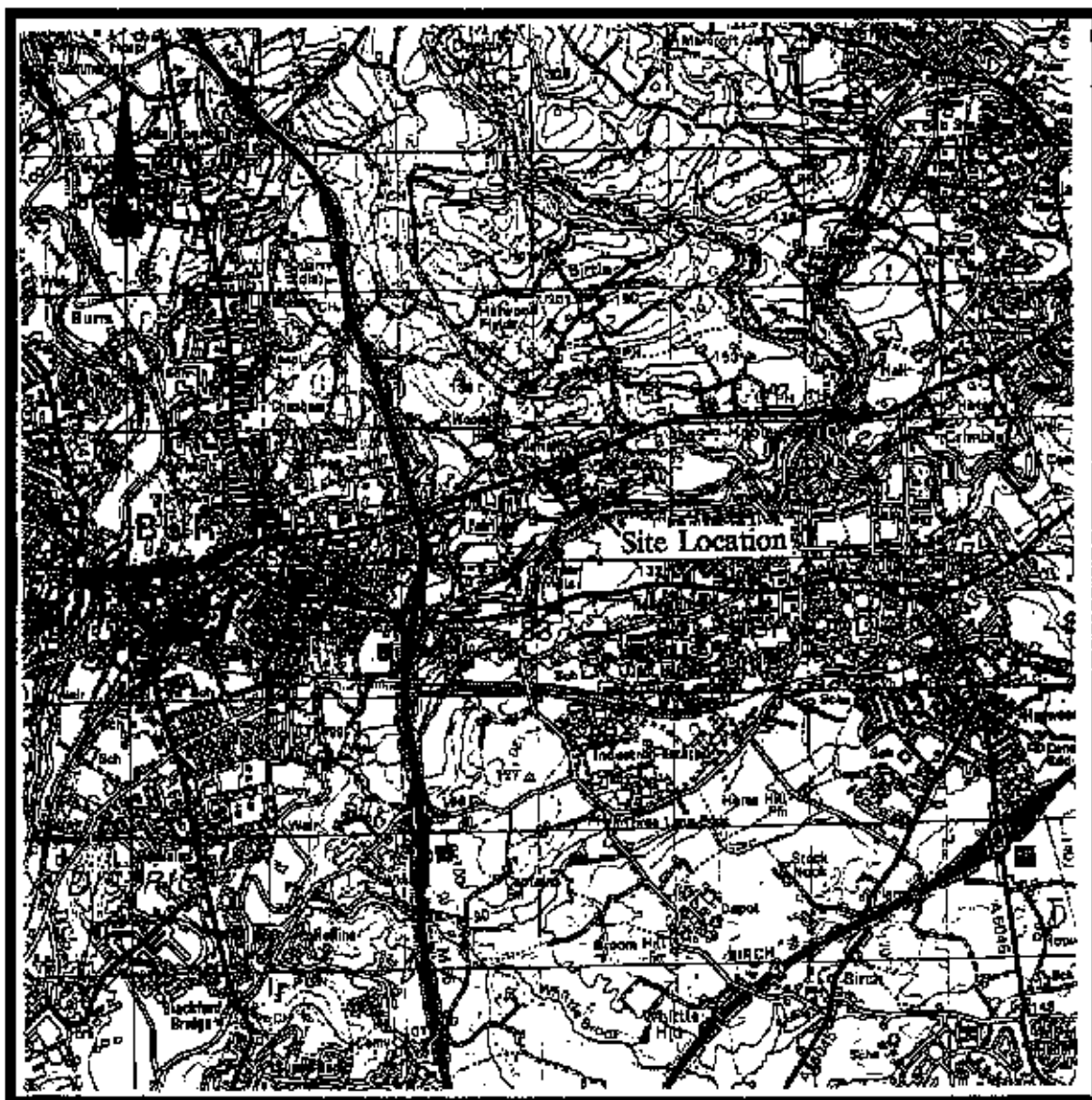
WATER AUTHORITY SUPPLY
CLOSED VALVE EMERGENCY
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DETAIL 'C'

PUMPING STATION AND
UNDERGROUND STORAGE

SD81SW
321-330



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SD81SW 10 N^o 321-330

Site Location Plan



Exploration Associates

Project

Fairfield General Hospital, Bury
Phase 11A Development
Bury Health Care NHS Trust

Contract 125085

Drawing 1

