GroundSolve Ltd
Consulting Geotechnical Engineers

# VERIFICATION REPORT – PLOTS 01 & 02 HERITAGE COURT, ACREFAIR

**GSL3059R02**

**VERSION 1**

**01 DECEMBER 2024**

**FINAL**

Prepared for:

GOWER HOMES

Prepared by: A Ridge

GroundSolve Ltd

# DOCUMENT CONTROL

| | |
|---|---|
| **Report No. :** | GSL3059R02 |
| **Report Status:** | FINAL |
| **Version No.:** | 1 |
| **Project Engineer:** | A Ridge |
| **Date of Issue:** | 01/12/2024 |

This report has been prepared by GroundSolve Ltd with all reasonable care and diligence, within the best practice and guidance current at the time of issue within the proposed redline boundary and proposed Site end use as presented by the Client.

This report is confidential to the Client and GroundSolve Ltd accepts no responsibility whatsoever to third parties to whom this report is presented.

| Version No. | Description of Issue / Revision | Date of Issue | Author | Reviewed By | Approved By |
|---|---|---|---|---|---|
| 1 | FINAL | 04/12/2024 | A Ridge<br>BSc (Hons) FGS GMICE | James Thorburn<br>BSc FGS | Sam Fishburne<br>BEng MSc FGS CGeol RoGEP |

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# 1 INTRODUCTION

GroundSolve Ltd was commissioned by Gower Homes to undertake a verification report for Plots 01 and 02 which are part of a wider development off Llangollen Road, Acrefair in North Wales referred to as Heritage Court (the "Site").

This report has been devised to generally comply with the relevant principles and requirements of a range of guidance including:

- Welsh Local Government Assoc- Development of Land Affected By Contamination Guide for Developers 2017
- Part IIA of the Environment Protection Act, 1990
- BS5930:2015: "Code of practice for site investigations"
- BS10175: 2011 +A2:2017 "Investigation of Potentially Contaminated Sites - Code of Practice"
- The Building Regulations 2010. Part C (HM Government 2013)
- Environment Agency: Land Contamination Risk Management (LCRM), Version 3, October 2020
- Environment Agency (2017) "The Environment Agency's Approach to Groundwater Protection" November 2018 Version 1.2.

## 1.1 Proposed Development

The proposed development comprises the construction of 22 three and four bedroom residential properties with associated gardens, roads and services. This verification report relates to Plots 01 and-02 only.

It is understood that the Principal Contractor for the development is Gower Homes Ltd.

Planning Application number P/2021/0793 – Condition 4

*Each part of the site subject to the remediation under the scheme approved as part of condition 3 shall not be occupied/used until a validation report has been completed in respect of that part of the site.*




**Extract from proposed development plan (see Appendix A, Figure 1)**

The findings and conclusions of the risk assessments have been set out and recommendations given for the proposed residential end use.

## 1.2 Objectives

The report provides verification of site material, compares site conditions and soil chemical parameters to the specification for verification as agreed with Wrexham County Borough Council in the Remediation Strategy outlined in Groundsolve Ltd report GSL3059R01-1 Issued, 26th February 2024.

## 1.3 Previous Investigations

The following reports have already been undertaken and will be summarised in Section 3:

- Phase II Assessment, South Site (Former Engineering Works), Acrefair, Wrexham – carried out by WSP (Reference 9460(2), dated July 2011. which encompassed the current site of interest within a larger parcel of land.
- Coal Mining Risk Assessment Report undertaken by Earth Environmental & Geotechnical Ltd (Reference: A3341/17, August 2017)
- Phase 1 Preliminary Risk Assessment undertaken by Earth Environmental & Geotechnical Ltd (Ref. A3341/19, dated 17th December 2019)
- Phase 2 Ground Investigation undertaken by Earth Environmental & Geotechnical Ltd (Ref: A3341/20/SI/V2, dated 9th September 2020)
- A Soil Contamination Delineation Letter Report undertaken by Earth Environmental & Geotechnical Ltd (Ref: A3341/21, dated 24th June 2020)
- Remediation Strategy - Groundsolve Ltd report GSL3059R01-1 Issued, 26th February 2024
- Gas Membrane Verification - GSL3116R02 - Plots 01, 02, 03 – 05/09/24

The previous site investigation reports are discussed and summarised in **Section 3** of this report.

## 1.4 Limitations

This report has been prepared for the sole use of Gower Homes Ltd. No other third party may rely upon or reproduce the contents of this report without the written approval of GroundSolve Ltd. If any unauthorised third party comes into possession of this report, they rely on it entirely at their own risk.

# 2 SITE DETAILS AND DESCRIPTION

**Table 2.1 Current Site Overview.**

| | |
|---|---|
| **Site name** | Heritage Court, Llangollen Rd, Acrefair |
| **Site address** | Llangollen Rd, Acrefair, closest postcode LL14 3HW |
| **National Grid Reference (NGR)** | 328138, 343231 |
| **Approximate Site area** | The area of the site is 1.12 ha. |
| **Site shape** | The site is irregular in shape with maximum dimensions of approximately 150m north-south and 155m east-west. |
| **Current land use on the Site** | The site is currently part of the new residential development with plots under various phases of construction. |
| **Surrounding land uses** | To the northwest of the site is Llangollen Road (A539) with residential properties and vacant land beyond, to the north east is a bowling green, to the east is a steep slope with residential properties beyond and to the south is a vacant plot of land |
| **General topography and ground levels** | No up to date topographical survey has been provided to GSL since groundwork changes and development on the site, however the previous topographical survey suggests site slopes from generally from north to south varying between 53mOD on the northern boundary to 48.5m OD on the southern boundary. There is a steep overgrown slope along the eastern boundary ranging from 50m OD to 61m OD. |

# 3 PREVIOUS INVESTIGATIONS

Previous reports have already been undertaken and the findings are summarised:

- Phase II Assessment, South Site (Former Engineering Works), Acrefair, Wrexham – carried out by WSP (Reference 9460(2), dated July 2011. which encompassed the current site of interest within a larger parcel of land.
- Coal Mining Risk Assessment Report undertaken by Earth Environmental & Geotechnical Ltd (Reference: A3341/17, August 2017)
- Phase 1 Preliminary Risk Assessment undertaken by Earth Environmental & Geotechnical Ltd (Ref. A3341/19, dated 17th December 2019)
- Phase 2 Ground Investigation undertaken by Earth Environmental & Geotechnical Ltd (Ref: A3341/20/SI/V2, dated 9th September 2020)
- A Soil Contamination Delineation Letter Report undertaken by Earth Environmental & Geotechnical Ltd (Ref: A3341/21, dated 24th June 2020)
- Remediation Strategy - Groundsolve Ltd report GSL3059R01-1 Issued, 26th February 2024
- Gas Membrane Verification - GSL3116R02 - Plots 01, 02, 03 – 05/09/24

In summary, from the site history, review of historical maps and site walkover survey, there was identified a low risk of potential sources of contaminants being present at the site. Any Made Ground was anticipated to be relatively thin.

**Table 3.1 Summary of main findings from the Phase 1 Report.**

| Summary of main findings from the Phase 1 Report | |
|---|---|
| **Site History** | The earliest mapping (1873) shows the presence of railway tracks and sidings running though the centre of the site connecting works to the north and south. Along the southern section of the site there is a works, potentially connected to be New British Iron Works.<br>There are also associated buildings in the north and west. There is an embankment along the eastern boundary.<br><br>Offsite, there are three reservoirs / ponds relating to the works. There are other railway sidings along eastern boundary with a series of Coke Ovens further to the east.<br><br>The New British Iron Works were removed by 1899 along with the majority of associated railway lines and sidings. The previous buildings were removed within the north and southern parts of the site. By 1960s, new rectangular buildings were now present in the southern part of the site. The remaining parts of the site were used for vehicle parking.<br><br>The Acrefair engineering works and Air Products Engineering facility occupied to the south of the site. The former reservoirs / ponds were infilled by 1962.<br><br>The site generally has remained unchanged until recently when the previous buildings were demolished. |
| **Geological Setting** | Made ground – present on the site variable in thickness, deepest in southern part of site.<br>Superficial deposits – Till (Diamicton), Devensian.<br>Bedrock – Pennine Lower Coal Measures Formation comprising mudstone, coal seams, siltstone and sandstone), Carboniferous. Two coal seams outcrop through the site. |

| Summary of main findings from the Phase 1 Report | |
|---|---|
| **Mining** | The site is located in a coal mining Development High Risk Area by the Coal Authority. There are 3no. associated coal seams and 1no. ironstone coal seam potentially underlying the site. There is a mine shaft present along the eastern boundary.<br>The site is not in an area affected by historic brine or salt extraction.<br>In an area where possible historical mining of bedded iron ore.<br>Potential for difficult ground conditions are unlikely or localised and are at a level where they need not be considered |
| **Radon** | The site is located in a Radon Affected Area as between 3 and 5% of properties are above the Action Level. Basic Radon protection measures will therefore be necessary. |
| **Hydrogeology** | Superficial deposits (Glacial Till) – Secondary Undifferentiated Aquifer.<br>Bedrock(Pennine Lower Coal Measure) – Secondary A Aquifer.<br>There are no Groundwater Abstraction Licence, Potable Abstractions or Surface Water Abstraction Licence points within 1000m of the site.<br>The site is not located within 500m of a Source Protection Zone or Source Protection Zone within a confined aquifer |
| **Hydrology** | There are no surface water features identified within 250m of the site. |
| **Waste** | There are no records for current Environment Agency landfill records within 1km of the site<br>There are 9no. records of historic Environment Agency landfill sites within 1.5km of the site. The closest record refers to a site located 17m to the northwest of the site (former infilled works reservoir. The site received inert, industrial waste between 1950 and 1960. |
| **Contamination Sources** | Made Ground from various phases of on-site development and railway land<br>Made Ground is present on site known to comprise ash/clinker/ coal. Thickness of Made Ground varies from 0.3m to 2.0m.<br>Asbestos containing materials (ACM) from former structures<br>Ground gas associated with deep made ground, and infilled features from railway land<br><br>Contaminants may therefore include heavy metals, polycyclic aromatic hydrocarbons (PAH), total petroleum hydrocarbons (TPH), BTEX compounds, Volatile Organic Compounds (VOC), Polychlorinated Biphenyls (PCB), asbestos and ground gases (Carbon dioxide and methane). |
| **Scope of Phase 2 Site Investigation** | The scope of ground investigation works carried out at the site by GroundSolve comprised:<br>• 6 No. Rotary boreholes (RH01-06) to a maximum depth of 30.0mbgl,<br>• 4No Gas monitoring wells installed<br>• 12 No. machine excavated Trial Pits to maximum depth of 3.15mbgl ,<br>• Sampling for chemical and geotechnical testing of soils,<br>• Chemical testing. |
| **Findings of the Phase 2 Ground Investigation** | The sequence of strata encountered beneath the site was as follows:<br>• Made Ground – Variable Made Ground was encountered in all the exploratory holes, comprising:<br>o Asphalt hardstanding.<br>o Gravels with varying sand and cobble content (containing brick, slag, glass, timber, clinker, concrete, metal, pottery fragments, carbonaceous fragments, sandstone and mudstone.<br>• Clay was encountered in all the exploratory holes. The clay is thought to be a completely weathered mudstone that becomes less weathered with depth. This lithology was recovered as:<br>o o Sandy gravelly clay (containing gravel of mudstone and carbonaceous fragments).<br>o o Clayey mudstone was encountered In the rotary boreholes.<br>• Mudstone was encountered in all of the rotary boreholes as:<br>o Mudstone with occasional siltstone and sandstone bands.<br>• Sandstone was also encountered in all of the rotary boreholes as:<br>o Sandstone with mudstone bands and strong sandstone bands.<br>• Coal was encountered in RH1 and RH3 and was found to be intact and separated by a thin layer of black shale. |
| **Phase 2 Conclusions – Geoenvironmental** | **Human Health:**<br>Elevated concentrations of contaminants of Lead, Mercury, TPH and PAH, with respect to the long-term protection of human health, have been identified across the site when compared to residential end use (with plant uptake) assessment criteria.<br>**Controlled Waters:**<br>No unacceptable risks.<br>**Ground Gases (Human Health / Property):**<br>Basic radon protective measures are indicated by the current guidance.<br>Characteristic Situation 2 gas protection measures. |

| Summary of main findings from the Phase 1 Report | |
|---|---|
| **Remediation Strategy** | In order to break potential pollutant linkages to future residential end users, it is recommended that garden areas across the site should have a clean soil cover of 600mm thickness (450mm thick in front gardens).<br><br>Gas Protection measures to achieve CS2 and basic protection measures.<br>• Floor Slab:<br>▪ Cast in situ ground-bearing floor slab (with only nominal mesh reinforcement) – Score 0.5; or<br>• Passive sub floor dispersal layer<br>▪ Good performance– Score 1.5;<br>Media used to provide the dispersal layer are:<br>▪ No-fines gravel layer<br>• Gas resistant membrane – Score 2.0:<br>▪ Visqueen Gas Barrier – suitable for Co2 and Radon protection<br>▪ verified in accordance with CIRIA C735.<br><br>Report GSL3116R02 - Plots 01, 02, 03 – 05/09/24 Gas Membrane Verification has already been carried out and submitted to the council for review. |

# 4 VERIFICATION OF TOPSOIL AND SUBSOIL

## 4.1 Introduction

The risk assessments have concluded that remediation measures are required to address risks to human health only, resulting from minor contamination in the existing made ground.

It should be noted that the an initial site strip has been carried out and the majority of the Made Ground had been removed from site.

The remedial actions required are:

- Made Ground can be left in-situ below building floor slabs and future permanent hard standing (e.g., parking areas, roads, footpaths), excluding service runs and areas where future excavation might be anticipated (assuming all geotechnical requirements are met).
- Remediation is only required for below areas of gardens/soft landscaping to enable provision of uncontaminated cover soils in areas of garden/soft landscaping (minimum of 600 mm);
- Provision of a clean cover system in areas of gardens and soft landscaping. A 600 mm thick cover of 'clean and inert' capping is proposed (comprising 450 mm subsoil and 150 mm topsoil).

Imported topsoil and subsoil will be required to be analysed for a suitable suite of contaminants in relation to human health (in addition to topsoil being compliant with BS3882:2015).

The proposed development will be carried out in phases, with this verification report relating to Plots 01-02 only.

## 4.2 Unexpected Contamination

No unexpected contamination has been encountered within the garden areas of Plots 01-02.

## 4.3 Source of Topsoil / Subsoil

The source of the topsoil and soil is understood to have been delivered to site in 2021 and stored in stockpiles on site. The source of the was from another residential development names Willow Cottage, Ruabon. The Phase 2 Geoenvironmental Report GSL2400 – issued October 2020 is provided in Appendix E.

The haulage transfer notes are provided in Appendix F.

## 4.4 Site works

Groundsolve were present at the site on the 22nd November 2024 to describe and take samples of the topsoil and subsoil for chemical analysis from the garden areas of Plots 01 and 02. Photos are provided in Appendix B (topsoil and subsoil in garden areas).

## 4.5 Description of Topsoil and Thickness

Two trial pits were excavated in the garden area of Plots 01-02.

**Table 4.1 – Depth of Topsoil, Subsoil**

| Date | Exploratory Hole | Depth of Topsoil (m) | Depth of Subsoil (m) |
|---|---|---|---|
| 22/11/2024 | Plot01 Rear | 0.30 | 0.60 |
| 22/11/2024 | Plot02 Rear | 0.35 | 0.60 |

Topsoil – Dark brown silty gravelly clayey fine to coarse SAND with frequent rootlets. Gravel is fine-coarse sub-rounded

Subsoil – Light brown clayey slightly gravelly SAND. Gravel is fine to coarse angular, sub-rounded

Verification photographs gardens area are presented in **Appendix B**.

All areas of rear gardens show a thickness of topsoil which is a minimum of 200 mm depth and a depth of subsoil which is a minimum of 600mm. All areas comply with the requirements detailed in remediation strategy.

Table **4.2** – Acceptance Criteria for imported material (Topsoil and Subsoil)

| Analyte | Soil Re-Use and Importation Criteria | | Analyte | Soil Re-Use and Importation Criteria | |
|---|---|---|---|---|---|
| | mg/kg | Reference | | mg/kg | Reference |
| **Metals** | | | **BTEX** | | |
| Arsenic (total) | 37 | S4UL | Benzene | 0.087 | S4UL |
| Cadmium (total) | 11 | S4UL | Toluene | 130 | S4UL |
| Chromium (total) | 520 | HWT | Ethyl Benzene | 47 | S4UL |
| Chromium (hexavalent) | 6 | S4UL | Xylene – 0 | 60 | S4UL |
| Copper (total) | 200 | BS3882 | Xylene – M or P | 56 | S4UL |
| Lead (total) | 200 | C4SL | | | |
| Mercury (total inorganic) | 40 | S4UL | **Petroleum Hydrocarbons$** | | |
| Nickel (total) | 130 | S4UL | Aliphatic > EC5 - EC6 | 42 | S4UL |
| Selenium | 250 | S4UL | Aliphatic >EC6 - EC8 | 100 | S4UL |
| Vanadium | 410 | S4UL | Aliphatic >EC8 - EC10 | 27 | S4UL |
| Zinc (total) | 2,009** | HWT | Aliphatic >EC10 - EC12 | 130 | S4UL |

| Analyte | Soil Re-Use and Importation Criteria | | Analyte | Soil Re-Use and Importation Criteria | |
|---|---|---|---|---|---|
| | mg/kg | Reference | | mg/kg | Reference |
| | | | Aliphatic >EC12 - EC16 | 1000** | HWT |
| **Inorganic** | | | Aliphatic >EC16 - EC21 | 1000** | HWT |
| Sulphate | 2400*** | - | Aliphatic >EC21 - EC35 | 1000** | HWT |
| Phenol | 120 | S4UL | | | |
| | | | Aromatic >EC5 - EC7 | 70 | S4UL |
| **PAH[&]** | | | Aromatic >EC7 - EC8 | 130 | S4UL |
| Naphthalene | 2.3 | S4UL | Aromatic >EC8 - EC10 | 34 | S4UL |
| Acenaphthylene | 170 | S4UL | Aromatic >EC10 - EC12 | 74 | S4UL |
| Acenaphthene | 210 | S4UL | Aromatic >EC12 - EC16 | 140 | S4UL |
| Fluorene | 170 | S4UL | Aromatic >EC16 - EC21 | 260 | S4UL |
| Phenanthrene | 95 | S4UL | Aromatic >EC21 - EC35 | 1000** | HWT |
| Anthracene | 2400 | S4UL | Aromatic>EC35-44 | 1000** | HWT |
| Fluoranthene | 280 | S4UL | Aromatic>EC44-EC77 | 1000** | HWT |
| Pyrene | 620 | S4UL | | | |
| Benz(a)anthracene | 7.2 | S4UL | Asbestos | Not detected (<0.001%) for topsoil and subsoil | Lab LoD |
| Chrysene | 15 | S4UL | | | |
| Benzo(b)fluoranthene | 2.6 | S4UL | | | |
| Benzo(k)fluoranthene | 77 | S4UL | | | |
| Benzo(a)pyrene | 2.2 | S4UL | | | |
| Indeno(123cd)pyrene | 27 | S4UL | | | |
| Benzo(ghi)perylene | 320 | S4UL | | | |
| Dibenzo(ah)anthracene | 0.28 | S4UL | | | |

## 4.6 Verification of Topsoil and Subsoil – Sampling and Testing

A total of 2 no. samples of topsoil / subsoil were analysed. From visual observation, the materials constituted topsoil comprising of "Dark brown silty gravelly fine to coarse SAND".

The soil samples were sent to ChemTech. The laboratory is UKAS accredited in accordance with ISO17025 and is also MCERTS accredited for soil analysis in accordance with the Environment Agency's scheme. The laboratory analysis results are presented in Appendix C.

The results of the samples collected were screened against Generic Assessment Criteria (GAC) for Human Health Risk Assessment (LQM/CIEH 2015) for a residential with gardens end-use, sandy soil with 1% SOM and pH 7.0 (presented in Table 4.1 and Appendix D).

**Topsoil / Subsoil**

2No. samples were selected from the topsoil and subsoil material. All the topsoil and subsoil results pass the relevant screening criteria for residential landuse with plant uptake, therefore are suitable for use within the garden areas. The results are summarised in Appendix D.

**Gas Protection Verification**

Report GSL3116R01 - Gas Membrane Verification visits have already been carried between 28/06/24 to 13/07/2024 has already been carried out for Plots 01-03 and has been submitted to the council for review.

After onsite inspections, it was considered that the implemented ground gas protection measures were acceptable for Plots 01 and 02 and conformed with the specification.

# 5 CONCLUSIONS

## 5.1 Clean Cover Depth

The remediation strategy details the requirement details the requirement for a 0.60 m clean cover comprising a minimum of 200 mm topsoil across garden areas.

Visual inspection visits were performed by Groundsolve. Photographs showing the verification of depth across selected plots were found to comprise a sufficient clean cover system in accordance with the agreed remedial strategy and Welsh Local Government Association Guidance.

## 5.2 Topsoil and subsoil Material

Laboratory chemical analysis results from both the recovered sub-soil and topsoil material show the samples do not exceed the agreed GACs (1% SOM).

Laboratory analysis results of recovered samples show topsoil and subsoil are generally in compliance with BS3883:2015 and BS8601:2013.

## 5.3 Gas Protection Measures

After onsite inspections, it was considered that the implemented ground gas protection measures were acceptable for Plots 01 and 02 and conformed with the specification.

## 5.4 Conclusions

The report indicates that the site inspections and chemical tests results from Plots 01-02 have met all the requirements of the remediation as outlined in the remediation strategy agreed with the Welsh Local Government Assoc Guidance.

No unexpected contamination has been encountered within Plots 01-02.

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BGS Geology of Britain Viewer http://mapapps.bgs.ac.uk/geologyofbritain/home.html

# 7 DEFINITIONS

| | |
|---|---|
| AOD | Above Ordnance Datum |
| bgl | Below ground level |
| BGS | British Geological Survey |
| BRE | Building Research Establishment |
| CBR | California Bearing Ratio (test) |
| COMAH | Control of Major Accident Hazards (regulations) |
| DQRA | Detailed Quantitative Risk Assessment |
| DWS | Drinking Water Standard |
| EQS | Environmental Quality Standard |
| GAC | Generic Assessment Criterion |
| GQA | General Quality Assessment (Environment Agency) |
| GQRA | Generic Quantitative Risk Assessment |
| GSV | Gas Screening Value |
| HCV | Health Criteria Value |
| IPPC | Integrated Pollution Prevention and Control (regulations) |
| NGR | National Grid Reference |
| NIHHS | Notification of Installations Handling Hazardous Substances (regulations) |
| OS | Ordnance Survey |
| Ppm | Parts per million |
| Ppmv | Parts per million by volume |
| SAC | Special Area of Conservation |
| SPZ | Source Protection Zone |
| SSAC | Site-Specific Assessment Criterion |
| SSSI | Site of Special Scientific Interest |

# APPENDIX A - DRAWINGS




EDGE ARCHITECTS

RIBA Chartered Practice

EDGE Architects NW Ltd.
Studio 55:20
North Wales Business Park, Abergele
Conwy, LL22 8LJ

**CLIENT:**
Gower Homes Ltd

**ADDRESS:**
Former Air Products site, Llangollen Road, Acrefair LL14 3HW

**PROJECT:**
Proposed residential development

**DRAWING No:** 21-DES-001-02 D

**DATE:** MARCH 2022
**SCALE:** 1:500 @ A3

# APPENDIX B – SITE PHOTOGRAPH – PLOTS 01-02




Plot 01 Garden Area



Plot 01 Rear Garden after installation of 600mm cover system




Plot 21 Garden Area



Plot 21 Rear Garden after installation of 600mm cover system

# APPENDIX C – CHEMICAL TEST RESULTS

# ANALYTICAL TEST REPORT

| | |
|---|---|
| **Report Number** | 24-04491, issue number 1 |
| **Contract name:** | Heritage Court |
| **Client reference:** | 3059 |
| **Clients name:** | GroundSolve Ltd |
| **Clients address:** | GroundSolve Ltd<br>Unit 1 Well House Barns<br>Chester Road<br>Bretton<br>Flintshire CH4 0DH |
| **Samples received:** | 25/11/2024 |
| **Analysis started:** | 26/11/2024 |
| **Analysis completed:** | 02/12/2024 |
| **Report issued:** | 02/12/2024 |

**Key**

| | |
|---|---|
| U | UKAS accredited test |
| M | MCERTS & UKAS accredited test |
| $ | Test carried out by an approved subcontractor |
| I/S | Insufficient sample to carry out test |
| U/S | Sample not suitable for testing |
| NAD | No Asbestos Detected |

[redacted]

**Approved by:**

Abbie Neasham-Bourn
Senior Reporting Administrator

# SAMPLE INFORMATION

**MCERTS (Soils):**

Soil descriptions are only intended to provide a log of sample matrices with respect to MCERTS validation. They are not intended as full geological descriptions. MCERTS accreditation applies for sand, clay and loam/topsoil, or combinations of these whether these are derived from naturally occurring soils or from made ground, as long as these materials constitute the major part of the sample. Other materials such as concrete, gravel and brick are not accredited if they comprise the major part of the sample.

| Lab ref | Sample ID | Depth (m) | Sample description | Material removed | % Removed | % Moisture |
|---|---|---|---|---|---|---|
| 24269 | Plot 01 | 0.20 | Brown Sandy Clay with Gravel and Vegetation. | - | - | 9.0 |
| 24270 | Plot 02 | 0.50 | Brown Sandy Loam with Gravel and Vegetation. | - | - | 10.0 |

# DEVIATING SAMPLE INFORMATION

**Comments**

Sample deviation is determined in accordance with the UKAS note "Guidance on Deviating Samples" and based on reference standards and laboratory trials.
For samples identified as deviating, test result(s) may be compromised and may not be representative of the sample at the time of sampling.
Chemtech Environmental Ltd cannot be held responsible for the integrity of sample(s) received if Chemtech Environmental Ltd did not undertake the sampling. Such samples may be deviating.

**Key**

| | |
|---|---|
| a | Sampling date not provided |
| b | Sampling time not provided (waters only) |
| c | Sample not received in appropriate containers |
| d | Storage Temperature |
| e | Headspace present in sample container |
| f | Sample exceeded sampling to reciept |
| g | Sample exceeded holding time(s) |

| Lab ref | Sample ID | Depth (m) | Deviating | Tests (Reason for deviation) |
|---|---|---|---|---|
| 24269 | Plot 01 | 0.20 | N | |
| 24270 | Plot 02 | 0.50 | N | |

# SOILS

| Lab Number | | | | | 24269 | 24270 |
|---|---|---|---|---|---|---|
| **Client Reference** | | | | | 1XT2XJ | 1XT2XJ |
| **Sample ID** | | | | | Plot 01 | Plot 02 |
| **Depth (m)** | | | | | 0.20 | 0.50 |
| **Sampling Date** | | | | | 22/11/2024 | 22/11/2024 |
| **Test** | **Method** | **Accred** | **LoD** | **Units** | | |
| **Asbestos** | | | | | | |
| Asbestos Identification | SUBCON | SU | 0 | - | NAD | NAD |
| **Soil sample preparation parameters** | | | | | | |
| Stones Content | CE001 | N | 0.1 | % | < 0.1 | < 0.1 |
| **Metals** | | | | | | |
| Water Soluble Sulphate | CE061 | M | 0.01 | g/l | 1.60 | 0.366 |
| Acid Soluble Sulphate (SO4) | CE062 | M | 0.01 | % | 0.56 | 0.14 |
| Arsenic | CE264 | U | 1.8 | mg/kg | 19.0 | 4.7 |
| Cadmium | CE264 | M | 1.6 | mg/kg | < 1.6 | < 1.6 |
| Chromium | CE264 | U | 2 | mg/kg | 69.4 | 19.8 |
| Copper | CE264 | M | 1.6 | mg/kg | 59.7 | 11.8 |
| Lead | CE264 | U | 2.3 | mg/kg | 134 | 43.0 |
| Mercury | CE264 | U | 0.7 | mg/kg | < 0.7 | < 0.7 |
| Nickel | CE264 | M | 2.1 | mg/kg | 23.3 | 8.2 |
| Selenium | CE264 | U | 3 | mg/kg | < 3.0 | < 3.0 |
| Zinc | CE264 | M | 4 | mg/kg | 144 | 53.9 |
| **Volatile Petroleum Hydrocarbons** | | | | | | |
| >C5-C6 Aliphatic (HS_1D_AL) | CE267 | N | 0.1 | mg/kg | < 0.10 | < 0.10 |
| >C6-C8 Aliphatic (HS_1D_AL) | CE267 | N | 0.1 | mg/kg | < 0.10 | < 0.10 |
| >C8-C10 Aliphatic (HS_1D_AL) | CE267 | N | 0.1 | mg/kg | < 0.10 | < 0.10 |
| >C8-C10 Aromatic (HS_1D_AR) | CE267 | N | 0.01 | mg/kg | < 0.010 | < 0.010 |
| >C6-C7 Aromatic (HS_1D_AR) | CE267 | N | 0.01 | mg/kg | < 0.010 | < 0.010 |
| >C7-C8 Aromatic (HS_1D_AR) | CE267 | N | 0.01 | mg/kg | < 0.010 | < 0.010 |
| **Colourimetric** | | | | | | |
| Total Monohydric Phenols | CE078 | N | 0.5 | mg/kg | < 0.50 | < 0.50 |
| Total Cyanide | CE077 | N | 1 | mg/kg | < 1.0 | < 1.0 |
| **Combustion** | | | | | | |
| Moisture Content | CE001 | N | 0.1 | % | 9.0 | 10.0 |
| Total Organic Carbon | CE197 | N | 0.1 | % | 1.63 | 2.20 |
| Soil Organic Matter | CE072 | N | 0.1 | % | 2.81 | 3.79 |
| **TPH Ali/Aro** | | | | | | |

# SOILS

| | | | | | | |
|---|---|---|---|---|---|---|
| >C12-C16 Aliphatic (EH_2D_AL) | CE250 | N | 0.5 | mg/kg | 0.5 | < 0.5 |
| >C12-C16 Aromatic (EH_2D_AR) | CE250 | N | 1 | mg/kg | 3.1 | 2.5 |
| >C16-C21 Aliphatic (EH_2D_AL) | CE250 | N | 0.7 | mg/kg | < 0.7 | < 0.7 |
| >C16-C21 Aromatic (EH_2D_AR) | CE250 | N | 2 | mg/kg | 4.5 | 3.6 |
| >C21-C35 Aliphatic (EH_2D_AL) | CE250 | N | 4 | mg/kg | 7.4 | < 4.0 |
| >C21-C35 Aromatic (EH_2D_AR) | CE250 | N | 4.5 | mg/kg | 17.5 | 17.6 |
| >C35-C40 Aliphatic (EH_2D_AL) | CE250 | N | 0.5 | mg/kg | 1.6 | 0.6 |
| >C35-C40 Aromatic (EH_2D_AR) | CE250 | N | 1.5 | mg/kg | 3.3 | 3.2 |
| >C10-C12 Aliphatic (EH_2D_AL) | CE250 | N | 1 | mg/kg | < 1.0 | < 1.0 |
| >C10-C12 Aromatic (EH_2D_AR) | CE250 | N | 0.6 | mg/kg | 1.4 | 0.9 |
| **Polyaromatic hydrocarbons** | | | | | | |
| Naphthalene | CE087 | M | 0.016 | mg/kg | 0.041 | < 0.016 |
| Acenaphthylene | CE087 | M | 0.015 | mg/kg | < 0.015 | < 0.015 |
| Acenaphthene | CE087 | M | 0.013 | mg/kg | 0.078 | < 0.013 |
| Fluorene | CE087 | U | 0.013 | mg/kg | 0.033 | < 0.013 |
| Phenanthrene | CE087 | M | 0.014 | mg/kg | 0.484 | 0.077 |
| Anthracene | CE087 | U | 0.017 | mg/kg | 0.172 | 0.029 |
| Fluoranthene | CE087 | M | 0.017 | mg/kg | 2.02 | 0.388 |
| Pyrene | CE087 | M | 0.016 | mg/kg | 1.84 | 0.350 |
| Benzo(a)anthracene | CE087 | U | 0.012 | mg/kg | 0.960 | 0.223 |
| Chrysene | CE087 | M | 0.028 | mg/kg | 0.802 | 0.245 |
| Benzo(b)fluoranthene | CE087 | M | 0.02 | mg/kg | 1.66 | 0.318 |
| Benzo(k)fluoranthene | CE087 | M | 0.025 | mg/kg | 0.592 | 0.121 |
| Benzo(a)pyrene | CE087 | U | 0.019 | mg/kg | 1.59 | 0.246 |
| Indeno(1,2,3-cd)pyrene | CE087 | M | 0.019 | mg/kg | 1.54 | 0.237 |
| Dibenzo(a,h)anthracene | CE087 | M | 0.017 | mg/kg | 0.254 | 0.042 |
| Benzo(g,h,i)perylene | CE087 | M | 0.019 | mg/kg | 1.39 | 0.209 |
| Coronene | CE087 | N | 0.02 | mg/kg | 0.207 | 0.035 |
| Total PAH(17) | CE087 | N | 0.3 | mg/kg | 13.7 | 2.52 |
| **BTEX** | | | | | | |
| Benzene | CE267 | U | 0.0005 | mg/kg | < 0.0005 | < 0.0005 |
| Toluene | CE267 | U | 0.001 | mg/kg | < 0.001 | < 0.001 |
| Ethylbenzene | CE267 | U | 0.001 | mg/kg | < 0.001 | < 0.001 |
| MTBE | CE267 | N | 0.002 | mg/kg | < 0.002 | < 0.002 |
| Total BTEX | CE267 | N | 0.006 | mg/kg | < 0.006 | < 0.006 |
| m,p-Xylene | CE267 | U | 0.002 | mg/kg | < 0.002 | < 0.002 |
| oXylenes | CE267 | U | 0.002 | mg/kg | < 0.002 | < 0.002 |

# SOILS

| | | | | | | |
|---|---|---|---|---|---|---|
| **Wet Chem** | | | | | | |
| pH | CE004 | M | 0.1 | pH units | 8.8 | 8.0 |
| **EPH** | | | | | | |
| Diesel Range Organics (>C10-C25) (EH_1D_ | CE033 | M | 12 | mg/kg | 21 | 75 |
| >C10-C40 Soil (EH_1D_Total) | CE033 | M | 19 | mg/kg | 74.0 | 236 |
| Mineral Oil (>C10-C40 Total) (EH_CU_1D_T | CE162 | N | 19 | mg/kg | 60 | 153 |

# METHOD DETAILS

| METHOD | TESTNAME | METHOD SUMMARY | ANALYSIS BASIS |
|---|---|---|---|
| CE267 | VPH in Soil | HS-GCFID | As submitted sample |
| SUBCON | Asbestos Solid | HSG248 | Air Dried Sample |
| CE061 | W. Sol Metals | ICPOES | Air dried sample |
| CE062 | Acid Soluble Sulphate in Solids | Primacs | Air dried sample |
| CE264 | Metals by ICP in Soil | ICPOES | Air dried sample |
| CE267 | BTEX in solids | Analysis by HSGCFID | As submitted sample |
| CE033 | EPH in Solids | Acetone:Hexane Extraction and GCFID | As submitted sample |
| CE250 | GCXGC in Solids | DCM Extraction and GCxGC-FID | As submitted sample |
| CE087 | PAH in Soil | DCM Extraction and GCMS | As submitted sample |
| CE078 | Phenols in Solids | Continuous Flow Analyser | As submitted sample |
| CE077 | Cyanides in Solids | Continuous Flow Analyser | As submitted sample |
| CE197 | Primacs in Solids | Primacs | Air dried sample |
| CE162 | Mineral Oil in Solids | Acetone:Hexane extract, Floriil clean up and GCFID | As submitted sample |

# REPORT INFORMATION

**Report No.:24-04491, issue number 1**

**Key**

| | |
|---|---|
| U | ISO17025 Accredited Result |
| M | ISO17025 and MCERTS Accredited Result |
| N | Do not currently hold accreditation |
| ^ | MCERTS accreditation not applicable for sample matrix |
| * | ISO17025 accreditation not applicable for sample matrix |
| S | Subcontracted |
| I/S | Insufficient Sample |
| U/S | Unsuitable sample |
| N/T | Not tested |
| < | Means "less than" |
| > | Means "greater than" |

LOD refers to limit of detection, except in the case of pH soils and pH waters where it means limit of discrimination.

This report shall not be reproduced except in full, without prior written approval.

Opinions and interpretations expressed herein are outside the UKAS accreditation scope.

All testing carried out at Unit 6 Parkhead, Stanley, DH9 7YB, except for subcontracted testing.

The results relate only to the sample received.

Unless otherwise stated, sample information has been provided by the client. This may affect the validity of the results.

Moisture Content Calculated on a Wet Weight basis

Unless otherwise stated, Chemtech Environmental Ltd was not responsible for sampling.

Sampling was undertaken by Chemtech Environmental Limited and is outside the UKAS accreditation scope.

Methods, procedures and performance data are available on request.

Results reported herein relate only to the material supplied to the laboratory.

BTEX compounds are identified by retention time only and may include interference from co-eluting compounds.

For soils and solids, all results are reported on a dry basis. Samples dried at no more than 30°C in a drying

For soils and solids, analytical results are inclusive of stones, where applicable.

**Sample Retention and Disposal**

All soil samples will be retained for a period of 4 weeks from the point of receipt

All water samples will be retained for a period of 2 weeks from the point of Reporting

Charges may apply to extended sample storage

**TPH Classification - HWOL Acronym System**

| | |
|---|---|
| HS | Headspace analysis |
| EH | Extractable Hydrocarbons - i.e. everything extracted by the solvent |
| CU | Clean-up - e.g. by florisil, silica gel |
| 1D | GC - Single coil gas chromatography |
| Total | Aliphatics & Aromatics |
| AL | Aliphatics only |
| AR | Aromatics only |
| 2D | GC-GC - Double coil gas chromatography |
| #1 | EH_Total but with humics mathematically subtracted |
| #2 | EH_Total but with fatty acids mathematically subtracted |
| _ | Operator - underscore to separate acronyms (exception for +) |
| + | Operator to indicate cumulative e.g. EH+HS_Total or EH_CU+HS_Total |
| MS | Mass Spectrometry |

# APPENDIX D –SUMMARY OF CHEMICAL TEST

**Job No: 3059**
**Site Name: Plot 20-21 - Heritage Court, Llangollen Rd, Acrefair**
**Residential with gardens (2.5% SOM)**

GroundSolve Ltd
Consulting Geotechnical Engineers

| Metals & Non-Metals | Plot 01 | Plot 02 | Min | Max | Average | Count | Adopted Guideline | Source | Exceedances |
|---|---|---|---|---|---|---|---|---|---|
| | 0.20 | 0.50 | (mg/kg) | (mg/kg) | (mg/kg) | | (mg/kg) | | |
| Arsenic | 19 | 4.7 | 4.7 | 19 | 11.85 | 2 | 37 | C4SL | 0 |
| Cadmium | < 1.6 | < 1.6 | < 1.6 | <1.6 | 1.6 | 2 | 22 | C4SL | 0 |
| Chromium | 69.4 | 19.8 | 19.8 | 69.4 | 44.6 | 2 | 910 | S4UL | 0 |
| Copper | 59.7 | 11.8 | 11.8 | 59.7 | 35.75 | 2 | 2400 | S4UL | 0 |
| Lead | 134 | 43 | 43 | 134 | 88.5 | 2 | 200 | C4SL | 0 |
| Mercury | < 0.7 | < 0.7 | < 0.7 | <0.7 | 0.7 | 2 | 1.2 | S4UL | 0 |
| Nickel | 23.3 | 8.2 | 8.2 | 23.3 | 15.75 | 2 | 130 | S4UL | 0 |
| Phenol - Monohydric | < 0.50 | < 0.50 | < 0.50 | <0.5 | 0.5 | 2 | 200 | S4UL | 0 |
| Selenium | < 3.0 | < 3.0 | < 3.0 | <3 | 3 | 2 | 250 | S4UL | 0 |
| Zinc | 144 | 53.9 | 53.9 | 144 | 98.95 | 2 | 3700 | S4UL | 0 |

| Petroleum Hydrocarbons | Plot 01 | Plot 02 | Min | Max | Average | Count | Adopted Guideline | Source | Exceedances |
|---|---|---|---|---|---|---|---|---|---|
| | 0.20 | 0.50 | (mg/kg) | (mg/kg) | (mg/kg) | | (mg/kg) | | |
| Benzene | < 0.0005 | < 0.0005 | < 0.0005 | <0.0005 | 0.0005 | 2 | 0.87 | C4SL | 0 |
| Toluene | < 0.001 | < 0.001 | < 0.001 | <0.001 | 0.001 | 2 | 290 | S4UL | 0 |
| Ethylbenzene | < 0.001 | < 0.001 | < 0.001 | <0.001 | 0.001 | 2 | 110 | S4UL | 0 |
| Xylenes | < 0.002 | < 0.002 | < 0.002 | <0.002 | 0.002 | 2 | 130 | S4UL | 0 |
| Aliphatic C5-C6 | < 0.10 | < 0.10 | < 0.10 | <0.1 | 0.1 | 2 | 78 | S4UL | 0 |
| Aliphatic C6-C8 | < 0.10 | < 0.10 | < 0.10 | <0.1 | 0.1 | 2 | 230 | S4UL | 0 |
| Aliphatic C8-C10 | < 0.10 | < 0.10 | < 0.10 | <0.1 | 0.1 | 2 | 65 | S4UL | 0 |
| Aliphatic >EC10-EC12 | < 1.0 | < 1.0 | < 1.0 | <1 | 1 | 2 | 330 | S4UL | 0 |
| Aliphatic >EC12-EC16 | 0.5 | < 0.5 | < 0.5 | <0.5 | 0.5 | 2 | 2400 | S4UL | 0 |
| Aliphatic >EC16-EC35 | 7.4 | < 4.0 | < 4.0 | 7.4 | 5.7 | 2 | 92000 | S4UL | 0 |
| Aliphatic >EC35-EC40 | 1.6 | 0.6 | 0.6 | 1.6 | 1.1 | 2 | 92000 | S4UL | 0 |
| Aromatic C5-C7 | < 0.10 | < 0.10 | < 0.10 | <0.1 | 0.1 | 2 | 140 | S4UL | 0 |
| Aromatic C7-C8 | < 0.10 | < 0.10 | < 0.10 | <0.1 | 0.1 | 2 | 290 | S4UL | 0 |
| Aromatic C8-C10 | < 0.10 | < 0.10 | < 0.10 | <0.1 | 0.1 | 2 | 83 | S4UL | 0 |
| Aromatic >EC10-EC12 | 1.4 | 0.9 | 0.9 | 1.4 | 1.15 | 2 | 180 | S4UL | 0 |
| Aromatic >EC12-EC16 | 3.1 | 2.5 | 2.5 | 3.1 | 2.8 | 2 | 330 | S4UL | 0 |
| Aromatic >EC16-EC21 | 4.5 | 3.6 | 3.6 | 4.5 | 4.05 | 2 | 540 | S4UL | 0 |
| Aromatic >EC21-EC35 | 17.5 | 17.6 | 17.5 | 17.6 | 17.55 | 2 | 1500 | S4UL | 0 |
| Aromatic >EC35-EC40 | 3.3 | 3.2 | 3.2 | 3.3 | 3.25 | 2 | 1500 | S4UL | 0 |

| Polyaromatic Hydrocarbons (PAH) | Plot 01 | Plot 02 | Min | Max | Average | Count | Adopted Guideline | Source | Exceedances |
|---|---|---|---|---|---|---|---|---|---|
| | 0.20 | 0.50 | (mg/kg) | (mg/kg) | (mg/kg) | | (mg/kg) | | |
| Acenaphthene | 0.078 | < 0.013 | < 0.013 | 0.078 | 0.05 | 2 | 510 | S4UL | 0 |
| Acenaphthylene | < 0.015 | < 0.015 | < 0.015 | <0.015 | 0.02 | 2 | 420 | S4UL | 0 |
| Anthracene | 0.172 | 0.029 | 0.029 | 0.172 | 0.1 | 2 | 5400 | S4UL | 0 |
| Benzo(a)anthracene | 0.96 | 0.223 | 0.223 | 0.96 | 0.59 | 2 | 11 | S4UL | 0 |
| Benzo(a)pyrene | 1.59 | 0.246 | 0.246 | 1.59 | 0.92 | 2 | 5 | C4SL | 0 |
| Benzo(b)fluoranthene | 1.66 | 0.318 | 0.318 | 1.66 | 0.99 | 2 | 3.3 | S4UL | 0 |
| Benzo(g,h,i)perylene | 1.39 | 0.209 | 0.209 | 1.39 | 0.8 | 2 | 340 | S4UL | 0 |
| Benzo(k)fluoranthene | 0.592 | 0.121 | 0.121 | 0.592 | 0.36 | 2 | 93 | S4UL | 0 |
| Chrysene | 0.802 | 0.245 | 0.245 | 0.802 | 0.52 | 2 | 22 | S4UL | 0 |
| Dibenzo(a,h)anthracene | 0.254 | 0.042 | 0.042 | 0.254 | 0.15 | 2 | 0.28 | S4UL | 0 |
| Fluoranthene | 2.02 | 0.388 | 0.388 | 2.02 | 1.2 | 2 | 560 | S4UL | 0 |
| Fluorene | 0.033 | < 0.013 | < 0.013 | 0.033 | 0.02 | 2 | 400 | S4UL | 0 |
| Indeno(1,2,3-c,d)pyrene | 1.54 | 0.237 | 0.237 | 1.54 | 0.89 | 2 | 36 | S4UL | 0 |
| Naphthalene | 0.041 | < 0.016 | < 0.016 | 0.041 | 0.03 | 2 | 5.6 | S4UL | 0 |
| Phenanthrene | 0.484 | 0.077 | 0.077 | 0.484 | 0.28 | 2 | 220 | S4UL | 0 |
| Pyrene | 1.84 | 0.35 | 0.35 | 1.84 | 1.1 | 2 | 1200 | S4UL | 0 |

| Other Contaminants / Testing | Plot 01 | Plot 02 | Min | Max | Average | Count | Adopted Guideline | Source | Exceedances |
|---|---|---|---|---|---|---|---|---|---|
| | 0.20 | 0.50 | (mg/kg) | (mg/kg) | (mg/kg) | | (mg/kg) | | |
| Total Organic Carbon | 2.81 | 3.79 | 2.81 | 3.79 | 3.3 | 2 | - | - | - |
| pH | 8.8 | 8 | 8 | 8.8 | 8.4 | 2 | - | - | - |
| Total Cyanide | < 1.0 | < 1.0 | < 1.0 | <1 | 1 | 2 | - | - | - |
| Sulphate Aqueous Extract as SO4 | 1.6 | 0.366 | 0.366 | 1.6 | 0.98 | 2 | - | - | - |

# APPENDIX E –TOPSOIL REPORT

# Proposed Residential Development

# Willow Cottage, Ruabon

# Geo-Environmental Report

# Gower Homes



GroundSolve Ltd
Consulting Geotechnical, Engineering Geology and Environmental Engineers

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A. Site Photographs
B. CON29 Mining Report
C. Envirocheck Report
D. BGS Borehole Logs
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F. Soakaway Test Results & Calculations
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## 1.0 INTRODUCTION

Gower Homes (GH) are proposing to redevelop a site at Willow Cottage, by demolishing the current building on site and constructing eight new three to four-bedroom homes.

Outline planning permission was granted in July 2019 for ten dwellings. Whilst no land contamination conditions have been imposed, the standard condition on complying with SUDS drainage is incorporated.

GH have appointed GroundSolve Ltd (GSL) to undertake a Phase I desk study and Phase II site investigation, and to produce an interpretive geo-environmental report for the development.

This report presents the findings of the desk study and the site investigation, and gives firm geotechnical recommendations for the development. In addition, conceptual ground models and environmental risk assessments are presented.

## 2.0 THE SITE

### 2.1 Site Location and Description

The site is located off Park Street (B5097), Ruabon, at National Grid Reference SJ 305 437, see Figure 1.

It is bounded by Park Street to the south, with a driveway accessing the existing property from this road. To the west lies St Mary's Church in Wales School, with the playing fields for the school defining the northern site boundary. It is bounded to the east by woodland on a slope leading down to the A483 Trunk Road, see Figure 2.

The site is roughly triangular in shape being up to 110m long and 55m wide. A topographical survey of the site has been provided; which confirmed the site to be fairly flat, with elevations in the northern section of the site around 115mAOD, with the site sloping gently to the south and east to between 113.5 and 114mAOD.

A low brick retaining wall is situated just outside the western site boundary, with the land to the west at a lower elevation. An overhead power line runs along the western site boundary. The land immediately east of the site slopes down towards the A483 Trunk Road, with Park Street passing over the A483 on a bridge.

The site is currently occupied by a small single storey Cottage located in the central part of the site, with several small outbuildings and asphalt hardstanding located to the north. A steel fence separates the Cottage from the open fields to the northern and eastern sides of the site.

Photographs of the site are presented in Appendix A.

### 2.2 Geology and Hydrogeology

The geology of the site has been studied on the British Geological Survey (BGS) 1:50,000 scale geology plan, Sheet 121, Wrexham, and the associated memoirs, Reference 1.

This confirms the site to be underlain by glaciofluvial deposits, comprising sands and gravels, deposited by glacial meltwaters following the last glaciation. However, glacial till is shown outcropping immediately west of the site.

The underlying bedrock is the Eturia Formation (formerly Ruabon Marl), described as red, purple, brown, mottled mudstone, with lenticular sandstones and conglomerates, referred to as 'espleys' with common pedogenic horizons, and rare coal seams.

Therefore, the underlying Coal Measures should be at substantial depth beneath the site.

A fault lies to the immediate east of the site trending north to south.

Both the superficial deposits and underlying bedrock are classified as Secondary aquifer – A. They are both classified as being of medium vulnerability, with the bedrock being described as productive.

The water table would be anticipated to be at considerable depth beneath the site due to the granular nature of the sub soils and the significant road cutting on the eastern site boundary, with water flow in this direction towards the cutting.

## 2.3 Abandoned Mining

A CON29M coal mining report was obtained for the purpose of this investigation. A summary of the information is presented below, with the report presented in full in Appendix B.

The report concluded:

- The property is in a surface area that could be affected by underground mining in 3 seams of coal at 540m to 570m depth, and last worked in 1927.
- The property is not within a surface area that could be affected by present underground mining.
- The property is not in an area where the Coat Authority are considering granting a license to work coal using underground methods.
- No notices have been given under section 46 of the Coal Mining Subsidence Act 1991.

## 2.4 History

In order to determine the history of the site, extracts from historical Ordnance Survey (OS) plans dating from 1874 have been examined. Unless otherwise stated, all plans are at a scale of 1: 2,500.

The 1874 OS plan shows the site to be within open fields, with a tree lined field boundary running north to south through the site. An existing road defines the southern site boundary and a footpath/track borders the northern site boundary, see Figure 3a. A ‘National School’ is located immediately west of the site, with the village of Ruabon further to the west. A small building is situated to the southeast of the site, adjacent to a small field or paddock. Immediately east of the site are open fields.

The 1912 OS plan shows no significant changes to the site or its surroundings, see Figure 3b.

The 1938 OS plan at 1:10,560 and 1954 OS plans at 1:10,000 fail to record any significant changes to the site, or its surroundings other than the beginning of a residential development some 150m east of the site.

The 1961 OS plan shows several new small buildings had been constructed on the south eastern site, see Figure 3c. The school building located immediately west of the site boundary had been named 'Ruabon Church in Wales', with a Recreation Ground and Playground shown to the north of the site boundary. Residential development around Vicarage Fields had commenced to the east of the site.

The 1989 OS plan confirms that Willow Cottage had been constructed along with the A483 on the eastern edge of the site, with a cut slope shown leading down to the road, and a bridge constructed to take Park Street over the new road, see Figure 3d. The small buildings formerly situated on the eastern site boundary had been demolished to make way for the road. To the west of the site the school buildings had been extensively extended, with the buildings in the south being used as a Community Centre.

The 1992 OS plan confirms that additional outbuildings had been constructed north of Willow Cottage, see Figure 3e.

The 1994 OS plan fails to record any significant changes to the site or its surroundings, see Figure 3f.

The aerial photograph dated 2001 shows Willow Cottage on site with outbuildings located towards the northern boundary, see Figure 3g. It also shows the school and community Centre located just off the western boundary and the main road constructed just off the eastern boundary.

## 3.0 ENVIRONMENTAL SEARCHES

An Envirocheck report has been obtained for the site, the main points are summarised below, with the report presented in full in Appendix C.

### Agency and Hydrological

- The closest discharge consent is 112m south west of the site, and is part of the sewerage network.
- The closest pollution incident to controlled waters was 159m west of the site and was a Category 3- minor incident.
- The closest ware feature is 101m south west of the site.
- The closest river quality chemistry sampling point is 184m west of the site on the Afon Eitha, with the most recent river quality given as grade A- Very good.
- There are no water abstractions within 1km of the site.

### Waste

- The closest historical landfill site is 470m north west of the site. The last input was 31st August 1984, and the specified waste included industrial, commercial and household.
- There is no potentially infilled land within 500m of the site.
- The closest potentially infilled water is 115m south west of the site.
- There are no registered landfill sites within 500m of the site.

### Geological

The BGS have provided estimated soil chemistry for the site as follows:

- Arsenic <15 mg/kg,
- Cadmium <1.8 mg/kg,
- Chromium 60 – 90 mg/kg,
- Lead <100 mg/kg,
- Nickel 15 – 30 mg/kg.

In addition, the following geological information has been provided:

- The site is in an area that may be affected by Coal mining and it recommended that a Coal Authority report be obtained.
- The potential for collapsible ground is very low.
- There is no hazard for compressible ground stability hazards.
- There is no hazard for ground dissolution stability hazards.
- There is a very low hazard for potential landslides.
- There is a very low hazard for running sands.

- There is no hazard for shrinking or swelling clay.

The site is within an intermediate probability radon area where 3 to 5% of homes are estimated to be at or above the action level. Therefore, basic radon measures are necessary in the construction of new dwellings or extensions.

**Industrial Land Use**

- The closest contemporary trade directory is located 159m north of the site, although it is inactive.
- There are no active fuel stations within 500m.
- An obsolete fuel station is recorded 220m north of the site

**Sensitive Land Use**

- There is no sensitive land use within 500m of the site.

## 4.0 PROPOSED DEVELOPMENT

GH are proposing to redevelop the Willow Cottage, by demolishing the current building on site and constructing eight new three to four-bedroom homes. The proposed site layout is presented on Figure 4.

No foundation loads have been provided at this stage, however line loads between 50 to 75 kN/m run would be anticipated for the proposed development type, with floor slab loadings not exceeding 5 kN/m$^2$. In addition, development levels have yet to be set.

The recommendations given in this report are based on the above assumptions, therefore, they should be reviewed and if necessary revised during the detailed design.

# 5.0 SITE INVESTIGATIONS

## 5.1 Previous Investigations

BGS borehole records confirmed the presence of a previous borehole drilled on site immediately east of Willow Cottage in 1968 for Wrexham Sewerage. It encountered 7ft (2.13m) of made ground, overlying medium dense, grey-brown, silty sand, with fine to coarse gravel, and a few cobbles to a depth of 22ft (6.70m). At this depth, red brown, silty, sandy clay, with medium to fine gravel was encountered, which is considered to represent glacial till. Groundwater was encountered at a depth of 9ft (2.75m).

In addition, a borehole drilled to the south of Park Street for the Ruabon By pass drilled in 1977 was found. This encountered 2.30m of made ground, overlying medium dense to dense, brown and grey, clayey, becoming silty, fine to coarse sand and gravel, with occasional cobbles and boulders. These were proved to a depth of 6m, with no groundwater being encountered. SPT "N" values ranged from 12 at 3m, to greater than 44 to final depth.

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

## 5.2 This Investigation

A brief initial investigation was carried out on 26th June 2020, prior to purchase of the site, which was intended to determine if a drainage scheme using soakaways would be feasible.

It comprised:

- One machine excavated trial pit to a depth of 1.90m (TP A),
- One soakaway test carried out within the trial pit.

The trial pit was excavated to a depth of 1.90m, however, the soakaway test was undertaken in a second pit excavated nearby to a depth of 1.0m.

This was followed by the main investigation, undertaken on Thursday 27th August 2020, which comprised:

- Five machine excavated trial pits, to a maximum depth of 2.40m (TP1 to 4),
- Three soakaway tests carried out within three of the trial pits.

The trial pits were supervised and logged by an engineer from GSL in general accordance with BS 5930, Reference 2.

The soakaway testing was carried out by filling the pits quickly from a water bowser and monitoring the fall in water level in general accordance with BRE 365, Reference 3.

The locations of the trial pits are presented on Figure 2, with their logs are presented in Appendix E, and the soakaway test results and calculations presented in Appendix F.

## 5.3 Laboratory Work

Samples for physical testing were taken from the glaciofluvial deposits, and sent to Geotechnics' laboratory in Chester for the following testing:

- Particle size distribution (PSD) – 3 no.
- Moisture content – 3 no.
- pH and water-soluble sulphate – 3n no.

The testing was carried out in accordance with BS 1377, Reference 4. The results of the testing are presented in Appendix G, and discussed in Section 6.0.

Samples for chemical testing were taken from the topsoil and glaciofluvial deposits encountered within the trial pits, placed in the appropriate containers and a cool box, and taken immediately to the laboratories of Derwentside Environmental Testing Services (DETS) for the following testing:

Metals & Non-metals - Arsenic (As), Boron (B), Cadmium (Cd), Chromium (hexavalent), Chromium (Trivalent), Copper (Cu), Lead (Pb), Mercury (Hg), Nickel (Ni), Phenol, Selenium (Se), and Zinc (Zn).

Petroleum Hydrocarbons - Benzene, Toluene, Ethylbenzene, o-xylene, m-xylene, p-xylene, Aliphatics >C5 – C44, Aromatics >EC5 – EC44.

Polyaromatic Hydrocarbons (PAH) – Acenaphthene, Acenaphthylene, Anthracene, Benz (a) anthracene, Benzo (a) pyrene, Benzo (b) fluoranthene, Benzo (g, h, i) perylene, Benzo (k) fluoranthene, Chrysene, Dibenzo (a, h) anthracene, Fluorene, Fluoranthene, Indeno (1,2,3-cd) pyrene, Naphthalene, Phenanthrene, Pyrene.

Other Contaminants – Sulphide (easily liberated), Water soluble Sulphate (2:1 extract), Cyanide, pH, Soil Organic Matter (SOM).

In addition, asbestos screening was carried out on all samples.

The results are summarised in Section 7.0, with the results presented in full in Appendix H.

# 6.0 GROUND CONDITIONS

## 6.1 General Stratigraphy

The ground conditions encountered in the trial pits and borehole typically comprised a thin layer of topsoil overlying glacial deposits (sand and gravel), with made ground encountered in TP4 and TP5 and in the BGS borehole.

The general stratigraphy encountered in the boreholes is summarised in Table 6.1 below:

**Table 6.1: General Stratigraphy**

| TP Ref. | Stratigraphy | | |
|---|---|---|---|
| | **Topsoil (m)** | **Made Ground (m)** | **Glacial Deposits (m)** |
| *BH* | | *0.00 - 2.13* | *2.13 – 6.70* |
| *TP A* | *0.00 – 0.40* | *N/E* | *0.40 – 1.90* |
| TP1 | 0.00-0.40 | N/E | 0.40-1.80 |
| TP2 | 0.00-0.40 | N/E | 0.40-1.80 |
| TP3 | 0.00-0.30 | N/E | 0.30-2.00 |
| TP4 | N/E | 0.00- (0.50-0.80) | (0.50-0.80)-2.00 |
| TP5 | N/E | 0.00-0.40<br>0.40-1.50 | 1.50-2.40 |

N/E = Not Encountered

*Italics = previous investigations*

## 6.2 Topsoil

Topsoil was encountered in the majority of the trial pits excavated, where it was described as grass over loose, black and dark brown, slightly ashy, sandy silt, with frequent roots and rootlets.

## 6.3 Made Ground

Made ground was only encountered in TP4 and TP5, to a maximum depth of 1.5m, and comprised medium dense, greyish brown, silty, very gravelly sand, with low cobble content and occasional stone flags and wire rope pieces. The gravel was angular, of sandstone, brick and rarely tarmac fragments, with the cobbles angular, of sandstone and brick.

TP 4 and TP 5 were excavated on the western site boundary, consequently the made ground is likely to be associated with backfilling behind the nearby retaining wall, and probably comprises arisings from nearby excavations.

A pH value of 6.43 was recorded in the made ground, with a water-soluble sulphate value of 0.02g/l.

## 6.4 Glacial Deposits

Glacial deposits where encountered in all trial pits and generally comprised loose to medium dense, brown, slightly silty, sand and gravel, with high cobble content. Gravel is subrounded to rounded fine to coarse of sandstone, siltstone and mudstone. Cobbles are subangular to subrounded of sandstone, mudstone and siltstone.

PSD testing carried out on three samples is presented below in Table 6.2, which confirms the deposits to be a sandy gravel.

**Table 6.2: PSD Results**

| TP No | Depth (m) | Silt/Clay % | Sand % | Gravel % | Cobble % |
|---|---|---|---|---|---|
| 1 | 1.50 | 6 | 27 | 52 | 15 |
| 2 | 1.70 | 6 | 31 | 48 | 15 |
| 5 | 1.80 | 13 | 30 | 57 | 0 |

pH values of 5.19 and 6.76 were recorded, with water soluble sulphate values (2:1 extract) of 0.02 and 0.03 g/l.

## 6.5 Groundwater

Groundwater was not encountered in any of the trial pits.

However, it was encountered at a depth of 2.74m in the previous borehole drilled in 1968, which was drilled before the road cutting was constructed. Consequently, the water table would have been lowered by natural drainage following construction of the cutting.

## 6.6 Soakaway Testing

Soakaway testing was carried out in TP1, TP2 and TP5 in general accordance with Reference 3. Three cycles were carried out in TP1 and TP2, with one cycle carried out in TP5. In addition, an initial test was carried out in TP A. The results of all tests are summarised in Table 6.3 below, and presented in full in Appendix E.

**Table 6.2: Soakaway Testing**

| Location | Cycle 1 (m/s) | Cycle 2 (m/s) | Cycle 3 (m/s) | Notes |
|---|---|---|---|---|
| **TPA** | 8.20E-05 | - | - | Indicative test only |
| **TP1** | 1.41E-04 | 8.93E-05 | 4.10E-05 | |
| **TP2** | 6.80E-05 | 2.69E-05 | 7.40E-05 | Cycle 3 result based on extrapolation due to time constraints |
| **TP5** | 1.53E-04 | - | - | Pit collapsing due to overlying made ground, indicative only |

## 7.0 RESULTS OF CHEMICAL TESTING

The soil samples were taken from the topsoil and made ground, with the sample depths presented in Table 7.1 below.

**Table 7.1: Sample Details**

| TP No | Depth (m) | Strata |
|---|---|---|
| TP1 | 0.1 | Topsoil |
| TP2 | 0.2 | Topsoil |
| TP4 | 0.4 | Topsoil |
| TP5 | 0.6 | Made Ground |

The results of the soil analyses are presented below, where they have been compared to suitable generic assessment criteria (GACs), in order to allow a generic quantitative risk assessment (GQRA) to be carried out for the site and the proposed development.

The Category 4 Screening Levels (C4SL's) published by DEFRA (2014) have been adopted in the first instance, which have been published for six substances to date. Where a C4SL is unavailable, the "Suitable 4 Use Levels" (S4ULs) published by LQM/CIEH (2015) have been adopted.

These criteria have been derived using the CLEA model for a range of standard end-use scenarios and a range of soil organic matter (SOM) contents. It should be noted that the C4SL values are derived on the basis of a "low level of toxicological concern", while the S4UL values are based on a "tolerable" or "minimal" level of risk. As such, the S4ULs describe a lower level of risk than the C4SLs, and are equivalent to the former Soil Guideline Values (SGVs, published by the Environment Agency) and the previous editions of the LQM/CIEH GAC values.

A "residential with gardens" end-use has been adopted for this analysis, based on the most-conservative SOM content of 1%.

*Note: the S4UL values presented below are Copyright Land Quality Management Limited, reproduced with permission; Publication Number S4UL3668. All rights reserved.*

| Metals & Non-Metals | TP1 0.10 | TP2 0.20 | TP4 0.40 | TP5 0.60 | Adopted Guideline (mg/kg) | Source | Exceedances |
|---|---|---|---|---|---|---|---|
| Arsenic | 21 | 6.60 | 7.1 | 9 | 37 | C4SL | 0 |
| Boron, Water Soluble | 1.5 | 0.60 | 0.5 | 0.8 | 290 | S4UL | 0 |
| Cadmium | 0.4 | 0.30 | 0.5 | 0.4 | 22 | C4SL | 0 |
| Chromium III | 21 | 12 | 11 | 17 | 910 | S4UL | 0 |
| Chromium, Hexavalent | < 1.0 | < 1.0 | < 1.0 | < 1.0 | 21 | C4SL | 0 |
| Copper | 33 | 17 | 22 | 32 | 2400 | S4UL | 0 |
| Lead | 73 | 41 | 110 | 130 | 200 | C4SL | 0 |
| Mercury | 0.11 | 0.12 | 0.08 | 0.14 | 1.2 | S4UL | 0 |
| Nickel | 14 | 9.90 | 11 | 16 | 130 | S4UL | 0 |
| Phenol - Monohydric | < 0.3 | < 0.3 | < 0.3 | < 0.3 | 120 | S4UL | 0 |
| Selenium | < 0.5 | < 0.5 | 0.7 | < 0.5 | 250 | S4UL | 0 |
| Zinc | 130 | 70.00 | 110 | 160 | 3700 | S4UL | 0 |

None of the above values exceeded the adopted GAC values for residential land use with gardens.

| Petroleum Hydrocarbons | TP1 0.10 | TP2 0.20 | TP4 0.40 | TP5 0.60 | Adopted Guideline (mg/kg) | Source | Exceedances |
|---|---|---|---|---|---|---|---|
| Aliphatic C5-C6 | < 0.01 | < 0.01 | < 0.01 | < 0.01 | 42 | S4UL | 0 |
| Aliphatic C6-C8 | < 0.01 | < 0.01 | < 0.01 | < 0.01 | 100 | S4UL | 0 |
| Aliphatic C8-C10 | < 0.01 | < 0.01 | < 0.01 | < 0.01 | 27 | S4UL | 0 |
| Aliphatic C10-C12 | < 1.5 | < 1.5 | < 1.5 | < 1.5 | 130 | S4UL | 0 |
| Aliphatic C12-C16 | < 1.2 | < 1.2 | < 1.2 | < 1.2 | 1100 | S4UL | 0 |
| Aliphatic C16-C21 | < 1.5 | < 1.5 | < 1.5 | < 1.5 | 65000 | S4UL | 0 |
| Aliphatic C21-C35 | < 3.4 | < 3.4 | < 3.4 | < 3.4 | 65000 | S4UL | 0 |
| Aliphatic C35-C40 | < 3.4 | < 3.4 | < 3.4 | < 3.4 | 70 | S4UL | 0 |
| Aromatic C5-C7 | < 0.01 | < 0.01 | < 0.01 | < 0.01 | 130 | S4UL | 0 |
| Aromatic C7-C8 | < 0.01 | < 0.01 | < 0.01 | < 0.01 | 34 | S4UL | 0 |
| Aromatic C8-C10 | < 0.01 | < 0.01 | < 0.01 | < 0.01 | 74 | S4UL | 0 |
| Aromatic C10-C12 | < 0.9 | < 0.9 | < 0.9 | < 0.9 | 140 | S4UL | 0 |
| Aromatic C12-C16 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | 260 | S4UL | 0 |
| Aromatic C16-C21 | < 0.6 | < 0.6 | < 0.6 | < 0.6 | 1100 | S4UL | 0 |
| Aromatic C21-C35 | < 1.4 | < 1.4 | < 1.4 | < 1.4 | 1100 | S4UL | 0 |

None of the above values exceeded the adopted GAC values for residential land use with gardens.

| Polyaromatic Hydrocarbons (PAH) | TP1 0.10 | TP2 0.20 | TP4 0.40 | TP5 0.60 | Adopted Guideline (mg/kg) | Source | Exceedances |
|---|---|---|---|---|---|---|---|
| Acenaphthene | < 0.03 | < 0.03 | < 0.03 | < 0.03 | 210 | S4UL | 0 |
| Acenaphthylene | < 0.03 | < 0.03 | < 0.03 | < 0.03 | 170 | S4UL | 0 |
| Anthracene | < 0.03 | < 0.03 | < 0.03 | 0.06 | 2400 | S4UL | 0 |
| Benzo(a)anthracene | < 0.03 | < 0.03 | 0.12 | 0.26 | 7.2 | S4UL | 0 |
| Benzo(a)pyrene | < 0.03 | < 0.03 | 0.1 | 1.2 | 5 | C4SL | 0 |
| Benzo(b)fluoranthene | 0.05 | 0.03 | 0.13 | 1 | 2.6 | S4UL | 0 |
| Benzo(g,h,i)perylene | < 0.03 | < 0.03 | 0.05 | 0.82 | 320 | S4UL | 0 |
| Benzo(k)fluoranthene | < 0.03 | 0.03 | 0.05 | 0.35 | 77 | S4UL | 0 |
| Chrysene | 0.05 | < 0.03 | 0.14 | 0.39 | 15 | S4UL | 0 |
| Dibenzo(a,h)anthracene | < 0.03 | < 0.03 | < 0.03 | 0.19 | 0.24 | S4UL | 0 |
| Fluoranthene | < 0.03 | 0.03 | 0.24 | 0.44 | 280 | S4UL | 0 |
| Fluorene | < 0.03 | < 0.03 | < 0.03 | < 0.03 | 170 | S4UL | 0 |
| Indeno(1,2,3-c,d)pyrene | < 0.03 | < 0.03 | 0.05 | 0.68 | 27 | S4UL | 0 |
| Naphthalene | < 0.03 | < 0.03 | < 0.03 | 0.03 | 2.3 | S4UL | 0 |
| Phenanthrene | < 0.03 | < 0.03 | 0.07 | 0.19 | 95 | S4UL | 0 |
| Pyrene | < 0.03 | 0.03 | 0.22 | 0.44 | 620 | S4UL | 0 |

None of the above values exceeded the adopted GAC values for residential land use with gardens.

| Other Contaminants / Testing | TP1 0.10 | TP2 0.20 | TP4 0.40 | TP5 0.60 | Adopted Guideline (mg/kg) | Source | Exceedances |
|---|---|---|---|---|---|---|---|
| Organic matter | 5.2 | 2.90 | 6.5 | 3.1 | - | - | - |
| pH | 7.3 | 7.00 | 5.9 | 7.8 | - | - | - |
| Sulphide | 78 | 29.00 | 20 | 740 | - | - | - |
| Cyanide, Total | 1 | < 0.1 | < 0.1 | < 0.1 | - | - | - |
| Sulphur (free) | < 0.75 | < 0.75 | < 0.75 | < 0.75 | - | - | - |
| Sulphate Aqueous Extract as SO4 | 58 | 35 | 12 | 16 | - | - | - |

None of the above values exceeded the adopted GAC values for residential land use with gardens.

In addition, all four samples were screened for the presence of asbestos, with no asbestos nor any asbestos-containing material being detected in any of the samples.

# 8.0 CONCEPTUAL MODEL AND RISK ASSESSMENT

## 8.1 General

According to the Contaminated Land Regulations, to determine whether there is a significant possibility of significant harm, the following should be considered:

*"The nature and degree of harm, the susceptibility of the receptors and the timescale within which the harm might occur".*

Current good practice therefore requires that the findings from the desk study or site investigation be evaluated for contamination on a site-specific basis using a risk-based approach. Risk assessment involves identification of the hazards and evaluation of the risks associated with these hazards. Risk assessment requires an evaluation of a conceptual "source – pathway – receptor" linkage model and can be qualitative or quantitative.

The basis of an environmental risk assessment involves identifying a 'source' of contamination, a 'pathway' along which the contamination may migrate and a 'receptor' at risk from the contamination.

Current legislation defines the various elements of the pollution linkage as:

- A contaminant 'source' is a substance, which is in, or under the ground, and which has the potential to cause harm or to cause pollution of controlled waters.
- A 'pathway' is one or more routes through which a receptor is being exposed to, or affected by, a contaminant, or could be so affected.
- A 'receptor' is either a living organism, an ecological system, a piece of land or property, or controlled water.

A pollutant linkage indicates that all three elements have been identified. The site can only be defined as 'Contaminated Land' if a pollutant linkage exists and the contamination meets the criteria above.

## 8.2 Hazard Identification

**On Site**

The desk study has revealed that the site's previous uses were open fields, used as agricultural land and later occupied by several small structures, probably sheds or stables, before being developed for residential purposes.

Therefore, the only potential source of contamination would be localised made ground from demolition of the previous structures.

**Off Site**

The desk study did not reveal any potential sources of significant contamination close to the site boundaries. It largely being surrounded by residential or agricultural land, and the A483, which is at a significantly lower elevation than the site.

8.3 Summary of Conceptual Ground Model

| Potential Contamination Sources | Potential Contaminants of Concern | Potential Pathways | Receptor Group |
|---|---|---|---|
| Localised Made Ground | Heavy Metals<br>PAHs<br>Asbestos | Inhalation of ground gas<br>Inhalation/ingestion of contaminated dust<br>Dermal contact<br>Ingestion of soil or home-grown vegetables | Construction Workers<br>End users |
| | | Leaching of contaminated materials<br>Lateral Migration and<br>Infiltration | Surface and groundwater<br>Building materials and buried services |

8.4 Pathways

In relation to any on site contamination reaching potential site users, the following pathways are generally considered:

- Ingestion and skin contact with soils on site,
- Ingestion of homegrown vegetables,
- Inhalation of ground gas,
- Inhalation of contaminated dust,
- Leaching of contaminated materials that may affect controlled waters,
- Direct contact with contaminated material during construction,
- Infiltration and accumulation of ground gas.

## 8.5 Receptors

The potential impact of a hazard must be assessed with regard to the following target groups:

- Future site users,
- Construction workers,
- Surface and groundwater, both on and off the site,
- Nearby vegetation,
- Building materials and buried services.

## 8.6 Future Site Users Risk Assessment

The site is to be developed with housing, which is the most sensitive end use.

The desk study failed to record any past contaminative land uses. In addition, the trial pits failed to reveal any visual or olfactory evidence of contamination, which was confirmed by the chemical testing.

Therefore, no source-pathway-receptor links are considered active, and the site therefore poses no significant risk to future site users from the proposed development, and is considered to be uncontaminated.

However, in accordance with current good practice, a watching brief should be kept on all excavations, should contamination be encountered it should be excavated, stored safely on site, tested and disposed of at a suitably licensed landfill facility.

## 8.7 Controlled Waters Risk Assessment

When considering the risk to controlled, waters both surface waters and underlying aquifers have to be considered.

There are no nearby watercourses that could be affected by the development and the underlying bedrock is a low permeability mudstone.

No significant sources of contamination have been identified on site, and therefore there are no significant plausible pollutant linkages present that could affect controlled waters.

Therefore, the overall risk to controlled waters from the proposed development is considered to be negligible.

## 8.8 Construction Workers

The risk to construction workers is considered to be very low; and can be catered for by appropriate PPE and washing facilities in accordance with current good practice.

## 8.9 Ground Gases

No significant sources of ground gas have been identified during the desk study and site investigation.

However, the site is situated in an intermediate probability radon area, therefore, basic radon protection measures will be required in the construction of new dwellings or extensions.

## 8.10 Building Materials

The investigation has not revealed any contamination that could adversely affect building materials or services, other than low pH values in the glaciofluvial deposits. A suitable concrete classification will therefore be required, see Section 9.5. This should also be checked with the statutory suppliers, who should be supplied with the laboratory test results.

## 8.11 Vegetation

The site is currently in residential use, and the investigation has not identified any phytotoxic contaminants that may affect vegetation. The risk to vegetation is considered to be negligible and the topsoil can be re used on site.

## 8.12 Remediation Strategy

The site is considered uncontaminated, and no remediation is necessary ahead of the development.

However, the existing made ground will not be physically suitable for use in garden areas, and it should be excavated out and replaced from these areas with a 600mm thickness of subsoil/topsoil. It is envisaged that these materials will be obtained from the foundation excavations on site.

# 9.0 GEOTECHNICAL RECOMMENDATIONS

## 9.1 Excavations and Site Preparation

Firstly, it will be necessary to strip the topsoil and stockpile it for reuse in garden areas. Any excess should be taken off site to a suitably licensed landfill facility.

The existing Willow Cottage, outbuildings and associated hardstandings will require demolition, and it would be possible to crush any brick, masonry and concrete to form a suitable structural fill such as 6F2. However, the limited amount of material available may make this process uneconomic. It will also be necessary to grub out any foundations for the Cottage, where they interfere with new construction. However, this is only likely to affect Plot 3, and its garage.

It may also be necessary to fell some trees within the site area, the roots of which should be grubbed out. All resulting excavations for roots, foundations etc. will need to be backfilled with suitable well compacted granular material beneath buildings, roads and hard standings, which may be suitable site-won material. All compaction should be carried out in accordance with an approved earthworks specification, Reference 5.

A foul drain is known to cross the site, which GSL understands to be at considerable depth beneath the site, with a suitable wayleave to protect it, see Figure 4.

Excavations will be in made ground and granular glacial deposits, and should be possible using conventional earthmoving equipment.

Excavation sides will be unstable in the glaciofluvial deposits, and should be battered back or shored appropriately.

Groundwater seepages are not anticipated, if encountered they should be slight and easily catered for by pumping from sumps cut within the excavation.

## 9.2 Slope Stability

The proposed development is sufficiently far from the low retaining wall adjacent to the western site boundary that its stability should not be affected by the development, with newly constructed foundations anticipated to be below the level of the retaining wall.

The steep embankment to the east of the site could not be inspected during the investigation. However, inspection of the slope gradient suggest that it is at a stable gradient given the ground conditions proven by the site investigation. In addition, inspection of the mature trees on the slope failed to reveal any evidence of slope instability. Therefore, the slope in its current form is considered to be stable.

The overall stability of the slope should be checked once the proposed building loads are known, and their exact distances from the crest of the slope are confirmed. For example, the location of Plot 8 is shown to be within 2m of the slope crest.

In addition, it will be necessary to ensure that any soakaways are positioned sufficiently away from the eastern site boundary in order to avoid causing slope instability. Without further analysis, it is recommended that soakaways should not be within 10m of the slope crest. Based on the site layout presented in Figure 4, Plot 8 is the only plot likely to be affected, although the soakway could be positioned beneath the parking areas.

### 9.3 Foundations and Floor Slabs

The desk study has confirmed that mining is not an issue at this site.

Traditional spread foundations, bearing on the glacial deposits of at least loose to medium dense consistency are recommended for the proposed development. An allowable bearing pressure of 125kN/m$^2$ should be adopted for design purposes. Based on the anticipated loadings, a 0.6m wide bucket would suffice for the excavations. Foundations should extend to a minimum depth of 0.90m, with 0.20m penetration into the glacial deposits. However, an allowance for deeper foundations should be allowed for on the western site boundary for Plots 1 and 4, and the garage for Plot 3.

Ground bearing floor slabs may be used for plots underlain by the glacial deposits, designed assuming a "Good" formation as described in Reference 6. However, where plots are underlain by made ground, this thickness would be in excess of 600mm and therefore suspended floor slabs would be required, in accordance with Reference 7.

### 9.4 Drainage

The site investigation has confirmed that soakaway drainage is suitable at the site in the glacial deposits, where an average permeability of 8.4 x $10^{-5}$ m/sec has been determined, based on eight test results.

However, as discussed above soakaways should be positioned at least 10m away from the slope crest.

### 9.5 Reuse of Materials

As discussed previously the crushed brick and concrete from the existing buildings will be suitable for re-use on site as a structural fill and capping for the road construction.

Excavated glacial deposits would also be suitable for reuse on site, provided they are placed in accordance with a suitable earthworks specification, such as Reference 5.

### 9.6 Protection of Buried Concrete

Chemical testing of the topsoil, made ground, and superficial deposits has indicated that the glacial deposits have a low pH.

Therefore, in accordance with Reference 8 and assuming mobile groundwater, the buried concrete can be classified as:

- DS-1,
- AC-2z.

### 9.7 Roads and Hardstandings

CBR testing was not carried out as part of the investigation. However, it would appear from the results and the description of the materials that a CBR value of at least 10% can be assumed in the design, for formations in the glacial deposits.

However, formations will need to be proof rolled and any soft/loose areas identified excavated an additional 300m and replaced with suitable well compacted granular material. Following this treatment, CBR values in excess of 15% would be anticipated.

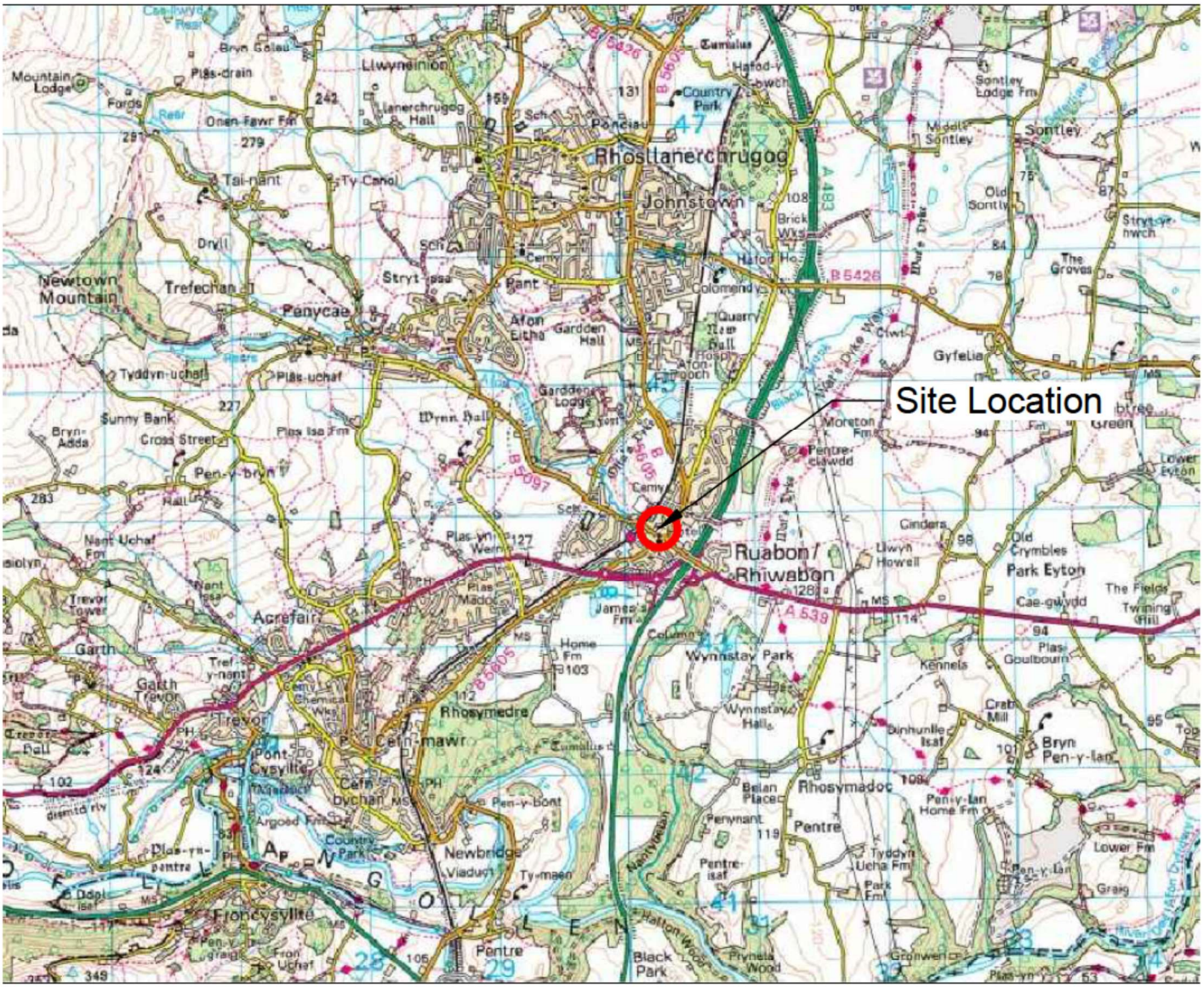
### 9.8 Landfill and Radon Gas

The site lies in an intermediate probability radon area, and therefore basic radon protection measures are required for the new properties, in accordance with Reference 9.

## REFERENCES


1. The Geology of the Country around Wrexham (Part II), British Geological Survey, 1928.
2. BS 5930:2015, Code of Practice for Site Investigation.
3. BRE Digest 365, Soakaway Design, 2003.
4. BS 1377:1991, British Standard Methods of Tests for Soils for Civil engineering Purposes.
5. Manual of Contract Documents for Highway Works, Volume 1, Specification for Highway Works - Series 600, Department of Transport, 2016.
6. Cement & Concrete Association, Concrete Ground floors: their design, construction and finish, Deacon, R, Publication 48.034, 1986.
7. NHBC Standards, Part 4 Foundations, 2019.
8. BRE Special Digest 1, 2005, Concrete in Aggressive Ground.
9. Radon: Guidance on protective measures for New Buildings, BRE 211, 2007.

**FIGURES**



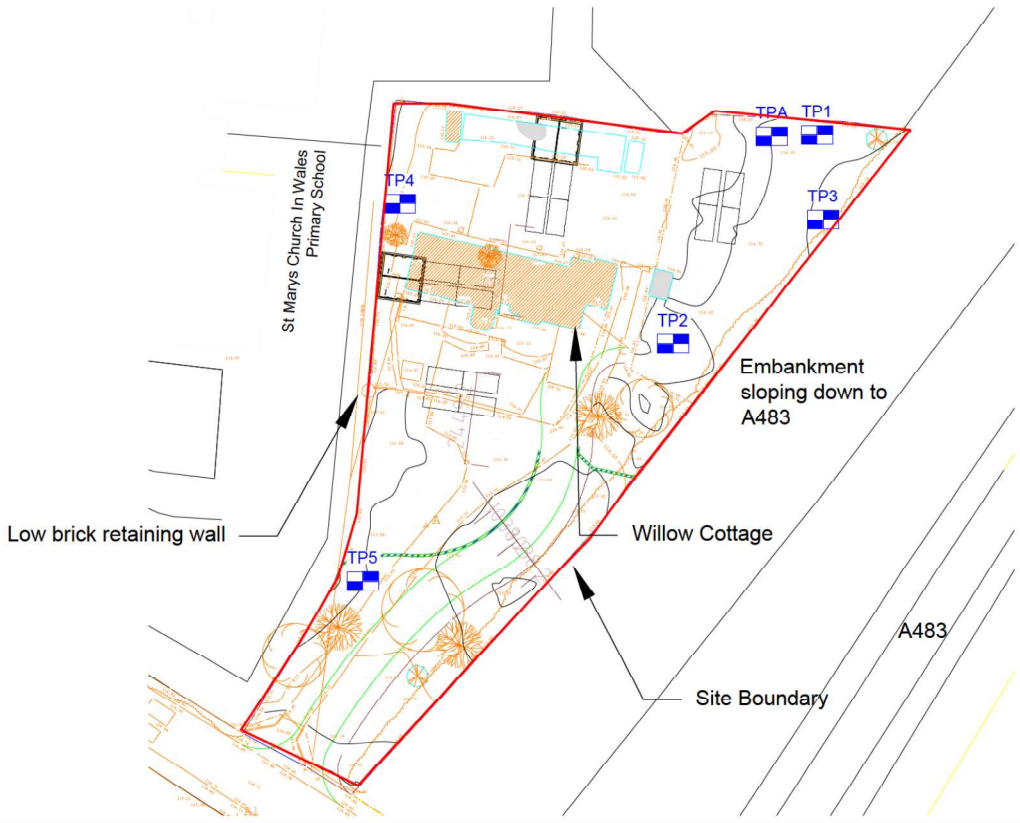

OS LICENSE No. 100030802

SCALE 1:50,000 @ A4

Figure Title

SITE LOCATION

FIGURE 1




SCALE 1:500 @ A3

Figure Title

Existing Site Layout and Location of Exploratory Holes

FIGURE 2

# APPENDIX A

## Site Photographs

# APPENDIX B

# CON29M Report

# APPENDIX C

## Envirocheck Report

# APPENDIX D

# BGS Boreholes

GroundSolve Ltd

# Percussion Drilling Log

| | | |
|---|---|---|
| Project Name: Willow Cottage | Client: Gower Homes | Date: 09/04/2021 - 13/04/2021 |
| Location: Ruabon | Contractor: Cheshire Drilling | |
| Project No. : 2400 | Crew Name: G&D | Drilling Equipment: D2000 |

| Borehole Number | Hole Type | Level | Logged By | Scale | Page Number |
|---|---|---|---|---|---|
| BH01 | CP | | ES | 1:50 | Sheet 1 of 2 |

| Well | Water Strikes | Sample and In Situ Testing | | | Depth (m) | Level (m) | Legend | Stratum Description |
|---|---|---|---|---|---|---|---|---|
| | | Depth (m) | Type | Results | | | | |
| | | | | | 0.30 | | | Loose to medium dense brown and grey slightly clayey gravelly SAND Gravel is subangular to angular fine to coarse of concrete. (MADE GROUND) |
| | | 1.20 | SPT | N=11 (3,3/3,3,3,2) | | | | Medium dense brown slightly clayey SAND and GRAVEL with medium cobble content. Gravel is subrounded to rounded fine to coarse of mudstone. Cobbles are subrounded of mudstone (GLACIAL DEPOSITS). |
| | | 2.00 | SPT | N=14 (3,5/3,3,4,4) | | | | |
| | | 3.00 | SPT | N=11 (5,5/3,2,3,3) | | | | |
| | | 4.00 | SPT | N=50 (6,6/50 for 250mm) | | | | |
| | | | | | 4.30 | | | Very dense brown very clayey gravelly SAND with medium cobble content. Gravel is subrounded to rounded fine to coarse of mudstone. Cobbles are subrounded of mudstone (GLACIAL DEPOSITS). |
| | | 5.00 | SPT | N=50 (10,12/50 for 250mm) | | | | |
| | | 6.00 | SPT | N=50 (25 for 135mm/50 for 200mm) | | | | |
| | ▼ | 7.00 | SPT | N=50 (25 for 115mm/50 for 180mm) | | | | |
| | | 8.00 | SPT | N=50 (9,12/50 for 220mm) | | | | |
| | | | | | 8.70 | | | Very stiff to hard brown sandy gravelly CLAY. Gravel is subrounded to rounded fine to coarse of mudstone. (GLACIAL TILL) |
| | | 9.00 | SPT | N=50 (25 for 135mm/50 for 170mm) | | | | |

| Hole Diameter | | Casing Diameter | | Chiselling | | | | Inclination and Orientation | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Depth Base | Diameter | Depth Base | Diameter | Depth Top | Depth Base | Duration | Tool | Depth Top | Depth Base | Inclination | Orientation |
| 12.40 | 150 | | | 6.00<br>8.20<br>9.30 | 8.00<br>8.30<br>9.60 | 03:00<br>00:30<br>00:45 | | | | | |

Remarks

Ground water monitoring level (BGL)
15/04/21- 7.46m
16/04/21- 7.46m
19/04/21- 7.485m
~~20/04/21- 7.495m~~
21/04/21- 7.51m

AGS

GroundSolve Ltd

# Percussion Drilling Log

| | | |
|---|---|---|
| Project Name: Willow Cottage | Client: Gower Homes | Date: 09/04/2021 - 13/04/2021 |
| Location: Ruabon | Contractor: Cheshire Drilling | |
| Project No. : 2400 | Crew Name: G&D | Drilling Equipment: D2000 |

| Borehole Number | Hole Type | Level | Logged By | Scale | Page Number |
|---|---|---|---|---|---|
| BH01 | CP | | ES | 1:50 | Sheet 2 of 2 |

| Well | Water Strikes | Sample and In Situ Testing | | | Depth (m) | Level (m) | Legend | Stratum Description |
|---|---|---|---|---|---|---|---|---|
| | | Depth (m) | Type | Results | | | | |
| | | 10.00 | SPT | N=50 (25 for 90mm/50 for 180mm) | | | | Very stiff to hard brown sandy gravelly CLAY. Gravel is subrounded to rounded fine to coarse of mudstone. (GLACIAL TILL) |
| | | 11.00 | SPT | N=50 (12,13/50 for 175mm) | | | | |
| | | 12.00 | SPT | N=50 (8,11/50 for 275mm) | | | | |
| | | | | | 12.40 | | | End of Borehole at 12.400m |

| Hole Diameter | | Casing Diameter | | Chiselling | | | | Inclination and Orientation | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Depth Base | Diameter | Depth Base | Diameter | Depth Top | Depth Base | Duration | Tool | Depth Top | Depth Base | Inclination | Orientation |
| 12.40 | 150 | | | 6.00 | 8.00 | 03:00 | | | | | |
| | | | | 8.20 | 8.30 | 00:30 | | | | | |
| | | | | 9.30 | 9.60 | 00:45 | | | | | |

Remarks

Ground water monitoring level (BGL)
15/04/21- 7.46m
16/04/21- 7.46m
19/04/21- 7.485m
~~20/04/21- 7.495m~~
21/04/21- 7.51m

AGS

# APPENDIX E

## Trial Pit Logs

TRIAL PIT 1

| Depth (m) | Strata |
|---|---|
| 0.00-0.40 | Grass over black and dark brown slightly ashy sandy SILT with frequent roots and rootlets (TOPSOIL) |
| 0.40-1.80 | Loose to medium dense brown slightly silty SAND and GRAVEL with high cobble content. Gravel is subrounded to rounded fine to coarse of sandstone, siltstone and mudstone. Cobbles are subangular to subrounded of sandstone mudstone and siltstone (GLACIAL DEPOSITS). |

Notes

1. Pit becoming unstable at 1.80m. Excavation terminated for soakaway testing.
2. No groundwater encountered.
3. Samples for chemical testing taken at 0.20m.
4. Samples for physical testing taken at 1.50m.

Spoil Heap



# Pit Walls



TRIAL PIT 2

| Depth (m) | Strata |
|---|---|
| 0.00-0.40 | Grass over black and dark brown slightly gravelly sandy SILT with frequent roots and rootlets. Gravel is subrounded to rounded fine to coarse sandstone (TOPSOIL). |
| 0.40-1.80 | Loose to medium dense brown slightly silty SAND and GRAVEL with high cobble content. Gravel is subrounded to rounded fine to coarse of sandstone, siltstone and mudstone. Cobbles are subrounded of sandstone mudstone and siltstone (GLACIAL DEPOSITS). |

Notes

1. Pit becoming unstable at 1.80m. Excavation terminated for soakaway testing.
2. No groundwater encountered.
3. Samples for chemical testing taken at 0.20m.
4. Samples for physical testing taken at 1.70m.

Spoil Heap



# Pit Walls



TRIAL PIT 3

| Depth (m) | Strata |
|---|---|
| 0.00-0.30 | Grass over black and dark brown slightly gravelly sandy SILT with frequent roots and rootlets. Gravel is subrounded to rounded fine to coarse sandstone (TOPSOIL). |
| 0.30-2.00 | Medium dense brown slightly silty SAND and GRAVEL with high cobble content. Gravel is subrounded to rounded fine to coarse of sandstone, siltstone and mudstone. Cobbles are subrounded of sandstone mudstone and siltstone (GLACIAL DEPOSITS). |

Notes

1. Pit becoming unstable at 2.00m, further excavation terminated.
2. No groundwater encountered.
3. No samples taken.

Spoil Heap



# Pit Walls



TRIAL PIT 4

| Depth (m) | Strata |
|---|---|
| 0.00-(0.50-0.80) | Grass over black and dark brown slightly gravelly sandy SILT with frequent roots and rootlets and occasional plastic fragments. Gravel is subrounded to rounded fine to coarse sandstone (MADE GROUND). |
| (0.50-0.80)-2.00 | Medium dense brown slightly silty SAND and GRAVEL with high cobble content. Gravel is subrounded to rounded fine to coarse of sandstone, siltstone and mudstone. Cobbles are subrounded of sandstone mudstone and siltstone (GLACIAL DEPOSITS). |

Notes

1. Pit stable
2. Made Ground dipping towards site boundary in western end of pit.
3. Pit excavated to 1m from site boundary.
4. No groundwater encountered.
5. Samples for chemical testing taken at 0.40m.
6. Samples for physical testing taken at 0.90m

Spoil Heap



# Pit Walls



TRIAL PIT 5

| Depth (m) | Strata |
|---|---|
| 0.00-0.04 | Grass over black and dark brown slightly gravelly sandy SILT with frequent roots and rootlets. Gravel is subrounded to rounded fine to coarse sandstone (MADE GROUND). |
| 0.40-1.50 | Medium dense greyish brown silty very gravelly SAND with low cobble content and occasional stone flags and wire rope pieces. Gravel is angular of sandstone, brick and rare tarmac. Cobbles are angular of sandstone and brick (MADE GROUND). |
| 1.50-2.40 | Medium dense brown slightly silty SAND and GRAVEL with high cobble content. Gravel is subrounded to rounded fine to coarse of sandstone, siltstone and mudstone. Cobbles are subrounded of sandstone mudstone and siltstone (GLACIAL DEPOSITS). |

Notes

1. Pit becoming unstable at base.
2. No groundwater encountered.
3. Samples for chemical testing taken at 0.60m.
4. Samples for physical testing taken at 1.80m.
5. Occasional hydrocarbon odours.
6. Soakaway test carried out.

Spoil Heap



# Pit Walls



# APPENDIX F

## Soakaway Test Results and Calculations

# APPENDIX G

## Physical Test Results

# *Laboratory Test Certificate*

Form REP008 Rev 3

| | | | |
|---|---|---|---|
| **Issued To** | Stefan Imiolczyk<br>Groundsolve Ltd<br>Unit 1 Charter Court, Well House Barns<br>Chester Road, Bretton<br>Flintshire, CH4 0DH | **Date of issue** | 21/09/2020 |
| | | **Issue No.** | 1 |
| | | **Client Ref. No.** | N/A |
| | | **Samples / Material Source** | |
| | | Samples Recv'd | 10/09/2020 |
| **Testing Start Date** | 10/09/2020 | Sample State | As received |
| **Testing Complete** | 21/09/2020 | Sampled by | Groundsolve Ltd |
| **Comments** | BS 1377-3:1990 is considered out of date and has been replaced. | | |
| **Project No** | PC207956 | | |
| **Project Name** | WILLOW COTTAGE, RUABON | | |

## Summary of Tests

| Standard | Test Description | Test Quantity | UKAS |
|---|---|---|---|
| BS EN ISO 17892-4:2016<br>Cl. 5.2 | Particle Size Distribution by Sieving Method | 3 | Yes |
| BS 1377-3:1990<br>Cl. 5.3 & 5.5<br>(Standard withdrawn) | Sulphate Analysis - Water Extract | 3 | Yes |
| BS 1377-3:1990<br>Cl. 9.0<br>(Standard withdrawn) | pH | 3 | Yes |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |

Note: Any descriptions, opinions or interpretations are outside the scope of UKAS accreditation.
The results within this report relate only to the samples tested and received from the client.

UKAS TESTING
1365

Test Results checked and approved for issue.
Signed for and on behalf of Geotechnics Limited

[redacted]

**Stephane Schiano (Laboratory Testing Manager)**

GEOTECHNICS
geotechnical and geoenvironmental specialists
203 Torrington Avenue, Tile Hill,
Coventry, CV4 9UT

# *LABORATORY RESULTS - Chemical Analysis*

**Project** WILLOW COTTAGE, RUABON **Project No:** PC207956

| Sample | | | | | Sulphate | | | | pH | Loss on Ignition | Chloride | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | In Soil | | | In Water | | | In Soil | | In Water |
| Hole | Depth (Specimen Depth) m | Type | Sample Ref | Description | % Finer 2mm | Acid Soluble % | Water Soluble g/l | g/l | | (Organic Content) % | Acid Soluble % | Water Soluble g/l | g/l |
| TP1 | 1.50 (1.50) | B | C48064 | Brown clayey sandy GRAVEL with cobbles and roots. | 44.1 | | 0.029 (0.03) | | 6.76 | | | | |
| TP2 | 1.70 (1.70) | B | C48065 | Brown clayey sandy GRAVEL with cobbles and roots. | 42.6 | | 0.019 (0.02) | | 5.19 | | | | |
| TP5 | 1.80 (1.80) | B | C48066 | MADE GROUND: Dark brown clayey sandy GRAVEL with brick and tarmac | 46.3 | | 0.016 (0.02) | | 6.43 | | | | |

**Remarks** For Standards followed please see Laboratory Test Certficate
Sulphate reported as SO3, results in brackets reported as SO4

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# LABORATORY RESULTS - *Particle Size Distribution*

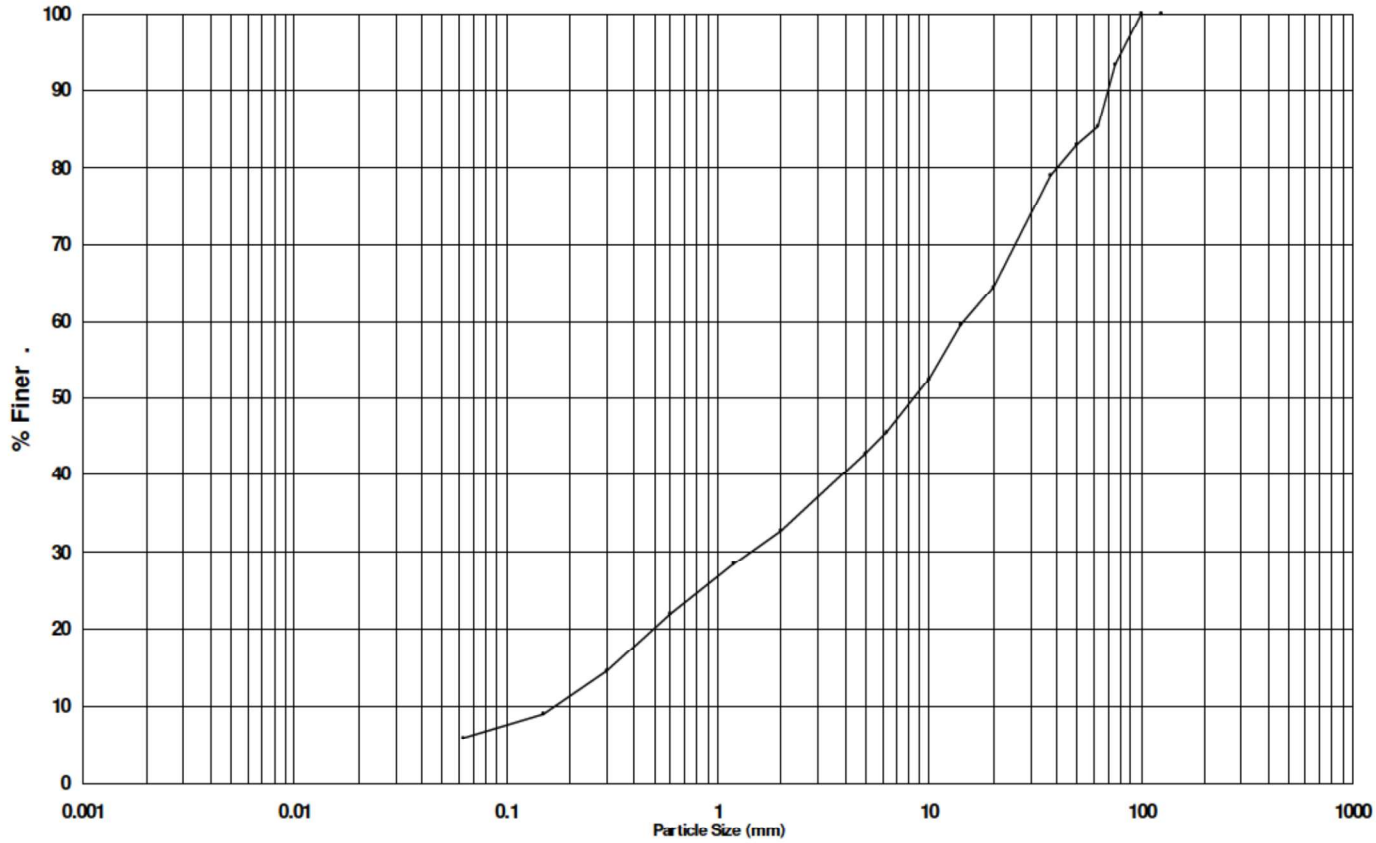
**Project:** WILLOW COTTAGE, RUABON

**Project No:** PC207956

**Hole** TP1
**Sample Depth** 1.50m
**Sample Type** B
**Sample Ref** C48064

## Sample Description

Brown clayey sandy GRAVEL with cobbles and roots.




| Classification | CLAY | Fine | Medium | Coarse | Fine | Medium | Coarse | Fine | Medium | Coarse | Cobbles | Boulders |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | SILT | | | SAND | | | Gravel | | | | |

| Classification | % of each |
|---|---|
| | |
| SILT (including CLAY) | 6 |
| SAND | 27 |
| GRAVEL | 52 |
| COBBLES | 15 |
| BOULDERS | 0 |

| Size | % Finer |
|---|---|
| 125 mm | 100 |
| 100 mm | 100 |
| 75 mm | 93 |
| 63 mm | 85 |
| 50 mm | 83 |
| 37.5 mm | 79 |
| 20 mm | 64 |
| 14 mm | 60 |
| 10 mm | 52 |
| 6.3 mm | 46 |
| 5 mm | 43 |
| 2 mm | 33 |
| 1.18 mm | 28 |
| 600 µm | 22 |
| 300 µm | 14 |
| 150 µm | 9 |

| Size | % Finer |
|---|---|
| 63 µm | 6 |

| Uniformity Coefficient |
|---|
| 85.42 |
| **Sieving Method** |
| Wet sieve |
| **Fine Particle Analysis** |

| | |
|---|---|
| Method | |
| Pre-treated with | |
| % loss on Pre-treatment | |
| Particle Density | |

**Remarks** AGS Sieve:-Test performed in accordance with BS EN ISO 17892-4:2016

21/09/2020

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# *LABORATORY RESULTS - Particle Size Distribution*

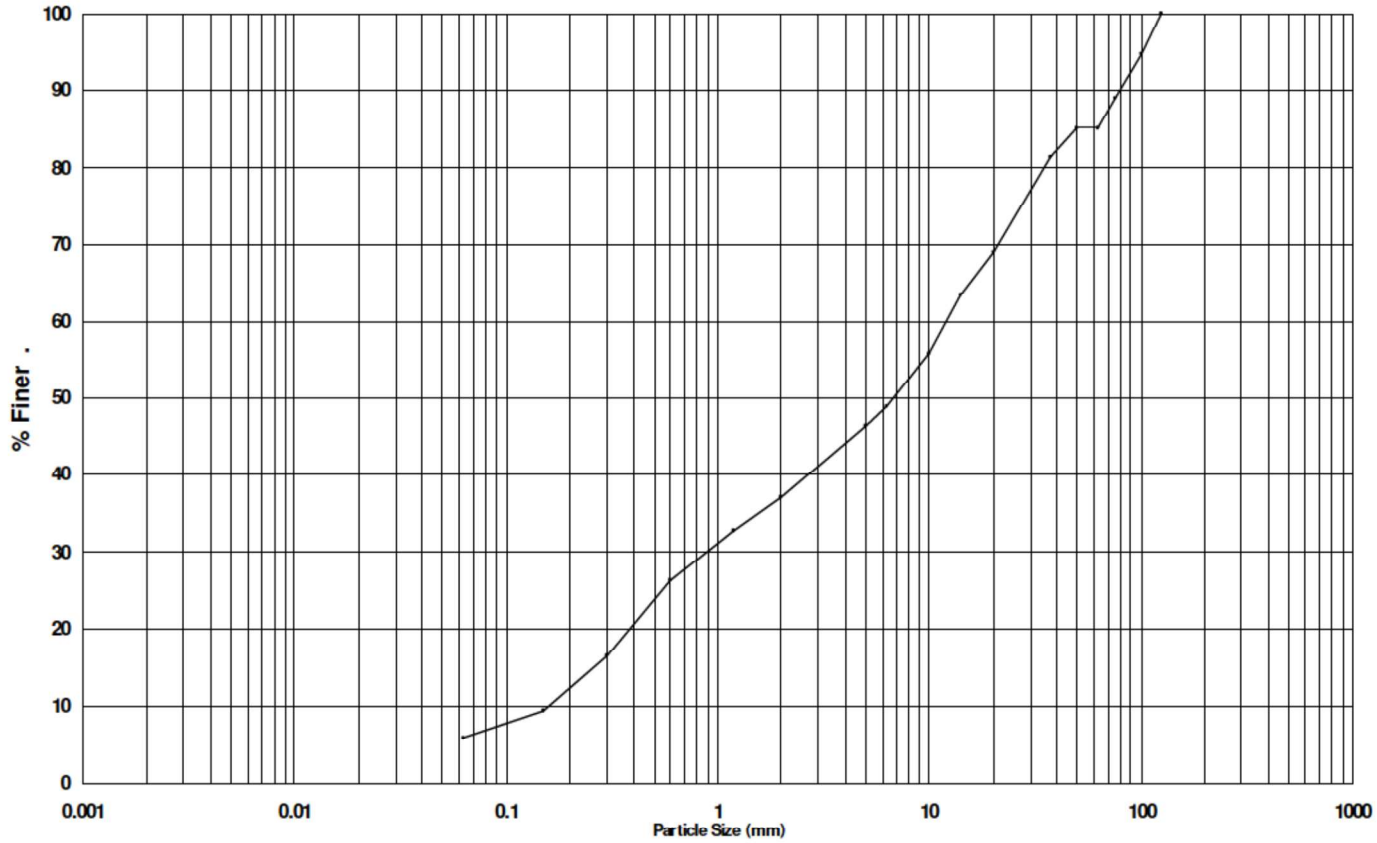
**Project:** WILLOW COTTAGE, RUABON

**Project No:** PC207956

**Hole** TP2
**Sample Depth** 1.70m
**Sample Type** B
**Sample Ref** C48065

## Sample Description

Brown clayey sandy GRAVEL with cobbles and roots.




| Classification | CLAY | Fine | Medium | Coarse | Fine | Medium | Coarse | Fine | Medium | Coarse | Cobbles | Boulders |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | SILT | | | SAND | | | Gravel | | | | |

| Classification | % of each |
|---|---|
| | |
| SILT (including CLAY) | 6 |
| SAND | 31 |
| GRAVEL | 48 |
| COBBLES | 15 |
| BOULDERS | 0 |

| Size | % Finer |
|---|---|
| 125 mm | 100 |
| 100 mm | 95 |
| 75 mm | 89 |
| 63 mm | 85 |
| 50 mm | 85 |
| 37.5 mm | 81 |
| 20 mm | 69 |
| 14 mm | 64 |
| 10 mm | 56 |
| 6.3 mm | 49 |
| 5 mm | 46 |
| 2 mm | 37 |
| 1.18 mm | 33 |
| 600 µm | 26 |
| 300 µm | 17 |
| 150 µm | 9 |

| Size | % Finer |
|---|---|
| 63 µm | 6 |

| Uniformity Coefficient |
|---|
| 75.18 |
| **Sieving Method** |
| Wet sieve |
| **Fine Particle Analysis** |

| | |
|---|---|
| Method | |
| Pre-treated with | |
| % loss on Pre-treatment | |
| Particle Density | |

**Remarks** Sieve:-Test performed in accordance with BS EN ISO 17892-4:2016

21/09/2020

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# *LABORATORY RESULTS - Particle Size Distribution*

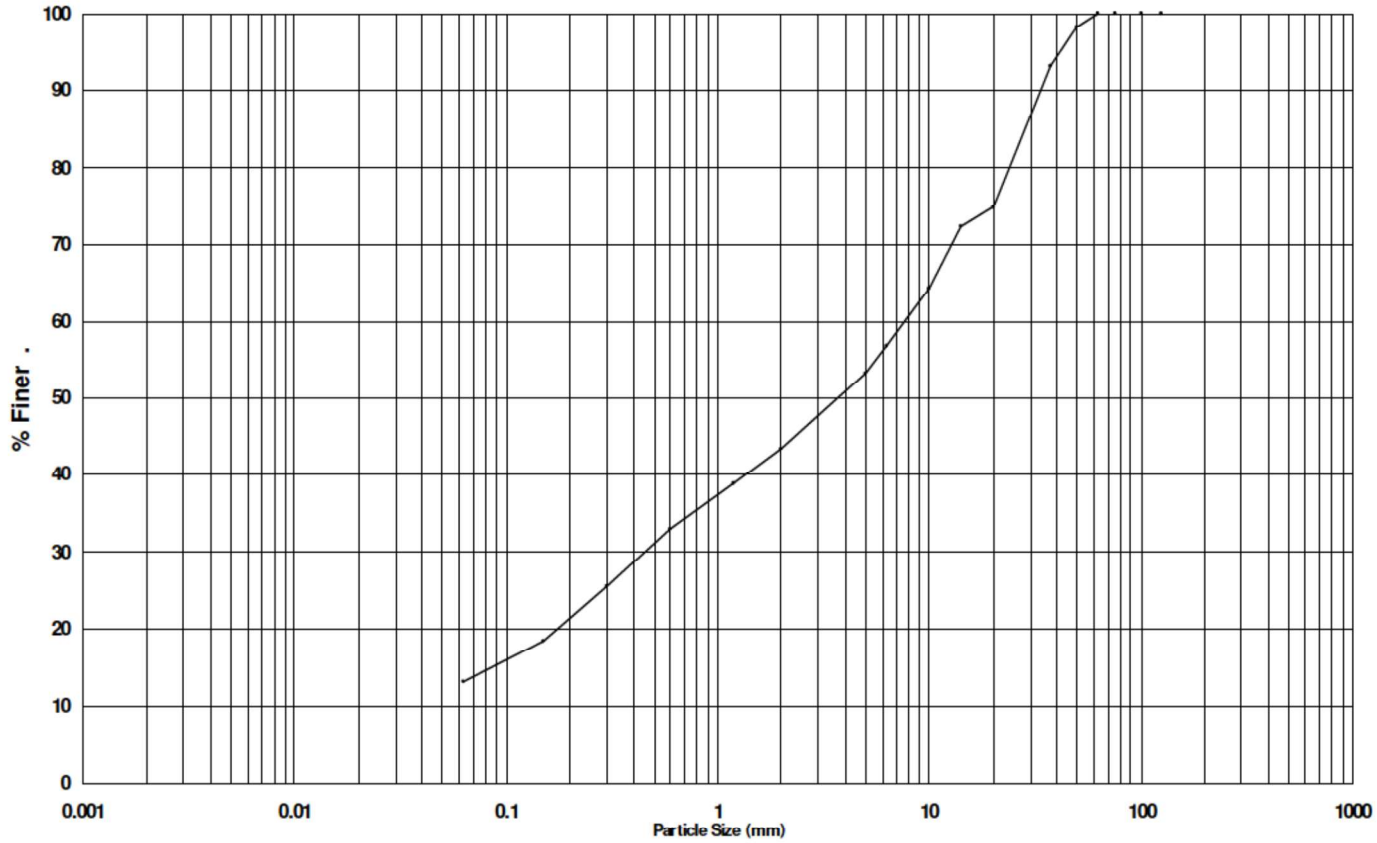
**Project:** WILLOW COTTAGE, RUABON

**Project No:** PC207956

| | |
|---|---|
| **Hole** | TP5 |
| **Sample Depth** | 1.80m |
| **Sample Type** | B |
| **Sample Ref** | C48066 |

**Sample Description**

MADE GROUND: Dark brown clayey sandy GRAVEL with brick and tarmac




| Classification | CLAY | Fine | Medium | Coarse | Fine | Medium | Coarse | Fine | Medium | Coarse | Cobbles | Boulders |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | SILT | | | SAND | | | Gravel | | | | |

| Classification | % of each |
|---|---|
| | |
| SILT (including CLAY) | 13 |
| SAND | 30 |
| GRAVEL | 57 |
| COBBLES | 0 |
| BOULDERS | 0 |

| Size | % Finer |
|---|---|
| 125 mm | 100 |
| 100 mm | 100 |
| 75 mm | 100 |
| 63 mm | 100 |
| 50 mm | 98 |
| 37.5 mm | 93 |
| 20 mm | 75 |
| 14 mm | 72 |
| 10 mm | 64 |
| 6.3 mm | 57 |
| 5 mm | 53 |
| 2 mm | 43 |
| 1.18 mm | 39 |
| 600 µm | 33 |
| 300 µm | 26 |
| 150 µm | 19 |

| Size | % Finer |
|---|---|
| 63 µm | 13 |

| Uniformity Coefficient |
|---|
| Not Available |
| **Sieving Method** |
| Wet sieve |
| **Fine Particle Analysis** |

| | |
|---|---|
| Method | |
| Pre-treated with | |
| % loss on Pre-treatment | |
| Particle Density | |

**Remarks** AGS Sieve:-Test performed in accordance with BS EN ISO 17892-4:2016

21/09/2020

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# APPENDIX H

## Chemical Test Results

# Certificate of Analysis

| | |
|---|---|
| *Certificate Number* | 20-17036 |
| | 14-Sep-20 |
| *Client* | GroundSolve Limited<br>Unit 1<br>Well House Barns<br>Bretton<br>Flintshire<br>FAO Adam Fenwick<br>CH4 0DH |
| *Our Reference* | 20-17036 |
| *Client Reference* | (not supplied) |
| *Order No* | (not supplied) |
| *Contract Title* | Willow Cottage |
| *Description* | 6 Soil samples. |
| *Date Received* | 07-Sep-20 |
| *Date Started* | 07-Sep-20 |
| *Date Completed* | 14-Sep-20 |
| *Test Procedures* | Identified by prefix DETSn (details on request). |
| *Notes* | Opinions and interpretations are outside the laboratory's scope of ISO 17025 accreditation. This certificate is issued in accordance with the accreditation requirements of the United Kingdom Accreditation Service. The results reported herein relate only to the material supplied to the laboratory. This certificate shall not be reproduced except in full, without the prior written approval of the laboratory. |

*Approved By* [redacted]

Adam Fenwick
Contracts Manager

UKAS TESTING
2139

# Summary of Chemical Analysis
# Soil Samples

*Our Ref* 20-17036
*Client Ref*
*Contract Title* Willow Cottage

| | | | | Lab No | 1722546 | 1722547 | 1722548 | 1722549 | 1722550 | 1722551 |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Sample ID | TP1 | TP2 | TP2 | TP4 | TP4 | TP5 |
| | | | | Depth | 0.10 | 0.20 | 0.90 | 0.40 | 0.90 | 0.60 |
| | | | | Other ID | | | | | | |
| | | | | Sample Type | SOIL | SOIL | SOIL | SOIL | SOIL | SOIL |
| | | | | Sampling Date | 27/08/2020 | 27/08/2020 | 27/08/2020 | 27/08/2020 | 27/08/2020 | 27/08/2020 |
| | | | | Sampling Time | n/s | n/s | n/s | n/s | n/s | n/s |
| **Test** | **Method** | **LOD** | **Units** | | | | | | | |
| **Metals** | | | | | | | | | | |
| Arsenic | DETSC 2301# | 0.2 | mg/kg | 21 | 6.6 | | 7.1 | | 9.0 |
| Boron, Water Soluble | DETSC 2311# | 0.2 | mg/kg | 1.5 | 0.6 | | 0.5 | | 0.8 |
| Cadmium | DETSC 2301# | 0.1 | mg/kg | 0.4 | 0.3 | | 0.5 | | 0.4 |
| Chromium | DETSC 2301# | 0.15 | mg/kg | 21 | 12 | | 11 | | 17 |
| Chromium III | DETSC 2301* | 0.15 | mg/kg | 21 | 12 | | 11 | | 17 |
| Chromium, Hexavalent | DETSC 2204* | 1 | mg/kg | < 1.0 | < 1.0 | | < 1.0 | | < 1.0 |
| Copper | DETSC 2301# | 0.2 | mg/kg | 33 | 17 | | 22 | | 32 |
| Lead | DETSC 2301# | 0.3 | mg/kg | 73 | 41 | | 110 | | 130 |
| Mercury | DETSC 2325# | 0.05 | mg/kg | 0.11 | 0.12 | | 0.08 | | 0.14 |
| Nickel | DETSC 2301# | 1 | mg/kg | 14 | 9.9 | | 11 | | 16 |
| Selenium | DETSC 2301# | 0.5 | mg/kg | < 0.5 | < 0.5 | | 0.7 | | < 0.5 |
| Zinc | DETSC 2301# | 1 | mg/kg | 130 | 70 | | 110 | | 160 |
| **Inorganics** | | | | | | | | | | |
| pH | DETSC 2008# | | pH | 7.3 | 7.0 | 5.7 | 5.9 | 6.5 | 7.8 |
| Cyanide, Total | DETSC 2130# | 0.1 | mg/kg | 1.0 | < 0.1 | | < 0.1 | | < 0.1 |
| Organic matter | DETSC 2002# | 0.1 | % | 5.2 | 2.9 | | 6.5 | | 3.1 |
| Sulphate Aqueous Extract as SO4 | DETSC 2076# | 10 | mg/l | 58 | 35 | 21 | 12 | 11 | 16 |
| Sulphide | DETSC 2024* | 10 | mg/kg | 78 | 29 | | 20 | | 740 |
| Sulphur (free) | DETSC 3049# | 0.75 | mg/kg | < 0.75 | < 0.75 | | < 0.75 | | < 0.75 |
| **Petroleum Hydrocarbons** | | | | | | | | | | |
| Aliphatic C5-C6 | DETSC 3321* | 0.01 | mg/kg | < 0.01 | < 0.01 | | < 0.01 | | < 0.01 |
| Aliphatic C6-C8 | DETSC 3321* | 0.01 | mg/kg | < 0.01 | < 0.01 | | < 0.01 | | < 0.01 |
| Aliphatic C8-C10 | DETSC 3321* | 0.01 | mg/kg | < 0.01 | < 0.01 | | < 0.01 | | < 0.01 |
| Aliphatic C10-C12 | DETSC 3072# | 1.5 | mg/kg | < 1.5 | < 1.5 | | < 1.5 | | < 1.5 |
| Aliphatic C12-C16 | DETSC 3072# | 1.2 | mg/kg | < 1.2 | < 1.2 | | < 1.2 | | < 1.2 |
| Aliphatic C16-C21 | DETSC 3072# | 1.5 | mg/kg | < 1.5 | < 1.5 | | < 1.5 | | < 1.5 |
| Aliphatic C21-C35 | DETSC 3072# | 3.4 | mg/kg | < 3.4 | < 3.4 | | < 3.4 | | < 3.4 |
| Aliphatic C35-C40 | DETSC 3072* | 3.4 | mg/kg | < 3.4 | < 3.4 | | < 3.4 | | < 3.4 |
| Aliphatic C5-C35 | DETSC 3072* | 10 | mg/kg | < 10 | < 10 | | < 10 | | < 10 |
| Aromatic C5-C7 | DETSC 3321* | 0.01 | mg/kg | < 0.01 | < 0.01 | | < 0.01 | | < 0.01 |
| Aromatic C7-C8 | DETSC 3321* | 0.01 | mg/kg | < 0.01 | < 0.01 | | < 0.01 | | < 0.01 |
| Aromatic C8-C10 | DETSC 3321* | 0.01 | mg/kg | < 0.01 | < 0.01 | | < 0.01 | | < 0.01 |
| Aromatic C10-C12 | DETSC 3072# | 0.9 | mg/kg | < 0.9 | < 0.9 | | < 0.9 | | < 0.9 |
| Aromatic C12-C16 | DETSC 3072# | 0.5 | mg/kg | < 0.5 | < 0.5 | | < 0.5 | | < 0.5 |
| Aromatic C16-C21 | DETSC 3072# | 0.6 | mg/kg | < 0.6 | < 0.6 | | < 0.6 | | < 0.6 |
| Aromatic C21-C35 | DETSC 3072# | 1.4 | mg/kg | < 1.4 | < 1.4 | | < 1.4 | | < 1.4 |
| Aromatic C35-C40 | DETSC 3072* | 1.4 | mg/kg | < 1.4 | < 1.4 | | < 1.4 | | < 1.4 |
| Aromatic C5-C35 | DETSC 3072* | 10 | mg/kg | < 10 | < 10 | | < 10 | | < 10 |
| TPH Ali/Aro Total | DETSC 3072* | 10 | mg/kg | < 10 | < 10 | | < 10 | | < 10 |
| **PAHs** | | | | | | | | | | |
| Naphthalene | DETSC 3303# | 0.03 | mg/kg | < 0.03 | < 0.03 | | < 0.03 | | 0.03 |
| Acenaphthylene | DETSC 3303# | 0.03 | mg/kg | < 0.03 | < 0.03 | | < 0.03 | | < 0.03 |

Key: * -not accredited. # -MCERTS (accreditation only applies if report carries the MCERTS logo). n/s -not supplied.

# Summary of Chemical Analysis
# Soil Samples

*Our Ref* 20-17036
*Client Ref*
*Contract Title* Willow Cottage

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | **Lab No** | 1722546 | 1722547 | 1722548 | 1722549 | 1722550 | 1722551 |
| | | | **Sample ID** | TP1 | TP2 | TP2 | TP4 | TP4 | TP5 |
| | | | **Depth** | 0.10 | 0.20 | 0.90 | 0.40 | 0.90 | 0.60 |
| | | | **Other ID** | | | | | | |
| | | | **Sample Type** | SOIL | SOIL | SOIL | SOIL | SOIL | SOIL |
| | | | **Sampling Date** | 27/08/2020 | 27/08/2020 | 27/08/2020 | 27/08/2020 | 27/08/2020 | 27/08/2020 |
| | | | **Sampling Time** | n/s | n/s | n/s | n/s | n/s | n/s |
| **Test** | **Method** | **LOD** | **Units** | | | | | | |
| Acenaphthene | DETSC 3303# | 0.03 | mg/kg | < 0.03 | < 0.03 | | < 0.03 | | < 0.03 |
| Fluorene | DETSC 3303 | 0.03 | mg/kg | < 0.03 | < 0.03 | | < 0.03 | | < 0.03 |
| Phenanthrene | DETSC 3303# | 0.03 | mg/kg | < 0.03 | < 0.03 | | 0.07 | | 0.19 |
| Anthracene | DETSC 3303 | 0.03 | mg/kg | < 0.03 | < 0.03 | | < 0.03 | | 0.06 |
| Fluoranthene | DETSC 3303# | 0.03 | mg/kg | < 0.03 | 0.03 | | 0.24 | | 0.44 |
| Pyrene | DETSC 3303# | 0.03 | mg/kg | < 0.03 | 0.03 | | 0.22 | | 0.44 |
| Benzo(a)anthracene | DETSC 3303# | 0.03 | mg/kg | < 0.03 | < 0.03 | | 0.12 | | 0.26 |
| Chrysene | DETSC 3303 | 0.03 | mg/kg | 0.05 | < 0.03 | | 0.14 | | 0.39 |
| Benzo(b)fluoranthene | DETSC 3303# | 0.03 | mg/kg | 0.05 | 0.03 | | 0.13 | | 1.0 |
| Benzo(k)fluoranthene | DETSC 3303# | 0.03 | mg/kg | < 0.03 | 0.03 | | 0.05 | | 0.35 |
| Benzo(a)pyrene | DETSC 3303# | 0.03 | mg/kg | < 0.03 | < 0.03 | | 0.10 | | 1.2 |
| Indeno(1,2,3-c,d)pyrene | DETSC 3303# | 0.03 | mg/kg | < 0.03 | < 0.03 | | 0.05 | | 0.68 |
| Dibenzo(a,h)anthracene | DETSC 3303# | 0.03 | mg/kg | < 0.03 | < 0.03 | | < 0.03 | | 0.19 |
| Benzo(g,h,i)perylene | DETSC 3303# | 0.03 | mg/kg | < 0.03 | < 0.03 | | 0.05 | | 0.82 |
| PAH - USEPA 16, Total | DETSC 3303 | 0.1 | mg/kg | < 0.10 | 0.13 | | 1.2 | | 6.0 |
| **Phenols** | | | | | | | | | |
| Phenol - Monohydric | DETSC 2130# | 0.3 | mg/kg | < 0.3 | < 0.3 | | < 0.3 | | < 0.3 |

Key: * -not accredited. # -MCERTS (accreditation only applies if report carries the MCERTS logo). n/s -not supplied.

# Summary of Asbestos Analysis
# Soil Samples

*Our Ref* 20-17036
*Client Ref*
*Contract Title* Willow Cottage

| Lab No | Sample ID | Material Type | Result | Comment* | Analyst |
|---|---|---|---|---|---|
| 1722546 | TP1 0.10 | SOIL | NAD | none | Jordan Eadington |
| 1722547 | TP2 0.20 | SOIL | NAD | none | Jordan Eadington |
| 1722549 | TP4 0.40 | SOIL | NAD | none | Jordan Eadington |
| 1722551 | TP5 0.60 | SOIL | NAD | none | Jordan Eadington |

Crocidolite = Blue Asbestos, Amosite = Brown Asbestos, Chrysotile = White Asbestos. Anthophyllite, Actinolite and Tremolite are other forms of Asbestos. Samples are analysed by DETSC 1101 using polarised light microscopy in accordance with HSG248 and documented in-house methods. NAD = No Asbestos Detected. Where a sample is NAD, the result is based on analysis of at least 2 sub-samples and should be taken to mean 'no asbestos detected in sample'. Key: * - not included in laboratory scope of accreditation.

# Information in Support of the Analytical Results

*Our Ref* 20-17036
*Client Ref*
*Contract* Willow Cottage

## Containers Received & Deviating Samples

| Lab No | Sample ID | Date Sampled | Containers Received | Holding time exceeded for tests | Inappropriate container for tests |
|---|---|---|---|---|---|
| 1722546 | TP1 0.10 SOIL | 27/08/20 | GJ 250ml, GJ 60ml x2 | Sulphur (free) (7 days), pH + Conductivity (7 days) | |
| 1722547 | TP2 0.20 SOIL | 27/08/20 | GJ 250ml, GJ 60ml x2 | Sulphur (free) (7 days), pH + Conductivity (7 days) | |
| 1722548 | TP2 0.90 SOIL | 27/08/20 | PT 1L | pH + Conductivity (7 days) | |
| 1722549 | TP4 0.40 SOIL | 27/08/20 | GJ 250ml, GJ 60ml x2 | Sulphur (free) (7 days), pH + Conductivity (7 days) | |
| 1722550 | TP4 0.90 SOIL | 27/08/20 | PT 1L | pH + Conductivity (7 days) | |
| 1722551 | TP5 0.60 SOIL | 27/08/20 | GJ 250ml, GJ 60ml x2, PT 1L | Sulphur (free) (7 days), pH + Conductivity (7 days) | |

Key: G-Glass J-Jar P-Plastic T-Tub

DETS cannot be held responsible for the integrity of samples received whereby the laboratory did not undertake the sampling. In this instance samples received may be deviating. Deviating Sample criteria are based on British and International standards and laboratory trials in conjunction with the UKAS note 'Guidance on Deviating Samples'. All samples received are listed above. However, those samples that have additional comments in relation to hold time, inappropriate containers etc are deviating due to the reasons stated. This means that the analysis is accredited where applicable, but results may be compromised due to sample deviations. If no sampled date (soils) or date+time (waters) has been supplied then samples are deviating. However, if you are able to supply a sampled date (and time for waters) this will prevent samples being reported as deviating where specific hold times are not exceeded and where the container supplied is suitable.

## Soil Analysis Notes

Inorganic soil analysis was carried out on a dried sample, crushed to pass a 425µm sieve, in accordance with BS1377.

Organic soil analysis was carried out on an 'as received' sample. Organics results are corrected for moisture and expressed on a dry weight basis.

The Loss on Drying, used to express organics analysis on an air dried basis, is carried out at a temperature of 28°C +/-2°C.

## Disposal

From the issue date of this test certificate, samples will be held for the following times prior to disposal :-

Soils - 1 month, Liquids - 2 weeks, Asbestos (test portion) - 6 months

End of Report

# APPENDIX F – TRANSFER NOTES

# L & D PLANT HIRE Ltd

**HAULAGE • AGGREGATES • TOP SOIL**

NO.: 1538

Date: 2 / 7 / 2021

51 BRANDIE BROOK
JOHNSTOWN
WREXHAM
LL14 2AH

TEL & FAX: 01978 846359
MOBILE: 07917 350007

Customer Names: GOWER HOMES

Collect From: RUABON

Deliver To: ~~ACREGAIR~~ ACREFAIR

Gross: _____

Tare: _____

Net: _____

| | |
|---|---|
| Collection | ✓ |
| Delivery | |

Type of material (please tick):

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Inert | | Spoil | | 170504 | | Hazardous | | Non-Haz. | |
| Type 1 | | BF2 | | 6FS | | Pipe Bedding | | Recycled | |
| Topsoil | | Gravel | ✓ | Sand | | Planings | | Ballast | |

| | | | | | |
|---|---|---|---|---|---|
| 8 Wheeler | | Other | | SIC | |

| Time On Site: | Time Off Sheet | Time Waited | Site Signature |
|---|---|---|---|
| | | | |

Driver's Name: DAVE

Vehicle Reg. No [redacted]

Site Signature [redacted]

Site Print

CPA

# L & D PLANT HIRE Ltd

**HAULAGE • AGGREGATES • TOP SOIL**

NO.: 1562

Date: 6 / 7 / 2021

51 BRANDIE BROOK
JOHNSTOWN
WREXHAM
LL14 2AH

TEL & FAX: 01978 846359
MOBILE: 07917 350007

Customer Names: Boney Homes

Collect From: Ruabon

Deliver To: Acrefair

Gross: _____

Tare: _____

Net: _____

| | |
|---|---|
| Collection | ✓ |
| Delivery | |

Type of material (please tick):

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Inert | | Spoil | | 170504 | | Hazardous | | Non-Haz. | |
| Type 1 | | BF2 | | 6FS | | Pipe Bedding | | Recycled | |
| Topsoil | | Gravel | ✓ | Sand | | Planings | | Ballast | |

| | | | | | |
|---|---|---|---|---|---|
| 8 Wheeler | | Other | | SIC | |

| Time On Site: | Time Off Sheet | Time Waited | Site Signature |
|---|---|---|---|
| | | | |

Driver's Name: Dave

Vehicle Reg. No [redacted]

Site Signature [redacted]

Site Print

# L & D PLANT HIRE Ltd

**HAULAGE • AGGREGATES • TOP SOIL**

NO.: 1548

Date: 6 / 7 / 2021

51 BRANDIE BROOK
JOHNSTOWN
WREXHAM
LL14 2AH

TEL & FAX: 01978 846359
MOBILE: 07917 350007

| | |
|---|---|
| Customer Names: GOWER HOMES | |
| Collect From: RUABON<br><br>Deliver To: ~~CHESTER~~ ACCRINGTON | Gross: _____<br><br>Tare: _____<br><br>Net: _____ |
| | Collection ✓ |
| | Delivery |

Type of material (please tick):

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Inert | | Spoil | | 170504 | | Hazardous | | Non-Haz. | |
| Type 1 | | BF2 | | 6FS | | Pipe Bedding | | Recycled | |
| Topsoil | | Gravel | ✓ | Sand | | Planings | | Ballast | |

| | | | | | |
|---|---|---|---|---|---|
| 8 Wheeler | ✓ | Other | | SIC | |
| Time On Site: | | Time Off Sheet | Time Waited | | Site Signature |
| | | | | | |
| Driver's Name: RICHARD | | | [redacted] | | |
| Site Signature [redacted] | | | Site Print | | |

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(9)

# L & D PLANT HIRE Ltd

**HAULAGE • AGGREGATES • TOP SOIL**

NO.: 1546

Date: 6 / 7 / 2021

51 BRANDIE BROOK
JOHNSTOWN
WREXHAM
LL14 2AH

TEL & FAX: 01978 846359
MOBILE: 07917 350007

| | |
|---|---|
| Customer Names: GOWER HOMES | |
| Collect From: RUABON | Gross: |
| | Tare: |
| Deliver To: ACERFIAR | Net: |
| | Collection ✓ |
| | Delivery |

Type of material (please tick):

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Inert | | Spoil | | 170504 | | Hazardous | | Non-Haz. | |
| Type 1 | | BF2 | | 6FS | | Pipe Bedding | | Recycled | |
| Topsoil | | Gravel | ✓ | Sand | | Planings | | Ballast | |

| | | | | | |
|---|---|---|---|---|---|
| 8 Wheeler | ✓ | Other | | SIC | |
| Time On Site: | Time Off Sheet | Time Waited | Site Signature | | |
| | | | | | |
| Driver's Name: RHYS | | Vehicle Reg. No [redacted] | | | |
| Site Signature [redacted] | | Site Print | | | |

CPA

(5)

# L & D PLANT HIRE Ltd

**HAULAGE • AGGREGATES • TOP SOIL**

NO.: 1540

Date: 6 / 7 /2021

51 BRANDIE BROOK
JOHNSTOWN
WREXHAM
LL14 2AH

TEL & FAX: 01978 846359
MOBILE: 07917 350007

Customer Names: Gower Homes

Collect From: Ruabon

Deliver To: Acrefair

Gross: _____

Tare: _____

Net: _____

| | |
|---|---|
| Collection | ✓ |
| Delivery | |

Type of material (please tick):

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Inert | | Spoil | | 170504 | | Hazardous | | Non-Haz. | |
| Type 1 | | BF2 | | 6FS | | Pipe Bedding | | Recycled | |
| Topsoil | | Gravel | ✓ | Sand | | Planings | | Ballast | |

| | | | | | |
|---|---|---|---|---|---|
| 8 Wheeler | ✓ | Other | | SIC | |
| Time On Site: | | Time Off Sheet | | Time Waited | Site Signature |
| | | | | | |

Driver's Name: RHYS

Vehicle Reg. No [redacted]

Site Signature [redacted]

Site Print

CPA

# L & D PLANT HIRE Ltd

HAULAGE • AGGREGATES • TOP SOIL

NO.: 1544

Date: 6 / 1 / 2021

51 BRANDIE BROOK
JOHNSTOWN
WREXHAM
LL14 2AH

TEL & FAX: 01978 846359
MOBILE: 07917 350007

Customer Names: GOWER HOMES

Collect From: RUABON

Deliver To: ACE FAIR

Gross: _____

Tare: _____

Net: _____

| | |
|---|---|
| Collection | ✓ |
| Delivery | |

Type of material (please tick):

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Inert | | Spoil | | 170504 | | Hazardous | | Non-Haz. | |
| Type 1 | | BF2 | | 6FS | | Pipe Bedding | | Recycled | |
| Topsoil | | Gravel | ✓ | Sand | | Planings | | Ballast | |

| | | | | | |
|---|---|---|---|---|---|
| 8 Wheeler | ✓ | Other | | SIC | |

| Time On Site: | Time Off Sheet | Time Waited | Site Signature |
|---|---|---|---|
| | | | |

Driver's Name: RHYS

Vehicle Reg. No [redacted]

Site Signature [redacted]

Site Print

CPA

# L & D PLANT HIRE Ltd

HAULAGE • AGGREGATES • TOP SOIL

NO.: 1559

Date: 1 / 7 / 2021

1 BRANDIE BROOK
HNSTOWN
EXHAM
.4 2AH

TEL & FAX: 01978 846359
MOBILE: 07917 350007

Customer Names: Bower Homes

Collect From: RUABON.

Deliver To: ACRE FAIR.

Gross: _____

Tare: _____

Net: _____

| | |
|---|---|
| Collection | ✓ |
| Delivery | |

Type of material (please tick):

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Inert | | Spoil | | 170504 | | Hazardous | | Non-Haz. | |
| Type 1 | | BF2 | | 6FS | | Pipe Bedding | | Recycled | |
| Topsoil | | Gravel | | Sand | | Planings | | Ballast | |

| | | | | | |
|---|---|---|---|---|---|
| 8 Wheeler | ✓ | Other | | SIC | |

| Time On Site: | Time Off Sheet | Time Waited | Site Signature |
|---|---|---|---|
| | | | |

Driver's Name: DAVE

Vehicle Reg. No [redacted]

Site Signature [redacted]

Site Print CEVANS

CPA

(8)

# L & D PLANT HIRE Ltd

**HAULAGE • AGGREGATES • TOP SOIL**

NO.: 1545

Date: 6 / 7 / 2021

51 BRANDIE BROOK
JOHNSTOWN
WREXHAM
LL14 2AH

TEL & FAX: 01978 846359
MOBILE: 07917 350007

Customer Names: GOWER HOMES

Collect From: RUABON

Deliver To: ACCIAR

Gross: _____

Tare: _____

Net: _____

| | |
|---|---|
| Collection | ✓ |
| Delivery | |

Type of material (please tick):

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Inert | | Spoil | | 170504 | | Hazardous | | Non-Haz. | |
| Type 1 | | BF2 | | 6FS | | Pipe Bedding | | Recycled | |
| Topsoil | | Gravel | ✓ | Sand | | Planings | | Ballast | |

| | | | | | |
|---|---|---|---|---|---|
| 8 Wheeler | ✓ | Other | | SIC | |
| Time On Site: | | Time Off Sheet | | Time Waited | Site Signature |
| | | | | | |

Driver's Name: RHYS

[redacted]

Site [redacted]

Site Print: CLWYD-S

CPA

# L & D PLANT HIRE Ltd

**HAULAGE • AGGREGATES • TOP SOIL**

NO.: 1558

Date: 6 / 7 / 2021

51 BRANDIE BROOK
JOHNSTOWN
WREXHAM
LL14 2AH

TEL & FAX: 01978 846359
MOBILE: 07917 350007

Customer Names: Gower Homes

Collect From: Ruabon

Deliver To: Acrefair

Gross: _____

Tare: _____

Net: _____

| | |
|---|---|
| Collection | ✓ |
| Delivery | |

Type of material (please tick):

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Inert | | Spoil | | 170504 | | Hazardous | | Non-Haz. | |
| Type 1 | | BF2 | | 6FS | | Pipe Bedding | | Recycled | |
| Topsoil | | Gravel | ✓ | Sand | | Planings | | Ballast | |

| | | | | | |
|---|---|---|---|---|---|
| 8 Wheeler | ✓ | Other | | SIC | |

| Time On Site: | Time Off Sheet | Time Waited | Site Signature |
|---|---|---|---|
| | | | |

Driver's Name: Davis

Vehicle Reg. No [redacted]

Site Signature [redacted]

Site Print Coles

CPA

# L & D PLANT HIRE Ltd

**HAULAGE • AGGREGATES • TOP SOIL**

NO.: 1557

Date: 6 / 7 /2021

51 BRANDIE BROOK
JOHNSTOWN
WREXHAM
LL14 2AH

TEL & FAX: 01978 846359
MOBILE: 07917 350007

Customer Names: GUNEY HOMES

Collect From: RUABON

Deliver To: ACRE FAIR

Gross: _____

Tare: _____

Net: _____

| | |
|---|---|
| Collection | ✓ |
| Delivery | |

Type of material (please tick):

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Inert | | Spoil | | 170504 | | Hazardous | | Non-Haz. | |
| Type 1 | | BF2 | | 6FS | | Pipe Bedding | | Recycled | |
| Topsoil | | Gravel | ✓ | Sand | | Planings | | Ballast | |

| | | | | | |
|---|---|---|---|---|---|
| 8 Wheeler | | Other | | SIC | |

| Time On Site: | Time Off Sheet | Time Waited | Site Signature |
|---|---|---|---|
| | | | |

Driver's Name: DAVE

Vehicle Reg. No [redacted]

[redacted]

Site Print

CPA

# L & D PLANT HIRE Ltd

**HAULAGE • AGGREGATES • TOP SOIL**

NO.: 1543

Date: 6 / 7 / 21

51 BRANDIE BROOK
JOHNSTOWN
WREXHAM
LL14 2AH

TEL & FAX: 01978 846359
MOBILE: 07917 350007

Customer Names: GOWER HOMES

Collect From: RUABON

Deliver To: ACE KLAR.

Gross: _____

Tare: _____

Net: _____

| | |
|---|---|
| Collection | ✓ |
| Delivery | |

Type of material (please tick):

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Inert | | Spoil | | 170504 | | Hazardous | | Non-Haz. | |
| Type 1 | | BF2 | | 6FS | | Pipe Bedding | | Recycled | |
| Topsoil | | Gravel | ✓ | Sand | | Planings | | Ballast | |

| | | | | | |
|---|---|---|---|---|---|
| 8 Wheeler | ✓ | Other | | SIC | |

| Time On Site: | Time Off Sheet | Time Waited | Site Signature |
|---|---|---|---|
| | | | |

Driver's Name: RHYS

Vehicle Reg. No [redacted]

Site Signature [redacted]

Site Print GLYNN S

CPA

# L & D PLANT HIRE Ltd

HAULAGE • AGGREGATES • TOP SOIL

NO.: 1556

Date: 6 / 7 / 2024

51 BRANDIE BROOK
JOHNSTOWN
WREXHAM
LL14 2AH

TEL & FAX: 01978 846359
MOBILE: 07917 350007

Customer Names: GOWER HOMES

Collect From: RUABON

Deliver To: ACREFAIR

Gross: _____

Tare: _____

Net: _____

| | |
|---|---|
| Collection | ✓ |
| Delivery | |

Type of material (please tick):

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Inert | | Spoil | | 170504 | | Hazardous | | Non-Haz. | |
| Type 1 | | BF2 | | 6FS | | Pipe Bedding | | Recycled | |
| Topsoil | | Gravel | ✓ | Sand | | Planings | | Ballast | |

| | | | | | |
|---|---|---|---|---|---|
| 8 Wheeler | | Other | | SIC | |
| Time On Site: | Time Off Sheet | Time Waited | Site Signature | | |
| | | | | | |

Driver's Name: DAVE

Vehicle Reg. No [redacted]

[redacted]

Site Print: GGVA1-5

CPA

# L & D PLANT HIRE Ltd

**HAULAGE • AGGREGATES • TOP SOIL**

NO.: 1542

Date: 6 / 7 / 2021

51 BRANDIE BROOK
JOHNSTOWN
WREXHAM
LL14 2AH

TEL & FAX: 01978 846359
MOBILE: 07917 350007

Customer Names: GOWER HOMES

Collect From: RUABON

Deliver To: ACEFAIR

Gross: _____

Tare: _____

Net: _____

| | |
|---|---|
| Collection | ✓ |
| Delivery | |

Type of material (please tick):

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Inert | | Spoil | | 170504 | | Hazardous | | Non-Haz. | |
| Type 1 | | BF2 | | 6FS | | Pipe Bedding | | Recycled | |
| Topsoil | | Gravel | ✓ | Sand | | Planings | | Ballast | |

| | | | | | |
|---|---|---|---|---|---|
| 8 Wheeler | ✓ | Other | | SIC | |

| Time On Site: | Time Off Sheet | Time Waited | Site Signature |
|---|---|---|---|
| | | | |

Driver's Name: RHYS

Vehicle Reg. No [redacted]

Site Signature [redacted]

Site Print GEMMS

CPA

# L & D PLANT HIRE Ltd

HAULAGE • AGGREGATES • TOP SOIL

NO.: 1555

Date: 6 / 7 / 2021

51 BRANDIE BROOK
JOHNSTOWN
WREXHAM
LL14 2AH

TEL & FAX: 01978 846359
MOBILE: 07917 350007

Customer Names: Gower Homes

Collect From: Ruabon

Deliver To: Acrefare

Gross: _____

Tare: _____

Net: _____

| | |
|---|---|
| Collection | ✓ |
| Delivery | |

Type of material (please tick):

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Inert | | Spoil | | 170504 | | Hazardous | | Non-Haz. | |
| Type 1 | | BF2 | | 6FS | | Pipe Bedding | | Recycled | |
| Topsoil | | Gravel | ✓ | Sand | | Planings | | Ballast | |

| 8 Wheeler | | Other | | SIC | |
|---|---|---|---|---|---|
| Time On Site: | Time Off Sheet | Time Waited | Site Signature | | |
| | | | | | |

Driver's Name: DJL

Vehicle Reg. No [redacted]

Site Signature [redacted]

Site Print G Evans

CPA

# L & D PLANT HIRE Ltd

HAULAGE • AGGREGATES • TOP SOIL

NO.: 1553

Date: 6 / 7 / 2024

51 BRANDIE BROOK
JOHNSTOWN
WREXHAM
LL14 2AH

TEL & FAX: 01978 846359
MOBILE: 07917 350007

Customer Names: GOWER HOMES

Collect From: RUABON.

Deliver To: ACRE FAIR.

Gross: _____

Tare: _____

Net: _____

| | |
|---|---|
| Collection | ✓ |
| Delivery | |

Type of material (please tick):

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Inert | | Spoil | | 170504 | | Hazardous | | Non-Haz. | |
| Type 1 | | BF2 | | 6FS | | Pipe Bedding | | Recycled | |
| Topsoil | | Gravel | ✓ | Sand | | Planings | | Ballast | |

| | | | | | |
|---|---|---|---|---|---|
| 8 Wheeler | | Other | | SIC | |

| Time On Site: | Time Off Sheet | Time Waited | Site Signature |
|---|---|---|---|
| | | | |

Driver's Name: DAVE

Vehicle Reg. No [redacted]

Site Signature [redacted]

Site Print

CPA

# L & D PLANT HIRE Ltd

HAULAGE • AGGREGATES • TOP SOIL

NO.: 1541

Date: 6 / 7 / 2021

51 BRANDIE BROOK
JOHNSTOWN
WREXHAM
LL14 2AH

TEL & FAX: 01978 846359
MOBILE: 07917 350007

Customer Names: CONNER HOMES

Collect From: RUABON

Deliver To: ACREFAIR

Gross: _____

Tare: _____

Net: _____

| | |
|---|---|
| Collection | ✓ |
| Delivery | |

Type of material (please tick):

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Inert | | Spoil | | 170504 | | Hazardous | | Non-Haz. | |
| Type 1 | | BF2 | | 6FS | | Pipe Bedding | | Recycled | |
| Topsoil | | Gravel | ✓ | Sand | | Planings | | Ballast | |

| | | | | | |
|---|---|---|---|---|---|
| 8 Wheeler | ✓ | Other | | SIC | |

| Time On Site: | Time Off Sheet | Time Waited | Site Signature |
|---|---|---|---|
| | | | |

Driver's Name: RHYS

Vehicle Reg. No. [redacted]

Site Signature [redacted]

Site Print

# L & D PLANT HIRE Ltd

**HAULAGE • AGGREGATES • TOP SOIL**

NO.: 1554

Date: 6 / 7 /2021

51 BRANDIE BROOK
JOHNSTOWN
WREXHAM
LL14 2AH

TEL & FAX: 01978 846359
MOBILE: 07917 350007

Customer Names: GOWER HOMES

Collect From:

RUABON.

Deliver To:

ACRE FAIR.

Gross: _____

Tare: _____

Net: _____

| | |
|---|---|
| Collection | ✓ |
| Delivery | |

Type of material (please tick):

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Inert | | Spoil | | 170504 | | Hazardous | | Non-Haz. | |
| Type 1 | | BF2 | | 6FS | | Pipe Bedding | | Recycled | |
| Topsoil | | Gravel | ✓ | Sand | | Planings | | Ballast | |

| | | | | | |
|---|---|---|---|---|---|
| 8 Wheeler | ✓ | Other | | SIC | |

| Time On Site: | Time Off Sheet | Time Waited | Site Signature |
|---|---|---|---|
| | | | |

| | |
|---|---|
| Driver's Name: DAVE | Vehicle Reg. No [redacted] |
| Site Signature [redacted] | Site Print |

CPA

# L & D PLANT HIRE Ltd

**HAULAGE • AGGREGATES • TOP SOIL**

NO.: 1552

Date: 6 / 7 / 2024

51 BRANDIE BROOK
JOHNSTOWN
WREXHAM
LL14 2AH

TEL & FAX: 01978 846359
MOBILE: 07917 350007

Customer Names: GOWER HOMES

Collect From: RUABON

Deliver To: ACREFAIR

Gross: _____

Tare: _____

Net: _____

| | |
|---|---|
| Collection | ✓ |
| Delivery | |

Type of material (please tick):

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Inert | | Spoil | | 170504 | | Hazardous | | Non-Haz. | |
| Type 1 | | BF2 | | 6FS | | Pipe Bedding | | Recycled | |
| Topsoil | | Gravel | ✓ | Sand | | Planings | | Ballast | |

| | | | | | |
|---|---|---|---|---|---|
| 8 Wheeler | | Other | | SIC | |

| Time On Site: | Time Off Sheet | Time Waited | Site Signature |
|---|---|---|---|
| | | | |

Driver's Name: DAVE

Vehicle Reg. No [redacted]

Site Signature [redacted]

Site Print

CPA

# L & D PLANT HIRE Ltd

HAULAGE • AGGREGATES • TOP SOIL

NO.: 1551

Date: 6 / 7 / 2021

51 BRANDIE BROOK
JOHNSTOWN
WREXHAM
LL14 2AH

TEL & FAX: 01978 846359
MOBILE: 07917 350007

Customer Names: GOWER HOMES

Collect From: RUABON

Deliver To: ACREFAIR

Gross: _____

Tare: _____

Net: _____

| | |
|---|---|
| Collection | ✓ |
| Delivery | |

Type of material (please tick):

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Inert | | Spoil | | 170504 | | Hazardous | | Non-Haz. | |
| Type 1 | | BF2 | | 6FS | | Pipe Bedding | | Recycled | |
| Topsoil | | Gravel | ✓ | Sand | | Planings | | Ballast | |

| | | | | | |
|---|---|---|---|---|---|
| 8 Wheeler | ✓ | Other | | SIC | |

| Time On Site: | Time Off Sheet | Time Waited | Site Signature |
|---|---|---|---|
| | | | |

Driver's Name: DAVE

Vehicle Reg. No [redacted]

Site Signature [redacted]

Site Print

# L & D PLANT HIRE Ltd

**HAULAGE • AGGREGATES • TOP SOIL**

NO.: 1539

Date: 6 / 7 / 2021

51 BRANDIE BROOK
JOHNSTOWN
WREXHAM
LL14 2AH

TEL & FAX: 01978 846359
MOBILE: 07917 350007

Customer Names: GOWER HOMES

Collect From: RUABON

Deliver To: ACREFAIR

Gross: _____

Tare: _____

Net: _____

| | |
|---|---|
| Collection | ✓ |
| Delivery | |

Type of material (please tick):

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Inert | | Spoil | | 170504 | | Hazardous | | Non-Haz. | |
| Type 1 | | BF2 | | 6FS | | Pipe Bedding | | Recycled | |
| Topsoil | | Gravel | ✓ | Sand | | Planings | | Ballast | |

| | | | | | |
|---|---|---|---|---|---|
| 8 Wheeler | ✓ | Other | | SIC | |

| Time On Site: | Time Off Sheet | Time Waited | Site Signature |
|---|---|---|---|
| | | | |

Driver's Name: RHYS

Vehicle Reg. No [redacted]

Site Signature [redacted]

Site Print

CPA

# L & D PLANT HIRE Ltd

HAULAGE • AGGREGATES • TOP SOIL

NO.: 1577

Date: 9 / 7 / 2021

51 BRANDIE BROOK
JOHNSTOWN
WREXHAM
LL14 2AH

TEL & FAX: 01978 846359
MOBILE: 07917 350007

| | |
|---|---|
| Customer Names: | GONER HOMES |
| Collect From: RUABON<br><br>Deliver To: ACER FAIR | Gross: _____<br><br>Tare: _____<br><br>Net: _____ |
| | Collection ✓ |
| | Delivery |

Type of material (please tick):

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Inert | | Spoil | | 170504 | | Hazardous | | Non-Haz. | |
| Type 1 | | BF2 | | 6FS | | Pipe Bedding | | Recycled | |
| Topsoil | | Gravel | ✓ | Sand | | Planings | | Ballast | |

| | | | | | |
|---|---|---|---|---|---|
| 8 Wheeler | | Other | | SIC | |
| Time On Site: | Time Off Sheet | Time Waited | Site Signature | | |
| | | | | | |
| Driver's Name: DAVE | | Vehicle Reg. No [redacted] | | | |
| Site Signature [redacted] | | Site Print | | | |

CPA

# L & D PLANT HIRE Ltd

**HAULAGE • AGGREGATES • TOP SOIL**

NO.: 1576

Date: 9 / 7 / 2021

51 BRANDIE BROOK
JOHNSTOWN
WREXHAM
LL14 2AH

TEL & FAX: 01978 846359
MOBILE: 07917 350007

Customer Names: Gower Homes

Collect From: Ruabon

Deliver To: ACRE Fair

Gross: _____

Tare: _____

Net: _____

| | |
|---|---|
| Collection | ✓ |
| Delivery | |

Type of material (please tick):

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Inert | | Spoil | | 170504 | | Hazardous | | Non-Haz. | |
| Type 1 | | BF2 | | 6FS | | Pipe Bedding | | Recycled | |
| Topsoil | | Gravel | ✓ | Sand | | Planings | | Ballast | |

| | | | | | |
|---|---|---|---|---|---|
| 8 Wheeler | ✓ | Other | | SIC | |

| Time On Site: | Time Off Sheet | Time Waited | Site Signature |
|---|---|---|---|
| | | | |

Driver's Name: Dave

Vehicle Reg. No [redacted]

Site Signature [redacted]

Site Print

CPA

# L & D PLANT HIRE Ltd

**HAULAGE • AGGREGATES • TOP SOIL**

NO.: 1574

Date: 9 / 7 / 2021

51 BRANDIE BROOK
JOHNSTOWN
WREXHAM
LL14 2AH

TEL & FAX: 01978 846359
MOBILE: 07917 350007

Customer Names: Gower Homes

Collect From: Ruabon

Deliver To: Acre Fairs

Gross: _____

Tare: _____

Net: _____

| | |
|---|---|
| Collection | ✓ |
| Delivery | |

Type of material (please tick):

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Inert | | Spoil | | 170504 | | Hazardous | | Non-Haz. | |
| Type 1 | | BF2 | | 6FS | | Pipe Bedding | | Recycled | |
| Topsoil | | Gravel | ✓ | Sand | | Planings | | Ballast | |

| | | | | | |
|---|---|---|---|---|---|
| 8 Wheeler | | Other | | SIC | |
| Time On Site: | | Time Off Sheet | Time Waited | | Site Signature |
| | | | | | |

Driver's Name: DJR

Vehicle Reg. No [redacted]

Site Signature [redacted]

Site Print

CPA

# L & D PLANT HIRE Ltd

**HAULAGE • AGGREGATES • TOP SOIL**

NO.: 1575

Date: 9 / 7 /2024

51 BRANDIE BROOK
JOHNSTOWN
WREXHAM
LL14 2AH

TEL & FAX: 01978 846359
MOBILE: 07917 350007

| | |
|---|---|
| Customer Names: | BOWER HOMES |
| Collect From: RUABON<br><br>Deliver To: ACRE FAIRE | Gross: _____<br><br>Tare: _____<br><br>Net: _____ |
| | Collection ✓ |
| | Delivery |

Type of material (please tick):

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Inert | | Spoil | | 170504 | | Hazardous | | Non-Haz. | |
| Type 1 | | BF2 | | 6FS | | Pipe Bedding | | Recycled | |
| Topsoil | | Gravel | ✓ | Sand | | Planings | | Ballast | |

| | | | | | |
|---|---|---|---|---|---|
| 8 Wheeler | ✓ | Other | | SIC | |
| Time On Site: | Time Off Sheet | Time Waited | Site Signature | | |
| | | | | | |
| Driver's Name: DAVE | | Vehicle Reg. No [redacted] | | | |
| Site Signature [redacted] | | Site Print | | | |

CPA

# L & D PLANT HIRE Ltd

**HAULAGE • AGGREGATES • TOP SOIL**

NO.: 1573

Date: 9 / 7 / 2021

51 BRANDIE BROOK
JOHNSTOWN
WREXHAM
LL14 2AH

TEL & FAX: 01978 846359
MOBILE: 07917 350007

Customer Names: GONER HOMES

Collect From: RUABON

Deliver To: ACREFAIRE

[redacted]

Gross: _____

Tare: _____

Net: _____

| | |
|---|---|
| Collection | ✓ |
| Delivery | |

Type of material (please tick):

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Inert | | Spoil | | 170504 | | Hazardous | | Non-Haz. | |
| Type 1 | | BF2 | | 6FS | | Pipe Bedding | | Recycled | |
| Topsoil | | Gravel | ✓ | Sand | | Planings | | Ballast | |

| | | | | | |
|---|---|---|---|---|---|
| 8 Wheeler | | Other | | SIC | |

| Time On Site: | Time Off Sheet | Time Waited | Site Signature |
|---|---|---|---|
| | | | |

Driver's Name: DAVE

Vehicle Reg. No [redacted]

Site Signature [redacted]

Site Print

CPA