



e3p

Phase II Geoenvironmental Site Assessment
Well Street, Buckley

Reference: 14-278-R2
Date: October 2020



PHASE II GEOENVIRONMENTAL SITE ASSESSMENT

Proposed Residential Development
Well Street
Buckley
Wales
CH7 2PQ

Prepared for:
Alan Johnston Partnership Ltd

Report Ref: 14-278-R2
Date Issued: October 2020

Well Street, Buckley

Phase II Geoenvironmental Site Assessment
October 2020

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QUALITY ASSURANCE

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| PROJECT NUMBER | 14-278 | | |
| VERSION | Version 1 | | |
| REMARKS | Draft for Comment | | |
| DATE | October 2020 | | |
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EXECUTIVE SUMMARY

| | | |
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| Site Address | Land at Well Street, Buckley, Wales, CH7 2PQ | |
| Grid Reference | E326750, N363630 | |
| Site Area | 5.31 Hectares | |
| Current Site Use | The site is currently utilised as agricultural land with evidence of silage production predominantly. The site is split north west-south east by a hedgerow. | |
| | The site is accessed from Well Street present along the south eastern boundary and lined with hedgerow. The north eastern and north western boundaries are lined with fencing backing onto residential gardens. The south west is also lined with hedgerow and farmhouse beyond. | |
| Proposed Development | It is understood that the site will be developed for residential end use comprising 154 units (through a mixture of apartment, detached, semi-detached and terraced property) with associated estate roads, utility infrastructure, private gardens and areas of landscaping. | |
| | A proposed development plan has been included as an attachment (Ref 14-278-002). | |
| Environmental Setting | Drift Geology | Glacial Till (Devensian) – Diamicton, Clay. |
| | Bedrock Geology | Gwepsyr Sandstone (East) Pennine Lower Coal Measures (mudstone, siltstone, sandstone) (West) Bowland Shale Formation (mudstone – South) |
| | Faults | An inferred fault is present bisecting the site north-south due to the change in bedrock strata through the site. |
| | Hydrogeology | Secondary A Aquifer (Bedrock) Secondary Undifferentiated (Drift) |
| | Hydrology | A large pond is present 31 m south and a number of tributaries of the River Alyn are present in the immediate (30 m) surrounding area. The River Alyn is noted at 987m south of the site. |
| | Flood Risk | Low lying areas of the site are considered to be at risk from surface water flooding however, no risk of fluvial flooding has been identified in data searches. |
| Natural Landform and Geomorphology | The site is located between the Dee estuary and the northern welsh mountains as such there is undulation throughout the site evident of glacial retreat. The site in its current state is likely to be the natural landform. | |
| Site History | A review of the historical mapping indicated the site has always comprised two undeveloped fields, split in half by a field boundary. | |
| | On the 1872 mapping, a pond in noted on the northern boundary however, this was infilled by 1899. | |
| | A hedgerow is noted to be present between 1982 and 1987 cutting the southern field through the centre. No changes have occurred since. | |



Previous Reports

Pertinent points from the previously completed E3P Ltd Phase 1 Desk Study are as follows:

- ✦ Site is underlain by glacial till (clay) and three bedrock strata through its length (sandstone, mudstone and siltstone) with secondary undifferentiated aquifer in the bedrock.
- ✦ Low lying areas of the site are at risk of surface flooding from rivers.
- ✦ No historic structures have been present on site.
- ✦ The south western area of the site is in a 5-10% Radon area and will require mitigation.
- ✦ Site is reported within a Coal authority areas but not within a development high risk.
- ✦ Soakaway drainage is unlikely to be suitable given cohesive clay stratum.
- ✦ In the absence of anthropogenic processes at the site there is a low likelihood of significant contamination and therefore a low risk to human health.
- ✦ Similarly, in the absence of significant contamination, cohesive strata, and the presence of an undifferentiated aquifer there is considered a low risk to controlled waters.
- ✦ Infilled ponds/hedgerows are a likely source of Made Ground.
- ✦ Made Ground and localised areas of peat and possibility of shallow mine workings are potential sources of ground gas at the site.

E3P has also been provided with a Smith Grant Phase 1 and 2 Contaminated Land and Geotechnical Assessment completed on behalf of Flintshire County Council September 2017 (Ref: R2458-R01-v1). The pertinent points are listed below:

- ✦ Site comprises a vacant parcel of open land with two fields separated by a hedgerow.
- ✦ Historical mapping confirmed the land has remained undeveloped through its history.
- ✦ 12 trial pits completed across the site.
- ✦ Ground conditions identified across the site were consistent and comprised a surface cover of topsoil overlying a firm to stiff glacial clay. One location at the southeast boundary identified soft clay with peat.
- ✦ Groundwater was not encountered other than one trial pit in the south east that was flooded.
- ✦ A human health assessment confirmed the presence of lead in the topsoil stratum.



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| <p>Previous Reports Continued...</p> | <ul style="list-style-type: none"> ✿ Ground gas monitoring did not identify any elevated concentrations of carbon dioxide or methane. ✿ The report recommended shallow traditional spread foundations across the site other than where groundwater and peat were identified to the south east boundary of the site. It was recommended this material is excavated and replaced with an engineered fill. |
| <p>Utility Locations</p> | <p>A formal GPR survey has not been completed to date. However, a review of national utility plans show overhead high voltage cables to the north west of the site and along Well Street to the south east. Further underground HV cables exist along the north eastern boundary.</p> |
| <p>Landfill Sites and Ground Gases</p> | <p>No currently active or historic landfills are identified within 250 m of the site.</p> <p>Historical pond is noted to the north of the site, since infilled. Historic hedgerows are noted in the south since removed. The Made Ground infill materials used in each location could be a source of ground gas generation.</p> <p>One area of peat was noted within the previously completed site investigation that could also present a source of ground gas generation.</p> |
| <p>Radon</p> | <p>The south western area of the site is within an intermediate probability radon area where 5-10% of homes will be affected. The remainder of the site is considered to be in a lower probability area where 1% of homes will be affected. Basic radon protective measures may be necessary within the site.</p> |
| <p>Coal Mining/Land Stability</p> | <p>The site is reported to be within an area which may be affected by coal mining however it is not within a Development High Risk Area as set out by the Coal Authority.</p> <p>Previous investigation identifies two seams potentially underlying the site. Shallow workings have been identified in the area surrounding the site.</p> |
| <p>Brine Workings</p> | <p>The proposed development is not located within the Cheshire Brine Compensation District; therefore, is not affected by brine workings.</p> |
| <p>Hazardous Installations</p> | <p>No hazardous installations that could potentially prejudice the proposed construction of highly sensitive residential dwellings have been identified within influencing distance of the subject site.</p> |

SITE INVESTIGATION

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| <p>Ground Investigation Works</p> | <p>E3P has completed an intrusive ground investigation comprising mechanically excavated trial pits, window sample boreholes, rotary open holes, BRE365 soakaway tests and dynamic cone penetrometers and environmental monitoring installations.</p> |
| <p>Ground Conditions</p> | <p>MADE GROUND – 0.00 m bgl to 0.50 m bgl</p> <p>Made Ground has been identified in two discrete areas of the site (TP121-0.50m and TP123-0.30m) as reworked topsoil with clay pipe fragments and as reworked natural clay with fragments of a land drain present. Not considered significant sources of potential contaminants and are likely due to agricultural practices at the site. The full depth of Made Ground has been proven in both instances.</p> |



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| Ground Conditions | <p>TOPSOIL – 0.00m bgl to 0.30m bgl</p> <p>Topsoil has been identified in all exploratory locations with the exception of the two Made Ground areas. Topsoil is encountered as a slightly gravelly sandy clay with frequent rootlets and gravel of fine to coarse subangular to subrounded mudstone. Topsoil has been identified to depths between ground level and 0.30m bgl.</p> |
| | <p>DRIFT – 0.20- m bgl to 8.10 m bgl</p> <p>Natural drift deposits have been identified within all exploratory locations. Predominantly throughout the site a gravelly sandy CLAY with gravel of mudstone and sandstone is identified. Clay stratum has been noted as highly friable and so hand shear vane tests could not be completed in some cases.</p> <p>Occasionally a grey gravel of mudstone is identified at the base of excavations (TP116, TP117, TP121, WS105, WS106 and WS106A) circa 2.00-3.00m bgl and within RBH103 between 4.00m and 7.60m bgl. Mudstone bedrock is noted through the site and this could therefore be representative of a weathered layer of bedrock stratum.</p> <p>In rare locations (TP120, 124, WS110, RBH102 and RBH105) a clayey sand is identified at similar depths.</p> <p>Within the previous site investigation a ‘highly localised’ area of peat was identified to the south west of the site. E3P advanced a number of locations in this area that has not identified peat.</p> |
| | <p>SOLID – 3.30m bgl to 30.00m bgl</p> <p>The solid bedrock geology was identified throughout the site in rotary positions at depths between 3.30m and 8.10m bgl. Bedrock was identified as interbedded grey siltstone, sandstone and mudstone with occasional marl. Bedrock strata was encountered to a maximum proven depth of 30.00m bgl.</p> |
| | <p>GROUNDWATER – 2.00m bgl to 4.00m bgl</p> <p>Groundwater was encountered at six locations through the site as perched water within cohesive strata and above bedrock strata at depths between 2.00m and 4.00m bgl.</p> |

CONTAMINATED LAND ASSESSMENT

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| Human Health | <p>A Tier I human health risk assessment has been undertaken using the chemical analysis results of the soils and comparing to the relevant Tier I criteria. This assessment has identified the presence of elevated lead, within the topsoil at the site. These findings are consistent with those of the previously completed smith grant report.</p> <p>Lead is identified at 0.10m bgl in TP123 and TP111. The concentrations have primary exposure pathways related to dermal contact and ingestion, soil ingestion and consumption of homegrown produce. These exceedances can be mitigated by the installation of a chemically suitable cover system within all proposed garden areas. Alternatively, these can be excavated and delineated through chemical validation during remedial works and placed in a future low sensitivity area within the proposed development, after which cover systems will no longer be required.</p> |
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| <p>Human Health Continued...</p> | <p>Asbestos, petroleum hydrocarbons and poly aromatic hydrocarbons have not been identified within any of the samples submitted for assessment</p> <p>Chemical analysis of the natural drift deposits have identified these soils to be acceptable for use as subsoil within the proposed garden areas; however, further chemical validation samples will be required to confirm this. In addition, topsoil at the site (with the exception of the two locations noted above) will be suitable for reuse.</p> |
| <p>Controlled Waters</p> | <p>A Teir 1 controlled waters risk assessment has been completed for the site utilising leachate analysis of soils and groundwater samples obtained during and after the site works. Three locations within 2 discrete areas of the site confirm the presence of Zinc and one location (WS111) identifies the presence of TPH C5-C6.</p> <p>All three groundwater samples obtained identify Methylphenol which is considered to be a potential vapour risk. However, and in the context of controlled waters, the risk is considered low in the absence of a viable receptor, significant source and the presence of low permeability cohesive stratum.</p> |
| <p>Ground Gas</p> | <p>Current assessment based on initial monitoring visit confirms one area of the site (WS108) identifies levels of CO₂ that would require CS₂/Amber 1 classification. Given the absence of a significant source in this area it is likely that this is the degretation/decomposition of carbonate minerals within the natural stratum.</p> <p>The full phase of ground gas monitoring should be completed to inform the full and detailed assessment and therefore level of risk. Currently an allowance for Cs₂/amber 1 mitigation measures should be retained.</p> |
| <p>Potable Water Infrastructure</p> | <p>This will need to be confirmed following the completion of a UKWIR risk assessment. Post-remediation and enabling works ground conditions may be different from those identified during this site investigation. It is most likely that the site will be suitable for PE pipeline.</p> |

GEOTECHNICAL ASSESSMENT

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| <p>Underground Obstructions</p> | <p>Made Ground has not been identified to contain obstructions and given the sites history anthropogenic obstructions are not expected.</p> <p>In addition, natural boulders and obstructions have not been encountered during the site investigations completed to date.</p> |
| <p>Allowable Bearing Pressure</p> | <p>The underlying natural clay drift deposits have been assessed as being very stiff, high strength with a net allowable bearing pressure (ABP) in the order of 150 kN/m² at circa 1 m bgl increasing to 150–200 kN/m² at circa 2 m bgl.</p> <p>Granular drift deposits have been assessed as dense with a net ABP in excess of 400kN/m² at circa 2.50m bgl.</p> |
| <p>Foundation Options</p> | <p>Due to the existing large variances in the site topography, a phase of cut-and-fill enabling works will be required in order to create a proposed development platform suitable for a residential development. This will generally comprise stepping levels through the site as the road to the south and property to the north currently tie into the site at the boundaries.</p> |



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| <p>Foundation Options Continued...</p> | <p>Therefore, upon completion of these enabling works, it is likely that the most cost-effective option for the majority of the site would be to construct plots utilising a shallow strip, spread foundation or mass trench fill.</p> <p>Peat was not encountered during the E3P site investigation however, where this is recorded in previous investigation E3P identified a soft clay. As such, foundations may require deepening to a structural engineering design to tolerate risks associated with the compressibility of the materials and to tolerate total and differential settlement across the plot footprint.</p> <p>Subject to finished levels it is expected that <5% of the site may require a deep mass trench or driven pile foundation solution.</p> <p>Foundation depths within the conjectured influence of former, existing or proposed trees will need to be deepened to ensure that structural loading bears within the underlying target founding stratum, which cannot be subject to volumetric instability associated with fluctuation in moisture content.</p> |
| <p>Building Floor Slabs</p> | <p>Ground-bearing floor slabs are unlikely to be viable given the presence of shallow cohesive soils.</p> <p>Where a ground bearing slab is a preferred construction method it will be subject to an engineer's design to tolerate any total and differential settlement and heave within the substratum.</p> |
| <p>Heave Precautions</p> | <p>Given that the underlying clay is of low volume change potential, heave precautions will not be required to the internal face of a foundation less than 1.5 m in depth.</p> <p>Heave precautions will be required to the underside of floor slabs (where there is no 200 mm void) and pile ground beams are required within the modelled influencing distance of trees.</p> |
| <p>Soakaway Drainage</p> | <p>The underlying soils are cohesive in nature and have not demonstrated significant permeability potential to support a sustainable drainage solution.</p> <p>The ultimate design will be subject to a specialist design and the requirement of the future proposed development.</p> |
| <p>Sulphate Assessment</p> | <p>Assessment of sulphate and pH levels at the site confirms that concrete classification will in all likelihood be DS1 AC1s.</p> |
| <p>CBR Design %</p> | <p>Natural clay soils will provide a CBR in the order of 3–5% during drier climatic periods; however, if water is allowed to shed onto the formation, the CBR will reduce to < 2%, which will require specialist engineering of the subgrade.</p> |
| <p>Cut/Fill</p> | <p>Development levels unknown at this time; however, cut-and-fill works are likely to be required to prepare the development platform.</p> |
| <p>Civil Engineering Excavations</p> | <p>The E3P Intrusive Ground Investigation has identified the presence of weathered/competent bedrock at depths between 3.30m and 8.10m. Depending on foundation/drainage levels the presence may impede the excavation of materials to form sewerage and drainage infrastructure and foundations.</p> |
| <p>Waste Characterisation</p> | <p>Any material that is to be disposed off-site should undergo assessment using Technical Guidance WM3: <i>Waste Classification – Guidance on the classification and assessment of waste</i>.</p> |



Coal Mining

Within the Smith Grant report reference is made to a previously completed Coal Mining Risk Assessment carried out by NKC Geotech Ltd (Ref: 1720, dated August 2017) that recommended an intrusive investigation to determine the geology and prove the depth or absence of shallow mine workings in the half yard and premier coal seams.

Following a review of the Coal Authority interactive viewer by E3P, it was determined that a potentially unmarked seam of coal continued from the north dissected the site and in the presence of mine shafts and a colliery historically to the east of the site following the conjectured dip of the seam there is a potential risk of workings beneath the site. A review of the 1:10,000 geological mapping also confirmed the potential presence of a seam of coal noted at the 'premier' coal seam of 1.00-1.50m thickness.

E3P has, in accordance with best practice as detailed within Ciria 32, carried out a series of boreholes through the site specifically positioned to intersect any such feature at shallow depth (<30m) beneath the site. Within six locations advanced, no evidence of workings or intact seams of coal have been encountered. As such any worked seams present would be at a significant depth below the site and sufficient rock overburden would therefore be achieved.

As evidence of worked seams of coal have not been identified beneath the site, and there is sufficient rock overburden (10x the suspected seam thickness) present to mitigate any collapse above any much deeper workings at depths in excess of 30m bgl, there is considered to be a low risk to the proposed future development.

RECOMMENDATIONS

Based on the findings of the geoenvironmental site assessment, the following additional works are recommended to be completed in due course:

- ✳ Plot-specific foundation schedule (upon receipt of the final development levels);
- ✳ Materials management plan;
- ✳ Geotechnical earthworks strategy (infrastructure);
- ✳ Remediation and enabling works strategy; and
- ✳ Full three-dimensional earthworks cut/fill model



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DRAWING LIST

- 14-278-001 - Site Location Plan
- 14-278-002 - Proposed Development Plan
- 14-278-003 - Historical Features Plan
- 14-278-004 - Site Features Plan
- 14-278-005 - Exploratory Hole Location Plan
- 14-278-006 - Depth of Made Ground Plan
- 14-278-007 – Depth of Topsoil
- 14-278-008 - Depth to Founding Strata Plan
- 14-278-009 – Conceptual Foundation Zoning Plan
- 14-278-010 - Conceptual Site Model
- 14-278-011 - Depth to Bedrock Plan
- 14-278-012 - Depth & Thickness of Peat Plan
- 14-278-013 - Development Constraints Plan



1. INTRODUCTION

1.1. BACKGROUND

E3P has been commissioned by Alan Johnson Partnership Ltd to undertake a detailed Phase II Geoenvironmental Site Assessment for a parcel of agricultural land to the north of Well Street, Buckley.

This report is required to determine potential contaminated land liabilities, remediation requirements and geotechnical engineering works that will be required as part of the proposed low-rise residential development.

The scope of work includes the following elements:

- ✦ Detailed review of desk study;
- ✦ Design of suitable intrusive ground investigation;
- ✦ Six 30m rotary boreholes
- ✦ Window sample probeholes with, and construction of, environmental monitoring installations;
- ✦ Mechanically excavated trial pits;
- ✦ BRE35 soakaway tests;
- ✦ In-situ geotechnical testing;
- ✦ Chemical and geotechnical laboratory analysis;
- ✦ Groundwater monitoring and sampling;
- ✦ Ground gas monitoring;
- ✦ Contamination risk assessment and conceptual site model;
- ✦ Geotechnical assessment and interpretation;
- ✦ Coal mining assessment and interpretation;
- ✦ Factual and interpretive reporting.

1.2. PROPOSED DEVELOPMENT

E3P understands that the proposed development will comprise a residential end use of 154 units (through a mix of apartment, detached, semi-detached, terraced property) with associated estate roads, utility infrastructure, private gardens and areas of landscaping.

A proposed development plan has been included in Appendix III (Ref 14-278-002) and is shown in Figure 1.1.



FIGURE 1.1 SNAPSHOT OF PROPOSED DEVELOPMENT



1.3. OBJECTIVES

The objectives of the geoenvironmental assessment are as follows:

- ✿ Undertake a stage of sampling and analysis to provide an overview of environmental issues identified.
- ✿ Assess the implications of any potential environmental risks, liabilities and development constraints associated with the site in relation to the future use of the site and in relation to off-site receptors.
- ✿ Assess the geotechnical information and provide recommendations in relation to foundations, pavement construction and floor slabs.
- ✿ Provide recommendations regarding future works required.

1.4. LIMITATIONS

The limitations of this report are presented in Appendix I.



1.5. CONFIDENTIALITY

E3P has prepared this report solely for the use of the client and those parties with whom a warranty agreement has been executed, or with whom an assignment has been agreed. Should any third party wish to use or rely upon the contents of the report, written approval must be sought from E3P; a charge may be levied against such approval.



2. GROUND INVESTIGATION

2.1. PHASE I DESK STUDY SUMMARY

Pertinent points from the previously completed E3P Ltd Phase 1 Desk Study (Ref: 14-278-R1, dated August 2020) are as follows:

- ✳ The site is underlain by glacial till (clay) and three bedrock strata through its length (sandstone, mudstone and siltstone) with secondary undifferentiated aquifer in the bedrock.
- ✳ Low lying areas of the site are at risk of surface flooding from rivers.
- ✳ No historic structures have been present on site.
- ✳ The south western area of the site is in a 5-10% Radon area and will require mitigation measures.
- ✳ The site is located within a Coal Authority reporting area but not within a development high risk.
- ✳ Soakaway drainage is unlikely to be suitable given the presence of low permeability cohesive clay stratum.
- ✳ In the absence of anthropogenic processes at the site there is a low likelihood of significant contamination and therefore a low risk to human health.
- ✳ Similarly, in the absence of significant contamination, cohesive strata, and the presence of an undifferentiated aquifer there is considered a low risk to controlled waters.
- ✳ Infilled ponds/hedgerows are a likely source of Made Ground.
- ✳ Made Ground and localised areas of peat and possibility of shallow mine workings are potential sources of ground gas at the site.

E3P has also been provided with a Smith Grant Phase 1 and 2 Contaminated Land and Geotechnical Assessment completed on behalf of Flintshire County Council September 2017 (Ref: R2458-R01-v1). The pertinent points are listed below:

- ✳ The site comprises a vacant parcel of open land with two fields separated by a hedgerow.
- ✳ Historical mapping confirmed the land has remained undeveloped through its history.
- ✳ 12 trial pits completed across the site.
- ✳ Ground conditions identified across the site were consistent and comprised a surface cover of topsoil overlying a firm to stiff glacial clay. One location at the southeast boundary identified soft clay with peat.
- ✳ Groundwater was not encountered other than one trial pit in the south east that was flooded.
- ✳ A human health assessment confirmed the presence of lead in the topsoil stratum.
- ✳ Ground gas monitoring did not identify any elevated concentrations of carbon dioxide or methane.
- ✳ The report recommended shallow traditional spread foundations across the site other than where groundwater and peat were identified to the south east boundary of the site. It was recommended this material is excavated and replaced with an engineered fill.



2.2. GENERAL OVERVIEW

A ground investigation has been designed based on the findings of the desk study, with exploratory holes advanced to target specific potential contaminant sources summarised in Table 2.1. The investigation has also been used to collect geotechnical information to assist in the design and construction of the proposed development.

Exploratory fieldwork was completed between 1st September and 2nd September 2020. The works are summarised in Table 2.1.

TABLE 2.1 SUMMARY OF FIELDWORK

| POTENTIAL SOURCE/RATIONALE | LOCATION HOLE | TYPE | MAXIMUM DEPTH (m bgl) | MONITORING WELLS RESPONSE ZONE (m bgl) |
|---|---------------|-----------------------------------|-----------------------|--|
| General Ground Conditions Including the Presence/Nature of Obstructions | WS101 | Window Sample Probehole | 4.38 | 1.00–4.00 |
| | WS102 | | 3.28 | 1.00–3.00 |
| | WS102A | | 5.45 | N/A |
| | WS103 | | 4.30 | 1.00–4.00 |
| | WS104 | | 3.30 | 1.00–3.00 |
| | WS105 | | 3.90 | 1.00–3.60 |
| | WS106 | | 2.38 | 1.00–2.00 |
| | WS106A | | 2.88 | N/A |
| | WS107 | | 3.41 | 1.00–3.00 |
| | WS108 | | 4.32 | 1.00–4.00 |
| | WS109 | | 4.39 | 1.00–4.00 |
| | WS110 | | 5.45 | 1.00–5.00 |
| | WS111 | | 4.40 | 1.00–4.00 |
| | WS112 | | 4.33 | 1.00–4.00 |
| | TP101 | Mechanically Excavated Trial Pits | 3.00 | N/A |
| | TP102 | | 3.00 | N/A |
| | TP103 | | 2.50 | N/A |
| | TP104 | | 3.10 | N/A |
| | TP105/SA101 | | 2.00 | N/A |
| | TP106/SA102 | | 2.00 | N/A |
| | TP107/SA103 | | 2.00 | N/A |
| | TP108/SA104 | | 2.00 | N/A |
| | TP109 | | 3.00 | N/A |
| | TP110 | | 3.10 | N/A |
| | TP111 | | 3.10 | N/A |
| | TP112 | | 3.30 | N/A |
| TP113 | 3.30 | | N/A | |
| TP114 | 3.00 | | N/A | |



| POTENTIAL SOURCE/RATIONALE | LOCATION HOLE | TYPE | MAXIMUM DEPTH (m bgl) | MONITORING WELLS RESPONSE ZONE (m bgl) |
|--|---------------|-----------------------------------|-----------------------|--|
| General Ground Conditions Including the Presence/Nature of Obstructions | TP115 | Mechanically Excavated Trial Pits | 3.00 | N/A |
| | TP116 | | 3.30 | N/A |
| | TP117 | | 2.10 | N/A |
| | TP118 | | 3.00 | N/A |
| | TP119 | | 3.00 | N/A |
| | TP120 | | 3.30 | N/A |
| | TP121 | | 2.60 | N/A |
| | TP122 | | 3.00 | N/A |
| | TP123 | | 2.50 | N/A |
| | TP124 | | 3.70 | N/A |
| | TP125 | | 2.90 | N/A |
| | TP126 | | 3.60 | N/A |
| | TP127 | | 3.00 | N/A |
| | TP128 | | 3.00 | N/A |
| TP129 | 2.80 | N/A | | |
| TP130 | 3.00 | N/A | | |
| Investigation of Shallow Mine Workings Across the Site | RB101–RB106 | Rotary Open Holes | 30.00 | N/A |

Mechanically excavated trial pits were advanced to investigate ground conditions and to retrieve environmental samples, spatially distributed to offer the maximum site coverage whilst also being advanced to target specific contaminant sources.

Four trial pits were utilised to carry out BRE365 soakaway tests spread throughout the site to obtain data pertinent to the permeability characteristics of the underlying stratum.

Window sample probeholes were advanced to undertaken in-situ detailed geotechnical testing, obtain environmental samples and install groundwater and ground gas monitoring wells.

The series of rotary boreholes were advanced to investigate the potential presence of shallow mine workings. These boreholes were drilled in accordance with the CA permissions process and industry best practice.

The sampling locations are illustrated in Drawing 14-278-005 (Appendix III). The ground conditions encountered are indicated on the logs, which are provided in Appendix V.

Return visits were made to monitor installations for groundwater level and gas concentrations. In addition, selected wells were purged and samples of groundwater recovered for chemical analysis.



2.3. IN-SITU STANDARD PENETRATION TESTING (SPT)

In-situ geotechnical testing was conducted using the standard penetration test (SPT) and, where the ground is granular, a 60° cone (SPT(C)) was used instead of the sampling tube. The results are shown in the probehole logs in Appendix V and presented in Table 3.5 and discussed in Section 5.

2.4. IN-SITU CALIFORNIA BEARING RATIO (CBR)

In-situ CBR tests were undertaken at selected locations using a TRL probe. Tests were undertaken at depths of between 0.3 m and 1 m below ground level in order to intersect the likely pavement subformation level. The results are presented in Table 3.10 and test certificates are included within Appendix IX.

2.5. PERMEABILITY TESTS

Four soakaway permeability tests were undertaken (SA101-SA104) in order to assess the likely permeability of the underlying strata to determine the potential suitability for soakaway drainage within the proposed development. The results are presented in Table 3.8 and the test certificates are included within Appendix X.

2.6. LABORATORY ANALYSIS

Selected soil samples were submitted for a range of chemical analysis comprising:

- ✿ Metals.
- ✿ pH, total sulphate, water-soluble sulphate (2:1 extract).
- ✿ Sulphide.
- ✿ Cyanide.
- ✿ Phenols.
- ✿ Total and speciated polycyclic aromatic hydrocarbons (PAHs).
- ✿ Asbestos identification and quantification.
- ✿ Banded total petroleum hydrocarbon (TPH).

I2 Analytical undertook the analytical work and the testing results are included in Appendix VI and discussed in Section 4.

Selected samples were submitted to PSL Laboratory where the following geotechnical tests were undertaken:

- ✿ Atterberg limits determinations;
- ✿ Particle size distribution;
- ✿ One-dimensional consolidation test and
- ✿ Single-stage triaxial tests.

Laboratory analysis sheets are included in Appendix VIII and are summarised in Section 5.



3. GROUND AND GROUNDWATER CONDITIONS

3.1. SUMMARY OF GROUND CONDITIONS

The ground investigation generally confirms the published geology and identifies the strata set out in Table 3.1.

TABLE 3.1 SUMMARY OF STRATA

| HOLE | DEPTH TO STRATUM (m bgl) | | | | | |
|-------------|--------------------------|-----------|--------------------------|-----------|-------------|-------------------|
| | MADE GROUND | TOPSOIL | STIFF TO VERY STIFF CLAY | GRAVEL | CLAYEY SAND | WEATHERED BEDROCK |
| TP101 | | 0.00-0.20 | 0.20-3.00 | | | |
| TP102 | | 0.00-0.20 | 0.20-3.00 | | | |
| TP103 | | 0.00-0.20 | 0.20-2.50 | | | |
| TP104 | | 0.00-0.30 | 0.30-3.10 | | | |
| TP105/SA101 | | 0.00-0.30 | 0.30-2.00 | | | |
| TP106/SA102 | | 0.00-0.30 | 0.30-2.00 | | | |
| TP107/SA103 | | 0.00-0.30 | 0.30-2.00 | | | |
| TP108/SA104 | | 0.00-0.20 | 0.20-2.00 | | | |
| TP109 | | 0.00-0.20 | 0.20-3.00 | | | |
| TP110 | | 0.00-0.40 | 0.40-3.10 | | | |
| TP111 | | 0.00-0.30 | 0.30-3.10 | | | |
| TP112 | | 0.00-0.20 | 0.20-3.30 | | | |
| TP113 | | 0.00-0.20 | 0.20-3.30 | | | |
| TP114 | | 0.00-0.20 | 0.20-3.00 | | | |
| TP115 | | 0.00-0.20 | 0.20-3.00 | | | |
| TP116 | | 0.00-0.30 | 0.30-3.20 | 3.20-3.30 | | |
| TP117 | | 0.00-0.20 | 0.20-2.00 | 2.00-2.10 | | |
| TP118 | | 0.00-0.20 | 0.20-3.00 | | | |
| TP119 | | 0.00-0.20 | 0.20-3.00 | | | |
| TP120 | | 0.00-0.30 | 0.30-2.90 | | 2.90-3.30 | |
| TP121 | 0.00-0.50 | | 0.50-2.50 | 2.50-2.60 | | |
| TP122 | | 0.00-0.20 | 0.20-3.00 | | | |
| TP123 | 0.00-0.30 | | 0.30-2.50 | | | |
| TP124 | | 0.00-0.30 | 0.30-3.00 | | 3.00-3.70 | |
| TP125 | | 0.00-0.20 | 0.20-2.90 | | | |
| TP126 | | 0.00-0.20 | 0.20-3.60 | | | |
| TP127 | | 0.00-0.20 | 0.20-3.00 | | | |
| TP128 | | 0.00-0.20 | 0.20-3.00 | | | |



| HOLE | DEPTH TO STRATUM (m bgl) | | | | | |
|--------|--------------------------|-----------|--------------------------|-----------|-------------|-------------------|
| | MADE GROUND | TOPSOIL | STIFF TO VERY STIFF CLAY | GRAVEL | CLAYEY SAND | WEATHERED BEDROCK |
| TP129 | | 0.00-0.20 | 0.20-2.80 | | | |
| TP130 | | 0.00-0.20 | 0.20-3.00 | | | |
| WS101 | | 0.00-0.15 | 0.15-4.38 | | | |
| WS102 | | 0.00-0.20 | 0.20-3.28 | | | |
| WS102A | | 0.00-0.20 | 0.20-5.45 | | | |
| WS103 | | 0.00-0.30 | 0.30-4.30 | | | |
| WS104 | | 0.00-0.20 | 0.20-3.30 | | | |
| WS105 | | 0.00-0.20 | 0.20-3.60 | 3.60-3.90 | | |
| WS106 | | 0.00-0.20 | 0.20-2.00 | 2.00-2.38 | | |
| WS106A | | 0.00-0.20 | 0.20-2.50 | 2.50-2.88 | | |
| WS107 | | 0.00-0.20 | 0.20-3.41 | | | |
| WS108 | | 0.00-0.20 | 0.20-4.32 | | | |
| WS109 | | 0.00-0.20 | 0.20-4.45 | | | |
| WS110 | | 0.00-0.20 | 0.20-4.50 | | 4.50-5.45 | |
| WS111 | | 0.00-0.30 | 0.30-4.40 | | | |
| WS112 | | 0.00-0.20 | 0.20-4.33 | | | |
| RBH101 | | 0.00-0.40 | 0.40-3.40 | | | 3.40-30.00 |
| RBH102 | | 0.00-0.10 | 0.10-5.50 | | 5.50-8.10 | 8.10-30.00 |
| RBH103 | | 0.00-0.20 | 0.20-4.00 | 4.00-7.60 | | 7.60-30.00 |
| RBH104 | | 0.00-0.20 | 0.20-3.30 | | | 3.30-30.00 |
| RBH105 | | 0.00-0.30 | 0.30-4.80 | | 4.80-6.90 | 6.90-30.00 |
| RBH106 | | 0.00-0.20 | 0.20-3.80 | | | 3.80-30.00 |

3.2. MADE GROUND

Made Ground has been identified in two discrete areas of the site (TP121-0.50 and TP123-0.30) as reworked topsoil with clay pipe fragments and as reworked natural clay with fragments of a land drain present. Not considered significant sources of potential contaminants and are likely due to agricultural practices at the site. The full depth of Made Ground has been proven in both instances.

A depth of Made Ground plan is presented within Appendix III (Ref: 14-278-006).

3.3. TOPSOIL

Topsoil has been identified in all exploratory locations with the exception of the two Made Ground areas. Topsoil is encountered as a slightly gravelly sandy clay with frequent rootlets and gravel of fine to coarse subangular to subrounded mudstone. Topsoil has been identified to depths between ground level and 0.30m bgl.

A depth of topsoil plan is presented in Appendix III (Ref: 14-278-007)



3.4. DRIFT DEPOSITS

Natural drift deposits have been identified within all exploratory locations. Predominantly throughout the site a gravelly sandy CLAY with gravel of mudstone and sandstone is identified. Clay stratum has been noted as highly friable and so hand shear vane tests could not be completed in some cases.

Occasionally a grey gravel of mudstone is identified at the base of excavations (TP116, TP117, TP121, WS105, WS106 and WS106A) circa 2.00-3.00m bgl and within RBH103 between 4.00m and 7.60m bgl. Mudstone bedrock is noted through the site and this could therefore be representative of a weathered layer of bedrock stratum.

In rare locations (TP120, 124, WS110, RBH102 and RBH105) a clayey sand is identified at similar depths.

Within the previous site investigation a 'highly localised' area of peat was identified to the south west of the site. E3P advanced a number of locations in this area that has not identified peat.

3.5. SOLID GEOLOGY

The solid bedrock geology was identified throughout the site in rotary positions at depths between 3.30m and 8.10m bgl. Bedrock was identified as interbedded grey siltstone, sandstone and mudstone with occasional marl. Bedrock strata was encountered to a maximum proven depth of 30.00m bgl.

3.6. GROUNDWATER

Groundwater strikes were encountered as seepages. The depth of the seepages are shown on the exploratory hole records in Appendix V and are summarised in Table 3.2.

TABLE 3.2 SUMMARY GROUNDWATER STRIKES

| LOCATION | DEPTH TO STRIKE (m) | NOTES |
|----------|---------------------|----------------------|
| TP116 | 3.20 | Steady water ingress |
| TP117 | 2.00 | Steady water ingress |
| WS101 | 3.00 | Perched |
| WS102A | 4.00 | Perched |
| WS106A | 2.50 | Perched |
| WS108 | 3.00 | Perched |

Monitoring was undertaken using an electronic dip meter and interface probe to record the depth to groundwater and the thickness of any free-phase hydrocarbon product, if present. These results are summarised in Table 3.13.

3.7. VISUAL AND OLFACTORY EVIDENCE OF CONTAMINATION

Visual and olfactory evidence of potential contamination has not been identified during the site investigation.



3.8. SOIL CONSISTENCY

Undrained shear strength values were measured using both field hand shear vane tests and laboratory undrained triaxial tests. Results of the tests are presented in Table 3.3 and Table 3.4, which indicate the clay soils to vary between stiff and very stiff. Strength test data is generally consistent with the field descriptions of the aforementioned soils.



TABLE 3.3 SUMMARY OF HAND SHEAR VANE TESTS

| LOCATION | DEPTH | SHEAR STRENGTH (kPA) | CALCULATED ALLOWABLE BEARING PRESSURE (kN/m ²) |
|-------------|-------|----------------------|--|
| TP102 | 2.00 | 78 | 179.4 |
| TP107/SA103 | 0.50 | 109 | 250.70 |
| TP107/SA103 | 1.00 | 131 | 301.30 |
| TP110 | 2.50 | 157 | 361.10 |
| TP111 | 0.80 | 38 | 87.40 |
| TP111 | 1.20 | 42 | 96.60 |
| TP111 | 2.00 | 45 | 103.50 |
| TP111 | 2.50 | 120 | 2760 |
| TP116 | 2.50 | 114 | 262.20 |
| TP120 | 0.60 | 156 | 358.80 |
| TP129 | 0.40 | 114 | 262.20 |

Results of the standard penetration tests, including undrained shear strengths derived from SPTs are included in Table 3.5.

TABLE 3.4 SUMMARY OF UNDRAINED SHEAR STRENGTH TEST RESULTS

| LOCATION | SAMPLE DEPTH (m) | LAB DESCRIPTION | UNDRAINED SHEAR STRENGTH (kN/m ²) | CONSISTENCY |
|----------|------------------|---|---|-------------|
| WS102 | 0.5–1.0 | Stiff, brown, slightly gravelly, sandy CLAY | 77 | Stiff |

3.9. SIDE STABILITY AND EASE OF EXCAVATION

The sides of the exploratory trial pit excavations appeared to be stable during excavation.

The presence of stiff to very stiff clay deposits meant excavation was relatively slow through the natural strata; however, no obstructions or boulders were encountered during site investigations.



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TABLE 3.5 STANDARD/CONE PENETRATION TEST RESULTS

| BOREHOLES | DEPTH (m bgl) | MATERIAL FIELD DESCRIPTION | CPT/SPT "N" VALUE | CORRECTED "N" VALUE (N ₁) ₆₀ | TERZAGHI & PECK RELATIVE DENSITY (SANDS) | EUROCODE SOIL STRENGTH | CONSISTENCY (BS 5930) | TERZAGHI & PECK APPROXIMATE UNDRAINED SHEAR STRENGTH (kN/m ²) | ALLOWABLE BEARING PRESSURE (kN/m ²)* |
|-----------|---------------|------------------------------|-------------------|---|--|------------------------|-----------------------|---|--|
| WS101 | 1.00 | gravelly slightly sandy CLAY | 18 | 18.15 | N/A | High strength | Very Stiff | 90.73 | 186.55 |
| WS101 | 2.00 | gravelly slightly sandy CLAY | 18 | 16.44 | N/A | High strength | Very Stiff | 82.22 | 169.04 |
| WS101 | 3.00 | gravelly slightly sandy CLAY | 25 | 21.74 | N/A | High strength | Very Stiff | 108.71 | 223.50 |
| WS101 | 4.00 | gravelly slightly sandy CLAY | 50 | 42.24 | N/A | Very high strength | Very Stiff | 211.21 | 434.25 |
| WS102 | 1.00 | gravelly slightly sandy CLAY | 17 | 17.14 | N/A | High strength | Very Stiff | 85.69 | 176.18 |
| WS102 | 2.00 | gravelly slightly sandy CLAY | 28 | 25.58 | N/A | High strength | Very Stiff | 127.90 | 262.95 |
| WS102 | 2.90 | gravelly slightly sandy CLAY | 50 | 43.65 | N/A | Very high strength | Very Stiff | 218.23 | 448.69 |
| WS102A | 1.00 | gravelly slightly sandy CLAY | 20 | 20.16 | N/A | High strength | Very Stiff | 100.81 | 207.28 |
| WS102A | 2.00 | gravelly slightly sandy CLAY | 28 | 25.58 | N/A | High strength | Very Stiff | 127.90 | 262.95 |
| WS102A | 3.00 | gravelly slightly sandy CLAY | 29 | 25.22 | N/A | High strength | Very Stiff | 126.10 | 259.26 |
| WS102A | 4.00 | gravelly slightly sandy CLAY | 27 | 22.81 | N/A | High strength | Very Stiff | 114.05 | 234.50 |
| WS102A | 5.00 | gravelly slightly sandy CLAY | 21 | 17.42 | N/A | High strength | Very Stiff | 87.11 | 179.10 |
| WS103 | 1.00 | gravelly slightly sandy CLAY | 20 | 20.16 | N/A | High strength | Very Stiff | 100.81 | 207.28 |
| WS103 | 2.00 | gravelly slightly sandy CLAY | 17 | 15.53 | N/A | High strength | Very Stiff | 77.65 | 159.65 |
| WS103 | 3.00 | gravelly slightly sandy CLAY | 21 | 18.26 | N/A | High strength | Very Stiff | 91.31 | 187.74 |
| WS103 | 4.00 | gravelly slightly sandy CLAY | 50 | 42.24 | N/A | Very high strength | Very Stiff | 211.21 | 434.25 |



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| BOREHOLES | DEPTH (m bgl) | MATERIAL FIELD DESCRIPTION | CPT/SPT "N" VALUE | CORRECTED "N" VALUE (N ₁) ₆₀ | TERZAGHI & PECK RELATIVE DENSITY (SANDS) | EUROCODE SOIL STRENGTH | CONSISTENCY (BS 5930) | TERZAGHI & PECK APPROXIMATE UNDRAINED SHEAR STRENGTH (kN/m ²) | ALLOWABLE BEARING PRESSURE (kN/m ²)* |
|-----------|---------------|------------------------------|-------------------|---|--|------------------------|-----------------------|---|--|
| WS104 | 1.00 | gravelly slightly sandy CLAY | 18 | 18.15 | N/A | High strength | Very Stiff | 90.73 | 186.55 |
| WS104 | 2.00 | gravelly slightly sandy CLAY | 27 | 24.67 | N/A | High strength | Very Stiff | 123.33 | 253.56 |
| WS104 | 3.00 | gravelly slightly sandy CLAY | 50 | 43.48 | N/A | Very high strength | Very Stiff | 217.41 | 447.00 |
| WS105 | 1.00 | gravelly slightly sandy CLAY | 14 | 14.11 | N/A | Medium strength | Stiff | 70.57 | 145.09 |
| WS105 | 2.00 | gravelly slightly sandy CLAY | 20 | 18.27 | N/A | High strength | Very Stiff | 91.35 | 187.82 |
| WS105 | 3.00 | gravelly slightly sandy CLAY | 21 | 18.26 | N/A | High strength | Very Stiff | 91.31 | 187.74 |
| WS105 | 3.60 | gravelly slightly sandy CLAY | 50 | 42.66 | N/A | Very high strength | Very Stiff | 213.32 | 438.59 |
| WS105 | 3.60 | GRAVEL | 50 | 42.66 | Dense | N/A | N/A | N/A | 426.64 |
| WS106 | 1.00 | gravelly slightly sandy CLAY | 15 | 15.12 | N/A | High strength | Very Stiff | 75.61 | 155.46 |
| WS106 | 2.00 | GRAVEL | 50 | 45.68 | Dense | N/A | N/A | N/A | 456.77 |
| WS106A | 1.00 | gravelly slightly sandy CLAY | 21 | 21.17 | N/A | High strength | Very Stiff | 105.86 | 217.64 |
| WS106A | 2.80 | GRAVEL | 50 | 43.82 | Dense | N/A | N/A | N/A | 438.21 |
| WS107 | 1.00 | gravelly slightly sandy CLAY | 24 | 24.20 | N/A | High strength | Very Stiff | 120.98 | 248.73 |
| WS107 | 2.00 | gravelly slightly sandy CLAY | 24 | 21.92 | N/A | High strength | Very Stiff | 109.62 | 225.39 |
| WS107 | 3.00 | gravelly slightly sandy CLAY | 50 | 43.48 | N/A | Very high strength | Very Stiff | 217.41 | 447.00 |



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| BOREHOLES | DEPTH (m bgl) | MATERIAL FIELD DESCRIPTION | CPT/SPT "N" VALUE | CORRECTED "N" VALUE (N ₁) ₆₀ | TERZAGHI & PECK RELATIVE DENSITY (SANDS) | EUROCODE SOIL STRENGTH | CONSISTENCY (BS 5930) | TERZAGHI & PECK APPROXIMATE UNDRAINED SHEAR STRENGTH (kN/m ²) | ALLOWABLE BEARING PRESSURE (kN/m ²)* |
|-----------|---------------|------------------------------|-------------------|---|--|------------------------|-----------------------|---|--|
| WS108 | 1.00 | gravelly slightly sandy CLAY | 18 | 18.15 | N/A | High strength | Very Stiff | 90.73 | 186.55 |
| WS108 | 2.00 | gravelly slightly sandy CLAY | 23 | 21.01 | N/A | High strength | Very Stiff | 105.06 | 216.00 |
| WS108 | 3.00 | gravelly slightly sandy CLAY | 22 | 19.13 | N/A | High strength | Very Stiff | 95.66 | 196.68 |
| WS108 | 4.00 | gravelly slightly sandy CLAY | 50 | 42.24 | N/A | Very high strength | Very Stiff | 211.21 | 434.25 |
| WS109 | 1.00 | gravelly slightly sandy CLAY | 22 | 22.18 | N/A | High strength | Very Stiff | 110.90 | 228.00 |
| WS109 | 2.00 | gravelly slightly sandy CLAY | 33 | 30.15 | N/A | Very high strength | Very Stiff | 150.73 | 309.91 |
| WS109 | 3.00 | gravelly slightly sandy CLAY | 22 | 19.13 | N/A | High strength | Very Stiff | 95.66 | 196.68 |
| WS109 | 4.00 | gravelly slightly sandy CLAY | 50 | 42.24 | N/A | Very high strength | Very Stiff | 211.21 | 434.25 |
| WS110 | 4.00 | gravelly slightly sandy CLAY | 34 | 28.72 | N/A | High strength | Very Stiff | 143.62 | 295.29 |
| WS110 | 5.00 | gravelly slightly sandy CLAY | 34 | 28.21 | N/A | High strength | Very Stiff | 141.04 | 289.97 |
| WS110 | 2.80 | gravelly slightly sandy CLAY | 50 | 43.82 | N/A | Very high strength | Very Stiff | 219.10 | 450.48 |
| WS110 | 1.00 | gravelly slightly sandy CLAY | 17 | 17.14 | N/A | High strength | Very Stiff | 85.69 | 176.18 |
| WS110 | 2.00 | gravelly slightly sandy CLAY | 22 | 20.10 | N/A | High strength | Very Stiff | 100.49 | 206.61 |
| WS110 | 3.00 | gravelly slightly sandy CLAY | 42 | 36.53 | N/A | Very high strength | Very Stiff | 182.63 | 375.48 |



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| BOREHOLES | DEPTH (m bgl) | MATERIAL FIELD DESCRIPTION | CPT/SPT "N" VALUE | CORRECTED "N" VALUE (N ₁) ₆₀ | TERZAGHI & PECK RELATIVE DENSITY (SANDS) | EUROCODE SOIL STRENGTH | CONSISTENCY (BS 5930) | TERZAGHI & PECK APPROXIMATE UNDRAINED SHEAR STRENGTH (kN/m ²) | ALLOWABLE BEARING PRESSURE (kN/m ²)* |
|-----------|---------------|------------------------------|-------------------|---|--|------------------------|-----------------------|---|--|
| WS111 | 1.00 | gravelly slightly sandy CLAY | 18 | 18.15 | N/A | High strength | Very Stiff | 90.73 | 186.55 |
| WS111 | 2.00 | gravelly slightly sandy CLAY | 33 | 30.15 | N/A | Very high strength | Very Stiff | 150.73 | 309.91 |
| WS111 | 3.00 | gravelly slightly sandy CLAY | 33 | 28.70 | N/A | High strength | Very Stiff | 143.49 | 295.02 |
| WS111 | 4.00 | gravelly slightly sandy CLAY | 50 | 42.24 | N/A | Very high strength | Very Stiff | 211.21 | 434.25 |
| WS112 | 1.00 | gravelly slightly sandy CLAY | 17 | 17.14 | N/A | High strength | Very Stiff | 85.69 | 176.18 |
| WS112 | 2.00 | gravelly slightly sandy CLAY | 24 | 21.92 | N/A | High strength | Very Stiff | 109.62 | 225.39 |
| WS112 | 3.00 | gravelly slightly sandy CLAY | 43 | 37.40 | N/A | Very high strength | Very Stiff | 186.98 | 384.42 |
| WS112 | 4.00 | gravelly slightly sandy CLAY | 50 | 42.24 | N/A | Very high strength | Very Stiff | 211.21 | 434.25 |

NOTES

* The Allowable Bearing Pressure (ABP) should be considered indicative.



3.10. CONSOLIDATION

One undisturbed samples of Glacial Till were submitted for oedometer analysis. The results are provided in Table 3.7.

TABLE 3.7 OEDOMETER CONSOLIDATION RESULTS

| LOCATION | DEPTH (m) | SAMPLE TYPE | MOISTURE CONTENT (%) | OEDOMETER CONSOLIDATION | | |
|----------|-----------|-------------|----------------------|-------------------------|-------------------------------------|---------------------------------------|
| | | | | PRESSURE RANGE (kPa) | M _v (m ² /MN) | C _v (m ² /year) |
| CP102 | 1.50 | U100 | 15 | 0–35 | Swelling | Swelling |
| | | | | 35–70 | 0.197 | 40.888 |
| | | | | 70–140 | 0.150 | 13.570 |
| | | | | 140–280 | 0.101 | 9.634 |
| | | | | 280–35 | 0.034 | 5.465 |

When considered at overburdened pressure with an additional load of 120 kPa the coefficient of volume compressibility (M_v) ranged from 0.150 m²/MN up to 0.197 m²/MN. The material is considered to be medium compressibility.

The rate at which settlement is likely to occur is determined by the coefficient of consolidation (C_v). As shown in Table 3.7, the coefficient ranges from 5.465 m²/yr to 40.89 m²/yr.

3.11. SOIL INFILTRATION

In-situ BRE 365 Soakaway tests were undertaken over a 48 hour period within trial pits completed as SA101-SA105.

The results are presented in Table 3.8 below and the test certificates are included within Appendix X.

TABLE 3.8 BRE365 SOAKAWAY TESTING RESULTS

| LOCATION | DEPTH (m) | MATERIAL | TEST NO. | SOIL INFILTRATION RATE (m/s) |
|----------|-----------|------------------------|-----------|------------------------------|
| SA101 | 2.00 | Slightly gravelly CLAY | Test No.1 | N/A |
| SA102 | 2.00 | Slightly gravelly CLAY | Test No.1 | N/A |
| SA103 | 2.00 | Slightly gravelly CLAY | Test No.1 | N/A |
| SA104 | 2.00 | Slightly gravelly CLAY | Test No.1 | N/A |

Soil infiltration was taken over the wetted area from between 75% and 25% of the effective depth. All tests showed cohesive drift deposits to have poor soakage potential.

Therefore, considering the significant volumes of clay on the site, it is considered that soakaway drainage will not be suitable for the proposed development. However, the application of soakaway drainage will ultimately be dependent on the specific requirements of the development. All soakaways should be designed in accordance with BRE Special Digest 365 – *Soakaway Design*.



3.12. SOIL PLASTICITY

The liquid and plastic limits of samples of natural in-situ clay are determined using the cone penetrometer method and the rolling thread test. These tests enable determination of an average plasticity index (PI) for each “type” of clay, although judgement is applied where variable results are reported.

PI can be related to shrinkability (low, medium or high) and then to minimum founding depth.

E3P typically only consider a soil to be shrinkable if the proportion finer than 63 µm is > 35%.

PI results are compared against guidance given in the NHBC standards, Chapter 4.2 (revised January 2014), which advocates the use of modified plasticity index (I_p), defined as:

$$I_p = Ip \times (\% < 425 \mu\text{m}/100)$$

In other words, if PI is 30%, but the soil contains 80% < 425 µm, then I_p = 30 × 80/100 = 24%.

It should be noted that in accordance with the requirements of BS 1377, the % passing the 425 µm sieve is routinely reported by testing labs.

E3P apply engineering judgement where PI results are spread over a range of classifications. Consideration is given to the average values for each particular soil type (differentiate between residual soil and alluvium), the number of results in each class and the actual values.

The Atterberg limits determinations, summarised in Table 3.9, show the clay to be of low plasticity.

TABLE 3.9 SUMMARY OF PLASTICITY INDEX TEST RESULTS

| LOCATION | DEPTH (m) | NATURAL MOISTURE CONTENT (%) | PLASTIC LIMIT (%) | LIQUID LIMIT (%) | PLASTICITY INDEX (%) | PASSING 425 µm SIEVE (%) | MODIFIED PLASTICITY INDEX | NHBC VOLUME CHANGE POTENTIAL |
|----------|-----------|------------------------------|-------------------|------------------|----------------------|--------------------------|---------------------------|------------------------------|
| WS107 | 1.00 | 15 | 16 | 31 | 15 | 94 | 14.1 | Low |
| WS112 | 2.00 | 13 | 19 | 38 | 19 | 88 | 16.72 | Low |
| WS104 | 2.00 | 12 | 17 | 33 | 16 | 90 | 14.4 | Low |

The results of the Atterberg limits testing confirmed that the soils would be deemed to be “Low Volume Change Potential” in accordance with the classification system utilised by the LABC/NHBC industry guidance.

3.13. CALIFORNIA BEARING RATIO

The California bearing ratio (CBR) for the soils were measured using an in-situ TRL probe. The results are summarised in Table 3.10.

The result sheets are included in Appendix IX and the locations are shown on Drawing 14-278-005 (Appendix III). CBR results have been averaged from the blow counts across the strata tested and any abnormally high blow counts ignored as these are likely to be from larger granular material and so represent anomalies.



TABLE 3.10 SUMMARY OF DCP RESULTS

| LOCATION | DEPTH (m) | STRATA | IN-SITU OR LAB TEST | CBR (%) |
|----------|-----------|------------------------------|---------------------|---------|
| DCP101 | 0.22-0.79 | Slightly gravelly sandy CLAY | In-Situ | 8.71 |
| DCP102 | 0.43-0.65 | | In-Situ | 4.27 |
| DCP103 | 0.20-0.65 | | In-Situ | 7.11 |
| DCP104 | 0.36-0.74 | | In-Situ | 8.72 |
| DCP105 | 0.37-0.71 | | In-Situ | 8.62 |
| DCP106 | 0.18-0.58 | | In-Situ | 5.40 |
| DCP107 | 0.23-0.80 | | In-Situ | 6.51 |
| DCP108 | 0.45-0.80 | | In-Situ | 6.92 |
| DCP109 | 0.29-0.68 | | In-Situ | 6.99 |
| DCP110 | 0.20-0.39 | | In-Situ | 5.28 |
| DCP111 | 0.17-0.44 | | In-Situ | 4.40 |
| DCP112 | 0.41-0.85 | | In-Situ | 6.71 |

It should be noted that the reported CBR results were obtained from soils in a highly undisturbed state. If, however, the topsoil and surface cover is removed during periods of wetter climatic condition, the formation will soften, reducing the CBR.

3.14. pH AND SULPHATE

Chemical analyses for pH and soluble sulphate content contained in Appendix VI (summarised in Table 3.11), shows that the soils at the site generally meet Class DS-1, Aggressive Chemical Environment for Concrete Classification (ACEC) AC-1s in accordance with BRE *Special Digest 1* (2005).

TABLE 3.11 SUMMARY OF pH AND SULPHATE DATA

| LOCATION | DEPTH (m) | SO ₄ IN 2:1 WATER/SOIL (g/l) | pH VALUE | CLASSIFICATION |
|----------|-----------|---|----------|------------------|
| TP105 | 1.00 | 0.04 | 7.9 | Class DS-1, AC-1 |
| TP108 | 0.10 | 0.029 | 7.9 | Class DS-1, AC-1 |
| TP111 | 0.10 | 0.014 | 7.4 | Class DS-1, AC-1 |
| TP112 | 1.00 | 0.028 | 8.1 | Class DS-1, AC-1 |
| TP120 | 0.10 | 0.024 | 7.1 | Class DS-1, AC-1 |
| TP121 | 0.40 | 0.086 | 7.2 | Class DS-1, AC-1 |
| WS107 | 0.10 | 0.014 | 6.7 | Class DS-1, AC-1 |

3.15. GROUND GAS

A ground gas assessment has been completed in accordance with guidance provided within CIRIA 665 – *Assessing risk posed by hazardous ground gases to buildings*.



3.16. INVESTIGATION RATIONALE

The ICSM has identified that the infilled ponds/hedgerow and potential shallow coal mining may represent a potential source of ground gas generation. Based on the identification of these sources, E3P has determined that the site represents a low ground gas source generation potential.

Within the context of the proposed residential end use and ground gas generation potential, the gas assessment requires that six visits are required over months, with at least two sets of readings at low or falling atmospheric pressure as set out within CIRIA 665 Tables 5.5a and 5.5b.

The spacing requirements for monitoring wells are detailed within CIRIA 665 Table 4.2, which indicates that for low gas hazard sites (Made Ground with limited degradable material, organic clay of limited thickness) and a high sensitivity development, nominal well spacing should be between 25 m and 50 m.

The spacing requirements for monitoring wells are detailed within CIRIA 665 Table 4.2, which indicates that for moderate gas hazard sites (older domestic landfill sites, disused shallow mine workings, hydrocarbon vapour sources) and a high sensitivity development, nominal well spacing should be between 25 m and 50 m.

The spacing requirements for high gas hazard sites (domestic landfill sites) and a high sensitivity development, nominal well spacing should be less than 25 m.

TABLE 3.12 GROUND GAS MONITORING LOCATION RATIONALE

| LOCATION | GROUND GAS SOURCE | DEPTH OF MONITORING WELL (m) |
|----------|-------------------|------------------------------|
| WS101 | Natural Strata | 1.00–4.00 |
| WS102 | Natural Strata | 1.00–3.00 |
| WS103 | Natural Strata | 1.00–4.00 |
| WS104 | Natural Strata | 1.00–3.00 |
| WS105 | Natural Strata | 1.00–3.60 |
| WS106 | Natural Strata | 1.00–2.00 |
| WS107 | Natural Strata | 1.00–3.00 |
| WS108 | Natural Strata | 1.00–4.00 |
| WS109 | Natural Strata | 1.00–4.00 |
| WS110 | Natural Strata | 1.00–5.00 |
| WS111 | Natural Strata | 1.00–4.00 |
| WS112 | Natural Strata | 1.00–4.00 |

3.17. MONITORING METHODOLOGY

Concentrations of methane (CH₄), carbon dioxide (CO₂) and oxygen (O₂) were measured using a calibrated infra-red gas analyser (GFM435) with gas flow rates were measured using an integrated flow meter.

Gas measurements were recorded for a minimum of 60 seconds at each location, at which point the maximum concentration of CH₄ and CO₂, together with the lowest concentration of O₂ were recorded. The results of the ground gas monitoring are presented in Table 3.13.



Well Street, Buckley

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TABLE 3.13 SUMMARY OF GROUND GAS MONITORING RESULTS

| WELL | DATE | CH ₄ INITIAL (%V/V) | CH ₄ STEADY (%V/V) | CH ₄ GSV (l/hr) | CO ₂ INITIAL (%V/V) | CO ₂ STEADY (%V/V) | CO ₂ GSV (l/hr) | O ₂ (%V/V) | ATMOS (mb) | ATMOS. DYNAMIC | FLOW (l/hr) | RESPONSE ZONE (m bgl) | DEPTH TO BASE (m bgl) | DEPTH TO WATER (m bgl) |
|-------|---------|--------------------------------|-------------------------------|----------------------------|--------------------------------|-------------------------------|----------------------------|-----------------------|------------|----------------|-------------|-----------------------|-----------------------|------------------------|
| WS101 | 22/9/20 | 0.10 | 0.10 | 0.00052 | 0.60 | 0.60 | 0.00312 | 19.80 | 991 | falling | 0.52 | 1.00–4.00 | 2.87 | 2.11 |
| WS102 | 22/9/20 | 0.10 | 0.10 | 0.00096 | 2.20 | 2.20 | 0.02112 | 18.30 | 991 | falling | 0.96 | 1.00–3.00 | 3.15 | 3.00 |
| WS103 | 22/9/20 | 0.10 | 0.10 | 0.00026 | 0.70 | 0.70 | 0.00182 | 19.20 | 991 | falling | 0.26 | 1.00–4.00 | 4.14 | Dry |
| WS104 | 22/9/20 | 0.10 | 0.10 | 0.00026 | 2.80 | 2.80 | 0.00728 | 15.50 | 991 | falling | 0.26 | 1.00–3.00 | 3.13 | Dry |
| WS105 | 22/9/20 | 0.10 | 0.10 | 0.00026 | 3.70 | 3.70 | 0.00962 | 14.00 | 991 | falling | 0.26 | 1.00–3.60 | 3.77 | 3.68 |
| WS106 | 22/9/20 | 0.10 | 0.10 | 0.00052 | 0.60 | 0.60 | 0.00312 | 19.80 | 991 | falling | 0.52 | 1.00–2.00 | 2.12 | 2.00 |
| WS107 | 22/9/20 | 0.10 | 0.10 | 0.00026 | 1.90 | 1.90 | 0.00494 | 15.60 | 991 | falling | 0.26 | 1.00–3.00 | 3.50 | Dry |
| WS108 | 22/9/20 | 0.10 | 0.10 | 0.00013 | 7.20 | 7.20 | 0.00936 | 9.90 | 991 | falling | 0.13 | 1.00–4.00 | 3.20 | 2.08 |
| WS109 | 22/9/20 | 0.10 | 0.10 | 0.0001 | 2.20 | 2.20 | 0.0022 | 12.10 | 991 | falling | 0.10 | 1.00–4.00 | 4.49 | Dry |
| WS110 | 22/9/20 | 0.10 | 0.10 | 0.0034 | 1.70 | 1.70 | 0.0578 | 13.30 | 991 | falling | 3.40 | 1.00–5.00 | 5.51 | Dry |
| WS111 | 22/9/20 | 0.10 | 0.10 | 0.00176 | 4.60 | 4.60 | 0.08096 | 16.80 | 991 | falling | 1.76 | 1.00–4.00 | 3.37 | 1.20 |
| WS112 | 22/9/20 | 0.10 | 0.10 | 0.0018 | 1.80 | 1.80 | 0.0324 | 14.00 | 991 | falling | 1.80 | 1.00–4.00 | 4.20 | Dry |



4. TIER I QUALITATIVE CONTAMINATED LAND RISK ASSESSMENT

E3P has undertaken a Tier 1 qualitative risk assessment to determine if any potential contaminants within the underlying soils and groundwater pose an unacceptable level of risk to the identified receptors.

4.1. HUMAN HEALTH RISK ASSESSMENT

At Tier 1 stage, the long term (chronic) human health toxicity of the soil has been assessed by comparing the on-site concentrations of organic and inorganic compounds with reference values published in LQM/CIEH S4UL (S4UL3267).

The results of this comparison have been summarised within Table 4.1.



TABLE 4.1 SUMMARY OF INORGANIC AND HYDROCARBON TOXICITY ASSESSMENT FOR A RESIDENTIAL END USE

| DETERMINANT | UNIT | GAC | N | MC | LOC. OF EX | PATH-WAY | ASSESSMENT |
|--------------------------------|--------|------|----|------------|--------------------------|----------|-----------------------|
| Arsenic | mg/kg | 37 | 15 | 12 | N/A | 1 | No Further Action |
| Cadmium | mg/kg | 17 | 15 | 0.4 | N/A | 1 | No Further Action |
| Chromium (VI) | mg/kg | 6.1 | 15 | < 4.0 | N/A | 1 | No Further Action |
| Lead | mg/kg | 200 | 15 | 430 230 | TP123-0.10 TP111-0.10 | 1 | Further Action |
| Mercury | mg/kg | 1.2 | 15 | < 0.30 | N/A | 3 | No Further Action |
| Nickel | mg/kg | 180 | 15 | 29 | N/A | 1 | No Further Action |
| Selenium | mg/kg | 250 | 15 | < 1.0 | N/A | 1 | No Further Action |
| Copper | mg/kg | 2400 | 15 | 32 | N/A | 1 | No Further Action |
| Zinc | mg/kg | 3700 | 15 | 140 | N/A | 1 | No Further Action |
| Cyanide – Total | mg/kg | 791 | 15 | < 1.0 | N/A | 1 | No Further Action |
| Phenols – Total | mg/kg | 210 | 7 | < 1.0 | N/A | 1 | No Further Action |
| Asbestos | Fibres | NFD | 15 | NFD | N/A | 4 | No Further Action |
| Naphthalene | mg/kg | 2.3 | 15 | <0.05 | N/A | 3 | No Further Action |
| Acenaphthylene | mg/kg | 170 | 15 | <0.05 | N/A | 2 | No Further Action |
| Acenaphthene | mg/kg | 210 | 15 | <0.05 | N/A | 1 | No Further Action |
| Fluorene | mg/kg | 170 | 15 | <0.05 | N/A | 1 | No Further Action |
| Phenanthrene | mg/kg | 95 | 15 | 0.46 | N/A | 2 | No Further Action |
| Anthracene | mg/kg | 2400 | 15 | 0.15 | N/A | 2 | No Further Action |
| Fluoranthene | mg/kg | 280 | 15 | 1.10 | N/A | 2 | No Further Action |
| Pyrene | mg/kg | 620 | 15 | 0.82 | N/A | 2 | No Further Action |
| Benzo(a)Anthracene | mg/kg | 7.2 | 15 | 0.996 | N/A | 2 | No Further Action |
| Chrysene | mg/kg | 15 | 15 | 0.92 | N/A | 2 | No Further Action |
| Benzo(b)Fluoranthene | mg/kg | 2.6 | 15 | 1.10 | N/A | 2 | No Further Action |
| Benzo(k)Fluoranthene | mg/kg | 77 | 15 | 0.55 | N/A | 2 | No Further Action |
| Benzo(a)Pyrene** | mg/kg | 2.2 | 15 | 0.88 | N/A | 2 | No Further Action |
| Indeno(123-cd)Pyrene | mg/kg | 27 | 15 | 0.44 | N/A | 2 | No Further Action |
| Dibenzo(a,h)Anthracene | mg/kg | 0.24 | 15 | <0.05 | N/A | 2 | No Further Action |
| Benzo(ghi)Perylene | mg/kg | 320 | 15 | 0.44 | N/A | 2 | No Further Action |
| TPH C5-C6 (aliphatic)* | mg/kg | 42 | 15 | <1.0 | N/A | 3 | No Further Action |
| TPH C6-C8 (aliphatic)* | mg/kg | 100 | 15 | <0.1 | N/A | 3 | No Further Action |
| TPH C8-C10 (aliphatic)* | mg/kg | 27 | 15 | <0.1 | N/A | 3 | No Further Action |
| TPH C10-C12 (aromatic)* | mg/kg | 74 | 15 | <2.0 | N/A | 3 | No Further Action |
| TPH C12-C16 (aromatic)* | mg/kg | 140 | 15 | <4.0 | N/A | 3 | No Further Action |
| TPH C16-C21 (aromatic)* | mg/kg | 260 | 15 | 9.7 | N/A | 1 | No Further Action |



| DETERMINANT | UNIT | GAC | N | MC | LOC. OF EX | PATH-WAY | ASSESSMENT |
|--------------------------------|-------|------|----|----|------------|----------|-------------------|
| TPH C21-C35 (aromatic)* | mg/kg | 1100 | 15 | 48 | N/A | 1 | No Further Action |

Notes

Main exposure pathways: 1 = soil ingestion, 2 = dermal contact and ingestion, 3 = vapour inhalation (indoor), 4 = dust inhalation.

Abbreviations: GAC = general assessment criteria, n = number of samples, MC = maximum concentration; Loc of Ex = location of exceedance; NFD = no fibres detected.

Referring to Table 4.1, the results of this direct comparison indicates that the data exceeds the screening criteria for a residential end use for the following contaminant:

 Lead.

Asbestos, petroleum hydrocarbons and poly aromatic hydrocarbons have not been identified within any of the samples submitted for assessment.

The laboratory analysis confirms the assessment within the initial conceptual site model that the main constituents of concern were likely to be heavy metals.

In relation to the exceedance in lead, the main exposure pathways based on the Tier I exceedances is soil ingestion. These exceedances were noted within two discrete locations (TP111 and TP123) within the topsoil at 0.10 m bgl.

HUMAN HEALTH RISK ASSESSMENT AND MITIGATION

The elevated concentrations have a primary exposure pathway related to ingestion of soils. The risk to chronic human health associated with the elevated concentrations on inorganic heavy metals and non-volatile PAH compounds can be mitigated through the installation of a suitable cover system in all proposed private gardens, landscaping and public open space to remove any potential for direct exposure to impacted soils.

Alternatively, given that the exceedances are localised they could be treated as an isolated hotspot and removed during a phase of remedial works with validation sampling to ensure future placement within a low risk area. On completion, a 600mm cover system would no longer be a requirement and a 300mm growing medium (comprising 150mm topsoil and 150mm subsoil) would be necessary.

The specific design and installation process for the appropriate cover systems will be clearly defined within the site remediation and enabling works strategy.

Chemical analysis of the natural drift deposits have identified these soils to be acceptable for use as subsoil within the proposed garden areas. In addition, topsoil at the site (with the exception of TP111 and TP123) will be suitable for reuse. Once the two minor hotspots have been removed from the topsoil at the site a cover system will not be necessary as all the potential risk will be managed by this process. Following a topsoil scrape the clean natural stratum will be exposed and can be capped with 150mm (site generated) topsoil to finish the development.



4.2. CONTROLLED WATERS RISK ASSESSMENT

The site sensitivity with respect to controlled waters is summarised within Table 4.2.

TABLE 4.2 CONTROLLED WATERS SENSITIVITY PROFILE

| RISK PROFILE | DISCUSSION | SENSITIVITY RATING |
|---|--|--------------------|
| Groundwater Source Protection Zone or Drinking Water Safeguard Zone | The site is not within a designated groundwater source protection or drinking water safeguard zone. | Low |
| Distance to the Closest Groundwater Abstraction Point | Two groundwater abstractions are actively licensed 70 m south east of the site for general farming and domestic use registered to Bistre Farm and Mrs E Jones. | High |
| Aquifer Classification in Superficial Drift Deposits | Secondary Undifferentiated aquifer in the superficial drift deposits at the site. The natural cohesive deposits are likely to afford protection to the underlying bedrock aquifer. | Moderate |
| Aquifer Classification in Bedrock | A secondary A aquifer is noted in the bedrock strata. The cohesive overburden and limited potential to support groundwater on a strategic level reduces the overall risk. | Moderate |
| Viability for Anthropogenic Soil in Direct Contact with Aquifer (Drift or Bedrock) | Minimal Made Ground deposits (maximum depth of 0.50 m bgl) were identified during site investigations and therefore have not been found to be in direct contact with the underlying secondary A aquifer. | Low |
| Is the Site Located Within 50 m of a Surface Watercourse? | A pond is noted circa 50 m from the southern boundary however more recent imagery suggests this may now be silted up. A surface ditch is noted 50 m south east of the site. | Low |
| <p>SUMMARY The ICSM developed within the context of the site setting has only identified a single viable pollutant risk, which would be the downward migration of potentially mobile phase-soluble contaminants towards the underlying secondary A aquifer. A groundwater abstraction point is located 70 m south east; however, the overall sensitivity of this receptor is reduced given underlying cohesive deposits and limited contamination at the site and thus the potential for the creation of a complete pollutant linkage.</p> | | |

To further refine the ICSM, E3P has undertaken an initial qualitative assessment of the soil data analysis to assess the potential for a source of separate-phase or dissolved-phase contamination originating from either a defined on-site source or from impacted soils. This assessment is summarised in Table 4.3.



TABLE 4.3 QUALITATIVE RISK TO CONTROLLED WATERS FROM SOIL ANALYTICAL RESULTS

| | |
|------------------------------------|--|
| BTEX > 1 mg/kg | The soil data analysis has not identified any detectable concentrations of TPH C5 to C6 that might otherwise be indicative of VOC impact |
| Total VOC > 1 mg/kg | |
| Total SVOC > 1 mg/kg | PAH analysis recorded concentrations either below or only slightly elevated above the laboratory LOD |
| C5-C10 > 5 mg/kg | All concentrations are below the laboratory LOD |
| C10-C12 > 10 mg/kg | All concentrations are below the laboratory LOD |
| C12-C16 > 50 mg/kg | All concentrations are below the laboratory LOD |
| Phenols > 2 mg/kg | All concentrations are below the laboratory LOD |
| Naphthalene > 2 mg/kg | The most soluble SVOC (naphthalene) has not been identified at concentrations above the limit of detection (0.05 mg/kg) |
| Total PAH > 10 mg/kg | Concentrations of low-solubility PAH compounds greater than 10 mg/kg have not been detected in the soil analysis |
| PCB > 1 mg/kg | No potential sources of PCB have been identified |
| Heavy metals > 500 mg/kg | Concentrations of heavy metals are all below 500 mg/kg |

In due consideration of the ICSM, which has identified a potential pollutant linkage associated with the migration towards the underlying secondary A aquifer, E3P has undertaken a Tier I controlled waters risk assessment. The Tier I assessment has included a comparison of leachate analysis and groundwater samples to drinking water standards in the first instance and in absence of environmental quality standards (EQS).

These are presented in Table 4.4.



TABLE 4.4 COMPARISON OF GROUNDWATER ANALYSIS WITH TIER 1 SCREENING LEVELS

| DETERMINANT | UNIT | EQS SCREENING VALUE ^{1, 2, 3} | DWS _{3,4,5} | N | | MC | LOC. OF EX | ASSESSMENT |
|-----------------------------------|------|--|----------------------|---|----|----------------|--|---------------------------|
| | | AA | | L | GW | | | |
| Arsenic | µg/l | 50 | 10 | 3 | 3 | <1.1 | N/A | No Further Action |
| Cadmium | µg/l | 0.08-0.25 | 5 | 3 | 3 | <0.08 | N/A | No Further Action |
| Chromium (VI) | µg/l | 3.4 | – | 3 | 3 | <5.0 | N/A | No Further Action |
| Chromium (III) | µg/l | 4.7 | 50 | 3 | 3 | 15 | N/A | No Further Action |
| Copper | µg/l | 1 | 2000 | 3 | 3 | 31 | N/A | No Further Action |
| Total Cyanide | µg/l | 1 | 50 | 3 | 3 | <1.0 | N/A | No Further Action |
| Lead | µg/l | 1.2 | 10 | 3 | 3 | 4.1 | N/A | No Further Action |
| Mercury | µg/l | – | 1.0 | 3 | 3 | <0.5 | N/A | No Further Action |
| Nickel | µg/l | 4 | 20 | 3 | 3 | 0.8 | N/A | No Further Action |
| Selenium | µg/l | – | 10 | 3 | 3 | <4.0 | N/A | No Further Action |
| Zinc | µg/l | 10.9 | – | 3 | 3 | 48 15 14 | WS111 (GW) TP128-0.10 (L) TP121-0.40 (L) | Further Assessment |
| pH | | 6–9 | | 3 | 3 | 5.8- 5.9 | TP128-0.10 (L) TP121-0.40 (L) | Further Assessment |
| PAH | | | | | | | | |
| Naphthalene | µg/l | 2 | | 3 | 3 | <0.01 | N/A | No Further Action |
| Anthracene | µg/l | 0.1 | | 3 | 3 | <0.01 | N/A | No Further Action |
| Benzo[b]fluoranthene | µg/l | 0.00017* | | 3 | 3 | <0.01 | N/A | No Further Action |
| Benzo[k]fluoranthene | µg/l | 0.00017* | | 3 | 3 | <0.01 | N/A | No Further Action |
| Benzo(a)pyrene | µg/l | 0.00017* | 10* | 3 | 3 | <0.01 | N/A | No Further Action |
| Indeno(123-cd)pyrene | µg/l | 0.00017* | | 3 | 3 | <0.01 | N/A | No Further Action |
| Benzo(ghi)pyrene | µg/l | 0.00017* | | 3 | 3 | <0.01 | N/A | No Further Action |
| Fluoranthene | µg/l | 0.0063 | | 3 | 3 | <0.01 | N/A | No Further Action |
| Benzo(ghi)perylene | µg/l | 1.7–4 | | 3 | 3 | <0.01 | N/A | No Further Action |
| TPH-Aromatic | | | | | | | | |
| TPH C5-C6 (benzene) | µg/l | 10 | 1 | 3 | 3 | 3.1 | WS111 (GW) | Further Assessment |
| TPH C6-C8 (toluene) | µg/l | 74 | 700 | 3 | 3 | 9 | N/A | No Further Action |
| TPH C8-C10 (ethyl benzene) | µg/l | 20 | 300 | 3 | 3 | <1.0 | N/A | No Further Action |
| TPH C10-C12 (xylene) | µg/l | 30 | 500 | 3 | 3 | <10 | N/A | No Further Action |



| DETERMINANT | UNIT | EQS SCREENING VALUE ^{1, 2, 3} | DWS _{3,4,5} | N | | MC | LOC. OF EX | ASSESSMENT |
|----------------------------------|------|--|----------------------|---|----|------|------------|-------------------|
| | | AA | | L | GW | | | |
| TPH C12-C16 | µg/l | 2 | 90 ⁵ | 3 | 3 | <10 | N/A | No Further Action |
| TPH C16-C35 | µg/l | 50# | 90 ⁵ | 3 | 3 | <10 | N/A | No Further Action |
| TPH Aliphatic⁵ | | | | | | | | |
| TPH C5-C6 | µg/l | – | 15000 | 3 | 3 | <1.0 | N/A | No Further Action |
| TPH C6-C8 | µg/l | – | 15000 | 3 | 3 | <1.0 | N/A | No Further Action |
| TPH C8-C10 | µg/l | – | 300 | 3 | 3 | <1.0 | N/A | No Further Action |
| TPH C10-C12 | µg/l | – | 300 | 3 | 3 | <10 | N/A | No Further Action |
| TPH C12-C16 | µg/l | – | 300 | 3 | 3 | <10 | N/A | No Further Action |
| TPH C16 – C21 | µg/l | – | 300** | 3 | 3 | <10 | N/A | No Further Action |
| TPH C21-C35 | µg/l | – | 300** | 3 | 3 | <10 | N/A | No Further Action |
| VOC | | | | | | | | |
| Tetrachloroethylene | µg/l | 0.4 | 10 | 0 | 3 | <1.0 | N/A | No Further Action |
| Trichloroethylene | µg/l | 10 | 10 | 0 | 3 | <1.0 | N/A | No Further Action |
| Trichlorobenzene | µg/l | 0.4 | – | 0 | 3 | <1.0 | N/A | No Further Action |
| Trichloromethane | µg/l | 2.5 | – | 0 | 3 | <1.0 | N/A | No Further Action |
| Dichloromethane | µg/l | 20 | 200 | 0 | 3 | <1.0 | N/A | No Further Action |
| Carbon Tetrachloride | µg/l | 12 | 3 | 0 | 3 | <1.0 | N/A | No Further Action |
| Vinyl Chloride | µg/l | – | 0.3 | 0 | 3 | <1.0 | N/A | No Further Action |

Notes

Solubility <0.01µg/l

AA – Annual Average

* Polycyclic aromatic hydrocarbons (PAH) - Benzo(a)pyrene (BaP), Benzo(b)fluoranthene, Benzo(k)fluoranthene, Benzo(g,h,i)-perylene and Indeno(1,2,3-cd)-pyrene. Benzo(a)pyrene can be considered as a marker for the other PAHs, hence only benzo(a)pyrene needs to be monitored for comparison with the biota EQS or the corresponding AA-EQS in water

** There are no WHO Guideline Values for aliphatic fractions C16-C21 and C21-C35, therefore the guideline value for aliphatic fractions inclusive of C8-C16 (300µg/l) has been applied.

1. The Water Environment (Water Framework Directive) (England and Wales) (Amendment) Regulations (2015)
2. Directive establishing a framework for Community action in the field of water policy (Water Framework Directive)
3. Council Directive on pollution caused by certain dangerous substances discharged into the aquatic environment of the Community (Dangerous Substances Directive) - List II substances
4. Council Directive on the quality of water intended for human consumption (Drinking Water Directive)
5. WHO Guidelines for Drinking Water Quality. Third edition (2004)

CONTROLLED WATER RISK ASSESSMENT AND MITIGATION

This comparison indicates that the data exceeds the DWS values for the following inorganic compounds:

- ☛ Zinc
- ☛ TPH C5-C6 (benzene)
- ☛ pH



It should be noted that the Tier I assessment criteria provides a conservative view, which may overstate the risk. Inorganic determinants identified above are of a general low solubility and therefore mobility, suggesting that these will not migrate to controlled water receptors.

Heavy metals have been identified in three samples positioned in two discrete low lying areas of the site. The low lying nature and prolonged periods of standing water could encourage decomposition of plant matter releasing zinc into the near surface and shallow groundwater. These areas are also low pH which encourages the bioavailability of zinc. Given the significant depth of low permeability cohesive strata through the site and absence of significant surface water features in the area surrounding the site this is considered to be a low risk to controlled waters and the wider environ.

Elevated levels of TPH C5-C6, as well as Toluene, Benzene, Phenol and Isopropyltoluene within WS111 can be also linked to varying quantities of Methylphenol identified within all three water samples. These semi-volatile/volatile hydrocarbons have a low solubility in water and can all be associated with a localised spill of oil/fuel/degreasing agents/pesticides that could all be linked to the agricultural uses and machinery utilised at the site. Given the low solubility and therefore low mobility in cohesive stratum beneath the site they are considered to be localised and a low risk. These contaminants do have a potential volatilisation risk associated, however, there is no significant source on or off site beyond those mentioned above. Due to the cohesive nature of the soils and the absence of VOCs in leachate analysis there is considered to be a low risk.

Given that the site is underlain by low-permeability, predominantly cohesive glacial till deposits, which will afford protection to the underlying secondary A aquifer, and in the absence of a groundwater abstraction within influencing distance of the site, there is considered to be a low risk to controlled waters and the wider environ as no complete pollutant linkage can be determined.

4.3. GROUND GAS

The potential impact on the development from ground gases has been assessed with reference to standards and guidelines published in CIRIA Report 665 – *Assessing risks posed by hazardous ground gases to buildings* (2007). However, it is recommended that the full ground gas assessment and recommended protection measures are agreed with the local authority prior to their adoption on site. Furthermore, all protection measures adopted should be validated by a suitably qualified engineer.

CIRIA C665 and NHBC Report No 10627-R01 provide assessments for carbon dioxide and methane based upon gas screening values (GSVs) utilising flow rates and concentrations. The site-based GSVs for steady state methane and carbon dioxide are based upon the following equation:

$$GSV = \frac{\text{concentration (by vol)}}{100} \times \text{flowrate (1 / hr)}$$

The GSVs within CIRIA C665 are based upon all buildings other than standard residential houses. The NHBC GSVs are based upon standard residential houses with precast concrete floors (block and beam). The CIRIA 665 report author (Steve Wilson) since provided further clarification regarding which guidance should be adopted for residential houses that have suspended cast in-situ concrete floor slab: for the avoidance of doubt, it was confirmed that the GSVs within the CIRIA 665 guidance should be adopted. The thresholds for GSVs based upon NHBC and CIRIA guidance are provided within Table 4.5.



TABLE 4.5 RESIDENTIAL THRESHOLDS FOR GAS SCREENING VALUES (GSV) IN ACCORDANCE WITH CIRIA C665 AND NHBS REPORT NO 10627-R01 – RESIDENTIAL END USE

| CIRIA – NO SUBFLOOR VOID | | NHBC – SUBFLOOR VOID | | |
|--------------------------|----------------------------------|----------------------|---------------|----------------------|
| CLASSIFICATION | GSV (METHANE AND CARBON DIOXIDE) | CLASSIFICATION | GSV (METHANE) | GSV (CARBON DIOXIDE) |
| CS1 | < 0.07 | Green | < 0.13 | < 0.76 |
| CS2 | < 0.70 | Amber 1 | < 0.63 | < 1.60 |
| CS3 | < 3.5 | Amber 2 | < 1.60 | < 3.10 |
| CS4 | < 15 | Red | > 1.60 | > 3.10 |
| CS5 | < 70 | N/A | N/A | N/A |
| CS6 | > 70 | N/A | N/A | N/A |

4.3.1. SOURCES OF GROUND GAS

The Phase I report and subsequent ground investigation has identified the following potential sources of ground gas:

- ☛ Infilled ponds and field boundaires.

4.3.2. GROUNDWATER

Groundwater levels were observed to be low over the majority of locations with half the wells being dry on the initial visit. WS108 and WS112 were observed to have high water levels during the initial visit. These were set within a low-permeability clay stratum and groundwater may be a result of surface water collecting in the well rather than a measure of true groundwater.

4.3.3. GAS FLOW

During the monitoring a positive flow was noted within all locations. The measure of positive flow is considered to be the result of groundwater fluctuations and flooding of the well causing compression – as opposed to gas generation – as the highest flows are recorded during periods of high groundwater levels.

4.3.4. GAS CONCENTRATIONS

No elevated concentrations of methane were recorded within any of the remaining monitoring wells.

Carbon dioxide concentrations were recorded within all the monitoring wells at concentrations ranging from 0.60% v/v to 7.20% v/v (WS108). The maximum carbon dioxide levels were also associated with low oxygen concentrations and appear to be associated with natural stratum, identified in WS108.

4.3.5. GAS ASSESSMENT

In accordance with the methodology outlined with the CIRIA publication C665, E3P have utilised the results of the ground gas monitoring surveys to calculate a tentative gas screening value (GSV). The GSVs for the monitoring positions are summarised in Table 4.6.



TABLE 4.6 GAS RISK PROFILE AND LOCATION

| LOCATION | MAX CH ₄ (% v/v) | GSV (l/hr) | MAX CO ₂ (% v/v) | GSV (l/hr) | CLASSIFICATION |
|----------|--------------------------------|---------------|--------------------------------|---------------|----------------|
| WS101 | 0.10 | 0.00052 | 0.60 | 0.00312 | Green/CS1 |
| WS102 | 0.10 | 0.00096 | 2.20 | 0.02112 | Green/CS1 |
| WS103 | 0.10 | 0.00026 | 0.70 | 0.00182 | Green/CS1 |
| WS104 | 0.10 | 0.00026 | 2.80 | 0.00728 | Green/CS1 |
| WS105 | 0.10 | 0.00026 | 3.70 | 0.00962 | Green/CS1 |
| WS106 | 0.10 | 0.00052 | 0.60 | 0.00312 | Green/CS1 |
| WS107 | 0.10 | 0.00026 | 1.90 | 0.00494 | Green/CS1 |
| WS108 | 0.10 | 0.00013 | 7.20 | 0.00936 | Amber 1/CS2 |
| WS109 | 0.10 | 0.00010 | 2.20 | 0.00220 | Green/CS1 |
| WS110 | 0.10 | 0.00340 | 1.70 | 0.05780 | Green/CS1 |
| WS111 | 0.10 | 0.00176 | 4.60 | 0.08096 | Green/CS1 |
| WS112 | 0.10 | 0.00180 | 1.80 | 0.03240 | Green/CS1 |

The GSV has been compared to the criteria outlined with CIRIA C665 to determine the level of risk to the proposed development and to ensure the appropriate remedial options are incorporated into any future building design in this area.

Preliminary ground gas monitoring suggests that the site can be predominantly classified as CS1, and in these areas it is considered that gas protection measures will not be required. However, a localised area of the site have been assessed as being CS2 and properties within this area may require specialist protection measures as detailed below.

Elevated Carbon Dioxide is present marginally above 5% v/v within one borehole (WS108). This presence of carbon dioxide in glacial clays is relatively common, with reference as a potential source where mitigation measures would not be required within BS8485 (Annex D), and in more detail within CIEH (2008). The references of the presence of carbon dioxide generated from natural carbonate materials within glacial clays is detailed as: *“Carbon dioxide produced by natural soils at very low rates can nevertheless result in elevated concentrations within monitoring wells and be present in wells installed in soils or rocks that include carbonate content such as chalk and limestone or clay with chalk gravel.”*

Consideration should be given to the monitoring results which are marginally above 5% v/v and as stated within above, NHBC indicate that only typical concentration of 10% can be classified as Amber 1. Furthermore, the absence of notable methane confirms there are no anthropogenic sources currently promoting gas release.

Upon completion of the full phase of ground gas monitoring at the site, it may be possible to appropriately regard the site as Characteristic Situation 1 and plots within the proposed future development may not require the installation of ground gas mitigation measures.



4.4. RESIDENTIAL BUILDING GAS RISK MITIGATION

British Standard BS8485 (2015)+A1(2019) provides two types of residential property that require assessment. These building types are:

- ✚ **Type A Building** – Private ownership with no building management controls on alterations to the internal structure, the use of rooms, the ventilation of rooms or the structural fabric of the building. Some small rooms are present. Probably conventional building construction (rather than civil engineering). Examples include private housing and some retail premises.
- ✚ **Type B Building** – Private or commercial property with central building management control of any alterations to the building or its uses but limited or no central building management control of the maintenance of the building, including the gas protection measures. Multiple occupancy. Small- to medium-sized rooms with passive ventilation of rooms and other internal spaces throughout ground floor and basement areas. May be conventional building or civil engineering construction. Examples include managed apartments, multiple occupancy offices, some retail premises and parts of some public buildings (such as schools, hospitals, leisure centres) and parts of hotels.

Based on the ground gas risk assessment and the proposed Type A Building, it is envisaged that a point score of 3.5 will be required for affected properties, as summarised in Table 4.7.

TABLE 4.7 BS 8485 (2015) POINTS REQUIRED FOR TYPE A AND TYPE B BUILDINGS

| CHARACTERISTIC SITUATION | NHBC TRAFFIC LIGHT SYSTEM | MINIMUM GAS PROTECTION SCORE (POINTS) | |
|--------------------------|---------------------------|---------------------------------------|-----------------|
| | | HIGH SENSITIVITY | |
| | | TYPE A BUILDING | TYPE B BUILDING |
| 1 | Green | 0 | 0 |
| 2 | Amber 1 | 3.5 | 3.5 |
| 3 | Amber 2 | 4.5 | 4 |
| 4 | Red | 6.5 | 5.5 |
| 5 | N/A | N/A | 6.5 |
| 6 | N/A | N/A | N/A |

Residential buildings should not be built on CS4 or higher sites unless the type of construction or site circumstances allow additional levels of protection to be incorporated, for example, high-performance ventilation or pathway intervention measures, and an associated sustainable system of management of maintenance of the gas control system such as in institutional and/or fully serviced contractual situations.

The requisite 3.5 points must be achieved by installation of a suitable combination of measures detailed in Table 4.8.



TABLE 4.8 SUMMARY OF GROUND GAS MITIGATION MEASURES – BS8485 (2015)+A1(2019)

| GAS PROTECTION SCORES FOR THE STRUCTURAL BARRIER | SCORE ^A |
|--|-----------------------|
| Floor and Substructure Design | |
| Precast Suspended Segmental Subfloor (Beam and Block) | 0 |
| Cast In-Situ Ground-Bearing Floor Slab (With Only Nominal Mesh Reinforcement) | 0.5 |
| Cast In-Situ Monolithic Reinforced Ground-Bearing Raft or Reinforced Cast In-Situ Suspended Floor Slab With Minimal Penetrations | 1 or 1.5 ^B |
| Basement Floor and Walls Conforming to BS 8102:2009, Grade 2 Waterproofing^C | 2 |
| Basement Floor and Walls Conforming to BS 8102:2009, Grade 3 Waterproofing^C | 2.5 |
| <p>A) The scores are conditional on breaches of floor slabs, etc. being effectively sealed. B) To achieve a score of 1.5 the raft or suspended slab should be well reinforced to control cracking and have minimal penetrations cast in (see A.2.2.2). C) The score is conditional on the waterproofing not being based on the use of a geosynthetic clay liner waterproofing product (see C.3, Note 4).</p> | |

| PROTECTION ELEMENT SYSTEM | SCORE | COMMENTS |
|--|--|--|
| Gas protection scores for ventilation protection measures | | |
| <p>(a) Pressure Relief Pathway – Usually formed of low fines gravel or with a thin geocomposite blanket or strips terminating in a gravel trench external to the building.</p> | 0.5 | <p>Whenever possible a pressure relief pathway (as a minimum) should be installed in all gas protection measures systems.</p> <p>If the layer has a low permeability and/or is not terminated in a venting trench (or similar), then the score is 0.</p> |
| <p>(b) Passive Subfloor Dispersal Layer – Media used to provide the dispersal layer are:</p> <ul style="list-style-type: none"> ☛ Clear void; ☛ Polystyrene void former blanket; ☛ Geocomposite void former blanket; ☛ No-fines gravel layer with gas drains; and ☛ No-fines gravel layer. | <p>Very good performance</p> <p>Good performance</p> | <p>2.5</p> <p>1.5</p> <p>The ventilation effectiveness of different media depends on a number of different factors including the transmissivity of the medium, the width of the building, the side ventilation spacing and type and the thickness of the layer. The selected score should be assigned taking into account the recommendations in Annex B of BS 8485 (2015).</p> <p>Passive ventilation should be designed to meet at least “good performance”.</p> |



| PROTECTION ELEMENT SYSTEM | SCORE | COMMENTS |
|---|-------------------|---|
| <p>(c) Active Dispersal Layer – Usually comprising fans with active abstraction (suction) from a subfloor dilution layer with roof-level vents. The dilution layer may comprise a clear void or be formed of geocomposite or polystyrene void formers.</p> | <p>1.5 to 2.5</p> | <p>This system relies on continued serviceability of the pumps, therefore alarm and response systems should be in place.</p> <p>There should be robust management systems in place to ensure the continued maintenance of the system, including pumps and vents.</p> <p>Active ventilation should always be designed to meet at least “good performance”.</p> |
| <p>(d) Active Positive Pressurisation – Provided by the creation of a blanket of external fresh air beneath the building floor slab by pumps supplying air to points across the central footprint of the building into a permeable layer, usually formed of a thin geocomposite blanket.</p> | <p>1.5 to 2.5</p> | <p>This system relies on continued operation of the pumps, therefore alarm and response systems should be in place.</p> <p>The score assigned should be based on the efficient “coverage” of the building footprint and the redundancy of the system.</p> <p>Active ventilation should always be designed to meet at least “good performance”.</p> |
| <p>(e) Ventilated Car Park – Floor slab of occupied part of the building under consideration is underlain by a basement or undercroft car park.</p> | <p>4</p> | <p>Assumes that the car park is vented to deal with car exhaust fumes, designed to Buildings Regulations 2000, Approved Document F [9].</p> |



| Gas Protection Score for the Gas-Resistant Membrane | | |
|---|-------|---|
| PROTECTION ELEMENT SYSTEM | SCORE | COMMENTS |
| <p>Gas-resistant membrane meeting all of the following criteria:</p> <ul style="list-style-type: none"> ✳ Sufficiently impervious to the gases with a methane gas transmission rate < 40.0 ml/day/m²/atm (average) for sheet and joints (tested in accordance with BS ISO 15105-1 manometric method); ✳ Sufficiently durable to remain serviceable for the anticipated life of the building and duration of gas emissions; ✳ Sufficiently strong to withstand in-service stresses (e.g. settlement if placed below a floor slab); ✳ Sufficiently strong to withstand the installation process and following trades until covered (e.g. penetration from steel fibres in fibre-reinforced concrete, penetration of reinforcement ties, tearing due to working above it, dropping tools); ✳ Capable, after installation, of providing a complete barrier to the entry of the relevant gas; and ✳ Verified in accordance with CIRIA C735. | 2 | <p>The performance of membranes is heavily dependent on the quality and design of the installation, resistance to damage after installation and integrity of joints.</p> <p>For example, a minimum 0.4 mm thickness (equivalent to 370 g/m² for polyethylene) reinforced membrane (virgin polymer) meets the performance criteria opposite.</p> <p>If a membrane is installed that does not meet all the criteria opposite, then the score is 0.</p> |
| <p>This table should be read in conjunction with the notes presented in BS 8485 (2015)+A1 (2019)</p> | | |



4.5. POTABLE WATER SUPPLY

This section provides a summary of the site investigation data with reference to the selection of potable water supply pipework. The assessment is made with reference to the UK Water Industry Research (UKWIR) publication "Guidance on the selection of Water Supply Pipes to be used in Brownfield Sites"

TABLE 4.9 PIPELINE SELECTION PE THRESHOLD CONCENTRATIONS

| Contaminant Group | PE-threshold (mg/kg) | Concentrations at <u>Current</u> pipeline depth (mg/kg) |
|--|--|---|
| Total VOC | 0.5 | N/A |
| Total BTEX And MTBE | 0.1 | N/A |
| Total SVOCs (Excluding PAH and those substances marked with an *) | 2 | N/A |
| EC5-EC10 Aliphatic and Aromatic Hydrocarbons | 2 | <1.0 |
| EC10-EC16- Aliphatic and Aromatic Hydrocarbons | 10 | <4.0 |
| EC16-EC40 Aliphatic and Aromatic Hydrocarbons | 500 | <10 |
| Phenols (From SVOC Analysis)* | 2 | N/A |
| Cresols and Chlorinated Phenols (From SVOC Analysis) | 2 | N/A |
| Ethers* | 0.5 | N/A |
| Nitrobenzene* | 0.5 | N/A |
| Ketones* | 0.5 | N/A |
| Aldehydes* | 0.5 | N/A |
| Amines | Fail | N/A |
| Other Consideration | | |
| Are there any exceedances of the PE threshold outside of the pipeline depth? | None | |
| Is free product present in soil and groundwater? | None | |
| Could hydrocarbon impact at greater depth than current pipeline depth be mobilised by rising groundwater levels? | No – heavy end hydrocarbon impact and low solubility PAH has been identified within soils analysis completed to date. | |
| Will soils impacted with above determinands likely be utilised elsewhere on site? | No | |
| Will soils be imported to site as part of any future earth works | A cut/fill will be required as part of a phase of enabling works. Where a shortfall of site won materials exists the importation of materials may affect the WIR Risk Assessment which should be updated after completion. | |

Notes - Pipe line depth normally between 0.75m–1.35m

Based on the assessment of current site conditions it is likely that polyethylene (PE) pipe will be suitable at the proposed development.



4.6. CONCEPTUAL SITE MODEL

Following the completion of the intrusive site investigation, chemical analysis and risk assessment, the conceptual model shown in Table 4.10 has been prepared for the site.

TABLE 4.10 CONCEPTUAL MODEL

| POLLUTANT LINKAGE | CONTAMINANT (SOURCE) | PATHWAY | RECEPTOR | PROBABILITY | CURRENT RISK | RESIDUAL RISK AFTER MITIGATION |
|--|--|---|---|-------------|--------------|--------------------------------|
| PL1 PL2 | Dermal contact. Dermal contact and ingestion. | Future site users. Off-site receptors. | Heavy metals (in Topsoil) | Likely | Low | LOW |
| <p>Discussion: Heavy metals (Lead) identified in discrete locations between depths of 0.10m and 0.40m.</p> <p>Recommendation: Given the isolated occurrence and limited sources on site the impacted materials should be excavated and placed in low future sensitivity area of the site. Where this is completed cover system to garden and landscaped areas will not be required. Construction works completed with suitable PPE and provision of welfare.</p> | | | | | | |
| PL3 | Volatile Contaminants such as hydrocarbons, solvents, (spills/leaks) | Inhalation of vapours. Migration through permeable strata and preferential pathways. | Future site users. Off-site receptors. | Likely | Low | LOW |
| <p>Assessment: Benzene (TPH C5-6) and methylphenol has been identified (WS111) which has a potential volatolisation risk. Considered to be an isolated occurrence localised in this area. Given the volumes identified and absence of a source not considered to be a significant risk.</p> <p>Recommendation: N/A</p> | | | | | | |



| POLLUTANT LINKAGE | CONTAMINANT (SOURCE) | PATHWAY | RECEPTOR | PROBABILITY | CURRENT RISK | RESIDUAL RISK AFTER MITIGATION |
|--|---|--|--|----------------|--------------|--------------------------------|
| PL5 | Methane, carbon dioxide (Infilled features – hedgerow/low areas) | Inhalation of gas. Migration through permeable strata and preferential pathways. Explosion in confined spaces. | Future site users. Buildings. Off-site land users. | Low likelihood | Moderate | LOW |
| <p>Assessment: Current assessment based on initial monitoring visit confirms one area of the site (WS108) identifies levels of CO2 that would require CS2/Amber 1 classification. Given the absence of a significant source in this area it is likely that this is the degretation/decomposition of carbonate minerals within the natural stratum.</p> <p>Recommendation: The full phase of ground gas monitoring should be completed to inform the full and detailed assessment and therefore level of risk. Currently an allowance for CS2/amber 1 mitigation measures should be retained.</p> | | | | | | |
| PL5 | Mobile contaminants such as metals, hydrocarbons, volatile compounds (spills/leaks) | Surface runoff. Migration through permeable strata and preferential pathways. Perched waters migration. | Groundwater (secondary A aquifer). Surface water (Ponds surrounding site and River Alyn). | Low Likelihood | Low | LOW |
| <p>Assessment: Low Likelihood as potentially mobile contamination has been identified yet glacial till across the site may reduce downward migration into the underlying bedrock aquifer and in the absence of a significant source on site and/or significant receptor within influencing distance the risk is considered low.</p> <p>Recommendation: No risk to controlled waters has been identified in the absence of a viable receptor and significant source of contaminants.</p> | | | | | | |



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| POLLUTANT LINKAGE | CONTAMINANT (SOURCE) | PATHWAY | RECEPTOR | PROBABILITY | CURRENT RISK | RESIDUAL RISK AFTER MITIGATION |
|-------------------|--------------------------------|------------------------------|---------------------|-------------|--------------|--------------------------------|
| PL6 | Sulphate (limited Made Ground) | Sulphate attack on concrete. | Building structure. | Unlikely | Low | LOW |

Assessment:

Assessment completed based on soil samples obtained during the site investigation confirms DS-1 AC-1s concrete classification will be required in the future development.

Recommendation:

Utilise DS-1 AC-1s concrete classification within subsurface concrete.

| | | | | | | |
|------------|--|------------------------------------|------------------------------------|----------|-----|------------|
| PL7 | Organic contaminants such as hydrocarbons, solvents (spills/leaks) | Ingestion of tainted water supply. | Future site users. Water pipes. | Unlikely | Low | LOW |
|------------|--|------------------------------------|------------------------------------|----------|-----|------------|

Assessment:

Unlikely probability as significant contamination has not been identified at pipeline depth across the site (0.75–1.35 m).

Recommendation:

Completion of UKWIR assessment to confirm the required pipeline materials post remediation works. Currently polyethylene pipeline is considered to be sufficient.

| | | | | | | |
|------------|--|--------------------------------|--------|--------|-----|------------|
| PL8 | Phytotoxic contaminants (Made Ground/spills/leaks) | Direct Contact (plant uptake). | Flora. | Likely | Low | LOW |
|------------|--|--------------------------------|--------|--------|-----|------------|

Assessment:

Likely probability as contamination has been identified in the near surface.

Recommendation:

Excavation and placement of impacted materials in an area of low risk within the future development or alternatively cover system required within private gardens in this area of the site.

Main exposure pathways:

PL1 = soil ingestion, PL2 = dermal contact and ingestion, PL3 = vapour inhalation (indoor), PL4 = dust inhalation; PL5 = Vertical/lateral migration;

PL6 = Corrosion of concrete; PL7=Tainting of water supply; PL8 = Uptake by plants



5. GEOTECHNICAL ASSESSMENT

5.1. PROPOSED DEVELOPMENT

E3P understands that the proposed development will comprise a residential end use of 154 units (through a mix of apartment, detached, semi-detached, terraced property) with associated estate roads, utility infrastructure, private gardens and areas of landscaping.

5.2. SUMMARY OF GROUND CONDITIONS

- ✿ Made Ground - Made Ground has been identified in two discrete areas of the site (TP121-0.50 and TP123-0.30) as reworked topsoil with clay pipe fragments and as reworked natural clay with fragments of a land drain present. Not considered significant sources of potential contaminants and are likely due to agricultural practices at the site. The full depth of Made Ground has been proven in both instances.
- ✿ Topsoil - Topsoil has been identified in all exploratory locations with the exception of the two Made Ground areas. Topsoil is encountered as a slightly gravelly sandy clay with frequent rootlets and gravel of fine to coarse subangular to subrounded mudstone. Topsoil has been identified to depths between ground level and 0.30m bgl.
- ✿ Drift - Natural drift deposits have been identified within all exploratory locations. Predominantly throughout the site a gravelly sandy CLAY with gravel of mudstone and sandstone is identified. Clay stratum has been noted as highly friable and so hand shear vane tests could not be completed in some cases. Occasionally a grey gravel of mudstone is identified at the base of excavations (TP116, TP117, TP121, WS105, WS106 and WS106A) circa 2.00-3.00m bgl and within RBH103 between 4.00m and 7.60m bgl indicative of weathered bedrock. In rare locations (TP120, 124, WS110, RBH102 and RBH105) a clayey sand is identified at similar depths. Within the previous site investigation a 'highly localised' area of peat was identified to the south west of the site. E3P advanced a number of locations in this area that has not identified peat.
- ✿ Solid - The solid bedrock geology was identified throughout the site in rotary positions at depths between 3.30m and 8.10m bgl. Bedrock was identified as interbedded grey siltstone, sandstone and mudstone with occasional marl. Bedrock strata was encountered to a maximum proven depth of 30.00m bgl.
- ✿ Groundwater - Groundwater strikes were encountered as seepages between 2.00m bgl and 4.00m bgl.

5.3. SITE PREPARATION

The site should be cleared and any vegetation below areas of proposed development stripped in accordance with Series 200 of the *Manual of Contract Documents for Highway Works (MCHW)*. This should include the following:

- ✿ Removal of hedgerows and trees (as required).
- ✿ Roots present below the footprint of proposed structures and infrastructure should be grubbed out and the resulting void infilled with suitable compacted engineered fill.



- ✳ Redundant services should be sealed off and grubbed out and replaced with suitable compacted engineered fill.
- ✳ Buried structures and old foundations have not been encountered on site but any obstructions identified during the works should be excavated from below the proposed development footprint with the resulting void backfilled.

5.4. FOUNDATION CONDITIONS AND ASSESSMENT OF POTENTIAL BEARING CAPACITIES

In due consideration of the identified ground conditions, in-situ and laboratory geotechnical testing, E3P has undertaken an assessment of the net safe allowable bearing pressure (ABP) within the underlying natural stratum to assist in the detailed design of foundations and infrastructure and determine the target founding stratum. The results of this assessment are summarised in Table 5.1.

TABLE 5.1 SUMMARY OF ABPS

| GRANULAR SOILS | | | |
|----------------------------------|---------------------|--|---|
| Description | Depth (Range m bgl) | Relative Density | Allowable Bearing Pressure (kN/m ²) |
| GRAVEL | 2.00–3.00 | Dense | 438-456 |
| | 3.60 | | 426 |
| COHESIVE SOILS | | | |
| Description | Depth (range m bgl) | Undrained Shear Strength (Cu) (kN/m ²) | Allowable Bearing Pressure (kN/m ²) |
| Gravelly slightly sandy CLAY | 1.00–1.45 | 70-120 | 145-248 |
| | 2.00-2.45 | 77-150 | 159-309 |
| | 2.50-3.00 | 218-219 | 448-450 |
| | 3.00-3.45 | 91-217 | 187-447 |
| | 3.50-4.00 | 213 | 438 |
| | 4.00-4.45 | 114-211 | 234-434 |
| | 5.00-5.45 | 87-141 | 179-289 |
| Soft gravelly silty CLAY (TP111) | 0.80-1.20 | 38-42 | 89-98 |

Based on the assessment of the relative undrained shear strength, relative in-situ densities and corresponding safe net allowable bearing pressure, the suitable target founding stratum has been identified as the underlying stiff to very stiff glacial clays and localised areas of dense gravel.

However, given the significant topographical variances on the site, prior to the detailed design of suitable foundations solutions, a programme of remediation and enabling works will be required to cut/fill the site to provide suitable development platform levels.



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The exception to this would be in the location of TP111 where soft clay has been identified (also in the area of previously identified peat). In this location it is likely that a deep mass trench fill solution would be required.

Therefore, upon completion of these enabling works, it is likely that the most cost effective option for the majority of the site would be a shallow strip or spread foundation and depending on upfill levels and therefore resulting depth of newly placed Made Ground a mass trench fill solution or driven pile solution (given the potential tree influence) to support a reinforced strip foundation.

Foundation depths should take account of the presence of existing and proposed trees, with foundations deepened locally to mitigate the potential for volumetric instability attributed to fluctuations in moisture content, in accordance with the requirements of NHBC standards.

It is recommended that at working drawing stage a foundation schedule is prepared for the development, taking account of the physical change of natural clay soils and the current/proposed locations of trees.

TABLE 5.2 ANTICIPATED FOUNDATIONS

| LOCATION | ANTICIPATED FOUNDING STRATA DEPTH (m bgl) | GROUND WATER (m bgl) | TARGET STRATUM | TREES | FOUNDATION TYPE | TYPE OF CONCRETE |
|-------------|---|----------------------|----------------|-------|-----------------|------------------|
| WS101 | 0.75 | 3.00 | Stiff CLAY | N | Shallow Strip | DS-1 AC-1s |
| WS102 | 0.75 | N/A | Stiff CLAY | N | Shallow Strip | DS-1 AC-1s |
| WS102A | 1.15 | 4.00 | Stiff CLAY | N | Shallow Strip | DS-1 AC-1s |
| WS103 | 0.75 | N/A | Stiff CLAY | N | Shallow Strip | DS-1 AC-1s |
| WS104 | 0.96 | N/A | Stiff CLAY | N | Shallow Strip | DS-1 AC-1s |
| WS105 | 0.75 | N/A | Stiff CLAY | N | Shallow Strip | DS-1 AC-1s |
| WS106 | 0.95 | N/A | Stiff CLAY | N | Shallow Strip | DS-1 AC-1s |
| WS106a | 0.95 | 2.50 | Stiff CLAY | N | Shallow Strip | DS-1 AC-1s |
| WS107 | 0.95 | N/A | Stiff CLAY | Y | Shallow Strip | DS-1 AC-1s |
| WS108 | 0.95 | 3.00 | Stiff CLAY | N | Shallow Strip | DS-1 AC-1s |
| WS109 | 0.75 | N/A | Stiff CLAY | N | Shallow Strip | DS-1 AC-1s |
| WS110 | 0.75 | N/A | Stiff CLAY | N | Shallow Strip | DS-1 AC-1s |
| WS111 | 0.75 | N/A | Stiff CLAY | N | Shallow Strip | DS-1 AC-1s |
| WS112 | 0.95 | N/A | Stiff CLAY | N | Shallow Strip | DS-1 AC-1s |
| TP101 | 0.75 | N/A | Stiff CLAY | N | Shallow Strip | DS-1 AC-1s |
| TP102 | 0.75 | N/A | Stiff CLAY | Y | Shallow Strip | DS-1 AC-1s |
| TP103 | 1.15 | N/A | Stiff CLAY | Y | Shallow Strip | DS-1 AC-1s |
| TP104 | 1.15 | N/A | Stiff CLAY | Y | Shallow Strip | DS-1 AC-1s |
| TP105/SA101 | 1.15 | N/A | Stiff CLAY | N | Shallow Strip | DS-1 AC-1s |
| TP106/SA102 | 0.75 | N/A | Stiff CLAY | N | Shallow Strip | DS-1 AC-1s |
| TP107/SA103 | 1.15 | N/A | Stiff CLAY | N | Shallow Strip | DS-1 AC-1s |



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| LOCATION | ANTICIPATED FOUNDING STRATA DEPTH (m bgl) | GROUND WATER (m bgl) | TARGET STRATUM | TREES | FOUNDATION TYPE | TYPE OF CONCRETE |
|-------------|---|----------------------|----------------|-------|-----------------|------------------|
| TP108/SA104 | 0.75 | N/A | Stiff CLAY | N | Shallow Strip | DS-1 AC-1s |
| TP109 | 0.75 | N/A | Stiff CLAY | N | Shallow Strip | DS-1 AC-1s |
| TP110 | 0.75 | N/A | Stiff CLAY | N | Shallow Strip | DS-1 AC-1s |
| TP111 | 2.45 | N/A | Stiff CLAY | N | Deep MTF/Pile | DS-1 AC-1s |
| TP112 | 0.85 | N/A | Stiff CLAY | N | Shallow Strip | DS-1 AC-1s |
| TP113 | 0.75 | N/A | Stiff CLAY | N | Shallow Strip | DS-1 AC-1s |
| TP114 | 0.75 | N/A | Stiff CLAY | N | Shallow Strip | DS-1 AC-1s |
| TP115 | 0.75 | N/A | Stiff CLAY | N | Shallow Strip | DS-1 AC-1s |
| TP116 | 0.75 | 3.20 | Stiff CLAY | N | Shallow Strip | DS-1 AC-1s |
| TP117 | 0.85 | 2.00 | Stiff CLAY | N | Shallow Strip | DS-1 AC-1s |
| TP118 | 0.75 | N/A | Stiff CLAY | Y | Shallow Strip | DS-1 AC-1s |
| TP119 | 0.85 | N/A | Stiff CLAY | N | Shallow Strip | DS-1 AC-1s |
| TP120 | 0.75 | N/A | Stiff CLAY | N | Shallow Strip | DS-1 AC-1s |
| TP121 | 0.95 | N/A | Stiff CLAY | N | Shallow Strip | DS-1 AC-1s |
| TP122 | 0.95 | N/A | Stiff CLAY | N | Shallow Strip | DS-1 AC-1s |
| TP123 | 0.75 | N/A | Stiff CLAY | N | Shallow Strip | DS-1 AC-1s |
| TP124 | 0.75 | N/A | Stiff CLAY | N | Shallow Strip | DS-1 AC-1s |
| TP125 | 0.75 | N/A | Stiff CLAY | N | Shallow Strip | DS-1 AC-1s |
| TP126 | 0.75 | N/A | Stiff CLAY | Y | Shallow Strip | DS-1 AC-1s |
| TP127 | 0.75 | N/A | Stiff CLAY | N | Shallow Strip | DS-1 AC-1s |
| TP128 | 0.75 | N/A | Stiff CLAY | Y | Shallow Strip | DS-1 AC-1s |
| TP129 | 0.75 | N/A | Stiff CLAY | N | Shallow Strip | DS-1 AC-1s |
| TP130 | 0.95 | N/A | Stiff CLAY | Y | Shallow Strip | DS-1 AC-1s |

It is recommended that, at working drawing stage, a foundation schedule is prepared for the development taking account of the physical change of natural clay soils and the current/proposed locations of trees and the required design levels through the site.

At this time it is not possible to accurately define the foundation types due to the absence of a detailed tree survey and final development levels; however, based on our extensive experience of similar sites, we would anticipate that the final foundation solution would be a combination of the following:

- ☛ Shallow strip foundations bearing on firm to very stiff gravelly CLAY at circa 1 m bgl; and
- ☛ Trench fill to support reinforced strip foundations in areas of variable ground and/or potential tree influence.



- Driven pile (over VSC given tree influence) for less than 5% of the site (currently) to support a reinforced strip footing in areas of poor ground.

A conceptual foundation zoning plan is included as Drawing 14-278-009 in Appendix III.

5.5. GROUND FLOOR SLABS

Current building control regulations require that where infilled ground is present to depths in excess of 600 mm, or where the substratum is variable in terms of the structure and settlement potential, or where clay soils are present within the influence of existing or proposed trees, a suspended floor slab is required.

In this instance, it is considered that for the majority of substructures, the underlying stratum would have in excess of 600 mm of cohesive strata and, as such, a suspended floor slab will be required.

Where a cast in-situ suspended slab is utilised with no subfloor void, appropriate compressible material (heave precautions) will be required in the construction of the substructure with specialist design.

5.6. HEAVE PRECAUTIONS

The site has been proven to be underlain by clay soils, which are susceptible to volumetric instability due to fluctuations in moisture content, particularly within influencing distance of trees as per the NHBC/LABC conjectured zones of influence.

As the clay is deemed to be low plasticity, heave precautions are not required to the internal face of the external load-bearing walls (outside or within tree influence).

If a ground beam is to be constructed within the zone of tree influence, heave precautions are required to the underside of this and edge beams.

If the ground floor slab is to be constructed with a beam and block floor, a minimum subfloor void of 200 mm is required within any structures located in the zone of conjectured tree influence.

If the ground floor slab is constructed with a cast in-situ suspended floor slab, then heave precautions that can tolerate 50 mm of clay swelling are required within any part of the floor slab to be located within the zone of influence of a tree.

A summary of heave precautions is presented in Table 5.4.



TABLE 5.4 SUMMARY OF HEAVE PRECAUTIONS

| | | MINIMUM VOID DIMENSION FOR FOUNDATIONS, GROUND BEAMS AND SUSPENDED IN-SITU CONCRETE GROUND FLOORS | | MINIMUM VOID DIMENSIONS UNDER PRECAST CONCRETE AND SUSPENDED TIMBER FLOORS |
|------------------------------------|-------------------------------|---|--|--|
| Plasticity Index of Soil | Required Foundation Depth (m) | Thickness of Void Former Against Side of Foundation or Ground Beam (mm) | Thickness of Void Former on Underside of Edge Beam and Floor Slab (mm) | Void Dimension (mm) |
| High Plasticity (> 40) | > 2.5 | Engineer Design | | Engineer Design |
| | 2.0–2.5 | 35 | 150 | 300 |
| | 1.5–2.0 | 25 | 75 | |
| Moderate Plasticity (20–40) | > 2.5 | Engineer Design | | Engineer Design |
| | 2.0–2.5 | 25 | 100 | 250 |
| | 1.5–2.0 | 25 | 50 | |
| Low Plasticity (< 20) | 2.0–2.5 | N/A | 50 | 200 |
| | > 2.0 | No Special Precautions | | |

5.7. HIGHWAYS CONSTRUCTION

A programme of remediation and enabling works will be required to remediate the proposed road subgrade in accordance with the requirements of the Manual of Contract Documents for Highway Works Volume 1 Specification For Highway Works (Series 600-Earthworks) for a method compaction.

It is considered that the material can be re-engineered using method compaction to achieve a CBR in excess of 5% if works are completed in favourable climatic conditions.

5.8. DRAINAGE

Following the potential upfill in required in some areas of the site the presence of newly placed Made Ground may result in settlement. It is therefore recommended that drain runs are designed using steeper gradients and flexible joints to allow for some differential settlement.

Shallow bedrock identified between 3.30m and 8.10m bgl may impede excavations to install drainage and should therefore be considered in the design.

Furthermore, the site is predominantly underlain by circa 1–2 m of likely low-permeability gravelly CLAY. Completion of four soakaway tests during the site investigation confirmed this stratum to have a low permeability coefficient and therefore is unlikely to support significant soakaway drainage.

If soakaway drainage is to be considered, the BRE 365 testing completed to date must be used to inform the specialist detailed design.



5.9. CONCRETE DURABILITY

Based upon the results of the chemical analyses it is considered that subsurface concrete can be designed in accordance with Design Sulphate Class DS-1, Aggressive Chemical Environment for Concrete Classification (ACEC) AC-1s in accordance with the recommendations provided in BRE *Special Digest 1* (2005).

5.10. EXCAVATIONS

Trial pits were generally stable in both shallow Made Ground and natural strata; as such, it is considered that near-surface excavations will be feasible.

Site observations indicated that excavations should be feasible in the near surface with normal plant as obstructions were not identified. It is anticipated that any obstructions are unlikely but will be grubbed out during the reduced-level dig for the substructure works.

It is recommended that all excavations are supported or battered back in accordance with guidance contained in CIRIA R97.

If local pumping of groundwater is required during the advancement of excavations for the proposed foundations then consideration should be given to the potential for dewatering gravels in the surrounding areas that may cause structural damage to building substructures in close proximity to the site.

TABLE 5.5 CIVIL ENGINEERING EXCAVATION RISK MATRIX

| RISK ITEM | PRESENT | COMMENT |
|---------------------|---------|---|
| Running Sands | No | No running sand has been identified. |
| Minor Water Ingress | Yes | Minor water ingress will require localised dewatering/sump pumping during the construction of site drainage infrastructure. Ingress of water into foundation excavation will potentially flood foundation excavations, limiting the viability of spread foundations to be constructed. |
| Shallow Bedrock | Yes | Shallow bedrock has been identified within the north and central sectors at depths of between 3.30m and 8.10m below current ground levels. The presence of bedrock will impede excavation for drainage infrastructure using traditional excavation plant and equipment. |

5.11. COAL MINING RISK ASSESSMENT AND RECOMMENDATIONS

A detailed coal mining risk assessment has been undertaken due to the identified presence of shallow coal mining (potential shallow workings) on site and in the immediate surrounding area.



5.11.1. COAL MINING GEOLOGY

TABLE 5.6 COAL MINING GEOLOGY

| COAL SEAM | THICKNESS | OUTCROP | DEPTH |
|----------------|-----------|---|---------|
| Half Yard Carl | 450mm | Mapped cutting through the southern tip of the site | Unknown |
| Premier | 530 mm | Cutting the site E-W | Unknown |

A review of the mining geology confirmed the presence of both seams as a subcrop within the site dipping north towards the site boundary inferred from geological records of the wider area. The CA do not record a definitive seam outcrop at this position.

5.11.2. RECORDED COAL AUTHORITY WORKINGS

The Coal Authority consultants report does not note any recorded workings however, the online interactive mapping notes the presence of a number of shafts in the 1km surrounding the site.

TABLE 5.7 RECORDED COAL AUTHORITY WORKINGS

| FEATURE | LOCATION | REFERENCE | COMMENT |
|---------|-------------|------------|-------------------------------|
| Shaft | ~210m North | 326363-311 | No detail currently available |
| Shaft | ~297m East | 327363-036 | No detail currently available |

5.11.3. SCOPE OF INTRUSIVE GROUND INVESTIGATION

In due consideration of the potential presence of a subcrop within the Premier Coal Seam and an area of potential shallow mine workings within the site (transecting east/west), a series of rotary boreholes have been advanced in accordance with Coal Authority Permission ref: 20588 to assess the potential presence of shallow workings within this seam and the potential for ground instability to induce a future subsidence event within the proposed development.

5.11.4. SUMMARY OF GROUND INVESTIGATION WORKS

ROTARY BOREHOLES TO INVESTIGATE WORKINGS IN COAL

Six rotary boreholes have been advanced at the locations detailed within the E3P exploratory borehole location plan (Ref 14-278-005, Appendix III) at positions to interject the potential coal seams and assess the potential for any workings.

TABLE 5.8 ROTARY BOREHOLES

| ROTARY BOREHOLE | DEPTH TO ROCKHEAD (m bgl) | DEPTH TO COAL (m bgl) | EVIDENCE OF MINING ACTIVITY/SEAM | REMARKS |
|-----------------|---------------------------|-----------------------|----------------------------------|-------------------------------------|
| RB101 | 3.40 | N/A | N/A | No loss of flush or broken drilling |
| RB102 | 8.10 | N/A | N/A | |
| RB103 | 7.60 | N/A | N/A | |
| RB104 | 3.30 | N/A | N/A | |



| ROTARY BOREHOLE | DEPTH TO ROCKHEAD (m bgl) | DEPTH TO COAL (m bgl) | EVIDENCE OF MINING ACTIVITY/SEAM | REMARKS |
|-----------------|---------------------------|-----------------------|----------------------------------|-------------------------------------|
| RB105 | 6.90 | N/A | N/A | No loss of flush or broken drilling |
| RB106 | 3.80 | N/A | N/A | |

5.11.5. SUMMARY OF COAL MINING ISSUES

E3P has reviewed the BGS geological mapping and CA information, in addition to completing six 30 m rotary boreholes to investigate shallow mine workings. A summary of the findings follow.

- ✳ The intrusive ground investigations comprising six, deep, rotary boreholes did not identify any shallow coal seams
- ✳ Those locations also did not provide evidence of historic mine workings to the base of the boreholes (30m bgl).
- ✳ Given the potential seam thickness ~530mm there is sufficient rock thickness above and workings at greater depth (>30m bgl) to achieve a 10x seam thickness standard within Ciria 758 guidance

In the absence of evidence suggesting worked seams are present beneath the site and where 10x seam thickness has been identified it is considered that there is a low risk to the site from any subsurface historic mining activities. No further assessment is required.

5.12. FURTHER WORKS

Based on the findings of the intrusive site investigation, the following additional works are recommended to be completed in due course:

- ✳ Plot-specific foundation schedule (upon receipt of the final development levels);
- ✳ Materials management plan;
- ✳ Geotechnical earthworks strategy (infrastructure);
- ✳ Remediation and enabling works strategy; and
- ✳ Full three-dimensional earthworks cut/fill model.

5.13. CONSTRUCTION ACTIVITY AND INSPECTION

The following activities and inspections should be incorporated in to the site works:

- ✳ Due to the variability of the soils at the site, it is recommended that sufficient allowance is made for the inspection of formations and subformations to foundations and pavement construction.
- ✳ Excavations where access is required should be subject to a risk assessment from a competent person and, where appropriate, mitigation measures such as benching back the sides or use of support systems in accordance with CIRIA R97 should be utilised.



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- ✳ It is considered that dewatering may be required, especially following periods of heavy rainfall. Removal of surface water and water within trenches should be possible with conventional sump pumping. Discharge of any water should be agreed with the relevant regulatory body and be undertaken under a trade effluent discharge, where required. Measures to remove silt and suspended solids may be required and consideration should be given to provision of space for settling tanks or an attenuation pond.
- ✳ Where access to confined spaces is required, appropriate mitigation measures should be addressed within the construction stage health and safety plan. Particular account should be taken of the gas results.
- ✳ The presence of potential contamination and mitigation measures should be addressed as part of the construction stage health and safety plan and should include measures to design out the risks, reduce their impact and, finally, to include the use of personnel protective equipment (PPE).



5.14. GEOTECHNICAL RISK REGISTER

| POTENTIAL CONSTRAINT | ABNORMAL | LOCATION ON SITE | ESTIMATED AREA OF SITE AT RISK (%) | ASSESSMENT AND MITIGATION |
|--|----------|------------------|------------------------------------|--|
| Remediation of contaminated soils | | On site | 5% | Discrete locations (TP111, TP128, TP121 and TP123) have identified heavy metals contaminant exceedances. Material deemed to have a potential vapour risk may require hotspot removal, resulting the requirement to backfill the resulting void. Should significant backfill be needed deeper or specialist foundations may be required in those areas. |
| Bedrock | | Throughout | 0 | Bedrock has been identified at depths between 3.30m and 8.10m through the site. Dependant on the excavation depth required for utilities/foundations the bedrock may present an obstruction in certain areas. E3P has produced a depth to Bedrock plan (14-278-012, Appendix III). |
| Obstructions | | N/A | - | No development has taken place at the site and as such underground obstructions are not expected. In addition none were identified during the ground investigation completed at the site. |
| Artificially levelled and filled platforms | | N/A | - | The site is considered to follow the natural landform. No Made Ground evident of upfilling was identified. |
| Retaining walls | | N/A | - | None Identified. |
| Trench collapse | | N/A | - | Shallow Made Ground and natural strata encountered were identified to be stable and not susceptible to trench collapse. |
| Infilled canal | | N/A | - | N/A |
| Mature trees | | Periphery | <5% | Arboriculture survey has previously been completed by others. Sporadic mature trees and hedgerows are present surrounding the site and bisecting the sith north-south through the centre. |
| Volume change potential clay | | On site | 100 | Assessment of the cohesive strata beneath the site confirms low volume change potential. |



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| POTENTIAL CONSTRAINT | ABNORMAL | LOCATION ON SITE | ESTIMATED AREA OF SITE AT RISK (%) | ASSESSMENT AND MITIGATION |
|--------------------------------------|----------|------------------|------------------------------------|---|
| Peat | | South East | <1% | Peat was identified within the previously completed site investigation to the south east of the site. E3P locations in this area did not identify the same ground conditions despite extensive intrusive investigation in this area. |
| Running sands | | N/A | N/A | Data searches indicate low risk. |
| Ground dissolution | | N/A | N/A | Data searches indicate no hazard. |
| Concrete design | | Throughout | - | Assessment of soils identified at the site confirms the concrete classification should be DS-1 AC-1s. |
| Low-permeability ground | | On site | 100 | Soakaways completed during the E3P site investigation has identified low permeability cohesive deposits through the site not likely to be suitable for sustainable drainage solutions. The ultimate use of such a system will be dependant on the requirements of the site and a specialist design. |
| Services/sensitive structures | | Site boundaries | 5% | A review of online services has identified a number of services within the site boundary which should be considered sensitive in this case. Piling may not be possible within close proximity to any sensitive infrastructure. |
| Abnormal foundation solutions | | Throughout site | <10% | Intrusive investigation confirms low volume change potential firm to stiff cohesive material through the site. Where trees are present, and where excavation is required to manage contaminant issues a deeper foundation solution may be required. |
| Areas not investigated | | N/A | - | N/A |
| Surface water features | | N/A | - | None present |
| Current ponds to be filled | | N/A | - | None present |
| Historically infilled pond | | N/A | - | N/A |
| Quarry high wall | | - | - | N/A |



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| POTENTIAL CONSTRAINT | ABNORMAL | LOCATION ON SITE | ESTIMATED AREA OF SITE AT RISK (%) | ASSESSMENT AND MITIGATION |
|----------------------|----------|------------------|------------------------------------|---|
| Mining | - | - | - | Shallow mine workings have not been identified through the works completed to date. The site is within a coal mining reporting area however, confirmation has been received that suggests they have no concerns regarding the site. |
| Slope | - | - | - | No significant slopes have been identified at the site. |



6. CONCLUSIONS AND RECOMMENDATIONS

CONTAMINATED LAND ASSESSMENT

| | |
|---------------------------------|--|
| <p>Human Health</p> | <p>A Tier I human health risk assessment has been undertaken using the chemical analysis results of the soils and comparing to the relevant Tier I criteria. This assessment has identified the presence of elevated lead, within the topsoil at the site. These findings are consistent with those of the previously completed smith grant report.</p> <p>Lead is identified at 0.10m bgl in TP123 and TP111. The concentrations have primary exposure pathways related to dermal contact and ingestion, soil ingestion and consumption of homegrown produce. These exceedances can be mitigated by the installation of a chemically suitable cover system within all proposed garden areas. Alternatively, these can be excavated and delineated through chemical validation during remedial works and placed in a future low sensitivity area within the proposed development, after which cover systems will no longer be required.</p> <p>Asbestos, petroleum hydrocarbons and poly aromatic hydrocarbons have not been identified within any of the samples submitted for assessment.</p> <p>Chemical analysis of the natural drift deposits have identified these soils to be acceptable for use as subsoil within the proposed garden areas; however, further chemical validation samples will be required to confirm this. In addition, topsoil at the site (with the exception of the two locations noted above) will be suitable for reuse.</p> |
| <p>Controlled Waters</p> | <p>A Teir 1 controlled waters risk assessment has been completed for the site utilising leachate analysis of soils and groundwater samples obtained during and after the site works. Three locations within 2 discrete areas of the site confirm the presence of Zinc and one location (WS111) identifies the present of TPH C5-C6.</p> <p>All three groundwater samples obtained identify Methylphenol which is considered to be a potential vapour risk. However, and in the context of controlled waters, the risk is considered low in the absence of a viable receptor, significant source and the presence of low permeability cohesive stratum.</p> |
| <p>Ground Gas</p> | <p>Current assessment based on initial monitoring visit confirms one area of the site (WS108) identifies levels of CO2 that would require CS2/Amber 1 classification. Given the absence of a significant source in this area it is likely that this is the degretation/decomposition of carbonate minerals within the natural stratum.</p> <p>The full phase of ground gas monitoring should be completed to inform the full and detailed assessment and therefore level of risk. Currently an allowance for Cs2/amber 1 mitigation measures should be retained.</p> |



Potable Water

This will need to be confirmed following the completion of a UKWIR risk assessment. Post-remediation and enabling works ground conditions may be different from those identified during this site investigation. As assessment utilising chemical analysis of soils during the investigation suggests polyethylene (PE) pipeline will be suitable.

GEOTECHNICAL ASSESSMENT

Significant concrete and brick obstructions are not expected and have not been identified to date. During a phase of cut-and-fill enabling works, required to create a developable platform, all below-ground obstructions will require grubbing out to the base of the Made Ground to enable the construction of proposed plots.

The underlying natural clay drift deposits have been assessed as being very stiff, high-strength with a net ABP in excess of 120 kN/m² at circa 1 m bgl increasing to 150–200 kN/m² at circa 2 m bgl. Similarly, granular gravel deposits have been identified as Dense with an ABP in excess of 400kN/m³ at 2.00m bgl.

Drift deposits to the south east of the site (in the area of formerly identified peat deposits) comprised soft silty clay and were assessed as having a net ABP of 89 kN/m² increasing in the clay strata beneath to in excess of 100kN/m³ from circa 1.20m bgl

Due to the existing variances in the site topography, it is likely that a phase of cut-and-fill enabling works will be required in order to create a proposed development platform suitable for a residential development. The property to the north and well street to the south tie in to the levels at the site currently and so it is likely that some steps/gradient will be incorporated throughout.

As a result it is likely that for the majority of the site a strip or mass trench foundation solution will be viable. Where poor ground in the location of WS111 and/or where levels have been raised significantly a vibro stone column solution or driven pile may be required.

On completion of the finished design levels, topographical survey and arboricultural surveys a detailed foundation zoning plan and cut/fill model should be completed to confirm the foundation requirements and model the presence of tree influence on foundations to determine the level of works required.

END OF REPORT



APPENDIX I LIMITATIONS

1. This report and its findings should be considered in relation to the terms of reference and objectives agreed between E3P and the client as indicated in Section 1.3.
2. For the work, reliance has been placed on publicly available data obtained from the sources identified. The information is not necessarily exhaustive and further information relevant to the site may be available from other sources. When using the information it has been assumed it is correct. No attempt has been made to verify the information.
3. This report has been produced in accordance with current UK policy and legislative requirements for land and groundwater contamination which are enforced by the local authority and the Environment Agency. Liabilities associated with land contamination are complex and requires advice from legal professionals.
4. During the site walkover, reasonable effort has been made to obtain an overview of the site conditions. However, during the site walkover, no attempt has been made to enter areas of the site that are unsafe or present a risk to health and safety, are locked, barricaded, overgrown, or the location of the area has not been made known or accessible.
5. Access considerations, the presence of services and the activities being carried out on the site limited the locations where sampling locations could be installed and the techniques that could be used.
6. Site sensitivity assessments have been made based on available information at the time of writing and are ultimately for the decision of the regulatory authorities.
7. Where mention has been made to the identification of Japanese Knotweed and other invasive plant species and asbestos or asbestos-containing materials, this is for indicative purposes only and do not constitute or replace full and proper surveys.
8. The executive summary, conclusions and recommendations sections of the report provide an overview and guidance only and should not be specifically relied upon without considering the context of the report in full.
9. E3P cannot be held responsible for any use of the report or its contents for any purpose other than that for which it was prepared. The copyright in this report and other plans and documents prepared by E3P is owned by them and no such plans or documents may be reproduced, published or adapted without written consent. Complete copies of this may, however, be made and distributed by the client as is expected in dealing with matters related to its commission. Should the client pass copies of the report to other parties for information, the whole report should be copied, but no professional liability or warranties shall be extended to other parties by E3P in this connection without their explicit written agreement there to by E3P.
10. New information, revised practices or changes in legislation may necessitate the re-interpretation of the report, in whole or in part.



APPENDIX II

GLOSSARY

TERMS

| | | | |
|--------------|--|----------------|--|
| ACM | Asbestos-containing material | MMP | Materials management plan |
| ADS | Acoustic design statement | ND | Not detected |
| AST | Above-ground storage tank | NDP | Nuclear density probe |
| BGS | British Geological Survey | NMP | Noise management plan |
| BSI | British Standards Institute | NPSE | Noise policy statement for England |
| BTEX | Benzene, toluene, ethylbenzene, xylenes | NR | Not recorded |
| CA | Coal Authority | PAH | Polycyclic aromatic hydrocarbon |
| CBR | California bearing ratio | PCB | Polychlorinated biphenyl |
| CIEH | Chartered Institute of Environmental Health | PI | Plasticity index |
| CIRIA | Construction Industry Research Association | PID | Photo ionisation detector |
| CLEA | Contaminated land exposure assessment | POS | Public open space |
| CML | Council of Mortgage Lenders | PPE | Personnel protective equipment |
| CoC | Contaminants of concern | ProPG | Professional practice guidance |
| CSM | Conceptual site model | QA | Quality assurance |
| DNAPL | Dense non-aqueous phase liquid (chlorinated solvents, PCB) | SGV | Soil guideline value |
| DWS | Drinking water standard | SPH | Separate-phase hydrocarbon |
| EA | Environment Agency | SPT | Standard penetration test |
| EQS | Environmental quality standard | SVOC | Semi-volatile organic compound |
| FFL | Finished floor level | TPH | Total and speciated petroleum hydrocarbon |
| GAC | General assessment criteria | TPH CWG | Total Petroleum Hydrocarbon (Criteria Working Group) |
| GL | Ground level | UKWIR | United Kingdom Water Infrastructure Risk |
| GSV | Gas screening value | UST | Underground storage tank |
| HCV | Health criteria value | VCC | Vibro-concrete column |
| ICSM | Initial conceptual site model | VOC | Volatile organic compound |
| LEL | Lower explosive limit | VRSC | Vibro-replacement stone columns |
| LMRL | Lower method reporting limit | VSC | Vibro-stone columns |
| LNAPL | Light non-aqueous phase liquid (petrol, diesel, kerosene) | WHO | World Health Organisation |



Well Street, Buckley

Phase II Geoenvironmental Site Assessment

October 2020

| | | | |
|----------------|--|-------------------------|---|
| MCV | Moisture condition value | WRAP | Waste and Resources Action Programme |
| MIBK | Methyl isobutyl ketone | WTE | Water table elevation |
| m | Metres | ppm | Parts per million |
| km | Kilometres | mg/m³ | Milligram per metre cubed |
| % v/v | Percent volume in air | m bgl bgl | Metres below ground level |
| mb | Millibars (atmospheric pressure) | m bcl | Metre below cover level |
| l/hr | Litres per hour | mAOD | Metres above ordnance datum (sea level) |
| µg/l | Micrograms per litre (parts per billion) | kN/m² | Kilonewtons per metre squared |
| ppb | Parts per billion | µm | Micrometre |
| mg/kg | Milligrams per kilogram (parts per million) | SSRT | Site Specific Remediation Target |
| PSD | Particle Size Distribution | DD | Dry Density |
| CL:AIRE | Contaminated Applications in Land: Real Environments | Mc | Moisture Content |
| ρ | Bulk Density | GPR | Ground Penetrating Radar |
| NDP | Nuclear Density Probe | FFL | Finished Floor Level |
| LEL | Lower Explosive Limit | UKWIR | UK Water Industry Research |
| CIRIA | Construction Industry Research and Information Association | LOD | Limit of Detection |



APPENDIX III DRAWINGS



Notes:

Client:
AJP

Job No:
14-278

Date:
22.09.2020

Drawing No:
002

Scale:
NTS

| | | | | |
|-------|-------|------------|-------|---------|
| P1 | REVA | 22.09.2020 | HM | VW |
| Phase | Issue | Date | Drawn | Checked |

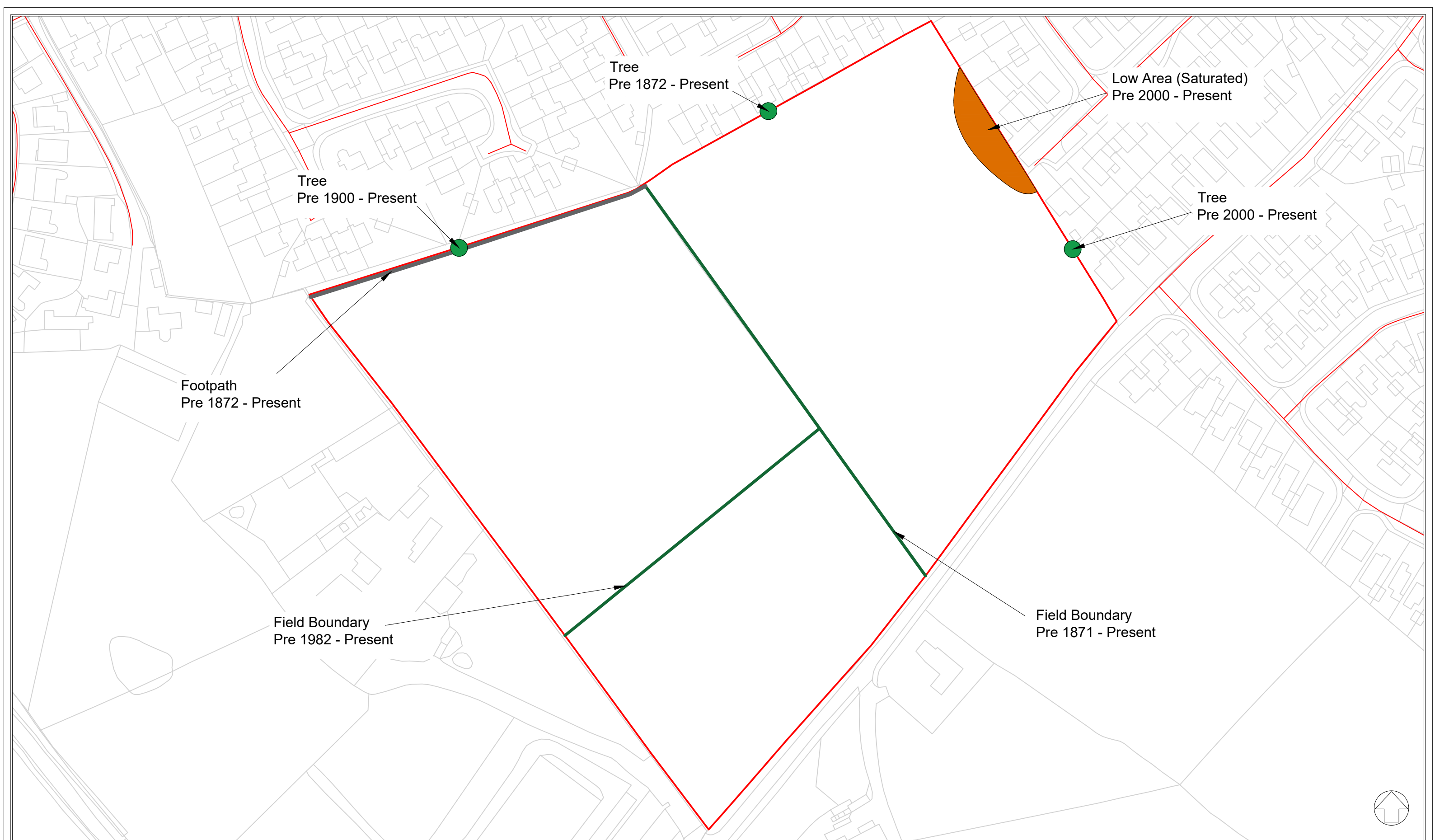
Job Title:
**Well Street,
Brackley**

Drawing Title:
**Proposed
Development Plan**



Environmental Engineering
Partnership Ltd
Taylor Road, Trafford Park
Urmston, Manchester, M41 7JQ
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- Historical Features**
- Field Boundary
 - Footpath
 - Low Area
 - Trees

Notes:

Client:
AJP

Job No:
14-278

Drawing No:
003

Date:
14.08.2020

Scale:
NTS



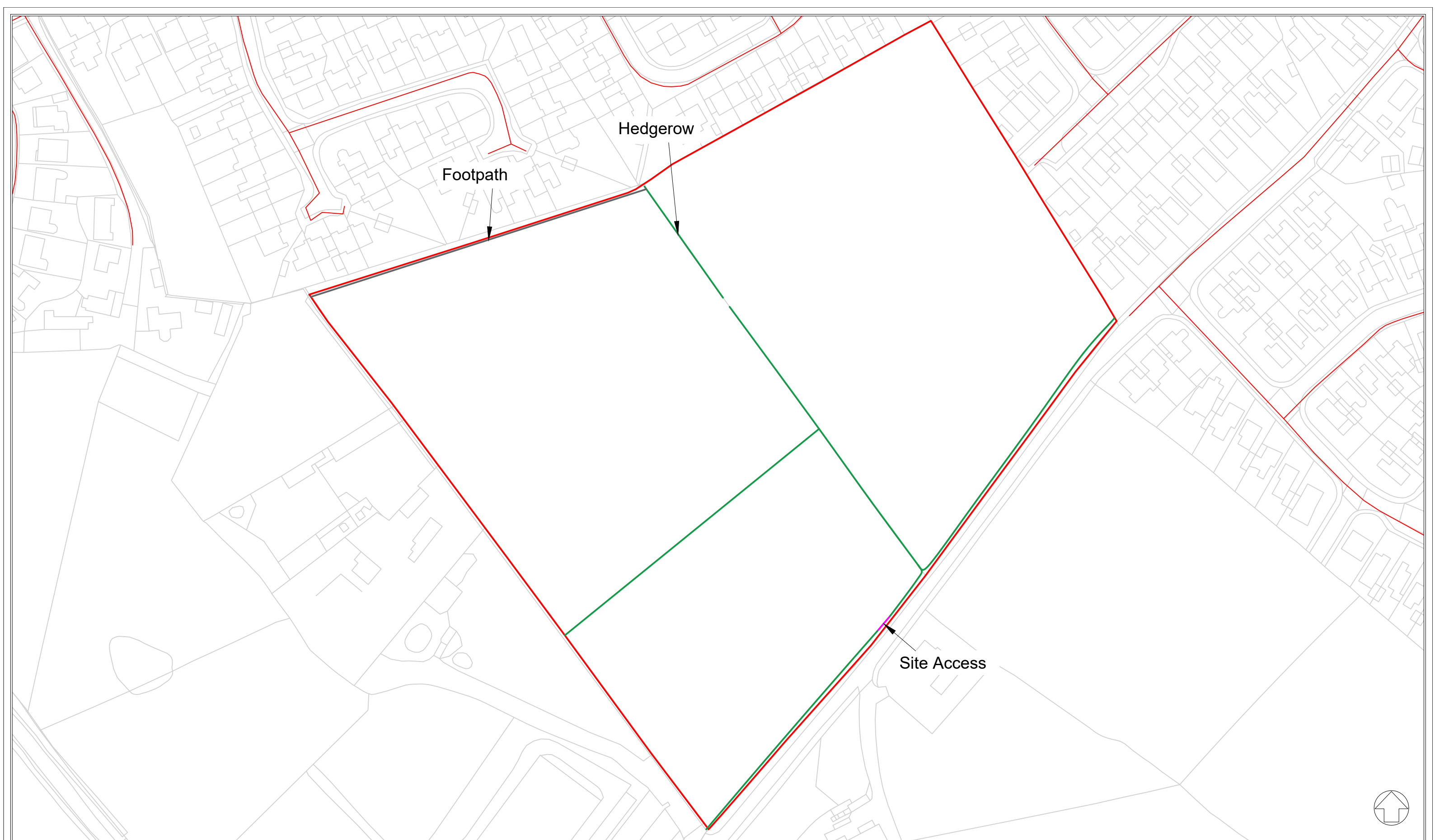
Environmental Engineering Partnership Ltd
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Urmston, Manchester, M41 7JQ
Tel: 0161 707 9612
E-mail: info@e3p.co.uk
Website: www.e3p.co.uk

| | | | | |
|-------|-------|------------|-------|---------|
| P1 | REVB | 14.08.2020 | LM | RJW |
| P1 | REVA | 12.08.2020 | LM | RJW |
| Phase | Issue | Date | Drawn | Checked |

Job Title:
Well Street,
Brackley

Drawing Title:
Historical Features
Plan

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Historical Features

- Field Boundary
- Footpath
- Site Access

Notes:

Client:

AJP

Job No:

14-278

Drawing No:

004

Date:

18.09.2020

Scale:

NTS



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 E-mail: info@e3p.co.uk
 Website: www.e3p.co.uk

| Phase | Issue | Date | Drawn | Checked |
|-------|-------|------------|-------|---------|
| P1 | REVA | 18.09.2020 | HM | RJW |

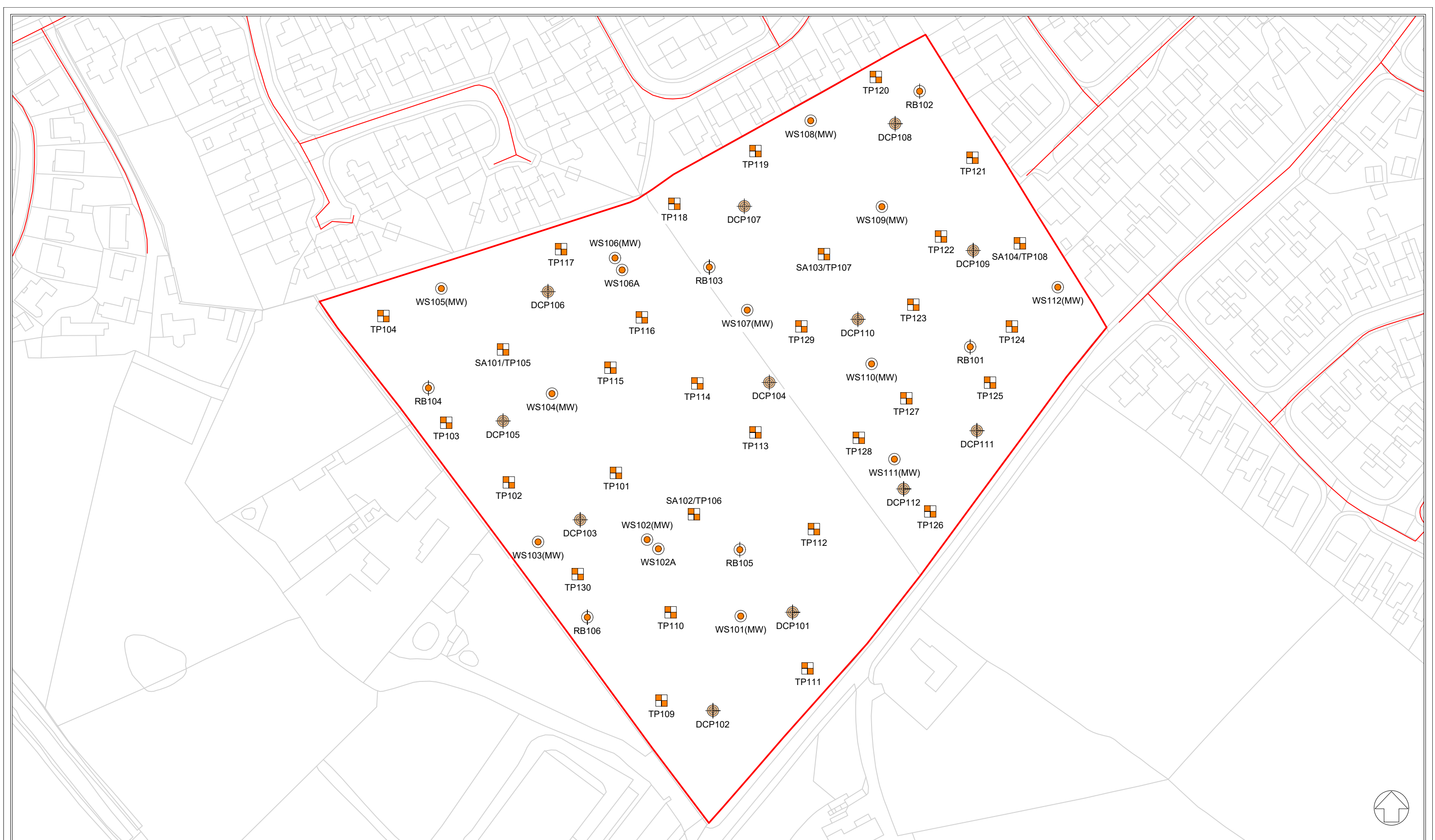
Job Title:






Well Street, Brackley

Drawing Title:

Site Features Plan

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- Location Symbols**
-  Approximate Window Sample Probehole Location
 -  Approximate Window Sample Probehole Location with Install
 -  Approximate Trial Pit Location
 -  Approximate Soakaway Test Location
 -  Approximate Rotary Borehole Location


| | | | | |
|---------------|-------|------------|-------|---------|
| Notes: | | | | |
| | | | | |
| P1 | REVA | 17.09.2020 | CB | RJW |
| Phase | Issue | Date | Drawn | Checked |

| | |
|-------------------|--------------------------|
| Client: | AJP |
| Job Title: | Well Street, Brackley |

| | |
|--------------------|--------|
| Job No: | 14-278 |
| Drawing No: | 005 |

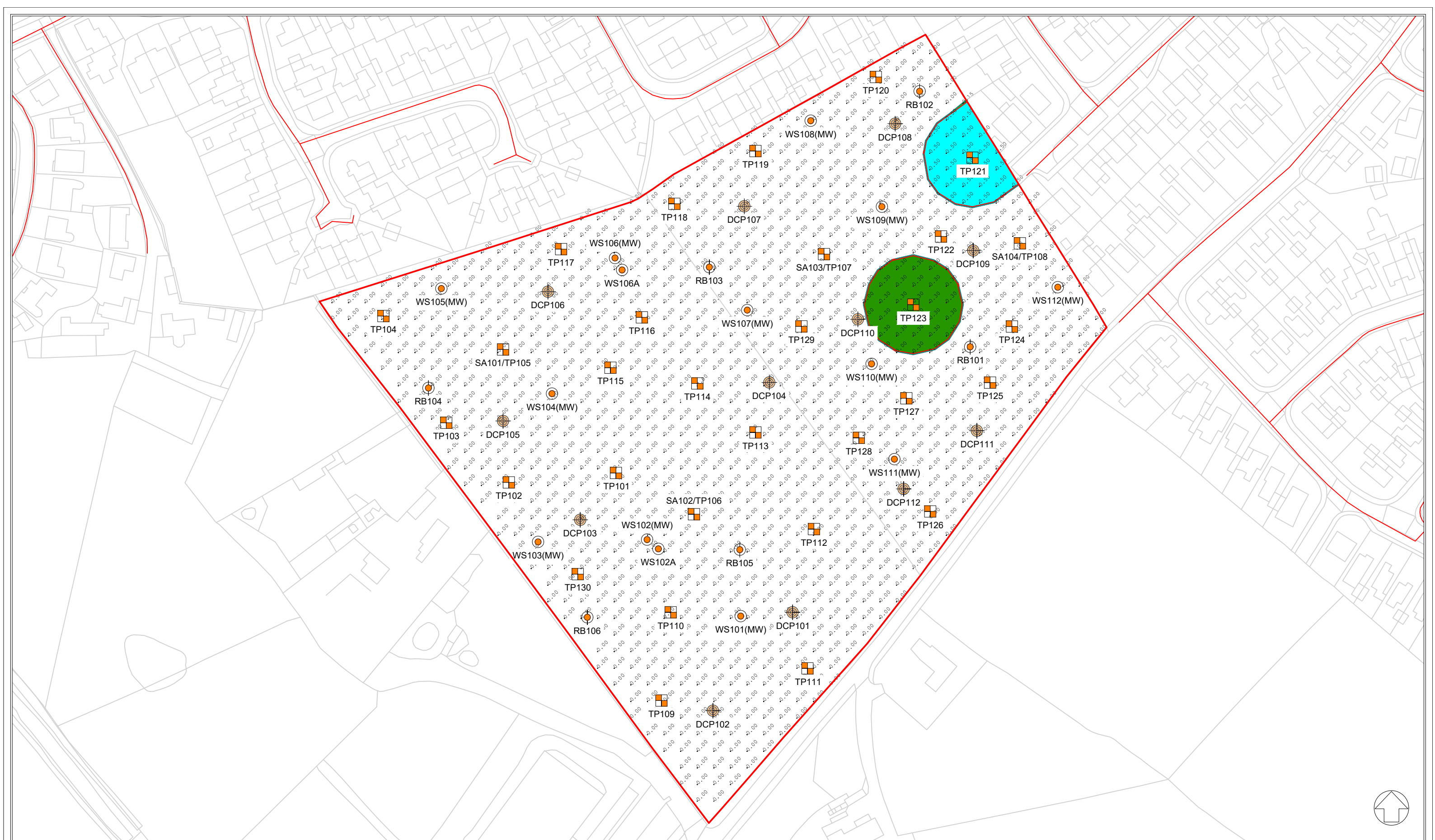
| | |
|---------------|------------|
| Date: | 17.09.2020 |
| Scale: | NTS |

Drawing Title:
Exploratory Hole
Location Plan



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- Location Symbols**
- Approximate Window Sample Probehole Location
 - Approximate Window Sample Probehole Location with Install
 - Approximate Trial Pit Location
 - Approximate Soakaway Test Location
 - Approximate Rotary Borehole Location

- Made Ground Depth (m)**
- Depth of Made Ground 0.00 - 0.19m
 - Depth of Made Ground 0.20 - 0.39m
 - Depth of Made Ground 0.40 - 0.59m
 - Depth of Made Ground 0.60 - 0.79m
 - Depth of Made Ground 0.80 - 0.99m
 - Depth of Made Ground 1.00 - 1.19m
 - Depth of Made Ground 1.20 - 1.39m
 - Depth of Made Ground 1.40 - 1.59m
 - Depth of Made Ground >1.60m

Notes:

Client:

Job No:

Date:

| | | | | |
|--|--|--|--|--|
| | | | | |
| | | | | |

AJP

14-278

09.10.2020

| Phase | Issue | Date | Drawn | Checked |
|-------|-------|------------|-------|---------|
| P1 | REVC | 09.10.2020 | HM | RJW |
| P1 | REVA | 08.10.2020 | HM | RJW |
| P1 | REVA | 29.09.2020 | HM | VW |

Job Title:
Well Street,
Brackley

Drawing No:
006

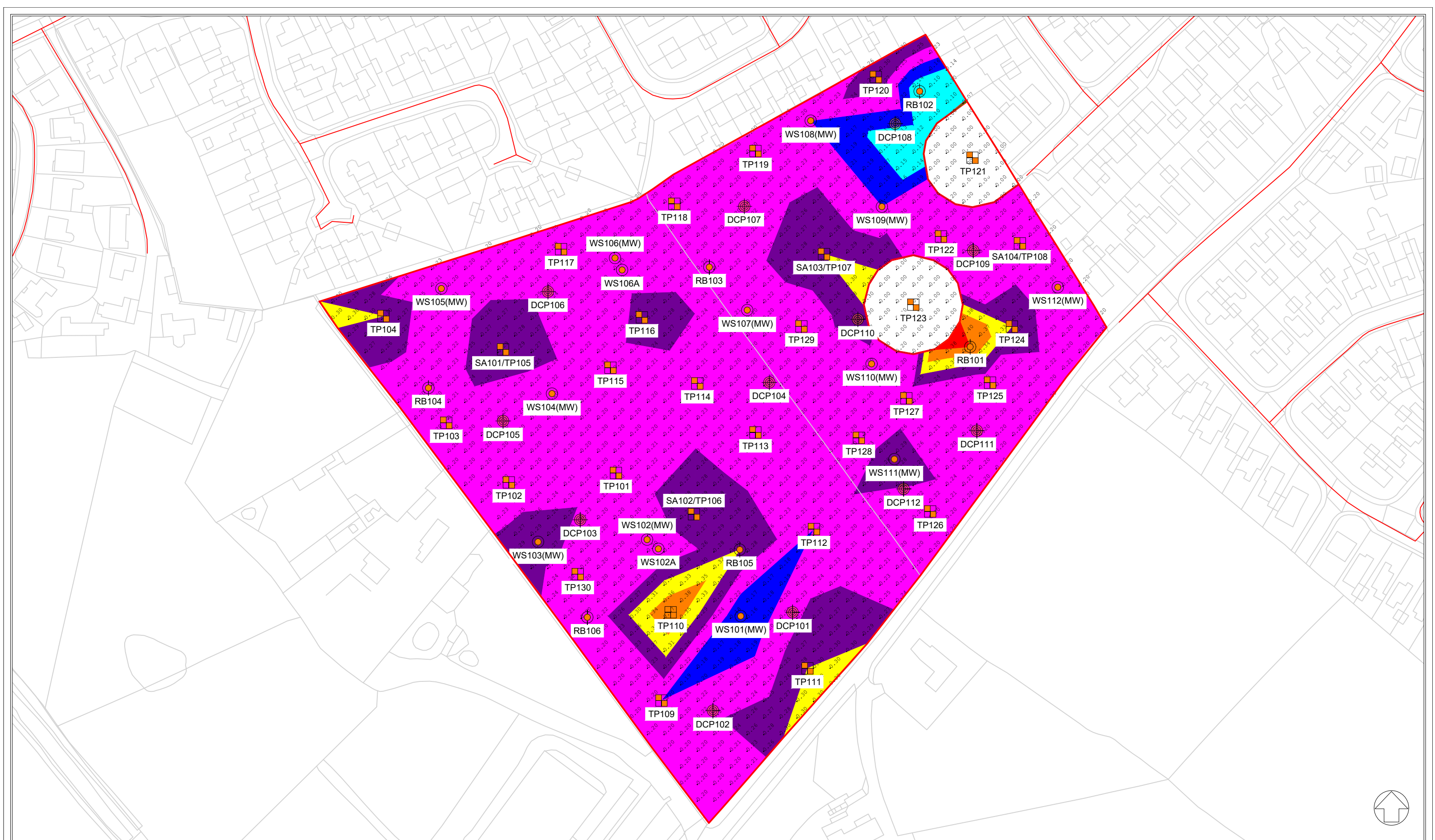
Scale:
NTS

Drawing Title:
Depth of Made
Ground Plan



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| Location Symbols | | Topsoil Depth (m) | |
|------------------|---|-------------------|--------------------------------|
| | Approximate Window Sample Probehole Location | | Depth of Topsoil 0.00 - 0.049m |
| | Approximate Window Sample Probehole Location with Install | | Depth of Topsoil 0.05 - 0.099m |
| | Approximate Trial Pit Location | | Depth of Topsoil 0.10 - 0.14m |
| | Approximate Soakaway Test Location | | Depth of Topsoil 0.15 - 0.19m |
| | Approximate Rotary Borehole Location | | Depth of Topsoil 0.20 - 0.24m |
| | | | Depth of Topsoil 0.25 - 0.29m |
| | | | Depth of Topsoil 0.30 - 0.34m |
| | | | Depth of Topsoil 0.35 - 0.39m |
| | | | Depth of Topsoil >0.40m |

Notes:

Client:

Job No:

Date:

AJP

14-278

09.10.2020

Job Title:

Drawing No:

Scale:

| Phase | Issue | Date | Drawn | Checked |
|-------|-------|------------|-------|---------|
| P1 | REVC | 09.10.2020 | HM | RJW |
| P1 | REVB | 08.10.2020 | HM | RJW |
| P1 | REVA | 22.09.2020 | HM | VW |

007

NTS

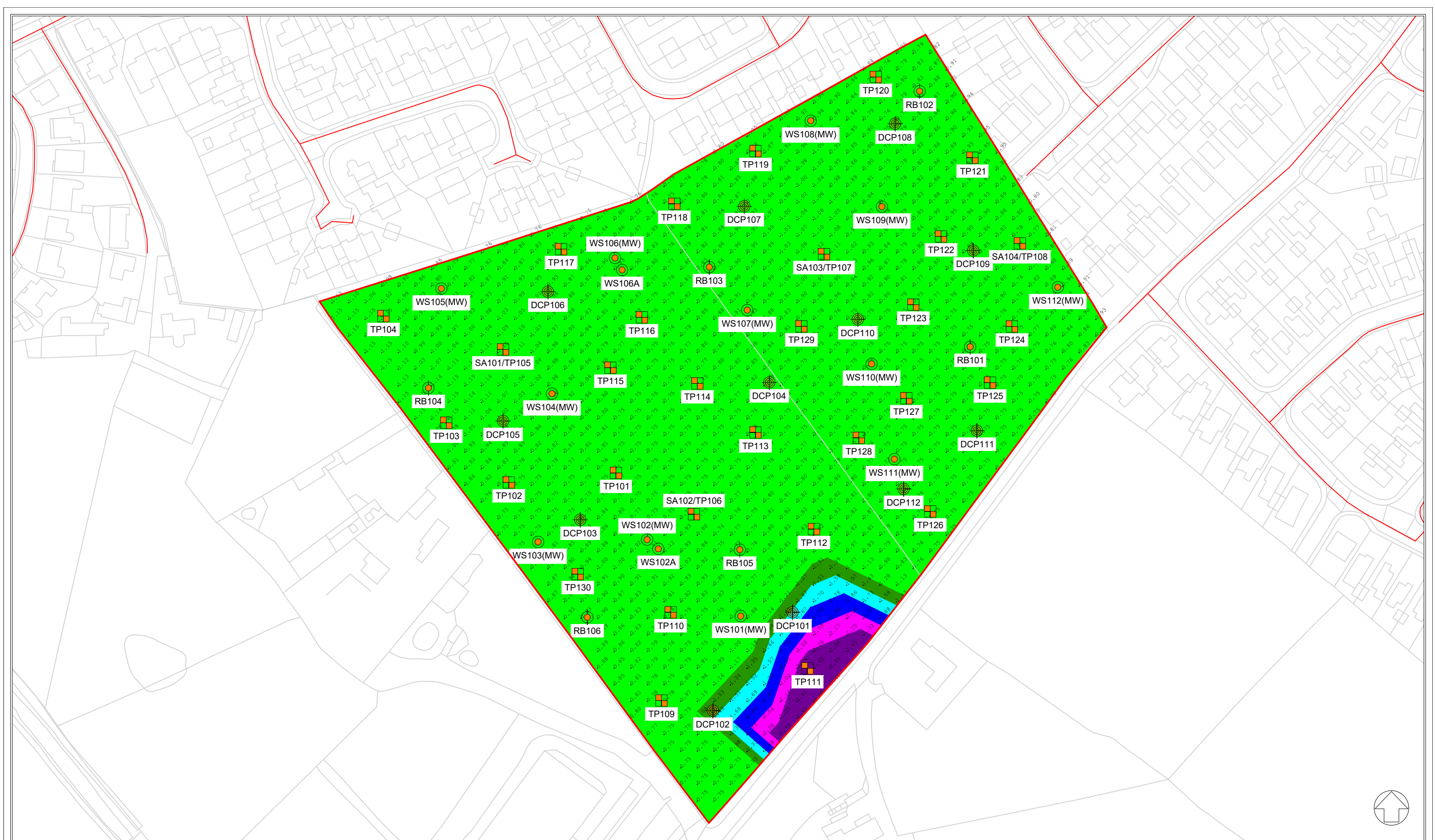
Well Street,
Brackley

Drawing Title:
Depth of Topsoil Plan

Environmental Engineering Partnership Ltd
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Urmston, Manchester, M41 7JQ
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- Location Symbols**
- Approximate Window Sample Probehole Location
 - Approximate Window Sample Probehole Location with Install
 - Approximate Trial Pit Location
 - Approximate Soakaway Test Location
 - Approximate Rotary Borehole Location

- Shallow Spread Footings**
- Depth to Founding Strata 0.00 - 1.24m
 - Depth to Founding Strata 1.25 - 1.49m
- Mass Trench Fill Footings**
- Depth to Founding Strata 1.50 - 1.74m
 - Depth to Founding Strata 1.75 - 1.99m
 - Depth to Founding Strata 2.00 - 2.24m
- Engineered Footings**
- Depth to Founding Strata 2.25 - 2.49m
 - Depth to Founding Strata >2.50m

Notes:

| | | | | |
|-------|-------|------------|-------|---------|
| P1 | REVA | 28.09.2020 | HM | VW |
| Phase | Issue | Date | Drawn | Checked |

Client:

AJP

Job Title:

Well Street,
Brackley

Job No:

14-278

Drawing No:

008

Date:

28.09.2020

Scale:

NTS

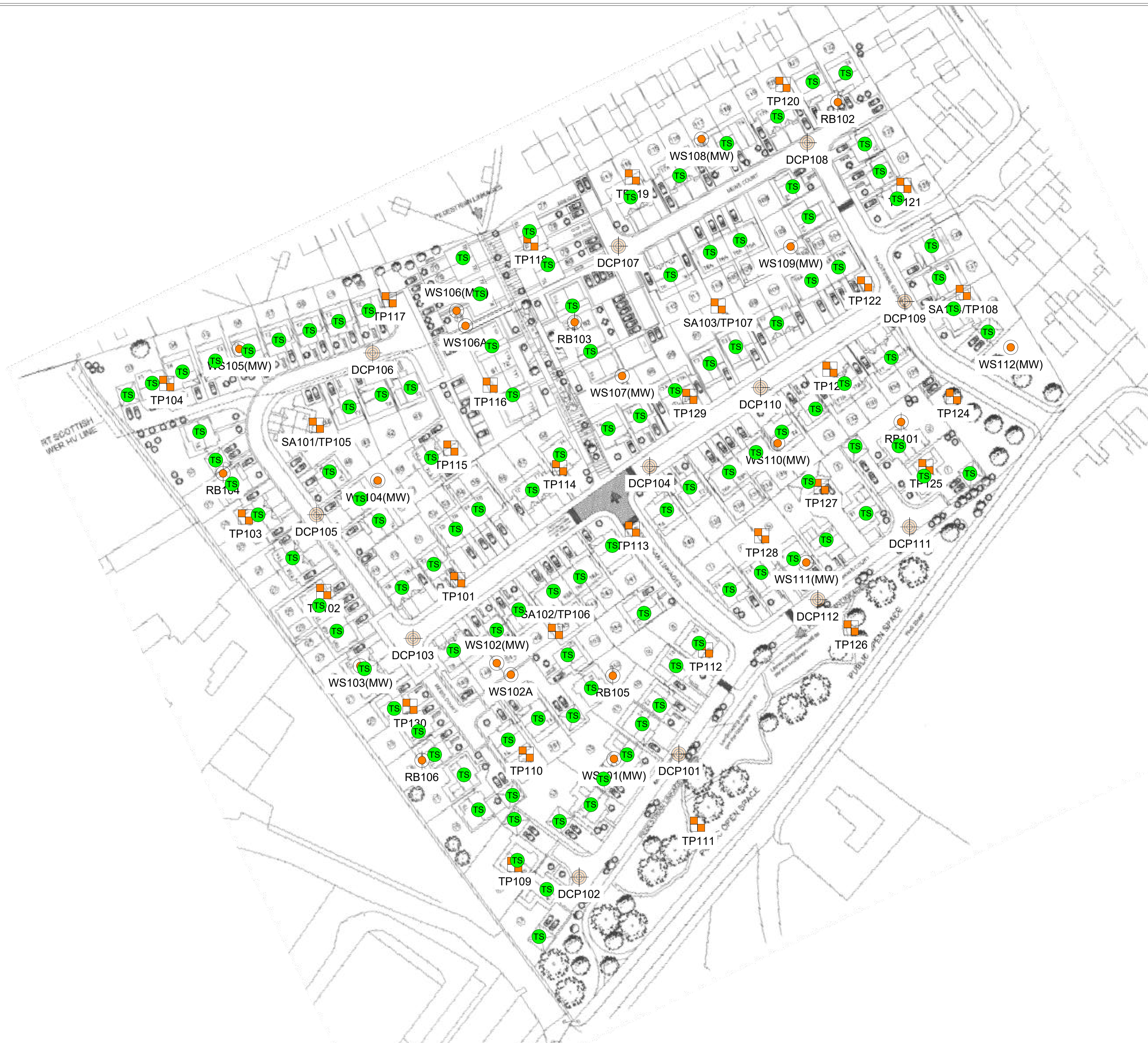
Drawing Title:

Depth to Founding
Strata Plan

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| Summary of Heave Precaution Requirements | | | | |
|--|-------------------------------|--|--|---|
| Volume Change Potential | Required Foundation Depth (m) | Minimum Void Dimensions for Foundations, Ground Beams & Suspended in-Situ Concrete Ground Floors | | Minimum Void Dimensions Under Pre-Cast Concrete & Suspended Timber Floors |
| | | Thickness of Void Former Against Side of Foundation of Ground Beam (mm) | Thickness of Void Former on Underside of Edge Beam & Floor Slab (mm) | Void Dimension (mm) |
| Low Volume Change Potential (<20%) | >2.00 | No Special Precautions | | 200 |
| | 2.00-2.50 | - | 50 | |
| Medium Volume Change Potential (20-40%) | 1.50-2.00 | 25 | 50 | 250 |
| | 2.00-2.50 | 25 | 100 | |
| High Volume Change Potential (>40%) | >2.50 | Engineer Design | | Engineer Design |
| | 1.50-2.00 | 25 | 75 | |
| | 2.00-2.50 | 35 | 150 | |
| >2.50 | Engineer Design | | Engineer Design | |

| Minimum Width of Strip Footings | | | | | | | |
|--|---------------------|---|-----|-----|-----|-----|-----|
| Type of Ground (including Engineered Fill) | Condition of Ground | Total Load of Load-Bearing Walling more than 4kN/linear metre | | | | | |
| | | 20 | 30 | 40 | 50 | 60 | 70 |
| Minimum Width of Strip Foundation (mm) | | | | | | | |
| Gravel | Sand | 250 | 300 | 400 | 500 | 600 | 650 |
| Clay | Sandy Clay | 250 | 300 | 400 | 500 | 600 | 650 |
| Clay | Sandy Clay | 300 | 350 | 450 | 600 | 750 | 850 |

| Items Considered | | |
|-------------------------|--|-----|
| Bearing Capacity | | TBC |
| Trees | | TBC |
| Historical | | TBC |
| Groundwater Table | | TBC |
| FFL | | TBC |
| Contamination | | TBC |
| Remediation | | TBC |
| Volume Change Potential | | TBC |
| Root Protection Areas | | TBC |

| Residual Risks | | | |
|---|------------------|--|--|
| Foreseeable Risks That Cannot be Avoided | Applicable (Y/N) | Action to Reduce Risk | Justification for Design Decision |
| Deep Excavations | Y | Identify locations on drawing and depths on schedule | Lesser risk than other alternatives |
| Trench Collapse | Y | Risk highlighted on drawing | Lesser risk than other alternatives |
| Use of Working Platform for Pile/Vibro Operations | Y | Compliance with working platform directive required | Pile/Vibro foundation less risky than other alternatives |

- Anticipated Foundation Types**
- TS Traditional Strip Foundations
Minimum depth 1200mm below proposed Final Finished Level.
Maximum safe bearing pressure limited to 150kN/m².
 - MT Mass Trench Fill Foundations
Minimum depth 1200mm below proposed Final Finished Level.
Maximum safe bearing pressure limited to 150kN/m².
 - V Vibro Stone Ground Compaction
In accordance with BS5930 Chapter 4.2.
 - P Piled Foundations
Where the maximum foundation depth exceeds 2.0m a piled foundation option other than a trench fill deep reinforced strip foundations may be adopted. Columns in line loads supported by ground beams.
 - R Raft Foundations
Minimum safe bearing pressure limited to 150kN/m² or approved equivalent practice. All Raft foundations to be designed by a structural engineer in accordance with Chapter 4.3 of BS5930. Raft foundations are considered suitable to mitigate against potential influence of clay heave / desiccation in accordance with Section 4.2, sub-section 4.2E.
 - TB Traditional Strip / Trench Block Foundations
Traditional strip founded at 450mm below current level with build up to Trench Block and subsequent build to development level.
 - Colours on Plot Corners to be Used When Referring to Foundation Schedule.
(Showing Final Level)
- Depth to Target Founding Strata**
- Light Green Footings 0.75 - 0.90m Deep
From Final Finished Level
In accordance with BS5930 Chapter 4.2
 - Green Footings 0.90 - 1.25m Deep
From Final Finished Level
In accordance with BS5930 Chapter 4.2
 - Dark Green Footings 1.25 - 1.50m Deep
From Final Finished Level
In accordance with BS5930 Chapter 4.2
 - Cyan Footings 1.50 - 1.75m Deep
From Final Finished Level
In accordance with BS5930 Chapter 4.2
 - Blue Footings 1.75 - 2.00m Deep
From Final Finished Level
In accordance with BS5930 Chapter 4.2
 - Dark Blue Footings 2.00 - 2.25m Deep
From Final Finished Level
In accordance with BS5930 Chapter 4.2
 - Purple Footings 2.25 - 2.50m Deep
From Final Finished Level
In accordance with BS5930 Chapter 4.2
- Engineered Foundation Solutions**
- Red Footings >2.50m Deep
From Final Finished Level
In accordance with BS5930 Chapter 4.2
 - Yellow Vibro
 - Orange Low Volume Change Potential Clay
Heave precautions required to underside of cast in-situ floor slab (with no sub-floor void) within corrected zone of free influence. Heave precautions not required to foundation.

Notes:

Client: AJP

Job No: 14-278

Date: 28.09.2020


Drawing No: 009

Scale: NTS

Job Title: Well Street, Brackley

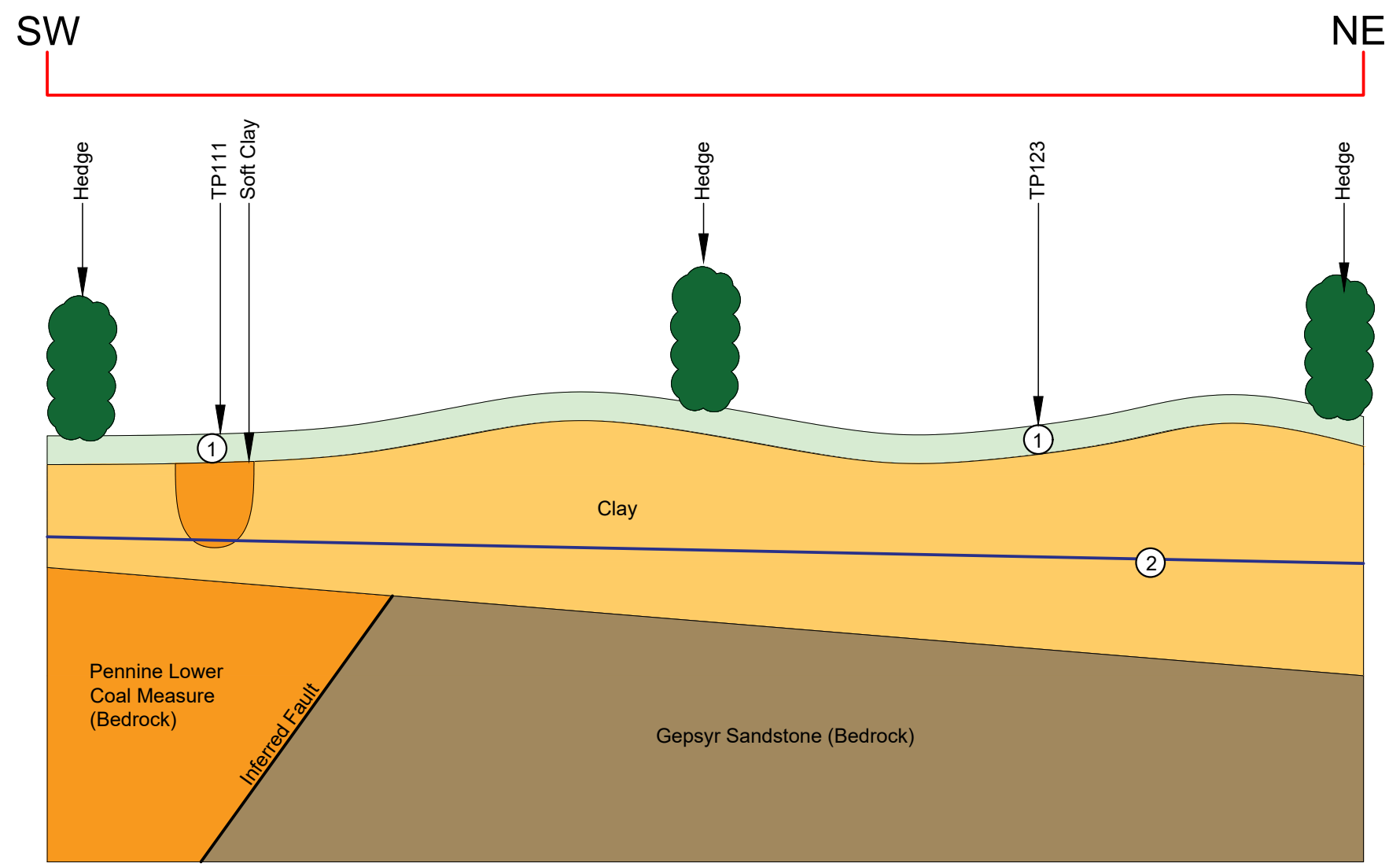
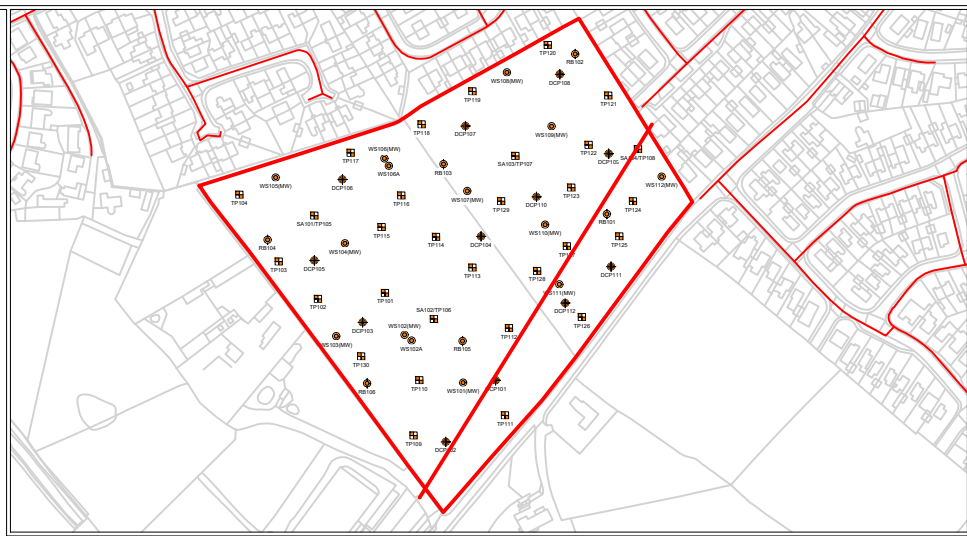
Drawing Title: Concept Foundation Zoning Plan

| Phase | Issue | Date | Drawn | Checked |
|-------|-------|------------|-------|---------|
| P1 | REVA | 28.09.2020 | HM | VW |


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| ID | CONTAMINANT ACTIVITY | CONTAMINANTS | MIGRATION / EXPOSURE PATHWAY | RECEPTORS |
|---------------------|------------------------------|--|------------------------------|---------------------|
| HUMAN HEALTH | | | | |
| 1 | Agricultural Activity | Heavy Metals (Lead) | Soil Ingestion | Future Site Users |
| 2 | Off-Site Commercial Activity | Mobile Contaminants (Methylphenol, phenol, benzene, toluene, isopropyltoluene) | Vertical Migration | Secondary A Aquifer |



- Geological Features**
- Topsoil
 - Clay
 - Soft Clay
 - Gwepsyr Sandstone (Bedrock)
 - Pennine Lower Coal Measure (Bedrock)
 - Inferred Fault
 - Groundwater

Notes:

| | | | | |
|-------|-------|------------|-------|---------|
| P1 | REVA | 28.09.2020 | HM | VW |
| Phase | Issue | Date | Drawn | Checked |

Client:

AJP

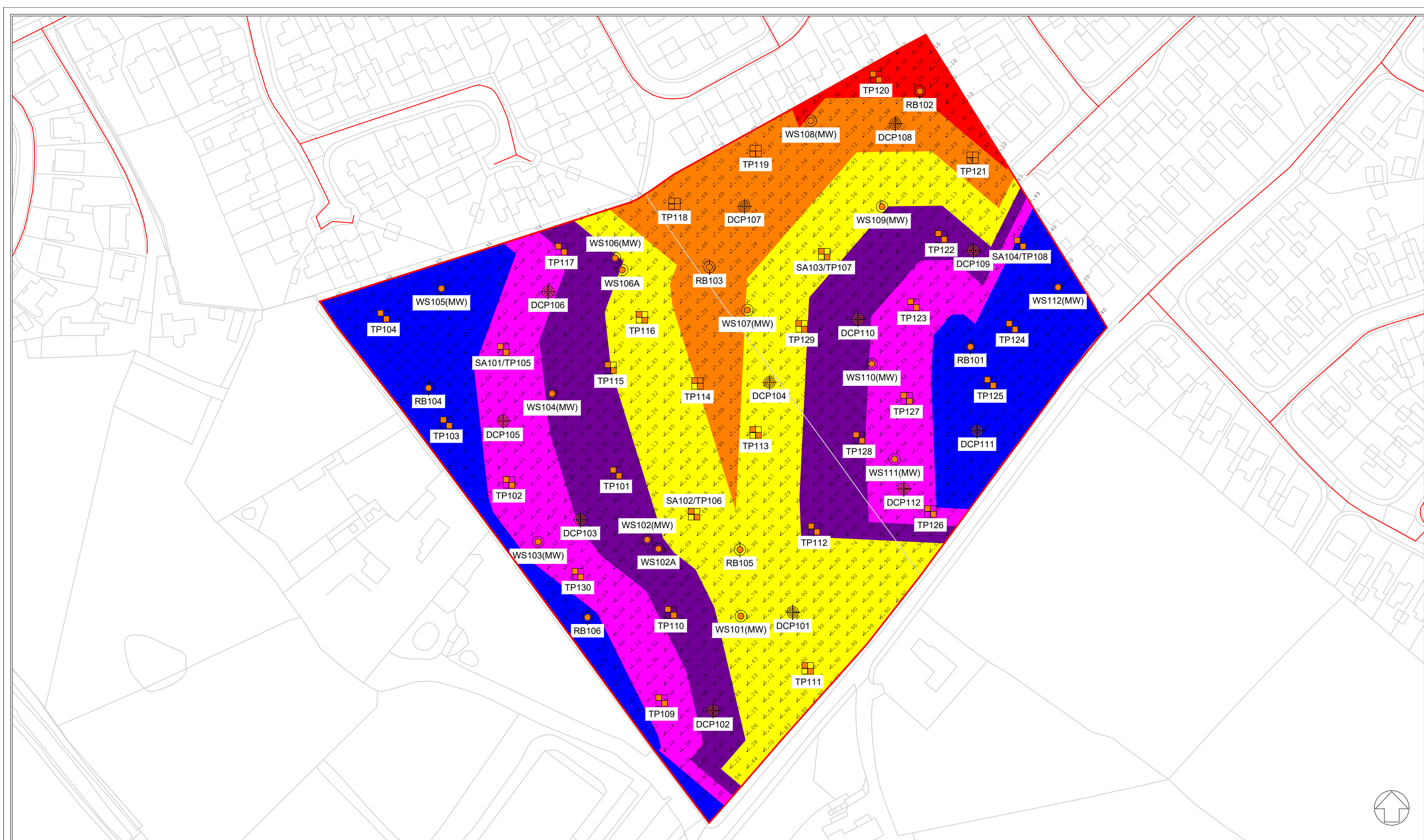
Job Title:

Well Street,
Brackley

| | | | |
|-----------------------|--------|-----------------------|------------|
| Job No: | 14-278 | Date: | 28.09.2020 |
| Drawing No: | 010 | Scale: | NTS |
| Drawing Title: | | Conceptual Site Model | |

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 Urmston, Manchester, M41 7JQ
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| Location Symbols | | Bedrock Depth (m) | |
|------------------|--|-------------------|-------------------------------|
| | Approximate Window Sample Probeshole Location | | Depth of Bedrock 0.00 - 0.99m |
| | Approximate Window Sample Probeshole Location with Install | | Depth of Bedrock 1.00 - 1.99m |
| | Approximate Trial Pit Location | | Depth of Bedrock 2.00 - 2.99m |
| | Approximate Soakaway Test Location | | Depth of Bedrock 3.00 - 3.99m |
| | Approximate Rotary Borehole Location | | Depth of Bedrock 4.00 - 4.99m |
| | | | Depth of Bedrock 5.00 - 5.99m |
| | | | Depth of Bedrock 6.00 - 6.99m |
| | | | Depth of Bedrock 7.00 - 7.99m |
| | | | Depth of Bedrock >8.00m |

Notes:

Client:

Job No:

Date:

AJP

14-278

22.09.2020

| Phase | Issue | Date | Drawn | Checked |
|-------|-------|------------|-------|---------|
| P1 | REVA | 22.09.2020 | HM | VW |

Job Title:
Well Street,
Brackley

Drawing No:

Scale:

012

NTS

Drawing Title:
Depth to Bedrock
Plan

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APPENDIX IV PHOTOGRAPHS

PLATE 1 ENTRANCE TO SITE FROM WELL STREET



PLATE 2 VIEW OF SITE NORTH WEST




PLATE 3 VIEW OF SITE NORTH EAST


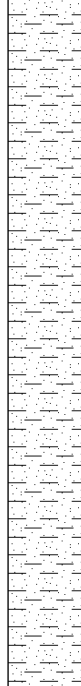


PLATE 4 GROUND CONDITIONS IDENTIFIED IN TP110



APPENDIX V
E3P EXPLORATORY HOLE
LOGS

| | | | |
|-----------------------------------|-------------------|--|------------------------|
| Project Name: Well Street | Project No. 14278 | Co-ords: 326702.00 - 363600.00 Level: | Date 01/09/2020 |
| Location: Buckley | | Dimensions (m): 2.10  | Scale 1:30 |
| Client: Alan Johnston Partnership | | Depth 3.00 | Logged V. Wilkinson |

| Water Strike | Samples & In Situ Testing | | | Depth (m) | Level (m) | Legend | Stratum Description |
|--------------|---------------------------|------|---------|-----------|-----------|--|---|
| | Depth | Type | Results | | | | |
| | 0.10 | ES | | 0.20 | |  | Dark brown slightly gravelly sandy CLAY (Topsoil) with frequent rootlets. Gravel is fine to coarse, sub-angular to sub-rounded of mudstone. |
| | 1.00 | ES | | | |  | Stiff brown slightly gravelly sandy CLAY with occasional cobbles. Gravel is fine to coarse, sub-angular to sub-rounded of mudstone and sandstone. Cobbles are sub-angular to sub-rounded of mudstone. |
| | | | | 3.00 | | | End of Pit at 3.00m |

Trial Pit Photographs




Trial Pit 101


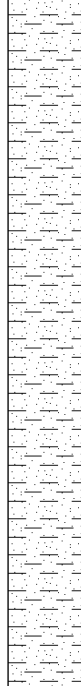


Trial Pit 101 Spoil

Remarks: Complete. Unable to complete hand shear vane due to friable nature of clay.

Stability: Stable

| | | | |
|-----------------------------------|-------------------|--|------------------------|
| Project Name: Well Street | Project No. 14278 | Co-ords: 326657.00 - 363596.00 Level: | Date 01/09/2020 |
| Location: Buckley | | Dimensions (m): Depth 3.00 | Scale 1:30 |
| Client: Alan Johnston Partnership | | 0.60  | Logged V. Wilkinson |

| Water Strike | Samples & In Situ Testing | | | Depth (m) | Level (m) | Legend | Stratum Description |
|--------------|---------------------------|-----------|---------|-----------|-----------|--|---|
| | Depth | Type | Results | | | | |
| | 0.10 | ES | | 0.20 | |  | Dark brown slightly gravelly sandy CLAY (Topsoil) with frequent rootlets. Gravel is fine to coarse, sub-angular to sub-rounded of mudstone. |
| | 2.00 2.00 | ES HVP | 78 | 3.00 | |  | Stiff high strength brown slightly gravelly sandy CLAY with occasional cobbles. Gravel is fine to coarse, sub-angular to sub-rounded of mudstone and sandstone. Cobbles are sub-angular to sub-rounded of mudstone. |
| | | | | | | | End of Pit at 3.00m |

Trial Pit Photographs



Trial Pit 102


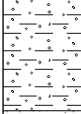



Trial Pit 102 Spoil

Remarks: Complete.

Stability: Stable

| | | | |
|-----------------------------------|-------------------|--|------------------------|
| Project Name: Well Street | Project No. 14278 | Co-ords: 326633.00 - 363622.00 Level: | Date 01/09/2020 |
| Location: Buckley | | Dimensions (m): 2.10 | Scale 1:30 |
| Client: Alan Johnston Partnership | | Depth 2.50 | Logged V. Wilkinson |

| Water Strike | Samples & In Situ Testing | | | Depth (m) | Level (m) | Legend | Stratum Description |
|--------------|---------------------------|------|---------|-----------|-----------|--|--|
| | Depth | Type | Results | | | | |
| | 0.10 | ES | | 0.20 | |  | Dark brown slightly gravelly sandy CLAY (Topsoil) with frequent rootlets and rare cobbles. Gravel is fine to coarse, sub-angular to sub-rounded of mudstone. Cobbles are sub-angular to sub-rounded of mudstone. Stiff orange brown mottled grey slightly sandy gravelly CLAY. Gravel is fine to coarse, angular to sub-rounded of mudstone, sandstone and coal. |
| | 0.60 | ES | | 0.70 | |  | |
| | | | | 2.50 | |  | Stiff brown slightly gravelly sandy CLAY with occasional cobbles. Gravel is fine to coarse, sub-angular to sub-rounded of mudstone and sandstone. Cobbles are sub-angular to sub-rounded of mudstone. |
| | | | | | | | End of Pit at 2.50m |

Trial Pit Photographs



Trial Pit 103


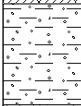
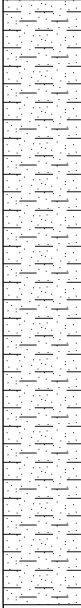


Trial Pit 103 Spoil

Remarks: Complete. Unable to complete hand shear vane due to friable nature of clay.

Stability: Stable

| | | | |
|-----------------------------------|-------------------|---|------------------------|
| Project Name: Well Street | Project No. 14278 | Co-ords: 326607.00 - 363669.00 Level: | Date 01/09/2020 |
| Location: Buckley | | Dimensions (m): 2.10 Depth 3.10 | Scale 1:30 |
| Client: Alan Johnston Partnership | | | Logged V. Wilkinson |

| Water Strike | Samples & In Situ Testing | | | Depth (m) | Level (m) | Legend | Stratum Description |
|--------------|---------------------------|------|---------|-----------|-----------|--|---|
| | Depth | Type | Results | | | | |
| | 0.10 | ES | | 0.30 | |  | Dark brown slightly gravelly sandy CLAY (Topsoil) with frequent rootlets. Gravel is fine to coarse, sub-angular to sub-rounded of mudstone. |
| | | | | 0.70 | |  | Stiff orange brown mottled grey slightly sandy gravelly CLAY. Gravel is fine to coarse, angular to sub-rounded of mudstone, sandstone and coal. |
| | 1.00 | B | | 3.10 | |  | Stiff brown slightly gravelly sandy CLAY with occasional cobbles. Gravel is fine to coarse, sub-angular to sub-rounded of mudstone and sandstone. Cobbles are sub-angular to sub-rounded of mudstone. |
| | | | | | | | End of Pit at 3.10m |

Trial Pit Photographs



Trial Pit 104



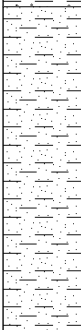


Trial Pit 104 Spoil

Remarks: Complete. Unable to complete hand shear vane due to friable nature of clay.

Stability: Stable

| | | | |
|-----------------------------------|-------------------|---|------------------------|
| Project Name: Well Street | Project No. 14278 | Co-ords: 326657.00 - 363654.00 Level: | Date 01/09/2020 |
| Location: Buckley | | Dimensions (m): 2.10 | Scale 1:30 |
| Client: Alan Johnston Partnership | | Depth 2.00 0.60 | Logged V. Wilkinson |

| Water Strike | Samples & In Situ Testing | | | Depth (m) | Level (m) | Legend | Stratum Description |
|--------------|---------------------------|------|---------|-----------|-----------|---|---|
| | Depth | Type | Results | | | | |
| | 0.10 | ES | | 0.30 | |  | Dark brown slightly gravelly sandy CLAY (Topsoil) with frequent rootlets. Gravel is fine to coarse, sub-angular to sub-rounded of mudstone. |
| | | | | 0.70 | |  | Stiff orange brown mottled grey slightly sandy gravelly CLAY. Gravel is fine to coarse, angular to sub-rounded of mudstone, sandstone and coal. |
| | 1.00 | ES | | 2.00 | |  | Stiff brown slightly gravelly sandy CLAY with occasional cobbles. Gravel is fine to coarse, sub-angular to sub-rounded of mudstone and sandstone. Cobbles are sub-angular to sub-rounded of mudstone. |
| | | | | | | | End of Pit at 2.00m |

Trial Pit Photographs



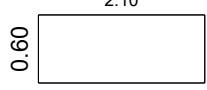
Trial Pit 105/ Soakaway 101


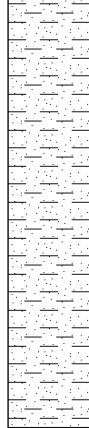


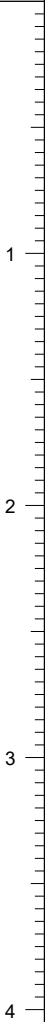
Trial Pit 105/ Soakaway 101 Spoil

Remarks: Complete. Unable to complete hand shear vane due to friable nature of clay.

Stability: Stable

| | | | |
|-----------------------------------|-------------------|--|------------------------|
| Project Name: Well Street | Project No. 14278 | Co-ords: 326734.00 - 363584.00 Level: | Date 01/09/2020 |
| Location: Buckley | | Dimensions (m): 2.10  | Scale 1:30 |
| Client: Alan Johnston Partnership | | Depth 2.00 | Logged V. Wilkinson |

| Water Strike | Samples & In Situ Testing | | | Depth (m) | Level (m) | Legend | Stratum Description |
|--------------|---------------------------|------|---------|-----------|-----------|---|---|
| | Depth | Type | Results | | | | |
| | 0.10 | ES | | 0.30 | |  | Dark brown slightly gravelly sandy CLAY (Topsoil) with frequent rootlets. Gravel is fine to coarse, sub-angular to sub-rounded of mudstone. |
| | | | | 2.00 | |  | Stiff brown slightly gravelly sandy CLAY with occasional cobbles. Gravel is fine to coarse, sub-angular to sub-rounded of mudstone and sandstone. Cobbles are sub-angular to sub-rounded of mudstone. |
| | | | | | | | End of Pit at 2.00m |



Trial Pit Photographs




Trial Pit 106



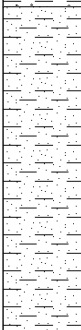


Trial Pit 106 Spoil

Remarks: Complete. Unable to complete hand shear vane due to friable nature of clay.

Stability: Stable

| | | | |
|-----------------------------------|-------------------|--|---------------------|
| Project Name: Well Street | Project No. 14278 | Co-ords: 326789.00 - 363693.00 Level: | Date 01/09/2020 |
| Location: Buckley | | Dimensions (m): 2.10  | Scale 1:30 |
| Client: Alan Johnston Partnership | | Depth 2.00 | Logged V. Wilkinson |

| Water Strike | Samples & In Situ Testing | | | Depth (m) | Level (m) | Legend | Stratum Description |
|--------------|---------------------------|-----------------|---------|-----------|-----------|---|---|
| | Depth | Type | Results | | | | |
| | | | | 0.30 | |  | Dark brown slightly gravelly sandy CLAY (Topsoil) with frequent rootlets. Gravel is fine to coarse, sub-angular to sub-rounded of mudstone. |
| | 0.50 0.50 0.60 | ES HVP ES | 109 | 0.70 | |  | Stiff high strength orange brown mottled grey slightly sandy gravelly CLAY. Gravel is fine to coarse, angular to sub-rounded of mudstone, sandstone and coal. |
| | 1.00 | HVP | 131 | 2.00 | |  | Stiff high strength brown slightly gravelly sandy CLAY with occasional cobbles. Gravel is fine to coarse, sub-angular to sub-rounded of mudstone and sandstone. Cobbles are sub-angular to sub-rounded of mudstone. |
| | | | | | | | End of Pit at 2.00m |

Trial Pit Photographs



Trial Pit 107/ Soakaway 103


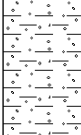



Trial Pit 107/ Soakaway 103 Spoil

Remarks: Complete.

Stability: Stable

| | | | |
|-----------------------------------|-------------------|--|------------------------|
| Project Name: Well Street | Project No. 14278 | Co-ords: 326868.00 - 363696.00 Level: | Date 01/09/2020 |
| Location: Buckley | | Dimensions (m): 2.10 | Scale 1:30 |
| Client: Alan Johnston Partnership | | Depth 2.00 | Logged V. Wilkinson |

| Water Strike | Samples & In Situ Testing | | | Depth (m) | Level (m) | Legend | Stratum Description |
|--------------|---------------------------|------|---------|-----------|-----------|---|---|
| | Depth | Type | Results | | | | |
| | 0.10 | ES | | 0.20 | |  | Dark brown slightly gravelly sandy CLAY (Topsoil) with frequent rootlets. Gravel is fine to coarse, sub-angular to sub-rounded of mudstone. |
| | | | | 0.80 | |  | Stiff orange brown mottled grey slightly sandy gravelly CLAY. Gravel is fine to coarse, angular to sub-rounded of mudstone, sandstone and coal. |
| | | | | 2.00 | |  | Stiff brown slightly gravelly sandy CLAY with occasional cobbles. Gravel is fine to coarse, sub-angular to sub-rounded of mudstone and sandstone. Cobbles are sub-angular to sub-rounded of mudstone. |
| | | | | | | | End of Pit at 2.00m |

Trial Pit Photographs



Trial Pit 108/ Soakaway 104


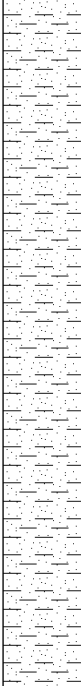


Trial Pit 108/ Soakaway 104

Remarks: Complete.

Stability: Stable

| | | | |
|-----------------------------------|-------------------|---|------------------------|
| Project Name: Well Street | Project No. 14278 | Co-ords: 326720.00 - 363504.00 Level: | Date 01/09/2020 |
| Location: Buckley | | Dimensions (m): 2.10 Depth 3.00 | Scale 1:30 |
| Client: Alan Johnston Partnership | | | Logged V. Wilkinson |

| Water Strike | Samples & In Situ Testing | | | Depth (m) | Level (m) | Legend | Stratum Description |
|--------------|---------------------------|------|---------|-----------|-----------|--|---|
| | Depth | Type | Results | | | | |
| | 0.10 | ES | | 0.20 | |  | Dark brown slightly gravelly sandy CLAY (Topsoil) with frequent rootlets. Gravel is fine to coarse, sub-angular to sub-rounded of mudstone. |
| | 2.90 | ES | | 3.00 | |  | Stiff brown slightly gravelly sandy CLAY with occasional cobbles. Gravel is fine to coarse, sub-angular to sub-rounded of mudstone and sandstone. Cobbles are sub-angular to sub-rounded of mudstone. (Becoming very sandy at 2.00 m bgl) |
| | | | | | | | End of Pit at 3.00m |

Trial Pit Photographs



Trial Pit 109



Trial Pit 109 Spoil

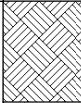
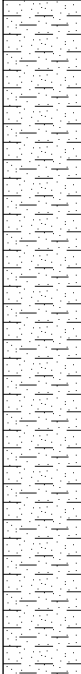
Remarks: Complete. Unable to complete hand shear vane due to friable nature of clay.

Stability: Stable

Project Name: Well Street Project No. 14278 Co-ords: 326725.00 - 363542.00 Date 01/09/2020

Location: Buckley Dimensions (m): 2.10 Scale 1:30

Client: Alan Johnston Partnership Depth 3.10 Logged V. Wilkinson

| Water Strike | Samples & In Situ Testing | | | Depth (m) | Level (m) | Legend | Stratum Description |
|--------------|---------------------------|------|---------|-----------|-----------|--|---|
| | Depth | Type | Results | | | | |
| | 0.10 | ES | | 0.40 | |  | Dark brown slightly gravelly sandy CLAY (Topsoil) with frequent rootlets. Gravel is fine to coarse, sub-angular to sub-rounded of mudstone. |
| | 0.80 | ES | | | |  | Stiff brown slightly gravelly sandy CLAY with occasional cobbles. Gravel is fine to coarse, sub-angular to sub-rounded of mudstone and sandstone. Cobbles are sub-angular to sub-rounded of mudstone. |
| | 2.50 | HVP | 157 | 3.10 | | | |
| | End of Pit at 3.10m | | | | | | |

Trial Pit Photographs



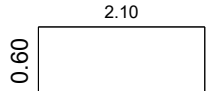
Trial Pit 110









Trial Pit 110 Spoil

Remarks: Complete.

Stability: Stable

| | | | |
|-----------------------------------|-------------------|---|------------------------|
| Project Name: Well Street | Project No. 14278 | Co-ords: 326780.00 - 363518.00 Level: | Date 01/09/2020 |
| Location: Buckley | | Dimensions (m):  | Scale 1:30 |
| Client: Alan Johnston Partnership | | Depth 3.10 | Logged V. Wilkinson |

| Water Strike | Samples & In Situ Testing | | | Depth (m) | Level (m) | Legend | Stratum Description | |
|--------------|---------------------------|------|---------|-----------|-----------|---|---|---|
| | Depth | Type | Results | | | | | |
| | 0.10 | ES | | 0.30 | |  | Dark brown slightly gravelly sandy CLAY (Topsoil) with frequent rootlets. Gravel is fine to coarse, sub-angular to sub-rounded of mudstone. | |
| | 0.50 | ES | | 0.70 | |  | Stiff orange brown mottled grey slightly sandy gravelly CLAY. Gravel is fine to coarse, angular to sub-rounded of mudstone, sandstone and coal. | |
| | 0.80 | HVP | 38 | | |  | Soft low strength slightly gravelly silty CLAY. Gravel is fine to coarse, angular to sub-rounded of mudstone of sandstone. Becoming firm medium strength at 1.20 m bgl. | 1 |
| | 1.20 | HVP | 42 | | |  | | |
| | 2.00 | HVP | 45 | | |  | | 2 |
| | 2.50 | HVP | 120 | 2.30 | |  | Stiff high strength brown slightly gravelly sandy CLAY with occasional cobbles. Gravel is fine to coarse, sub-angular to sub-rounded of mudstone and sandstone. Cobbles are sub-angular to sub-rounded of mudstone. | 3 |
| | | | | 3.10 | | | End of Pit at 3.10m | 4 |

Trial Pit Photographs



Trial Pit 111



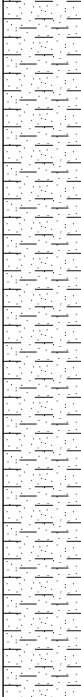


Trial Pit 111 Spoil

Remarks: Complete.

Stability: Stable

| | | | |
|-----------------------------------|-------------------|--|------------------------|
| Project Name: Well Street | Project No. 14278 | Co-ords: 326784.00 - 363577.00 Level: | Date 01/09/2020 |
| Location: Buckley | | Dimensions (m): 2.10 | Scale 1:30 |
| Client: Alan Johnston Partnership | | Depth 3.30 | Logged V. Wilkinson |

| Water Strike | Samples & In Situ Testing | | | Depth (m) | Level (m) | Legend | Stratum Description |
|--------------|---------------------------|------|---------|-----------|-----------|--|---|
| | Depth | Type | Results | | | | |
| | 0.10 | ES | | 0.20 | |  | Dark brown slightly gravelly sandy CLAY (Topsoil) with frequent rootlets. Gravel is fine to coarse, sub-angular to sub-rounded of mudstone. |
| | | | | 0.40 | |  | Stiff orange brown mottled grey slightly sandy gravelly CLAY. Gravel is fine to coarse, angular to sub-rounded of mudstone, sandstone and coal. |
| | 1.00 | ES | | | |  | Stiff brown slightly gravelly sandy CLAY with occasional cobbles and boulders. Gravel is fine to coarse, sub-angular to sub-rounded of mudstone and sandstone. Cobbles and boulders are sub-angular to sub-rounded of mudstone. |
| | | | | 3.30 | | | End of Pit at 3.30m |

Trial Pit Photographs



Trial Pit 112


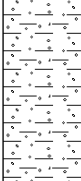

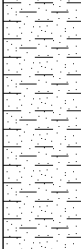


Trial Pit 112 Spoil

Remarks: Complete. Unable to complete hand shear vane due to friable nature of clay.

Stability: Stable

| | | | |
|-----------------------------------|-------------------|---|------------------------|
| Project Name: Well Street | Project No. 14278 | Co-ords: 326760.00 - 363619.00 Level: | Date 01/09/2020 |
| Location: Buckley | | Dimensions (m): 2.10 | Scale 1:30 |
| Client: Alan Johnston Partnership | | Depth 3.30 | Logged V. Wilkinson |

| Water Strike | Samples & In Situ Testing | | | Depth (m) | Level (m) | Legend | Stratum Description |
|--------------|---------------------------|------|---------|-----------|-----------|---|---|
| | Depth | Type | Results | | | | |
| | 0.10 | ES | | 0.20 | |  | Dark brown slightly gravelly sandy CLAY (Topsoil) with frequent rootlets. Gravel is fine to coarse, sub-angular to sub-rounded of mudstone. |
| | | | | 1.00 | |  | Stiff orange brown mottled grey slightly sandy gravelly CLAY. Gravel is fine to coarse, angular to sub-rounded of mudstone, sandstone and coal. |
| | 1.50 | B | | | |  | Stiff brown slightly gravelly sandy CLAY with occasional cobbles. Gravel is fine to coarse, sub-angular to sub-rounded of mudstone and sandstone. Cobbles are sub-angular to sub-rounded of mudstone. |
| | 2.50 | ES | | | |  | |
| | | | | 3.30 | | | End of Pit at 3.30m |

Trial Pit Photographs



Trial Pit 113


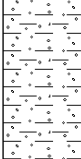
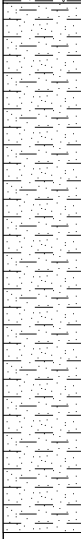


Trial Pit 113 Spoil

Remarks: Complete. Unable to complete hand shear vane due to friable nature of clay.

Stability: Stable

| | | | |
|-----------------------------------|-------------------|--|------------------------|
| Project Name: Well Street | Project No. 14278 | Co-ords: 326736.00 - 363638.00 Level: | Date 01/09/2020 |
| Location: Buckley | | Dimensions (m): 2.10 | Scale 1:30 |
| Client: Alan Johnston Partnership | | Depth 3.00 | Logged V. Wilkinson |

| Water Strike | Samples & In Situ Testing | | | Depth (m) | Level (m) | Legend | Stratum Description |
|--------------|---------------------------|------|---------|-----------|-----------|--|---|
| | Depth | Type | Results | | | | |
| | 0.10 | ES | | 0.20 | |  | Dark brown slightly gravelly sandy CLAY (Topsoil) with frequent rootlets. Gravel is fine to coarse, sub-angular to sub-rounded of mudstone. |
| | | | | 0.90 | |  | Stiff orange brown mottled grey slightly sandy gravelly CLAY. Gravel is fine to coarse, angular to sub-rounded of mudstone, sandstone and coal. |
| | 2.00 | ES | | 3.00 | |  | Stiff brown slightly gravelly sandy CLAY with occasional cobbles. Gravel is fine to coarse, sub-angular to sub-rounded of mudstone and sandstone. Cobbles are sub-angular to sub-rounded of mudstone. |
| | | | | | | | End of Pit at 3.00m |

Trial Pit Photographs



Trial Pit 114


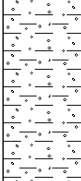



Trial Pit 114 Spoil

Remarks: Complete. Unable to complete hand shear vane due to friable nature of clay.

Stability: Stable

| | | | |
|-----------------------------------|-------------------|---|------------------------|
| Project Name: Well Street | Project No. 14278 | Co-ords: 326700.00 - 363645.00 Level: | Date 01/09/2020 |
| Location: Buckley | | Dimensions (m): 2.10 | Scale 1:30 |
| Client: Alan Johnston Partnership | | Depth 3.00 0.60 | Logged V. Wilkinson |

| Water Strike | Samples & In Situ Testing | | | Depth (m) | Level (m) | Legend | Stratum Description |
|--------------|---------------------------|------|---------|-----------|-----------|--|---|
| | Depth | Type | Results | | | | |
| | 0.40 | ES | | 0.20 | |  | Dark brown slightly gravelly sandy CLAY (Topsoil) with frequent rootlets. Gravel is fine to coarse, sub-angular to sub-rounded of mudstone. |
| | | | | 1.00 | |  | Stiff orange brown mottled grey slightly sandy gravelly CLAY. Gravel is fine to coarse, angular to sub-rounded of mudstone, sandstone and coal. |
| | | | | 3.00 | |  | Stiff brown slightly gravelly sandy CLAY with occasional cobbles. Gravel is fine to coarse, sub-angular to sub-rounded of mudstone and sandstone. Cobbles are sub-angular to sub-rounded of mudstone. |
| | | | | | | | End of Pit at 3.00m |

Trial Pit Photographs



Trial Pit 115




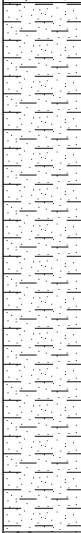



Trial Pit 115 Spoil

Remarks: Complete. Unable to complete hand shear vane due to friable nature of clay.

Stability: Stable

| | | | |
|-----------------------------------|-------------------|--|------------------------|
| Project Name: Well Street | Project No. 14278 | Co-ords: 326713.00 - 363666.00 Level: | Date 01/09/2020 |
| Location: Buckley | | Dimensions (m): 2.10 | Scale 1:30 |
| Client: Alan Johnston Partnership | | Depth 3.30 | Logged V. Wilkinson |

| Water Strike | Samples & In Situ Testing | | | Depth (m) | Level (m) | Legend | Stratum Description |
|---|---------------------------|------|---------|--------------|-----------|---|---|
| | Depth | Type | Results | | | | |
|  3.20 | | | | 0.30 | |  | Dark brown slightly gravelly sandy CLAY (Topsoil) with frequent rootlets. Gravel is fine to coarse, sub-angular to sub-rounded of mudstone. |
| | 1.00 | ES | | 1.10 | |  | Stiff orange brown mottled grey slightly sandy gravelly CLAY. Gravel is fine to coarse, angular to sub-rounded of mudstone, sandstone and coal. |
| | 2.50 | HVP | 114 | | |  | Stiff high strength brown slightly gravelly sandy CLAY with occasional cobbles. Gravel is fine to coarse, sub-angular to sub-rounded of mudstone and sandstone. Cobbles are sub-angular to sub-rounded of mudstone. |
| | | | | 3.20 3.30 | |  | Grey GRAVEL. Gravel is fine to coarse, angular to sub-angular of mudstone. (weathered bedrock) End of Pit at 3.30m |

Trial Pit Photographs



Trial Pit 116



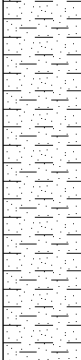



Trial Pit 116 Spoil

Remarks: 1. Complete. 2. Steady water seepage encountered at 3.20 m bgl.

Stability: Stable

| | | | |
|-----------------------------------|-------------------|--|------------------------|
| Project Name: Well Street | Project No. 14278 | Co-ords: 326679.00 - 363695.00 Level: | Date 01/09/2020 |
| Location: Buckley | | Dimensions (m): 2.10 Depth 2.10 | Scale 1:30 |
| Client: Alan Johnston Partnership | | | Logged V. Wilkinson |

| Water Strike | Samples & In Situ Testing | | | Depth (m) | Level (m) | Legend | Stratum Description |
|--------------|---------------------------|------|---------|-----------|-----------|---|---|
| | Depth | Type | Results | | | | |
| ▼ 2.00 | 0.10 | ES | | 0.20 | |  | Dark brown slightly gravelly sandy CLAY (Topsoil) with frequent rootlets. Gravel is fine to coarse, sub-angular to sub-rounded of mudstone. |
| | | | | 0.40 | |  | Stiff orange brown mottled grey slightly sandy gravelly CLAY. Gravel is fine to coarse, angular to sub-rounded of mudstone, sandstone and coal. |
| | 1.50 | ES | | | |  | Stiff brown slightly gravelly sandy CLAY with occasional cobbles. Gravel is fine to coarse, sub-angular to sub-rounded of mudstone and sandstone. Cobbles are sub-angular to sub-rounded of mudstone. |
| | | | | 2.00 | |  | Grey GRAVEL. Gravel is fine to coarse, angular to sub-angular of mudstone. (weathered bedrock) |
| | | | | 2.10 | | | End of Pit at 2.10m |

Trial Pit Photographs



Trial Pit 117






Trial Pit 117 Spoil

Remarks: 1. Complete. 2. Steady water seepage encountered at 2.00 m bgl.

Stability: Stable

| | | | |
|-----------------------------------|-------------------|--|------------------------|
| Project Name: Well Street | Project No. 14278 | Co-ords: 326734.00 - 363712.00 Level: | Date 02/09/2020 |
| Location: Buckley | | Dimensions (m): 2.10 | Scale 1:30 |
| Client: Alan Johnston Partnership | | Depth 3.00 | Logged V. Wilkinson |

| Water Strike | Samples & In Situ Testing | | | Depth (m) | Level (m) | Legend | Stratum Description |
|--------------|---------------------------|------|---------|-----------|-----------|---|---|
| | Depth | Type | Results | | | | |
| | 0.10 | ES | | 0.20 | |  | Dark brown slightly gravelly sandy CLAY (Topsoil) with frequent rootlets. Gravel is fine to coarse, sub-angular to sub-rounded of mudstone. |
| | | | | 0.90 | |  | Stiff orange brown mottled grey slightly sandy gravelly CLAY. Gravel is fine to coarse, angular to sub-rounded of mudstone, sandstone and coal. |
| | 1.50 | ES | | 3.00 | |  | Stiff brown slightly gravelly sandy CLAY with occasional cobbles. Gravel is fine to coarse, sub-angular to sub-rounded of mudstone and sandstone. Cobbles are sub-angular to sub-rounded of mudstone. |
| | | | | | | | End of Pit at 3.00m |

Trial Pit Photographs



Trial Pit 118



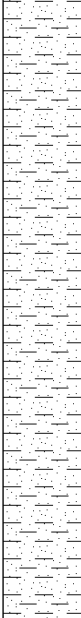


Trial Pit 118 Spoil

Remarks: Complete. Unable to complete hand shear vane due to friable nature of clay.

Stability: Stable

| | | | |
|-----------------------------------|-------------------|--|------------------------|
| Project Name: Well Street | Project No. 14278 | Co-ords: 326764.00 - 363732.00 Level: | Date 02/09/2020 |
| Location: Buckley | | Dimensions (m): 2.10 Depth 3.00 | Scale 1:30 |
| Client: Alan Johnston Partnership | | | Logged V. Wilkinson |

| Water Strike | Samples & In Situ Testing | | | Depth (m) | Level (m) | Legend | Stratum Description |
|--------------|---------------------------|------|---------|-----------|-----------|--|---|
| | Depth | Type | Results | | | | |
| | 0.10 | ES | | 0.20 | |  | Dark brown slightly gravelly sandy CLAY (Topsoil) with frequent rootlets. Gravel is fine to coarse, sub-angular to sub-rounded of mudstone. |
| | | | | 0.40 | |  | Stiff orange brown mottled grey slightly sandy gravelly CLAY. Gravel is fine to coarse, angular to sub-rounded of mudstone, sandstone and coal. |
| | | | | 3.00 | |  | Stiff brown slightly gravelly sandy CLAY with occasional cobbles. Gravel is fine to coarse, sub-angular to sub-rounded of mudstone and sandstone. Cobbles are sub-angular to sub-rounded of mudstone. |
| | | | | | | | End of Pit at 3.00m |

Trial Pit Photographs



Trial Pit 119


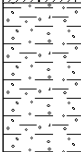
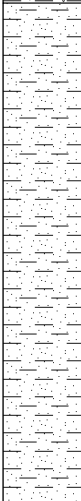



Trial Pit 119 Spoil

Remarks: Complete. Unable to complete hand shear vane due to friable nature of clay.

Stability: Stable

| | | | |
|-----------------------------------|-------------------|--|------------------------|
| Project Name: Well Street | Project No. 14278 | Co-ords: 326814.00 - 363761.00 Level: | Date 02/09/2020 |
| Location: Buckley | | Dimensions (m): 2.10 | Scale 1:30 |
| Client: Alan Johnston Partnership | | Depth 3.30 | Logged V. Wilkinson |

| Water Strike | Samples & In Situ Testing | | | Depth (m) | Level (m) | Legend | Stratum Description |
|--------------|---------------------------|---------|---------|-----------|-----------|---|---|
| | Depth | Type | Results | | | | |
| | 0.10 | ES | | 0.30 | |  | Dark brown slightly gravelly sandy CLAY (Topsoil) with frequent rootlets. Gravel is fine to coarse, sub-angular to sub-rounded of mudstone. |
| | 0.60 | HVP | 156 | 0.90 | |  | Very stiff very high strength orange brown mottled grey slightly sandy gravelly CLAY. Gravel is fine to coarse, angular to sub-rounded of mudstone, sandstone and coal. |
| | 1.00 1.00 | B ES | | 2.90 | |  | Stiff brown slightly gravelly sandy CLAY with occasional cobbles. Gravel is fine to coarse, sub-angular to sub-rounded of mudstone and sandstone. Cobbles are sub-angular to sub-rounded of mudstone. |
| | | | | 3.30 | |  | Reddish brown clayey fine to medium SAND. |
| | | | | | | | End of Pit at 3.30m |

Trial Pit Photographs



Trial Pit 120






Trial Pit 120 Spoil

Remarks: Complete.

Stability: Stable

| | | | |
|-----------------------------------|-------------------|--|------------------------|
| Project Name: Well Street | Project No. 14278 | Co-ords: 326843.00 - 363734.00 Level: | Date 02/09/2020 |
| Location: Buckley | | Dimensions (m): 2.10 Depth 2.60 | Scale 1:30 |
| Client: Alan Johnston Partnership | | | Logged V. Wilkinson |

| Water Strike | Samples & In Situ Testing | | | Depth (m) | Level (m) | Legend | Stratum Description |
|--------------|---------------------------|------|---------|--------------|-----------|---|---|
| | Depth | Type | Results | | | | |
| | 0.10 | ES | | 0.20 | |  | MADE GROUND: Dark brown slightly gravelly sandy clay (Topsoil) with frequent rootlets. Gravel is fine to coarse, sub-angular to sub-rounded of mudstone. |
| | 0.30 | ES | | | | | MADE GROUND: Brown slightly gravelly sandy clay. Gravel is fine to coarse, sub-angular to sub-rounded of mudstone and sandstone and coppers pipe. (Land drain encountered at 0.30 m bgl). |
| | | | | 0.50 | |  | Stiff brown slightly gravelly sandy CLAY with occasional cobbles. Gravel is fine to coarse, sub-angular to sub-rounded of mudstone and sandstone. Cobbles are sub-angular to sub-rounded of mudstone. |
| | | | | 2.50 2.60 | |  | Grey GRAVEL. Gravel is fine to coarse, angular to sub-angular of mudstone. (weathered bedrock) End of Pit at 2.60m |

Trial Pit Photographs



Trial Pit 121






Trial Pit 121 Spoil

Remarks: Complete.

Stability: Stable

| | | | |
|-----------------------------------|-------------------|--|------------------------|
| Project Name: Well Street | Project No. 14278 | Co-ords: 326837.00 - 363699.00 Level: | Date 02/09/2020 |
| Location: Buckley | | Dimensions (m): 2.10 Depth 3.00 | Scale 1:30 |
| Client: Alan Johnston Partnership | | | Logged V. Wilkinson |

| Water Strike | Samples & In Situ Testing | | | Depth (m) | Level (m) | Legend | Stratum Description |
|--------------|---------------------------|------|---------|-----------|-----------|--|---|
| | Depth | Type | Results | | | | |
| | 0.10 | ES | | 0.20 | |  | Dark brown slightly gravelly sandy CLAY (Topsoil) with frequent rootlets. Gravel is fine to coarse, sub-angular to sub-rounded of mudstone. |
| | | | | 0.50 | |  | Stiff orange brown mottled grey slightly sandy gravelly CLAY. Gravel is fine to coarse, angular to sub-rounded of mudstone, sandstone and coal. |
| | | | | 3.00 | |  | Stiff brown slightly gravelly sandy CLAY with occasional cobbles. Gravel is fine to coarse, sub-angular to sub-rounded of mudstone and sandstone. Cobbles are sub-angular to sub-rounded of mudstone. |
| | | | | | | | End of Pit at 3.00m |

Trial Pit Photographs



Trial Pit 122


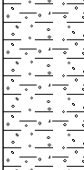
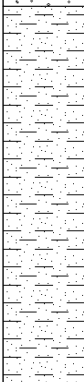


Trial Pit 122 Spoil

Remarks: Complete.

Stability: Stable

| | | | |
|-----------------------------------|-------------------|--|---------------------|
| Project Name: Well Street | Project No. 14278 | Co-ords: 326821.00 - 363672.00 Level: | Date 02/09/2020 |
| Location: Buckley | | Dimensions (m): 2.10 <div style="display: inline-block; border: 1px solid black; width: 100px; height: 40px; vertical-align: middle;"></div> | Scale 1:30 |
| Client: Alan Johnston Partnership | | Depth 2.50 | Logged V. Wilkinson |

| Water Strike | Samples & In Situ Testing | | | Depth (m) | Level (m) | Legend | Stratum Description |
|--------------|---------------------------|------|---------|-----------|-----------|--|---|
| | Depth | Type | Results | | | | |
| | 0.10 | ES | | 0.30 | |  | MADE GROUND: Dark brown slightly gravelly sandy clay (Topsoil) with frequent rootlets. Gravel is fine to coarse, sub-angular to sub-rounded of mudstone and rare ceramic. |
| | | | | 1.00 | |  | Stiff orange brown mottled grey slightly sandy gravelly CLAY. Gravel is fine to coarse, angular to sub-rounded of mudstone, sandstone and coal. |
| | 2.00 | ES | | 2.50 | |  | Stiff brown slightly gravelly sandy CLAY with occasional cobbles. Gravel is fine to coarse, sub-angular to sub-rounded of mudstone and sandstone. Cobbles are sub-angular to sub-rounded of mudstone. |
| | | | | | | | End of Pit at 2.50m |

Trial Pit Photographs



Trial Pit 123



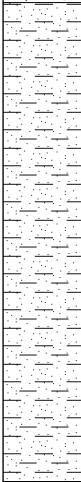



Trial Pit 123 Spoil

Remarks: Complete.

Stability: Stable

| | | | |
|-----------------------------------|-------------------|--|---------------------|
| Project Name: Well Street | Project No. 14278 | Co-ords: 326863.00 - 363665.00 Level: | Date 02/09/2020 |
| Location: Buckley | | Dimensions (m): 2.10 | Scale 1:30 |
| Client: Alan Johnston Partnership | | Depth 3.70 | Logged V. Wilkinson |

| Water Strike | Samples & In Situ Testing | | | Depth (m) | Level (m) | Legend | Stratum Description |
|--------------|---------------------------|------|---------|-----------|-----------|---|---|
| | Depth | Type | Results | | | | |
| | 0.10 | ES | | 0.30 | |  | Dark brown slightly gravelly sandy CLAY (Topsoil) with frequent rootlets. Gravel is fine to coarse, sub-angular to sub-rounded of mudstone. |
| | | | | 1.10 | |  | Stiff orange brown mottled grey slightly sandy gravelly CLAY. Gravel is fine to coarse, angular to sub-rounded of mudstone, sandstone and coal. |
| | 2.00 | ES | | 3.00 | |  | Stiff brown slightly gravelly sandy CLAY with occasional cobbles. Gravel is fine to coarse, sub-angular to sub-rounded of mudstone and sandstone. Cobbles are sub-angular to sub-rounded of mudstone. |
| | 3.20 | ES | | 3.70 | |  | Reddish brown clayey fine to medium SAND. |
| | | | | | | | End of Pit at 3.70m |

Trial Pit Photographs



Trial Pit 124


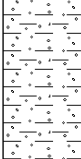



Trial Pit 124 Spoil

Remarks: Complete. Unable to complete hand shear vane due to friable nature of clay.

Stability: Stable

| | | | |
|-----------------------------------|-------------------|---|------------------------|
| Project Name: Well Street | Project No. 14278 | Co-ords: 326857.00 - 363638.00 Level: | Date 02/09/2020 |
| Location: Buckley | | Dimensions (m): 2.10 Depth 2.90 | Scale 1:30 |
| Client: Alan Johnston Partnership | | | Logged V. Wilkinson |

| Water Strike | Samples & In Situ Testing | | | Depth (m) | Level (m) | Legend | Stratum Description |
|--------------|---------------------------|------|---------|-----------|-----------|--|---|
| | Depth | Type | Results | | | | |
| | 0.10 | ES | | 0.20 | |  | Dark brown slightly gravelly sandy CLAY (Topsoil) with frequent rootlets. Gravel is fine to coarse, sub-angular to sub-rounded of mudstone. |
| | 1.00 | ES | | 0.90 | |  | Stiff orange brown mottled grey slightly sandy gravelly CLAY. Gravel is fine to coarse, angular to sub-rounded of mudstone, sandstone and coal. |
| | | | | 2.90 | |  | Stiff brown slightly gravelly sandy CLAY with occasional cobbles. Gravel is fine to coarse, sub-angular to sub-rounded of mudstone and sandstone. Cobbles are sub-angular to sub-rounded of mudstone. |
| | | | | | | | End of Pit at 2.90m |

Trial Pit Photographs



Trial Pit 125






Trial Pit 125 Spoil

Remarks: Complete. Unable to complete hand shear vane due to friable nature of clay.

Stability: Stable

| | | | |
|-----------------------------------|-------------------|--|------------------------|
| Project Name: Well Street | Project No. 14278 | Co-ords: 326832.00 - 363584.00 Level: | Date 02/09/2020 |
| Location: Buckley | | Dimensions (m): 2.10 | Scale 1:30 |
| Client: Alan Johnston Partnership | | Depth 3.60 | Logged V. Wilkinson |

| Water Strike | Samples & In Situ Testing | | | Depth (m) | Level (m) | Legend | Stratum Description |
|--------------|---------------------------|------|---------|-----------|-----------|---|---|
| | Depth | Type | Results | | | | |
| | 0.10 | ES | | 0.20 | |  | Dark brown slightly gravelly sandy CLAY (Topsoil) with frequent rootlets. Gravel is fine to coarse, sub-angular to sub-rounded of mudstone. |
| | | | | 0.90 | |  | Stiff orange brown mottled grey slightly sandy gravelly CLAY. Gravel is fine to coarse, angular to sub-rounded of mudstone, sandstone and coal. |
| | | | | | |  | Stiff brown slightly gravelly sandy CLAY with occasional cobbles. Gravel is fine to coarse, sub-angular to sub-rounded of mudstone and sandstone. Cobbles are sub-angular to sub-rounded of mudstone. Becoming very gravelly at 3.10 m bgl. |
| | 3.30 | ES | | 3.60 | | | End of Pit at 3.60m |

Trial Pit Photographs



Trial Pit 126


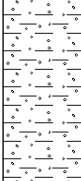



Trial Pit 126 Spoil

Remarks: Complete.

Stability: Stable

| | | | |
|-----------------------------------|-------------------|---|---------------------|
| Project Name: Well Street | Project No. 14278 | Co-ords: 326826.00 - 363637.00 Level: | Date 02/09/2020 |
| Location: Buckley | | Dimensions (m): 2.10 Depth 3.00 | Scale 1:30 |
| Client: Alan Johnston Partnership | | | Logged V. Wilkinson |

| Water Strike | Samples & In Situ Testing | | | Depth (m) | Level (m) | Legend | Stratum Description |
|--------------|---------------------------|------|---------|-----------|-----------|--|---|
| | Depth | Type | Results | | | | |
| | 0.10 | ES | | 0.20 | |  | Dark brown slightly gravelly sandy CLAY (Topsoil) with frequent rootlets. Gravel is fine to coarse, sub-angular to sub-rounded of mudstone. |
| | | | | 1.00 | |  | Stiff orange brown mottled grey slightly sandy gravelly CLAY. Gravel is fine to coarse, angular to sub-rounded of mudstone, sandstone and coal. |
| | 1.50 | ES | | 3.00 | |  | Stiff brown slightly gravelly sandy CLAY with occasional cobbles. Gravel is fine to coarse, sub-angular to sub-rounded of mudstone and sandstone. Cobbles are sub-angular to sub-rounded of mudstone. |
| | | | | | | | End of Pit at 3.00m |

Trial Pit Photographs



Trial Pit 127






Trial Pit 127 Spoil

Remarks: Complete. Unable to complete hand shear vane due to friable nature of clay.

Stability: Stable

| | | | |
|-----------------------------------|-------------------|---|------------------------|
| Project Name: Well Street | Project No. 14278 | Co-ords: 326802.00 - 363615.00 Level: | Date 02/09/2020 |
| Location: Buckley | | Dimensions (m): 2.10 Depth 3.00 | Scale 1:30 |
| Client: Alan Johnston Partnership | | | Logged V. Wilkinson |

| Water Strike | Samples & In Situ Testing | | | Depth (m) | Level (m) | Legend | Stratum Description |
|--------------|---------------------------|------|---------|-----------|-----------|---|---|
| | Depth | Type | Results | | | | |
| | 0.10 | ES | | 0.20 | |  | Dark brown slightly gravelly sandy CLAY (Topsoil) with frequent rootlets. Gravel is fine to coarse, sub-angular to sub-rounded of mudstone. |
| | 0.80 | B | | 1.00 | |  | Stiff orange brown mottled grey slightly sandy gravelly CLAY. Gravel is fine to coarse, angular to sub-rounded of mudstone, sandstone and coal. |
| | 2.00 | ES | | 3.00 | |  | Stiff brown slightly gravelly sandy CLAY with occasional cobbles. Gravel is fine to coarse, sub-angular to sub-rounded of mudstone and sandstone. Cobbles are sub-angular to sub-rounded of mudstone. |
| | | | | | | | End of Pit at 3.00m |

Trial Pit Photographs




Trial Pit 128


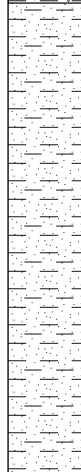


Trial Pit 128 Spoil

Remarks: Complete. Unable to complete hand shear vane due to friable nature of clay.

Stability: Stable

| | | | |
|-----------------------------------|-------------------|--|------------------------|
| Project Name: Well Street | Project No. 14278 | Co-ords: 326780.00 - 363663.00 Level: | Date 02/09/2020 |
| Location: Buckley | | Dimensions (m): 2.10  | Scale 1:30 |
| Client: Alan Johnston Partnership | | Depth 2.80 | Logged V. Wilkinson |

| Water Strike | Samples & In Situ Testing | | | Depth (m) | Level (m) | Legend | Stratum Description |
|--------------|---------------------------|-----------|---------|-----------|-----------|--|---|
| | Depth | Type | Results | | | | |
| | 0.10 | ES | | 0.20 | |  | Dark brown slightly gravelly sandy CLAY (Topsoil) with frequent rootlets. Gravel is fine to coarse, sub-angular to sub-rounded of mudstone. |
| | 0.40 0.50 | HVP ES | 114 | | | | 0.90 |
| | | | | 2.80 | |  | Stiff brown slightly gravelly sandy CLAY with occasional cobbles. Gravel is fine to coarse, sub-angular to sub-rounded of mudstone and sandstone. Cobbles are sub-angular to sub-rounded of mudstone. |
| | | | | | | | End of Pit at 2.80m |

Trial Pit Photographs



Trial Pit 129



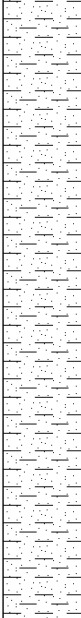


Trial Pit 129 Spoil

Remarks: Complete.

Stability: Stable

| | | | |
|-----------------------------------|-------------------|--|------------------------|
| Project Name: Well Street | Project No. 14278 | Co-ords: 326686.00 - 363559.00 Level: | Date 02/09/2020 |
| Location: Buckley | | Dimensions (m): 2.10 Depth 3.00 | Scale 1:30 |
| Client: Alan Johnston Partnership | | | Logged V. Wilkinson |

| Water Strike | Samples & In Situ Testing | | | Depth (m) | Level (m) | Legend | Stratum Description |
|--------------|---------------------------|------|---------|-----------|-----------|--|---|
| | Depth | Type | Results | | | | |
| | 0.10 | ES | | 0.20 | |  | Dark brown slightly gravelly sandy CLAY (Topsoil) with frequent rootlets. Gravel is fine to coarse, sub-angular to sub-rounded of mudstone. |
| | 0.40 | ES | | 0.50 | |  | Stiff orange brown mottled grey slightly sandy gravelly CLAY. Gravel is fine to coarse, angular to sub-rounded of mudstone, sandstone and coal. |
| | | | | 3.00 | |  | Stiff brown slightly gravelly sandy CLAY with occasional cobbles. Gravel is fine to coarse, sub-angular to sub-rounded of mudstone and sandstone. Cobbles are sub-angular to sub-rounded of mudstone. |
| | | | | | | | End of Pit at 3.00m |

Trial Pit Photographs



Trial Pit 130



Trial Pit 130 Spoil

Remarks: Complete. Unable to complete hand shear vane due to friable nature of clay.

Stability: Stable

Project Name: Well Street

 Project No.
14278

Co-ords: 326753E - 363540N

 Hole Type
WS

Location: Buckley

Level:

 Scale
1:50

Client: Alan Johnston Partnership

Dates: 01/09/2020

 Logged By
V. Wilkinson

| Well | Water Strikes | Sample and In Situ Testing | | | Depth (m) | Level (m) | Legend | Stratum Description | |
|------|---------------|----------------------------|------|-------------------------|-----------|-----------|--------|--------------------------|----|
| | | Depth (m) | Type | Results | | | | | |
| | | | | | 0.15 | | | | |
| | | | | | 0.30 | | | | |
| | | 0.50 | U | | | | | | |
| | | 1.00 | D | | | | | | |
| | | 1.00 | SPT | N=18 (3,4/5,4,5,4) | | | | | 1 |
| | | 2.00 | D | | | | | | |
| | | 2.00 | SPT | N=18 (3,4/4,4,5,5) | | | | | 2 |
| | | 3.00 | D | | | | | | |
| | | 3.00 | SPT | N=25 (4,7/6,6,6,7) | | | | | 3 |
| | | 3.20 | ES | | | | | | |
| | | 4.00 | SPT | 50 (10,13/50 for 265mm) | | | | | 4 |
| | | | | | 4.38 | | | | |
| | | | | | | | | End of Borehole at 4.38m | 5 |
| | | | | | | | | | 6 |
| | | | | | | | | | 7 |
| | | | | | | | | | 8 |
| | | | | | | | | | 9 |
| | | | | | | | | | 10 |

Remarks

1. Complete. 2. Refused on stiff CLAY at 4.38 m bgl. 3. Water strike encountered at 3.00 m bgl. 4. Monitoring well installed, response zone 1.00 m to 4.00 m bgl.



Borehole Log

Borehole No.

WS102

Sheet 1 of 1

| | | | |
|-----------------------------------|-------------------|----------------------------|------------------------|
| Project Name: Well Street | Project No. 14278 | Co-ords: 326719E - 363569N | Hole Type WS |
| Location: Buckley | | Level: | Scale 1:50 |
| Client: Alan Johnston Partnership | | Dates: 01/09/2020 | Logged By V. Wilkinson |

| Well | Water Strikes | Sample and In Situ Testing | | | Depth (m) | Level (m) | Legend | Stratum Description | |
|------|---------------|----------------------------|------|------------------------|-----------|-----------|--|---------------------|--|
| | | Depth (m) | Type | Results | | | | | |
| | | 0.10 | ES | | 0.20 | | Dark brown slightly gravelly sandy CLAY (Topsoil) with frequent rootlets. Gravel is fine to coarse, sub-angular to sub-rounded of mudstone. | | |
| | | 1.00 | D | | 1.00 | | Stiff orange brown mottled grey slightly sandy gravelly CLAY. Gravel is fine to coarse, angular to sub-rounded of mudstone, sandstone and coal. | 1 | |
| | | 1.00 | SPT | N=17 (3,4/4,4,4,5) | | | | | |
| | | 1.50 | U | | | | Very stiff high strength brown slightly gravelly sandy CLAY. Gravel is fine to coarse, sub-angular to sub-rounded of mudstone and sandstone. Becoming very stiff very high strength at 2.90 m bgl. | | |
| | | 2.00 | D | | | | | 2 | |
| | | 2.00 | SPT | N=28 (6,4/8,7,7,6) | | | | | |
| | | 2.90 | SPT | 50 (7,13/50 for 255mm) | | | | 3 | |
| | | | | | 3.28 | | End of Borehole at 3.28m | 4 | |
| | | | | | | | | 5 | |
| | | | | | | | | 6 | |
| | | | | | | | | 7 | |
| | | | | | | | | 8 | |
| | | | | | | | | 9 | |
| | | | | | | | | 10 | |

Remarks
 1. Complete. 2. Refused on cobble at 3.28 m bgl. 3. Monitoring well installed, response zone 1.00 m to 3.00 m bgl.



Project Name: Well Street

 Project No.
14278

Co-ords: 326722E - 363566N

 Hole Type
WS

Location: Buckley


Level:

 Scale
1:50

Client: Alan Johnston Partnership

Dates: 01/09/2020

 Logged By
V. Wilkinson

| Well | Water Strikes | Sample and In Situ Testing | | | Depth (m) | Level (m) | Legend | Stratum Description | |
|---|---------------|----------------------------|---------------------|--------------------|-----------|-----------|---|--|---|
| | | Depth (m) | Type | Results | | | | | |
|  4.00 | | | | | 0.20 | | Dark brown slightly gravelly sandy CLAY (Topsoil) with frequent rootlets. Gravel is fine to coarse, sub-angular to sub-rounded of mudstone. | | |
| | | | | | 0.60 | | Stiff orange brown mottled grey slightly sandy gravelly CLAY. Gravel is fine to coarse, angular to sub-rounded of mudstone, sandstone and coal. | | |
| | | 1.00 | D | N=20 (5,4/4,6,5,5) | | | | Very stiff high strength brown slightly gravelly sandy CLAY. Gravel is fine to coarse, sub-angular to sub-rounded of mudstone and sandstone. Band of fine to medium red brown fine to medium SAND between 3.00 m and 3.20 m bgl. | 1 |
| | | 1.00 | SPT | | | | | | |
| | | 2.00 | D | N=28 (6,8/7,9,6,6) | | | | | 2 |
| | 2.00 | SPT | | | | | | | |
| | 3.00 | D | N=29 (6,9/7,10,7,5) | | | | | 3 | |
| | 3.00 | SPT | | | | | | | |
| | 4.00 | D | N=27 (6,8/5,7,8,7) | | | | | 4 | |
| | 4.00 | SPT | | | | | | | |
| | 5.00 | D | N=21 (8,7/5,5,5,6) | | | | | 5 | |
| | 5.00 | SPT | | | | | | | |
| | | | | | 5.45 | | End of Borehole at 5.45m | 6 | |
| | | | | | | | | 7 | |
| | | | | | | | | 8 | |
| | | | | | | | | 9 | |
| | | | | | | | | 10 | |

Remarks

1. Complete 2. Water strike encountered at 4.00 m bgl.

Project Name: Well Street

 Project No.
14278

Co-ords: 326670E - 363572N

 Hole Type
WS

Location: Buckley

Level:

 Scale
1:50

Client: Alan Johnston Partnership

Dates: 01/09/2020

 Logged By
V. Wilkinson

| Well | Water Strikes | Sample and In Situ Testing | | | Depth (m) | Level (m) | Legend | Stratum Description | |
|------|---------------|----------------------------|------|------------------------|-----------|-----------|--|---------------------|--|
| | | Depth (m) | Type | Results | | | | | |
| | | 0.10 | ES | | 0.30 | | Dark brown slightly gravelly sandy CLAY (Topsoil) with frequent rootlets. Gravel is fine to coarse, sub-angular to sub-rounded of mudstone. | | |
| | | 1.00 | D | | 1.00 | | Stiff orange brown mottled grey slightly sandy gravelly CLAY. Gravel is fine to coarse, angular to sub-rounded of mudstone, sandstone and coal. | 1 | |
| | | 1.00 | SPT | N=20 (3,4/5,4,5,6) | | | Very stiff high strength brown slightly gravelly sandy CLAY. Gravel is fine to coarse, sub-angular to sub-rounded of mudstone and sandstone. Becoming very stiff very high strength at 4.00 m bgl. | | |
| | | 2.00 | D | | | | | 2 | |
| | | 2.00 | SPT | N=17 (3,4/4,4,4,5) | | | | | |
| | | 3.00 | D | | | | | 3 | |
| | | 3.00 | SPT | N=21 (7,6/5,5,5,6) | | | | | |
| | | 4.00 | SPT | 50 (17,8/50 for 170mm) | 4.30 | | | 4 | |
| | | | | | | | End of Borehole at 4.30m | 5 | |
| | | | | | | | | 6 | |
| | | | | | | | | 7 | |
| | | | | | | | | 8 | |
| | | | | | | | | 9 | |
| | | | | | | | | 10 | |

Remarks

1. Complete. 2. Refused on weathered MUDSTONE bedrock at 4.30 m bgl. 3. Monitoring well installed, response zone 1.00 m to 4.00 m bgl.



Borehole Log

Borehole No.

WS104

Sheet 1 of 1

| | | | |
|-----------------------------------|-------------------|----------------------------|------------------------|
| Project Name: Well Street | Project No. 14278 | Co-ords: 326676E - 363635N | Hole Type WS |
| Location: Buckley | | Level: | Scale 1:50 |
| Client: Alan Johnston Partnership | | Dates: 01/09/2020 | Logged By V. Wilkinson |

| Well | Water Strikes | Sample and In Situ Testing | | | Depth (m) | Level (m) | Legend | Stratum Description | |
|------|---------------|----------------------------|------|-------------------------|-----------|-----------|--------|--------------------------|----|
| | | Depth (m) | Type | Results | | | | | |
| | | | | | 0.20 | | | | |
| | | 0.40 | ES | | 0.50 | | | | |
| | | 1.00 | SPT | N=18 (4,5/4,5,5,4) | | | | | 1 |
| | | 2.00 | SPT | N=27 (5,7/6,6,8,7) | | | | | 2 |
| | | 3.00 | SPT | 50 (10,13/50 for 190mm) | | | | | 3 |
| | | | | | 3.30 | | | End of Borehole at 3.30m | 4 |
| | | | | | | | | | 5 |
| | | | | | | | | | 6 |
| | | | | | | | | | 7 |
| | | | | | | | | | 8 |
| | | | | | | | | | 9 |
| | | | | | | | | | 10 |

Remarks
 1. Complete. 2. Refused on weathered MUDSTONE bedrock at 3.30 m bgl. 3. Monitoring well installed, response zone 1.00 m to 3.00 m bgl.





Borehole Log

Borehole No.

WS105

Sheet 1 of 1

| | | | |
|-----------------------------------|-------------------|----------------------------|------------------------|
| Project Name: Well Street | Project No. 14278 | Co-ords: 326631E - 363678N | Hole Type WS |
| Location: Buckley | | Level: | Scale 1:50 |
| Client: Alan Johnston Partnership | | Dates: 01/09/2020 | Logged By V. Wilkinson |

| Well | Water Strikes | Sample and In Situ Testing | | | Depth (m) | Level (m) | Legend | Stratum Description | |
|------|---------------|----------------------------|------|-------------------------|-----------|-----------|---|---------------------|--|
| | | Depth (m) | Type | Results | | | | | |
| | | | | | 0.20 | | Dark brown slightly gravelly sandy CLAY (Topsoil) with frequent rootlets. Gravel is fine to coarse, sub-angular to sub-rounded of mudstone. | | |
| | | | | | 0.80 | | Stiff orange brown mottled grey slightly sandy gravelly CLAY. Gravel is fine to coarse, angular to sub-rounded of mudstone, sandstone and coal. | | |
| | | 1.00 | D | N=14 (7,8/5,3,3,3) | | | Stiff medium strength brown slightly gravelly sandy CLAY. Gravel is fine to coarse, sub-angular to sub-rounded of mudstone and sandstone. Band of red brown fine to medium SAND encountered between 2.50 m and 2.80 m bgl. Becoming very stiff high strength at 2.00 m bgl. | 1 | |
| | | 1.00 | SPT | | | | | | |
| | | 2.00 | D | N=20 (3,4/6,5,4,5) | | | | 2 | |
| | | 2.00 | SPT | | | | | | |
| | | 3.00 | SPT | N=21 (4,6/5,5,5,6) | | | | 3 | |
| | | 3.60 | SPT | 50 (14,11/50 for 180mm) | 3.60 | | Dense grey GRAVEL. Gravel is fine to coarse, angular to sub-angular of mudstone. (weathered bedrock) | 4 | |
| | | | | | 3.90 | | End of Borehole at 3.90m | 4 | |
| | | | | | | | | 5 | |
| | | | | | | | | 6 | |
| | | | | | | | | 7 | |
| | | | | | | | | 8 | |
| | | | | | | | | 9 | |
| | | | | | | | | 10 | |

Remarks
 1. Complete. 2. Refused on weathered MUDSTONE bedrock at 3.90 m bgl. 3. Monitoring well installed, response zone 1.00 m to 3.60 m bgl.





Borehole Log

Borehole No.

WS106

Sheet 1 of 1




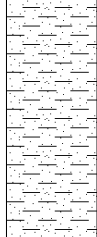


| | | | |
|-----------------------------------|-------------------|----------------------------|------------------------|
| Project Name: Well Street | Project No. 14278 | Co-ords: 326702E - 363692N | Hole Type WS |
| Location: Buckley | | Level: | Scale 1:50 |
| Client: Alan Johnston Partnership | | Dates: 01/09/2020 | Logged By V. Wilkinson |

| Well | Water Strikes | Sample and In Situ Testing | | | Depth (m) | Level (m) | Legend | Stratum Description | |
|------|---------------|----------------------------|------|-----------------------|-----------|-----------|---|---------------------|--|
| | | Depth (m) | Type | Results | | | | | |
| | | 0.10 | ES | | 0.20 | | Dark brown slightly gravelly sandy CLAY (Topsoil) with frequent rootlets. Gravel is fine to coarse, sub-angular to sub-rounded of mudstone. | | |
| | | 0.50 | U | | 0.50 | | Stiff orange brown mottled grey slightly sandy gravelly CLAY. Gravel is fine to coarse, angular to sub-rounded of mudstone, sandstone and coal. | | |
| | | 1.00 | D | | | | Very stiff high strength brown slightly gravelly sandy CLAY. Gravel is fine to coarse, sub-angular to sub-rounded of mudstone and sandstone. | 1 | |
| | | 1.00 | SPT | N=15 (4,5/4,4,4,3) | | | | | |
| | | 2.00 | ES | | 2.00 | | Dense grey GRAVEL. Gravel is fine to coarse, angular to sub-angular of mudstone. (weathered bedrock) | 2 | |
| | | 2.00 | SPT | 50 (4,5/50 for 265mm) | 2.38 | | | | |
| | | | | | | | End of Borehole at 2.38m | 3 | |
| | | | | | | | | 4 | |
| | | | | | | | | 5 | |
| | | | | | | | | 6 | |
| | | | | | | | | 7 | |
| | | | | | | | | 8 | |
| | | | | | | | | 9 | |
| | | | | | | | | 10 | |

Remarks
 1. Complete. 2. Refused on weathered MUDSTONE bedrock at 2.38 m bgl. 3. Monitoring well installed, response zone 1.00 m to 2.00 m bgl.



| | | | |
|-----------------------------------|-------------------|----------------------------|------------------------|
| Project Name: Well Street | Project No. 14278 | Co-ords: 326702E - 363689N | Hole Type WS |
| Location: Buckley | | Level: | Scale 1:50 |
| Client: Alan Johnston Partnership | | Dates: 01/09/2020 | Logged By V. Wilkinson |

| Well | Water Strikes | Sample and In Situ Testing | | | Depth (m) | Level (m) | Legend | Stratum Description | |
|---|---------------|----------------------------|------|------------------------------|-----------|---|---|--|---|
| | | Depth (m) | Type | Results | | | | | |
|  2.50 | | 0.20 | | | |  | Dark brown slightly gravelly sandy CLAY (Topsoil) with frequent rootlets. Gravel is fine to coarse, sub-angular to sub-rounded of mudstone. | | |
| | | 0.50 | | | |  | Stiff orange brown mottled grey slightly sandy gravelly CLAY. Gravel is fine to coarse, angular to sub-rounded of mudstone, sandstone and coal. | | |
| | | 1.00 | D | N=21 (5,4/5,6,5,5) | | |  | Very stiff high strength brown slightly gravelly sandy CLAY. Gravel is fine to coarse, sub-angular to sub-rounded of mudstone and sandstone. | 1 |
| | | 2.00 | D | N=29 (5,6/7,7,7,8) | | |  | | 2 |
| | | 2.50 | | | |  | Dense grey GRAVEL. Gravel is fine to coarse, angular to sub-angular of mudstone. (weathered bedrock) | | |
| | | 2.80 | SPT | 50 (25 for 40mm/50 for 95mm) | 2.88 | | End of Borehole at 2.88m | 3 | |
| | | | | | | | | 4 | |
| | | | | | | | | 5 | |
| | | | | | | | | 6 | |
| | | | | | | | | 7 | |
| | | | | | | | | 8 | |
| | | | | | | | | 9 | |
| | | | | | | | | 10 | |

Remarks
1. Complete. 2. Refused on weathered MUDSTONE bedrock at 2.88 m bgl. 3. Water strike encountered at 2.50 m bgl.

| | | | |
|-----------------------------------|-------------------|----------------------------|------------------------|
| Project Name: Well Street | Project No. 14278 | Co-ords: 326758E - 363668N | Hole Type WS |
| Location: Buckley | | Level: | Scale 1:50 |
| Client: Alan Johnston Partnership | | Dates: 02/09/2020 | Logged By V. Wilkinson |

| Well | Water Strikes | Sample and In Situ Testing | | | Depth (m) | Level (m) | Legend | Stratum Description | |
|------|---------------|----------------------------|------|-------------------------|-----------|-----------|--|---------------------|--|
| | | Depth (m) | Type | Results | | | | | |
| | | 0.10 | ES | | 0.20 | | Dark brown slightly gravelly sandy CLAY (Topsoil) with frequent rootlets. Gravel is fine to coarse, sub-angular to sub-rounded of mudstone. | | |
| | | 0.50 | U | | 0.50 | | Stiff orange brown mottled grey slightly sandy gravelly CLAY. Gravel is fine to coarse, angular to sub-rounded of mudstone, sandstone and coal. | | |
| | | 1.00 | D | | | | Very stiff high strength brown slightly gravelly sandy CLAY. Gravel is fine to coarse, sub-angular to sub-rounded of mudstone and sandstone. Band of fine to medium red brown fine to medium SAND between 1.80 m and 2.20 m bgl. Becoming very gravelly at 3.20 m bgl. Becoming very stiff very high strength at 3.00 m bgl. | 1 | |
| | | 1.00 | SPT | N=24 (6,6/6,6,5,7) | | | | 2 | |
| | | 2.00 | D | | | | | 3 | |
| | | 2.00 | SPT | N=24 (3,4/4,5,7,8) | | | | 4 | |
| | | 3.00 | D | | | | | 5 | |
| | | 3.00 | SPT | 50 (10,13/50 for 255mm) | 3.41 | | | 6 | |
| | | | | | | | End of Borehole at 3.41m | 7 | |
| | | | | | | | | 8 | |
| | | | | | | | | 9 | |
| | | | | | | | | 10 | |

Remarks

1. Complete. 2. Refused on stiff CLAY at 3.41 m bgl. 3. Monitoring well installed, response zone 1.00 m to 3.00 m bgl.

Project Name: Well Street

 Project No.
14278

Co-ords: 326785E - 363746N

 Hole Type
WS

Location: Buckley

Level:

 Scale
1:50

Client: Alan Johnston Partnership

Dates: 02/09/2020

 Logged By
V. Wilkinson

| Well | Water Strikes | Sample and In Situ Testing | | | Depth (m) | Level (m) | Legend | Stratum Description | |
|------|---------------|----------------------------|------|------------------------|-----------|-----------|--------|--------------------------|----|
| | | Depth (m) | Type | Results | | | | | |
| | | | | | 0.20 | | | | |
| | | | | | 0.50 | | | | |
| | | 1.00 | D | | | | | | |
| | | 1.00 | SPT | N=18 (4,4/4,4,5,5) | | | | | 1 |
| | | 2.00 | D | | | | | | |
| | | 2.00 | SPT | N=23 (4,4/4,5,5,9) | | | | | 2 |
| | | 3.00 | D | | | | | | |
| | ▼ 3.00 | 3.00 | SPT | N=22 (5,4/5,5,6,6) | | | | | 3 |
| | | 4.00 | SPT | 50 (8,10/50 for 170mm) | | | | | 4 |
| | | | | | 4.32 | | | End of Borehole at 4.32m | |
| | | | | | | | | | 5 |
| | | | | | | | | | 6 |
| | | | | | | | | | 7 |
| | | | | | | | | | 8 |
| | | | | | | | | | 9 |
| | | | | | | | | | 10 |

Remarks

1. Complete. 2. Refused on weathered MUDSTONE bedrock at 4.32 m bgl. 3. Water strike encountered at 3.00 m bgl. 4. Monitoring well installed, response zone 1.00 m to 4.00 m bgl.

| | | | |
|-----------------------------------|-------------------|----------------------------|------------------------|
| Project Name: Well Street | Project No. 14278 | Co-ords: 326812E - 363711N | Hole Type WS |
| Location: Buckley | Level: | | Scale 1:50 |
| Client: Alan Johnston Partnership | Dates: 02/09/2020 | | Logged By V. Wilkinson |

| Well | Water Strikes | Sample and In Situ Testing | | | Depth (m) | Level (m) | Legend | Stratum Description | |
|------|---------------|----------------------------|------|-----------------------|-----------|-----------|---|---------------------|---|
| | | Depth (m) | Type | Results | | | | | |
| | | 0.10 | ES | | 0.20 | | Dark brown slightly gravelly sandy CLAY (Topsoil) with frequent rootlets. Gravel is fine to coarse, sub-angular to sub-rounded of mudstone. | | |
| | | 1.00 | D | | 1.00 | | Stiff orange brown mottled grey slightly sandy gravelly CLAY. Gravel is fine to coarse, angular to sub-rounded of mudstone, sandstone and coal. | 1 | |
| | | 1.00 | SPT | N=22 (6,7/6,6,5,5) | | | Very stiff high strength brown slightly gravelly sandy CLAY. Gravel is fine to coarse, sub-angular to sub-rounded of mudstone and sandstone. Becoming very stiff very high strength at 2.00 m bgl. Becoming very stiff high strength at 3.00 m bgl. Becoming very stiff very high strength at 4.00 m bgl. | | |
| | | 1.50 | U | | | | | | |
| | | 2.00 | D | | | | | | 2 |
| | | 2.00 | SPT | N=33 (5,5/7,8,8,10) | | | | | |
| | | 3.00 | D | | | | | 3 | |
| | | 3.00 | SPT | N=22 (9,7/5,6,6,5) | | | | | |
| | | 4.00 | D | | | | | 4 | |
| | | 4.00 | SPT | 50 (5,6/50 for 235mm) | 4.45 | | | | |
| | | | | | | | End of Borehole at 4.39m | 5 | |
| | | | | | | | | 6 | |
| | | | | | | | | 7 | |
| | | | | | | | | 8 | |
| | | | | | | | | 9 | |
| | | | | | | | | 10 | |

Remarks

1. Complete. 2. Refused on stiff CLAY at 4.39 m bgl. 3. Monitoring well installed, response zone 1.00 m to 4.00 m bgl.

| | | | |
|-----------------------------------|-------------------|----------------------------|------------------------|
| Project Name: Well Street | Project No. 14278 | Co-ords: 326807E - 363645N | Hole Type WS |
| Location: Buckley | | Level: | Scale 1:50 |
| Client: Alan Johnston Partnership | | Dates: 02/09/2020 | Logged By V. Wilkinson |

| Well | Water Strikes | Sample and In Situ Testing | | | Depth (m) | Level (m) | Legend | Stratum Description | |
|------|---------------|----------------------------|------|------------------------|-----------|-----------|---|---------------------|--|
| | | Depth (m) | Type | Results | | | | | |
| | | 0.10 | ES | | 0.20 | | Dark brown slightly gravelly sandy CLAY (Topsoil) with frequent rootlets. Gravel is fine to coarse, sub-angular to sub-rounded of mudstone. | | |
| | | 1.00 | D | | 1.00 | | Stiff orange brown mottled grey slightly sandy gravelly CLAY. Gravel is fine to coarse, angular to sub-rounded of mudstone, sandstone and coal. | 1 | |
| | | 1.00 | SPT | N=17 (3,4/4,4,4,5) | | | Very stiff high strength brown slightly gravelly sandy CLAY. Gravel is fine to coarse, sub-angular to sub-rounded of mudstone and sandstone. Becoming very stiff very high strength at 3.00 m bbl.. Becoming stiff high strength at 4.00 m bgl. | | |
| | | 2.00 | D | | | | | 2 | |
| | | 2.00 | SPT | N=22 (5,5/5,5,6,6) | | | | | |
| | | 2.50 | U | | | | | | |
| | | 3.00 | D | | | | | 3 | |
| | | 3.00 | SPT | N=42 (6,8/11,10,10,11) | | | | | |
| | | 4.00 | D | | 4.50 | | Reddish brown clayey fine to medium SAND. | 4 | |
| | | 4.00 | SPT | N=34 (5,6/8,8,8,10) | | | | | |
| | | 5.00 | D | | 5.45 | | | 5 | |
| | | 5.00 | SPT | N=34 (7,7/7,8,9,10) | | | | | |
| | | | | | | | End of Borehole at 5.45m | 6 | |
| | | | | | | | | 7 | |
| | | | | | | | | 8 | |
| | | | | | | | | 9 | |
| | | | | | | | | 10 | |

Remarks

1. Complete. 2. Monitoring well installed, response zone 1.00 m to 5.00 m bgl.

Project Name: Well Street

 Project No.
14278

Co-ords: 326817E - 363604N

 Hole Type
WS

Location: Buckley

Level:

 Scale
1:50

Client: Alan Johnston Partnership

Dates: 02/09/2020

 Logged By
V. Wilkinson

| Well | Water Strikes | Sample and In Situ Testing | | | Depth (m) | Level (m) | Legend | Stratum Description | |
|------|---------------|----------------------------|----------|------------------------|-----------|-----------|--|---------------------|--|
| | | Depth (m) | Type | Results | | | | | |
| | | | | | 0.30 | | Dark brown slightly gravelly sandy CLAY (Topsoil) with frequent rootlets. Gravel is fine to coarse, sub-angular to sub-rounded of mudstone. | | |
| | | 1.00 1.00 | D SPT | N=18 (3,4/4,5,4,5) | | | Very stiff high strength orange brown mottled grey slightly sandy gravelly CLAY. Gravel is fine to coarse, angular to sub-rounded of mudstone, sandstone and coal. | 1 | |
| | | 2.00 2.00 | D SPT | N=33 (6,6/7,8,8,10) | 2.00 | | Very stiff very high strength brown slightly gravelly sandy CLAY. Gravel is fine to coarse, sub-angular to sub-rounded of mudstone and sandstone. Becoming very stiff high strength at 3.00 m bgl. Becoming very stiff very high strength at 4.00 m bgl. | 2 | |
| | | 3.00 3.00 | D SPT | N=33 (6,6/8,9,8,8) | | | | 3 | |
| | | 4.00 4.00 | D SPT | 50 (8,10/50 for 250mm) | 4.40 | | | 4 | |
| | | | | | | | End of Borehole at 4.40m | 5 | |
| | | | | | | | | 6 | |
| | | | | | | | | 7 | |
| | | | | | | | | 8 | |
| | | | | | | | | 9 | |
| | | | | | | | | 10 | |

Remarks

1. Complete. 2. Refused on stiff CLAY at 4.40 m bgl. 3. Monitoring well installed, response zone 1.00 m to 4.00 m bgl.

Project Name: Well Street

 Project No.
14278

Co-ords: 326881E - 363679N

 Hole Type
WS

Location: Buckley

Level:

 Scale
1:50

Client: Alan Johnston Partnership

Dates: 02/09/2020

 Logged By
V. Wilkinson

| Well | Water Strikes | Sample and In Situ Testing | | | Depth (m) | Level (m) | Legend | Stratum Description | |
|------|---------------|----------------------------|------|-------------------------|-----------|-----------|--|---|---|
| | | Depth (m) | Type | Results | | | | | |
| | | 0.10 | ES | | 0.20 | | Dark brown slightly gravelly sandy CLAY (Topsoil) with frequent rootlets. Gravel is fine to coarse, sub-angular to sub-rounded of mudstone. | | |
| | | | | | 0.50 | | | Stiff orange brown mottled grey slightly sandy gravelly CLAY. Gravel is fine to coarse, angular to sub-rounded of mudstone, sandstone and coal. | |
| | | 1.00 | D | | | | Very stiff high strength brown slightly gravelly sandy CLAY. Gravel is fine to coarse, sub-angular to sub-rounded of mudstone and sandstone. Becoming very stiff very high strength at 3.00 m bgl. | 1 | |
| | | 1.00 | SPT | N=17 (3,4/4,4,4,5) | | | | | |
| | | 2.00 | D | | | | | | 2 |
| | | 2.00 | SPT | N=24 (4,4/4,5,7,8) | | | | | |
| | | 3.00 | D | | | | | 3 | |
| | | 3.00 | SPT | N=43 (3,6/7,10,13,13) | | | | | |
| | | 4.00 | D | | | | | 4 | |
| | | 4.00 | SPT | 50 (10,13/50 for 180mm) | 4.33 | | | | |
| | | | | | | | End of Borehole at 4.33m | 5 | |
| | | | | | | | | 6 | |
| | | | | | | | | 7 | |
| | | | | | | | | 8 | |
| | | | | | | | | 9 | |
| | | | | | | | | 10 | |

Remarks

1. Complete. 2. Refused on stiff CLAY at 4.33 m bgl. 3. Monitoring well installed, response zone 1.00 m to 4.00 m bgl.



Borehole Log

Borehole No.

RB101

Sheet 1 of 3

Project Name: Well Street

Project No.
14278

Co-ords:

Hole Type
BH

Location: Buckley

Level:

Scale
1:50

Client: Alan Johnston Partnership

Dates: 03/09/2020

Logged By
V. Wilkinson

| Well | Water Strikes | Sample and In Situ Testing | | | Depth (m) | Level (m) | Legend | Stratum Description | |
|------|---------------|----------------------------|------|---------|-----------|-----------|---|---------------------|--|
| | | Depth (m) | Type | Results | | | | | |
| | | | | | 0.40 | | Dark brown slightly gravelly sandy CLAY (Topsoil) with frequent rootlets. Gravel is fine to coarse, sub-angular to sub-rounded of mudstone. | | |
| | | | | | | | Very stiff brown slightly gravelly sandy CLAY. Gravel is fine to coarse, sub-angular to sub-rounded of mudstone and sandstone. | 1 | |
| | | | | | 3.40 | | Grey MUDSTONE. | 2 | |
| | | | | | | | | 3 | |
| | | | | | | | | 4 | |
| | | | | | | | | 5 | |
| | | | | | | | | 6 | |
| | | | | | | | | 7 | |
| | | | | | 8.30 | | Grey SANDSTONE. | 8 | |
| | | | | | 8.80 | | Brey SILTSTONE. | 9 | |
| | | | | | | | | 10 | |

Remarks
Complete.





Borehole Log

Borehole No.

RB101

Sheet 2 of 3

Project Name: Well Street

Project No.
14278

Co-ords:

Hole Type
BH

Location: Buckley

Level:

Scale
1:50

Client: Alan Johnston Partnership

Dates: 03/09/2020

Logged By
V. Wilkinson

| Well | Water Strikes | Sample and In Situ Testing | | | Depth (m) | Level (m) | Legend | Stratum Description | |
|------|---------------|----------------------------|------|---------|-----------|--|---------------------------------------|---------------------|--|
| | | Depth (m) | Type | Results | | | | | |
| | | | | | 11.70 | XXXXXX | Brey SILTSTONE. | 11 | |
| | | | | | 13.30 | XXXXXX | Dark grey SILTSTONE. | 12 | |
| | | | | | 15.80 | XXXXXX | Dark grey SILTSTONE with coal traces. | 13 | |
| | | | | | 16.40 | | Grey SANDSTONE. | 14 | |
| | | | | | 18.20 | XXXXXX | Grey SILTSTONE. | 15 | |
| | | | | | 18.70 | | Grey SANDSTONE. | 16 | |
| | | | | | 19.20 | XXXXXX | Dark grey SILTSTONE. | 17 | |
| | | | | | | incorrect incorrect incorrect key key key incorrect incorrect incorrect key key key incorrect incorrect incorrect key key key incorrect incorrect incorrect key key key | Red MARL. | 18 | |
| | | | | | | | | 19 | |
| | | | | | | | | 20 | |

Remarks
Complete.





Borehole Log

Borehole No.

RB102

Sheet 1 of 3

Project Name: Well Street

Project No.
14278

Co-ords:

Hole Type
BH

Location: Buckley






Level:

Scale
1:50

Client: Alan Johnston Partnership

Dates: 03/09/2020

Logged By
V. Wilkinson

| Well | Water Strikes | Sample and In Situ Testing | | | Depth (m) | Level (m) | Legend | Stratum Description | |
|------|---------------|----------------------------|------|---------|-----------|-----------|--|---------------------|--|
| | | Depth (m) | Type | Results | | | | | |
| | | | | | 0.10 | |  Dark brown slightly gravelly sandy CLAY (Topsoil) with frequent rootlets. Gravel is fine to coarse, sub-angular to sub-rounded of mudstone.  Stiff orange brown mottled grey slightly sandy gravelly CLAY. Gravel is fine to coarse, angular to sub-rounded of mudstone, sandstone and coal. | 1 | |
| | | | | | 1.50 | |  Very stiff brown slightly gravelly sandy CLAY. Gravel is fine to coarse, sub-angular to sub-rounded of mudstone and sandstone. | 2 | |
| | | | | | 5.50 | |  Dense brown medium SAND. | 6 | |
| | | | | | 8.10 | |  Grey MUDSTONE. | 8 | |
| | | | | | | | | 9 | |
| | | | | | | | | 10 | |

Remarks
Complete.





Borehole Log

Borehole No.

RB102

Sheet 2 of 3

Project Name: Well Street

Project No.
14278

Co-ords:

Hole Type
BH

Location: Buckley

Level:

Scale
1:50

Client: Alan Johnston Partnership

Dates: 03/09/2020

Logged By
V. Wilkinson

| Well | Water Strikes | Sample and In Situ Testing | | | Depth (m) | Level (m) | Legend | Stratum Description | |
|------|---------------|----------------------------|------|---------|-----------|-----------|----------------------|---------------------|--|
| | | Depth (m) | Type | Results | | | | | |
| | | | | | | | Grey MUDSTONE. | | |
| | | | | | 11.90 | | Grey SILTSTONE. | | |
| | | | | | 17.80 | | Grey SANDSTONE. | | |
| | | | | | 18.40 | | Dark grey SILTSTONE. | | |

Remarks
Complete.





Borehole Log

Borehole No.

RB102

Sheet 3 of 3

Project Name: Well Street

Project No.
14278

Co-ords:

Hole Type
BH

Location: Buckley

Level:

Scale
1:50

Client: Alan Johnston Partnership

Dates: 03/09/2020

Logged By
V. Wilkinson

| Well | Water Strikes | Sample and In Situ Testing | | | Depth (m) | Level (m) | Legend | Stratum Description | |
|------|---------------|----------------------------|------|---------|-----------|-----------|---------------------------|---------------------|--|
| | | Depth (m) | Type | Results | | | | | |
| | | | | | | XXXXXX | Dark grey SILTSTONE. | | |
| | | | | | 24.30 | | | 21 | |
| | | | | | | | Grey MUDSTONE. | | |
| | | | | | 26.90 | | | 22 | |
| | | | | | | | Dark grey SILTSTONE. | | |
| | | | | | | | | 23 | |
| | | | | | | | | 24 | |
| | | | | | | | | 25 | |
| | | | | | | | | 26 | |
| | | | | | | | | 27 | |
| | | | | | | | | 28 | |
| | | | | | | | | 29 | |
| | | | | | 30.00 | | End of Borehole at 30.00m | 30 | |

Remarks
Complete.





Borehole Log

Borehole No.

RB103

Sheet 1 of 3

Project Name: Well Street

Project No.
14278

Co-ords:

Hole Type
BH

Location: Buckley

Level:

Scale
1:50

Client: Alan Johnston Partnership

Dates: 03/09/2020

Logged By
V. Wilkinson

| Well | Water Strikes | Sample and In Situ Testing | | | Depth (m) | Level (m) | Legend | Stratum Description | |
|------|---------------|----------------------------|------|---------|-----------|-----------|---|---------------------|--|
| | | Depth (m) | Type | Results | | | | | |
| | | | | | 0.20 | | Dark brown slightly gravelly sandy CLAY (Topsoil) with frequent rootlets. Gravel is fine to coarse, sub-angular to sub-rounded of mudstone. | | |
| | | | | | 1.10 | | Stiff orange brown mottled grey slightly sandy gravelly CLAY. Gravel is fine to coarse, angular to sub-rounded of mudstone, sandstone and coal. | 1 | |
| | | | | | | | Very stiff high strength brown slightly gravelly sandy CLAY. Gravel is fine to coarse, sub-angular to sub-rounded of mudstone and sandstone. | 2 | |
| | | | | | 4.00 | | Dense grey GRAVEL. Gravel is fine to coarse, angular to sub-angular of mudstone. (weathered bedrock) | 4 | |
| | | | | | 7.60 | | Grey SANDSTONE. | 8 | |
| | | | | | 8.90 | | Grey SILTSTONE. | 9 | |
| | | | | | | | | 10 | |

Remarks
Complete.





Borehole Log

Borehole No.

RB103

Sheet 2 of 3

Project Name: Well Street

Project No.
14278

Co-ords:

Hole Type
BH

Location: Buckley

Level:

Scale
1:50

Client: Alan Johnston Partnership

Dates: 03/09/2020

Logged By
V. Wilkinson

| Well | Water Strikes | Sample and In Situ Testing | | | Depth (m) | Level (m) | Legend | Stratum Description | |
|------|---------------|----------------------------|------|---------|-----------|-----------|---------------------------------------|---------------------|--|
| | | Depth (m) | Type | Results | | | | | |
| | | | | | 11.80 | | Grey SILTSTONE. | 11 | |
| | | | | | 15.20 | | Grey MUDSTONE with sandstone bands. | 12 | |
| | | | | | 19.10 | | Dark grey SILTSTONE with coal traces. | 16 | |
| | | | | | | | Grey SANDSTONE. | 19 | |
| | | | | | | | | 20 | |

Remarks
Complete.





Borehole Log

Borehole No.

RB103

Sheet 3 of 3

Project Name: Well Street

Project No.
14278

Co-ords:

Hole Type
BH

Location: Buckley

Level:

Scale
1:50

Client: Alan Johnston Partnership

Dates: 03/09/2020

Logged By
V. Wilkinson

| Well | Water Strikes | Sample and In Situ Testing | | | Depth (m) | Level (m) | Legend | Stratum Description | |
|------|---------------|----------------------------|------|---------|-----------|-----------|--|----------------------------------|--|
| | | Depth (m) | Type | Results | | | | | |
| | | | | | 20.20 | | Grey SANDSTONE. x x x x x Grey SILTSTONE. | | |
| | | | | | 22.80 | | x x x x x Dark grey SILTSTONE with mudstone bands. | 21 22 23 24 25 26 | |
| | | | | | 26.80 | | x x x x x Grey SANDSTONE with mudstone bands. | 27 28 29 | |
| | | | | | 30.00 | | End of Borehole at 30.00m | 30 | |

Remarks
Complete.





Borehole Log

Borehole No.

RB104

Sheet 1 of 3

Project Name: Well Street

Project No.
14278

Co-ords:

Hole Type
BH

Location: Buckley

Level:

Scale
1:50

Client: Alan Johnston Partnership

Dates: 03/09/2020

Logged By
V. Wilkinson

| Well | Water Strikes | Sample and In Situ Testing | | | Depth (m) | Level (m) | Legend | Stratum Description | |
|------|---------------|----------------------------|------|---------|-----------|-----------|---|---------------------|--|
| | | Depth (m) | Type | Results | | | | | |
| | | | | | 0.20 | | Dark brown slightly gravelly sandy CLAY (Topsoil) with frequent rootlets. Gravel is fine to coarse, sub-angular to sub-rounded of mudstone. | | |
| | | | | | 1.30 | | Stiff orange brown mottled grey slightly sandy gravelly CLAY. Gravel is fine to coarse, angular to sub-rounded of mudstone, sandstone and coal. | | |
| | | | | | 3.30 | | Very stiff high strength brown slightly gravelly sandy CLAY. Gravel is fine to coarse, sub-angular to sub-rounded of mudstone and sandstone. | | |
| | | | | | 4.60 | | Light grey MUDSTONE. | | |
| | | | | | 6.50 | | Grey brown SILTSTONE. | | |
| | | | | | 8.90 | | Grey SILTSTONE. | | |
| | | | | | 9.80 | | Grey SANDSTONE. | | |
| | | | | | | | Grey SILTSTONE. | | |

Remarks
Complete.





Borehole Log

Borehole No.

RB104

Sheet 2 of 3

Project Name: Well Street

Project No.
14278

Co-ords:

Hole Type
BH

Location: Buckley

Level:

Scale
1:50

Client: Alan Johnston Partnership

Dates: 03/09/2020

Logged By
V. Wilkinson

| Well | Water Strikes | Sample and In Situ Testing | | | Depth (m) | Level (m) | Legend | Stratum Description | |
|------|---------------|----------------------------|------|---------|-----------|-----------|--|---------------------|--|
| | | Depth (m) | Type | Results | | | | | |
| | | | | | | XXXXXX | Grey SILTSTONE. | | |
| | | | | | 14.20 | XXXXXX | | 11 | |
| | | | | | | XXXXXX | | 12 | |
| | | | | | | XXXXXX | | 13 | |
| | | | | | | XXXXXX | | 14 | |
| | | | | | 16.90 | XXXXXX | Dark grey MUDSTONE with siltstone bands. | 15 | |
| | | | | | | XXXXXX | | 16 | |
| | | | | | | XXXXXX | Dark grey SILTSTONE with coal traces. | 17 | |
| | | | | | | XXXXXX | | 18 | |
| | | | | | | XXXXXX | | 19 | |
| | | | | | | XXXXXX | | 20 | |

Remarks
Complete.





Borehole Log

Borehole No.

RB104

Sheet 3 of 3

Project Name: Well Street

Project No.
14278

Co-ords:

Hole Type
BH

Location: Buckley

Level:

Scale
1:50

Client: Alan Johnston Partnership

Dates: 03/09/2020

Logged By
V. Wilkinson

| Well | Water Strikes | Sample and In Situ Testing | | | Depth (m) | Level (m) | Legend | Stratum Description | |
|---------------------------|---------------|----------------------------|------|---------|-----------|-----------|---------------------------------------|---------------------|--|
| | | Depth (m) | Type | Results | | | | | |
| | | | | | 21.20 | XXXXXX | Dark grey SILTSTONE with coal traces. | 21 | |
| | | | | | 22.10 | | Grey SANDSTONE. | 22 | |
| | | | | | 24.50 | XXXXXX | Grey SILTSTONE. | 23 24 | |
| | | | | | 26.20 | XXXXXX | Dark grey SILTSTONE. | 25 26 | |
| | | | | | 29.10 | XXXXXX | Grey SILTSTONE. | 27 28 29 | |
| End of Borehole at 30.00m | | | | | | | | 30 | |

Remarks
Complete.



Project Name: Well Street

 Project No.
14278

Co-ords:

 Hole Type
BH

Location: Buckley

Level:

 Scale
1:50

Client: Alan Johnston Partnership

Dates: 03/09/2020

 Logged By
V. Wilkinson

| Well | Water Strikes | Sample and In Situ Testing | | | Depth (m) | Level (m) | Legend | Stratum Description | |
|------|---------------|----------------------------|------|---------|-----------|-----------|---|---------------------|--|
| | | Depth (m) | Type | Results | | | | | |
| | | | | | 0.30 | | Dark brown slightly gravelly sandy CLAY (Topsoil) with frequent rootlets. Gravel is fine to coarse, sub-angular to sub-rounded of mudstone. | | |
| | | | | | 2.90 | | Stiff orange brown mottled grey slightly sandy gravelly CLAY. Gravel is fine to coarse, angular to sub-rounded of mudstone, sandstone and coal. | 1 | |
| | | | | | 4.80 | | Very stiff high strength brown slightly gravelly sandy CLAY. Gravel is fine to coarse, sub-angular to sub-rounded of mudstone and sandstone. | 2 | |
| | | | | | 6.90 | | Brown medium SAND. | 3 | |
| | | | | | 8.60 | | Brown clayey MUDSTONE | 4 | |
| | | | | | 9.80 | | Grey SANDSTONE. | 5 | |
| | | | | | | | Grey SILTSTONE with mudstone bands. | 6 | |
| | | | | | | | | 7 | |
| | | | | | | | | 8 | |
| | | | | | | | | 9 | |
| | | | | | | | | 10 | |

 Remarks
Complete.



Borehole Log

Borehole No.

RB105

Sheet 2 of 3

Project Name: Well Street

Project No.
14278

Co-ords:

Hole Type
BH

Location: Buckley

Level:

Scale
1:50

Client: Alan Johnston Partnership

Dates: 03/09/2020

Logged By
V. Wilkinson

| Well | Water Strikes | Sample and In Situ Testing | | | Depth (m) | Level (m) | Legend | Stratum Description | |
|------|---------------|----------------------------|------|---------|-----------|-----------|--|---------------------|--|
| | | Depth (m) | Type | Results | | | | | |
| | | | | | | | Grey SILTSTONE with mudstone bands. | 11 | |
| | | | | | 12.80 | | Dark grey SILTSTONE with thin coal traces. | 13 | |
| | | | | | 14.90 | | Grey MUDSTONE with sandstone bands. | 15 | |
| | | | | | 17.60 | | Red brown MARL. | 18 | |
| | | | | | | | | 19 | |
| | | | | | | | | 20 | |

Remarks
Complete.



Borehole Log

Borehole No.

RB106

Sheet 1 of 3

Project Name: Well Street

Project No.
14278

Co-ords:

Hole Type
BH

Location: Buckley

Level:

Scale
1:50

Client: Alan Johnston Partnership

Dates: 03/09/2020

Logged By
V. Wilkinson

| Well | Water Strikes | Sample and In Situ Testing | | | Depth (m) | Level (m) | Legend | Stratum Description | |
|------|---------------|----------------------------|------|---------|-----------|-----------|---|---------------------|--|
| | | Depth (m) | Type | Results | | | | | |
| | | | | | 0.20 | | Dark brown slightly gravelly sandy CLAY (Topsoil) with frequent rootlets. Gravel is fine to coarse, sub-angular to sub-rounded of mudstone. | | |
| | | | | | 1.20 | | Stiff orange brown mottled grey slightly sandy gravelly CLAY. Gravel is fine to coarse, angular to sub-rounded of mudstone, sandstone and coal. | 1 | |
| | | | | | 3.80 | | Very stiff high strength brown slightly gravelly sandy CLAY. Gravel is fine to coarse, sub-angular to sub-rounded of mudstone and sandstone. | 2 | |
| | | | | | 7.90 | | Light grey MUDSTONE. | 3 | |
| | | | | | | | Grey sandy SILTSTONE with occasional strong sandstone bands. | 4 | |
| | | | | | | | | 5 | |
| | | | | | | | | 6 | |
| | | | | | | | | 7 | |
| | | | | | | | | 8 | |
| | | | | | | | | 9 | |
| | | | | | | | | 10 | |

Remarks
Complete.





Borehole Log

Borehole No.

RB106

Sheet 2 of 3

Project Name: Well Street

Project No.
14278

Co-ords:

Hole Type
BH

Location: Buckley

Level:

Scale
1:50

Client: Alan Johnston Partnership

Dates: 03/09/2020

Logged By
V. Wilkinson

| Well | Water Strikes | Sample and In Situ Testing | | | Depth (m) | Level (m) | Legend | Stratum Description | |
|------|---------------|----------------------------|------|---------|-----------|-----------|--|---------------------|--|
| | | Depth (m) | Type | Results | | | | | |
| | | | | | | XXXXXX | Grey sandy SILTSTONE with occasional strong sandstone bands. | | |
| | | | | | | XXXXXX | | 11 | |
| | | | | | | XXXXXX | | 12 | |
| | | | | | | XXXXXX | | 13 | |
| | | | | | | XXXXXX | | 14 | |
| | | | | | | XXXXXX | | 15 | |
| | | | | | | XXXXXX | | 16 | |
| | | | | | | XXXXXX | | 17 | |
| | | | | | | XXXXXX | | 18 | |
| | | | | | | XXXXXX | | 19 | |
| | | | | | | XXXXXX | | 20 | |

Remarks
Complete.





Borehole Log

Borehole No.

RB106

Sheet 3 of 3

Project Name: Well Street

Project No.
14278

Co-ords:

Hole Type
BH

Location: Buckley

Level:

Scale
1:50

Client: Alan Johnston Partnership

Dates: 03/09/2020

Logged By
V. Wilkinson

| Well | Water Strikes | Sample and In Situ Testing | | | Depth (m) | Level (m) | Legend | Stratum Description | |
|------|---------------|----------------------------|------|---------|-----------|-----------|--|---------------------|--|
| | | Depth (m) | Type | Results | | | | | |
| | | | | | | XXXXXX | Grey sandy SILTSTONE with occasional strong sandstone bands. | | |
| | | | | | 22.50 | | | 21 | |
| | | | | | | | Dark grey MUDSTONE. | | |
| | | | | | | | | 22 | |
| | | | | | | | | 23 | |
| | | | | | | | | 24 | |
| | | | | | | | | 25 | |
| | | | | | 26.10 | | Strong grey SANDSTONE. | | |
| | | | | | | | | 26 | |
| | | | | | 26.80 | | Dark grey SILTSTONE. | | |
| | | | | | | | | 27 | |
| | | | | | | | | 28 | |
| | | | | | | | | 29 | |
| | | | | | 30.00 | | | 30 | |
| | | | | | | | End of Borehole at 30.00m | | |

Remarks
Complete.



APPENDIX VI
CHEMICAL TESTING
RESULTS



4041



Environmental Science

Veronique Wilkinson

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Analytical Report Number : 20-28594

| | | | |
|-----------------------------|--------------------------------------|--|------------|
| Project / Site name: | Well Street | Samples received on: | 03/09/2020 |
| Your job number: | 14-278 | Samples instructed on/ Analysis started on: | 04/09/2020 |
| Your order number: | 14278-VW-E | Analysis completed by: | 11/09/2020 |
| Report Issue Number: | 1 | Report issued on: | 11/09/2020 |
| Samples Analysed: | 3 leachate samples - 15 soil samples | | |

Signed: *Karolina Marek*

Karolina Marek
PL Head of Reporting Team
For & on behalf of i2 Analytical Ltd.

Standard Geotechnical, Asbestos and Chemical Testing Laboratory located at: ul. Pionierów 39, 41 -711 Ruda Śląska, Poland.

Accredited tests are defined within the report, opinions and interpretations expressed herein are outside the scope of accreditation.

Standard sample disposal times, unless otherwise agreed with the laboratory, are :

| | |
|-----------|---------------------------|
| soils | - 4 weeks from reporting |
| leachates | - 2 weeks from reporting |
| waters | - 2 weeks from reporting |
| asbestos | - 6 months from reporting |

Excel copies of reports are only valid when accompanied by this PDF certificate.

Any assessments of compliance with specifications are based on actual analytical results with no contribution from uncertainty of measurement. Application of uncertainty of measurement would provide a range within which the true result lies. An estimate of measurement uncertainty can be provided on request.



Analytical Report Number: 20-28594

Project / Site name: Well Street

Your Order No: 14278-VW-E

| Lab Sample Number | 1613195 | 1613196 | 1613197 | 1613198 |
|---|---------------|--------------------|----------------------|---------------|
| Sample Reference | TP104 | TP105 | TP107 | TP108 |
| Sample Number | None Supplied | None Supplied | None Supplied | None Supplied |
| Depth (m) | 0.10 | 1.00 | 0.60 | 0.10 |
| Date Sampled | 01/09/2020 | 01/09/2020 | 01/09/2020 | 01/09/2020 |
| Time Taken | None Supplied | None Supplied | None Supplied | None Supplied |
| Analytical Parameter (Soil Analysis) | Units | Limit of detection | Accreditation Status | |

| | | | | | | | |
|-------------------------------|----|-------|------|-------|-------|-------|-------|
| Stone Content | % | 0.1 | NONE | < 0.1 | < 0.1 | < 0.1 | < 0.1 |
| Moisture Content | % | N/A | NONE | 17 | 9.1 | 10 | 8.6 |
| Total mass of sample received | kg | 0.001 | NONE | 0.3 | 0.3 | 0.3 | 0.3 |

| | | | | | | | |
|------------------|------|-----|-----------|--------------|--------------|--------------|--------------|
| Asbestos in Soil | Type | N/A | ISO 17025 | Not-detected | Not-detected | Not-detected | Not-detected |
|------------------|------|-----|-----------|--------------|--------------|--------------|--------------|

General Inorganics

| | | | | | | | |
|---|----------|---------|--------|-----|------|-----|-------|
| pH - Automated | pH Units | N/A | MCERTS | - | 7.6 | - | 7.9 |
| Total Cyanide | mg/kg | 1 | MCERTS | < 1 | < 1 | < 1 | < 1 |
| Total Sulphate as SO4 | mg/kg | 50 | MCERTS | - | 290 | - | 590 |
| Water Soluble Sulphate as SO4 16hr extraction (2:1) | mg/kg | 2.5 | MCERTS | - | 79 | - | 59 |
| Water Soluble SO4 16hr extraction (2:1 Leachate Equivalent) | g/l | 0.00125 | MCERTS | - | 0.04 | - | 0.029 |
| Water Soluble SO4 16hr extraction (2:1 Leachate Equivalent) | mg/l | 1.25 | MCERTS | - | 39.6 | - | 29.3 |
| Sulphide | mg/kg | 1 | MCERTS | - | 1.7 | - | 21 |
| Total Sulphur | mg/kg | 50 | MCERTS | - | 120 | - | 290 |
| Total Organic Carbon (TOC) | % | 0.1 | MCERTS | - | 0.7 | 0.6 | - |

Total Phenols

| | | | | | | | |
|----------------------------|-------|---|--------|---|-------|---|-------|
| Total Phenols (monohydric) | mg/kg | 1 | MCERTS | - | < 1.0 | - | < 1.0 |
|----------------------------|-------|---|--------|---|-------|---|-------|

Speciated PAHs

| | | | | | | | |
|------------------------|-------|------|--------|--------|--------|--------|--------|
| Naphthalene | mg/kg | 0.05 | MCERTS | < 0.05 | < 0.05 | < 0.05 | < 0.05 |
| Acenaphthylene | mg/kg | 0.05 | MCERTS | < 0.05 | < 0.05 | < 0.05 | < 0.05 |
| Acenaphthene | mg/kg | 0.05 | MCERTS | < 0.05 | < 0.05 | < 0.05 | < 0.05 |
| Fluorene | mg/kg | 0.05 | MCERTS | < 0.05 | < 0.05 | < 0.05 | < 0.05 |
| Phenanthrene | mg/kg | 0.05 | MCERTS | < 0.05 | < 0.05 | < 0.05 | < 0.05 |
| Anthracene | mg/kg | 0.05 | MCERTS | < 0.05 | < 0.05 | < 0.05 | < 0.05 |
| Fluoranthene | mg/kg | 0.05 | MCERTS | < 0.05 | < 0.05 | < 0.05 | < 0.05 |
| Pyrene | mg/kg | 0.05 | MCERTS | < 0.05 | < 0.05 | < 0.05 | < 0.05 |
| Benzo(a)anthracene | mg/kg | 0.05 | MCERTS | < 0.05 | < 0.05 | < 0.05 | < 0.05 |
| Chrysene | mg/kg | 0.05 | MCERTS | < 0.05 | < 0.05 | < 0.05 | < 0.05 |
| Benzo(b)fluoranthene | mg/kg | 0.05 | MCERTS | < 0.05 | < 0.05 | < 0.05 | < 0.05 |
| Benzo(k)fluoranthene | mg/kg | 0.05 | MCERTS | < 0.05 | < 0.05 | < 0.05 | < 0.05 |
| Benzo(a)pyrene | mg/kg | 0.05 | MCERTS | < 0.05 | < 0.05 | < 0.05 | < 0.05 |
| Indeno(1,2,3-cd)pyrene | mg/kg | 0.05 | MCERTS | < 0.05 | < 0.05 | < 0.05 | < 0.05 |
| Dibenz(a,h)anthracene | mg/kg | 0.05 | MCERTS | < 0.05 | < 0.05 | < 0.05 | < 0.05 |
| Benzo(ghi)perylene | mg/kg | 0.05 | MCERTS | < 0.05 | < 0.05 | < 0.05 | < 0.05 |

Total PAH

| | | | | | | | |
|-----------------------------|-------|-----|--------|--------|--------|--------|--------|
| Speciated Total EPA-16 PAHs | mg/kg | 0.8 | MCERTS | < 0.80 | < 0.80 | < 0.80 | < 0.80 |
|-----------------------------|-------|-----|--------|--------|--------|--------|--------|



Environmental Science

Analytical Report Number: 20-28594

Project / Site name: Well Street

Your Order No: 14278-VW-E

| Lab Sample Number | | | | 1613195 | 1613196 | 1613197 | 1613198 |
|---|-------|--------------------|----------------------|---------------|---------------|---------------|---------------|
| Sample Reference | | | | TP104 | TP105 | TP107 | TP108 |
| Sample Number | | | | None Supplied | None Supplied | None Supplied | None Supplied |
| Depth (m) | | | | 0.10 | 1.00 | 0.60 | 0.10 |
| Date Sampled | | | | 01/09/2020 | 01/09/2020 | 01/09/2020 | 01/09/2020 |
| Time Taken | | | | None Supplied | None Supplied | None Supplied | None Supplied |
| Analytical Parameter (Soil Analysis) | Units | Limit of detection | Accreditation Status | | | | |
| | | | | | | | |

Heavy Metals / Metalloids

| Element | Units | Limit of detection | Accreditation Status | 1613195 | 1613196 | 1613197 | 1613198 |
|------------------------------------|-------|--------------------|----------------------|---------|---------|---------|---------|
| Arsenic (aqua regia extractable) | mg/kg | 1 | MCERTS | 7.8 | 6.2 | 6.7 | 7.5 |
| Barium (aqua regia extractable) | mg/kg | 1 | MCERTS | 84 | - | 170 | - |
| Beryllium (aqua regia extractable) | mg/kg | 0.06 | MCERTS | 0.58 | - | 0.97 | - |
| Boron (water soluble) | mg/kg | 0.2 | MCERTS | 0.6 | - | 0.2 | - |
| Cadmium (aqua regia extractable) | mg/kg | 0.2 | MCERTS | 0.2 | < 0.2 | < 0.2 | 0.2 |
| Chromium (hexavalent) | mg/kg | 4 | MCERTS | < 4.0 | < 4.0 | < 4.0 | < 4.0 |
| Chromium (aqua regia extractable) | mg/kg | 1 | MCERTS | - | 23 | - | 15 |
| Copper (aqua regia extractable) | mg/kg | 1 | MCERTS | 17 | 22 | 22 | 16 |
| Lead (aqua regia extractable) | mg/kg | 1 | MCERTS | 96 | 14 | 14 | 140 |
| Mercury (aqua regia extractable) | mg/kg | 0.3 | MCERTS | < 0.3 | < 0.3 | < 0.3 | < 0.3 |
| Nickel (aqua regia extractable) | mg/kg | 1 | MCERTS | 11 | 28 | 29 | 8.3 |
| Selenium (aqua regia extractable) | mg/kg | 1 | MCERTS | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| Vanadium (aqua regia extractable) | mg/kg | 1 | MCERTS | 26 | - | 24 | - |
| Zinc (aqua regia extractable) | mg/kg | 1 | MCERTS | 74 | 55 | 50 | 55 |

Petroleum Hydrocarbons

| Parameter | Units | Limit of detection | Accreditation Status | 1613195 | 1613196 | 1613197 | 1613198 |
|--------------------|-------|--------------------|----------------------|---------|---------|---------|---------|
| TPH (C5 - C6) | mg/kg | 1 | NONE | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| TPH (C6 - C8) | mg/kg | 0.1 | MCERTS | < 0.1 | < 0.1 | < 0.1 | < 0.1 |
| TPH (C8 - C10) | mg/kg | 0.1 | MCERTS | < 0.1 | < 0.1 | < 0.1 | < 0.1 |
| TPH (C10 - C12) | mg/kg | 2 | MCERTS | < 2.0 | < 2.0 | < 2.0 | < 2.0 |
| TPH (C12 - C16) | mg/kg | 4 | MCERTS | < 4.0 | < 4.0 | < 4.0 | < 4.0 |
| TPH (C16 - C21) | mg/kg | 1 | MCERTS | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| TPH (C21 - C35) | mg/kg | 1 | MCERTS | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| TPH (C35 - C40) | mg/kg | 10 | MCERTS | < 10 | < 10 | < 10 | < 10 |
| TPH Total C5 - C40 | mg/kg | 10 | MCERTS | < 10 | < 10 | < 10 | < 10 |

U/S = Unsuitable Sample I/S = Insufficient Sample



Analytical Report Number: 20-28594

Project / Site name: Well Street

Your Order No: 14278-VW-E

| Lab Sample Number | 1613199 | 1613200 | 1613201 | 1613202 |
|---|---------------|--------------------|----------------------|---------------|
| Sample Reference | TP109 | TP111 | WS104 | TP112 |
| Sample Number | None Supplied | None Supplied | None Supplied | None Supplied |
| Depth (m) | 2.90 | 0.10 | 0.40 | 1.00 |
| Date Sampled | 01/09/2020 | 01/09/2020 | 01/09/2020 | 01/09/2020 |
| Time Taken | None Supplied | None Supplied | None Supplied | None Supplied |
| Analytical Parameter (Soil Analysis) | Units | Limit of detection | Accreditation Status | |

| | | | | | | | |
|-------------------------------|----|-------|------|-------|-------|-------|-------|
| Stone Content | % | 0.1 | NONE | < 0.1 | < 0.1 | < 0.1 | < 0.1 |
| Moisture Content | % | N/A | NONE | 9.3 | 14 | 9 | 8.7 |
| Total mass of sample received | kg | 0.001 | NONE | 0.3 | 0.3 | 0.3 | 1.1 |

| | | | | | | | |
|------------------|------|-----|-----------|--------------|--------------|--------------|--------------|
| Asbestos in Soil | Type | N/A | ISO 17025 | Not-detected | Not-detected | Not-detected | Not-detected |
|------------------|------|-----|-----------|--------------|--------------|--------------|--------------|

General Inorganics

| | | | | | | | |
|---|----------|---------|--------|-----|-------|-----|-------|
| pH - Automated | pH Units | N/A | MCERTS | - | 7.4 | - | 8.1 |
| Total Cyanide | mg/kg | 1 | MCERTS | < 1 | < 1 | < 1 | < 1 |
| Total Sulphate as SO4 | mg/kg | 50 | MCERTS | - | 640 | - | 280 |
| Water Soluble Sulphate as SO4 16hr extraction (2:1) | mg/kg | 2.5 | MCERTS | - | 29 | - | 55 |
| Water Soluble SO4 16hr extraction (2:1 Leachate Equivalent) | g/l | 0.00125 | MCERTS | - | 0.014 | - | 0.028 |
| Water Soluble SO4 16hr extraction (2:1 Leachate Equivalent) | mg/l | 1.25 | MCERTS | - | 14.4 | - | 27.7 |
| Sulphide | mg/kg | 1 | MCERTS | - | 23 | - | < 1.0 |
| Total Sulphur | mg/kg | 50 | MCERTS | - | 330 | - | 93 |
| Total Organic Carbon (TOC) | % | 0.1 | MCERTS | - | - | - | 0.5 |

Total Phenols

| | | | | | | | |
|----------------------------|-------|---|--------|---|-------|---|-------|
| Total Phenols (monohydric) | mg/kg | 1 | MCERTS | - | < 1.0 | - | < 1.0 |
|----------------------------|-------|---|--------|---|-------|---|-------|

Speciated PAHs

| | | | | | | | |
|------------------------|-------|------|--------|--------|--------|--------|--------|
| Naphthalene | mg/kg | 0.05 | MCERTS | < 0.05 | < 0.05 | < 0.05 | < 0.05 |
| Acenaphthylene | mg/kg | 0.05 | MCERTS | < 0.05 | < 0.05 | < 0.05 | < 0.05 |
| Acenaphthene | mg/kg | 0.05 | MCERTS | < 0.05 | < 0.05 | < 0.05 | < 0.05 |
| Fluorene | mg/kg | 0.05 | MCERTS | < 0.05 | < 0.05 | < 0.05 | < 0.05 |
| Phenanthrene | mg/kg | 0.05 | MCERTS | < 0.05 | < 0.05 | < 0.05 | < 0.05 |
| Anthracene | mg/kg | 0.05 | MCERTS | < 0.05 | < 0.05 | < 0.05 | < 0.05 |
| Fluoranthene | mg/kg | 0.05 | MCERTS | < 0.05 | < 0.05 | < 0.05 | 0.28 |
| Pyrene | mg/kg | 0.05 | MCERTS | < 0.05 | < 0.05 | < 0.05 | 0.25 |
| Benzo(a)anthracene | mg/kg | 0.05 | MCERTS | < 0.05 | < 0.05 | < 0.05 | 0.25 |
| Chrysene | mg/kg | 0.05 | MCERTS | < 0.05 | < 0.05 | < 0.05 | 0.3 |
| Benzo(b)fluoranthene | mg/kg | 0.05 | MCERTS | < 0.05 | < 0.05 | < 0.05 | 0.3 |
| Benzo(k)fluoranthene | mg/kg | 0.05 | MCERTS | < 0.05 | < 0.05 | < 0.05 | 0.2 |
| Benzo(a)pyrene | mg/kg | 0.05 | MCERTS | < 0.05 | < 0.05 | < 0.05 | 0.2 |
| Indeno(1,2,3-cd)pyrene | mg/kg | 0.05 | MCERTS | < 0.05 | < 0.05 | < 0.05 | < 0.05 |
| Dibenz(a,h)anthracene | mg/kg | 0.05 | MCERTS | < 0.05 | < 0.05 | < 0.05 | < 0.05 |
| Benzo(ghi)perylene | mg/kg | 0.05 | MCERTS | < 0.05 | < 0.05 | < 0.05 | < 0.05 |

Total PAH

| | | | | | | | |
|-----------------------------|-------|-----|--------|--------|--------|--------|------|
| Speciated Total EPA-16 PAHs | mg/kg | 0.8 | MCERTS | < 0.80 | < 0.80 | < 0.80 | 1.78 |
|-----------------------------|-------|-----|--------|--------|--------|--------|------|



Analytical Report Number: 20-28594

Project / Site name: Well Street

Your Order No: 14278-VW-E

| Lab Sample Number | 1613199 | 1613200 | 1613201 | 1613202 |
|---|---------------|--------------------|----------------------|---------------|
| Sample Reference | TP109 | TP111 | WS104 | TP112 |
| Sample Number | None Supplied | None Supplied | None Supplied | None Supplied |
| Depth (m) | 2.90 | 0.10 | 0.40 | 1.00 |
| Date Sampled | 01/09/2020 | 01/09/2020 | 01/09/2020 | 01/09/2020 |
| Time Taken | None Supplied | None Supplied | None Supplied | None Supplied |
| Analytical Parameter (Soil Analysis) | Units | Limit of detection | Accreditation Status | |

Heavy Metals / Metalloids

| Element | Units | Limit of detection | Accreditation Status | 1613199 | 1613200 | 1613201 | 1613202 |
|------------------------------------|-------|--------------------|----------------------|---------|---------|---------|---------|
| Arsenic (aqua regia extractable) | mg/kg | 1 | MCERTS | 5.4 | 12 | 6.9 | 6.1 |
| Barium (aqua regia extractable) | mg/kg | 1 | MCERTS | 77 | - | 56 | - |
| Beryllium (aqua regia extractable) | mg/kg | 0.06 | MCERTS | 0.66 | - | 0.81 | - |
| Boron (water soluble) | mg/kg | 0.2 | MCERTS | < 0.2 | - | < 0.2 | - |
| Cadmium (aqua regia extractable) | mg/kg | 0.2 | MCERTS | < 0.2 | 0.4 | < 0.2 | < 0.2 |
| Chromium (hexavalent) | mg/kg | 4 | MCERTS | < 4.0 | < 4.0 | < 4.0 | < 4.0 |
| Chromium (aqua regia extractable) | mg/kg | 1 | MCERTS | - | 23 | - | 19 |
| Copper (aqua regia extractable) | mg/kg | 1 | MCERTS | 18 | 32 | 23 | 20 |
| Lead (aqua regia extractable) | mg/kg | 1 | MCERTS | 11 | 230 | 23 | 15 |
| Mercury (aqua regia extractable) | mg/kg | 0.3 | MCERTS | < 0.3 | < 0.3 | < 0.3 | < 0.3 |
| Nickel (aqua regia extractable) | mg/kg | 1 | MCERTS | 21 | 22 | 19 | 26 |
| Selenium (aqua regia extractable) | mg/kg | 1 | MCERTS | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| Vanadium (aqua regia extractable) | mg/kg | 1 | MCERTS | 18 | - | 24 | - |
| Zinc (aqua regia extractable) | mg/kg | 1 | MCERTS | 42 | 140 | 46 | 48 |

Petroleum Hydrocarbons

| Parameter | Units | Limit of detection | Accreditation Status | 1613199 | 1613200 | 1613201 | 1613202 |
|--------------------|-------|--------------------|----------------------|---------|---------|---------|---------|
| TPH (C5 - C6) | mg/kg | 1 | NONE | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| TPH (C6 - C8) | mg/kg | 0.1 | MCERTS | < 0.1 | < 0.1 | < 0.1 | < 0.1 |
| TPH (C8 - C10) | mg/kg | 0.1 | MCERTS | < 0.1 | < 0.1 | < 0.1 | < 0.1 |
| TPH (C10 - C12) | mg/kg | 2 | MCERTS | < 2.0 | < 2.0 | < 2.0 | < 2.0 |
| TPH (C12 - C16) | mg/kg | 4 | MCERTS | < 4.0 | < 4.0 | < 4.0 | < 4.0 |
| TPH (C16 - C21) | mg/kg | 1 | MCERTS | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| TPH (C21 - C35) | mg/kg | 1 | MCERTS | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| TPH (C35 - C40) | mg/kg | 10 | MCERTS | < 10 | < 10 | < 10 | < 10 |
| TPH Total C5 - C40 | mg/kg | 10 | MCERTS | < 10 | < 10 | < 10 | < 10 |

U/S = Unsuitable Sample I/S = Insufficient Sample



Analytical Report Number: 20-28594

Project / Site name: Well Street

Your Order No: 14278-VW-E

| Lab Sample Number | 1613203 | 1613204 | 1613205 | 1613206 |
|---|---------------|--------------------|----------------------|---------------|
| Sample Reference | TP119 | TP120 | TP121 | TP123 |
| Sample Number | None Supplied | None Supplied | None Supplied | None Supplied |
| Depth (m) | 0.10 | 0.10 | 0.40 | 0.10 |
| Date Sampled | 02/09/2020 | 02/09/2020 | 02/09/2020 | 02/09/2020 |
| Time Taken | None Supplied | None Supplied | None Supplied | None Supplied |
| Analytical Parameter (Soil Analysis) | Units | Limit of detection | Accreditation Status | |

| Parameter | Units | Limit of detection | Accreditation Status | 1613203 | 1613204 | 1613205 | 1613206 |
|-------------------------------|-------|--------------------|----------------------|---------|---------|---------|---------|
| Stone Content | % | 0.1 | NONE | < 0.1 | < 0.1 | < 0.1 | < 0.1 |
| Moisture Content | % | N/A | NONE | 13 | 13 | 15 | 11 |
| Total mass of sample received | kg | 0.001 | NONE | 0.3 | 0.3 | 1.1 | 0.3 |

| Asbestos in Soil | Type | N/A | ISO 17025 | 1613203 | 1613204 | 1613205 | 1613206 |
|------------------|------|-----|-----------|--------------|--------------|--------------|--------------|
| | | | | Not-detected | Not-detected | Not-detected | Not-detected |

General Inorganics

| Parameter | Units | N/A | MCERTS | 1613203 | 1613204 | 1613205 | 1613206 |
|---|----------|---------|--------|---------|---------|---------|---------|
| pH - Automated | pH Units | N/A | MCERTS | - | 7.1 | 7.2 | - |
| Total Cyanide | mg/kg | 1 | MCERTS | < 1 | < 1 | < 1 | < 1 |
| Total Sulphate as SO4 | mg/kg | 50 | MCERTS | - | 680 | 420 | - |
| Water Soluble Sulphate as SO4 16hr extraction (2:1) | mg/kg | 2.5 | MCERTS | - | 47 | 170 | - |
| Water Soluble SO4 16hr extraction (2:1 Leachate Equivalent) | g/l | 0.00125 | MCERTS | - | 0.024 | 0.086 | - |
| Water Soluble SO4 16hr extraction (2:1 Leachate Equivalent) | mg/l | 1.25 | MCERTS | - | 23.6 | 85.8 | - |
| Sulphide | mg/kg | 1 | MCERTS | - | 16 | < 1.0 | - |
| Total Sulphur | mg/kg | 50 | MCERTS | - | 390 | 150 | - |
| Total Organic Carbon (TOC) | % | 0.1 | MCERTS | - | 2.9 | - | - |

Total Phenols

| Parameter | Units | N/A | MCERTS | 1613203 | 1613204 | 1613205 | 1613206 |
|----------------------------|-------|-----|--------|---------|---------|---------|---------|
| Total Phenols (monohydric) | mg/kg | 1 | MCERTS | - | < 1.0 | < 1.0 | - |

Speciated PAHs

| Parameter | Units | N/A | MCERTS | 1613203 | 1613204 | 1613205 | 1613206 |
|------------------------|-------|------|--------|---------|---------|---------|---------|
| Naphthalene | mg/kg | 0.05 | MCERTS | < 0.05 | < 0.05 | < 0.05 | < 0.05 |
| Acenaphthylene | mg/kg | 0.05 | MCERTS | < 0.05 | < 0.05 | < 0.05 | < 0.05 |
| Acenaphthene | mg/kg | 0.05 | MCERTS | < 0.05 | < 0.05 | < 0.05 | < 0.05 |
| Fluorene | mg/kg | 0.05 | MCERTS | < 0.05 | < 0.05 | < 0.05 | < 0.05 |
| Phenanthrene | mg/kg | 0.05 | MCERTS | < 0.05 | < 0.05 | 0.46 | < 0.05 |
| Anthracene | mg/kg | 0.05 | MCERTS | < 0.05 | < 0.05 | 0.15 | < 0.05 |
| Fluoranthene | mg/kg | 0.05 | MCERTS | < 0.05 | < 0.05 | 1.1 | < 0.05 |
| Pyrene | mg/kg | 0.05 | MCERTS | < 0.05 | < 0.05 | 0.82 | < 0.05 |
| Benzo(a)anthracene | mg/kg | 0.05 | MCERTS | < 0.05 | < 0.05 | 0.96 | < 0.05 |
| Chrysene | mg/kg | 0.05 | MCERTS | < 0.05 | < 0.05 | 0.92 | < 0.05 |
| Benzo(b)fluoranthene | mg/kg | 0.05 | MCERTS | < 0.05 | < 0.05 | 1.1 | < 0.05 |
| Benzo(k)fluoranthene | mg/kg | 0.05 | MCERTS | < 0.05 | < 0.05 | 0.55 | < 0.05 |
| Benzo(a)pyrene | mg/kg | 0.05 | MCERTS | < 0.05 | < 0.05 | 0.88 | < 0.05 |
| Indeno(1,2,3-cd)pyrene | mg/kg | 0.05 | MCERTS | < 0.05 | < 0.05 | 0.44 | < 0.05 |
| Dibenz(a,h)anthracene | mg/kg | 0.05 | MCERTS | < 0.05 | < 0.05 | < 0.05 | < 0.05 |
| Benzo(ghi)perylene | mg/kg | 0.05 | MCERTS | < 0.05 | < 0.05 | 0.44 | < 0.05 |

Total PAH

| Parameter | Units | N/A | MCERTS | 1613203 | 1613204 | 1613205 | 1613206 |
|-----------------------------|-------|-----|--------|---------|---------|---------|---------|
| Speciated Total EPA-16 PAHs | mg/kg | 0.8 | MCERTS | < 0.80 | < 0.80 | 7.79 | < 0.80 |



Environmental Science

Analytical Report Number: 20-28594

Project / Site name: Well Street

Your Order No: 14278-VW-E

| Lab Sample Number | | | | 1613203 | 1613204 | 1613205 | 1613206 |
|---|-------|--------------------|----------------------|---------------|---------------|---------------|---------------|
| Sample Reference | | | | TP119 | TP120 | TP121 | TP123 |
| Sample Number | | | | None Supplied | None Supplied | None Supplied | None Supplied |
| Depth (m) | | | | 0.10 | 0.10 | 0.40 | 0.10 |
| Date Sampled | | | | 02/09/2020 | 02/09/2020 | 02/09/2020 | 02/09/2020 |
| Time Taken | | | | None Supplied | None Supplied | None Supplied | None Supplied |
| Analytical Parameter (Soil Analysis) | Units | Limit of detection | Accreditation Status | | | | |
| | | | | | | | |

Heavy Metals / Metalloids

| | mg/kg | 1 | MCERTS | 8.9 | 8.4 | 6.9 | 7.9 |
|------------------------------------|-------|------|--------|-------|-------|-------|-------|
| Arsenic (aqua regia extractable) | mg/kg | 1 | MCERTS | 8.9 | 8.4 | 6.9 | 7.9 |
| Barium (aqua regia extractable) | mg/kg | 1 | MCERTS | 46 | - | - | 59 |
| Beryllium (aqua regia extractable) | mg/kg | 0.06 | MCERTS | 0.51 | - | - | 0.62 |
| Boron (water soluble) | mg/kg | 0.2 | MCERTS | < 0.2 | - | - | < 0.2 |
| Cadmium (aqua regia extractable) | mg/kg | 0.2 | MCERTS | < 0.2 | 0.3 | < 0.2 | 0.2 |
| Chromium (hexavalent) | mg/kg | 4 | MCERTS | < 4.0 | < 4.0 | < 4.0 | < 4.0 |
| Chromium (aqua regia extractable) | mg/kg | 1 | MCERTS | - | 20 | 24 | - |
| Copper (aqua regia extractable) | mg/kg | 1 | MCERTS | 14 | 19 | 20 | 18 |
| Lead (aqua regia extractable) | mg/kg | 1 | MCERTS | 85 | 120 | 20 | 430 |
| Mercury (aqua regia extractable) | mg/kg | 0.3 | MCERTS | < 0.3 | < 0.3 | < 0.3 | < 0.3 |
| Nickel (aqua regia extractable) | mg/kg | 1 | MCERTS | 11 | 12 | 17 | 11 |
| Selenium (aqua regia extractable) | mg/kg | 1 | MCERTS | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| Vanadium (aqua regia extractable) | mg/kg | 1 | MCERTS | 29 | - | - | 29 |
| Zinc (aqua regia extractable) | mg/kg | 1 | MCERTS | 58 | 75 | 38 | 74 |

Petroleum Hydrocarbons

| | mg/kg | 1 | NONE | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
|--------------------|-------|-----|--------|-------|-------|-------|-------|
| TPH (C5 - C6) | mg/kg | 1 | NONE | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| TPH (C6 - C8) | mg/kg | 0.1 | MCERTS | < 0.1 | < 0.1 | < 0.1 | < 0.1 |
| TPH (C8 - C10) | mg/kg | 0.1 | MCERTS | < 0.1 | < 0.1 | < 0.1 | < 0.1 |
| TPH (C10 - C12) | mg/kg | 2 | MCERTS | < 2.0 | < 2.0 | < 2.0 | < 2.0 |
| TPH (C12 - C16) | mg/kg | 4 | MCERTS | < 4.0 | < 4.0 | < 4.0 | < 4.0 |
| TPH (C16 - C21) | mg/kg | 1 | MCERTS | < 1.0 | < 1.0 | 9.7 | < 1.0 |
| TPH (C21 - C35) | mg/kg | 1 | MCERTS | < 1.0 | < 1.0 | 48 | < 1.0 |
| TPH (C35 - C40) | mg/kg | 10 | MCERTS | < 10 | < 10 | < 10 | < 10 |
| TPH Total C5 - C40 | mg/kg | 10 | MCERTS | < 10 | < 10 | 60 | < 10 |

U/S = Unsuitable Sample I/S = Insufficient Sample



Analytical Report Number: 20-28594

Project / Site name: Well Street

Your Order No: 14278-VW-E

| Lab Sample Number | 1613207 | 1613208 | 1613209 |
|---|---------------|--------------------|----------------------|
| Sample Reference | TP125 | WS107 | TP130 |
| Sample Number | None Supplied | None Supplied | None Supplied |
| Depth (m) | 0.10 | 0.10 | 0.10 |
| Date Sampled | 02/09/2020 | 02/09/2020 | 02/09/2020 |
| Time Taken | None Supplied | None Supplied | None Supplied |
| Analytical Parameter (Soil Analysis) | Units | Limit of detection | Accreditation Status |

| | | | | | | |
|-------------------------------|----|-------|------|-------|-------|-------|
| Stone Content | % | 0.1 | NONE | < 0.1 | < 0.1 | < 0.1 |
| Moisture Content | % | N/A | NONE | 14 | 18 | 14 |
| Total mass of sample received | kg | 0.001 | NONE | 0.3 | 0.3 | 0.3 |

| | | | | | | |
|------------------|------|-----|-----------|--------------|--------------|--------------|
| Asbestos in Soil | Type | N/A | ISO 17025 | Not-detected | Not-detected | Not-detected |
|------------------|------|-----|-----------|--------------|--------------|--------------|

General Inorganics

| | | | | | | |
|---|----------|---------|--------|-----|-------|-----|
| pH - Automated | pH Units | N/A | MCERTS | - | 6.7 | - |
| Total Cyanide | mg/kg | 1 | MCERTS | < 1 | < 1 | < 1 |
| Total Sulphate as SO4 | mg/kg | 50 | MCERTS | - | 390 | - |
| Water Soluble Sulphate as SO4 16hr extraction (2:1) | mg/kg | 2.5 | MCERTS | - | 29 | - |
| Water Soluble SO4 16hr extraction (2:1 Leachate Equivalent) | g/l | 0.00125 | MCERTS | - | 0.014 | - |
| Water Soluble SO4 16hr extraction (2:1 Leachate Equivalent) | mg/l | 1.25 | MCERTS | - | 14.3 | - |
| Sulphide | mg/kg | 1 | MCERTS | - | 20 | - |
| Total Sulphur | mg/kg | 50 | MCERTS | - | 330 | - |
| Total Organic Carbon (TOC) | % | 0.1 | MCERTS | - | 2.8 | - |

Total Phenols

| | | | | | | |
|----------------------------|-------|---|--------|---|-------|---|
| Total Phenols (monohydric) | mg/kg | 1 | MCERTS | - | < 1.0 | - |
|----------------------------|-------|---|--------|---|-------|---|

Speciated PAHs

| | | | | | | |
|------------------------|-------|------|--------|--------|--------|--------|
| Naphthalene | mg/kg | 0.05 | MCERTS | < 0.05 | < 0.05 | < 0.05 |
| Acenaphthylene | mg/kg | 0.05 | MCERTS | < 0.05 | < 0.05 | < 0.05 |
| Acenaphthene | mg/kg | 0.05 | MCERTS | < 0.05 | < 0.05 | < 0.05 |
| Fluorene | mg/kg | 0.05 | MCERTS | < 0.05 | < 0.05 | < 0.05 |
| Phenanthrene | mg/kg | 0.05 | MCERTS | < 0.05 | < 0.05 | < 0.05 |
| Anthracene | mg/kg | 0.05 | MCERTS | < 0.05 | < 0.05 | < 0.05 |
| Fluoranthene | mg/kg | 0.05 | MCERTS | < 0.05 | < 0.05 | < 0.05 |
| Pyrene | mg/kg | 0.05 | MCERTS | < 0.05 | < 0.05 | < 0.05 |
| Benzo(a)anthracene | mg/kg | 0.05 | MCERTS | < 0.05 | < 0.05 | < 0.05 |
| Chrysene | mg/kg | 0.05 | MCERTS | < 0.05 | < 0.05 | < 0.05 |
| Benzo(b)fluoranthene | mg/kg | 0.05 | MCERTS | < 0.05 | < 0.05 | < 0.05 |
| Benzo(k)fluoranthene | mg/kg | 0.05 | MCERTS | < 0.05 | < 0.05 | < 0.05 |
| Benzo(a)pyrene | mg/kg | 0.05 | MCERTS | < 0.05 | < 0.05 | < 0.05 |
| Indeno(1,2,3-cd)pyrene | mg/kg | 0.05 | MCERTS | < 0.05 | < 0.05 | < 0.05 |
| Dibenz(a,h)anthracene | mg/kg | 0.05 | MCERTS | < 0.05 | < 0.05 | < 0.05 |
| Benzo(ghi)perylene | mg/kg | 0.05 | MCERTS | < 0.05 | < 0.05 | < 0.05 |

Total PAH

| | | | | | | |
|-----------------------------|-------|-----|--------|--------|--------|--------|
| Speciated Total EPA-16 PAHs | mg/kg | 0.8 | MCERTS | < 0.80 | < 0.80 | < 0.80 |
|-----------------------------|-------|-----|--------|--------|--------|--------|



Analytical Report Number: 20-28594

Project / Site name: Well Street

Your Order No: 14278-VW-E

| | | | | |
|---|--------------|---------------------------|-----------------------------|---------------|
| Lab Sample Number | | 1613207 | 1613208 | 1613209 |
| Sample Reference | | TP125 | WS107 | TP130 |
| Sample Number | | None Supplied | None Supplied | None Supplied |
| Depth (m) | | 0.10 | 0.10 | 0.10 |
| Date Sampled | | 02/09/2020 | 02/09/2020 | 02/09/2020 |
| Time Taken | | None Supplied | None Supplied | None Supplied |
| Analytical Parameter (Soil Analysis) | Units | Limit of detection | Accreditation Status | |

Heavy Metals / Metalloids

| | | | | | | |
|------------------------------------|-------|------|--------|-------|-------|-------|
| Arsenic (aqua regia extractable) | mg/kg | 1 | MCERTS | 8.5 | 7.7 | 8.8 |
| Barium (aqua regia extractable) | mg/kg | 1 | MCERTS | 49 | - | 56 |
| Beryllium (aqua regia extractable) | mg/kg | 0.06 | MCERTS | 0.48 | - | 0.59 |
| Boron (water soluble) | mg/kg | 0.2 | MCERTS | 0.5 | - | 0.9 |
| Cadmium (aqua regia extractable) | mg/kg | 0.2 | MCERTS | < 0.2 | < 0.2 | 0.2 |
| Chromium (hexavalent) | mg/kg | 4 | MCERTS | < 4.0 | < 4.0 | < 4.0 |
| Chromium (aqua regia extractable) | mg/kg | 1 | MCERTS | - | 18 | - |
| Copper (aqua regia extractable) | mg/kg | 1 | MCERTS | 18 | 14 | 19 |
| Lead (aqua regia extractable) | mg/kg | 1 | MCERTS | 99 | 100 | 100 |
| Mercury (aqua regia extractable) | mg/kg | 0.3 | MCERTS | < 0.3 | < 0.3 | < 0.3 |
| Nickel (aqua regia extractable) | mg/kg | 1 | MCERTS | 12 | 9 | 13 |
| Selenium (aqua regia extractable) | mg/kg | 1 | MCERTS | < 1.0 | < 1.0 | < 1.0 |
| Vanadium (aqua regia extractable) | mg/kg | 1 | MCERTS | 29 | - | 27 |
| Zinc (aqua regia extractable) | mg/kg | 1 | MCERTS | 74 | 72 | 81 |

Petroleum Hydrocarbons

| | | | | | | |
|--------------------|-------|-----|--------|-------|-------|-------|
| TPH (C5 - C6) | mg/kg | 1 | NONE | < 1.0 | < 1.0 | < 1.0 |
| TPH (C6 - C8) | mg/kg | 0.1 | MCERTS | < 0.1 | < 0.1 | < 0.1 |
| TPH (C8 - C10) | mg/kg | 0.1 | MCERTS | < 0.1 | < 0.1 | < 0.1 |
| TPH (C10 - C12) | mg/kg | 2 | MCERTS | < 2.0 | < 2.0 | < 2.0 |
| TPH (C12 - C16) | mg/kg | 4 | MCERTS | < 4.0 | < 4.0 | < 4.0 |
| TPH (C16 - C21) | mg/kg | 1 | MCERTS | < 1.0 | < 1.0 | < 1.0 |
| TPH (C21 - C35) | mg/kg | 1 | MCERTS | < 1.0 | < 1.0 | < 1.0 |
| TPH (C35 - C40) | mg/kg | 10 | MCERTS | < 10 | < 10 | < 10 |
| TPH Total C5 - C40 | mg/kg | 10 | MCERTS | < 10 | < 10 | < 10 |

U/S = Unsuitable Sample I/S = Insufficient Sample



Analytical Report Number: 20-28594
Project / Site name: Well Street

Your Order No: 14278-VW-E

| Lab Sample Number | 1613210 | | | 1613211 | | | 1613212 | | |
|--|---------------|--------------------|----------------------|---------------|--|--|---------------|--|--|
| Sample Reference | TP103 | | | TP121 | | | TP128 | | |
| Sample Number | None Supplied | | | None Supplied | | | None Supplied | | |
| Depth (m) | 0.60 | | | 0.40 | | | 0.10 | | |
| Date Sampled | 01/09/2020 | | | 02/09/2020 | | | 02/09/2020 | | |
| Time Taken | None Supplied | | | None Supplied | | | None Supplied | | |
| Analytical Parameter (Leachate Analysis) | Units | Limit of detection | Accreditation Status | | | | | | |

General Inorganics

| Parameter | Units | Limit of detection | Accreditation Status | 1613210 | 1613211 | 1613212 |
|----------------------------------|----------|--------------------|----------------------|---------|---------|---------|
| pH | pH Units | N/A | ISO 17025 | 7.1 | 5.8 | 5.9 |
| Total Cyanide (Low Level 1 µg/l) | µg/l | 1 | ISO 17025 | < 1.0 | < 1.0 | < 1.0 |

Total Phenols

| Parameter | Units | Limit of detection | Accreditation Status | 1613210 | 1613211 | 1613212 |
|----------------------------|-------|--------------------|----------------------|---------|---------|---------|
| Total Phenols (monohydric) | µg/l | 1 | ISO 17025 | < 1.0 | 1.4 | < 1.0 |

Speciated PAHs

| Parameter | Units | Limit of detection | Accreditation Status | 1613210 | 1613211 | 1613212 |
|------------------------|-------|--------------------|----------------------|---------|---------|---------|
| Naphthalene | µg/l | 0.01 | ISO 17025 | < 0.01 | < 0.01 | < 0.01 |
| Acenaphthylene | µg/l | 0.01 | ISO 17025 | < 0.01 | < 0.01 | < 0.01 |
| Acenaphthene | µg/l | 0.01 | ISO 17025 | < 0.01 | < 0.01 | < 0.01 |
| Fluorene | µg/l | 0.01 | ISO 17025 | < 0.01 | < 0.01 | < 0.01 |
| Phenanthrene | µg/l | 0.01 | ISO 17025 | < 0.01 | < 0.01 | < 0.01 |
| Anthracene | µg/l | 0.01 | ISO 17025 | < 0.01 | < 0.01 | < 0.01 |
| Fluoranthene | µg/l | 0.01 | ISO 17025 | < 0.01 | < 0.01 | < 0.01 |
| Pyrene | µg/l | 0.01 | ISO 17025 | < 0.01 | < 0.01 | < 0.01 |
| Benzo(a)anthracene | µg/l | 0.01 | ISO 17025 | < 0.01 | < 0.01 | < 0.01 |
| Chrysene | µg/l | 0.01 | ISO 17025 | < 0.01 | < 0.01 | < 0.01 |
| Benzo(b)fluoranthene | µg/l | 0.01 | ISO 17025 | < 0.01 | < 0.01 | < 0.01 |
| Benzo(k)fluoranthene | µg/l | 0.01 | ISO 17025 | < 0.01 | < 0.01 | < 0.01 |
| Benzo(a)pyrene | µg/l | 0.01 | ISO 17025 | < 0.01 | < 0.01 | < 0.01 |
| Indeno(1,2,3-cd)pyrene | µg/l | 0.01 | NONE | < 0.01 | < 0.01 | < 0.01 |
| Dibenz(a,h)anthracene | µg/l | 0.01 | NONE | < 0.01 | < 0.01 | < 0.01 |
| Benzo(ghi)perylene | µg/l | 0.01 | NONE | < 0.01 | < 0.01 | < 0.01 |

Total PAH

| Parameter | Units | Limit of detection | Accreditation Status | 1613210 | 1613211 | 1613212 |
|-------------------|-------|--------------------|----------------------|---------|---------|---------|
| Total EPA-16 PAHs | µg/l | 0.2 | NONE | < 0.2 | < 0.2 | < 0.2 |

Heavy Metals / Metalloids

| Parameter | Units | Limit of detection | Accreditation Status | 1613210 | 1613211 | 1613212 |
|-----------------------|-------|--------------------|----------------------|---------|---------|---------|
| Arsenic (dissolved) | µg/l | 1.1 | ISO 17025 | < 1.1 | < 1.1 | < 1.1 |
| Cadmium (dissolved) | µg/l | 0.08 | ISO 17025 | < 0.08 | < 0.08 | < 0.08 |
| Chromium (hexavalent) | µg/l | 5 | ISO 17025 | < 5.0 | < 5.0 | < 5.0 |
| Chromium (dissolved) | µg/l | 0.4 | ISO 17025 | 2.4 | 0.5 | 2.4 |
| Copper (dissolved) | µg/l | 0.7 | ISO 17025 | 9.9 | 9.4 | 31 |
| Lead (dissolved) | µg/l | 1 | ISO 17025 | 1.1 | 2.1 | 4.1 |
| Mercury (dissolved) | µg/l | 0.5 | ISO 17025 | < 0.5 | < 0.5 | < 0.5 |
| Nickel (dissolved) | µg/l | 0.3 | ISO 17025 | < 0.3 | 0.8 | 0.7 |
| Selenium (dissolved) | µg/l | 4 | ISO 17025 | < 4.0 | < 4.0 | < 4.0 |
| Zinc (dissolved) | µg/l | 0.4 | ISO 17025 | 6.8 | 14 | 15 |

Monoaromatics & Oxygenates

| Parameter | Units | Limit of detection | Accreditation Status | 1613210 | 1613211 | 1613212 |
|------------------------------------|-------|--------------------|----------------------|---------|---------|---------|
| Benzene | µg/l | 1 | ISO 17025 | < 1.0 | < 1.0 | < 1.0 |
| Toluene | µg/l | 1 | ISO 17025 | < 1.0 | < 1.0 | < 1.0 |
| Ethylbenzene | µg/l | 1 | ISO 17025 | < 1.0 | < 1.0 | < 1.0 |
| p & m-xylene | µg/l | 1 | ISO 17025 | < 1.0 | < 1.0 | < 1.0 |
| o-xylene | µg/l | 1 | ISO 17025 | < 1.0 | < 1.0 | < 1.0 |
| MTBE (Methyl Tertiary Butyl Ether) | µg/l | 10 | NONE | < 10 | < 10 | < 10 |



Analytical Report Number: 20-28594
 Project / Site name: Well Street

Your Order No: 14278-VW-E

| | | | |
|---|---------------|--------------------|----------------------|
| Lab Sample Number | 1613210 | 1613211 | 1613212 |
| Sample Reference | TP103 | TP121 | TP128 |
| Sample Number | None Supplied | None Supplied | None Supplied |
| Depth (m) | 0.60 | 0.40 | 0.10 |
| Date Sampled | 01/09/2020 | 02/09/2020 | 02/09/2020 |
| Time Taken | None Supplied | None Supplied | None Supplied |
| Analytical Parameter (Leachate Analysis) | Units | Limit of detection | Accreditation Status |

Petroleum Hydrocarbons

| | | | | | | |
|------------------|------|----|------|------|------|------|
| TPH1 (C10 - C40) | µg/l | 10 | NONE | < 10 | < 10 | < 10 |
|------------------|------|----|------|------|------|------|

| | | | | | | |
|--------------------------------|------|----|-----------|-------|-------|-------|
| TPH-CWG - Aliphatic >C5 - C6 | µg/l | 1 | ISO 17025 | < 1.0 | < 1.0 | < 1.0 |
| TPH-CWG - Aliphatic >C6 - C8 | µg/l | 1 | ISO 17025 | < 1.0 | < 1.0 | < 1.0 |
| TPH-CWG - Aliphatic >C8 - C10 | µg/l | 1 | ISO 17025 | < 1.0 | < 1.0 | < 1.0 |
| TPH-CWG - Aliphatic >C10 - C12 | µg/l | 10 | NONE | < 10 | < 10 | < 10 |
| TPH-CWG - Aliphatic >C12 - C16 | µg/l | 10 | NONE | < 10 | < 10 | < 10 |
| TPH-CWG - Aliphatic >C16 - C21 | µg/l | 10 | NONE | < 10 | < 10 | < 10 |
| TPH-CWG - Aliphatic >C21 - C35 | µg/l | 10 | NONE | < 10 | < 10 | < 10 |
| TPH-CWG - Aliphatic (C5 - C35) | µg/l | 10 | NONE | < 10 | < 10 | < 10 |

| | | | | | | |
|-------------------------------|------|----|-----------|-------|-------|-------|
| TPH-CWG - Aromatic >C5 - C7 | µg/l | 1 | ISO 17025 | < 1.0 | < 1.0 | < 1.0 |
| TPH-CWG - Aromatic >C7 - C8 | µg/l | 1 | ISO 17025 | < 1.0 | < 1.0 | < 1.0 |
| TPH-CWG - Aromatic >C8 - C10 | µg/l | 1 | ISO 17025 | < 1.0 | < 1.0 | < 1.0 |
| TPH-CWG - Aromatic >C10 - C12 | µg/l | 10 | NONE | < 10 | < 10 | < 10 |
| TPH-CWG - Aromatic >C12 - C16 | µg/l | 10 | NONE | < 10 | < 10 | < 10 |
| TPH-CWG - Aromatic >C16 - C21 | µg/l | 10 | NONE | < 10 | < 10 | < 10 |
| TPH-CWG - Aromatic >C21 - C35 | µg/l | 10 | NONE | < 10 | < 10 | < 10 |
| TPH-CWG - Aromatic (C5 - C35) | µg/l | 10 | NONE | < 10 | < 10 | < 10 |

U/S = Unsuitable Sample I/S = Insufficient Sample



Analytical Report Number : 20-28594
Project / Site name: Well Street

* These descriptions are only intended to act as a cross check if sample identities are questioned. The major constituent of the sample is intended to act with respect to MCERTS validation. The laboratory is accredited for sand, clay and loam (MCERTS) soil types. Data for unaccredited types of solid should be interpreted with care.

Stone content of a sample is calculated as the % weight of the stones not passing a 10 mm sieve. Results are not corrected for stone content.

| Lab Sample Number | Sample Reference | Sample Number | Depth (m) | Sample Description * |
|-------------------|------------------|---------------|-----------|---|
| 1613195 | TP104 | None Supplied | 0.1 | Brown loam and clay with gravel and vegetation. |
| 1613196 | TP105 | None Supplied | 1 | Brown clay and sand with gravel. |
| 1613197 | TP107 | None Supplied | 0.6 | Brown clay and sand with gravel. |
| 1613198 | TP108 | None Supplied | 0.1 | Brown loam and clay with vegetation. |
| 1613199 | TP109 | None Supplied | 2.9 | Light brown sand with gravel. |
| 1613200 | TP111 | None Supplied | 0.1 | Brown sandy loam with gravel and vegetation. |
| 1613201 | WS104 | None Supplied | 0.4 | Light brown clay and sand with gravel. |
| 1613202 | TP112 | None Supplied | 1 | Brown clay and sand with gravel. |
| 1613203 | TP119 | None Supplied | 0.1 | Light brown loam and clay with vegetation and gravel. |
| 1613204 | TP120 | None Supplied | 0.1 | Light brown loam and clay with vegetation and gravel. |
| 1613205 | TP121 | None Supplied | 0.4 | Light brown clay and sand with gravel. |
| 1613206 | TP123 | None Supplied | 0.1 | Brown loam and clay with gravel and vegetation. |
| 1613207 | TP125 | None Supplied | 0.1 | Brown loam and clay with gravel and vegetation. |
| 1613208 | WS107 | None Supplied | 0.1 | Brown loam and clay with gravel and vegetation. |
| 1613209 | TP130 | None Supplied | 0.1 | Brown loam and clay with gravel and vegetation. |



Environmental Science

Analytical Report Number : 20-28594
Project / Site name: Well Street

Water matrix abbreviations: Surface Water (SW) Potable Water (PW) Ground Water (GW)

| Analytical Test Name | Analytical Method Description | Analytical Method Reference | Method number | Wet / Dry Analysis | Accreditation Status |
|--|--|---|---------------|--------------------|----------------------|
| Sulphate, water soluble, in soil (16hr extraction) | Determination of water soluble sulphate by ICP-OES. Results reported directly (leachate equivalent) and corrected for extraction ratio (soil equivalent). | In house method. | L038-PL | D | MCERTS |
| Metals in soil by ICP-OES | Determination of metals in soil by aqua-regia digestion followed by ICP-OES. | In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil. | L038-PL | D | MCERTS |
| BS EN 12457-1 (2:1) Leachate Prep | 2:1 (as recieved, moisture adjusted) end over end extraction with water for 24 hours. Eluate filtered prior to analysis. | In-house method based on BSEN12457-1. | L043-PL | W | NONE |
| Asbestos identification in soil | Asbestos Identification with the use of polarised light microscopy in conjunction with disperion staining techniques. | In house method based on HSG 248 | A001-PL | D | ISO 17025 |
| Metals by ICP-OES in leachate | Determination of metals in leachate by acidification followed by ICP-OES. | In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil. | L039-PL | W | ISO 17025 |
| Boron, water soluble, in soil | Determination of water soluble boron in soil by hot water extract followed by ICP-OES. | In-house method based on Second Site Properties version 3 | L038-PL | D | MCERTS |
| Hexavalent chromium in leachate | Determination of hexavalent chromium in leachate by acidification, addition of 1,5 diphenylcarbazide followed by colorimetry. | In-house method | L080-PL | W | ISO 17025 |
| Hexavalent chromium in soil | Determination of hexavalent chromium in soil by extraction in water then by acidification, addition of 1,5 diphenylcarbazide followed by colorimetry. | In-house method | L080-PL | W | MCERTS |
| Moisture Content | Moisture content, determined gravimetrically. (30 oC) | In house method. | L019-UK/PL | W | NONE |
| Monohydric phenols in leachate - LOW LEVEL 1 ug/l | Determination of phenols in leachate by distillation followed by colorimetry. | In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (skalar) | L080-PL | W | ISO 17025 |
| Monohydric phenols in soil | Determination of phenols in soil by extraction with sodium hydroxide followed by distillation followed by colorimetry. | In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (skalar) | L080-PL | W | MCERTS |
| Speciated EPA-16 PAHs in leachate | Determination of PAH compounds in leachate by extraction in dichloromethane followed by GC-MS with the use of surrogate and internal standards. | In-house method based on USEPA 8270 | L102B-PL | W | NONE |
| Speciated EPA-16 PAHs in soil | Determination of PAH compounds in soil by extraction in dichloromethane and hexane followed by GC-MS with the use of surrogate and internal standards. | In-house method based on USEPA 8270 | L064-PL | D | MCERTS |
| pH in soil (automated) | Determination of pH in soil by addition of water followed by automated electrometric measurement. | In house method. | L099-PL | D | MCERTS |
| pH at 20oC in leachate | Determination of pH in leachate by electrometric measurement. | In house method. | L005-PL | W | ISO 17025 |
| Sulphide in soil | Determination of sulphide in soil by acidification and heating to liberate hydrogen sulphide, trapped in an alkaline solution then assayed by ion selective electrode. | In-house method | L010-PL | D | MCERTS |
| Total sulphate (as SO4 in soil) | Determination of total sulphate in soil by extraction with 10% HCl followed by ICP-OES. | In house method. | L038-PL | D | MCERTS |



Environmental Science

Analytical Report Number : 20-28594

Project / Site name: Well Street

Water matrix abbreviations: Surface Water (SW) Potable Water (PW) Ground Water (GW)

| Analytical Test Name | Analytical Method Description | Analytical Method Reference | Method number | Wet / Dry Analysis | Accreditation Status |
|--|---|---|---------------|--------------------|----------------------|
| Stones content of soil | Standard preparation for all samples unless otherwise detailed. Gravimetric determination of stone > 10 mm as % dry weight. | In-house method based on British Standard Methods and MCERTS requirements. | L019-UK/PL | D | NONE |
| Total Sulphur in soil | Determination of total sulphur in soil by extraction with aqua-regia, potassium bromide/bromate followed by ICP-OES. | In house method. | L038-PL | D | MCERTS |
| TPH1 (Leachates) | Determination of dichloromethane extractable hydrocarbons in leachate by GC-MS. | In-house method | L070-PL | W | NONE |
| TPHCWG (Leachates) | Determination of dichloromethane extractable hydrocarbons in leachate by GC-MS. | In-house method | L070-PL | W | NONE |
| Total cyanide in soil | Determination of total cyanide by distillation followed by colorimetry. | In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (Skalar) | L080-PL | W | MCERTS |
| Total organic carbon (Automated) in soil | Determination of organic matter in soil by oxidising with potassium dichromate followed by titration with iron (II) sulphate. | In house method. | L009-PL | D | MCERTS |
| BTEX and MTBE in leachates (Monoaromatics) | Determination of BTEX and MTBE in leachates by headspace GC-MS. | In-house method based on USEPA8260 | L073B-PL | W | ISO 17025 |
| TPH in (Soil) | Determination of TPH bands by HS-GC-MS/GC-FID | In-house method, TPH with carbon banding and silica gel split/cleanup. | L076-PL | D | MCERTS |
| Total cyanide in leachate - 1µg/l | Determination of total cyanide by distillation followed by colorimetry. | In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton | L080-PL | W | ISO 17025 |
| D.O. for Gravimetric Quant if Screen/ID positive | Dependent option for Gravimetric Quant if Screen/ID positive scheduled. | In house asbestos methods A001 & A006. | A006-PL | D | NONE |
| Sulphate, water soluble, in soil | Determination of water soluble sulphate by ICP-OES. Results reported directly (leachate equivalent) and corrected for extraction ratio (soil equivalent). | In house method. | L038-PL | D | MCERTS |

For method numbers ending in 'UK' analysis have been carried out in our laboratory in the United Kingdom.

For method numbers ending in 'PL' analysis have been carried out in our laboratory in Poland.

Soil analytical results are expressed on a dry weight basis. Where analysis is carried out on as-received the results obtained are multiplied by a moisture correction factor that is determined gravimetrically using the moisture content which is carried out at a maximum of 30°C.



4041

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e:

Analytical Report Number : 20-30713

| | | | |
|-----------------------------|-----------------|--|------------|
| Project / Site name: | Well St | Samples received on: | 17/09/2020 |
| Your job number: | 14278 | Samples instructed on/ Analysis started on: | 17/09/2020 |
| Your order number: | | Analysis completed by: | 23/09/2020 |
| Report Issue Number: | 1 | Report issued on: | 23/09/2020 |
| Samples Analysed: | 3 water samples | | |

Signed: *A. Czerwińska*

Agnieszka Czerwińska
Technical Reviewer (Reporting Team)
For & on behalf of i2 Analytical Ltd.

Standard Geotechnical, Asbestos and Chemical Testing Laboratory located at: ul. Pionierów 39, 41 -711 Ruda Śląska, Poland.

Accredited tests are defined within the report, opinions and interpretations expressed herein are outside the scope of accreditation.

| | | |
|--|-----------|---------------------------|
| Standard sample disposal times, unless otherwise agreed with the laboratory, are : | soils | - 4 weeks from reporting |
| | leachates | - 2 weeks from reporting |
| | waters | - 2 weeks from reporting |
| | asbestos | - 6 months from reporting |

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Any assessments of compliance with specifications are based on actual analytical results with no contribution from uncertainty of measurement. Application of uncertainty of measurement would provide a range within which the true result lies. An estimate of measurement uncertainty can be provided on request.



Analytical Report Number: 20-30713
Project / Site name: Well St



| Lab Sample Number | | | | 1623382 | 1623383 | 1623384 |
|--|-------|--------------------|----------------------|---------------|---------------|---------------|
| Sample Reference | | | | WS101 | WS108 | WS111 |
| Sample Number | | | | None Supplied | None Supplied | None Supplied |
| Depth (m) | | | | None Supplied | None Supplied | None Supplied |
| Date Sampled | | | | 16/09/2020 | 16/09/2020 | 16/09/2020 |
| Time Taken | | | | None Supplied | None Supplied | None Supplied |
| Analytical Parameter (Water Analysis) | Units | Limit of detection | Accreditation Status | | | |

General Inorganics

| | | | | | | |
|----------------------------------|----------|-----|-----------|-------|-------|-----|
| pH | pH Units | N/A | ISO 17025 | 7.5 | 7 | 7.1 |
| Total Cyanide (Low Level 1 µg/l) | µg/l | 1 | ISO 17025 | < 1.0 | < 1.0 | U/S |
| Dissolved Organic Carbon (DOC) | mg/l | 0.1 | NONE | 4.78 | 109 | 857 |

Total Phenols

| | | | | | | |
|----------------------------|------|---|-----------|-----|-----|-----|
| Total Phenols (monohydric) | µg/l | 1 | ISO 17025 | 6.2 | 250 | U/S |
|----------------------------|------|---|-----------|-----|-----|-----|

Heavy Metals / Metalloids

| | | | | | | |
|-----------------------|------|-------|-----------|-------|-------|-----|
| Calcium (dissolved) | mg/l | 0.012 | ISO 17025 | 91 | 130 | 370 |
| Chromium (hexavalent) | µg/l | 5 | ISO 17025 | < 5.0 | < 5.0 | U/S |

| | | | | | | |
|-----------------------|------|------|-----------|--------|--------|--------|
| Arsenic (dissolved) | µg/l | 0.15 | ISO 17025 | < 0.15 | 3.69 | 0.93 |
| Cadmium (dissolved) | µg/l | 0.02 | ISO 17025 | < 0.02 | < 0.02 | 0.13 |
| Chromium (dissolved) | µg/l | 0.2 | ISO 17025 | 4 | 5.9 | 15 |
| Copper (dissolved) | µg/l | 0.5 | ISO 17025 | < 0.5 | 0.7 | 14 |
| Lead (dissolved) | µg/l | 0.2 | ISO 17025 | 0.6 | 0.3 | 3.9 |
| Manganese (dissolved) | µg/l | 0.05 | ISO 17025 | 520 | 1500 | 2100 |
| Mercury (dissolved) | µg/l | 0.05 | ISO 17025 | < 0.05 | < 0.05 | < 0.05 |
| Nickel (dissolved) | µg/l | 0.5 | ISO 17025 | 2.2 | 5.5 | 25 |
| Selenium (dissolved) | µg/l | 0.6 | ISO 17025 | 0.8 | 1.9 | 3.8 |
| Zinc (dissolved) | µg/l | 0.5 | ISO 17025 | 5.2 | 3.4 | 48 |

Monoaromatics & Oxygenates

| | | | | | | |
|------------------------------------|------|---|-----------|-------|-------|-------|
| Benzene | µg/l | 1 | ISO 17025 | < 1.0 | < 1.0 | 3.1 |
| Toluene | µg/l | 1 | ISO 17025 | < 1.0 | < 1.0 | 9 |
| Ethylbenzene | µg/l | 1 | ISO 17025 | < 1.0 | < 1.0 | < 1.0 |
| p & m-xylene | µg/l | 1 | ISO 17025 | < 1.0 | < 1.0 | < 1.0 |
| o-xylene | µg/l | 1 | ISO 17025 | < 1.0 | < 1.0 | < 1.0 |
| MTBE (Methyl Tertiary Butyl Ether) | µg/l | 1 | ISO 17025 | < 1.0 | < 1.0 | < 1.0 |

Petroleum Hydrocarbons

| | | | | | | |
|------------------|------|----|------|------|------|------|
| TPH1 (C10 - C40) | µg/l | 10 | NONE | < 10 | < 10 | < 10 |
|------------------|------|----|------|------|------|------|

| | | | | | | |
|--------------------------------|------|----|-----------|-------|-------|-------|
| TPH-CWG - Aliphatic >C5 - C6 | µg/l | 1 | ISO 17025 | < 1.0 | < 1.0 | < 1.0 |
| TPH-CWG - Aliphatic >C6 - C8 | µg/l | 1 | ISO 17025 | < 1.0 | < 1.0 | < 1.0 |
| TPH-CWG - Aliphatic >C8 - C10 | µg/l | 1 | ISO 17025 | < 1.0 | < 1.0 | < 1.0 |
| TPH-CWG - Aliphatic >C10 - C12 | µg/l | 10 | NONE | < 10 | < 10 | < 10 |
| TPH-CWG - Aliphatic >C12 - C16 | µg/l | 10 | NONE | < 10 | < 10 | < 10 |
| TPH-CWG - Aliphatic >C16 - C21 | µg/l | 10 | NONE | < 10 | < 10 | < 10 |
| TPH-CWG - Aliphatic >C21 - C35 | µg/l | 10 | NONE | < 10 | < 10 | < 10 |
| TPH-CWG - Aliphatic (C5 - C35) | µg/l | 10 | NONE | < 10 | < 10 | < 10 |

| | | | | | | |
|-------------------------------|------|----|-----------|-------|-------|-------|
| TPH-CWG - Aromatic >C5 - C7 | µg/l | 1 | ISO 17025 | < 1.0 | < 1.0 | 3.1 |
| TPH-CWG - Aromatic >C7 - C8 | µg/l | 1 | ISO 17025 | < 1.0 | < 1.0 | 9 |
| TPH-CWG - Aromatic >C8 - C10 | µg/l | 1 | ISO 17025 | < 1.0 | < 1.0 | < 1.0 |
| TPH-CWG - Aromatic >C10 - C12 | µg/l | 10 | NONE | < 10 | < 10 | < 10 |
| TPH-CWG - Aromatic >C12 - C16 | µg/l | 10 | NONE | < 10 | < 10 | < 10 |
| TPH-CWG - Aromatic >C16 - C21 | µg/l | 10 | NONE | < 10 | < 10 | < 10 |
| TPH-CWG - Aromatic >C21 - C35 | µg/l | 10 | NONE | < 10 | < 10 | < 10 |



Analytical Report Number: 20-30713
Project / Site name: Well St

| Lab Sample Number | | | | 1623382 | 1623383 | 1623384 |
|--|-------|--------------------|----------------------|---------------|---------------|---------------|
| Sample Reference | | | | WS101 | WS108 | WS111 |
| Sample Number | | | | None Supplied | None Supplied | None Supplied |
| Depth (m) | | | | None Supplied | None Supplied | None Supplied |
| Date Sampled | | | | 16/09/2020 | 16/09/2020 | 16/09/2020 |
| Time Taken | | | | None Supplied | None Supplied | None Supplied |
| Analytical Parameter (Water Analysis) | Units | Limit of detection | Accreditation Status | | | |
| TPH-CWG - Aromatic (C5 - C35) | µg/l | 10 | NONE | < 10 | < 10 | 12 |

VOCs

| | | | | | | |
|---------------------------------------|------|---|-----------|-------|-------|-------|
| Chloromethane | µg/l | 1 | ISO 17025 | < 1.0 | < 1.0 | < 1.0 |
| Chloroethane | µg/l | 1 | ISO 17025 | < 1.0 | < 1.0 | < 1.0 |
| Bromomethane | µg/l | 1 | ISO 17025 | < 1.0 | < 1.0 | < 1.0 |
| Vinyl Chloride | µg/l | 1 | NONE | < 1.0 | < 1.0 | < 1.0 |
| Trichlorofluoromethane | µg/l | 1 | NONE | < 1.0 | < 1.0 | < 1.0 |
| 1,1-Dichloroethene | µg/l | 1 | ISO 17025 | < 1.0 | < 1.0 | < 1.0 |
| 1,1,2-Trichloro-1,2,2-trifluoroethane | µg/l | 1 | ISO 17025 | < 1.0 | < 1.0 | < 1.0 |
| Cis-1,2-dichloroethene | µg/l | 1 | ISO 17025 | < 1.0 | < 1.0 | < 1.0 |
| MTBE (Methyl Tertiary Butyl Ether) | µg/l | 1 | ISO 17025 | < 1.0 | < 1.0 | < 1.0 |
| 1,1-Dichloroethane | µg/l | 1 | ISO 17025 | < 1.0 | < 1.0 | < 1.0 |
| 2,2-Dichloropropane | µg/l | 1 | ISO 17025 | < 1.0 | < 1.0 | < 1.0 |
| Trichloromethane | µg/l | 1 | ISO 17025 | < 1.0 | < 1.0 | < 1.0 |
| 1,1,1-Trichloroethane | µg/l | 1 | ISO 17025 | < 1.0 | < 1.0 | < 1.0 |
| 1,2-Dichloroethane | µg/l | 1 | ISO 17025 | < 1.0 | < 1.0 | < 1.0 |
| 1,1-Dichloropropene | µg/l | 1 | ISO 17025 | < 1.0 | < 1.0 | < 1.0 |
| Trans-1,2-dichloroethene | µg/l | 1 | ISO 17025 | < 1.0 | < 1.0 | < 1.0 |
| Benzene | µg/l | 1 | ISO 17025 | < 1.0 | < 1.0 | 3.1 |
| Tetrachloromethane | µg/l | 1 | ISO 17025 | < 1.0 | < 1.0 | < 1.0 |
| 1,2-Dichloropropane | µg/l | 1 | ISO 17025 | < 1.0 | < 1.0 | < 1.0 |
| Trichloroethene | µg/l | 1 | ISO 17025 | < 1.0 | < 1.0 | < 1.0 |
| Dibromomethane | µg/l | 1 | ISO 17025 | < 1.0 | < 1.0 | < 1.0 |
| Bromodichloromethane | µg/l | 1 | ISO 17025 | < 1.0 | < 1.0 | < 1.0 |
| Cis-1,3-dichloropropene | µg/l | 1 | ISO 17025 | < 1.0 | < 1.0 | < 1.0 |
| Trans-1,3-dichloropropene | µg/l | 1 | ISO 17025 | < 1.0 | < 1.0 | < 1.0 |
| Toluene | µg/l | 1 | ISO 17025 | < 1.0 | < 1.0 | 9 |
| 1,1,2-Trichloroethane | µg/l | 1 | ISO 17025 | < 1.0 | < 1.0 | < 1.0 |
| 1,3-Dichloropropane | µg/l | 1 | ISO 17025 | < 1.0 | < 1.0 | < 1.0 |
| Dibromochloromethane | µg/l | 1 | ISO 17025 | < 1.0 | < 1.0 | < 1.0 |
| Tetrachloroethene | µg/l | 1 | ISO 17025 | < 1.0 | < 1.0 | < 1.0 |
| 1,2-Dibromoethane | µg/l | 1 | ISO 17025 | < 1.0 | < 1.0 | < 1.0 |
| Chlorobenzene | µg/l | 1 | ISO 17025 | < 1.0 | < 1.0 | < 1.0 |
| 1,1,1,2-Tetrachloroethane | µg/l | 1 | ISO 17025 | < 1.0 | < 1.0 | < 1.0 |
| Ethylbenzene | µg/l | 1 | ISO 17025 | < 1.0 | < 1.0 | < 1.0 |
| p & m-Xylene | µg/l | 1 | ISO 17025 | < 1.0 | < 1.0 | < 1.0 |
| Styrene | µg/l | 1 | ISO 17025 | < 1.0 | < 1.0 | < 1.0 |
| Tribromomethane | µg/l | 1 | ISO 17025 | < 1.0 | < 1.0 | < 1.0 |
| o-Xylene | µg/l | 1 | ISO 17025 | < 1.0 | < 1.0 | < 1.0 |
| 1,1,2,2-Tetrachloroethane | µg/l | 1 | ISO 17025 | < 1.0 | < 1.0 | < 1.0 |
| Isopropylbenzene | µg/l | 1 | ISO 17025 | < 1.0 | < 1.0 | < 1.0 |
| Bromobenzene | µg/l | 1 | ISO 17025 | < 1.0 | < 1.0 | < 1.0 |
| n-Propylbenzene | µg/l | 1 | ISO 17025 | < 1.0 | < 1.0 | < 1.0 |
| 2-Chlorotoluene | µg/l | 1 | ISO 17025 | < 1.0 | < 1.0 | < 1.0 |
| 4-Chlorotoluene | µg/l | 1 | ISO 17025 | < 1.0 | < 1.0 | < 1.0 |
| 1,3,5-Trimethylbenzene | µg/l | 1 | ISO 17025 | < 1.0 | < 1.0 | < 1.0 |
| tert-Butylbenzene | µg/l | 1 | ISO 17025 | < 1.0 | < 1.0 | < 1.0 |
| 1,2,4-Trimethylbenzene | µg/l | 1 | ISO 17025 | < 1.0 | < 1.0 | < 1.0 |
| sec-Butylbenzene | µg/l | 1 | ISO 17025 | < 1.0 | < 1.0 | < 1.0 |
| 1,3-Dichlorobenzene | µg/l | 1 | ISO 17025 | < 1.0 | < 1.0 | < 1.0 |
| p-Isopropyltoluene | µg/l | 1 | ISO 17025 | < 1.0 | < 1.0 | 25.5 |



Analytical Report Number: 20-30713
Project / Site name: Well St

| Lab Sample Number | | | | 1623382 | 1623383 | 1623384 |
|--|-------|--------------------|----------------------|---------------|---------------|---------------|
| Sample Reference | | | | WS101 | WS108 | WS111 |
| Sample Number | | | | None Supplied | None Supplied | None Supplied |
| Depth (m) | | | | None Supplied | None Supplied | None Supplied |
| Date Sampled | | | | 16/09/2020 | 16/09/2020 | 16/09/2020 |
| Time Taken | | | | None Supplied | None Supplied | None Supplied |
| Analytical Parameter (Water Analysis) | Units | Limit of detection | Accreditation Status | | | |
| 1,2-Dichlorobenzene | µg/l | 1 | ISO 17025 | < 1.0 | < 1.0 | < 1.0 |
| 1,4-Dichlorobenzene | µg/l | 1 | ISO 17025 | < 1.0 | < 1.0 | < 1.0 |
| Butylbenzene | µg/l | 1 | ISO 17025 | < 1.0 | < 1.0 | < 1.0 |
| 1,2-Dibromo-3-chloropropane | µg/l | 1 | ISO 17025 | < 1.0 | < 1.0 | < 1.0 |
| 1,2,4-Trichlorobenzene | µg/l | 1 | ISO 17025 | < 1.0 | < 1.0 | < 1.0 |
| Hexachlorobutadiene | µg/l | 1 | ISO 17025 | < 1.0 | < 1.0 | < 1.0 |
| 1,2,3-Trichlorobenzene | µg/l | 1 | ISO 17025 | < 1.0 | < 1.0 | < 1.0 |

SVOCs

| | | | | | | |
|-----------------------------|------|------|-----------|--------|--------|--------|
| Aniline | µg/l | 0.05 | NONE | < 0.05 | < 0.05 | < 0.05 |
| Phenol | µg/l | 0.05 | NONE | < 0.05 | 58 | 420 |
| 2-Chlorophenol | µg/l | 0.05 | NONE | < 0.05 | < 0.05 | < 0.05 |
| Bis(2-chloroethyl)ether | µg/l | 0.05 | NONE | < 0.05 | < 0.05 | < 0.05 |
| 1,3-Dichlorobenzene | µg/l | 0.05 | NONE | < 0.05 | < 0.05 | < 0.05 |
| 1,2-Dichlorobenzene | µg/l | 0.05 | NONE | < 0.05 | < 0.05 | < 0.05 |
| 1,4-Dichlorobenzene | µg/l | 0.05 | NONE | < 0.05 | < 0.05 | < 0.05 |
| Bis(2-chloroisopropyl)ether | µg/l | 0.05 | NONE | < 0.05 | < 0.05 | < 0.05 |
| 2-Methylphenol | µg/l | 0.05 | NONE | < 0.05 | < 0.05 | < 0.05 |
| Hexachloroethane | µg/l | 0.05 | NONE | < 0.05 | < 0.05 | < 0.05 |
| Nitrobenzene | µg/l | 0.05 | NONE | < 0.05 | < 0.05 | < 0.05 |
| 4-Methylphenol | µg/l | 0.05 | NONE | 2.1 | 600 | 5900 |
| Isophorone | µg/l | 0.05 | NONE | < 0.05 | < 0.05 | < 0.05 |
| 2-Nitrophenol | µg/l | 0.05 | NONE | < 0.05 | < 0.05 | < 0.05 |
| 2,4-Dimethylphenol | µg/l | 0.05 | NONE | < 0.05 | < 0.05 | < 0.05 |
| Bis(2-chloroethoxy)methane | µg/l | 0.05 | NONE | < 0.05 | < 0.05 | < 0.05 |
| 1,2,4-Trichlorobenzene | µg/l | 0.05 | NONE | < 0.05 | < 0.05 | < 0.05 |
| Naphthalene | µg/l | 0.01 | ISO 17025 | < 0.01 | < 0.01 | < 0.01 |
| 2,4-Dichlorophenol | µg/l | 0.05 | NONE | < 0.05 | < 0.05 | < 0.05 |
| 4-Chloroaniline | µg/l | 0.05 | NONE | < 0.05 | < 0.05 | < 0.05 |
| Hexachlorobutadiene | µg/l | 0.05 | NONE | < 0.05 | < 0.05 | < 0.05 |
| 4-Chloro-3-methylphenol | µg/l | 0.05 | NONE | < 0.05 | < 0.05 | < 0.05 |
| 2,4,6-Trichlorophenol | µg/l | 0.05 | NONE | < 0.05 | < 0.05 | < 0.05 |
| 2,4,5-Trichlorophenol | µg/l | 0.05 | NONE | < 0.05 | < 0.05 | < 0.05 |
| 2-Methylnaphthalene | µg/l | 0.05 | NONE | < 0.05 | < 0.05 | < 0.05 |
| 2-Chloronaphthalene | µg/l | 0.05 | NONE | < 0.05 | < 0.05 | < 0.05 |
| Dimethylphthalate | µg/l | 0.05 | NONE | < 0.05 | < 0.05 | < 0.05 |
| 2,6-Dinitrotoluene | µg/l | 0.05 | NONE | < 0.05 | < 0.05 | < 0.05 |
| Acenaphthylene | µg/l | 0.01 | ISO 17025 | < 0.01 | < 0.01 | < 0.01 |
| Acenaphthene | µg/l | 0.01 | ISO 17025 | < 0.01 | < 0.01 | < 0.01 |
| 2,4-Dinitrotoluene | µg/l | 0.05 | NONE | < 0.05 | < 0.05 | < 0.05 |
| Dibenzofuran | µg/l | 0.05 | NONE | < 0.05 | < 0.05 | < 0.05 |
| 4-Chlorophenyl phenyl ether | µg/l | 0.05 | NONE | < 0.05 | < 0.05 | < 0.05 |
| Diethyl phthalate | µg/l | 0.05 | NONE | < 0.05 | < 0.05 | < 0.05 |
| 4-Nitroaniline | µg/l | 0.05 | NONE | < 0.05 | < 0.05 | < 0.05 |
| Fluorene | µg/l | 0.01 | ISO 17025 | < 0.01 | < 0.01 | < 0.01 |
| Azobenzene | µg/l | 0.05 | NONE | < 0.05 | < 0.05 | < 0.05 |
| Bromophenyl phenyl ether | µg/l | 0.05 | NONE | < 0.05 | < 0.05 | < 0.05 |
| Hexachlorobenzene | µg/l | 0.05 | NONE | < 0.05 | < 0.05 | < 0.05 |
| Phenanthrene | µg/l | 0.01 | ISO 17025 | < 0.01 | < 0.01 | < 0.01 |
| Anthracene | µg/l | 0.01 | ISO 17025 | < 0.01 | < 0.01 | < 0.01 |
| Carbazole | µg/l | 0.05 | NONE | < 0.05 | < 0.05 | < 0.05 |
| Dibutyl phthalate | µg/l | 0.05 | NONE | < 0.05 | < 0.05 | < 0.05 |



Analytical Report Number: 20-30713
 Project / Site name: Well St



| Lab Sample Number | | | | 1623382 | 1623383 | 1623384 |
|--|-------|--------------------|----------------------|---------------|---------------|---------------|
| Sample Reference | | | | WS101 | WS108 | WS111 |
| Sample Number | | | | None Supplied | None Supplied | None Supplied |
| Depth (m) | | | | None Supplied | None Supplied | None Supplied |
| Date Sampled | | | | 16/09/2020 | 16/09/2020 | 16/09/2020 |
| Time Taken | | | | None Supplied | None Supplied | None Supplied |
| Analytical Parameter (Water Analysis) | Units | Limit of detection | Accreditation Status | | | |
| Anthraquinone | µg/l | 0.05 | NONE | < 0.05 | < 0.05 | < 0.05 |
| Fluoranthene | µg/l | 0.01 | ISO 17025 | < 0.01 | < 0.01 | < 0.01 |
| Pyrene | µg/l | 0.01 | ISO 17025 | < 0.01 | < 0.01 | < 0.01 |
| Butyl benzyl phthalate | µg/l | 0.05 | NONE | < 0.05 | < 0.05 | < 0.05 |
| Benzo(a)anthracene | µg/l | 0.01 | ISO 17025 | < 0.01 | < 0.01 | < 0.01 |
| Chrysene | µg/l | 0.01 | ISO 17025 | < 0.01 | < 0.01 | < 0.01 |
| Benzo(b)fluoranthene | µg/l | 0.01 | ISO 17025 | < 0.01 | < 0.01 | < 0.01 |
| Benzo(k)fluoranthene | µg/l | 0.01 | ISO 17025 | < 0.01 | < 0.01 | < 0.01 |
| Benzo(a)pyrene | µg/l | 0.01 | ISO 17025 | < 0.01 | < 0.01 | < 0.01 |
| Indeno(1,2,3-cd)pyrene | µg/l | 0.01 | ISO 17025 | < 0.01 | < 0.01 | < 0.01 |
| Dibenz(a,h)anthracene | µg/l | 0.01 | ISO 17025 | < 0.01 | < 0.01 | < 0.01 |
| Benzo(ghi)perylene | µg/l | 0.01 | ISO 17025 | < 0.01 | < 0.01 | < 0.01 |

U/S = Unsuitable Sample I/S = Insufficient Sample



Analytical Report Number : 20-30713
Project / Site name: Well St

Water matrix abbreviations: Surface Water (SW) Potable Water (PW) Ground Water (GW)

| Analytical Test Name | Analytical Method Description | Analytical Method Reference | Method number | Wet / Dry Analysis | Accreditation Status |
|--|---|---|---------------|--------------------|----------------------|
| Metals in water by ICP-OES (dissolved) | Determination of metals in water by acidification followed by ICP-OES. Accredited Matrices SW, GW, PW, PrW.(Al, Cu,Fe,Zn). | In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil. | L039-PL | W | ISO 17025 |
| Metals in water by ICP-MS (dissolved) | Determination of metals in water by acidification followed by ICP-MS. Accredited Matrices: SW, GW, PW except B=SW,GW, Hg=SW,PW, Al=SW,PW. | In-house method based on USEPA Method 6020 & 200.8 "for the determination of trace elements in water by ICP-MS. | L012-PL | W | ISO 17025 |
| Hexavalent chromium in water | Determination of hexavalent chromium in water by acidification, addition of 1,5 diphenylcarbazide followed by colorimetry. | In-house method by continuous flow analyser. Accredited Matrices SW, GW, PW. | L080-PL | W | ISO 17025 |
| Monohydric phenols in water - LOW LEVEL 1 ug/l | Determination of phenols in water by continuous flow analyser. Accredited matrices: SW PW GW | In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (skalar) | L080-PL | W | ISO 17025 |
| Semi-volatile organic compounds in water | Determination of semi-volatile organic compounds in leachate by extraction in dichloromethane followed by GC-MS. | In-house method based on USEPA 8270 | L102B-PL | W | NONE |
| TPH1 (Waters) | Determination of dichloromethane extractable hydrocarbons in water by GC-MS. | In-house method | L070-PL | W | NONE |
| TPHCWG (Waters) | Determination of dichloromethane extractable hydrocarbons in water by GC-MS, speciation by interpretation. | In-house method | L070-PL | W | NONE |
| Volatile organic compounds in water | Determination of volatile organic compounds in water by headspace GC-MS. Accredited matrices: SW PW GW | In-house method based on USEPA8260 | L073B-PL | W | ISO 17025 |
| Dissolved Organic Carbon in water | Determination of dissolved inorganic carbon in water by TOC/DOC NDIR Analyser. | In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton | L037-PL | W | NONE |
| BTEX and MTBE in water (Monoaromatics) | Determination of BTEX and MTBE in water by headspace GC-MS. Accredited matrices: SW PW GW | In-house method based on USEPA8260 | L073B-PL | W | ISO 17025 |
| Low level total cyanide in water | Determination of total cyanide by distillation followed by colorimetry. Accredited matrices: SW PW GW | In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (Skalar) | L080-PL | W | ISO 17025 |
| pH at 20oC in water (automated) | Determination of pH in water by electrometric measurement. Accredited matrices: SW PW GW | In house method. | L099-PL | W | ISO 17025 |

For method numbers ending in 'UK' analysis have been carried out in our laboratory in the United Kingdom.

For method numbers ending in 'PL' analysis have been carried out in our laboratory in Poland.

Soil analytical results are expressed on a dry weight basis. Where analysis is carried out on as-received the results obtained are multiplied by a moisture correction factor that is determined gravimetrically using the moisture content which is carried out at a maximum of 30oC.

**APPENDIX VII
ORIGIN OF TIER I GENERIC
ASSESSMENT CRITERIA**

| CONSTITUENT | ORIGIN OF RISK ASSESSMENT VALUE |
|--|--|
| Arsenic | 2014 LQM/CIEH S4ULs |
| Cadmium | 2014 LQM/CIEH S4ULs |
| Chromium | 2014 LQM/CIEH S4ULs |
| Lead | 2014 LQM/CIEH S4ULs |
| Mercury | 2014 LQM/CIEH S4ULs – methylmercury |
| Nickel | 2014 LQM/CIEH S4ULs |
| Selenium | 2014 LQM/CIEH S4ULs |
| Copper | 2014 LQM/CIEH S4ULs |
| Zinc | 2014 LQM/CIEH S4ULs |
| Cyanide – Total | 2014 LQM/CIEH S4ULs |
| Phenols – Total | 2014 LQM/CIEH S4ULs |
| Naphthalene | General assessment criteria (GAC) developed by CIEH/LQM Suitable 4 Use Levels with supporting data from SR3, SR7 and existing Tox report where applicable. 1% SOM. |
| Acenaphthylene | |
| Acenaphthene | |
| Fluorene | |
| Phenanthrene | |
| Anthracene | |
| Fluoranthene | |
| Pyrene | |
| Benzo(a)Anthracene | |
| Chrysene | |
| Benzo(b/k)Fluoranthene (iii) | |
| Benzo(a)Pyrene | |
| Indeno(123-cd)Pyrene | |
| Dibenzo(a,h)Anthracene | |
| Benzo(ghi)Perylene | |
| TPH C ₅ -C ₆ (aliphatic) | |
| TPH C ₆ -C ₈ (aliphatic) | |
| TPH C ₈ -C ₁₀ (aliphatic) | |
| TPH C ₁₀ -C ₁₂ (aliphatic) | |
| TPH C ₁₂ -C ₁₆ (aromatic) | |
| TPH C ₁₆ -C ₂₁ (aromatic) | |
| TPH C ₂₁ -C ₃₅ (aromatic) | |



APPENDIX VIII
GEO TECHNICAL TESTING
RESULTS



LABORATORY REPORT



4043

Contract Number: PSL20/4666

Report Date: 18 September 2020

Client's Reference: 14-278

Client Name: E3P
Taylor Road
Urmston
Manchester
M41 7JQ

For the attention of: Veronique Wilkinson

Contract Title: Well Street, Buckley

Date Received: 7/9/2020
Date Commenced: 7/9/2020
Date Completed: 18/9/2020

Notes: Opinions and Interpretations are outside the UKAS Accreditation

A copy of the Laboratory Schedule of accredited tests as issued by UKAS is attached to this report. 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 other than in full, without the prior written approval of the laboratory.

Checked and Approved Signatories:

R Gunson
(Director)

S Royle
(Laboratory Manager)

A Watkins
(Director)

S Eyre
(Senior Technician)

R Berriman
(Quality Manager)

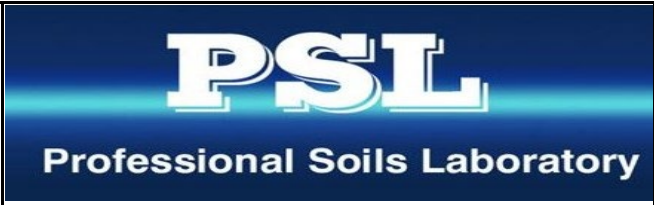
L Knight
(Senior Technician)

5 – 7 Hexthorpe Road, Hexthorpe,
Doncaster DN4 0AR
tel: +44 (0)844 815 6641
fax: +44 (0)844 815 6642
e-mail: rgunson@prosoils.co.uk
awatkins@prosoils.co.uk

Page 1 of

SUMMARY OF LABORATORY SOIL DESCRIPTIONS

| Hole Number | Sample Number | Sample Type | Top Depth m | Base Depth m | Description of Sample |
|-------------|---------------|-------------|----------------|-----------------|---|
| WS102 | | U | 1.50 | 2.00 | Stiff brown slightly gravelly sandy CLAY. |
| WS107 | | D | 1.00 | | Brown slightly gravelly sandy CLAY. |
| WS112 | | D | 2.00 | | Brown slightly gravelly sandy CLAY. |
| TP107 | | B | 1.50 | | Brown gravelly very sandy CLAY. |
| WS104 | | D | 2.00 | | Brown slightly gravelly sandy CLAY. |
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Well Street, Buckley

| |
|---------------------|
| Contract No: |
| PSL20/4666 |
| Client Ref: |
| 14-278 |

SUMMARY OF SOIL CLASSIFICATION TESTS

(BS1377 : PART 2 : 1990)

| Hole Number | Sample Number | Sample Type | Top Depth m | Base Depth m | Moisture Content % <small>Clause 3.2</small> | Linear Shrinkage % <small>Clause 6.5</small> | Particle Density Mg/m ³ <small>Clause 8.2</small> | Liquid Limit % <small>Clause 4.3/4</small> | Plastic Limit % <small>Clause 5.3</small> | Plasticity Index % <small>Clause 5.4</small> | Passing .425mm % | Remarks |
|----------------|------------------|----------------|-------------------|--------------------|---|---|---|---|--|---|------------------------|-----------------------------|
| WS107 | | D | 1.00 | | 15 | | | 31 | 16 | 15 | 94 | Low plasticity CL. |
| WS112 | | D | 2.00 | | 13 | | | 38 | 19 | 19 | 88 | Intermediate plasticity CI. |
| WS104 | | D | 2.00 | | 12 | | | 33 | 17 | 16 | 90 | Low plasticity CL. |
| | | | | | | | | | | | | |
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SYMBOLS : NP : Non Plastic

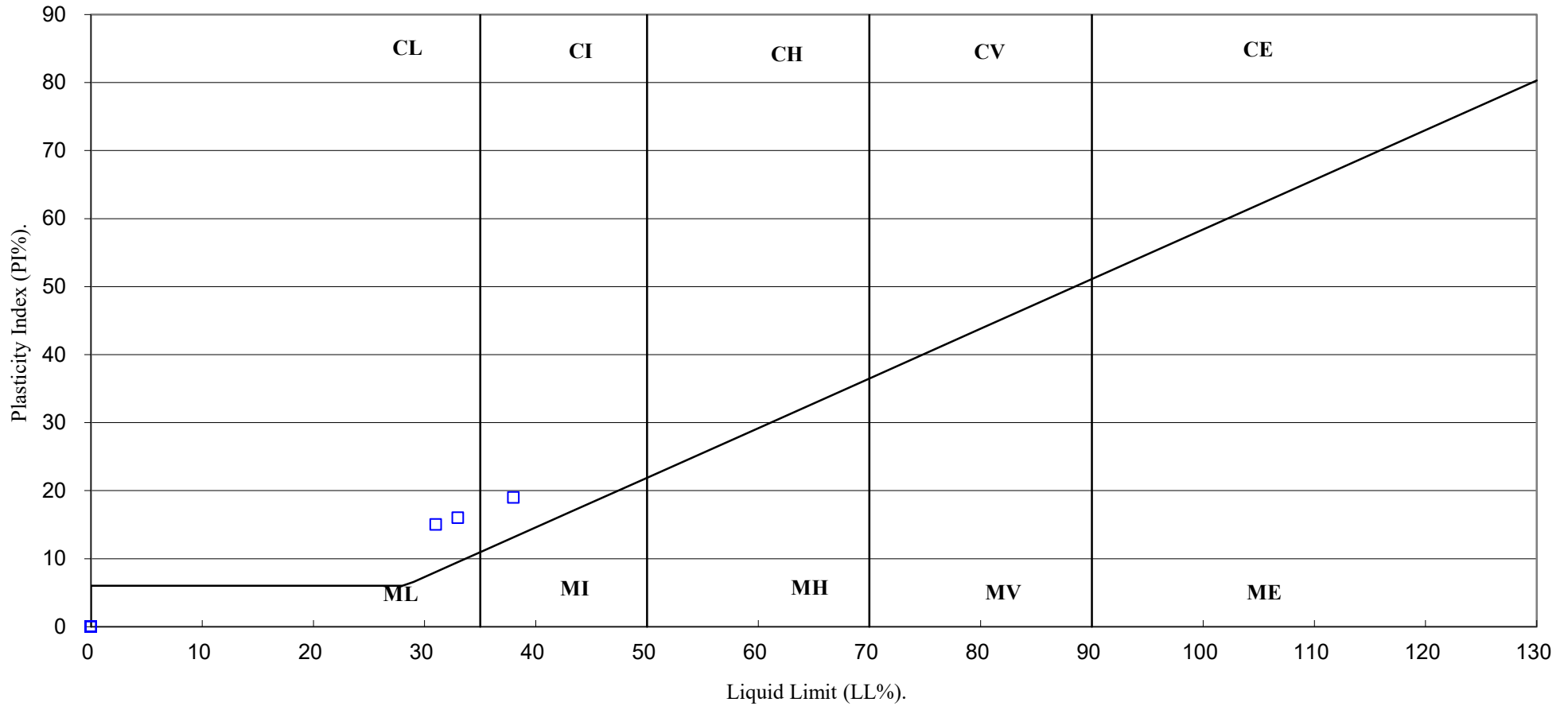
* : Liquid Limit and Plastic Limit Wet Sieved.



Well Street, Buckley

| |
|---------------------|
| Contract No: |
| PSL20/4666 |
| Client Ref: |
| 14-278 |

PLASTICITY CHART FOR CASAGRANDE CLASSIFICATION.



4043

PSL
Professional Soils Laboratory

Well Street, Buckley

Contract No:

PSL20/4666

Client Ref:

14-278

PARTICLE SIZE DISTRIBUTION TEST

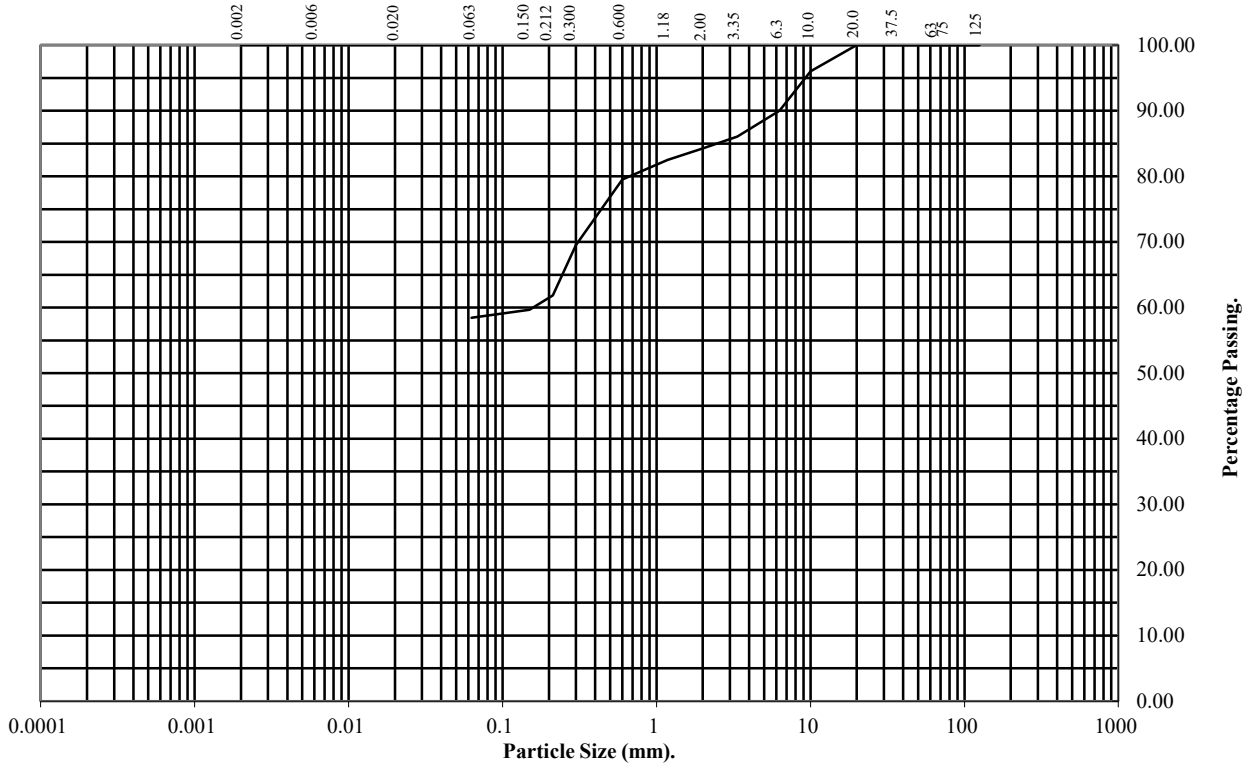
BS1377 : Part 2 : 1990

Wet Sieve, Clause 9.2

Hole Number: TP107 **Top Depth (m):** 1.50

Sample Number: **Base Depth(m):**

Sample Type: B



| BS Test Sieve (mm) | Percentage Passing |
|--------------------|--------------------|
| 125 | 100 |
| 75 | 100 |
| 63 | 100 |
| 37.5 | 100 |
| 20 | 100 |
| 10 | 96 |
| 6.3 | 90 |
| 3.35 | 86 |
| 2 | 84 |
| 1.18 | 82 |
| 0.6 | 80 |
| 0.3 | 70 |
| 0.212 | 62 |
| 0.15 | 60 |
| 0.063 | 58 |

| Soil Fraction | Total Percentage |
|---------------|------------------|
| Cobbles | 0 |
| Gravel | 16 |
| Sand | 26 |
| Silt/Clay | 58 |

Remarks:
See Summary of Soil Descriptions



Well Street, Buckley

| |
|---------------------|
| Contract No: |
| PSL20/4666 |
| Client Ref: |
| 14-278 |

UNDRAINED SHEAR STRENGTH IN TRIAXIAL COMPRESSION

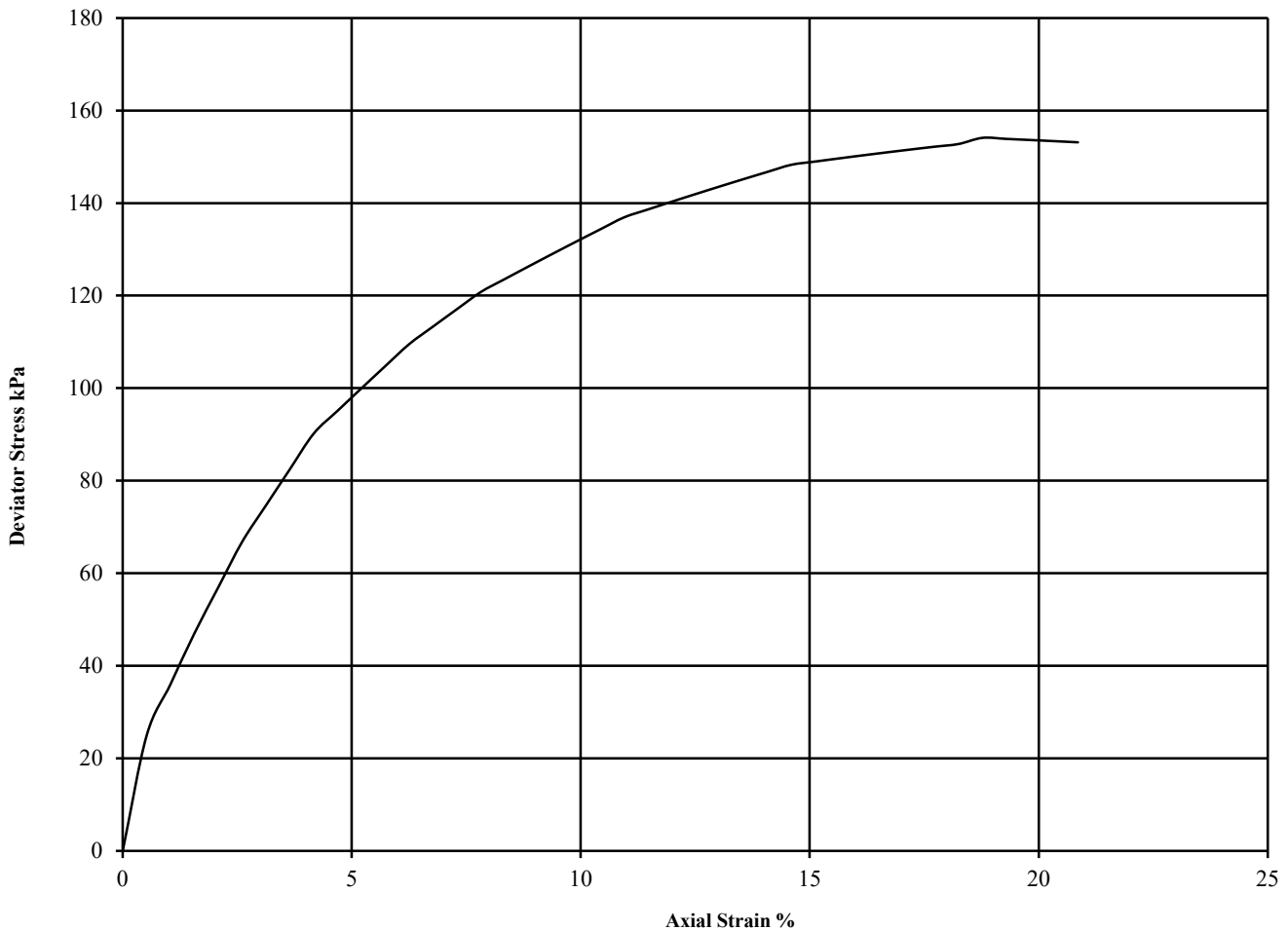
WITHOUT MEASUREMENT OF PORE PRESSURE

BS1377 : Part7 : 1990: Clause 8

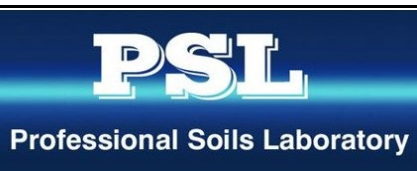
Hole Number: **WS102** Top Depth (m): **1.50**

Sample Number: Base Depth (m): **2.00**

Sample Type **U**



| Diameter (mm): | | 73 | | Height (mm): | | 140 | | Test: | | UU Single Stage | | Remarks: | |
|----------------|----------------------|-----------------------------------|----------------------------------|---------------------|----------------------------------|-------------------------|--------------------|-----------------|---|-----------------|--|----------|--|
| Specimen | Moisture Content (%) | Bulk Density (Mg/m ³) | Dry Density (Mg/m ³) | Cell Pressure (kPa) | Corr. Max. Deviator Stress (kPa) | Shear Strength Cu (kPa) | Failure Strain (%) | Mode of Failure | Undisturbed Sample Sample taken from top of tube Rate of strain = 2 %/min Latex Membrane used 0.2 mm thick, Correction applied 0.45 See summary of soil descriptions | | | | |
| 1 | 15 | 2.15 | 1.87 | 35 | 154 | 77 | 18.8 | Plastic | | | | | |



Well Street, Buckley

Contract No:

PSL20/4666

Client Ref:

14-278

ONE DIMENSIONAL CONSOLIDATION TEST

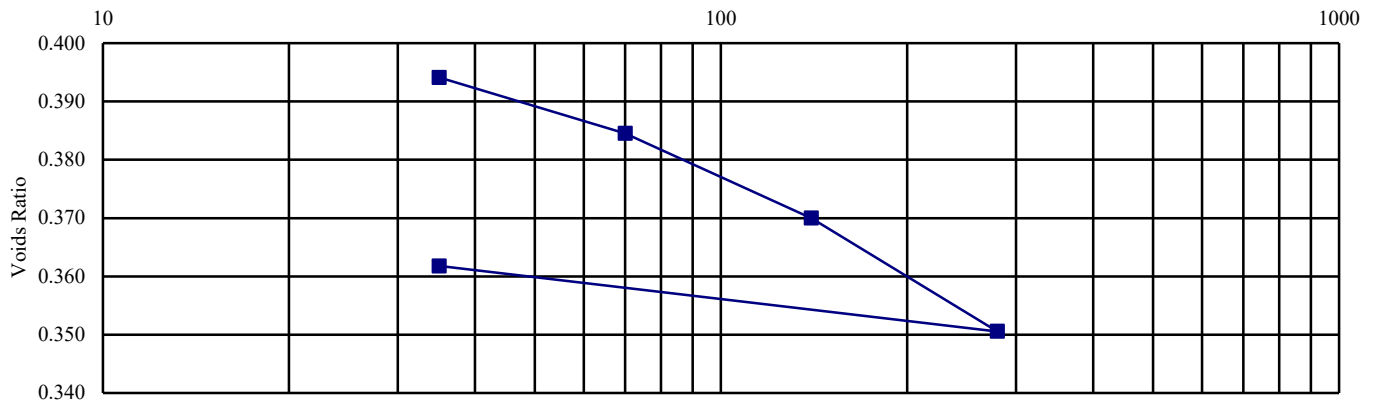
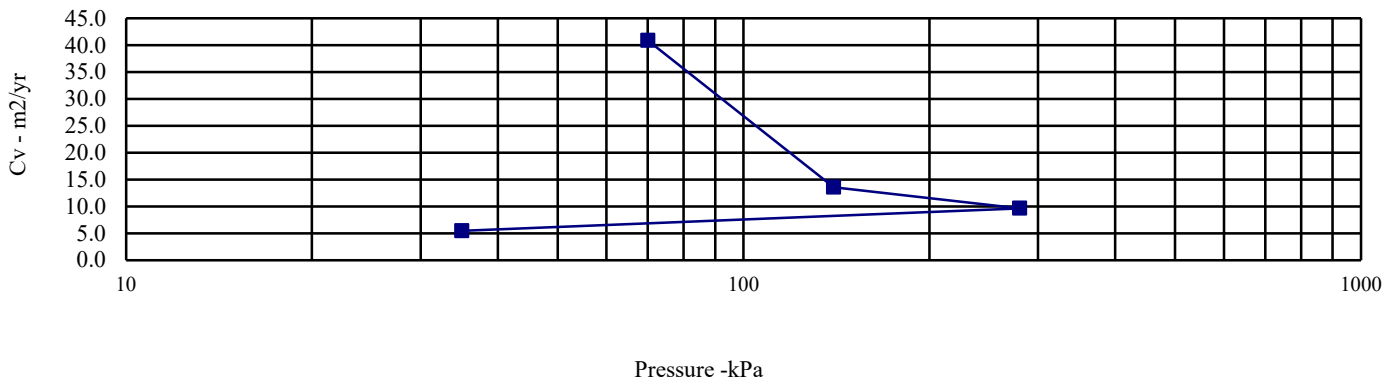
BS 1377: Part 5: 1990: Clause 3

Hole Number: **WS102** **Top Depth (m):** **1.50**

Sample Number: **Base Depth (m) :** **2.00**

Sample Type: **U**

| Initial Conditions | | Pressure Range | | Mv | Cv | Specimen location | |
|---------------------------|--------|----------------------------------|-----|----------|----------|---------------------|-----|
| Moisture Content (%): | 15 | kPa | | m2/MN | m2/yr | within tube: | Top |
| Bulk Density (Mg/m3): | 2.18 | 0 | 35 | Swelling | Swelling | Method used to | |
| Dry Density (Mg/m3): | 1.89 | 35 | 70 | 0.197 | 40.888 | determine CV: | T90 |
| Voids Ratio: | 0.402 | 70 | 140 | 0.150 | 13.570 | Nominal temperature | |
| Degree of saturation: | 100.2 | 140 | 280 | 0.101 | 9.634 | during test ' C: | 20 |
| Height (mm): | 19.852 | 280 | 35 | 0.034 | 5.465 | Remarks: | |
| Diameter (mm) | 49.868 | See summary of soil descriptions | | | | | |
| Particle Density (Mg/m3): | 2.65 | | | | | | |
| Assumed | | | | | | | |



Well Street, Buckley

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|---------------------|
| Contract No: |
| PSL20/4666 |
| Client Ref: |
| 14-278 |

**APPENDIX IX
DYNAMIC CONE
PENETROMETER TEST
CERTIFICATES**

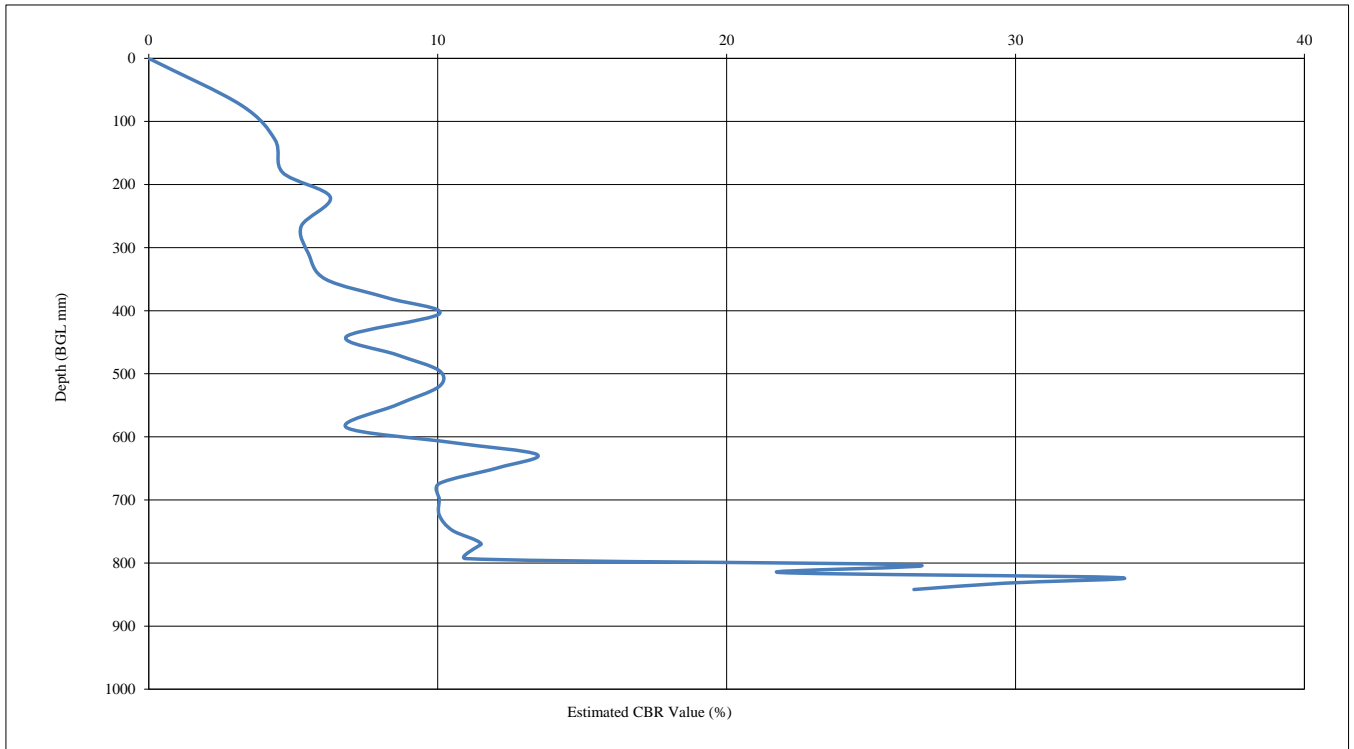


Determination of Dynamic Cone Penetrometer - Estimated CBR Value (%)

In Accordance with TRL Report PR/INT/277/04

| | | | |
|--------------------------------|-------------|-----------------------|------------|
| Site Name | Well Street | Test Date: | 16/09/2020 |
| Site Ref | 14-278 | Test Location: | Buckley |
| Test No.: | DCP101 | Easting: | 0 |
| Initial Depth (mm BGL): | 0 | Northing: | 0 |
| Final Depth (mm BGL): | 842 | | |

Estimated California Bearing Ratio Graph



| Start Depth (mm) BGL | Finish Depth (mm) BGL | No. of Blows | Blows Per Layer | DCP mm/Blows | Ave Estimated Layer (CBR %) |
|----------------------|-----------------------|--------------|-----------------|--------------|-----------------------------|
| 0 | 220 | 4 | 4 | 55.00 | 4.37 |
| 220 | 793 | 24 | 20 | 28.65 | 8.71 |
| 793 | 842 | 29 | 5 | 9.80 | 27.06 |
| | | | | | |
| | | | | | |

Comments

| | | | | |
|-----------------------|--------------------|--------------|---------------------|--------------|
| Site Engineer: | Checked By: | Date: | Approved By: | Date: |
| RW | VW | 26/09/2020 | RJW | 01/10/2020 |

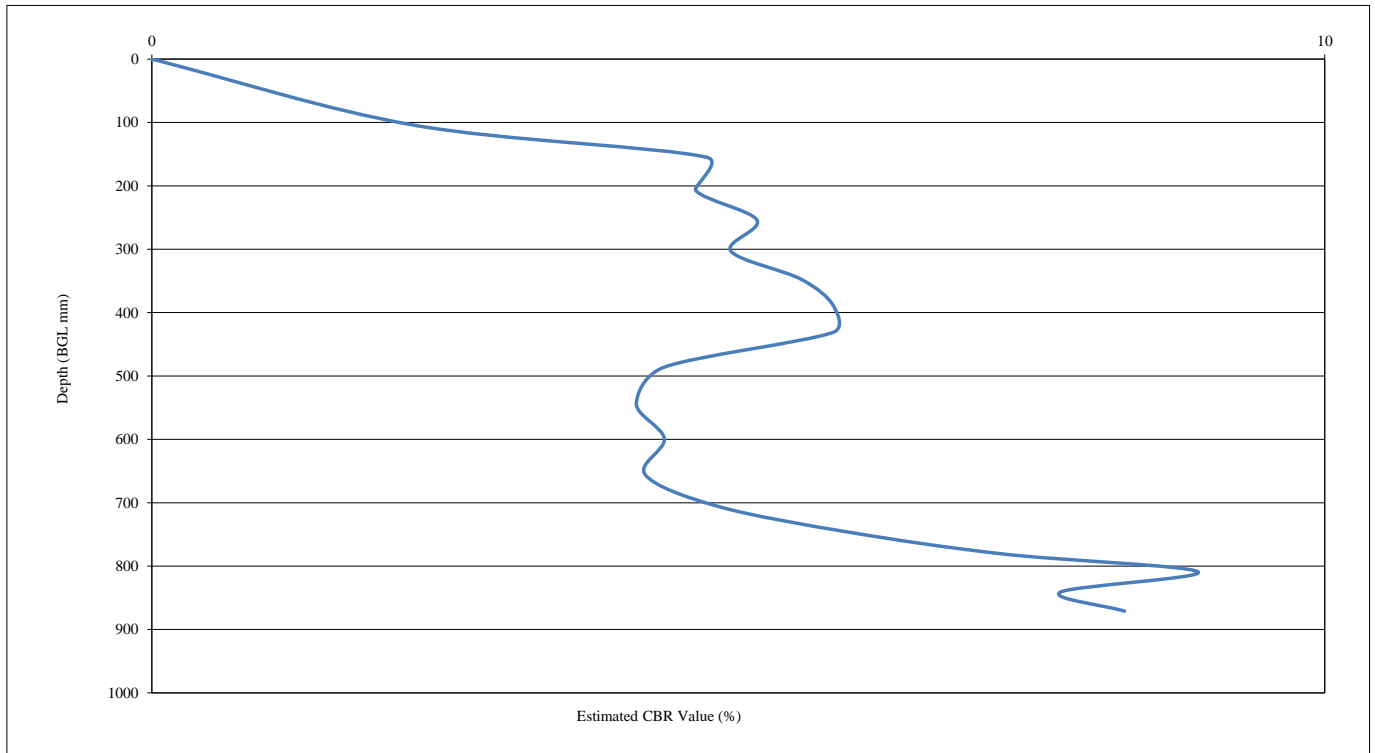


Determination of Dynamic Cone Penetrometer - Estimated CBR Value (%)

In Accordance with TRL Report PR/INT/277/04

| | | | |
|--------------------------------|-------------|-----------------------|------------|
| Site Name | Well Street | Test Date: | 16/09/2020 |
| Site Ref | 14-278 | Test Location: | Buckley |
| Test No.: | DCP102 | Easting: | 0 |
| Initial Depth (mm BGL): | 0 | Northing: | 0 |
| Final Depth (mm BGL): | 871 | | |

Estimated California Bearing Ratio Graph



| Start Depth (mm) BGL | Finish Depth (mm) BGL | No. of Blows | Blows Per Layer | DCP mm/Blows | Ave Estimated Layer (CBR %) |
|----------------------|-----------------------|--------------|-----------------|--------------|-----------------------------|
| 0 | 155 | 2 | 2 | 77.50 | 3.04 |
| 155 | 431 | 8 | 6 | 46.00 | 5.28 |
| 431 | 656 | 12 | 4 | 56.25 | 4.27 |
| 655 | 871 | 18 | 6 | 36.00 | 6.84 |
| | | | | | |

Comments

| | | | | |
|-----------------------|--------------------|--------------|---------------------|--------------|
| Site Engineer: | Checked By: | Date: | Approved By: | Date: |
| RW | VW | 26/09/2020 | RJW | 01/10/2020 |

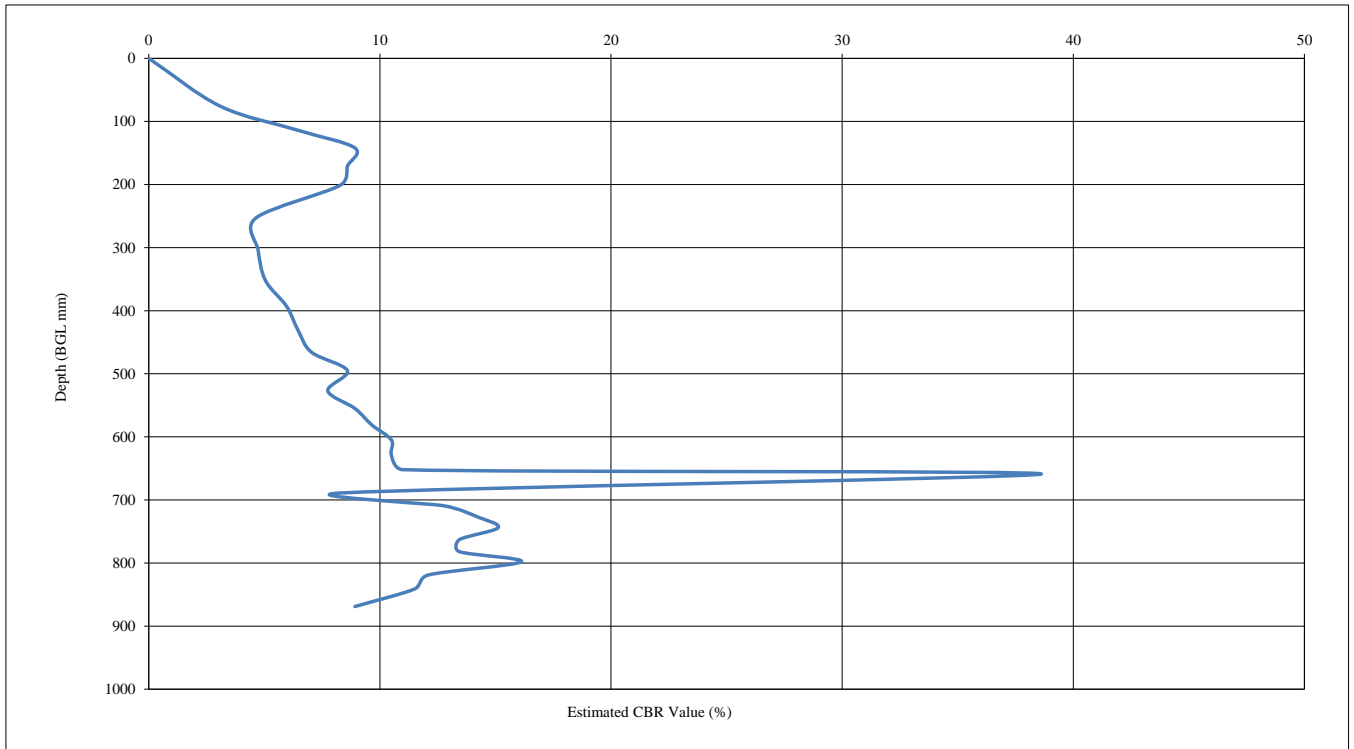


Determination of Dynamic Cone Penetrometer - Estimated CBR Value (%)

In Accordance with TRL Report PR/INT/277/04

| | | | |
|--------------------------------|-------------|-----------------------|------------|
| Site Name | Well Street | Test Date: | 16/09/2020 |
| Site Ref | 14-278 | Test Location: | Buckley |
| Test No.: | DCP103 | Easting: | 0 |
| Initial Depth (mm BGL): | 62 | Northing: | 0 |
| Final Depth (mm BGL): | 869 | | |

Estimated California Bearing Ratio Graph



| Start Depth (mm) BGL | Finish Depth (mm) BGL | No. of Blows | Blows Per Layer | DCP mm/Blows | Ave Estimated Layer (CBR %) |
|----------------------|-----------------------|--------------|-----------------|--------------|-----------------------------|
| 0 | 201 | 5 | 5 | 40.20 | 6.09 |
| 201 | 652 | 18 | 13 | 34.69 | 7.11 |
| 652 | 869 | 29 | 11 | 19.73 | 12.92 |
| | | | | | |
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Comments

| | | | | |
|-----------------------|--------------------|--------------|---------------------|--------------|
| Site Engineer: | Checked By: | Date: | Approved By: | Date: |
| RW | VW | 26/09/2020 | RJW | 01/10/2020 |

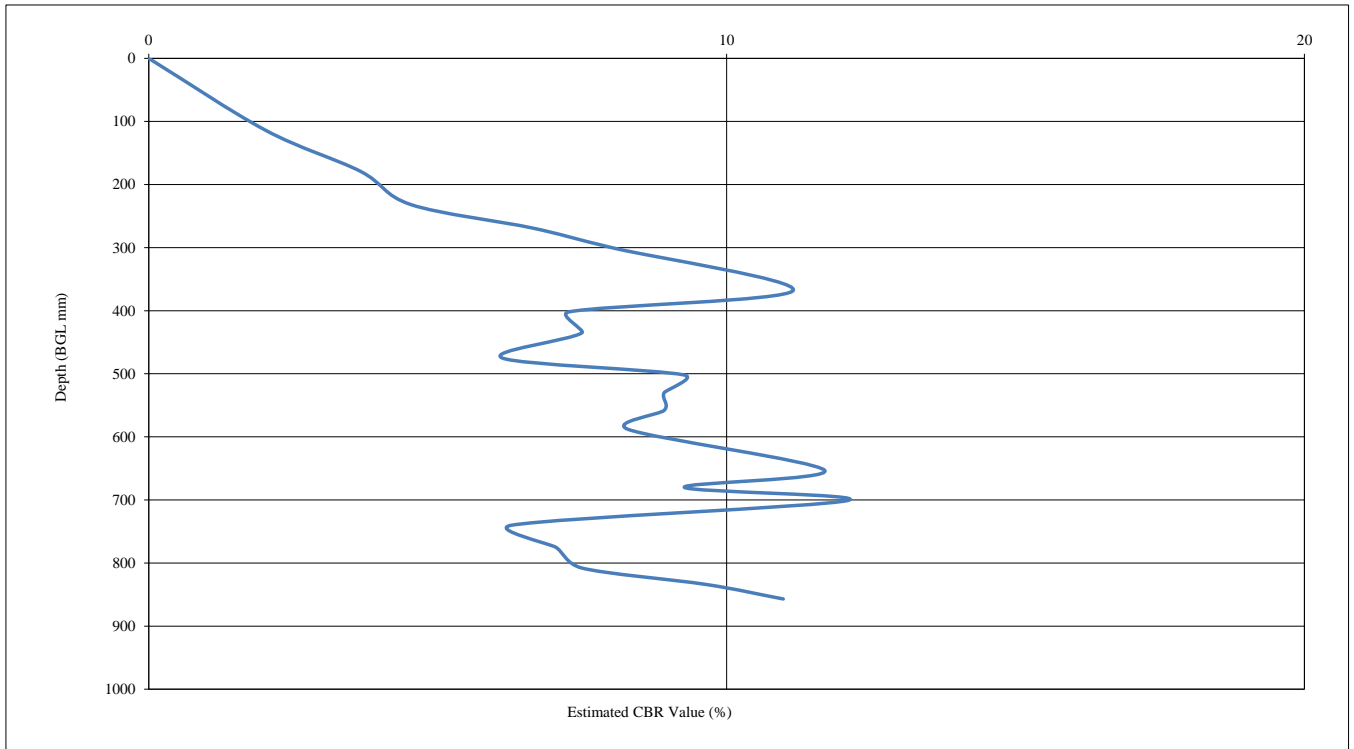


Determination of Dynamic Cone Penetrometer - Estimated CBR Value (%)

In Accordance with TRL Report PR/INT/277/04

| | | | |
|--------------------------------|-------------|-----------------------|------------|
| Site Name | Well Street | Test Date: | 16/09/2020 |
| Site Ref | 14-278 | Test Location: | Buckley |
| Test No.: | DCP104 | Easting: | 0 |
| Initial Depth (mm BGL): | 0 | Northing: | 0 |
| Final Depth (mm BGL): | 857 | | |

Estimated California Bearing Ratio Graph



| Start Depth (mm) BGL | Finish Depth (mm) BGL | No. of Blows | Blows Per Layer | DCP mm/Blows | Ave Estimated Layer (CBR %) |
|----------------------|-----------------------|--------------|-----------------|--------------|-----------------------------|
| 0 | 368 | 8 | 8 | 46.00 | 5.28 |
| 368 | 740 | 21 | 13 | 28.62 | 8.72 |
| 740 | 857 | 25 | 4 | 29.25 | 8.52 |
| | | | | | |
| | | | | | |

Comments

| | | | | |
|-----------------------|--------------------|--------------|---------------------|--------------|
| Site Engineer: | Checked By: | Date: | Approved By: | Date: |
| RW | VW | 26/09/2020 | RJW | 01/10/2020 |

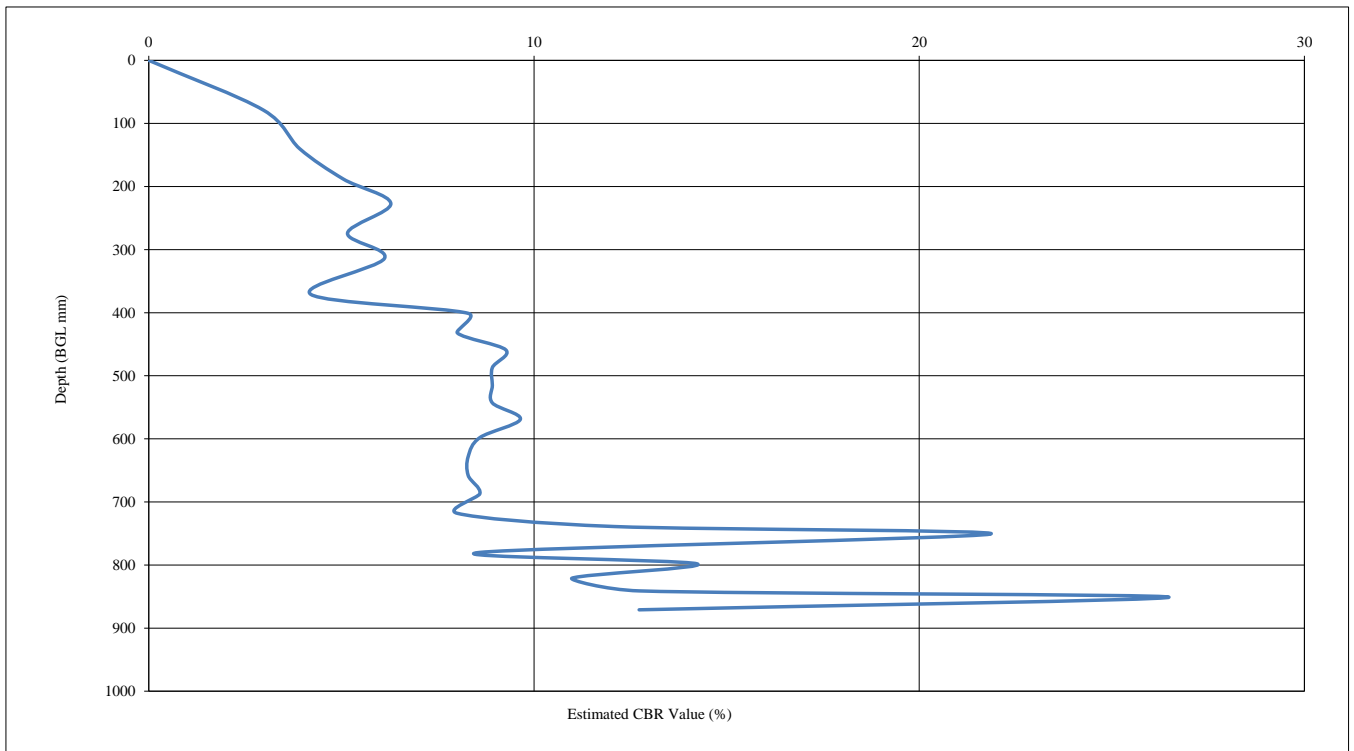


Determination of Dynamic Cone Penetrometer - Estimated CBR Value (%)

In Accordance with TRL Report PR/INT/277/04

| | | | |
|--------------------------------|-------------|-----------------------|------------|
| Site Name | Well Street | Test Date: | 16/09/2020 |
| Site Ref | 14-278 | Test Location: | Buckley |
| Test No.: | DCP105 | Easting: | 0 |
| Initial Depth (mm BGL): | 0 | Northing: | 0 |
| Final Depth (mm BGL): | 871 | | |

Estimated California Bearing Ratio Graph



| Start Depth (mm) BGL | Finish Depth (mm) BGL | No. of Blows | Blows Per Layer | DCP mm/Blows | Ave Estimated Layer (CBR %) |
|----------------------|-----------------------|--------------|-----------------|--------------|-----------------------------|
| 0 | 371 | 7 | 7 | 53.00 | 4.54 |
| 371 | 718 | 19 | 12 | 28.92 | 8.62 |
| 718 | 871 | 27 | 8 | 19.13 | 13.35 |
| | | | | | |
| | | | | | |

Comments

| | | | | |
|-----------------------|--------------------|--------------|---------------------|--------------|
| Site Engineer: | Checked By: | Date: | Approved By: | Date: |
| RW | VW | 26/09/2020 | RJW | 01/10/2020 |

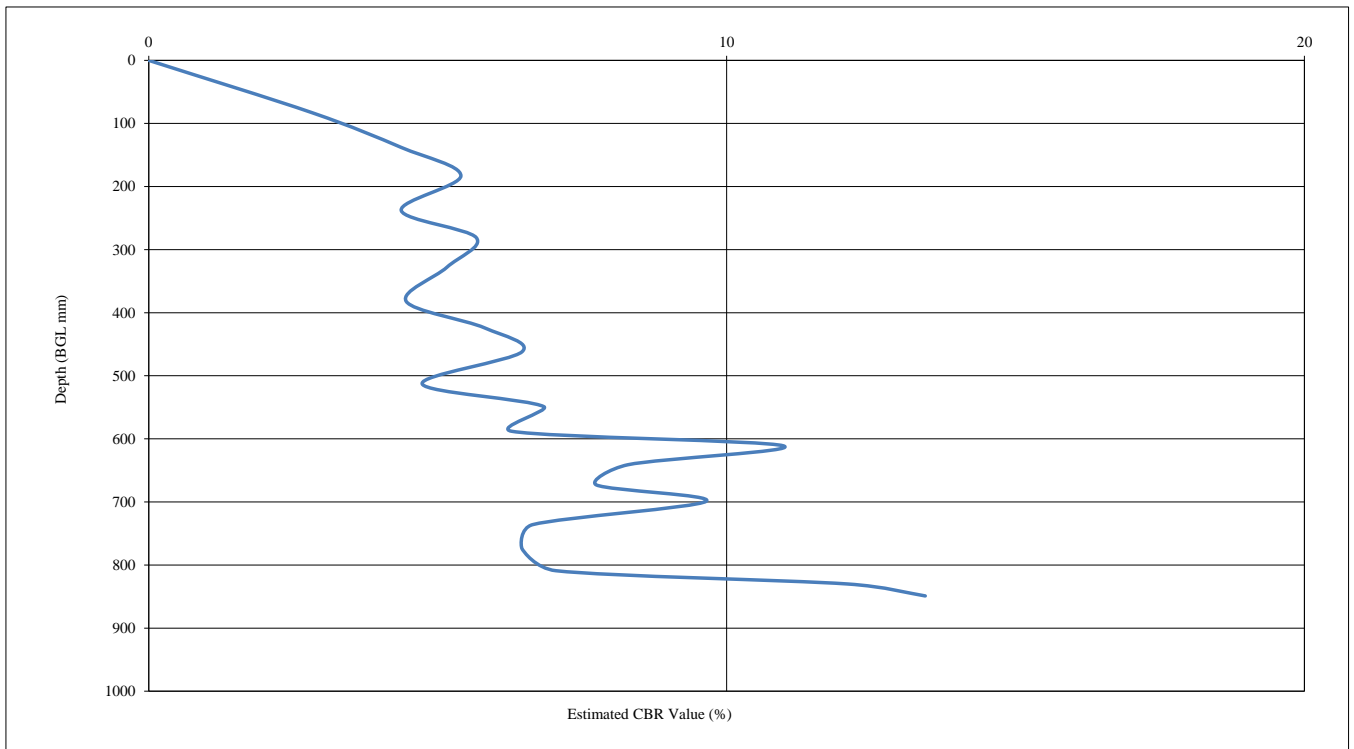


Determination of Dynamic Cone Penetrometer - Estimated CBR Value (%)

In Accordance with TRL Report PR/INT/277/04

| | | | |
|--------------------------------|-------------|-----------------------|------------|
| Site Name | Well Street | Test Date: | 16/09/2020 |
| Site Ref | 14-278 | Test Location: | Buckley |
| Test No.: | DCP106 | Easting: | 0 |
| Initial Depth (mm BGL): | 0 | Northing: | 0 |
| Final Depth (mm BGL): | 849 | | |

Estimated California Bearing Ratio Graph



| Start Depth (mm) BGL | Finish Depth (mm) BGL | No. of Blows | Blows Per Layer | DCP mm/Blows | Ave Estimated Layer (CBR %) |
|----------------------|-----------------------|--------------|-----------------|--------------|-----------------------------|
| 0 | 183 | 3 | 3 | 61.00 | 3.92 |
| 183 | 588 | 12 | 9 | 45.00 | 5.40 |
| 588 | 849 | 21 | 9 | 29.00 | 8.59 |
| | | | | | |
| | | | | | |

Comments

| Site Engineer: | Checked By: | Date: | Approved By: | Date: |
|----------------|-------------|------------|--------------|------------|
| RW | VW | 26/09/2020 | RJW | 01/10/2020 |

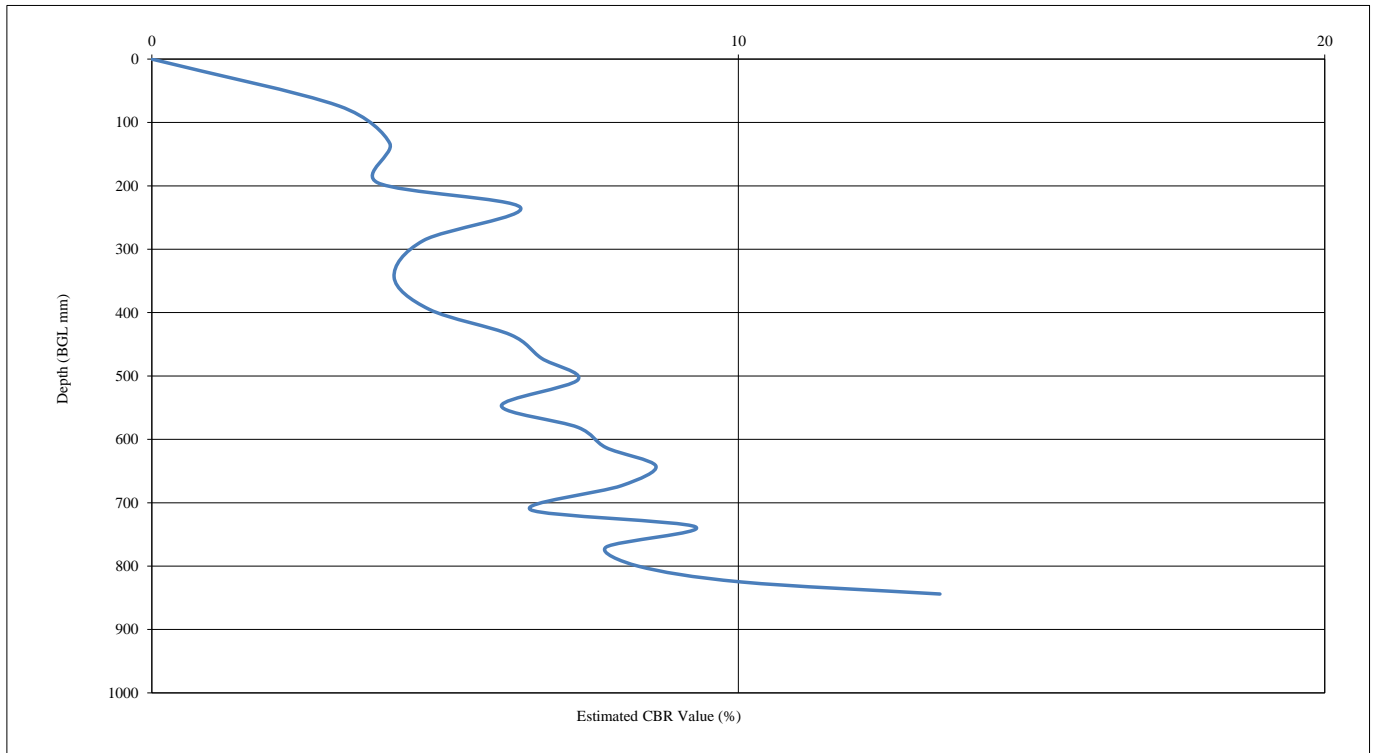


Determination of Dynamic Cone Penetrometer - Estimated CBR Value (%)

In Accordance with TRL Report PR/INT/277/04

| | | | |
|--------------------------------|-------------|-----------------------|------------|
| Site Name | Well Street | Test Date: | 16/09/2020 |
| Site Ref | 14-278 | Test Location: | Buckley |
| Test No.: | DCP107 | Easting: | 0 |
| Initial Depth (mm BGL): | 0 | Northing: | 0 |
| Final Depth (mm BGL): | 844 | | |

Estimated California Bearing Ratio Graph



| Start Depth (mm) BGL | Finish Depth (mm) BGL | No. of Blows | Blows Per Layer | DCP mm/Blows | Ave Estimated Layer (CBR %) |
|----------------------|-----------------------|--------------|-----------------|--------------|-----------------------------|
| 0 | 234 | 4 | 4 | 58.50 | 4.09 |
| 234 | 800 | 19 | 15 | 37.73 | 6.51 |
| 800 | 844 | 21 | 2 | 22.00 | 11.51 |
| | | | | | |
| | | | | | |

Comments

| Site Engineer: | Checked By: | Date: | Approved By: | Date: |
|----------------|-------------|------------|--------------|------------|
| RW | VW | 26/09/2020 | RJW | 01/10/2020 |

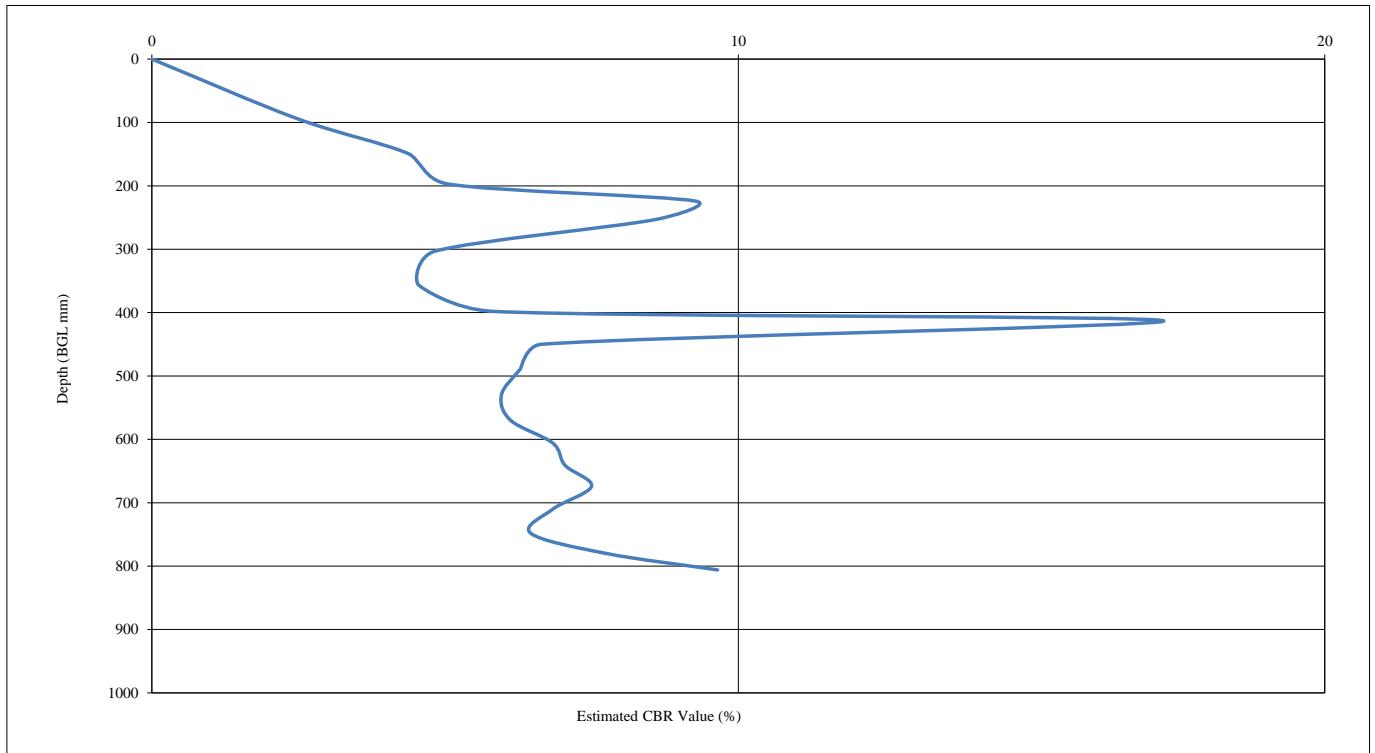


Determination of Dynamic Cone Penetrometer - Estimated CBR Value (%)

In Accordance with TRL Report PR/INT/277/04

| | | | |
|--------------------------------|-------------|-----------------------|------------|
| Site Name | Well Street | Test Date: | 16/09/2020 |
| Site Ref | 14-278 | Test Location: | Buckley |
| Test No.: | DCP108 | Easting: | 0 |
| Initial Depth (mm BGL): | 0 | Northing: | 0 |
| Final Depth (mm BGL): | 806 | | |

Estimated California Bearing Ratio Graph



| Start Depth (mm) BGL | Finish Depth (mm) BGL | No. of Blows | Blows Per Layer | DCP mm/Blows | Ave Estimated Layer (CBR %) |
|----------------------|-----------------------|--------------|-----------------|--------------|-----------------------------|
| 0 | 197 | 3 | 3 | 65.67 | 3.62 |
| 197 | 450 | 10 | 7 | 36.14 | 6.81 |
| 450 | 806 | 20 | 10 | 35.60 | 6.92 |
| | | | | | |
| | | | | | |

Comments

| | | | | |
|-----------------------|--------------------|--------------|---------------------|--------------|
| Site Engineer: | Checked By: | Date: | Approved By: | Date: |
| RW | VW | 26/09/2020 | RJW | 01/10/2020 |

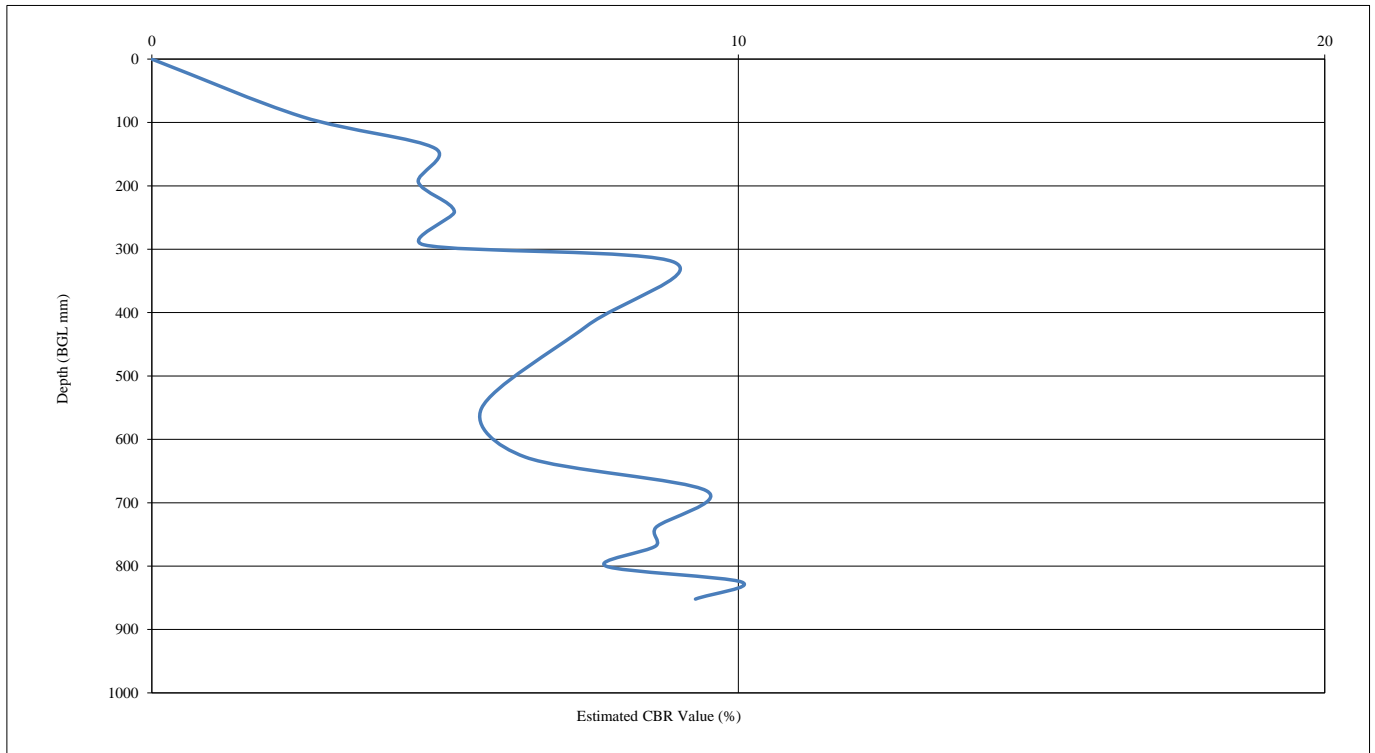


Determination of Dynamic Cone Penetrometer - Estimated CBR Value (%)

In Accordance with TRL Report PR/INT/277/04

| | | | |
|--------------------------------|-------------|-----------------------|------------|
| Site Name | Well Street | Test Date: | 16/09/2020 |
| Site Ref | 14-278 | Test Location: | Buckley |
| Test No.: | DCP109 | Easting: | 0 |
| Initial Depth (mm BGL): | 0 | Northing: | 0 |
| Final Depth (mm BGL): | 852 | | |

Estimated California Bearing Ratio Graph



| Start Depth (mm) BGL | Finish Depth (mm) BGL | No. of Blows | Blows Per Layer | DCP mm/Blows | Ave Estimated Layer (CBR %) |
|----------------------|-----------------------|--------------|-----------------|--------------|-----------------------------|
| 0 | 293 | 5 | 5 | 58.60 | 4.09 |
| 293 | 681 | 16 | 11 | 35.27 | 6.99 |
| 556 | 852 | 22 | 6 | 49.33 | 4.90 |
| | | | | | |
| | | | | | |

Comments

| Site Engineer: | Checked By: | Date: | Approved By: | Date: |
|----------------|-------------|------------|--------------|------------|
| RW | VW | 26/09/2020 | RJW | 01/10/2020 |

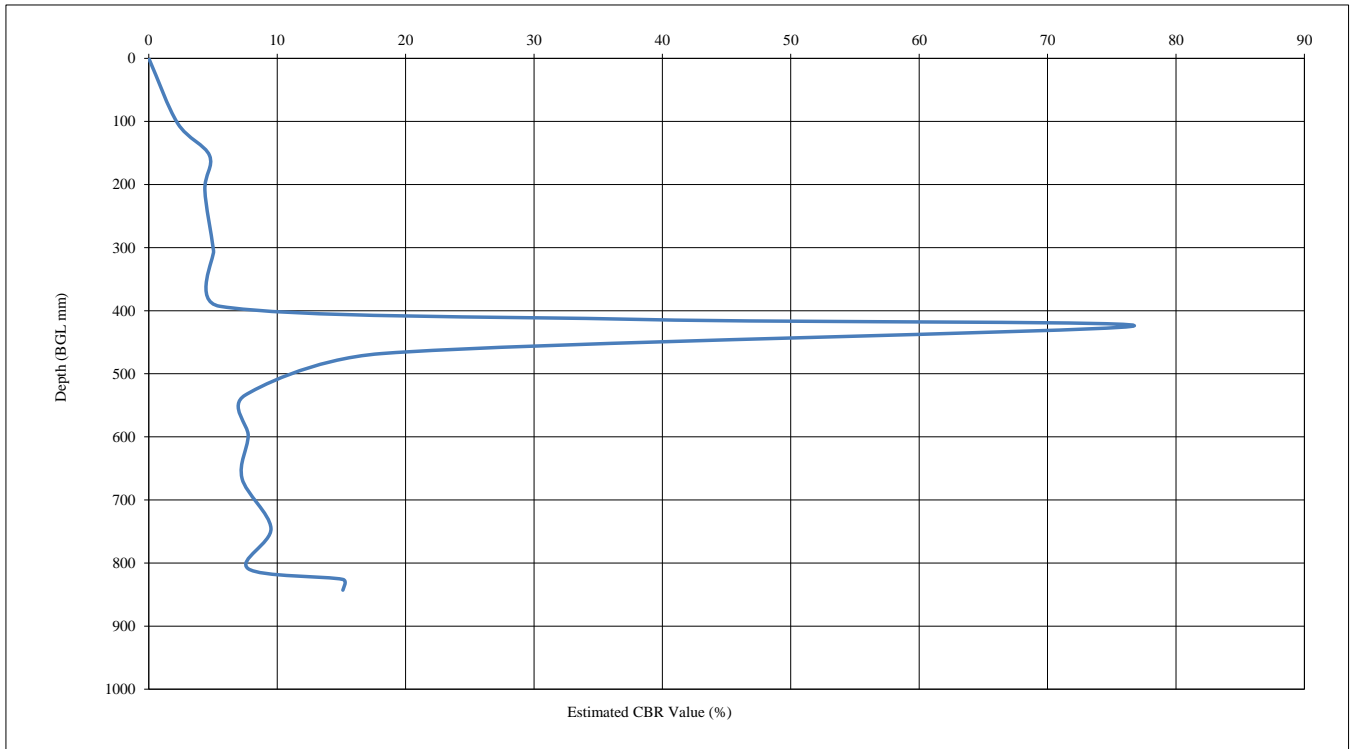


Determination of Dynamic Cone Penetrometer - Estimated CBR Value (%)

In Accordance with TRL Report PR/INT/277/04

| | | | |
|--------------------------------|-------------|-----------------------|------------|
| Site Name | Well Street | Test Date: | 16/09/2020 |
| Site Ref | 14-278 | Test Location: | Buckley |
| Test No.: | DCP110 | Easting: | 0 |
| Initial Depth (mm BGL): | 0 | Northing: | 0 |
| Final Depth (mm BGL): | 843 | | |

Estimated California Bearing Ratio Graph



| Start Depth (mm) BGL | Finish Depth (mm) BGL | No. of Blows | Blows Per Layer | DCP mm/Blows | Ave Estimated Layer (CBR %) |
|-------------------------|--------------------------|-----------------|--------------------|-----------------|--------------------------------|
| 0 | 209 | 3 | 3 | 69.67 | 3.40 |
| 209 | 393 | 7 | 4 | 46.00 | 5.28 |
| 393 | 534 | 18 | 11 | 12.82 | 20.37 |
| 534 | 843 | 29 | 11 | 28.09 | 8.89 |
| | | | | | |

Comments

| | | | | |
|-----------------------|--------------------|--------------|---------------------|--------------|
| Site Engineer: | Checked By: | Date: | Approved By: | Date: |
| RW | VW | 26/09/2020 | RJW | 01/10/2020 |

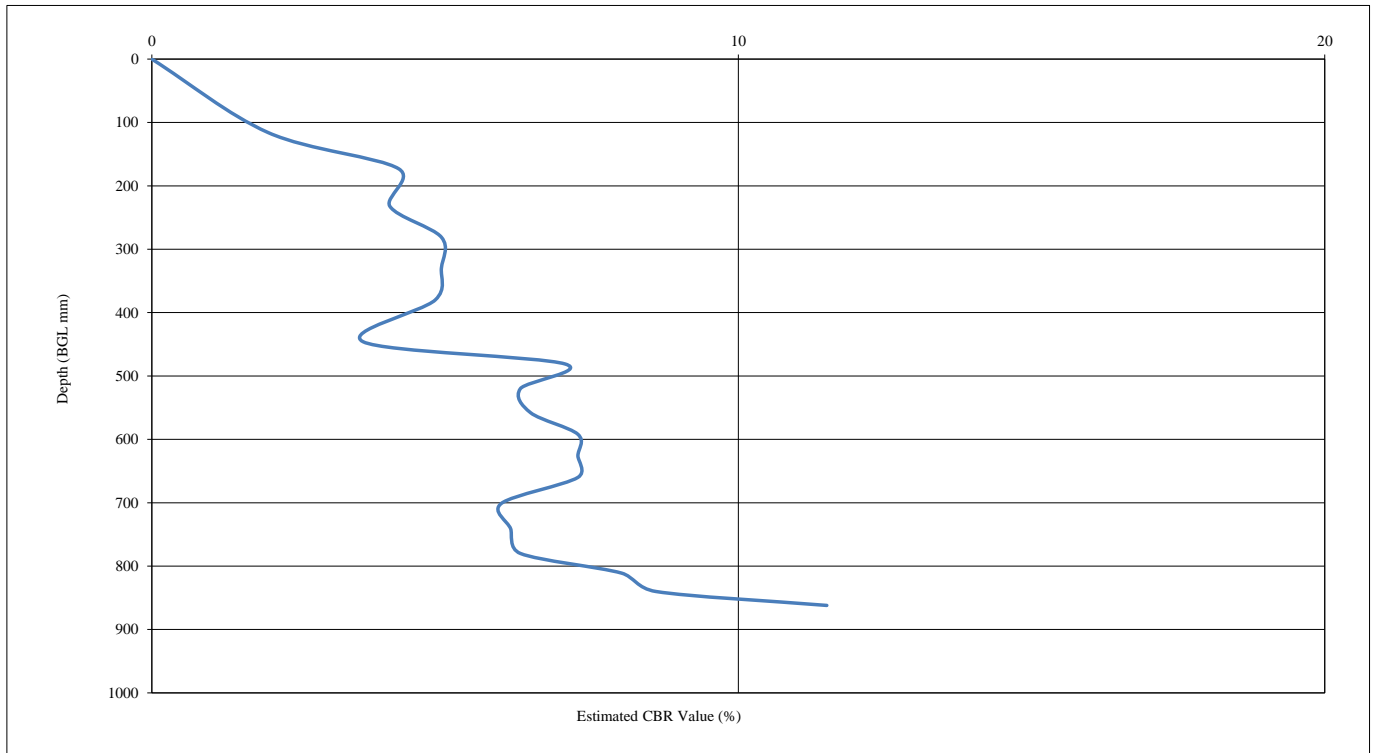


Determination of Dynamic Cone Penetrometer - Estimated CBR Value (%)

In Accordance with TRL Report PR/INT/277/04

| | | | |
|--------------------------------|-------------|-----------------------|------------|
| Site Name | Well Street | Test Date: | 16/09/2020 |
| Site Ref | 14-278 | Test Location: | Buckley |
| Test No.: | DCP111 | Easting: | 0 |
| Initial Depth (mm BGL): | 0 | Northing: | 0 |
| Final Depth (mm BGL): | 862 | | |

Estimated California Bearing Ratio Graph



| Start Depth (mm) BGL | Finish Depth (mm) BGL | No. of Blows | Blows Per Layer | DCP mm/Blows | Ave Estimated Layer (CBR %) |
|----------------------|-----------------------|--------------|-----------------|--------------|-----------------------------|
| 0 | 173 | 2 | 2 | 86.50 | 2.71 |
| 173 | 446 | 7 | 5 | 54.60 | 4.40 |
| 446 | 660 | 13 | 6 | 35.67 | 6.91 |
| 660 | 862 | 19 | 6 | 33.67 | 7.34 |
| | | | | | |

Comments

| Site Engineer: | Checked By: | Date: | Approved By: | Date: |
|----------------|-------------|------------|--------------|------------|
| RW | VW | 26/09/2020 | RJW | 01/10/2020 |

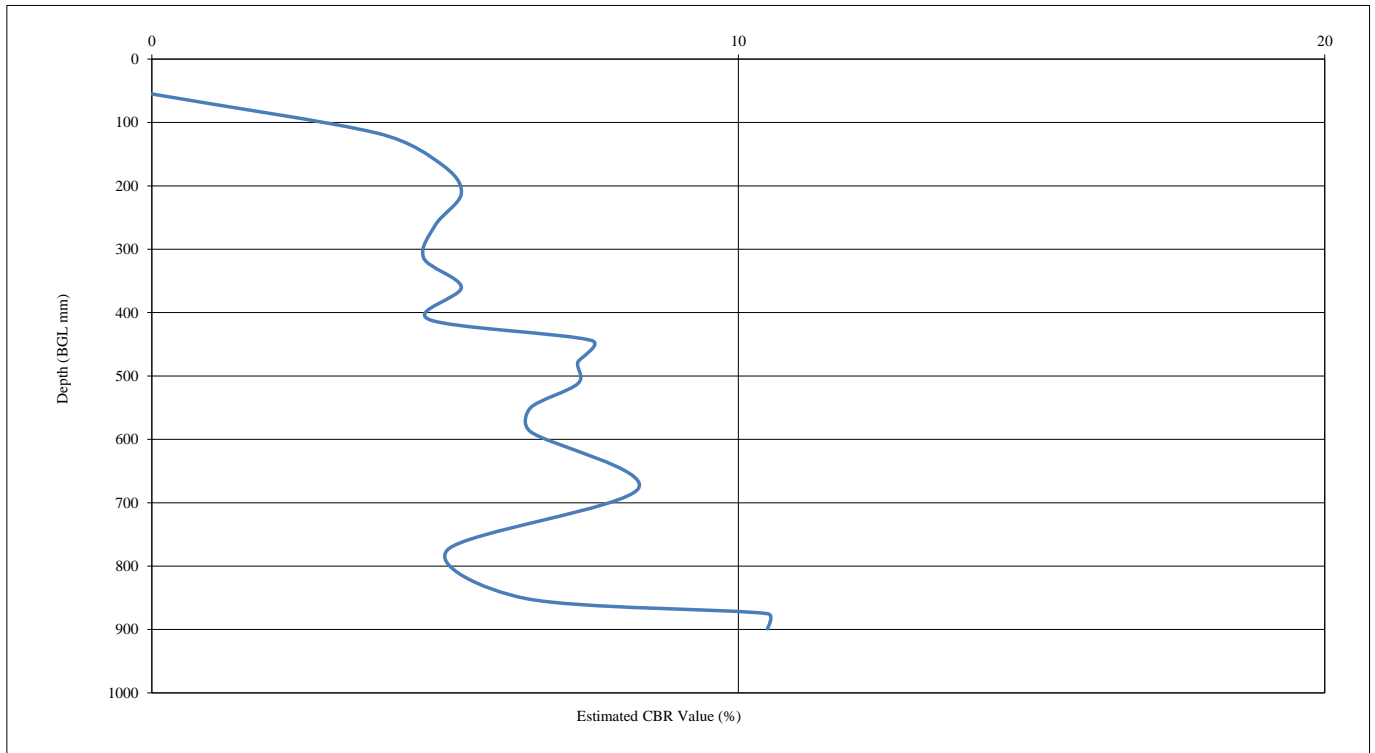


Determination of Dynamic Cone Penetrometer - Estimated CBR Value (%)

In Accordance with TRL Report PR/INT/277/04

| | | | |
|--------------------------------|-------------|-----------------------|------------|
| Site Name | Well Street | Test Date: | 16/09/2020 |
| Site Ref | 14-278 | Test Location: | Buckley |
| Test No.: | DCP112 | Easting: | 0 |
| Initial Depth (mm BGL): | 0 | Northing: | 0 |
| Final Depth (mm BGL): | 899 | | |

Estimated California Bearing Ratio Graph



| Start Depth (mm) BGL | Finish Depth (mm) BGL | No. of Blows | Blows Per Layer | DCP mm/Blows | Ave Estimated Layer (CBR %) |
|----------------------|-----------------------|--------------|-----------------|--------------|-----------------------------|
| 0 | 212 | 3 | 3 | 70.67 | 3.35 |
| 212 | 411 | 7 | 4 | 49.75 | 4.86 |
| 411 | 851 | 19 | 12 | 36.67 | 6.71 |
| 851 | 899 | 21 | 2 | 24.00 | 10.50 |
| | | | | | |

Comments

| Site Engineer: | Checked By: | Date: | Approved By: | Date: |
|----------------|-------------|------------|--------------|------------|
| RW | VW | 26/09/2020 | RJW | 01/10/2020 |

**APPENDIX X
BRE365 SOAKAWAY
PERMEABILITY TEST
CERTIFICATES**

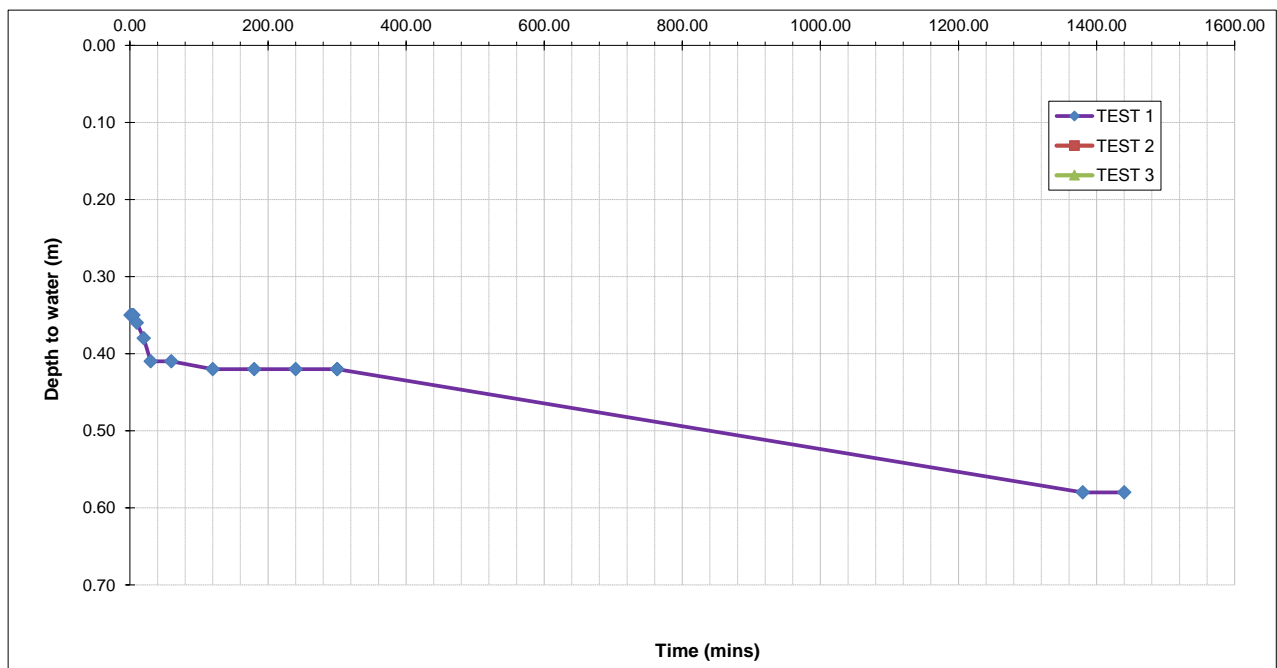


Site: Well Street
Job Number: 14-278
Date of Test: 01/09/2020

Trial Pit Number: SA101
Length: 2.20 m
Width: 0.70 m
Depth: 2.00 m
Groundwater Level: N/A m

| | TEST 1 | | TEST 2 | | TEST 3 | |
|--|-----------|--------------------|-----------|--------------------|-----------|--------------------|
| | Time(min) | Depth to Water (m) | Time(min) | Depth to Water (m) | Time(min) | Depth to Water (m) |
| Test did not fall below 25% or 75% effective storage depths. As such the stratum is not considered to have significant permeability coefficient to support sustainable drainage strategies. | 1.00 | 0.35 | | | | |
| | 2.00 | 0.35 | | | | |
| | 3.00 | 0.35 | | | | |
| | 4.00 | 0.35 | | | | |
| | 5.00 | 0.35 | | | | |
| | 10.00 | 0.36 | | | | |
| | 20.00 | 0.38 | | | | |
| | 30.00 | 0.41 | | | | |
| | 60.00 | 0.41 | | | | |
| | 120.00 | 0.42 | | | | |
| | 180.00 | 0.42 | | | | |
| | 240.00 | 0.42 | | | | |
| | 300.00 | 0.42 | | | | |
| | 300.00 | 0.42 | | | | |
| | 1380.00 | 0.58 | | | | |
| 1440.00 | 0.58 | | | | | |
| Effective Storage Depth | m | 1.65 | | | | |
| 75% Effective Storage Depth | m | 1.24 | | | | |
| (i.e. depth below GL) | m | 0.76 | | | | |
| 25% Effective Storage Depth | m | 0.41 | | | | |
| (i.e. depth below GL) | m | 1.59 | | | | |
| Effective Storage Depth 75%-25% | m | 0.83 | | | | |
| Time to fall to 75% effective depth | mins | N/A | | | | |
| Time to fall to 25% effective depth | mins | N/A | | | | |
| V (75%-25%) | m3 | 1.27 | | | | |
| a (50%) | m2 | 6.33 | | | | |
| t (75%-25%) | mins | N/A | | | | |
| SOIL INFILTRATION RATE | m/s | N/A | | | | |

| | |
|---|------------|
| DESIGN SOIL INFILTRATION RATE, f | N/A |
|---|------------|



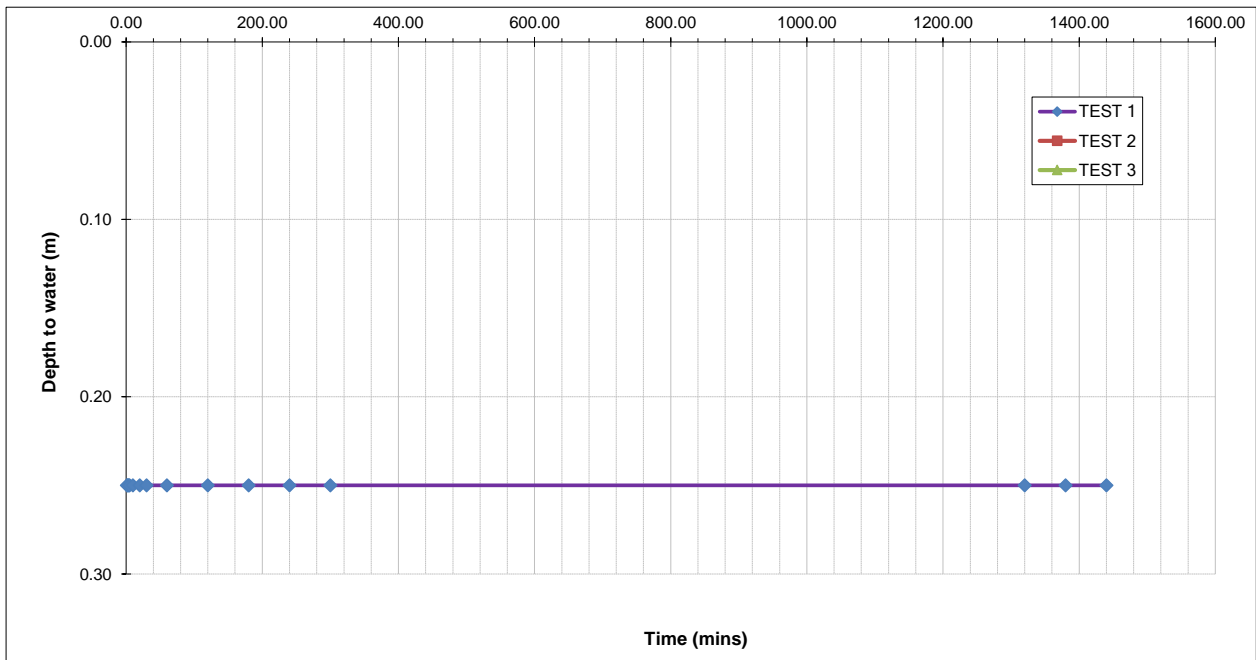


Site: Well Street
Job Number: 14-278
Date of Test: 01/09/2020

Trial Pit Number: SA102
Length: 2.00 m
Width: 0.70 m
Depth: 2.00 m
Groundwater Level: N/A m

| | TEST 1 | | TEST 2 | | TEST 3 | |
|---|-----------|--------------------|-----------|--------------------|-----------|--------------------|
| | Time(min) | Depth to Water (m) | Time(min) | Depth to Water (m) | Time(min) | Depth to Water (m) |
| Test did not fall below 25% or 75% effective storage depths. As such the stratum is not considered to have significant permeability coefficient to support sustainable drainage strategies. | 1.00 | 0.25 | | | | |
| | 2.00 | 0.25 | | | | |
| | 3.00 | 0.25 | | | | |
| | 4.00 | 0.25 | | | | |
| | 5.00 | 0.25 | | | | |
| | 10.00 | 0.25 | | | | |
| | 20.00 | 0.25 | | | | |
| | 30.00 | 0.25 | | | | |
| | 60.00 | 0.25 | | | | |
| | 120.00 | 0.25 | | | | |
| | 180.00 | 0.25 | | | | |
| | 240.00 | 0.25 | | | | |
| | 300.00 | 0.25 | | | | |
| | 1320.00 | 0.25 | | | | |
| | 1380.00 | 0.25 | | | | |
| 1440.00 | 0.25 | | | | | |
| Effective Storage Depth | m | 1.75 | | | | |
| 75% Effective Storage Depth | m | 1.31 | | | | |
| (i.e. depth below GL) | m | 0.69 | | | | |
| 25% Effective Storage Depth | m | 0.44 | | | | |
| (i.e. depth below GL) | m | 1.56 | | | | |
| Effective Storage Depth 75%-25% | m | 0.88 | | | | |
| Time to fall to 75% effective depth | mins | N/A | | | | |
| Time to fall to 25% effective depth | mins | N/A | | | | |
| V (75%-25%) | m3 | 1.23 | | | | |
| a (50%) | m2 | 6.13 | | | | |
| t (75%-25%) | mins | N/A | | | | |
| SOIL INFILTRATION RATE | m/s | N/A | | | | |

| | |
|---|------------|
| DESIGN SOIL INFILTRATION RATE, f | N/A |
|---|------------|



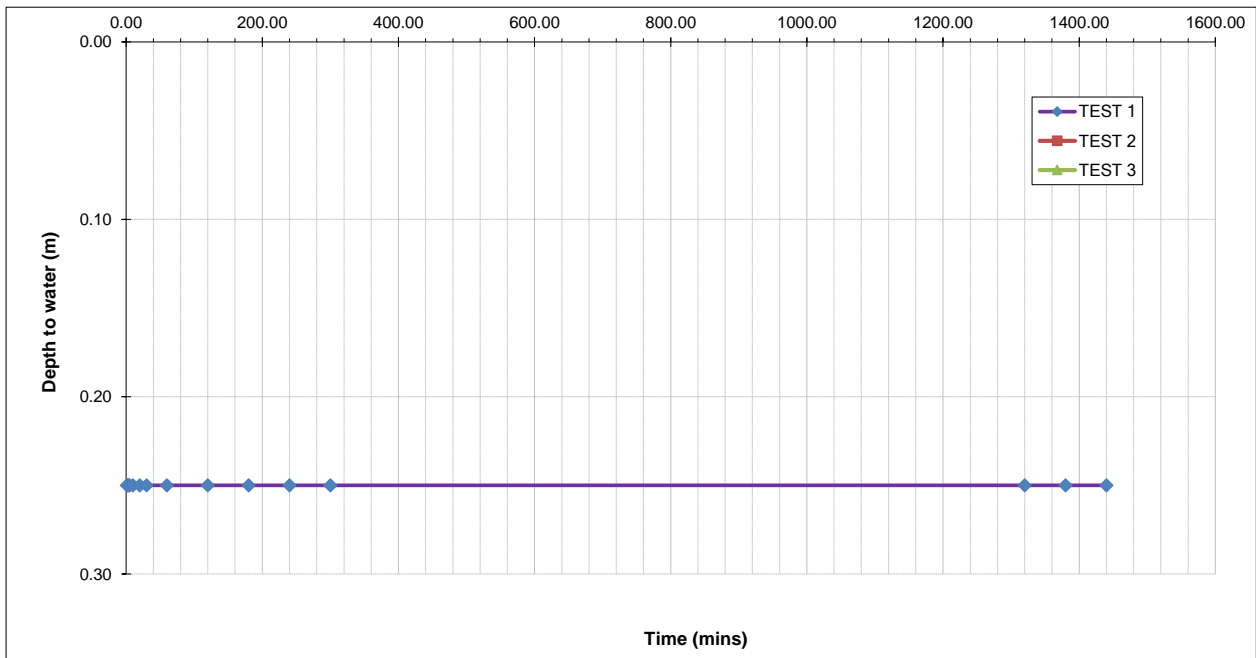


Site: Well Street
Job Number: 14-278
Date of Test: 01/09/2020

Trial Pit Number: SA103
Length: 1.80 m
Width: 0.70 m
Depth: 1.60 m
Groundwater Level: N/A m

| | TEST 1 | | TEST 2 | | TEST 3 | |
|---|-----------|--------------------|-----------|--------------------|-----------|--------------------|
| | Time(min) | Depth to Water (m) | Time(min) | Depth to Water (m) | Time(min) | Depth to Water (m) |
| Test did not fall below 25% or 75% effective storage depths. As such the stratum is not considered to have significant permeability coefficient to support sustainable drainage strategies. | 1.00 | 0.25 | | | | |
| | 2.00 | 0.25 | | | | |
| | 3.00 | 0.25 | | | | |
| | 4.00 | 0.25 | | | | |
| | 5.00 | 0.25 | | | | |
| | 10.00 | 0.25 | | | | |
| | 20.00 | 0.25 | | | | |
| | 30.00 | 0.25 | | | | |
| | 60.00 | 0.25 | | | | |
| | 120.00 | 0.25 | | | | |
| | 180.00 | 0.25 | | | | |
| | 240.00 | 0.25 | | | | |
| | 300.00 | 0.25 | | | | |
| | 1320.00 | 0.25 | | | | |
| | 1380.00 | 0.25 | | | | |
| 1440.00 | 0.25 | | | | | |
| Effective Storage Depth | m | 1.35 | | | | |
| 75% Effective Storage Depth (i.e. depth below GL) | m | 1.01 | | | | |
| 25% Effective Storage Depth (i.e. depth below GL) | m | 0.59 | | | | |
| Effective Storage Depth 75%-25% | m | 0.34 | | | | |
| Effective Storage Depth 75%-25% | m | 1.26 | | | | |
| Effective Storage Depth 75%-25% | m | 0.68 | | | | |
| Time to fall to 75% effective depth | mins | N/A | | | | |
| Time to fall to 25% effective depth | mins | N/A | | | | |
| V (75%-25%) | m3 | 0.85 | | | | |
| a (50%) | m2 | 4.64 | | | | |
| t (75%-25%) | mins | N/A | | | | |
| SOIL INFILTRATION RATE | m/s | N/A | | | | |

| | |
|---|------------|
| DESIGN SOIL INFILTRATION RATE, f | N/A |
|---|------------|



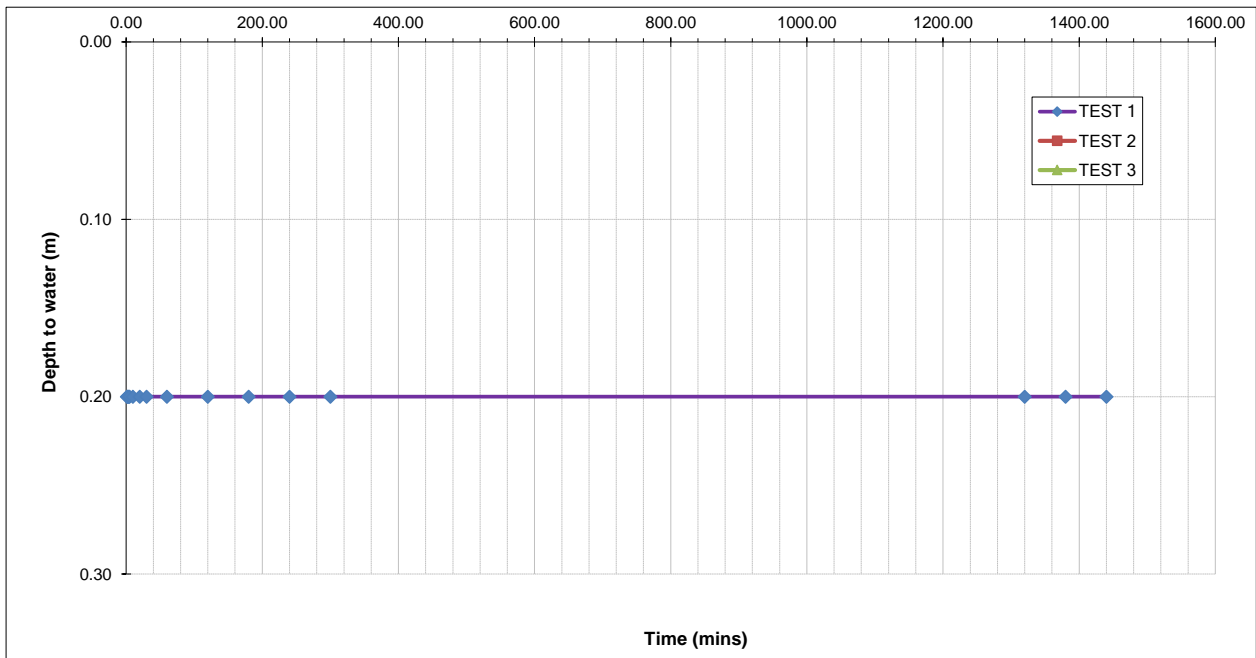


Site: Well Street
 Job Number: 14-278
 Date of Test: 01/09/2020

Trial Pit Number: SA104
 Length: 1.90 m
 Width: 0.70 m
 Depth: 1.80 m
 Groundwater Level: N/A m

| | TEST 1 | | TEST 2 | | TEST 3 | |
|---|-----------|--------------------|-----------|--------------------|-----------|--------------------|
| | Time(min) | Depth to Water (m) | Time(min) | Depth to Water (m) | Time(min) | Depth to Water (m) |
| Test did not fall below 25% or 75% effective storage depths. As such the stratum is not considered to have significant permeability coefficient to support sustainable drainage strategies. | 1.00 | 0.20 | | | | |
| | 2.00 | 0.20 | | | | |
| | 3.00 | 0.2 | | | | |
| | 4.00 | 0.2 | | | | |
| | 5.00 | 0.2 | | | | |
| | 10.00 | 0.2 | | | | |
| | 20.00 | 0.2 | | | | |
| | 30.00 | 0.2 | | | | |
| | 60.00 | 0.2 | | | | |
| | 120.00 | 0.2 | | | | |
| | 180.00 | 0.2 | | | | |
| | 240.00 | 0.20 | | | | |
| | 300.00 | 0.2 | | | | |
| | 1320.00 | 0.2 | | | | |
| | 1380.00 | 0.20 | | | | |
| 1440.00 | 0.20 | | | | | |
| Effective Storage Depth | m | 1.60 | | | | |
| 75% Effective Storage Depth (i.e. depth below GL) | m | 1.20 | | | | |
| 25% Effective Storage Depth (i.e. depth below GL) | m | 0.60 | | | | |
| Effective Storage Depth 75%-25% | m | 0.40 | | | | |
| Effective Storage Depth 75%-25% | m | 1.40 | | | | |
| Effective Storage Depth 75%-25% | m | 0.80 | | | | |
| Time to fall to 75% effective depth | mins | N/A | | | | |
| Time to fall to 25% effective depth | mins | N/A | | | | |
| V (75%-25%) | m3 | 1.06 | | | | |
| a (50%) | m2 | 5.49 | | | | |
| t (75%-25%) | mins | N/A | | | | |
| SOIL INFILTRATION RATE | m/s | N/A | | | | |


| | |
|---|------------|
| DESIGN SOIL INFILTRATION RATE, f | N/A |
|---|------------|



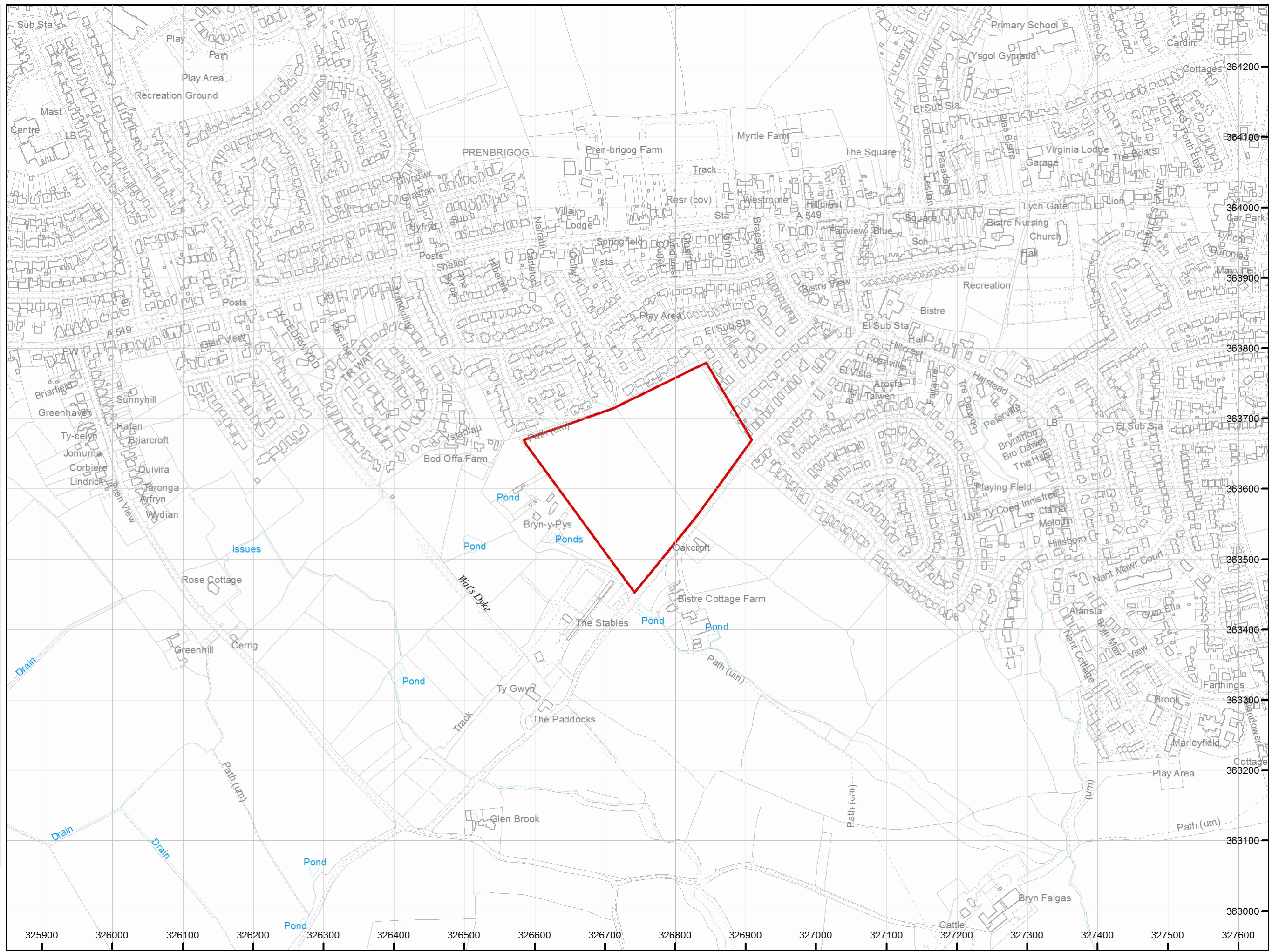
**APPENDIX XI
COAL AUTHORITY REPORT
AND MINE ABANDONMENT
PLANS**

The map highlights any specific surface or subsurface features within or near to the boundary of the site.

Key

Approximate position of the enquiry boundary shown 

How to contact us
 0345 762 6848 (UK)
 +44 (0)1623 637 000 (International)
 www.groundstability.com





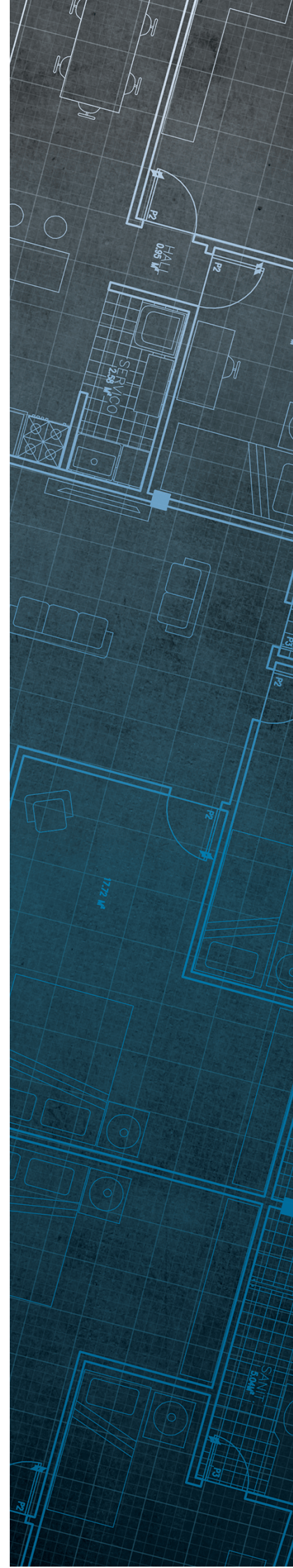
The Coal
Authority

Consultants Coal Mining Report

Land Fronting Well Street
Buckley
Flintshire
CH7 2PQ

Date of enquiry: 7 August 2020
Date enquiry received: 7 August 2020
Issue date: 7 August 2020

Our reference: 51002294140001
Your reference: 14-278/B/RJW



Consultants

Coal Mining Report

This report is based on and limited to the records held by the Coal Authority at the time the report was produced.

Client name

E3P

Enquiry address

Land Fronting Well Street
Buckley
Flintshire
CH7 2PQ

How to contact us

0345 762 6848 (UK)
+44 (0)1623 637 000 (International)

200 Lichfield Lane
Mansfield
Nottinghamshire
NG18 4RG

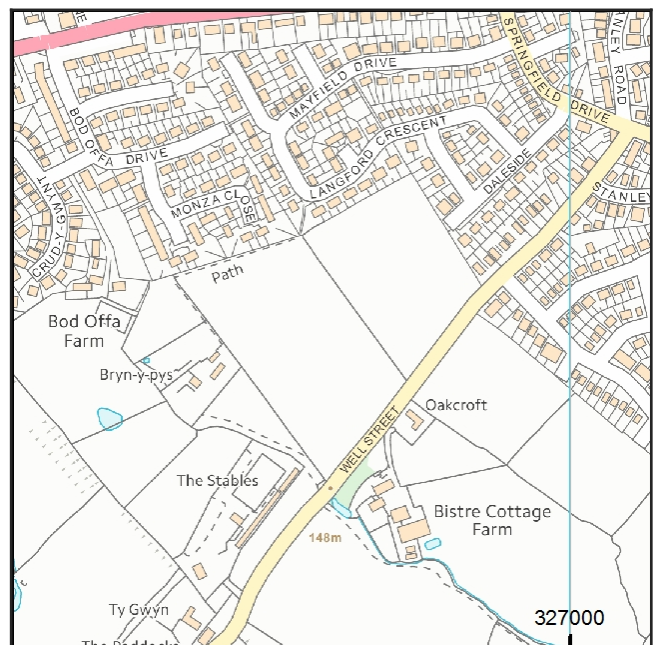
www.groundstability.com

 @coalauthority

 /company/the-coal-authority

 /thecoalauthority

 /thecoalauthority



Approximate position of property



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Section 1 – Mining activity and geology

Past underground mining

No past mining recorded.

Probable unrecorded shallow workings

None.

Spine roadways at shallow depth

No spine roadway recorded at shallow depth.

Mine entries

None recorded within 100 metres of the enquiry boundary.

Abandoned mine plan catalogue numbers

None available.

Outcrops

No outcrops recorded.

Geological faults, fissures and breaklines

No faults, fissures or breaklines recorded.

Opencast mines

None recorded within 500 metres of the enquiry boundary.

Coal Authority managed tips

None recorded within 500 metres of the enquiry boundary.

Section 2 – Investigative or remedial activity

Please refer to the 'Summary of findings' map (on separate sheet) for details of any activity within the area of the site boundary.

Site investigations

None recorded within 50 metres of the enquiry boundary.

Remediated sites

None recorded within 50 metres of the enquiry boundary.

Coal mining subsidence

The Coal Authority has not received a damage notice or claim for the subject property, or any property within 50 metres of the enquiry boundary, since 31 October 1994.

There is no current Stop Notice delaying the start of remedial works or repairs to the property.

The Coal Authority is not aware of any request having been made to carry out preventive works before coal is worked under section 33 of the Coal Mining Subsidence Act 1991.

Mine gas

None recorded within 500 metres of the enquiry boundary.

Mine water treatment schemes

None recorded within 500 metres of the enquiry boundary.

Section 3 – Licensing and future mining activity

Future underground mining

None recorded.

Coal mining licensing

None recorded within 200 metres of the enquiry boundary.

Court orders

None recorded.

Section 46 notices

No notices have been given, under section 46 of the Coal Mining Subsidence Act 1991, stating that the land is at risk of subsidence.

Withdrawal of support notices

The property is not in an area where a notice to withdraw support has been given.

The property is not in an area where a notice has been given under section 41 of the Coal Industry Act 1994, cancelling the entitlement to withdraw support.

Payments to owners of former copyhold land

The property is not in an area where a relevant notice has been published under the Coal Industry Act 1975/Coal Industry Act 1994.

Section 4 – Further information

Based on the responses in this report, no further information has been highlighted.

Section 5 – Data definitions

The datasets used in this report have limitations and assumptions within their results. For more guidance on the data and the results specific to the enquiry boundary, please **call us on 0345 762 6848** or **email us at groundstability@coal.gov.uk**.

Past underground coal mining

Details of all recorded underground mining relative to the enquiry boundary. Only past underground workings where the enquiry boundary is within 0.7 times the depth of the workings (zone of likely physical influence) allowing for seam inclination, will be included.

Probable unrecorded shallow workings

Areas where the Coal Authority believes there to be unrecorded coal workings that exist at or close to the surface (less than 30 metres deep).

Spine roadways at shallow depth

Connecting roadways either, working to working, or, surface to working, both in-seam and cross measures that exist at or close to the surface (less than 30 metres deep), either within or within 10 metres of the enquiry boundary.

Mine entries

Details of any shaft or adit either within, or within 100 metres of the enquiry boundary including approximate location, brief treatment details where known, the mineral worked from the mine entry and conveyance details where the mine entry has previously been sold by the Authority or its predecessors British Coal or the National Coal Board.

Abandoned mine plan catalogue numbers

Plan numbers extracted from the abandoned mines catalogue containing details of coal and other mineral abandonment plans deposited via the Mines Inspectorate in accordance with the Coal Mines Regulation Act and Metalliferous Mines Regulation Act 1872. A maximum of 9 plan extents that intersect with the enquiry boundary will be included. This does not infer that the workings and/or mine entries shown on the abandonment plan will be relevant to the site/property boundary.

Outcrops

Details of seam outcrops will be included where the enquiry boundary intersects with a conjectured or actual seam outcrop location (derived by either the British Geological Survey or the Coal Authority) or intersects with a defined 50 metres buffer on the coal (dip) side of the outcrop. An indication of whether the Coal Authority believes the seam to be of sufficient thickness and/or quality to have been worked will also be included.

Geological faults, fissures and breaklines

Geological disturbances or fractures in the bedrock. Surface fault lines (British Geological Survey derived data) and fissures and breaklines (Coal Authority derived data) intersecting with the enquiry boundary will be included. In some circumstances faults, fissures or breaklines have been known to contribute to surface subsidence damage as a consequence of underground coal mining.

Opencast mines

Opencast coal sites from which coal has been removed in the past by opencast (surface) methods and where the enquiry boundary is within 500 metres of either the licence area, site boundary, excavation area (high wall) or coaling area.

Coal Authority managed tips

Locations of disused colliery tip sites owned and managed by the Coal Authority, located within 500 metres of the enquiry boundary.

Site investigations

Details of site investigations within 50 metres of the enquiry boundary where the Coal Authority has received information relating to coal mining risk investigation and/or remediation by third parties.

Remediated sites

Sites where the Coal Authority has undertaken remedial works either within or within 50 metres of the enquiry boundary following report of a hazard relating to coal mining under the Coal Authority's Emergency Surface Hazard Call Out procedures.

Coal mining subsidence

Details of alleged coal mining subsidence claims made since 31 October 1994 either within or within 50 metres of the enquiry boundary. Where the claim relates to the enquiry boundary confirmation of whether the claim was accepted, rejected or whether liability is still being determined will be given. Where the claim has been discharged, whether this was by repair, payment of compensation or a combination of both, the value of the claim, where known, will also be given.

Details of any current 'Stop Notice' deferring remedial works or repairs affecting the property/site, and if so the date of the notice.

Details of any request made to execute preventative works before coal is worked under section 33 of the Coal Mining Subsidence Act 1991. If yes, whether any person withheld consent or failed to comply with any request to execute preventative works.

Mine gas

Reports of alleged mine gas emissions received by the Coal Authority, either within or within 500 metres of the enquiry boundary that subsequently required investigation and action by the Coal Authority to mitigate the effects of the mine gas emission.

Mine water treatment schemes

Locations where the Coal Authority has constructed or operates assets that remove pollutants from mine water prior to the treated mine water being discharged into the receiving water body.

These schemes are part of the UK's strategy to meet the requirements of the Water Framework Directive. Schemes fall into 2 basic categories: Remedial – mitigating the impact of existing pollution or Preventative – preventing a future pollution incident.

Mine water treatment schemes generally consist of one or more primary settlement lagoons and one or more reed beds for secondary treatment. A small number are more specialised process treatment plants.

Future underground mining

Details of all planned underground mining relative to the enquiry boundary. Only those future workings where the enquiry boundary is within 0.7 times the depth of the workings (zone of likely physical influence) allowing for seam inclination will be included.

Coal mining licensing

Details of all licenses issued by the Coal Authority either within or within 200 metres of the enquiry boundary in relation to the under taking of surface coal mining, underground coal mining or underground coal gasification.

Court orders

Orders in respect of the working of coal under the Mines (Working Facilities and Support) Acts of 1923 and 1966 or any statutory modification or amendment thereof.

Section 46 notices

Notice of proposals relating to underground coal mining operations that have been given under section 46 of the Coal Mining Subsidence Act 1991.

Withdrawal of support notices

Published notices of entitlement to withdraw support and the date of the notice. Details of any revocation notice withdrawing the entitlement to withdraw support given under Section 41 of the Coal Industry Act 1994.

Payment to owners of former copyhold land

Relevant notices which may affect the property and any subsequent notice of retained interests in coal and coal mines, acceptance or rejection notices and whether any compensation has been paid to a claimant.

