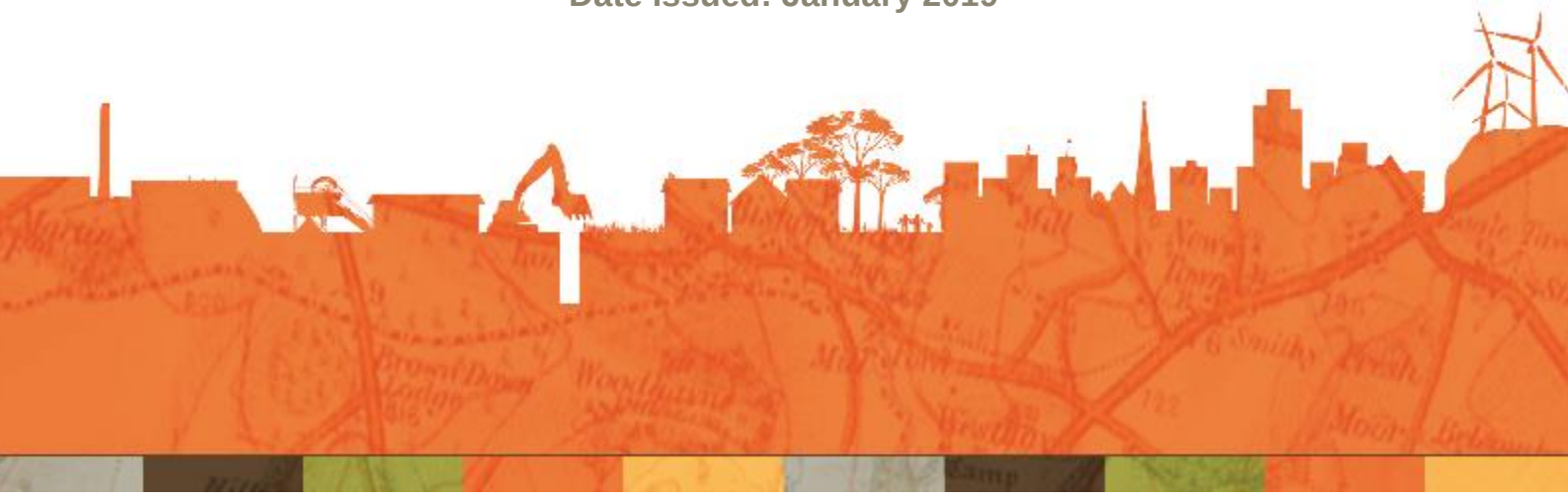
PHASE II GEO-ENVIRONMENTAL SITE ASSESSMENT

Land off Croadella Avenue
Egremont
Cumbria
CA22 2QL

Prepared for:

homes by gleeson
builders for generations

Report Ref: 13-019-R01
Date Issued: January 2019



e3p | Environmental | Energy | Engineering

E3P

Heliport Business Park,
Liverpool Road,
Eccles,
Manchester,
M30 7RU

Tel : + 00 (0) 161 707 9612
http:\\www. e3p.co.uk

Registered in England
No.: 807255262

QUALITY ASSURANCE

REMARKS	***FINAL***
DATE	January 2019
PREPARED BY	E Fearn
QUALIFICATIONS	BSc (Hons), MSc
SIGNATURE	
CHECKED BY	A Smith
QUALIFICATIONS	BSc (Hons), FGS, MIEnvSc, CEnv
SIGNATURE	
AUTHORISED BY	A Edgar
QUALIFICATIONS	BSc, MSc, AIEMA, MIEnvSc, CEnv
SIGNATURE	
PROJECT NUMBER	13-019-R01

IMS Template Reference:
QR009-3

EXECUTIVE SUMMARY		
Site Address	Land off Croadella Avenue, Egremont, Cumbria CA22 2QL	
Grid Reference	E 300461, N 511093	
Site Area	0.70 Hectares	
Current Site Use	The site is currently undeveloped, covered by an area of concrete and asphalt hardstand in the northern sector (footprint of the former school) and grassed across the southern sector.	
Proposed Development	The client intends to develop the site for residential use; comprising the construction of 19 No. residential properties.	
Environmental Setting	*Drift Geology*	River Terrace Deposits (NE) – *Clay, Sand & Gravel*; Alluvium - *Clay, Silt, Sand & Gravel*
	Bedrock Geology	Brockham (Breccia) – *Sedimentary.*
	Hydrogeology	Drift Deposits – Secondary A Aquifer; Bedrock Geology - Principal Aquifer.
	Groundwater Source Protection	The site is not located within a Groundwater Source Protection Zone or Drinking Water Safeguard Zone.
	Hydrology	A stream is understood to have been culverted beneath the site which flows in a southeast direction towards the River Ehen.
	Flood Risk	The majority of the site is located within a currently defined Flood Zone 2 & 3; therefore, affected by flooding from rivers. A culvert is recorded beneath the site. A Flood Risk Assessment will be required.
	Ecology	No risk to ecology or aquatic ecosystems identified.
	Sensitive Land	Residential properties are located adjacent to the south in all directions.
	Industrial Land	There are no hazardous installations or industrial land uses on-site or the immediate locality that may potentially prejudice the future development of the site for residential end use.
	Subsidence Hazard	None identified in data searches.
Site History	A review of the pertinent Ordnance Survey mapping dating from the 1860s indicates the site remained undeveloped agricultural land until c. 1970 when the Orgill School was constructed. The school is now demolished.	
Utility Locations	The site is served by utility connections within Chauncer Avenue (north) and Coradella Avenue (east).	
Landfill Sites & Ground Gases	No potential sources of hazardous ground gas which may pose a risk to human health have been identified. No landfill sites are located within influencing distance of the site (<250m).	
Invasive Plant Species	No invasive plant species were observed during the site walkover.	
Radon	Lower Probability Area (<1%) affected – No radon protection measures required.	
Coal Mining / Land Stability	The site is not located within an area deemed to be at risk from ground instability arising from historic coal mining activities.	
Brine Pumping / Subsidence	The site is not located within an area deemed to be at risk from ground instability arising from historic brine pumping and/or salt extraction.	

EXECUTIVE SUMMARY	
E3P Intrusive Ground Investigation	
Site Investigation Works	E3P has completed an intrusive Ground Investigation comprising: ▪ 10 No. Mechanically Excavated Trial Pits; ▪ 6 No. Window Sample Boreholes; and ▪ Installation of 4 No. Environmental Monitoring Wells.
Ground Conditions	Made Ground Made Ground was encountered in the northern sector within the footprint of the former school to a proden depth of 0.70m bgl and generally comprised a concrete or asphalt hard-stand which was in turn underlain by a clayey and/or sandy gravel of brick and mudstone. Topsoil A variable horizon of natural black gravelly CLAY (Topsoil) with rootlets was encountered across the southern portion of the site between 200mm and 700mm in thickness. Drift Drift deposits were encountered within all exploratory hole locations to a proven depth of 4.45m bgl and generally comprised a stiff to very stiff medium to very high strength silty CLAY. Solid The bedrock was not encountered during the intrusive Ground Investigation. Groundwater Groundwater strikes were at depths of between 1.20-1.90m bgl.
Contaminated Land Assessment	
Human Health	The Tier I Human Health Risk Assessment has identified marginally elevated PAHs at TP106 within the shallow topsoil (0.10m bgl). This is considered a localised hotspot and the impacted soil will need be stripped and placed in an area of low-sensitivity (such as beneath hardstanding) to remove the exposure pathway to future site users. No other elevated concentrations of contaminants of concern which exceed the Tier I screening values for the protection of human health were encountered, as such the site is considered to pose a very low risk to future residential site users.
Controlled Waters	In the absence of any potentially soluble / mobile contaminants of concern within the soil analysis or sources of potential pollutants; it is concluded the site poses a very low risk to the controlled water receptors.
Ground Gas	The RB17 ground gas assessment indicates the site falls into classification Characteristic Situation 1 / Green. No protection measures are not required in the proposed residential units.
Potable Water	Based on the preliminary chemical analysis it is concluded Poly-Ethylene Pipe (PE) will be suitable for the proposed residential development. However, further chemical analysis will be required to confirm this at the placement depth for the water supply pipeline infrastructure.

EXECUTIVE SUMMARY	
Geotechnical Assessment	
Underground Obstructions	A concrete slab associated with the former school remains in the northern portion of the site. Furthermore, the presence of relict foundations underlying the concrete slab cannot be discounted. There features will need to be grubbed out in their entirety as part of the development.
Allowable Bearing Pressure (ABP)	The underlying stiff to very stiff medium strength to very high strength silty CLAY soils have been assessed as having a net ABP of >75kN/m² at circa 0.75-1.50m bgl. which generally increase with depth.
Foundation Options	Based on the findings of the site investigations to date, it should be feasible to utilise shallow strip foundations bearing on stiff to very stiff silty CLAY soils at circa 0.75 -1.50m bgl. Mass trench fill may be required within any areas of current or proposed tree influence. The finished floor levels (FFLs) and a detailed flood risk assessment will be required to accurately determine the foundation depth.
Building Floor Slabs	Current building control regulations require that where the sub-stratum is variable in terms of the structure and settlement potential and/or where clay soils are present within the influence of existing or proposed trees, a suspended floor slab is required.
Heave Precautions	The underlying CLAY is likely to be of low plasticity, as such heave precautions will not be required to the internal face of a foundation. However, plasticity analysis results are still awaited to confirm this. However, heave precautions will be required to the underside of floor slabs (where there is no 200mm void) or ground beams within the modelled influencing distance of trees.
Soakaway Drainage	Preliminary infiltration tests indicate the underlying predominantly cohesive deposits do not offer the required permeability to make the use of soakaway drainage systems viable.
Sulphate Assessment	Concrete classification DS1 / AC1s.
CBR Design %	It is considered the underlying cohesive soils (excluding organic soils at the near surface) may provide a sub-grade formation to support proposed roads and infrastructure with a likely CBR of >5%. DCP Tests will need to be undertaken once the development levels have been finalised to confirm the CBR%.
Cut / Fill	Development levels unknown at this time, however a major programme of cut / fill works is not anticipated based on the current topography.
Waste Characterisation	Soil waste generated at the site will likely be classified as Non Hazardous. However, a WM3 waste classification will need to be completed for any waste materials to be removed off-site.
Recommendations	Based on the findings of the intrusive site investigation, the following additional works are recommended to be completed in due course: - DCP Testing at Access / Estate Road formation Level; - Foundations to be designed by a suitably qualified Structural Engineer; - Materials Management Plan; and, - Geotechnical Earthworks Strategy (Infrastructure).

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APPENDICES

1. INTRODUCTION

1.1 Background

E3P has been commissioned by Gleeson Homes Ltd on behalf of their client to undertake a Phase II Geo-Environmental Site Investigation for a parcel of land located to the west of Croadella Avenue, Egremont, Cumbria, herein referred to as ***the site.***

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

The scope of work comprised the following elements:

- *Review of Historic Information & Design of Suitable Intrusive Ground Investigation;*
- *6 No. Window Sample Probeholes & Install 3 No. Environmental Monitoring Wells;*
- *10 No. Mechanically Excavated Trial Pits;*
- *In-Situ Geotechnical Testing;*
- *Chemical & Geotechnical Laboratory Analysis;*
- *Groundwater Monitoring & Sampling;*
- *RB17 Ground Gas Assessment;*
- *Contamination Risk Assessment & Conceptual Site Model;*
- *Geotechnical Assessment & Interpretation; and,*
- *Factual & Interpretive Reporting.*

1.2 Proposed Development

E3P understands Gleeson Homes Ltd intend to develop the site for residential end use, comprising the construction of 19 No. residential units with associated access and estate roads, car parking, private gardens and adopted utility infrastructure.

The Indicative Development Scheme is presented in Drawing No. 13-019-002 (Appendix III).

1.3 Objectives

The objectives of the Geo-Environmental Investigation are to:

- Review historical plans, geology, hydrogeology, site sensitivity, flood-plain issues, mining records and any local authority information available in order to complete a Desk Study in line with Environment Agency (EA) document Model Procedures for the Management of Contaminated Land (Contaminated Land Report 11 (CLR11));

- Undertake a preliminary 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 preliminary recommendations in relation to foundations, pavement construction and floor slabs; and,

- Provide recommendations regarding future works required.

1.4 Previous Reports

No previous reports have been made available for the site.

1.5 Limitations

The limitations of this report are presented in Appendix I.

1.6 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. INTRUSIVE GROUND INVESTIGATION

2.1 Site Details

Site Address	Land off Croadella Avenue, Egremont, Cumbria CA22 2QL
National Grid Reference	E 300461, N 511093
Site Area	0.70 Hectares

All acronyms used within this report are defined in the Glossary presented in Appendix II.

A site location map is presented in Appendix III as Drawing 13-019-001.

2.2 Current Site Use

E3P has undertaken a site walkover of the entire site and a description of the key findings is summarised in Table 2.1.

Table 2.1 Site Description

SITE DESCRIPTION		
Occupancy / Use	The subject site is a rectangular shaped parcel of land located to the northwest of Egremont. The site is currently undeveloped, covered by an area of concrete and asphalt hardstand in the northern sector (footprint of the former school) and grassed across the southern sector.	
Structures	There are no structures located within the site boundary.	
Access	The site is accessed from the east via Croadella Avenue and north via Chaucer Avenue.	
Slope	The gradient falls by c. 2m from north to south.	
Retaining Structures	None identified.	
Surface Cover (%)	Buildings:	Nil
	Hardstand:	40%
	Soft Cover:	60%
Vegetation / Ecology	Local areas of bushes and self-seeding trees are located along eastern boundary and within the northwest corner of the site.	
Invasive Plant Species	No invasive plant species were observed at the site.	
Hazardous Material Storage	No Above Ground Storage Tanks (ASTs) or Underground Storage Tank (USTs) were observed at the site.	
Asbestos Containing Material (ACM)	No ACM was identified at the site, however the presence of ACM within the underlying Made Ground could not be entirely discounted.	
Polychlorinated Biphenyl (PCB)	No equipment that may potentially contain PCB was observed at the site.	
Waste Storage	No potentially hazardous waste streams are generated at the site.	
Drainage	The United Utilities service records indicate the presence of drainage infrastructure in Chaucer Avenue (north) and Croadella Avenue (east). A drainage pipe is located through the central sector in an E to W orientation.	

3. GROUND INVESTIGATION

3.1 General

A Ground Investigation has been designed based on the findings of the desk study with exploratory holes advanced to assess for potential contaminants and collect geotechnical information to assist in the design and construction of the proposed residential development.

Exploratory fieldwork was completed between the 21st and 29th November 2018. The works are summarised in Table 3.1 below.

Table 3.1 Summary of Fieldwork

POTENTIAL SOURCE/RATIONALE	LOCATION HOLE	TYPE	MAX DEPTH (mbgl)	MONITORING WELLS RESPONSE ZONE (mbgl)
Investigation of general ground conditions, depth of Topsoil, installation of environmental monitoring wells; geotechnical information, collection of environmental samples.	WS101	Window Sample Probehole	4.00	1.00-3.00
	WS102		4.00	0.50-2.50
	WS103		4.00	N/A
	WS104		3.80	0.50-3.00
	WS105		2.00	N/A
	WS106		3.00	N/A
Investigation of general ground conditions, depth of Topsoil geotechnical information, collection of environmental samples.	TP101-TP110	Mechanically Excavated	2.40	N/A

The sampling locations are illustrated in Drawing 12-237-003 (Appendix III). The ground conditions encountered are indicated on the logs which are provided in Appendix IV.

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.

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

3.2 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 60º cone (SPT(C)) was used instead of the sampling tube.

The results are shown in the probehole logs in Appendix IV and presented in Table 4.3 and discussed in Section 6.

3.3 Permeability Tests

Falling Head Infiltration Tests were undertaken at three locations (WS101, WS102 & WS104) across the site in order to assess the permeability of the underlying strata to determine the potential suitability for soakaway drainage as part of the proposed residential development.

The results are presented in Table 4.5.

3.4 Laboratory Analysis

Selected soil and groundwater samples were submitted to i2 Analytical Laboratory for a range of chemical analysis comprising:

- Metals, pH, total sulphate, water soluble sulphate (2:1 extract), sulphide, cyanide, phenols;
- Asbestos;
- Total and speciated poly-aromatic hydrocarbons (PAHs); and
- Total and speciated petroleum hydrocarbon (TPH).

The chemical testing results are included in Appendix V and discussed in Section 5.

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

- Atterberg Limits Determinations; and
- Single Stage Triaxial Tests

Laboratory analysis sheets are currently awaited and will be issued as an addendum to this report.

4. GROUND AND GROUNDWATER CONDITIONS

4.1 Ground and Groundwater Conditions

4.1.1 Summary of Ground Conditions

The Ground Investigation generally confirms the published geology and identifies the strata set out in Table 4.1 below:

Table 4.1 Summary of Strata

HOLE	DEPTH TO STRATUM (mbgl)					
	MADE GROUND	TOPSOIL	CLAY	SAND	GRAVEL	SILT
WS101	GL-0.30		0.30-3.45			
WS102	GL-0.40		0.40-4.00			
WS103		GL-0.20	0.20-4.45			
WS104		GL-0.20	0.20-3.80			
WS105		GL-0.30	0.30-2.45			
WS106		GL-0.30	0.30-1.45			
TP101		GL-0.70	0.70-2.10			
TP102		GL-0.60	0.60-2.10			
TP103		GL-0.60	0.60-2.20			
TP104		GL-0.50	0.50-2.30			
TP105	GL-0.70		0.70-1.70			
TP106	GL-0.60		0.60-2.30			
TP107	GL-0.30		0.30-1.60			
TP108		GL-0.70	0.70-2.10			
TP109		GL-0.30	0.30-1.50			
TP110		GL-0.30	0.30-2.30			

4.1.2 Made Ground

Made Ground deposits were encountered at five locations in the northern portion of the site associated with the relict foundations of the former school which occupied the site.

The Made Ground was encountered to a proven depth of 0.70m bgl and generally comprised a concrete or asphalt hard-stand which was in turn underlain by a clayey and/or sandy gravel. The gravel constituents comprised brick and mudstone.

4.1.3 Topsoil

A variable horizon of natural black gravelly CLAY (Topsoil) with rootlets was encountered across the southern portion of the site between 200mm and 700mm in thickness.

A Depth of Topsoil Plan is presented in Drawing No. 12-237-004 (Appendix III).

4.1.4 Drift Deposits

Drift deposits were encountered within all exploratory hole locations to a proven depth of 4.45m bgl.

The superficial deposits were uniform across the site and generally comprised a stiff to very stiff medium to very high strength silty CLAY.

4.1.5 Solid Geology

The bedrock was not encountered during the intrusive Ground Investigation.

4.1.6 Visual and Olfactory Evidence of Contamination

No visual and olfactory evidence of potential contamination was identified at the site.

4.1.7 Soil Consistency

Results of the Standard Penetration Tests, including undrained shear strengths derived from SPTs are included on Table 4.3.

Consideration must be made to the granular content of the glacial soils which can lead to misrepresentative results.

4.1.8 Groundwater

Groundwater strikes were encountered as a mixture of seepages and strikes. The depth of the these are shown on the exploratory hole records and summarised in Table 4.2 below.

Table 4.2 Summary Groundwater Strikes

LOCATION	DEPTH TO STRIKE (m)	NOTES
TP101	1.90	Steady ingress within CLAY.
TP102	1.50	Steady ingress within CLAY.
TP103	1.60	Steady ingress within CLAY.
TP104	1.20	Steady ingress within CLAY.
TP106	1.50	Steady ingress within CLAY.
TP107	1.20	Steady ingress within CLAY.
TP110	1.40	Steady ingress within CLAY.
WS101	1.60	Slow ingress within CLAY.
WS102	1.40	Slow ingress within CLAY.
WS104	1.30	Steady ingress within CLAY.

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.

4.1.9 Side Stability and Ease of Excavation

The concrete slab associated with the former school is still present in the northern sector of the site. No other relict foundations or sub-structures were encountered in the southern sector.

The excavated trial pits appeared to be generally stable and the natural glacial soils were excavated with relative ease. It is considered that future excavation activities should be feasible with normal plant.

However, where water ingress was noted the sidewall of the trial pits at depth became increasingly unstable.

The window sample boreholes penetrated the cohesive soils with relative east, however, refusals on stiff to very stiff clay meant that boreholes were terminated at <5.45m bgl.

Table 4.3 Standard/Cone Penetration Test Results

BOREHOLES	DEPTH (mbgl)	MATERIAL FIELD DESCRIPTION	CPT/SPT "N" VALUE	CORRECTED "N" VALUE $(N_1)_{60}$	TERZAGHI & PECK RELATIVE DENSITY (SANDS)	EUROCODE SOIL STRENGTH	CONSISTENCY (BS5930)	TERZAGHI & PECK APPROXIMATE UNDRAINED SHEAR STRENGTH (kN/m^2)
WS101	1.0	Silty CLAY	8	8.07	N/A	Medium Strength	Stiff	40.33
	2.0	Silty CLAY	13	11.88	N/A	Medium Strength	Stiff	59.38
	3.0	Silty CLAY	50	43.48	N/A	Very High Strength	Very Stiff	217.41
WS102	1.0	Silty CLAY	9	9.07	N/A	Medium Strength	Stiff	45.37
	2.0	Silty CLAY	14	12.79	N/A	Medium Strength	Stiff	63.95
	3.0	Silty CLAY	25	21.74	N/A	High Strength	Very Stiff	108.71
	4.0	Silty CLAY	50	42.24	N/A	Very High Strength	Very Stiff	211.21
WS103	1.0	Silty CLAY	12	12.10	N/A	Medium Strength	Stiff	60.49
	2.0	Silty CLAY	12	10.96	N/A	Medium Strength	Stiff	54.81
	3.0	Silty CLAY	22	19.13	N/A	High Strength	Very Stiff	95.66
	4.0	Silty CLAY	50	42.24	N/A	Very High Strength	Very Stiff	211.21
WS104	1.0	Silty CLAY	2	2.02	N/A	Very Low Strength	Soft	10.08
	2.0	Silty CLAY	17	15.53	N/A	High Strength	Very Stiff	77.65
	3.0	Silty CLAY	50	43.48	N/A	Very High Strength	Very Stiff	217.41
WS105	1.0	Silty CLAY	27	27.22	N/A	High Strength	Very Stiff	136.10
	2.0	Silty CLAY	50	45.68	N/A	Very High Strength	Very Stiff	228.38
WS106	1.0	Silty CLAY	50	50.41	N/A	Very High Strength	Very Stiff	252.04

4.1.10 Soil Plasticity

The plasticity analysis results are currently awaited and will be issued as an addendum to this report.

4.1.11 pH and Sulphate

Chemical analyses for pH and soluble sulphate content contained in Appendix V (summarised below in Table 4.4), 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 4.4 Summary of pH and Sulphate Data

LOCATION	DEPTH (m)	SO_4 IN 2:1 WATER / SOIL (g/l)	pH VALUE	CLASSIFICATION
WS102	1.10	0.027	8.1	DC-1, AC-1s
WS104	0.60	0.041	7.8	DC-1, AC-1s
WS105	0.20	0.017	5.8	DC-1, AC-1s
WS105	1.20	0.013	8.0	DC-1, AC-1s
WS106	0.80	0.015	7.8	DC-1, AC-1s
TP101	0.50	0.019	6.1	DC-1, AC-1s
TP104	0.80	0.017	6.5	DC-1, AC-1s
TP105	0.40	0.029	6.8	DC-1, AC-1s
TP106	0.10	0.024	7.1	DC-1, AC-1s
TP108	0.20	0.019	7.4	DC-1, AC-1s
TP109	1.20	0.0085	7.7	DC-1, AC-1s
WS102	1.10	0.027	8.1	DC-1, AC-1s

4.1.12 BRE365 Permeability Tests

Falling head infiltration tests were undertaken within three monitoring wells in order to assess the permeability of the underlying strata and determine the potential suitability for soakaway drainage within the proposed development.

The locations were bailed prior to the tests being taken.

The results are presented in Table 4.5 below.

Table 4.5 Soil Infiltration Results

LOCATION	DEPTH (m)	MATERIAL	TEST NO.	SOIL INFILTRATION RATE (m/s)
WS101	3.00	Silty CLAY	Test No.1	FAIL
WS102	2.50	Silty CLAY	Test No.1	2.46E-07
WS104	3.00	Silty CLAY	Test No.1	FAIL

The results indicate the natural soil to offer poor effective permeability.

The groundwater at WS104 was recorded at 0.3m bgl; as such a rising head test was undertaken. The monitoring well was emptied, and the time taken for the well to recharge was recorded to be 12 minutes.

In consideration of the above, E3P do not consider soakaway drainage to be viable.

4.2 Ground Gas

E3P have not identified any significantly potential sources of ground gas on site or within the immediate locality.

Given the low sensitivity of the site with respect to hazardous ground gas, it was considered that a ground gas assessment undertaken in accordance with the latest guidance provided by CL:AIRE in their research bulletin RB17 would be suitable, which is detailed in Section 5.3.

5. 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.

5.1 Human Health Risk Assessment

At a 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 5.1 (overleaf).

Table 5.1 Summary of Inorganic and Hydrocarbon Toxicity Assessment for a Residential End Use

Determinand	Units	GAC	n	MC	Loc. of Ex	Pathway	Assessment
Arsenic	mg/kg	37	11	28	N/A	1	No Further Action
Cadmium	mg/kg	17	11	<0.2	N/A	1	No Further Action
Chromium (VI)	mg/kg	6.1	11	<4.0	N/A	1	No Further Action
Lead	mg/kg	200	11	180	N/A	1	No Further Action
Mercury	mg/kg	11	11	<0.3	N/A	2	No Further Action
Nickel	mg/kg	130	11	49	N/A	1	No Further Action
Selenium	mg/kg	250	11	1.4	N/A	1	No Further Action
Copper[ii]	mg/kg	2400	11	56	N/A	1	No Further Action
Zinc[ii]	mg/kg	3700	11	140	N/A	1	No Further Action
Cyanide - Total	mg/kg	791	11	<1.0	N/A	1	No Further Action
Phenols - Total.	mg/kg	210	11	<1.0	N/A	1	No Further Action
Asbestos	Fibres	NFD	5	NFD	N/A	4	No Further Action
Naphthalene	mg/kg	2.3	11	<0.05	N/A	2	No Further Action
Acenaphthylene	mg/kg	170	11	<0.05	N/A	3	No Further Action
Acenaphthene	mg/kg	210	11	<0.05	N/A	1	No Further Action
Fluorene	mg/kg	170	11	<0.05	N/A	1	No Further Action
Phenanthrene	mg/kg	95	11	2.1	N/A	3	No Further Action
Anthracene	mg/kg	2400	11	0.78	N/A	3	No Further Action
Fluoranthene	mg/kg	280	11	7.5	N/A	3	No Further Action
Pyrene	mg/kg	620	11	5.6	N/A	3	No Further Action
Benzo(a)Anthracene	mg/kg	7.2	11	3.8	N/A	3	No Further Action
Chrysene	mg/kg	15	11	2.9	N/A	3	No Further Action
Benzo(b)Fluoranthene [i]	mg/kg	2.6	11	3.5	TP106-0.10	3	Further Assessment
Benzo(k)Fluoranthene [i]	mg/kg	77	11	1.9	N/A	3	No Further Action
Benzo(a)Pyrene	mg/kg	2.2	11	2.9	TP106-0.10	3	Further Assessment
Indeno(123-cd)Pyrene	mg/kg	27	11	1.4	N/A	3	No Further Action
Dibenzo(a,h)Anthracene	mg/kg	0.24	11	0.39	TP106-0.10	3	Further Assessment
Benzo(ghi)Perylene	mg/kg	320	11	1.6	N/A	3	No Further Action
TPH C5-C6 (aliphatic)*	mg/kg	42	11	< 1.0	N/A	2	No Further Action
TPH C6-C8 (aliphatic)*	mg/kg	100	11	< 0.1	N/A	2	No Further Action
TPH C8-C10 (aliphatic)*	mg/kg	27	11	< 0.1	N/A	2	No Further Action
TPH C10-C12 (aromatic)*	mg/kg	74	11	< 2.0	N/A	2	No Further Action
TPH C12-C16 (aromatic)*	mg/kg	140	11	5.3	N/A	2	No Further Action
TPH C16-C21 (aromatic)*	mg/kg	260	11	22	N/A	1	No Further Action
TPH C21-C35 (aromatic)*	mg/kg	1100	11	67	N/A	1	No Further Action

Notes
Main Exposure Pathways: 1 = Soil Ingestion, 2 = Vapour Inhalation (indoor), 3 = Dermal Contact & Ingestion, 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, S4UL = LQM/CIEH Suitable For Use Levels
* The Tier 1 GAC for the hydrocarbon fraction is derived from the CIEH assessment for petroleum hydrocarbons Criteria Working Group (CWG) for both aliphatic and aromatic compounds. E3P has utilised the Tier 1 values for aliphatic compounds for the volatile and semi volatile fractions (C_5-C_{12}) and the Tier 1 values for aromatic compound for the non-volatile fractions (C_{12}-C_{35}). The comparison of a total (aliphatic/aromatic) compounds to an individual fraction is considered to be a conservative approach and satisfactory for the protection of human health.

Referring to Table 5.1, the results of this direct comparison indicates that the data exceeds the screening criteria for a residential end use for the following contaminants:

- Benzo(b)Fluoranthene
- Benzo(a)Pyrene
- Dibenzo(a,h)Anthracene

Asbestos was not identified in any of the 5 No. Made Ground samples submitted for chemical analysis.

In relation to these above exceedances, the following can be determined:

- The main exposure pathways based on the Tier I exceedances are:
    - Dermal Contact & Soil Ingestion

Risk Assessment and Mitigation

For the elevated concentrations of PAHs listed above the viable exposure pathway is directly related to dermal contact and soil ingestion.

The exceedances were identified at one location (TP106) within the shallow Made Ground at 0.10m bgl. This is considered a localised hotspot.

These risks can be mitigated through careful management of earthworks so as to prevent impacted soils being exposed to construction workers through the use of appropriate Personal Protective Equipment (PPE) and provision of welfare facilities.

In consideration of the proposed development scheme; the Made Ground at TP106 can be excavated and placed in an area of low-sensitivity (such as beneath hard-standing), thereby removing the exposure pathway and ensuring no risk to residential site users.

Preliminary chemical analysis has confirmed the Topsoil and underlying soils are suitable for re-use within any proposed gardens and landscaped areas (other than soils at TP106); however further chemical analysis will be required to confirm this.

If topsoil or sub-soil is to be removed from site, a U1 Exemption or a CL:AIRE MMP for the direct transfer of naturally occurring soils will be required.

If any material is removed for off-site disposal a WM-3 waste classification will be required.

5.2 Controlled Waters Risk Assessment

The site sensitivity with respect to controlled waters is summarised within Table 5.2

Table 5.2 Controlled Waters Sensitivity Profile

RISK PROFILE	DISCUSSION	SENSITIVITY RATING
Groundwater Source Protection Zone or Drinking Water Safeguard Zone	The subject site is not located within a GSPZ or Drinking Water Safeguard Area.	**LOW**
Distance to the closest groundwater abstraction point.	There are no potable groundwater abstraction boreholes within 500m of the site.	**LOW**
Aquifer Classification in Superficial Drift Deposits.	The Secondary A Aquifer within the superficial deposits is not considered a sensitive receptor in this instance.	**LOW**
Aquifer Classification in Bedrock.	The Principal Aquifer is considered a potential receptor; however, the overall sensitivity is reduced given the absence of any potentially contaminative sources on-site and potable water supply boreholes in the locality (500m).	**MODERATE**
Viability for Anthropogenic soil in direct contact with aquifer (drift or bedrock).	Made Ground has been encountered within the northern sector to a proven depth of 0.70m bgl overlying natural cohesive deposits.	**LOW**
Is the site located within 50m of a surface watercourse?	A stream / drainage ditch is understood to have been culverted beneath the site.	**MODERATE**
Summary The ICSM developed within the context of the site setting has only identified a single viable pollutant risk which would be the lateral migration of potentially mobile phase soluble contaminants into the stream culverted beneath the site flowing southeast towards the River Ehen. The underlying Principal Aquifer is not considered a sensitive receptor given absence of any sources of soluble contaminants or potable groundwater abstraction boreholes within close proximity (500m); as such the site is considered to pose a very low risk to controlled waters.		

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 5.3.

Table 5.3 Qualitative Risk to Controlled Waters from Soil Analytical Results

BTEX - >1mg/kg	The soil data analysis has not identified any detectable concentrations of TPH C5 to C6 that might otherwise be indicative of BTEX and/or SVOC impact.
Total SVOC - > 1mg/kg	
Total VOC - > 1 mg/kg	As above.
C5-C10 - > 5mg/kg	All concentrations are below the laboratory LOD.
C10-C12 - > 10mg/kg	All concentrations are below the laboratory LOD.
C12-C16 - > 50mg/kg	Concentrations above 50mg/kg have not been recorded.
Phenols – > 2mg/kg	All concentrations are below the laboratory LOD.
Naphthalene - > 2mg/kg	Naphthalene has not been identified at concentrations greater than 2mg/kg.
Total PAH - > 10mg/kg	Concentrations above 50mg/kg have not been recorded.
PCB - > 1mg/kg	No potential sources of PCB have been identified.
Heavy metals - > 500mg/kg	Concentrations of heavy metals above 500mg/kg have not been recorded.

Given the absence of any potentially soluble contaminants of concern within the soil or sources of potential pollutants, no complete pollutant linkage has been established and it is concluded that the site poses no unacceptable degree of risk to controlled waters or the wider environ.

5.3 Ground Gas

E3P has not identified any potentially significant sources of hazardous ground gases at the site; however, the underlying limestone is a potential low-level risk due to dissolution processes.

Given the low sensitivity of the site with respect to hazardous ground gas, it was considered that a ground gas assessment undertaken in accordance with the latest guidance provided by CL:AIRE in their research bulletin RB17 would be suitable.

CL:AIRE Research Bulletin RB17 provides an alternative framework for the preliminary investigation and assessment of ground gas that takes into account other factors such as such as site history and the nature of the ground conditions beneath a site.

It has been prepared to allow gas well installation and monitoring to be avoided where appropriate and may also be used in conjunction with gas monitoring to reduce the monitoring period or to avoid extra gas monitoring where anomalous results are recorded.

E3P has completed a ground gas assessment in accordance with industry best practice as detailed in the CL:AIRE Research Bulletin (RB17) and the assessment is summarised in Table 5.4.

Table 5.4 RB17 Ground Gas Risk Assessment

E3P CL:AIRE RB 17 Ground Gas Risk Assessment			
Item	**Outcome**	**Action**	**Risk Score**
Have any credible ON SITE ground gas sources been identified within the Desk Study & ICSM?	No	None identified.	1
Have any credible OFF SITE ground gas sources been identified within the Desk Study & ICSM?	No	None identified.	1
Is the site located within close proximity to a variable groundwater regime (river or tidal) that could potentially influence the ground gas regime?	No	Groundwater strikes were recorded at depth of between 1.20-1.90m bgl. A small stream is understood to have been culverted beneath the site.	1
Has a credible pathway for the migration of gas from historical mine workings been identified?	No	N/A	1
Average depth Made Ground >5.0m	No	No Made ground in excess of 1.00m bgl was encountered.	1
Average depth Made Ground >3.0m	No		
Average Depth Made Ground >1.0m	No		
TOC <3	Yes	TOC in natural soils <3%	1
TOC >3	No	N/A	1
Made Ground In-situ >20 Years	Yes	Shallow Made Ground in northern sector associated with former school.	1
Made Ground In-situ <20 Years	No	N/A	1
Natural soils with no potential to generate CH4 only CO2.	No	None	1
Hydrocarbons or volatile compounds above the Tier I GAC identified.	No	None	1
Radon Protection Measures Required	No	<1% of properties above the action level for radon. No protection required.	1
Risk Score			**12**

Notes for E3P RB17 Gas Risk Assessment

Risk Score – 1 = Low / 2 = Moderate / 3 = High

Risk Profile
Cumulative risk score is **<14** the site is deemed to be very low risk and thus conforms to **Characteristic Situation 1.**
Cumulative risk score is **>14 but <20** the site is deemed to be very low risk and thus conforms to **Characteristic Situation 2.**
Cumulative risk score is **>20** the site is deemed to be very low risk and thus conforms to **Characteristic Situation 3.**

The RB17 assessment indicates a cumulative score of 12, and in light of the rationale outlined above, E3P can confirm that the site meets Characteristic Situation 1 / Green which stipulates no ground gas protection measures are required for the proposed residential units.

5.4 Conceptual Site Model

Following the completion of the intrusive site investigation, chemical analysis and risk assessment the conceptual model shown in Table 4.5 has been prepared for the site.

Table 4.5 Conceptual Model

POLLUTANT LINKAGE	PATHWAY	RECEPTOR	CONTAMINANT (SOURCE)	PROBABILITY	RISK	ASSESSMENT AND RECOMMENDATIONS
PL1	Dermal contact.	Future site users.	PAH in potentially reworked Topsoil.	Likely	Low	Localised PAH impact to shallow Made Ground at TP106. Impacted Topsoil to be placed beneath hard-stand, thereby removing the exposure pathway.
PL3	Ingestion of tainted water supply.	Future site users through water supply infrastructure.	Localised Made Ground	Likely	Low	Chemical analysis would suggest that Polyethylene (PE) pipeline will be suitable for the proposed residential development. Further chemical analysis would be required to confirm this at the proposed pipeline depth once finished floor levels are known.

6. GEOTECHNICAL ASSESSMENT

6.1 Proposed Development

The client intends to develop the site for residential end use; comprising the construction of 19 No. residential units with associated access and estate roads, car parking, private gardens and adopted utility infrastructure.

The Indicative Development Scheme is presented in Drawing No. 12-567-002 (Appendix III).

6.2 Summary of Ground Conditions

Made Ground

Made Ground was encountered in the northern sector within the footprint of the former school to a proden depth of 0.70m bgl and generally comprised a concrete or asphalt hard-stand which was in turn underlain by a clayey and/or sandy gravel of brick and mudstone.

Topsoil

A variable horizon of natural black gravelly CLAY (Topsoil) with rootlets was encountered across the southern portion of the site between 200mm and 700mm in thickness.

Drift

Drift deposits were encountered within all exploratory hole locations to a proven depth of 4.45m bgl and generally comprised a stiff to very stiff medium to very high strength silty CLAY.

Solid

The bedrock was not encountered during the intrusive Ground Investigation.

Groundwater

Groundwater strikes have been recorded at depths of between 1.20-1.90m bgl.

6.3 Site Preparation

The site should be cleared and any vegetation below areas of proposed development stripped in accordance with Series 200 of the Specification for Highway Works. This should include:

- Any roots present below the footprint of proposed structures and infrastructure should be grubbed out and the resulting void infilled with suitable compacted engineered fill;
- No invasive plant species have been identified at the site. If encountered, the infested soils will require treatment / removal by a suitably qualified contractor;
- Redundant services should be sealed off and grubbed out and replaced with suitable compacted engineered fill;
- Relict foundations have been encountered, these features should be excavated from below the proposed development footprint with the resulting void backfilled; and,
- Consideration should be given to any proposed retaining structures on the site and should be assessed by a structural engineer prior to development.

6.4 Foundation Conditions & 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 6.1.

Table 6.1 Summary of ABPs

NATURAL COHESIVE SOILS			
DESCRIPTION	**DEPTH RANGE (m BGL)**	**UNDRAINED SHEAR STRENGTH (CU) kN/m²**	**ALLOWABLE BEARING PRESSURE (kN/m²)**
Silty CLAY	1.00 – 1.45	10 – 136	**20 – 280**
Silty CLAY	2.00 – 2.45	55 – 228	**112 – 470**
Silty CLAY	3.00 – 3.45	95 – 217	**196 – 447**
Silty CLAY	4.00 – 4.45	~211	**>435**

Based on the assessment of the relative undrained shear strength, relative in-situ densities and corresponding safe net ABP, the target founding stratum has been identified as the stiff to very stiff medium to very high strength silty CLAY soils at a depth of between 1.00-1.50m bgl where an ABP of >75kN/m² can be achieved which generally increases with depth.

6.5 Foundation Solution

Following a strip of the near surface organic Topsoil underlying proposed plot footprints, it is considered the proposed structures could be constructed using traditional shallow strip foundations bearing on the underlying natural cohesive soils, with potential for mass trench fill in areas of proposed tree influence.

However, locally soft to firm very low strength soils have been encountered within WS104 at 1.00m bgl, as such the depth to competent strata is deeper at this location.

The anticipated depth to founding strata is presented in Table 6.2 (overleaf), however this does not take into consideration the potential requirement to upfill the site for flood alleviation.

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 not possible to accurately define the foundation types due to the absence of a flood risk assessment and finished floor levels (FFLs). This information will ultimately dictate the foundation depths.

Consideration must also be given to the varying soil matrices and differing settlement characteristics and where a foundation spans two varying matrices the sub-structure should be designed accordingly.

Table 6.2 Anticipated Foundations

LOCATION	ANTICIPATED FOUNDING STRATA DEPTH	GROUND WATER DEPTH	FOUNDATION TYPE	TYPE OF CONCRETE	PLOT(S)
WS101	1.10	1.60	STRIP	DS-1 AC-1S	8-10
WS102	1.00	1.40	STRIP		11-13
WS103	1.00	-	STRIP		6-7
WS104	1.50	0.30	STRIP		1-5
WS105	0.75	-	STRIP		17-19
WS106	0.75	-	STRIP		14-16

A Depth to Founding Strata Plan is included as Drawing 12-237-005 in Appendix III.

6.6 Ground Floor Slabs

Due to the cohesive nature of the underlying soils across the site it is considered that ground bearing floor slabs, whilst viable, will require detailed design to accommodate variability of the formation and account for differential settlement where soil moistures are evident and susceptibility to heave.

Where suspended floor slabs are employed ventilation of the under floor void will be required to address condensation issues. This would also assist in the mitigation of potential gas ingress issues.

6.7 Heave Precautions

The results of the plasticity analysis are currently awaited and will be issued as an addendum to this report.

Based on field observations the cohesive soils are considered to be of low plasticity.

6.8 Pavement Construction

It is considered that the underlying natural cohesive soils (underlying the Topsoil horizon within the upper 1.0m) can be re-engineered in accordance with the requirements of the highways design manual (series 600) for a Method Compaction to achieve a CBR in excess of 5% if works are completed in favourable climatic conditions.

Following excavation, the sub formation should be proof rolled and any soft material inspected and removed during favourable climatic conditions to prevent exposure to precipitation.

During the enabling works, Dynamic Cone Penetrometer (DCP) tests should be undertaken at the highway formation level to confirm the CBR%.

6.9 Drainage

Preliminary Falling Head Permeability Tests indicate the cohesive soils do not offer the required effective permeability, and as such the use of soakaways drainage systems for disposal of surface water run-off is not considered viable for this site.

6.10 Concrete Durability

Based upon the results of the chemical analysis, 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).

6.11 Excavations

The boreholes and trial pits were advanced with relative ease through the natural soils and generally excavations should be feasible as part of future works with normal plant.

The concrete slab associated with the former school building is present, the slab and any relict foundations will need to be grubbed out in their entirety.

Groundwater strikes have been recorded at depth of between 1.20-1.90m bgl.

6.12 Re-Use of Materials

Chemical analysis of the topsoil and underlying natural strata indicates this material is suitable for re-use within the private gardens and/or landscaped areas as part of the development; however further chemical analysis will be required to confirm this.

6.13 Minerals

There are minerals of economic value underlying the site at shallow depth, however mining is considered to be very unlikely. The site is considered to be minerally stable.

6.14 Further Works

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

- Flood Risk Assessment;
- DCP Testing along Access / Estate Road formation level;
- Foundations to be designed by a suitably qualified Structural Engineer;
- Geotechnical Earthworks Compaction Specification (Infrastructure); and
- A Materials Management Plan should be completed on receipt of the proposed FFLs.

6.15 Construction Activity and Inspection

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

- It is recommended that sufficient allowance is made for the inspection of formation and sub formations 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 utilised;
- It is considered that de-watering may be required, particularly 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.
- 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 the use of Personnel Protective Equipment (PPE).

7. CONCLUSIONS AND RECOMMENDATIONS

Contaminated Land	
Human Health	The Tier I Human Health Risk Assessment has identified marginally elevated PAHs at TP106 within the shallow topsoil (0.10m bgl). This is considered a localised hotspot and the impacted soil will need be stripped and placed in an area of non-sensitivity (such as beneath hardstand) to remove the exposure pathway to future site users. No other elevated concentrations of contaminants of concern which exceed the Tier I screening values for the protection of human health were encountered, as such the site is considered to pose a very low risk to future residential site users.
Controlled Waters	In the absence of any potentially soluble / mobile contaminants of concern within the soil analysis or sources of potential pollutants; it is concluded the site poses a very low risk to the controlled water receptors.
Ground Gas	The RB17 ground gas assessment indicates the site falls into classification Characteristic Situation 1 / Green; as such protection measures are not required in the proposed residential units.
Radon	Lower Probability Area – No radon protection measures are required.
Potable Water	Based on the preliminary chemical analysis it is concluded Poly-Ethylene Pipe (PE) will be suitable for the proposed residential development. However, further chemical analysis will be required to confirm this at the placement depth for the water supply pipeline infrastructure.
Geotechnical Issues	
The underlying stiff to very stiff medium strength to very high strength silty CLAY soils have been assessed as having a net ABP of >75kN/m² at circa 0.75-1.50m bgl. E3P believe the most viable foundation solution would comprise shallow strip foundations bearing on the silty CLAY soils at between 0.75-1.50m bgl or mass trench fill in the areas of tree influence. The proposed development scheme and finished floor levels (FFLs) will however dictate this; The final foundation solution will be dependent on the structural loadings and elevation and should be designed by a suitably qualified structural engineer; It is considered the underlying cohesive soils (excluding organic soils at the near surface) may provide a sub-grade formation to support proposed roads and infrastructure with a likely CBR of >5%; The site is not located in an area of historic coal mine workings or ground instability and the risk of future subsidence is considered to be very low. An iron ore mine was historically located to the north of the site, however, this area has since been redeveloped for residential use; and The underlying predominantly cohesive deposits do not offer the required permeability to make the use of soakaway drainage systems viable, in this instance.	

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 1.2.

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 be 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.

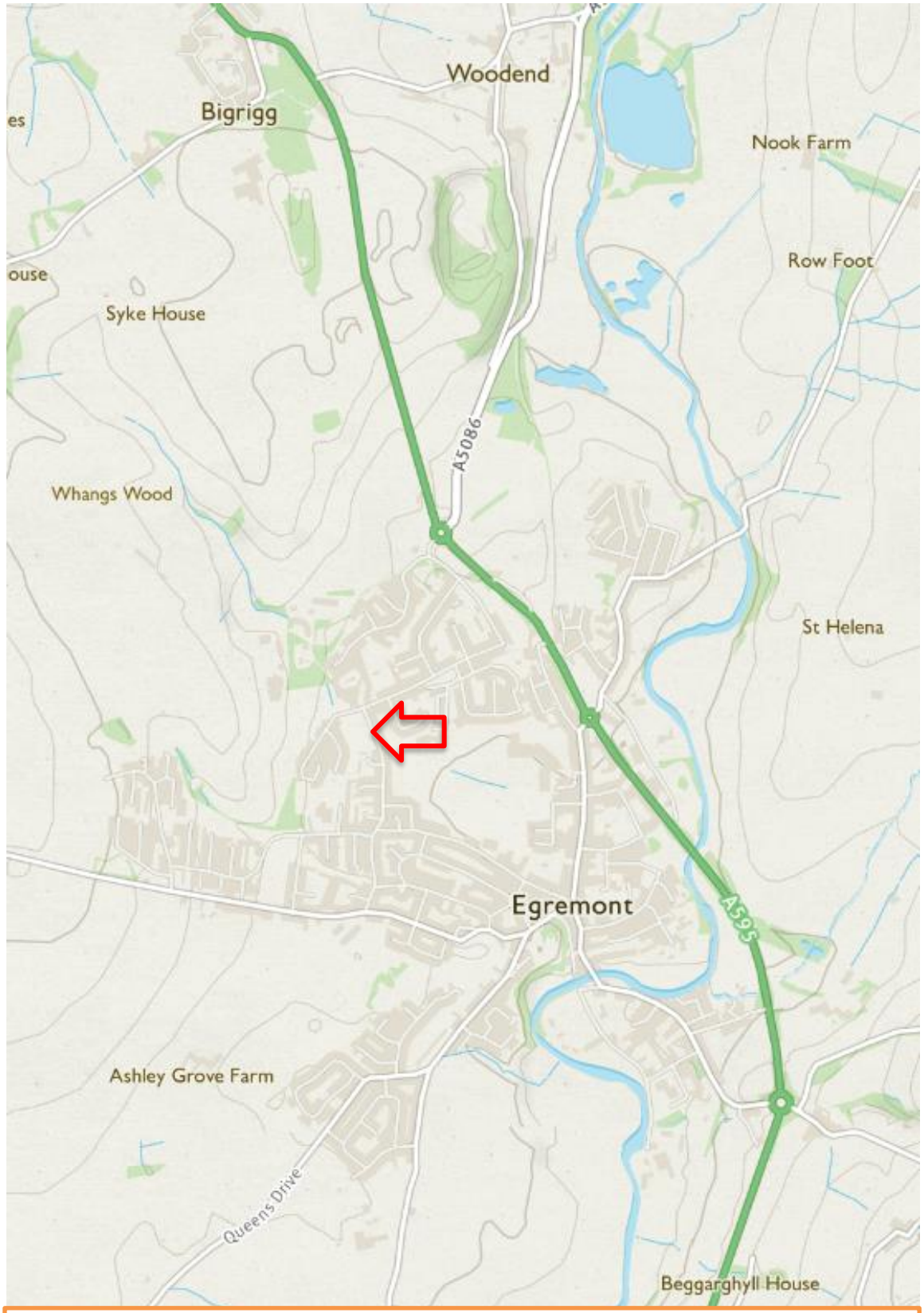
10. New information, revised practices or changes in legislation may necessitate the re-interpretation of the report, in whole or in part.

APPENDIX II
GLOSSARY

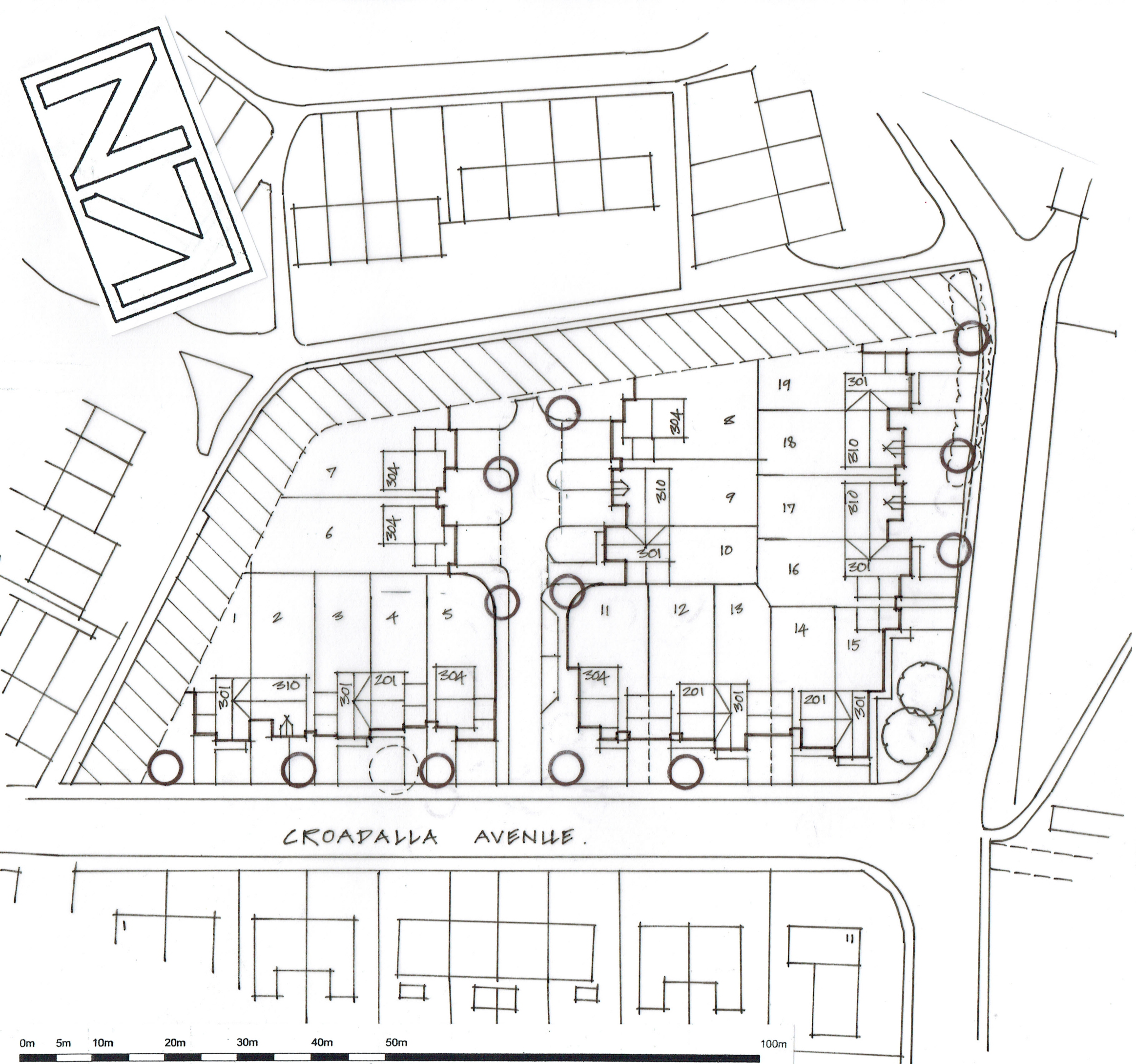
TERMS

AST	Above Ground Storage Tank	**SGV**	Soil Guideline Value
BGS	British Geological Survey	**SPH**	Separate Phase Hydrocarbon
BSI	British Standards Institute	**TPH CWG**	Total Petroleum Hydrocarbon (Criteria Working Group)
BTEX	Benzene, Toluene, Ethylbenzene, Xylenes	**SPT**	Standard Penetration Test
CIEH	Chartered Institute of Environmental Health	**SVOC**	Semi Volatile Organic Compound
CIRIA	Construction Industry Research Association	**UST**	Underground Storage Tank
CLEA	Contaminated Land Exposure Assessment	**VCCs**	Vibro Concrete Columns
CSM	Conceptual Site Model	**VOC**	Volatile Organic Compound
DNAPL	Dense Non-Aqueous Phase Liquid (chlorinated solvents, PCB)	**WTE**	Water Table Elevation
DWS	Drinking Water Standard	**m**	Metres
EA	Environment Agency	**km**	Kilometres
EQS	Environmental Quality Standard	**%**	Percent
GAC	General Assessment Criteria	**%v/v**	Percent volume in air
GL	Ground Level	**mb**	Milli Bars (atmospheric pressure)
GSV	Gas Screening Value	**l/hr**	Litres per hour
HCV	Health Criteria Value	**µg/l**	Micrograms per Litre (parts per billion)
ICSM	Initial Conceptual Site Model	**ppb**	Parts Per Billion
LNAPL	Light Non-Aqueous Phase Liquid (petrol, diesel, kerosene)	**mg/kg**	Milligrams per kilogram (parts per million)
ND	Not Detected	**ppm**	Parts Per Million
LMRL	Lower Method Reporting Limit	**mg/m^3**	Milligram per metre cubed
NR	Not Recorded	**m bgl**	Metres Below Ground Level
PAH	Polycyclic Aromatic Hydrocarbon	**m bcl**	Metre Below Cover Level
PCB	Poly-Chlorinated Biphenyl	**mAOD**	Metres Above Ordnance Datum (sea level)
PID	Photo Ionisation Detector	**kN/m^2**	Kilo Newtons per metre squared
QA	Quality Assurance	**µm**	Micro metre
SGV	Soil Guideline Value		

APPENDIX III
DRAWINGS



Drawing 13-019-001 - Site Location Plan



SCHEDULE OF ACCOMMODATION

TYPE	SQ.FT	No.
201	651	3
301	759	7
310	788	4
304	772	5
TOTAL	**14,278 SQ.FT**	**19no.**

GROSS SITE AREA	1.59 ACRES
UNDEVELOPABLE AREA	0.34 ACRES
NET SITE AREA	1.25 ACRES
GROSS DENSITY	11.95 U.P.A
GROSS FOOTAGE	8,980 SQ.FT/ACRE
NET DENSITY	15.20 U.P.A
NET FOOTAGE	11,422 SQ.FT/ACRE

SUBJECT TO SITE SURVEY AND LPA APPROVAL

REV	DESCRIPTION	DATE

gleeson

GLEESON HOMES & REGENERATION

DRAWING

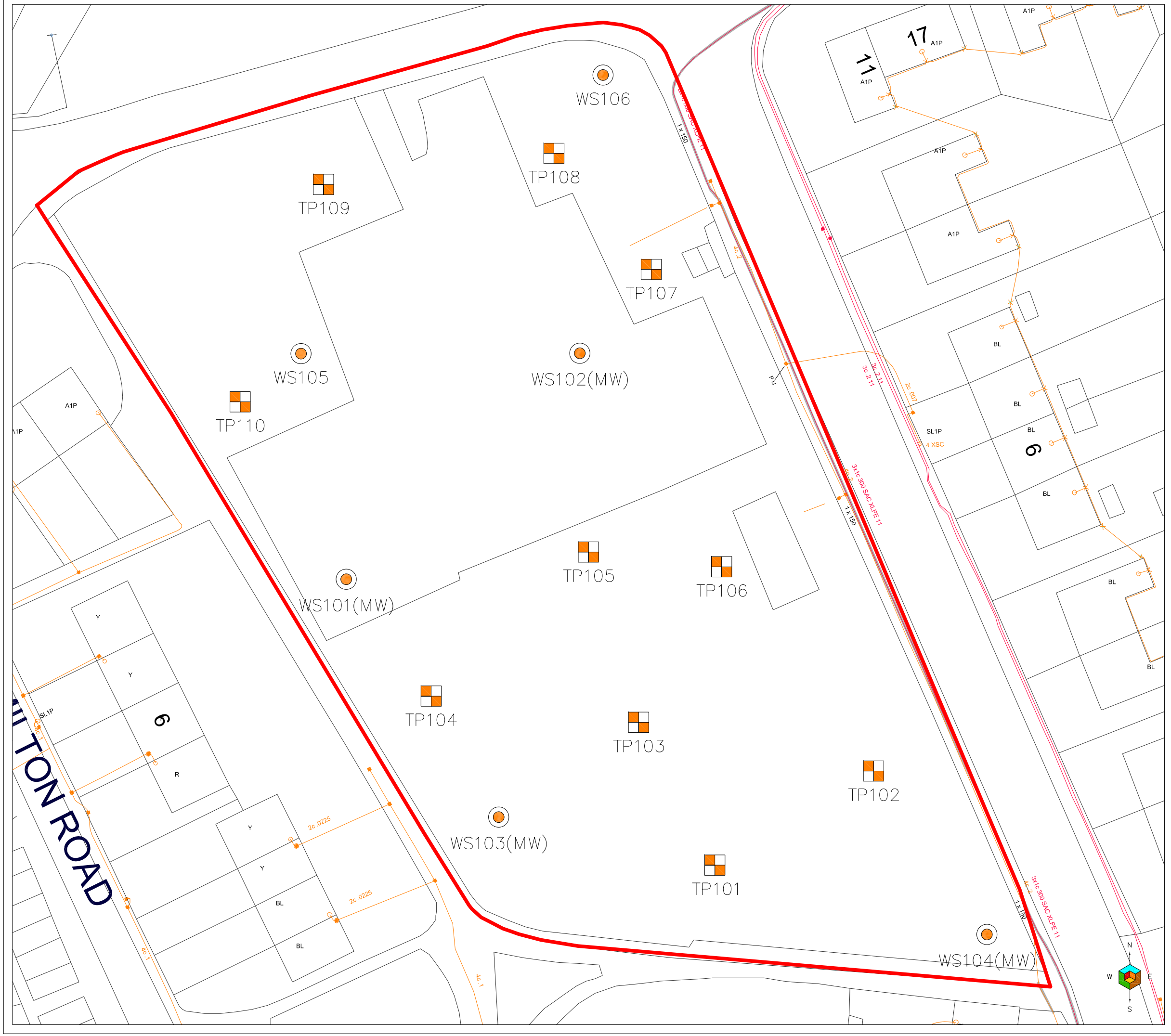
SKETCH SCHEME

PROJECT

CROADALLA AVENUE, EGREMONT

SCALE	1:500@A2	REV.	DRAWING No.
DATE	JUNE 2018		MJG/SKL-195
DRAWN	TWENTY10		

TWENTY 10
DESIGN AND PLANNING
Twenty10 Management Limited, 62 Hawkshead Avenue, Euxton, Chorley , Lancashire. PR7 6TF
Tel (01257) 277 100 Email: info@twenty10.biz Fax (01257) 266 911



Key:

Location Symbols

WS101 — Approximate Window Sample Probehole Location

WS101(MW) — Approximate Window Sample Probehole Location with Install

TP101 — Approximate Trial Pit Location

Notes:

P1	R1	05.12.2018	REVISION	HM	AS
P1	-	04.12.2018	DRAFT	HM	AS
Phase	Revision	Date	Issue	Drawn	Authorised

Client: Gleeson Homes

Job No: 13-019

Date: 05.12.2018

Drawing No: 003

Scale: NTS

Job Title: Croadella Avenue, Egremont

Drawing Title: Exploratory Hole Location Plan

e3p

Environmental Engineering Partnerships Ltd
City Heliport & Business Centre
Eccles, Manchester, M30 7RU
Tel: 0161 707 9612
E-mail: info@e3p.co.uk
Website: www.e3p.co.uk

Key:

Location Symbols

- WS101 — Approximate Window Sample Probehole Location
- WS101(MW) — Approximate Window Sample Probehole Location with Install
- TP101 — Approximate Trial Pit Location

Topsoil Depth (m)

- Topsoil in Excess of 1.00m
- Depth of Topsoil Between 0.90 - 0.99m
- Depth of Topsoil Between 0.80 - 0.89m
- Depth of Topsoil Between 0.70 - 0.79m
- Depth of Topsoil Between 0.60 - 0.69m
- Depth of Topsoil Between 0.50 - 0.59m
- Depth of Topsoil Between 0.40 - 0.49m
- Depth of Topsoil Between 0.30 - 0.39m
- Depth of Topsoil Between 0.20 - 0.29m
- Depth of Topsoil Between 0.10 - 0.19m
- Depth of Topsoil Between 0.00 - 0.09m
- Topsoil Not Identified Due To Concrete Hardstanding.

Notes:

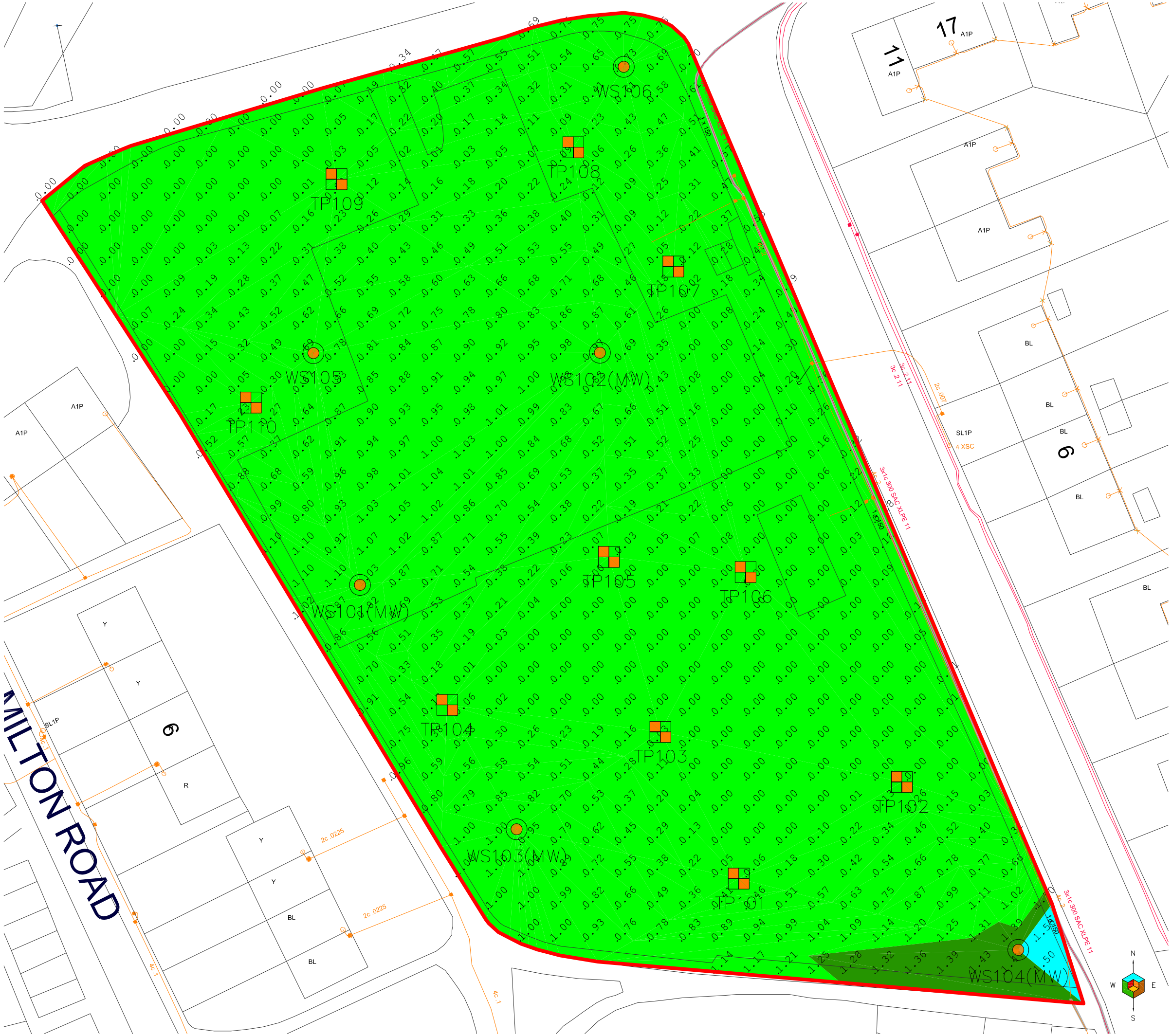
The conjectured depth mapping has been completed using 3D modelling software to produce indicative assessments that at this time are the most accurate interpretation of the Ground Investigation data. However, the conjectured nature of the model, limitations and areas of uncertainty between two proven points and the intermediary area result in uncertainties that should be considered by the reader of a drawing and incorporated in any subsequent assessment.

Phase	Revision	Date	Issue	Drawn	Authorised
P1	R1	08.01.2019	REVISION	HM	AS
P1	-	03.01.2019	DRAFT	HM	AS

Client: Gleeson Homes	Job No: 13-019	Date: 08.01.2019
	Drawing No: 004	Scale: NTS
Job Title: Croadella Avenue, Egremont	Drawing Title: Depth of Topsoil Plan	

e3p

Environmental Engineering Partnerships Ltd
City Heliport & Business Centre
Eccles, Manchester, M30 7RU
Tel: 0161 707 9612
E-mail: info@e3p.co.uk
Website: www.e3p.co.uk



Key:

Location Symbols

WS101 — Approximate Window Sample Probehole Location

TP101 — Approximate Trial Pit 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:

The conjectured depth mapping has been completed using 3D modelling software to produce indicative assessments that at this time are the most accurate interpretation of the Ground Investigation data. However, the conjectured nature of the model, limitations and areas of uncertainty between two proven points and the intermediary area result in uncertainties that should be considered by the reader of a drawing and incorporated in any subsequent assessment.

P1	-	03.01.2019	DRAFT	HM	AS
Phase	Revision	Date	Issue	Drawn	Authorised

Client: Gleeson Homes	Job No: 13-019	Date: 03.01.2019
	Drawing No: 005	Scale: NTS
Job Title: Croadella Avenue, Egremont	Drawing Title: Depth to Founding Strata Plan	

e3p

Environmental Engineering Partnerships Ltd
City Heliport & Business Centre
Eccles, Manchester, M30 7RU
Tel: 0161 707 9612
E-mail: info@e3p.co.uk
Website: www.e3p.co.uk

APPENDIX IV
E3P EXPLORATORY HOLE LOGS

Trial Pit Log

TrialPit No: TP101
Sheet 1 of 1

Project Name: Croadella Avenue	Project No. 13019	Co-ords: - Level:	Date 21/11/2018
Location: Egremont		Dimensions (m): Depth 2.10	Scale 1:24
Client: Gleeson Homes		1.20 × 1.50	Logged E. Fearn

Water Strike	Samples & In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
	0.20	ES					Black slightly gravelly CLAY with occasional cobbles and rootlets (Topsoil). Gravel is coarse, sub-angular of mudstone. Cobbles are sub-angualr to sub-rounded of mudstone.
	0.50	ES		0.70			Stiff dark red slightly silty CLAY with gravel and cobbles. Gravel is fine to coarse, sub-angular to sub-rounded of mudstone and sandstone. Cobbles are sub-rounded of mudstone.
	1.50	ES					
▼ 1.90	1.80	B		2.10			End of Pit at 2.10m

Remarks: Terminated at 2.10m bgl due to instability. Water strike encountered at 1.90m bgl.

Stability: Stable.

Trial Pit Log

TrialPit No: TP102
Sheet 1 of 1

Project Name: Croadella Avenue	Project No. 13019	Co-ords: - Level:	Date 21/11/2018
Location: Egremont		Dimensions (m): 1.40 x 1.00 Depth 2.10	Scale 1:24
Client: Gleeson Homes			Logged E. Fearn

Water Strike	Samples & In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
	0.40	ES					Black slightly gravelly CLAY with occasional cobbles and rootlets (Topsoil). Gravel is coarse, sub-angular of mudstone. Cobbles are sub-angualr to sub-rounded of mudstone.
	0.50	ES		0.60			Soft dark red slightly silty CLAY with gravel and cobbles. Gravel is fine to coarse, sub-angular to sub-rounded of mudstone and sandstone. Cobbles are sub-rounded of mudstone. Becoming very stiff from 2.0m bgl.
▼ 1.50	1.60	ES					
	2.20	ES		2.10			End of Pit at 2.10m

Remarks: 1. Terminated at 2.10m bgl due to instability. 2. Water strike encountered at 1.50m bgl.

Stability: Unstable at 1.50m to 2.00m bgl.

Trial Pit Log

TrialPit No: TP103
Sheet 1 of 1

Project Name: Croadella Avenue	Project No. 13019	Co-ords: - Level:	Date 21/11/2018
Location: Egremont		Dimensions (m): Depth 2.20 — 1.50 × 0.90	Scale 1:24
Client: Gleeson Homes			Logged E. Fearn

Water Strike	Samples & In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
	0.20	ES					Black slightly gravelly CLAY with occasional cobbles and rootlets (Topsoil). Gravel is coarse, sub-angular of mudstone. Cobbles are sub-angular to sub-rounded of mudstone.
	0.30	ES					
				0.60			Stiff dark red slightly silty CLAY with gravel and cobbles. Gravel is fine to coarse, sub-angular to sub-rounded of mudstone and sandstone. Cobbles are sub-rounded of mudstone.
▼ 1.60	1.50	ES					
	1.70	ES					
				2.20			End of Pit at 2.20m

1 2 3 4 5

Remarks: 1. Terminated at 2.20m bgl due to water. 2. Water strike encountered at 1.60m bgl.

Stability:

Trial Pit Log

TrialPit No: TP104
Sheet 1 of 1

Project Name: Croadella Avenue	Project No. 13019	Co-ords: - Level:	Date 21/11/2018
Location: Egremont		Dimensions (m): 1.30 x 0.90 Depth 2.30	Scale 1:24
Client: Gleeson Homes			Logged E. Fearn

Water Strike	Samples & In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
	0.10	ES					Black slightly gravelly CLAY with occasional cobbles and rootlets (Topsoil). Gravel is coarse, sub-angular of mudstone. Cobbles are sub-angular to sub-rounded of mudstone.
				0.50			Stiff dark red slightly silty CLAY with gravel and cobbles. Gravel is fine to coarse, sub-angular to sub-rounded of mudstone and sandstone. Cobbles are sub-rounded of mudstone.
	0.80	ES					
	1.00	ES					
▼ 1.20							
				2.00			Stiff grey/green very silty CLAY with gravel. Gravel is coarse, sub-angular to sub-rounded of mudstone.
	2.10	ES					
	2.20	HVP	15.957				
				2.30			End of Pit at 2.30m

Remarks: 1. Terminated at 2.30m bgl due to water. 2. Water strike encountered at 1.20m bgl.

Stability:

Trial Pit Log

TrialPit No: TP105
Sheet 1 of 1

Project Name: Croadella Avenue	Project No. 13019	Co-ords: - Level:	Date 21/11/2018
Location: Egremont		Dimensions (m): 1.30 x 1.20 Depth 1.70	Scale 1:24
Client: Gleeson Homes			Logged E. Fearn

Water Strike	Samples & In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
				0.20			MADE GROUND: Black slightly gravelly clay with occasional cobbles and rootlets (Topsoil). Gravel is coarse, sub-angular of mudstone. Cobbles are sub-angular to sub-rounded of mudstone.
	0.40	ES					MADE GROUND: Black slightly sandy very clayey gravel with cobbles. Gravel is coarse angular to sub-rounded, of mudstone and brick. Cobbles are angular of paving slabs.
	0.60	B		0.70			Stiff dark red slightly silty CLAY with gravel and cobbles. Gravel is fine to coarse, sub-angular to sub-rounded of mudstone and sandstone. Cobbles are sub-rounded of mudstone.
	1.40	D					
	1.50	ES					
	1.70	D		1.70			End of Pit at 1.70m

Remarks: Terminated at 1.70m bgl due to boulder. Moved Trial Pit to the right due to foundations encountered.

Stability: Stable.

Trial Pit Log

TrialPit No: TP106
Sheet 1 of 1

Project Name: Croadella Avenue	Project No. 13019	Co-ords: - Level:	Date 21/11/2018
Location: Egremont		Dimensions (m): Depth 2.30	Scale 1:24
Client: Gleeson Homes		1.40 × 2.20	Logged E. Fearn

Water Strike	Samples & In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
	0.10	ES					MADE GROUND: Black slightly gravelly clay (Topsoil) with occasional cobbles and frequent rootlets. Gravel is coarse sub-angular of mudstone. Cobbles are sub-angular to sub-rounded of mudstone.
	0.20	ES		0.20			MADE GROUND: Light grey slightly sandy gravel. Gravel is coarse angular of mudstone and brick.
				0.60			Stiff dark red slightly silty CLAY with gravel and cobbles. Gravel is fine to coarse, sub-angular to sub-rounded of mudstone and sandstone. Cobbles are sub-rounded of mudstone.
▼ 1.50	1.40	ES					
				2.30			End of Pit at 2.30m

Remarks: 1. Terminated at 2.30m bgl due to water. 2. Water strike encountered at 1.50m bgl.

Stability:

Trial Pit Log

TrialPit No: TP107
Sheet 1 of 1

Project Name: Croadella Avenue	Project No. 13019	Co-ords: - Level:	Date 21/11/2018
Location: Egremont		Dimensions (m): Depth 1.60 — 1.50 × 1.00	Scale 1:24
Client: Gleeson Homes			Logged E. Fearn

Water Strike	Samples & In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
	0.10	ES		0.20			MADE GROUND: Black slightly gravelly clay with occasional cobbles and rootlets (Topsoil). Gravel is coarse, sub-angular of mudstone. Cobbles are sub-angular to sub-rounded of mudstone.
				0.30			MADE GROUND: Red/brown slightly clayey sand with gravel and cobbles. Gravel is coarse, angular of mudstone. Cobbles are angular of brick.
▼ 1.20	1.30	ES					Stiff dark red slightly silty CLAY with gravel and cobbles. Gravel is fine to coarse, sub-angular to sub-rounded of mudstone and sandstone. Cobbles are sub-rounded of mudstone.
				1.60			End of Pit at 1.60m
	2.00	ES					

Remarks: 1. Terminated at 1.60m bgl due to water ingress and sidewall instability. 2. Water strike encountered at 1.20m bgl.

Stability: Unstable at 1.20m to 1.60m bgl.

Trial Pit Log

TrialPit No: TP108
Sheet 1 of 1

Project Name: Croadella Avenue	Project No. 13019	Co-ords: - Level:	Date 21/11/2018
Location: Egremont		Dimensions (m): Depth 2.10 — 1.20 × 0.90	Scale 1:24
Client: Gleeson Homes			Logged E. Fearn

Water Strike	Samples & In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
	0.20	ES					Black slightly gravelly CLAY with occasional cobbles and rootlets (Topsoil). Gravel is coarse sub-angular of mudstone. Cobbles are sub-angular to sub-rounded of mudstone.
	0.50	B					
				0.70			Stiff dark red slightly silty CLAY with gravel and cobbles. Gravel is fine to coarse, sub-angular to sub-rounded of mudstone and sandstone. Cobbles are sub-rounded of mudstone.
	1.20	ES					
				2.10			End of Pit at 2.10m
	2.30	ES					

1
2
3
4
5

Remarks: Terminated at 2.10m bgl due to side wall instability.

Stability:

Trial Pit Log

TrialPit No: TP109
Sheet 1 of 1

Project Name: Croadella Avenue	Project No. 13019	Co-ords: - Level:	Date 21/11/2018
Location: Egremont		Dimensions (m): Depth 1.50 — 1.20 × 1.00	Scale 1:24
Client: Gleeson Homes			Logged E. Fearn

Water Strike	Samples & In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
	0.20	ES		0.30			Black slightly gravelly CLAY with occasional cobbles and rootlets (Topsoil). Gravel is coarse, sub-angular of mudstone. Cobbles are sub-angular to sub-rounded of mudstone.
	0.80	ES					Stiff dark red slightly silty CLAY with gravel and cobbles. Gravel is fine to coarse sub-angular to sub-rounded of mudstone and sandstone. Cobbles are sub-rounded of mudstone.
	1.20	ES		1.50			End of Pit at 1.50m

Remarks: Terminated at 1.50m bgl due to foundation footings encountered.

Stability:

Trial Pit Log

TrialPit No: TP110
Sheet 1 of 1

Project Name: Croadella Avenue	Project No. 13019	Co-ords: - Level:	Date 21/11/2018
Location: Egremont		Dimensions (m): Depth 2.30 — 1.30 × 0.90	Scale 1:24
Client: Gleeson Homes			Logged E. Fearn

Water Strike	Samples & In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
	0.10	ES					Black slightly gravelly CLAY with occasional cobbles and rootlets (Topsoil). Gravel is coarse sub-angular of mudstone. Cobbles are sub-angular to sub-rounded of mudstone.
	0.20	ES		0.30			Stiff dark red slightly silty CLAY with gravel and cobbles. Gravel is fine to coarse sub-angular to sub-rounded of mudstone and sandstone. Cobbles are sub-rounded of mudstone.
▼ 1.40	1.50	ES					
	1.60	ES		2.30			End of Pit at 2.30m

Remarks: 1. Terminated at 2.30m bgl due to water ingress. 2. Water strike encountered at 1.40m bgl.

Stability:

Borehole Log

Borehole No. **WS101**

Sheet 1 of 1

Project Name: Croadella Avenue	Project No. 13019	Co-ords:	Hole Type WS
Location: Egremont		Level:	Scale 1:50
Client: Gleeson Homes		Dates: 21/11/2018	Logged By E. Fearn

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
		0.40	PP	18.39	0.30			MADE GROUND: Asphalt.
		0.50	ES					Stiff dark grey/brown slightly silty CLAY with gravel. Gravel is fine to medium, angular of mudstone.
		0.60	ES					
		0.90	PP	12.26				
		1.00	SPT	N=8 (2,3/2,2,2,2)	1.10			Stiff medium strength dark red slightly silty CLAY with gravel and cobbles. Gravel is fine to coarse, sub-angular to sub-rounded of mudstone and sandstone. Cobbles are sub-rounded of mudstone.
	1.60	1.50	ES					
		2.00	SPT	N=13 (2,2/2,5,4,2)				
		3.00	SPT	50 (6,8/50 for 255mm)	3.00			Stiff very high strength dark red slightly silty CLAY with gravel and cobbles. Gravel is fine to coarse, sub-angular to sub-rounded of mudstone and sandstone. Cobbles are sub-rounded of mudstone.
					3.45			End of Borehole at 3.45m

Remarks

1. Refused at 3.45m bgl. 2. Water strike encountered at 1.60m bgl. 3 Monitoring well installed.

Borehole Log

Borehole No. **WS102**

Sheet 1 of 1

Project Name: Croadella Avenue	Project No. 13019	Co-ords:	Hole Type WS
Location: Egremont		Level:	Scale 1:50
Client: Gleeson Homes		Dates: 21/11/2018	Logged By E. Fearn

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
					0.40			MADE GROUND: Asphalt.
	1.40	1.00 1.10	SPT ES	N=9 (2,2/2,2,3,2)				Stiff to very stiff medium to very high strength dark red slightly silty CLAY with gravel and cobbles. Gravel is fine to coarse sub-angular to sub-rounded of mudstone and sandstone. Cobbles are sub-rounded of mudstone.
		2.00	SPT	N=14 (3,4/4,3,4,3)				
		2.30 2.40	PP ES	36.79				
		2.70	PP	36.79				
		3.00	SPT	N=25 (6,6/6,7,6,6)				
		3.80	SPT	50 (8,9/50 for 265mm)				
					4.00			End of Borehole at 4.00m

Remarks

1. Refused at 4.00m bgl. 2. Water strike encountered at 1.40m bgl. 3. Monitoring well installed.

Borehole Log

Borehole No. **WS103**

Sheet 1 of 1

Project Name: Croadella Avenue	Project No. 13019	Co-ords:	Hole Type WS
Location: Egremont		Level:	Scale 1:50
Client: Gleeson Homes		Dates: 21/11/2018	Logged By E. Fearn

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
					0.20			Black slightly gravelly CLAY with occasional cobbles and frequent rootlets (Topsoil). Gravel is coarse, sub-angular of mudstone. Cobbles are sub-angular to sub-rounded of mudstone.
		0.50	PP	12.26				Stiff dark grey/brown slightly silty CLAY with gravel. Gravel is fine to medium, angular of mudstone.
		0.70	ES					
		1.00	SPT	N=12 (2,3/3,3,3,3)	1.10			
		1.20	PP	15.33				Stiff to very stiff medium to high strength dark red slightly silty CLAY with gravel and cobbles. Gravel is fine to coarse, sub-angular to sub-rounded of mudstone and sandstone. Cobbles are sub-rounded of mudstone.
		1.70	ES					
		1.90	PP	35.25				
		2.00	SPT	N=12 (2,2/3,3,3,3)				
		3.00	SPT	N=22 (5,6/6,5,6,5)				
		4.00	SPT	N=50 (7,8/10,12,13,15)				
					4.45			End of Borehole at 4.45m

1 2 3 4 5 6 7 8 9 10

Remarks

Refused at 4.45m bgl.

Borehole Log

Borehole No. **WS104**

Sheet 1 of 1

Project Name: Croadella Avenue	Project No. 13019	Co-ords:	Hole Type WS
Location: Egremont		Level:	Scale 1:50
Client: Gleeson Homes		Dates: 21/11/2018	Logged By E. Fearn

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
					0.20			Black slightly gravelly CLAY with occasional cobbles and frequent rootlets (Topsoil). Gravel is coarse, sub-angular of mudstone. Cobbles are sub-angular to sub-rounded of mudstone.
		0.50 0.60	PP ES	12.26				Soft very low strength dark red slightly silty CLAY with gravel and cobbles. Gravel is fine to coarse, sub-angular to sub-rounded of mudstone and sandstone. Cobbles are sub-rounded of mudstone. Becoming very stiff high strength from 2.0m.
	1.30	1.00	SPT	N=2 (1,0/0,1,0,1)				
		1.50	PP	15.33				
		2.00	SPT	N=17 (3,4/4,4,5,4)				
		2.50 2.60	PP ES	15.33				
		3.00	SPT	N=50 (7,8/10,11,14,15)	3.00			No recovery, except for SPT, inferred to be very stiff very high strength dark red slightly silty CLAY with gravel and cobbles. Gravel is fine to coarse, sub-angular to sub-rounded of mudstone and sandstone. Cobbles are sub-rounded of mudstone
					3.80			End of Borehole at 3.80m

Remarks

1. Refused at 3.80m bgl. 2 Monitoring well installed. 3. Water strike encountered at 1.30m bgl.

Borehole Log

Borehole No. **WS105**

Sheet 1 of 1

Project Name: Croadella Avenue	Project No. 13019	Co-ords:	Hole Type WS
Location: Egremont		Level:	Scale 1:50
Client: Gleeson Homes		Dates: 21/11/2018	Logged By E. Fearn

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
		0.20	ES		0.30			Black slightly gravelly CLAY with occasional cobbles and frequent rootlets (Topsoil). Gravel is coarse, sub-angular of mudstone. Cobbles are sub-angular to sub-rounded of mudstone.
		0.90	PP	12.26				Very stiff high strength, dark red slightly silty CLAY with gravel and cobbles. Gravel is fine to coarse, sub-angular to sub-rounded of mudstone and sandstone. Cobbles are sub-rounded of mudstone. Becoming very stiff, very high strength from 2.0m.
		1.00	SPT	N=27 (4,5/6,7,7,7)				
		1.20	ES					
		1.20	PP	15.33				
		2.00	SPT	N=50 (7,8/10,14,14,12)				
					2.45			End of Borehole at 2.45m

Remarks

1. Refused at 2.45m bgl. 2. Monitoring well installed.

Borehole Log

Borehole No. **WS106**

Sheet 1 of 1

Project Name: Croadella Avenue	Project No. 13019	Co-ords:	Hole Type WS
Location: Egremont		Level:	Scale 1:50
Client: Gleeson Homes		Dates: 21/11/2018	Logged By E. Fearn

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
		0.70	PP	12.26	0.30			Black slightly gravelly CLAY with occasional cobbles and frequent rootlets (Topsoil). Gravel is coarse sub-angular of mudstone. Cobbles are sub-angular to sub-rounded of mudstone.
		0.80 1.00	ES SPT	N=50 (6,7/10,13,15,12)				Very stiff, very high strength, dark red slightly silty CLAY with gravel and cobbles. Gravel is fine to coarse, sub-angular to sub-rounded of mudstone and sandstone. Cobbles are sub-rounded of mudstone.
					1.45			End of Borehole at 1.45m

Remarks

1. Refused at 1.45m bgl.2. Monitoring well installed.

APPENDIX V
CHEMICAL TESTING RESULTS

Alex Smith
e3p
Office 4
Heliport Business Park
Eccles
Liverpool Road
Manchester
M30 7RU

t: 0161 707 9612

e: asmith@e3p.co.uk

i2 Analytical Ltd.
7 Woodshots Meadow,
Croxley Green
Business Park,
Watford,
Herts,
WD18 8YS

t: 01923 225404
f: 01923 237404
e: reception@i2analytical.com

Analytical Report Number : 18-19933

Replaces Analytical Report Number : 18-19933, issue no. 1

Project / Site name:	Croadella Avenue, Egremont	**Samples received on:**	22/11/2018
Your job number:	13-019	**Samples instructed on:**	26/11/2018
Your order number:	13019-EF	**Analysis completed by:**	28/12/2018
Report Issue Number:	2	**Report issued on:**	28/12/2018
Samples Analysed:	11 soil samples		

Signed:

Jordan Hill
Reporting Manager
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.

Analytical Report Number: 18-19933

Project / Site name: Croadella Avenue, Egremont
Your Order No: 13019-EF

Lab Sample Number				1099954	1099955	1099956	1099957	1099958
Sample Reference				WS102	WS104	WS105	WS105	WS106
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				1.10	0.60	0.20	1.20	0.80
Date Sampled				21/11/2018	21/11/2018	21/11/2018	21/11/2018	21/11/2018
Time Taken				None Supplied	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	< 0.1
Moisture Content	%	N/A	NONE	11	24	21	10	18
Total mass of sample received	kg	0.001	NONE	0.55	0.43	0.38	0.60	0.43
Asbestos in Soil	Type	N/A	ISO 17025	-	-	Not-detected	-	-
General Inorganics								
pH - Automated	pH Units	N/A	MCERTS	8.1	7.8	5.8	8.0	7.8
Total Cyanide	mg/kg	1	MCERTS	< 1	< 1	< 1	< 1	< 1
Total Sulphate as SO_4	mg/kg	50	MCERTS	270	570	630	120	410
Water Soluble Sulphate as SO_4 16hr extraction (2:1)	mg/kg	2.5	MCERTS	54	82	34	25	29
Water Soluble SO4 16hr extraction (2:1 Leachate Equivalent)	g/l	0.00125	MCERTS	0.027	0.041	0.017	0.013	0.015
Water Soluble SO4 16hr extraction (2:1 Leachate Equivalent)	mg/l	1.25	MCERTS	27.1	41.0	16.8	12.6	14.5
Sulphide	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Total Sulphur	mg/kg	50	MCERTS	170	500	330	63	240
Total Organic Carbon (TOC)	%	0.1	MCERTS	1.7	0.5	-	0.5	1.8
Total Phenols								
Total Phenols (monohydric)	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Speciated PAHs								
Naphthalene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Acenaphthylene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Acenaphthene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Fluorene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Phenanthrene	mg/kg	0.05	MCERTS	0.50	0.89	< 0.05	< 0.05	0.31
Anthracene	mg/kg	0.05	MCERTS	< 0.05	0.21	< 0.05	< 0.05	< 0.05
Fluoranthene	mg/kg	0.05	MCERTS	1.0	1.7	< 0.05	< 0.05	0.51
Pyrene	mg/kg	0.05	MCERTS	0.86	1.5	< 0.05	< 0.05	0.42
Benzo(a)anthracene	mg/kg	0.05	MCERTS	0.46	1.1	< 0.05	< 0.05	0.26
Chrysene	mg/kg	0.05	MCERTS	0.38	0.94	< 0.05	< 0.05	0.22
Benzo(b)fluoranthene	mg/kg	0.05	MCERTS	0.42	1.0	< 0.05	< 0.05	0.21
Benzo(k)fluoranthene	mg/kg	0.05	MCERTS	0.25	0.68	< 0.05	< 0.05	0.15
Benzo(a)pyrene	mg/kg	0.05	MCERTS	0.30	0.98	< 0.05	< 0.05	0.20
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	MCERTS	< 0.05	0.38	< 0.05	< 0.05	< 0.05
Dibenz(a,h)anthracene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	< 0.05	0.45	< 0.05	< 0.05	< 0.05
Total PAH								
Speciated Total EPA-16 PAHs	mg/kg	0.8	MCERTS	4.19	9.82	< 0.80	< 0.80	2.28

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Project / Site name: Croadella Avenue, Egremont
Your Order No: 13019-EF

Lab Sample Number				1099954	1099955	1099956	1099957	1099958
Sample Reference				WS102	WS104	WS105	WS105	WS106
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				1.10	0.60	0.20	1.20	0.80
Date Sampled				21/11/2018	21/11/2018	21/11/2018	21/11/2018	21/11/2018
Time Taken				None Supplied	None Supplied	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	23	28	14	12	17
Cadmium (aqua regia extractable)	mg/kg	0.2	MCERTS	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Chromium (hexavalent)	mg/kg	4	MCERTS	< 4.0	< 4.0	< 4.0	< 4.0	< 4.0
Chromium (aqua regia extractable)	mg/kg	1	MCERTS	30	29	22	21	21
Copper (aqua regia extractable)	mg/kg	1	MCERTS	18	56	22	10	19
Lead (aqua regia extractable)	mg/kg	1	MCERTS	25	180	40	13	33
Mercury (aqua regia extractable)	mg/kg	0.3	MCERTS	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3
Nickel (aqua regia extractable)	mg/kg	1	MCERTS	23	49	18	19	20
Selenium (aqua regia extractable)	mg/kg	1	MCERTS	< 1.0	4.0	< 1.0	< 1.0	1.2
Zinc (aqua regia extractable)	mg/kg	1	MCERTS	48	130	43	43	47
Petroleum Hydrocarbons								
TPH (C5 - C6)	mg/kg	1	NONE	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
TPH (C6 - C8)	mg/kg	0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
TPH (C8 - C10)	mg/kg	0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
TPH (C10 - C12)	mg/kg	2	MCERTS	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
TPH (C12 - C16)	mg/kg	4	MCERTS	< 4.0	< 4.0	< 4.0	< 4.0	< 4.0
TPH (C16 - C21)	mg/kg	1	MCERTS	< 1.0	8.5	< 1.0	< 1.0	< 1.0
TPH (C21 - C35)	mg/kg	1	MCERTS	11	44	< 1.0	11	< 1.0
TPH (C35 - C40)	mg/kg	10	MCERTS	< 10	< 10	< 10	< 10	< 10
TPH Total C5 - C40	mg/kg	10	MCERTS	13	55	< 10	13	< 10

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Project / Site name: Croadella Avenue, Egremont
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Lab Sample Number				1099959	1099960	1099961	1099962	1099963
Sample Reference				TP101	TP104	TP105	TP106	TP108
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				0.50	0.80	0.40	0.10	0.20
Date Sampled				21/11/2018	21/11/2018	21/11/2018	21/11/2018	21/11/2018
Time Taken				None Supplied	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	< 0.1
Moisture Content	%	N/A	NONE	13	21	14	16	15
Total mass of sample received	kg	0.001	NONE	0.45	0.44	0.53	0.41	0.41
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	6.1	6.5	6.8	7.1	7.4
Total Cyanide	mg/kg	1	MCERTS	< 1	< 1	< 1	< 1	< 1
Total Sulphate as SO_4	mg/kg	50	MCERTS	740	620	580	990	690
Water Soluble Sulphate as SO_4 16hr extraction (2:1)	mg/kg	2.5	MCERTS	38	33	59	48	38
Water Soluble SO4 16hr extraction (2:1 Leachate Equivalent)	g/l	0.00125	MCERTS	0.019	0.017	0.029	0.024	0.019
Water Soluble SO4 16hr extraction (2:1 Leachate Equivalent)	mg/l	1.25	MCERTS	19.0	16.6	29.4	23.8	18.9
Sulphide	mg/kg	1	MCERTS	< 1.0	< 1.0	1.2	21	< 1.0
Total Sulphur	mg/kg	50	MCERTS	360	310	400	700	380
Total Organic Carbon (TOC)	%	0.1	MCERTS	-	2.2	-	-	-
Total Phenols								
Total Phenols (monohydric)	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Speciated PAHs								
Naphthalene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Acenaphthylene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Acenaphthene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Fluorene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Phenanthrene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	2.1	0.30
Anthracene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	0.78	0.08
Fluoranthene	mg/kg	0.05	MCERTS	0.41	< 0.05	0.44	7.5	0.91
Pyrene	mg/kg	0.05	MCERTS	0.31	< 0.05	0.37	5.6	0.66
Benzo(a)anthracene	mg/kg	0.05	MCERTS	0.20	< 0.05	0.22	3.8	0.39
Chrysene	mg/kg	0.05	MCERTS	0.20	< 0.05	0.28	2.9	0.44
Benzo(b)fluoranthene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	0.35	3.5	0.54
Benzo(k)fluoranthene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	0.16	1.9	0.16
Benzo(a)pyrene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	0.26	2.9	0.38
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	1.4	0.20
Dibenz(a,h)anthracene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	0.39	< 0.05
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	1.6	0.20
Total PAH								
Speciated Total EPA-16 PAHs	mg/kg	0.8	MCERTS	1.12	< 0.80	2.08	34.3	4.26

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Project / Site name: Croadella Avenue, Egremont
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Lab Sample Number				1099959	1099960	1099961	1099962	1099963
Sample Reference				TP101	TP104	TP105	TP106	TP108
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				0.50	0.80	0.40	0.10	0.20
Date Sampled				21/11/2018	21/11/2018	21/11/2018	21/11/2018	21/11/2018
Time Taken				None Supplied	None Supplied	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	14	18	14	18	20
Cadmium (aqua regia extractable)	mg/kg	0.2	MCERTS	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Chromium (hexavalent)	mg/kg	4	MCERTS	< 4.0	< 4.0	< 4.0	< 4.0	< 4.0
Chromium (aqua regia extractable)	mg/kg	1	MCERTS	25	21	18	19	23
Copper (aqua regia extractable)	mg/kg	1	MCERTS	26	21	20	40	34
Lead (aqua regia extractable)	mg/kg	1	MCERTS	40	53	33	110	60
Mercury (aqua regia extractable)	mg/kg	0.3	MCERTS	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3
Nickel (aqua regia extractable)	mg/kg	1	MCERTS	25	22	17	25	24
Selenium (aqua regia extractable)	mg/kg	1	MCERTS	< 1.0	1.4	< 1.0	< 1.0	< 1.0
Zinc (aqua regia extractable)	mg/kg	1	MCERTS	51	49	63	140	60

Petroleum Hydrocarbons

TPH (C5 - C6)	mg/kg	1	NONE	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
TPH (C6 - C8)	mg/kg	0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
TPH (C8 - C10)	mg/kg	0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
TPH (C10 - C12)	mg/kg	2	MCERTS	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
TPH (C12 - C16)	mg/kg	4	MCERTS	5.3	< 4.0	< 4.0	< 4.0	< 4.0
TPH (C16 - C21)	mg/kg	1	MCERTS	4.5	< 1.0	4.0	22	13
TPH (C21 - C35)	mg/kg	1	MCERTS	48	< 1.0	17	67	29
TPH (C35 - C40)	mg/kg	10	MCERTS	26	< 10	< 10	17	< 10
TPH Total C5 - C40	mg/kg	10	MCERTS	86	< 10	23	110	44

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Lab Sample Number				1099964				
Sample Reference				TP109				
Sample Number				None Supplied				
Depth (m)				1.20				
Date Sampled				21/11/2018				
Time Taken				None Supplied				
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
Stone Content	%	0.1	NONE	< 0.1				
Moisture Content	%	N/A	NONE	17				
Total mass of sample received	kg	0.001	NONE	0.42				
Asbestos in Soil	Type	N/A	ISO 17025	-				
General Inorganics								
pH - Automated	pH Units	N/A	MCERTS	7.7				
Total Cyanide	mg/kg	1	MCERTS	< 1				
Total Sulphate as SO_4	mg/kg	50	MCERTS	500				
Water Soluble Sulphate as SO_4 16hr extraction (2:1)	mg/kg	2.5	MCERTS	17				
Water Soluble SO4 16hr extraction (2:1 Leachate Equivalent)	g/l	0.00125	MCERTS	0.0085				
Water Soluble SO4 16hr extraction (2:1 Leachate Equivalent)	mg/l	1.25	MCERTS	8.5				
Sulphide	mg/kg	1	MCERTS	< 1.0				
Total Sulphur	mg/kg	50	MCERTS	280				
Total Organic Carbon (TOC)	%	0.1	MCERTS	1.5				
Total Phenols								
Total Phenols (monohydric)	mg/kg	1	MCERTS	< 1.0				
Speciated PAHs								
Naphthalene	mg/kg	0.05	MCERTS	< 0.05				
Acenaphthylene	mg/kg	0.05	MCERTS	< 0.05				
Acenaphthene	mg/kg	0.05	MCERTS	< 0.05				
Fluorene	mg/kg	0.05	MCERTS	< 0.05				
Phenanthrene	mg/kg	0.05	MCERTS	< 0.05				
Anthracene	mg/kg	0.05	MCERTS	< 0.05				
Fluoranthene	mg/kg	0.05	MCERTS	< 0.05				
Pyrene	mg/kg	0.05	MCERTS	< 0.05				
Benzo(a)anthracene	mg/kg	0.05	MCERTS	< 0.05				
Chrysene	mg/kg	0.05	MCERTS	< 0.05				
Benzo(b)fluoranthene	mg/kg	0.05	MCERTS	< 0.05				
Benzo(k)fluoranthene	mg/kg	0.05	MCERTS	< 0.05				
Benzo(a)pyrene	mg/kg	0.05	MCERTS	< 0.05				
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	MCERTS	< 0.05				
Dibenz(a,h)anthracene	mg/kg	0.05	MCERTS	< 0.05				
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	< 0.05				
Total PAH								
Speciated Total EPA-16 PAHs	mg/kg	0.8	MCERTS	< 0.80				

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Project / Site name: Croadella Avenue, Egremont
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Lab Sample Number				1099964				
Sample Reference				TP109				
Sample Number				None Supplied				
Depth (m)				1.20				
Date Sampled				21/11/2018				
Time Taken				None Supplied				
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
Heavy Metals / Metalloids								
Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	19				
Cadmium (aqua regia extractable)	mg/kg	0.2	MCERTS	< 0.2				
Chromium (hexavalent)	mg/kg	4	MCERTS	< 4.0				
Chromium (aqua regia extractable)	mg/kg	1	MCERTS	26				
Copper (aqua regia extractable)	mg/kg	1	MCERTS	22				
Lead (aqua regia extractable)	mg/kg	1	MCERTS	37				
Mercury (aqua regia extractable)	mg/kg	0.3	MCERTS	< 0.3				
Nickel (aqua regia extractable)	mg/kg	1	MCERTS	21				
Selenium (aqua regia extractable)	mg/kg	1	MCERTS	< 1.0				
Zinc (aqua regia extractable)	mg/kg	1	MCERTS	45				

Petroleum Hydrocarbons

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

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Project / Site name: Croadella Avenue, Egremont

* 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 *
1099954	WS102	None Supplied	1.10	Brown clay and sand with gravel.
1099955	WS104	None Supplied	0.60	Brown clay and sand with gravel and vegetation.
1099956	WS105	None Supplied	0.20	Brown clay and loam with gravel and vegetation.
1099957	WS105	None Supplied	1.20	Brown clay and sand with gravel.
1099958	WS106	None Supplied	0.80	Brown clay and sand with gravel and vegetation.
1099959	TP101	None Supplied	0.50	Brown clay and sand with gravel and vegetation.
1099960	TP104	None Supplied	0.80	Brown clay and sand with gravel.
1099961	TP105	None Supplied	0.40	Brown clay and loam with gravel and vegetation.
1099962	TP106	None Supplied	0.10	Brown clay and loam with gravel and vegetation.
1099963	TP108	None Supplied	0.20	Brown clay and loam with gravel and vegetation.
1099964	TP109	None Supplied	1.20	Brown clay and sand with gravel.

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Project / Site name: Croadella Avenue, Egremont

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

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
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
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
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
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
Moisture Content	Moisture content, determined gravimetrically.	In-house method based on BS1377 Part 2, 1990, Chemical and Electrochemical Tests	L019-UK/PL	W	NONE
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
pH in soil (automated)	Determination of pH in soil by addition of water followed by automated electrometric measurement.	In-house method based on BS1377 Part 3, 1990, Chemical and Electrochemical Tests	L099-PL	D	MCERTS
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
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
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 based on BS1377 Part 3, 1990, Chemical and Electrochemical Tests, 2:1 water:soil extraction, analysis by ICP-OES.	L038-PL	D	MCERTS
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 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 based on BS1377 Part 3, 1990, Chemical and Electrochemical Tests""	L009-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 based on BS1377 Part 3, 1990, Chemical and Electrochemical Tests	L038-PL	D	MCERTS
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 based on BS1377 Part 3, 1990, and MEWAM 2006 Methods for the Determination of Metals in Soil	L038-PL	D	MCERTS
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

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 VI
ORIGIN OF TIER I GENERIC ASSESSMENT CRITERIA

CONSTITUENT	ORIGIN OF RISK ASSESSMENT VALUE
Arsenic	PC4SL - DEFRA
Cadmium	P4CSL - DEFRA
Chromium	P4CSL - DEFRA
Lead	P4CSL - DEFRA
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	P4CSL - DEFRA
Indeno(123-cd)Pyrene	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
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 VII
GEOTECHNICAL TESTING RESULTS