



**APPEAL BY BARRATT HOMES, BLOOR HOMES NORTH WEST, JOHN RAYMOND JONES
AND THE TRUSTEES OF THE WREXHAM (PAROCHIAL) EDUCATION FOUNDATION**

SITE AT LAND SOUTH OF HOLT ROAD, WREXHAM, LL13 9SA

PROOF OF EVIDENCE OF STEPHEN BARRY

**REVIEW OF WREXHAM COUNCIL'S OBJECTION ON THE GROUNDS OF DEVELOPMENT
IN A MINERAL SAFEGUARDING AREA**

NOVEMBER 2021

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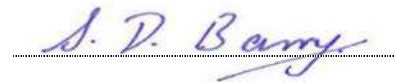
**REVIEW OF WREXHAM COUNCIL'S OBJECTION ON THE GROUNDS OF DEVELOPMENT IN
A MINERAL SAFEGUARDING AREA**

NOVEMBER 2021

PREPARED BY:

Stephen Barry

Technical Director



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SUMMARY

The superficial deposit on the site is sand of the Lower Sands unit. The log of a borehole in the centre of the site shows sand to a depth of 25m with an average gravel content of 2%. Trial pits on the site to a depth of 4m show considerable variability with gravel absent in 6 out of 12 samples and an average gravel content of 9.6% in the 12 samples. The sand is very fine and is not coarse enough to be used in manufacturing concrete or used for mortar sand. The County Planning Officer stated in a report to the Planning Committee in 2005 that the sand in the Lower Sands layer is generally too fine grained to be used for the manufacture of high quality aggregate products.

The adopted mineral safeguarding Policy MW9 is intended to safeguard “exploitable” mineral deposits. The evidence shows that the sand on the appeal site is not commercially exploitable in its own right and therefore it does not meet the criteria to be safeguarded. The emerging mineral safeguarding policy MW1 safeguards minerals which “merit extraction”. The evidence shows that the mineral on this site does not merit extraction as it has no commercial use in its own right.

The Council’s case relies on a report from its consultant, the North Wales Minerals and Waste Planning Service (MPS). That report states that the superficial deposits on this site “*are some of the best quality aggregates in North Wales*”. However, that statement is contradicted later in the report where MPS acknowledges that the material is predominantly sand and that it does not meet standard industry specifications for concreting sand and mortar sand because it is too fine. The MPS report states that “a minimal quantity of sand could be extracted” which suggests that the deposit is not as important as MPS states elsewhere in its report.

The Council’s mineral safeguarding policy encourages prior extraction. However, the Council’s Background Paper 11 (supporting the Deposit LDP) cautions that a requirement for prior extraction of sand on this site could have a potentially significant impact in terms of delivery of housing. It states that it is essential that other problems are not created by lowering the land, such as drainage and flood risk.

Prior extraction is a complex undertaking which will require legal agreements between the landowners, the developers and a mineral operator and in addition, it would need detailed planning permission. I estimate that these requirements indicate that prior extraction would probably not start until 2025.

1 INTRODUCTION

Experience and qualifications of the witness

- 1.1 My name is Stephen David Barry and I am a Technical Director with Wardell Armstrong LLP. I hold a Polytechnic Associateship in Minerals Surveying from Sheffield Polytechnic (1977) and a BSc (Hons) in Geology from Manchester University (1984).
- 1.2 I am a Chartered Minerals Surveyor and a Chartered Geologist. I have worked with the Wardell Armstrong LLP multi-disciplinary consultancy for 35 years. My experience is in mineral estate management which includes mineral planning, mineral valuation, consultancy on the identification and exploitation of mineral deposits, and advice on the ownership of severed minerals.

Statement of Truth

- 1.3 The evidence which I have prepared and provide for this appeal in this proof of evidence is true and has been prepared and is given in accordance with the guidance of my professional institution which is the Royal Institution of Chartered Surveyors. I confirm that the opinions I have expressed are my true and professional opinions.

Scope of evidence

- 1.4 This report is my review of the consultation response dated 12th February 2019 which was provided by the North Wales Minerals and Waste Planning Service to Wrexham Council and is attached at Appendix 2 of Wrexham Council's Statement of Case in relation to mineral safeguarding.
- 1.5 This report is supplemental to a Mineral Resource Assessment dated May 2017 which I prepared in support of the planning application which is the subject of this appeal and a Prior Extraction Assessment dated December 2018 which I prepared in response to a request from the Council.

2 SITE GEOLOGY

- 2.1 Geologically, a distinction is made between “superficial deposits” and “solid geology”. Superficial deposits such as sand and gravel are found at, or close to, the surface. The solid bedrock beneath the superficial deposits is called the “solid geology.”

Superficial deposits

- 2.2 The composition of the superficial deposits of sand on this site is of great importance to this appeal. Most sand and gravel is used for making ready mixed concrete which has a typical composition of 1 part cement, 2 parts sand, 4 parts gravel, plus water. In geological terms, sand is much more common than gravel, but the manufacturing of concrete requires twice as much gravel as sand. The consequence of this is that sand is worth much less than gravel, so a deposit with a very high sand content and a very low gravel content (which is the case on the subject site) is not usually commercially viable in its own right.
- 2.3 An inspection of the British Geological Survey (BGS) 1:50,000 online geological plan shows that the superficial deposits on the site are mapped as glaciofluvial sand and gravel. The deposits in this area are variable and generally comprise a coarse-grained Upper Layer and a fine-grained Lower Layer. The Lower Layer Sands has very little gravel content and is the deposit of fine sand which is present on the subject site. The sand in the Lower Sands unit is very fine which further reduces its use and value, because concreting sand needs to be relatively coarse grained.
- 2.4 The online geological plan contains the log of a borehole located in the centre of the site. An extract of the log is attached at **Appendix 1** and it shows the presence of 0.3 metres of soil above 1.5 metres of clayey sand at the surface, followed by 23.2 metres of sand to the end of the borehole at 25 metres. The borehole log shows that the average composition of the deposit is 91% sand, 2% gravel and 7% fines. This absence of gravel indicates that the coarse Upper Layer is absent on this site.
- 2.5 A preliminary site investigation was undertaken by the appellant’s contractor between 30th and 31st March 2017, comprising 12 windowless sample boreholes. The boreholes were drilled to 5m depth or refusal. A borehole location plan and the borehole logs are attached at **Appendix 2**.
- 2.6 The ground conditions encountered in the boreholes generally confirmed the published mapping and comprised topsoil to a depth of between 0.28m – 0.40m overlying generally loose to medium dense, slightly silty, slightly gravelly sands. The

site investigation also reported that there are some areas of looser sand where the material contains more silt and clay. Water was encountered in three locations towards the south west corner of the site at depths of between 1m and 2m.

- 2.7 In October 2018, the appellant commissioned the excavation of 7 soakaway pits at locations shown on the plan attached at **Appendix 3**. Samples of sand and gravel were taken from the pits at depths of up to 4m for analysis. The laboratory analysis is shown in 12 Particle Size Distribution graphs which are attached at **Appendix 3**. The analysis showed that gravel content was zero in 6 of the 12 samples and with an average of 9.6% gravel content across the 12 samples. The graphs show a line representing the proportion of particles that pass through a series of progressively finer sieves. The line on most of the graphs is nearly vertical indicating that the material is very fine sand and in most cases the sand particles are smaller than 0.5mm which is too small for concreting sand.
- 2.8 The gravel content is of critical importance in determining whether a deposit is commercially viable. The superficial deposit that is mapped as sand and gravel is actually a very fine sand. It is not commercially viable as a mineral resource in its own right and it is therefore not a commercially “exploitable reserve”, which the adopted Wrexham UDP aims to safeguard.
- 2.9 The requirement for a ratio of 2 gravel to 1 sand for manufacturing concrete means that many sand and gravel pits have a surplus of sand, as the demand for gravel is greater than the demand for sand. The consequence of this is that sand and gravel pits do not usually import sand from other sites, so it would not be feasible to prior-extract sand from this site, because there is unlikely to be any demand for it as a mineral in its own right.
- 2.10 Additional evidence is contained in the Chief Planning Officer’s report to the Planning Committee dated 5th December 2005 (attached at **Appendix 4**) in relation to a planning application for mineral extraction at Borrass quarry, which is to the north of the appeal site. The report stated that *“The mineral within the Lower Sands layer is generally too fine to be used on its own for the manufacture of high quality aggregate products and requires blending with coarser sands and gravels. Without the coarser materials, the working of the Lower Sands reserves is unlikely to be economic”*.

Solid geology

- 2.11 The solid geology of the site beneath the superficial deposits is shown on the BGS geological plans as being interbedded mudstone, sandstone and conglomerate of the

Salop Formation, of Permian age. These strata are not of commercial interest and are not safeguarded.

3 RESPONSE TO THE LPA REASONS FOR REFUSAL

3.1 The outline planning application for the development was the subject of a decision to refuse planning permission. The Decision Notice cited the following reason for doing so in relation to mineral sterilisation: *“The proposed development lies outside the settlement limit and within a designated green barrier. To allow the development would be contrary to policies PS1, EC1, EC2, HS, MW9, GDP1, GDP2, and CLFS of the adopted Wrexham Unitary Development Plan.”* Policy MW9 is the policy that relates to mineral sterilisation. At paragraph 5.12 of its Statement of Case, the Council states that it relies on the consultation response from the North Wales Minerals and Waste Planning Service (MPS) which is attached at Appendix 2 of the Council’s Statement of Case. The Statement of Case quotes the conclusion of the MPS report, as follows:

“Given that the deposits in this site are some of the best quality aggregate resources in Wales, this is a very important issue that has not been sufficiently addressed within the planning application. The information has not demonstrated that there are no exploitable resources within the site. It is considered that, based on the information provided, the mineral does merit extraction. It is considered that the information provided to date has not demonstrated compliance with Policy MW9 of the Wrexham UDP or the emerging policies SP3 and MW1 of the Deposit Draft LDP.”

3.2 The phrase *“Given that the deposits in this site are some of the best quality aggregate resources in Wales”* has been taken out of context and conveys an incorrect impression. The phrase originates from a geological plan of north east Wales published by the British Geological Survey at a scale of 1:100,000. The phrase *“some of the best quality aggregate resources in Wales”* is a broad brush description of sand and gravel in north east Wales on a regional basis, covering several hundred km² and not restricted to only Wrexham. That region-wide description cannot be applied to an individual site without detailed site investigation to provide supporting evidence. It is possible that on a regional basis, some of the sand and gravel deposits in north east Wales are of good quality, but the geological evidence set out in this evidence clearly shows that this site is not one of them.

3.3 The MPS report recognises this where it states that *“The borehole logs provided suggest the material is predominantly sand, however with a proportion of gravel which is in accord with lower Borrass material”*. The first part of that sentence recognises that the material is predominantly sand and the second half of the sentence means that the gravel content is very low.

- 3.4 The MPS report acknowledges that the Particle Size Distribution (PSD) data submitted in my 2018 Prior Extraction Assessment shows that the samples of sand are generally too fine to meet the British Standard (BS) for concreting sand. The MPS report also states that in relation to BS building / mortar sand, individual samples may not conform within certain size ranges, although if an average grade for all the samples is taken, the resulting PSD *“approaches Type S and Type G grading curves albeit a little too coarse in the 5 and 2.36 mm size ranges and slightly too fine in the 0.075 mm size.”* It is therefore clear from the MPS report that the sand does not meet the specifications for concreting sand or mortar sand. Concreting sand is generally more coarse grained whereas mortar sand usually contains more rounded sand grains so that the mortar can be spread more easily.
- 3.5 The MPS report goes on to state that *“If sand was extracted at this site, then an operator would blend materials from different sources to achieve the required sand gradings. With sand becoming a finite resource in many areas (particularly North Wales) many companies will now source grits, recycled glass and other materials to add to sands in order to create the required specifications. The sand in question would not be used as-dug...”*. This indicates that the MPS accepts that the superficial deposit on this site is fine sand rather than sand and gravel, and furthermore that the sand is not a useable mineral in its own right but must be blended with grit, recycled glass and other (unspecified) materials to meet industry specifications. The fact that the sand would require blending with other materials in order to be useable clearly indicates that the sand is not an “exploitable resource” in its own right. The MPS report is based on a representation submitted by Breedon Southern Ltd (“Breedon”) which is the operator of Borrass quarry to the north of the site. Breedon advised the MPS that it would be interested in taking some of the sand to Borrass quarry to blend with other materials to create industrial aggregate products.
- 3.6 The MPS report states that the Prior Extraction Assessment does not provide the tonnage of sand on the site. The calculation of sand tonnage is a function of area and depth of excavation so it clearly can only be calculated for a specific excavation design. In this case, the borehole evidence indicates that the sand deposit could be 25m thick. It is not possible to excavate a sand pit to that depth because the walls would collapse. The amount of sand on the site depends on the depth of an excavation and in the absence of an excavation design, it is not possible to prepare a tonnage estimate.
- 3.7 The MPS report states that there is no policy guidance on how much safeguarded mineral should be extracted prior to non-mineral development. It also states that it

would not be appropriate to work the entire mineral resource as it would present an inappropriate landform and extraction of the entire resource would not be compatible with the housing scheme. The MPS report also states that “*A minimal amount of material could be extracted prior to commencement of construction, and in a phased manner*”. The reference to “a minimal amount of material” suggests that in practical terms, this sand deposit is of no real significance.

4 THE EXTENT OF SAFEGUARDED SAND AND GRAVEL IN WREXHAM

- 4.1 In 2014, the Welsh Government advised Chief Planning Officers that a national aggregates safeguarding map had been published. The map is A0 size at its published scale of 1:100,000 and I have included an extract of it in my evidence. The part of the map showing mineral safeguarding areas in the County Borough of Wrexham is attached at **Appendix 5**. The safeguarding area for sand and gravel is shaded yellow on the map. The safeguarding areas extend 100m beyond the mapped superficial mineral deposits to account for “buffer zones” and any possible imprecision in the boundaries of identified resource areas. The maps do not show aggregates resources in urban areas. It can be seen that the safeguarding areas for sand and gravel in the County Borough of Wrexham are extensive (approximately 1,000 ha) and it is apparent that, seen in that context, the proposed development area of approximately 28.4 ha on a deposit of fine sand is not significant. A significant proportion of that area is already indirectly sterilised due to standoffs from constraints such as neighbouring residential areas.

5 ADOPTED AND EMERGING MINERAL SAFEGUARDING POLICY

- 5.1 The current Development Plan for the area is the Wrexham Unitary Development Plan (UDP) 1996 - 2011, which was adopted in February 2005. The Plan covers the administrative area of Wrexham County Borough Council. The Wrexham UDP sets out its mineral safeguarding policy at Policy MW9 (see **Appendix 6**):

“Protection of Mineral Resources: Policy MW9”

Resources of sand and gravel, and clay, will be safeguarded from non-mineral development in order to prevent the sterilisation of unworked mineral deposits. The identification of mineral resource areas gives no presumption in favour of the working of any deposits. Within such areas, non-mineral development will be strongly resisted unless a resource assessment (or other information) is provided to demonstrate that no exploitable reserves exist within the development site. Where non-mineral development which materially prejudices mineral resources is granted planning permission on land holding mineral deposits, provision should be made for the prior removal of mineral deposits.”

- 5.2 The site is located within a sand and gravel mineral resource protection area which has been identified by Wrexham County Borough Council. The mineral resource areas are based on mineral resource mapping completed by the British Geological Survey (BGS). However, my Mineral Resource Assessment report of May 2017 demonstrated that the sand deposit is not a commercially viable mineral in its own right and is unlikely to be so in the future, so it is not an exploitable mineral resource and therefore it does not qualify to be safeguarded. I therefore consider that the proposed development at this site does not conflict with Policy MW9 and prior extraction is not necessary.
- 5.3 The emerging LDP contains draft Policy MW1. In summary, the policy states that non-mineral development will only be permitted in a Mineral Safeguarding Area where it can be shown that:
1. the mineral does not merit extraction; or
 2. there is an overriding need for the incompatible development; or
 3. prior extraction can be undertaken satisfactorily; or
 4. the development is temporary; or
 5. essential mineral industry infrastructure would not be compromised.

- 5.4 In relation to criterion 1, this Proof of Evidence demonstrates that the superficial deposit on the site is fine sand with a small proportion of gravel. It is not suitable in its own right to be used to make concrete or mortar. Consequently, it does not merit extraction and the site therefore satisfies criterion 1 of the emerging mineral safeguarding policy.
- 5.5 In relation to criterion 2, the site is allocated for a substantial housing development which indicates an overriding need for the development to meet the Plan's requirements. The issue of overriding need is addressed in further detail in Mr Ryan's Proof of Evidence.
- 5.6 Criterion 3 relates to prior extraction. Later in this Proof of Evidence, I show how prior extraction would introduce a significant delay of several years into the delivery of the housing development. As a consequence, prior extraction is not a practicable option. Criteria 4 and 5 do not apply to this site.
- 5.7 This report demonstrates that the sand deposit does not merit commercial extraction in its own right and there is a demonstrable overriding need for the housing development. The emerging policy requires a development to meet only one of the policy criteria for development to be acceptable in a mineral safeguarding area, so I consider this site to satisfy that threshold.
- 5.8 The adopted and emerging mineral safeguarding policy relates specifically to sand and gravel. In terms of commercial minerals, "sand" is not the same as "sand and gravel". Sand (without gravel) can be used for making mortar but only if it meets the relevant British Standards. The sand on this site is glacial in origin and is not the right type of sand for mortar and in any event it is too fine. The policy was apparently designed to relate to sand and gravel, but it makes no reference to sand as a separate mineral. Consequently, there is a reasonable case to assert that the policy applies to sand and gravel but not to sand. On that basis, the mineral safeguarding policy would not apply to this site.
- 5.9 The Welsh Government introduced a new development plan system in 2004, and the existing UDP is due to be replaced by the Wrexham Local Development Plan 2 (LDP2) 2013-2028. The LDP's "Policy SP3 Key Strategic Housing Sites" relates to an allocated site identified as "Land East of Cefn Road", the northern part of which is the Appeal Site subject of this Proof of Evidence. The text accompanying the policy states that *"In order to minimise the loss of mineral, a Prior Extraction Assessment will be sought in accordance with Policy MW1 as it is considered that any opportunities to recover*

mineral prior to housing development should be sought". In December 2018 the appellant instructed me to prepare a Prior Extraction Assessment in compliance with emerging policy SP3 and it was submitted to the Council. The scope for prior extraction is discussed below.

6 THE SCOPE FOR PRIOR EXTRACTION

- 6.1 I have explained earlier in this evidence that the superficial deposit on this site is not a commercially viable mineral resource in its own right because the proportion of gravel in it is too low and the sand is too fine. However, Breedon Southern Ltd ("Breedon"), which is the operator of Borrass quarry to the north of the site, has submitted a representation to Wrexham Council advising that it would be interested in taking some of the sand from the site. The company considers that the sand could be blended with other materials to create products that meet specifications for commercial use. Although it is clear that the sand does not constitute a commercially viable mineral resource in its own right, the representation from Breedon has led me to consider whether prior extraction would be compatible with the delivery timescale of the proposed housing development.
- 6.2 The prior extraction of sand from this site is not a simple or straightforward project and it is subject to numerous practical and commercial considerations. The first step would be the need for the landowners, the mineral operator and the housing developers to negotiate a commercial agreement for prior extraction which is acceptable to all parties. In my experience, it typically takes about 12 months for a mineral owner and a mineral operator to negotiate and complete an option and lease for conventional mineral extraction which is acceptable to both parties. That timescale is without the added complication of two housing developers being involved, which is likely to prolong the timescale due to their technical requirements for an appropriate development platform.
- 6.3 The mineral operator would then need to undertake a formal pre-application consultation process (which is a statutory requirement in Wales) with the Mineral Planning Service. This could easily take 6 months to complete from start to finish. Mineral extraction is Schedule 2 development, so EIA screening would be required which could take 3 months to prepare and submit a screening request and receive the Council's opinion, assuming an EIA is not required.
- 6.4 The preparation of the supporting statement would be a particular challenge because this appeal relates to an outline planning application, but a planning application for mineral extraction can only be for detailed planning permission. This means that the mineral operator would have to design an excavation scheme that is compatible with the development platform that is needed for the houses, but that would probably have to be designed before the details of the development platform are finalised. In

addition to that complication, even if no EIA was required, the application would have to include the usual matters such as prediction and mitigation of noise and dust impacts, HGV traffic limits, identification of lorry routes, visual screening, lighting, and working methods with plant specifications. The preparation of a planning application for mineral extraction typically takes about 12 months to complete and determination of the application and discharge of conditions also typically takes about 12 months.

- 6.5 It can be seen from the above that 3 years or more could elapse before the mineral operator even entered the site to start the prior extraction. The duration of prior extraction operations would depend on the quantity of mineral to be extracted, which in turn depends on how the prior extraction could be matched with the development platform. At this stage, this duration is unknown, which adds further uncertainty to the concept of prior extraction.
- 6.6 The presence of sensitive existing residential development on the western boundary of the site and in the south east corner of the site means that any prior extraction would need to take place in the northern and central parts of the site. This would significantly reduce the prospect of the early phases of the housing development (which are in the north of the site) progressing while prior extraction takes place.
- 6.7 It is apparent that there is a timing conflict between the concept of prior extraction and the urgent need for the housing development to meet the requirements of the LDP. I estimate that prior extraction would seriously delay the start of construction of the housing development to 2025 or even later.
- 6.8 The County Borough has prepared Background Paper 11 (Minerals) to support the Deposit Local Development Plan. It shows how potential allocations have been examined to assess their impact on mineral deposits. Paragraph 3.1.10 of BP11 (attached at **Appendix 7**) acknowledges that a requirement for prior extraction could have a potentially significant impact in terms of delivery. It states that it is essential that other problems are not created by lowering the land, such as drainage and flood risk. It speculates that some importation of inert waste might help achieve an appropriate platform but then advises that the availability of waste fluctuates and in any event it is very limited in quantity. It therefore appears that in the Council's opinion, there are significant potential risks to delivery resulting from prior extraction, and infilling after prior extraction is unlikely to be practicable.

7 CONCLUSION

- 7.1 The superficial deposit on this site is “fine sand” rather than “sand and gravel”. This distinction is important because the mineral safeguarding policy relates to sand and gravel which is an essential mineral for manufacturing concrete, whereas fine sand is of no commercial use in its own right.
- 7.2 The advice given to the Council by MPS states that the mineral in the site is some of the best quality aggregate in Wales but no evidence was provided to support that assertion. However, in the same advice note, MPS advises that the sand is generally too fine to be used for making concrete and it does not meet the specification for building/mortar sand. This is an acknowledgement that the sand is not a commercially viable mineral in its own right.
- 7.3 The extract of the BGS geological map in this report shows that sand and gravel is widespread in Wrexham Council’s jurisdiction. In that context, the MPS statement that *“a minimal amount of material could be extracted prior to the commencement of construction”* leads to the conclusion that “a minimal amount” would not have any measurable effect on the quantity of sand and gravel in the Council’s jurisdiction.
- 7.4 The mineral reports submitted to the Council demonstrate that the site does not contain a material that constitutes a commercially viable mineral in its own right. Consequently, the proposed development would be compatible with mineral safeguarding policy without the need for prior extraction. The Council’s reason for refusal does not provide any cogent reasons for refusal of permission on the grounds of its own mineral safeguarding policy.
- 7.5 “Prior extraction” has been suggested by MPS as a solution to the mineral safeguarding issue. However, prior extraction is a complex and risky procedure and I estimate that it is unlikely to be completed before 2025, which would be a significant delay in delivering the housing development. The Council’s own officers warn of the risks in Background Paper 11, particularly the risk of potentially significant impacts in terms of delivery. It also notes that it is essential that other problems such as drainage and flood risk are not created by lowering the land.

APPENDICES

Appendix 1
Log of BGS borehole in centre of site

SJ 35 SE 26

3622 5156

North of Bryn Estyn, Bieston 1st no. 121

Block B

Surface level (+73.2 m) +240 ft

Water not struck

Shell and auger 8-in (203 mm) diameter

February 1977

Overburden 1.8 m

Mineral 23.2 m +

LOG

Geological classification	Lithology	Thickness m	Depth m
Glacial Sand and Gravel	Soil, slightly sandy with pebbles	0.3	0.3
	Clay, reddish brown, silty and sandy with occasional fine quartzite pebbles	1.5	1.8
	Sand, pebbly in parts Sand: buff-brown, medium and fine with a trace of coarse, subangular to subrounded. Fines with depth, with pebbles of quartzite, sandstone, volcanics, quartz, coal and limestone at the top	23.2+	25.0

GRADING

Mean for deposit percentages			Depth below surface (m)	percentages						
Fines	Sand	Gravel		Fines	Sand			Gravel		
				1-16	+1-16	+1-4	+1-4	+4-16	+16-64	+64-100
7	91	2	1.8-2.8	8	27	57	3	3	2	0
			2.8-3.8	2	19	62	6	6	5	0
			3.8-4.8	5	15	63	5	6	6	0
			4.8-5.8	3	15	79	2	1	0	0
			5.8-6.8	2	11	79	7	1	0	0
			6.8-7.8	1	18	75	5	1	0	0
			7.8-8.8	2	36	53	1	1	0	7
			8.8-9.8	2	28	70	0	0	0	0
			9.8-10.8	2	36	61	1	0	0	0
			10.8-11.8	24	48	28	0	0	0	0
			11.8-12.8	4	40	56	0	0	0	0
			12.8-13.8	4	47	49	0	0	0	0
			13.8-14.8	2	36	62	0	0	0	0
			14.8-16.8	6	35	58	0	1	0	0
			16.8-18.8	6	53	41	0	0	0	0
			18.8-21.8	15	74	11	0	0	0	0
			21.8-25.0	13	69	18	0	0	0	0
			Mean	7	43	47	1	1	1	0

COMPOSITION

Depth below surface (m)	Percentages by weight in +8 mm fraction						
	Quartz	Quartzite	Sandstone	Limestone	Other sediments	Igneous	Chert, flint
1.8-3.8	3	60	17	5	2	9	4
3.8-5.8	2	71	1	Trace	6	18	1
5.8-7.8	6	36	13		2	33	10
8.8-16.8	1	92	Trace	1	Trace	3	3

Appendix 2
Logs of window borehole samples

Project Id: ST16134

Project Title: Holt Road, Wrexham

Location: Holt Road, Wrexham

Client: Bloor Homes North West

Title: Site Plan

Scale: 1:3000

Engineer: M Heys

Contractor: Exploration Ltd



- Legend Key**
- Locations By Type - Empty
 - Locations By Type - WLS
 - Project Bounds - Project Bounds

1100 Metres
400 Feet



Borehole Log

Borehole No.

WS101

Sheet 1 of 1

Project Name: Holt Road, Wrexham

Project No.
ST16134

Co-ords: 335959.01 - 351479.32

Hole Type
WLS

Location: Holt Road, Wrexham

Level: 75.00

Scale
1:25

Client: Bloor Homes North West

Dates: 30/03/2017 -

Logged By
G Usher

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.10 - 0.20	ES		0.37	74.63		TOPSOIL: Grass over soft dark brown organic silty sandy CLAY with rootlets. Sand is fine to medium.	
								Loose yellowish brown slightly silty slightly gravelly SAND. Sand is medium to coarse. Gravel is fine to medium angular to sub-rounded of sandstone and mudstone.	
		1.00		N=9 (4,3/3,2,2,2)				Water encountered from 1.0m depth (2nd run).	1
					1.60	73.40		Light orangish brown to yellowish brown mottled grey slightly silty very clayey SAND. Sand is medium.	
		2.00		N=5 (4,2/1,1,2,1)	2.00	73.00		Very loose light brown silty SAND. Sand is fine to coarse with rare black coarse sand of coal.	2
		3.00		N=22 (3,4/4,5,7,6)	2.80	72.20		Medium dense becoming dense light yellowish to orangish brown slightly silty SAND. Sand is fine to coarse.	3
		4.00		N=50 (11,11/12,12,13,13)					4
		4.35		N=48 (11,12/14,10,11,13)					
					4.80	70.20		End of borehole at 4.80 m	5

Remarks

Terminated at 4.8m depth due to sample refusal.
Water encountered from 1.0m depth.
Backfilled with arisings upon completion.





Borehole Log

Borehole No.

WS102

Sheet 1 of 2

Project Name: Holt Road, Wrexham

Project No.
ST16134

Co-ords: 335896.93 - 351583.64

Hole Type
WLS

Location: Holt Road, Wrexham

Level: 74.00

Scale
1:25

Client: Bloor Homes North West

Dates: 31/03/2017 -

Logged By
G Usher

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.10 - 0.20	ES		0.40	73.60		TOPSOIL: Dark brown slightly clayey silty gravelly SAND. Sand is medium. Gravel is fine to medium sub-angular to sub-rounded of mudstone and sandstone.	1
								Orangish brown mottled black slightly silty slightly gravelly SAND. Sand is medium to coarse. Gravel is fine to medium sub-angular to sub-rounded of sandstone, coal and mudstone.	
		1.20		N=14 (2,3/4,3,3,4)	1.26	72.74		Brown mottled orange and black clayey slightly silty sandy GRAVEL. Sand is fine to medium. Gravel is fine to coarse sub-angular to sub-rounded of sandstone and mudstone.	2
					1.36	72.64			
					1.76	72.24		Medium dense light orangish brown slightly silty slightly gravelly SAND with low cobble content. Sand is medium. Gravel is fine to coarse angular to sub-rounded of sandstone and coal. Cobble is sub-rounded of sandstone.	
		2.00		N=21 (3,3/4,8,5,4)				Coal fragments between 1.7m and 1.76m depth.	
								Medium dense orangish light brown slightly silty sand. Sand is medium to coarse.	3
					2.24	71.76		Medium dense orangish brown mottled black slightly silty gravelly SAND. Sand is medium. Gravel is fine to coarse sub-angular to sub-rounded of sandstone and mudstone.	
					2.56	71.44		Medium dense becoming dense orangish brown becoming light brown slightly silty slightly gravelly SAND. Sand is medium to coarse. Gravel is fine to medium sub-angular to sub-rounded of sandstone.	
		3.00		N=22 (5,6/6,5,6,5)				Becoming pale brown with increasing gravel coarseness between 2.8m and 5.45m depth.	4
		4.00		N=19 (3,4/4,4,5,6)					5
								Coal fragments between 4.3m and 4.37m depth.	
		5.00		N=34 (9,9/8,8,9,9)					

Continued on next sheet

Remarks

Target depth achieved.
Water not encountered.
1.2m hand dug service pit prior to sampling.
Backfilled with arisings upon completion.

AGS



Borehole Log

Borehole No.

WS103

Sheet 1 of 1

Project Name: Holt Road, Wrexham

Project No.
ST16134

Co-ords: 335892.40 - 351351.97

Hole Type
WLS

Location: Holt Road, Wrexham

Level: 78.00

Scale
1:25

Client: Bloor Homes North West

Dates: 30/03/2017 -

Logged By
G Usher

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.10 - 0.20	ES		0.40	77.60		TOPSOIL: Dark brown slightly clayey slightly silty gravelly SAND. Sand is medium. Gravel is fine to medium angular to sub-rounded of sandstone and mudstone.	1
								Loose yellowish brown slightly silty slightly gravelly SAND. Sand is medium to coarse. Gravel is fine sub-angular to sub-rounded of quartzite and sandstone.	
		1.00		N=10 (2,1/2,2,3,3)	1.60	76.40		Soft with occasional firm pockets light brown mottled grey, orange and black silty sandy CLAY. Sand is fine to medium. Feels damp throughout.	2
		2.00		N=3 (2,1/1,0,1,1)	2.50	75.50		Increased sand content between 2.0m and 2.5m depth.	
		3.00		N=29 (4,3/4,6,8,11)				Medium dense becoming very dense yellowish brown slightly silty slightly gravelly SAND. Sand is medium to coarse. Gravel is fine sub-angular to sub-rounded of quartzite and sandstone	3
		3.50		50 (20,10 for 10mm/18,14,13,5 for 15mm)	3.95	74.05		End of borehole at 3.95 m	4
									5

Remarks

Terminated at 3.95m depth due to sample refusal.
Water encountered from 2.0m depth.
Backfilled with arisings upon completion.





Borehole Log

Borehole No.

WS104

Sheet 1 of 2

Project Name: Holt Road, Wrexham

Project No.
ST16134

Co-ords: 336098.28 - 351581.67

Hole Type
WLS

Location: Holt Road, Wrexham

Level: 73.00

Scale
1:25

Client: Bloor Homes North West

Dates: 31/03/2017 -

Logged By
G Usher

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.45 - 0.65	ES		0.35	72.65		TOPSOIL: Grass over dark brown clayey silty slightly gravelly SAND. Sand is fine to medium. Gravel is angular to sub-rounded of sandstone and mudstone.	
		1.20		N=11 (4,3/3,2,3,3)	1.50	71.50		Medium dense light orangish brown mottled black slightly silty slightly gravelly SAND. Sand is fine to medium. Gravel is fine to medium sub-rounded of sandstone.	1
		2.00		N=6 (1,2/1,1,2,2)	1.64	71.38		Medium dense light orangish brown mottled black slightly clayey slightly silty slightly gravelly SAND. Sand is medium. Gravel is fine to medium sub-rounded of sandstone. Loose light orangish brown mottled black slightly silty slightly gravelly SAND. Sand is medium. Gravel is fine to medium sub-rounded of sandstone. <i>Slightly damp from 1.65m depth.</i>	2
		3.00		N=4 (1,1/1,1,1,1)				<i>Increased gravel content between 3.5m and 3.75m depth.</i>	3
		4.00		N=12 (2,2/3,3,3,3)	3.75	69.25		Medium dense becoming loose light orangish brown slightly silty SAND. Sand is fine to coarse.	4
		5.00		N=8 (0,1/2,1,2,3)					5

Continued on next sheet

Remarks

Target depth achieved.
Water not encountered.
1.2m hand dug service pit prior to sampling.
Backfilled with arisings upon completion.

AGS



Borehole Log

Borehole No.

WS105

Sheet 1 of 2

Project Name: Holt Road, Wrexham

Project No.
ST16134

Co-ords: 336062.95 - 351359.74

Hole Type
WLS

Location: Holt Road, Wrexham

Level: 79.00

Scale
1:25

Client: Bloor Homes North West

Dates: 31/03/2017 -

Logged By
G Usher

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.10 - 0.20	ES		0.40	78.60		TOPSOIL: Grass over dark brown clayey silty slightly gravelly SAND. Sand is fine to medium. Gravel is fine to medium sub-angular to sub-rounded of sandstone and mudstone.	
								Loose orangish brown mottled reddish brown slightly clayey slightly silty gravelly SAND. Sand is fine to coarse. Gravel is fine to coarse angular to sub-rounded of sandstone, mudstone, quartzite and clayey sand nodules.	1
		1.20		N=7 (1,2/1,2,2,2)	1.57	77.43		Loose orangish brown slightly silty SAND. Sand is fine to medium.	
								Loose orangish brown mottled black and reddish brown slightly clayey slightly silty gravelly SAND. Sand is fine to medium. Gravel is fine to medium sub-angular to sub-rounded of sandstone, mudstone and clayey sand nodules.	2
		2.00		N=10 (2,2/1,3,3,3)	2.00	77.00		Medium dense orangish brown mottled black slightly silty SAND. Sand is fine to medium.	
					2.32	76.68			
		3.00		N=13 (2,2/3,2,4,4)					3
								Medium dense light greyish brown slightly silty gravelly SAND. Sand is fine to medium. Gravel is fine to medium angular to sub-rounded of sandstone and mudstone.	4
		4.00		N=28 (5,6/7,6,7,8)	4.00	75.00		Medium dense light brown slightly silty SAND. Sand is medium to coarse.	
					4.56	74.44			
		5.00		N=22 (5,4/5,5,6,6)					5

Continued on next sheet

Remarks

Target depth achieved.
Water not encountered.
1.2m hand dug service pit prior to sampling.
Backfilled with arisings upon completion.

AGS



Borehole Log

Borehole No.

WS106

Sheet 1 of 2

Project Name: Holt Road, Wrexham

Project No.
ST16134

Co-ords: 336265.29 - 351593.80

Hole Type
WLS

Location: Holt Road, Wrexham

Level: 74.00

Scale
1:25

Client: Bloor Homes North West

Dates: 30/03/2017 -

Logged By
G Usher

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.10 - 0.20	ES		0.30	73.70		TOPSOIL: Grass over dark brown slightly clayey slightly silty slightly gravelly SAND with rootlets. Sand is fine to medium. Gravel is fine to medium sub-angular to sub-rounded of sandstone and mudstone.	
		1.00		N=16 (4,4/4,4,5,5)				Loose to medium dense orangish light brown slightly clayey slightly silty slightly gravelly SAND. Sand is medium to coarse. Gravel is medium sub-angular to sub-rounded of quartzite, sandstone and nodules of clayey sands.	1
		2.00		N=11 (3,3/2,3,3,3)					2
		3.00		N=23 (4,5/6,5,6,6)				Inclusions of reddish brown clayey sand nodules between 2.46m and 2.65m depth.	3
		4.00		N=8 (2,3/2,2,2,2)					4
		5.00		N=11 (2,3/3,2,3,3)					5

Continued on next sheet

Remarks

Target depth achieved.
Water not encountered.
Backfilled with arisings upon completion.

AGS



Borehole Log

Borehole No.

WS107

Sheet 1 of 2

Project Name: Holt Road, Wrexham

Project No.
ST16134

Co-ords: 336223.51 - 351372.66

Hole Type

WLS

Location: Holt Road, Wrexham

Level: 78.00

Scale

1:25

Client: Bloor Homes North West

Dates: 30/03/2017 -

Logged By

G Usher

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
					0.30	77.70		TOPSOIL: Dark brown clayey silty gravelly SAND. Sand is medium. Gravel is fine to coarse angular to sub-rounded of mudstone, sandstone and quartzite.	
		1.20		N=6 (2,2/1,1,2,2)				Loose to medium dense light orangish brown slightly clayey slightly silty slightly gravelly SAND. Sand is fine to medium. Gravel is fine to coarse sub-angular to sub-rounded of sandstone, mudstone, coal fragments and nodules of clayey sand.	1
		2.00		N=11 (2,3/2,3,3,3)				Increased gravel size between 1.5m and 2.0m depth.	2
		3.00		N=9 (2,2/3,2,2,2)				Reddish brown clayey sand nodules between 2.45m and 2.95m depth.	3
		4.00		N=10 (3,2/3,2,2,3)				Sand becoming finer between 3.46m and 4.55m depth.	4
		5.00		N=18 (1,1/4,4,5,5)				Continued on next sheet	5

Remarks

Target depth achieved.
Water not encountered.
1.2m hand dug service pit prior to sampling.
Backfilled with arisings upon completion.





Borehole Log

Borehole No.

WS108

Sheet 1 of 2

Project Name: Holt Road, Wrexham

Project No.
ST16134

Co-ords: 336375.86 - 351742.99

Hole Type
WLS

Location: Holt Road, Wrexham

Level: 71.00

Scale
1:25

Client: Bloor Homes North West

Dates: 30/03/2017 -

Logged By
G Usher

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.10 - 0.20	ES		0.28	70.72		TOPSOIL: Brown slightly clayey silty gravelly SAND. Sand is fine to medium. Gravel is fine to medium sub-angular to sub-rounded of sandstone and mudstone.	
		1.00		N=8 (2,2/2,2,2,2)				Loose orangish light brown slightly silty slightly gravelly SAND. Sand is medium to coarse. Gravel is medium to coarse sub-angular to sub-rounded of sandstone, mudstone and quartzite. <i>Becoming paler with depth. Damp throughout.</i>	1
		2.00		N=8 (2,1/2,2,2,2)					2
		3.00		N=8 (3,2/2,2,2,2)					3
		4.00		N=8 (1,2/3,2,2,1)					4
		5.00		N=10 (3,3/3,2,2,3)				<i>Increased gravel content between 4.5m and 4.6m depth.</i> <i>Increased sand coarseness between 4.6m and 5.0m depth.</i>	5

Continued on next sheet

Remarks

Target depth achieved.
Water not encountered.
Backfilled with arisings upon completion.

AGS



Borehole Log

Borehole No.

WS109

Sheet 1 of 2

Project Name: Holt Road, Wrexham

Project No.
ST16134

Co-ords: 336394.99 - 351558.36

Hole Type
WLS

Location: Holt Road, Wrexham

Level: 74.00

Scale
1:25

Client: Bloor Homes North West

Dates: 30/03/2017 -

Logged By
G Usher

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.10 - 0.30	ES		0.30	73.70		TOPSOIL: Grass over dark brown slightly clayey silty slightly gravelly SAND with rootlets. Sand is fine to medium. Gravel is fine to medium sub-angular to sub-rounded of sandstone and mudstone.	
		1.00		N=14 (2,3/3,3,4,4)				Loose to medium dense orangey light brown slightly silty slightly gravelly SAND. Sand is medium to coarse. Gravel is fine to coarse angular to sub-rounded of sandstone. <i>Becoming paler between 0.3m and 5.45m depth.</i>	1
		2.00		N=9 (2,3/2,2,3,2)					2
		3.00		N=5 (2,1/1,2,1,1)					3
		4.00		N=5 (0,0/0,2,1,2)					4
		5.00		N=11 (1,1/2,3,3,3)				Increased gravel content from 4.7m and 5.0m depth. Also damp.	5

Remarks

Target depth achieved.
Water not encountered.
Backfilled with arisings upon completion.

Continued on next sheet





Borehole Log

Borehole No.

WS110

Sheet 1 of 2

Project Name: Holt Road, Wrexham

Project No.
ST16134

Co-ords: 336391.54 - 351352.50

Hole Type
WLS

Location: Holt Road, Wrexham

Level: 75.00

Scale
1:25

Client: Bloor Homes North West

Dates: 30/03/2017 -

Logged By
G Usher

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.10 - 0.20	ES					TOPSOIL: Grass on top dark brown clayey silty gravelly SAND. Sand is medium. Gravel is fine to coarse angular to sub-rounded of mudstone, sandstone and quartzite.	
					0.40	74.60			
					0.60	74.40		Light orangish brown slightly silty sandy GRAVEL. Sand is fine to coarse. Gravel is fine to coarse sub-angular to sub-rounded of sandstone and mudstone.	
		1.00		N=14 (4,3/4,3,3,4)				Medium dense light orangish brown slightly silty gravelly SAND. Sand is fine to coarse. Gravel is fine to coarse sub-angular to sub-rounded of sandstone and mudstone.	1
					1.50	73.50			
								Light orangish brown slightly silty slightly gravelly SAND. Sand is medium. Gravel is fine to medium sub-angular to sub-rounded of sandstone and mudstone.	
		2.00		N=18 (6,5/4,5,4,5)	2.00	73.00		Medium dense light orangish brown slightly silty sandy GRAVEL. Sand is medium. Gravel is fine to coarse angular to sub-rounded of sandstone, mudstone and quartzite.	2
					2.47	72.53			
								Loose to medium dense light orangish brown slightly silty slightly gravelly SAND. Sand is medium. Gravel is fine to medium sub-angular to sub-rounded of sandstone and mudstone.	
		3.00		N=11 (3,2/3,2,3,3)					3
								Increased gravel content with reddish brown mottling between 3.53m and 3.71m depth.	
								Sand becoming predominately fine to medium with black to brown mottling from 4.52m to 5.0m depth.	
		4.00		N=7 (2,2/2,1,2,2)					4
		5.00		N=19 (2,3/4,4,5,6)					5

Continued on next sheet

Remarks

Target depth achieved.
Water not encountered.
Backfilled with arisings upon completion.





Borehole Log

Borehole No.

WS111

Sheet 1 of 1

Project Name: Holt Road, Wrexham

Project No.
ST16134

Co-ords: 336182.00 - 351473.00

Hole Type
WLS

Location: Holt Road, Wrexham

Level: 77.00

Scale
1:25

Client: Bloor Homes North West

Dates: 31/03/2017 -

Logged By
G Usher

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.10 - 0.20	ES		0.35	76.65		TOPSOIL: Dark brown silty clayey gravelly SAND. Sand is fine to medium. Gravel is fine to medium sub-angular to sub-rounded of sandstone and mudstone.	
								Medium dense light orangish brown mottled reddish brown slightly clayey slightly silty slightly gravelly SAND. Sand is fine to medium. Gravel is fine to medium sub-angular to sub-rounded of sandstone, mudstone and nodules of clayey sand.	1
		1.20		N=11 (3,3/3,3,2,3)	1.60	75.40		Brown mottled orange, grey and black clayey slightly silty SAND. Sand is fine to coarse.	
					1.76	75.24		Firm brown to orangish brown silty very sandy CLAY. Sand is medium.	
		2.00		N=32 (6,7/7,7,9,9)	2.00	75.00		Dense light orangish brown slightly silty SAND. Sand is fine to coarse.	2
		3.00		N=45 (4,4/5,6,17,17)					3
		4.00		50 (9,9/8,10,15,17 for 70mm)					4
					4.45	72.55		End of borehole at 4.45 m	5

Remarks

Terminated at 4.45 due to sample refusal.
Water not encountered.
1.2m hand dug service pit prior to sampling.
Backfilled with arisings upon completion.





Borehole Log

Borehole No.

WS112

Sheet 1 of 2

Project Name: Holt Road, Wrexham

Project No.
ST16134

Co-ords: 335903.00 - 351241.00

Hole Type
WLS

Location: Holt Road, Wrexham

Level: 76.00

Scale
1:25

Client: Bloor Homes North West

Dates: 31/03/2017 -

Logged By
G Usher

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.10 - 0.20	ES		0.30	75.70		TOPSOIL: Dark brown slightly clayey silty slightly gravelly SAND with rootlets. Sand is fine to medium. Gravel is fine to medium sub-angular to sub-rounded of sandstone and mudstone.	1
								Orangish brown slightly silty slightly gravelly SAND. Sand is medium. Gravel is fine to medium sub-angular to sub-rounded of sandstone.	
		1.20		N=12 (3,2/3,3,3,3)	1.16	74.84		Soft to firm light yellowish brown mottled grey silty sandy CLAY. Sand is medium.	
					1.38	74.62		Medium dense light brown slightly silty gravelly SAND. Sand is fine to medium. Gravel is fine to coarse angular to sub-angular of mudstone, sandstone and coal.	2
					1.65	74.35		Medium dense light orangish brown slightly silty slightly gravelly SAND. Sand is medium. Gravel is fine to medium sub-angular to sub-rounded of sandstone and coal.	
		2.00		N=11 (2,3/2,3,3,3)					
					2.60	73.40		Light orangish brown slightly silty gravelly SAND with low cobble content. Sand is medium to coarse. Gravel is fine to coarse angular to sub-rounded of sandstone and mudstone. Cobble is sub-rounded sandstone.	3
		3.00		N=12 (2,4/3,3,3,3)	2.82	73.18		Medium dense orangish brown slightly silty SAND. Sand is fine to coarse.	
									
		4.00		N=19 (3,4/4,4,5,5)					4
		5.00		N=20 (3,5/5,5,5,5)					5

*Becoming paler and coarser from 3.59m to 5.45m depth.**Increased gravel content including coal between 4.51m and 4.63m depth.*

Continued on next sheet

Remarks

Target depth achieved.
Water encountered at 1.16m depth.
1.2m hand dug service pit prior to sampling.
Backfilled with arisings upon completion.



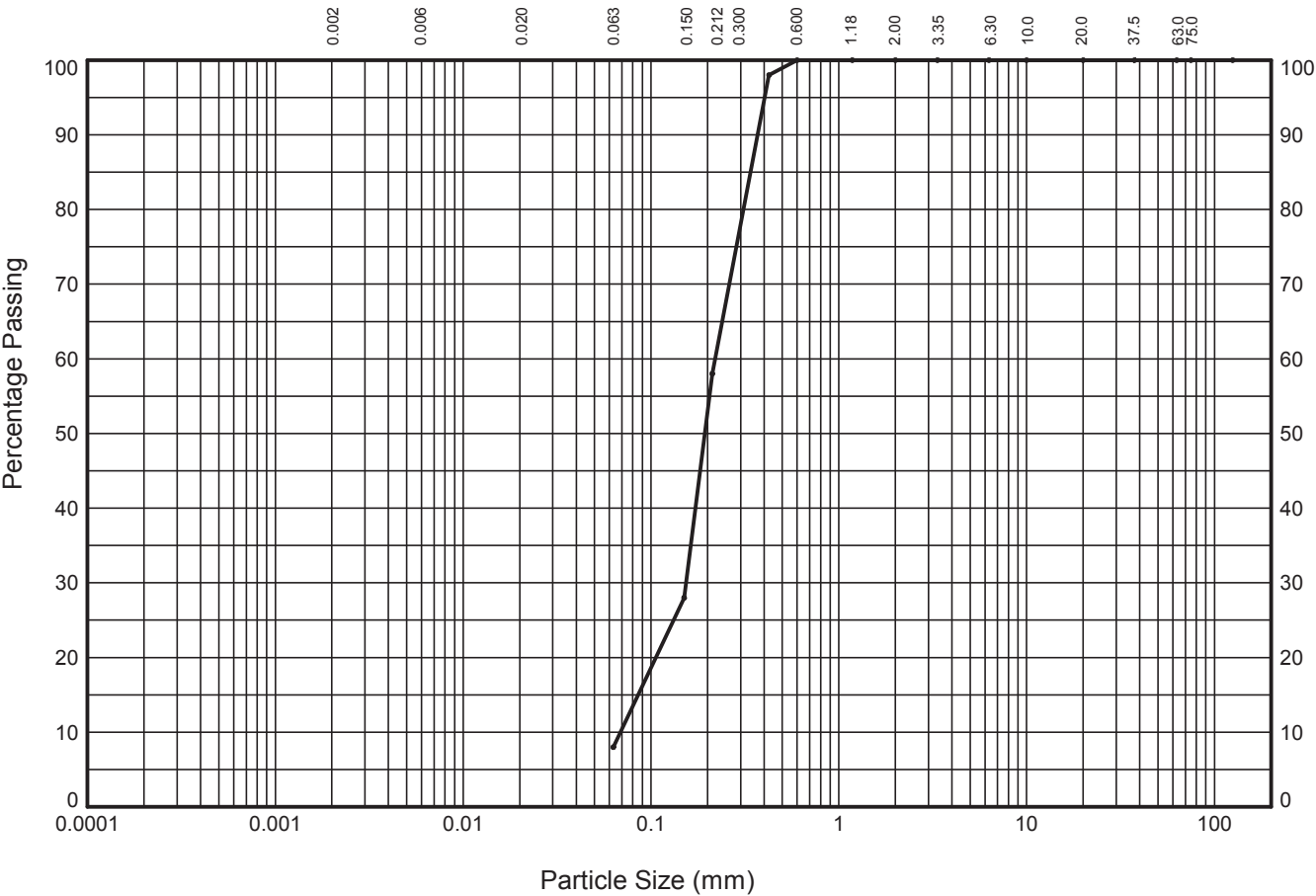
Appendix 3
Particle Size Distribution graphs from soakaway pit samples



PARTICLE SIZE DISTRIBUTION TEST

In accordance with clauses 9.2 of BS1377:Part 2:1990

Borehole: **BH4** Sample Ref: **18/08978/24** Sample Type: **D** Depth (m): **4.00**



CLAY	fine	medium	coarse	fine	medium	coarse	fine	medium	coarse	COBBLES
	SILT			SAND			GRAVEL			

Test Sieve (mm)	Percent Passing (%)
125.0	100
75.0	100
63.0	100
37.5	100
20.0	100
10.0	100
6.30	100
3.35	100
2.00	100
1.18	100
0.600	100
0.425	98
0.212	58
0.150	28
0.063	8

Particle Diameter (mm)	Percent Passing (%)
Sedimentation sample was not pre-treated	

Soil Fraction	Sieve Percentage (%)
GRAVEL	0
SAND	92
SILT/CLAY	8

Soil Description:
Brown clayey SAND



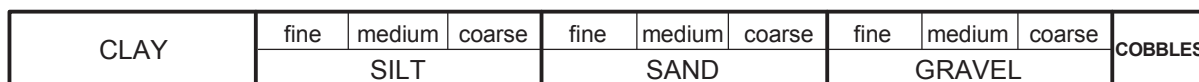
STRUCTURAL SOILS
The Potteries
Pottery Street
Castleford
W. Yorkshire WF10 1NJ

Compiled By		Date
SARAH MUNDY		09/11/18
Contract		Contract Ref:
18/08978		783504



In accordance with clauses 9.2 of BS1377:Part 2:1990

Depth (m): **7.00**



Particle Diameter (mm)	Percent Passing (%)
Sedimentation sample was not pre-treated	

Soil Fraction	Sieve Percentage (%)
GRAVEL	0
SAND	81
SILT/CLAY	19

Soil Description:
Brown clayey SAND



Compiled By

уравају.

SARAH MUNDY

Contract

18/08978

Contract Ref:

783504

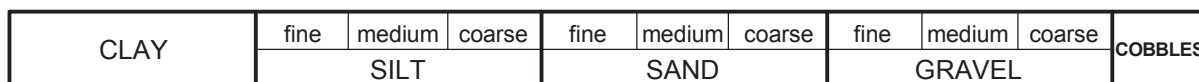
Date _____

09/11/18



In accordance with clauses 9.2 of BS1377:Part 2:1990

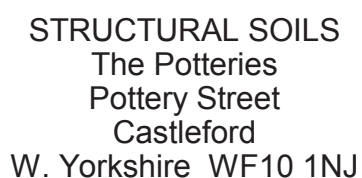
Depth (m): **0.60**



Particle Diameter (mm)	Percent Passing (%)
Sedimentation sample was not pre-treated	

Soil Fraction	Sieve Percentage (%)
GRAVEL	44
SAND	52
SILT/CLAY	4

Soil Description:
Brown slightly clayey very gravelly SAND



Date _____

SARAH MUNDY

09/11/18

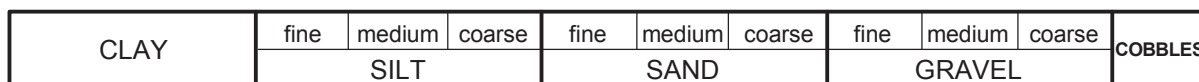
Contract Ref:

783504



In accordance with clauses 9.2 of BS1377:Part 2:1990

Depth (m): **1.40**



Particle Diameter (mm)	Percent Passing (%)
Sedimentation sample was not pre-treated	

Soil Fraction	Sieve Percentage (%)
GRAVEL	0
SAND	91
SILT/CLAY	9

Soil Description:
Brown clayey SAND



Compiled By

уравају.

SARAH MUNDY

Contract

18/08978

Contract Ref:

783504

Date _____

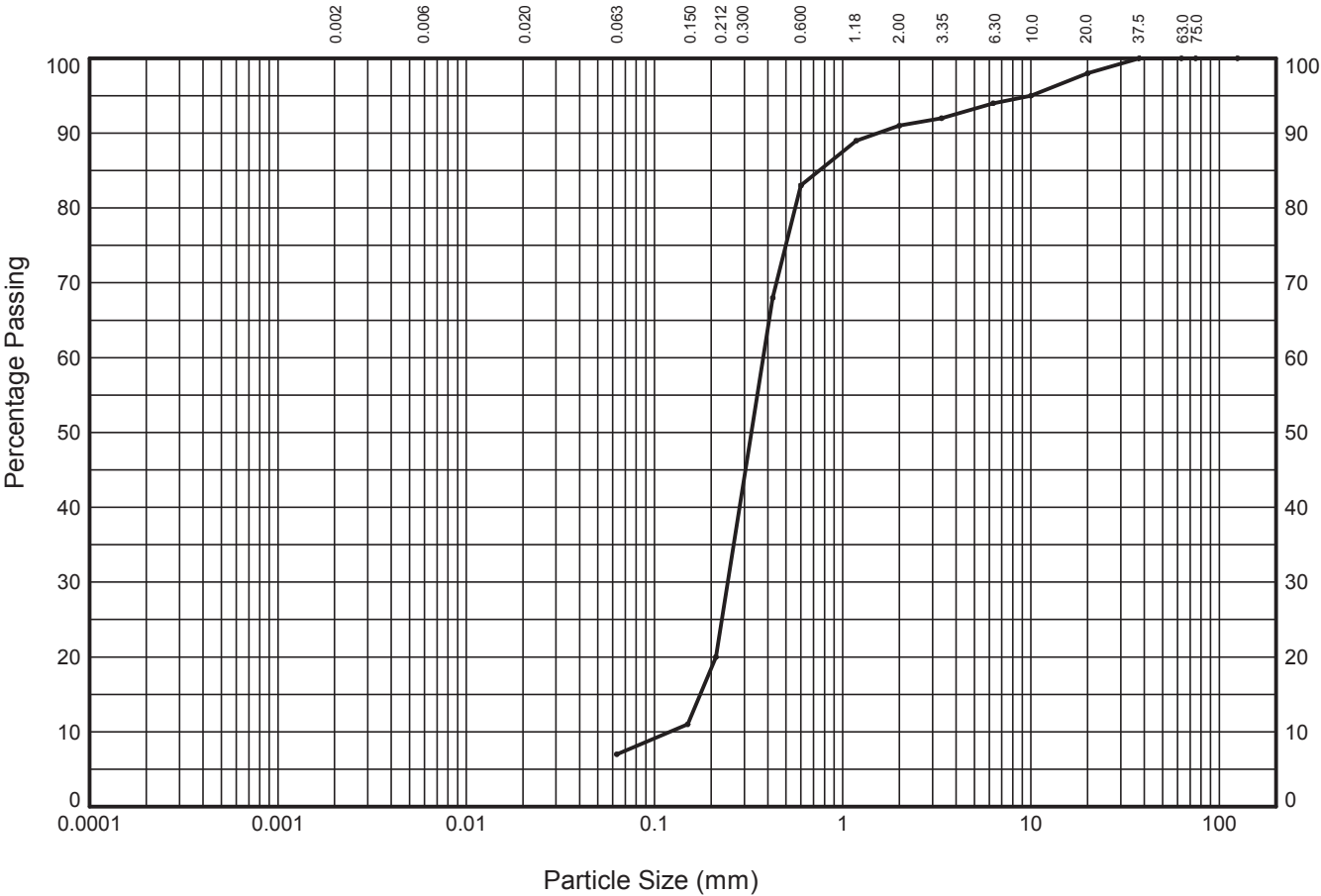
09/11/18



PARTICLE SIZE DISTRIBUTION TEST

In accordance with clauses 9.2 of BS1377:Part 2:1990

Position ID: **SA4** Sample Ref: **18/08978/23** Sample Type: **D** Depth (m): **0.80**



CLAY	fine	medium	coarse	fine	medium	coarse	fine	medium	coarse	COBBLES
	SILT			SAND			GRAVEL			
Test Sieve (mm)	Percent Passing (%)									
125.0	100									
75.0	100									
63.0	100									
37.5	100									
20.0	98									
10.0	95									
6.30	94									
3.35	92									
2.00	91									
1.18	89									
0.600	83									
0.425	68									
0.212	20									
0.150	11									
0.063	7									

Particle Diameter (mm)	Percent Passing (%)
Sedimentation sample was not pre-treated	

Soil Fraction	Sieve Percentage (%)
GRAVEL	9
SAND	84
SILT/CLAY	7

Soil Description: Brown clayey gravelly SAND
--



STRUCTURAL SOILS
The Potteries
Pottery Street
Castleford
W. Yorkshire WF10 1NJ

Compiled By

Sarah Mundy

SARAH MUNDY

Date

09/11/18

Contract

18/08978

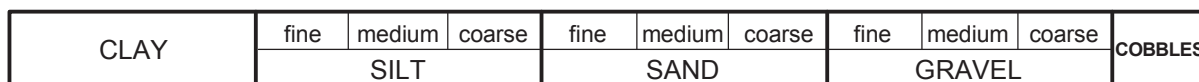
Contract Ref:

783504



In accordance with clauses 9.2 of BS1377:Part 2:1990

Depth (m): **0.80**



Particle Diameter (mm)	Percent Passing (%)
Sedimentation sample was not pre-treated	

Soil Fraction	Sieve Percentage (%)
GRAVEL	0
SAND	98
SILT/CLAY	2

Soil Description:
Brown slightly clayey SAND



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SARAH MUNDY

Contract

18/08978

Contract Ref:

783504

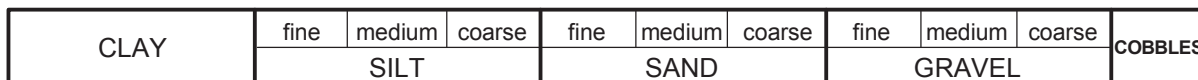
Date _____

09/11/18



In accordance with clauses 9.2 of BS1377:Part 2:1990

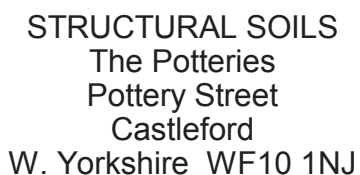
Depth (m): **0.50**



Particle Diameter (mm)	Percent Passing (%)
Sedimentation sample was not pre-treated	

Soil Fraction	Sieve Percentage (%)
GRAVEL	1
SAND	98
SILT/CLAY	1

Brown slightly clayey slightly gravelly SAND



Date _____

SARAH MUNDY

09/11/18

18/08978

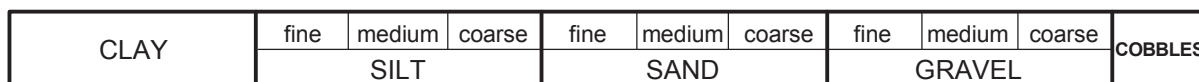
Contract Ref:

783504



In accordance with clauses 9.2 of BS1377:Part 2:1990

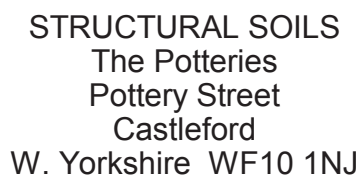
Depth (m): 1.00



Particle Diameter (mm)	Percent Passing (%)
Sedimentation sample was not pre-treated	

Soil Fraction	Sieve Percentage (%)
GRAVEL	14
SAND	83
SILT/CLAY	3

Brown slightly clayey gravelly SAND



Date _____

SARAH MUNDY

09/11/18

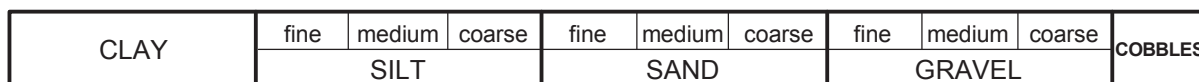
18/08978

783504



In accordance with clauses 9.2 of BS1377:Part 2:1990

Depth (m): **1.60**



Particle Diameter (mm)	Percent Passing (%)
Sedimentation sample was not pre-treated	

Soil Fraction	Sieve Percentage (%)
GRAVEL	34
SAND	63
SILT/CLAY	3

Soil Description:
Brown slightly clayey very gravelly SAND



Date _____

SARAH MUNDY

09/11/18

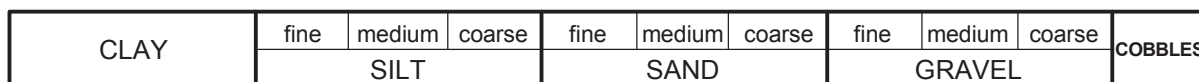
Contract Ref:

783504



In accordance with clauses 9.2 of BS1377:Part 2:1990

Depth (m): **1.40**



Particle Diameter (mm)	Percent Passing (%)
Sedimentation sample was not pre-treated	

Soil Fraction	Sieve Percentage (%)
GRAVEL	5
SAND	92
SILT/CLAY	3

Brown slightly clayey gravelly SAND



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Contract

18/08978

Contract Ref:

783504

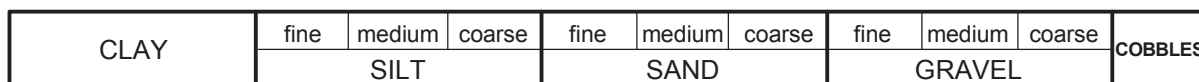
Date _____

09/11/18



In accordance with clauses 9.2 of BS1377:Part 2:1990

Depth (m): **2.00**



Particle Diameter (mm)	Percent Passing (%)
Sedimentation sample was not pre-treated	

Soil Fraction	Sieve Percentage (%)
GRAVEL	0
SAND	96
SILT/CLAY	4

Soil Description:
Brown slightly clayey SAND



Compiled By

уравају.

SARAH MUNDY

Contract

18/08978

Contract Ref:

783504

Date _____

09/11/18



Appendix 4

Chief Planning Officer's December 2005 report to Wrexham Council Planning Committee

REPORT TO:	Planning Committee
REPORT NO.	CPLO/79/05
DATE:	5 December 2005
REPORTING OFFICER:	Chief Planning Officer
CONTACT OFFICER:	Bob Dewey (Ext 2470)
SUBJECT:	Borras Quarry
WARD:	Holt and Gresford (East and West)

PURPOSE OF THE REPORT

To consider the report of the Chief Planning Officer in respect of a proposal to extend Borras Quarry.

INFORMATION

Contained in the report which follows (see attached).

RECOMMENDATION

To determine the planning application in accordance with the recommendation.

BACKGROUND PAPERS

Planning File P/2003/0579.

main changes that have been made to the proposed development are:

- A significant reduction in the extraction boundaries at the Holt Estate, including the removal of extraction Phase H6
- A reduction in the proposed working hours at the Holt Estate
- Major improvements to the main Quarry access
- Greater stand-offs to residential properties along Barkers Lane and Borrass Road

As a result of these changes the extraction area has been reduced from 58.3 has to 43.4 has and a revised scheme of working and restoration phases submitted.

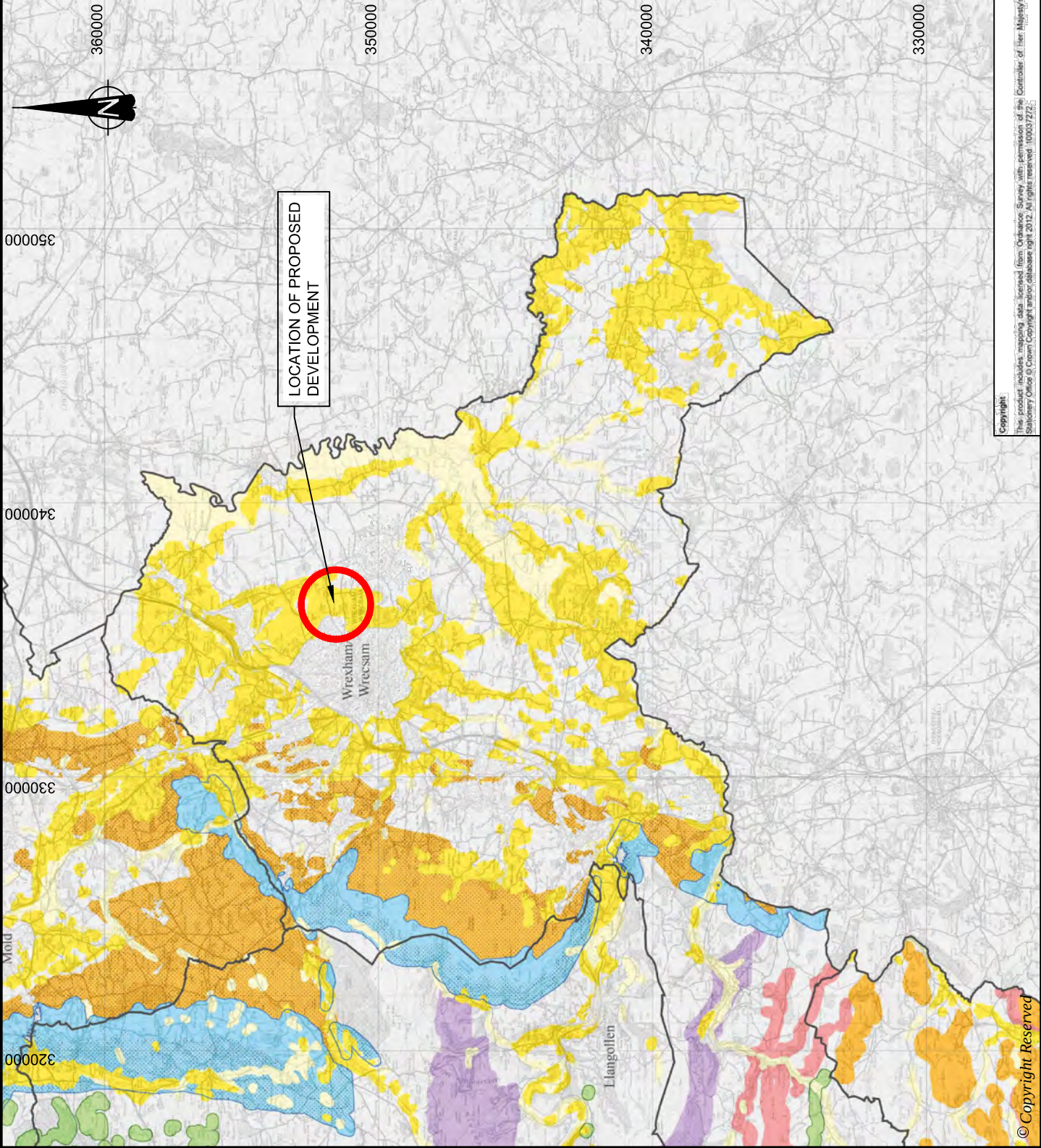
The deposits of sand and gravel in the area generally consist of a coarse grained upper layer, referred to as the Upper Sands and Gravels and a finer lower layer, referred to as the Lower Sands. The aggregate products manufactured by Tarmac depend on the correct balance of coarse and fine materials being supplied to the processing plant. Most of the Upper Sands and Gravel layer within the Airfield has now been worked out. The reserves of mineral within the Airfield are mostly of the finer material in the Lower Sand layer. **The mineral within the Lower Sands layer is generally too fine grained to be used on its own for the manufacture of high quality aggregate products and requires blending with coarser sands and gravels. Without the coarser materials the working of the Lower Sands reserves is unlikely to be economic.**

The original application proposed a comprehensive scheme for the working and blending of 22.8 million tonnes of sand and gravel from Borrass Quarry and the Holt Estate. This comprised both planned (6.8 million tonnes) and unplanned (16.0 million tonnes) sand and gravel (planned is with permission and unplanned is without permission). As of 1st January 2003 the planned reserves at Borrass Quarry were 6.8 million tonnes. 1.2 million tonnes have been worked in the intervening 2 years, leaving 5.6 million tonnes of planned sand and gravel as of 1st January 2005. The unplanned sand and gravel within the Application Site comprised 2 million tonnes in Borrass Airfield (below 62m AOD) and 14 million tonnes in the Holt Estate. The reduction in the extraction boundaries now being proposed within the Holt Estate has reduced the sand and gravel resource from 14 million tonnes to 9.8 million tonnes, resulting in an overall reduction within the application site from 16 million tonnes to 11.8 million tonnes. The amended Application now proposes a total extractable reserve (both planned and unplanned) of 17.7 million tonnes, compared with the 22.8 million tonnes stated in the original Application.

The existing planning permissions contain additional reserves of about 1.8 million tonnes, which would be relinquished if permission for the extension were to be granted. The reasons for relinquishment of these reserves are that some would require working to take place below the local water table and some would require removal of substantial amounts of overburden materials. The reserve figures are based on information gathered in January 2003 and allowance will need to be made for depletion as reserves are worked at a rate of over 600,000 tonnes per year. The permitted reserves are within Caia Farm, which is likely to be worked out in late 2005, and within the Airfield. At current rates of output the coarse material at the Airfield is likely to be exhausted by 2009.

The proposed development envisages that current production levels at between 600,000 and 700,000 tonnes per year would be maintained until 2011. At that time, owing to closure of Tarmac quarries in Cheshire, production at Borrass Quarry is expected to rise to 900,000 tonnes per year. The additional tonnage would be made

Appendix 5
Map of sand and gravel deposits in Wrexham



DO NOT SCALE FROM THIS DRAWING

KEY

SAND AND GRAVEL DEPOSITS

A

FIRST ISSUE

26-10-21

DR

SB

REVISION

DETAILS

DATE

26-10-21

CHECKED

APPROD

CLIENT

BARRATT HOMES, BLOOR HOMES AND OTHERS

PROJECT

LAND SOUTH OF HOLT ROAD, WREXHAM

DRAWING TITLE

SAND AND GRAVEL DEPOSITS IN WREXHAM

DRG No

ST16134-001

REV

A

SIZE

A4

SCALE

1:200000

DATE

26-10-21

DRAWN BY

DR

CHECKED BY

SB

APPROVED BY

SB

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wardell
armstrong

Appendix 6
Policy MW9 Protection of Mineral Resources

Restoration of Mineral Working Sites

Policy MW8 Proposals for the winning, working and processing of minerals should make provision for securing a beneficial after use. Sites should be progressively restored in accordance with the following criteria:-

- a) where the development comprises a single, discrete phase of working, restoration of the site should commence immediately on conclusion of all extraction and processing operations;
- b) where the development comprises two or more discrete phases of working, restoration of the site should be undertaken in sequence commencing as soon as extraction and processing operations within each phase have been completed;
- c) where the development comprises overlapping phases of working which prevent full restoration of each phase in sequence, deferred restoration of some phases may be acceptable within the broader context of the site restoration as a whole.
- d) if the restoration scheme entails the return to agriculture of land which is classified as Grades 1, 2 or 3a, the site should be restored as closely as practicable to its original grade.

11.9 Planning permissions for mineral working are granted for finite periods at the end of which land affected must be restored to a beneficial and sustainable after use. Operations must generally allow for phased restoration which reduces the overall environmental impact of the working and, as far as reasonably practicable, restricts the

amount of land subject to mineral working at any one time. In accordance with the principles of sustainability, reclamation schemes should be to a high standard that enhances the quality of poorer land and landscapes and provides opportunities for creating sites for nature conservation interest. In addition to restoration, where a site is restored to a "green" after use then reclamation will normally also involve aftercare. The phasing of operations allows for a phased restoration that reduces the overall environmental impact of the working and minimises the loss of agricultural land. The restoration scheme must comply with the Plan's land use and environmental policies.

Protection of Mineral Resources

Policy MW9 Resources of sand and gravel, and clay will be safeguarded from non-mineral development in order to prevent the sterilisation of unworked minerals deposits. The identification of mineral resource areas gives no presumption in favour of the working of any deposits. Within such areas non-mineral development will be strongly resisted unless a resource assessment (or other information) is provided to demonstrate that no exploitable reserves exist within the development site. Where non-mineral development which materially prejudices minerals resources is granted planning permission on land holding minerals deposits, provision should be made for the prior removal of mineral deposits.

11.10 Sand and gravel extraction is the principal mineral working activity in the County Borough with output contributing significantly to the total regional output of North Wales. In addition, the County Borough's clay reserves provide a high quality

material for brick and tile making. Policies MW2 and MW5 therefore seek to ensure that the extraction of sand, gravel and clay is undertaken in a sustainable manner within the broad context of meeting realistic market demands during the plan period. However, extensive unworked reserves of these minerals occur throughout the County Borough and, in accordance with Welsh Assembly Government policy, it is important that access to these resources should be safeguarded in case they are needed in the longer term. Policy MW9 therefore protects sand, gravel and clay resources from other types of permanent development which would either sterilise them completely or hinder future extraction.

Inactive Minerals Sites

Policy MW10 Prohibition Orders, designed to ensure that no further extraction takes place without a further planning consent, will be made for the following inactive sites:-

- 1 Bwlchgwyn: Bwlchgwyn Quarry (north)
- 2 Bwlchgwyn: Bwlchgwyn Quarry (south)
- 3 Froncysyllte: Pen y Craig
- 4 Rhos: Llwyneinion
- 5 Wern: Tir Celyn

11.11 Clarification regarding the future of inactive sites which are considered unlikely to be reactivated is required to provide certainty to the local community, encourage early and effective restoration and after use, and contribute to a more accurate and realistic reflection of minerals landbanks.

Minerals Buffer Zones

Policy MW11 Open buffer zones, where new mineral extraction and new sensitive non-mineral development will be resisted, will provide protection around the following minerals sites:-

Inactive Sites

- 1 Bwlchgwyn: Bwlchgwyn Quarry (north)
- 2 Bwlchgwyn: Bwlchgwyn Quarry (south)
- 3 Froncysyllte: Pen y Craig
- 4 Rhos: Llwyneinion
- 5 Wern: Tir Celyn

Active Sites

- 6 Bronington: Fenns Bank and Whixall Mosses
- 7 Gresford: Caia Farm
- 8 Johnstown: Hafod
- 9 Llay: Ballswood
- 10 Llay: Llay Main Tip
- 11 Minera: Minera
- 12 Wrexham: Borrass Airfield/Caia Farm

11.12 There is often conflict between mineral workings and other land uses resulting from the environmental impact of noise and dust from mineral extraction and processing and vibration from blasting. Establishing and retaining open buffer zones around both inactive and active minerals sites provides protection against such conflicts. New non-minerals development (e.g. housing, schools, etc) which would be sensitive to any adverse impact of minerals development or new mineral extraction that would significantly and detrimentally affect existing adjacent non-mineral development will be resisted. In view

Appendix 7
Background Paper 11 (Minerals)

Wrexham Local Development Plan 2013 - 2028

BP 11

housing

open space

employment

community

transport

education



Minerals (January 2018)

Limestone: Other	155ha	0	0
Primary Coal	343ha	20.95	6%
Secondary Coal	1,874ha	68.24	3.6%

3.1.10. Requiring prior extraction on a site the size of Land East of Cefn Road could have a potentially significant impact in terms of delivery. It is essential that the non-mineral development itself is acceptable in landscape terms and that other problems are not created by any lowering of the land such as drainage and flood risk. Some importation of inert material could help achieve an appropriate development platform, however, the availability of inert waste fluctuates over time and actual waste disposed of in inert landfill sites in North Wales is actually very limited in terms of the overall tonnage produced¹¹. It is therefore recommended that the potential for prior extraction is considered at an early stage so that it can be incorporated into the overall development.

3.1.11. The loss of sand and gravel as a proportion of the overall sand and gravel within the County Borough is relatively small and would be less than 3% of the total resource available outside settlements and sites constrained by national and international designations. Sand and gravel is not identified as a nationally scarce mineral, however, because of its distribution it is increasingly being sterilised by non-mineral development. Sand and gravel distribution across the region is more limited elsewhere, though there are deposits of potentially commercial significance within the west of Gwynedd and Flintshire. Cheshire also has significant deposits and is an important supplier of sand and gravel to the North West, though historically smaller tonnages have been exported to North Wales with exports from Wrexham being of more significance.

3.1.12. The assessment carried out cannot take into account factors such as depth, level of overburden, quality (for example, commercial sand and gravel extraction is composed of particles that are rich in silica, e.g. quartz, quartzite and flint) and particle size (i.e. how much fine sand, coarse sand and gravel there is). This means that the estimates of available mineral are likely to significantly overstate what is actually commercially viable mineral, particularly when the requirement for buffer zones and compensation land are taken into account. Whilst it is accepted that there will be a loss of mineral as a result of the delivery of allocations in the LDP this increases the importance of protecting mineral resources outside existing and allocated sites.

3.2 Identifying Areas which should be safeguarded:

3.1.13. Wrexham is underlain by a variety of different minerals of economic importance including sand and gravels, limestones, sandstone, clay, salt, peat, clay, dolerite intrusions, other igneous rocks, and metalliferous minerals. Safeguarding all mineral which underlies Wrexham would result in vast areas of the County Borough being safeguarded and is considered unnecessary and potentially counterproductive. Table 2 identifies the rationale for the safeguarding of different minerals.

¹¹ North Wales Waste Planning Monitoring Report April 2017

STOKE-ON-TRENT

Sir Henry Doulton House
Forge Lane
Etruria
Stoke-on-Trent
ST1 5BD
Tel: +44 (0)1782 276 700

BIRMINGHAM

Two Devon Way
Longbridge Technology Park
Longbridge
Birmingham
B31 2TS
Tel: +44 (0)121 580 0909

BOLTON

41-50 Futura Park
Aspinall Way
Middlebrook
Bolton
BL6 6SU
Tel: +44 (0)1204 227 227

BRISTOL

Desklodge
2 Redcliffe Way
Bristol
BS1 6NL

BURY ST EDMUNDS

9 Lamdin Road
Bury St Edmunds
Suffolk
IP32 6NU
Tel: +44 (0)1284 765 210

CARDIFF

Tudor House
16 Cathedral Road
Cardiff
CF11 9LJ
Tel: +44 (0)292 072 9191

CARLISLE

Marconi Road
Burgh Road Industrial
Estate Carlisle
Cumbria
CA2 7NA
Tel: +44 (0)1228 550 575

EDINBURGH

Great Michael House
14 Links Place
Edinburgh
EH6 7EZ
Tel: +44 (0)131 555 3311

GLASGOW

24 St Vincent Place
Glasgow
G1 2EU
Tel: +44 (0)141 428 449

LEEDS

36 Park Row
Leeds
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46 Chancery Lane
London
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NEWCASTLE UPON TYNE

City Quadrant
11 Waterloo Square
Newcastle upon Tyne
NE1 4DP
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TRURO

Baldhu House
Wheal Jane Earth Science Park
Baldhu
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