CAPITA SYMONDS

Planning, Environment & Design

Penrhos Leisure Village

Minerals

April 2013

Executive Summary

A proposal is being made to develop a mainly coastal site on Holy Island, Anglesey for leisure and residential use.

The application area includes a dormant minerals site. Site investigation work suggests that the total resource remaining in the permission is in the range of 1,160 to 1,630 tonnes of sand. The potential impacts on this resource from developing the proposed scheme have been assessed as 'minor'.

The dormant site has a 400m consultation buffer, within which is a small amount of additional but unpermitted sand resource in the range of 7,200 to 11,450 tonnes. The potential impacts on this resource from developing the proposed scheme have been assessed as 'negligible.

For the life of the proposed development, its presence will sterilise the resources. However, the nature of the proposed development means that there will be no (or extremely limited) direct / physical impacts on the sands.

Extraction of the remaining sand would require the agreement of new planning conditions as the sandpit is dormant. This process would likely be uneconomical for such a small amount of material now and in the foreseeable future.

For the foreseeable future, the supply assumption for sand and gravel in local and regional minerals policy is that they will come from Gwynedd or marine sources. However, should supply become so constrained at some point in the future that this small quantity of sands becomes commercially attractive, they could become available if/when the proposed development is demolished or redeveloped.

There are environmental constraints in this area (including the Area of Outstanding National Beauty designation) so resuming extraction is likely to be considered inappropriate, when compared to the amount of mineral gained and options for alternative supply. The sandpit has also naturally re-vegetated. As such, this site appears to be a candidate for a Prohibition Order.

For all other potential resources identified within the development boundary, the potential impacts have been assessed as 'negligible'.

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Appendices

1. Introduction

This report examines the potential for mineral resources to be present within, and impacted by, a proposed development on Holy Island. The proposed development boundary is shown on the Overall Indicative Masterplan (Drawing PL1114.P.GA103, Rev D) in Appendix A. The plan shows the three key sites and their proposed uses: Penrhos and Cae Glas, for leisure and holiday accommodation, and Kingsland for residential development.

The potential impact of the proposed development on other aspects of geology, including contaminated land and hydrogeology, has been assessed within Chapter 12 of the Environmental Statement for this development.

This report comprises:

- a review of the relevant planning and environmental policies and current relevant guidance regarding minerals to
    - provide a context for the significance assessment
    - identify permitted and safeguarded mineral resources (receptors)
- a review of the geology of the area and planning information to
    - better understand the nature of permitted and safeguarded mineral resources,
    - identify additional areas within the development boundary where further mineral resources may be present
- a review of the Overall Indicative Masterplan to identify potential impacts on those with resources
- an assessment of the significance of potential impacts on the mineral resources
- a consideration of mitigation methods that may alleviate potential adverse impacts.

2. Planning Policy Context

2.1 National Policy & Guidance

2.1.1 Minerals Planning Policy Wales

MPPW (2001) sets out the national planning policy for land-won mineral extraction and related development in Wales, which Minerals Planning Authorities (MPAs) should take into account in the development of their plans. MPPW requires that Unitary Development Plans should provide a clear guide as to where mineral extraction is likely to be acceptable, and include policies which protect resources. The policies should include mineral resources in current use and those which may need to be used in the foreseeable future. To this end, MPPW provides guidance on safeguarding of mineral resources and notes that safeguarding does not necessarily indicate an acceptance of working but that the "*location and quality of the mineral is known, and that the environmental constraints associated with extraction have been considered*".

Areas should be marked as Minerals Safeguarding Areas (MSAs) on plan maps and policies should protect these from permanent development which would "*either sterilise them or hinder extraction*". MPPW also states that prior to undertaking other forms of development, the potential for extraction of minerals must be considered.

Under MPPW, areas for future working should be identified on a proposals map and take the form of 'specific sites', 'preferred areas' and 'areas of search'.

Inactive sites with planning permission for future working but which are unlikely to be worked should be identified and a strategy with associated policies should outline the approach that will be taken with such sites (MPPW gives examples for this including the ability to make Prohibition Orders).

Another relevant point within MPPW, is the presumption against minerals development within National Parks and Areas of Outstanding Natural Beauty (AONBs) "*save in exceptional circumstances*".

2.1.2 Minerals Technical Advice Notes (MTANs)

The MTANSs supplement MPPW, and the guidance contained within them is significant to decisions on individual applications, and should be taken in to account by MPAs when preparing their plans.

'Minerals Technical Advice Note Wales 1: Aggregates' (2004) (MTAN1) states that sand and gravel resources in North Wales must be safeguarded for possible future use. MTAN1 requires that development plans use buffer zones around permitted or allocated sites, within which no new sensitive development should be approved. MTAN1 defines 'sensitive development' as "*any building occupied by people on a regular basis and includes housing areas, hostels, meeting places, schools and hospitals where an acceptable standard of amenity should be expected*" and "*specialised high technology industrial development where operational needs require high standards of amenity*".

Within MTAN1, the Welsh Assembly Government (WAG) take the view that a minimum distance of 100m should be adopted for safeguarding around a sand and gravel site unless there are "*clear and justifiable reasons for reducing the distance*".

MTAN1 requires MPAs to eliminate (in the period between its publication and "the next 5 years") any likelihood of future aggregate extraction at "*historically obsolete and long dormant sites*". MTAN1 refers to the need stressed in MPPW for MPAs to assess landbanks and consider where Prohibition Orders can be made to prevent the resumption of mineral extraction.

The aim is to provide a realistic landbank against which 'need' for minerals extraction can be judged.

2.1.3 Regional Technical Statements

As a requirement of MTAN1, a Regional Technical Statement (RTS) has been produced for North Wales (2008). The RTS provides a strategic basis for local development plans in North Wales and its objectives include safeguarding land-based minerals.

The RTS advises on the minerals apportionments for each MPA and for planning purposes Anglesey has a joint sand and gravel apportionment with Gwynedd. The RTS recommends making allocations of 1.5 million tonnes and that land based sand and gravel resources should be safeguarded. The RTS anticipates that the "*vast bulk of sand and gravel would be derived from Gwynedd*".

The RTS also notes the requirement of MTAN1 for all MPAs to assess and, if appropriate, pursue the issuing of Prohibition Orders on long dormant sites.

2.2 Local Policy

The MPA for the area in which the development is proposed is a joint planning policy unit formed by the Isle of Anglesey County Council and Gwynedd Council in 2010. One LDP is being prepared for the two areas.

Prior to forming the joint planning unit, the Isle of Anglesey had been in the process of producing its own Unitary Development Plan (UDP). A deposit plan was prepared in 2001 which then had proposed changes issued (in 2002 and 2003) and the Inspector's Report was published in 2004. In 2005, the Council resolved to stop work on the UDP and a document has been produced that combines the relevant stages of the UDP with the Inspector's Recommendations to give a working version of the UDP (which is a material consideration in the determination of current planning applications).

2.2.1 Isle of Anglesey Stopped Unitary Development Plan 2005 (SUDP)

Chapter 15 of the SUDP outlines the Authority's policies for minerals and provides a context for minerals planning in the area. The plan states that "*areas with extant planning permission* [for sand and gravel extraction] *are minimal with no commercial activity taking* place" and that *"the areas which have sand and gravel deposits lie within or close to designated areas of importance*". The plan notes that sand and gravel is obtained from Gwynedd (with the exception of Tywyn Trewan which is the only sand and gravel site commercially operated on Anglesey, mainly serving its associated company) or from marine sources.

Safeguarding and efficient use of minerals is referred to within Minerals Policy 8 (MP8). This policy states that "*mineral resources will be protected from sterilisation unless there is a justified and overriding need for the development concerned"*.

The plan also notes that in order to prevent the sterilisation of minerals which have smaller reserves (as opposed to the large reserves of hard rock, for example), developments which may affect future workings or possible extensions will be opposed.

In addition to this wording, the Inspector recommended "*a 400m consultation zone extending from the outer edge of mineral sites".* This amendment refers to maps in Appendix 9 of the SUDP, which show the mineral sites and the extent of the consultation zones. Map 11, reproduced in Appendix B of this report, shows the Penrhos sandpit and 400m buffer.

The SUDP does not establish a planning policy position on prior extraction.

2.3 Guidance

2.3.1 BGS Mineral Resources Maps for Wales (NERC, 2010)

This is a series of six maps at a scale of 1:100,000 completed in 2010. The maps were intended to contribute to a comprehensive information base to enhance the sustainability of minerals resources in Wales. The maps show onshore mineral resources, metallic mineral occurrences and current/former/historic mineral extraction sites. The maps state that they "*should not be used to determine individual planning applications*".

The report[1] that accompanies this series states that the "*mineral resources defined on the maps show the areas within which potentially workable minerals may occur*". The report also notes that what is of economic interest changes over time and can be affected by such things as market forces and extraction technology.

Therefore, the maps show all areas that have resource potential (based on the geology), regardless of the extent of the mineral, its quality or market factors. As such, there is no implication of viability.

2.3.2 BGS Aggregates Safeguarding Maps for Wales (NERC, 2013)

The BGS aggregates safeguarding maps, also provided as a series of six, were completed in 2012. They are "*intended to assist with the delineation of safeguarding areas in Local Development Plans*". The maps state that they "*should not be used to determine individual planning applications...or in taking other decisions on the acquisition or use of a particular tract of land* ".

These maps were the product of a staged approach to the selection and categorisation of potential natural *aggregate* resources (identified on the BGS mineral resource maps), and the application of a margin around those potential resources for safeguarding.

Like the mineral resource maps, the aggregate safeguarding maps show all areas that have aggregate resource potential (based on the geology), regardless of the extent of the mineral, its quality or market factors. As such, there is no implication of viability.

Three Aggregates Safeguarding Area (ASA) category levels were used: 1) national importance, 2) more than local or some regional importance and 3) local supply importance (category 3 resources were not indicated on the maps). National importance was inferred by information provided in the Regional Technical Statements and the types of geological unit that are more likely to produce higher quality resources.

The safeguarding approach for superficial resources (such as river terrace gravels or blown sand) was to apply a 100m buffer, and for bedrock resources (such as limestone or sandstone) a 200m buffer was applied. These distances are consistent with MTAN1. Subsequently, these distances were applied around urban areas, and the resulting areas removed from the safeguarded margin.

[1] Humpage A J and Bide T P, 2010. The Mineral Resource Maps of Wales. British Geological Survey Open Report OR/10/032 49pp.

3. Potential for Mineral Resource Receptors

3.1 Introduction

This section outlines the potential for mineral resources to be present within the proposed development area that might be considered as receptors of any potential impacts related to that development. The general geology of the development area is considered, along with existing and historical mineral resources, and areas where resources may be identified in the future.

3.2 General Bedrock & Superficial Geology

Bedrock geology in the area comprises the New Harbour Group and South Stack Formation of the Monian Supergroup. The New Harbour Group is described as mica schist and psammite and underlies the Penrhos and Cae Glas sites, and part of the Kingsland site (see Table 3.1 below). The South Stack Formation is described as psammite and pelite and underlies the land in the northern half of the Kingsland site.

An igneous intrusion of unknown age crosses through the western-most area of the Kingsland site (within the blue ownership boundary). This may be composed of gabbro, micro gabbro, or diorite (or a combination thereof).

The older superficial deposits include glaciofluvial deposits of sand and gravel and Till (probably poorly sorted sand, silt and clays). The till covers the majority of the Penrhos and Kingsland sites and partially covers the Cae Glas site. One area of glaciofluvial deposits is identified along the eastern edge of the Kingsland site.

Blown sand is found on the north west side of the Gorsedd peninsula and on the land to the east and south of the Penrhos Beach.

An area of tidal flat deposits is present within the southern section of the Cae Glas site, and coastal zone deposits border the Penrhos site in the bay of Penrhos Beach and on the coast to the east.

Table 3.1 Superficial and bedrock geology in the vicinity of the proposed development

Age		Unit	Lithology	Presence in relation to the proposed development
Superficial	**Quaternary**	Tidal flat deposits	Normally a consolidated soft silty clay, with layers of sand, gravel and peat. Characteristically low relief; from the tidal zone	Within the southern part of the **Cae Glas application boundary**
		Coastal zone deposits	Shingle, gravel, sand, silt and clay, locally with peat layers; may be bedded or chaotic	Not present within the development plan boundaries
		Blown sand	Sand, pale brown, fine-grained, uncemented	Two areas within the **Penrhos application boundary**
		Glaciofluvial deposits	Sand and gravel	To the north of the **Cae Glas** site (**application boundary**). Within the **Kingsland** ownership boundary.
		Till	Diamicton	Found across much of all three sites' (within application boundaries)
Bedrock	**?**	Igneous intrusion	Not recorded	Within **Kingsland** part of site (western ownership boundary only)
	Cambrian	South Stack Formation	Schistose greywackes with partings of mica-schist, or interbedded metasandstones, pelites and subordinate quartzites	Underlies the northern half of **Kingsland** part of site (within **application boundary**)
		New Harbour Group	Fissile green mica schist, gritty green mica schist, with bedded jasper, jaspery phyllite and pelitic lava	Underlies all of **Penrhos** and **Cae Glas** parts of site (both ownership and **application boundaries**). Underlies southern half of **Kingsland** part of site (within **application boundary**)

Sources: BGS Lexicon descriptions, BGS GeoIndex geological mapping

3.3 Permitted Mineral Resources

3.3.1 Planning History

The 'Penrhos sandpit' (and a 400m consultation buffer) is identified on the north west side of the Gorsedd peninsula on Map 11 in Appendix 9 of the Anglesey SUDP.

The sandpit was granted planning permission in 1955 for sand extraction within a defined boundary and over two distinct phases of working. Restrictions of working were to a depth of 10 feet and not below the water table. The reason for approval in 1955 was given as:

> "*To protect the amenities of the locality and to ensure that any buildings proposed to be built on the site will be satisfactory from an amenity and architectural aspect*".

This implies that the sand was to be used for building and maintaining properties locally and not in major infrastructure projects (for example) nor was it likely to be transported any significant distance.

Restoration conditions included a maximum steepness of final faces of one in one, no tipping of material, spreading of overburden across the site along with a covering of material that would readily promote plant growth. All plant, machinery and foundations were to be removed and the land left in a tidy condition.

Reportedly[2], the site ceased working around 1969 after the sale of land to Anglesey Aluminium, however correspondence from 1961 (between the operator and the planning officer), indicates that there may still be sand resources within the permission boundary[3].

It does not appear that this site has been subject to a Prohibition Order at any time since the SUDP was published, even though it has not been worked potentially since 1969 (and certainly not since 1982). Therefore, under the Environment Act 1995, the Penrhos sandpit would be termed a 'dormant site' and would require a new scheme of planning conditions to be submitted to and approved by the MPA in order for the mineral to be worked. However, the site has not been included in the survey of dormant/inactive sites (as reported in the North Wales Regional Aggregates Working Party Annual Reports) since at least 2005.

3.3.2 Site Walkover, 2013

A site walkover in March 2013 confirmed that the sandpit has re-vegetated, largely with bracken and scrub, and now forms a natural buffer between the formal access tracks and beach area. The photograph below shows the Winter vegetation typical of the sandpit.

[2] Pers comm. Mrs Conant to J Sykes (via Kehoe Countryside, 19/02/2013)
[3] Pers comm. Robin Wynne Williams, North Wales Minerals and Waste Planning Service (27/2/2013)

Photograph 1 Sandpit Winter vegetation

3.3.3 Requirement for Additional Information

The Penrhos sandpit has been un-worked for some time, and appears to have largely naturally regenerated. For extraction to occur in the future, new conditions would need to be agreed. If there are little or no reserves left within the permission boundary or in adjacent areas, this site may therefore be an appropriate candidate for a Prohibition Order at some stage in the future.

Given this situation (and in order to be more certain of the potential impacts of the proposed development on mineral resources), greater understanding of what sand resource remains at the sandpit is needed. The results of a site investigation carried out with this aim are given in Section 4, below.

3.4 Historical Extraction Sites

An area that appears to have undergone extraction in the past has been identified in historical mapping in the north west of the Penrhos site, near Brynglas. However this appears not to have any planning permissions associated with it and to be of significant age (it was marked on a 1901 Ordnance Survey map of the area but not since). This sandpit is not safeguarded under the SUDP.

No other areas of historical mineral working have been identified within or close to the boundaries of the proposed development.

3.5 Potential Mineral Resources

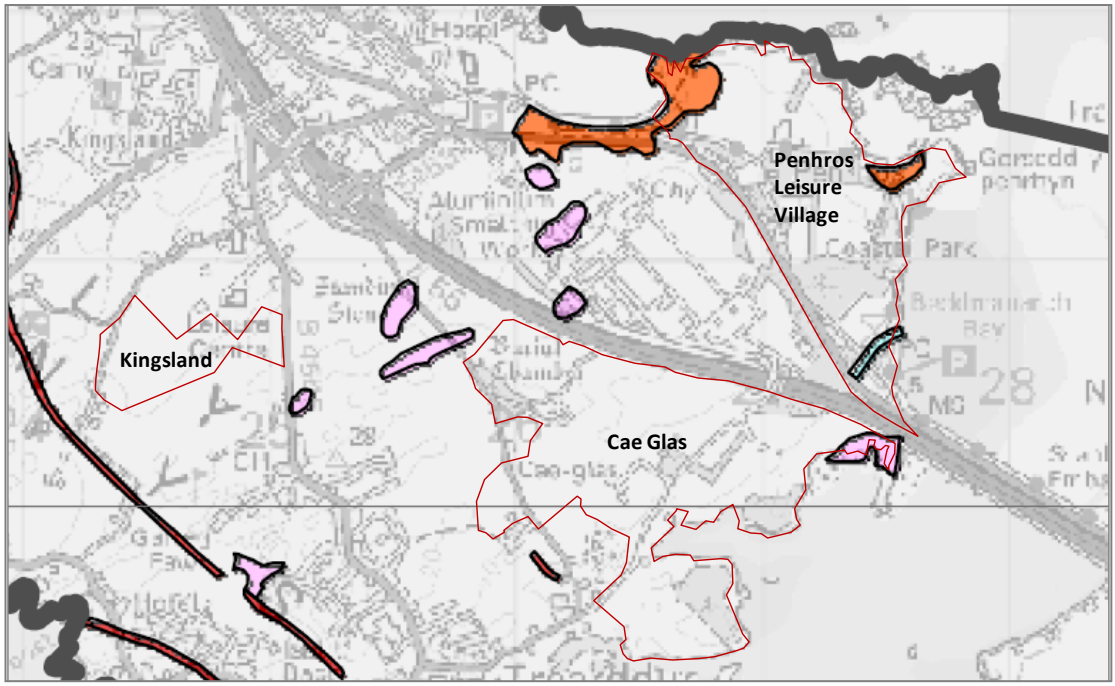
The BGS Mineral Resource Map of North West Wales (NERC, 2010) shows that the proposed development intersects with *potential* areas of mineral resource. An extract from this map, over which the red outline boundary of the proposed development is laid, is shown in Figure 3.1 below.

Areas of potential mineral resource identified within the proposed development boundaries are: glaciofluvial sand and gravel (in pink), located south of the A55 in the Cae Glas area; blown sand (in orange), in the vicinity of the Penrhos sandpit and at Brynglas; and limestone (in blue) near the Toll House pub in the east of the Penrhos Leisure Village boundary. The boundaries do not contain any areas of potential igneous resource (linear features in red).

Figure 3.2 applies the same development boundary overlay to the BGS Aggregates Safeguarding Map of North-west Wales (NERC, 2012). The glaciofluvial sands and gravel and wind-blown sand have been classified on the map as Category 1 ASA (of national importance)

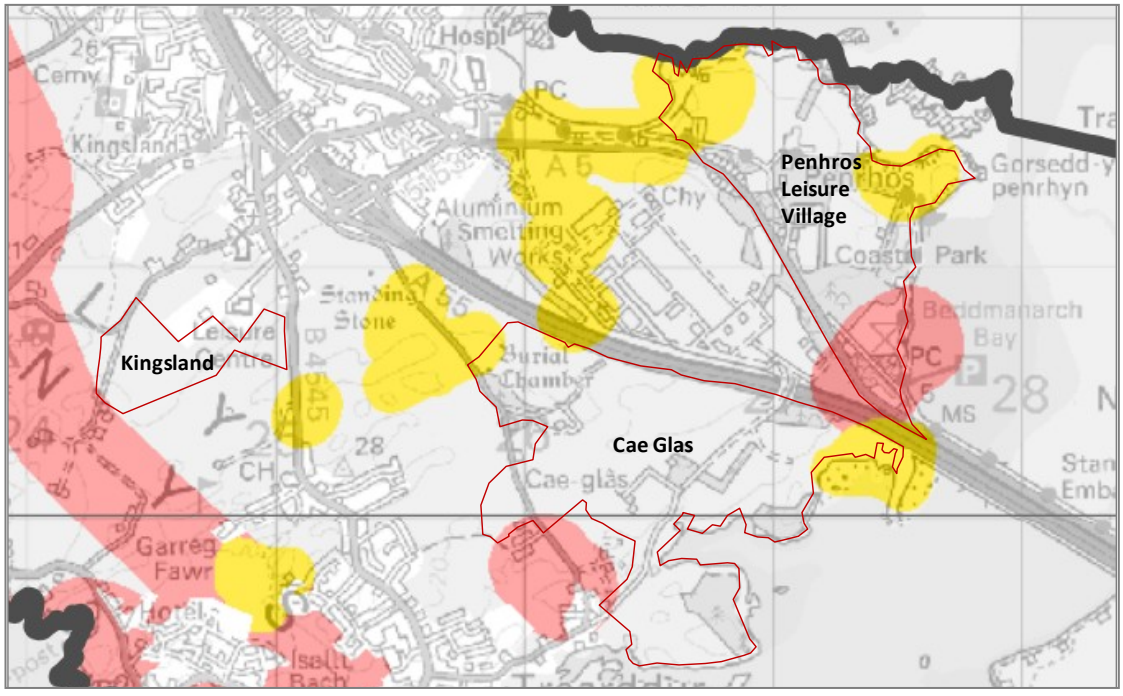
(in yellow) and the limestone and igneous rocks as Category 2 ASA (of regional and local importance) (in pink).

It is important to note that both these maps were intended for general consideration of minerals and aggregate safeguarding, but not as a source of information on specific sites. The accuracy of the excerpts in Figures 3.1 and 3.2 is reduced due to the reproduction size and the method used by the BGS to generalise from smaller scale maps. Thus the resource outcrops may be exaggerated or simplified.



Source: Mineral Resource Map of North West Wales © NERC, 2010.

Figure 3.1 Excerpt from the BGS Mineral Resource Map of North Wales, superimposed with the indicative proposed development boundaries (red outline).



Source: Aggregate Safeguarding Map of North West Wales © NERC, 2012.

Figure 3.2 Excerpt from the BGS Aggregates Safeguarding Map of North-west Wales, superimposed with the indicative proposed development boundaries (red outline). Yellow = Category 1 Aggregates Safeguarding Areas, Pink = Category 2 Aggregates Safeguarding Areas.

3.6 Previous Ground Investigations

Several previous reports that included reference to the geological conditions at or near the proposed development were reviewed for any additional information that they might provide about the permitted resource and areas of potential resource identified on the BGS mapping. This review, which can be found in Appendix D, did not provide any further evidence for these areas.

4. Site Investigation & Interpretation

In order to better understand the extent of the potential sand resources remaining in the Penrhos permission, and to the east and north east (as indicated on the BGS maps), a small scale investigation was undertaken on 26th March 2013. The relevant permissions were gained from the North Wales Minerals and Waste Planning Service and the landowner for these works.

4.1 Scope & Constraints

A series of trial pits were planned in order to identify the vertical and lateral extent of the potential area of blown sand. Specifically, the investigation was required to identify to what extent the permitted area had been worked, what potential resource may be remaining within the permitted area and the extent of similar deposits outside the permission.

Trial pits were to be limited to 3m depth, to not extend below the water table and only be dug to the full depth where sand identified as potential resource was present. These pits were to be terminated when the base of this sand was proved or, on the basis of the area's geological sequence, sand was not encountered directly below the topsoil. Exceptions to this were two shallower trial pits that were dug to prove the presence of sand between the greater-depth trial pit locations.

On completion, the site investigation covered 18 trial pits which extended to a maximum depth of 2.1m below ground level (m bgl). The deepest trial pit, which was within a unit of sand, was abandoned before the full depth of sand was reached due to stability issues.

Further details on the method used, and the locations and logs for these trial pits, are given in the report attached as Appendix C.

4.2 Geological Conditions

The trial pits confirmed that the geology underlying this area generally comprises topsoil, with reworked/made ground in some locations, above clays, silts, silty sand, 'low-fines sand' or bedrock of schist.

The 'low-fines sand' is interpreted to represent the mineral type that had been exploited as a resource at the sandpit, and is described on the logs as a light brown slightly to very silty fine to medium occasionally coarse sand with occasional fine gravel, including shell fragments. In places this was seen to grade into a very silty sand or silt at depth. This was seen at the greatest thickness in TP16 and is inferred to be most representative of the material historically used as a resource.

Inspection of samples of the low-fines sand material with a hand lens generated the following description:

> *"a light to mid-brown damp or slightly moist slightly silty fine to medium grained, occasionally coarse, SAND; generally comprising sub rounded to rounded cubic/spherical smooth quartzite grains, with occasional sand to fine gravel sized angular tabular shell fragments, and some fine to medium sand-grade sub-angular cubic/spherical, dark brown/black basic rock-type particles. This material was also noted to contain weathered red-brown ironstone or similar particles (to gravel sized) and with occasional organic matter/pockets." (pers. comm. R Sibley, 28/03/2013)*

The description above indicates that this material might be considered a 'fine aggregate', and that it is fairly clean (the lack of silt implies that only limited processing might be needed for use in building).

On this basis, and without testing to the appropriate British Standards, it appears that the 'low-fines sand' as identified in this investigation might be suitable for use as a fine aggregate.

4.3 Occurrence of Sand Resource

The site investigation identified areas where former extraction has removed the sand (both from within and outside of the permitted zone) and three areas were defined on the basis of the thickness of the low-fines sand for estimating resource volume. These zones can be seen on Figure 2 of the site investigation report in Appendix C.

The mapped interpretation of the trial pit findings shows that the extracted area (outlined in purple) extends across all of Part A of the permission and, to a small extent, into Part B. Sands with a thickness of around 1m were seen to remain within the permitted area (orange zone) but were limited to a small area towards the southern boundary (350 m^2).

Extraction also appears to have taken place outside of the permitted area. It is interpreted that the most workable sand within the permission may have been worked out and that the extraction has instead continued along the raised topography of a dune feature which contains the greatest thicknesses of low-fines sand. This dune area is identified on Figure 2 as the pink zone and covers an area of 1,983m^2. Beyond this dune feature, the sand was identified to be only up to 0.5m thick (green zone).

The site investigation report concludes that quarrying activities have removed much of the workable low-fines sand within the permission, and in general the deposits outside of the permission are not of similar quality. The exception to this appeared to be in the area of the raised dune feature.

4.4 Quantity Estimates of Low-fines Sand

It is useful to try understand the volume of this low-fines sand in terms of aggregate tonnage, as this is the unit generally used in mineral resource planning. This can be done by calculating approximate weight per unit volume, or bulk density. Densities for unconsolidated sand vary depending on grain size and moisture content but range between 1.4 to 1.6 tonnes/m^3 for dry sand and 1.9 to 2.1 tonnes/m^3 for saturated sand.

Tables 4.1 and 4.2 show the results of applying an average dry sand bulk density of 1.5 tonnes/m^3 to the estimated quantities of 'low-fines sand' given in the site investigation report. The volumes presented below assume a constant thickness of sand at average upper and lower bounds identified in the site investigation report but are considered optimistic due to no allowances having been made for:

- the removal of the low amount of fines;
- loss through grading; and
- removal of impurities that might be required to produce saleable product.

The estimated quantity of 'unprocessed low-fines sand' remaining *inside* the permitted area in the range of 1,160 to 1,630 tonnes, in deposits that are 0.25m to 1m thick.

For areas *outside* the permission, the quantity of 'unprocessed low-fines sand' is estimated in the range of 7,200 to 11,450 tonnes. The majority of this is present within the raised dune feature (containing up to 3m of potentially workable sand depth[4]), rather than in the thinner but more widespread sand to the east (0.25m to 0.5m thick).

To put these figures in context, Anglesey and Gwynedd are required by national planning policy to meet an apportionment of 1.5 million tonnes of land won sand and gravel. The potential resource that might be gained from the low-fines sand (dry and after silt removal) at Penrhos is likely to represent ≤1% of that apportionment.

[4] The base was not proved due to instability so this is based on the maximum permitted depth for the Penrhos sandpit (10ft)

Table 4.1 Upper estimate of quantity of low-fines sand inside and outside of the permitted Penrhos sandpit

Zone		Yellow Zone	Orange Zone	Pink Zone	Sub-Totals
Estimated Average Resource Thickness		0.50m	Approx. 1.0m	3.0m	
Low Fines Sand Volume (m^3)	Inside	376	350	357	1,083
	Outside	1,681	0	5,949	7,630
Low Fines Sand Tonnes	Inside	564	525	536	**1,625**
	Outside	2,522	0	8,924	**11,445**
				Upper estimate total	**13,070**

Note: Figures are rounded to the nearest whole tonne or metre

Table 4.2 Lower estimate of quantity of low-fines sand inside and outside of the permitted Penrhos sandpit

Zone		Yellow Zone	Orange Zone	Pink Zone	Sub-Totals
Estimated Average Resource Thickness		0.25m	Approx. 1.0m	2.0m	
Low Fines Sand Volume (m^3)	Inside	188	350	238	776
	Outside	841	0	3,966	4,807
Low Fines Sand Tonnes	Inside	282	525	357	**1,164**
	Outside	1,262	0	5,949	**7,211**
				Lower estimate total	**8,375**

Note: Figures are rounded to the nearest whole tonne or metre

5. Proposed Development in Relation to Mineral Resources

5.1 Penrhos Permitted Resources and Adjacent Low-fines Sand

The proposed development site boundary encompasses the permitted Penrhos Sandpit and its consultation buffer which are both identified as mineral resources on the basis of their inclusion within minerals planning policy (there are no other such permissions or safeguarded minerals in the development area).

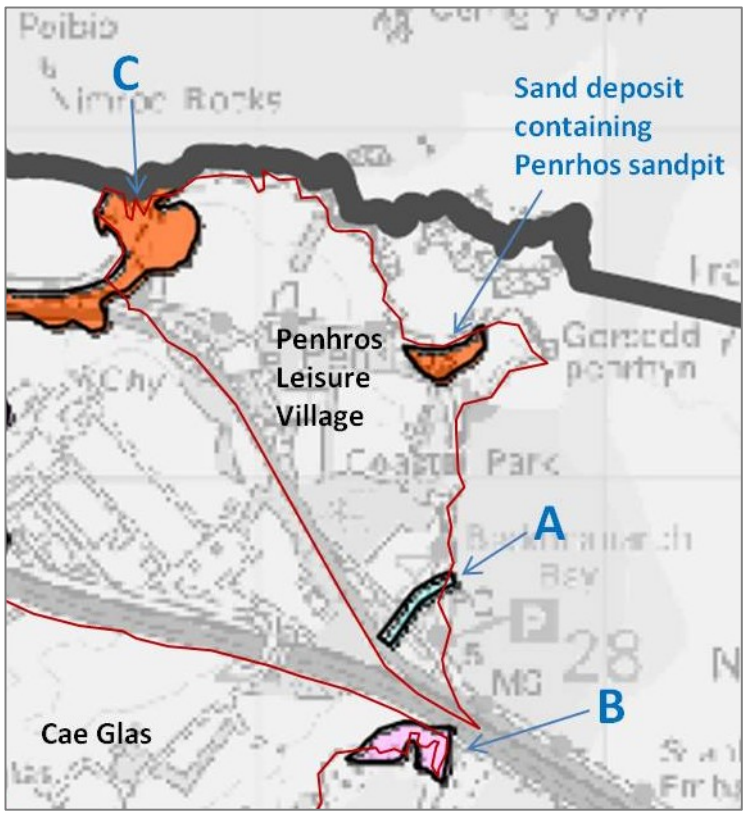
Within the permission boundary, site investigation here indicated that less than 1,630 tonnes of sand remains in the ground.

Outside of the permission, but within its 400m consultation buffer, is an area that contains less than 11,450 tonnes of sand.

No structures or re-profiling are proposed on these sands. The nearest proposed development features to the permitted and potential resources are lodges, located to the south west of the track, more than 100m from the point where deposits cease to be thicker than 0.5m.

5.2 Areas Indicated on the BGS Mineral Resource Maps

Three areas that have the potential for mineral resources (as identified on the BGS maps) intersect with the proposed development's boundary. The mineral that may be present is identified as limestone (marked as 'A' on Figure 5.1, below), glaciofluvial sands and gravels ('B') and blown sand ('C').



Source: Mineral Resource Map of North West Wales © NERC, 2010.

Figure 5.1 Excerpt from the BGS Mineral Resource Map of North Wales, superimposed with the indicative proposed development boundaries (red outline) and potential resource areas as indicated.

A. The area of limestone and its margin is within the woodland north of the Toll House and the character of this area is generally to be retained in the development plans as Coastal Park, with managed woodland habitats. A 'vehicular linkage' is proposed that would run SSE to NNW, across the limestone outcrop, making use of the route of an existing track way.

B. The area of potential glaciofluvial sand and gravel resource is proposed for 'habitat value'.

C. Near Brynglas, where an area of potential blown sand resource is identified, the development plan shows coastal grasslands and grazing pastures within the proposed Coastal Park. Existing residential buildings are within the BGS proposed safeguarding area.

While these three areas are not safeguarded by current minerals *policy*, they have been carried forward to the assessment as receptors in respect of their inclusion within aggregates safeguarding guidance (the BGS Aggregate Safeguarding Map).

6. Significance Assessment

6.1 Significance

The process of assessing the significance of a development's potential effects (i.e. the imposition of changes onto receptors/resources) includes a combination of professional judgement and/or appropriate best practice guidance, taking into account specific statutory or non statutory values and objectives as may be applicable. The strength of change and the importance of the receptor/resource (including its sensitivity and resilience to change) can be categorized as high, medium or low, and all other relevant considerations as to the effect's probability, duration, permanence and/or frequency should be included in the assessment.

6.2 Assessment

In the case of the proposed development, the key **receptors/resources** are 1) the permitted but dormant Penrhos sandpit, 2) the low-fines sand within the consultation buffer of the Penrhos sandpit, and 3) the unsafeguarded but potential areas of minerals resource identified by the BGS.

The development's **potential impact** is generally one of proximity to the receptors (which can in effect sterilise a resource). No (or extremely limited) direct / physical impacts are anticipated on the receptors.

Tables 6.1 to 6.3 below, provides a summary significance assessment of the potential impacts for each of the receptors identified.

Table 6.1 Significance assessment for impacts on the Penrhos sandpit permission

Receptor/resource 1: Penrhos Sandpit Permission		
Assessment		**Significance**
Source and nature of change	*A leisure development, including areas of environmental enhancement, with some residential buildings and amenity use within a 400m consultation buffer.*	**Minor**
Receptor(s) and/or resource affected	*< 1,600 tonnes of mineral in a dormant site.*	
Key 'built-in mitigation' measure(s), including design features and commitments	*No residential buildings are proposed on the sandpit in the concept masterplan, but there may be some lodges within 100m of the permission.*	
Strength of change	*Medium*	
Importance of receptor/resource	*Low*	
Material considerations (e.g. probability, duration, permanence and/or frequency)	*There is a small amount of material left in the permitted area.* *The sands are not going to be removed or otherwise destroyed by the development and could become available at some future date if/when the proposed development is demolished or redeveloped.* *Extraction of the remaining sand would require the agreement of new planning conditions as the sandpit is dormant. This process would likely be uneconomical for a landowner/an operator for such a small amount of material now and in the foreseeable future.* *There are environmental constraints in this area (including AONB) so resuming extraction is likely to be considered inappropriate when compared to the mineral gained and the natural regeneration of the sandpit. As such, this site appears to be a candidate for a Prohibition Order.*	

Table 6.2 Significance assessment for impacts on the low-fines sand at Penrhos

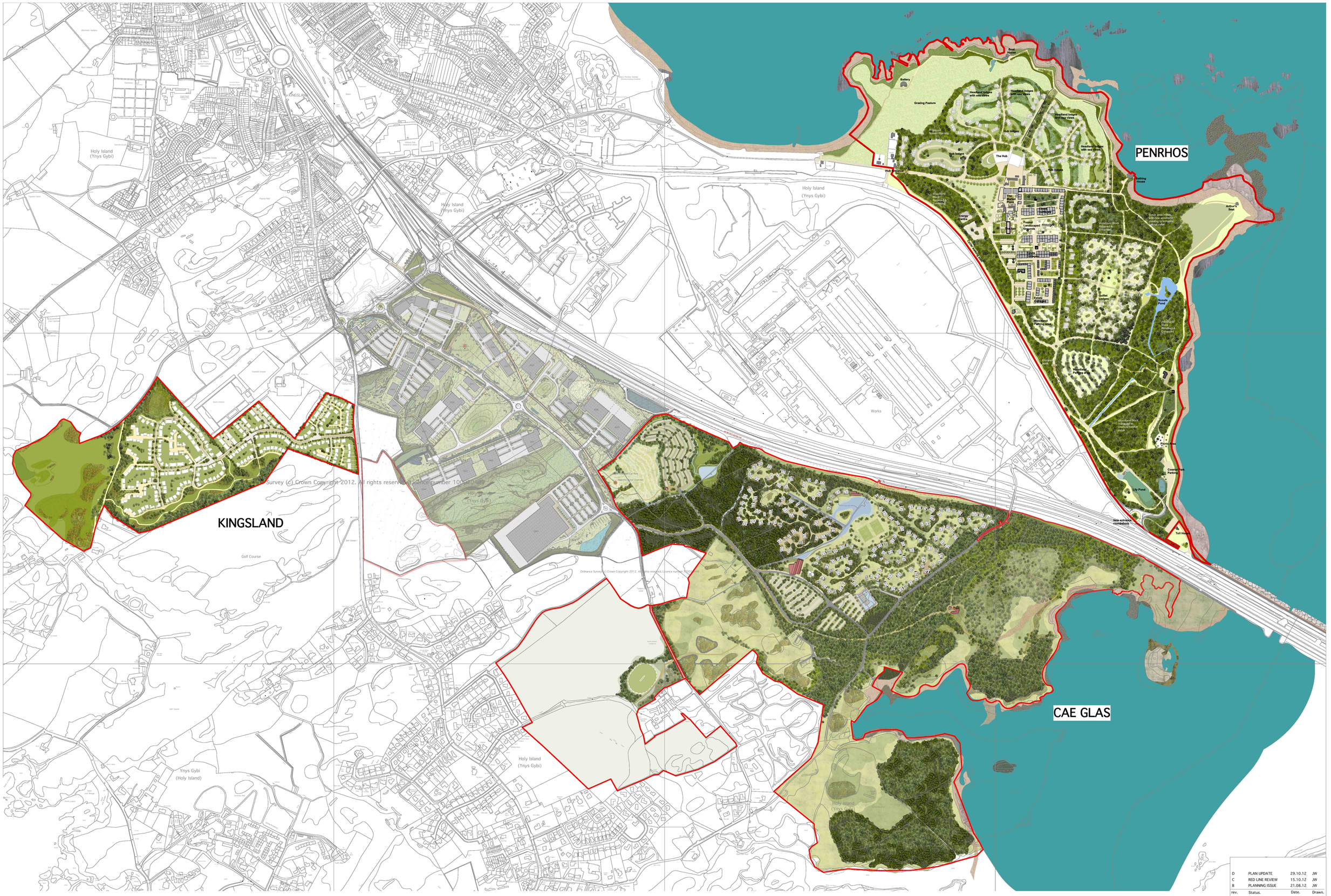
Receptor/resource 2: Low-fines sand at Penrhos		
Assessment		**Significance**
Source and nature of change	*A leisure development, including areas of environmental enhancement.*	**Negligible**
Receptor(s) and/or resource affected	*An area of potential sand resource (<11,450 tonnes) neighbouring a dormant site and within a planning consultation buffer zone.*	
Key 'built-in mitigation' measure(s), including design features and commitments	*No residential buildings are proposed on this area in the development plan, or within 100m of sands at depths >0.5m.*	
Strength of change	*Low*	
Importance of receptor/resource	*Low*	
Material considerations (e.g. probability, duration, permanence and/or frequency)	*The potential resource is small.* *It is within a zone safeguarded by policy.* *There are environmental constraints in this area (including AONB) so extraction is likely to be considered inappropriate under national policy, when compared to the mineral gained and the availability of existing alternative resources such as marine sands (this is the foreseeable future supply assumption in local minerals policy).* *Extraction of these resources might require new planning conditions on the neighbouring dormant site. This process would likely be uneconomical for a landowner/an operator for such a small amount of material now and in the future, unless demand becomes extreme.* *The sands are not going to be removed or otherwise destroyed by the development and could become available at some future date if/when the proposed development is demolished or redeveloped.*	

Table 6.3 Significance assessment for impacts on non-safeguarded potential resource

Receptor/resource 3: Areas of non-safeguarded potential resource		
Assessment		**Significance**
Source and nature of change	*A leisure development, including areas of environmental enhancement.*	**Negligible**
Receptor(s) and/or resource affected	*Three small areas of potential resource identified on the Mineral Resource Map of North Wales, NERC 2012 .*	
Key 'built-in mitigation' measure(s), including design features and commitments	*No residential buildings are proposed on these areas in the development plan.*	
Strength of change	*Low*	
Importance of receptor/resource	*Low*	
Material considerations (e.g. probability, duration, permanence and/or frequency)	*These areas are not safeguarded in policy.* *The resources are included on the BGS Aggregates Safeguarding Map, with a buffer on 100m, but the map should not be used to determine individual planning applications or to make other decisions on the use of a particular tract of land.* *There are already residential properties within the BGS proposed safeguarding buffer at Brynglas ('C' on Figure 5.1).* *In reference to the sand and gravel, existing alternative resources, such as marine sands, supply Anglesey and this provision for the foreseeable future is noted in minerals policy. As regards the limestone, there is a wealth of permitted hard rock mineral resource on Anglesey for the foreseeable future.* *There are environmental constraints in this area (including AONB and SSSI) so extraction may be considered inappropriate under national policy when compared to options for mineral to be gained elsewhere.* *The sands are not going to be removed or otherwise destroyed by the development and could become available at some future date if/when the proposed development is demolished or redeveloped.*	

On the basis of the foregoing assessment, the impact of the development proposals on minerals is classed as **minor**. No mitigation is suggested for the permitted Penrhos sandpit as prior extraction would be uneconomical given the small quantities of sand, its dormant status, natural regeneration and location within an AONB. Likewise, no such mitigation is proposed for the other receptors.

Appendix A : Overall Indicative Masterplan - Drawing PL1114.P.GA103, Rev D



rev.	Status.	Date.	Drawn.
D	PLAN UPDATE	29.10.12	JW
C	RED LINE REVIEW	15.10.12	JW
B	PLANNING ISSUE	21.08.12	JW

LAND & LAKES (ANGLESEY) LTD

North

Dwg. Title: OVERALL INDICATIVE MASTERPLAN

Dwg. No.	rev.	Status.
PL1114.P.GA103	D	PLANNING

Scale	Date	Drawn	Appd.
A1 1:5000	06.02.12	GS	EL

2 Back Grafton Street
Altrincham
Cheshire
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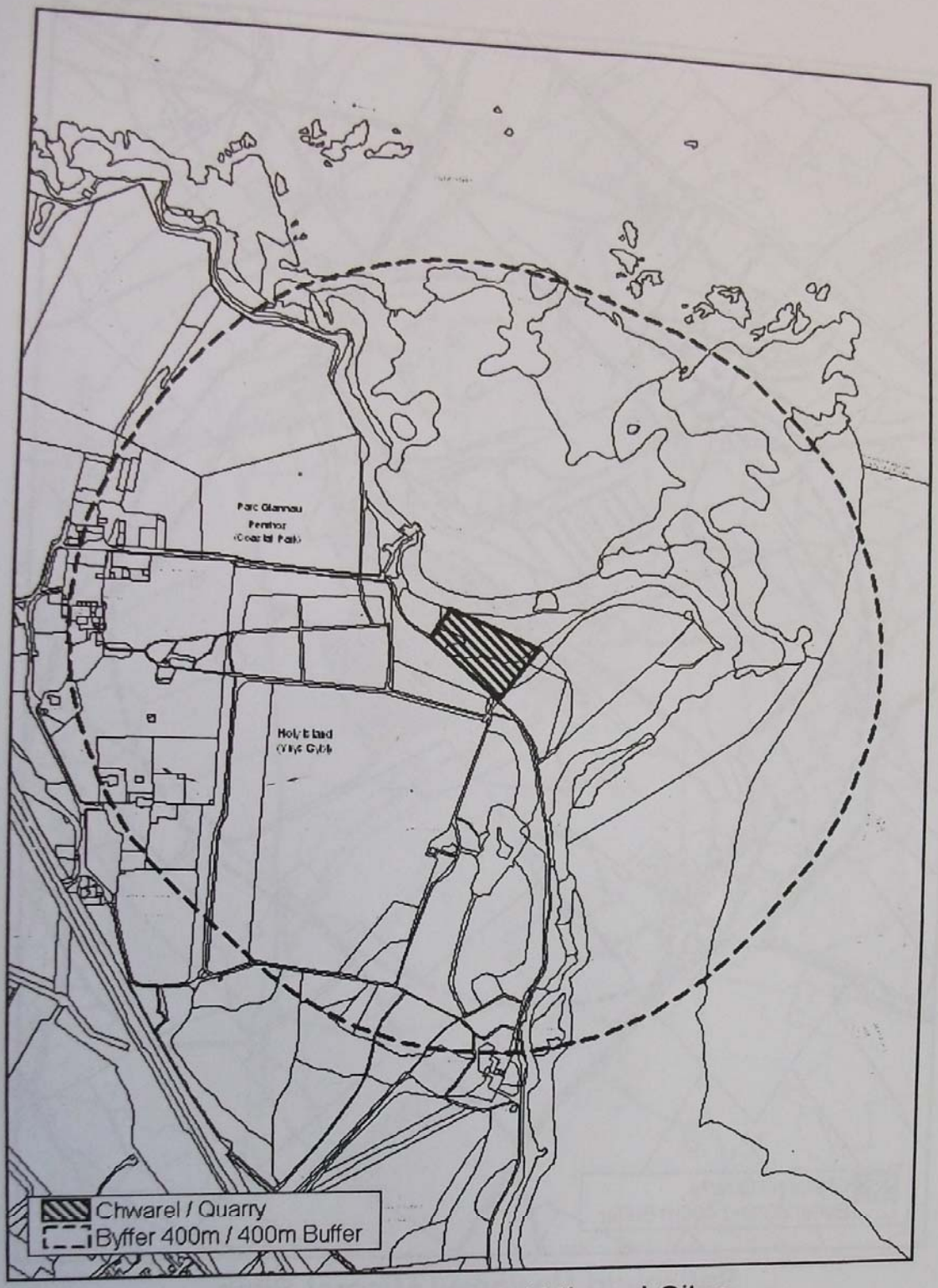
Tel: 0161 928 9281
Fax: 0161 928 9284
E-mail: mail@planit-ie.com

planit
intelligent environments

Appendix B : Map 11 of Appendix 9 of the SUDP



Safleoedd Mwynau / Mineral Sites

11. Penrhos
Caergybi / Holyhead

CYNGOR SIR YNYS MÔN ISLE OF ANGLESEY COUNTY COUNCIL

Dim i Raddfa / Not to Scale

G/N

Appendix C : Site Investigation Report

CAPITA SYMONDS
STRUCTURES

Penrhos Mineral Site

Investigation Summary Report

Introduction

Capita Symonds (Structures) Ltd ("CSS") has undertaken a ground investigation at Penrhos on the 26th March 2013. In support of this, the following drawings are attached in Appendix A:

- Figure 1: Plan depicting the exploratory hole locations, as well as the inferred "limit of extraction" of the historical quarry, a line depicting the base of an area of higher ground (sand dunes potentially) and the conjectured southern and eastern limits of the Blown Sand deposits based on the trial pit findings;
- Figure 2: Plan with the estimated areas of the "low-fines sand" separated into:
  - 2.0m thickness or more
  - Approx 1.0m thickness
  - 0.5m thickness or less.

The trial pit logs are presented in Appendix B.

Works undertaken

The works undertaken comprised the excavation of 18 trial pits; these were formed using a Kuboto tracked mini-excavator with driver and banks-man kindly provided by Kehoe Countryside. Prior to commencement of the site work, CSS was advised that Kehoe scanned the various areas for underground utilities.

The trial pits were formed to a range of depths between 0.30m and 2.10m below ground level (m bgl), under the supervision of an engineering geologist (Ralph Sibley of CSS) who recorded ground and groundwater conditions as holes were excavated and took selected representative disturbed soil samples. Pits were formed sequentially, with each being backfilled and reinstated on completion, before commencement with the next.

In relation to our Brief:

- trial pits TP01-TP10 were formed to delineate the southern/eastern margin of the Blown Sand deposits;
- trial pits TP11-TP14 were formed along the margin of the existing quarry/limit of the permitted area, to determine how much "low-fines sand" remains;
- trial pits TP15 and TP16 were formed to determine the thickness of the "low-fines sand" to the east of the permitted area;
- trial pits TP17 and TP18 were formed in the base of the quarry, to determine the underlying ground and groundwater conditions, and determine if any "low-fines sand" remained.

The hole locations were set out initially by visual reference to site features/provided plans, and (on completion) hole locations were recorded to national grid using a GPS; the accuracy of this is inferred to be about +/-3m. The as-formed locations are estimated to be within the areas defined by

the symbols on Figure 1 in Appendix A. In addition, selected features were also surveyed using the GPS (also presented on Figure 1) and included:

- The (inferred) limit of extraction of the existing quarry at the site;
- The (south-eastern alignment of the) base of an area of sand-dunes/mounds where the Blown Sand deposits are inferred to be thicker and form an elevated topographical feature; this is estimated to be about 1.5-2.0m higher than adjacent ground.

Findings – Ground Conditions

From the delineation trial pits (TP01-TP10) the eastern/southern margin of the Blown Sand deposits is indicated to be west and north of that depicted on the published geological plans/records. As a consequence, the area of the deposits is somewhat smaller than depicted. In particular, trial pits TP01, TP02, TP04, TP05 and TP09 all encountered natural clay directly beneath Topsoil, and trial pit TP08 encountered rock-head (micaceous schist, inferred to be of the Mona Complex) directly beneath Topsoil. All these locations were, therefore, formed outside the area of the Blown Sand deposits. In trial pits TP07 and TP10, a limited thickness of sandy soil was encountered directly beneath Topsoil (0.35-0.55mbgl in TP07, and 0.35-0.60mbgl in TP10). In both cases, the sand was noted to have significant "fines" (silt) content; the limited thicknesses were underlain by clay soils or schist rock-head. Accordingly, these holes are inferred to define the approximate limit of the Blown Sand deposits and to reflect a poorer grade of Blown Sand associated with the elevated fines content.

In trial pits TP11-TP16 (including TP03 and TP06) a "*slightly silty fine to medium, occasionally course SAND with occasional fine gravel (including shell fragments) and occasional organic pockets*" was encountered directly beneath the Topsoil and was found to extend to a range of depths between 0.55mbgl (TP15) and at least 2.10mbgl (in TP16 – formed at/near the top of an inferred dune/ topographical feature at the site; this pit was terminated at this depth due to sidewall collapse preventing advancement). In general, the slightly silty ("low-fines") sand was found to be limited in thickness. The silt content of the sand was noted to increase significantly with depth, varying to sandy silt in trial pit TP11 and TP12 below 1.10 – 1.30mbgl. Within these trial pits, the good quality ("low-fines") sand was found to vary in thickness between 0.20m (in TP13) and at least 1.90mbgl (in TP16) but rarely exceeded 1.0m in thickness. The base of the silty sand/sandy silt was encountered in most of these pits (except TP16) at depths of between 0.70m (in TP13, underlain by schist rock-head) and 1.90mbgl (TP12, also underlain by schist). In addition, soils were observed to be saturated and/or groundwater ingress occurred below depths of about 1.0-1.5mbgl, with the only exception being TP16 which was dry to at least 2.10mbgl.

In trial pits TP17-TP18 Made Ground/possible Made Ground was encountered to depths of between 0.40m and 0.50mbgl respectively. In TP17 this was underlain by silty sand (not the good quality low-fines material) to at least 1.80m, with groundwater entering below 1.10mbgl. In TP18 a thin horizon of (what appeared to be well-compacted/dense) low-fines sand was underlain below 0.70m bgl by a stiff clay inferred to be Glacial Till.

Estimated Areas and Volumes of Remaining Low Fines Sand

The foregoing data and information regarding ground conditions has been reviewed in relation to the remaining "low-fines" sand. The fines content of the lower horizons of granular soils (silty-very silty sand and sandy silt) are considered to be detrimental to the Blown Sand quality, such that they would be unsuitable for use as an aggregate without significant treatment to remove the fines, which is likely to render such materials uneconomical. This is considered to be reflected by the fact that the outline of the former quarry (as defined by the inferred limit of extraction) does not correlate with the permitted area.

The findings have been evaluated with the extent of the Blown Sand deposits south and east of the permitted quarry area defined in terms of three zones in relation to the "low-fines sand"; namely (see Figure 2):

Zone	Estimated Average Thickness	Zone Surface Area (m^2)			Low Fine Sand Volume (m^3)		
		Total	Within permit area	Outside permit area	Total	Within permit area	Outside permit area
Green	0.50m or less (#1)	4114	752	3362	1029 – 2057	188 – 376	841 – 1681
Orange	Approx. 1.0m	350	350	0	350	350	0
Pink	2.0 – 3.0m (#2)	2102	119	1983	4204 – 6306	238 – 357	3966 – 5949
TOTAL		**6566**	**1221**	**5345**	**5583 – 8713**	**776 – 1083**	**4807 – 7630**

The foregoing figures are estimates based on the information obtained in this investigation; in particular the following should be noted:

#1: the volumes present within the Green Zone represent an upper limit, and assume a mean thickness of low-fines sand of 0.25 – 0.50m; if the thicknesses are substantially less, the volumes of low-fines sand in this Zone would be accordingly less.

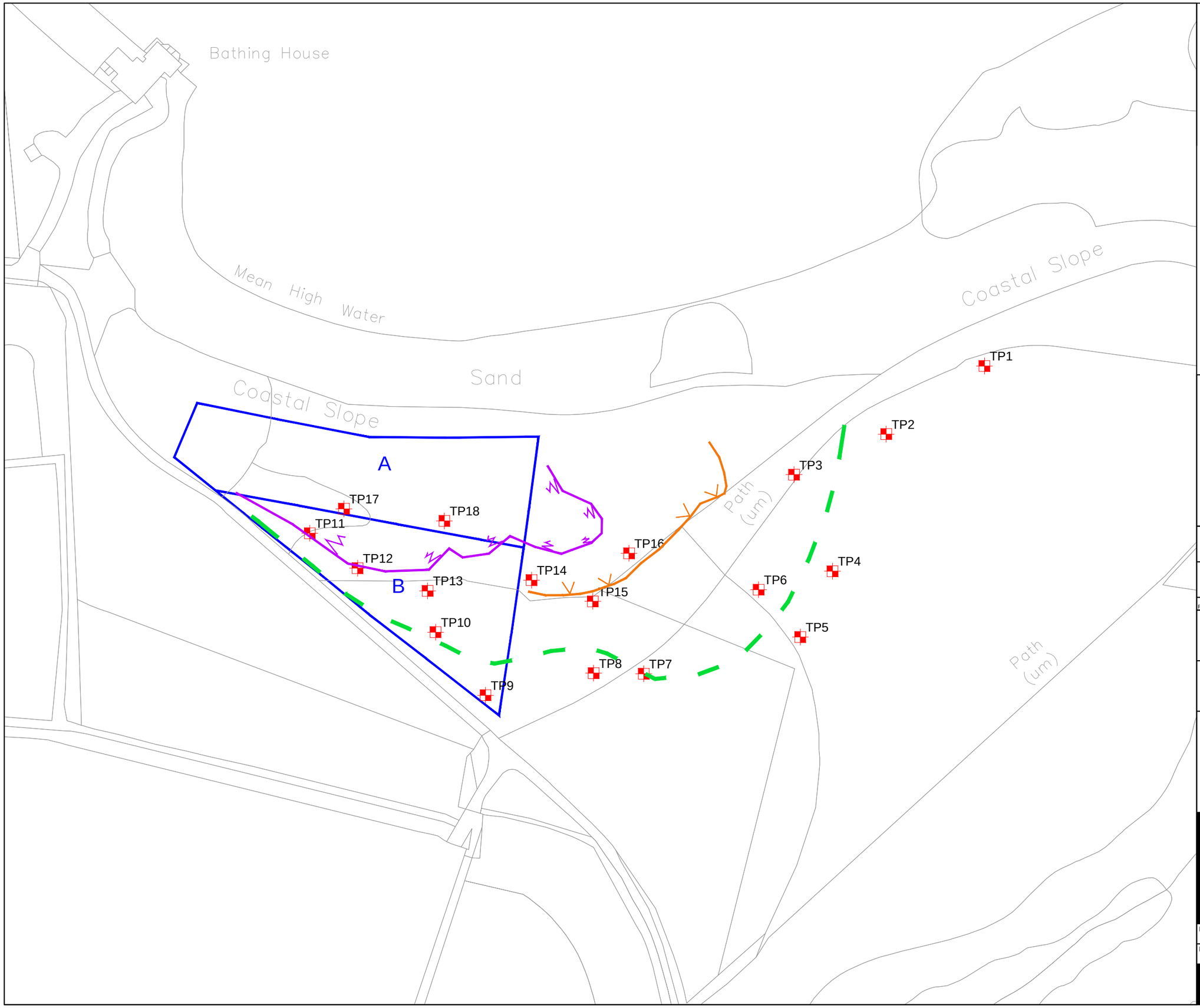
#2: the volumes present within the Pink Zone assume a mean thickness of low-fines sand of between 2.0m (the maximum depth penetrated in TP16) and 3.0m (as per the planning permit). If greater or lesser thicknesses of low fines sand exist, the volumes would be greater or less than those estimated.

Conclusions

In summary, our conclusions on the ground conditions encountered are as follows:

- The Blown Sand deposit is smaller in area than anticipated/indicated on the BGS plans;
- The (remaining) deposit contains an upper horizon of reasonable quality low-fines sand; this rapidly increases in silt content with depth and/or is limited in thickness;
- The former quarry did not follow the outline of the permitted area. It is inferred that quarrying activities have removed much of the workable low-fines sand within the permitted area, and that which is outside is probably not of particularly good quality/thickness or value;
- The only exception relates to a topographical feature some 1.5-2.0m higher than the surrounding ground in which the low-fines sand was found to extend to at least 2.10mbgl. The extent of this feature (and the depth of workable low fines sand) in a northerly direction is not particularly well defined.

Appendix A Figures & Drawings



GENERAL NOTES

Do not scale from this drawing. Work from figured dimensions only. All dimensions are in millimetres u.n.o.

No deviation from the details shown on this drawing will be allowed without prior permission in writing.

All drawings are to be read in conjunction with all architects, engineers and specialist drawings and details.

KEY

- MACHINE EXCAVATED TRIAL PIT
- LIMIT OF BLOWN SAND
- TOE OF INFERRED SAND DUNE
- QUARRY LIMIT OF EXTRACTION (INFERRED)
- PERMISSION BOUNDARY

Rev	Date	Revision	By	Checked	Authorised

Client:

LAND AND LAKES

Project:

PENRHOS MINERAL SITE

Title:

FIGURE 1:
EXPLORATORY HOLE LOCATION PLAN WITH LANDSCAPE FEATURES

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Consulting Civil, Structural & Geo-Environmental Engineers
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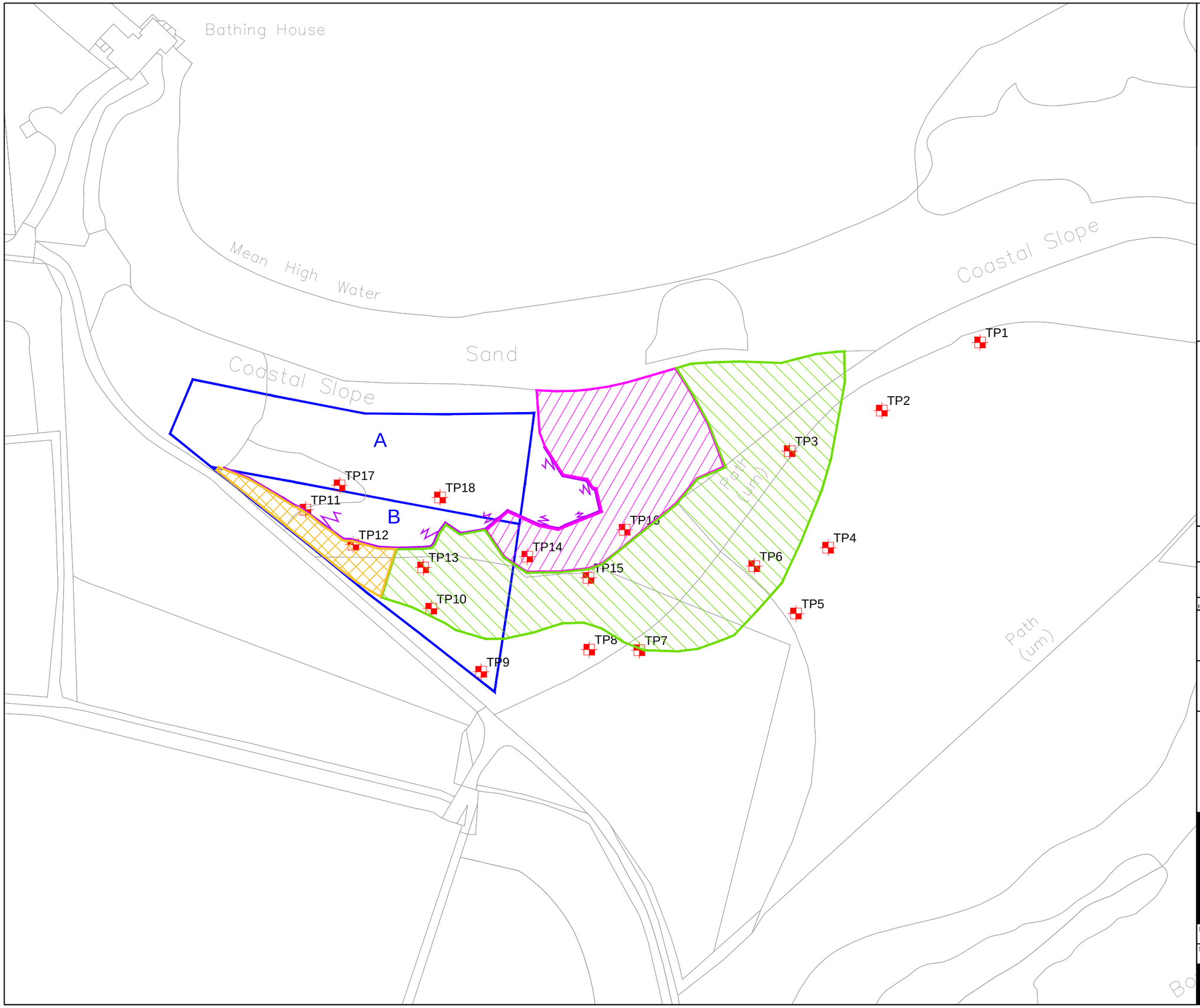
E-mail: capitasymonds.cheadle@capita.co.uk
Offices also at:
Bristol Cambridge
London Sheffield
Watford
Special Projects: Cheadle Hulme
www.capitasymonds.co.uk/structures

Drawn at	Scale @ A3	Date
MANCHESTER	1:1000	APR '13
Drawn	Checked	Authorised
END	MSG	

Project No.:	Drawing No.:	Revision:
SS018899	002	-



GENERAL NOTES

Do not scale from this drawing. Work from figured dimensions only. All dimensions are in millimetres u.n.o.

No deviation from the details shown on this drawing will be allowed without prior permission in writing.

All drawings are to be read in conjunction with all architects, engineers and specialist drawings and details.

KEY

- MACHINE EXCAVATED TRIAL PIT
- PERMISSION BOUNDARY
- QUARRY LIMIT OF EXTRACTION (INFERRED)

"LOW-FINES SAND" ZONES

- PINK ZONE ≥2.0m THICK
- ORANGE ZONE APPROX. 1.0m THICK
- GREEN ZONE ≤0.5m THICK

Rev	Date	Revision	By	Checked	Authorised

Client:

LAND AND LAKES

Project:

PENRHOS MINERAL SITE

Title:

FIGURE 2:
ESTIMATED AREAS
OF THE LOW-FINES SAND

CAPITA SYMONDS
STRUCTURES
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Tel: (+44) 0161 486 1521
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London Sheffield
Watford
Special Projects: Cheadle Hulme
www.capitasymonds.co.uk/structures

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MANCHESTER	1:1000	APR '13
Drawn	**Checked**	**Authorised**
END	RDS	

Project No.:	Drawing No.:	Revision:
SS018899	003	-

Appendix B Trial Pit Logs

CAPITA SYMONDS

Clemence House
9 Mellor Road
Cheadle Hulme
Cheshire SK8 5AT

Tel : 0161 486 1521
Fax : 0161 486 1580

Project Name : Penrhos Mineral Site			Trial Pit Number TP01
Job Number : SS/018899			Sheet 1 of 1 Scale :1:50
Client Name : AAG			
E Coord: 27643	N Coord: 81395	G.L. : - (m) AOD	Logged By : RDS
Date : 26/03/2013	Plant : Tracked Excavator		Checked By : END

SAMPLING DATA			GROUND STRATA				
Depth (m)	Type	Test Results / Remarks	Legend	Level (m) AOD	Description	Depth & [thickness] (m)	Water
					Grass over firm moist dark brown friable sandy silt/clay, with rootlets. TOPSOIL	[0.40] 0.40	
					Soft/firm moist grey brown sandy gravelly CLAY	0.50	
					End of Trial Pit at 0.50 m		

SAMPLE/TEST KEY

B	Bulk Sample
D	Disturbed Sample
ES	Environmental Sample
EV	Environmental Vial Sample
W	Water Sample
V	Vane Test Result
▽	Water Strikes
▼	Water Level

HB 3 - CSS TP LOG
last revised 18-10-07 jp

Comments :
Pit excavated to delineate extent of Blown Sand.

Stability :
Pit stable

Groundwater Remarks

No Groundwater Encountered

CAPITA SYMONDS
Clemence House
9 Mellor Road
Cheadle Hulme
Cheshire SK8 5AT
Tel : 0161 486 1521
Fax : 0161 486 1580

Project Name : Penrhos Mineral Site			Trial Pit Number TP02
Job Number : SS/018899			Sheet 1 of 1 Scale :1:50
Client Name : AAG			
E Coord: 27615	N Coord: 81377	G.L. : - (m) AOD	Logged By : RDS
Date : 26/03/2013	Plant : Tracked Excavator		Checked By : END

SAMPLING DATA			GROUND STRATA				
Depth (m)	Type	Test Results / Remarks	Legend	Level (m) AOD	Description	Depth & [thickness] (m)	Water
					Grass over firm moist dark brown friable sandy clayey silt with rootlets. TOPSOIL	[0.45]	
						0.45	
					Soft/firm moist blue grey mottled brown sandy gravelly CLAY, with coarse angular gravel of schist.		
					End of Trial Pit at 0.55 m	0.55	

SAMPLE/TEST KEY
B Bulk Sample
D Disturbed Sample
ES Environmental Sample
EV Environmental Vial Sample
W Water Sample
V Vane Test Result
▽ Water Strikes
▼ Water Level

HB 3 - CSS TP LOG
last revised 18-10-07 jp

Comments :
Pit excavated to delineate extent of Blown Sand.

Stability :
Pit stable

Groundwater Remarks
No Groundwater Encountered

CAPITA SYMONDS

Clemence House
9 Mellor Road
Cheadle Hulme
Cheshire SK8 5AT

Tel : 0161 486 1521
Fax : 0161 486 1580

Project Name : Penrhos Mineral Site			Trial Pit Number TP03
Job Number : SS/018899			Sheet 1 of 1 Scale :1:50
Client Name : AAG			
E Coord: 27590	N Coord: 81366	G.L. : - (m) AOD	Logged By : RDS
Date : 26/03/2013	Plant : Tracked Excavator		Checked By : END

SAMPLING DATA			GROUND STRATA				
Depth (m)	Type	Test Results / Remarks	Legend	Level (m) AOD	Description	Depth & [thickness] (m)	Water
					Rough vegetation over mid brown moist silty gravelly sand with rootlets. TOPSOIL	[0.30] 0.30	
					Moist light brown slightly silty fine to medium occasionally coarse SAND, with occasional fine gravel, including shell fragments/similar.	0.40	
					End of Trial Pit at 0.40 m		

SAMPLE/TEST KEY
B Bulk Sample
D Disturbed Sample
ES Environmental Sample
EV Environmental Vial Sample
W Water Sample
V Vane Test Result
▽ Water Strikes
▼ Water Level

HB 3 - CSS TP LOG
last revised 18-10-07 jp

Comments :
Pit excavated to delineate extent of Blown Sand.

Stability :
Pit stable

Groundwater Remarks
No Groundwater Encountered

CAPITA SYMONDS

Clemence House
9 Mellor Road
Cheadle Hulme
Cheshire SK8 5AT

Tel : 0161 486 1521
Fax : 0161 486 1580

Project Name : Penrhos Mineral Site			Trial Pit Number TP04
Job Number : SS/018899			
Client Name : AAG			Sheet 1 of 1 Scale :1:50
E Coord: 27600	N Coord: 81339	G.L. : - (m) AOD	Logged By : RDS
Date : 26/03/2013	Plant : Tracked Excavator		Checked By : END

SAMPLING DATA			GROUND STRATA				
Depth (m)	Type	Test Results / Remarks	Legend	Level (m) AOD	Description	Depth & [thickness] (m)	Water
					Grass over firm moist dark brown friable sandy clayey silt with rootlets. TOPSOIL	[0.25] 0.25	
					Firm light brown mottled grey sandy gravelly CLAY.	0.30	
					End of Trial Pit at 0.30 m		

SAMPLE/TEST KEY
B Bulk Sample
D Disturbed Sample
ES Environmental Sample
EV Environmental Vial Sample
W Water Sample
V Vane Test Result
▽ Water Strikes
▼ Water Level

HB 3 - CSS TP LOG
last revised 18-10-07 jp

Comments :
Pit excavated to delineate extent of Blown Sand.

Stability :
Pit stable

Groundwater Remarks
No Groundwater Encountered

CAPITA SYMONDS
Clemence House
9 Mellor Road
Cheadle Hulme
Cheshire SK8 5AT
Tel : 0161 486 1521
Fax : 0161 486 1580

Project Name : Penrhos Mineral Site			Trial Pit Number TP05
Job Number : SS/018899			
Client Name : AAG			Sheet 1 of 1 Scale :1:50
E Coord: 27591	N Coord: 81322	G.L. : - (m) AOD	Logged By : RDS
Date : 26/03/2013	Plant : Tracked Excavator		Checked By : END

SAMPLING DATA			GROUND STRATA				
Depth (m)	Type	Test Results / Remarks	Legend	Level (m) AOD	Description	Depth & [thickness] (m)	Water
					Rough grass over firm moist sandy silty clay with rootlets. TOPSOIL	[0.50]	
					Firm light brown moist sandy gravelly CLAY with occasional angular cobbles of schist.	0.50	
					End of Trial Pit at 0.60 m	0.60	

SAMPLE/TEST KEY
B Bulk Sample
D Disturbed Sample
ES Environmental Sample
EV Environmental Vial Sample
W Water Sample
V Vane Test Result
▽ Water Strikes
▼ Water Level

HB 3 - CSS TP LOG
last revised 18-10-07 jp

Comments :
Pit excavated to delineate extent of Blown Sand.

Stability :
Pit stable

Groundwater Remarks
No Groundwater Encountered

CAPITA SYMONDS

Clemence House
9 Mellor Road
Cheadle Hulme
Cheshire SK8 5AT

Tel : 0161 486 1521
Fax : 0161 486 1580

Project Name : Penrhos Mineral Site			Trial Pit Number TP06
Job Number : SS/018899			Sheet 1 of 1 Scale :1:50
Client Name : AAG			
E Coord: 27580	N Coord: 81334	G.L. : - (m) AOD	Logged By : RDS
Date : 26/03/2013	Plant : Tracked Excavator		Checked By : END

SAMPLING DATA			GROUND STRATA				
Depth (m)	Type	Test Results / Remarks	Legend	Level (m) AOD	Description	Depth & [thickness] (m)	Water
					Rough grass over brown moist silty sand. TOPSOIL	[0.25] 0.25	
					Light-mid brown moist very silty fine-medium SAND.	0.40	
					End of Trial Pit at 0.40 m		

SAMPLE/TEST KEY
B Bulk Sample
D Disturbed Sample
ES Environmental Sample
EV Environmental Vial Sample
W Water Sample
V Vane Test Result
▽ Water Strikes
▼ Water Level

HB 3 - CSS TP LOG
last revised 18-10-07 jp

Comments :
Pit excavated to delineate extent of Blown Sand.

Stability :
Pit stable

Groundwater Remarks
No Groundwater Encountered

CAPITA SYMONDS

Clemence House
9 Mellor Road
Cheadle Hulme
Cheshire SK8 5AT

Tel : 0161 486 1521
Fax : 0161 486 1580

Project Name : Penrhos Mineral Site			Trial Pit Number TP07
Job Number : SS/018899			
Client Name : AAG			Sheet 1 of 1 Scale :1:50
E Coord: 27548	N Coord: 81311	G.L. : - (m) AOD	Logged By : RDS
Date : 26/03/2013	Plant : Tracked Excavator		Checked By : END

SAMPLING DATA

GROUND STRATA

Depth (m)	Type	Test Results / Remarks	Legend	Level (m) AOD	Description	Depth & [thickness] (m)	Water
					Rough vegetation over brown silty, sand/clay, with rootlets. TOPSOIL	[0.35] 0.35	
					Moist brown clayey/silty SAND, with occasional angular gravel.	0.55	
					Soft moist light grey/brown sandy CLAY. Water entry (seeps) at 0.55m	0.60	
					End of Trial Pit at 0.60 m		

SAMPLE/TEST KEY
B Bulk Sample
D Disturbed Sample
ES Environmental Sample
EV Environmental Vial Sample
W Water Sample
V Vane Test Result
▽ Water Strikes
▼ Water Level

HB 3 - CSS TP LOG
last revised 18-10-07 jp

Comments :
Pit excavated to delineate extent of Blown Sand.

Stability :
Pit stable

Groundwater Remarks
at 0.55 m bgl

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Project Name : Penrhos Mineral Site			Trial Pit Number TP08
Job Number : SS/018899			
Client Name : AAG			Sheet 1 of 1 Scale :1:50
E Coord: 27534	N Coord: 81311	G.L. : - (m) AOD	Logged By : RDS
Date : 26/03/2013	Plant : Tracked Excavator		Checked By : END

SAMPLING DATA			GROUND STRATA				
Depth (m)	Type	Test Results / Remarks	Legend	Level (m) AOD	Description	Depth & [thickness] (m)	Water
					Rough vegetation over very soft, very moist brown sandy clayey silt with rootlets. TOPSOIL	[0.25] 0.25	▽
					Greenish grey mottled yellow, micaceous SCHIST. entry/standing at 0.30m	0.35	
					End of Trial Pit at 0.35 m		

SAMPLE/TEST KEY
B Bulk Sample
D Disturbed Sample
ES Environmental Sample
EV Environmental Vial Sample
W Water Sample
V Vane Test Result
▽ Water Strikes
▼ Water Level

HB 3 - CSS TP LOG
last revised 18-10-07 jp

Comments :
Pit excavated to delineate extent of Blown Sand.

Stability :
Pit stable

Groundwater Remarks
at 0.3 m bgl

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Project Name : Penrhos Mineral Site			Trial Pit Number TP09
Job Number : SS/018899			
Client Name : AAG			Sheet 1 of 1 Scale :1:50
E Coord: 27504	N Coord: 81305	G.L. : - (m) AOD	Logged By : RDS
Date : 26/03/2013	Plant : Tracked Excavator		Checked By : END

SAMPLING DATA			GROUND STRATA				
Depth (m)	Type	Test Results / Remarks	Legend	Level (m) AOD	Description	Depth & [thickness] (m)	Water
					Rough vetetation over brown clayey/sandy silt with rootlets. TOPSOIL	[0.30] 0.30	
					Mid brown clayey sandy SILT; varying with depth to soft/firm moist brown very sandy (silty) CLAY	[0.25] 0.55	
					End of Trial Pit at 0.55 m		

SAMPLE/TEST KEY
B Bulk Sample
D Disturbed Sample
ES Environmental Sample
EV Environmental Vial Sample
W Water Sample
V Vane Test Result
▽ Water Strikes
▼ Water Level

HB 3 - CSS TP LOG
last revised 18-10-07 jp

Comments :
Pit excavated to delineate extent of Blown Sand.

Stability :
Pit stable

Groundwater Remarks
No Groundwater Encountered

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Project Name : Penrhos Mineral Site			Trial Pit Number TP10
Job Number : SS/018899			
Client Name : AAG			Sheet 1 of 1 Scale :1:50
E Coord: 27490	N Coord: 81322	G.L. : - (m) AOD	Logged By : RDS
Date : 26/03/2013	Plant : Tracked Excavator		Checked By : END

SAMPLING DATA | GROUND STRATA

Depth (m)	Type	Test Results / Remarks	Legend	Level (m) AOD	Description	Depth & [thickness] (m)	Water
					Rough vegetation over brown moist silty fine-medium sand with roots. TOPSOIL	[0.35] 0.35	
					Slightly damp, mid brown very silty fine to medium SAND; varying moist, slightly orange brown, clayey/sandy SILT, with depth.	[0.25] 0.60	▽
					Large boulders of greenish grey weathered micaceous SCHIST; possibly bedrock. Seepages 0.60-0.70m	0.70	
					End of Trial Pit at 0.70 m		

SAMPLE/TEST KEY
B Bulk Sample
D Disturbed Sample
ES Environmental Sample
EV Environmental Vial Sample
W Water Sample
V Vane Test Result
▽ Water Strikes
▼ Water Level

HB 3 - CSS TP LOG
last revised 18-10-07 jp

Comments :
Pit excavated to delineate extent of Blown Sand.

Stability :
Pit stable

Groundwater Remarks
at 0.6 m bgl

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Project Name : Penrhos Mineral Site			Trial Pit Number TP11
Job Number : SS/018899			Sheet 1 of 1 Scale :1:50
Client Name : AAG			
E Coord: 27456	N Coord: 81350	G.L. : - (m) AOD	Logged By : RDS
Date : 26/03/2013	Plant : Tracked Excavator		Checked By : END

SAMPLING DATA			GROUND STRATA				
Depth (m)	Type	Test Results / Remarks	Legend	Level (m) AOD	Description	Depth & [thickness] (m)	Water
					Rough vegetation over humic matter/decaying vegetation. 'TOPSOIL'	0.15	
0.60	B1				Light brown slightly silty fine to medium SAND, with occasional organic matter and occasional sub-rounded boulders of schist. In parts, mottled grey, locally more sandy.	[0.95]	▽
						1.10	
1.30	D2				Very wet/saturated light greyish brown sandy SILT, with occasional organic matter. entries/saturated below 1.10m	[0.30]	
					End of Trial Pit at 1.40 m	1.40	

SAMPLE/TEST KEY
B Bulk Sample
D Disturbed Sample
ES Environmental Sample
EV Environmental Vial Sample
W Water Sample
V Vane Test Result
▽ Water Strikes
▼ Water Level

HB 3 - CSS TP LOG
last revised 18-10-07 jp

Comments :
Tried to penetrate below saturated soils; progressive sidewall collape - pit terminated.

Stability :
Collapse below 1.10m

Groundwater Remarks
at 1.1 m bgl

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Project Name : Penrhos Mineral Site			Trial Pit Number TP12
Job Number : SS/018899			Sheet 1 of 1 Scale :1:50
Client Name : AAG			
E Coord: 27469	N Coord: 81340	G.L. : - (m) AOD	Logged By : RDS
Date : 26/03/2013	Plant : Tracked Excavator		Checked By : END

SAMPLING DATA			GROUND STRATA				
Depth (m)	Type	Test Results / Remarks	Legend	Level (m) AOD	Description	Depth & [thickness] (m)	Water
					Rough vegetation over dark brown organic silty sand with roots and rootlets, occasional gravel. TOPSOIL	[0.25] 0.25	
0.50	B1				Mid brown slightly damp slightly silty fine to medium occsaionally coarse SAND, with occasional gravel, including shell fragments and rock. Occasional pockets of organic matter.	[1.05]	
						1.30	▽
1.60	D2				Mid brown saturated very sandy SILT, locally with sand lenses/beds, occasional organic matter and gravel of schist. Wet/saturated below 1.50-1.70m	[0.60]	
					Soft/firm greenish grey sandy gravelly CLAY, varying clayey GRAVEL of weathered schist. Refusal on bedrock at approx 2.00m.	1.90 [0.30] 2.20	
					End of Trial Pit at 2.00 m		

SAMPLE/TEST KEY
B Bulk Sample
D Disturbed Sample
ES Environmental Sample
EV Environmental Vial Sample
W Water Sample
V Vane Test Result
▽ Water Strikes
▼ Water Level

HB 3 - CSS TP LOG
last revised 18-10-07 jp

Comments :
Terminated at refusal on rockhead..

Stability :
Generally stable, occasional spalling

Groundwater Remarks
at 1.5 m bgl

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Project Name : Penrhos Mineral Site			Trial Pit Number TP13
Job Number : SS/018899			Sheet 1 of 1 Scale :1:50
Client Name : AAG			
E Coord: 27488	N Coord: 81333	G.L. : - (m) AOD	Logged By : RDS
Date : 26/03/2013	Plant : Tracked Excavator		Checked By : END

SAMPLING DATA			GROUND STRATA				
Depth (m)	Type	Test Results / Remarks	Legend	Level (m) AOD	Description	Depth & [thickness] (m)	Water
0.60	B1				Rough vegetation over dark brown slightly silty sand, with rootlets and occasional gravel. TOPSOIL	[0.30] 0.30	
					Mid brown slightly damp slightly silty fine to medium SAND with occsaional gravel; below 0.50m silty/very silty and wet.	[0.40] 0.70	
					Weathered bedrock - recovered as clayey/silty sandy gravel and cobbles of micaceous SCHIST.	0.80	
					End of Trial Pit at 0.80 m		

SAMPLE/TEST KEY
B Bulk Sample
D Disturbed Sample
ES Environmental Sample
EV Environmental Vial Sample
W Water Sample
V Vane Test Result
▽ Water Strikes
▼ Water Level

HB 3 - CSS TP LOG
last revised 18-10-07 jp

Comments :
Terminated at refusal on rockhead at 0.80m .

Stability :
pit stable

Groundwater Remarks
No Groundwater Encountered

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Project Name : Penrhos Mineral Site			Trial Pit Number TP14
Job Number : SS/018899			Sheet 1 of 1 Scale :1:50
Client Name : AAG			
E Coord: 27517	N Coord: 81337	G.L. : - (m) AOD	Logged By : RDS
Date : 26/03/2013	Plant : Tracked Excavator		Checked By : END

SAMPLING DATA

GROUND STRATA

Depth (m)	Type	Test Results / Remarks	Legend	Level (m) AOD	Description	Depth & [thickness] (m)	Water
					Rough vegetation over dark brown silty sand with rootlets. TOPSOIL	[0.35] 0.35	
0.60	D1				Mid brown slightly damp slightly silty fine to medium SAND. Below 1.00-1.20m very silty in parts, and mottled grey brown; saturated.	[1.25]	
1.30	B2						▽
1.70	D3				seepages/standing at 1.50m	1.60	
					Soft/firm greenish grey mottled brown slightly sandy gravelly CLAY, with gravel of schist.	[0.30] 1.90	
					End of Trial Pit at 1.90 m		

SAMPLE/TEST KEY

B	Bulk Sample
D	Disturbed Sample
ES	Environmental Sample
EV	Environmental Vial Sample
W	Water Sample
V	Vane Test Result
▽	Water Strikes
▼	Water Level

HB 3 - CSS TP LOG
last revised 18-10-07 jp

Comments :
Terminated due to groundwater entry and pit collapse.

Stability :
Some collapse below 1.50m

Groundwater Remarks

at 1.5 m bgl

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Project Name : Penrhos Mineral Site			Trial Pit Number TP15
Job Number : SS/018899			
Client Name : AAG			Sheet 1 of 1 Scale :1:50
E Coord: 27534	N Coord: 81330	G.L. : - (m) AOD	Logged By : RDS
Date : 26/03/2013	Plant : Tracked Excavator		Checked By : END

SAMPLING DATA			GROUND STRATA				
Depth (m)	Type	Test Results / Remarks	Legend	Level (m) AOD	Description	Depth & [thickness] (m)	Water
0.40	B1				Rough vegetatio over rgeyish brown silty sand with organic matter. TOPSOIL	[0.35] 0.35	
0.80	D2				Damp greyish brown slightly silty fine to medium SAND, with occsaional quartzite gravel and organic matter/roots. Below 0.50-0.60m silty to very silty and increasingly wet. Groundwater entries below 1.00-1.20m	[0.85] 1.20	▽
1.30	D3				Soft yellowish brown mottled grey sandy gravelly CLAY with gravel of weathered schist, occasionally cobbles.	[0.30] 1.50	
					End of Trial Pit at 1.50 m		

SAMPLE/TEST KEY
B Bulk Sample
D Disturbed Sample
ES Environmental Sample
EV Environmental Vial Sample
W Water Sample
V Vane Test Result
▽ Water Strikes
▼ Water Level

HB 3 - CSS TP LOG
last revised 18-10-07 jp

Comments :
Pit terminated due to groundwater entry/collapse.

Stability :
Some collapse below 1.20m

Groundwater Remarks
at 1.0 m bgl

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Project Name : Penrhos Mineral Site			Trial Pit Number TP16
Job Number : SS/018899			Sheet 1 of 1 Scale :1:50
Client Name : AAG			
E Coord: 27544	N Coord: 81344	G.L. : - (m) AOD	Logged By : RDS
Date : 26/03/2013	Plant : Tracked Excavator		Checked By : END

SAMPLING DATA			GROUND STRATA				
Depth (m)	Type	Test Results / Remarks	Legend	Level (m) AOD	Description	Depth & [thickness] (m)	Water
					Rough vegetation over dark brown silty sand, with organic matter/roots. TOPSOIL	0.20	
1.20	B1				Light brown damp slightly silty fine to medium SAND, with occasional shell fragments (course sand to fine gravel) and occasional organic matter/pockets; occasional silty pockets. More gravelly near base?	[1.90]	
2.00	D2				End of Trial Pit at 2.10 m	2.10	

SAMPLE/TEST KEY
B Bulk Sample
D Disturbed Sample
ES Environmental Sample
EV Environmental Vial Sample
W Water Sample
V Vane Test Result
▽ Water Strikes
▼ Water Level

HB 3 - CSS TP LOG
last revised 18-10-07 jp

Comments :
Extensive sidewall collpase by 2.10m; pit terminated..

Stability :
Collapsing below 1.50m

Groundwater Remarks
No Groundwater Encountered

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Project Name : Penrhos Mineral Site			Trial Pit Number TP17
Job Number : SS/018899			Sheet 1 of 1 Scale :1:50
Client Name : AAG			
E Coord: 27465	N Coord: 81356	G.L. : - (m) AOD	Logged By : RDS
Date : 26/03/2013	Plant : Tracked Excavator		Checked By : END

SAMPLING DATA

GROUND STRATA

Depth (m)	Type	Test Results / Remarks	Legend	Level (m) AOD	Description	Depth & [thickness] (m)	Water
0.40	D1				Rough vegetation over dark brown organic silty sand, woth organic matter. TOPSOIL	0.20 [0.30]	
					Multicoloured brown/grey/dark brown, silty fine to medium sand, organic in parts? (Possibly Reworked) POSSIBLE MADE GROUND	0.50 [0.60]	
1.30	D2				Light greyish brown moist silty fine to medium SAND, with depth varying brown in parts, occsaional cobbles to boulders of schist and quartzite (Possibly reworked).	1.10 [0.70]	▽
					Light yellowish brown saturated slightly silty fine to medium SAND, with occasional dark brown 'iron-stained' weathered ironstone nodules or similar. Wet below 1.1.0m	1.80	
					End of Trial Pit at 1.80 m		

SAMPLE/TEST KEY

B Bulk Sample
D Disturbed Sample
ES Environmental Sample
EV Environmental Vial Sample
W Water Sample
V Vane Test Result
▽ Water Strikes
▼ Water Level

HB 3 - CSS TP LOG
last revised 18-10-07 jp

Comments :
Pit termianted on collapse.

Stability :
Collapse at 1.80m with water entry

Groundwater Remarks

at 1.1 m bgl

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Project Name : Penrhos Mineral Site			Trial Pit Number TP18
Job Number : SS/018899			
Client Name : AAG			Sheet 1 of 1 Scale :1:50
E Coord: 27493	N Coord: 81353	G.L. : - (m) AOD	Logged By : RDS
Date : 26/03/2013	Plant : Tracked Excavator		Checked By : END

SAMPLING DATA | GROUND STRATA

Depth (m)	Type	Test Results / Remarks	Legend	Level (m) AOD	Description	Depth & [thickness] (m)	Water
0.60	D1				Rough vegetation over dark brown clayey/silty gravelly sand, with organic matter/wood and fragments of polythene. MADE GROUND	[0.40] 0.40	
					Light-mid brown moist slightly silty fine to medium, occsaionally coarse SAND, mottled orange brown in parts (appeared to be dense/compacted).	[0.30] 0.70	
					Stiff to very stiff brown mottled orange brown and grey slightly sandy/gravelly CLAY, with gravel of schist.	0.80	
					End of Trial Pit at 0.80 m		

SAMPLE/TEST KEY
B Bulk Sample
D Disturbed Sample
ES Environmental Sample
EV Environmental Vial Sample
W Water Sample
V Vane Test Result
▽ Water Strikes
▼ Water Level

HB 3 - CSS TP LOG
last revised 18-10-07 jp

Comments :
Silage waste/similar in Made Ground; Pit terminated on encountering stiff clay..

Stability :
pti stable

Groundwater Remarks
No Groundwater Encountered

Appendix D : Previous Ground Investigations

D.1 A55 Llandegai to Holyhead, DBFO Project, Geotechnical Design Report No. 4 (Hyder Consulting, 2001)

This report provides a summary of the earthworks design for the A55 and an account of the geology encountered in excavations along the route (which runs WNW to ESE, to the south of the Penrhos site).

The intrusive investigations identified superficial deposits of 'alluvium' and 'marine alluvium' (presumably equivalent to the tidal flat and coastal zone deposits in the table above), and 'boulder clay' and 'glacial gravel' (glaciofluvial deposits/till). No discrete areas of *blown sand* are identified on Holyhead (though some 'alluvial sand' is noted at the Newlands Park side of the Stanley Embankment) .

Bedrock was identified as being of the 'South Stack Series' and 'Green Mica Schist Amlwich Beds'.

D.2 Phase II Environmental Site Investigation of Cae Glas Landfill, Penrhos, Holyhead, Anglesey (Golder Associates for Anglesey Aluminium Metal Ltd, 2008)

The report focuses on land south of the A55 (south east of the main AAM site) known as Cae Glas Landfill. It summarises the findings of relevant previous investigations and additional ground investigations.

In reviewing previously published information, the report identifies superficial deposits of clay, with some silt and fine gravel, and bedrock of schist. The additional ground works were undertaken specifically on the landfill site and thus the boreholes generally encountered significant thicknesses of made-ground above silty clay and schist bedrock.

D.3 Anglesey Aluminium Renewable Energy Plant, Environmental Statement, Volume 2 (PB Power, 2009)

This report contains the borehole and trial pit logs from the Wallace Evans investigations of the AAM site (dated 1993) which were used to support the findings of the 'Phase 1a Site Report for IPPC Application' (2001) (both information sources are included as appendices to the ES).

The area of land investigated is the Penrhos works and lies between the A5 and the A55. The borehole and trial pit logs show superficial deposits that vary both laterally and vertically. These deposits comprise glacial and glaciofluvial deposits of gravels, sands, silts and clays, and peat which lie above a mica schist bedrock.

Overall, the deposits identified appear not to have the characteristics of a potential sand and gravel resource due to their restricted depth and the silt and clay content that is present at the majority of the locations. TP 62A has approximately 2.5m of loose (presumably clean) sand but its potential as resource is questionable as resource has not been identified on the BGS safeguarding or geological maps in this location and may therefore be a localised (i.e. very limited) deposit. None of the boreholes presented in this report intersect with areas marked

Table 6.4 Superficial deposits recorded in the boreholes and trail pits for AAM (Wallace Evans, 1993) (excludes details on made ground)

Location	Abbreviated description	Depth of BH/TP
SBH 51	Very silty fine SAND (with silt and gravel) Very fine sandy SILT (with gravel) Very fine sandy silty CLAY (with gravel and boulders)	2.70m
SBH 55	Silty fine SAND (with gravel) Soft silty slightly fine sandy CLAY (with gravel and cobbles)	3.26m
SBH 57	Silty slightly clayey fine SAND (with gravel)	0.60 m
SBH 58	Soft to firm sandy to very sandy CLAY (with gravel) Soft very sandy very silty CLAY (with gravel and pockets of clayey silt) Soft slightly sandy very silty CLAY (with gravel)	2.70m
SBH 59	Soft to firm very silty CLAY (with gravel) Fine sandy SILT (with gravel) Sandy very silty CLAY (with gravel)	1.80m
SBH 60	Medium dense to dense silty fine SAND (with gravel and cobbles)	1.50 m
TP 62A	GRAVEL Loose fine SAND Very loose coarse SAND and fine GRAVEL Loose medium SAND (with fine sand and fine gravel) & lenses of fine/medium GRAVEL Loose fine to medium SAND	3.00 m
TP 66	Slightly sandy slightly clayey SILT Firm very silty CLAY Loose to medium dense slightly silty fine SAND Clayey and silty PEAT Very soft to soft CLAY	1.30 m
TP 67	Medium dense coarse GRAVEL (matrix of slightly silty fine and medium sand) Firm fine sandy very silty CLAY (with fine medium coarse gravel, some cobbles, boulders) Slightly clayey sandy coarse SILT (with fine medium gravel, occasional cobbles, boulders)	1.43 m

D.4 Ynys Cybi Development Sites, Penrhos Leisure Village, Preliminary Sources (Desk) Study and Ground Risk Assessment (Capita Symonds Ltd. for Land and Lakes, 2011)

This report is written in support of the planning application for the Penrhos Leisure Village and provides geotechnical and geo-environmental information specifically for this part of the wider proposed development. This report confirms the general geology of the area on the basis of BGS mapping and reports on the site investigations that were undertaken in 1992/1993 by Wallace Evans Ltd. (WEL) (as reported by URS Ltd. 2001).

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