SOCG 15

Chelmsford Local Plan

Statement of Common Ground with North East Chelmsford (SGS4) Site Promoters - Minerals Issues

November 2018

Our Planning Strategy to 2036

Chelmsford Local Plan

CHELMSFORD DRAFT LOCAL PLAN

STATEMENT OF COMMON GROUND WITH NORTH EAST CHELMSFORD (SGS4) SITE PROMOTERS

MINERAL ISSUES

1. Introduction

1.1 This Statement of Common Ground (SoCG) concerns Strategic Growth Site 4 – North East Chelmsford and the representations made in respect of the issues of mineral sterilisation and the potential impact of the proposal on permitted mineral developments by:

a) Hanson UK (Hanson);
b) Threadneedle Pensions Ltd (Threadneedle);
c) Chelmsford Land (Stage 2) Ltd (Ptarmigan);
d) Countryside Zest (CZ); and
e) Essex County Council (ECC).

1.2 This SoCG has been jointly prepared and agreed by the above Respondents and by Chelmsford City Council (CCC) (the Parties).

1.3 For the purposes of this SoCG, Strategic Growth Site 4 – North East Chelmsford (the Site) has been divided into five areas (Areas A to E) as shown on Figure 1 in **Appendix 1**.

1.4 This SoCG is one of a series that have been prepared for this Strategic Growth Site. Separate SOCGs cover strategic site matters and transport and highways.

1.5 The agreed matters in this SOCG do not preclude any further written or verbal representations that the Parties may wish to make as part of the Local Plan Examination, in relation to any other matters which may not have been agreed and/or which do not form part of this SOCG.

2. Extant Minerals Planning Permissions

2.1 The Site includes two extant planning permissions for the extraction of minerals (sand and gravel). These permissions consist of Boreham Airfield (ECC ref. CHL/1019/87) and Park Farm (ECC ref. CHL/1890/87)[1], as shown hatched green and blue respectively on Figure 1 in **Appendix 1** and collectively referred to as 'Bulls Lodge Quarry'. The Park Farm permission extends beyond the boundaries of the Site2.2 A section of the Park Farm permission, lying

[1] Decision notices can be viewed at https://planning.essex.gov.uk/search.aspx

immediately to the south of the Site and shown hatched blue on Figure 1 in **Appendix 1**, is currently subject to the prior extraction of minerals and the disposal of inert wastes (ECC ref. ESS/21/12/CHL) ahead of the consented Beaulieu Park scheme (ref. 09/01314/EIA)[2].

3. The Parties

3.1 Hanson is the operator of Bulls Lodge Quarry and, within the Site, is the owner of the land and minerals within the Park Farm permission (Areas B and E) and is the mineral tenant at the Airfield (Area A). In addition to this Hanson is also the owner of the land and minerals across the greater part of Powers Farm (Area D).

3.2 Ptarmigan is the promoter of land across Area C and the western section of Area D.

3.3 Threadneedle is the owner of the land and minerals at Boreham Airfield (Area A) and thus the landlord of Hanson in respect of mineral extraction from that Area.

3.4 CZ is, inter alia, the owner of land hatched brown on Figure 1 in **Appendix 1** that has the benefit of planning permission for the prior extraction of minerals ahead of the Beaulieu Park scheme. CZ is also the developer of the Beaulieu Park scheme.

3.5 ECC is the Mineral and Waste Planning Authority.

3.6 CCC is the Local Planning Authority.

4. Purpose

4.1 The purpose of this SoCG is to advise the Inspector that the Parties have agreed that:

- the actions to be taken in order to ensure that the development of Strategic Growth Site 4 – North East Chelmsford will not conflict with the effective working of mineral reserves within Areas A and B or any other permitted minerals development.
- No economically important minerals worthy of safeguarding are present beneath Areas C, D and E;

4.2 Hanson, Ptarmigan, Threadneedle and CZ have engaged in detailed negotiations and are jointly and collaboratively promoting their respective land interests to facilitate the delivery of Strategic Growth Site 4 – North East Chelmsford, subject to receiving the requisite statutory consents.

[2] Decision notices can be viewed at and https://www.chelmsford.gov.uk/planning-and-building-control/planning-permission/search-track-and-comment-on-planning-applications/

5. Common Ground

5.1 The Minerals Resource Assessment for North East Chelmsford Garden Village (August 2018 Hughes Craven Ltd, v1.02) was submitted to ECC in August 2018 and is attached at **Appendix 2**. ECC has reviewed the MRA and their response is attached at **Appendix 3**. This review takes into account the findings of an independent review (at **Appendix 4**) of the financial appraisals and the assumptions contained within the MRA by SLR.

In respect of the above, the Parties have agreed the following:

- That the extraction of permitted mineral reserves within Areas A and B will not be prejudiced by the appropriately phased development of Strategic Growth Site 4 – North East Chelmsford.
- The effective operation of any other permitted mineral development will not be prejudiced by development of Strategic Growth Site 4 – North East Chelmsford.
- That, within the site, all economic minerals have been extracted from beneath the proposed route of the Chelmsford North East Bypass and that these areas and will be fully restored prior to any highway construction works.
- No current or future silt lagoons have been located on the route of the Chelmsford North East Bypass.
- Owing either to the naturally occurring geological conditions or the previous extraction of minerals, Area C does not contain any mineral resource of economic importance.
- As a result of an excessive thickness of overlying clays (overburden) any mineral present at depth within Area D is not of economic importance and does not therefore require safeguarding in accordance with Policy S8 ('Safeguarding mineral resources and mineral reserves') of the ECC Minerals Local Plan (2014).
- Owing to the geology Area E contains no mineral resource of economic importance. Whilst included within the boundary of the Park Farm permission, no extraction of mineral is proposed within Area E.
- That the evidence, analysis and conclusions of the Minerals Resource Assessment (Hughes Craven Ltd, v1.02, dated 6 August 2018) are robust and confirm that the development of Strategic Growth Site 4 – North East Chelmsford will not result in the sterilisation of any economically important mineral resource.

6. Actions

6.1 It is proposed that Hanson and Threadneedle jointly submit two applications (one for each current minerals planning permission) to ECC under section 73 of the 1990 Town & Country Planning Act (as amended) for permission to continue mineral extraction at variance to the current phasing programme. The applications will seek to:

- Suspend extraction within the Airfield and allow the working of minerals within Area B (being the section of the Park Farm permission lying within the Site) prior to the exhaustion of reserves within the Airfield;
- Vary the working direction within Area B to a generally north to south direction; and
- Extend the time period for the extraction of minerals across the Airfield from 2020 to 2035.

6.2 ECC Officers have confirmed in principle that they know of no reasons why suitable applications from Hanson and Threadneedle for the developments described above should not be recommended for approval, provided that the submitted applications are complete and thorough and are in accordance with the Development Plan and address all other material considerations.

6.3 Subject to the grant of these permissions, the minerals would be worked in accordance with their terms.

7. Timescales

7.1 Hanson and Threadneedle expect the applications to be submitted (accompanied by an Environmental Statement prepared in accordance with the Town and Country Planning (Environmental Impact Assessment) (England) Regulations 2017) to ECC by early 2019 and to have obtained a resolution on the planning applications within 6 months of submission by late 2019.

7.2 ECC officers have confirmed that in principle the period for determination (not including the time to execute any associated legal agreement) estimated by Hanson and Threadneedle is reasonable, on the basis that the submitted applications are complete and thorough.

7.3 On this basis Hanson anticipates that extraction across the Airfield will be suspended and works will commence within Area B by mid to late 2020. Hanson expects to have completed the extraction of minerals from Area B by 2026, and completed the extraction of minerals from the remaining areas of the Airfield, and restored those areas, by 2035.

8. Conclusions

8.1 All Parties agree that there are no mineral resources of economic importance within areas C, D and E. Consequently, no safeguarding is required.

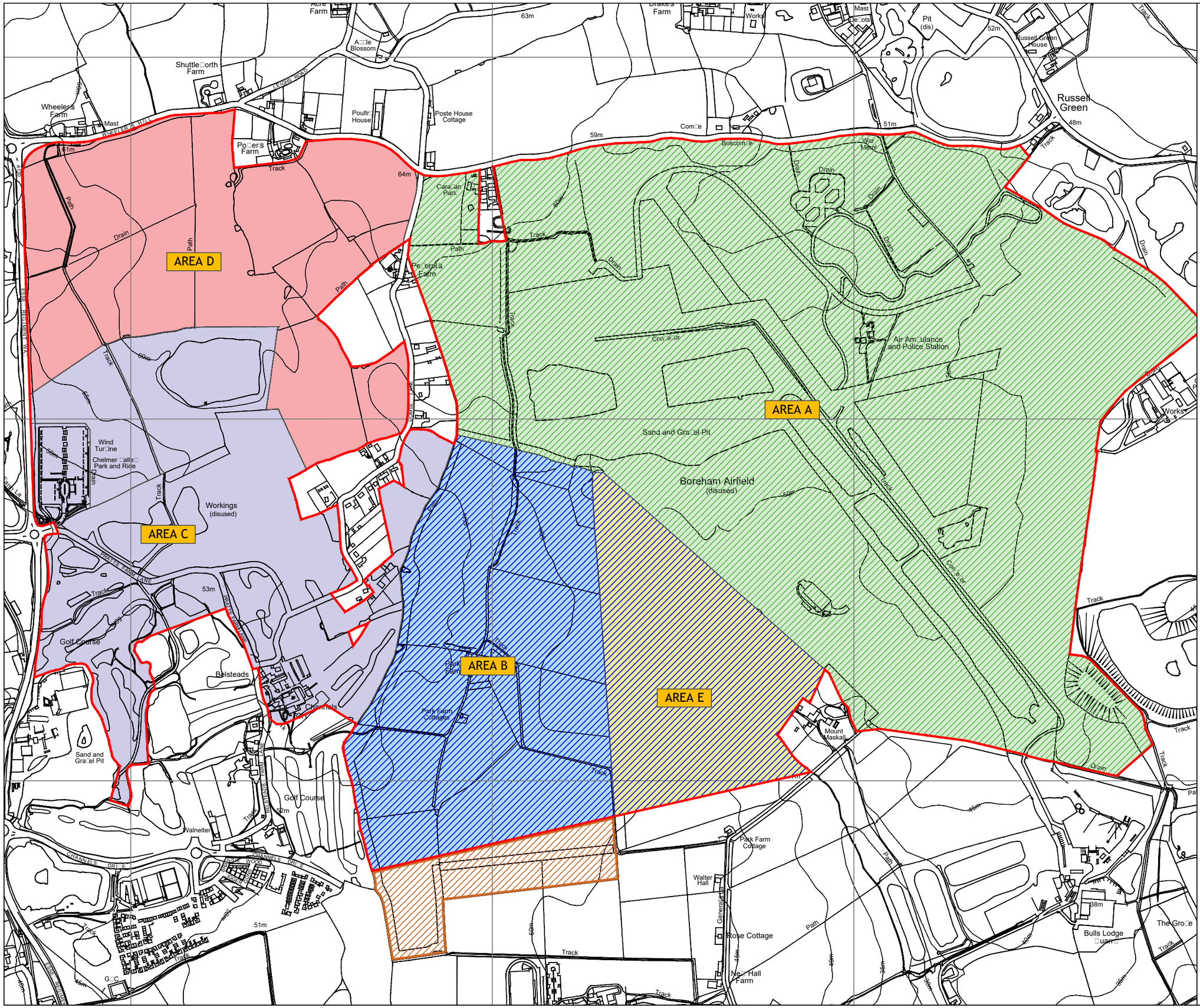
8.2 The agreed actions to be taken by the Parties will ensure that all permitted mineral reserves within Areas A and B are extracted prior to the land being required for non-mineral development as part of Strategic Growth Site 4 – North East Chelmsford.

8.3 The development of Strategic Growth Site 4 – North East Chelmsford will not prejudice the effective operation of Bulls Lodge Quarry or any other permitted mineral development.

Signatories:

Jeremy Potter Planning and Strategic Housing Policy Manager Chelmsford City Council	Richard Greaves Chief Planning Officer (County Planning and Major Development), Essex County Council
Iain Macpherson Property Development Manager Hanson UK	~~Rob Flavelle~~ James Rigg Threadneedle Pensions Ltd
Olly Buck Senior Development Manager Chelmsford Land (Stage 2) Ltd (Ptarmigan)	Andrew Taylor Director – Head of Planning Countryside Zest
Graham Thomas Head of Planning and Development Essex County Council	

APPENDIX 1



KEY:

- SITE BOUNDARY
- AREA A - Airfield
- AREA B - Park Farm
- AREA C
- AREA D - Powers Farm
- AREA E

MINERAL PLANNING PERMISSIONS (ECC Ref.)

- AIRFIELD (CHL/1019/87)
- PARK FARM (CHL/1890/87)
- BEAULIEU (ESS/21/12/CHL)

NOTES:

1. For clarity the Airfield and Park Farm permissions are only shown within the Site's boundaries.
2. All boundaries are indicative only and should not be scaled.

HUGHES CRAVEN
Minerals | Planning | Geology | Environment
Sparkhouse, Ropewalk, Lincoln, LN6 7DQ
01522 849555
www.hughes-craven.co.uk

PROJECT
NORTH EAST CHELMSFORD GARDEN VILLAGE

TITLE
FIGURE 1

DATE	STATUS
31/07/2018	FINAL

SCALE	SHEET	DRAWING NO.	REV
1:10,000	A3	0742-1-17	-

APPENDIX 2

HUGHES CRAVEN

Minerals | Planning | Geology | Environment

NORTH EAST CHELMSFORD GARDEN VILLAGE
CHELMSFORD
ESSEX

MINERAL RESOURCE ASSESSMENT

AUGUST 2018

HC/0742/1

HUGHES CRAVEN

Minerals | Planning | Geology | Environment

NORTH EAST CHELMSFORD GARDEN VILLAGE
CHELMSFORD
ESSEX

MINERAL RESOURCE ASSESSMENT

Report Status:	Final
Revision:	1.02
Issue Date:	06.08.2018

Hughes Craven Ltd.
Sparkhouse, Ropewalk, Lincoln, LN6 7DQ
T: 01522 849555
E: info@hughes-craven.co.uk
W: www.hughes-craven.co.uk

CONTENTS

APPENDICES

APPENDIX 1. - Overview Plans

0742-1-3 Site Location Plan (1:10,000 @ A3)

0742-1-4 Site Areas (1:10,000 @ A3)

0742-1-5 Geological Overview (1:10,000 @ A3)

APPENDIX 2. – Extant Minerals Permissions

Extraction and Restoration Phasing (AECOM drawing 60548237.BL.SC.003)

APPENDIX 3. – Area C Geology

0742-1-14 Area C (1:5,000 @ A3)

Area C Borehole Logs

APPENDIX 4. – Area D Geology

0742-1-15 Area D – Powers Farm (1:5,000 @ A3)

Area D Borehole Logs

APPENDIX 5. – Area E Geology

0742-1-16 Area E (1:5,000 @ A3)

Area E Borehole Logs

APPENDIX 6. – Area D Appraisal

LSS Phase Design Plans

LSS Phase Design Volume and Tonnage Breakdown

Stripping and Restoration Material Balance

Financial Appraisals

1. EXECUTIVE SUMMARY

1.1. This Mineral Resource Assessment (the 'Assessment') relates to the North East Chelmsford Garden Village ('the Development'), which is included as a future growth location within Chelmsford City Council's (CCC's) emerging Local Plan.

1.2. The site lies within a Mineral Safeguarding Area (MSA) and, owing to the presence of on-going mineral working, parts of the site also lie within a Mineral Consultation Area (MCA). Within such areas Essex County Council (ECC), as the appropriate Mineral Planning Authority (MPA), require that allocations within emerging local plans be accompanied by an appropriate Mineral Resource Assessment (MRA). Such MRAs must demonstrate that the proposed non-mineral development does not unnecessarily sterilise mineral resources of economic significance or prejudice the effective working of permitted mineral reserves. Sand and gravel has been confirmed as the sole potentially economic mineral within the site.

1.3. In order to ensure the effective assessment of such an extensive site it has been divided into a number of areas, each of which has been assessed with reference to published geological data, augmented where necessary by site investigations. The extent of historic mineral working has been determined with reference to a variety of sources and, where relevant, the Assessment has been prepared in conjunction with the operator of the current mineral workings.

1.4. The extraction of sand and gravel is currently permitted throughout parts of the site by two separate but interlinked permissions known as 'Airfield' and 'Park Farm' and collectively referred to as 'Bulls Lodge Quarry'. Significant areas within the southern and southeastern sections of the Airfield permission have already been worked, with the land restored to agriculture.

1.5. In line with the approved phasing extraction is currently progressing throughout the north of the Airfield, with all economic mineral beneath the proposed Chelmsford North East Bypass (CNEB) route having been extracted. The consented mineral working does not therefore impact upon the delivery of the CNEB.

1.6. The current phasing involves the completion of extraction throughout the Airfield prior to working commencing within Park Farm. In order to provide a more efficient method of working the reserve, and to allow the early delivery of Park Farm for non-mineral development, the operator proposes to suspend working within the Airfield whilst extraction is undertaken across Park Farm, following which working will revert to the Airfield. In order to facilitate these changes the operator proposes to vary the phasing of both permissions, with appropriate applications anticipated to be submitted in early 2019.

1.7. In order to prevent non-mineral development impacting upon consented mineral operations, the Development will be designed to take account of the planned mineral working and, where necessary, will incorporate appropriate stand-offs to ensure that it does not prejudice the working of the permitted reserve.

1.8. Outside the mineral permissions an assessment of the geology has identified extensive areas within which no economic mineral is present. A review of historic working has identified further substantial areas which have previously been worked and the land subsequently restored. Owing to the absence of any mineral of economic importance these areas are unconstrained by any mineral issues have been discounted from further assessment.

1.9. Where areas have been identified as containing potentially workable mineral, the potential for the deposits to represent a resource of economic importance has been assessed. A detailed assessment of the geology has identified a deposit of sand and gravel within the northwestern section of the site however this is overlain by a substantial thickness of clay which presents a significant barrier to its economic extraction. In line with ECC's safeguarding policy this deposit has been assessed to determine whether or not it represents a resource of economic significance and therefore warrants consideration of extraction.

1.10. A potential phasing of extraction has been designed, using industry standard software, which has allowed the volumes of overburden and mineral to be calculated. A financial appraisal of the modelled working has been undertaken, which confirms the exceptional costs associated with the excavation, handling and placement of overburden to be excessive. The surface and mineral landowner has confirmed that they do not consider mineral extraction across the area to be a financially viable proposition under any reasonably foreseeable scenario.

1.11. Consideration has been given to the prior extraction of the mineral however the volume of overburden present renders any potential extraction unviable. Accordingly the resource cannot be considered to be of economic significance and its presence does not therefore represent a barrier to non-mineral development.

1.12. This Assessment has demonstrated that, whilst the area contains deposits of sand and gravel, where it is economic to do so the mineral will be extracted prior to the Development. Within those areas benefitting from extant permissions for mineral working, the timing of extraction will be such that it will not conflict with the Development.

1.13. The extant mineral permissions do not therefore pose a barrier to the successful delivery of the North East Chelmsford Garden Village and the Development does not prejudice the effective working of permitted reserves. Accordingly the allocation of the Development within CCC's Local Plan is considered to be consistent with ECC's mineral safeguarding Policy.

2. INTRODUCTION

2.1. Background

2.1.1. Chelmsford City Council's emerging Local Plan ('the Plan') recognises that Chelmsford will continue to be a major growth location for new homes and jobs in Essex. The Plan identifies three strategic growth areas: Chelmsford Urban and Central, Chelmsford North, and Chelmsford South. The North East Chelmsford Garden Village will be a pivotal element in the emerging spatial strategy for the Chelmsford North Growth Area and for the City as a whole.

2.1.2. The Development will deliver a new Garden Settlement in North East Chelmsford, building on the current developments at Beaulieu and Channels. The new settlement will provide an additional 5,500 homes, with around 3,000 in the Plan period (2021 to 2036). 45,000 sq. m of employment space will also be provided, much of it in a new Innovation Hub next to the Park and Ride facility on Essex Regiment Way.

2.1.3. There will be two primary schools and a secondary school serving the new community, together with three new neighbourhood centres. The settlement will be served by a wide range of public open spaces linked together in a network of green infrastructure, including a Country Park. The development will contribute to significant new transport infrastructure, including Beaulieu Train Station and the CNEB.

2.2. Purpose and Scope of the Assessment

2.2.1. Planning policy at all levels acknowledges that minerals are a finite natural resource which must be used prudently in order to ensure adequate resources for future generations. Non-mineral development proposals with the potential to impact upon either current mineral workings or known mineral resources should therefore be accompanied by appropriate information to allow an informed decision on future development proposals to be reached.

2.2.2. As the site lies within an area where deposits of sand and gravel are known to exist, and in line with policy contained within ECC's adopted Minerals Local Plan (MLP), an appropriate MRA is required to demonstrate that the Development will not result in the unnecessary sterilisation of mineral resources.

2.2.3. This Assessment demonstrates that, where present, mineral reserves that are economic to extract are being actively worked or will be worked in the near future. Where deposits of sand and gravel have been identified, their economic significance has been assessed and conclusions on their potential economic extraction reached. Importantly, this Assessment does not differentiate between mineral operators, mineral owners or landowners, and has been prepared in conjunction with the operators of the current mineral extraction site.

2.3. Sources of Information

2.3.1. This Assessment draws on a range of information, the majority of which is available in the public domain. The principal sources of information referred to are included within Table 1, below, in addition to which previously unpublished geological information has been consulted and is appended to this Assessment.

Source	Description
Essex County Council (ECC)	• Minerals Local Plan (2014). • Minerals Safeguarding Areas for Essex, Rationale Report (2012). • Local Aggregate Assessment for Greater Essex (2017). • Online planning records: (https://planning.essex.gov.uk/search.aspx)
Chelmsford City Council (CCC)	• Local Plan Pre-Submission Draft (January 2018). • Online planning records: (https://publicaccess.chelmsford.gov.uk/online-applications/search.do)
British Geological Survey (BGS)	• 1:50,000 geological sheet 241 – Chelmsford (1975). • Minerals Assessment Report 6 *'The Sand and Gravel Resources of the Country Around Terling, Essex'* (1973). • Mineral Resources Map – Essex (2002). • Geology of Britain Viewer (http://mapapps.bgs.ac.uk/geologyofbritain/home.html)
Others	• Ordnance Survey mapping at a variety of scales. • Historic aerial photography. • MAGIC database (http://www.magic.gov.uk/home.htm)

Table 1. Principal sources of information.

3. SITE DETAILS

3.1. Location and Description

3.1.1. The site lies approximately 5km to the northeast of Chelmsford City centre and, in total, extends to approximately 480ha. Its western boundary is marked by Essex Regiment Way (A130), whilst the greater part of its northern boundary is delineated by Wheelers Hill and Cranham Road. To the east and southeast areas of former mineral working have been restored to a variety of afteruses, whilst much of the site's southern boundary is coincident with land consented as part of the on-going Channels and Beaulieu developments. The site is edged in red on drawing 0742-1-3 (Appendix 1).

3.1.2. Significant areas, including the northwest, central and southern sections, are in productive agricultural use, with much of the southwestern area having historically been worked for sand and gravel and subsequently restored to a variety of uses, including the Channels Golf Club and Channels Lodge hotel complex. The site is crossed by a number of minor roads, the majority of which link to Essex Regiment Way. The eastern section of the site includes the former RAF Boreham, significant areas of which are currently being worked for sand and gravel.

3.1.3. For the purposes of this Assessment the site has been sub-divided in to five areas as outlined below, the boundaries of which are shown on drawing 0742-1-4 (Appendix 1).

3.2. Area A (Airfield)

3.2.1. Area A extends to approximately 238ha., and covers the former RAF Boreham and adjacent lands, which originally lay at between 50m and 60m AOD. The Area is consented for the extraction of sand and gravel, with in excess of 85ha. already having been worked and restored to agricultural land. Mineral working is currently (summer 2018) ongoing throughout the north of the Area.

3.2.2. Whilst limited buildings and infrastructure remain across the former Airfield, these will be removed as mineral extraction progresses. Following the completion of extraction the area will be restored to a mixture of agricultural land and open water. Significant peripheral screen planting was undertaken ahead of extraction and will be retained as part of the restored landscape. The on-going extraction of sand and gravel within this Area is discussed in more detail in Section 6 of this Assessment.

3.3. Area B (Park Farm)

3.3.1. Area B extends to approximately 64ha. and is also underlain by consented mineral reserves. Mineral extraction has yet to commence here and the Area remains in agricultural use.

3.3.2. The greater part of the Area lies between 50m and 55m AOD, with built development limited to Park Farm, associated agricultural buildings and cottages. Advanced planting along the western boundary of the Area has now matured and, in addition to valuable screening, provides a locally important north-south wildlife corridor.

3.3.3. Immediately to the south sand and gravel is being extracted from a limited area ahead of the Beaulieu residential development which, together with the future mineral extraction within Area B, is discussed in more detail in Section 6 of this Assessment.

3.4. Area C

3.4.1. Area C covers the southwestern section of the site, extending to approximately 80ha. and lying between 50m and 60m AOD. It is bordered to the west by Essex Regiment Way and encompasses a variety of land uses including the Chelmer Valley Park and Ride, a golf course and agricultural land. Built development includes the Channels Golf Club and the Channels Lodge hotel complex, which includes three grade 2 listed buildings. Immediately to the south of this Area the construction of the Channels residential development is on-going.

3.4.2. Much of the Area has historically been worked for sand and gravel, having subsequently been restored at, or close to, original ground levels. To the southwest the former plant site associated with historic mineral working now accommodates a variety of commercial and industrial uses. The northern part of the Area includes the Chelmer Valley Park and Ride, agricultural land and a storage reservoir.

3.4.3. The extent of former mineral working has been determined through a review of historic Ordnance Survey plans, historic aerial photographs, EA data and planning records. These sources have subsequently been confirmed by means of a site inspection and anecdotal evidence from the landowner. Correlation between the various sources has been good and the boundaries of former working align with current physical boundaries. Accordingly confidence in the derived boundaries is high.

3.5. Area D (Powers Farm)

3.5.1. Area D occupies the northwestern section of the site and extends to 65ha., consisting almost entirely of agricultural land, the greater part of which lies between 55m and 60m AOD. It is bordered to the west by Essex Regiment Way, to the north by Wheelers Hill and Cranham Road, and to the east by Domsey Lane. A number of residential properties are located along the roads to the north, east and southeast, including several listed buildings.

3.5.2. During 1990 a speculative planning application was submitted to ECC for the extraction of sand and gravel throughout Area D. The application (ECC Ref. CHL/1093/90CM) was presented as an extension to the previous workings to the south. ECC refused the application, with the grounds for refusal including:

- The existence of a sufficient landbank to support at least 10 years sand and gravel extraction and the absence of any exceptional circumstances to justify the release of further reserves.
- Any need arising for additional mineral could be met by allocated 'Preferred Sites'.
- The proposal would intensify the use of an existing access and interfere with the free flow of traffic and have an adverse effect on public safety.

3.5.3. Since this refusal the area has remained in the ownership of mineral operators, despite which it was not promoted for inclusion within ECC's MLP. Whilst planning policies have changed significantly since the refusal of the application, the sand and gravel landbank remains above the required level and a number of Preferred and Reserve sites have been allocated within the MLP to ensure that the an adequate supply of mineral can be maintained.

3.6. Area E

3.6.1. Area E consist of a triangular parcel of land lying between areas A and B that extends to approximately 36ha. It covers a southeasterly dipping valley, the greater part of which lies between 40m and 50m AOD, and which creates a notable, lower lying feature within the local landscape. The Area is in productive agricultural use and, whilst it includes no built development, the Mount Maskall complex, including a grade 2 listed building, lies immediately to the southeast.

3.6.2. As with the adjacent areas, the land is covered by an extant permission for mineral working however owing to the absence of any economic mineral deposits, no sand and gravel extraction is proposed here.

4. PLANNING POLICY AND GUIDANCE

4.1. National Planning Policy

4.1.1. Mineral safeguarding is the process used in the planning system to ensure the protection of mineral resources from the risk of sterilisation. Paragraph 204 of the National Planning Policy Framework (NPPF - 2018) requires MPAs to define MSAs and adopt appropriate policies within their local plans to ensure that known locations of specific minerals are not needlessly sterilised by other forms of development. Importantly the NPPF acknowledges that this does not create a presumption that such resources will ever be worked.

4.1.2. This is reinforced by Paragraph 005 (Reference ID: 27-005-20140306) of the Planning Practice Guidance (PPG - 2014) which identifies that, whilst district councils are not mineral planning authorities, they have an important role in safeguarding minerals in three ways:

- *having regard to the local minerals plan when identifying suitable areas for non-mineral development in their local plans. District councils should show Mineral Safeguarding Areas on their policy maps;*
- *in those areas where a mineral planning authority has defined a Minerals Consultation Area, consulting the mineral planning authority and taking account of the local minerals plan before determining a planning application on any proposal for non-minerals development within it; and*
- *when determining planning applications, doing so in accordance with development policy on minerals safeguarding, and taking account of the views of the mineral planning authority on the risk of preventing minerals extraction.*

4.2. Essex County Council Minerals Local Plan

4.2.1. ECC's MLP was adopted in 2014 and provides both strategic and development management policies. It sets out the requirements for the provision of primary minerals within Essex up to the end of 2029, including the provision of an adequate and steady supply of land won sand and gravel. It includes specific allocations in the form of Preferred and Reserve Sites, including 16 allocations on 10 sites, of which 13 are extensions and 3 are new sites.

4.2.2. The approach to meeting the mineral supply needs of the County relied upon landowners and the minerals industry to promote sites for consideration, with the number of sites initially proposed substantially exceeding those required. None of the Preferred or Reserve sites lie in close proximity to the Development and no extension to the current workings at Boreham Airfield/Park Farm is included. Accordingly no allocated extraction sites need be directly considered within this Assessment.

4.2.3. Within Essex all sand and gravel resources, as identified on the BGS Mineral Resource Map, have been defined as MSAs and the MLP Policies Map confirms the site to lie within an MSA. The presence of an MSA does not necessarily preclude other forms of development nor confer any presumption that the mineral will be worked, however, with some exceptions, non-mineral developments within an MSA must be subject to consultation with ECC.

4.2.4. Further to this, MCAs have been designed up to 250m from the boundary of safeguarded mineral sites. Safeguarded sites include all consented mineral extraction sites and their associated facilities (active, inactive or dormant), Preferred and Reserve Sites. MCAs ensure that, should mineral extraction have to take place up to the consented mineral site boundary, any proposed development on adjacent land would not prevent or compromise the safeguarded site's operation. The site contains two extant minerals consents which are safeguarded by the MLP and consequently significant areas of the site lie within an MCA.

4.2.5. In respect of safeguarding, Policy S8 *'Safeguarding mineral resources and mineral reserves'* states:

> *By applying Mineral Safeguarding Areas (MSAs) and/or Mineral Consultation Areas (MCAs), the Mineral Planning Authority will safeguard mineral resources of national and local importance from surface development that would sterilise a significant economic resource or prejudice the effective working of a permitted mineral reserve, Preferred or Reserve Site allocation within the Minerals Local Plan. The Minerals Planning Authority shall be consulted, and its views taken into account, on proposed developments within MSAs and MCAs except for the excluded development identified in Appendix 5.*
>
> ***Mineral Safeguarding Areas***
>
> *Mineral Safeguarding Areas are designated for mineral deposits of sand and gravel, silica sand, chalk, brickearth and brick clay considered to be of national and local importance, as defined on the Policies Map.*
>
> *The Mineral Planning Authority shall be consulted on:*
>
> *a) all planning applications for development on a site located within an MSA that is 5ha or more for sand and gravel, 3ha or more for chalk and greater than 1 dwelling for brickearth or brick clay; and*
>
> *b) any land-use policy, proposal or allocation relating to land within an MSA being considered by the Local Planning Authority for possible development as part of preparing a Local Plan (with regard to the above thresholds).*
>
> *Non-mineral proposals that exceed these thresholds shall be supported by a minerals resource assessment to establish the existence or otherwise of a mineral resource of economic importance. If, in the opinion of the Local Planning Authority, surface development should be permitted, consideration shall be given to the prior extraction of existing minerals.*
>
> ***Mineral Consultation Areas***
>
> *MCAs are designated within and up to an area of 250 metres from each safeguarded permitted minerals development and Preferred and Reserve Site allocation as shown on the Policies Map and defined on the maps in Appendix 6. The Mineral Planning Authority shall be consulted on:*
>
> *a) Any planning application for development on a site located within an MCA except for the excluded development identified in Appendix 5,*
>
> *b) Any land-use policy, proposal or allocation relating to land within an MCA that is being considered as part of preparing a Local Plan*
>
> *Proposals which would unnecessarily sterilise mineral resources or conflict with the effective workings of permitted minerals development, Preferred or Reserve Mineral Site allocation shall be opposed.*

4.2.6. In addition to safeguarding mineral extraction sites, the MLP also seeks to safeguard strategically important mineral transhipment sites and secondary processing facilities. As with extraction sites, an MCA applies for 250m from any existing or approved mineral transhipment site or strategic coated stone plant.

4.2.7. Policy S9 *'Safeguarding mineral transhipment sites and secondary processing facilities'* identifies mineral facilities of strategic importance which should be safeguarded from development which would compromise their continued operation. The Policy lists a number of facilities within the County which are considered to be of strategic importance and should therefore be safeguarded. In respect of the Development, coated stone plants at Bulls Lodge Quarry and at Essex Regiment Way are of relevance. In relation to such sites the Policy states:

> *The Local Planning Authority shall consult the Mineral Planning Authority and take account of its views before making planning decisions on all developments within 250 metres of the above facilities as defined in the maps in Appendices 2 and 4.*
>
> *Where planning permission is granted for new rail or marine transhipment sites and coated stone plant of strategic importance, those sites will also be safeguarded so that their operation is not compromised. The safeguarding of a strategic plant is for the life of the planning permission or where located in a mineral working, until completion of extraction.*
>
> *The Local Planning Authority shall consult the Mineral Planning Authority for its views and take them into account on proposals for development within the Mineral Consultation Area of these safeguarded sites, as identified on the Policies Map, before making planning decisions on such proposals.*

4.3. Chelmsford City Council Local Plan

4.3.1. In preparing their Local Plan, CCC have taken into account the guidance contained within ECCs MLP and the PPG and, in relation to the Development, have identified that:

> *7.236. The allocation includes areas which have been consented for long-term minerals extraction. The masterplanned development will require careful phasing together with an application from the mineral operator to modify the phasing programme for mineral extraction, which would be approved by the Minerals Planning Authority.*
>
> *7.237. The site lies within a Minerals Safeguarding Area. In line with the Minerals Planning Authority, the developer will be required to undertake a Minerals Resource Assessment to assess if further areas of the site contain a viable minerals resource that would require extraction prior to development.*

4.3.2. The phasing of the consented mineral extraction is discussed in Section 6 of this Assessment.

4.4. Other Relevant Publications

ECC Mineral Safeguarding Areas - Rationale Report

4.4.1. During 2012 ECC commissioned works to define MSAs in order to support the (then) emerging MLP. The resultant report *'Mineral Safeguarding Areas - Rationale Report'* outlines the approach taken to mineral safeguarding, confirming the minerals deemed worthy of safeguarding and, in respect of sand and gravel, the criteria to be used in their assessment.

4.4.2. As set out in the NPPF, the report confirms that there is no presumption that any areas within an MSA will be extracted in the future nor does their designation preclude other forms of development. The purpose of the MSAs is confirmed as ensuring that mineral resources are adequately and effectively considered in land-use planning decisions and that sterilisation of viable resources does not occur.

Local Aggregates Assessment

4.4.3. The latest Local Aggregate Assessment (LAA) for Greater Essex was published in October 2017 and covers the administrative areas of the County of Essex and the unitary authorities of Southend-on-Sea and Thurrock. It confirms that throughout the last ten years sales of sand and gravel have shown a general decrease.

4.4.4. When assessed on the basis of a rolling average of ten year sales figures the published landbank (2016) stood at 10.82 years, which exceeds the national requirement of seven years. Accordingly it is considered that the area has sufficient reserves and/or allocations of sand and gravel to meet predicted needs throughout the MLP period and there is no need to review ECC's MLP or allocate any additional sites.

4.4.5. In addition to land won aggregates the LAA identifies that the east of England is a major point of entry for marine dredged aggregate, which makes an increasing contribution to the supply of minerals. Marine won sand and gravel landed in ports either within or adjacent to Greater Essex (plus London) has increased between 2007 and 2016, from 7.44 million tonnes in 2007, to 8.7 million tonnes in 2016, with a year-on-year increase since 2012.

4.4.6. Whilst beyond the remit of ECC, it is acknowledged that the potential exists to increase the proportion of marine won sand and gravel to offset the provision required from land won sources. Marine sources are not constrained by resource availability or by a limit on permitted reserves, but the production capability is limited primarily by existing dredger numbers and the capacity of wharfs and associated infrastructure.

4.4.7. In this respect it should be noted that the operator of Bulls Lodge (Hanson) has announced a €70 million investment in two new dredgers, due to enter service in 2019. This significant investment was announced as a key part of the Company's overall strategic plan which recognises marine dredged sand and gravel as being critical to their UK business.

4.4.8. In addition to this, Cemex have recently announces a significant investment to improve docking for dredgers to deliver sand and gravel to London and have also ordered an increased capacity 'super dredger', to be delivered in 2019.

5. GEOLOGY

5.1. Overview

5.1.1. The geology of the area is shown on the BGS sheet 241 'Chelmsford' (1:50,000, 1975), with a more detailed assessment of the potential sand and gravel resources is contained within the 1973 Institute of Geological Sciences (now BGS) Mineral Assessment Report 6 *'The Sand and Gravel Resources of the Country Around Terling, Essex'* ('the MAR').

5.1.2. Both publications confirm the general geological sequence to consist of glacial superficial deposits of varying depth and composition, overlying clays of the London Clay Formation. The underlying geology, including both BGS data and information on the areas which have previously been worked, is shown on drawing 0742-1-5 (Appendix 1).

5.1.3. The Lowestoft Formation typically consists of brown and grey, frequently sandy and silty clays which include coarse gravels of chalk and flint. Borehole records confirm the thickness of these clays to be highly variable and, where present in significant thickness, these deposits represent a notable constraint to the working of underlying minerals and are referred to within this Assessment as 'overburden'.

5.1.4. The Lowestoft Formation is underlain by Mid Pleistocene Glaciofluvial Deposits, known locally as the Chelmsford Gravels. These consist of sand and gravel which have been extensively worked throughout the area and are referred to within this Assessment as 'mineral'. As with the overlying clays, borehole data shows these deposits to be of variable thickness and, in some areas, they are absent. The contact between the Lowestoft Formation and the Glaciofluvial Deposits is generally sharp and well defined.

5.1.5. In addition to the above, localised deposits of alluvium and head, both typically consisting of mixtures of clays, silts, sands and gravels, are recorded throughout the area. Such deposits are of highly variable composition and limited lateral extent and therefore do not represent a potential mineral resource.

5.1.6. The superficial deposits are underlain by Palaeogene age clays, silts and sands of the London Clay Formation. These clays are generally unsuitable for use in modern brick making owing to relatively high levels of montmorillonite and problems of excessive shrinkage and cracking in firing. They are therefore not deemed a viable economic resource and are consequently not considered further within this Assessment.

5.2. Assessment of Sand and Gravel

5.2.1. Sand and gravel is the most widespread mineral resource in Essex and is widely extracted throughout the County. In order to identify deposits the BGS have assessed the geology, based on published borehole data, against the following criteria:

- The deposit average is at least 1m in thickness.
- The ratio of overburden to mineral is no more than 3:1.
- The proportion of fines (particles less than 1/16mm) is less than 40%.
- The deposit lies within 25m of the surface.

5.2.2. Deposits that meet these criteria are classified as 'potentially workable' and are shown on the BGS Mineral Assessment Report maps. These criteria have also been adopted by ECC in their MSA Rationale report.

5.2.3. Data contained within the MAR indicates that, where present, sand and gravel throughout the site generally meets the above criteria and can therefore be classified as potentially workable. It is however recognised that, whilst these criteria are suitable to identify a potentially workable deposit, compliance not imply that a deposit could be worked economically or confirm the presence of a mineral resource of economic importance.

5.2.4. Given the geology the ratio of overburden to sand and gravel ('the overburden ratio') is of particular importance here. The ratio of 3:1 adopted by the BGS is designed to be applied on a regional scale rather than in a site specific context, in order to avoid restricting the identification of potentially workable deposits. There is no fixed overburden ratio at which any particular deposit becomes uneconomic and each deposit must be assessed on its own merits. Such assessment must take into account a wide range of issues which have an economic impact upon the extraction of a given deposit.

5.2.5. The Institute of Quarrying's publication 'Sand and Gravel Production' acknowledges the importance of the overburden ratio in sand and gravel extraction, confirming that, dependent upon the quality of the mineral and its local commercial value, deposits with a ratio above 1.5:1 are unlikely to form a commercial proposition.

5.2.6. Within the wider minerals industry this is considered to be representative of an upper limit, with a ratio of 1:1 typically being accepted as the economic limit. Notwithstanding this, it is recognised that a wide range of factors can influence a resource's economic importance and accordingly all deposits within the site with a ratio of up to 3:1 have been assessed.

5.2.7. In order to provide an initial screening tool a traffic light system has been adopted. Deposits with a ratio of less than 1:1 are classified as potentially workable (green), those with ratios between 1:1 and 3:1 require more detailed assessment (amber), and those with a ratio of 3:1 or greater are discounted (red). This system is applied within the following borehole summary tables.

5.3. Areas A and B (Airfield and Park Farm)

5.3.1. Areas A and B are covered by extant minerals permissions and the geology is well understood, with both areas having been subject to extensive geological investigations. Where economically important mineral is present this is scheduled for extraction as part of either the Airfield or Park Farm permissions (see Section 6 of this Assessment).

5.3.2. Area A includes overburden overlying mineral which, in places, extends to in excess of 12m. The mineral thickness is, in part, reflective of the topography of the underlying London Clay, with the maximum thickness of mineral present within buried valleys. Similarly, Area B is underlain by a variable thickness of mineral beneath overburden, with site investigations having proved a general thickening of the overburden from north to south.

5.3.3. Though the thicknesses are subject to localised variations, both the Airfield and Park Farm exhibit overall overburden to mineral ratios of approximately 1:1. For the purposes of this Assessment it is therefore is assumed that both areas are underlain by potentially workable mineral and, where economically and environmentally acceptable to do so, this will be worked.

5.4. Area C

Overview

5.4.1. BGS mapping confirms the Lowestoft Formation to extend across the greater part of Area C, with the MAR recording the Area to be underlain by *'continuous or almost continuous spreads of mineral beneath overburden'*. Whilst mineral has previously been extracted from significant sections of Area C, there remain areas within the northwest and southeast/eastern boundary where no working has occurred.

Northwestern Area

5.4.2. The northwestern area extends to 16ha. and includes the Chelmer Valley Park and Ride and adjacent agricultural land. It has previously been subject to extensive geological investigation, including eight boreholes drilled in 1987 and a further borehole drilled in 2017. A summary of these borehole is shown in Table 2, below, and on drawing 0742-1-14 (Appendix 3). Borehole logs are reproduced at Appendix 3.

5.4.3. The results generally show good correlation, with the area being underlain by extensive overburden and little or no mineral. Only one borehole (19/87), which lies on the northern boundary of the Area, identified an overburden to mineral ratio classified as being 'potentially workable'. Based on this information it is concluded that the remaining unworked land within the northwestern section of Area C does not contain any mineral of economic importance and can therefore be discounted from further consideration.

Borehole	O'burden	Mineral	O'burden:Mineral
01/87	20.0	-/-	-/-
02/87	21.0	-/-	-/-
03/87	12.8	1.8	7.1:1
06/87	22.0	-/-	-/-
09/87	11.3	1.7	6.6:1
11/87	10.4	0.6	17.3:1
12/87	14.0	-/-	-/-
19/87	13.9	7.6	1.8:1
1/17	16.3	2.6	6.3:1
Average	**15.7**	**2.9**	**5.4:1**

Table 2. Summary borehole data from the northwestern section of Area C.

Southeastern/Eastern Area

5.4.4. The southeastern section of Area C extends to 15ha., and includes the Channels Golf Club/Channels Lodge hotel complex and a strip of agricultural land along the Area's eastern boundary. Four boreholes are recorded in relatively close proximity. Summaries of the borehole data are shown on Table 3 and on drawing 0742-1-14.

Borehole	O'burden	Mineral	O'burden:Mineral
6	7.1	7.5	0.9:1
11	7.1	5.9	1.2:1
20/86	6.5	4.0	1.6:1
TL71SW40	6.8	7.8	0.9:1
Average	**6.9**	**6.3**	**1.1:1**

Table 3. Summary borehole data in proximity to the southeastern section of Area C.

5.4.5. Whilst these boreholes lie outside the Area, all four record a broadly similar geology, with an average overburden to mineral ration of 1.1:1 and samples from TL71SW40 having a fines content of 1%. Based on this information the southeastern section of Area C is considered to contain 'potentially workable' mineral and therefore should be subject to further assessment to determine whether this may represent a resource of economic importance.

5.5. Area D (Powers Farm)

5.5.1. BGS mapping confirms the Lowestoft Formation to extend across Area D, with the MAR recording the Area to be underlain by *'continuous or almost continuous spreads of mineral beneath overburden'*. BGS borehole TL71 SW39, located on the Area's northern boundary, records 12.8m of overburden and 7.6m of mineral, with the sand and gravel having an average fines content of 2%.

5.5.2. The Area has been extensively drilled, including:

- Eight flight auger boreholes (1986) drilled to a maximum depth of 15m, none of which encountered mineral.
- Six boreholes (1987), drilled to a maximum depth of 21.9m, five of which encountered mineral.
- Eleven shell and auger boreholes (1989) drilled to a maximum depth of 27m, all of which encountered mineral and the underlying London Clay Formation.
- Two shell and auger boreholes (2017) drilled to a maximum depth of 20m, both of which encountered mineral and the underlying London Clay Formation.

5.5.3. Whilst a number of boreholes are recorded by the BGS along the line of Essex Regiment Way, these are generally shallow and do not intersect mineral. A summary of the borehole data is shown in Table 4 and on drawing 0742-1-15 which, along with borehole logs, is reproduced at Appendix 4.

Borehole	O'burden	Mineral	O'burden:Mineral
TL71SW39	12.8	7.6	1.7:1
01/86	15.0*	8.0*	1.9:1*
02/86	15.0*	8.0*	1.9:1*
03/86	12.0*	8.0*	1.5:1*
04/86	12.0*	8.0*	1.5:1*
05/86	12.0*	8.0*	1.5:1*
06/86	12.0*	8.0*	1.5:1*
07/86	15.0*	8.0*	1.9:1*
08/86	15.0*	8.0*	1.9:1*
04/87	9.6	9.0	1.1:1
5/87	16.3	5.6	2.9:1
8/87	3.4	12.4	0.3:1
10/87	6.8	8.6	0.8:1
12/87	14.0	0.0	-/-
19/87	13.9	7.6	1.8:1
1/89	16.7	7.2	2.3:1

2/89	12.2	7.6	1.6:1
4/89	13.1	7.6	1.7:1
6/89	11.1	7.3	1.5:1
7/89	2.2	8.1	0.3:1
8/89	8.1	9.2	0.9:1
9/89	4.5	13.0	0.3:1
10/89	13.6	7.3	1.9:1
13/89	18.2	5.6	3.3:1
14/89	11.8	6.6	1.8:1
17/89	5.2	8.7	0.6:1
2/17	4.2	10.3	0.4:1
3/17	8.4	10.9	0.8:1
Average	**11.2**	**8.0**	**1.4:1**

Table 4. Summary borehole results from Area D.

5.5.4. The 1986 boreholes (marked *) did not intersect mineral, therefore an assumed mineral thickness, based on the average of the boreholes that did prove mineral, has been applied. The results confirm an overall overburden to mineral ratio of 1.4:1. It should however be noted that, as the 1986 boreholes did not prove the full thickness of the overburden, the results are conservative.

5.5.5. Whilst this overburden to mineral ratio is greater than that typically considered economic throughout the minerals industry, it nevertheless falls within the definition of potentially workable mineral and accordingly the Area should be subject to further assessment to determine whether it may include a resource of economic importance.

5.6. Area E

5.6.1. Area E consists of a south-easterly dipping valley located between Areas A and B, which are both known to contain economic mineral reserves. In common with the adjacent lands, BGS mapping records the upper flanks of the valley as being underlain by the Lowestoft Formation, though the lower slopes and valley floor are recorded as being underlain by head deposits and the London Clay Formation.

5.6.2. The MAR records a significant proportion of Area E as being barren and, whilst economic mineral exists to the north, east and west, negligible Glaciofluvial Deposits are recorded on the valley slopes. Their absence is confirmed by the geological mapping of the western flank of the valley, where the London Clay Formation to directly underlies the Lowestoft Formation, indicating that, at this location, the Glaciofluvial Deposits have been eroded.

5.6.3. The closest BGS boreholes, TL71 SW41 to the west and TL71SW45 to the south, record average fines contents of 0% and 14% respectively, with the latter describing the limited depth of mineral encountered as 'clayey'.

5.6.4. Notwithstanding the geological mapping, and in common with adjacent lands, Area E was subject to geological investigation in the late 1980s, including:

- Nine power auger boreholes (1m to 9m, 1982) drilled within or adjacent to the Area to a maximum depth of 5.5m.
- Five shell and auger boreholes (28 to 32, 1985) on the northeastern flank of the valley, drilled to a maximum depth of 14m, of which two encountered mineral.
- Two additional boreholes, located on adjacent land, from various phases of drilling.

Summaries of these boreholes are included in Table 5 and are shown on drawing 0742-1-8.

Borehole	O'burden	Mineral	London Clay	O'bdn:Min
1m	5.5	-/-		-/-
2m	4.3	-/-	1.2	-/-
3m	5.5	-/-	-/-	-/-
4m	2.0	-/-	3.5	-/-
5m	5.5	-/-	-/-	-/-
6m	4.5	1.0	-/-	4.5:1
7m	0.6	4.9	-/-	0.1:1
8m	2.3	3.2	-/-	0.7:1
9m	1.2	-/-	4.3	-/-
11/86	6.0	2.0	-/-	3:1
8	8.5	-/-	1.0	-/-
28	9.1	-/-	4.9	-/-
29	1.6	-/-	8.4	-/-
30	0.8	3.3	6.9	0.2:1
31	6.9	-/-	3.1	-/-
32	5.2	5.2	3.6	1:1

Table 5. Summary borehole results from Area E. Average thicknesses and overall overburden ratios are not included owing to the number of boreholes that did not encounter mineral.

5.6.5. The borehole data confirms mineral to be absent in the majority of boreholes, with only six encountering relatively limited thicknesses of mineral, all of which are located close to, or immediately beyond the boundary of the Area. Given the geological mapping and the absence of mineral in the majority of boreholes, such limited occurrences are interpreted as being highly localised. Accordingly Area E is not considered to contain any significant extent of potentially workable mineral and is therefore not considered further within this Assessment.

6. EXTANT MINERAL PERMISSIONS

6.1. Overview

6.1.1. Mineral extraction throughout Areas A and B is permitted by two separate planning consents, with Area A covered by CHL/1019/87 (Airfield) and Area B by CHL/1890/87 (Park Farm), the boundaries of which are shown on drawing 60548237.BL.SC.003 (Appendix 2). The Park Farm consent also covers Area E however, as no economic mineral is present here, no extraction is proposed within this Area. The permissions are subject to a legal agreement which requires the Airfield to be worked prior to Park Farm.

6.1.2. Working is currently progressing through the northern section of the Airfield, with production in the region 700,000 tonnes per annum. The output is anticipated to remain at, or close to, such levels for the foreseeable future. Mineral is transported by conveyor to processing plant at Bulls Lodge, to the south, thereafter being exported by road via Generals Lane and the Boreham Interchange (A12 Junction 19).

6.1.3. Owing to a number of factors the operator wishes to revise the phasing of extraction across the two permission and is currently in the process of preparing planning applications to vary the permissions. The proposed variations are discussed below.

6.2. Airfield (CHL/1019/87)

6.2.1. CHL/1019/87 permits extraction across the former RAF Boreham until 2020, with working having commenced in the east and progressed clockwise. To date in excess of 160ha. has been worked, of which a significant proportion has been restored to agriculture. The extent of working, the areas restored and the current phasing of extraction are shown on drawing 60548237.BL.SC.003.

6.2.2. At the time of writing (summer 2018) extraction was taking place throughout the north of the Airfield. Restoration works have been undertaken with future development in mind and, along the proposed CNEB route, the restoration has been engineered to a standard suitable to support future highway construction. Accordingly the continued working of the Airfield permission will not restrict the delivery of the CNEB.

6.2.3. In order to facilitate the revised phasing the operator proposes to submit a planning application to vary the Airfield consent, which will consist of the following principal elements:

- A temporary suspension of extraction at the Airfield whilst extraction in Park Farm is undertaken;
- A 15 year extension to the end date for extraction and restoration (to 31 December 2035).
- A revised routeing of the overland mineral conveyor across the Airfield (from Park Farm) to the Plant Site.

6.2.4. During late 2017 the operator submitted a request for a Screening Opinion (Ref. ESS/66/17/CHL/SO) in line with the Town and Country Planning (Environmental Impact Assessment) Regulations 2017 (the 'EIA Regulations'). ECC subsequently adopted the opinion that the proposed changes represent Environmental Impact Assessment (EIA) development and accordingly that the planning application must be accompanied by an EIA. At the time of writing baseline technical studies were being undertaken, with a request for a Scoping Opinion submitted in August 2018. It is anticipated that the planning application will submitted in early 2019.

6.2.5. In order to allow time for the submission and determination of the application, extraction will continue across the north of the Airfield until 2020, whereupon extraction will switch to Park Farm. Following the exhaustion of reserves within Park Farm extraction will revert to the remaining areas of the Airfield and is currently anticipated to recommence in 2026. Following recommencement, extraction of the remaining reserves will extend until 2032, with a further 2 years for the completion of restoration.

6.3. Park Farm (CHL/1890/87)

6.3.1. The Park Farm consent runs until 2030 and, in addition to extraction across Park Farm (Area B), the permission also covers Area E, the Bulls Lodge processing plant, and extraction from Brick Farm, to the east.

6.3.2. No mineral extraction is proposed from within Area E, though minor landforming works will take place here to aid the drainage of the restored Park Farm landform. Whilst outside the boundaries of the site, the Bulls Lodge processing plant and Brick Farm extraction area are discussed within later sections of this Assessment.

6.3.3. The current extraction phasing across Park Farm involves working from south to north and it is proposed to alter this to allow working from south to north. The revised phasing will better reflect the geological conditions and the available infrastructure already developed within the Airfield. Mineral will be transported by conveyor to the existing processing plant at Bulls Lodge. The proposed variation will consist of the following principal elements:

- To commence development ahead of the completion of extraction in the Airfield.
- To change the phasing direction from the south to north to north to south to better reflect geological conditions and the available infrastructure.
- A revised conveyor route from Park Farm to the Plant Site, with the new route being to the north of the Park Farm buildings rather than to the south.
- Exclude extraction and restoration proposals for areas now falling within planning permission ESS/21/12/CHL (see below).

6.3.4. As with the Airfield consent, a request for a screening opinion was submitted to ECC in late 2017, with ECC adopting the opinion that the proposed variations represent EIA development. At the time of writing baseline technical studies were being undertaken, with a request for a Scoping Opinion submitted in August 2018. It is anticipated that the planning application will submitted in early 2019.

6.3.5. Following the suspension of operations across the Airfield extraction is anticipated to commence within Park Farm in 2020 and take approximately 5-6 years to complete. As restoration will be progressive significant areas of Park Farm will be available for non-mineral development shortly after mineral has been worked.

6.4. Beaulieu Prior Extraction (ESS/21/12/CHL)

6.4.1. Land to the south of Park Farm is scheduled to be developed as part of the Beaulieu mixed use development, including the southernmost section of the Park Farm consent (CHL/1890/87), as shown on drawing 60548237.BL.SC.003. As there was no possibility of the current Airfield mineral working switching to the southern area of Park Farm prior to the Beaulieu development commencing, a stand-alone permission for the prior extraction of mineral within this area was granted by ECC (ESS/21/12/CHL).

6.4.2. In addition to the prior extraction of mineral, the permission allows for the backfilling of the resultant void with soils and overburden arising from the Beaulieu development. Extraction commenced in 2017 and is currently ongoing, with works scheduled to be completed prior to extraction commencing within Park Farm. As such this consent will have no impact upon either the working of permitted reserves at Park Farm or the Development.

7. ASSESSMENT OF RESOURCE POTENTIAL

7.1. Overview

7.1.1. Policy S8 of ECC's MLP confirms that ECC will *'safeguard mineral resources of national and local importance from surface development that would sterilise a significant economic resource or prejudice the effective working of a permitted mineral reserve.'* Accordingly an assessment must be made as to the potential of any identified mineral deposit within the site to represent *'a significant economic resource'*.

7.1.2. The identification of potentially workable mineral (with reference to the BGS criteria) does not necessarily equate to a mineral resource of economic importance however where mineral has been identified it should be subject to further assessment. Such assessment should aim to determine:

- Whether or not a mineral resource of sufficient size and quality exists, with regard to all relevant and reasonably identifiable constraints;
- The reasonable likelihood of any identified resource being extracted and marketed economically; and
- If a potentially economically significant resource exists, whether it would be practical to extract this prior to non-mineral development ('prior extraction').

7.1.3. Where mineral is present within the site the principal constraints have been identified and potential extraction areas determined. Where relevant an appropriate assessment of its economic potential has then been undertaken. For the purposes of an initial assessment the following stand-offs have been applied:

- 100m from the extraction face to the facade of a residential property; and
- 20m from all roads, ownership boundaries, previously worked and backfilled areas, and peripheral vegetation.

7.1.4. Where the application of the above stand-offs results in an area of less than 100m in width remaining, consideration has been given as to whether such areas are likely to be workable, given the general thickness of overburden and resultant depth of working.

7.2. Areas A and B

7.2.1. As set out in the preceding section of this Assessment, where economically recoverable mineral is present within Areas A and B it will be extracted prior to non-mineral development taking place. Significant areas of the Airfield (Area A), including the route of the CNEB bypass, have already been worked and restored, or are currently undergoing restoration, and the proposed re-phasing will allow the early delivery of Park Farm (Area B) for non-mineral development.

7.2.2. Non-mineral development will be carefully planned to ensure that appropriate stand-offs are maintained to the mineral workings and the Development will not therefore prejudice the working of consented reserves. Whilst outside of Area B, it should be noted that mineral working within Beaulieu (as part of ESS/21/12/CHL) will be completed prior to non-mineral development taking place within Area B.

7.2.3. As all economic mineral is scheduled to be extracted from both Areas A and B, and appropriate stand-offs are to be adopted, it is therefore concluded that the Development will not sterilise mineral resources or conflict with the effective working of permitted minerals within these areas and is therefore in line with Policy S8 of ECC's MLP. No further assessment of these areas is therefore required.

7.3. Area C

Overview

7.3.1. Owing to its varied geology and history Area C has been subdivided, with each sub-area addressed below. The extent of each area and a summary of the geological information is shown on drawing 0742-1-14 (Appendix 3).

Northwest

7.3.2. Geological data has confirmed that no economic mineral is present within the northwestern section of Area C (hatched on drawing 0742-1-14). No further assessment of this sub-area is therefore required.

Central

7.3.3. The greater part of the central section of Area C has previously been worked and the land restored. Within this sub-area (shown on drawing 0742-1-14) no economic mineral remains. No further assessment of this sub-area is therefore required.

East of Domsey Lane

7.3.4. The sub-area to the east of Domsey Lane comprises of a relatively narrow strip of agricultural land bordered to the west by residential properties and to the east by an established tree belt. Geological information indicates that sand and gravel is present beneath clay overburden.

7.3.5. The required stand-offs to boundaries and residential properties effectively reduces any potential working area to less than 0.6ha., thereby effectively preventing any potential mineral working. Accordingly this sub-area does not contain a resource of economic significance and no further assessment is therefore required.

Southeast of Domsey Lane

7.3.6. The remaining section of Area C, to the southeast of Domsey Lane, lies between the Channels Golf Club/Channels Lodge hotel to the southwest and residential properties to the north. Geological information indicates that sand and gravel is present beneath clay overburden.

7.3.7. Given the nature of the Channels Golf Club/Channels Lodge hotel, and in particular the presence of three listed buildings, it is considered appropriate to apply a 100m stand-off from these buildings, as with residential properties. The eastern boundary of the sub-area is marked by an established tree belt which provides an important north-south wildlife corridor.

7.3.8. The application of the required stand-offs reduces any potential extraction area to 3.8ha., significant parts of which are less than 100m in width. The requirement for batters within the overburden would further reduce the potential extraction area to less than 3ha. Given the required depth of working (an average 13.2m of overburden/mineral) and the relatively low volume of mineral present, extraction within these areas would not be practical given the limited widths available.

7.3.9. Accordingly whilst this sub-area includes a limited mineral resource at depth, it is considered to be highly constrained to the extent that extraction would be impractical to undertake and unacceptable on the grounds of potential impacts on a number of receptors. The sub-area is therefore not considered to contain a mineral resource of economic importance and is discounted from further assessment.

7.4. Area D

7.4.1. In total Area D extends to 65ha. and has been extensively drilled, providing a high degree of confidence in the geology. This data, summarised on drawing 0742-1-15 (Appendix 4), confirms that sand and gravel is present beneath clay overburden. Given the presence of mineral, albeit overlain by a significant thickness of overburden, and the extent of the Area, it is considered that the potential economic importance of this resource should be evaluated.

7.5. Area E

7.5.1. Geological data, summarised on drawing 0742-1-16 (Appendix 5), has confirmed that no significant economic mineral is present within of Area E. Whilst minor landforming associated with operations across Park Farm is proposed within a small part of this Area, this could be easily accommodated within any non-mineral development. Accordingly it is considered that no further assessment of this Area is required.

8. AREA D ECONOMIC APPRAISAL

8.1. Overview

8.1.1. Area D has remained in the ownership of mineral operators since the submission of a speculative planning application in 1990, which was refused on a number of grounds. Despite remaining in the ownership of mineral operators no further planning application has been submitted and the Area is not allocated within the MLP.

8.1.2. A recent review of the Area has confirmed that, whilst a deposit of sand and gravel is present at depth, this cannot be exploited economically. The Area's surface and mineral owners have subsequently confirmed that they do not consider the Area to be viable as a minerals prospect and that they have no interest in pursuing mineral interests across the Area.

8.1.3. Notwithstanding this fact, paragraph 3.138 of ECC's MLP states that it is necessary for *'the economic importance of the resource to be evaluated'*. Accordingly an appraisal of the deposit has been undertaken, the findings of which are outlined below, with design, volumetric and financial information reproduced at Appendix 6.

8.2. Potential Working

Working and Processing of Mineral

8.2.1. Although land may contain minerals it is not always feasible or economically viable to extract these in part or in full. To successfully exploit a resource requires, amongst other factors, the careful management of soils, overburden, waters and silts, whilst working depths and the available working areas are also crucial.

8.2.2. In order to assess the economic importance of a resource it is necessary to consider how it may be worked and assess the potential economic viability of various scenarios. In the case of Area D, three principal scenarios have been identified:

- Extraction and processing of mineral on-site, with export of saleable product by road.
- Extracted mineral to be transported to the existing Bulls Lodge processing plant by road.
- Extracted mineral to be transported to the existing Bulls Lodge processing plant by conveyor.

8.2.3. The existing Bulls Lodge processing plant lies approximately 3km to the southeast and is scheduled to process mineral from the Airfield and Park Farm for their remaining lifetime. The plant's operators have confirmed that, owing to contractual obligations, the current plant would not be available to process mineral from alternative sites until beyond this date, if at all.

8.2.4. In addition to the availability of the plant, its design life is such that it is unlikely to remain available for the processing of additional material over and above that from the Airfield and Park Farm without significant replacement and renewals. Whilst it may be possible to install additional plant at Bulls Lodge, the economics of doing so would be prohibitive.

8.2.5. Notwithstanding the above, the transport of unprocessed mineral to the plant site would introduce significant additional costs. In both cases material would be subject to additional handling and loading and, in the case of road transport, would require hauling approximately 8km, whereas a conveyor route would be in the region of 3km. Furthermore any conveyor route would require the agreement of third party landowners and the crossing of Domsey Lane.

8.2.6. For the above reasons it is considered that the transport of mineral to the Bulls Lodge processing plant would be both economically unviable and potentially undeliverable. Accordingly neither of these scenarios has been assessed further.

8.2.7. It is therefore concluded that the potential extraction of mineral from Area D should be assessed on the basis of a 'stand-alone' site including provision for processing the mineral and the accommodation of silts. In order to avoid the need for extensive settling lagoons it has been assessed on the basis that material could be processed using a relatively compact, modular plant incorporating a filter press or similar silt management techniques.

Extraction Phasing

8.2.8. In total Area D extends to 65ha., with the adoption of appropriate stand-offs (100m to residential, 20m to other boundaries) reducing the potential extraction area to 50ha. Land within these stand-offs would remain available for screen bunding and overburden storage. In order to provide a robust assessment no allowance has been made for the presence of any other potential constraints (Public Footpath diversions, water courses, listed buildings etc.).

8.2.9. Taking the above into account a potential extraction design has been modelled using industry standard software (LSS) with appropriate input from experienced operational staff, geologists and landscape architects. The software combines a digital map of the surface with the available borehole data to create a digital model of the overburden and mineral. Areas and depths of excavation are then specified to give volumes of both overburden and mineral within each phase. In order to provide a realistic model, the phasing has incorporated the following assumptions:

- Phase 1 to include the formation of a plant site/operations centre, to be located as far from residential properties as reasonably possible in order to minimise impacts.
- Phase 2 is targeted for early extraction as it has the greatest mineral depth and will provide early void space to aid material handling.

- Thereafter phasing to progress in a clockwise direction to provide the maximum amount of edge to facilitate direct overburden placement and minimise the requirement for double handling.
- From Phase 3 onwards it is assumed that sufficient void space will exist to facilitate direct placement of the majority of overburden from latter phases.
- A restoration landform comprising principally of dry land with some woodland and hedgerow planting. If no external outfall is available a wetland system may be required accommodate surface run off.
- In order to avoid an incongruous landform, Phase 2 will be backfilled to original ground levels, with other areas restored to a reduced level.

8.2.10. The modelled phasing, along with further notes on the proposed design, are reproduced at Appendix 6. The north-south haul road to the plant site shown is indicative only and it is acknowledged that, subject to appropriate access being available, the alignment of this haul road could be altered. Any such alteration would not have a material impact on volumes.

8.3. Material Quantities

8.3.1. In addition to the available geological data a number of assumptions have been made to allow realistic volumes of both mineral and overburden to be calculated (volumes for each phase are reproduced at Appendix 6). Where relevant these assumptions have been based on operational experience from the on-going working at the Airfield and include:

- A mineral density of 1.85t/m^3;
- 0.15m of mineral lost at the top and the bottom of the deposit;
- Operational losses (fines etc.) of 10%.

8.3.2. Taking into account the available extraction area, the proposed phasing, and the above assumptions, the Area contains approximately 4.9Mt of saleable mineral. The extraction of this mineral (2,655,595m^3) would require the handling of 5,536,000m^3 of overburden, giving an overburden to mineral ratio in excess of 2:1. Such ratios are generally considered to be uneconomic however, in order to provide a robust assessment, an economic appraisal has been prepared and is discussed below.

8.4. Economic Appraisal

Overview

8.4.1. In order to establish whether or not the resource is of economic significance the material volumes have been assessed in light of the readily identifiable economics of extraction. Summaries of the financial appraisals undertaken are reproduced at Appendix 6.

Production Rate

8.4.2. Owing to contractual obligations output from Bulls Lodge is approximately 700,000 tonnes per annum, significantly higher than a typical sand and gravel operation. As a new, stand-alone site, any production from Area D would be expected to achieve rates more in keeping with typical sand and gravel quarries. It is considered that an output in the region of 300,000 tonnes per annum would be more likely which, given a saleable resource of 4.9Mt, would equate to a potential lifetime (allowing for setup and restoration) in the region of 18 years.

Set-up Costs

8.4.3. As a greenfield site any working across Area D would involve significant setup costs. In addition to physical site setup (access, offices, power connection, security etc.) these costs would include obtaining planning permission, the diversion of footpaths, advanced planting and compensation for agricultural tenants. As mineral would be processed on site there would also be a requirement to source a process water supply (borehole).

Production Costs

8.4.4. Typical costs associated with overburden stripping and handling, the extraction and processing of mineral and silt management have been supplied by the operator of Bulls Lodge. Other costs such as the loss of agricultural income, central administrative costs, rates and aggregates levy have been factored into the model, with potential mineral incomes based on an average ex-works selling price of mineral achieved across Essex by the operator of Bulls Lodge.

8.4.5. Significant abnormal costs would arise in the working of Area D as a result of the overburden thickness. This is compounded by the greenfield nature of the site, with a lack of available void space throughout the initial phases requiring the temporary, above ground stocking of overburden and its subsequent double handling prior to final placement.

Financial Conclusions

8.4.6. The above information has been used to create a Discounted Cash Flow model in order to assess the financial potential of any extraction. In order to provide a robust appraisal a range of representative royalty values have been assessed. It is important to note that none of the results make any allowance for profit.

8.4.7. The result of the appraisal confirms that the modelled extraction from Area D would be uneconomic, with the most likely royalty of £2.50/tonne predicted to result in a cumulative loss of £6.7 million and a Net Present Value of -£3.2 million. As all modelled scenarios would result in a financial loss, the extraction of the mineral as a stand-alone site is not considered to be finically viable and the resource cannot therefore be considered to be of economic significance. Whilst it is acknowledged that mineral prices may rise, an associated increase in production costs would cancel out any future increase in revenues.

8.5. Consideration of Prior Extraction

8.5.1. Notwithstanding the conclusion that the resource cannot be worked economically as a stand-alone mineral development, it is recognised that potential efficiencies can be achieved through the working of any mineral in conjunction with non-mineral developments.

8.5.2. In this case the principal efficiencies of combining mineral extraction with non-mineral development include the provision of highways access and power supplies. Whilst there will remain cost associated with these elements, it is estimated that the overall setup costs of the project could be reduced by approximately £0.5 million.

8.5.3. Whilst prior extraction may result in setup efficiencies over a stand-alone site, there are unlikely to be any significant, on-going efficiencies in extraction and processing costs. It is however possible that prior extraction would add to the cost of extraction through compromises in site design which may be required to accommodate infrastructure associated with non-mineral development.

8.5.4. Applying the reduced setup costs to all modelled royalty levels confirms that the prior extraction of minerals would not be economic, with all scenarios making a loss. As outlined above the deposit is not considered to be viable as a stand-alone mineral project and, in light of the excessive thickness of overburden and the costs associated with the handling of this material, it is considered that prior extraction would not be viable or practicable.

8.5.5. Notwithstanding this, and whilst considered to be highly unlikely owing to the depth of overburden, should any economic mineral be encountered during the Development, it will be utilised within the Development wherever reasonably possible.

9. PROXIMAL STERILISATION

9.1. Permitted Mineral Operations

9.1.1. All permitted mineral within the site that can be economically extracted without unacceptable impacts will be worked and, whilst the phasing detail of the Garden Village will be addressed at the planning application stage, wherever necessary stand-offs of no less than 100m from any working face to the façade of a residential property will be adopted.

9.1.2. Whist the greater part of the Bulls Lodge processing plant is not immediately adjacent to the site, consideration will also be given to ensuring that appropriate stand-offs to the plant and any other operational areas are in place. Minor landforming works within Area E, proposed as part of the Park Farm operations, can be incorporated within any non-mineral development, whilst extraction from Brick Farm, to the east, will take place in excess of 100m from the Garden Village site boundary.

9.1.3. Mineral is also currently being extracted from the northern section of Beaulieu, south of Park Farm, however these works are scheduled to be completed prior to the Garden Village Development commencing.

9.1.4. Accordingly the Development will not prejudice the working of any permitted mineral resources either within or adjacent to the site and is therefore in compliance with the relevant sections of MLP Policy S8.

9.2. Adjacent Land

Overview

9.2.1. Non-mineral developments within MSAs have the potential to sterilise mineral not only through their immediate land take but also through their influence on the potential workability of surrounding land. Account should therefore be taken of the Development's potential to indirectly sterilise minerals within adjacent land.

Northern Boundary

9.2.2. Land to the north of Areas A and D consists primarily of agricultural land, separated from the site by Wheelers Hill and Cranham Road. Numerous existing residential properties effectively sterilise large areas of land and any underlying mineral which may be present. Where open land of a sufficient size to support mineral working exists to the north of Area A, BGS borehole TL71 SW43 confirms an excessive thickness of overburden (15.2m overburden, 5.5m mineral) and it is considered unlikely that any economically important mineral resource would be present here.

Eastern Boundary

9.2.3. Along the eastern, northeastern and southeastern boundaries of Area A much of the land has previously been worked for mineral, having being restored to a mixture of grassland, woodland and open water. Permitted mineral working proposed within Brick Farm (as part of the Park Farm permission), to the east lies in excess of 100m form the site boundary and will not be affected by the Development. Accordingly it is considered that the Development would not sterilise any mineral to the northeast and east.

Southern Boundary

9.2.4. To the south of Area E borehole data shows no potentially workable mineral to be present, whist to the south of Area B, any economic mineral is being worked as part of the Beaulieu prior extraction. To the south of Area C the greater part of the land has been previously worked and restored and is currently being developed as part of the Channels development. Accordingly there is considered to be no potential for any further mineral working to the south.

Western Boundary

9.2.5. Geological mapping indicates that mineral may exist beneath overburden to the west of Areas C and D however, owing to the presence of Essex Regiment Way, the Development would not prejudice the working of any mineral which may be present here.

9.2.6. Accordingly it is considered that the Development will not result in the sterilisation of any mineral resource of economic importance beneath adjacent lands and this should not be viewed as a constraint on the Development.

9.3. Safeguarded Minerals Infrastructure

9.3.1. Policy S9 of ECC's MLP aims to safeguard mineral related infrastructure, applying a 250m consultation area from the safeguarded plant listed within Policy S9. In proximity to the site this includes the coated stone plants at Bulls Lodge (to the southeast) and Essex Regiment Way (to the southwest).

9.3.2. Accordingly the presence of both plants should be taken into account in the master planning of the Development in order to ensure that potentially conflicting land uses are not located within areas of the site which may prejudice the operation of either plant.

10. CONCLUSIONS

10.1. Sand and gravel has historically been worked throughout the area and substantial parts of the site benefit from extant permissions for mineral working. Owing to the underlying geology and the on-going mineral working, the site lies within a MSA and partially within a MCA. Accordingly this Assessment has been undertaken to address two key issues:

- Whether or not the Development can be undertaken without prejudicing the permitted mineral extraction, and
- Within other areas, reviewing the potential for any potentially workable mineral to be present and, if so, whether it represents a mineral resource of economic importance that is worthy of safeguarding.

10.2. BGS data has confirmed the general geological sequence across the site to include basal clays, overlain by sand and gravel, which is in turn overlain by boulder clays. The sand and gravel represents the sole potentially economic mineral.

10.3. An initial assessment of the geology has identified areas within which no potentially workable mineral is present, whilst a review of historic mapping, planning and environmental records has identified areas which have previously been worked for sand and gravel and subsequently restored.

10.4. The site includes two extant permissions for the extraction of sand and gravel, with extraction currently taking place within the Airfield. Whilst the Park Farm permission extends across Area E, geological investigations have confirmed this Area to be devoid of any economic mineral and accordingly no extraction is proposed here.

10.5. Significant section of the Airfield have been already been worked and restored to agriculture, with current (summer 2018) working focussed within the north of the Airfield. This is scheduled to progress eastwards until 2020, with progressive restoration following shortly thereafter. All economic mineral has been extracted from the proposed route of the CNEB and the land either restored or is currently being restored. Accordingly the permitted mineral working does not present any restriction upon the delivery of the CNEB.

10.6. In order to allow the working of permitted mineral in Park Farm it is proposed to suspend operations within the Airfield and vary the original phasing of extraction. This will allow all economic mineral within Park Farm to be worked by 2025/26, with progressive restoration allowing significant areas to become available for non-mineral development prior to this date. Following the completion of extraction within Park Farm working will recommence within the Airfield.

10.7. Works on the required planning applications are underway and it is anticipated that these are anticipated to be submitted in early 2019. The revised phasing will not conflict with the proposed non-mineral development and therefore the allocation of the land within CCC's Local Plan is in accordance with ECC's MLP Policy S8.

10.8. Where areas have been identified as containing potentially workable mineral, the potential for the deposits to represent a resource of economic importance has been assessed. Where a resource of sufficient size and quality to be considered as a potentially economic has been identified, the potential for prior extraction has been considered.

10.9. A potential mineral resource has been identified within the northwestern section of the site, however this is overlain by a significant thickness of overburden. The economic viability this resource has been assessed and, owing principally to the excessive thickness of overburden, it has been concluded that it cannot be worked economically, either as a standalone minerals site or in association with non-mineral development as 'prior extraction'. Accordingly the mineral does not represent a mineral resource of economic importance and its presence does not therefore represent a barrier to the Development.

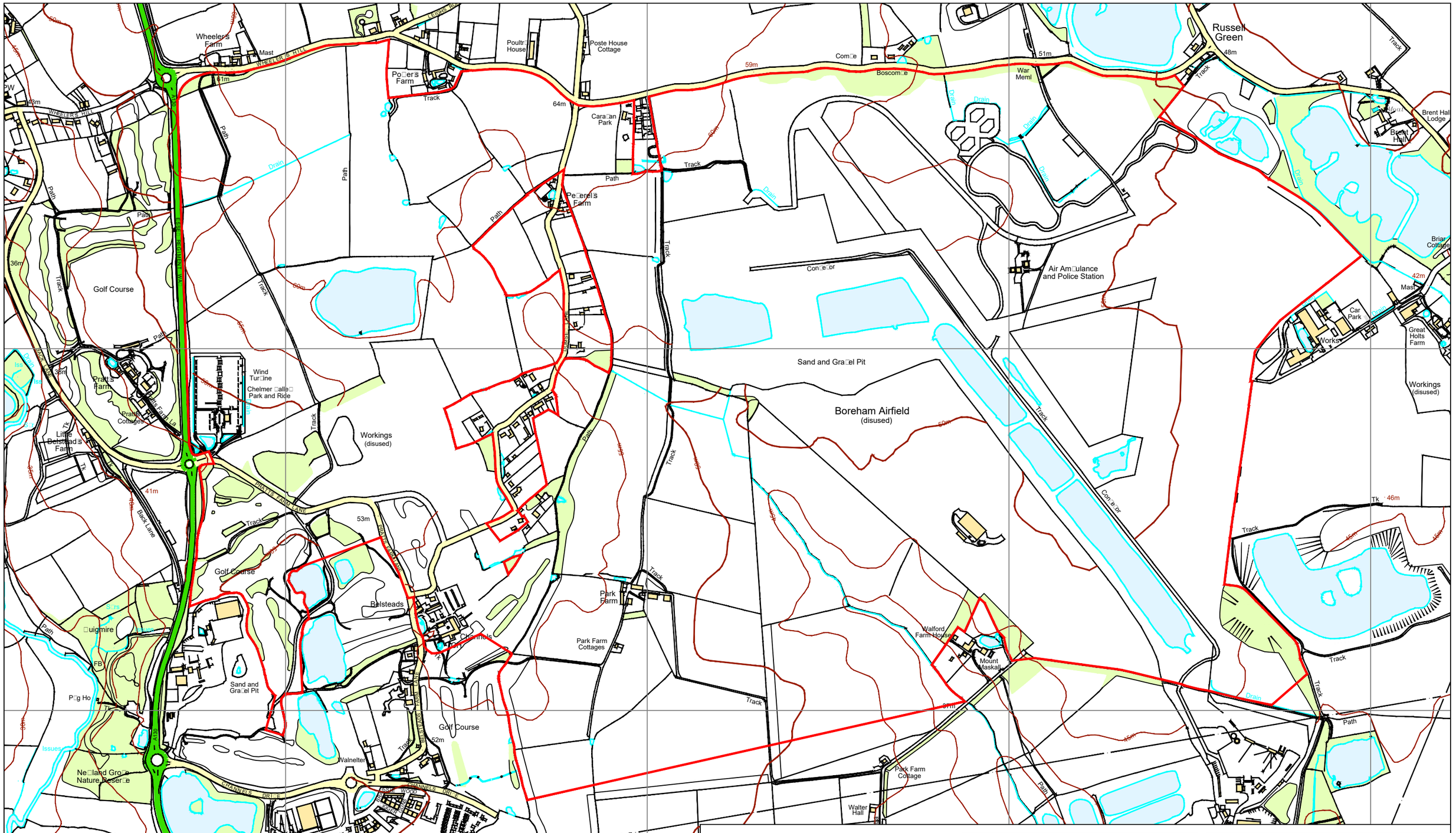
10.10. In addition to any mineral present beneath the site an assessment has also been undertaken as to the Development's potential to result in the sterilisation of mineral within adjacent land. Owing largely to the presence of pre-existing constraints it has been demonstrated that the Development will not result in the sterilisation of any mineral of economic importance beneath adjacent land.

10.11. Overall this Assessment has demonstrated that, where sand and gravel are present and it is economic to do so, the mineral will be extracted, with the timings of extraction being such that they will not pose a barrier to the successful delivery of the North East Chelmsford Garden Village.

10.12. The Development will not result in the sterilisation of any mineral resource of economic importance and will not prejudice the working of any permitted mineral. Accordingly the allocation of the Development within CCC's Local Plan is considered to be consistent with ECC's mineral safeguarding Policy.

APPENDIX 1

PLANS



NOTES:

SITE BOUNDARY

1. Ordnance Survey base mapping does not reflect the latest extent of mineral working across Boreham Airfield.
2. All boundaries are indicative only and should not be scaled.

HUGHES CRAVEN
Minerals | Planning | Geology | Environment
Sparkhouse, Ropewalk, Lincoln, LN6 7DQ
01522 849555
www.hughes-craven.co.uk

TITLE: SITE BOUNDARY PLAN

DATE: 04/07/2018

STATUS: FINAL

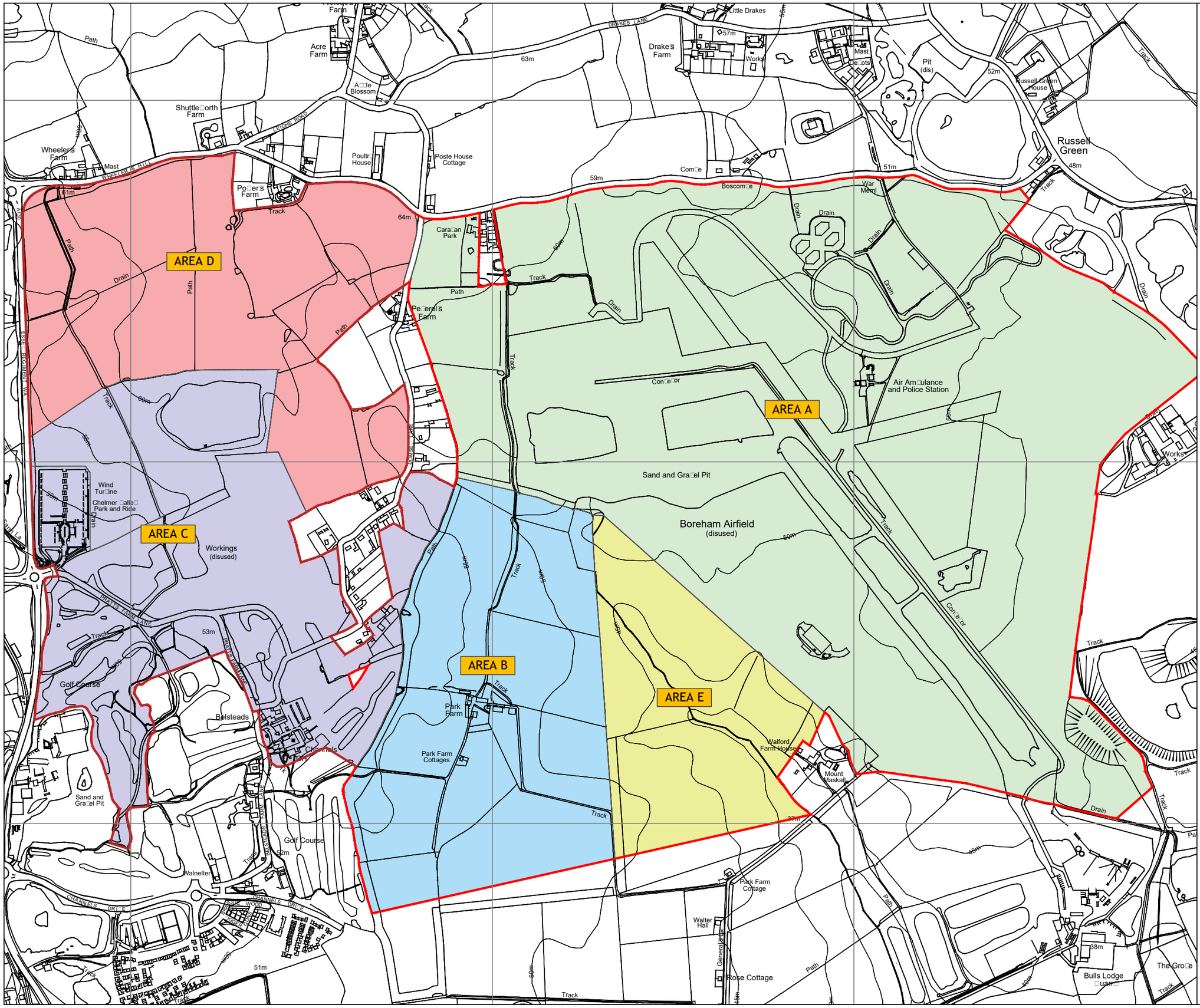
PROJECT: NORTH EAST CHELMSFORD GARDEN VILLAGE MINERAL RESOURCE ASSESSMENT

SCALE: 1:10,000

SHEET: A3

DRAWING NO.: 0742-1-3

REV: A



KEY:

- SITE BOUNDARY
- AREA A - Airfield
- AREA B - Park Farm
- AREA C
- AREA D - Powers Farm
- AREA E

NOTES:

All boundaries are indicative only and should not be scaled.

HUGHES CRAVEN
Minerals | Planning | Geology | Environment
Sparkhouse, Ropewalk, Lincoln, LN6 7DQ
01522 849555
www.hughes-craven.co.uk

PROJECT
NORTH EAST CHELMSFORD
GARDEN VILLAGE
MINERAL RESOURCE ASSESSMENT

TITLE
SITE AREAS

DATE	STATUS
04/07/2018	FINAL

SCALE	SHEET	DRAWING NO.	REV
1:10,000	A3	0742-1-4	A

KEY:

- SITE BOUNDARY
- INDICATIVE BYPASS ROUTE

BGS GEOLOGY

- ALLUVIUM (clay, silt, sand and gravel)
- LOWESTOFT FORMATION (boulder clay)
- GLACIOFLUVIAL DEPOSITS (sand and gravel)
- HEAD (clay, silt, sand and gravel)
- LONDON CLAY (clay, silt and sand)
- WORKED AND RESTORED
- CURRENT MINERAL WORKING
- BULLS LODGE PROCESSING PLANT

NOTES

1. For clarity worked and restored areas are only shown within the site boundary.
2. Current working areas shown are approximate only and includes peripheral areas set aside for screening/ operational purposes.
3. All boundaries are indicative only and should not be scaled.

HUGHES CRAVEN
Minerals | Planning | Geology | Environment
Sparkhouse, Ropewalk, Lincoln, LN6 7DQ
01522 849555
www.hughes-craven.co.uk

PROJECT
NORTH EAST CHELMSFORD
GARDEN VILLAGE
MINERAL RESOURCE ASSESSMENT

TITLE
GEOLOGICAL OVERVIEW

DATE	STATUS
04/07/2018	FINAL

SCALE	SHEET	DRAWING NO.	REV
1:10,000	A3	0742-1-5	A

APPENDIX 2

MINERAL PERMISSIONS

N

KEY

- PLANNING PERMISSION BOUNDARY REF. CHL/1019/87 (BOREHAM)
- PLANNING PERMISSION BOUNDARY REF. CHL/1890/87 (PARK FARM)
- PROPOSED CONVEYOR ROUTE
- APPROVED CONVEYOR ROUTE
- 01 PHASING OF REMAINING EXTRACTION AREAS
- WORKED AND RESTORED
- LANDSCAPE WOODLAND PLANTED AND MANAGED BY HANSON
- AREA OF PLANNING PERMISSION ESS/21/12/CHL (CZ PARK FARM QUARRY)

WORKED OUT AREA NOW STOCKPILING WATER STORAGE AND RESTORATION AREA

BOREHAM LAND

08 09 10 11 12 13 14 15 16 17 18 19 20

01 02 03 04 05 06 07 08

SOIL STORAGE AREA

PARK FARM BROOK

PARK FARM

CHANNELS DEVELOPMENT (RESIDENTIAL)

PLANT SITE

Bulls Lodge Quarry

F G H

BRICK FARM

SOIL STORAGE AREA

GREATER BEAULIEU PARK

Project Title: BULLS LODGE QUARRY

Client: Hanson HEIDELBERGCEMENT Group

Drawing Title: EXTRACTION AND RESTORATION PHASING

Purpose of issue

Designed	Drawn	Checked	Approved	Date
-	AAO	CN	CN	08/18

AECOM Internal Project No.	Suitability
60548237	-
Scale @ A3: 1:1250	Zone / Mileage

AECOM
Royal Court, Basil Close
Chesterfield
Derbyshire. S41 7SL
Telephone. (01246) 209221
Fax. (01246) 209229
□□□.aecom.com

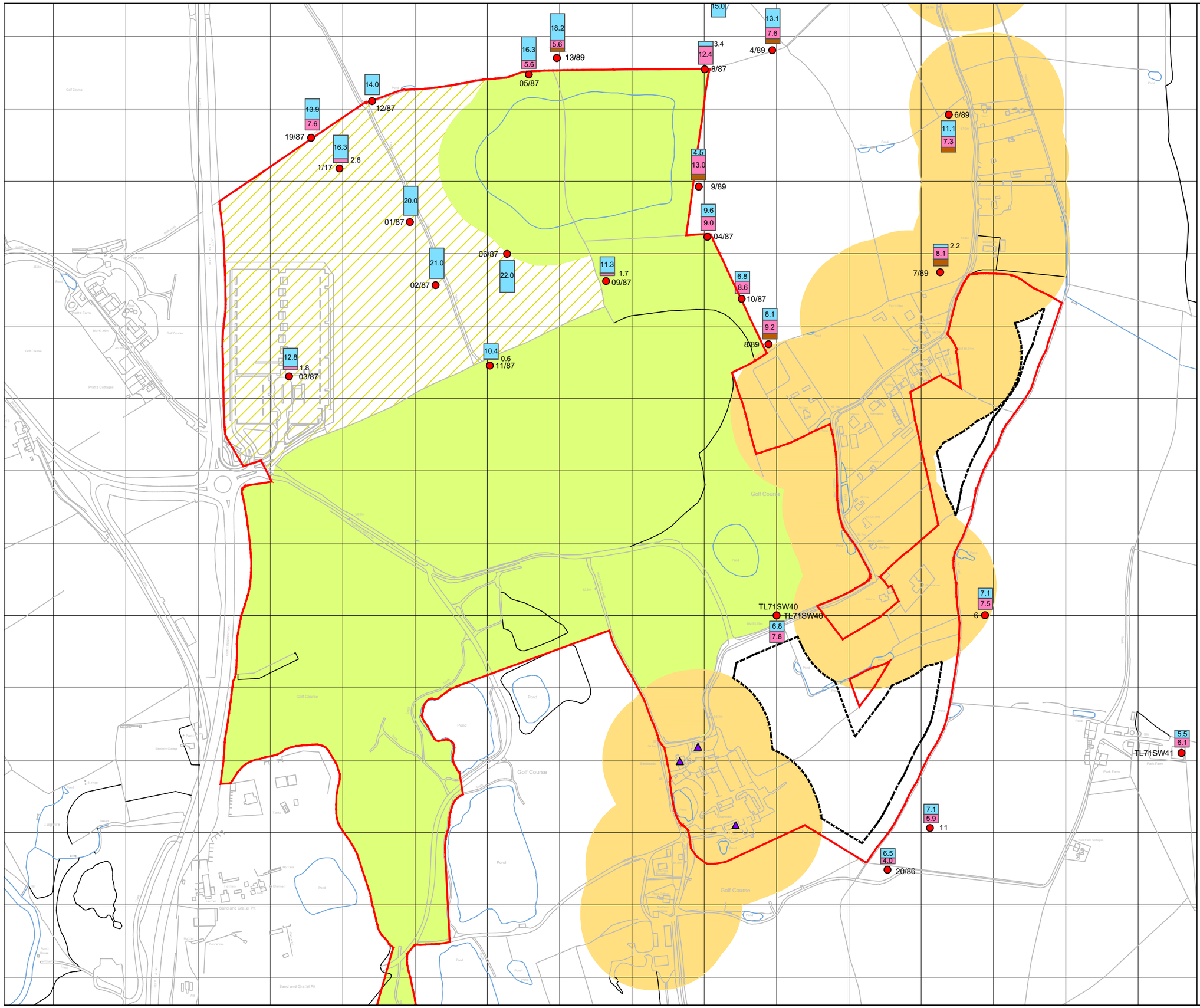
AECOM

Drawing Number: 60548237.BL.SC.003

Rev: -

APPENDIX 3

AREA C – GEOLOGY



KEY:

- AREA C BOUNDARY
- POTENTIAL EXTRACTION AREA
- 100m RESIDENTIAL STAND-OFF
- LISTED BUILDING

GEOLOGY

- 1/89 BOREHOLE
- LOWESTOFT FORMATION (overburden)
- GLACIOFLUVIAL DEPOSITS (mineral)
- LONDON CLAY
- PREVIOUSLY WORKED AND RESTORED LAND
- BARREN AREA

NOTES

1. Potentially workable areas shown inlcude 100m stand-off to the facade of residential properties and 20m to all other boundaries. No additional stand-off from listed buildings applied.
2. Base mapping does not show on-going residential development to the south.
3. All locations and boundaries are indicative only.

HUGHES CRAVEN
Minerals | Planning | Geology | Environment
Sparkhouse, Ropewalk, Lincoln, LN6 7DQ
01522 849555
www.hughes-craven.co.uk

PROJECT
NORTH EAST CHELMSFORD
GARDEN VILLAGE
MINERAL RESOURCE ASSESSMENT

TITLE
AREA C

DATE	STATUS
19/07/2018	FINAL

SCALE	SHEET	DRAWING NO.	REV
1:5,000	A3	0742-1-14	-

deltasimons
Environment - Health & Safety - Sustainability
Head Office
3 Henley Way, Doddington Road
Lincoln, LN6 3QR
Tel: +44 (0) 1522 882555
Email: info@deltasimons.com

Project No: 10-3046.10 | Hole ID: BH1 | Page: 1 of 4

Project: North Chelmsford

Cable Percussive Borehole Log

Date: 02/05/2017 | Client: Ptarmigan Land

Description of Strata	Legend	Strata Depth (m bgl)	Strata Thickness (m)	Reduced Level (mAOD)	Casing Diameter (mm)	Water	Sample Details: Depth (m)	Sample Details: Type	Sample Details: Ref	Test Details: Depth (m)	Test Details: Results	Backfill
TOPSOIL: Grass over brown slightly sandy, slightly gravelly clay. Gravel is angular to subangular fine to coarse of flint.			(0.60)									
		0.60										
Stiff brownish grey, slightly gravelly CLAY. Gravel is subangular to rounded fine to coarse of flint and chalk.			(7.20)				1.00	D	D			
							2.00	D	D			
							3.00	D	D			
							4.00	D	D			
							5.00	D	D			

Remarks:
1. Engineer verified logged in general accordance to BS 5930:2015. 2. Area CAT scanned prior to intrusive works. 3. Groundwater encountered at 17.50 m bgl. 4. Borehole backfilled upon completion.

Water Stike: Date	Water Stike: Time	Water Stike: Strike	Water Level: Duration	Water Level: Standing	Chiselling: Depth (m)	Chiselling: Time (h:m)
		17.50 m				

Coordinates:	Elevation (mAOD):	Drilled By:	Plant Used:	Logged:	Checked:	Approved:	Scale (m):
		SE Drilling	Dando 4000	RM	WC	SS	1:30

deltasimons
Environment - Health & Safety - Sustainability
Head Office
3 Henley Way, Doddington Road
Lincoln, LN6 3QR
Tel: +44 (0) 1522 882555
Email: info@deltasimons.com

Project No: 10-3046.10 | Hole ID: BH1 | Page: 2 of 4

Project: North Chelmsford

Cable Percussive Borehole Log

Date: 02/05/2017 | Client: Ptarmigan Land

Description of Strata	Legend	Strata Depth (m bgl)	Strata Thickness (m)	Reduced Level (mAOD)	Casing Diameter (mm)	Water	Sample Details: Depth (m)	Sample Details: Type	Sample Details: Ref	Test Details: Depth (m)	Test Details: Results	Backfill
Stiff brownish grey, slightly gravelly CLAY. Gravel is subangular to rounded fine to coarse of flint and chalk.							6.00	D	D			
							7.00	D	D			
		7.80										
Grey friable CLAY.			(0.30)				8.00	D	D			
		8.10										
Stiff grey gravelly CLAY. Gravel is subangular to rounded fine to coarse of flint and chalk.							9.00	D	D			
							10.00	D	D			
							11.00	D	D			

Remarks:
1. Engineer verified logged in general accordance to BS 5930:2015. 2. Area CAT scanned prior to intrusive works. 3. Groundwater encountered at 17.50 m bgl. 4. Borehole backfilled upon completion.

Water Stike: Date	Water Stike: Time	Water Stike: Strike	Water Level: Duration	Water Level: Standing	Chiselling: Depth (m)	Chiselling: Time (h:m)
		17.50 m				

Coordinates:	Elevation (mAOD):	Drilled By:	Plant Used:	Logged:	Checked:	Approved:	Scale (m):
		SE Drilling	Dando 4000	RM	WC	SS	1:30

deltasimons
Environment - Health & Safety - Sustainability
Head Office
3 Henley Way, Doddington Road
Lincoln, LN6 3QR
Tel: +44 (0) 1522 882555
Email: info@deltasimons.com

Project No: 10-3046.10 | Hole ID: BH1 | Page: 3 of 4

Project: North Chelmsford

Cable Percussive Borehole Log

Date: 02/05/2017 | Client: Ptarmigan Land

Description of Strata	Legend	Strata Depth (m bgl)	Strata Thickness (m)	Reduced Level (mAOD)	Casing Diameter (mm)	Water	Sample Details: Depth (m)	Sample Details: Type	Sample Details: Ref	Test Details: Depth (m)	Test Details: Results	Backfill
Stiff grey gravelly CLAY. Gravel is subangular to rounded fine to coarse of flint and chalk.			(8.20)				12.00	D	D			
							13.00	D	D			
							14.00	D	D			
							15.00	D	D			
							16.00	D	D			
		16.30										
Brown slightly clayey, very sandy GRAVEL. Gravel is subangular to subrounded fline to coarse of flint.							17.00	D	D			

Remarks:
1. Engineer verified logged in general accordance to BS 5930:2015. 2. Area CAT scanned prior to intrusive works. 3. Groundwater encountered at 17.50 m bgl. 4. Borehole backfilled upon completion.

Water Stike: Date	Time	Strike	Water Level: Duration	Standing	Chiselling: Depth (m)	Time (h:m)
		17.50 m				

Coordinates:	Elevation (mAOD):	Drilled By:	Plant Used:	Logged:	Checked:	Approved:	Scale (m):
		SE Drilling	Dando 4000	RM	WC	SS	1:30

deltasimons
Environment - Health & Safety - Sustainability
Head Office
3 Henley Way, Doddington Road
Lincoln, LN6 3QR
Tel: +44 (0) 1522 882555
Email: info@deltasimons.com

Project No: 10-3046.10 | Hole ID: BH1 | Page: 4 of 4

Project: North Chelmsford

Cable Percussive Borehole Log

Date: 02/05/2017 | Client: Ptarmigan Land

Description of Strata	Legend	Strata Depth (m bgl)	Strata Thickness (m)	Reduced Level (mAOD)	Casing Diameter (mm)	Water	Sample Details: Depth (m)	Sample Details: Type	Sample Details: Ref	Test Details: Depth (m)	Test Details: Results	Backfill
Brown slightly clayey, very sandy GRAVEL. Gravel is subangular to subrounded fline to coarse of flint.			(2.60)			17.50	18.00	D	D			
		18.90										
Very stiff greyish brown weathered CLAY. (LONDON CLAY)			(1.10)				19.00	D	D			
		20.00					20.00	D	D			
Borehole complete at 20.00 m bgl.												

Remarks:
1. Engineer verified logged in general accordance to BS 5930:2015. 2. Area CAT scanned prior to intrusive works. 3. Groundwater encountered at 17.50 m bgl. 4. Borehole backfilled upon completion.

Water Stike: Date	Time	Strike	Water Level: Duration	Standing	Chiselling: Depth (m)	Time (h:m)
		17.50 m				

Coordinates:	Elevation (mAOD):	Drilled By:	Plant Used:	Logged:	Checked:	Approved:	Scale (m):
		SE Drilling	Dando 4000	RM	WC	SS	1:30

PARK FARM, BOREHAM

SCHEDULE OF BOREHOLES CARRIED OUT BY PIONEER AGGREGATES (U.K.) LIMITED WITH A POWER AUGER RIG

B/H 1

G.L.	-	0.20	Topsoil
0.20	-	1.50	Red brown clay and stones
1.50	-	2.30	Sandy clay and gravel
2.30	-	6.30	Sand and gravel
6.30	-	8.60	Brown and dark grey clay

(wet at 5.60 m)

B/H 2

G.L.	-	0.20	Topsoil
0.20	-	1.30	Sandy clay and gravel
1.30	-	4.30	Sand and gravel
4.30	-	5.60	Brown clay
5.60	-	7.10	Dark grey clay

(wet at 4.20 m)

B/H 3

G.L.	-	0.20	Topsoil
0.20	-	1.50	Red brown clay and stones
1.50	-	3.00	Red brown clay and stones and chalk
3.00	-	9.50	Sand and gravel
9.50	-	11.00	Brown and dark grey clay

(wet at 7.10 m)

B/H 4

G.L.	-	0.20	Topsoil
0.20	-	2.40	Red brown clay and gravel
2.40	-	3.00	Red brown clay gravel and chalk
3.00	-	4.20	Sandy clay and gravel
4.20	-	8.30	Sand and gravel
8.30	-	10.10	Brown and dark grey clay

(no water)

B/H 5

G.L.	-	0.20	Topsoil
0.20	-	1.50	Red brown clay and stones
1.50	-	6.00	Red brown clay and stones, chalk
6.00	-	10.10	Dark grey clay with chalk and stones
10.10	-	11.60	Dark grey clay

B/H 6

G.L.	-	0.20	Topsoil
0.20	-	7.10	Red brown clay and chalk and stones
7.10	-	14.60	Sand and gravel
14.60	-	15.50	Brown and dark grey clay

(wet at 12.00 m)

B/H 7

G.L.	-	0.20	Topsoil
0.20.	-	1.00	Dark brown clay
1.00	-	1.50	Green clay and stones
1.50	-	3.00	Green clay with chalk and stones
3.00	-	7.10	Sand and gravel
7.10	-	8.60	Sandy clay and gravel
8.60	-	10.30	Sand and gravel
10.30	-	11.60	Dark grey clay

(wet at 8.60 m)

B/H 8

G.L.	-	0.20	Topsoil
0.20	-	1.50	Red brown clay and stones
1.50	-	4.50	Green clay with chalk and stones
4.50	-	5.30	Dark grey clay and chalk
5.30	-	8.50	Sandy clay and stones
8.50	-	9.50	Brown and dark grey clay

(wet at 5.30 m)

B/H 9

G.L.	-	0.20	Topsoil
0.20	-	3.00	Red brown clay and stones
3.00	-	10.40	Sand and gravel
10.40	-	11.60	Brown and dark grey clay

(wet at 7.60 m)

B/H 10

G.L.	-	0.20	Topsoil
0.20	-	5.60	Red brown clay with stones and chalk
5.60	-	7.10	Sandy clay and gravel
7.10	-	12.50	Sand and gravel
12.50	-	13.50	Brown and dark grey clay

(wet at 10.00 m)

B/H 11

G.L.	-	0.20	Topsoil
0.20	-	7.10	Red brown clay and stones and chalk
7.10	-	13.00	Sand and gravel

(wet at 11.00 m)

B/H 12

G.L.	- 0.20	Topsoil
0.20	- 5.60	Brown clay with chalk and stones
5.60	- 7.10	Sandy clay and gravel
7.10	- 11.00	Sand and gravel
11.00	- 11.60	Brown and dark grey clay

(wet at 10.00 m)

B/H 13

G.L.	- 0.20	Topsoil
0.20	- 8.80	Sand and gravel
8.80	- 10.10	Brown and dark grey clay

(wet at 5.50 m)

B/H 14
Not drilled

B/H 15

G.L.	- 0.20	Topsoil
0.20	- 1.50	Red brown clay and stones
1.50	- 4.50	Red brown clay stones and chalk
4.50	- 7.10	Brown clay
7.10	- 8.60	Dark grey clay

B/H 16

G.L.	- 0.20	Topsoil
0.20	- 3.00	Red brown clay with chalk and stones
3.00	- 4.50	Sand and gravel
4.50	- 9.60	Sandy clay and gravel
9.60	- 10.50	Brown and dark grey clay

(wet at 9.60 m)

B/H 17

G.L.	- 0.20	Topsoil
0.20	- 1.50	Red brown clay
1.50	- 4.50	Red brown clay with stones and chalk
4.50	- 5.60	Sand and gravel
5.60	- 10.50	Sandy clay and gravel
10.50	- 11.60	Dark grey clay

(wet at 10.00 m)

B/H 18

G.L.	- 0.20	Topsoil
0.20	- 1.50	Red brown clay and stones
1.50	- 3.00	Sandy clay and gravel
3.00	- 9.50	Sand and gravel
9.50	- 10.50	Brown and dark grey clay

(wet at 9.00 m)

B/H 19

G.L.	- 0.20	Topsoil
0.20	- 1.50	Red brown clay and stones
1.50	- 5.00	Red brown clay, stones and chalk
5.00	- 10.10	Sandy clay and gravel
10.10	- 10.40	Sand and gravel
10.40	- 11.60	Brown and dark grey clay

(wet at 10.10 m)

B/H 20

G.L.	- 0.20	Topsoil
0.20	- 1.50	Red brown clay and stones
1.50	- 7.10	Red brown clay, stones and chalk
7.10	- 11.50	Sand and gravel
11.50	- 12.50	Brown and dark grey clay

(wet at 7.00 m)

B/H 21

G.L.	- 0.20	Topsoil
0.20	- 7.10	Red brown clay and stones
7.10	- 8.60	Sandy clay and gravel
8.60	- 13.10	Sand and gravel
13.10	- 14.60	Brown and dark grey clay

(wet at 8.6 m)

DKS/YW/8668
17.2.87

BOREHOLE LOGS OF RMC LIMITED OBTAINED FROM PLAN PROVIDED TO PIONEER AGGREGATES (UK) LIMITED

Borehole No.	Thickness of Overburden (metres)	Thickness of Sand & Gravel (metres)
1/86	3.0	6.0
2/86	6.0	4.0
3/86	7.0	4.5
4/86	11.5	3.5
5/86	1.0	7.5
6/86	2.5	10.4
7/86	3.0	7.5
8/86	2.0	8.0
9/86	2.5	7.5
10/86	4.0	3.5
11/86	6.0	2.0
12/86	Barren	
13/86	6.0	1.5
14/86	5.0	2.5
15/86	0.3	2.2
16/86	2.5	5.5
17/86	5.0	6.0
18/86	2.5	8.0
19/86	5.5	6.5
20/86	6.5	4.0
21/86	7.0	6.0

DKS/YW/8668
16.2.87

TL 71 SW 40 7250 1150 nr. Belsteads

Surface level (+ 55.5 m) + 182 ft
Water not struck
Shell and auger, 6 inch diam.,
January/February 1969

Overburden (6.8 m) 22.5 ft;
Mineral (7.8 m) 25.5 ft;
Bedrock (0.8 m +) 2.5 ft +

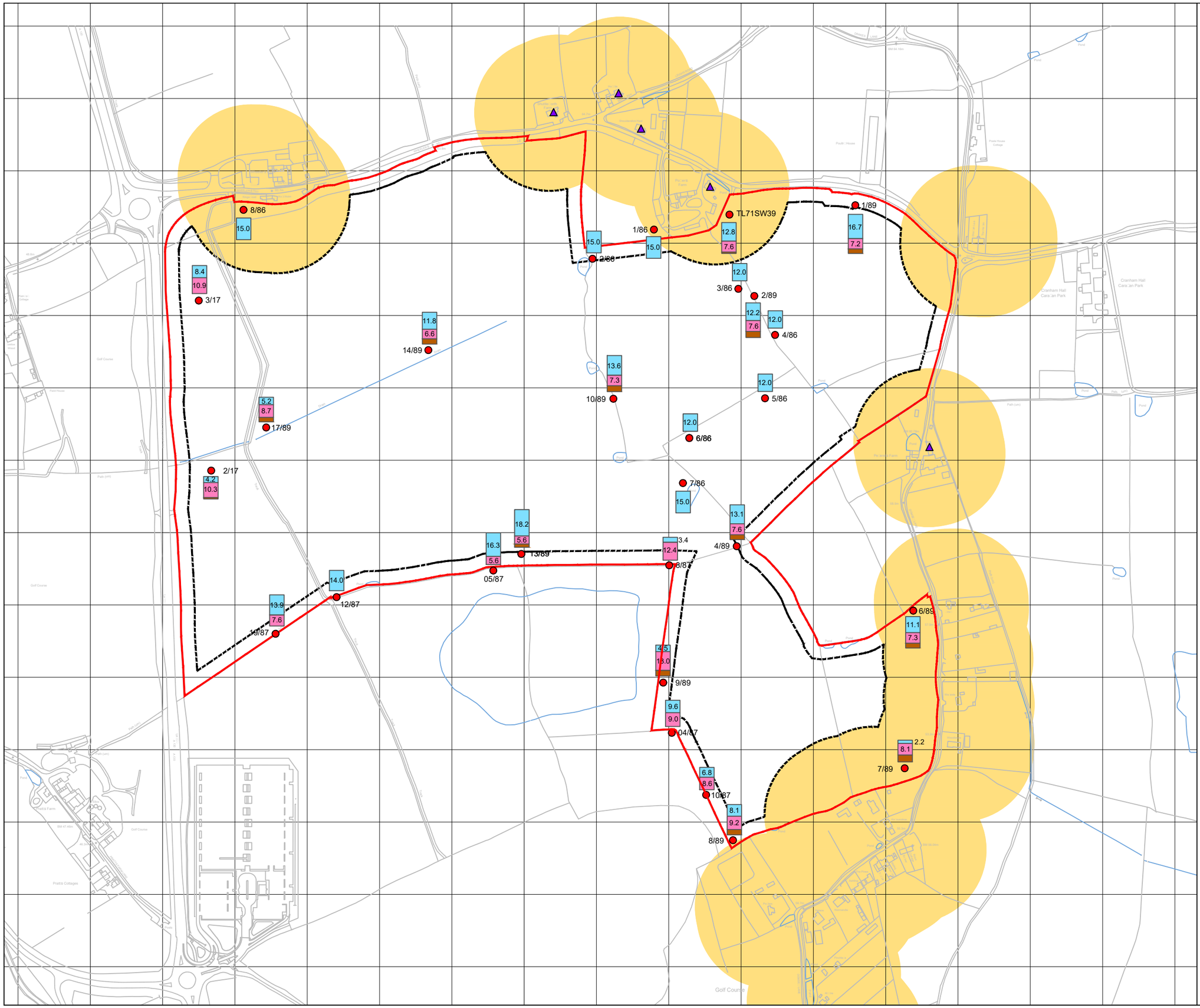
		Thickness (m)	Thickness ft	Depth (m)	Depth ft
Soil		(0.2)	0.5	(0.2)	0.5
Boulder Clay	Brown. Chalky from 0.5 to 15.5 feet. No pebbles recorded below 15.5 feet	(6.6)	22	(6.8)	22.5
Glacial Sand and Gravel	Gravel	(7.8)	25.5	(14.6)	48
London Clay	Brown	(0.8 +)	2.5 +	(15.4)	50.5

	%	mm	%
Gravel	54	+ 64	0
		– 64 + 16	26
		– 16 + 4	28
Sand	45	– 4 + 1	13
		– 1 + ¼	26
		– ¼ + 1/16	6
Fines	1	– 1/16	1

Depth below surface (ft)	Percentage Fines	Sand	Gravel
22.5 – 25	2	48	50
25 – 28	2	39	59
28 – 31	2	48	50
31 – 34	2	41	57
34 – 37	1	47	52
37 – 40	1	43	56
40 – 43	grading not available		
43 – 46	0	53	47
46 – 48	1	36	63

APPENDIX 4

AREA D – GEOLOGY



KEY:

- AREA D (POWERS FARM) BOUNDARY
- POTENTIAL EXTRACTION AREA
- 100m RESIDENTIAL STAND-OFF
- LISTED BUILDING

GEOLOGY

- 1/89 BOREHOLE
- LOWESTOFT FORMATION (overburden)
- GLACIOFLUVIAL DEPOSITS (mineral)
- LONDON CLAY

NOTES

1. Potentially workable areas shown inlcude 100m stand-off to the facade of residential properties and 20m to all other boundaries. No additional stand-off from listed buildings applied.
2. All locations and boundaries are indicative only.

HUGHES CRAVEN
Minerals | Planning | Geology | Environment
Sparkhouse, Ropewalk, Lincoln, LN6 7DQ
01522 849555
www.hughes-craven.co.uk

PROJECT
NORTH EAST CHELMSFORD
GARDEN VILLAGE
MINERAL RESOURCE ASSESSMENT

TITLE
AREA D (POWERS FARM)

DATE	STATUS
19/07/2018	FINAL

SCALE	SHEET	DRAWING NO.	REV
1:5,000	A3	0742-1-15	-

TL 71 SW 39 7247 1274 nr. Power's Farm

Surface level (+ 62.2 m) + 204 ft
Water not struck
Wirth B O, 8 inch diam.,
November 1968

Overburden (12.8 m) 42 ft;
Mineral (7.6 m) 25 ft;
Bedrock (0.9 m +) 3 ft +

		Thickness (m)	Thickness ft	Depth (m)	Depth ft
Soil		(0.3)	1	(0.3)	1
Boulder Clay	Brown from 1 to 18 feet, otherwise grey. Very chalky	(12.5)	41	(12.8)	42
Glacial Sand and Gravel	Gravel	(7.6)	25	(20.4)	67
London Clay	Brown from 67 to 68 feet, otherwise blue/grey	(0.9 +)	3 +	(21.3)	70

	%	mm	%
Gravel	49	+ 64	0
		– 64 + 16	20
		– 16 + 4	29
Sand	49	– 4 + 1	19
		– 1 + ¼	26
		– ¼ + 1/16	4
Fines	2	– 1/16	2

Depth below surface (ft)	Percentage Fines	Sand	Gravel
42 – 46	1	47	52
46 – 49	13	42	45
49 – 52	1	81	18
52 – 55	grading not available		
55 – 58	1	49	50
58 – 61	0	53	47
61 – 64	0	43	57
64 – 67	0	29	71

REF: 89042
DATE: May 1989
RIG: Shell & Auger
DIAM: 150 mm

BOREHOLE LOG

No. 1 (Sheet 1 of 2)

LOCATION: POWERS FARM
GROUND LEVEL:

DESCRIPTION OF STRATA	CHANGE OF STRATA LEGEND	DEPTH (m)	REDUCED LEVEL	SAMPLES REF:	DEPTH (m)	TYPE	WATER LEVEL Struck (m)	Standing (m)	S.P.T. C.P.T N-VALU
TOPSOIL			0.3						
Soft grey silty CLAY		1.0		1	1.0	B			
		2.0		2	2.0	B			
			2.8	3	3.0	B			
Firm brown boulder CLAY		3.0							
		4.0		4	4.0	B			
		5.0		5	5.0	B			
		6.0	6.3	6	6.0	B			
Firm blue boulder CLAY		7.0		7	7.0	B			
		8.0		8	8.0	B			
		9.0		9	9.0	B			
		10.0		10	10.0	B			
		11.0		11	11.0	B			
		12.0		12	12.0	B			
		13.0		13	13.0	B			
		14.0		14	14.0	B			
		15.0		15	15.0	B			
		16.0		16	16.0	B			
			16.7						
SAND & GRAVEL		17.0		17	17.0	B			
		18.0		18	18.0	B			
		19.0		19	19.0	B			
		20.0		20	20.0	B			

D. K. SYMES ASSOCIATES
Mineral Planning & Development Consultants
44 NORTH BAR, BANBURY, OXON OX16 0TH 0295 - 61542/3

REF: 89042
DATE: May 1989
RIG: Shell & Auger
DIAM: 150 mm

BOREHOLE LOG

No. 1 (Sheet 2 of 2)

LOCATION: POWERS FARM
GROUND LEVEL:

DESCRIPTION OF STRATA	CHANGE OF STRATA			SAMPLES			WATER LEVEL		S.P.T C.P.T N-VAL
	LEGEND	DEPTH (m)	REDUCED LEVEL	REF:	DEPTH (m)	TYPE	Struck (m)	Standing (m)	
SAND & GRAVEL		21.0		21	21.0	B			
		22.0		22	22.0	B	22.10		
		23.0		23	23.0	B			
		24.0	23.9						
Firm brown CLAY		25.0							
		26.0	25.6						
Firm blue CLAY									
		27.0	27.0	24	27.0	B			

D. K. SYMES ASSOCIATES
Mineral Planning & Development Consultants

44 NORTH BAR, BANBURY, OXON OX16 0TH 0295 - 61542/3

REF: 89042
DATE: May 1989
RIG: Shell & Auger
DIAM: 150 mm

BOREHOLE LOG

No. 2 (Sheet 1 of 2)

LOCATION: POWERS FARM
GROUND LEVEL:

DESCRIPTION OF STRATA	CHANGE OF STRATA			SAMPLES			WATER LEVEL		S.P.T. C.P.T. N-VALV
	LEGEND	DEPTH (m)	REDUCED LEVEL	REF:	DEPTH (m)	TYPE	Struck (m)	Standing (m)	
TOPSOIL			0.3						
		1.0		1	1.0	B			
Firm brown boulder CLAY		2.0		2	2.0	B			
		3.0		3	3.0	B			
		4.0		4	4.0	B			
		5.0		5	5.0	B			
		6.0	6.2	6	6.0	B	6.2		
GRAVEL			6.6						
		7.0		7	7.0	B			
		8.0		8	8.0	B			
Firm blue boulder CLAY		9.0		9	9.0	B			
		10.0		10	10.0	B			
		11.0		11	11.0	B			
		12.0	12.2	12	12.0	B			
		13.0		13	13.0	B			
		14.0		14	14.0	B			
		15.0		15	15.0	B			
SAND & GRAVEL		16.0		16	16.0	B			
		17.0		17	17.0	B			
		18.0		18	18.0	B	17.6		
		19.0		19	19.0	B			
CLAY		20.0	19.8						

D. K. SYMES ASSOCIATES
Mineral Planning & Development Consultants

44 NORTH BAR, BANBURY, OXON OX16 0TH 0295 - 61542/3

REF: 89042
DATE: May 1989
RIG: Shell & Auger
DIAM: 150 mm

BOREHOLE LOG

No. 2 (Sheet 2 of 2)

LOCATION:
POWERS FARM
GROUND LEVEL:

DESCRIPTION OF STRATA	CHANGE OF STRATA			SAMPLES			WATER LEVEL		S.P.T. C.P.T. N-VALV
	LEGEND	DEPTH (m)	REDUCED LEVEL	REF:	DEPTH (m)	TYPE	Struck (m)	Standing (m)	
Firm brown laminated CLAY		21.0	21.9						
		22.0							
Firm blue laminated CLAY		23.0							
		24.0	24.0	20	24.0	B			

D. K. SYMES ASSOCIATES
Mineral Planning & Development Consultants
44 NORTH BAR, BANBURY, OXON OX16 0TH 0295 - 61542/3

REF: 89042
DATE: May 1989
RIG: Shell & Auger
DIAM: 150 mm

BOREHOLE LOG

No. 4 (Sheet 1 of 2)

LOCATION:
POWERS FARM
GROUND LEVEL:

DESCRIPTION OF STRATA	CHANGE OF STRATA			SAMPLES			WATER LEVEL		S.P.T C.P.T N-VAL
	LEGEND	DEPTH (m)	REDUCED LEVEL	REF:	DEPTH (m)	TYPE	Struck (m)	Standing (m)	
TOPSOIL			0.3						
Firm brown boulder CLAY		1.0		1	1.0	B			
		2.0		2	2.0	B			
		3.0	3.1	3	3.0	B	3.1		
GRAVEL		4.0	3.9	4	4.0	B			
Firm brown boulder CLAY		5.0		5	5.0	B			
		6.0	6.1	6	6.0	B			
Firm blue boulder CLAY		7.0		7	7.0	B			
		8.0		8	8.0	B			
		9.0		9	9.0	B			
		10.0		10	10.0	B			
		11.0		11	11.0	B			
		12.0		12	12.0	B			
		13.0	13.1	13	13.0	B			
SAND & GRAVEL		14.0		14	14.0	B			
		15.0		15	15.0	B			
		16.0		16	16.0	B			
		17.0		17	17.0	B			
		18.0		18	18.0	B	18.1		
		19.0		19	19.0	B			
		20.0		20	20.0	B			

D. K. SYMES ASSOCIATES
Mineral Planning & Development Consultants
44 NORTH BAR, BANBURY, OXON OX16 0TH 0295 - 61542/3

REF: 89042
DATE: May 1989
RIG: Shell & Auger
DIAM: 150 mm

BOREHOLE LOG

No. 4 (Sheet 2 of 2)

LOCATION:
POWERS FARM
GROUND LEVEL:

DESCRIPTION OF STRATA	CHANGE OF STRATA			SAMPLES			WATER LEVEL		S.P.T. C.P.T. N-VALVI
	LEGEND	DEPTH (m)	REDUCED LEVEL	REF:	DEPTH (m)	TYPE	Struck (m)	Standing (m)	
SAND & GRAVEL		21.0	20.7						
Firm brown CLAY		22.0	22.3						
Firm blue CLAY		23.0							
		24.0	24.0	21	24.0	B			

D. K. SYMES ASSOCIATES
Mineral Planning & Development Consultants
44 NORTH BAR, BANBURY, OXON OX16 0TH 0295 - 61542/3

REF: 89042
DATE: May 1989
RIG: Shell & Auger
DIAM: 150 mm

BOREHOLE LOG

No. 6 (Sheet 1 of 2)

LOCATION:
POWERS FARM
GROUND LEVEL:

DESCRIPTION OF STRATA	CHANGE OF STRATA			SAMPLES			WATER LEVEL		S.P.T C.P.T N-VAL
	LEGEND	DEPTH (m)	REDUCED LEVEL	REF:	DEPTH (m)	TYPE	Struck (m)	Standing (m)	
TOPSOIL			0.3						
Firm brown boulder CLAY		1.0		1	1.0	B			
		2.0	2.3	2	2.0	B			
GRAVEL			2.6						
Firm brown boulder CLAY		3.0		3	3.0	B			
		4.0		4	4.0	B			
		5.0		5	5.0	B			
		6.0	6.1	6	6.0	B			
Firm blue boulder CLAY		7.0		7	7.0	B			
		8.0		8	8.0	B			
		9.0		9	9.0	B			
		10.0		10	10.0	B			
		11.0	11.1	11	11.0	B			
SAND & GRAVEL		12.0		12	12.0	B			
		13.0		13	13.0	B			
		14.0		14	14.0	B			
		15.0		15	15.0	B			
		16.0		16	16.0	B			
		17.0		17	17.0	B	16.9		
		18.0	18.4	18	18.0	B			
Firm brown laminated CLAY		19.0							
CLAY		20.0	19.9						

D. K. SYMES ASSOCIATES
Mineral Planning & Development Consultants
44 NORTH BAR, BANBURY, OXON OX16 0TH 0295 - 61542/3

REF: 89042
DATE: May 1989
RIG: Shell & Auger
DIAM: 150 mm

BOREHOLE LOG

No. 6 (Sheet 2 of 2)

LOCATION: POWERS FARM
GROUND LEVEL:

DESCRIPTION OF STRATA	CHANGE OF STRATA			SAMPLES			WATER LEVEL		S.P.T. C.P.T. N-VALVE
	LEGEND	DEPTH (m)	REDUCED LEVEL	REF:	DEPTH (m)	TYPE	Struck (m)	Standing (m)	
Firm blue laminated CLAY		21.0							
		22.0	22.0	19	22.0	B			

D. K. SYMES ASSOCIATES
Mineral Planning & Development Consultants

44 NORTH BAR, BANBURY, OXON OX16 0TH 0295 - 61542/3

REF: 89042
DATE: May 1989
RIG: Shell & Auger
DIAM: 150 mm

BOREHOLE LOG

No. 7

LOCATION: POWERS FARM
GROUND LEVEL:

DESCRIPTION OF STRATA	CHANGE OF STRATA			SAMPLES			WATER LEVEL		S.P.T. C.P.T. N-VALV
	LEGEND	DEPTH (m)	REDUCED LEVEL	REF:	DEPTH (m)	TYPE	Struck (m)	Standing (m)	
TOPSOIL			0.3						
Firm brown boulder CLAY		1.0		1	1.0	B			
		2.0	2.2	2	2.0	B			
SAND & GRAVEL		3.0		3	3.0	B			
		4.0		4	4.0	B			
		5.0		5	5.0	B			
		6.0		6	6.0	B			
		7.0		7	7.0	B			
		8.0		8	8.0	B	8.0		
		9.0		9	9.0	B			
		10.0		10	10.0	B			
Firm brown laminated CLAY		11.0	10.3						
		12.0							
		13.0	13.1						
Firm blue laminated CLAY		14.0							
		15.0	15.0	11	15.0	B			

D. K. SYMES ASSOCIATES
Mineral Planning & Development Consultants

44 NORTH BAR, BANBURY, OXON OX16 0TH 0295 - 61542/3

REF: 89042
DATE: May 1989
RIG: Shell & Auger
DIAM: 150 mm

BOREHOLE LOG

No. 8 (Sheet 1 of 2)

LOCATION: POWERS FARM
GROUND LEVEL:

DESCRIPTION OF STRATA	CHANGE OF STRATA			SAMPLES			WATER LEVEL		S.P.T / C.P.T / N-VAL
	LEGEND	DEPTH (m)	REDUCED LEVEL	REF:	DEPTH (m)	TYPE	Struck (m)	Standing (m)	
TOPSOIL			0.3						
Firm brown boulder CLAY		1.0		1	1.0	B			
		2.0		2	2.0	B			
		3.0		3	3.0	B			
		4.0		4	4.0	B			
		5.0		5	5.0	B			
		6.0		6	6.0	B			
		7.0		7	7.0	B			
		8.0	8.1	8	8.0	B			
SAND & GRAVEL		9.0		9	9.0	B			
		10.0		10	10.0	B			
		11.0		11	11.0	B			
		12.0		12	12.0	B			
		13.0		13	13.0	B			
		14.0		14	14.0	B			
		15.0		15	15.0	B			
		16.0		16	16.0	B	15.8		
		17.0	17.3	17	17.0	B			
		18.0		18	18.0	B			
Firm brown CLAY		19.0	18.9						
Firm blue CLAY		20.0							

D. K. SYMES ASSOCIATES
Mineral Planning & Development Consultants

44 NORTH BAR, BANBURY, OXON OX16 0TH 0295 - 61542/3

REF: 89042
DATE: May 1989
RIG: Shell & Auger
DIAM: 150 mm

BOREHOLE LOG

No. 8 (Sheet 2 of 2)

LOCATION: POWERS FARM
GROUND LEVEL:

DESCRIPTION OF STRATA	CHANGE OF STRATA			SAMPLES			WATER LEVEL		S.P.T. / C.P.T. / N-VALV
	LEGEND	DEPTH (m)	REDUCED LEVEL	REF:	DEPTH (m)	TYPE	Struck (m)	Standing (m)	
Firm blue CLAY		21.0	21.0	19	21.0	B			

D. K. SYMES ASSOCIATES
Mineral Planning & Development Consultants

44 NORTH BAR, BANBURY, OXON OX16 0TH 0295 - 61542/3

REF: 89042
DATE: May 1989
RIG: Shell & Auger
DIAM: 150 mm

BOREHOLE LOG

No. 9 (Sheet 1 of 2)

LOCATION: POWERS FARM
GROUND LEVEL:

DESCRIPTION OF STRATA	CHANGE OF STRATA			SAMPLES			WATER LEVEL		S.P.T. C.P.T. N-VALV
	LEGEND	DEPTH (m)	REDUCED LEVEL	REF:	DEPTH (m)	TYPE	Struck (m)	Standing (m)	
TOPSOIL			0.3						
Firm brown boulder CLAY		1.0		1	1.0	B			
		2.0		2	2.0	B			
			2.8				2.8		
SAND & GRAVEL		3.0		3	3.0	B			
		4.0		4	4.0	B			
		5.0	4.9	5	5.0	B			
Firm brown CLAY		6.0		6	6.0	B			
			6.6						
SAND & GRAVEL		7.0		7	7.0	B			
		8.0		8	8.0	B			
		9.0		9	9.0	B			
		10.0		10	10.0	B			
		11.0		11	11.0	B			
		12.0		12	12.0	B			
		13.0		13	13.0	B			
		14.0		14	14.0	B			
		15.0		15	15.0	B	15.1		
		16.0		16	16.0	B			
		17.0		17	17.0	B			
			17.5						
Firm brown CLAY		18.0							
		19.0	19.2						
Firm blue CLAY		20.0							

D. K. SYMES ASSOCIATES
Mineral Planning & Development Consultants
44 NORTH BAR, BANBURY, OXON OX16 0TH 0295 - 61542/3

REF: 89042
DATE: May 1989
RIG: Shell & Auger
DIAM: 150 mm

BOREHOLE LOG

No. 9 (Sheet 2 of 2)

LOCATION: POWERS FARM
GROUND LEVEL:

DESCRIPTION OF STRATA	CHANGE OF STRATA			SAMPLES			WATER LEVEL		S.P.T. C.P.T. N-VALV
	LEGEND	DEPTH (m)	REDUCED LEVEL	REF:	DEPTH (m)	TYPE	Struck (m)	Standing (m)	
Firm blue CLAY		21.0	21.0	18	21.0	B			

D. K. SYMES ASSOCIATES
Mineral Planning & Development Consultants
44 NORTH BAR, BANBURY, OXON OX16 0TH 0295 - 61542/3

REF: 89042
DATE: May 1989
RIG: Shell & Auger
DIAM: 150 mm

BOREHOLE LOG

No. 10 (Sheet 1 of 2)

LOCATION: POWERS FARM
GROUND LEVEL:

DESCRIPTION OF STRATA	CHANGE OF STRATA			SAMPLES			WATER LEVEL		S.P.T. C.P.T. N-VALV
	LEGEND	DEPTH (m)	REDUCED LEVEL	REF:	DEPTH (m)	TYPE	Struck (m)	Standing (m)	
TOPSOIL			0.3						
Firm brown boulder CLAY		1.0		1	1.0	B			
		2.0		2	2.0	B			
		3.0		3	3.0	B			
		4.0		4	4.0	B			
		5.0		5	5.0	B			
		6.0	6.3	6	6.0	B			
Firm blue boulder CLAY		7.0		7	7.0	B			
		8.0		8	8.0	B			
		9.0		9	9.0	B			
		10.0		10	10.0	B			
		11.0		11	11.0	B			
		12.0		12	12.0	B			
		13.0		13	13.0	B			
			13.6						
SAND & GRAVEL		14.0		14	14.0	B			
		15.0		15	15.0	B			
		16.0		16	16.0	B			
		17.0		17	17.0	B			
		18.0		18	18.0	B	18.3		
		19.0		19	19.0	B			
		20.0		20	20.0	B			

D. K. SYMES ASSOCIATES
Mineral Planning & Development Consultants
44 NORTH BAR, BANBURY, OXON OX16 0TH 0295 - 61542/3

REF: 89042
DATE: May 1989
RIG: Shell & Auger
DIAM: 150 mm

BOREHOLE LOG

No. 10 (Sheet 2 of 2)

LOCATION: POWERS FARM
GROUND LEVEL:

DESCRIPTION OF STRATA	CHANGE OF STRATA			SAMPLES			WATER LEVEL		S.P.T. C.P.T. N-VALVE
	LEGEND	DEPTH (m)	REDUCED LEVEL	REF:	DEPTH (m)	TYPE	Struck (m)	Standing (m)	
SAND & GRAVEL		21.0	20.9						
Firm brown CLAY		22.0							
		23.0	22.6						
Firm blue CLAY		24.0							
		25.0	25.0	21	25.0	B			

D. K. SYMES ASSOCIATES
Mineral Planning & Development Consultants
44 NORTH BAR, BANBURY, OXON OX16 0TH 0295 - 61542/3

REF: 89042
DATE: May 1989
RIG: Shell & Auger
DIAM: 150 mm

BOREHOLE LOG

No. 13 (Sheet 1 of 2)

LOCATION: POWERS FARM
GROUND LEVEL:

DESCRIPTION OF STRATA	CHANGE OF STRATA			SAMPLES			WATER LEVEL		S.P.T. C.P.T. N-VALVE
	LEGEND	DEPTH (m)	REDUCED LEVEL	REF:	DEPTH (m)	TYPE	Struck (m)	Standing (m)	
TOPSOIL			0.3						
		1.0		1	1.0	B			
		2.0		2	2.0	B			
Firm brown boulder CLAY		3.0		3	3.0	B			
		4.0		4	4.0	B			
		5.0		5	5.0	B			
		6.0		6	6.0	B			
		7.0	7.1	7	7.0	B			
		8.0		8	8.0	B			
Firm blue boulder CLAY		9.0		9	9.0	B			
		10.0		10	10.0	B			
		11.0		11	11.0	B			
		12.0		12	12.0	B			
		13.0		13	13.0	B			
		14.0		14	14.0	B			
		15.0		15	15.0	B			
		16.0	16.1	16	16.0	B			
Firm brown laminated CLAY		17.0		17	17.0	B			
		18.0	18.2	18	18.0	B			
SAND & GRAVEL		19.0		19	19.0	B			
		20.0		20	20.0	B	19.9		

D. K. SYMES ASSOCIATES
Mineral Planning & Development Consultants
44 NORTH BAR, BANBURY, OXON OX16 0TH 0295 - 61542/3

REF: 89042
DATE: May 1989
RIG: Shell & Auger
DIAM: 150 mm

BOREHOLE LOG

No. 13 (Sheet 2 of 2)

LOCATION: POWERS FARM
GROUND LEVEL:

DESCRIPTION OF STRATA	CHANGE OF STRATA			SAMPLES			WATER LEVEL		S.P.T. C.P.T. N-VALVE
	LEGEND	DEPTH (m)	REDUCED LEVEL	REF:	DEPTH (m)	TYPE	Struck (m)	Standing (m)	
		21.0		21	21.0	B			
SAND & GRAVEL		22.0		22	22.0	B			
		23.0		23	23.0	B			
		24.0	23.8						
Firm brown CLAY		25.0	24.5						
Firm blue CLAY		26.0	26.0	24	26.0	B			

D. K. SYMES ASSOCIATES
Mineral Planning & Development Consultants
44 NORTH BAR, BANBURY, OXON OX16 0TH 0295 - 61542/3

REF: 89042
DATE: May 1989
RIG: Shell & Auger
DIAM: 150 mm

BOREHOLE LOG

No. 14 (Sheet 1 of 2)

LOCATION: POWERS FARM
GROUND LEVEL:

DESCRIPTION OF STRATA	CHANGE OF STRATA			SAMPLES			WATER LEVEL		S.P.T. C.P.T. N-VALV
	LEGEND	DEPTH (m)	REDUCED LEVEL	REF:	DEPTH (m)	TYPE	Struck (m)	Standing (m)	
TOPSOIL			0.3						
Firm brown boulder CLAY		1.0		1	1.0	B			
		2.0		2	2.0	B			
		3.0		3	3.0	B			
		4.0		4	4.0	B			
		5.0		5	5.0	B			
		6.0		6	6.0	B			
		7.0	6.6	7	7.0	B			
Firm blue boulder CLAY		8.0		8	8.0	B			
		9.0		9	9.0	B			
		10.0		10	10.0	B			
		11.0		11	11.0	B			
		12.0	11.8	12	12.0	B			
SAND & GRAVEL		13.0		13	13.0	B			
		14.0		14	14.0	B			
		15.0		15	15.0	B			
		16.0		16	16.0	B	16.1		
		17.0		17	17.0	B			
		18.0		18	18.0	B			
Firm brown CLAY		19.0	18.4						
CLAY		20.0	19.9						

D. K. SYMES ASSOCIATES
Mineral Planning & Development Consultants

44 NORTH BAR, BANBURY, OXON OX16 0TH 0295 - 61542/3

REF: 89042
DATE: May 1989
RIG: Shell & Auger
DIAM: 150 mm

BOREHOLE LOG

No. 14 (Sheet 2 of 2)

LOCATION: POWERS FARM
GROUND LEVEL:

DESCRIPTION OF STRATA	CHANGE OF STRATA			SAMPLES			WATER LEVEL		S.P.T. C.P.T. N-VALVE
	LEGEND	DEPTH (m)	REDUCED LEVEL	REF:	DEPTH (m)	TYPE	Struck (m)	Standing (m)	
Firm blue CLAY		21.0							
		22.0	22.0	19	22.0	B			

D. K. SYMES ASSOCIATES
Mineral Planning & Development Consultants

44 NORTH BAR, BANBURY, OXON OX16 0TH 0295 - 61542/3

REF: 89042
DATE: May 1989
RIG: Shell & Auger
DIAM: 150 mm

BOREHOLE LOG

No. 17

LOCATION: POWERS FARM

GROUND LEVEL:

DESCRIPTION OF STRATA	CHANGE OF STRATA			SAMPLES			WATER LEVEL		S.P.T. C.P.T. N-VALVI
	LEGEND	DEPTH (m)	REDUCED LEVEL	REF:	DEPTH (m)	TYPE	Struck (m)	Standing (m)	
TOPSOIL			0.3				DRY		
Firm brown boulder CLAY		1.0		1	1.0	B			
		2.0		2	2.0	B			
		3.0		3	3.0	B			
		4.0		4	4.0	B			
		5.0	5.2	5	5.0	B			
SAND & GRAVEL		6.0		6	6.0	B			
		7.0		7	7.0	B			
		8.0		8	8.0	B			
		9.0		9	9.0	B			
		10.0		10	10.0	B			
		11.0		11	11.0	B			
		12.0		12	12.0	B			
		13.0		13	13.0	B			
		14.0	13.9						
Firm brown CLAY		15.0	15.4						
Firm blue CLAY		16.0							
		17.0	17.0	14	17.0	B			

D. K. SYMES ASSOCIATES
Mineral Planning & Development Consultants

44 NORTH BAR, BANBURY, OXON OX16 0TH

0295 - 61542/3

---

deltasimons
Environment - Health & Safety - Sustainability

Head Office
3 Henley Way, Doddington Road
Lincoln, LN6 3QR
Tel: +44 (0) 1522 882555
Email: info@deltasimons.com

Project No: 10-3046.10 | Hole ID: BH2 | Page: 1 of 3

Project: North Chelmsford

Cable Percussive Borehole Log

Date: 28/04/2017 | Client: Ptarmigan Land

Description of Strata	Legend	Strata Depth (m bgl)	Strata Thickness (m)	Reduced Level (mAOD)	Casing Diameter (mm)	Water	Sample Details: Depth (m)	Sample Details: Type	Sample Details: Ref	Test Details: Depth (m)	Test Details: Results	Backfill
TOPSOIL: Grass over brown slightly sandy, slightly gravelly clay. Gravel is angular to subangular fine to coarse of flint.		1.10	(1.10)				1.00	D	D			
Stiff brownish grey, slightly gravelly CLAY. Gravel is subangular to rounded fine to coarse of flint and chalk.		4.20	(3.10)				2.00	D	D			
							3.00	D	D			
							4.00	D	D			
Brown very sandy GRAVEL. Gravel is subangular to subrounded fine to coarse of flint.		4.50	(0.30)									
Multicoloured sandy GRAVEL. Gravel is angular to subrounded fine to coarse of flint.							5.00	D	D			

Remarks:
1. Engineer verified logged in general accordance to BS 5930:2015. 2. Area CAT scanned prior to intrusive works. 3. Groundwater encountered at 13.0 m bgl. 4. Borehole backfilled upon completion.

Water Stike			Water Level		Chiselling	
Date	Time	Strike	Duration	Standing	Depth (m)	Time (h:m)
		13.00 m				

Coordinates:	Elevation (mAOD):	Drilled By:	Plant Used:	Logged:	Checked:	Approved:	Scale (m):
		SE Drilling	Dando 4000	RM	WC	SS	1:30

deltasimons
Environment - Health & Safety - Sustainability
Head Office
3 Henley Way, Doddington Road
Lincoln, LN6 3QR
Tel: +44 (0) 1522 882555
Email: info@deltasimons.com

Project No: 10-3046.10 | Hole ID: BH2 | Page: 2 of 3

Project: North Chelmsford

Cable Percussive Borehole Log

Date: 28/04/2017 | Client: Ptarmigan Land

Description of Strata	Legend	Strata Depth (m bgl)	Strata Thickness (m)	Reduced Level (mAOD)	Casing Diameter (mm)	Water	Sample Details: Depth (m)	Sample Details: Type	Sample Details: Ref	Test Details: Depth (m)	Test Details: Results	Backfill
Multicoloured sandy GRAVEL. Gravel is angular to subrounded fine to coarse of flint.			(10.00)				6.00	D	D			
							7.00	D	D			
							8.00	D	D			
							9.00	D	D			
							10.00	D	D			
							11.00	D	D			

Remarks:
1. Engineer verified logged in general accordance to BS 5930:2015. 2. Area CAT scanned prior to intrusive works. 3. Groundwater encountered at 13.0 m bgl. 4. Borehole backfilled upon completion.

Water Stike: Date	Time	Strike	Water Level: Duration	Standing	Chiselling: Depth (m)	Time (h:m)
		13.00 m				

Coordinates:	Elevation (mAOD):	Drilled By:	Plant Used:	Logged:	Checked:	Approved:	Scale (m):
		SE Drilling	Dando 4000	RM	WC	SS	1:30

deltasimons
Environment - Health & Safety - Sustainability
Head Office
3 Henley Way, Doddington Road
Lincoln, LN6 3QR
Tel: +44 (0) 1522 882555
Email: info@deltasimons.com

Project No: 10-3046.10 | Hole ID: BH2 | Page: 3 of 3

Project: North Chelmsford

Cable Percussive Borehole Log

Date: 28/04/2017 | Client: Ptarmigan Land

Description of Strata	Legend	Strata Depth (m bgl)	Strata Thickness (m)	Reduced Level (mAOD)	Casing Diameter (mm)	Water	Sample Details: Depth (m)	Sample Details: Type	Sample Details: Ref	Test Details: Depth (m)	Test Details: Results	Backfill
Multicoloured sandy GRAVEL. Gravel is angular to subrounded fine to coarse of flint.		14.50				13.00	12.00	D	D			
							13.00	D	D			
							14.00	D	D			
Stiff greyish brown weathered CLAY. (LONDON CLAY)		15.50	(1.00)				15.00	D	D			
Borehole complete at 15.50 m bgl.												

Remarks:
1. Engineer verified logged in general accordance to BS 5930:2015. 2. Area CAT scanned prior to intrusive works. 3. Groundwater encountered at 13.0 m bgl. 4. Borehole backfilled upon completion.

Water Stike: Date	Time	Strike	Water Level: Duration	Standing	Chiselling: Depth (m)	Time (h:m)
		13.00 m				

Coordinates:	Elevation (mAOD):	Drilled By:	Plant Used:	Logged:	Checked:	Approved:	Scale (m):
		SE Drilling	Dando 4000	RM	WC	SS	1:30

deltasimons
Environment - Health & Safety - Sustainability
Head Office
3 Henley Way, Doddington Road
Lincoln, LN6 3QR
Tel: +44 (0) 1522 882555
Email: info@deltasimons.com

Project No: 10-3046.10 | Hole ID: BH3 | Page: 1 of 4

Project: North Chelmsford

Cable Percussive Borehole Log

Date: 27/04/2017 - 28/04/2017 | Client: Ptarmigan Land

Description of Strata	Legend	Strata Depth (m bgl)	Strata Thickness (m)	Reduced Level (mAOD)	Casing Diameter (mm)	Water	Sample Details: Depth (m)	Sample Details: Type	Sample Details: Ref	Test Details: Depth (m)	Test Details: Results	Backfill
TOPSOIL: Grass over brown slightly sandy, slightly gravelly clay. Gravel is angular to subangular fine to coarse of flint.		0.70	(0.70)									
Brown mottled orange gravelly CLAY. Gravel is subangular to subrounded fine to coarse of flint.		1.20	(0.50)				1.00	D	D			
Stiff brown slightly sandy slightly gravelly CLAY. Gravel is subrounded to rounded fine to medium chalk and occasional subangular fine to coarse flint.			(5.30)				2.00	D	D			
							3.00	D	D			
							4.00	D	D			
							5.00	D	D			

Remarks:
1. Engineer verified logged in general accordance to BS 5930:2015. 2. Area CAT scanned prior to intrusive works. 3. Groundwater encountered at 16.70 m bgl. 4. Borehole backfilled upon completion.

Water Stike: Date	Time	Strike	Water Level: Duration	Standing	Chiselling: Depth (m)	Time (h:m)
		16.70 m				

Coordinates:	Elevation (mAOD):	Drilled By:	Plant Used:	Logged:	Checked:	Approved:	Scale (m):
		SE Drilling	Dando 4000	RM	WC	SS	1:30

deltasimons
Environment - Health & Safety - Sustainability
Head Office
3 Henley Way, Doddington Road
Lincoln, LN6 3QR
Tel: +44 (0) 1522 882555
Email: info@deltasimons.com

Project No: 10-3046.10 | Hole ID: BH3 | Page: 2 of 4

Project: North Chelmsford

Cable Percussive Borehole Log

Date: 27/04/2017 - 28/04/2017 | Client: Ptarmigan Land

Description of Strata	Legend	Strata Depth (m bgl)	Strata Thickness (m)	Reduced Level (mAOD)	Casing Diameter (mm)	Water	Sample Details: Depth (m)	Sample Details: Type	Sample Details: Ref	Test Details: Depth (m)	Test Details: Results	Backfill
Stiff brown slightly sandy slightly gravelly CLAY. Gravel is subrounded to rounded fine to medium chalk and occasional subangular fine to coarse flint.		6.50					6.00	D	D			
Multicoloured sandy GRAVEL. Gravel is angular to subrounded fine to coarse of flint.			(3.30)				7.00	D	D			
							8.00	D	D			
							9.00	D	D			
Soft orangish brown sandy SILT with rare subangular fine to coarse flint.		9.80	(1.90)				10.00	D	D			
							11.00	D	D			

Remarks:
1. Engineer verified logged in general accordance to BS 5930:2015. 2. Area CAT scanned prior to intrusive works. 3. Groundwater encountered at 16.70 m bgl. 4. Borehole backfilled upon completion.

Water Stike: Date	Time	Strike	Water Level: Duration	Standing	Chiselling: Depth (m)	Time (h:m)
		16.70 m				

Coordinates:	Elevation (mAOD):	Drilled By:	Plant Used:	Logged:	Checked:	Approved:	Scale (m):
		SE Drilling	Dando 4000	RM	WC	SS	1:30

deltasimons
Environment - Health & Safety - Sustainability
Head Office
3 Henley Way, Doddington Road
Lincoln, LN6 3QR
Tel: +44 (0) 1522 882555
Email: info@deltasimons.com

Project No: 10-3046.10 | Hole ID: BH3 | Page: 3 of 4

Project: North Chelmsford

Cable Percussive Borehole Log

Date: 27/04/2017 - 28/04/2017 | Client: Ptarmigan Land

Description of Strata	Legend	Strata Depth (m bgl)	Strata Thickness (m)	Reduced Level (mAOD)	Casing Diameter (mm)	Water	Sample Details: Depth (m)	Sample Details: Type	Sample Details: Ref	Test Details: Depth (m)	Test Details: Results	Backfill
Soft orangish brown sandy SILT with rare subangular fine to coarse flint.		11.70										
Orangish brown silty, gravelly SAND. Gravel is angular to subrounded fine to coarse of flint.		12.50	(0.80)				12.00	D	D			
Multicoloured slightly sandy GRAVEL. Gravel is angular to rounded fine to coarse of flint.		16.70	(4.20)			16.70	13.00	D	D			
							14.00	D	D			
							15.00	D	D			
							16.00	D	D			
Multicoloured slightly sandy GRAVEL. Gravel is angular to rounded coarse of flint.							17.00	D	D			

Remarks:
1. Engineer verified logged in general accordance to BS 5930:2015. 2. Area CAT scanned prior to intrusive works. 3. Groundwater encountered at 16.70 m bgl. 4. Borehole backfilled upon completion.

Water Stike: Date	Time	Strike	Water Level: Duration	Standing	Chiselling: Depth (m)	Time (h:m)
		16.70 m				

Coordinates:	Elevation (mAOD):	Drilled By:	Plant Used:	Logged:	Checked:	Approved:	Scale (m):
		SE Drilling	Dando 4000	RM	WC	SS	1:30

deltasimons
Environment - Health & Safety - Sustainability
Head Office
3 Henley Way, Doddington Road
Lincoln, LN6 3QR
Tel: +44 (0) 1522 882555
Email: info@deltasimons.com

Project No: 10-3046.10 | Hole ID: BH3 | Page: 4 of 4

Project: North Chelmsford

Cable Percussive Borehole Log

Date: 27/04/2017 - 28/04/2017 | Client: Ptarmigan Land

Description of Strata	Legend	Strata Depth (m bgl)	Strata Thickness (m)	Reduced Level (mAOD)	Casing Diameter (mm)	Water	Sample Details: Depth (m)	Sample Details: Type	Sample Details: Ref	Test Details: Depth (m)	Test Details: Results	Backfill
Multicoloured slightly sandy GRAVEL. Gravel is angular to rounded coarse of flint.		19.30	(2.60)				18.00	D	D			
							19.00	D	D			
Very stiff brown weathered CLAY. (LONDON CLAY)		20.00	(0.70)									
Borehole complete at 20.00 m bgl.							20.00	D	D			

Remarks:
1. Engineer verified logged in general accordance to BS 5930:2015. 2. Area CAT scanned prior to intrusive works. 3. Groundwater encountered at 16.70 m bgl. 4. Borehole backfilled upon completion.

Water Stike: Date	Time	Strike	Water Level: Duration	Standing	Chiselling: Depth (m)	Time (h:m)
		16.70 m				

Coordinates:	Elevation (mAOD):	Drilled By:	Plant Used:	Logged:	Checked:	Approved:	Scale (m):
		SE Drilling	Dando 4000	RM	WC	SS	1:30

JAS

POWER AUGER LOG

POWERS FARM

DATE: June 86 ?

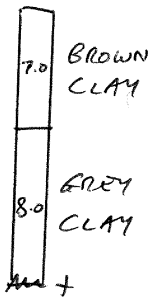
LOG BOOK REF: 09525

SITE: POWER'S FARM, LITTLE WALTHAM

BOREHOLE No. 1/86

O.D. LEVEL: _____ (m)

DESCRIPTION OF MATERIAL	FROM (m)	TO (m)	THICKNESS (m)	SAMPLES (m)
Top soil	0.0	0.3	0.3	
Brown clay and chalk	0.3	7.0	6.7	
Grey clay and chalk	7.0	15.0	8.0+	



WATER STRUCK @ Wet 8.0 Nil (m) TOTAL DEPTH DRILLED 15 (m)

REMARKS: Power auger

POWER AUGER LOG

DATE: _____

LOG BOOK REF: 09526

SITE: POWER'S FARM, LITTLE WALTHAM

BOREHOLE No. 2/86

O.D. LEVEL: _____ (m)

DESCRIPTION OF MATERIAL	FROM (m)	TO (m)	THICKNESS (m)	SAMPLES (m)
Top soil	0.0	0.3	0.3	
Brown clay and chalk	0.3	9.0	8.7	
Grey clay and chalk	9.0	15.0	6.0+	

9.0
6.0 +

WATER STRUCK @ NIL (m) TOTAL DEPTH DRILLED 15 (m)

REMARKS:

POWER AUGER LOG

DATE: _____ LOG BOOK REF: 09527

SITE: POWERS FARM, LITTLE WALTHAM

BOREHOLE No. 3/86

O.D. LEVEL: _____ (m)

DESCRIPTION OF MATERIAL	FROM (m)	TO (m)	THICKNESS (m)	SAMPLES (m)
Top soil	0.0	0.3	0.3	
Brown clay and chalk	0.3	8.0	7.7	
Grey clay and chalk	8.0	12.0	4.0+	

8.0
4.0 +

WATER STRUCK @ NIL (m) TOTAL DEPTH DRILLED 12 (m)

REMARKS:

© RMC Form No. 4198 (3/86)

POWER AUGER LOG

DATE: _____ LOG BOOK REF: 09528

SITE: ~~PARK~~ FARM, LITTLE WALTHAM

Powers

BOREHOLE No. 4/86

O.D. LEVEL: _____ (m)

DESCRIPTION OF MATERIAL	FROM (m)	TO (m)	THICKNESS (m)	SAMPLES (m)
Top soil	0.0	0.3	0.3	
Brown clay and chalk	0.3	7.0	6.7	
Grey clay and chalk	7.0	12.0	5.0+	

7.0
5.0 +

WATER STRUCK @ Nil (m) TOTAL DEPTH DRILLED 12 (m)

REMARKS:

© RMC Form No. 4198 (3/86)

POWER AUGER LOG

DATE: _____ LOG BOOK REF: 09529

SITE: ~~PARK~~ FARM, LITTLE WALTHAM
POWERS

BOREHOLE No. 5/86

O.D. LEVEL: _____ (m)

DESCRIPTION OF MATERIAL	FROM (m)	TO (m)	THICKNESS (m)	SAMPLES (m)
Top soil	0.0	0.3	0.3	
Brown clay and chalk	0.3	6.0	5.7	
Brown silty sandy clay and chalk	6.0	9.0	3.0	
Grey clay and chalk	9.0	12.0	3.0+	

6.0
3.0
3.0+

WATER STRUCK @ 7.0 (m) TOTAL DEPTH DRILLED 12.0 (m)

REMARKS:

POWER AUGER LOG

DATE: _____ LOG BOOK REF: 09530

SITE: POWER'S FARM, LITTLE WALTHAM

BOREHOLE No. 6/86

O.D. LEVEL: _____ (m)

DESCRIPTION OF MATERIAL	FROM (m)	TO (m)	THICKNESS (m)	SAMPLES (m)
Top soil	0.0	0.3	0.3	
Brown clay and chalk	0.3	8.0	7.7	
Grey clay and chalk	8.0	12.0	4.0+	

8.0
4.0+

WATER STRUCK @ Nil (m) TOTAL DEPTH DRILLED 12.0 (m)

REMARKS:

POWER AUGER LOG

DATE: _____ LOG BOOK REF: 09531

SITE: POWER'S FARM, LITTLE WALTHAM

BOREHOLE No. 7/86

O.D. LEVEL: _____ (m)

DESCRIPTION OF MATERIAL	FROM (m)	TO (m)	THICKNESS (m)	SAMPLES (m)
Top soil	0.0	0.3	0.3	
Brown clay and chalk.	0.3	8.0	7.7	
Grey clay and chalk	8.0	15.0	7.0+	

8.0
7.0+

WATER STRUCK @ NIL (m) TOTAL DEPTH DRILLED 15.0 (m)

REMARKS:

POWER AUGER LOG

DATE: _____ LOG BOOK REF: 09532

SITE: POWER'S FARM, LITTLE WALTHAM

BOREHOLE No. 8/86

O.D. LEVEL: _____ (m)

DESCRIPTION OF MATERIAL	FROM (m)	TO (m)	THICKNESS (m)	SAMPLES (m)
Top soil	0.0	0.3	0.3	
Brown clay and chalk	0.3	6.0	5.7	
Grey clay and chalk	6.0	15.0	9.0+	

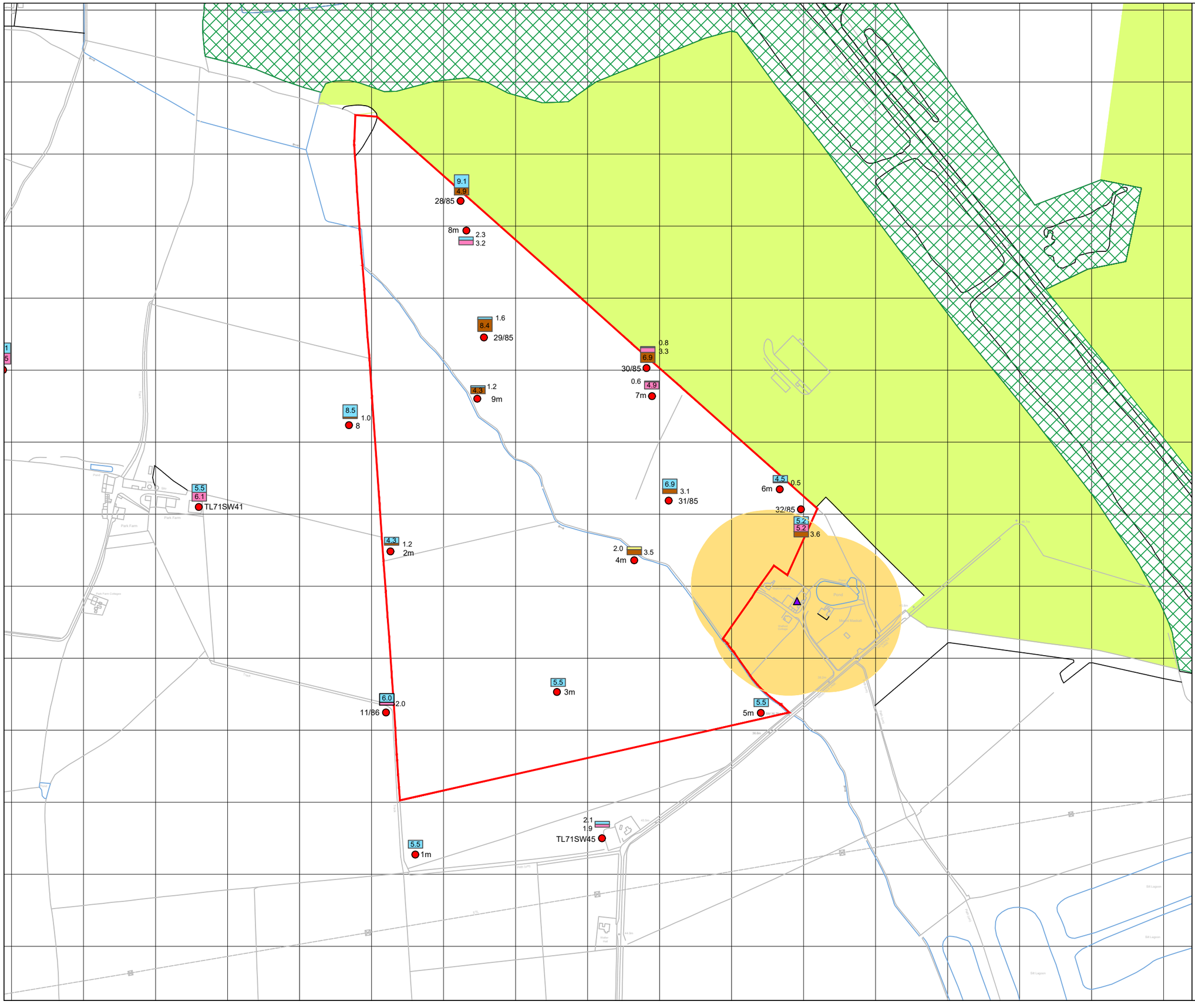
6.0
9.0+

WATER STRUCK @ Nil (m) TOTAL DEPTH DRILLED 15.0 (m)

REMARKS:

APPENDIX 5

AREA E – GEOLOGY



KEY:

- AREA E BOUNDARY
- 100m RESIDENTIAL STAND-OFF
- LISTED BUILDING

GEOLOGY

- 1/89 BOREHOLE
- ALLUVIUM
- LOWESTOFT FORMATION (overburden)
- GLACIOFLUVIAL DEPOSITS (mineral)
- LONDON CLAY
- PREVIOUSLY WORKED AND RESTORED LAND
- CURRENT MINERAL/IN RESTORATION

NOTES

1. Stand-offs from residential properties only shown where they intersect Area E.
2. All locations and boundaries are indicative only.

HUGHES CRAVEN
Minerals | Planning | Geology | Environment
Sparkhouse, Ropewalk, Lincoln, LN6 7DQ
01522 849555
www.hughes-craven.co.uk

PROJECT
NORTH EAST CHELMSFORD
GARDEN VILLAGE
MINERAL RESOURCE ASSESSMENT

TITLE
AREA E

DATE	STATUS
19/07/2018	FINAL

SCALE	SHEET	DRAWING NO.	REV
1:5,000	A3	0742-1-16	-

BOREHOLE No. 1m (Northern Area)

Location BULLS LODGE FARM, BOREHAM, ESSEX. Date 3.11.82

STRATA DESCRIPTION	STRATA CHANGE: Legend	Depth m.	Reduced Level m.	SAMPLES: No.	Depth m.	Type	S.P.T. 'N' Value	Water Level m.
TOPSOIL			0.2					
Soft light brown CLAY		0.5	0.6					
Firm light brown CLAY		1.0						
		1.5	1.5					
Firm light brown CLAY with chalk fragments		2.0						
		2.5						
		3.0						
		3.5						
		4.0						
		4.5						
		5.0						
		5.5	5.5					
		6.0						
		6.5						
		7.0						
		7.5						
		8.0						
		8.5						
		9.0						

BOREHOLE DIAMETER : 75 mm.
GROUND LEVEL :
SCALE OF LEGEND : 2 cm: 1 m.
WEATHER :
RIG : Rotary auger
REMARKS :

B - BULK SAMPLE
D - DISTURBED SAMPLE
U - UNDISTURBED SAMPLE
W - WATER SAMPLE
S.P.T. - STANDARD PENETRATION TEST
▽ - WATER STRUCK

Report No. 8232 | BOREHOLE LOG | Date. 26.11.82

BOREHOLE No. 2 m (northern area)

Location BULLS LODGE FARM, BOREHAM ESSEX. Date 3.11.82

STRATA DESCRIPTION	STRATA CHANGE: Legend	Depth m.	Reduced Level m.	SAMPLES: No.	Depth m.	Type	S.P.T. 'N' Value	Water Level m.
TOPSOIL			0.2					
Very wet black clayey subsoil		0.5	0.6					
Soft blue/grey CLAY with flints		1.0						
		1.5	1.5					
Very soft wet black/grey CLAY with flints (10 mm.)		2.0						
		2.5	2.5					
Firm brown CLAY with abundance of small chalk fragments		3.0						
		3.5	3.35					
Soft to firm grey CLAY with occasional chalk fragments		4.0						
		4.5	4.25					
Stiff blue/grey CLAY		5.0						
		5.5	5.5					
		6.0						
		6.5						
		7.0						
		7.5						
		8.0						
		8.5						
		9.0						

BOREHOLE DIAMETER : 75 mm.
GROUND LEVEL :
SCALE OF LEGEND : 2 cm: 1 m.
WEATHER :
RIG : Rotary auger
REMARKS :

B - BULK SAMPLE
D - DISTURBED SAMPLE
U - UNDISTURBED SAMPLE
W - WATER SAMPLE
S.P.T. - STANDARD PENETRATION TEST
▽ - WATER STRUCK

Report No. 8232 | BOREHOLE LOG | Date. 26.11.82

BOREHOLE No. 3m (Northern Area)

Location BULLS LODGE FARM, BOREHAM, ESSEX. Date 9.11.82

STRATA DESCRIPTION	STRATA CHANGE: Legend	Depth m.	Reduced Level m.	SAMPLES: No.	Depth m.	Type	S.P.T. 'N' Value	Water Level m.
Very flinty clayey TOPSOIL		0.0	0.2					
Soft light brown CLAY, occasional chalk and flints		0.5	0.6					
Firm light brown CLAY with occasional minute chalk fragments		1.0						
		1.5	1.5					
Stiff brown CLAY, with abundance of chalk and gravel fragments		2.0						
		2.5	2.5					
Stiff light brown silty sandy CLAY, abundance of chalk fragments and occasional flints, some cobbles		3.0						
		3.5						
		4.0						
		4.5						
		5.0						
		5.5	5.5					
		6.0						
		6.5						
		7.0						
		7.5						
		8.0						
		8.5						
		9.0						

BOREHOLE DIAMETER : 75 mm.
GROUND LEVEL :
SCALE OF LEGEND : 2 cm : 1m.
WEATHER :
RIG : Rotary Auger
REMARKS :

B - BULK SAMPLE
D - DISTURBED SAMPLE
U - UNDISTURBED SAMPLE
W - WATER SAMPLE
S.P.T. - STANDARD PENETRATION TEST
▽ - WATER STRUCK

Report No. 8232 | BOREHOLE LOG | Date. 26.11.82

BOREHOLE No. 4m (Northern Area)

Location BULLS LODGE FARM, BOREHAM, ESSEX. Date 9.11.82

STRATA DESCRIPTION	STRATA CHANGE: Legend	Depth m.	Reduced Level m.	SAMPLES: No.	Depth m.	Type	S.P.T. 'N' Value	Water Level m.
Brown clayey flinty TOPSOIL		0.0	0.2					
Soft brown CLAY		0.5						
		1.0	1.2					
Brown sandy gravelly CLAY		1.5						
		2.0	2.0					
Very stiff brown/blue streaky CLAY		2.5						
		3.0						
		3.5						
		4.0						
		4.5						
		5.0						
		5.5	5.5					
		6.0						
		6.5						
		7.0						
		7.5						
		8.0						
		8.5						
		9.0						

BOREHOLE DIAMETER : 75 mm.
GROUND LEVEL :
SCALE OF LEGEND : 2 cm: 1 m.
WEATHER :
RIG : Rotary auger
REMARKS :

B - BULK SAMPLE
D - DISTURBED SAMPLE
U - UNDISTURBED SAMPLE
W - WATER SAMPLE
S.P.T. - STANDARD PENETRATION TEST
▽ - WATER STRUCK

Report No. 8232 | BOREHOLE LOG | Date. 26.11.82

BOREHOLE No. 5 m (Northern Area)

Location BULLS LODGE FARM, BOREHAM, ESSEX. Date 9.11.82

STRATA DESCRIPTION	STRATA CHANGE Legend	Depth m.	Reduced Level m.	SAMPLES No.	Depth m.	Type	S.P.T. 'N' Value	Water Level m.
Brown clayey TOPSOIL, large flint		0.0	0.2					
Soft brown CLAY with occasional small chalk fragments		0.5						
		1.0						
		1.5	1.5					
Firm brown CLAY with occasional small chalk fragments		2.0					X	2.0
		2.5	2.5					
Very stiff wet brown CLAY with blue streaks		3.0						
		3.5	3.35					
Very stiff brown CLAY with gravel fragments		4.0						
		4.5						
		5.0						
		5.5	5.5					
		6.0						
		6.5						
		7.0						
		7.5						
		8.0						
		8.5						
		9.0						

BOREHOLE DIAMETER : 75 mm.
GROUND LEVEL :
SCALE OF LEGEND : 2 cm: 1 m.
WEATHER :
RIG : Rotary Auger
REMARKS :

B - BULK SAMPLE
D - DISTURBED SAMPLE
U - UNDISTURBED SAMPLE
W - WATER SAMPLE
S.P.T. - STANDARD PENETRATION TEST
▽ - WATER STRUCK

Report No. 8232 | BOREHOLE LOG | Date. 26.11.82

BOREHOLE No. 6 m (Northern Area)

Location BULLS LODGE FARM, BOREHAM, ESSEX. Date 9.11.82

STRATA DESCRIPTION	STRATA CHANGE Legend	Depth m.	Reduced Level m.	SAMPLES No.	Depth m.	Type	S.P.T. 'N' Value	Water Level m.
Dark brown clayey flinty TOPSOIL		0.0	0.25					
Soft light brown CLAY		0.5	0.6					
Firm light brown silty sandy CLAY, abundance of chalk and gravel fragments		1.0						
		1.5						
		2.0						
		2.5						
		3.0						
		3.5						
		4.0						
		4.5	4.5					
Gravel drilling but no recovery on auger		5.0						
		5.5	5.5					
		6.0						
		6.5						
		7.0						
		7.5						
		8.0						
		8.5						
		9.0						

BOREHOLE DIAMETER : 75 mm.
GROUND LEVEL :
SCALE OF LEGEND : 2 cm: 1 m.
WEATHER :
RIG : Rotary auger
REMARKS :

B - BULK SAMPLE
D - DISTURBED SAMPLE
U - UNDISTURBED SAMPLE
W - WATER SAMPLE
S.P.T. - STANDARD PENETRATION TEST
▽ - WATER STRUCK

Report No. 8232 | BOREHOLE LOG | Date. 26.11.82

BOREHOLE No. 7m (Northern Area)

Location BULLS LODGE FARM, BOREHAM, ESSEX. Date 9.11.82

STRATA DESCRIPTION	STRATA CHANGE: Legend	Depth m.	Reduced Level m.	SAMPLES: No.	Depth m.	Type	S.P.T. 'N' Value	Water Level m.
Black/brown clayey TOPSOIL			0.2					
Soft light brown flinty CLAY		0.5	0.6					
Light brown clayey SAND and GRAVEL		1.0						
		1.5						
		2.0	2.0					
Brown clayey gravelly SAND approximately 90/10		2.5		1	2.5			
		3.0						
		3.5	3.35	2	3.35			
Brown clayey SAND AND GRAVEL		4.0						
		4.5						
		5.0						
		5.5	5.5					
		6.0						
		6.5						
		7.0						
		7.5						
		8.0						
		8.5						
		9.0						

BOREHOLE DIAMETER : 75 mm.
GROUND LEVEL :
SCALE OF LEGEND : 2 cm: 1 m.
WEATHER :
RIG : Rotary Auger
REMARKS :

B - BULK SAMPLE
D - DISTURBED SAMPLE
U - UNDISTURBED SAMPLE
W - WATER SAMPLE
S.P.T. - STANDARD PENETRATION TEST
▽ - WATER STRUCK

Report No. 8232 | BOREHOLE LOG | Date. 26.11.82

BOREHOLE No. 8m (Northern Area)

Location BULLS LODGE FARM, BOREHAM, ESSEX. Date 11.11.82

STRATA DESCRIPTION	STRATA CHANGE: Legend	Depth m.	Reduced Level m.	SAMPLES: No.	Depth m.	Type	S.P.T. 'N' Value	Water Level m.
Dark brown clayey flinty TOPSOIL			0.2					
Firm light brown silty sandy CLAY		0.5	0.6					
Stiff light brown CLAY, occasional chalk and flints		1.0						
		1.5						
		2.0						
		2.5	2.3	1	2.3			
Dense brown clayey FMC SAND AND GRAVEL, cobble sizes		3.0		2	2.7			
		3.5						
		4.0						
		4.5	4.25	3	4.25			
Grey/white FMC SAND AND GRAVEL		5.0						
		5.5	5.5					
		6.0						
		6.5						
		7.0						
		7.5						
		8.0						
		8.5						
		9.0						

BOREHOLE DIAMETER : 75 mm.
GROUND LEVEL :
SCALE OF LEGEND : 2 cm: 1 m.
WEATHER :
RIG : Rotary Auger
REMARKS :

B - BULK SAMPLE
D - DISTURBED SAMPLE
U - UNDISTURBED SAMPLE
W - WATER SAMPLE
S.P.T. - STANDARD PENETRATION TEST
▽ - WATER STRUCK

Report No. 8232 | BOREHOLE LOG | Date. 26.11.82

BOREHOLE No. 9m (Northern Area)

Location BULLS LODGE FARM, BOREHAM, ESSEX. Date 11.11.82

STRATA DESCRIPTION	STRATA CHANGE			SAMPLES			S.P.T. 'N' Value	Water Level m.
	Legend	Depth m.	Reduced Level m.	No.	Depth m.	Type		
Dark brown clayey TOPSOIL			0.2					
Soft brown CLAY		0.5	0.6					
Soft light brown gravelly CLAY		1.0	1.2					
Stiff light brown/blue streaky CLAY		1.5						
		2.0						
		2.5						
		3.0						
		3.5						
		4.0						
		4.5						
		5.0						
		5.5	5.5					
		6.0						
		6.5						
		7.0						
		7.5						
		8.0						
		8.5						
		9.0						

BOREHOLE DIAMETER : 75 mm.
GROUND LEVEL :
SCALE OF LEGEND : 2 cm: 1 m.
WEATHER :
RIG : Rotary Auger
REMARKS :

B - BULK SAMPLE
D - DISTURBED SAMPLE
U - UNDISTURBED SAMPLE
W - WATER SAMPLE
S.P.T. - STANDARD PENETRATION TEST
▽ - WATER STRUCK

Report No. 8232 | BOREHOLE LOG | Date 26.11.82

BOREHOLE LOGS OF RMC LIMITED OBTAINED FROM PLAN PROVIDED TO PIONEER AGGREGATES (UK) LIMITED

Borehole No.	Thickness of Overburden (metres)	Thickness of Sand & Gravel (metres)
1/86	3.0	6.0
2/86	6.0	4.0
3/86	7.0	4.5
4/86	11.5	3.5
5/86	1.0	7.5
6/86	2.5	10.4
7/86	3.0	7.5
8/86	2.0	8.0
9/86	2.5	7.5
10/86	4.0	3.5
11/86	6.0	2.0
12/86	Barren	
13/86	6.0	1.5
14/86	5.0	2.5
15/86	0.3	2.2
16/86	2.5	5.5
17/86	5.0	6.0
18/86	2.5	8.0
19/86	5.5	6.5
20/86	6.5	4.0
21/86	7.0	6.0

DKS/YW/8668
16.2.87

PARK FARM, BOREHAM

SCHEDULE OF BOREHOLES CARRIED OUT BY PIONEER AGGREGATES (U.K.) LIMITED WITH A POWER AUGER RIG

B/H 1

G.L.	-	0.20	Topsoil
0.20	-	1.50	Red brown clay and stones
1.50	-	2.30	Sandy clay and gravel
2.30	-	6.30	Sand and gravel
6.30	-	8.60	Brown and dark grey clay

(wet at 5.60 m)

B/H 2

G.L.	-	0.20	Topsoil
0.20	-	1.30	Sandy clay and gravel
1.30	-	4.30	Sand and gravel
4.30	-	5.60	Brown clay
5.60	-	7.10	Dark grey clay

(wet at 4.20 m)

B/H 3

G.L.	-	0.20	Topsoil
0.20	-	1.50	Red brown clay and stones
1.50	-	3.00	Red brown clay and stones and chalk
3.00	-	9.50	Sand and gravel
9.50	-	11.00	Brown and dark grey clay

(wet at 7.10 m)

B/H 4

G.L.	-	0.20	Topsoil
0.20	-	2.40	Red brown clay and gravel
2.40	-	3.00	Red brown clay gravel and chalk
3.00	-	4.20	Sandy clay and gravel
4.20	-	8.30	Sand and gravel
8.30	-	10.10	Brown and dark grey clay

(no water)

B/H 5

G.L.	-	0.20	Topsoil
0.20	-	1.50	Red brown clay and stones
1.50	-	6.00	Red brown clay and stones, chalk
6.00	-	10.10	Dark grey clay with chalk and stones
10.10	-	11.60	Dark grey clay

B/H 6

G.L.	-	0.20	Topsoil
0.20	-	7.10	Red brown clay and chalk and stones
7.10	-	14.60	Sand and gravel
14.60	-	15.50	Brown and dark grey clay

(wet at 12.00 m)

B/H 7

G.L.	-	0.20	Topsoil
0.20.	-	1.00	Dark brown clay
1.00	-	1.50	Green clay and stones
1.50	-	3.00	Green clay with chalk and stones
3.00	-	7.10	Sand and gravel
7.10	-	8.60	Sandy clay and gravel
8.60	-	10.30	Sand and gravel
10.30	-	11.60	Dark grey clay

(wet at 8.60 m)

B/H 8

G.L.	-	0.20	Topsoil
0.20	-	1.50	Red brown clay and stones
1.50	-	4.50	Green clay with chalk and stones
4.50	-	5.30	Dark grey clay and chalk
5.30	-	8.50	Sandy clay and stones
8.50	-	9.50	Brown and dark grey clay

(wet at 5.30 m)

B/H 9

G.L.	-	0.20	Topsoil
0.20	-	3.00	Red brown clay and stones
3.00	-	10.40	Sand and gravel
10.40	-	11.60	Brown and dark grey clay

(wet at 7.60 m)

B/H 10

G.L.	-	0.20	Topsoil
0.20	-	5.60	Red brown clay with stones and chalk
5.60	-	7.10	Sandy clay and gravel
7.10	-	12.50	Sand and gravel
12.50	-	13.50	Brown and dark grey clay

(wet at 10.00 m)

B/H 11

G.L.	-	0.20	Topsoil
0.20	-	7.10	Red brown clay and stones and chalk
7.10	-	13.00	Sand and gravel

(wet at 11.00 m)

B/H 12

G.L.	- 0.20	Topsoil
0.20	- 5.60	Brown clay with chalk and stones
5.60	- 7.10	Sandy clay and gravel
7.10	- 11.00	Sand and gravel
11.00	- 11.60	Brown and dark grey clay

(wet at 10.00 m)

B/H 13

G.L.	- 0.20	Topsoil
0.20	- 8.80	Sand and gravel
8.80	- 10.10	Brown and dark grey clay

(wet at 5.50 m)

B/H 14
Not drilled

B/H 15

G.L.	- 0.20	Topsoil
0.20	- 1.50	Red brown clay and stones
1.50	- 4.50	Red brown clay stones and chalk
4.50	- 7.10	Brown clay
7.10	- 8.60	Dark grey clay

B/H 16

G.L.	- 0.20	Topsoil
0.20	- 3.00	Red brown clay with chalk and stones
3.00	- 4.50	Sand and gravel
4.50	- 9.60	Sandy clay and gravel
9.60	- 10.50	Brown and dark grey clay

(wet at 9.60 m)

B/H 17

G.L.	- 0.20	Topsoil
0.20	- 1.50	Red brown clay
1.50	- 4.50	Red brown clay with stones and chalk
4.50	- 5.60	Sand and gravel
5.60	- 10.50	Sandy clay and gravel
10.50	- 11.60	Dark grey clay

(wet at 10.00 m)

B/H 18

G.L.	- 0.20	Topsoil
0.20	- 1.50	Red brown clay and stones
1.50	- 3.00	Sandy clay and gravel
3.00	- 9.50	Sand and gravel
9.50	- 10.50	Brown and dark grey clay

(wet at 9.00 m)

B/H 19

G.L.	- 0.20	Topsoil
0.20	- 1.50	Red brown clay and stones
1.50	- 5.00	Red brown clay, stones and chalk
5.00	- 10.10	Sandy clay and gravel
10.10	- 10.40	Sand and gravel
10.40	- 11.60	Brown and dark grey clay

(wet at 10.10 m)

B/H 20

G.L.	- 0.20	Topsoil
0.20	- 1.50	Red brown clay and stones
1.50	- 7.10	Red brown clay, stones and chalk
7.10	- 11.50	Sand and gravel
11.50	- 12.50	Brown and dark grey clay

(wet at 7.00 m)

B/H 21

G.L.	- 0.20	Topsoil
0.20	- 7.10	Red brown clay and stones
7.10	- 8.60	Sandy clay and gravel
8.60	- 13.10	Sand and gravel
13.10	- 14.60	Brown and dark grey clay

(wet at 8.6 m)

DKS/YW/8668
17.2.87

REF: 8213
DATE: October 1985
RIG: Shell & Auger
DIAM:

BOREHOLE LOG

No. 28

LOCATION:
BULLS LODGE
GROUND LEVEL:

DESCRIPTION OF STRATA	CHANGE OF STRATA			SAMPLES			WATER LEVEL		S.P.T. C.P.T. N-VALVE
	LEGEND	DEPTH (m)	REDUCED LEVEL	REF:	DEPTH (m)	TYPE	Struck (m)	Standing (m)	
Topsoil			0.3						
Firm brown boulder CLAY		1.0		1	1.0	B			
		2.0							
		3.0	3.2						
Brown stony CLAY thin layers of sand and gravel		4.0		2	3.5	B			
		5.0		3	5.0	B			
		6.0							
		7.0		4	6.5	B			
		8.0		5	8.0	B			
		9.0	9.1						
Firm brown laminated CLAY		10.0							
		11.0							
		12.0							
		13.0	12.8						
Firm blue laminated CLAY		14.0	14.0	6	14.0	B			

D. K. SYMES ASSOCIATES
Mineral Planning & Development Consultants

44 NORTH BAR, BANBURY, OXON OX16 0TH 0295 - 61542/3

REF: 8213
DATE: October 1985
RIG: Shell & Auger
DIAM:

BOREHOLE LOG

No. 29

LOCATION:
BULLS LODGE
GROUND LEVEL:

DESCRIPTION OF STRATA	CHANGE OF STRATA			SAMPLES			WATER LEVEL		S.P.T. C.P.T. N-VALVE
	LEGEND	DEPTH (m)	REDUCED LEVEL	REF:	DEPTH (m)	TYPE	Struck (m)	Standing (m)	
Topsoil			0.3						
Firm brown boulder CLAY		1.0		1	1.0	B			
			1.6						
		2.0		2	2.0	B			
Firm brown/grey laminated CLAY		3.0							
		4.0							
		5.0							
		6.0							
		7.0							
		8.0							
			8.7						
Firm blue laminated CLAY		9.0							
		10.0	10.0	3	10.0	B			

D. K. SYMES ASSOCIATES
Mineral Planning & Development Consultants

44 NORTH BAR, BANBURY, OXON OX16 0TH 0295 - 61542/3

REF: 8213
DATE: October 1985
RIG: Shell & Auger
DIAM:

BOREHOLE LOG

No. 30

LOCATION:
BULLS LODGE
GROUND LEVEL:

DESCRIPTION OF STRATA	CHANGE OF STRATA			SAMPLES			WATER LEVEL		S.P.T. C.P.T. N-VALVE
	LEGEND	DEPTH (m)	REDUCED LEVEL	REF:	DEPTH (m)	TYPE	Struck (m)	Standing (m)	
Topsoil			0.2						
Firm brown boulder CLAY		1.0	0.8	1	1.0	B			
SAND & GRAVEL		2.0		2	2.5	B			
		3.0							
		4.0	4.1	3	4.0	B			
Firm brown laminated CLAY		5.0							
		6.0							
		7.0							
		8.0							
		9.0							
		10.0	9.6						
Firm blue laminated CLAY		11.0	11.0	4	11.0	B			

D. K. SYMES ASSOCIATES
Mineral Planning & Development Consultants

44 NORTH BAR, BANBURY, OXON OX16 0TH 0295 - 61542/3

REF: 8213
DATE: October 1985
RIG: Shell & Auger
DIAM:

BOREHOLE LOG

No. 31

LOCATION:
BULLS LODGE
GROUND LEVEL:

DESCRIPTION OF STRATA	CHANGE OF STRATA			SAMPLES			WATER LEVEL		S.P.T. C.P.T. N-VALVE
	LEGEND	DEPTH (m)	REDUCED LEVEL	REF:	DEPTH (m)	TYPE	Struck (m)	Standing (m)	
Topsoil			0.4						
Firm brown laminated CLAY		1.0		1	1.0	B			
		2.0							
		3.0							
		4.0							
		5.0							
		6.0							
		7.0	6.9						
Firm blue laminated CLAY		8.0							
		9.0							
		10.0	10.0	2	10.0	B			

D. K. SYMES ASSOCIATES
Mineral Planning & Development Consultants

44 NORTH BAR, BANBURY, OXON OX16 0TH 0295 - 61542/3

REF: 8213
DATE: October 1985
RIG: Shell & Auger
DIAM:

BOREHOLE LOG

No. 32

LOCATION:

BULLS LODGE

GROUND LEVEL:

DESCRIPTION OF STRATA	CHANGE OF STRATA			SAMPLES			WATER LEVEL		S.P.T. C.P.T. N-VALVE
	LEGEND	DEPTH (m)	REDUCED LEVEL	REF:	DEPTH (m)	TYPE	Struck (m)	Standing (m)	
Topsoil			0.3						
Firm brown boulder CLAY		1.0		1	1.0	B			
		2.0							
		3.0							
		4.0							
		5.0	5.2						
SAND & GRAVEL		6.0		2	6.0	B			
		7.0							
				3	7.5	B			
		8.0							
		9.0		4	9.0	B			
		10.0	10.4						
Firm brown laminated CLAY		11.0							
		12.0							
			12.6						
Firm blue laminated CLAY		13.0							
		14.0	14.0	5	14.0	B			

D. K. SYMES ASSOCIATES
Mineral Planning & Development Consultants

44 NORTH BAR, BANBURY, OXON OX16 0TH 0295 - 61542/3

TL 71 SW 41 7235 1059 nr. Belstead Hall

Surface level (+ 51.5 m) + 169 ft
Water not struck
Wirth B O, 8 inch diam.,
Date not recorded

Overburden (5.5 m) 18 ft;
Mineral (6.1 m) 20 ft;
Bedrock (0.6 m +) 2 ft +

		Thickness (m)	ft	Depth (m)	ft
Soil	With flints	(0.5)	1.5	(0.5)	1.5
Boulder Clay	Brown. Chalky	(5.0)	16.5	(5.5)	18
Glacial Sand and Gravel	Gravel	(6.1)	20	(11.6)	38
London Clay	Brown at surface, otherwise blue/grey	(0.6 +)	2 +	(12.2)	40

	%	mm	%
Gravel	51	+ 64	0
		- 64 + 16	23
		- 16 + 4	28
Sand	49	- 4 + 1	13
		- 1 + ¼	30
		- ¼ + 1/16	6
Fines	0	- 1/16	0

Depth below surface (ft)	Percentage Fines	Sand	Gravel
18 - 21	0	35	65
21 - 24	1	44	55
24 - 27	0	75	25
27 - 30	0	60	40
30 - 33	1	41	58
33 - 36	0	40	60
36 - 38	0	42	58

TL 71 SW 45 7362 1085 nr. Water Hall

Surface level (+ 45.7 m) + 150 ft
Water struck at (+ 43.6 m) + 143 ft
Wirth B O, 8 inch diam.,
November 1968

Overburden (2.1 m) 7 ft;
Mineral (1.9 m) 6 ft;
Bedrock (1.5 m +) 5 ft +

		Thickness (m)	Thickness ft	Depth (m)	Depth ft
Made ground		(0.8)	2.5	(0.8)	2.5
Boulder Clay	Brown. Slightly chalky	(1.3)	4.5	(2.1)	7
Glacial Sand and Gravel	'Clayey' sandy gravel	(1.9)	6	(4.0)	13
London Clay	Brown. With concretions below 16 feet	(1.5 +)	5 +	(5.5)	18

	%	mm	%
Gravel	32	+ 64	0
		– 64 + 16	13
		– 16 + 4	19
Sand	54	– 4 + 1	6
		– 1 + ¼	37
		– ¼ + 1/16	11
Fines	14	– 1/16	14

Depth below surface (ft)	Percentage Fines	Sand	Gravel
7 – 10	20	38	42
10 – 13	6	72	22
	8	70	22

TL 71 SW 46 7464 1445 nr. Scarlett's Farm

Surface level (+ 57.9 m) + 190 ft
No record of groundwater
Gryphon, 12 inch diam.,
December 1968

Overburden (11.9 m) 39 ft;
Mineral (6.4 m) 21 ft;
Bedrock (0.6 m +) 2 ft +

		Thickness (m)	Thickness ft	Depth (m)	Depth ft
Soil		(0.3)	1	(0.3)	1
Boulder Clay	Brown from 1 to 20 feet, otherwise grey. No pebbles recorded from 1 to 12.5 feet. Chalky below 12.5 feet	(11.6)	38	(11.9)	39
Glacial Sand and Gravel	Mainly fine to medium sand and fine gravel	(6.4)	21	(18.3)	60
London Clay		(0.6 +)	2 +	(18.9)	62

Average grading not available

Depth below surface (ft)	Percentage Fines	Sand	Gravel
39 – 42	1	64	35
42 – 60	grading not available		

APPENDIX 6

AREA D APPRAISAL

LEGEND

Building	Top of Batter
Kerb	Bottom of Batter
Fence	Conveyor
Gate	Royalty Boundary
Hedge	OS General Feature
Stock	Top of Face
Road	Overhead Cable (El
Rail	Overhead Cable (Te
Track	Waters Edge
Wall	Edge of Concrete
Manhole	Water Pipe
Edge of Veg	Lamp Post (LP)
Tree (Con)	Tree (Dec)
Ditch Invert (BH)	Telegraph Post (TP)
Borehole	Electricity Pylon (EP)
Pipe Invert	Piezometer
Building	Stock
Water	

Hanson HEIDELBERGCEMENT Group

Site: B215 - Powers Farm

Title: Phasing Plan
Phase 0 - Mineral / OB

Scale 1:4000	Date JUL 2018	Drawing no B215r426
Drawn by AMC	Revised	

OVERBURDEN MOVE
510,000m³
TO PERMINANT
STORE (PERIMETER
BUNDS)

PHASE 1

Phase 1 (OB)
OB (m³): 510,700m³

LEGEND

Building	Top of Batter
Kerb	Bottom of Batter
Fence	Conveyor
Gate	Royalty Boundary
Hedge	OS General Feature
Stock	Top of Face
Road	Overhead Cable (El
Rail	Overhead Cable (Te
Track	Waters Edge
Wall	Edge of Concrete
Manhole	Water Pipe
Edge of Veg	Lamp Post
Tree (Con)	Tree (Dec)
Ditch Invert	Telegraph Post
Borehole	Electricity Pylon
Pipe Invert	Piezometer
Building	Stock
Water	

MINERAL EXTRACTION PHASE

OVERBURDEN EXTRACTION PHASE

Hanson HEIDELBERGCEMENT Group

Site: B215 - Powers Farm

Title: Phasing Plan
Phase 1 PLANT SITE - OB

Scale	Date	Drawing no
1:4000	JUL 2018	B215r426
Drawn by AMC	Revised	

OVERBURDEN MOVE
510,000m³
TO BE STORED ON ONE OF LATER PHASED. THIS WILL NEED TO BE MOVED AGAIN LATER IN THE PROJECT LIFE.

PHASE 2

Phase 2 (OB)
OB (m³): 509,500m³

LEGEND

Building	Top of Batter
Kerb	Bottom of Batter
Fence	Conveyor
Gate	Royalty Boundary
Hedge	OS General Feature
Stock	Top of Face
Road	Overhead Cable (El
Rail	Overhead Cable (Te
Track	Waters Edge
Wall	Edge of Concrete
Manhole	Water Pipe
Edge of Veg	Lamp Post
Tree (Con)	Tree (Dec)
Ditch Invert	Telegraph Post
Borehole	Electricity Pylon
Pipe Invert	Piezometer
Building	Stock
Water	

MINERAL EXTRACTION PHASE

OVERBURDEN EXTRACTION PHASE

Hanson HEIDELBERGCEMENT Group

Site: B215 - Powers Farm

Title: Phasing Plan
Phase 2 - OB

Scale	Date	Drawing no
1:4000	JUL 2018	B215r426
Drawn by AMC	Revised	

LEGEND

Building	Top of Batter
Kerb	Bottom of Batter
Fence	Conveyor
Gate	Royalty Boundary
Hedge	OS General Feature
Stock	Top of Face
Road	Overhead Cable (El
Rail	Overhead Cable (Te
Track	Waters Edge
Wall	Edge of Concrete
Manhole	Water Pipe
Edge of Veg	Lamp Post
Tree (Con)	Tree (Dec)
Ditch Invert	Telegraph Post
Borehole	Electricity Pylon
Pipe Invert	Piezometer
Building	Stock
Water	

MINERAL EXTRACTION PHASE

OVERBURDEN EXTRACTION PHASE

PHASE 2

Phase 2 (MINERAL)
MIN - INSITU (m^3): 412,500m^3
MIN - SALEABLE (t): 662,900t

- @1.85t/m^3.
- 10% Processing losses.
- Assume 0.15m Lost at top and base of gravel.

Hanson HEIDELBERGCEMENT Group

Site: B215 - Powers Farm

Title: Phasing Plan
Phase 2 - Mineral

Scale	Date	Drawing no
1:4000	JUL 2018	B215r426
Drawn by AMC	Revised	

OVERBURDEN MOVE
608,000m³
TO BE STORED ON ONE OF LATER PHASED. THIS WILL ALSO NEED TO BE MOVED AGAIN LATER IN THE PROJECT LIFE.

PHASE 3

Phase 3 (OB)
OB (m³): 608,100m³

LEGEND

Building	Top of Batter
Kerb	Bottom of Batter
Fence	Conveyor
Gate	Royalty Boundary
Hedge	OS General Feature
Stock	Top of Face
Road	Overhead Cable (El
Rail	Overhead Cable (Te
Track	Waters Edge
Wall	Edge of Concrete
Manhole	Water Pipe
Edge of Veg	Lamp Post
Tree (Con)	Tree (Dec)
Ditch Invert	Telegraph Post
Borehole	Electricity Pylon
Pipe Invert	Piezometer
Building	Stock
Water	

MINERAL EXTRACTION PHASE

OVERBURDEN EXTRACTION PHASE

Hanson HEIDELBERGCEMENT Group

Site: B215 - Powers Farm

Title: Phasing Plan
Phase 3 - OB

Scale	Date	Drawing no
1:4000	JUL 2018	B215r426
Drawn by AMC	Revised	

PHASE 3

Phase 3 (MINERAL)
MIN - INSITU (m^3): 357,000m^3
MIN - SALEABLE (t): 571,200t

- @1.85t/m^3.
- 10% Processing losses.
- Assume 0.15m Lost at top and base of gravel.

LEGEND

Building	Top of Batter
Kerb	Bottom of Batter
Fence	Conveyor
Gate	Royalty Boundary
Hedge	OS General Feature
Stock	Top of Face
Road	Overhead Cable (El
Rail	Overhead Cable (Te
Track	Waters Edge
Wall	Edge of Concrete
Manhole	Water Pipe
Edge of Veg	Lamp Post
Tree (Con)	Tree (Dec)
Ditch Invert	Telegraph Post
Borehole	Electricity Pylon
Pipe Invert	Piezometer
Building	Stock
Water	

MINERAL EXTRACTION PHASE

OVERBURDEN EXTRACTION PHASE

Hanson HEIDELBERGCEMENT Group

Site: B215 - Powers Farm

Title: Phasing Plan
Phase 3 - Mineral

Scale	Date	Drawing no
1:4000	JUL 2018	B215r426
Drawn by AMC	Revised	

PHASE 4

510,000m³ OVERBURDEN MOVED TO BACKFILL PHASE 2.

PHASE 2 BACKFILL CAPACITY IS CIRCA 1,000,000m³. ASSUMING IT IS BACKFILLED TO OGL.

Phase 4 (OB)
OB (m³): 550,500m³

LEGEND

Building	Top of Batter
Kerb	Bottom of Batter
Fence	Conveyor
Gate	Royalty Boundary
Hedge	OS General Feature
Stock	Top of Face
Road	Overhead Cable (El
Rail	Overhead Cable (Te
Track	Waters Edge
Wall	Edge of Concrete
Manhole	Water Pipe
Edge of Veg	Lamp Post
Tree (Con)	Tree (Dec)
Ditch Invert	Telegraph Post
Borehole	Electricity Pylon
Pipe Invert	Piezometer
Building	Stock
Water	

MINERAL EXTRACTION PHASE

OVERBURDEN EXTRACTION PHASE

Hanson HEIDELBERGCEMENT Group

Site: B215 - Powers Farm

Title: Phasing Plan
Phase 4 - OB

Scale	Date	Drawing no
1:4000	JUL 2018	B215r426
Drawn by AMC	Revised	

PHASE 4

Phase 4 (MINERAL)
MIN - INSITU (m^3): 485,300m^3
MIN - SALEABLE (t): 778,900t

- @1.85t/m^3.
- 10% Processing losses.
- Assume 0.15m Lost at top and base of gravel.

LEGEND

Building	Top of Batter
Kerb	Bottom of Batter
Fence	Conveyor
Gate	Royalty Boundary
Hedge	OS General Feature
Stock	Top of Face
Road	Overhead Cable (El
Rail	Overhead Cable (Te
Track	Waters Edge
Wall	Edge of Concrete
Manhole	Water Pipe
Edge of Veg	Lamp Post
Tree (Con)	Tree (Dec)
Ditch Invert	Telegraph Post
Borehole	Electricity Pylon
Pipe Invert	Piezometer
Building	Stock
Water	

MINERAL EXTRACTION PHASE

OVERBURDEN EXTRACTION PHASE

Hanson HEIDELBERGCEMENT Group

Site: B215 - Powers Farm

Title: Phasing Plan
Phase 4 - Mineral

Scale	Date	Drawing no
1:4000	JUL 2018	B215r426
Drawn by AMC	Revised	

PHASE 5

250,000m³ OVERBURDEN MOVED TO BACKFILL PHASE 3. IT IS LIKELY THAT 250,000m3 WILL NEED TO BE STORED ON ANOTHER AREA UNTIL SUFFICIENT BACKFILL EDGE IS AVAILABLE.

500,000m³ OVERBURDEN MOVED TO BACKFILL PHASE 2.

Phase 5 (OB)
OB (m³): 1,072,200m³

LEGEND

- Building
- Kerb
- Fence
- Gate
- Hedge
- Stock
- Road
- Rail
- Track
- Wall
- Manhole
- Edge of Veg
- Tree (Con)
- Ditch Invert
- Borehole
- Pipe Invert
- Building
- Water
- Top of Batter
- Bottom of Batter
- Conveyor
- Royalty Boundary
- OS General Feature
- Top of Face
- Overhead Cable (El
- Overhead Cable (Te
- Waters Edge
- Edge of Concrete
- Water Pipe
- Lamp Post
- Tree (Dec)
- Telegraph Post
- Electricity Pylon
- Piezometer
- Stock

MINERAL EXTRACTION PHASE

OVERBURDEN EXTRACTION PHASE

Hanson HEIDELBERGCEMENT Group

Site: B215 - Powers Farm

Title: Phasing Plan
Phase 5 - OB

Scale	Date	Drawing no
1:4000	JUL 2018	B215r426
Drawn by AMC	Revised	

PHASE 5

Phase 5 (MINERAL)
MIN - INSITU (m^3): 537,100m^3
MIN - SALEABLE (t): 853,700t

- @1.85t/m^3.
- 10% Processing losses.
- Assume 0.15m Lost at top and base of gravel.

LEGEND

Building	Top of Batter
Kerb	Bottom of Batter
Fence	Conveyor
Gate	Royalty Boundary
Hedge	OS General Feature
Stock	Top of Face
Road	Overhead Cable (El
Rail	Overhead Cable (Te
Track	Waters Edge
Wall	Edge of Concrete
Manhole	Water Pipe
Edge of Veg	Lamp Post
Tree (Con)	Tree (Dec)
Ditch Invert	Telegraph Post
Borehole	Electricity Pylon
Pipe Invert	Piezometer
Building	Stock
Water	

MINERAL EXTRACTION PHASE

OVERBURDEN EXTRACTION PHASE

Hanson HEIDELBERGCEMENT Group

Site: B215 - Powers Farm

Title: Phasing Plan
Phase 5 - Mineral

Scale 1:4000	Date JUL 2018	Drawing no B215r426
Drawn by AMC	Revised	

364,000m³
OVERBURDEN MOVED
TO BACKFILL PHASE 4.

PHASE 6

Phase 6 (OB)
OB (m³): 364,900m³

LEGEND

Building	Top of Batter
Kerb	Bottom of Batter
Fence	Conveyor
Gate	Royalty Boundary
Hedge	OS General Feature
Stock	Top of Face
Road	Overhead Cable (El
Rail	Overhead Cable (Te
Track	Waters Edge
Wall	Edge of Concrete
Manhole	Water Pipe
Edge of Veg	Lamp Post
Tree (Con)	Tree (Dec)
Ditch Invert	Telegraph Post
Borehole	Electricity Pylon
Pipe Invert	Piezometer
Building	Stock
Water	

MINERAL EXTRACTION PHASE

OVERBURDEN EXTRACTION PHASE

Hanson HEIDELBERGCEMENT Group

Site: B215 - Powers Farm

Title: Phasing Plan
Phase 6 - OB

Scale	Date	Drawing no
1:4000	JUL 2018	B215r426
Drawn by AMC	Revised	

LEGEND

Building	Top of Batter
Kerb	Bottom of Batter
Fence	Conveyor
Gate	Royalty Boundary
Hedge	OS General Feature
Stock	Top of Face
Road	Overhead Cable (El
Rail	Overhead Cable (Te
Track	Waters Edge
Wall	Edge of Concrete
Manhole	Water Pipe
Edge of Veg	Lamp Post
Tree (Con)	Tree (Dec)
Ditch Invert	Telegraph Post
Borehole	Electricity Pylon
Pipe Invert	Piezometer
Building	Stock
Water	

MINERAL EXTRACTION PHASE

OVERBURDEN EXTRACTION PHASE

PHASE 6

Phase 6 (MINERAL)
MIN - INSITU (m^3): 224,600m^3
MIN - SALEABLE (t): 358,000t

- @1.85t/m^3.
- 10% Processing losses.
- Assume 0.15m Lost at top and base of gravel.

Hanson HEIDELBERGCEMENT Group

Site: B215 - Powers Farm

Title: Phasing Plan
Phase 6 - Mineral

Scale	Date	Drawing no
1:4000	JUL 2018	B215r426
Drawn by AMC	Revised	

935,000m³ OVERBURDEN MOVED TO BACKFILL PHASE 4 and 5.

PHASE 7

Phase 7 (OB)
OB (m³): 935,500m³

LEGEND

Building	Top of Batter
Kerb	Bottom of Batter
Fence	Conveyor
Gate	Royalty Boundary
Hedge	OS General Feature
Stock	Top of Face
Road	Overhead Cable (El
Rail	Overhead Cable (Te
Track	Waters Edge
Wall	Edge of Concrete
Manhole	Water Pipe
Edge of Veg	Lamp Post
Tree (Con)	Tree (Dec)
Ditch Invert	Telegraph Post
Borehole	Electricity Pylon
Pipe Invert	Piezometer
Building	Stock
Water	

MINERAL EXTRACTION PHASE

OVERBURDEN EXTRACTION PHASE

Hanson HEIDELBERGCEMENT Group

Site: B215 - Powers Farm

Title: Phasing Plan
Phase 7 - OB

Scale	Date	Drawing no
1:4000	JUL 2018	B215r426
Drawn by AMC	Revised	

PHASE 7

Phase 7 (MINERAL)
MIN - INSITU (m^3): 445,000m^3
MIN - SALEABLE (t): 710,300t

- @1.85t/m^3.
- 10% Processing losses.
- Assume 0.15m Lost at top and base of gravel.

LEGEND

Building		Top of Batter	
Kerb		Bottom of Batter	
Fence		Conveyor	
Gate		Royalty Boundary	
Hedge		OS General Feature	
Stock		Top of Face	
Road		Overhead Cable (El	
Rail		Overhead Cable (Te	
Track		Waters Edge	
Wall		Edge of Concrete	
Manhole		Water Pipe	
Edge of Veg		LP Lamp Post	
Tree (Con)		Tree (Dec)	
BH Ditch Invert		TP Telegraph Post	
Borehole		EP Electricity Pylon	
Pipe Invert		Piezometer	
Building		Stock	
Water			

MINERAL EXTRACTION PHASE

OVERBURDEN EXTRACTION PHASE

Hanson HEIDELBERGCEMENT Group

Site: B215 - Powers Farm

Title: Phasing Plan
Phase 7 - Mineral

Scale	Date	Drawing no
1:4000	JUL 2018	B215r426
Drawn by AMC	Revised	

Phase 8 (OB)
OB (m^3): 823,500m^3

PHASE 8

825,000m^3 OVERBURDEN MOVED TO BACKFILL PHASES 6 AND 7.

PREVIOUSLY STORED 1,000,000m3 OF OVERBURDEN ON THIS PHASE WILL NEED TO BE MOVED AGAIN TO COMPLETE THE RESTORATION DESIGN.

LEGEND

Building	Top of Batter
Kerb	Bottom of Batter
Fence	Conveyor
Gate	Royalty Boundary
Hedge	OS General Feature
Stock	Top of Face
Road	Overhead Cable (El
Rail	Overhead Cable (Te
Track	Waters Edge
Wall	Edge of Concrete
Manhole	Water Pipe
Edge of Veg	Lamp Post
Tree (Con)	Tree (Dec)
Ditch Invert	Telegraph Post
Borehole	Electricity Pylon
Pipe Invert	Piezometer
Building	Stock
Water	

MINERAL EXTRACTION PHASE

OVERBURDEN EXTRACTION PHASE

Hanson HEIDELBERGCEMENT Group

Site: B215 - Powers Farm

Title: Phasing Plan
Phase 8 - OB

Scale	Date	Drawing no
1:4000	JUL 2018	B215r426
Drawn by AMC	Revised	

PHASE 8

Phase 8 (MINERAL)
MIN - INSITU (m^3): 382,500m^3
MIN - SALEABLE (t): 605,500t

- @1.85t/m^3.
- 10% Processing losses.
- Assume 0.15m Lost at top and base of gravel.

LEGEND

Building	Top of Batter
Kerb	Bottom of Batter
Fence	Conveyor
Gate	Royalty Boundary
Hedge	OS General Feature
Stock	Top of Face
Road	Overhead Cable (El
Rail	Overhead Cable (Te
Track	Waters Edge
Wall	Edge of Concrete
Manhole	Water Pipe
Edge of Veg	Lamp Post
Tree (Con)	Tree (Dec)
Ditch Invert	Telegraph Post
Borehole	Electricity Pylon
Pipe Invert	Piezometer
Building	Stock
Water	

MINERAL EXTRACTION PHASE

OVERBURDEN EXTRACTION PHASE

Hanson HEIDELBERGCEMENT Group

Site: B215 - Powers Farm

Title: Phasing Plan
Phase 8 - Mineral

Scale	Date	Drawing no
1:4000	JUL 2018	B215r426
Drawn by AMC	Revised	

Phase 1 (OB)
OB (m^3): 161,000m^3

PHASE 1

161,000m^3 OVERBURDEN MOVED TO BACKFILL PHASE 7.

LEGEND

Building	Top of Batter
Kerb	Bottom of Batter
Fence	Conveyor
Gate	Royalty Boundary
Hedge	OS General Feature
Stock	Top of Face
Road	Overhead Cable (El
Rail	Overhead Cable (Te
Track	Waters Edge
Wall	Edge of Concrete
Manhole	Water Pipe
Edge of Veg	Lamp Post
Tree (Con)	Tree (Dec)
Ditch Invert	Telegraph Post
Borehole	Electricity Pylon
Pipe Invert	Piezometer
Building	Stock
Water	

MINERAL EXTRACTION PHASE

OVERBURDEN EXTRACTION PHASE

Hanson HEIDELBERGCEMENT Group

Site: B215 - Powers Farm

Title: Phasing Plan
Phase 1 - REMAINING OB

Scale	Date	Drawing no
1:4000	JUL 2018	B215r426
Drawn by AMC	Revised	

PHASE 1

Phase 1 (PLANT SITE REMAINING MINERAL)
MIN - INSITU (m^3): 236,300m^3
MIN - SALEABLE (t): 372,400t

- @1.85t/m^3.
- 10% Processing losses.
- Assume 0.15m Lost at top and base of gravel.

LEGEND

Building	Top of Batter
Kerb	Bottom of Batter
Fence	Conveyor
Gate	Royalty Boundary
Hedge	OS General Feature
Stock	Top of Face
Road	Overhead Cable (El
Rail	Overhead Cable (Te
Track	Waters Edge
Wall	Edge of Concrete
Manhole	Water Pipe
Edge of Veg	Lamp Post
Tree (Con)	Tree (Dec)
Ditch Invert	Telegraph Post
Borehole	Electricity Pylon
Pipe Invert	Piezometer
Building	Stock
Water	

MINERAL EXTRACTION PHASE

OVERBURDEN EXTRACTION PHASE

Hanson HEIDELBERGCEMENT Group

Site: B215 - Powers Farm

Title: Phasing Plan
Phase 1 - FINAL Mineral

Scale 1:4000	Date JUL 2018	Drawing no B215r426
Drawn by AMC	Revised	

Site Reference	B215
Site Name	Bulls Lodge - Powers Farm
Project	Phasing Plans
Date Completed	
Completed by	AMC

Key	
Overburden	OB
Top Soil	TS

Density	1.85 t/m3
Production Losses	10 %

ITERATION 4

Design Phase										
Extraced Volumes		**Phase 1**	**Phase 2**	**Phase 3**	**Phase 4**	**Phase 5**	**Phase 6**	**Phase 7**	**Phase 8**	
		Plant OB								Plant Area OB + Mineral
LSS Survey OB										
Survey Name		001	002	004	006	008	0010	0012	0014	0016
Area (m2)	m2	47,967	76,802	64,568	71,843	93,085	46,853	82,643	69,068	20,171
OB Volume (m3)	m3	510,714	509,492	608,150	550,480	1,072,184	364,860	935,541	823,483	161,006
TS Volume (m3)	m3	14,390	23,041	19,370	21,553	27,926	14,056	24,793	20,720	-
IN-SITU MINERAL										
LSS Survey MINERAL (IN-SITU)										
Survey Name			003	005	007	009	0011	0013	0015	0017
Area (m2)	m2	-	47,975	46,458	58,228	81,304	31,905	61,413	62,579	42,219
Mineral Volume (m3)	m3	-	412,522	357,010	485,280	537,115	224,609	445,020	382,427	236,302
Mineral Tonnage (t)	t	-	763,166	660,469	897,768	993,663	415,527	823,287	707,490	437,159
SALEABLE MINERAL										
Area (m2)	m2	-	47,975	46,458	58,228	81,304	31,905	61,413	62,579	42,219
Waste Volume	m3	-	14,393	13,937	17,468	24,391	9,572	18,424	18,774	12,666
Recoverable Gravel	m3	-	398,130	343,073	467,812	512,724	215,038	426,596	363,653	223,636
Processing Losses	m3 (10%)	-	39,813	34,307	46,781	51,272	21,504	42,660	36,365	22,364
SALEABLE MINERAL	m3	-	358,317	308,765	421,030	461,451	193,534	383,936	327,288	201,273
SALEABLE MINERAL	t	-	662,886	571,216	778,906	853,685	358,037	710,283	605,483	372,354

IN SITU TOTALS

TOTALS	
OB (m3)	5,535,910
TS (m3)	165,849
MINERAL (m3)	3,080,285
MINERAL (t)	5,698,527

SALEABLE TOTALS

TOTALS	
OB (m3)	**5,535,910**
TS (m3)	165,849
MINERAL (m3)	**2,655,595**
MINERAL (t)	**4,912,850**
OB:Mineral	**2.08**

Powers Farm
Stripping and restoration material balance

Phase No.	Phase Area m²	Stripped OB volume m³	Stripped Topsoil volume m³	Total Volume m³	Cost to stripping	Cost to restoration	Comments
1	47,967	510,714	14,390	525,104	£1,050,208	£0	Plant site to be established as far from residential properties as possible, to be built on top of the mineral deposit. All TS and OB to perimeter store as no void available. On cessation of mineral working, all TS and OB will be removed from store to final restoration.
2	76,802	509,492	23,041	532,533	£1,065,066	£0	Phase 2 stripped, TS and OB to store as no void available to receive direct placement. TS and OB likely to remain in store until Phase 8.
3	64,568	608,150	19,370	627,520	£1,255,040	£0	Phase 3 TS and OB to go in to store as no room for direct placement in Phase 2 whilst mineral extraction on-going (likely worked north to south and therefore direct placement would conflict with working area). TS and OB likely to remain in store until Phase 8.
4	71,843	550,480	21,553	572,033	£1,144,066	£43,106	OB to be used in restoration of Phase 2. To prevent an unchractiersitc landform it is proposed Phase 2 be backfilled to original ground level. Therefore all Phase 4 OB can be direct placed. Phase 4 TS to be stored as insufficient area of backfill will be placed to final level to facilitate direct placement.
5	93,085	1,072,184	27,926	1,100,110	£2,200,220	£500,000	Approx 500,000m³ OB direct placed in to Phase 2 to complete restoration backfill. All TS can be windrowed temporarily and then placed. Approx 250,000m³ OB direct placed in Phase 3 void, additional 250,000m³ to be stored as insufficient void space available in Phase 3 without conflicting with extraction.
6	46,853	364,860	14,056	378,916	£757,832	£0	All TS and OB can be direct placed in to worked out void in phases 3, 4 and 5 as necessary.
7	82,643	935,541	24,793	960,334	£1,920,668	£2,320,106	All TS and OB can be direct placed in to worked out void in phases 4 and 5 as necessary. OB previously stocked on Phase to be relocated.
8	69,068	823,483	20,720	844,203	£1,688,406	£0	All TS and OB can be direct placed in to worked out void in phases 6 and 7 as necessary.
Plant	20,171	161,006	0	161,006	£322,012	£1,050,208	Remaining OB stripped from beneath access to plant site, direct placed. Material recovered from periphral storage.
TOTALS	**573,000**	**5,535,910**	**165,849**	**5,701,759**	**£11,403,518.00**	**£3,913,420.00**	

Assumptions

TS = Topsoil OB = Overburden.
Rate per cube for stripping or placement of TS and OB £2.00 based upon current average costs.
Aim of restoration is to create as much dry land as possible. Likely concept landform will comprise dry land with some woodland and hedgerow planting.
Sufficient OB to create a completely dry landform but with no external drainage point there will need to be central wetland system to take surface and arable drainage run off.
Aim of concept phasing strategy is to create as much edge for backfilling as early as possible as this is where the most backfill can be placed and therefore aims to minimise double handling.
Phase 2 has the best overall mineral depth and also requires a large amount of OB backfill so was targeted for extraction earlier on to help with material handling.
Phasing to progress in a clockwise direction as this will provide the maximum amount of edge on the site to facilitate direct placement.
From the stripping of phase 3 it is assumed that with suitable stripping and working programs there will be sufficient quarry void created to facilitate direct placement of the majority of TS and OB from the latter phases.
All figures and asumptions are based upon the best information available at the time and current market values.

POWERS FARM APPRAISAL	
Planning Application fee	£78,000
Planning and EIA & discharge of pre com conditions	£250,000
Footpath closures	£10,000
Highways Access off Regiments Way	£350,000
Borehole (process water supply)	£110,000
Welfare/WB/office/Wheelwash/Sheeting	£135,000
Services hardware & Systems	£75,000
Security CCTV and Fencing	£35,000
Power connection (minimum)	£250,000
Statutory compensation for AHA Tenant	£75,000
Advanced tree planting	£20,000
Project management & legal	£100,000
Contingency 15%	£223,200
Set Up	**£1,711,200**

Jul-18

Price/te £11.22
Total sales 4,900,000 te

10%

Year	Set up	Sales (t)	Income	Overburden	Material to Restoration	Silt at 10% Management	Plant	Variable cost	Central Overheads	Staff	Loss of Agri Income	Rates	Aggs Tax	Restoration	Royalty	Cash Flow	Discount rate
						£2.00	£0.45	£1.73	£0.75	£400,000	£15,000	£0.43	£2.00	£0.09	£2.50		
1	£1,711,200		£0			£0	£0	£0	£0	£70,000		£0	£0	£0	£0	£1,781,200	0.909
2		150,000	£1,683,000	£1,050,208		£34,500	£67,500	£259,500	£112,500	£70,000	£15,000	£64,500	£300,000	£13,500	£375,000	£679,208	0.826
3		300,000	£3,366,000			£69,000	£135,000	£519,000	£225,000	£400,000	£15,000	£129,000	£600,000	£27,000	£750,000	£497,000	0.751
4		300,000	£3,366,000	£1,065,066		£69,000	£135,000	£519,000	£225,000	£400,000	£15,000	£129,000	£600,000	£27,000	£750,000	£568,066	0.683
5		300,000	£3,366,000			£69,000	£135,000	£519,000	£225,000	£400,000	£15,000	£129,000	£600,000	£27,000	£750,000	£497,000	0.621
6		300,000	£3,366,000	£1,255,040		£69,000	£135,000	£519,000	£225,000	£400,000	£15,000	£129,000	£600,000	£27,000	£750,000	£758,040	0.564
7		300,000	£3,366,000			£69,000	£135,000	£519,000	£225,000	£400,000	£15,000	£129,000	£600,000	£27,000	£750,000	£497,000	0.513
8		300,000	£3,366,000	£1,144,066	£43,106	£69,000	£135,000	£519,000	£225,000	£400,000	£15,000	£129,000	£600,000	£27,000	£750,000	£690,172	0.467
9		300,000	£3,366,000			£69,000	£135,000	£519,000	£225,000	£400,000	£15,000	£129,000	£600,000	£27,000	£750,000	£497,000	0.424
10		300,000	£3,366,000	£757,832	£500,000	£69,000	£135,000	£519,000	£225,000	£400,000	£15,000	£129,000	£600,000	£27,000	£750,000	£760,832	0.386
11		300,000	£3,366,000			£69,000	£135,000	£519,000	£225,000	£400,000	£15,000	£129,000	£600,000	£27,000	£750,000	£497,000	0.350
12		300,000	£3,366,000			£69,000	£135,000	£519,000	£225,000	£400,000	£15,000	£129,000	£600,000	£27,000	£750,000	£497,000	0.319
13		300,000	£3,366,000	£1,920,668		£69,000	£135,000	£519,000	£225,000	£400,000	£15,000	£129,000	£600,000	£27,000	£750,000	£1,423,668	0.290
14		300,000	£3,366,000			£69,000	£135,000	£519,000	£225,000	£400,000	£15,000	£129,000	£600,000	£27,000	£750,000	£497,000	0.263
15		300,000	£3,366,000	£1,688,406	£2,320,106	£69,000	£135,000	£519,000	£225,000	£400,000	£15,000	£129,000	£600,000	£27,000	£750,000	£3,511,512	0.239
16		300,000	£3,366,000			£69,000	£135,000	£519,000	£225,000	£400,000	£15,000	£129,000	£600,000	£27,000	£750,000	£497,000	0.218
17		300,000	£3,366,000			£69,000	£135,000	£519,000	£225,000	£400,000	£15,000	£129,000	£600,000	£27,000	£750,000	£497,000	0.198
18		250,000	£2,805,000	£322,012	£1,050,208	£57,500	£112,500	£432,500	£187,500	£400,000	£15,000	£107,500	£500,000	£22,500	£625,000	£1,027,220	0.180
																£6,726,918	
																NPV	-£3,231,826
																IRR	#NUM!

POWERS FARM APPRAISAL	
Planning Application fee	£78,000
Planning and EIA & discharge of pre com conditions	£250,000
Footpath closures	£10,000
Highways Access off Regiments Way	£350,000
Borehole (process water supply)	£110,000
Welfare/WB/office/Wheelwash/Sheeting	£135,000
Services hardware & Systems	£75,000
Security CCTV and Fencing	£35,000
Power connection (minimum)	£250,000
Statutory compensation for AHA Tenant	£75,000
Advanced tree planting	£20,000
Project management & legal	£100,000
Contingency 15%	£223,200
Set Up	**£1,711,200**

Jul-18

Price/te £11.22
Total sales 4,900,000 te

10%

Year	Set up	Sales (t)	Income	Overburden	Material to Restoration	Silt at 10% Management	Plant	Variable cost	Central Overheads	Staff	Loss of Agri Income	Rates	Aggs Tax	Restoration	Royalty	Cash Flow	Discount rate
						£2.00	£0.45	£1.73	£0.75	£400,000	£15,000	£0.43	£2.00	£0.09	£2.00		
1	£1,711,200		£0			£0	£0	£0	£0	£70,000		£0	£0	£0	£0	£1,781,200	0.909
2		150,000	£1,683,000	£1,050,208		£34,500	£67,500	£259,500	£112,500	£70,000	£15,000	£64,500	£300,000	£13,500	£300,000	£604,208	0.826
3		300,000	£3,366,000			£69,000	£135,000	£519,000	£225,000	£400,000	£15,000	£129,000	£600,000	£27,000	£600,000	£647,000	0.751
4		300,000	£3,366,000	£1,065,066		£69,000	£135,000	£519,000	£225,000	£400,000	£15,000	£129,000	£600,000	£27,000	£600,000	£418,066	0.683
5		300,000	£3,366,000			£69,000	£135,000	£519,000	£225,000	£400,000	£15,000	£129,000	£600,000	£27,000	£600,000	£647,000	0.621
6		300,000	£3,366,000	£1,255,040		£69,000	£135,000	£519,000	£225,000	£400,000	£15,000	£129,000	£600,000	£27,000	£600,000	£608,040	0.564
7		300,000	£3,366,000			£69,000	£135,000	£519,000	£225,000	£400,000	£15,000	£129,000	£600,000	£27,000	£600,000	£647,000	0.513
8		300,000	£3,366,000	£1,144,066	£43,106	£69,000	£135,000	£519,000	£225,000	£400,000	£15,000	£129,000	£600,000	£27,000	£600,000	£540,172	0.467
9		300,000	£3,366,000			£69,000	£135,000	£519,000	£225,000	£400,000	£15,000	£129,000	£600,000	£27,000	£600,000	£647,000	0.424
10		300,000	£3,366,000	£757,832	£500,000	£69,000	£135,000	£519,000	£225,000	£400,000	£15,000	£129,000	£600,000	£27,000	£600,000	£610,832	0.386
11		300,000	£3,366,000			£69,000	£135,000	£519,000	£225,000	£400,000	£15,000	£129,000	£600,000	£27,000	£600,000	£647,000	0.350
12		300,000	£3,366,000			£69,000	£135,000	£519,000	£225,000	£400,000	£15,000	£129,000	£600,000	£27,000	£600,000	£647,000	0.319
13		300,000	£3,366,000	£1,920,668		£69,000	£135,000	£519,000	£225,000	£400,000	£15,000	£129,000	£600,000	£27,000	£600,000	£1,273,668	0.290
14		300,000	£3,366,000			£69,000	£135,000	£519,000	£225,000	£400,000	£15,000	£129,000	£600,000	£27,000	£600,000	£647,000	0.263
15		300,000	£3,366,000	£1,688,406	£2,320,106	£69,000	£135,000	£519,000	£225,000	£400,000	£15,000	£129,000	£600,000	£27,000	£600,000	£3,361,512	0.239
16		300,000	£3,366,000			£69,000	£135,000	£519,000	£225,000	£400,000	£15,000	£129,000	£600,000	£27,000	£600,000	£647,000	0.218
17		300,000	£3,366,000			£69,000	£135,000	£519,000	£225,000	£400,000	£15,000	£129,000	£600,000	£27,000	£600,000	£647,000	0.198
18		250,000	£2,805,000	£322,012	£1,050,208	£57,500	£112,500	£432,500	£187,500	£400,000	£15,000	£107,500	£500,000	£22,500	£500,000	£902,220	0.180
																£4,276,918	
																NPV	-£2,204,458
																IRR	#NUM!

POWERS FARM APPRAISAL	
Planning Application fee	£78,000
Planning and EIA & discharge of pre com conditions	£250,000
Footpath closures	£10,000
Highways Access off Regiments Way	£350,000
Borehole (process water supply)	£110,000
Welfare/WB/office/Wheelwash/Sheeting	£135,000
Services hardware & Systems	£75,000
Security CCTV and Fencing	£35,000
Power connection (minimum)	£250,000
Statutory compensation for AHA Tenant	£75,000
Advanced tree planting	£20,000
Project management & legal	£100,000
Contingency 15%	£223,200
Set Up	**£1,711,200**

Jul-18

Price/te £11.22
Total sales 4,900,000 te

10%

Year	Set up	Sales (t)	Income	Overburden	Material to Restoration	Silt at 10% Management	Plant	Variable cost	Central Overheads	Staff	Loss of Agri Income	Rates	Aggs Tax	Restoration	Royalty	Cash Flow	Discount rate
						£2.00	£0.45	£1.73	£0.75	£400,000	£15,000	£0.43	£2.00	£0.09	£1.50		
1	£1,711,200		£0			£0	£0	£0	£0	£70,000		£0	£0	£0	£0	£1,781,200	0.909
2		150,000	£1,683,000	£1,050,208		£34,500	£67,500	£259,500	£112,500	£70,000	£15,000	£64,500	£300,000	£13,500	£225,000	£529,208	0.826
3		300,000	£3,366,000			£69,000	£135,000	£519,000	£225,000	£400,000	£15,000	£129,000	£600,000	£27,000	£450,000	£797,000	0.751
4		300,000	£3,366,000	£1,065,066		£69,000	£135,000	£519,000	£225,000	£400,000	£15,000	£129,000	£600,000	£27,000	£450,000	£268,066	0.683
5		300,000	£3,366,000			£69,000	£135,000	£519,000	£225,000	£400,000	£15,000	£129,000	£600,000	£27,000	£450,000	£797,000	0.621
6		300,000	£3,366,000	£1,255,040		£69,000	£135,000	£519,000	£225,000	£400,000	£15,000	£129,000	£600,000	£27,000	£450,000	£458,040	0.564
7		300,000	£3,366,000			£69,000	£135,000	£519,000	£225,000	£400,000	£15,000	£129,000	£600,000	£27,000	£450,000	£797,000	0.513
8		300,000	£3,366,000	£1,144,066	£43,106	£69,000	£135,000	£519,000	£225,000	£400,000	£15,000	£129,000	£600,000	£27,000	£450,000	£390,172	0.467
9		300,000	£3,366,000			£69,000	£135,000	£519,000	£225,000	£400,000	£15,000	£129,000	£600,000	£27,000	£450,000	£797,000	0.424
10		300,000	£3,366,000	£757,832	£500,000	£69,000	£135,000	£519,000	£225,000	£400,000	£15,000	£129,000	£600,000	£27,000	£450,000	£460,832	0.386
11		300,000	£3,366,000			£69,000	£135,000	£519,000	£225,000	£400,000	£15,000	£129,000	£600,000	£27,000	£450,000	£797,000	0.350
12		300,000	£3,366,000			£69,000	£135,000	£519,000	£225,000	£400,000	£15,000	£129,000	£600,000	£27,000	£450,000	£797,000	0.319
13		300,000	£3,366,000	£1,920,668		£69,000	£135,000	£519,000	£225,000	£400,000	£15,000	£129,000	£600,000	£27,000	£450,000	£1,123,668	0.290
14		300,000	£3,366,000			£69,000	£135,000	£519,000	£225,000	£400,000	£15,000	£129,000	£600,000	£27,000	£450,000	£797,000	0.263
15		300,000	£3,366,000	£1,688,406	£2,320,106	£69,000	£135,000	£519,000	£225,000	£400,000	£15,000	£129,000	£600,000	£27,000	£450,000	£3,211,512	0.239
16		300,000	£3,366,000			£69,000	£135,000	£519,000	£225,000	£400,000	£15,000	£129,000	£600,000	£27,000	£450,000	£797,000	0.218
17		300,000	£3,366,000			£69,000	£135,000	£519,000	£225,000	£400,000	£15,000	£129,000	£600,000	£27,000	£450,000	£797,000	0.198
18		250,000	£2,805,000	£322,012	£1,050,208	£57,500	£112,500	£432,500	£187,500	£400,000	£15,000	£107,500	£500,000	£22,500	£375,000	£777,220	0.180
																£1,826,918	
																NPV	-£1,177,090
																IRR	#NUM!

APPENDIX 3

Essex County Council
Planning Service – Minerals & Waste
Economy, Localities & Public Health
County Hall
Chelmsford
Essex CM1 1QH

Ms Stuckey
Planning Chelmsford City Council

Our ref:
Date: 11 September 2018

By email

Dear Ms Stuckey

North East Chelmsford Garden Village – Minerals Resource Assessment

The Mineral Planning Authority has reviewed the Mineral Resource Assessment (July 2018 Ref DC/0742/1 – copy attached), prepared by Hughes Craven on behalf of the developers.

The Mineral Resource Assessment has been structured such that it provides an assessment of the mineral resource dividing the site into 5 areas.

Area A (Boreham Airfield) and Area B (Park Farm) – The MRA concludes that the permitted mineral within these areas has either been worked or will be worked prior to non-mineral development taking place. This will require the rephasing of the permitted workings and pre-application discussions have commenced with the MPA to achieve this.

Therefore the MPA would not object to the allocation of Areas A and B for non-mineral development, subject to the rephasing and prior mineral working of areas A and B.

Area C – Includes areas that have either been previously worked for minerals, contain no mineral, or the configuration of the land is such that working any remaining mineral would not be practical or viable.

Therefore the MPA has no objection to the allocation of this area for non-mineral development as it would not result in the sterilisation of an economic mineral resource.

Area E – This area contains no significant mineral resource

The MPA has no objection to non-mineral development of this area, subject to its development not adversely impacting upon the effective working of Bulls Lodge Quarry (Boreham Airfield and Park Farm - Areas A and B)

Area D – Powers Farm – The MRA shows that there is a mineral resource of economic significance. Historically a planning application was made to work the mineral but this was refused, mainly as there was no need for the sand and gravel at that time.

The MRA concluded that the mineral resource was unviable/un-economic to work. The MRA included information to support this conclusion in the form of Viability Assessment. The MPA has required an independent review of this Viability Assessment. The review has been undertaken by SLR Consulting and the outcome of this review is attached at Appendix A.

The review considers that the viability assessment has presented a reasonable assessment of how the site might be worked and the financial assessment is based on reasonable assumptions and comparable commercial costs and as such that Area D is unviable as a stand-alone mineral operation.

The MPA therefore raises no objection to the allocation of area D for non-mineral development.

Conclusion The MPA raises no objection to the North East Chelmsford Garden Village allocation within the emerging new Chelmsford City Local Plan, subject to the prior working of all permitted mineral within Bulls Lodge Quarry (Areas A and B).

Yours faithfully

Claire Tomalin
Principal Planner

Telephone: 03330 136821
Enquiries to: Claire Tomalin
Internet: www.essex.gov.uk
Email: claire.tomalin@esex.gov.uk

APPENDIX 4

4th September 2018

Claire Tomalin BSc (Hons), MA, MATPI
Principal Planner, Minerals & Waste
Planning Service
Economy, Localities & Public Health
Essex County Council
County Hall
Chelmsford
Essex
CM1 1QH

Our Ref: 403.00027.00480

Dear Claire

RE: REVIEW OF MINERALS VIABILITY ASSESSMENT FOR ESSEX COUNTY COUNCIL

Further to your email dated 10th August 2018, my colleague Ben Matthews and I have reviewed the Minerals Resource Assessment for North East Chelmsford Garden Village (August 2018 ref. HC/0742/1) produced by Hughes Craven.

We have responded below to the two questions posed within the ECC Consultant's Brief attached to this email.

As per the Consultant's Brief we have focussed our review on Area D – Powers Farm.

1. IN PRINCIPLE, IS THE EXTRACTION AND PHASING PROPOSED BY THE LANDOWNERS AT POWERS FARM - AREA D OF THE MRA (SECTION 8 AND APPENDIX 6 OF THE MRA) REASONABLE?

The Area D extraction phasing presented in Appendix 6 can be considered reasonable based on the information given in the Mineral Resource Assessment (see comments below).

The phasing scheme involves temporary storage of overburden and subsequent 'double handling' of the material for placement into the excavated void for restoration. This is commonly the case whereby overburden occurs across the entire site and is required to backfill the void. Overburden from phases 1 (plant site) to 3 are placed in temporary storage, whereas phases 4 through to 8 involve direct placement into the void. Reconfiguring the phase boundaries and order of extraction could potentially reduce the volume of double handling, although it is unlikely that the reduction would be significant in relation to the entire scheme (perhaps <10% improvement). An example could be the repositioning of the processing plant into the area of Phase 6, where the initial

overburden strip would be less than Phase 1 and the final mineral for extraction following removal of the processing plant would be less.

The extraction programme is based on average sales of 300,000 tonnes per annum, whereas production from Bulls Lodge has been historically over 700,000 tonnes per annum, which is exceptional. Increased production increases revenue and may present economies of scale, albeit with increased costs and environmental impact. However, the principle of basing the assessment on a stand-alone quarry operating at a more standard output level of 300,000 tonnes per annum is not unreasonable.

2. ARE THE INPUTS AND ASSUMPTIONS RELIED UPON WITHIN THE FINANCIAL APPRAISAL (APPENDIX 6 OF THE MRA) REASONABLE?

We have reviewed the financial appraisals at Appendix 6 and the assumptions contained within the Section 8 (Economic Appraisal) of the MRA.

We note that the financial appraisal is based on the scenario of a "stand-alone" quarry (8.2.7) and consider this reasonable in the circumstances.

We have based our review on our knowledge and experience of sand & gravel quarries, both in the context of the "major", multi-site, UK operators and as an independent business unit. In respect of the latter, we are currently closely reviewing the financial performance of a comparable, single-site operation for the purposes of a compensation claim and, although the figures are confidential, this provides a usual reference point for this exercise.

Our findings are summarised below:

- The set up costs listed appear reasonable, but exclude any capital costs associated with acquiring and installing the sand & gravel washing and processing plant or any mobile, plant and machinery. Therefore, we have assumed that such costs have been incorporated into the "Plant Cost" and "Variable Cost" columns of the appraisal.

  If the capital cost of an aggregate washing/processing plant is incorporated into the cashflow model, with plant and variable costs adjusted accordingly, the NPV and overall viability are reduced further.

- The unit costs used for overburden and soil movement have been checked and are in line with current commercial rates.

  It is apparent that the costs associated with overburden stripping, storage and replacement have the major impact on the viability model. We note that the initial stripping costs are deferred to Year 2 of the DCF rather than Year 1 (prior to extraction). This understates the cash flow impact of the initial soil / overburden "cut", which must predate any mineral sales revenue.

- We note an apparent error in calculation of the "Silt Management" costs, but this does not materially change the figures. We would also note that due to the potential difficulties and associated costs of disposing of silt, the adopted costs may be understated.

- We have checked the "Staff" and "Central Overhead" costs against evidence presented for a single-site operation and the figures presented, as a percentage of revenue, are reasonable and consistent.
- There is an argument that "Loss of Agricultural Income" is compensated for by the "Royalty" column, but the removal of the former column from the appraisal does not make a material difference to the viability assessment.
- We are comfortable that the values used to reflect Business Rates liability are correct. We are also comfortable that the average, selling price per tonne adopted (£11.22) is inclusive of Aggregates Tax, so a deduction column is appropriate.
- We accept that including the "Royalty" column is appropriate to attribute value to the wasting asset. The financial model is presented with two royalty levels and we would expect a hypothetical landlord to accept a reduced royalty for a marginal site, but not to release a mineral asset for no consideration.
- We note that the appraisal does not reflect finance costs, depreciation, inflation or any element of developer profit.
- The further discounting of "Prior Extraction" (8.5) also appears reasonable, based on the above inputs and assumptions.
- As a general observation, aggregate industry accepted overburden to mineral ratios will vary on a regional basis, as determined by the availability of resources and also by the scale and other activities on a site. No consideration is given with regards to value added activities (such as aggregate uses – asphalt, ready mixed concrete) or waste disposal, which can serve to improve the financial viability of the site. However, it is not unreasonable for a mineral viability assessment to solely consider the primary activity.

Having reviewed the financial appraisal and developed comparator DCF models to check and challenge the calculations (all of which presented negative NPV and viability), we find the inputs and assumptions presented with the MRA to be reasonable and concur that, based on these assumptions, Area D is unviable as a stand-alone mineral operation.

We would be happy to discuss our findings with you and the Landowner.

Yours sincerely
SLR Consulting Limited

David Sandbrook, BSc, FRICS, MRTPI, FIQ, MCIWM
RICS Registered Valauer
Director

This publication is available in alternative formats including large print, audio and other languages

Please call 01245 606330

Planning and Housing Policy
Directorate for Sustainable Communities
Chelmsford City Council
Civic Centre
Duke Street
Chelmsford
Essex
CM1 1JE

Telephone 01245 606330
planning.policy@chelmsford.gov.uk
www.chelmsford.gov.uk

Document published by
Planning and Housing Policy

Chelmsford City Council