GeoDyne

Geotechnical &
Environmental
Consultants

Land off Bosworth Lane
Newbold Verdon

Phase I Desk Study Report
For
Bloor Homes

GeoDyne Limited
9 Brunel Parkway, Pride Park,
Derby, DE24 8HR
Tel: 01332 290798
Email: info@geodyne.co.uk

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Project No: D44061		**Date: 14th August 2024**	
Issue/revision	Prepared by	Checked By	Approved By
Revision A – 07.05.2025	**Deanna Leedle BSc (Hons) FGS** Geo-Environmental Engineer	**Stephen Sellers BSc (Hons) MSc FGS** Principal Geo-Environmental Engineer	**Paul Kershaw BSc (Hons) PGDip CGeol FGS** Director
Comments			

1.0 INTRODUCTION

1.1 Introduction

GeoDyne Limited has been appointed by the Client, Bloor Homes, to undertake a Phase I Desk Study on an undeveloped parcel of land off Bosworth Lane, Newbold Verdon, Leicestershire. A Site Location Plan (Figure No. D44061/01 Revision A) is included in Appendix I.

1.2 Project Understanding

We understand that the proposals at the site comprise the *'Erection of up to 200 dwellings, a community health and well-being hub (Use Class E(e)) or community shop (Use Class E(a)) of up to 108 sqm gross external area and provision of up to 0.5 hectares of school playing fields and sport pitches, together with landscaping, open space, infrastructure and other associated works'*, as indicated on the Indicative Framework Plan included in Appendix II. This report is to support the planning application for the proposed development.

The foregoing understanding has formed the basis of our assessment. Where the proposed site end-use is not consistent with our current understanding, it would be necessary to review our assessment to ensure it continues to apply.

1.3 Scope of Works

The scope of the Phase I Desk Study included the following:

- A site walkover.
- Review of available historical and contemporary Ordnance Survey publications relating to the site.
- Review of the sites geology, hydrology and hydrogeology.
- Review of the sites coal mining status and commission of a Consultants Coal Mining Report.
- Review of the sites radon status.
- Commission of a full detailed Landmark Envirocheck Report relating to the site.
- Commission of Landmark geological mapping data.
- Initial consideration of unexploded bomb risk (by Zetica Bomb Risk Map).
- An enquiry to British Gypsum to ascertain any mining interest with respect to gypsum.
- Production of a preliminary Conceptual Site Model (pCSM).

1.4 Limitations

The conclusions and recommendations made in this report are limited to those that can be made based on the findings of the investigation.

Where comments are made based on information obtained from third parties, GeoDyne Limited assumes that all third-party information is true and correct. No independent action has been undertaken to validate the findings of third parties.

This report has been prepared in accordance with our understanding of current good practice. However, changes to good practice, guidance or legislation may necessitate revision of this report after the date of issue.

GeoDyne Limited has prepared this report for the sole use and reliance of Bloor Homes, in accordance with our standard Conditions & Limitations (included in Appendix XI). This report may not be used or relied upon by any unauthorised third party without the explicit written agreement of GeoDyne Limited. Reliance may not be placed on our report until all invoices associated with the project have been paid.

2.0 SITE DESCRIPTION & HISTORY

2.1 Site Description

The site comprises an irregularly shaped parcel of land situated to the south-east off Bosworth Lane, located around approximate Ordnance Survey National Grid reference 444160E, 304160N. The site covers an area of approximately 8.4 hectares.

At the time of our site walkover (August 2024), the site comprised recently harvested arable land with hedges and occasional trees along the majority of the site edges. The site was noted to be generally level.

Access was gained onto the site from Bosworth Lane through a public footpath gate in the north-western corner of the site. The sites periphery to the north along Bosworth Lane had an overgrown drainage ditch.

All fields barring entrances were bounded by semi-mature to mature hedgerows and occasional trees on all sides which typically ran alongside wire fencing. A vehicular entrance was located along the south-western site boundary of the site.

A north-west / south-east orientated public footpath runs parallel with the south-western site boundary, between the western corner and the southern corner access points.

An overhead electricity cable was noted to cross through the site, running in an approximate north-east / south-west orientation in the northern portion of the site.

In the area surrounding the site, residential dwellings are present to the north-east and east of the site, with the Newbold Verdon Primary School located to the south-east of the site. Pastoral land was present to the site's south. To the west of the site, arable land was present with Bosworth Lane encompassing the north-western boundary with pastoral land beyond.

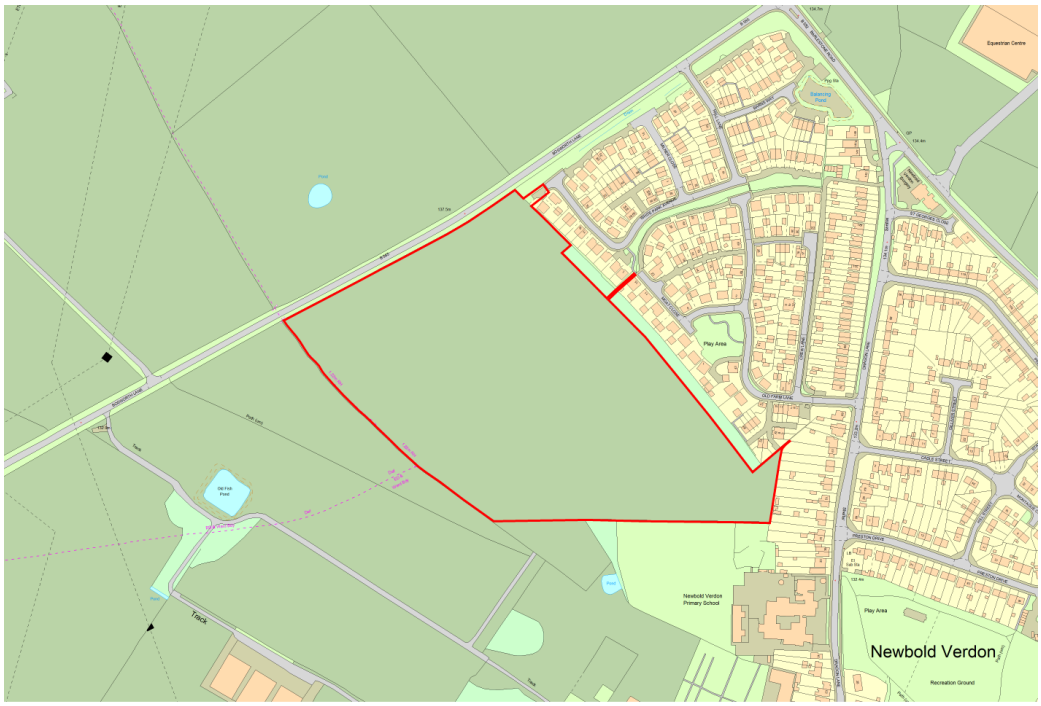
We would note that current Ordnance Survey maps indicate the presence of a nearby small pond beyond the southern boundary. At the time of our walkover, this location was largely an overgrown surface depression, with no apparent ditches flowing into the depression area.

The Annotated Site Plan in Appendix III of this report (Figure No. D44061/02 Revision A) shows the main features of the site and immediate surrounding area. General views of the site are included on the plan in Appendix IV of this report (Figure No. D44061/03 Revision A).

An aerial photograph of the site area proposed to be developed, obtained from the Landmark Analysis tool commissioned as part of our works, is presented in Figure 1 on the next page, with the current OS mapping plan for the site and surrounding area presented in Figure 2.

Figure 1: Aerial photograph of the site (2024 image)

Figure 2: Current OS Mastermap Plan



2.2 Site History

The historical and contemporary Ordnance Survey publications included within the Landmark Envirocheck Report have been reviewed by GeoDyne to establish the history of the site and its environmental setting. The historical Ordnance Survey maps are included as Appendix V of this report.

We would note that the boundary marked on the historical sheets within the Envirocheck Report appears to 'shift' on several of the maps due to scaling inaccuracies between maps of differing dates. This is a function of Envirocheck transposition algorithms.

The key findings of the historical search are summarised in Table 1.

TABLE 1 – HISTORICAL PUBLICATION DATA

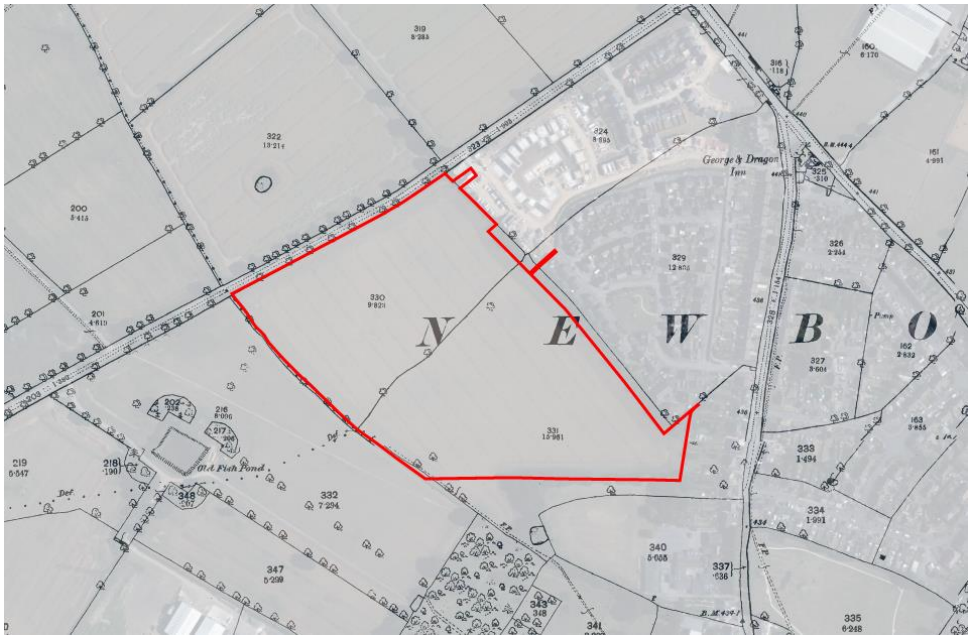
Date	Features on Site	Features off Site
1880s	• The site extends across two undeveloped fields. • A track / footpath runs along the south-western boundary of the site.	• The site is mainly surrounded by undeveloped fields, to the north-west of Newbold Verdon. • A '*Road*' (later known as '*Bosworth Lane'*) is located adjacent to the sites north-western boundary. • Small '*Ponds*' are located within the fields surrounding the site, the closest is located approximately 50m south of the site. • The '*Old Fish Pond'* is located approximately 120m west of the site. • A building known as *'The Hall'* is located approximately 200m to the south. • A '*Graveyard*' is located approximately 190m south-east of the site.
1890s	• No maps available for viewing.	• No maps available for viewing.
1900s	• The site remains essentially unchanged.	• The surrounding area remains essentially unchanged.
1910s	• No maps covering the site area are available for viewing.	• Mapping coverage is limited to an area to the east of the site. This area shows that minor residential development has occurred.
1920s	• No maps available for viewing.	• No maps available for viewing.
1930s	• No maps covering the site area are available for viewing.	• Mapping coverage is limited to an area to the east of the site. However, this area appears essentially unchanged.
1940s	• No maps available for viewing.	• No maps available for viewing.
1950s	• The site remains essentially unchanged.	• The expansion of '*Newbold Verdon'* has occurred with residential properties adjacent to the site's eastern boundary and north-eastwards away from the site's eastern boundary. • The '*Newbold Verdon County Primary School'* is adjacent to the sites south-eastern boundary. • The '*Graveyard'* to the south-east has expanded northwards and is now approximately 130m from the site. • A former '*Pond'* located approximately 130m to the south of the site, is no longer shown (presumably infilled).
1960s	• The site remains essentially unchanged.	• The further expansion of '*Newbold Verdon*' has occurred to the east of the site.
1970s	• The site remains essentially unchanged.	• The surrounding area remains essentially unchanged.

TABLE 1 – HISTORICAL PUBLICATION DATA		
Date	**Features on Site**	**Features off Site**
1980s	• The site is now one undeveloped field.	• Further expansion of '*Newbold Verdon*' has occurred to the south-east of the site. • A former '*Pond*' located approximately 75m to the north-west of the site, is no longer shown (presumably infilled).
1990s	• The site remains essentially unchanged. • The 1999 aerial imagery shows the site to comprise an agricultural cropped field, with an overhead power line crossing the northern portion of the site in a north-east / south-west orientation.	• The surrounding area remains essentially unchanged. • The 1999 aerial imagery appears to show the pond feature approximately 75m north-west of the site is still present.
2000s	• The site remains essentially unchanged.	• The '*Graveyard*' to the south-east is no longer labelled.
2024	• The site remains essentially unchanged.	• Further residential development is occurring within the vicinity of the site to the north-east.

2.3 Aerial Photography & Historical Map Overlays

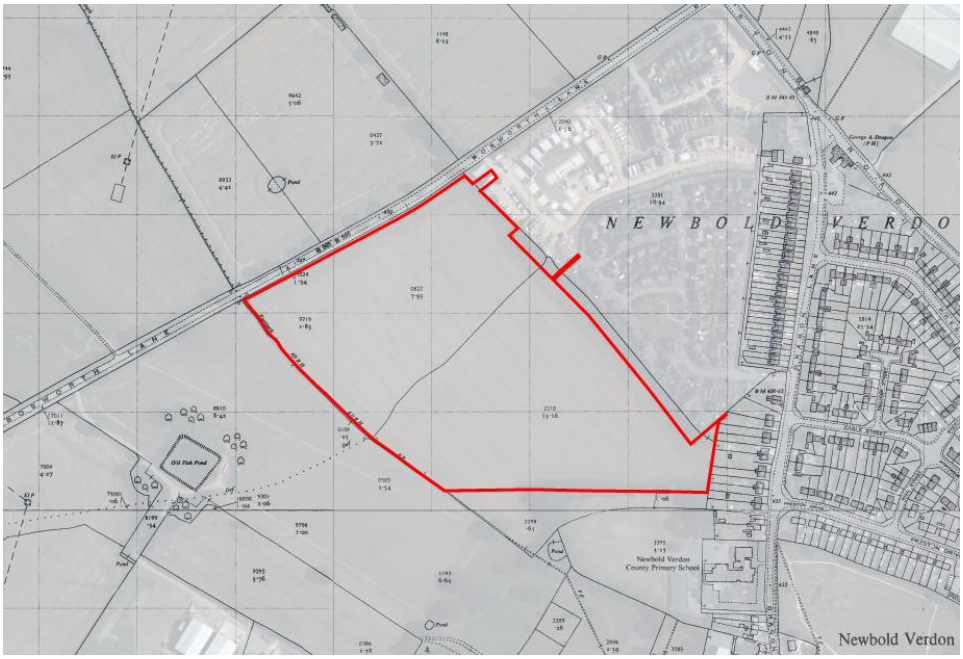
As part of the commissioned Landmark Report, the use of the Landmark Envirocheck Analysis tool was purchased to provide site specific aerial photographic imagery, and to provide the ability to undertake limited historical map overlay manipulation. The following pictures (Figures 3 to 5) shows overlays of the historical map publications from 1886, 1958-59 and 1994, as shown on current aerial imagery.

Figure 3: Current Aerial Imagery Overlain with 1886 Historical Map Data



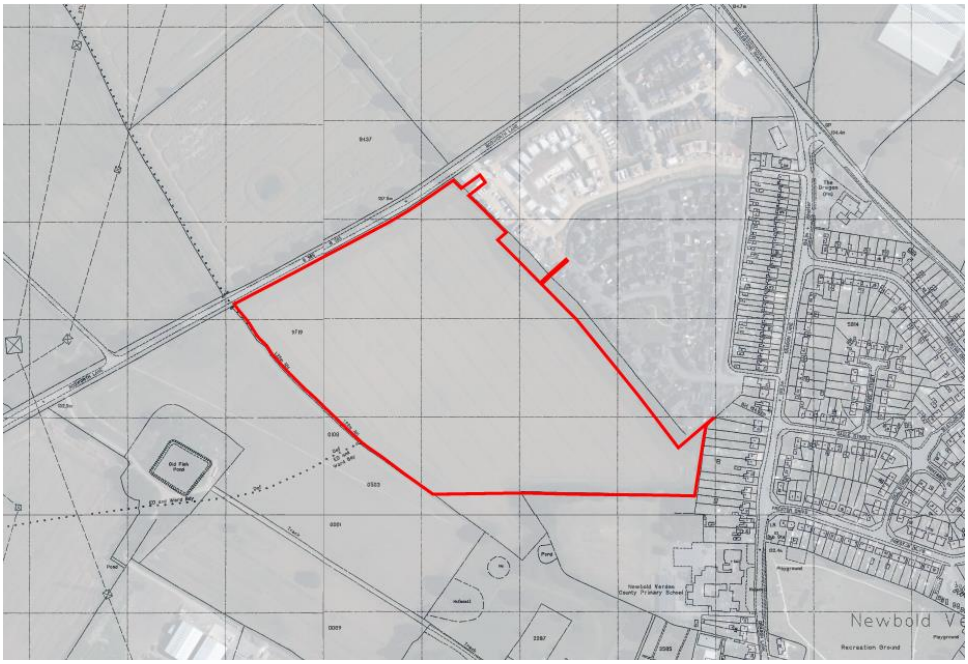
The site comprises part of two undeveloped fields with other features on site including a footpath / track situated parallel with the south-western site boundary.

Figure 4: Current Aerial Imagery Overlain with 1958-59 Historical Map Data



The expansion of Newbold Verdon has occurred and residential properties lie adjacent to the eastern boundary of the site.

Figure 5: Current Aerial Imagery Overlain with 1994 Historical Map Data



The site is now one undeveloped field.

3.0 GEOLOGY & ENVIRONMENTAL SETTING

3.1 Geological References

The following geological publications were referred to:

- BGS 1:50000 Series Sheets 155 *'Coalville'* Solid and Drift Edition (2010).
- BGS 1:10000 Series Sheet SK40SW Solid and Drift Edition (1982).
- Landmark geological map sheets (included in Appendix VI).
- The BGS online interactive map viewer and Lexicon of Named Rock Units.
- The Mining Remediation Authority online interactive map viewer.
- Environment Agency website: www.environment-agency.gov.uk.

3.2 Geology

Superficial Drift Deposits

Drift deposits comprising the Oadby Member (Diamicton) are indicated to be present beneath the approximate north-western half of the site. Glaciofluvial Deposits are indicated to be present beneath the approximate south-eastern half of the site.

The Oadby Member is described on the geological map as '*silty clay diamicton with clasts including flint, chalk and Jurassic rocks'*. We would further note that Diamicton can comprise a mixture of clay, sand and gravel which incorporates boulders of varying shape and size.

Glaciofluvial Deposits generally comprise sand and gravel with layers or lenses of clay and silt. The geological map notes that the Glaciofluvial Deposits in the Leicester area comprise '*sand and gravel'*.

We would note that superficial deposits have the potential to alter rapidly in character and geotechnical properties both laterally and vertically over relatively short distances and may also be water bearing.

Bedrock Geology

The bedrock underlying the majority site and the immediate surrounding area to the sites west is indicated to comprise strata of the Gunthorpe Member (part of the Mercia Mudstone Group), which generally comprises gypsiferous Mudstone with beds of green-grey dolomitic Siltstone and Sandstone.

The Gunthorpe Member is indicated to be sequentially overlain by strata of the Cotgrave Sandstone Member and then the Edwalton member close to the north-eastern boundary of the site.

The Edwalton Member is described on the geological map as '*Mudstone, red-brown or green-grey, gypsifereous, with beds of green-grey dolomitic siltstone'*.

The Cotgrave Sandstone Member generally comprises fine grained green-grey Sandstone. The Mudstone, Siltstone and localised Sandstone may weather to clay, silt and sand respectively in the near surface horizons.

In addition to the above, Coal Measures strata are indicated to be present at depth beneath the site. Based on the nearest known borehole record to the site (available on the British Geological Survey's website) which is situated approximately 59m east of the site, the Lower Coal Measures strata appear to be situated at a depth of 99.59m below ground level (based on the ground level at the borehole location). The borehole was drilled in 1959 and indicates the following:

- *'Sand and gravel'* (which are assumed to comprise drift deposits) to a depth of 9.14m below ground level.
- *'Keuper Marl'* (i.e. the former name of the Mercia Mudstone Group) and this typically comprises 'Marl' (i.e. mudstone) to a depth of approximately 73.13m below ground level.
- *'Keuper Sandstone'* (i.e. the former name of the Sherwood Sandstone Group) to a depth of approximately 99.59m below ground level.
- *'Lower Coal Measures'* to the base of the borehole at 150.88m below ground level.

Further comments relating to coal seams and mining are discussed in Section 4.0 of this report.

3.3 Faults

No surface faults are indicated to be present within the boundary of the site or within the immediate vicinity of the site, on the geological maps viewed.

3.4 Man-Made Deposits

The geological publications do not show the presence of any man-made deposits (i.e. Made Ground, Worked Ground or Landscaped Ground) beneath or within likely potential influencing distance of the site.

3.5 Unexploded Ordnance Risk

An initial Unexploded Bomb Risk Map search has been commissioned through ZeticaUXO. The plan (see Appendix VII) indicates that the site is within a '*Low'* risk area with regard to unexploded ordnance.

3.6 Landmark Envirocheck Report

A Landmark Envirocheck Report was commissioned to assist in ascertaining the environmental setting of the site. The full Envirocheck Report is presented in Appendix VIII and has revealed the following key relevant information (details are only listed where they are within potential influencing distance of the site).

No comments have been made in our report with respect to potential flooding issues. Advice from a qualified drainage consultant should be sought by the client with respect to this matter.

3.6.1 Agency and Hydrological

<u>Aquifer Status</u>

The aquifer designation maps are presented in Appendix VIII and are based on geological mapping provided to Landmark by the British Geological Survey. Different aquifer classifications may be applied to superficial (drift) deposits (typically forming shallow perched groundwater units where present) and bedrock aquifers (which may contain regional groundwater units). Possible aquifer designations comprise Principal Aquifers, Secondary (A, B or Undifferentiated) Aquifers and Unproductive Strata.

The Superficial Deposits of the Oadby Member and Glaciofluvial Deposits are indicated to be designated as a Secondary Undifferentiated Aquifer and Secondary A Aquifer, respectively.

The underlying bedrock (i.e. Gunthorpe Member and Edwalton Member) are designated as Secondary B Aquifers, with the more localised Cotgrave Sandstone Member being classified as a Secondary A Aquifer.

Secondary A Aquifers are described by the Environment Agency as having *'…permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers*'.

Secondary B Aquifers are described by the Environment Agency as *'…predominantly lower permeability layers which may store and yield limited amounts of groundwater due to localised features such as fissures, thin permeable horizons and weathering. These are generally the water-bearing parts of the former non-aquifers*'.

The Environment Agency use the term Secondary Aquifer - Undifferentiated to describe aquifers where *'…it has not been possible to attribute either category A or B to a rock type. In most cases, this means that the layer in question has previously been designated as both minor and non-aquifer in different locations due to the variable characteristics of the rock type'*.

Source Protection Zone Status

The site is not shown to lie within a Source Protection Zone (SPZ). SPZs relate to the protection of groundwater resources principally for public drinking water supply.

Surface Water

Five entries for surface water features (ponds / drainage diches) have been identified within a 250m radius of the site, with the closest record being located approximately 48m north of the site boundary. It would appear from the mapping contained within the Landmark report that this entry relates to a short length of drainage ditch bordering Bosworth Lane and adjacent to the residential housing estate to the north-east of the site. Other waste features shown on the mapping relate to ponds in the vicinity of the site.

Our walkover also revealed the presence of drainage ditches bordering the road to the north of the site.

Discharge Consents

No discharge consents are listed within 250m of the site boundary.

Water Abstractions

There are no licensed water abstractions listed within 250m of the site. The closest water abstraction is located approximately 323m south of the site, which is listed for the abstraction of groundwater for *'General Farming and Domestic'* uses at The Hall in Newbold Verdon.

3.6.2 Waste

There are no waste sites (i.e. current or historic landfills, waste transfer stations etc.) identified on or within 250m of the site.

One area of potentially infilled ground (water) is located approximately 191m south-east of the site. Based on our review of the historical mapping, this feature appears to relate to a former pond which was infilled in the late 1950s and has since been occupied by the graveyard to the south-east.

3.6.3 Hazardous Substances

There are no sites associated with hazardous substances (e.g. sites dealing with explosives etc) identified on the site, or within a 250m radius of the site, in the Landmark Envirocheck Report.

3.6.4 Geological Issues

BGS Soil Chemistry

The BGS has prepared estimated soil concentration maps for several metals (including Arsenic, Lead, Nickel, Chromium and Cadmium), which are extrapolated from records available for use within their assessments.

Whilst potentially useful for the inference of Natural Metal Enrichment (NME) of the natural soils in a general locale, the data should not be used to inform any detailed decisions with regards to the chemistry of a particular site as it does not allow for anthropogenic effects. Estimates of the soil chemistry at the site indicate anticipated concentrations of Arsenic of <15mg/kg, Cadmium of <1.8mg/kg, Chromium of 20-60mg/kg, Lead <100mg/kg and Nickel of <15mg/kg.

Based on the information supplied within the Envirocheck report, the site is not shown to be located within an area where significant Natural Metal Enrichment of the underlying natural soils is likely to be present. However, this is only applicable to the specific determinands listed above.

Ground Stability Hazards

No significant ground stability hazards have been identified by the Envirocheck report that relate to the site (including from collapsible, compressible, ground dissolution, landslide, running sand and shrinking or swelling clay ground stability hazards).

Radon

The Envirocheck report states that '*The property is in a Lower probability radon area (less than 1% of homes are estimated to be at or above the Action Level*'.

The report further states that '*No radon protective measures are necessary in the construction of new dwellings or extensions'*. No specific mitigation in relation to radon issues are therefore required at the site.

BGS Borehole Records

There are no further BGS borehole records within the immediate vicinity of the site (in addition to the comments contained within Section 3.2 above).

Mining and Ground Stability Datasheet

The Landmark Mining & Ground Stability Datasheet (included within Appendix VIII) identifies the presence of a pond within the data relating to Extractive Industries or Potential Excavations located approximately 53m south, listed as 1959. This feature relates to a small pond indicated from historical mapping to be present to the south of the site and currently is still present.

A further record of Extractive Industries or Potential Excavations is located approximately 80m north-west of the site and relates to a small pond that is currently still present, as shown on the historical / Ordnance Survey mapping.

3.6.5 Industrial Land Use

Contemporary Trade Directory Entries

Three inactive entries are located within 250m of the site boundary, with the closest entry located approximately 78m south-east and listed as *'Footwear Manufacturers & Wholesale'*. There are no recorded active entries within 250m of the site boundary.

Points of Interest – Manufacturing and Production

The Envirocheck Report has two entries relating to manufacturing and production located approximately 205m and 207m south of the site and both entries are indicated to relate to '*Arable Farming'*.

Points of Interest – Public Infrastructure

A single entry relating to public infrastructure is located approximately 242m east, associated with '*Waste Storage, Processing and Disposal'*.

3.6.6 Sensitive Land Use

The site and immediate surrounding area are identified as being within a Nitrate Vulnerable Zone.

3.7 British Gypsum Enquiry

A Landmark Envirocheck Report was commissioned to assist in ascertaining the environmental

Taking account of the potential presence of gypsum within the strata of the Gunthorpe Member and Edwalton Member beneath the site, an enquiry was made to British Gypsum to ascertain the potential for any gypsum workings beneath the site.

The response received from British Gypsum simply stated that *'The area you have indicated does not require a British Gypsum mining search'*.

A copy of the enquiry email and the response received from British Gypsum are enclosed within Appendix IX of this report.

3.8 Land Use Assessment

As part of the land use assessment, reference has been made to the *'Desk Reference Guide to potentially Contaminative Land Uses'* produced by Mr P Syms and published jointly by the ISVA (The professional Society for Valuers and Auctioneers) in association with The Royal Institution of Chartered Surveyors (RICS) and the Chartered Institute of Environmental Health (CIEH).

We have also made reference to the Department for Environment, Food and Rural Affairs and the Environment Agency Contaminated Land Report CLR8 '*Potential Contaminants for the Assessment of Land*' (March 2002). Although now formally withdrawn, this document identifies key contaminants which may potentially be present at a site as a result of a given historical land use and is considered useful as a desk based ready reference guide.

3.8.1 On Site Assessment

At the time of our site visit (August 2024), the site essentially comprised a recently harvested arable field.

From the evidence of historical mapping, the site appears to have remained as undeveloped fields since the earliest reviewed mapping of the 1880s.

The site is not identified in any of the land-use categories detailed within the publications referenced in Section 3.8. Based on the information obtained from our desk study enquiries, our walkover of the site and experience of similar sites, potential general soil contamination that may be present could include:

- Metals or metalloids associated with any potential localised Made Ground.
- Polycyclic Aromatic Hydrocarbons (PAHs) from any ashy inclusions and / or carbonaceous inclusions in the near surface soils.
- Pesticides and herbicides associated with the former and contemporary agricultural use of the site.

3.8.2 Off Site Assessment

The site lies within an area with only a very limited number of commercial and industrial activities. The closest known land uses to the site appear to be a former Footwear Manufacturers & Wholesale located approximately 78m south-east. However, based on the distances to the site, it is considered highly unlikely for any potentially mobile contaminants (such as hydrocarbons) to migrate and significantly impact the study site.

With regard to ground gases, it would appear that based on evidence from the desk study there is limited potential for on or off-site sources of hazardous ground gases at / near to the site. Any potential infill to the former small ponds (including to the south-east of the site) is considered not to represent a significant source of ground gas (i.e. carbon dioxide and methane). This is due to the limited volume of any potential remaining backfill, together with the small scale and the likely shallow nature of this feature, together with the time that has elapsed since the potential infilling and the distances to the site.

4.0 COAL MINING

4.1 Introduction

The site is indicated in the Envirocheck Report to lie within an area which may be affected by coal mining activity. The data.gov.uk website defines the Coal Mining Reporting Area as follows:

'*The Coal Mining Reporting Area, also known as CON29M Coal and Brine Consultation Areas, is the known extent of coal mining activity and is used to determine whether a coal mining report is required for property transactions and the conveyance process. This area does not represent the full extent of geological coal reserves and resources.*'

For any site located within a Coal Mining Reporting Area further works are required to determine the extent of recorded potential risks to ground stability from coal mining legacy hazards.

The Mining Remediation Authority (formerly known as the Coal Authority) has divided the coalfield into 2 No. spatial areas identified as Development High Risk Areas or Development Low Risk Areas.

The Mining Remediation Authority defines the Development High Risk Area as follows:

'The Development High Risk Area is the part of the coal mining reporting area which contains one or more recorded coal mining related features at surface or shallow depth. These features pose a potential risk to surface stability and public safety. The combination of features included in this composite area includes mine entries; shallow coal workings (recorded and probable); recorded coal mining related hazards; recorded mine gas sites; fissures and breaklines and previous surface mining sites. New development proposals in this defined area should be supported by a Coal Mining Risk Assessment in order to demonstrate that the development will be safe and stable, taking full account of former coal mining activities. This area was formally known as the Development Referral Area.'

The Mining Remediation Authority defines the Development Low Risk Area as follows:

'The Development Low Risk area is an area where our records do not indicate the presence of coal mining features at surface or shallow depth which may pose a risk to surface stability or public safety.'

Within a Development High Risk Area, a desk-based Coal Mining Risk Assessment (CMRA) is typically required as a minimum to accompany a planning application and assess the potential risk to new development from a coal mining legacy hazard, or combination of hazards.

Generally, where a site lies within a Development Low Risk Area, consideration of potential coal mining issues should be undertaken, however, a detailed Coal Mining Risk Assessment is not typically required.

The production of this report has been undertaken in accordance with the following guidance:

- The Mining Remediation Authority guidance detailed on www.gov.uk Planning applications and Coal Mining Risk Assessments, published 17th September 2014, revised 1st June 2023.
- CIRIA Special Publication 32 *'Construction over abandoned mine workings'* (1984).
- The Coal Authority document *'Guidance on managing the risk of hazardous gases when drilling or piling near coal'*, Version 2, April 2019.
- CIRIA Report C758 *'Abandoned Mine Workings Manual'* (2019).

4.2 Site Classification

The online interactive Mining Remediation Authority Map Viewer was viewed to ascertain whether the site is located within a Coal Mining Reporting Area. The results of this search are included in Table 2.

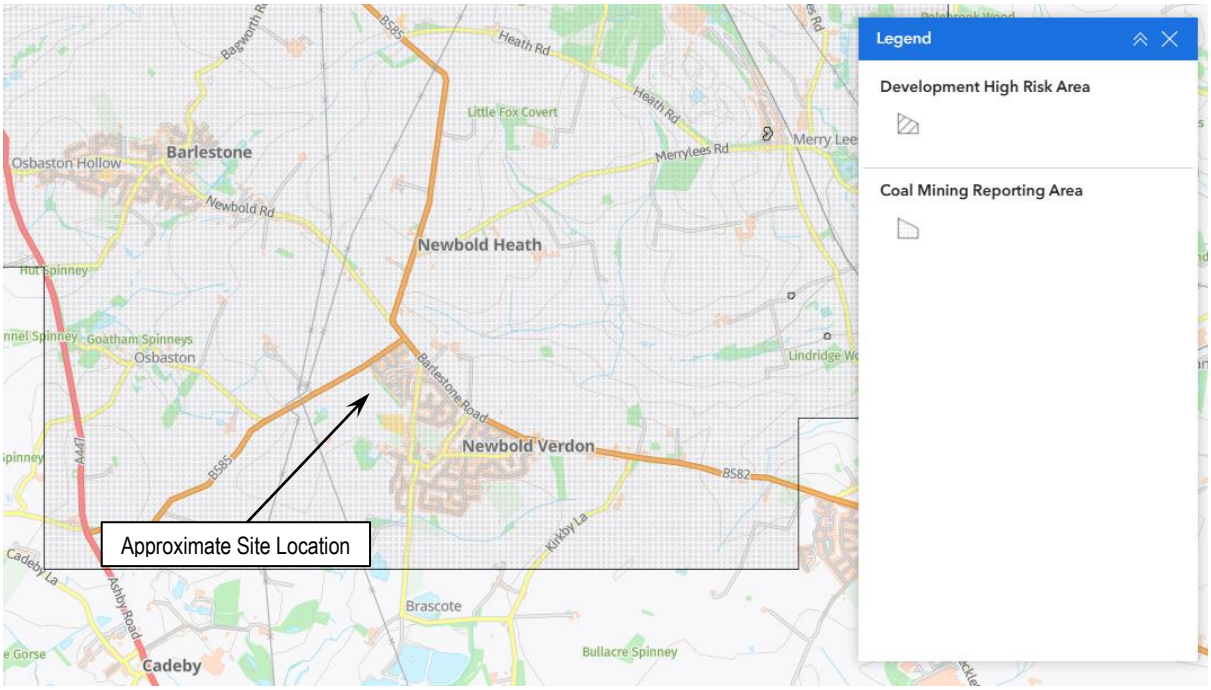
TABLE 2 – SUMMARY OF MINING REMEDIATION AUTHORITY MAP VIEWER (HIGHLIGHT RELEVANT SQUARE)		
Is the site located within a Coal Mining Reporting Area?	Yes – Commission a Consultants Coal Mining Report from the Mining Remediation Authority	No – No further works required.

The Map Viewer can also indicate whether the site is located within a Development High or Low Risk Area.

It is noted that due to the scale of the viewer, it can be unclear in borderline areas whether the site is Low or High risk. Where there is uncertainty, the site will be assumed to be in a Development High Risk Area until the information has been reviewed and assessed.

The Map Viewer indicates that the site is not located within a Development High Risk Area as shown in Figure 6 below.

Figure 6: Mining Remediation Authority Map Viewer



4.3 Consultants Coal Mining Report

With the site being located within a Coal Mining Reporting Area, a Consultants Coal Mining Report was obtained from the Mining Remediation Authority for review and interpretation. The Consultants Coal Mining Report is included in Appendix X and the key findings of the report are summarised below.

4.3.1 Mining Activity and Geology

The Consultants report has identified one named coal seam which has been recorded as having been worked beneath the site. This is listed as the *'Lower Main'* coal seam with approximate depths to the workings from surface of 118m / 119m and with approximate extraction thicknesses of 1.77m and 1.83m. The *'Lower Main'* coal seam is indicated to have last been worked in 1969. The Consultants report indicates that the coal seam dips to the north-east by 2.4 degrees.

The Consultants Report also states that no probable unrecorded shallow workings are anticipated beneath the site. The report confirms that there are no recorded mine entries at, or within 100m from, the site. No opencast mines are present within 500m from the site.

The report does not reveal any outcrops of coal at the site nor does the report identify the presence of any geological faults, fissures or breaklines beneath the site.

4.3.2 Investigative or Remedial Activity

The Consultants Report does not identify any records of site investigations or remedial activity in relation to coal mining within 50m of the sites boundary. Furthermore, there are no damage notices or claims in relation to subsidence at the site or within 50m of the boundary of the site, since 31st October 1994.

The Consultants Report does not reveal any records for mine gas or mine water treatment schemes within 500m of the sites boundary. Further consideration of Mine Gas is provided in Section 4.5 of this report.

4.3.3 Licensing and Future Mining Activity

The Consultants Report indicates that there are no records relating to future underground mining at the site or any coal mining licenses within 200m of the sites boundary.

The Consultants Report states that the property is in an area where notices to withdraw support were given in 1959 and 1975.

There are no Section 46 notices (stating the land is at risk of subsidence) or notices relating to payment to owners of former copyhold land. Furthermore, there are no records for court orders.

4.4 Additional Information

4.4.1 Geological Conditions & Coal Seams

As stated in Section 3.2, the bedrock geology underlying the site is indicated to comprise the Pennine Lower Coal Measures Formation. There are no coal seams shown to outcrop within the site as the Coal Measures strata are overlain by other bedrock strata (including Gunthorpe Member of the Mercia Mudstone Group over the majority of the site, with the Cotgrave Sandstone and the Edwalton Formation indicated in the far north-east portion of the site).

4.4.2 Geological Faults

As stated in Section 3.3, our review of the geological mapping has revealed that no surface faults are indicated to be present within the boundary of the site.

4.4.3 Historical Evidence of Mining

Our review of the historical mapping has not revealed any evidence of historical coal mining activity at the site.

4.4.4 Site Observations

No obvious evidence of historical coal mining was observed at the site during our site walkover.

4.5 Mine Gas Risk Assessment (MGRA)

4.5.1 Introduction

Guidance with respect to a coal Mine Gas Risk Assessment (MGRA) is provided in the following report:

- CL:AIRE (Contaminated Land: Applications in Real Environments) Report *'Good Practice for Risk Assessment for Coal Mining Gas Emissions'*, dated October 2021, Ref. ISBN 978-1-905046-39-3.

Section 2 of the report provides the following commentary:

'*The overall risk assessment process for mine gas follows the broad framework provided by the UK government on land contamination risk management (LCRM1) (Environment Agency, 2020). The Coal Mining Reporting Area (also known as CON29M Coal and Brine Consultation Areas) is the known extent of coal mining activity and is used to determine whether a coal mining report is required for property transaction and the conveyancing process. The coalfield is divided into two areas, referred to as Development High Risk Area and Development Low Risk Area:*

- *the High Risk Area (15% of the coalfield) is where coal mining risks are present at shallow depth which are likely to affect new development; and*

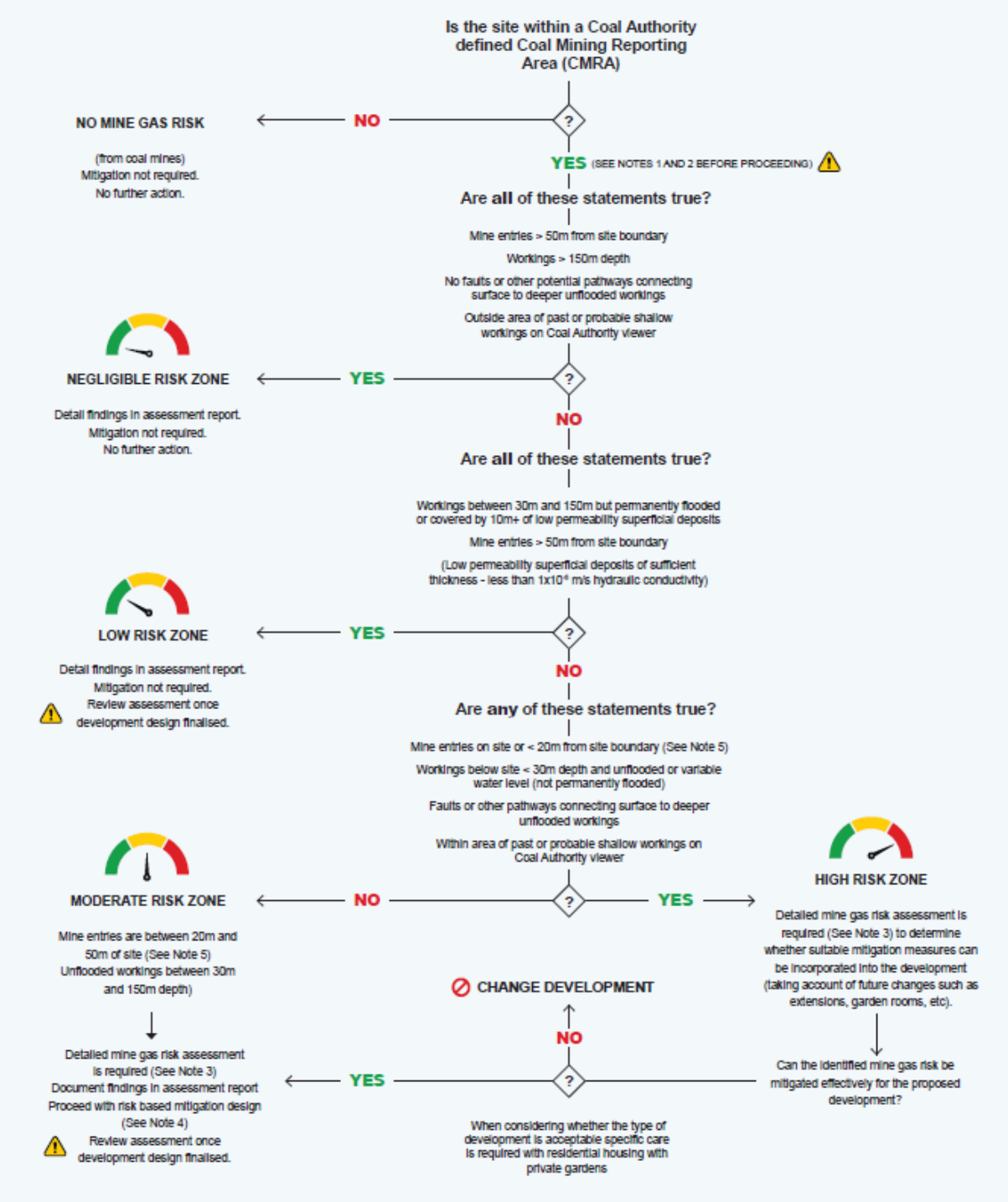
- *the Low Risk Area (85% of the coalfield) is where past coal mining activity has taken place at sufficient depth that it poses low risk to new development.*

If a site is within a Coal Mining Reporting Area (as defined by the Coal Authority, based on their current data and experience across Great Britain) then a mine gas risk assessment should be carried out. This may be relatively simple process in the Low Risk Area with detailed assessments more likely to be required in the High Risk Area.'

4.5.2 Preliminary Mine Gas Risk Assessment

The CL:AIRE report provides the following decision tool to support a Preliminary Mine Gas Risk Assessment (PMGRA).

Further guidance can be found in the CL:AIRE report.



4.5.3 Preliminary Data Review

The site is indicated to lie within a Coal Mining Reporting Area as detailed in Section 4.2.

A copy of the Consultants Coal Mining Report in relation to the site is included in Appendix X. A review of the mining report has been undertaken in Section 4.3.

As an initial screen of the site, the Consultants Coal Mining Report, together with other site-specific information such as geological mapping and historical mapping may be utilised to comprise the PMGRA.

The site lies within a Development Low Risk Area. There are records of past underground coal mining beneath the site, albeit at significant depth in excess of approximately 90m below surface. There are no probable unrecorded shallow coal workings beneath the site and there are no coal seams shown to outcrop within the site or in close proximity to the site. There are no recorded mine entries at, or within 100m from, the site. There are no known geological faults, fissures or breaklines beneath the site.

Given the significant depth of the workings, it is considered likely that the workings would be flooded. Furthermore, based on the nearby BGS borehole record, the Coal Measures strata are overlain by an approximate thickness of 64m of the Gunthorpe Member (formerly known as Keuper Marl) which is considered to generally comprise 'low permeability' deposits which should restrict the upward migration of any mine gases, where present at depth.

Taking account of the foregoing, it would be considered reasonable to assume the site should be considered to be within a Low Risk Zone with respect to mine gas. On this basis, mitigation is not required and no further action with respect to mine gas is considered to be required.

5.0 PRELIMINARY CONCEPTUAL SITE MODEL

5.1 General

The DEFRA publication '*Environmental Protection Act 1990: Part 2A Contaminated Land Statutory Guidance*' (dated April 2012) states the following with regards to the production of a Conceptual Site Model (CSM) for a site:

'*The process of risk assessment involves understanding the risks presented by land, and the associated uncertainties. In practice, this understanding is usually developed and communicated in the form of a "conceptual model"*'. The development of a CSM is typically undertaken in an iterative process, reflecting the changes in understanding as more detailed site information becomes available.

In developing a CSM, and specifically in the context of land contamination, consideration needs to be given to three essential elements; which form the basis of any risk present. The statutory guidance sections 3.8 and 3.9 (April 2012) states the following:

(a) '*A "contaminant" is a substance which is in, on or under the land and which has the potential to cause significant harm to a relevant receptor, or to cause significant pollution of controlled waters.*
(b) A "receptor" is something that could be adversely affected by a contaminant, for example a person, an organism, and ecosystem, property, or controlled waters...
(c) A "pathway" is a route by which a receptor is or might be affected by a contaminant.

The term "contaminant linkage" means the relationship between a contaminant, a pathway and a receptor.' For a contaminant linkage to be plausible, all three elements need to be present.

In undertaking a risk assessment and deriving a CSM for the purposes of the redevelopment of a site (i.e. planning and development control) reference has been made to both the Model Procedures for the Management of Land Contamination, as well as the National Planning Policy Framework (NPPF, dated July 2018).

The preliminary CSM should identify the hazards (source of potential contamination) and should set out the potential pollutant linkages with a view to identifying the nature and magnitude of the potential risks to receptors.

In order to undertake the foregoing assessment, consideration is required with respect to the probability or likelihood of the linkage occurring and the severity and significance of the potential consequences; taking account the nature of the pollutant linkage and the potential severity of the hazard and the sensitivity of the receptor within the context of the proposed land use (in consideration of the planning regime).

Consideration of consequence/severity, probability/likelihood and risk has been based on the following guidance documentation:

- CIRIA C552 '*Contaminated Land Risk Assessment, A Guide to Good Practice*', 2001.
- EA R&D publication 66 '*Guidance for the Safe Development of Housing on Land Affected by Contamination*', 2008.

5.2 Classification of Consequences

In order to apply a consequence classification to a particular potential pollutant linkage, it is first necessary to define the terminology used within the classification system. The following terminology and definitions detailed in Table 3 have been adopted within our assessment, based on the guidance referenced in Section 5.1.

TABLE 3 – CLASSIFICATION OF CONSEQUENCES

Classification	Definition
Severe	• Acute risks to human health. • Short-term risk of pollution of controlled waters or significant impact on controlled waters; e.g. large-scale pollution or very high levels of contamination. • Catastrophic damage to buildings or property (such as building explosion causing collapse). • Ecological system effects – immediate risks of major damage which is likely to result in irreversible substantial adverse changes in the functioning of the ecosystem or harm to a species of special interest that endangers the long-term maintenance of the population.
Medium	• Chronic risks to human health. • Pollution of sensitive water resources (such as leaching of contaminants into controlled waters) causing a significant effect on water quality. • Ecological system effects – Immediate risks of significant damage which may result in substantial adverse changes to the ecosystems functioning or harm to a species of special interest that may endanger the long-term maintenance of the population. • Significant damage to buildings, structures and services (for example foundation damage or rendering the building unsuitable for habitation).
Mild	• Non-permanent health effects to human health (i.e. exposure is unlikely to lead to 'significant harm' in the context of Part 2A of the Environmental Protection Act 1990. • Pollution of controlled waters or non-sensitive water resources (for example non-classified groundwater) that results in a short-lived effect to water quality or a marginal effect on amenity value, agriculture or commerce. • Minor damage to buildings, structures and services. • Ecological system effects – Minor or short-term damage which is unlikely to result in substantial adverse changes to the ecosystems functioning or harm to a species of special interest. • Substantial damage to non-sensitive environments (such as arable farmland for example).
Minor	• No measurable effects on human health including non-permanent health effects to human health that are easily preventable by appropriate use of PPE/RPE. • Minor pollution of controlled waters including non-sensitive water resources with no discernible effects on water quality or ecosystems. • Minor damage to non-sensitive environments (including arable farmland for example). • Easily repairable effects of damage to buildings, structures, services or the environment (for example discolouration of concrete, loss of plants in a landscaping scheme etc.).

5.3 Classification of Probability

Once the possibility of a pollutant linkage has been established (noting that probability classification does not apply when there is no possibility of a linkage being present), the probability should be classified in accordance with Table 4.

TABLE 4 – CLASSIFICATION OF PROBABILITY

Classification	Definition	Likelihood
High Likelihood	There is a pollutant linkage and an event is highly likely to occur in the short-term, and is almost inevitable over the long-term OR there is evidence at the receptor of harm or pollution occurring.	>95% likelihood of Consequence Occurring
Likely	There is a pollutant linkage and it is probable that an event will occur. It is not inevitable, but possible in the short-term and likely over the long-term.	50 – 95% likelihood of Consequence Occurring
Low Likelihood	There is a pollutant linkage and circumstances are possible under which an event could occur. It is by no means certain that even over a longer period such an event would take place, and less likely in the short-term.	5 – 49% likelihood of Consequence Occurring

TABLE 4 – CLASSIFICATION OF PROBABILITY		
Classification	**Definition**	**Likelihood**
Unlikely	There is a pollutant linkage and it is improbable that an event would occur even in the very long-term.	<5% likelihood of Consequence Occurring

5.4 Classification of Risk

In order to establish the relevant risk term applicable to the identified pollutant linkage, one of the risk phrases identified within Table 5 must be adopted, with the definitions of each risk term detailed within Table 6.

TABLE 5 – RISK CLASSIFICATION MATRIX (BASED ON C552 CIRIA, 2001)					
		Consequence of Risk			
		Severe	**Medium**	**Mild**	**Minor**
Probability (Likelihood)	**High Likelihood**	Very High	High	Moderate	Moderate/Low
	Likely	High	Moderate	Moderate/Low	Low
	Low Likelihood	Moderate	Moderate/Low	Low	Negligible
	Unlikely	Moderate/Low	Low	Negligible	Negligible or No Potential Risk

TABLE 6 – RISK CLASSIFICATION DEFINITIONS (BASED ON C552 CIRIA, 2001)	
Very High	There is a high probability that severe harm will arise to a designated receptor from an identified hazard OR there is evidence that severe harm to a designated receptor is currently happening. This risk, if realised, is likely to result in a substantial liability. Urgent investigation (if not undertaken already) and remediation are likely to be required.
High	Harm is likely to arise to a designated receptor from an identified hazard. Realisation of the risk is likely to present a substantial liability. Urgent investigation (if not undertaken already) is required and remedial works may be necessary in the short term and are likely over the longer term.
Moderate	It is possible that harm could arise to a designated receptor from an identified hazard. However, there is a low likelihood that such harm would be severe, or if any harm were to occur it is more likely that the harm would be mild. Investigation (if not already undertaken) is normally required to clarify the risk and to determine the potential liability. Some remedial works may be required in the longer term.
Moderate/Low	It is possible that harm could arise to a receptor. However, a combination of likelihood and consequence results in a risk that is above low but is not of sufficient concern to be classified as moderate. It can be driven by cases where there is an acute risk which carries a severe consequence, but where the exposure is unlikely. Such harm would at worst normally be mild. The risk is unlikely to present a substantial liability. Some limited further investigation may be required to clarify the risk and any associated liability. If subsequent remediation works are necessary, they are likely to be limited in extent.
Low	It is possible that harm could arise to a designated receptor from an identified hazard, but it is likely that this harm, if realised, would at worst normally be mild.
Negligible	There is a low possibility that harm could arise to a receptor. In the event of such harm being realised it is unlikely to be any worse than mild. No liability would be associated with such risks.
No Potential Risk	There is no potential risk or liability where no pollutant linkage has been established.

5.5 Contaminant [C] - Pathway [P] - Receptor [R] Considerations

The following CPR assessment has been undertaken based on the assumption that it is proposed to construct low-rise residential properties with associated private gardens.

5.6 Consideration of Potential Sources of Contamination [C]

Based on the findings of our desk study works, the potential key sources of contamination at the site that would require consideration for the derivation of a preliminary CSM would be the following:

TABLE 7 – SUMMARY OF POTENTIAL CONTAMINANT SOURCES

Areas of Potential Concern (APCs)	Associated Contaminants
Near Surface Soils (including potential localised Made Ground)	• Metals and metalloids. • PAHs. • Pesticides and Herbicides.

5.7 Consideration of Potential Pathways [P]

The potential pathways at the site are primarily:

- Direct ingestion of soil (either directly or as soil particles attached to produce).
- Inhalation of fugitive dust and vapours.
- Direct skin contact with the ground.
- Direct ingestion of home-grown produce.
- Direct ground contact with construction materials (including supply pipes).
- Vertical and lateral migration of contamination.

5.8 Consideration of Potential Receptors [R]

The potential receptors at the site are:

- The final end users (residents - typically long term (chronic) exposure) and site visitors – (typically short term (acute) exposure).
- The construction personnel (i.e. site workers) involved with the development of the site (typically short term (acute) exposure).
- Neighbouring properties (off-site receptors).
- Controlled Waters (i.e. underlying groundwater and nearby surface waters).
- Buildings and construction materials (including buried utilities).

In preparing this CSM, it has been assumed that construction personnel involved with the development of the site (typically short term (acute) exposure) will adopt all necessary personal protective equipment (PPE and RPE etc.) and conform to health and safety requirements of their site-specific Risk Assessments and Method Statements (RAMS). Site workers have therefore not been included within the following table, as the adoption of these appropriate mitigation measures will result in an overall low risk of exposure to the C-P-R linkages identified.

5.9 Preliminary Risk Assessment / Conceptual Site Model

Our preliminary conceptual model of possible pollutant linkages, applicable to the proposed site usage and based on our current understanding, is summarised in Table 8.

TABLE 8 – PRELIMINARY RISK ASSESSMENT SUMMARY TABLE
DESK STUDY

Potential Contaminant Source [C]	Potential Pathway(s) [P]	Potential Receptor [R]	Probability of CPR Linkage	Consequence of CPR Linkage	Risk Level	Comments / Justification
Near Surface Soils (including potential localised Made Ground)	Direct contact, ingestion or inhalation of fugitive dust / vapours	End users	Low Likelihood	Mild	Low	No Made Ground is indicated from geological mapping to be present on the site. No potentially significant historical contaminative land uses have been identified at the site. End users are likely to come into contact with the in-situ soils within areas of soft landscaping. Further consideration of this potential linkage should be provided during the course of the Phase II Exploratory Investigation works.
	Plant uptake / soil attached to home grown produce	End users	Low Likelihood	Mild	Low	No Made Ground is indicated from geological mapping to be present on the site. No potentially significant historical contaminative land uses have been identified at the site. Growing vegetables for private consumption may be anticipated at the site. Further consideration of this potential linkage should be provided during the course of the Phase II Exploratory Investigation works.
	Vertical and lateral migration	Neighbouring properties	Low Likelihood	Mild	Low	No Made Ground is indicated from geological mapping to be present on the site. No potentially significant historical contaminative land uses have been identified at the site. No significant sources of potentially mobile contamination have been identified. Further consideration of this potential linkage should be provided during the course of the Phase II Exploratory Investigation works.
	Leaching of contaminants through unsaturated zone and/or vertical and lateral migration	Controlled Waters	Low Likelihood	Mild	Low	No Made Ground is indicated from geological mapping to be present on the site. No potentially significant historical contaminative land uses have been identified at the site. No significant sources of potentially mobile contamination have been identified. The site does not lie within a designated SPZ. The drift deposits and bedrock geology underlying the site are all classified as Secondary aquifers of differing categories, (i.e. A, B & undifferentiated). Further consideration of this potential linkage should be provided during the course of the Phase II Exploratory Investigation works.

TABLE 8 – PRELIMINARY RISK ASSESSMENT SUMMARY TABLE DESK STUDY						
Potential Contaminant Source [C]	**Potential Pathway(s) [P]**	**Potential Receptor [R]**	**Probability of CPR Linkage**	**Consequence of CPR Linkage**	**Risk Level**	**Comments / Justification**
Near Surface Soils (including potential localised Made Ground)	Direct contact	Plastic buildings products (e.g. water supply pipes) and buried concrete	Low Likelihood	Mild	Low	No Made Ground is indicated from geological mapping to be present on the site. No potentially significant historical contaminative land uses have been identified at the site. Further consideration of this potential linkage should be provided during the course of the Phase II Exploratory Investigation works.

The foregoing preliminary conceptual model highlights the potential plausible pollutant linkages that may relate to the site and would therefore require addressing by appropriate Phase II Exploratory Works. The information contained within the conceptual model should be confirmed and revised upon completion of an appropriate intrusive investigation, as detailed in the following sections.

6.0 CONCLUSIONS

6.1 Site Summary

- At the time of our site visit (August 2024), the site essentially comprised a recently harvested arable field.
- The site has essentially remained as undeveloped fields since the earliest reviewed mapping of the 1880s.
- Drift deposits comprising Oadby Member (Diamicton) are indicated to be present beneath the approximate north-western half of the site, with Glaciofluvial Deposits indicated to be present beneath the approximate south-eastern half of the site.
- The majority of the underlying bedrock comprises strata of the Gunthorpe Member. The Edwalton Member and the Cotgrave Sandstone Member underlie the drift deposits to the north-eastern site boundary.
- The strata underlying the site are variously designated as Secondary A, B or Undifferentiated Aquifers.
- The site in not located within a Source Protection Zone (SPZ).

6.2 Geotechnical Assessment

We understand that it is the intention of the Client to develop the site with low-rise residential properties, including gardens. Published geological information indicates that the natural drift deposits underlying the site are likely to initially comprise a combination of clay and sand with varying amounts of gravel / cobbles and boulders. These drift deposits may provide a suitable bearing stratum for shallow foundations but have the potential to alter rapidly in character and geotechnical properties both laterally and vertically over relatively short distances and may be water bearing.

The bedrock strata (Gunthorpe Member, Cotgrave Sandstone Member and Edwalton Member) underlying the Superficial deposits typically comprise competent founding strata for shallow foundations.

The foundation and floor slab design for the site will depend on the results of intrusive geotechnical investigative works. These works should confirm the absence (or presence) of any Made Ground, determine the depth to, and strength of, the Natural Strata, and provide an assessment of the volume change potential of any potentially cohesive soils. It should be noted that the presence of potentially shallow groundwater may affect the ground bearing pressure of the near surface soils and effect stability of excavations.

An appropriate scope of geotechnical tests should also be included within a suitable Phase II investigation for the purposes of designing foundations (including plasticity index analysis and / or particle size distribution analysis, water soluble sulphate / pH etc.).

6.3 Building Near Trees

Foundation designs may need to be locally adjusted when building near existing, recently removed or proposed trees and hedgerows. Hedgerows, with occasional trees, are typically present along the site boundaries, and it is recommended that these are surveyed and identified by a qualified arborist prior to development where appropriate. Appropriate geotechnical soils testing should be undertaken as part of Phase II works, to assist in detailed foundation design.

6.4 Ground Gas

The Desk Study works have not identified any significant sources of potentially hazardous ground gases (i.e. carbon dioxide and methane) on or off-site.

Therefore, at this stage a programme of ground gas monitoring is considered not to be necessary at the site. However, should significant depths of Made Ground or organic soils be encountered at the site during the exploratory works, a programme of ground gas monitoring may become necessary to confirm the ground gas regime and the requirement for any ground gas precautions within the proposed dwellings.

6.5 Coal Mining

No specific investigation or mitigation in relation to historical coal mining issues are considered to be necessary at the site.

6.6 Radon

No radon protective measures are necessary at the site, in accordance with the landmark report.

6.7 Water

The results of the intrusive investigation will assist in establishing the groundwater regime beneath the site.

6.8 Surface Water Drainage

The use of soakaways would be subject to the ground conditions encountered during the intrusive works and the results of in-situ permeability testing.

6.9 Contamination Risk

It is considered that the following contaminants represent an appropriate list of determinands for initial assessment with regards to potential contamination risks at the site.

- Metals or metalloids associated with any potential localised Made Ground.
- Polycyclic Aromatic Hydrocarbons (PAHs) from any ashy inclusions and / or carbonaceous inclusions in the near surface soils.
- Pesticides and herbicides associated with the former and contemporary agricultural use.

The foregoing contaminants have the potential to adversely impact site workers, end users (i.e. residents) and building structures.

Detailed Phase II Exploratory Investigation works will be required to attempt to further investigate and resolve the potential contaminant risk. At this stage, we envisage undertaking a contamination assessment for the plausible contaminants identified at the site.

The requirement for water testing would be dependent upon the findings of the intrusive investigation (although is considered to be unlikely).

6.10 Statutory Consultation

We would recommend that a copy of this Phase I Desk Study report is issued (by the Client) to the Local Planning Authority for review and comment as part of the planning application process.

Any comments made by the Local Authority, or their appointed consultees, should be incorporated into the Phase II Exploratory Investigation to ensure that the intrusive investigation is acceptable to all parties.

6.11 Recommended Phase II Exploratory Investigation Works

Proposed Phase II Exploratory Works should be sufficient to investigate the possible issues raised in the Phase I Desk Study and should be undertaken in general accordance with current industry good practice. Based on our current understanding (preliminary Conceptual Site Model), it is recommended that Phase II works comprise the following, as a minimum:

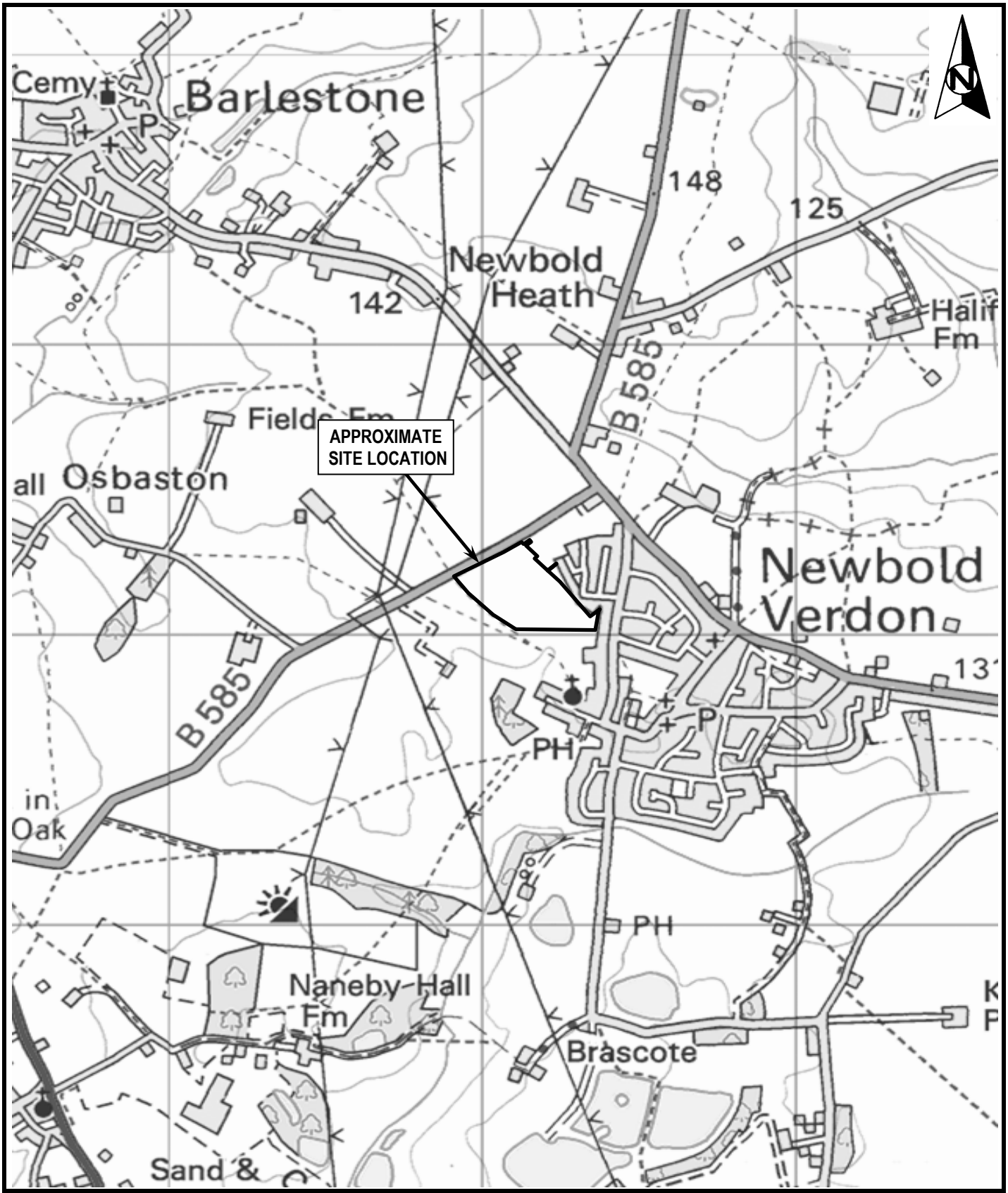
- A programme of exploratory holes (i.e. window sample boreholes and / or trial pits) across the site to provide an initial inspection of the ground conditions for geotechnical and environmental purposes.
- Appropriate geotechnical and environmental soil analysis.

6.12 Closing Comment

Based on the evidence of the findings of the Phase I Desk Study enquiries and following the implementation of any necessary remedial measures, the site is considered likely to be suitable for the proposed end-use from a geotechnical and environmental perspective.

APPENDIX I

Site Location Plan
(Figure No. D44061/01 Rev A)



Project No.	D44061	Drawn	SJ
Client	Bloor Homes	Checked	SS
Project	Land off Bosworth Lane Newbold Verdon Leicestershire	Approved	PK
		Scale	NTS
		Date Drawn	12/08/2024
Title	Site Location Plan	Rev.	Rev A - 01/05/2025
		Figure No.	**D44061/01**

GeoDyne

APPENDIX II

Indicative Framework Plan

0 20m 40m 60m 80m 100m

Status **Planning**

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Client: Bloor Homes - East Midlands

Project title: Land South of Bosworth Lane, Newbold Verdon

Drawing title: Indicative Framework Plan

Scale:	1:1500 (A2)
Date:	January 2025
Drawn by:	JMP
Checked by:	LH
Drawing no.:	2508709.11.03
Revision:	D

Marrons

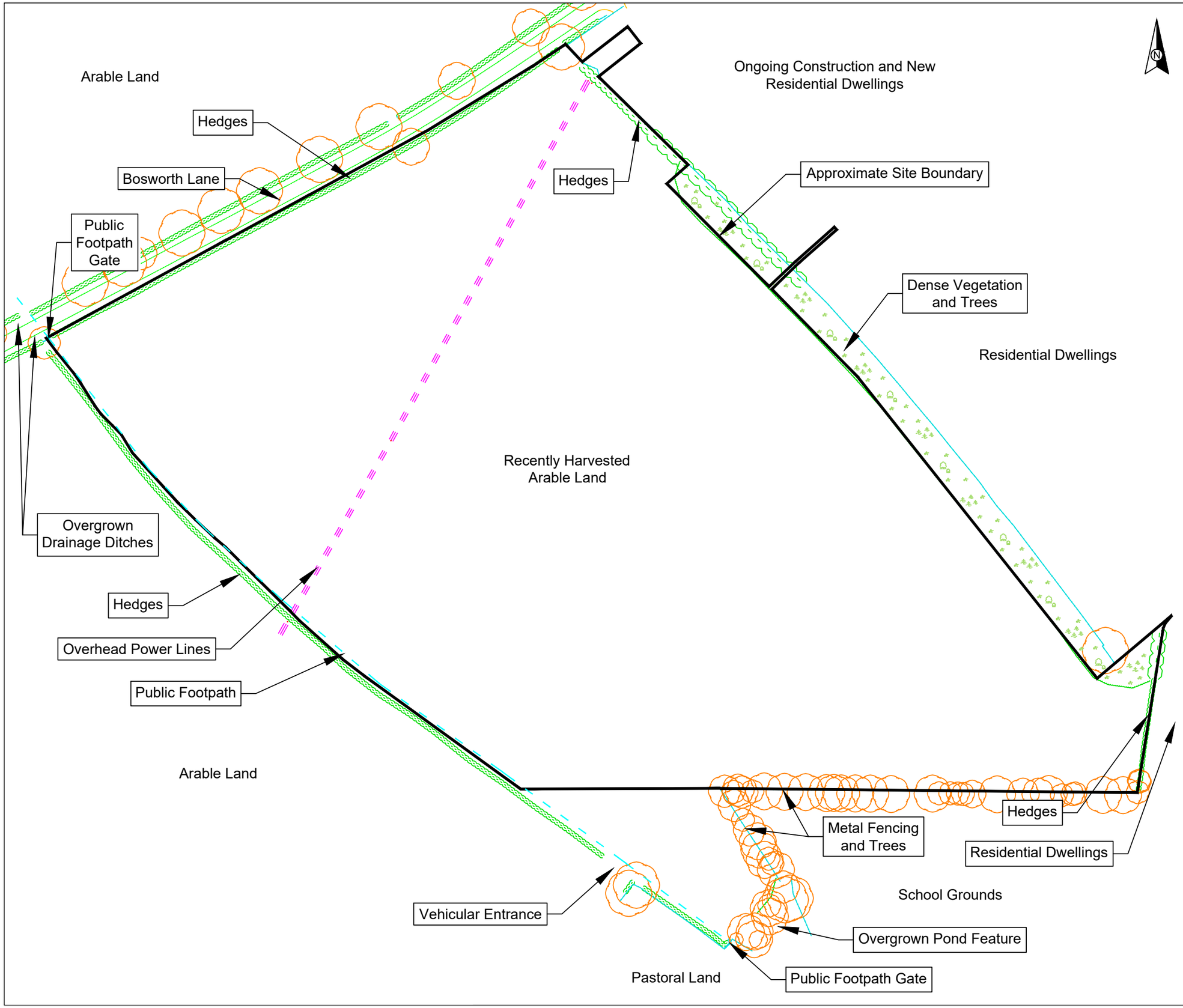
Birmingham
1 Colmore Square,
B4 6AA
t: 0121 214 0001

Bristol
One Temple Quay,
Temple Back East, BS1 6DZ
t: 0117 906 9400

w: www.marrons.co.uk e: info@marrons.co.uk

APPENDIX III

Annotated Site Plan
(Figure No. D44061/02 Rev A)



Project No.	D44061
Client	Bloor Homes
Project	Land off Bosworth Lane, Newbold Verdon Leicestershire
Title	Annotated Site Plan
Drawn By	SJ
Checked By	SS
Approved By	PK
Scale	NTS
Date Drawn	12/08/2024
Revision	Rev A - 01/05/2025
Figure No.	D44061/02

GeoDyne

Nottingham 0115 962 0001
Derby 01332 290 798

info@geodyne.co.uk
www.geodyne.co.uk