

Kettering East Energy Park Mining Risk Assessment

27th April 2023

Project Name: Kettering East Energy Park
Project No: LDP2474
Revision: P02
Reference: KEP-BWB-ZZ-XX-RP-YE-0006_MRA
Author: A. Higgs

1 Introduction

- 1.1 BWB Consulting Ltd (BWB) was instructed by First Renewable Developments Limited (the Client) to carry out a Mining Risk Assessment (MRA) in relation to the possibility of historical Ironstone mining beneath the proposed Kettering East Energy Park development, located between Burton Latimer, Northamptonshire and the A510 road to the east.
- 1.2 The report is required to facilitate the design and construction of the proposed Energy Park development, to include the hydroponics (vertical farm) unit and the solar farm. Works are anticipated to include some earthworks to form a series of level plateaux, construction of commercial and industrial buildings on the plateaux, together with the solar panel array and hydroponics facilities.
- 1.3 The assessment is based on the British Geological Survey (BGS) GeoReports received by BWB on 6th March 2023 and the updated report received on 5th April 2023, and information from "*The Ironstone Quarries of the Midlands, Part 5: The Kettering Area*" by Eric Tonks republished in 2009 by Book Law Publications, together with a search for information on the internet.
- 1.4 The proposed development Masterplan is shown on **Drawing 1**.
- 1.5 The site is located around 1.2km east of Burton Latimer. The site is currently agricultural fields. The site is towards the top of a gently rising hill.
- 1.6 The report refers to the ownership boundary and the application site boundary. The application site boundary is the outer boundary of the development shown on **Drawing 1**.

2 Site Geology

- 2.1 Superficial deposits are the Oadby Member which are underlain by the Bozeat Till deposits to the west and occasional pockets of Glaciofluvial sand and gravel deposits. Artificial or Made Ground is indicated on the BGS geology viewer and predominantly correlates with past quarries.
- 2.2 Bedrock comprises the Great Oolite Group, comprising the Blisworth Limestone Formation across the majority of the site and the Blisworth Clay Formation above the limestone along the eastern boundary. On the western side under the Blisworth Limestone the Wellingborough Limestone Formation, Rutland Formation and the

Stanford Formation form a narrow sub-crop above the Inferior Oolite Group Northampton Sand Formation.

- 2.3 A geological fault is identified crossing the A510, east of the site between Poplars Farm and Poplar's Bungalow.
- 2.4 The British Geological Survey Onshore Geindex contains a number of exploration locations in and around the site. The following table ordered from west to east demonstrates that the ironstone dips towards the east and is therefore deeper east of the site. The top of the Northampton Sand Formation is around 62.5mAOD at the western boundary and 50.6mAOD by the A510.

Table: Summary of exploration locations in the Onshore Geindex

Identification	Easting	Northing	Ground level (mAOD)	Indicated depth to top of Northampton Sand Formation(m)	Thickness (m)
NW335	490350	275320	N/a	2	>0.5
NW333	490400	275210	N/a	2.8	>0.1
SW203	490990	275370	81.38	14.0	4.2
NW204	491900	275130	74.48	14	3.5
SW280	492090	274840	81.08	21.6	2.4
SW178	492270	274410	85.65	28.6(?)	3.5
SW179	492470	274290	84.16	25.9	4.0
NW205	492710	275130	82.91	25.9	4.9
SW50	493350	274430	88.81	38.1	4.3
SW54	493500	274920	91.86	41.1	4.6
SW228	493554	274514	86.14	35.7	6.1
NW304	493630	275290	85.70	34.1	4.6
SW266	493754	274643	84.73	35.4	5.2
NW19	493820	275400	83.88	34.1	4.3
SW55	493830	274970	88.79	42.7	2.1
SW265	493850	274970	88.57	39.3	4.6

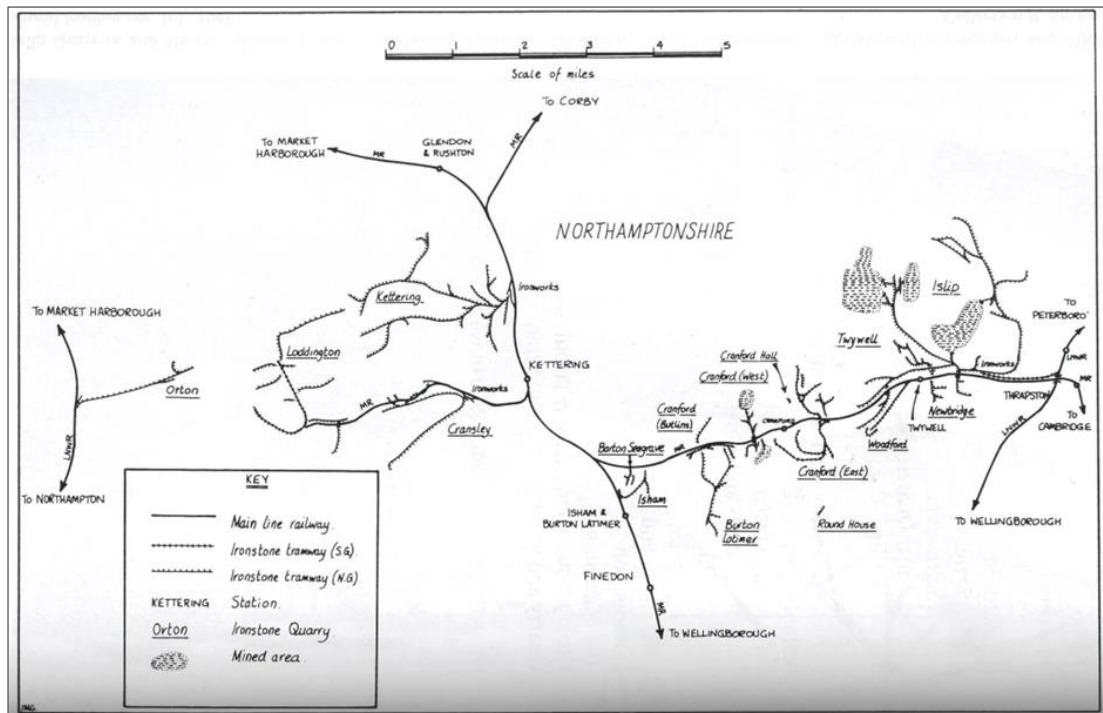
- 2.5 The logs listed in the table vary in age from 1901 to 1997 and description techniques they confirm the expected sequence of glacial deposits over limestones followed by Northampton Sand Formations and then the Whitby Mudstone Formation.

3 Existing Information and Background

- 3.1 The local area around Kettering is known to have been worked to remove the ironstone to extract the iron content. A preliminary review did not identify quarrying beneath the subject site. The review did identify that the ironstone was present beneath the site and may have been worked by underground methods.
- 3.2 BWB have recently produced the following geo-environmental reports:
- Phase 1 Geo-Environmental Assessment, by BWB for First Renewable Developments Ltd, reference KEP-BWB-ZZ-XX-RP-YE-0001 dated October 2021
 - Phase 2 Geo-Environmental Assessment, by BWB for First Renewable Developments Ltd, reference KEP-BWB-ZZ-XX-RP-YE-0003 dated February 2023.
- 3.3 A planning submission was submitted by First Renewable Developments Ltd in 2012 (Ref KET/2012/0556), the planning portal indicates this included a Landmark Report collating the historic information for the site and surrounding area. A figure from the report, based on its saved title, indicated it summarised historic quarrying. While the link to the document remained on the portal earlier in February it did not connect. By the end of February the list of documents had been removed and the new link to 'search planning documents' yields the planning authority documentation and two tables of predicted noise levels.
- 3.4 The Groundsure report included as Appendix 3 in the Phase 1 report presents in section 18 the information on mining and ground workings. The site is covered by historical mineral planning area applications. The Britpits database contains records of seven locations around the application site boundary. The two listed mines in section 18.6 are Irthlingbrough/Finedon and Cranford. Finedon is indicated as being on site, however, based on the abandonment plan in Appendix 2, this mine did not extend as far north as the ownership boundary.
- 3.5 The Burton Latimer Heritage Society website (www.burtonlatimer.info) includes an annotated plan of the quarrying around the village in the industry subsection. This plan indicates that quarrying was undertaken on the periphery of the ownership boundary but not within the application site boundary.
- 3.6 The industry page also has a link to a mine plan of the Irthlingborough Ironstone Mine, which was linked underground to Finedon. Finedon straddles the parish boundary to the south of the ownership boundary. This plan is similar to the Finedon Workings Abandonment Plan included as Appendix 6 in in the Phase 1 Geo-Environmental Assessment for Norbert Dentressangle Logistics by BWB dated March 2015 (Ref NTE2201EN/01/V1) which is included in Appendix 2 of this document.
- 3.7 The website <https://www.apack1.co.uk/htmlpage7.html> indicates that the Finedon mine was terminated due to faulting on the northern edge and that the ore was

expected to be deeper once the series of faults had been crossed; which likely discouraged further working.

- 3.8 “The Ironstone Quarries of the Midlands, Part 5: The Kettering Area” presents, on page 4, the named quarries covered in the book and those areas known at the time as having been mined are shaded – figure reproduced below. The nearest quarries to the site are Burton Latimer (to the West), Cranford West and Cranford East (to the North) and Roundhouse to the East. Irthlingborough or Finedon is not mentioned perhaps because it is included in Part 4: the Wellingborough Area.



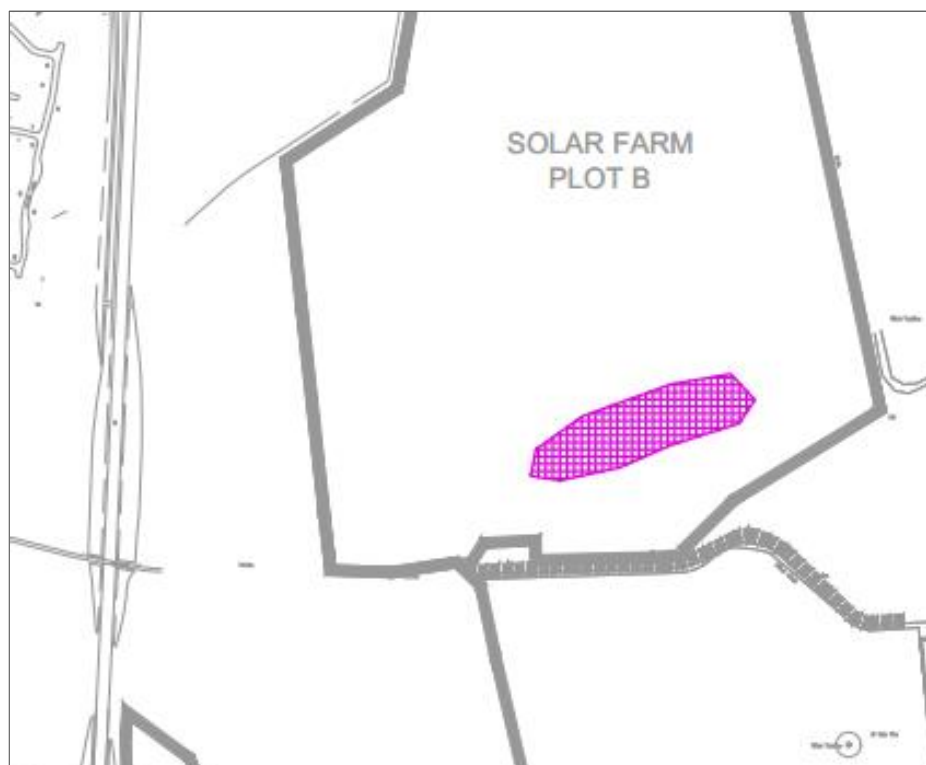
- 3.9 The BGS mines and quarries database identifies 14 locations between the A6 and A510. The nearest to the site is an old stone pit on the 1884 OS Map which is south of the bump in the Wold Road to Burton Wold Farm.
- 3.10 This MRA also references available existing data, including the following:

- Geological & related mapping and reporting by the British Geological Survey;
- 1:50,000 geological map, England and Wales Sheet no. 171 Kettering, Solid and Drift Geology (2002);
- 1:10,000 geological map Sheet no. SP97NW, (Cranford St John), Solid and Drift;
- 1:10,000 geological map Sheet no. SP97SW, Irthlingborough, Solid and Drift; and
- BGS GeoIndex published borehole records, artificial ground, mines and quarries and non-coal mining mine plan extents.

Summary of Findings

Burton Latimer Quarries

- 3.11 The Burton Latimer website also includes reminiscences of previous times. This includes one from Alan Smith who worked in the local mines (Islip, Irthlingborough and Finedon) and quarries (Blisworth); he recalled that the Burton Latimer area was wet and one of the headings he tried to get down was not completed; probably due to the water pouring in. The comment about the area being wet may be supported by the well noted on OS maps towards the northwest corner of the hydroponics farm and the well for the old tannery in Burton Latimer (BGS borehole record SP97NW341) suggested it provided 300 gallons per day or possibly per hour.
- 3.12 The Ironstone Quarries of the Midlands Part 5 includes several useful comments:
- The quarry closed in February 2021 as a result of the post war recession (p24); and because stone near to the surface was nearly exhausted and further east the quality of the ironstone tended to deteriorate (p25); and
 - The quarry was worked by hand methods limiting the depth of overburden that could economically be removed even with a seven foot (2.1m) seam (p20).
- 3.13 A small patch of artificial ground (an area where the land surface has been lowered as a result of man-made excavations) is recorded around grid reference 491300 275100, some 290 metres from the most north westerly corner of the applicants site boundary approximate locations shown below. This has not been linked to any recorded working.



Cranford Quarries and Mines

3.14 "The Ironstone Quarries of the Midlands Part 5" includes several useful comments and data:

- The Clay Cross Company obtained ore almost exclusively by pillar and stall mining from adits in the old quarry faces. Operations commenced in 1909 south of the railway and continued until the first half of 1913, when the mine was exhausted, flooding also being suggested as a reason. Work then transferred to the larger area north of the stream (River Nene tributary between Cranford St John and Cranford St Andrew) with two adits driven into the old quarry face (p39). Mining ceased in 1926 (p43);
- Sink holes betray the presence of the south mines and appear from time to time (photo p44) and two coordinates listed 915 766 and 918 774 (p46);
- According to Eric Tonks (p42) 'Unlike those at Islip, the Cranford mines were very damp... and because of irregular spacing of timber props were somewhat dangerous ... by the closure the mines had earned a somewhat evil reputation'; and
- The quarries further east, opposite Five Willows Farm, were the most extensive and long lived starting in 1898 (p47). The long duration due to the ore being some of the best in the district (p50) and the deeper overburden being worked by machines. As time passed machines became available which then increased in size and ability that permitted thicker overburden to be economically removed rather than switch to mining. Operations ceased in 1969 due to a number of factors including increased freight charges and flooding in the last working area probably from the Clay Cross Co mines and overburden having reached 70ft (21.3m) (p66).

3.15 Planning Application KET/2007/1033 included as figure 11.15 the mine abandonment plan of Cranford South mine. The plan is included in Appendix 2.

Round House

3.16 The Ironstone Quarries of the Midlands Part 5 is the only reference for this quarry.

3.17 This is noted as an obscure quarry, with limited supporting documentation, the lease to form a rail of tramway was signed in 1898 and preparations to lease the land noted in 1899. It is suggested that Limestone not Ironstone was the intended mineral from this quarry (p70). It is not clear if a quarry was developed, while researching his book Mr Tonks noted 'the present day' (pre 1991) 'condition of the site gives no clue at all, for either quarry or tramway'.

Burton Wold Farm Well

3.18 The BGS record SP97SW280 relates to a well sunk '2 miles east of Isham Station' in 1901. The BGS have placed the record on their GIS database at national grid reference 492090 274840. The 1924 to 1994 OS maps place a well at circa 491747 274785 some 340 metres further west. The well does not feature on the 1899 OS map. The

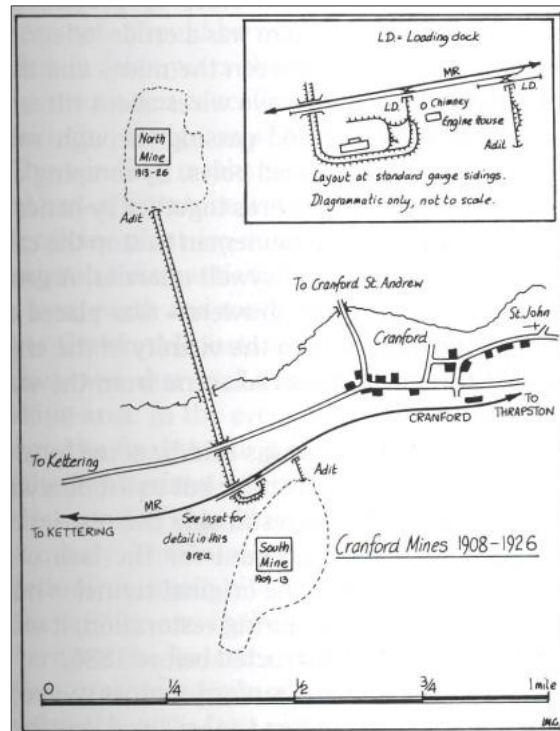
Groundsure Report maps post 1994 are not of the same style and quality to confirm its continued presence at the surface.

- 3.19 The BGS well record states that the well was formed with a diameter of 5 feet 4.5 inches, approximately 1.64m. from ground level (266ft 81mAOD) to 81 feet (24.69m) below ground level and continuing using drilling methods. The record states 'Headings were made in the grey ironstone 76 feet' (23.16m) 'from the top of well. 6 feet by 4.5 feet' (height presumed to be 6ft = 1.83m; width 1.37m) The yield is quoted as 12,000 gallons per day, circa 37 litres per minute with a standing water level noted as 59 feet (18m) below ground level.
- 3.20 There are no further details regarding the headings; if they were formed to improve the yield they could be several tens of metres long, if they were to take samples for iron content analysis then they are unlikely to be longer than 20m. Similarly, the number of headings is restricted by the circumference (4.57m) and potentially stability from which is it inferred there are unlikely to be more than two headings.

4 Mining Risk Assessment

- 4.1 According to the introduction to "*Ironstone Quarries of the Midlands Part 5*", quarries opened in the district between 1866 and 1905. The area was predominantly worked post the 1872 Coal Mines Regulations Act and Metalliferous Mines Regulations Act which established the requirement to deposit mine abandonment plans. Accordingly, any mining in the area from the quarries or by the quarrying companies would be expected to have plans/records of their extents having been deposited.
- 4.2 The BGS mine plan extents information indicates that land under the applicants site boundary was under the lease of "*Carrol Spring Mine Wellingboro Iron Co. Ltd*". The noted extent of the two mine abandonment plan just touches the southernmost tip of Solar Farm Plot A. The extent of the plan is not the same as the extent of the workings with the need for a border around the workings to adjacent surface physical features to clearly identify the extent of the mine post abandonment. Refer to section 3.15 and 4.6 and Appendix 2 for information on the abandonment plan.
- 4.3 The greatest potential mining risk comes from unrecorded or trial workings into the Northampton Sandstone Formation. Given the information available, in particular the period of working the deposit in the area, and more easily (closer to the surface) available ore in the district the likelihood of unrecorded or trial workings beneath the subject site is considered very low and, at worst, would only have comprised single or isolated workings of limited extent driven for exploration purposes.
- 4.4 The BGS Report based a review of the BGS dataset (including borehole records, mining plans, and geotechnical reports) only identified worked ground/artificial ground in a small patch just east of the A510 from Poplar's Bungalow towards Poplars Farm which is towards the southeast corner of the ownership boundary. An update of the GeoReport has been requested and is awaited. It is not anticipated the update will be material.

- 4.5 Given the challenges of mining due to groundwater, indication of the ore quality, economics at the time and the absence of any suggestion of mine records from Burton Latimer to the west and the abandonment plan for Finedon mine in the south it is not expected that unregistered mining has occurred under the subject site area.
- 4.6 The known mine workings to the north are given in outline in "*Ironstone Quarries of the Midlands, Part 5*" (p41) reproduced below, while the precise extent cannot be determined from the plan it does not extend as far as the ownership boundary. Therefore, there is sufficient distance from the application site boundary, even allowing for any inaccuracy, to conclude that there is not considered a risk for this mine to have extended under the applicants site boundary. The mine abandonment plan (see Appendix 2 reconfirms the mine is unlikely to extend south of northing 76.
- 4.7 The headings described for the Burton Wold Farm well remain a risk given the number, length and direction are not known. While other mines in the area were accessible and open suggesting the thin layer forming the roof may remain stable for 80 or more years stability cannot be relied on for the design life of the development. The potential doubt on the position of the well further complicates assessing the risk to the proposed development. The indicated ground level for the well of 81mAOD is more in keeping with the OS position (1927, nearest 82mAOD) than the BGS position (1927 nearest 78mAOD).



5 Recommendations

- 5.1 From the data and information obtained and review, while the mining risk cannot be totally discounted, and there is a (remote) possibility that unknown and unrecorded adits or shafts were driven below the site to investigate or recover ironstone, the likelihood is considered very low, and should not preclude or impact on the proposed development.
- 5.2 A walkover of the two potential locations of the identified well should be undertaken to determine if the location of the well can be identified at the surface. This could be assisted by any known workers on the farm or family of the previous owners that may help confirm where the well was. Presuming the well cannot be positively located from surface inspections an investigation to locate the well is recommended. This would comprise the excavation of a series of trial trenches across and centred around both reported positions to try and locate the well. Once located, the well should then be investigated via rotary drilling to determine its depth and nature of backfill, and then grouted. Assuming it to be infilled then a series of probe drill holes are recommended to be formed around the well to depths of around 25m bgl with the aim of intercepting any headings. Once encountered the headings should then be infilled with grout, with careful records of the volumes pumped to obtain an indication of the length and/or degree of infill of the headings.
- 5.3 The proposed development will mainly comprise relatively lightly loaded/warehouse-type structures, which will require only standard geotechnical investigations to inform structural/geotechnical design, noting the potential risk of underground voids is very low and the depth of influence of their associated foundations is anticipated to be relatively shallow in comparison to the intervening thickness of solid geology.
- 5.4 If any heavily loaded structures were proposed or required within the development, consideration should be given to undertaking rotary "open hole" boreholes at the

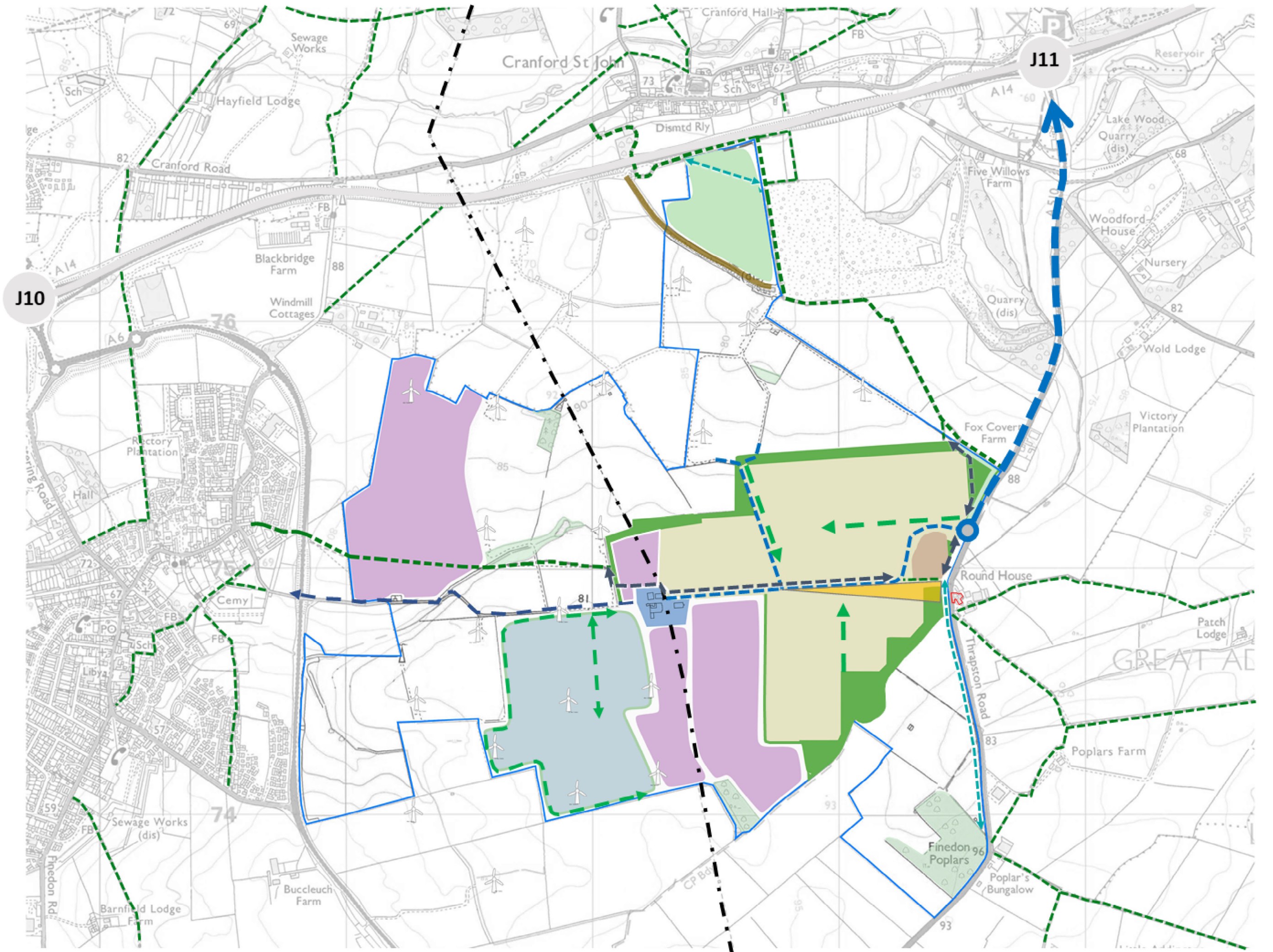
locations of key foundations/structural elements to depths in the order of 30-35m (based on BGS records) to:

- Identify depths and thickness of Northampton Ironstone and for an indication of the nature of the overlying soils and rock strata; and
- Investigate for evidence of workings to the depths of interest/depths of influence of the foundations.

6 **References**

- Burton Latimer Heritage Society.
- Groundsure Report HMD-214-8247974.
- North Northamptonshire Council Kettering Area planning application website.
- Tonks Eric, The Ironstone Quarries of the Midlands, Part 5: The Kettering Area published by Book Law Publishing in 2009 ISBN 978-1-907094-04-0 (first published in 1991 by Runpast Publishing).
- British Geological Survey borehole record - SP97SW280.

Drawing 1: Site Masterplan



APPENDIX 1: BGS Report 330425/41389 V2

Luke Cross
B W B Consulting Ltd
Waterfront House
35 Station Street
Nottingham
NG2 3DQ

Geological Assessment: Area

This report contains a geological description of the specified site or area. It is based on currently available 1:10 000 scale geological maps, unless otherwise stated, together with other relevant local information such as borehole records. The report includes extracts from digitised 1:50 000 scale geological maps (DigMapGB-50).

The report contains the following modules:

Geological Assessment (area)

Engineering Geological and Drilling Considerations

Geological Map Extracts

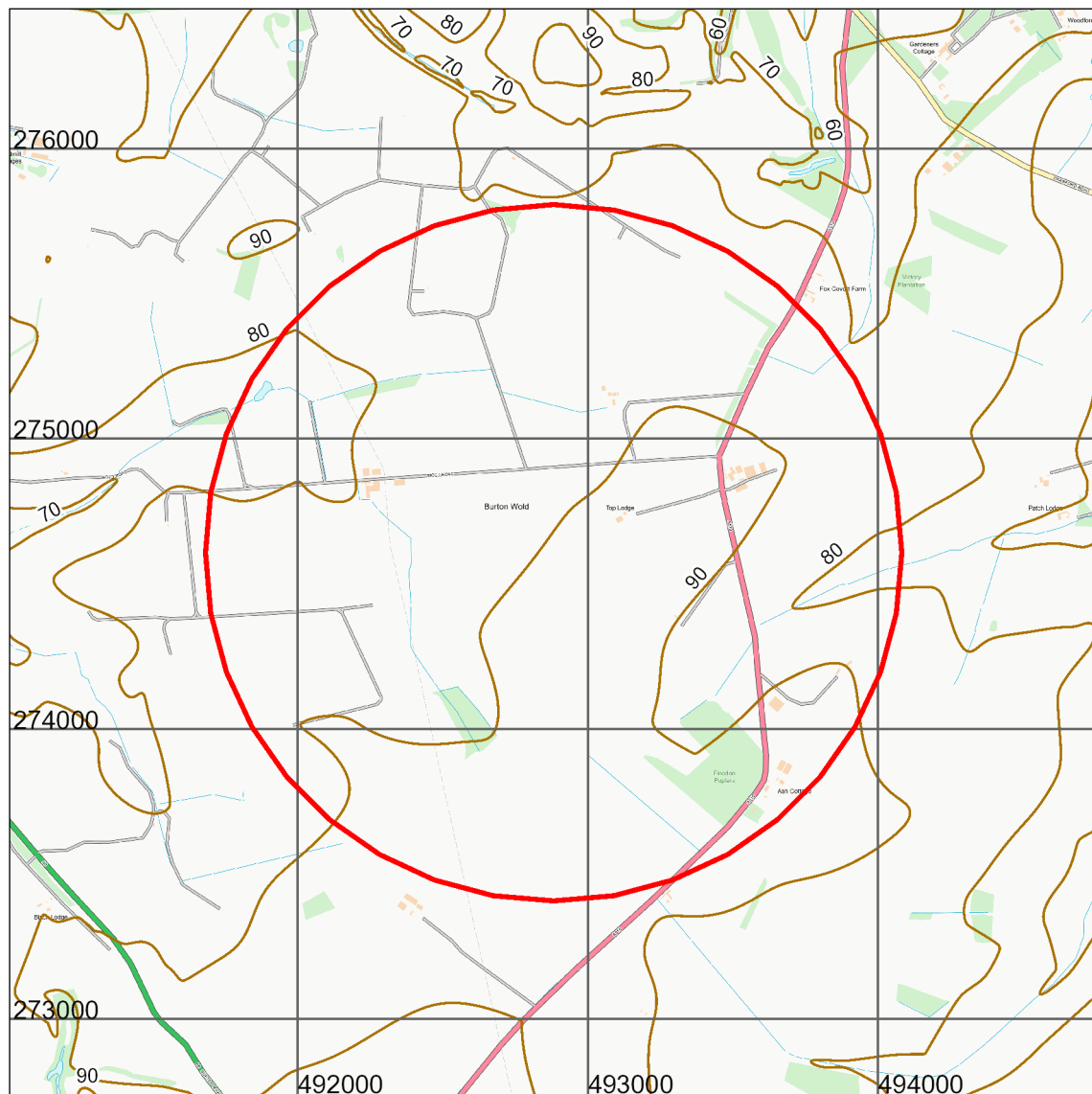
Geoscience Data List

Report Id: *BGS_330425/41389*

Client reference: **BWB Consulting Ltd (Nottingham)**

**Purpose: To help assess the extraction of Ironstone
beneath the site**

Search location



Contains OS data © Crown Copyright and database right 2023. OS OpenMap Local: Scale: 1:25 000 (1cm = 250 m)

Search location indicated in red

*This report describes a site located at National Grid Reference 492882, 274607.
Note that for sites of irregular shape, this point may lie outside the site boundary.
Where the client has submitted a site plan the assessment will be based on the area given.*

Geological Map Extracts 1:10,000 Scale

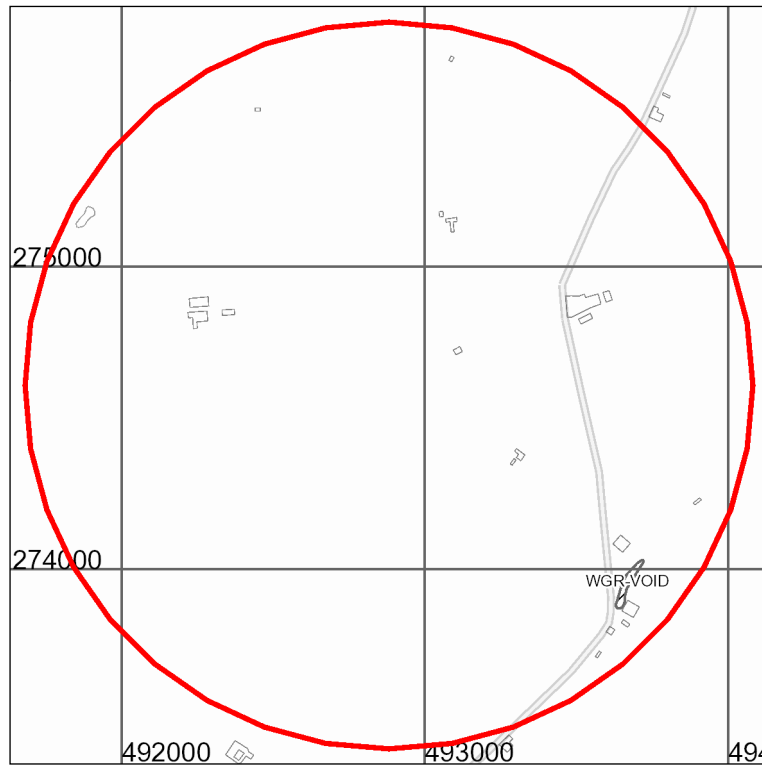
This part of the report contains extracts of geological maps taken from the 1:10 000 scale BGS Digital Geological Map of Great Britain (BGS Geology 10k). The geological information in BGS Geology is divided into four themes: artificial ground, landslide deposits, superficial deposits and bedrock, shown here in separate maps. The fifth 'combined geology' map superimposes all four of these themes, to show the uppermost geological formations.

More information about BGS Geology 10k is available here http://www.bgs.ac.uk/products/digitalmaps/DiGMapGB_10.html and information on the BGS geological classification schemes here <http://www.bgs.ac.uk/bgsrscs/>. The maps are labelled with two-part computer codes that indicate the name of the geological unit and its composition. Descriptions of the units listed in the map keys may be available in the BGS Lexicon of Named Rock Units (<http://www.bgs.ac.uk/lexicon/>). If available, these descriptions can be found by searching against the first part of the computer code used on the maps. Please consult the legend and the codes on the map in areas of complex geology. If in doubt, please contact BGS Enquiries for clarification.

In the map legends the geological units are listed in order of their age, as defined in the BGS Lexicon, with the youngest first. However, where units are of the same defined age they are listed alphabetically and this may differ from the actual geological sequence.

Artificial ground


This is ground at or near the surface that has been modified by man. It includes ground that has been deposited (Made Ground) or excavated (Worked Ground), or some combination of these: Landscaped Ground or Disturbed Ground.



Contains OS data © Crown Copyright and database right 2023
Scale: 1:25 000 (1cm = 250 m)

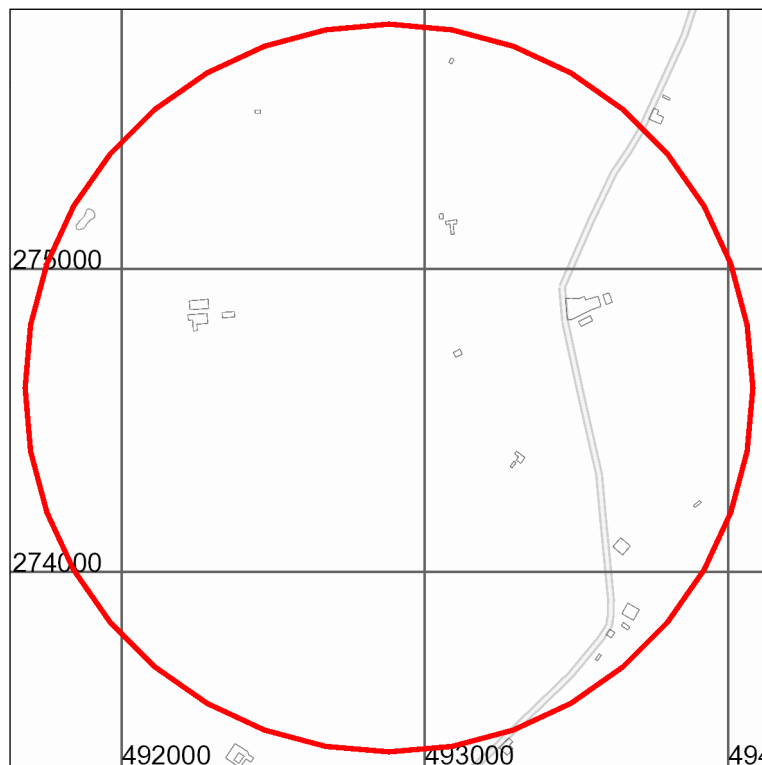
Search area indicated in red

Key to Artificial ground:

Map colour	Computer Code	Name of geological unit	Composition
	WGR-VOID	WORKED GROUND (UNDIVIDED)	VOID

Landslide deposits

These are deposits formed by localised mass-movement of soils and rocks on slopes under the action of gravity. Landslides may occur within the bedrock, superficial deposits or artificial ground; and the landslide deposits may themselves be artificially modified.



Contains OS data © Crown Copyright and database right 2023

Scale: 1:25 000 (1cm = 250 m)

Search area indicated in red

Key to Landslide deposits:

No deposits found in the search area

Superficial deposits

These are relatively young geological deposits, formerly known as ‘Drift’, which lie on the bedrock in many areas. They include deposits such as unconsolidated sands and gravels formed by rivers, and clayey tills formed by glacial action. They may be overlain by landslide deposits or by artificial deposits, or both.





Contains OS data © Crown Copyright and database right 2023

Scale: 1:25 000 (1cm = 250 m)

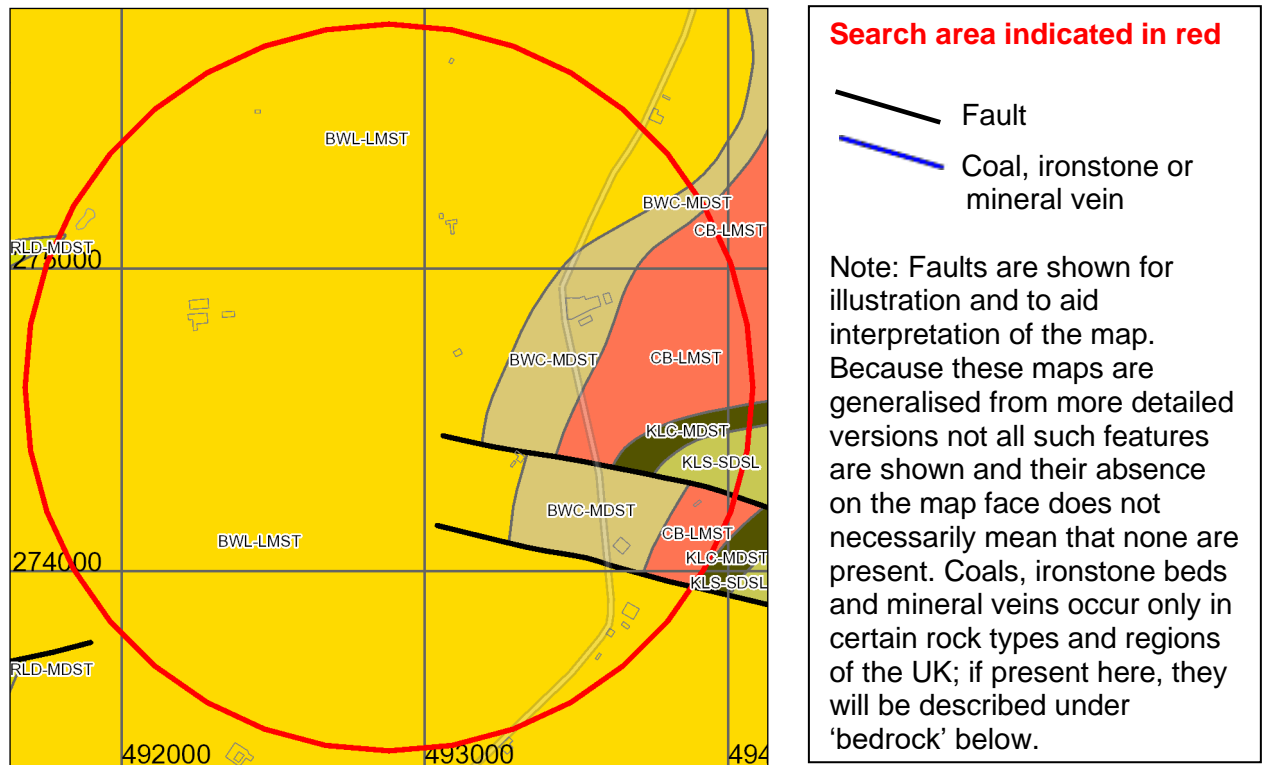
Search area indicated in red

Key to Superficial deposits:

Map colour	Computer Code	Name of geological unit	Composition
	ODT-DMTN	OADBY MEMBER	DIAMICTON
	BOZE-DMTN	BOZEAT TILL	DIAMICTON







Bedrock

Bedrock forms the ground underlying the whole of an area, commonly overlain by superficial deposits, landslide deposits or artificial deposits, in any combination. The bedrock formations were formerly known as the 'Solid Geology'.



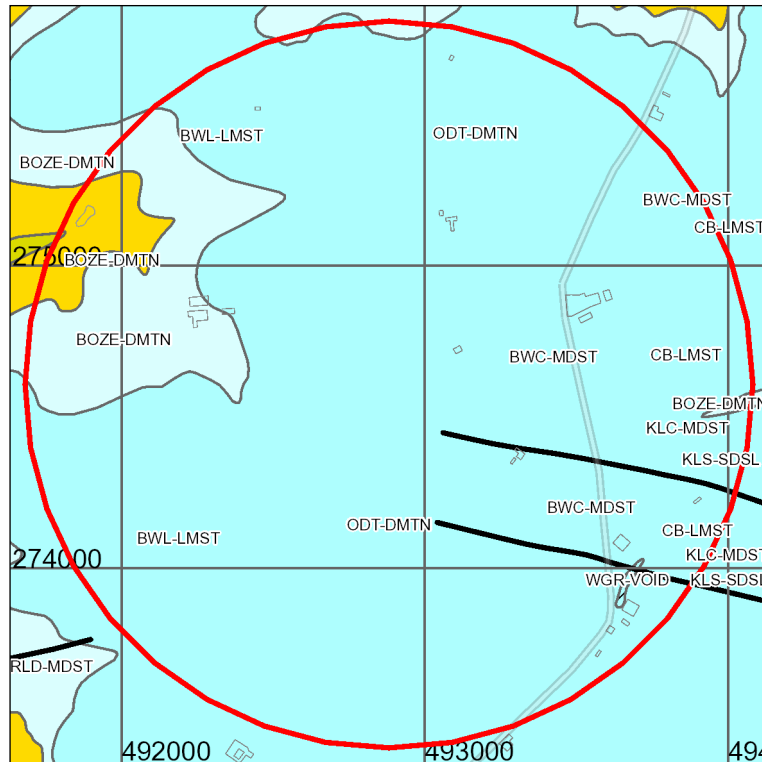
Contains OS data © Crown Copyright and database right 2023
Scale: 1:25 000 (1cm = 250 m)

Key to Bedrock geology:

Map colour	Computer Code	Name of geological unit	Rock type
	KLC-MDST	KELLAWAYS CLAY MEMBER	MUDSTONE
	KLS-SDSL	KELLAWAYS SAND MEMBER	SANDSTONE AND SILTSTONE, INTERBEDDED
	BWC-MDST	BLISWORTH CLAY FORMATION	MUDSTONE
	BWL-LMST	BLISWORTH LIMESTONE FORMATION	LIMESTONE
	CB-LMST	CORNBRASH FORMATION	LIMESTONE
	RLD-MDST	RUTLAND FORMATION	MUDSTONE

Combined 'Surface Geology' Map

This map shows all the geological themes from the previous four maps overlaid in order of age.



Contains OS data © Crown Copyright and database right 2023
Scale: 1:25 000 (1cm = 250 m)

Search area indicated in red

Please see the Keys to the Artificial, Landslide, Superficial and Bedrock geology maps.

Geological Assessment

This module contains a geological description of the site or area specified by the customer. The purpose of the report is to understand the shallow geology for the purposes of potential ironstone extraction.

It is based on currently available 1:10 000 scale geological maps unless otherwise stated, together with other relevant local information such as borehole records.

Setting:

The search area is located on a north-west facing slope at an elevation of approximately 91 m above sea level. An unnamed stream runs south-north to the south and west of the site and curves round to flow west-east to the north of the search area. At its closest this stream lies approximately 500 m from the search area to the west and north.

Artificial ground:

No artificial ground is mapped within the search area. However, parts of the search area have been developed, such as Wold Lodge and Burton Wold Farm, and artificial ground of variable thickness (up to 2m) and extent is expected in these areas. Several old pits and quarries are mapped just outside the search area to the west. Historic Ordnance Survey maps of the site dating from 1885 to 1938 were examined for evidence of old pits, and none were found. However, a pond at the northwest corner of the search area may be an old pit. There are no boreholes to confirm the nature or thickness of any artificial ground at the search area.

Superficial deposits:

The BGS 1:10,000 scale geological map of the area shows superficial deposits beneath all but the westernmost part of the search area. These superficial deposits consist of till (boulder clay), which is divided into two units on the geological map. The upper unit is the Oadby Till and the lower unit is the Bozeat Till. According to the sheet description that accompanies the Wellingborough 1:50,000 scale map sheet, the junction between the two tills is well defined. However, in boreholes in and around the search area, there is insufficient detail within the logs to validate this.

Oadby Till – this underlies the majority of the search area. It is the younger of the two till units and typically consists of olive grey to grey, weathering to yellowish brown, stony, sandy, silty clay with clasts of chalk, flint, limestone, ironstone, sandstone and quartz. Borehole SP97NW/205 is located in the middle of the search area and records 'boulder clay' (till) to a depth of 10.97 m. Borehole SP97SW/54, just outside the eastern margin of the site. This borehole records 'brown clay' to a depth of 0.9 m beneath the ground surface.

Bozeat Till – this is the older (lower) of the two tills. It is only mapped at surface in the western part of the site, pinching out westwards where bedrock is exposed, and it may continue eastwards beneath the Oadby Till. The Bozeat Till typically consists of dark bluish grey stony, sandy, silty clay with clasts of limestone, ironstone, sandstone and quartz. The Bozeat Till has a maximum thickness of 5 m in the area. Borehole SP97SW/280 is located just outside the western part of the site where Bozeat Till is mapped, and records ‘drift clay with rounded pebbles and fragments of yellow limestone’ to a depth of 4.27 m beneath the ground surface. A similar thickness is expected at the search area.

The maximum combined thickness of the glacial till deposits is uncertain but likely to be between 10-30m based on superficial deposits thickness model available on the 1:50 000 scale map (BGS, 2007).

Rockhead depth:

The rockhead depth varies from 4.27 m in the west, to around 11 m in the search area centre and 0.9 m just outside the eastern margin of the site. This shows the typical irregularity of the base of till.

Bedrock:

The bedrock is covered by the 1:50 000 scale Wellingborough map Sheet 186 (2007). The bedrock geology beneath the site is mostly concealed beneath a veneer of superficial deposits, with bedrock mapped at surface only in the western part of the site. The bedrock is composed of Jurassic rocks belonging to the Great Oolite Group. Three bedrock units are mapped at the site and are recorded within boreholes. The youngest bedrock unit is the Blisworth Clay Formation, the oldest is the Rutland Formation, and the middle unit is the Blisworth Limestone Formation. The Northampton Sand Formation is concealed beneath the Rutland Formation. These strata may be slightly offset beneath the eastern part of the search area by faulting.

Note that there is an apparent discrepancy between the geological map and the boreholes, which creates a degree of uncertainty in this interpretation. The three main bedrock units are described in age order from youngest to oldest below:

Blisworth Clay Formation

Blisworth Clay Formation is mapped in the eastern edge of the search area and consists of smooth plastic mudstone, with distinctive mottling of blue-grey, green, magenta, and purple. The base of the Blisworth Clay Formation in this area often contains ferruginous nodules. According to the geological map, the feather edge of the Blisworth Clay Formation is present at eastern margin of the site. However, borehole SP97NW/205 from the centre of the site records 1.2 m of ‘variegated clay’ (in borehole descriptions the term ‘variegated’ means multicoloured) where Blisworth Limestone is mapped. Given the description of ‘variegated’, this is interpreted as Blisworth Clay Formation. If this interpretation is correct, the boundary between the

Blisworth Clay/Limestone formations would be around 1 km to the west of its current mapped position. Based on this interpretation, the Blisworth Clay Formation is estimated to be up to 2 m thick at the site, thickening eastwards and pinching out entirely towards the middle of the site. Boreholes to the east of the site where Blisworth Clay Formation is mapped only record a thick limestone unit and no variegated clay.

Blisworth Limestone Formation

Blisworth Limestone Formation is mapped beneath the vast majority of the search area and extends eastwards beneath the Blisworth Clay Formation. The Blisworth Limestone Formation is dominated by limestone, with lime-mudstone (marl) and mudstone beds also present, particularly towards the base. The lime-mudstones contain varying amounts of shell fragments, and the limestone contains varying amounts of coated grains (oids and peloids) and shell fragments.

The Blisworth Limestone Formation is estimated to be around 9 m thick, as recorded in boreholes within or very close to the search area. Borehole SP97NW/304, located just outside the north-east corner of the search area, describes the Blisworth Limestone Formation as 9.7 m of 'medium-hard banded clay, interpreted in the log as limestone. Borehole SP97SW/280, just outside the western part of the site, describes the Blisworth Limestone Formation as follows:

0-4.3 m	till]
4.3-5.5 m	yellow limestone containing small shell fragments
5.5-6.1 m	dark grey clay
6.1-7.9 m	very fine dark grey limestone ('bluestone') containing shells
7.9-9.1 m	dark grey shale 'slate grey' compact but disintegrates
9.1-13.0 m	very hard compact grey limestones, crowded with shells

Rutland Formation

The Rutland Formation is mapped in a small outcrop in the far west of the search area, but it continues eastwards beneath the Blisworth Limestone Formation. The Rutland Formation is locally variable and composed of different lithologies, and it is unlikely that the full sequence described in this section will be represented beneath the search area. The basal unit of the Rutland Formation is named the Stamford Member, which consists of dark grey and black sandy mudstones with a nodular ironstone bed at the base and is overlain by white and pale grey sandstone. Above the Stamford Member, the main body of the Rutland Formation consists of shelly mudstone and sandstone, passing up into mudstone, which is overlain by a greenish grey mudstone unit. Within this mudstone sequence the Wellingborough Limestone Member occurs, which consists of interbedded calcareous mudstone, sandstone and bioclastic, sandy and ooidal limestone.

The Rutland Formation at the site is dominated by limestone, as described in

borehole SP97SW/280:

- 13.0-13.6 m dark grey clayey limestone
- 13.6-14.0 m hard grey compact limestone
- 14.0-14.6 m compact grey limestone, easily weathers
- 14.6-14.9 m very hard compact sandy limestone

The Rutland Formation is described in borehole SP97NW/304, located just outside the north-east corner of the site as 6 m of 'estuarine clays and sands'.

Northampton Sand Formation

The Northampton Sand Formation typically consists of ooidal and ferruginous ironstone and sandy limestone and mudstone.

Borehole SP97SW/280, just outside the western part of the site, describes the Northampton Sand Formation as follows:

- [0-14.9 m superficial deposits, Blisworth Clay Fm, Blisworth Limestone Fm and Rutland Fm]
- 15.68 m Loose grey dry sand
- 18.14 m Very fine white soft sandstone merging into fine yellow soft sandstone (water)
- 19.20 m Dark grey fine soft sandstone
- 21.64 m Dark grey very compact heavy sandstone
- 24.08 m Very dark grey compact fine sandstones
- Total thickness: 9.18 m

Borehole SP97NW/205 is located west of the site centre. This borehole describes the Northampton Sand Formation as 'ironstone', recorded from 25.91 to 30.79 m, giving a thickness of 4.88 m.

Three boreholes are located just outside the eastern side of the site describe the Northampton Sand Formation as 'ironstone'. The northernmost of these is SP79NE/304, which describes the Northampton Sand Formation as follows:

- [0-34.14 m superficial deposits and overlying bedrock units]
- 35.36 m grey/brown ironstone
- 36.58 m brown ironstone
- 36.88 m brown/green ironstone
- 37.19 m green ironstone
- 38.71 m grey ironstone
- Total thickness: 4.57 m

The middle borehole just outside the eastern part of the site is SP97SW/54, which records 'ironstone' from 41.15 to 45.72 m (4.15 m thick). The southernmost of the

three boreholes east of the site is SP97SW/50, located c. 260m away. This borehole records 'ironstone' from 38.1 to 42.37 m, giving a thickness of 4.27 m. It is not clear whether this borehole reaches the base of the Northampton Sand Formation because it does not record the underlying Whitby Mudstone Formation.

Depth to Northampton Sand Formation

The shallowest depth to the top of the Northampton Sand Formation is 14.9 m recorded in borehole SP97SW/280, just outside the western edge of the site. The deepest occurrence of the Northampton Sand Formation is 41.15 m, recorded just outside the eastern part of the site in borehole SP97SW/54. Borehole SP97NW/205 located to the west of the site centre records the top of the Northampton Sand Formation at 25.91 m below the ground surface.

Additional considerations:

Running sand may be an issue if lenses/layers of unconsolidated sand are present within the till, particularly if any sand is present and is saturated. The till may contain hard boulders, which can obstruct or damage drilling equipment or that may require removal or sorting for landscaping and placement of fill (see Engineering Geological and Drilling Considerations below).

Records for borehole [SP97SW/280] suggest 'headings were made in the grey ironstone 76 feet [23.2 m] from the top of the well. 6 feet by 4.5 feet. The borehole record does not state how extensive these headings are.

Engineering Geological and Drilling Considerations

The information provided below is based on the interpretation of maps and records held by the British Geological Survey. It is intended to be used as a preliminary guide for highlighting issues the site geology may pose for drilling and ground engineering. The information and comments provided are not intended to be used for design purposes or as a substitute for appropriate ground investigation.

Engineering Consideration	Should be considered at this site	Comments
Trafficability	Yes	Trafficability in plastic silty and clay-rich poorly draining superficial deposits (tills) may become more challenging in sustained wet conditions and when remoulded by vehicle movements.
Excavatability	Yes	Layers and lenses of sand may contain running sands, excavations below the water table may therefore require support. Till may contain harder boulders that may require removal for achieving some backfill material properties and increased chiselling if using light weight cable percussive drilling methods. Appropriate health and safety risk assessments should be undertaken if excavations are to be entered or left open for any length of time
Thickness of superficial deposits greater than 5 m	Yes	Borehole SP97NW/205 is located in the middle of the search area and records 'boulder clay' (Oadby Till and Bozeat Till Formations) to a depth of 10.97
Greater than 5 m of weathered bedrock	No	
Variable rockhead	Yes	The rockhead depth varies up to 11 m in the search area centre
Bedrock geology likely to be chemically/physically altered from original material.	Yes	Weathering of clay-rich bedrock units may soften the material and reduce intact and rock mass strength in the upper 10's of meters

Variable lithology in bedrock geology	Yes	Mudstone, limestone, sandstone, siltstone, marl, ferruginous nodules
Presence of highly fractured zones in the rock mass	Yes	Faults were recorded at the site shown on bedrock map
Very to extremely strong rock strength	No	
Aggressive sulphate conditions	No	
Running sand conditions at depth	Yes	Running sand issues may occur when saturated loose sand layers are encountered in Till

Geotechnical characteristics

The main geotechnical issues related to drilling are the nature and strength of the bedrock geology; the thickness and nature of the superficial deposits and the effective depth to hard rock drilling.

A number of boreholes in close proximity to the report area were found to have descriptive information on the strength of the superficial formations encountered. An indication of the strength and density of the bedrock and superficial deposits expected at this site is given in the tables below:

A few boreholes close to the report area were found to have descriptive information on the strength of the superficial and bedrock formations encountered. Indications of the strength and density of the artificial, superficial and bedrock deposits expected at this site are given in the table below:

BSI 2015. BS5930: 2015. *Code of practice for ground investigations*. British Standards Institution, London.

	Strength based on BS5930 (1999)	Typical range of SPT blow N Values	Typical range of UCS Values (MPa)
Made Ground	Variable	N/A	N/A
Oadby Till	Firm to Very Stiff fine soils	N/A	0.08 – 0.60
Bozeat Till	Firm to Very Stiff fine soils	N/A	0.08 – 0.60
Blisworth Clay Formation	Soft to Very Weak	15-50	0.04 – 5
Blisworth Limestone Formation	Medium Strong to Strong *	N/A	25 – 100
Rutland Formation	Stiff to Very Stiff	N/A	0.08 – 0.60

Geotechnical information and datasets

In addition to borehole, shaft and well records held in the BGS National Geoscience Data Centre, some 50 400 Site Investigation reports describing geotechnical data from over 420 000 boreholes provide a geotechnical information source for UK bedrock and superficial deposits. Additional Site Investigation reports (both digital and analogue) are being acquired annually. Drilling information and in situ and laboratory-derived geotechnical parameter data extracted from these reports are held in the Corporate National Geotechnical Properties Database. Currently, some 182 400 geotechnical data 'sample suites' from 67 000 boreholes are held in the database, with approximately 25 000 parameter records from 6000 boreholes being added on average each year.

Where geotechnical information is required for sites not currently entered into the National Geotechnical Properties Database, a search of the original site investigation reports and related boreholes can be undertaken. A small percentage of the borehole and site investigation records are held as commercial-in-confidence for various reasons and cannot be released without the written permission of the originator. If any of the records you need are listed as confidential apply in the normal way. If possible, the BGS Enquiry Service staff will release the data or provide you with the information needed to contact the originator.

For enquiries principally requiring geotechnical related information please contact the Keyworth office.

Geoscience Data List

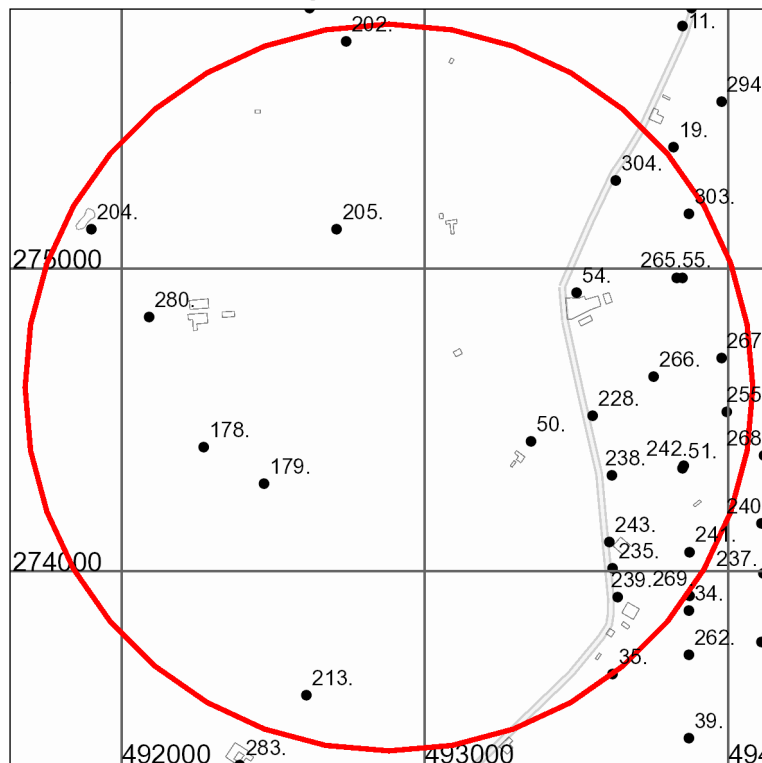
List of available geological data

This part of the report lists the principal data sets held in the National Geoscience Records Centre that are relevant to your enquiry and explains how to obtain copies of the records. Users can make their own index searches using the BGS web page (go to 'Online shops' at www.bgs.ac.uk). This will give access to the BGS Bookshop, Publications catalogue, GeoRecords (borehole browser) and GeoReports.

For current pricing see these internet pages or contact us using the list found at the back of this report.

Note that this report contains selective datasets and is not a definitive listing of all data held in BGS.

Borehole location map



Contains OS data © Crown Copyright and database right 2023
Scale: 1:25 000 (1cm = 250 m)

Borehole records

Number of records in map area: 37

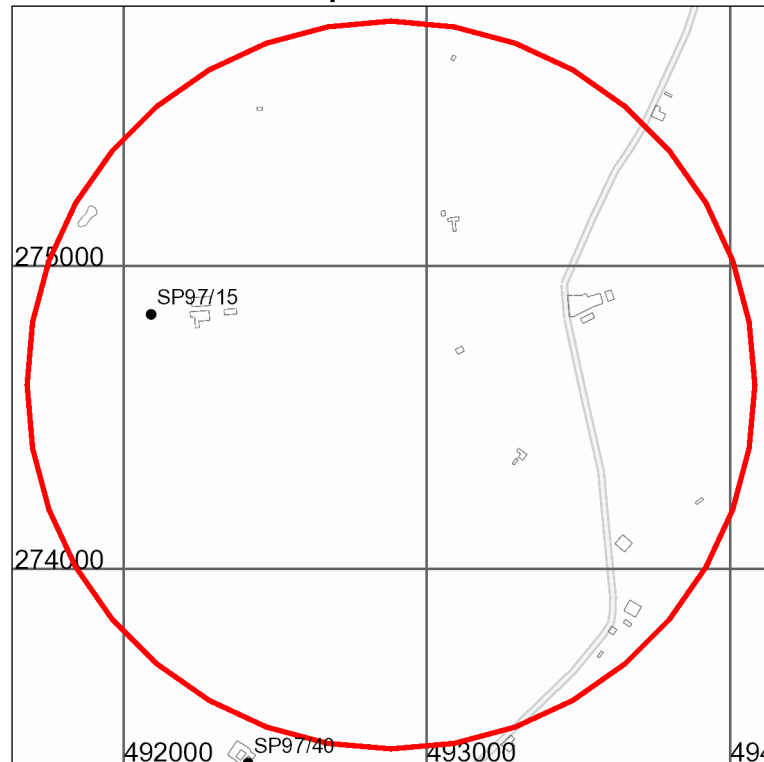
In the following table a blank 'Length' field indicates that the borehole is confidential or that no depth has been recorded digitally.

Enquiry staff may be able to provide you with contact details for the originator if you wish to seek release of confidential information.

Borehole registered no	Grid reference	Borehole name	Length (m)
SP97NW11	SP 93850 75800	CRANFORD SURF 244	20.42
SP97NW19	SP 93820 75400	WOODFORD 1 SOUTH A 48ZZ	38.4
SP97NW202	SP 92740 75750	CRANFORD IRONSTONE (STAVELEY)	18.59
SP97NW204	SP 91900 75130	BURTON GLEBE PROPERTY B OR NO.9	17.37
SP97NW205	SP 92710 75130	NO.10 WOLD FARM BURTON LATIMER	30.78
SP97NW294	SP 93980 75550	GREAT ADDINGTON 10321	29.26
SP97NW303	SP 93870 75180	GREAT ADDINGTON 10314	41.45
SP97NW304	SP 93630 75290	GREAT ADDINGTON 10310	39.01
SP97SW178	SP 92270 74410	BURTON LATIMER	32
SP97SW179	SP 92470 74290	BURTON LATIMER	29.87
SP97SW213	SP 92610 73590	POPLAR LODGE	30.63
SP97SW228	SP 93554 74514	GREAT ADDINGTON	42.37
SP97SW235	SP 93620 74010	GREAT ADDINGTON	50.29
SP97SW237	SP 94116 73994	GREAT ADDINGTON	49.68

Borehole registered no	Grid reference	Borehole name	Length (m)
SP97SW238	SP 93616 74317	GREAT ADDINGTON	42.98
SP97SW239	SP 93636 73914	GREAT ADDINGTON	51.21
SP97SW240	SP 94110 74159	GREAT ADDINGTON	56.69
SP97SW241	SP 93873 74064	GREAT ADDINGTON	56.39
SP97SW242	SP 93854 74348	GREAT ADDINGTON	50.29
SP97SW243	SP 93608 74096	GREAT ADDINGTON	53.19
SP97SW255	SP 93995 74526	GREAT ADDINGTON	34.44
SP97SW260	SP 94110 73766	GREAT ADDINGTON	43.59
SP97SW262	SP 93870 73724	GREAT ADDINGTON	41.15
SP97SW265	SP 93850 74970	GREAT ADDINGTON	44.81
SP97SW266	SP 93754 74643	GREAT ADDINGTON	40.84
SP97SW267	SP 93980 74705	GREAT ADDINGTON	38.71
SP97SW268	SP 94119 74382	GREAT ADDINGTON	45.11
SP97SW269	SP 93874 73920	GREAT ADDINGTON	43.89
SP97SW280	SP 92090 74840	BURTON WOLD FARM BURTON LATIMER	91.13
SP97SW283	SP 92390 73360	POPLARS FARM FINEDON	45.72
SP97SW34	SP 93870 73870	GREAT ADDINGTON	45.11
SP97SW35	SP 93620 73660	ADDINGTON	37.49
SP97SW39	SP 93870 73450	ADDINGTON	28.35
SP97SW50	SP 93350 74430	WOODFORD	42.37
SP97SW51	SP 93850 74340	GREAT ADDINGTON	49.38
SP97SW54	SP 93500 74920	WOODFORD	46.02
SP97SW55	SP 93830 74970	WOODFORD	45.11

Water well location map



Contains OS data © Crown Copyright and database right 2023
Scale: 1:25 000 (1cm = 250 m)

Water Well records

Number of records in map area: 2

All of these records are registered in the main Borehole Records collections (see Borehole Records Table and map above), but please note that some may be duplicate or part duplicate copies. This map shows records of water wells and boreholes in the National Well Record Archive held at Wallingford (WL) or Murchison House (MH). Each record has a Well Registration number which should be quoted when applying for copies.

Additional index information may be held for the Water Well Records as shown below, indicating the information that can be found on the well record itself. If fields are blank, then the well record has not been examined and its contents are unknown. A 'Yes' or a 'No' indicates that the well record has been examined and the information indicated is, or is not, present. This information should help you when requesting copies of records.

Water Well records

Well Reg No.	BH Reg No.	Name	Easting	Northing	Depth (m)	Date	Aquifer	G	C	W	Ch
SP97/15	SP97SW280/BJ	BURTON LATIMER	492090	274840	91.2	1901	INFERIOR OOLITE GROUP	Yes	Yes	Yes	No
SP97/40	SP97SW283/BJ	POPLARS FARM FINEDON	492410	273360	45.7	1957	GREAT OOLITE GROUP	Yes	Yes	Yes	No

KEY:

Aquifer = The principal aquifer recorded in the borehole

G = Geological Information present on the log

C = Borehole construction information present on the log

W = Water level or yield information present on the log

Ch = Water chemistry information present on the log

Boreholes with water level readings

Number of records in map area: 0

BGS holds no boreholes with water level readings for the selected area

Locations with aquifer properties

Number of records in map area: 0

BGS holds no locations with aquifer properties for the selected area

Site investigation reports

Number of records in search area: 3

Additional laboratory and test data may be available in these reports, subject to any copyright and confidentiality conditions. The grid references used are based on an un-refined rectangle and therefore may not be applicable to a specific site. Borehole records in these reports will be individually referenced within the borehole records collection, described above.

Number	Site investigation title
21602	M1-A1 LINK KETTERING TO BRAMPTON
37452	WHITE HEATHER GARGE VILLAGE ROAD DORNEY
52704	SIDEGATE LAND FILL WELLINGBOROUGH NORTHANTS

National Grid geological maps (1:10 000 and 1:10 560 scale)

Number of records in search area: 2

Map	Type	Survey
SP97NW	C	1943
SP97SW	C	1943

County Series geological maps (1:10 560 scale)

Number of records in search area: 6

Map	Type	Published
Northamptonshire32NE		1943
Northamptonshire32NE	C	0
Northamptonshire32SE	C	0
Northamptonshire33NW	C	0
Northamptonshire33NW		1943
Northamptonshire33SW	C	0

New Series medium scale geological maps (1:50 000 and 1:63 360 scale)

Number of records in search area: 2

Sheet number	Sheet name	Type	Published
186	Wellingborough	C	1958
186	Wellingborough	C	2007

Old Series one inch geological maps (1:63 360 scale)

Number of records in search area: 2

Sheet number	Sheet name	Type	Published
52NW	Kettering	S	1870
52NW	Kettering	D	1870

Hydrogeological maps (various scales)

Number of records in search area: 0

BGS holds no hydrogeological maps for the selected area

Geological Memoirs

Number of records in search area: 2

Geological memoir	Date
Wellingborough	2006
Wellingborough	2007

Technical reports

Technical reports may be available for this area. Please email sales@bgs.ac.uk for further information.

Waste sites

Number of records in search area: 0

Listing of some 3500 waste sites for England and Wales identified by BGS as part of a survey carried out on behalf of the Department of the Environment in 1973. Later information may be available from the Local authority.

BGS holds no records of waste sites for the selected area

BGS non-coal mining plans

Number of records in search area: 1

This listing shows mining plans, including abandonment plans. The coverage is not comprehensive.

Record Type	Plan No.	Title
KP	18191	WESTPHALIAN A & B OF THE COALFIELDS OF ENGLAND & WALES (INCLUDING CANONBIE)

Contact Details

Keyworth Office

British Geological Survey
Environmental Science Centre
Nicker Hill
Keyworth
Nottingham
NG12 5GG
Tel: 0115 9363143
Email: enquiries@bgs.ac.uk

Wallingford Office

British Geological Survey
Maclean Building
Wallingford
Oxford
OX10 8BB
Email: enquiries@bgs.ac.uk

Edinburgh Office

British Geological Survey
Lyell Centre
Research Avenue South
Edinburgh
EH14 4AP
Tel: 0131 6671000
Email: enquiry@bgs.ac.uk

Terms and Conditions

General Terms & Conditions

This Report is supplied in accordance with the GeoReports Terms & Conditions available on the BGS website at <https://shop.bgs.ac.uk/georeports> and also available from the BGS Enquiry Service at the above address.

Important notes about this Report

- The data, information and related records supplied in this Report by BGS can only be indicative and should not be taken as a substitute for specialist interpretations, professional advice and/or detailed site investigations. You must seek professional advice before making technical interpretations on the basis of the materials provided.
- Geological observations and interpretations are made according to the prevailing understanding of the subject at the time. The quality of such observations and interpretations may be affected by the availability of new data, by subsequent advances in knowledge, improved methods of interpretation, and better access to sampling locations.
- Raw data may have been transcribed from analogue to digital format, or may have been acquired by means of automated measuring techniques. Although such processes are subjected to quality control to ensure reliability where possible, some raw data may have been processed without human intervention and may in consequence contain undetected errors.
- Detail, which is clearly defined and accurately depicted on large-scale maps, may be lost when small-scale maps are derived from them.
- Although samples and records are maintained with all reasonable care, there may be some deterioration in the long term.
- The most appropriate techniques for copying original records are used, but there may be some loss of detail and dimensional distortion when such records are copied.
- Data may be compiled from the disparate sources of information at BGS's disposal, including material donated to BGS by third parties, and may not originally have been subject to any verification or other quality control process.
- Data, information and related records, which have been donated to BGS, have been produced for a specific purpose, and that may affect the type and completeness of the data recorded and any interpretation. The nature and purpose of data collection, and the age of the resultant material may render it unsuitable for certain applications/uses. You must verify the suitability of the material for your intended usage.
- If a report or other output is produced for you on the basis of data you have provided to BGS, or your own data input into a BGS system, please do not rely on it as a source of information about other areas or geological features, as the report may omit important details.
- The topography shown on any map extracts is based on the latest OS mapping and is not necessarily the same as that used in the original compilation of the BGS geological map, and to which the geological linework available at that time was fitted.
- Note that for some sites, the latest available records may be historical in nature, and while every effort is made to place the analysis in a modern geological context, it is possible in some cases that the detailed geology at a site may differ from that described.

Copyright:

Copyright in materials derived from the British Geological Survey's work, is owned by UK Research and Innovation (UKRI) and/ or the authority that commissioned the work. You may not copy or adapt this publication, or provide it to a third party, without first obtaining UKRI's permission, but if you are a consultant purchasing this report solely for the purpose of providing advice to your own individual client you may incorporate it unaltered into your report to that client without further permission, provided you give a full acknowledgement of the source. Please contact the BGS Copyright Manager, British Geological Survey, Environmental Science Centre, Nicker Hill, Keyworth, Nottingham NG12 5GG. Telephone: 0115 936 3100.

© UKRI 2023 All rights reserved.

This product includes mapping data licensed from the Ordnance Survey® with the permission of the Controller of Her Majesty's Stationery Office. © Crown Copyright 2023. All rights reserved. Licence number 100021290 EUL



Report issued by
BGS Enquiry Service

APPENDIX 2: Two Mine Abandonment Plans



Catalogue No. OM15342 Sheet Info: 1 OF 2

Date: 15/03/2015

Scale: 1 TO 2500

Database Right and Copyright. The Ordnance Survey 2003. Unauthorised Use Prohibited

Notes Reader - The Ordnance Survey 2003 Licensed Data. Modified/Added/Deleted Information

© 1996 Ordnance Survey. All rights reserved. No part of this publication may be reproduced, stored in a retrieval system, or transmitted, in any form or by any means, electronic, mechanical, photocopying, recording, or by any information storage and retrieval system, without the prior written permission of Ordnance Survey. This publication is for personal use only. It is not to be distributed, sold, or otherwise made available to the public. Ordnance Survey does not accept any liability for any errors or omissions in this publication.

The Burton Wold Wind Farm Extension

engena
prepared on behalf of

Burton Wold Wind Farm Extension
Limited

Proposed Turbines
Upgraded Track

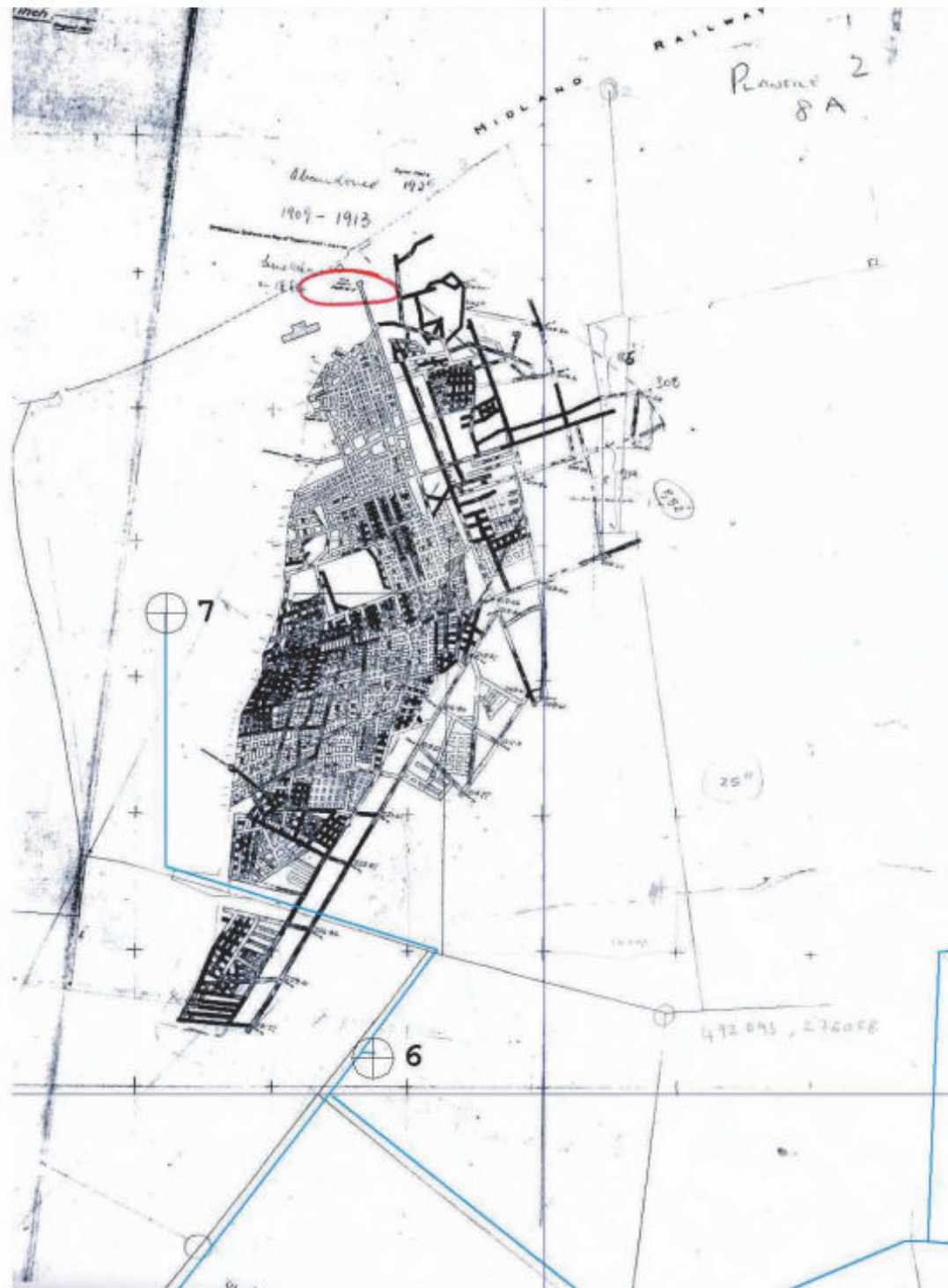


Figure 11.15

Mining Plan Courtesy of
British Steel and Staveley Minerals Ltd.

APPENDIX 3: BGS Borehole Record SP97SW280

18 / 5

SP 9209 7484.

Burton Latimer.

Geol. map 52 N.W. ; One-inch map N.S. 186 ; Six-inch map 32 N.E.

1. West of BURTON WOLFE, 2 miles East of Llan Station. 1901.

Sunk, diam. 5 feet 4 1/2 inches.

Communicated by Mr. W. Keay.

Height above Ordnance Datum 296 feet. Rest level of water about 59 feet from surface.

Yield 12,000 gallons per day from the Northampton Sand.

		Thickness, Ft. in.	Depth, Ft. in.
Boulder Clay.	(Drift clay with rounded pebbles and frag- ments of yellow limestone	14 0	14 0
	Yellow limestone, "White-stone," con- taining small fragments of shells	1 0	15 0
	Dark grey clay	2 0	20 0
Great Oolite Limestone (?)	Very fine dark grey limestone, "limestone," containing shells	6 0	26 0
	Dark grey shaly, "Slaty clay," compact in situ, but soon disintegrates on exposure	4 0	30 0
	Very hard compact grey limestones, crowded with shells	12 0	42 0
Upper Estuarine Beds (?)	Dark grey clayey limestone	1 0	44 0
	Hard grey compact limestone	1 6	46 0
	Compact grey limestone, easily weathers	2 0	48 0
	Very hard compact sandy limestone	1 0	49 0
Northampton Sand. (?)	Loose grey dry sand	2 6	51 6
	Very fine white soft sandstone merging into a fine yellow soft sandstone (water)	8 0	59 6
	Dark grey fine soft sandstone	3 6	63 0
	Dark grey very compact heavy sandstone	8 0	71 0
	Very dark grey compact fine sandstones	8 0	79 0
Upper Lias 182 feet.	Dark blue clay containing small dark concretions	2 0	81 0
	<i>Six-inch Borehole.</i>		
	Blue clay, with iron pyrites in lower part	148 0	229 0
	<i>Three-inch Borehole.</i>		
	Blue clay	20 0	249 0
	Communis Beds (Hard rock)	0 2	251 0
	Serpentines Beds (Clay)	6 4	257 4
	Hard rock	0 0	257 4
	Clay	5 0	262 4
	Rock Bed. (Rock-like stone dust and small pebbles, some subangular, others fairly round)	1 8	264 2
Middle Lias.	Clay	14 7	278 9
	Dark grey pebbles, and some quartz pebbles	0 9	279 8
	Blue clay with beds of rock from 1 to 6 inches in thickness, Gryphaea (cymbium ?) occurs near base	21 4	299 4

Headings were made in the grey ironstone 76 feet from top of well. 5 feet by 4 1/2 feet.

W. Will a picture or report of the Lias
& probably Northampton Sand.

From
'Water Supply of
Beds. & Northampton'
Page 81/82