

		246m NE: Pond 249m NE: Pond
Underground workings	<1000m	101-03m N: Disused Colliery 104m N: Colliery 182m NE: Unspecified Disused Shafts 197m NE: Unspecified Old Shafts 201m NE: Unspecified Old Shafts 202m N: Colliery 208m NE: Unspecified Disused Shafts 220m NE: Unspecified Old Shafts 228m NE: Unspecified Old Shafts 258m SW: Colliery 267m N: Colliery 276m NE: Unspecified Old Shafts 291m N: Colliery 318m NE: Unspecified Old Shafts 326m NE: Unspecified Old Shafts 382m N: Unspecified Old Shafts 385-87m N: Unspecified Old / Disused Shafts 392-94m N: Unspecified Old Shafts 398m N: Unspecified Old / Disused Shafts 429m N: Unspecified Old Shafts 436m SW: Unspecified Old Shaft 524m SW: Disused Colliery 542m SW: Disused Colliery 548m SW: Colliery 653m SW: Unspecified Disused Shaft 657m SW: Unspecified Old Shaft 659m SW: Unspecified Old Shafts 665m SW: Unspecified Old Shaft 667m SW: Unspecified Disused Shaft 672m SW: Unspecified Old Shaft 674m SW: Unspecified Old Shafts 678m SW: Unspecified Shafts 745-49m S: Old Colliery 750m S: Unspecified Disused Shafts 754-55m S: Unspecified Old Shafts 783m S: Unspecified Disused Shafts 787m S: Unspecified Old Shaft 790-91m S; Unspecified Old Shafts 825m S: Unspecified Disused Shafts 827m SW: Old Colliery 828m S: Unspecified Old Shaft 831m SW: Old Colliery 831m S: Unspecified Old Shafts 831m SW: Unspecified Disused Mine 849m S: Unspecified Disused Shafts 855m W: Unspecified Old Shaft 879m SW: Unspecified Old / Disused Shaft 883m SW: Unspecified Old Shaft
Historical Mineral Planning Areas	<500m	On Site: Whiston. Mineral: Clay, shale, bricks [Surface mineral working] 292m S: Whiston. Mineral: Clay, shale, bricks [Surface mineral working]
Non-coal mining	<1000m	816m E. Commodity: Vein Mineral. Class: A
Mining cavities	<1000m	No records
Coal mining	On Site	The site is located within a coal mining area as defined by the Coal Authority
Brine areas	On Site	No records
Gypsum areas	On Site	No records
Tin mining	On Site	No records
Clay mining	On Site	No records
HAZARDS		
Data	Distance	Comments
Maximum shrink swell clays	On site	Very Low
Maximum running sands	On site	Very Low
Maximum compressible deposits	On site	Negligible
Maximum collapsible deposits	On site	Very Low
Maximum landslides	On site	Very Low
Maximum ground dissolution of soluble rocks	On site	Negligible

5.2 Mining

The appended environmental data, **BGS** mapping data **COAL AUTHORITY** Gazetteer and the Knowsley District (B) Coal Plans

(contained herein) confirm that the site is located within an area underlain by productive coal measures which may have been worked in the past and therefore a **COAL AUTHORITY** mining report was procured (Report Reference No. 51002558040001, dated June 2021).

5.3 Coal Mine Risk Assessment

Since the site to be located in an area underlain by productive coal measures, a Coal Mine Risk Assessment (CMRA) was required to assess if the site is at risk of surface instability or other risk factors arising from shallow historical coal mining activities.

This CMRA was required to demonstrate to **KNOWSLEY METROPOLITAN BOROUGH COUNCIL** that coal mining information has been considered by the applicant, and that any issues of potential surface instability have been identified and, if warranted by the assessment, have been considered in the scope of any intrusive site investigation carried out as part of the assessment.

Coal mining may present hazards to proposed development in a number of ways. Such hazards may currently exist or may be caused as a result of the construction of the proposed development, or could occur at some time in the future, and may include:

- Collapse of shallow historical coal workings
- Collapse of or risk of entry into historical shafts or adits
- Gas emissions from historical coal mines including methane and/or carbon dioxide
- Spontaneous combustion or ignition of coal which may lead to underground heating and production of CO₂
- Transmission of gases to adjacent properties
- Coal mining subsidence
- Water emissions from historical coal mine workings

In assessing mining related risks at this site, the following sources of information were consulted:

- **BGS** Geology Sheet 097 Runcorn (2013) 1:50 000 and 1:10 000 Scale Solid and Drift Editions
 - Solid geology extract showing positions of coal outcrops/inferred sub-crops and recorded mine entries in relation to the development site (presented in Appendix A)
 - Knowsley Coal Mining Development Referral Area Plan 1:50000@A1 (presented in A)
 - Knowsley Specific Surface Coal Resources Plan 1:50000@A1 (presented in Appendix A)
 - Knowsley Surface Coal Mining Risk Plan 1:50000@A1 (presented in Appendix A)
 - Coal Authority Consultant Coal Mining Report (Reference No. 51002558040001, dated June 2021, Presented in Appendix J)
 - Coal Authority Interactive Mine Entry Viewer (<http://coal.decc.gov.uk/en/coal/cms/publications/data/map/map.aspx>) (Accessed: July / August 2021)

5.4 Summary of the Documented Geology & Historical Mining

5.4.1 Solid & Drift Geology

The **BGS** superficial drift mapping data indicates that the site is underlain by natural drift cover comprising impermeable diamicton (boulder clay) of glacial origin (*Pleistocene Epoch - Late Quaternary - Devensian Sub Age*).

The underlying solid geology is documented to comprise the Pennine Middle Coal Measures Formation (formerly the Middle Coal Measures Formation) of the Pennine Coal Measures Group comprising interbedded grey argillaceous mudstone – siltstone locally interbedded with productive coal seams of Upper Carboniferous Period (*Silesian Stage: Westphalian B/C Duckmantian- Bolsovian Substage Sub Ages*).

5.4.2 Geological Lines of Weakness – Faults, Marine Bands, Coal Seams

The study site is located within an area where ancient earth movements have caused significant displacements and misalignments of the underlying and surrounding country rock.

The general dip of the solid geology within the surrounding area is documented to be in the order of 4° in a southerly direction.

As illustrated on the appended geological mapping extract 1nr coal seam (*Lower Earthy Delph Coal*), trending on an east – west alignment, extends through the southern section of the study site.

As illustrated on the appended drawings (**CCG** Drawing No's, CCG-C-21-12319--3 to 5), the documented seams of coal sub cropping within the surrounding area are as follows:

1. Lower Earthy Delph Coal extending beneath the study site
2. Higher Florida Coal sub-cropping c.81m north of the study site
3. Un-named coal seam sub-cropping c.83m south of the study site
4. Un-named coal seam sub-cropping c.110m north of the study site
5. Un-named coal seam sub-cropping c.158m south of the study site
6. Un-named coal seam sub-cropping c.200m south of the study site
7. Cheshire Coal Seam sub-cropping 233m north of the study site
8. Potato Coal Seam sub-cropping 300m south of the study site

Taking account of the above and given the general dip of the solid geology within the surrounding area, it is assumed that the Higher Florida, Cheshire Coal and 1nr un-named coal seam will extend beneath the site

Given that a number of these seams are identifiable by name, it may be assumed that these coals have been worked in the past.

5.4.3 Historical Underground Coal Mining

- The site is located within the likely zone of influence from workings in 1nr coal seam at c.139m depth, last worked in 1903
- The site is in an area where the Coal Authority believe there is coal at or close to the surface which may have been worked at some time in the past
- There are no records of spine roadways at shallow depth
- The site is not in the likely zone of influence of any present underground coal workings
- The site is not in an area for which the Coal Authority is determining to grant a licence to extract coal using underground methods: the site however is in an area where reserves of coal may be extracted at some time in the future
- No notice of the risk of the land being affected by subsidence has been given under Section 46 of the Coal Mining Subsidence Act 1991
- The following abandoned mine plan catalogue numbers intersect with some, or all, of the site boundary

Table 4: Abandoned Mine Plan Catalogue No's

3671	NW849	4441
NW822	NW847	NW846
16820	POO	2378

5.4.4 Historical Mine Entries

- There are no recorded mine entries within 100m of the boundary of the site. However, records may be incomplete, and consequently, there may exist in the local area mine entries of which the Coal Authority have no knowledge

5.4.5 Geological Lines of Weakness

- There are no records to the presence of faults, fissures and/or break lines

5.4.6 Opencast Coal Mining & Coal Authority Managed Tips

- The site is not within the boundary of an opencast site from which coal has been removed by opencast methods
- The site does not lie within 200m of the boundary of an opencast site from which is being extracted by opencast methods
- The site lies within c.320m of a historical unlicensed opencast site (positioned c.318m south of study site)
- There are no records to the presence of any Coal Authority managed tips within 500m of the site boundary

5.4.7 Coal Mining Subsidence

- The Coal Authority has not received a damage notice or claim for the site, or any property within 50m since 31st October 1994

5.4.8 Mine Gas Emissions

- There is no record of a mine gas emission requiring action by the Coal Authority within the boundary of the property

5.4.9 Mine Water Treatment Schemes

- There are no records pertaining to the treatment of mine water schemes within 500m of the site boundary

5.4.10 SUMMARY RISK

By reference to the information sources listed above a risk assessment was constructed as tabulated in Table 5 hereunder:

Table 5: Summary of Coal Mining Information

Potential Hazards	Source	Comments
Is the site within a Coal Mining Referral Area?	Knowsley District (B) Coal Mining Development Referral Area 1:50000@A1 Knowsley District (B) Specific Coal Mining Risk Plan 1:50000@A1	Mapping indicates a strong probability that the site lies over an area of coal mining as defined on the Knowsley District (B) Plan of Coal Mining Development Referral Area, & Knowsley District (B) Specific Coal Mining Risk Plan
Is the site within a Surface Mining Resource Area?	Knowsley District (B) Surface Coal Resources Plan 1:50000@A1	Mapping indicates that the site is not within an area of surface mining resources as defined on the Knowsley District (B) Surface Mining Coal Resource Area
Is the site within the likely zone of influence of present underground coal mining?	Coal Authority Residential Coal Report (Ref' No. 51002558040001	Report indicates that the property is not within the likely zone of influence of any present underground coal workings
Is the site within the likely zone of influence of past underground coal mining?	COAL AUTHORITY Consultant Coal Mining Report (Ref' No. 51002558040001	Report indicates that the property is in the likely zone of influence at the surface arising from historical underground workings
Is there a possibility of unrecorded shallow mine workings and/or mine entries?	COAL AUTHORITY Consultant Coal Mining Report (Ref' No. 51002558040001 BGS mapping Sheet 097: Runcorn (2013) COAL AUTHORITY Interactive Mine Entry Viewer	The property is in an area where the COAL AUTHORITY believes there is coal at, or close to, the surface which may have been worked in the past. Where shallow seams (<30mbgl) are present then a presumption of a risk of unrecorded workings should be made BGS Solid & Drift mapping data shows numerous named seams of coal within close proximity of the study site, with the nearest named coal seam being the Lower Earthy Delph Coal extending on northwest – southeast alignment beneath the study site Other coal seams within surrounding area include: - Lower Earthy Delph Coal extending beneath the study site - Higher Florida Coal sub-cropping c.81m north of the study site - Un-named coal seam sub-cropping c.83m south of the study site - Un-named coal seam sub-cropping c.110m north of the study site - Un-named coal seam sub-cropping c.158m south of the study site - Un-named coal seam sub-cropping c.200m south of the study site - Cheshire Coal Seam sub-cropping 233m north of the study site - Potato Coal Seam sub-cropping 300m south of the study site The general dip of the solid geology is documented on the BGS solid mapping data is seen to be in a southerly direction with the angle of dip being in the order of c.4⁰ in a southerly direction Give the presence of named coal seams sub-cropping within close proximity of the study site, it has to be assumed that the site is underlain by coal seams which may have been worked in the past. The appended Coal Authority Report states that there are no documented mine entries within 100m of the study site.
Is there a record of mine gas emissions within the site boundary?	COAL AUTHORITY Consultant Coal Mining Report (Ref' No. 51002558040001	Report indicates that there are no records of the property ever having been affected by mine gas emissions
Is the proposed development in an area for which the COAL AUTHORITY is determining or has granted a license to remove coal by underground methods?	COAL AUTHORITY Consultant Coal Mining Report (Ref' No. 51002558040001	Report indicates that the property is not in an area for which a licence has been granted to remove coal by underground methods

Are there any known faults or other lines of weakness due to coal mining at the site?	BGS mapping Sheet 084: Runcorn (2013)	There are no records pertaining to a geological fault within and/or adjoining area
Has the site been subject to any remedial works by or on behalf of the COAL AUTHORITY under its surface hazard call out procedures?	COAL AUTHORITY Consultant Coal Mining Report (Ref' No. 51002558040001	Report indicates that the site has not been subject to remedial works by or on behalf of the Authority under its Emergency Surface Hazard Call Out procedures

5.5 MINE RISK ASSESSMENT CONCLUSIONS & RECOMMENDATIONS

Based on the above assessment, it was concluded that there is a potential risk of surface instability at this site. The actual existence or absence of this risk could only be determined by intrusive ground investigation. It is therefore recommended that a further intrusive investigation be carried out as described in Section 21.0 and Table 22.0 hereunder. The findings of the investigation should be used in the preparation of a further interpretative report, further assessing the actual risks, and if appropriate, making recommendations for preconstruction remedial works.

In the absence of any existing site investigation information pertaining directly to the site or its immediate surroundings, it could not be conclusively demonstrated that the site is not underlain by collapsible voids, and hence a ground investigation is recommended to access for the presence / absence of mine related voids and/or broken ground.

Workings in the shallow seams, if present, are likely to be pillar and stall and/or longwall, and for confidence in the investigation findings, and given that coal sub-cropping occurs beneath, to the south and north of the site, given the size of the site, it is recommended that 3nr boreholes be sunk in the underlying bedrock strata to c.30mbgl by rotary open hole drilling methods using water flush in the bedrock (coal bearing) strata.

5.3 Hydrology and Hydrogeology

Information on hydrology and hydrogeology obtained from a GroundSure Environmental Report is presented in Appendix J, and summarised hereunder:

Table 4: Summary of GroundSure Environmental Report

HYDROGEOLOGY AND HYDROLOGY		
Aquifer within Diamicton	On site	Boulder Clay Deposits, Secondary (undifferentiated) Aquifer: These are drift deposits with low permeability that have negligible significance for water supply or river base flow
Aquifer within Bedrock Deposits (Pennine Middle Coal Measures Formation)	On site	Pennine Middle Coal Measures Formation: Secondary A Aquifer: 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. These are generally aquifers formerly classified as minor aquifers
Groundwater Abstraction Licenses	<1000m	No records
Surface Water Abstraction Licenses	<1000m	No records
Potable Water Abstraction Licences	<1000m	No records
Source Protection Zones	<500m	No records
Source Protection Zones (confined aquifer)	<500m	No records
Water Network (OS Mastermap)	<250m	No records
Surface water features	<250m	No records
WFD Surface water body catchments	On Site	On Site: River WB catchment. Prescott Brook (Logwood Mill Brook]
WFD Surface water bodies	<250m	No records
WFD Groundwater bodies	<250m	No records
FLOODING		
Risk of Flooding from Rivers and Sea (RoFRaS)	<50m	No records
Historical Flood Events	<250m	No records
Flood Defences	<250m	No records
Areas Benefitting from Flood Defences	<250m	No records
Flood Storage Areas	<250m	No records
Flood Zone 2	<50m	No records
Flood Zone 3	<50m	No records
Surface water flooding: Highest risk	On Site	Negligible
	<50m	1 in 30 year, 0.1m – 0.3m
Groundwater flooding: Highest risk	On Site	Low