

Appendix: Water Resources, Flood Risk, Drainage and Ground Conditions

Annex 1: Legislation and Planning Policy Context

Annex 2: Phase 1 Contamination Assessment Report

Annex 3: Flood Risk Assessment and Surface Water Drainage Strategy

**PHASE 1
CONTAMINATION
ASSESSMENT
REPORT**

Northfleet Harbourside,
Gravesham

Prepared for:
Northfleet Central 1 Ltd

28th September 2022

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General Notes

This report has been prepared by RMA Environmental Ltd (RMA) and provides available factual data for the site at the time of the study and as obtained from the sources described in the text. The data is related to the site on the basis of the site location which has been provided by the Client.

It should be appreciated that the desk study information is not necessarily exhaustive and that further information relevant to the site and its proposed use may be available. The accuracy of map extracts cannot be guaranteed, and it should be recognised that different conditions on site may have existed between and subsequent to the various map editions.

Any borehole data from the British Geological Survey (BGS) sources is included on the following basis: 'The British Geological Survey accept no responsibility for omissions or misinterpretations of the data from their Data Bank as this may be old or obtained from non-BGS sources and may not represent current interpretation'.

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1 INTRODUCTION

Background

- 1.1 This Phase 1 Land Contamination Assessment has been prepared by RMA Environmental Ltd for Northfleet Central 1 Ltd in support for the following development on land at Grove Road in Northfleet, Kent, DA11 9AX:

“an outline application with all matters reserved, except for the primary means of access, for a mixed-use redevelopment involving the demolition of existing buildings and structures including site preparation/remediation works, and the development of residential units (Use Class C3), Use Class E floorspace including floorspace for retail, food and beverage, office floorspace and flexible Class E floorspace, floorspace for a new multi-use stadium with associated business and leisure facilities, floorspace for a hotel (Use Class C1), floorspace for community uses (Use Class F2) and other sui generis uses, delivery of open space and the realignment of the A226 Galley Hill Road/Stonebridge Road with hard/soft landscaping, car and cycle parking, highways works, infrastructure works, ancillary and associated works”.

- 1.2 The current site contains predominantly a mix of industrial warehouses and yards, as well as Ebbsfleet football stadium.
- 1.3 The objective of this Phase 1 Contamination Assessment is to gather information on site conditions and to identify any potential risks of ground contamination resulting from historical or current land uses on or in close proximity to the site.

Scope of Work

- 1.4 This Phase 1 Contamination Assessment report presents the information on and addresses the following:
- current use and condition of the site including any visual evidence of potentially contaminative operations on site;
 - land use history in the context of potentially contaminative activities (based on a review of available Ordnance Survey maps);
 - environmental setting in terms of geology, hydrogeology, hydrology and surrounding land uses;
 - a review of a third-party Groundsure Environmental Database report relating to the site and its surroundings (this is included within Appendix A of this report);
 - a review of a previous Phase 1 Environmental Assessment (Delta-Simons) undertaken for the site in March 2021;

- a review of the Environment Agency's (EA) website to identify any potential environmental issues relating to the site or surrounding areas;
- development of a preliminary conceptual site model and identification of potential risks to human health and environmental receptors; and
- conclusions and recommendations.

Technical Approach

1.5 This assessment generally follows the guidance provided in the following publications:

- Environment Agency Land Contamination Risk Management (LCRM) – (EA, 2020)¹;
- Managing and Reducing Land Contamination: Guiding Principles (GPLC, EA 2016)²;
- National Planning Policy Framework (NPPF, 2021)³;
- National Health Building Council Part 4 Foundations – Chapter 4.1 Land Quality: Managing Ground Conditions (NHBC, 2021)⁴; and
- Gravesham Local Plan Core Strategy (2014)⁵; and other relevant planning policy and guidance documents.

¹ Environment Agency. (2020). Land Contamination Risk Management.

² Environment Agency. (2016). Managing and reducing land contamination: guiding principles (GPLC)

³ Department for Levelling Up, Housing and Communities. (2021). National Planning Policy Framework

⁴ National House Building Council. (2021). Part 4 Foundations – Chapter 4.1 Land Quality: Managing Ground Conditions. (online). Available at: <https://nhbc-standards.co.uk/4-foundations/4-1-land-quality-managing-ground-conditions/>

⁵ Gravesham Borough Council. (2014). Gravesham Local Plan Core Strategy.

2 SITE LOCATION AND LAYOUT

Site Location

- 2.1 The site covers an area of approximately 19 hectares (ha) and is located in the Gravesham Borough Council authority area; it currently comprises of a mix of industrial warehouses and yards as well as Ebbsfleet football stadium.
- 2.2 The site is in an urban area and is centred around National Grid Reference (NGR) TQ 61539 75079 (refer to Figure 1.1). It is bordered by the following land uses:
- Tower Wharf is located to the north of the site;
 - the River Thames and Robins Creek are located north-east of the site;
 - woodland and residential dwellings are located to the south-east of the site;
 - railways lines are located to the south of the site;
 - residential dwellings are located to the south-west of the site;
 - Northfleet Industrial Estate is located to the north-west of the site; and
 - Swanscombe Marshes are located north-west of the site.

Site Environmental Setting

Geology

- 2.3 According to the British Geological Survey (BGS) online viewer, the majority of the site is underlain by the superficial deposits of Alluvium comprising clay, silt, sand and gravel. Areas along the eastern and western boundaries are underlain by the superficial deposits of Head comprising clay, silt, sand and gravel. A few areas along the eastern boundary and north-western corner are not underlain by any superficial geology.
- 2.4 The site is entirely underlain by the bedrock geology of the Lewes Nodular Chalk Formation, Seaford Chalk Formation and Newhaven Chalk Formation comprising chalk.
- 2.5 From reviewing the BGS 1:50,000 map series England and Wales Sheet 271 for Dartford, it shows that the site is located in an area of previously worked ground. The BGS map also shows that Kempton Park Gravels are located beneath the Alluvium deposits underlying the site.
- 2.6 From reviewing BGS mapping, there is an available borehole record located in the centre of the site, (TQ67SW791) which was drilled to a depth of 21.34 m. Groundwater was not recorded to be encountered within this borehole which had the following geological sequence:
- Drift deposits (4.28 m thick); and

- Chalk and flints (at least 17.06 m thick).

- 2.7 The site is in an area where between 1% and 3% of properties are above the Action Level for radon according to the Groundsure Geo Insight report (Appendix A); however, no radon protection measures are considered to be necessary for the Proposed Development in accordance with Building Control Regulations in England.
- 2.8 Zetica⁶ produce unexploded bomb risk maps for sites within the UK and a review of these has confirmed that the site is located within an area with a high risk of Unexploded Ordnance (UXO) (refer to Appendix B). Therefore, as the site is at high risk of UXO, it is recommended (in line with Zetica Mapping guidance) that additional detailed UXO survey is undertaken.

Hydrogeology

- 2.9 Online EA data sources provide the hydrogeological information as summarised in Table 2.1 below.

Table 2.1: Aquifer Properties

Aspect	Designation	Description
Groundwater Source Protection Zone (SPZ)	Zone II – Outer Protection Zone	This zone is defined by the 400-day travel time from a point below the water table. Additionally, this zone has a minimum radius of 250 or 500 metres, depending on the size of the abstraction. The travel time is derived from consideration of the minimum time required to provide delay, dilution and attenuation of slowly degrading pollutants.
Superficial Aquifer Designation: Alluvium	Secondary Undifferentiated	These rock types have been assigned in cases 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
Superficial Aquifer Designation: Head (north-western extent)	Secondary Undifferentiated	These rock types have been assigned in cases 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
Superficial Aquifer Designation: Gravels	Secondary A Aquifer	These are 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.

⁶<https://zeticauxo.com/downloads-and-resources/risk-maps/>

Aspect	Designation	Description
Bedrock Aquifer Designation: Chalk Formation	Principal Aquifer	These are layers of rock or drift deposits that have high intergranular and/or fracture permeability – meaning they usually provide a high level of water storage. They may support water supply and/or river base flow on a strategic scale.

Hydrology

- 2.10 The River Thames, a 'main river'⁷, is located along the north-eastern boundary of the site.
- 2.11 Ebbsfleet, another 'main river', flows in a northerly direction towards the River Thames into Robins Creek and is culverted along the eastern extent of the site.
- 2.12 Swanscombe Marshes are located directly north-west of the site which comprise areas of marshland and a number of local land drains.

⁷ Main river is defined by the EA as any watercourse that contributes significantly to the hydrology of a catchment.

3 SITE RECONNAISSANCE AND DESK STUDY

General

- 3.1 A desk study has been carried out using information obtained from Groundsure Enviro Insight and Geo Insight Report for the area, as well as a review of published information and information obtained from regulatory bodies (and online). A full copy of the Groundsure Report is included as Appendix A. The red line boundary in the Groundsure Report does not include the small section of site in the north-west within its red line boundary, however the Groundsure search includes a radius of 2 km from the Site boundary, this additional area has been reviewed and any information relating to it has been included as 'on site'. Full copies of the Groundsure Reports are included as Appendix A.
- 3.2 A site walkover was undertaken on the 29th June 2022. Access into the buildings was restricted at the time of the visit; however, the following site observations were made (site photographs are included within Appendix C of this report and the photograph locations are shown in Figure 3.1):
- the site comprises of a number of different business facilities ranging from commercial premises to industrial premises;
 - an electricity substation is located along the western boundary of the site as shown in Photo 8 of Appendix C, this appears contained and well maintained;
 - there are a number of materials storage yards including sealed skips associated with the commercial enterprises such as a storage yard for the builders' merchants located in the north of site and storage facilities located in the east of the site associated with the an aggregate processing facility. These were mostly well maintained and managed, although some areas showed moderate evidence of hydrocarbon spills and emissions of dust and other particulates (principally from the aggregate facility);
 - there are a number of car showrooms and Shell fuel station (Photo 12) and car cash facilities (Photo 17) located in the south-western extent of the site. Underground fuel tanks will be present at the fuel station. It is assumed that surface water runoff from the forecourt area of the fuel station and the car washing facility will discharge to foul drainage;
 - a waste storage bin area was present adjacent to the football ground (Photo 13);
 - Photo 14 shows untarmacked ground adjacent to the football ground which showed some evidence of hydrocarbon spills on the ground;
 - a bus maintenance depot is located in the central north-eastern extent of the site. There was moderate to high evidence of hydrocarbon staining seen on the ground / yard areas (Photo 18); and

- overall, the site comprises of a number of potentially contaminative land uses and materials which could potentially pose a risk to sensitive receptors. Although the majority of storage areas and yards looked to be well maintained and managed, the risk of soil and/groundwater contamination cannot be ruled out. The site was heavily trafficked with heavy goods vehicles frequently driving along the roads as a consequence of the industrial nature of the site.

Site History

- 3.3 Historical maps have been obtained as part of the Groundsure Enviro Insight report (refer to Appendix A).
- 3.4 The historical information of relevance is summarised in Table 3.1 below.

Table 3.1: Summary of Historic Mapping

Year of Change (Scale)	On Site	Surrounding Area
1865 - 1866 (1:2,500) (1:10,560)	A 'windmill (corn)' is located in the north-west section of the site. A 'Cement mill' and 'kiln' and a number of industrial buildings are located in the north-east of the site. The site is labelled as 'Botany bay' and a pit appears to be located in the centre of the site. 'The Creek' enters the north-eastern extent of the site. 'Stone Bridge' is located in the south of the site.	'Huggens College' is located to the east of the site. 'Cement works' including a number of industrial buildings are located along the River Thames river bank to the east of the site. This also includes a 'clay mill', 'wharves' and 'docks'. Residential dwellings are scattered among the industrial buildings on the river bank. A railway line is located directly south of the site and this includes 'Northfleet Station'. Beyond the railway line is marshlands which are labelled as 'The Brooks'. Greenfield land labelled as 'Botany Marshes' are located adjacent to the western boundary of the site. 'Galley Hill' which comprises of a number of cottages as well as 'Portland Cement Works' is located 750 m west of the site. 'Swancombe' comprising area of residential dwellings is located 750 m south-west of the site. The River Thames abuts the north-eastern boundary of the site.
1870 - 1872 (1:2,500)	No significant changes from the previous edition	No significant changes from the previous edition
1895-1898 (1:2,500) (1:10,560)	The 'windmill' in the north-western part of the site is now labelled as being 'disused'. There are a number of tramways going through the centre of the site. A pond is located in the southern extent of the site.	Land to the east has become more densely populated with residential dwellings as well as further industrial land uses. Similarly, land to the west of the site has become developed with further cement works as well as 'Northfleet Paper Works' and a chalk pit.

Year of Change (Scale)	On Site	Surrounding Area
	'Ebbsfleet' watercourse is shown along the eastern boundary of the site and connects to 'The Creek' which flows into the River Thames.	On land north of the site adjacent to the River Thames, there are a number of cement works and wharfs. A number of chalk pits are located to the south of the site around 200 – 400 m away from the site. A 'quarry' is located 750 m south of the site
1909 – 1910 (1:2,500) (1:10,560)	The pond in the south of the site is no longer shown on the maps. The disused windmill in the north-west of the site is no longer shown on the maps.	No significant changes from the previous edition
1932 – 1939 (1:2,500) (1:10,560)	The cement works in the north-eastern part of the site is now shown as a single building. A Football Ground is located in centre of the site. Stone Bridge is still present on site. The north-western part of the site is shown as disused/cleared ground. There are still a number of tramways/railway tracks through the site.	Allotment gardens are located directly south of the railway line along the southern boundary of the site. Beyond this is a sports ground and pavilion. Further development in terms of residential and industrial land uses has been undertaken on land directly east of the site. 'Portland cement works' is still present along with 'Huggens College' and a number of 'wharfs'. A number of 'old chalk pits' and 'old quarry's' are located 1 km south-east of the site. A 'miniature rifle range' is located 750 m south of the site, as well as a 'pumping station'. 'Swanscombe' to the south-west of the site has been further developed with recreation grounds, residential development and allotments. It now borders 'Galley Hill' which also has been further developed. The 'paper mill' to the west of the site has been further expanded and comprises a 'reservoir'. The cement works located north of the site that are adjacent to the River Thames is labelled as 'Britannia Lead Works'.
1947 (1:10,560)	No significant changes from the previous edition	No significant changes from the previous edition
1952 – 1955 (1:1,250) (1:2,500) (1:10,560)	The northern extent of the site is shown to be area of grassland/vegetation. A 'pipeline' is shown on the map along the north-western boundary of the site. The 'Ebbsfleet' watercourse that flows along the eastern boundary of the site appears to	A 'powder sack factory' is located directly west of the site. beyond this is a 'mineral railway track' Beyond 'Botany Marshes' is 'Swanscombe Marshes' located more than 1 km north-west of the site.

Year of Change (Scale)	On Site	Surrounding Area
	be an open watercourse in the south-eastern corner of the site. It then appears to be culverted at Stone Bridge where it is culverted through the majority of the site before becoming an open watercourse at 'The Creek'.	
1972-1979 (1:1,250) (1:2,500) (1:10,000)	A depot is shown to be located in the northern extent of the site. This appears to include a number of tanks and buildings on site. There are unknown buildings located in the north-western extent of the site. The football ground on site is labelled as 'Gravesend and Northfleet F.C.'	A 'sewer works' is located 800 m north-west of the site. A number of 'depot' buildings are located 750 m north of the site.
1980-1989 (1:1,250) (1:2,500) (1:10,000)	There is a building labelled as 'works' located in the eastern extent of the site adjacent to the football ground. A number of tramway and railways that go through the site have been removed.	The 'cement works' located around 500 m south of the site are no longer present on site.
1991-1995 (1:1,250) (1:10,000) (1:2,500)	An 'industrial estate' is located in the south-eastern corner of the site along with a number of buildings. The 'depot' buildings in the north of the site are referred to as 'sand and gravel works' and 'warehouse'. There is also a 'conveyor' along the northern boundary of the site. There is an 'electricity substation' located in the north-western extent of the site along the south boundary. A number of 'tanks' are dotted around the site'. The southern extent of the site comprises of two 'garages' 'service station' depot 'ebbsfleet industrial estate' and 'electricity substation'.	The 'cement works' located 500-750 m east of the site is now shown to be a large building labelled as 'works'. The factory and works located directly west of the site are now referred to as 'Kent Kraft Industrial Estate'.
2001 (1:10,000)	The buildings in the north of the site are labelled as 'works'. There are number of access roads into the site. The buildings in the south-eastern corner are labelled as 'industrial estate'.	An additional railway line is shown that runs along the southern boundary of the site. This includes 'Ebbsfleet international station' located approximately 500 m south of the site.

Year of Change (Scale)	On Site	Surrounding Area
2022 (1:10,000)	No significant changes from the previous edition.	No significant changes from the previous edition.

Consultation

- 3.5 A Contaminated Land Enquiry has been undertaken with Gravesham Borough Council (GBC) and this is included as Appendix D of this report. GBC confirms that there are records available which indicate historical industrial use of land for which concerns remain at a similar priority to landfill. The enquiry goes on to state that *"The site has historically experienced substantial industrial use including cement, lime & plaster products manufacturing circa 1869 (covering most of the area outlined), various factories/works of unspecified use 1991, as well as transport support & cargo handling in 1946"*. A plan is included within the consultation (Appendix D) this shows historical land uses that have been flagged on their system, these are listed below:

- historical land uses that comprise of 'cement, lime and plaster products (manufacture)' are located in the north-eastern extent of the site and within the western extent of the site;
- historical land uses that comprise of 'factory or works (not specified)' is located in the far southern extent of the site; and
- historical land uses that comprise of 'transport support and cargo handling' is recorded to have been located in the centre of the site.

Environmental Data Searches

- 3.6 Environmental data has been obtained for the site from the Groundsure report (Appendix A) and data from the EA and local authority websites.

Table 3.2: Historical Industrial Sites

Entry	On Site	0-250 m
Historical Industrial Land Uses	94	266
Historical Tanks	25	88
Historical Energy Features	11	10
Historical Petrol Stations	0	0
Historical Garages	2	0
Historical Military Land	0	0

- 3.7 According to the Groundsure report, there are 94 records of historical potentially contaminative industrial land uses located on site. These comprise a number of land uses including railway infrastructure such as railways and tramway sidings, buildings and depots which are dotted throughout the site. A 'corn windmill' was recorded in the north-western extent of the site. Cement works and various 'unspecified works' and 'depots' are recorded throughout the site. Associated with this are a number of 'unspecific tanks' and 'kilns'. On

review of the historic maps and Groundsure report, the site has been subject to various industrial land uses since the late 1800s until present.

- 3.8 There are 266 potentially historic contaminative land uses within a 250 m radius of the site that include railway infrastructure, mills, works and depots as well as unspecified tanks and pits.

- 3.9 There are 25 records of historical tanks on site; these are mostly located in the northern extent of the site associated with the cement works and the later depot buildings. A 'gas works' is also referenced in the Groundsure Report, although it is not clear where on site this is located. There are a further 88 tanks located within a 250 m radius of the site, the closest of which is located 3 m south-east of the site.
- 3.10 According to the Groundsure EnviroInsight report, there are 11 records of historical energy features on site; the majority of these are described as electricity substations but there are also electricity transformers and gasometers recorded on site. These substations are dotted throughout the site, but particular reference is in relation to the substations located in the north-western corner of the site and the far south-eastern corner. There are a further 10 electricity features recorded to be located within 250 m radius of the site.
- 3.11 According to the Groundsure report, there are two records of historical garages located in the southern extent of the site, referred to as a 'service station' and 'garage' from 1993 mapping. There are no other records of any other historical garages located within 250 m of the site.
- 3.12 There are no records of any historical petrol stations or historical military located on site or within a 250 m radius.

Table 3.3: Waste and Landfill

Entry	On Site	0-250 m
Active or Recent Landfill	0	1
Historical Landfill	0	3
Historical Waste Sites	0	3
Licensed Waste Site	0	5
Waste Exemptions	3	3

- 3.13 There is one active or recent landfill site under the EA regulations located within a 250 m radius of the site; this relates to London Resort Company Holdings Ltd located 75 m south-west of the site with a landfill type of household, commercial and industrial waste landfill.
- 3.14 There are three historical landfill sites located within 250 m radius of the site, the closest is of which is Bamber Pit which is located 76 m south-west of the site.
- 3.15 There are three waste sites within a 250 m radius of the site, the closest is located 6 m north of the site and is associated with a recycling centre at Britannia Refined Metals Ltd. A screening opinion request was applied for in 2021 for this e-scrap facility. The other two sites are located 17 and 18 m north-east and are historic planning applications for waste transfer stations handling category A and B waste.
- 3.16 There are five licensed waste sites within 250 m radius of the site, the closest is recorded to be located 113 north of the site at Botany Road and is in relation to industrial waste landfill which was issued in 1997 but has since expired.

- 3.17 There are three recorded waste exemptions relating to the site; these are all in relation to Robins Wharf for storing and treating non-agricultural waste in secure containers. There are a further three waste exemptions within a 250 m radius of the site. The closest is in relation to Britannia Refined Materials located 25 m north of the site for 'crushing waste fluorescent tubes'.

Table 3.4: Current Industrial Land Uses, Permits, Incidents and Registers

Entry	On Site	0-250 m
Recent Industrial Land Uses	53	63
Current or Recent Petrol Stations	1	0
Electricity Cables	0	0
Gas Pipelines	0	0
Sites Determined as Contaminated Land	0	0
Control of Major Accident Hazards	1	0
Regulated Explosive Sites	0	0
Hazardous substance storage/usage	0	1
Historical licensed industrial activities (IPC)	0	3
Licensed industrial activities (Part A (1))	0	3
Licensed pollutant release (Part A(2)/B)	7	5
Radioactive Substance Authorisations	0	0
Licensed Discharges to controlled waters	0	17
Pollutant release to surface waters (Red List)	0	0
Pollutant release to public sewer	0	0
List 1 Dangerous Substances	0	1
List 2 Dangerous Substances	0	1
Pollution Incidents (EA/NRW)	2	7
Pollution inventory substances	0	0
Pollution inventory waste transfers	0	0
Pollution inventory radioactive waste	0	0

- 3.18 According to the Groundsure report, there are 53 records of recent industrial land uses on site. These include (but are not limited to) 'electricity substation', pylons, tanks, Ebbsfleet industrial estate, concrete production, unspecified works and factories, sand and gravel extractions and materials, petrol and fuel stations and commercial and industrial company including printing solutions, construction supplies and vehicle repair testing and servicing.
- 3.19 There are a further 63 industrial land use within a 250 m radius of the site, the closest of which is recorded to be located 7 m south-east of the site and comprises a vehicle cleaning service centre.
- 3.20 There is one current petrol station (Shell) recorded in the southern extent of the site.
- 3.21 There is one Control of Major Accident Hazards (COMAH) record associated with Britannia Refined Metals Ltd. On further review of the Groundsure report, the company is located just outside the north-western boundary of the site and should be classified as an 'offsite' COMAH site. The COMAH record is currently in operation and is classified as an upper tier site which reflects an increasing potential for major accidents to occur in the absence of robust risk control systems.

- 3.22 The one hazardous substance storage site within a 250 m radius of the site is recorded to be located 23 m north of the site and was an approved application for the storage of various hazardous materials. No enforcement was notified for this activity.
- 3.23 There are three historical licensed industrial activities (IPC) within a 250 m radius of the site. These are all in relation to Britannia Refined Metals Ltd which is located 18 m north of the site for the process of non-ferrous metals.
- 3.24 There are three records of Part A (1) licensed industrial activities within a 150 m radius. The closest is associated with Britannia Refined Metals for non-ferrous metals processing. The remaining two records are associated within Urban Reserve Limited located 215 m south-west of the site for a new 'medium combustion plant'.
- 3.25 There are seven records of Part A (2) licensed pollution releases on site and these are summarised below:
- Part B permit for metal coating processes from North Kent Shotblasting and no enforcements were notified (historical);
 - Part B permit for road stone coating processes from North Kent Roadstone Ltd and no enforcements were notified (current);
 - Part B permit for waste oil burner from Hudsons Ltd and no enforcements were notified (new legislation applies);
 - Part B permit for use of bulk cement from CPI Mortars Ltd and no enforcements were notified (current);
 - Part B permit for use of bulk cement from Brett Concrete and no enforcements were notified (current);
 - Part B permit for timber manufacturer from N.T.C. Lumber Southern Ltd and no enforcements were notified (historical); and
 - Part B permit for unloading of petrol into storage at service stations from Shell Northfleet Station and no enforcements were notified (current).
- 3.26 There are 17 licensed discharges to controlled waters within a 250 m radius of the site. The closest record is 1 m north-east of the site for 'trade discharges' from 1988.
- 3.27 There is one record from List One Dangerous Substances within a 250 m radius of the site; this is an active record for mercury and cadmium for GEC Henley located 180 m south-east of the site.
- 3.28 There is one record of List Two Dangerous Substances within a 250 m radius of the site; this is no longer active and was for chromium, copper, cyanide, iron, pH, silver and zinc associated with WT Henly 180 m south-east of the site.

- 3.29 There are two recorded pollution incidents for the site. The first is recorded in 2001 for 'contaminated water' from 'vehicle and plant washings' which had a Category 3 (minor) impact on water. The second record was from 2002 and was classified as 'oils and fuels' which had a Category 3 (minor) impact on land.

Table 3.5: Hydrogeology and Hydrology

Entry	On Site	0-250 m
Groundwater Abstraction Licences	0	0
Surface Water Abstraction Licences	0	1
Potable Water Abstraction Licences	0	0
Source Protection Zones	1	1
Water Networks	1	21
WFD Surface Water Body Catchments	1	0
WFD Surface Water Bodies	1	0
WFD Groundwater Bodies	2	0

- 3.30 According to the Groundsure report, there is one surface water abstraction licence which is still active and is located 55 m north-east for mineral washing from the tidal River Thames at Swanscombe. This abstraction has a annual volume of 45,500 m³ of surface water with a maximum daily volume of 375 m³.
- 3.31 The site is located within a Zone 2 Outer Catchment Source Protection Zone (SPZ).
- 3.32 The Groundsure Report confirms that Ebbsfleet water network is located along the eastern boundary of the site; this is classified as a 'inland river not influenced by normal tidal action' located on the ground surface which contains water year round. There are another 21 records of water networks within a 250 m radius of the site. The closest to the site is Robins Creek located 5 m south of the site.
- 3.33 The site is reported to be located within the surface water body catchment known as 'Lower Medway Operational Catchment' and 'Medway Management Catchment'.
- 3.34 The site is located within the WFD 'Thames Middle Catchment' which has an overall ecological status of 'Moderate' for water quality and a chemical quality rating of 'fail'.
- 3.35 The site is located within two WFD groundwater bodies; these are the 'West Kent Darent and Cray Chalk' and the 'North Kent Medway Chalk' groundwater body catchments, both of which have poor overall quality ratings.

Table 3.6: Flooding

Entry	On Site and Surrounding Area
Environment Agency Flood Zone 2	Identified (within 50 m)
Environment Agency Flood Zone 3	Identified (within 50 m)
Risk of flooding from Rivers and Sea on site	High (within 50 m)
Flood Defences	None (within 250 m)
Areas Benefiting from Flood Defences	Yes (within 250 m)
Flood Storage	None (within 250 m)
BGS Groundwater Flooding susceptibility	High (within 50m)

- 3.36 The site is located within Flood Zones 2 and 3 and is located within an area from flood defences. However, there are no reported flood defences within 250 m radius of the site and the site is not located in a flood storage area.
- 3.37 According to BGS Groundwater flooding susceptibility, the site has up to a High risk of groundwater flooding.
- 3.38 The risk of flooding at the site from all sources including the benefits of flood defences at the site will be assessed within the Flood Risk Assessment (FRA) which will form part of the planning application.

Table 3.7: Designated Environmentally Sensitive Sites

Entry	On Site	0-250 m
Sites of Special Scientific Interest (SSSI)	0	4
Conserved wetland sites (Ramsar sites)	0	0
Special Areas of Conservation (SAC)	0	0
Special Protection Areas (SPA)	0	0
National Nature Reserves (NNR)	0	0
Local Nature Reserves (LNR)	0	0
Designated Ancient Woodland	0	0
Biosphere Reserves	0	0
Forest Parks	0	0
Marine Conservation Zones	0	0
Green Belt	0	0
Proposed Ramsar sites	0	0
Possible Special Areas of Conservation (pSAC)	0	0
Potential Special Protection Areas (pSPA)	0	0
Nitrate Sensitive Areas	0	0
Nitrate Vulnerable Zones	0	1
SSSI Impact Risk Zones	10	0
SSSI Units	0	5

- 3.39 There are four SSSIs located within a 250 m radius of the site; three of the four SSSIs are classified as Swanscombe Peninsula SSSI which is located at its closest 9 m north-west of the site. The remaining SSSI is Bakers Hole SSSI located 175 m north-west of the site.
- 3.40 The site is located 81 m north-east of the North Kent groundwater nitrate vulnerable zone (NVZ).
- 3.41 The site is located within 10 Site of Specific Scientific Interest (SSSI) Impact Risk Zones; these zones are located around SSSIs and reflect the particular sensitivities of the features for which the SSSI is notified and indicate the types of development proposal which could potentially have adverse impacts.

Table 3.9: Geology

Entry	On Site
Artificial and Made Ground	YES
Artificial Ground Permeability	YES

Entry	On Site
Superficial Geology	YES
Landslip	NO
Bedrock Geology	YES
Bedrock faults and other linear features	NO

- 3.42 When reviewing the 1:50,000 geological maps in Groundsure Reports, the site is underlain by artificial deposits of made ground and worked ground specifically in the northern extent of the site.
- 3.43 The Groundsure report confirms that there is a mix of artificial ground permeability on site with a maximum permeability of very high.
- 3.44 The Groundsure report confirms that the Head, alluvium and tidal river or creek deposits are the superficial deposits present on site.
- 3.45 There are no mass movement susceptible deposits in relation to landslips on site.
- 3.46 The Groundsure report confirms the site is underlain by the bedrock geology of the Lewes Nodular Chalk Formation.

Table 3.8: Natural Hazards

Entry	On Site
Shrink swell clays	Low (within 50 m)
Running sands	Moderate (within 50 m)
Compressible deposits	High (within 50 m)
Collapsible deposits	Very Low (within 50 m)
Landslides	Low (within 50 m)
Ground dissolution of soluble rocks	Low (within 50 m)

- 3.47 According to Groundsure, the risk of shrink-swell within the northern half of the site is Low and within the southern half of the site is Very Low. Ground conditions are considered to be between low and medium plasticity.
- 3.48 According to Groundsure, the majority of the site has a Very Low risk of running sand and the southern part of the site has up to a Moderate risk of running sands. Running sand conditions are probably present in the south and constraints may apply to land uses involving excavation or the addition or removal of water.
- 3.49 The risk of compressible deposits is Very Low in the northern half of the site, Moderate in the south of the site and there is a small area of High risk in the centre of the site. For the area in the centre of the site, there could be significant constraints on land use depending on the thickness of compressible deposits.
- 3.50 The risk of collapsible deposits is Negligible to Very Low according to Groundsure, as deposits with potential to collapse when loaded and saturated are unlikely to be present.
- 3.51 The risk of landslides on site is considered to be Very Low to Low and BGS information for the site suggests that slope instability problems are not likely to occur but consideration of potential problems for adjacent areas impacting on the site should be considered.

- 3.52 The risk of ground dissolution of soluble rocks within the site is considered to be Negligible to Very Low. BGS information for the site states that soluble rocks are present within the ground. Few dissolution features are likely to be present and the potential for difficult ground conditions or localised subsidence are at a level where they need not be considered.

Table 3.9: Mining

Entry	On Site	0-250 m
Natural Cavities	0	0
British Pits	2	1
Surface Ground Workings	23	177
Underground Workings	0	1
Historical Mineral Planning Areas	0	5
Non-coal Mining	2	1
Mining Cavities	0	0
JPB Mining Areas	0	0
Coal Mining	0	0
Brine Areas	0	0
Gypsum Areas	0	0
Tin Mining	0	0
Clay Mining	0	0

- 3.53 The two British pit records on site are located on the northern boundary of the site. These are marine sand and gravel and crushed road and are both actively extracting mineral produce or, in the case of wharfs and rail depots, is actively handling minerals.
- 3.54 There are 23 surface ground workings on site which relate to ponds, heaps, unspecified wharfs and ground workings taken from the historical mapping included in Appendix A. There are a further 177 records within a 250 m radius of the site.
- 3.55 The one underground working within a 250 m radius of the site is recorded from 1923 mapping located 206 m south-east of the site and was associated with a tunnel.
- 3.56 There are five historical mineral planning areas within 250 m radius of the site, the closest of which is 66 m north of the site for extracting chalk. The remaining areas are surface mineral working areas for chalk, cement, chert and flint.
- 3.57 There are two non-coal mining areas recorded on site which are in relation to Class A sporadic underground mining of chalk. Class A is classified as A (Rare) which is described as: "Hazards because of underground mine workings are rare. The rock types present in this area are such that minor mineral veins may be present within them on which it is possible that there have been attempts to work these by underground methods and/or it is possible that small scale underground extraction of other materials may have occurred. All such occurrences are likely to be restricted in size and infrequent".

Table 3.10: Railway Infrastructure and Projects

Entry	On Site	0-250 m
Underground Railways (London)	0	0
Railway Tunnels	0	0

Entry	On Site	0-250 m
Historical Railway and Tunnel Features	27	85
Royal Mail Tunnels	0	0
Historical Railways	0	1
Railways	0	42
Crossrail 1	0	0
Crossrail 2	0	0
HS2	0	0

- 3.58 According to the Groundsure report, there are 27 recorded historical railway and tunnel features located within on site which are all in relation to the northern and central areas of the site and are from tramway and railway sidings including mineral railway sidings. There are an additional 85 features recorded in a 250 m radius of the site.
- 3.59 The one historical railway within 250 m is described as 'disused' railway within 88 m south-east of the site.
- 3.60 There are 42 records of railways within 250 m radius of the site, the closest of which is located 23 m south-west of the site and is known as the 'North Kent Line'.

Asbestos

- 3.61 There is the potential that asbestos is present within the current buildings on site and/or within the underlying soil given the previous land uses. There is no known record of any asbestos surveys that have been undertaken on the building at the site, but given the building ages this cannot be ruled out.

Mineral Safeguarding

- 3.62 As reported within the Groundsure reports and given the current land uses on site, there are two British pit records on in the northern extent of the site. These comprise of marine sand and gravel and crushed road and are both actively extracting mineral produce or, in the case of wharfs and rail depots, are actively handling minerals.
- 3.63 When reviewing the Gravesham Borough Council Mineral Safeguarding Areas map which forms part of the Kent Minerals and Waste Local Plan, the site is located within the Gravesham Borough Council urban boundary/village confines and the Sub - Alluvial River Terrace Deposits Mineral safeguard area.
- 3.64 Mineral Safeguarding Areas cover the known locations of specific mineral resources that are (or may in future be) of sufficient economic value to warrant protection for future generations
- 3.65 Policy DM76 Safeguarding Mineral Resources of the Kent County Council Minerals and Waste Local Plan 2013 – 30 (adopted 2020) states the following:

"Planning permission will only be granted for non-mineral development that is incompatible with minerals safeguarding, where it is demonstrated that either:

1. the mineral is not of economic value or does not exist; or

2. that extraction of the mineral would not be viable or practicable; or
3. the mineral can be extracted satisfactorily, having regard to Policy DM9, prior to the non-minerals development taking place without adversely affecting the viability or deliverability of the non-minerals development; or
4. the incompatible development is of a temporary nature that can be completed and the site returned to a condition that does not prevent mineral extraction within the timescale that the mineral is likely to be needed; or
5. material considerations indicate that the need for the development overrides the presumption for mineral safeguarding such that sterilisation of the mineral can be permitted following the exploration of opportunities for prior extraction; or
6. it constitutes development that is exempt from mineral safeguarding policy, namely householder applications, infill development of a minor nature in existing built up areas, advertisement applications, reserved matters applications, minor extensions and changes of use of buildings, minor works, non-material amendments to current planning permissions; or
7. it constitutes development on a site allocated in the adopted development plan where consideration of the above factors (1-6) concluded that mineral resources will not be needlessly sterilised.”

3.66 A Mineral Assessment will be undertaken and submitted as part of the planning application.

4 CONCEPTUAL SITE MODEL

General

- 4.1 The assessment of risk from contamination follows the source-pathway-receptor approach as described in LCRM⁸ and is summarised as follows (refer to Figure 4.1).

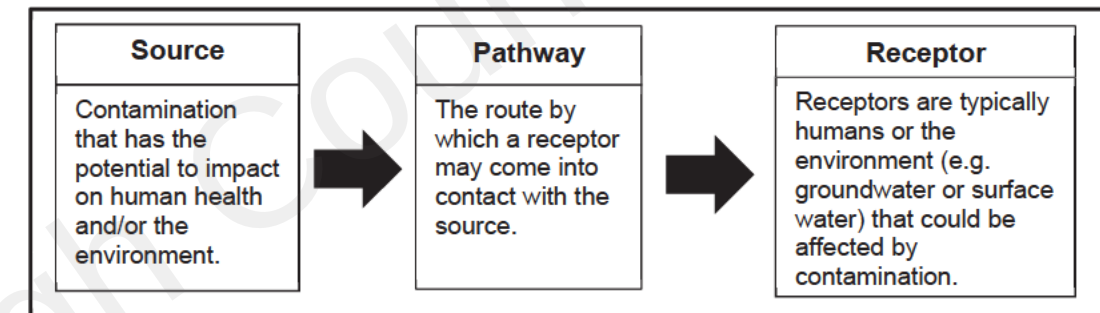


Figure 4.1: Source-Pathway-Receptor Model

- 4.2 If there is no source-pathway-receptor (SPR) linkage in place, it is concluded that there is no risk of harm. If, however, there is a linkage between source and receptor, then a risk-based assessment called a Qualitative Risk Assessment (QRA) is used to determine the significance or potential impact of the SPR-linkage.
- 4.3 The QRA process involves the identification of sources based on historical mapping and data searches, together with identification of the exposure pathway and sensitive receptors. A Conceptual Site Model (CSM), which defines the key sources, pathways and receptors that have been identified as being relevant to this site is then developed.
- 4.4 In terms, of identifying ‘significant’ pollution linkages (i.e. those that could require remediation), a level of risk is assigned to each linkage. The overall risk of each pollution linkage is determined by classifying each linkage with a probability and consequence classification. Probability of a pollution linkage is classified as either having a High Likelihood, Likely, Low Likelihood and Unlikely occurrence. Similarly, the consequence of a pollution linkage is classified as either being Severe, Medium, Mild and Minor. A ‘Risk Estimation’ matrix table is then used to determine the overall risk of the pollution linkages. Where the level of risk is Moderate or greater, then the pollution linkage is considered ‘significant’ and further investigation is required.
- 4.5 Descriptions and definitions for each probability, consequence and risk classifications, including the risk matrix table are included within Appendix E of this report.
- 4.6 The Conceptual Site Model has been prepared with due regard to the advice contained in the Contaminated Land (England) Regulations 2006⁹ and associated statutory guidance on contaminated land.

⁸ Environment Agency. (2020). Environment Agency Land Contamination Risk Management (LCRM)

⁹ Gov (2006) The Contaminated Land (England) Regulations.

Review of Potential Sources of Contamination

- 4.7 Based on the information presented in the Sections 2-3 of this report, the potential sources of contamination that could impact on receptors have been identified and are summarised in Tables 4.1 and 4.2 below.

Table 4.1: Potential Sources of Contamination – On Site

Source	Location on Site	Activity	Potential Contaminants
Railway infrastructure (historical)	Mostly central northern and western part of the site	Transport infrastructure	PAHs, heavy metals, TPH, creosote, lead, cleaning solvents and other hydrocarbons
Industrial land uses (Historical and current)	Most of the site	Cement works, quarry, corn mill, industrial estate, depots, aggregate industries, building materials suppliers.	TPH, PAHs, BTEX, VOCs, hydrocarbons, metals, asbestos
Electricity Substations (Historical and current)	Dotted throughout the site	Electrical Infrastructure	PCBs, radiation and other hydrocarbons
Existing buildings on site (current)	Most of the site	Industrial and commercial buildings, football club	Asbestos, pesticides
Garage and Service Station (Current and Historical)	South-eastern extent of the site	Fuel refilling	TPH, PAHs, BTEX, VOCs
Car Park (Historical and current)	Surrounding buildings	Car Park	PAHs, hydrocarbons
Tanks (Historic and current)	Mostly in the northern extent of the site	Unspecified	Unknown
Surface Ground Workings including Britpits onsite (current and historical)	Northern extent of the site	Heaps, pits and ponds	Unknown

Table 4.2: Potential Sources of Contamination – Off Site

Source	Location to the site	Activity	Potential Contaminants
Surface Ground Workings (historical and current)	2 m south-east	Wharfs, pit, heaps and ponds	Unknown
Electrical Substations (historical and current)	46 m east of the site	Electrical infrastructure	PCBs, radiation and other hydrocarbons

Source	Location to the site	Activity	Potential Contaminants
Railway and tramway Infrastructure (historical and current)	4 m south-west	Railway sidings, railway station, railway buildings, tramway sidings and railways	PAHs, heavy metals, TPH, creosote, lead, cleaning solvents and other hydrocarbons
Commercial and Industrial works (historical and current)	Closest is located 7 m south-east and is a vehicle cleaning service centre	Depots, factory's, works, commercial sites etc	TPH, PAHs, BTEX, VOCs, hydrocarbons, asbestos
Wharfs (historical and current)	2 m south-east	Wharf related activities	PAHs, asbestos, and other hydrocarbons
Tanks (historical and current)	The closest is 3 m south-east	Unspecified	Unknown
Pits (historical)	6 m north west	Unspecified	Unknown
Waste and landfill sites (historical and active)	75 m south west	Landfill and waste disposal	PAHs, heavy metals, TPH, other hydrocarbons, asbestos, ground gas
Hazardous substance storage (current)	23 m north	Britannia Refined Metals Ltd	Various hazardous materials (no enforcement notified)

Review of Potential Exposure Pathways

- 4.8 A review of the identified potential pathways that could exist at the site, whether or not a source of contamination has been identified in Tables 4.1 and 4.2, is summarised in Table 4.3.

Table 4.3: Potential Exposure Pathways and Receptors

Receptor	Pathway	Present	Notes
Human Health			
Future site users	Dermal contact, ingestion or inhalation of soil and soil dust	YES	There will be proposed areas of exposed soils at ground level within the Proposed Development.
	Migration in permeable strata and inhalation of gas and/or organic vapour	YES	There are two pits on site and records of surface ground working site. Therefore the likelihood of ground gas at the site cannot be ruled out. The site is underlain by relatively

Receptor	Pathway	Present	Notes
			permeable superficial deposits and bedrock geology and therefore potential for migration of ground gas beneath the site.
	Potential ground gas migration in permeable strata, accumulation and risk of explosion	YES	There are two pits on site and records of surface ground working site. Therefore the likelihood of ground gas at the site cannot be ruled out and could accumulate within any buildings on site. The site is underlain by relatively permeable superficial deposits and bedrock geology and therefore potential for migration of ground gas beneath the site.
Adjacent site users	Ingestion/inhalation of windblown dust	YES	Commercial and residential buildings are located within the surrounding area (<100 m distance). Construction effects only.
Demolition, Construction workers and service repair staff	Dermal contact, ingestion, or inhalation of soil and soil dust and/or hazardous material	YES	Site workers could be exposed to soil contamination during groundworks and/or other substances during demolition/construction.
	Migration in permeable strata and inhalation of gas and/or organic vapour	YES	There are two pits on site and records of surface ground working site. Therefore the likelihood of ground gas at the site cannot be ruled out. The site is underlain by relatively permeable superficial deposits and bedrock geology and therefore potential for migration of ground gas beneath the site.
Development			
Future plant life	Plant uptake in the areas of public open space and gardens	YES	There are proposed areas of exposed soils and planting at ground level within the development.
Buried Services / Infrastructure	Direct Contact	YES	The Proposed Development will include buried services (utilities) which are susceptible to corrosion from contact with pollutants within soil.

Receptor	Pathway	Present	Notes
Environment			
Surface Water (River Thames) (Ebsfleet)	Surface runoff (The River Thames along the northern boundary) (Ebsfleet is culverted along the southern boundary of the site and becomes an open watercourse in the north-eastern corner of the site (Robins Creek)).	YES	There is the potential that contaminated runoff from construction related activities can enter the watercourses adjacent to the site.
Superficial Aquifers: Gravels (Secondary A)	Leaching from soil and vertical fluid movement	YES	Piling and foundation works are likely to penetrate through the made ground into the Alluvium and through the gravels underlying the site. As this superficial geology is permeable, there is the potential that it could open up new groundwater pathways within the superficial geology.
Bedrock Aquifer: Chalk (Principal Aquifers)	Leaching from soil and vertical fluid movement	YES	Piling and foundation works are likely to penetrate through the superficial geology and into the underlying chalk. Therefore, it is considered likely that new groundwater pathways would open up within the permeable bedrock geology.

Potentially Complete SPR-Linkages

- 4.9 Based on the sources, pathways and receptors identified, Table 4.4 below summarises all potential complete pollutant linkages for the site and identifies the level of risk from each. Risk definitions are provided within Appendix E.

Table 4.4: Potential Complete SPR-Linkages

Source (Location)	Contaminants	Pathway	Receptor	Probability	Consequence	Overall Risk	Justification and/or Mitigating Factors
Potential Historical Contamination in Soils and Groundwater (on site and off site)	Hydrocarbons, Metals, PAHs, Asbestos, Radiation, PCBs	Ingestion, dermal contact and fugitive inhalation	Future site users	Likely	Medium	Moderate	There are proposed areas of exposed soils within the development and therefore there is a medium risk of future site users coming into contact with potentially contaminated soils. Targeted site investigation is required to determine the contamination status of the site for those areas where exposed soils will be present.
			Demolition, Construction and service repair workers	Likely	Medium	Moderate	Contractors may be working directly in soils and/or groundwater and there is the potential that contamination could be present in made ground. However, any risk from construction will be mitigated by good construction practices, such as Personal Protective Equipment (PPE).
		Windblown Dust	Adjacent site users	Low	Mild	Low	Good construction practices will be followed to ensure that adjacent site users are not affected (such as dust suppression measures).
		Plant Uptake	Future Planting	Likely	Medium	Moderate	There are proposed areas of exposed soils within the development and therefore there is a medium risk of plants coming into contact with potentially contaminated soils. Further site investigation in area where planting will take place is required to determine the contamination status of the site.
		Direct Contact	Buried Services	Low	Mild	Low	The Proposed Development will include buried services (utilities); therefore any pipes and utilities will be designed appropriately to reduce the risk of corrosion/damage.
		Vertical migration within soils and geology during construction	Superficial Aquifer (gravels)	Likely	Medium	Moderate	Piling and foundation works will penetrate through the made ground and into the superficial geology and into the chalk below. Given the permeable nature of the underlying geology at the site, this would open up groundwater pathways and cause contamination remobilisation.

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Source (Location)	Contaminants	Pathway	Receptor	Probability	Consequence	Overall Risk	Justification and/or Mitigating Factors
			Bedrock Aquifer (chalk)	Likely	Medium	Moderate	In order to verify contamination conditions, a comprehensive intrusive investigation will be undertaken and will include an assessment of contamination status to inform the detailed design and confirmation of groundwater levels. An appropriate foundation works risk assessment including a Piling Method Statement would be prepared prior to construction to inform the foundation designs for the various element of the Proposed Development and an appropriate quality assurance and control regime would be implemented. This would ensure that the source or pathway (or both) would be removed.
Existing Buildings (on site)	Asbestos	Ingestion, dermal contact and/or fugitive inhalation	Demolition and Construction Workers	Likely	Medium	Moderate	Given the historical and existing land uses on site and the age of the buildings, it is likely that asbestos is present on site. Asbestos demolition surveys will be undertaken for all buildings prior to demolition and any asbestos will be removed by a competent contractor prior to commencement of demolition/construction.
Existing Electricity Substation, (on site)	PCBs, Radiation and Hydrocarbons	Surface Water Runoff	Surface Water (River Thames and Ebbsfleet)	Low	Medium	Low	The electricity substations on site are likely to be contained units and it is considered unlikely that any contaminants would be able to enter the existing drainage system for the site especially considering the closest watercourse is culverted and defences surround the River Thames.
Existing Petrol station and car park (on site)	Hydrocarbons, PAHs and Metals			Low	Medium	Low	It is considered that there is a low potential risk of surface water contamination from existing contaminative uses on site as well as and from construction related activities if not managed properly to Ebbsfleet watercourse, this is because it is culverted through the site. The petrol station on site will ensure that all runoff from the station goes to foul drainage where it will be treated at the treatment works to a sufficient quality. The risk of runoff to the River Thames is also low given that the site slopes away from the river and is surrounded by flood defence wall.

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Source (Location)	Contaminants	Pathway	Receptor	Probability	Consequence	Overall Risk	Justification and/or Mitigating Factors
Existing Ground Gas (on site and off site)	Ground Gas	Ground Gas Accumulation Ground Gas Migration within permeable strata and inhalation of organic Vapours	Future Site Users	Moderate	Severe	High	There is a high risk of ground gas on site due to the historical and current land uses and records of surface ground workings on site. It is therefore recommended that ground gas monitoring is undertaken as part of the site investigation works. Following this a detailed ground gas risk assessment will be put forward to the council and mitigation measures will be agreed and implemented if necessary.
				Moderate	Severe	High	
			Construction Worker and service repair workers				The planning application will include an appropriate surface water drainage strategy which will provide sufficient mitigation and treatment for surface water runoff.
			Future Site Users	Moderate	Severe	High	

5 SUMMARY & RECOMMENDATIONS

- 5.1 This Phase 1 Contamination Assessment has been prepared with due regard to the advice contained in the Contaminated Land (England) Regulations 2006 and associated statutory guidance on contaminated land.
- 5.2 From reviewing the baseline data, there are a multitude of historical and current potentially contaminative land uses on site given the industrial nature of the site and use of aggregate and cement works including electricity substations, petrol fuelling station and tanks on site. Therefore, the likelihood of contaminants such as metals, asbestos, PAHs and other hydrocarbons cannot be ruled out. Similarly, there are a number of potentially historic and existing contaminative land uses within a 250 m radius of the site including electricity substations, wharfs, historical tanks and depots.
- 5.3 The site covers an area of approximately 19 hectares (ha) and is located in the Gravesham Borough Council authority area; it currently comprises of a mix of industrial warehouses and yards as well as Ebbsfleet football stadium. The site is within an area where between 1% and 3% of properties are above the Action Level for radon; however, no radon protection measures are considered necessary in accordance with Building Control Regulations. According to Zetica, the site is located within an area at High risk of UXO. Zetica recommend that as the site is of high risk, additional detailed UXO research is undertaken.
- 5.4 Given the historical and existing land uses on site and age of the buildings, there is the high potential that Asbestos Containing Materials (ACMs) are present on site. It is therefore recommended that an asbestos demolition survey should be undertaken in advance of any works being carried out.
- 5.5 Pollution pathways within the site and surrounding area have been identified to determine complete SPR pollutant linkages; each linkage has been classified with a risk by following the QRA methodology as defined within Appendix E. The identified pollutant linkages and their overall risk classification are as follows:
- there is **Moderate** risk to future site users from potential contamination within soils and groundwater as there are proposed areas of exposed soils at ground level on site;
 - the overall risk of potential contamination within soils and groundwater from on-site and off-site sources is **Moderate** for demolition and construction workers and **Low** for adjacent site users;
 - there is a **Moderate** risk of potential contamination within soils and groundwater via plant uptake;
 - the overall risk of potential contamination within soils and groundwater from on-site and off-site sources via direct contact is **Low** for buried services (utilities);

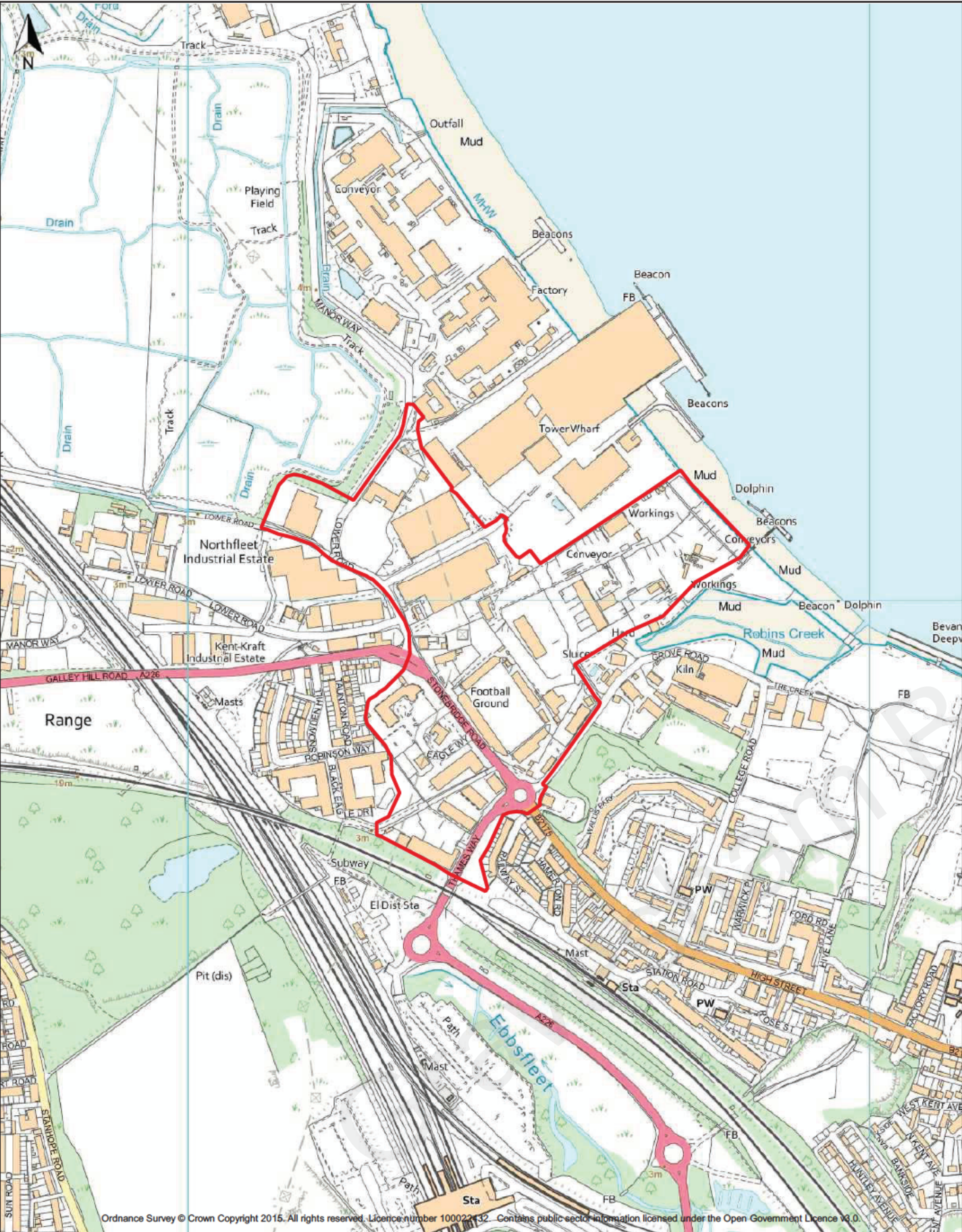
- the overall risk of potential contamination within soils and groundwater from on-site and off-site sources is **Moderate** for the superficial geology and bedrock as piling and foundation works could open up pathways to the gravels and chalk and cause contamination from general construction-related activities;
 - the overall contamination risk from the existing buildings is considered to be **Moderate** for demolition and construction workers due to the presence of ACMs;
 - there is a **Low** risk of surface water contamination from the existing electricity substation on surface water as the substation should be a contained unit;
 - there is **Low** risk of surface water contamination from the existing petrol station and car park on surface water as the drainage in place for the petrol station would ensure runoff goes to foul drainage. As well as this, an appropriate surface water drainage strategy will provide sufficient mitigation; and
 - the overall risk from existing ground gas and organic vapour accumulation/migration and risk of explosion to construction/demolition workers and future site users is **High** due to the current and historical use of the site for aggregate extraction. It is therefore recommended that ground gas monitoring is carried out.
- 5.6 Based on the above complete pollutant linkages the following measures are recommended:
- good demolition and construction practices will be used to reduce the contamination risks to demolition/construction workers on site and adjacent site users, this will include ensuring demolition/construction workers wear appropriate personal protective equipment (PPE), dust suppression measures and that any necessary licences would be obtained for the storage, treatment and disposal of waste;
 - it is recommended that an intrusive site investigation (Phase 2 Investigation) including a ground gas monitoring/assessment is undertaken prior to commencement of demolition and construction to determine the contamination status of the underlying soil and groundwater and following this an appropriate foundation works risk assessment including a Piling Method Statement would be prepared to inform the foundation designs for the various element of the Proposed Development and an appropriate quality assurance and control regime would be implemented. This would normally be secured by condition and the findings of the investigations will be reported to the Local Authority and a remediation and/or mitigation strategy and verification report will be prepared and agreed;
 - any pipes and utilities will be designed appropriately to reduce the risk of corrosion/damage;
 - an appropriate surface water drainage strategy will be implemented, and this will ensure that any runoff from the site will be treated to an appropriate water quality;

- construction vehicles will be properly maintained to reduce the risk of hydrocarbon contamination and will only be active when required. The implementation of the CEMP will minimise the risk of redistribution any potential contamination around the site, such as vehicle washdown; and
- it is recommended that an Asbestos demolition survey is undertaken for all buildings prior to demolition and that all ACMs are safely removed (and/or other hazardous materials) prior to the commencement of demolition/construction. Any waste will be removed by a specialist contractor.

5.7 Overall, with the recommended mitigation measures implemented, it is concluded that the contamination risk to the Proposed Development and/or identified receptors would be **Negligible**.

Figures

Appendix A
Groundsure Report



Key

Red Line Boundary

Figure 1.1: Site Location Plan

Client:	Northfleet Central 1 Ltd
Project:	Northfleet Harbourside, Gravesham
Project No.:	C2402

Drawn	Checked	Date	Scale
RT	RM	2 / 09/2022	1:5,000@A3

561461.8437713521, 174941.61831233115

Order Details

Date: 18/05/2022

Your ref: DA11_9GN

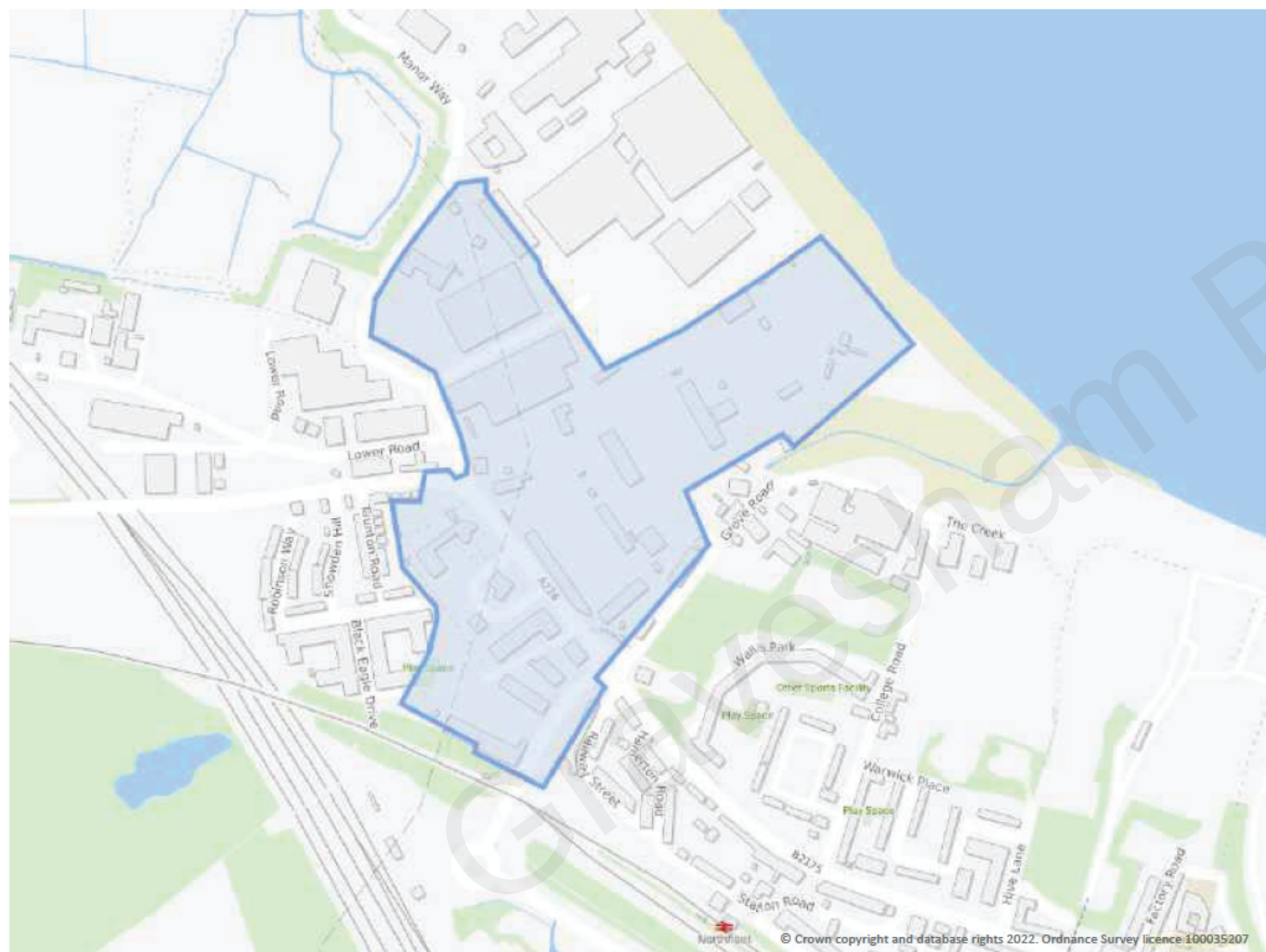
Our Ref: GS-8757221

Site Details

Location: 561461 174941

Area: 17.99 ha

Authority: [Dartford Borough Council](#), [Gravesham Borough Council](#)



Summary of findings

p. 2

Aerial image

p. 8

OS MasterMap site plan

N/A: >10ha

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info@groundsure.com
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Summary of findings

Page	Section	Past land use	On site	0-50m	50-250m	250-500m	500-2000m
13	1.1	Historical industrial land uses	94	57	209	194	-
33	1.2	Historical tanks	25	10	78	92	-
41	1.3	Historical energy features	11	2	8	13	-
43	1.4	Historical petrol stations	0	0	0	0	-
43	1.5	Historical garages	2	0	0	0	-
43	1.6	Historical military land	0	0	0	0	-
Page	Section	Past land use - un-grouped	On site	0-50m	50-250m	250-500m	500-2000m
44	2.1	Historical industrial land uses	127	79	284	259	-
71	2.2	Historical tanks	51	24	124	124	-
83	2.3	Historical energy features	16	6	16	17	-
85	2.4	Historical petrol stations	0	0	0	0	-
86	2.5	Historical garages	3	0	0	0	-
Page	Section	Waste and landfill	On site	0-50m	50-250m	250-500m	500-2000m
87	3.1	Active or recent landfill	0	0	1	1	-
88	3.2	Historical landfill (BGS records)	0	0	0	0	-
88	3.3	Historical landfill (LA/mapping records)	0	0	1	0	-
88	3.4	Historical landfill (EA/NRW records)	0	0	2	1	-
89	3.5	Historical waste sites	0	3	0	1	-
90	3.6	Licensed waste sites	0	0	5	16	-
97	3.7	Waste exemptions	3	1	2	11	-
Page	Section	Current industrial land use	On site	0-50m	50-250m	250-500m	500-2000m
100	4.1	Recent industrial land uses	50	10	53	-	-
107	4.2	Current or recent petrol stations	1	0	0	0	-
108	4.3	Electricity cables	0	0	0	0	-
108	4.4	Gas pipelines	0	0	0	0	-
108	4.5	Sites determined as Contaminated Land	0	0	0	0	-



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Date: 18 May 2022

108	4.6	Control of Major Accident Hazards (COMAH)	1	0	0	0	-
109	4.7	Regulated explosive sites	0	0	0	0	-
109	4.8	Hazardous substance storage/usage	0	1	0	0	-
109	4.9	Historical licensed industrial activities (IPC)	0	3	0	0	-
110	4.10	Licensed industrial activities (Part A(1))	0	1	2	8	-
112	4.11	Licensed pollutant release (Part A(2)/B)	7	1	4	3	-
114	4.12	Radioactive Substance Authorisations	0	0	0	0	-
114	4.13	Licensed Discharges to controlled waters	0	1	16	9	-
118	4.14	Pollutant release to surface waters (Red List)	0	0	0	0	-
119	4.15	Pollutant release to public sewer	0	0	0	0	-
119	4.16	List 1 Dangerous Substances	0	0	1	1	-
119	4.17	List 2 Dangerous Substances	0	0	1	1	-
120	4.18	Pollution Incidents (EA/NRW)	2	3	4	3	-
121	4.19	Pollution inventory substances	0	0	0	2	-
123	4.20	Pollution inventory waste transfers	0	0	0	1	-
125	4.21	Pollution inventory radioactive waste	0	0	0	0	-
Page	Section	Hydrogeology	On site	0-50m	50-250m	250-500m	500-2000m
126	5.1	Superficial aquifer	Identified (within 500m)				
128	5.2	Bedrock aquifer	Identified (within 500m)				
130	5.3	Groundwater vulnerability	Identified (within 50m)				
132	5.4	Groundwater vulnerability- soluble rock risk	Identified (within 0m)				
133	5.5	Groundwater vulnerability- local information	Identified (within 0m)				
134	5.6	Groundwater abstractions	0	0	0	0	44
144	5.7	Surface water abstractions	0	0	1	0	0
145	5.8	Potable abstractions	0	0	0	0	4
146	5.9	Source Protection Zones	1	0	1	2	-
146	5.10	Source Protection Zones (confined aquifer)	0	0	0	0	-
Page	Section	Hydrology	On site	0-50m	50-250m	250-500m	500-2000m
147	6.1	Water Network (OS MasterMap)	1	4	17	-	-

149	6.2	Surface water features	0	1	6	-	-
150	6.3	WFD Surface water body catchments	1	-	-	-	-
150	6.4	WFD Surface water bodies	1	0	0	-	-
150	6.5	WFD Groundwater bodies	2	-	-	-	-
Page	Section	River and coastal flooding	On site	0-50m	50-250m	250-500m	500-2000m
152	7.1	Risk of flooding from rivers and the sea	High (within 50m)				
153	7.2	Historical Flood Events	1	0	0	-	-
153	7.3	Flood Defences	0	0	0	-	-
153	7.4	Areas Benefiting from Flood Defences	1	0	1	-	-
154	7.5	Flood Storage Areas	0	0	0	-	-
155	7.6	Flood Zone 2	Identified (within 50m)				
156	7.7	Flood Zone 3	Identified (within 50m)				
Page	Section	Surface water flooding					
157	8.1	Surface water flooding	1 in 30 year, 0.3m - 1.0m (within 50m)				
Page	Section	Groundwater flooding					
159	9.1	Groundwater flooding	High (within 50m)				
Page	Section	Environmental designations	On site	0-50m	50-250m	250-500m	500-2000m
160	10.1	Sites of Special Scientific Interest (SSSI)	0	1	3	0	8
161	10.2	Conserved wetland sites (Ramsar sites)	0	0	0	0	0
161	10.3	Special Areas of Conservation (SAC)	0	0	0	0	0
162	10.4	Special Protection Areas (SPA)	0	0	0	0	0
162	10.5	National Nature Reserves (NNR)	0	0	0	0	1
162	10.6	Local Nature Reserves (LNR)	0	0	0	0	0
162	10.7	Designated Ancient Woodland	0	0	0	0	0
163	10.8	Biosphere Reserves	0	0	0	0	0
163	10.9	Forest Parks	0	0	0	0	0
163	10.10	Marine Conservation Zones	0	0	0	0	1
163	10.11	Green Belt	0	0	0	0	1
164	10.12	Proposed Ramsar sites	0	0	0	0	0

164	10.13	Possible Special Areas of Conservation (pSAC)	0	0	0	0	0
164	10.14	Potential Special Protection Areas (pSPA)	0	0	0	0	0
164	10.15	Nitrate Sensitive Areas	0	0	0	0	0
165	10.16	Nitrate Vulnerable Zones	0	0	1	0	0
166	10.17	SSSI Impact Risk Zones	10	-	-	-	-
175	10.18	SSSI Units	0	1	4	3	22
Page	Section	Visual and cultural designations	On site	0-50m	50-250m	250-500m	500-2000m
190	11.1	World Heritage Sites	0	0	0	-	-
191	11.2	Area of Outstanding Natural Beauty	0	0	0	-	-
191	11.3	National Parks	0	0	0	-	-
191	11.4	Listed Buildings	0	0	0	-	-
191	11.5	Conservation Areas	0	0	0	-	-
192	11.6	Scheduled Ancient Monuments	0	0	2	-	-
192	11.7	Registered Parks and Gardens	0	0	0	-	-
Page	Section	Agricultural designations	On site	0-50m	50-250m	250-500m	500-2000m
193	12.1	Agricultural Land Classification	Urban (within 250m)				
194	12.2	Open Access Land	0	0	0	-	-
194	12.3	Tree Felling Licences	0	0	0	-	-
194	12.4	Environmental Stewardship Schemes	0	0	0	-	-
194	12.5	Countryside Stewardship Schemes	0	0	0	-	-
Page	Section	Habitat designations	On site	0-50m	50-250m	250-500m	500-2000m
195	13.1	Priority Habitat Inventory	1	9	10	-	-
196	13.2	Habitat Networks	2	1	1	-	-
197	13.3	Open Mosaic Habitat	0	1	7	-	-
198	13.4	Limestone Pavement Orders	0	0	0	-	-
Page	Section	Geology 1:10,000 scale	On site	0-50m	50-250m	250-500m	500-2000m
199	14.1	10k Availability	Identified (within 500m)				
200	14.2	Artificial and made ground (10k)	4	4	6	10	-
202	14.3	Superficial geology (10k)	4	5	2	1	-

203	14.4	Landslip (10k)	0	0	0	0	-
204	14.5	Bedrock geology (10k)	2	0	0	0	-
205	14.6	Bedrock faults and other linear features (10k)	0	0	0	0	-
Page	Section	Geology 1:50,000 scale	On site	0-50m	50-250m	250-500m	500-2000m
206	15.1	50k Availability	Identified (within 500m)				
207	15.2	Artificial and made ground (50k)	5	2	7	9	-
208	15.3	Artificial ground permeability (50k)	4	1	-	-	-
210	15.4	Superficial geology (50k)	5	1	0	2	-
211	15.5	Superficial permeability (50k)	Identified (within 50m)				
212	15.6	Landslip (50k)	0	0	0	0	-
212	15.7	Landslip permeability (50k)	None (within 50m)				
213	15.8	Bedrock geology (50k)	1	0	0	0	-
214	15.9	Bedrock permeability (50k)	Identified (within 50m)				
214	15.10	Bedrock faults and other linear features (50k)	0	0	0	0	-
Page	Section	Boreholes	On site	0-50m	50-250m	250-500m	500-2000m
215	16.1	BGS Boreholes	2	10	78	-	-
Page	Section	Natural ground subsidence					
220	17.1	Shrink swell clays	Low (within 50m)				
222	17.2	Running sands	Moderate (within 50m)				
224	17.3	Compressible deposits	High (within 50m)				
226	17.4	Collapsible deposits	Very low (within 50m)				
227	17.5	Landslides	Low (within 50m)				
229	17.6	Ground dissolution of soluble rocks	Low (within 50m)				
Page	Section	Mining, ground workings and natural cavities	On site	0-50m	50-250m	250-500m	500-2000m
231	18.1	Natural cavities	0	0	0	1	-
232	18.2	BritPits	2	0	1	7	-
234	18.3	Surface ground workings	23	22	155	-	-
241	18.4	Underground workings	0	0	1	3	13
242	18.5	Historical Mineral Planning Areas	0	0	5	0	-

