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Practical, sustainable solutions to complex environmental problems

Stage 1, Tier 1 PRA

at

Broadfields Innovation & Business Park
Tilbury Road
East Horndon
Brentwood
CM13 3LS

(ref. TJ3710AR1v1.1)

[redacted]

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LIST OF ABBREVIATIONS

ACM	Asbestos Containing Material
Al	Aluminium
AONB	Area of Outstanding Natural Beauty
AoPC	Area(s) of Potential Concern
AST	Above Ground Storage Tank
BaA	Benzo(a)anthracene
BaP	Benzo(a)pyrene
BbF	Benzo(b)fluoranthene
BGS	British Geological Survey
BH	Borehole
BTEX	Benzene, Toluene, Ethylbenzene & Xylene
CAT	Cable Avoidance Tool
CD&E	Construction, Demolition & Excavation
Chy	Chrysene
CLEA	Contaminated Lane Exposure Assessment
CSM	Conceptual Site Model
CWG	California Working Group
C4SL	Category 4 Screening Levels
DEFRA	Dept. for Environment, Food & Rural Affairs
DQRA	Detailed Quantitative Risk Assessment
E	East
EA	Environment Agency
EU	European Union (Council/Commission etc.)
FRA	Flood Risk Assessment
GAC	Generic Assessment Criteria
GQA	General Quality Assessment
GQRA	Generic Quantitative Risk Assessment
Ha	Hectare(s)
IcdP	Indeno(123-cd)pyrene
LLTC	Low Level of Toxicological Concern
LNR	Local Nature Reserve
LoW	List of Wastes
m	Metre(s)
mAOD	Metres Above Ordnance Datum
mbgl	Metres Below Ground Level
MTBE	Methyl Tert-Butyl Ether
MCERTS	EA Monitoring Certification Scheme
N	North
NGR	National Grid Reference
NNR	National Nature Reserve
NP	National Park
NVZ	Nitrate Vulnerable Zone
PAH	Polyaromatic Hydrocarbon(s)
PCB	Polychlorinated Biphenyl(s)
PCoC	Potential Contaminants of Concern
PE	Polyethylene
PFS	Petrol Filling Station
PID	Photo Ionisation Detector
POS	Parks and Open Spaces
PPE	Personal Protective Equipment
PRA	Preliminary Risk Assessment
PVC	Polyvinyl Chloride
RBMP	River Basin Management Plan
RMS	Risk Management Strategy
RWFD	Revised Waste Framework Directive
RWL	Resting Water Level
S	South
S4UL	Suitable 4 Use Levels
SAC	Special Area of Conservation
SGV	Soil Guideline Value
SNRHW	Stable Non-Reactive Hazardous Waste
SPA	Special Protection Area
SPL	Significant Pollutant Linkage
SPR	Source-Pathway-Receptor
SPZ	Source Protection Zone
SSAC	Site Specific Assessment Criteria
SSSI	Site of Special Scientific Interest
SVOC	Semi Volatile Organic Compound(s)
TGEN	Terragen Environmental Consultants Limited
TOC	Total Organic Carbon
TP	Trial Pit
TPH	Total Petroleum Hydrocarbon(s)
UCL_{95}	95% Upper Confidence Limit
UK	United Kingdom
UKAS	UK Accreditation Service
UKEA	UK Environment Agencies
UN	United Nations
USEPA	United States Environmental Protection Agency
UST	Underground Storage Tank
VOC	Volatile Organic Compound(s)
W	West
WAC	Waste Assessment Criteria
WFD	Water Framework Directive
WS	Window Sampler

EXECUTIVE SUMMARY

The purpose of this report is to provide clear and pragmatic advice regarding the nature and potential significance of contaminated land hazards, which may be present at the site. As such, potential contaminated land risks have been assessed by considering two key elements:

- The likelihood that sources of contamination are present at the site.
- The consequence or severity of any impacts should contamination be present. The consequence or severity of impact is inferred from the nature of any potential receptors (i.e., something that could be adversely affected by a contaminant, such as human health, an ecological system, property, or controlled water etc.) as well as any relevant pathways (i.e., a route or means by which a receptor can be exposed to or affected by a contaminant) relating to the site and the surrounding area.

The site covers an area of circa 12ha and mainly comprises open land/fields with a small part in the NE that is developed (0.4 ha). The 0.4ha part of the site was historically used as a farm and then a waste transfer station within the past 20 years.

The proposed development will be delivered in two phases. The first phase and the development currently proposed will comprises up to 20,000 sqm of floorspace (flexible permission for Class Eg(ii), Eg(ii), B2 and B8 use). Access will be via the E side of the site on Tilbury Road. The existing buildings will be demolished. New employment floorspace will be provided across ten buildings with associated parking, access and landscaping.

Historically, the majority of the site appears to have been in agricultural and residential uses since the 1880s. A pond in the N part may have been infilled historically. The NE part was developed into a farm in the 1950s. In the early 2000s, the farm buildings were cleared, and earthwork activity appears in its place. The images suggest soil waste transfer, soil waste import or a combination. These activities ceased by 2013, whereupon the yard area in the NE corner resembles the present-day layout. Offsite, a former petrol filing station/garage site 80m to the NE was unused from approximately 2000 then redeveloped in 2020.

We would therefore consider the following to be potential sources of contamination:

- Onsite filling and earth bunds, N and NE corner.
- Onsite waste transfer activity, NE corner.
- Onsite residential oil AST.
- Offsite former petrol station to the NE.

We consider the following as PCoC:

- Heavy metals.
- Total petroleum hydrocarbons (TPH, BTEX and MTBE).
- Polyaromatic hydrocarbons (PAH).
- Sulphate.
- Asbestos.
- Ground gases.

End users of the proposed site will include adults.

According to the published geology any near surface soil is likely to be underlain by superficial drift comprising Head Deposit/Alluvium designated as a secondary (undifferentiated) and secondary (A) aquifer, which in turn is expected to be underlain by a significant thickness of low permeability London Clay designated as unproductive.

The site is not within an EA designated SPZ and there are no groundwater abstractions within 2000m.

Surface water ditches are present on site and drain offsite towards the S. The water body catchment is the Mardyke (E Tributary), which had an overall water body classification of moderate (chemical good and ecological moderate) in 2016. The only surface water abstraction within 2000m is 810m to the NE from a tributary of the River Mardyke for spray irrigation.

The site is in Zone 2 and Zone 3 of an EA designated floodplain.

There are no landfill sites (existing or historic) within 250m of the site, although made ground in the NE corner, from an infilled pond and area of Alluvium could be considered as potential sources of ground gas, although small in extent.

The site is in the Greenbelt and has designated ancient woodland adjacent to the W and a SSSI circa 225m to the N.

The risk of potentially significant harm being caused to potentially sensitive receptors by the impact of the potential environmental hazards identified at or surrounding the site in its current state with regards to the proposed end use ranges from **VERY LOW** to **MODERATE** with the overall average being **LOW/MODERATE.** The risk of the site being classified as contaminated land by the local authority under the provisions of the statutory guidance made under Part IIA of the Environmental Protection Act (1990) is **LOW.**

Due to the presence of potential sources of contamination (i.e., former waste transfer station, former petrol station), sensitive receptors and plausible pathways between the two, a Stage 1, Tier 2 site investigation and GQRA should be undertaken to confirm the qualitative assessment, refine the preliminary CSM and determine the requirement for and scope of additional investigative works, and/or remedial measures to be incorporated into the development.

1.0 INTRODUCTION

TGEN was commissioned by MM (Properties) London Limited (the client), via a written instruction to proceed (email), to undertake a Stage 1, Tier 1 PRA to support an application for development at the site and address future land contamination conditions anticipated to be part of planning permission for the proposed development.

Remit	The Land Contamination: Risk Management Guidance (EA, May 2020) outline how to assess if there is unacceptable risk and to decide which options are the most suitable to manage the risk through the implementation of remediation (if necessary). The guidance is based upon The Model Procedures for the Management of Land Contamination, CLR 11 (EA, 2004), which has been withdrawn and was originally developed to provide a technical framework for applying a risk management process when dealing with land potentially affected by contamination. The scope, framework and purpose remain the same. The process involves identifying, making decisions on, and taking appropriate action to deal with, land contamination in a way that is consistent with government policies and legislation within the UK. Environmental assessors use a SPR conceptual site model when determining the risk posed by a potentially contaminated site. For potential risk to arise each stage of the SPR linkage must be present, plausible and significant. Our approach follows the framework provided in the new guidance, the stages and tiers of which can be briefly summarised as follows: • **Stage 1 Risk Assessment (RA)** Tier 1: Preliminary Risk Assessment (PRA). Tier 2: Site Investigation and Generic Quantitative Risk Assessment (GQRA). Tier 3: Detailed Quantitative Risk Assessment (DQRA). • **Stage 2 Options Appraisal (OA)** Decide if sufficient up to date information is available. Tier 1: Identify feasible remediation options. Tier 2: Detailed evaluation of options. Tier 3: Selection of final remediation option. • **Stage 3 Remediation Strategy (RS)** Tier 1: Develop a Remediation Strategy. Tier 2: Remediation and Verification. Tier 3: Long term monitoring and maintenance (if required). Our remit was to undertake a Stage 1, Tier 1 preliminary risk assessment to identify potential risks associated with the development.
Supporting Information	• Site location plan (Figure 1). • Proposed development plans (Figure 2). • GroundSure report and historical maps relating to the site and surrounds (Appendix A). • Local authority records (Appendix B). • Site reconnaissance, site survey(s) and photographic record(s) (Appendix C). • Interviews with key stakeholders. • Geological maps of the local area. • BGS borehole records (Appendix D). • EA records of the local area (Appendix E). • Archaeology Data Service, Natural England and MAGIC search records.

2.0 SITE INFORMATION AND SETTING

Site Address	Broadfields Innovation & Business Park, Tilbury Road, East Horndon, Brentwood CM13 3LS.
NGR	TQ 63396 89143.
Site Location and Current Use	The site covers an area of circa 12ha and mainly comprises open land/fields with a small part in the NE that is developed with buildings and a yard area (0.4 ha). The buildings and yard area are used for storage of construction materials and vehicle parking.
Proposed Development	The site will be redeveloped as an employment site, providing office space, studio space and light industrial workshops spread across the site. Access will be via the E side of the site on Tilbury Road. The existing buildings will be demolished. The proposed development will be delivered in two phases. The first phase and the development currently proposed will comprises up to 20,000 sqm of floorspace (flexible permission for Class Eg(ii), Eg(ii), B2 and B8 use) (see Figure 2). The application is being submitted in outline with all matters reserved (apart from access). The site plan presented in Figure 2 is therefore indicative only and final layout, scale and appearance of buildings will be dealt with at reserved matters stage. New employment floorspace will be provided across ten buildings with associated parking, access, and landscaping.
Planning Status	An outline planning application (with all matters reserved except for access) will be submitted to Brentwood Borough Council (the local authority) for the redevelopment of the site to deliver the Broadfields Innovation and Business Park, comprising demolition of existing buildings and the erection of new buildings providing up to 20,000 sqm of Class Eg(ii), Eg(ii), B2 and B8 floorspace, together with associated landscaping, vehicle parking and loading, cycle parking and infrastructure. Should planning permission be granted, it is likely to be subject to conditions, which may include those related to the assessment, investigation, and management of potential land contamination, including requirements for: • Desk Study • Site Investigation and Risk Assessment • Remediation Scheme • Verification Report.

2.1 Historical Mapping & Aerial Photograph Search

Date of Mapping	Description of Land Use Activity	
	Onsite	Offsite
1866 to 1875	Site is undeveloped land with field drains crossing E to W and N to S. A small pond is in the N.	Surrounding land is predominately agriculture with woodland to the W and residential to the E.
1895 to 1898	No significant changes.	No significant changes.
1915 to 1921	No significant changes.	No significant changes.
1938 to 1940	No significant changes.	A127 trunk road developed adjacent to N boundary. Four buildings developed adjacent to the NE boundary.
1955 to 1960	Buildings developed on the E side of the site in the location of Broadfields Farm buildings.	A Garage is marked 80m to the NE
1973 to 1978	No significant changes.	A Pump House is marked on the NE boundary. The garage 80m NE has expanded in area with two buildings.
1987 to 1988	Partial map coverage shows no significant changes.	No map coverage.
2001	Pond no longer marked in N.	No significant changes.
2010	No significant changes.	No significant changes.
2021	No significant changes.	No significant changes.

Publicly accessible aerial photographs indicate the following activities since 2000:

Image Date 2000	Description of Land Use Activity	
	Onsite	Offsite
2006	Yard area in NE corner is mostly vegetated with a dilapidated building in the location of the present-day commercial building. 4 x portable cabins / shipping containers on E boundary. Wider site area is vegetated.	Garage buildings 80m NE are dilapidated.
2008	Dilapidated building demolished. Shipping containers/cabins moved.	No significant changes.
2010	Earthworks are visible with an elongate bund separating the NE corner from the rest of the site. Stockpiles of materials adjacent to the bund. Shipping containers/cabins moved and storage of other materials along E boundary.	No significant changes.
2013	The earthworks in the NE corner have expanded towards the W / SW, a new building being constructed adjacent to the residential house. Earth moving machinery and lorries visible.	No significant changes.
2017	Earth bunds are vegetated. Previously demolished building being re-constructed.	Garage site 80m NE appears to be fly tipped with waste materials.
2018	No significant changes.	Fly-tipped materials are removed; lorries and machinery on site.
2020	No significant changes.	Residential housing replaces garage site.

In summary, the majority of the site appears to have been in agricultural and residential uses since the 1880s. A pond in the N part may have been infilled historically. The NE part was developed into a farm in the 1950s. In the early 2000s, the farm buildings were cleared, and earthwork activity appears in its place. The images suggest soil waste transfer, soil waste import or a combination. These activities ceased by 2013, whereupon the yard area in the NE corner resembles the present-day layout.

Offsite, a former petrol filling station/garage site 80m to the NE was unused from circa 2000 then redeveloped in 2020.

2.2 Local Authority Records

The environmental health officer provided the following information relating to records held by the local authority, which can be summarised as follows:

- The local authority environmental health department are not aware of any information held by the Council with regard to this site or immediate surrounds.

2.3 Land Use and Surrounding Activities

Authorisations, Incidents & Registers (500m)	Number	Distance	Direction	Comments
Entries in the contaminated land register.	0	n/a	n/a	n/a.
IPC authorisations.	0	n/a	n/a	n/a.
Part A(1) and IPPC permits.	0	n/a	n/a	n/a.
Part A(2) and Part B permits.	0	n/a	n/a	n/a.
COMAH & NIHHS sites.	0	n/a	n/a	n/a.
Category 3 or 4 radioactive substances authorisations.	0	n/a	n/a	n/a.
Licensed discharges to controlled waters.	1	234m	W	The only record is for a historic licensed discharge to the Trib Mardyke, the effluent is described as miscellaneous.
Discharge of List 1 dangerous substances.	0	n/a	n/a	n/a.
Pollution Incidents.	2	137m	E	The closest incident (unidentified) on 09/09/2002 listed as having a category 4 (no impact).
Landfill and Waste Sites	**Number**	**Distance**	**Direction**	**Comments**
Operational or recently closed landfill sites. (500m)	0	n/a	n/a	n/a.
Historic landfill sites. (500m)	0	n/a	n/a	n/a.
EA licensed waste sites. (500m)	0	n/a	n/a	n/a.
Waste Exemptions (500m)	15	Onsite	n/a	Three of the entries are located onsite at Broadfields for storing of waste in secure containers, storage of waste in a secure place and treating waste (sorting mixed waste). The closest offsite exemption is 138m to the NE for use of waste in construction by at East Horndon Hall.
Ground Working Features	**Number**	**Distance**	**Direction**	**Comments**
Historic surface ground working features. (250m)	4	On Site	n/a	On site record is an infilled pond in the N part of the site, and three off-site records resembling small pond features.
Historic underground working features. (1000m)	0	n/a	n/a	n/a.
Current ground working features. (1000m)	0	n/a	n/a	n/a.

Distance and direction to the closest entry. Radius of the search from the boundary of the site in brackets.

Current Land Uses	Number	Distance	Direction	Comments
Entries in the trade directory. (0m)	0	n/a	n/a	No records for the site.
Entries in the trade directory. (250m)	2	138m	NE	The two entries are for vehicle hire and rental and a haulage company.
Petrol/fuel sites. (500m)	1	423m	SW	The only entry relates to a petrol filling station at 60 Station Road West Horndon, the status of which is listed as obsolete.

Distance and direction to the closest entry. Radius of the search from the boundary of the site in brackets.

2.4 Site Reconnaissance

Site reconnaissance, including interviews with the landowner, was undertaken in accordance with DoE (1994a), EA (2004) and BSI (2013b). Observations made are summarised below and should be read in conjunction with the supporting information to this report.

Feature	Details	Description
Land Uses	N	Residential housing and A127 trunk road.
	S	Agricultural land.
	E	Agricultural land, residential housing.
	W	Woodland, agriculture, farmyard.
Access	E	Off Tilbury Road, via private driveway to Broadfields residential property with separate access to the NE yard area.
Topography	Site	The site was on a gentle slope down from north to south an elevation of circa +15 to +20mAOD. At least two earth bunds approximately 2m in height in the NE corner.
Buildings	Site	The site includes two residential buildings on the E side with two garages/outbuildings. In the NE corner is a modern refurbished agricultural barn and a temporary portable cabin type-structure is on the E boundary. There were no observations of potential asbestos containing materials (ACM) e.g., cement-bonded corrugated sheeting.
Surfacing	Site	Most the site was vegetated with grass and young trees. There was limited hard surfacing surrounding the residential buildings. The yard area in the NE was unmade gravel. The earth bunds were vegetated.
Vegetation	Site	Mown grass and trees in the domestic areas in the E, most of the site area is grass, scrub and immature woodland, and was inaccessible as a result. The vegetation all appeared to be in good health with no obvious visual signs of stress or dieback.
Foundations	Site	Not investigated, although it is assumed that the residential buildings have conventional pad and strip foundations.
Services	Site	Not investigated, although it is assumed that any electricity, gas, water services run along Tilbury road and enter/leave the site from the E. Foul drain observed crossing the site NW-SE from the refurbished agricultural barn to a drain cover in the E.
Activities	Site	A building business was occupying NE part the site. The tenant was storing various building materials and waste building materials in pallets, in a skip, or on the ground. Three steel shipping containers were also used for storage. The rest of the yard area was open and used for parking vehicles.
Tanks	Site	Three above-ground storage tanks (ASTs) were observed at the residential part of site, comprising domestic heating oil and two domestic LPG tanks, and a third buried LPG tank, associated with the domestic properties.
Interceptors	Site	None observed at the site.
Surface Water	Site	The only observation was the domestic pond in the centre of the site, remainder of the site was overgrown and could not be accessed.
Observations	General	None.

2.5 Geology and Aquifer Status

The published geological survey map (1:50,000 scale, BGS, Sheet 257, Romford, Solid and Drift Edition) for the East Horndon area is summarised in sequence from the surface in the table below:

Strata		Aquifer Designation	Area Covered	Estimated Thickness	Age	Typical Description
Superficial Drift	Near Surface Soil*	N/A	Whole Site	Circa 0.5m	Recent	Brown, variably silty, sandy, gravelly clay.
	Alluvium	**Secondary (A)**	W and SW	Unknown	Quaternary	Sand, silt and clay with some gravel.
	Head Deposit	**Secondary (Undifferentiated)**	Whole Site	Circa 7m	Quaternary	Undifferentiated Clay, gravelly.
Bedrock	London Clay	**Unproductive**	Whole Site	Up to Circa 60m	Eocene	Stiff, brown and grey, silty clay.
	Lambeth Group	Secondary	Whole Site	Circa 15m	Palaeocene	Clayey, fine grained sand with pebbles and shells.
	Thanet Sand	Secondary	Whole Site	Circa 10m	Palaeocene	Fine grained sand.
	Chalk	Principal	Whole Site	Circa 200m	Cretaceous	Micritic limestone with flint nodules and interbedded calcareous mudstone.

* The geological map does not record near surface soil. We have based the assessment on observations made during the site reconnaissance.

The superficial drift deposits (Head Deposit and Alluvium) are classified as a secondary (Undifferentiated) and secondary (A) aquifer, respectively. Both superficial deposits have a medium vulnerability with a low leaching class; and the whole site is underlain by bedrock (London Clay), classified as unproductive.

Several BGS records exist for exploratory holes excavated in the vicinity of the site, the nearest of which can be summarised as follows:

- Borehole TQ68/NW72 (ref. East Horndon) was on the E boundary and showed the following strata succession:

Strata		Description	Thickness
Near Surface Soil	Topsoil	Topsoil	0.6m
Superficial Drift	Head Deposit	Firm becoming stiff fissured brown slightly silty clay with some blue grey veins.	7.10
Bedrock	London Clay	Stiff fissured blue grey CLAY with silt laminations.	>2.3

Groundwater was not encountered.

The BGS records corroborate the published geology with any near surface soil likely to be underlain by a layer of superficial drift comprising Head Deposit, partly Alluvium in the SW, which in turn is expected to be underlain by a significant thickness of low permeability London Clay.

2.6 BGS Estimated Urban Soil Chemistry

Records of background estimated soil chemistry (based upon the underlying geological conditions) at and within 50m of the site indicate urban soil types with typical arsenic concentrations of 25mg/kg, lead of 100mg/kg, chromium of 120mg/kg, cadmium of 1.8mg/kg and nickel of 45mg/kg.

2.7 Other Ground Conditions

A moderate risk is allocated to ground stability hazards associated with compressible deposits and shrink/swell clays and a low risk associated with running sands. A low to very low risk rating is allocated to a range of other ground stability hazards at the site.

The site is not within a radon affected area (as defined by the Health Protection Agency) as less than 1% of properties are above the radon action level. In accordance with BRE (2007b), no radon protective measures are considered necessary for new properties or extensions to existing ones. The site is not listed as being within 1000m of an area potentially affected by coal mining or non-coal mining activities.

2.8 Hydrogeology and Groundwater

Feature	Number	Distance	Direction	Comments
EA SPZ Boundary (500m)	1	469m	SE	The closest EA designated SPZ is Zone 3 (total catchment).
Groundwater Abstraction Permits (2000m)	0	n/a	n/a	No records of licensed groundwater abstractions within 2000m.
Potable Water Abstraction Permits (2000m)	0	n/a	n/a	No records of licensed groundwater abstractions within 2000m.

Distance and direction to the closest entry. Radius of the search from the boundary of the site in brackets.

2.9 Hydrology and Surface Water Features

Feature	Number	Distance	Direction	Comments
Water Network (OS Mastermap) (250m)	7	Onsite	n/a	Two entries are listed as being onsite, relating to drainage ditches; one transecting the site centre from E to W, connecting to the SW boundary, after which surface water flows south. The water body catchment is the Mardyke (E Tributary), which had an overall water body classification of moderate (chemical good and ecological moderate) in 2016.
Surface Water Abstraction Permits (2000m)	9	810m	NE	The closest entry relates to an abstraction from a tributary of the River Mardyke for spray irrigation.

Distance and direction to the closest entry. Radius of the search from the boundary of the site in brackets.

2.10 Environment Agency Records

The EA provided the following information relating to records relating to controlled water at and in the vicinity of the site, which can be summarised as follows:

- We have one Groundwater Quality Monitoring Site within 3000m of the site: "Orchard Farm, Little Warley, Brentwood".
- We have no Groundwater Level Monitoring Sites within 3000m of the site.
- The Essex Regional Groundwater Model estimates that in an average climatic month (based on May 1994) the water table is between 16mAOD and 20mAOD across the site, and the Chalk piezometric surface is between 4mAOD and 6mAOD.
- The Essex Regional Groundwater Model estimates that in an average climatic month (based on May 1994), groundwater flow in the sands and gravels is predominantly to the south, and in the chalk aquifer is predominantly to the south-east.
- The geology here consists of superficial head deposits (predominantly silt and clay based) on top of a significant thickness of London Clay. The chalk aquifer will be confined at considerable depth – the porosity/permeability of this aquifer is unlikely to be relevant for any development at surface.
- We do not have groundwater 'compliance points' in the vicinity of the site.

2.11 Flood Risk

Feature	Number	Distance	Direction	Comments
Zone 2 Floodplain (250m)	1	Onsite	n/a	The site is in Zone 2 of an EA designated floodplain.
Zone 3 Floodplain (250m)	1	Onsite	n/a	The site is in Zone 3 of an EA designated floodplain.
Flood Defences (250m)	0	n/a	n/a	None within 250m of the site.
Surface Water Flooding (50m)	1	Onsite		The maximum flood depth for a 1 in 30-year return period is estimated at 0.3 to 1.0m.
Groundwater Flooding (50m)	1	Onsite	n/a	The site is in an area considered to have a low risk of groundwater flooding.

Distance and direction to the closest entry. Radius of the search from the boundary of the site in brackets.

2.12 Environmentally Sensitive Land Uses

Designated Environmentally Sensitive Sites	Number	Distance	Direction	Comments
LNR	0	n/a	n/a	None within 2000m.
NVZ	4	Onsite	n/a	Mardyke NVZ.
Ancient Woodland, AONB, Greenbelt, NNR, NP, Ramsar, SAC, SPA, SSSI, World Heritage	3	Onsite	n/a	Site is within Brentwood Greenbelt, the adjacent Hollow Bottom Shaw (W) is designated Ancient & Semi-Natural Woodland, Horndon Park SSSI 223m N.
Listed Buildings	0	n/a	n/a	None within 250m.
Ancient Monuments or Archaeological Sites	0	n/a	n/a	None within 250m.

Distance and direction to the closest entry. Radius of the search from the boundary of the site was 2000m.

2.12 Previous Investigations

TGEN is not aware of any previous investigation work on or adjacent to the site.

2.13 Sources, Pathways and Receptors

The earliest mapping from 1866 shows the site to be undeveloped land in agricultural, woodland and residential use. A farmyard was developed in the NE corner in the 1950s. In the past 20 years, a pond in the N may have been infilled and the NE corner was used as a waste transfer station and modifications were made to the ground levels (earth bunds). The remainder of the site has been in residential and woodland/agricultural use only.

We would therefore consider the following to be potential sources of contamination:

- Onsite filling and earth bunds, N and NE corner.
- Onsite waste transfer activity, NE corner.
- Onsite oil AST.
- Offsite former petrol station to the NE.

We have reviewed the list of potential contaminants given in the relevant DoE Profile (1995), where relevant, in conjunction with the potential sources of contamination listed above and would therefore consider the following as PCoC:

- Heavy metals.
- Total petroleum hydrocarbons (TPH, BTEX and MTBE).
- Polyaromatic hydrocarbons (PAH).
- Sulphate.
- Asbestos.
- Ground gases.

We would consider the following potentially sensitive receptors to be present at or adjacent to the site as a result of the proposed development:

- Human Health (HH) including end users of the site, the developers and offsite neighbours etc.
- Landscape planting and property (LPP).
- Environment (ENV) including ecology, amenity, archaeology and scheduled monuments etc.
- Groundwater (GW).
- Surface water (SW).
- Buildings and construction materials (BCM).

3.0 PRELIMINARY CONCEPTUAL SITE MODEL

The following section summarises the information gathered during the Phase 1 PRA, culminating in the compilation of a detailed preliminary CSM. The purpose of this section of the report is to identify and assess the plausibility of sources of contamination, the presence of receptors sensitive to such contamination and pathways between the two.

- The site will be redeveloped as an employment site, providing office space, studio space and light industrial workshops spread across the site. Access will be via the E side of the site on Tilbury Road. All the existing buildings will be demolished.
- Development proposals include 11 buildings with dedicated parking areas, access and landscaping including rainwater retention ponds and perimeter landscaping.
- End users of the proposed site will be mainly adults, associated with a commercial end use.
- According to the published geology, near surface soils are likely to be underlain by superficial drift comprising mainly Head Deposit with some Alluvium designated as secondary (undifferentiated) and secondary (A) aquifers respectively, which in turn are expected to be underlain by a significant thickness of low permeability London Clay designated as unproductive.
- The closest EA designated SPZ is Zone 3 (total catchment) 470m SE and there are no groundwater abstractions within 2000m.
- Drainage ditches transect the site and are on the SW boundary after which surface water flows south. The water body catchment is the Mardyke (E tributary) which had an overall water body classification of moderate (chemical good and ecological moderate) in 2016. The only surface water abstraction within 2000m is 810m to the NE for spray irrigation.
- The site is in Zone 2 and Zone 3 of an EA designated floodplain. The site is not in an area considered to be at risk from groundwater flooding.
- Based on the latest UK guidance from BRE, CIRIA and NHBC etc., some types of contaminants (e.g., heavy metals, organic compounds, cyanides and sulphates etc.) associated with made ground, former commercial/industrial activities and some natural strata could potentially have a detrimental effect on construction materials, such as below ground concrete structures, pipework/services and membranes through direct contact. In addition to this, volatile compounds and ground gases may potentially migrate through permeable below ground strata and accumulate in void spaces (e.g., rooms and cavity spaces etc.), where they can be considered to pose a risk to the buildings through potential flammability/explosivity. There are no landfill sites (existing or historic) within 250m of the site. Sufficient quantities of made ground and Alluvium are not expected and therefore not considered to be potential sources of ground gas. Onsite commercial activities would be considered as potential sources of petroleum hydrocarbons that could migrate through permeable strata and/or on surface water. There is also a former petrol filling station from which there is the potential for organic contaminants to migrate onto the site, although considering the low permeability clay, this SPL is not considered to be plausible.
- The site is near two environmentally sensitive sites and is within Brentwood Greenbelt. The adjacent Hollow Bottom Shaw (W) is designated Ancient & Semi-Natural Woodland and Horndon Park SSSI is 223m N. Except for short-term impacts in the immediate vicinity of the site during the development itself (e.g., noise and dust), which we assume will be controlled through the implementation of good practice, it is not considered that a long-term SPL would be active as a result of the development.

Nr	Onsite Sources	Pathways	SPL	Receptors	Severity of Consequence	Probability of Linkage	Risk Matrix Classification	Comments
1	Potential for inorganic and low volatility organic contaminants to be present within the subsurface soils.	Dermal contact, soil and soil dust ingestion, and inhalation of soil dust.	HH	End users.	MEDIUM	LIKELY	MODERATE [12]	The severity of consequence to human health of inorganic contaminants in the near surface soils associated with the former waste transfer station in the NE is considered medium. The probability of a linkage associated with the proposed commercial redevelopment, which will include new buildings and landscaped areas is likely.
2		Consumption of home grown produce.	HH	End users.	MEDIUM	LIKELY	MODERATE [12]	
3		Root uptake of soluble contaminants in surface soils.	LPP	Landscape planting.	MILD	LIKELY	LOW/MODERATE [9]	Phytotoxic contaminants are likely to be present in the near surface soil, although the severity of consequence is considered to be mild based upon the vegetation growth observed on and directly adjacent to the site, which appeared to be in good health with no signs of stress or inhibited growth.
4		Intake of soil contaminants by animals.	LPP	Domesticated pets or livestock.	MEDIUM	UNLIKELY	LOW [4]	The severity of consequence is deemed medium, although domesticated pets are unlikely to be kept at the site.
5		Ingress into standard PE water supply pipework and subsequent water ingestion.	HH	End users.	MEDIUM	UNLIKELY	LOW [4]	The probability of ingress of inorganic contaminants and/or low volatility organic contaminants into standard PE pipes is considered unlikely.
6		Building materials in direct contact with aggressive ground.	BCM	Site buildings.	MEDIUM	LIKELY	MODERATE [12]	A moderate risk is allocated to ground stability hazards associated with compressible deposits and shrink/swell clays and a low risk associated with running sands.
7		Dissolution into pore water/shallow groundwater and subsequent migration.	GW	Groundwater (Secondary UD and A aquifer in SD and Unproductive BR).	MILD	LIKELY	LOW/MODERATE [9]	The risk classification reflects the designation of the superficial drift (Head / Alluvium) as a secondary (undifferentiated) and secondary (A) aquifer respectively, although the underlying bedrock (London Clay) is unproductive and will preclude leaching to the deeper aquifers. As such it is considered plausible that mobile contaminants from the site could be in hydraulic continuity with these receptors and could have an impact on them.
8		Dissolution into pore water/shallow groundwater and subsequent migration.	SW	On site surface waters flowing offsite to the S.	MILD	LIKELY	LOW/MODERATE [9]	
9		Dissolution into pore water/shallow groundwater and subsequent lateral migration.	ENV	Hollow Bottom Shaw adjacent to W and Horndon Park SSSI 200m N.	MILD	LOW	LOW [5]	The risk classification reflects distance between the relatively small NE part of the site and the surface water features in the centre and SW, as the majority of the site area is suspected as uncontaminated.

Nr	Onsite Sources	Pathways	SPL	Receptors	Severity of Consequence	Probability of Linkage	Risk Matrix Classification	Comments
10	Potential for volatile organic contaminants to be present within the subsurface soils.	Dermal contact, soil and soil dust ingestion, and inhalation of soil dust.	HH	End users.	MEDIUM	LIKELY	MODERATE [12]	The severity of consequence to human health of inorganic contaminants in the near surface soils associated with the former waste transfer station in the NE is considered medium. The probability of a linkage associated with the proposed commercial redevelopment, which will include new buildings and landscaped areas is likely.
11		Consumption of home grown produce.	HH	End users.	MEDIUM	LIKELY	MODERATE [12]	
12		Inhalation of vapours (indoors and outdoors).	HH	End users.	MEDIUM	LIKELY	MODERATE [12]	The probability of organic contaminants being present in the near surface soils associated with the former uses of the NE part of site is considered plausible and the probability is considered likely.
13		Root uptake of soluble contaminants in surface soils.	LPP	Landscape planting.	MILD	UNLIKELY	VERY LOW [2]	VOC are not directly toxic to plants unless free product is present, which can disrupt water uptake.
14		Intake of soil contaminants by animals.	LPP	Domesticated pets or livestock.	MEDIUM	UNLIKELY	LOW [5]	The severity of consequence is deemed medium, although domesticated pets are unlikely to be kept at the site.
15		Ingress into standard PE water supply pipework and subsequent water ingestion.	HH	End users.	MEDIUM	LIKELY	MODERATE [12]	Based on the former uses of the site, the probability of ingress of organic contaminants into standard PE pipes is considered likely.
16		Dissolution into pore water/shallow groundwater and subsequent migration.	GW	Groundwater (Secondary UD and A aquifer in SD and Unproductive BR).	MILD	LIKELY	LOW/MODERATE [9]	The risk classification reflects the designation of the superficial drift (Head / Alluvium) as a secondary (undifferentiated) and secondary (A) aquifer respectively, although the underlying bedrock (London Clay) is unproductive and will preclude leaching to the deeper aquifers. As such it is considered plausible that mobile contaminants from the site could be in hydraulic continuity with these receptors and could have an impact on them.
17		Dissolution into pore water/shallow groundwater and subsequent migration.	SW	On site surface waters flowing offsite to the S.	MILD	LIKELY	LOW/MODERATE [9]	
18		Dissolution into pore water/shallow groundwater and subsequent lateral migration.	ENV	Hollow Bottom Shaw adjacent to W and Horndon Park SSSI 200m N.	MILD	LOW LIKELIHOOD	LOW [5]	The risk classification reflects distance between the relatively small NE part of the site and the surface water features in the centre and SW, as the majority of the site area is suspected as uncontaminated.

Nr	Onsite Sources	Pathways	SPL	Receptors	Severity of Consequence	Probability of Linkage	Risk Matrix Classification	Comments
19	Potential for dissolved phase contaminants to be present within shallow groundwater.	Lateral and vertical groundwater movement via natural or artificial flow paths.	GW	Groundwater (Secondary UD and A aquifer in SD and Unproductive BR).	MILD	LIKELY	LOW/MODERATE [9]	The risk classification reflects the designation of the superficial drift (Head / Alluvium) as a secondary (undifferentiated) and secondary (A) aquifer respectively, although the underlying bedrock (London Clay) is unproductive and will preclude leaching to the deeper aquifers. As such it is considered plausible that mobile contaminants from the site could be in hydraulic continuity with these receptors and could have an impact on them.
20		Lateral and vertical groundwater movement via natural or artificial flow paths.	ENV	On site surface waters flowing offsite to the S.	MILD	LOW LIKELIHOOD	LOW [5]	The risk classification reflects distance between the relatively small NE part of the site and the surface water features in the centre and SW, as the majority of the site area is suspected as uncontaminated.
21	Potential for elevated methane to be present within the subsurface soils due to the presence of infilled ground.	Lateral and vertical migration into onsite buildings with a potential to cause an explosion.	HH	Onsite property and occupants.	MILD	LOW LIKELIHOOD	LOW [5]	There are no landfills or areas of infilled land onsite considered as potential sources of ground gas. The soil profile may comprise made ground in the NE and area of alluvium – these areas are relatively small and limited in extent. The severity of consequence is deemed mild due to the anticipated low generation potential of the made ground/alluvial deposits. The proposed development includes the erection of commercial/industrial buildings distributed across the site, the majority of which is expected to be uncontaminated.
22		Lateral migration towards offsite buildings with a potential to cause an explosion.	HH	Onsite property and occupants.	MILD	LOW LIKELIHOOD	LOW [5]	
23	Potential for elevated carbon dioxide to be present within the subsurface soils due to the presence of infilled ground.	Lateral and vertical migration into onsite buildings with a potential to cause asphyxiation.	HH	Occupants of onsite buildings.	MILD	LOW LIKELIHOOD	LOW [5]	
24		Lateral migration towards offsite buildings with a potential to cause asphyxiation.	HH	Occupants of offsite buildings.	MILD	LOW LIKELIHOOD	LOW [5]	
25	Potential for radon within the subsurface	Lateral migration towards onsite buildings with a potential to cause long term health effects.	HH	Occupants of onsite buildings.	MILD	UNLIKELY	VERY LOW [2]	The lies in an area where less than 1% of homes are at or above the UK radon action level (200 Bq/m^3). Radon protection measures are not required.

Nr	Offsite Sources	Pathways	SPL	Receptors	Severity of Consequence	Probability of Linkage	Risk Matrix Classification	Comments
26	Potential for dissolved phase inorganic contaminants to be present within shallow groundwater associated with offsite petrol station.	Lateral and vertical groundwater movement via natural or artificial flow paths.	GW	Groundwater (Secondary UD and A aquifer in SD and Unproductive BR).	MILD	LOW LIKELIHOOD	LOW [4]	The risk classification reflects the proximity to offsite sources of dissolved phase inorganic contamination (former petrol station 80m NE, recently redeveloped), the designation of the superficial drift (Head & Alluvium) as a secondary (undifferentiated) and secondary (A) aquifer with anticipated shallow water table. It is considered plausible that mobile contaminants from offsite sources have been remediated through redevelopment, however remaining impacts could be in hydraulic continuity with the soils below the site and could have an impact on them.
27	Potential for volatile organic contaminants to be present within the subsurface soils associated offsite petrol station.	Migration of vapours to the surface followed by inhalation (indoors and outdoors).	HH	End users.	MILD	LOW LIKELIHOOD	LOW [4]	
28	Potential for elevated methane to be present within the sub-surface soils.	Lateral and vertical migration into onsite buildings with a potential to cause an explosion.	HH	Onsite property occupants.	MEDIUM	UNLIKELY	LOW [4]	Potential offsite sources of ground gas not identified, and if present, the probability of a linkage is deemed unlikely due to the presence of low permeability London Clay at and surrounding the site that would preclude the migration of any significant offsite sources of ground gas from offsite activities.
29	Potential for elevated carbon dioxide to be present within the subsurface soils.	Lateral and vertical migration into onsite buildings with a potential to cause asphyxiation.	HH	Occupants of onsite buildings.	MEDIUM	UNLIKELY	LOW [4]	

4.0 CONCLUSIONS AND RECOMMENDATIONS

The risk of potentially significant harm being caused to potentially sensitive receptors by the impact of the potential environmental hazards identified at the site in its current state with regards to the proposed end use ranges from **VERY LOW** to **MODERATE** with the overall average being **LOW/MODERATE.** The risk of the site being classified as contaminated land by the local authority under the provisions of the statutory guidance made under Part IIA of the Environmental Protection Act (1990) is **LOW.**

Due to the presence of potential sources of contamination (i.e., former farmyard, waste transfer station, infilled pond), sensitive receptors and plausible pathways between the two, a Stage 1, Tier 2 site investigation and GQRA should be undertaken to confirm the qualitative assessment, refine the preliminary CSM and determine the requirement for and scope of additional investigative works, and/or remedial measures to be incorporated into the development. The Stage 1, Tier 2 site investigation and GQRA will be required to:

- Assess the presence, extent and significance of potential contaminants in the subsurface strata associated with former activities at the site.
- Assess the significance of potential impacts on sensitive receptors at or adjacent to the site.
- Assess the requirement for remedial measures to be implemented at the site as part of the development.
- Assess the potential environmental liabilities and consequences associated with the development of the site.
- Identify requirements for further works, including the design of any additional investigation, a DQRA and remedial measures, if deemed necessary.

We would recommend that a site investigation be undertaken in accordance with BSI (2017) upon which findings a GQRA should be undertaken to determine the potential presence and extent of the potential SPL identified at the site and therefore the requirement for additional investigation and/or remedial measures to be incorporated into the development.

The size of the whole site is 12ha in total, and the former waste transfer station in the NE part is 0.4ha. Considering the size of the site, it is possible that several phases of field investigation (i.e., exploratory, detailed and supplementary) may be required to meet the investigation objectives to provide further information for revisions and updates of the conceptual model and risk assessment and/or the design of remedial works. It is also considered likely that there will be requirements for other field investigations (e.g., geotechnical, archaeological, ecological etc.) to be undertaken to inform other aspects of the proposed development. There will therefore be an opportunity to integrate any such investigations. The degree of integration of contaminated land field investigations with other studies should be based upon the findings of a preliminary investigation. Any integrated field investigation should be designed so that it does not compromise the requirements of either discipline.

Typical densities of sampling grids can vary from 25m to 50m centres for exploratory investigations, and 10m to 25m centres for detailed investigations. A greater density of sampling grid (for example 10m centres or less) may be considered where:

- Heterogeneous contamination is indicated.
- Contaminant concentrations identified during an earlier investigation are close to the critical levels of interest.
- A high level of confidence is required for the outcome of a risk assessment (e.g., for a housing development).
- Delineation is required along the edges of known areas of contamination.
- The "averaging area" is small.

4.1 Exploratory Investigation

We would recommend commencing the field work with an exploratory investigation across the whole site, the objectives of which are:

- To test the conceptual model(s) of contamination and site characteristics.
- To obtain further information in relation to potential sources of contamination, likely pathways and features of immediate concern.
- To obtain further information on the geology, geochemistry, soil, hydrogeology and hydrology of the site.
- To provide further information to aid the design of the detailed investigation, including health and safety aspects.
- To provide data for a review of the conceptual model and to update the risk assessment.

4.1.1 Scope of Works

Based on an investigation area of 0.4ha, an investigation at 15-20m centres would generate circa 16 exploratory positions and another four should be allowed to sample other areas of the site, total 20 locations. We would assume that positions will be a combination of machine excavated trial pits and deeper boreholes, which will provide the most efficient method for implementing the first phase of field investigation. Given our understanding of the site and the proposed development we would assume that each exploratory hole, for assessment of potential contamination, will need to extend through any superficial surface soil and made ground and into the underlying natural ground (Head Deposit, Alluvium or London Clay) and would assume that in most cases this will necessitate the exploratory holes extending to a depth of circa 2-3mbgl. Should significantly variable soil conditions be encountered onsite then it may be necessary to increase the depth and/or number of exploratory hole locations.

4.1.2 Sampling and In-Situ Testing

During excavation of the exploratory holes a geo-environmental engineer should attend the site to assess the physical nature of the subsurface profile, which should be described through a combination of visual and olfactory observations and detections. Soil descriptions should be in accordance with BSI (2020). The assessment of soils for volatile organic compounds by visual and olfactory means should be supplemented with the use of a Tiger LT PID (or similar) in accordance with the procedures discussed in the TGEN protocol.

During the site investigation soil samples should be recovered from representative depths throughout the subsurface profiles from each of the exploratory locations. Of the soil samples collected from the twenty sampling locations we would anticipate selecting up to circa thirty soil samples (being a mixture of near surface soil/made ground and underlying natural ground) for analysis at a UKAS/MCERTS accredited laboratory. A proportion of the samples should be submitted for a broad screen of total potential contaminants including those PCoC discussed in Section 2.1.3 and as detailed in the table below:

Metals/Semi Metals		Hydrocarbons	Non – Metals
• Antimony • Arsenic • Barium • Beryllium • Boron • Cadmium • Chromium (Cr^{III}) • Chromium (Cr^{VI})	• Copper • Lead • Mercury • Molybdenum • Nickel • Selenium • Vanadium • Zinc	• Speciated PAH • Speciated TPH • Phenol (monohydric) • VOC (PID Headspace)	• Cyanide (Total & Free) • Sulphate (Total & Water Soluble) • Sulphide • pH • Total Organic Carbon • Asbestos

If deemed necessary and based upon the material encountered and/or in-situ monitoring, additional samples from the investigation may also be tested for PCB, BTEX, MTBE, VOC, SVOC, herbicides and/or pesticides.

Due to the presence of controlled water receptors samples returning elevated total concentrations should be submitted for leachate testing to determine the potential mobility of the contaminants. Groundwork associated with the development (e.g., foundations etc.) may generate soils that are excess to requirements, thus needing disposal offsite as waste. As such a proportion of the samples should be tested (e.g., leaching to BS EN 12457) to demonstrate compliance with waste acceptance criteria (WAC) in accordance with the Landfill Directive and UK waste management regulations.

4.1.3 Environmental Monitoring

Ground gas and vapours have not been identified as a potential risk, due to the limited potential for significant made ground, alluvium and organic contaminants. Ground gas and vapours are of most risk to the buildings proposed as part of the commercial development spread across the site. As such, we would assume a low gas generation potential and a moderate sensitivity of proposed use. This can be approached with an assessment of made ground and alluvium depth, extent and composition, and an assessment of the likelihood of ground gas generation potential. However, due to the site's past use

and the presence of a potential infilled pond, although small, the developer may opt to include ground gas in the investigation to rule out ground gas at an early stage.

In accordance with good practice, this would warrant 15m to 75m spacings between monitoring wells. We would therefore estimate as part of the detailed investigation circa six boreholes progressed across the NE part of the site coinciding with the former waste transfer station, and two in other parts of the site e.g. former pond. Wells should be installed with combined gas and groundwater monitoring standpipes. Each of the boreholes should be installed with a 50mm internal diameter standpipe, which is in accordance with the prescribed diameter required to enable correlation with Gas Screening Values (GSVs) derived by CIRIA and the NHBC. Each should contain circa 1m of plain pipe (depending on the depth to groundwater) with a bentonite seal at the surface to prevent surface water ingress that would flood the response zone and prevent leakage and/or atmospheric ingress. A gravel pack/screen was placed around the slotted response zone and the standpipes should be completed with a bung and valve, and a flush stopcock cover. The lengths of plain and slotted pipe for each standpipe should be recorded on the corresponding borehole log.

After a suitable period of stabilisation (i.e. minimum of one week, post completion of standpipe installation) ground gas monitoring should be undertaken in line with current UK guidance and good practice including CIRIA C665 and C682. A geo-environmental engineer should return to carry out a programme of environmental monitoring, which should consist of a minimum of six rounds at between two, and four, week intervals using a GA5000 infrared landfill gas analyser (or similar). During the monitoring visits the following gases (peak and steady state) and meteorological conditions should be recorded:

• Methane and LEL	• Carbon monoxide	• Barometric pressure and air temperature
• Carbon dioxide	• Hydrogen sulphide	• Downhole pressure and flow
• Oxygen	• VOC	• Depth to water

It may be necessary to recover samples of gas (e.g., using a silonite canister) for laboratory testing to corroborate the in-situ monitoring results, particularly if there are any spurious results.

In-lieu of a programme of gas monitoring it may be possible to install conservative gas/vapour protection measures in accordance with BSI 8485 (2019). The scope of any gas protection measures should be agreed with the local authority and/or building control prior to development works commencing at the site.

Based on the anticipated geology at the site, it is anticipated that shallow groundwater will be encountered. After installation, if encountered, the resting water level should be recorded, and the standpipes developed/purged of an appropriate volume (e.g. three well volumes) of water and then left to equilibrate for a minimum period of one week.

During each monitoring visit, the depth to water should be determined using an oil-water interface meter, to determine the presence of any free product.

If groundwater is encountered, then on three monitoring occasions, the standpipes should be developed, and a sample of groundwater recovered for testing. The samples should be submitted for testing, which should include a broad screen of potential contaminants associated with the former activities at the site and as detailed in Section 2.13.

4.1.4 Exploratory Investigation Report

The outcome of the Exploratory Investigation should be summarised within an interpretative report including observations of the site and soils, a generic quantitative risk assessment (GQRA) based on an assessment of the results of laboratory testing and recommendations for further investigation (i.e. Detailed Investigation) and/or remediation, should these be necessary. It should also include an updated CSM.

4.2 Detailed Investigation

The outcome of the exploratory investigation may identify the need for a more detailed investigation across some parts of the site in order:

- To obtain data on the nature and extent of contamination, the geology, geochemistry, soil, hydrogeology and hydrology of a site.
- To provide data to review the conceptual model and to update the risk assessment.
- To provide data for the selection and design of remedial works.

If necessary, it may involve additional exploratory positions targeted in areas of interest to determine the extent (e.g. lateral or vertical) of any contamination identified in the exploratory investigation, in areas that were inaccessible during the initial phase of investigation, or in areas requiring additional assessment. For more sensitive areas of the proposed development (e.g. landscaped areas) it is likely that an increased density of investigation/sampling will be required.

The detailed investigation may also include additional targeted investigation along the route of water supply pipes (once finalised) in accordance with UKWIR (2010) to allow an assessment to be made into the suitability of water supply pipes at the site.

4.3 Supplementary Investigation

Depending on the outcome of the exploratory investigation and the detailed investigation, including any programme of environmental monitoring, it may be necessary to undertake supplementary investigations for example to provide clearer delineation of a particular area (zone) of contamination or a contamination plume, or to address or clarify specific technical matters (e.g. to confirm the applicability and feasibility of potential remedial options or obtain information for their design). The need for and/or scope of any supplementary investigation would be confirmed upon completion of the detailed investigation.

4.4 Updated Risk Assessment and CSM

The outcome of the field investigations should be summarised within an interpretative report including observations of the site and soils, a generic quantitative risk assessment (GQRA) and/or detailed quantitative risk assessment (DQRA) based on the results of laboratory testing and in-situ monitoring.

The recommendations and conclusions within the report should include, where necessary, a risk management strategy and remediation scheme detailing works required to break any SPL identified as a potential risk to sensitive receptors.

4.5 Other Considerations

4.5.1 Integrated Investigations

A moderate risk is allocated to ground stability hazards associated with compressible deposits and shrink/swell clays and a low risk associated with running sands. As such a geotechnical investigation may be required to further assess such risks in terms of foundation design etc. It is also possible that other field investigations (e.g. archaeological, ecological, flood risk assessment etc.) will be required to inform other aspects of the proposed development and we would recommend that where possible the investigations are integrated with the contaminated land investigations to ensure efficiencies are maximised.

4.5.2 UXO Risk Assessment

A UXO risk assessment is beyond the scope of this report. A UXO risk assessment may be required for the development of the site.

4.5.3 Asbestos Containing Materials

Suspected ACMs are possible given the former presence of agricultural buildings onsite. As such, prior to any demolition works commencing onsite a materials/asbestos survey would be required. If identified, any ACM would require measures to be implemented during the works to ensure its safe management and/or removal during the development. All records should be retained.

4.5.4 Invasive Weeds

Whilst no invasive weeds were observed during the site walkover, it may be prudent to employ a specialist to carry out a survey of the site to identify if any stands of invasive weeds are present prior to any soils being disturbed.

4.6 Regulatory Approval

We would recommend that formal approval be sought from the local authority with regards to the recommendations contained within this report prior to commencing with future phases of investigation and/or development of the site.

5.0 LIMITATIONS AND USE OF THIS REPORT

IMPORTANT: This section should be read before reliance is placed on any of the opinions, advice, recommendations or conclusions set out in this report.

a) This report has been prepared for the purpose of providing advice to the client pursuant to its appointment of TGEN to act as a consultant.
b) Save for the client no duty is undertaken or warranty or representation made to any party in respect of the opinions, advice, recommendations or conclusions herein set out.
c) All work carried out in preparing this report has used, and is based upon, our professional knowledge and understanding of the current relevant English and European Community standards, approved codes of practice, technology and legislation.
d) Changes in the above may cause the opinion, advice, recommendations or conclusions set out in this report to become inappropriate or incorrect. However, in giving its opinions, advice, recommendations and conclusions, TGEN has considered pending changes to environmental legislation and regulations of which it is currently aware. Following delivery of this report, we will have no obligation to advise the client of any such changes, or of their repercussions.
e) TGEN acknowledges that it is being retained, in part, because of its knowledge and experience with respect to environmental matters. TGEN will consider and analyse all information provided to it in the context of our knowledge and experience and all other relevant information known to us. To the extent that the information provided to us is not inconsistent or incompatible therewith, TGEN shall be entitled to rely upon and assume, without independent verification, the accuracy and completeness of such information.
f) The content of this report represents the professional opinion of experienced environmental consultants. TGEN does not provide specialist legal advice and the advice of lawyers may be required.
g) In the summary and recommendations sections of this report, TGEN has set out our key findings and provided a summary and overview of our advice, opinions and recommendations. However, other parts of this report will often indicate the limitations of the information obtained by TGEN and therefore any advice, opinions or recommendations set out in the executive summary, summary and recommendations sections ought not to be relied upon unless they are considered in the context of the whole report.
h) The assessments made in this report are based on the ground conditions as revealed by walkover survey and/or intrusive investigations, together with the results of any field or laboratory testing or chemical analysis undertaken and other relevant data which may have been obtained including previous site investigations. In any event, ground contamination often exists as small discrete areas of contamination (hot spots) and there can be no certainty that any or all such areas have been located and/or sampled.
i) There may be special conditions appertaining to the site which have not been considered in the report. The assessment may be subject to amendment in light of additional information becoming available.
j) Where any data supplied by the client or from other sources, including that from previous site investigations, have been used it has been assumed that the information is correct. No responsibility can be accepted by TGEN for inaccuracies within the data supplied by other parties.
k) Whilst the report may express an opinion on possible ground conditions between or beyond trial pit or borehole locations, or on the possible presence of features based on either visual, verbal or published evidence this is for guidance only and no liability can be accepted for the accuracy thereof.
l) Comments on groundwater conditions are based on observations made at the time of the investigation unless otherwise stated. Groundwater conditions may vary due to seasonal or other effects.
m) This report is prepared and written in the context of the agreed scope of work and should not be used in a different context. Furthermore, new information, improved practices and changes in legislation may necessitate a reinterpretation of the report in whole or part after its original submission.
n) The copyright in the written materials shall remain the property of the TGEN but with a royalty-free perpetual license to the client deemed to be granted on payment in full to TGEN by the client of the outstanding amounts.
o) These terms apply in addition to the TGEN standard terms of engagement (or in addition to another written contract which may be in place instead thereof) unless specifically agreed in writing (In the event of a conflict between these terms and the said standard terms of engagement the said standard terms of engagement shall prevail). In the absence of such a written contract the standard terms of engagement will apply.
p) TGEN maintains adequate insurance cover for public liability and professional indemnity. However, we are unable to accept liability for asbestos related matters. Our work must not be taken as sufficient to identify the presence or absence of asbestos in or on the ground. In placing a contract with us the client accepts the restriction on asbestos. If we find or strongly suspect asbestos is or may be present in or on the ground, we will inform the client and advise specialist investigation. The client agrees that they shall not bring any claim personally against any director / employee or consultant to us in respect of loss or damage suffered by the client arising out of this contract.

Figure 1 Site Location Plan(s).

Site Location Plan

scale 1:1250 @ A1

Notes:
All setting out of work to be checked before work commences.

Any errors to be reported to Nicholas Webb Architects before any further work is carried out.

Work only to measured dimension, do not scale.

Revision	Notes	Date	Drawn By	Checked By
-	Issue for review	12.02.2021	AS	NW
A	Issue for review	17.03.2021	AS	NW

N

Drawing Scale 1:1250

Project:	Broadfields Innovation and Business Park	Client:	MM Properties Ltd.
Date:	17.03.2021	Title:	Site Location Plan
Drawn:	AS		
Checked:	NW	Status:	Planning
Scale:	1:1250 @ A1	Drawing:	0503-A03-005 Rev: A

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Figure 2 Proposed Development Plan(s).

m	BH	GF	FF	SF / mezz	TOTAL GIA (including Office space)	Office Area
B1	6	920	194		1114	194
B2	9	900	300		1200	600
B3	9	1220	300		1520	600
B4	9	424	160		584	320
B5	9	920	110		1030	220
B6	12	2550	200	200	2750	400
B7	12	2040	200	200	2440	400
B8	12	2970	210	210	3390	420
B9	9	2594	200		2794	400
B10	12	2580	200	200	2980	400
TOTAL					19802	3954
20% of TOTAL GIA					3960.4000	

Indicative Site Layout

scale 1:1250 @ A1

Notes:
All setting out of work to be checked before work commences.

Any errors to be reported to Nicholas Webb Architects before any further work is carried out.

Work only to measured dimension, do not scale.

Revision	Notes	Date	Drawn By	Checked By
-	Issued for review	12.02.2021	AS	NW
A	Issued for review	17.03.2021	AS	NW
B	Issued for review	29.04.2021	AS	NW
C	Issued for planning	14.06.2021	AS	NW
D	Issued for review.	06.09.2021	AS	NW
E	Issued for review.	07.09.2021	AS	NW

N

Project:	Broadfields Innovation and Business Park	Client:	MM Properties (London) Ltd.
Date:	07.09.2021	Title:	Indicative Site Layout
Drawn:	AS		
Checked:	NW	Status:	Planning
Scale:	1:1250 @ A1	Drawing:	0503-A20-007 Rev: E

NWA ltc Chartered Architects

Nicholas Webb Architects plc
The Old Dairy
Harpendenbury Farm
Redbourn
Hertfordshire AL3 7QA
[redacted].uk
www.nwarchitects.co.uk

Appendix A GroundSure Insight Report.

Groundsure
LOCATION INTELLIGENCE

Enviro+Geo
Insight

563213 189087

Order Details

Date: 26/03/2021
Your ref: EMS_680486_894400
Our Ref: EMS-680486_894400
Client: emapsite

Site Details

Location: 563213 189087
Area: 11.9 ha
Authority: Brentwood Borough Council

Contact us with any questions at:
[redacted]

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	0	0	3	5	-
14	1.2	Historical tanks	0	0	0	0	-
14	1.3	Historical energy features	0	0	0	0	-
14	1.4	Historical petrol stations	0	0	0	0	-
15	1.5	Historical garages	0	1	0	0	-
15	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
16	2.1	Historical industrial land uses	0	0	4	5	-
17	2.2	Historical tanks	0	0	0	0	-
17	2.3	Historical energy features	0	0	0	0	-
17	2.4	Historical petrol stations	0	0	0	0	-
18	2.5	Historical garages	0	1	0	0	-
Page	Section	Waste and landfill	On site	0-50m	50-250m	250-500m	500-2000m
19	3.1	Active or recent landfill	0	0	0	0	-
19	3.2	Historical landfill (BGS records)	0	0	0	0	-
20	3.3	Historical landfill (LA/mapping records)	0	0	0	0	-
20	3.4	Historical landfill (EA/NRW records)	0	0	0	0	-
20	3.5	Historical waste sites	0	0	0	0	-
20	3.6	Licensed waste sites	0	0	0	0	-
20	3.7	Waste exemptions	3	0	8	4	-
Page	Section	Current industrial land use	On site	0-50m	50-250m	250-500m	500-2000m
23	4.1	Recent industrial land uses	0	0	2	-	-
24	4.2	Current or recent petrol stations	0	0	0	1	-
24	4.3	Electricity cables	0	0	0	0	-
24	4.4	Gas pipelines	0	0	0	0	-
24	4.5	Sites determined as Contaminated Land	0	0	0	0	-

24	4.6	Control of Major Accident Hazards (COMAH)	0	0	0	0	-
25	4.7	Regulated explosive sites	0	0	0	0	-
25	4.8	Hazardous substance storage/usage	0	0	0	0	-
25	4.9	Historical licensed industrial activities (IPC)	0	0	0	0	-
25	4.10	Licensed industrial activities (Part A(1))	0	0	0	0	-
25	4.11	Licensed pollutant release (Part A(2)/B)	0	0	0	0	-
26	4.12	Radioactive Substance Authorisations	0	0	0	0	-
26	**4.13**	**Licensed Discharges to controlled waters**	0	0	1	0	-
26	4.14	Pollutant release to surface waters (Red List)	0	0	0	0	-
26	4.15	Pollutant release to public sewer	0	0	0	0	-
27	4.16	List 1 Dangerous Substances	0	0	0	0	-
27	4.17	List 2 Dangerous Substances	0	0	0	0	-
27	**4.18**	**Pollution Incidents (EA/NRW)**	0	0	1	1	-
27	4.19	Pollution inventory substances	0	0	0	0	-
28	4.20	Pollution inventory waste transfers	0	0	0	0	-
28	4.21	Pollution inventory radioactive waste	0	0	0	0	-

Page	Section	Hydrogeology	On site	0-50m	50-250m	250-500m	500-2000m
29	**5.1**	**Superficial aquifer**	Identified (within 500m)				
31	**5.2**	**Bedrock aquifer**	Identified (within 500m)				
32	**5.3**	**Groundwater vulnerability**	Identified (within 50m)				
34	5.4	Groundwater vulnerability- soluble rock risk	None (within 0m)				
34	5.5	Groundwater vulnerability- local information	None (within 0m)				
35	5.6	Groundwater abstractions	0	0	0	0	0
36	**5.7**	**Surface water abstractions**	0	0	0	0	9
38	5.8	Potable abstractions	0	0	0	0	0
38	**5.9**	**Source Protection Zones**	0	0	0	1	-
38	5.10	Source Protection Zones (confined aquifer)	0	0	0	0	-

Page	Section	Hydrology	On site	0-50m	50-250m	250-500m	500-2000m
39	**6.1**	**Water Network (OS MasterMap)**	1	5	2	-	-

40	6.2	Surface water features	1	2	3	-	-
40	6.3	WFD Surface water body catchments	1	-	-	-	-
41	6.4	WFD Surface water bodies	0	0	0	-	-
41	6.5	WFD Groundwater bodies	1	-	-	-	-
Page	Section	River and coastal flooding	On site	0-50m	50-250m	250-500m	500-2000m
42	7.1	Risk of Flooding from Rivers and Sea (RoFRaS)	None (within 50m)				
42	7.2	Historical Flood Events	0	0	0	-	-
42	7.3	Flood Defences	0	0	0	-	-
42	7.4	Areas Benefiting from Flood Defences	0	0	0	-	-
43	7.5	Flood Storage Areas	0	0	0	-	-
44	7.6	Flood Zone 2	Identified (within 50m)				
45	7.7	Flood Zone 3	Identified (within 50m)				
Page	Section	Surface water flooding					
46	8.1	Surface water flooding	1 in 30 year, 0.3m - 1.0m (within 50m)				
Page	Section	Groundwater flooding					
48	9.1	Groundwater flooding	Low (within 50m)				
Page	Section	Environmental designations	On site	0-50m	50-250m	250-500m	500-2000m
49	10.1	Sites of Special Scientific Interest (SSSI)	0	0	1	0	1
50	10.2	Conserved wetland sites (Ramsar sites)	0	0	0	0	0
50	10.3	Special Areas of Conservation (SAC)	0	0	0	0	0
50	10.4	Special Protection Areas (SPA)	0	0	0	0	0
50	10.5	National Nature Reserves (NNR)	0	0	0	0	0
51	10.6	Local Nature Reserves (LNR)	0	0	0	0	0
51	10.7	Designated Ancient Woodland	2	1	2	0	7
52	10.8	Biosphere Reserves	0	0	0	0	0
52	10.9	Forest Parks	0	0	0	0	0
52	10.10	Marine Conservation Zones	0	0	0	0	0
52	10.11	Green Belt	1	0	0	0	2
53	10.12	Proposed Ramsar sites	0	0	0	0	0

53	10.13	Possible Special Areas of Conservation (pSAC)	0	0	0	0	0
53	10.14	Potential Special Protection Areas (pSPA)	0	0	0	0	0
53	10.15	Nitrate Sensitive Areas	0	0	0	0	0
54	**10.16**	**Nitrate Vulnerable Zones**	1	0	0	0	3
55	**10.17**	**SSSI Impact Risk Zones**	3	-	-	-	-
57	**10.18**	**SSSI Units**	0	0	1	0	2
Page	Section	Visual and cultural designations	On site	0-50m	50-250m	250-500m	500-2000m
59	11.1	World Heritage Sites	0	0	0	-	-
60	11.2	Area of Outstanding Natural Beauty	0	0	0	-	-
60	11.3	National Parks	0	0	0	-	-
60	**11.4**	**Listed Buildings**	0	0	1	-	-
61	**11.5**	**Conservation Areas**	1	0	0	-	-
61	11.6	Scheduled Ancient Monuments	0	0	0	-	-
61	**11.7**	**Registered Parks and Gardens**	1	0	0	-	-
Page	Section	Agricultural designations	On site	0-50m	50-250m	250-500m	500-2000m
62	**12.1**	**Agricultural Land Classification**	Grade 3 (within 250m)				
63	12.2	Open Access Land	0	0	0	-	-
63	12.3	Tree Felling Licences	0	0	0	-	-
63	**12.4**	**Environmental Stewardship Schemes**	0	0	2	-	-
63	12.5	Countryside Stewardship Schemes	0	0	0	-	-
Page	Section	Habitat designations	On site	0-50m	50-250m	250-500m	500-2000m
64	**13.1**	**Priority Habitat Inventory**	3	1	4	-	-
65	13.2	Habitat Networks	0	0	0	-	-
65	13.3	Open Mosaic Habitat	0	0	0	-	-
65	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
66	**14.1**	**10k Availability**	Identified (within 500m)				
67	**14.2**	**Artificial and made ground (10k)**	1	1	4	2	-
69	**14.3**	**Superficial geology (10k)**	2	0	1	2	-

70	14.4	Landslip (10k)	0	0	1	0	-
71	14.5	Bedrock geology (10k)	1	0	0	0	-
72	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
73	15.1	50k Availability	Identified (within 500m)				
74	15.2	Artificial and made ground (50k)	0	1	2	2	-
75	15.3	Artificial ground permeability (50k)	0	1	-	-	-
76	15.4	Superficial geology (50k)	2	0	1	2	-
77	15.5	Superficial permeability (50k)	Identified (within 50m)				
77	15.6	Landslip (50k)	0	0	1	0	-
77	15.7	Landslip permeability (50k)	None (within 50m)				
79	15.8	Bedrock geology (50k)	1	0	0	0	-
80	15.9	Bedrock permeability (50k)	Identified (within 50m)				
80	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
81	16.1	BGS Boreholes	0	3	4	-	-
Page	Section	Natural ground subsidence					
83	17.1	Shrink swell clays	Moderate (within 50m)				
84	17.2	Running sands	Low (within 50m)				
86	17.3	Compressible deposits	Moderate (within 50m)				
88	17.4	Collapsible deposits	Very low (within 50m)				
89	17.5	Landslides	Very low (within 50m)				
90	17.6	Ground dissolution of soluble rocks	Negligible (within 50m)				
Page	Section	Mining, ground workings and natural cavities	On site	0-50m	50-250m	250-500m	500-2000m
92	18.1	Natural cavities	0	0	0	0	-
93	18.2	BritPits	0	0	0	0	-
93	18.3	Surface ground workings	5	3	17	-	-
94	18.4	Underground workings	0	0	0	0	0
94	18.5	Historical Mineral Planning Areas	0	0	0	0	-

94	18.6	Non-coal mining	0	0	0	0	0
95	18.7	Mining cavities	0	0	0	0	0
95	18.8	JPB mining areas	None (within 0m)				
95	18.9	Coal mining	None (within 0m)				
95	18.10	Brine areas	None (within 0m)				
95	18.11	Gypsum areas	None (within 0m)				
96	18.12	Tin mining	None (within 0m)				
96	18.13	Clay mining	None (within 0m)				

Page	Section	Radon	
97	**19.1**	**Radon**	Less than 1% (within 0m)

Page	Section	Soil chemistry	On site	0-50m	50-250m	250-500m	500-2000m
98	**20.1**	**BGS Estimated Background Soil Chemistry**	8	2	-	-	-
99	20.2	BGS Estimated Urban Soil Chemistry	0	0	-	-	-
99	20.3	BGS Measured Urban Soil Chemistry	0	0	-	-	-

Page	Section	Railway infrastructure and projects	On site	0-50m	50-250m	250-500m	500-2000m
100	21.1	Underground railways (London)	0	0	0	-	-
100	21.2	Underground railways (Non-London)	0	0	0	-	-
100	21.3	Railway tunnels	0	0	0	-	-
100	21.4	Historical railway and tunnel features	0	0	0	-	-
100	21.5	Royal Mail tunnels	0	0	0	-	-
101	21.6	Historical railways	0	0	0	-	-
101	21.7	Railways	0	0	0	-	-
101	21.8	Crossrail 1	0	0	0	0	-
101	21.9	Crossrail 2	0	0	0	0	-
101	21.10	HS2	0	0	0	0	-

Recent aerial photograph

Capture Date: 02/08/2018

Site Area: 11.9ha

Recent site history - 2014 aerial photograph

Capture Date: 24/08/2014

Site Area: 11.9ha

Recent site history - 2010 aerial photograph

Capture Date: 23/04/2010

Site Area: 11.9ha

Recent site history - 2008 aerial photograph

Capture Date: 20/09/2008

Site Area: 11.9ha

Recent site history - 1999 aerial photograph

Capture Date: 03/09/1999

Site Area: 11.9ha

1 Past land use

Site Outline

Search buffers in metres (m)

Historical industrial land uses

Historical garages

1.1 Historical industrial land uses

Records within 500m	8

Potentially contaminative land use features digitised from historical Ordnance Survey mapping at 1:10,000 and 1:10,560 scale, intelligently grouped into contiguous features. To prevent misrepresentation of the size of historical features at any given time, features are only grouped if they have similar geometries within immediately preceding or succeeding map editions. See section 2 for a breakdown of grouping if required. Grouped and the original un-grouped features can be cross-referenced across sections 1 and 2 using the 'Group ID'.

Features are displayed on the Past land use map on **page 13**

ID	Location	Land use	Dates present	Group ID
2	53m E	Saw Pit	1874	2162502

ID	Location	Land use	Dates present	Group ID
3	204m NE	Cuttings	1976	2129900
4	204m NE	Telephone Exchange	1960 - 1976	2173289
5	342m S	Grave Yard	1874	2145801
6	375m NE	Cuttings	1976	2129902
7	388m NE	Nursery	1960	2161541
8	431m NE	Cuttings	1976	2129903
9	487m NE	Cuttings	1976	2129901

This data is sourced from Ordnance Survey / Groundsure.

1.2 Historical tanks

Records within 500m	0

Tank features digitised from historical Ordnance Survey mapping at high-detail 1:1,250 and 1:2,500 scale, intelligently grouped into contiguous features. To prevent misrepresentation of the size of historical features at any given time, features are only grouped if they have similar geometries within immediately preceding or succeeding map editions. See section 2 for a breakdown of grouping if required. Grouped and the original un-grouped features can be cross-referenced across sections 1 and 2 using the 'Group ID'.

This data is sourced from Ordnance Survey / Groundsure.

1.3 Historical energy features

Records within 500m	0

Energy features digitised from historical Ordnance Survey mapping at high-detail 1:1,250 and 1:2,500 scale, intelligently grouped into contiguous features. To prevent misrepresentation of the size of historical features at any given time, features are only grouped if they have similar geometries within immediately preceding or succeeding map editions. See section 2 for a breakdown of grouping if required. Grouped and the original un-grouped features can be cross-referenced across sections 1 and 2 using the 'Group ID'.

This data is sourced from Ordnance Survey / Groundsure.

1.4 Historical petrol stations

Records within 500m	0

Petrol stations digitised from historical Ordnance Survey mapping at high-detail 1:1,250 and 1:2,500 scale, intelligently grouped into contiguous features. To prevent misrepresentation of the size of historical features at any given time, features are only grouped if they have similar geometries within immediately preceding

or succeeding map editions. See section 2 for a breakdown of grouping if required. Grouped and the original un-grouped features can be cross-referenced across sections 1 and 2 using the 'Group ID'.

This data is sourced from Ordnance Survey / Groundsure.

1.5 Historical garages

Records within 500m	1

Garages digitised from historical Ordnance Survey mapping at high-detail 1:1,250 and 1:2,500 scale, intelligently grouped into contiguous features. To prevent misrepresentation of the size of historical features at any given time, features are only grouped if they have similar geometries within immediately preceding or succeeding map editions. See section 2 for a breakdown of grouping if required. Grouped and the original un-grouped features can be cross-referenced across sections 1 and 2 using the 'Group ID'.

Features are displayed on the Past land use map on **page 13**

ID	Location	Land use	Dates present	Group ID
1	13m E	Garage	1955	73601

This data is sourced from Ordnance Survey / Groundsure.

1.6 Historical military land

Records within 500m	0

Areas of military land digitised from multiple sources including the National Archives, local records, MOD records and verified other sources, intelligently grouped into contiguous features.

This data is sourced from Ordnance Survey / Groundsure / other sources.

2 Past land use - un-grouped

Site Outline

Search buffers in metres (m)

Historical industrial land uses

Historical garages

2.1 Historical industrial land uses

Records within 500m	9

Potentially contaminative land use features digitised from historical Ordnance Survey mapping at 1:10,000 and 10,560 scale. Any records shown are available intelligently grouped in section 1. Grouped and the original un-grouped features can be cross-referenced across sections 1 and 2 using the 'Group ID'.

Features are displayed on the Past land use - un-grouped map on **page 16**

ID	Location	Land Use	Date	Group ID
2	53m E	Saw Pit	1874	2162502
3	204m NE	Cuttings	1976	2129900
A	204m NE	Telephone Exchange	1960	2173289

ID	Location	Land Use	Date	Group ID
A	210m NE	Telephone Exchange	1976	2173289
4	342m S	Grave Yard	1874	2145801
5	375m NE	Cuttings	1976	2129902
6	388m NE	Nursery	1960	2161541
7	431m NE	Cuttings	1976	2129903
8	487m NE	Cuttings	1976	2129901

This data is sourced from Ordnance Survey / Groundsure.

2.2 Historical tanks

Records within 500m	0

Tank features digitised from historical Ordnance Survey mapping at high-detail 1:1,250 and 1:2,500 scale. Any records shown are available intelligently grouped in section 1. Grouped and the original un-grouped features can be cross-referenced across sections 1 and 2 using the 'Group ID'.

This data is sourced from Ordnance Survey / Groundsure.

2.3 Historical energy features

Records within 500m	0

Energy features digitised from historical Ordnance Survey mapping at high-detail 1:1,250 and 1:2,500 scale. Any records shown are available intelligently grouped in section 1. Grouped and the original un-grouped features can be cross-referenced across sections 1 and 2 using the 'Group ID'.

This data is sourced from Ordnance Survey / Groundsure.

2.4 Historical petrol stations

Records within 500m	0

Petrol stations digitised from historical Ordnance Survey mapping at high-detail 1:1,250 and 1:2,500 scale. Any records shown are available intelligently grouped in section 1. Grouped and the original un-grouped features can be cross-referenced across sections 1 and 2 using the 'Group ID'.

This data is sourced from Ordnance Survey / Groundsure.

2.5 Historical garages

Records within 500m	1

Garages digitised from historical Ordnance Survey mapping at high-detail 1:1,250 and 1:2,500 scale. Any records shown are available intelligently grouped in section 1. Grouped and the original un-grouped features can be cross-referenced across sections 1 and 2 using the 'Group ID'.

Features are displayed on the Past land use - un-grouped map on **page 16**

ID	Location	Land Use	Date	Group ID
1	13m E	Garage	1955	73601

This data is sourced from Ordnance Survey / Groundsure.

3 Waste and landfill

Site Outline

Search buffers in metres (m)

Waste exemptions

3.1 Active or recent landfill

Records within 500m	0

Active or recently closed landfill sites under Environment Agency/Natural Resources Wales regulation.

This data is sourced from the Environment Agency and Natural Resources Wales.

3.2 Historical landfill (BGS records)

Records within 500m	0

Landfill sites identified on a survey carried out on behalf of the DoE in 1973. These sites may have been closed or operational at this time.

This data is sourced from the British Geological Survey.

3.3 Historical landfill (LA/mapping records)

Records within 500m	0

Landfill sites identified from Local Authority records and high detail historical mapping.

This data is sourced from the Ordnance Survey/Groundsure and Local Authority records.

3.4 Historical landfill (EA/NRW records)

Records within 500m	0

Known historical (closed) landfill sites (e.g. sites where there is no PPC permit or waste management licence currently in force). This includes sites that existed before the waste licensing regime and sites that have been licensed in the past but where a licence has been revoked, ceased to exist or surrendered and a certificate of completion has been issued.

This data is sourced from the Environment Agency and Natural Resources Wales.

3.5 Historical waste sites

Records within 500m	0

Waste site records derived from Local Authority planning records and high detail historical mapping.

This data is sourced from Ordnance Survey/Groundsure and Local Authority records.

3.6 Licensed waste sites

Records within 500m	0

Active or recently closed waste sites under Environment Agency/Natural Resources Wales regulation.

This data is sourced from the Environment Agency and Natural Resources Wales.

3.7 Waste exemptions

Records within 500m	15

Activities involving the storage, treatment, use or disposal of waste that are exempt from needing a permit. Exemptions have specific limits and conditions that must be adhered to.

Features are displayed on the Waste and landfill map on **page 19**

ID	Location	Site	Reference	Category	Sub-Category	Description
A	On site	BROADFIELDS, TILBURY ROAD, WEST HORNDON, BRENTWOOD, CM13 3LS	WEX001589	Storing waste exemption	Not on a farm	Storage of waste in secure containers

ID	Location	Site	Reference	Category	Sub-Category	Description
A	**On site**	**BROADFIELDS, TILBURY ROAD, WEST HORNDON, BRENTWOOD, CM13 3LS**	**WEX001589**	**Storing waste exemption**	**Not on a farm**	**Storage of waste in a secure place**
A	**On site**	**BROADFIELDS, TILBURY ROAD, WEST HORNDON, BRENTWOOD, CM13 3LS**	**WEX001589**	**Treating waste exemption**	**Not on a farm**	**Sorting mixed waste**
B	138m NE	EAST HORNDON HALL, TILBURY ROAD, WEST HORNDON, BRENTWOOD, CM13 3LR	WEX128324	Using waste exemption	Not on a farm	Use of waste in construction
B	138m NE	EAST HORNDON HALL, TILBURY ROAD, WEST HORNDON, BRENTWOOD, CM13 3LR	WEX167807	Using waste exemption	Not on a farm	Use of waste in construction
B	138m NE	EAST HORNDON HALL, TILBURY ROAD, WEST HORNDON, BRENTWOOD, CM13 3LR	WEX167807	Storing waste exemption	Not on a farm	Storage of waste in a secure place
B	138m NE	EAST HORNDON HALL, TILBURY ROAD, WEST HORNDON, BRENTWOOD, CM13 3LR	WEX167807	Treating waste exemption	Not on a farm	Screening and blending of waste
B	138m NE	EAST HORNDON HALL, TILBURY ROAD, WEST HORNDON, BRENTWOOD, CM13 3LR	WEX219217	Using waste exemption	Not on a farm	Use of waste in construction
B	138m NE	EAST HORNDON HALL, TILBURY ROAD, WEST HORNDON, BRENTWOOD, CM13 3LR	WEX074191	Using waste exemption	Not on a farm	Use of waste in construction
B	168m NE	East Horndon Hall Tilbury Road Brentwood Essex CM13 3LR	EPR/XF0239NR/A001	Using waste exemption	Non-Agricultural Waste Only	Use of waste in construction
1	206m E	East Horndon Hall Tilbury Road Brentwood Essex CM13 3LR	EPR/CF0406GH/A001	Using waste exemption	Non-Agricultural Waste Only	Use of waste in construction
C	466m W	-	WEX202184	Using waste exemption	On a Farm	Spreading of plant matter to confer benefit
C	466m W	-	WEX202184	Using waste exemption	On a Farm	Spreading waste on agricultural land to confer benefit

ID	Location	Site	Reference	Category	Sub-Category	Description
C	466m W	-	WEX202184	Using waste exemption	On a Farm	Use of waste in construction
C	466m W	-	WEX202184	Using waste exemption	On a Farm	Use of mulch

This data is sourced from the Environment Agency and Natural Resources Wales.

4 Current industrial land use

Site Outline

Search buffers in metres (m)

Recent industrial land uses

Current or recent petrol stations

Licensed Discharges to controlled waters

Pollution Incidents (EA/NRW)

4.1 Recent industrial land uses

Records within 250m	2

Current potentially contaminative industrial sites.

Features are displayed on the Current industrial land use map on **page 23**

ID	Location	Company	Address	Activity	Category
A	138m NE	Master Travel	East Horndon Hall, Tilbury Road, West Horndon, Brentwood, Essex, CM13 3LR	Vehicle Hire and Rental	Hire Services
A	138m NE	V J Milman Transport	East Horndon Hall, Tilbury Road, West Horndon, Brentwood, Essex, CM13 3LR	Distribution and Haulage	Transport, Storage and Delivery

This data is sourced from Ordnance Survey.

4.2 Current or recent petrol stations

Records within 500m	1

Open, closed, under development and obsolete petrol stations.

Features are displayed on the Current industrial land use map on **page 23**

ID	Location	Company	Address	LPG	Status
4	423m SW	OBSOLETE	60, Station Road, West Horndon, Brentwood, Essex, CM13 3XS	Not Applicable	Obsolete

This data is sourced from Experian.

4.3 Electricity cables

Records within 500m	0

High voltage underground electricity transmission cables.

This data is sourced from National Grid.

4.4 Gas pipelines

Records within 500m	0

High pressure underground gas transmission pipelines.

This data is sourced from National Grid.

4.5 Sites determined as Contaminated Land

Records within 500m	0

Contaminated Land Register of sites designated under Part 2a of the Environmental Protection Act 1990.

This data is sourced from Local Authority records.

4.6 Control of Major Accident Hazards (COMAH)

Records within 500m	0

Control of Major Accident Hazards (COMAH) sites. This data includes upper and lower tier sites, and includes a historical archive of COMAH sites and Notification of Installations Handling Hazardous Substances (NIHHS) records.

This data is sourced from the Health and Safety Executive.

4.7 Regulated explosive sites

Records within 500m	0

Sites registered and licensed by the Health and Safety Executive under the Manufacture and Storage of Explosives Regulations 2005 (MSER). The last update to this data was in April 2011.

This data is sourced from the Health and Safety Executive.

4.8 Hazardous substance storage/usage

Records within 500m	0

Consents granted for a site to hold certain quantities of hazardous substances at or above defined limits in accordance with the Planning (Hazardous Substances) Regulations 2015.

This data is sourced from Local Authority records.

4.9 Historical licensed industrial activities (IPC)

Records within 500m	0

Integrated Pollution Control (IPC) records of substance releases to air, land and water. This data represents a historical archive as the IPC regime has been superseded.

This data is sourced from the Environment Agency and Natural Resources Wales.

4.10 Licensed industrial activities (Part A(1))

Records within 500m	0

Records of Part A(1) installations regulated under the Environmental Permitting (England and Wales) Regulations 2016 for the release of substances to the environment.

This data is sourced from the Environment Agency and Natural Resources Wales.

4.11 Licensed pollutant release (Part A(2)/B)

Records within 500m	0

Records of Part A(2) and Part B installations regulated under the Environmental Permitting (England and Wales) Regulations 2016 for the release of substances to the environment.

This data is sourced from Local Authority records.

4.12 Radioactive Substance Authorisations

Records within 500m	0

Records of the storage, use, accumulation and disposal of radioactive substances regulated under the Radioactive Substances Act 1993.

This data is sourced from the Environment Agency and Natural Resources Wales.

4.13 Licensed Discharges to controlled waters

Records within 500m	1

Discharges of treated or untreated effluent to controlled waters under the Water Resources Act 1991.

Features are displayed on the Current industrial land use map on **page 23**

ID	Location	Address	Details	
2	234m W	415 YARDS EAST OF THE HALFWAY HOUSE, EAST HORNDON	Effluent Type: MISCELLANEOUS DISCHARGES - SURFACE WATER Permit Number: PR2NFE09670 Permit Version: 1 Receiving Water: Trib Mardyke	Status: PRE NRA LEGISLATION WHERE ISSUE DATE 01-SEP-89 (HISTORIC ONLY) Issue date: 09/09/1970 Effective Date: 09/09/1970 Revocation Date: 24/03/1992

This data is sourced from the Environment Agency and Natural Resources Wales.

4.14 Pollutant release to surface waters (Red List)

Records within 500m	0

Discharges of specified substances under the Environmental Protection (Prescribed Processes and Substances) Regulations 1991.

This data is sourced from the Environment Agency and Natural Resources Wales.

4.15 Pollutant release to public sewer

Records within 500m	0

Discharges of Special Category Effluents to the public sewer.

This data is sourced from the Environment Agency and Natural Resources Wales.

4.16 List 1 Dangerous Substances

Records within 500m	0

Discharges of substances identified on List I of European Directive E 2006/11/EC, and regulated under the Environmental Damage (Prevention and Remediation) Regulations 2015.

This data is sourced from the Environment Agency and Natural Resources Wales.

4.17 List 2 Dangerous Substances

Records within 500m	0

Discharges of substances identified on List II of European Directive E 2006/11/EC, and regulated under the Environmental Damage (Prevention and Remediation) Regulations 2015.

This data is sourced from the Environment Agency and Natural Resources Wales.

4.18 Pollution Incidents (EA/NRW)

Records within 500m	2

Records of substantiated pollution incidents. Since 2006 this data has only included category 1 (major) and 2 (significant) pollution incidents.

Features are displayed on the Current industrial land use map on **page 23**

ID	Location	Details	
1	137m E	Incident Date: 09/09/2002 Incident Identification: 107102 Pollutant: Specific Waste Materials Pollutant Description: Other Specific Waste Material	Water Impact: Category 4 (No Impact) Land Impact: Category 4 (No Impact) Air Impact: Category 4 (No Impact)
3	390m N	Incident Date: 26/02/2003 Incident Identification: 140061 Pollutant: Specific Waste Materials Pollutant Description: Tyres	Water Impact: Category 4 (No Impact) Land Impact: Category 3 (Minor) Air Impact: Category 4 (No Impact)

This data is sourced from the Environment Agency and Natural Resources Wales.

4.19 Pollution inventory substances

Records within 500m	0

The pollution inventory (substances) includes reporting on annual emissions of certain regulated substances to air, controlled waters and land. A reporting threshold for each substance is also included. Where emissions fall below the reporting threshold, no value will be given. The data is given for the most recent complete year available.

This data is sourced from the Environment Agency and the Scottish Environment Protection Agency.

4.20 Pollution inventory waste transfers

Records within 500m	0

The pollution inventory (waste transfers) includes reporting on annual transfers and recovery/disposal of controlled wastes from a site. A reporting threshold for each waste type is also included. Where releases fall below the reporting threshold, no value will be given. The data is given for the most recent complete year available.

This data is sourced from the Environment Agency and the Scottish Environment Protection Agency.

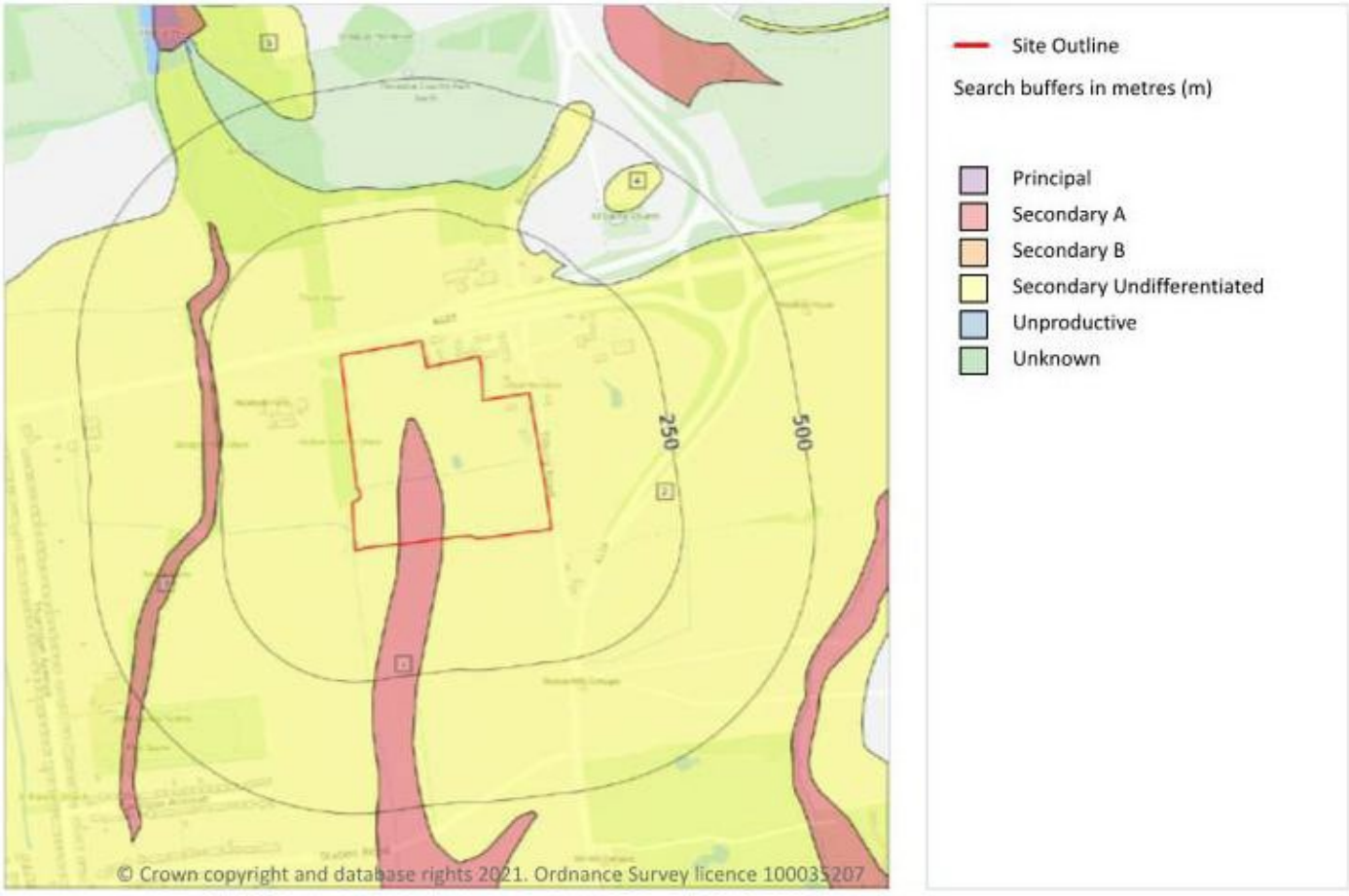
4.21 Pollution inventory radioactive waste

Records within 500m	0

The pollution inventory (radioactive wastes) includes reporting on annual releases of radioactive substances from a site, including the means of release. Where releases fall below the reporting threshold, no value will be given. The data is given for the most recent complete year available.

This data is sourced from the Environment Agency and the Scottish Environment Protection Agency.

5 Hydrogeology - Superficial aquifer



5.1 Superficial aquifer

Records within 500m	5

Aquifer status of groundwater held within superficial geology.

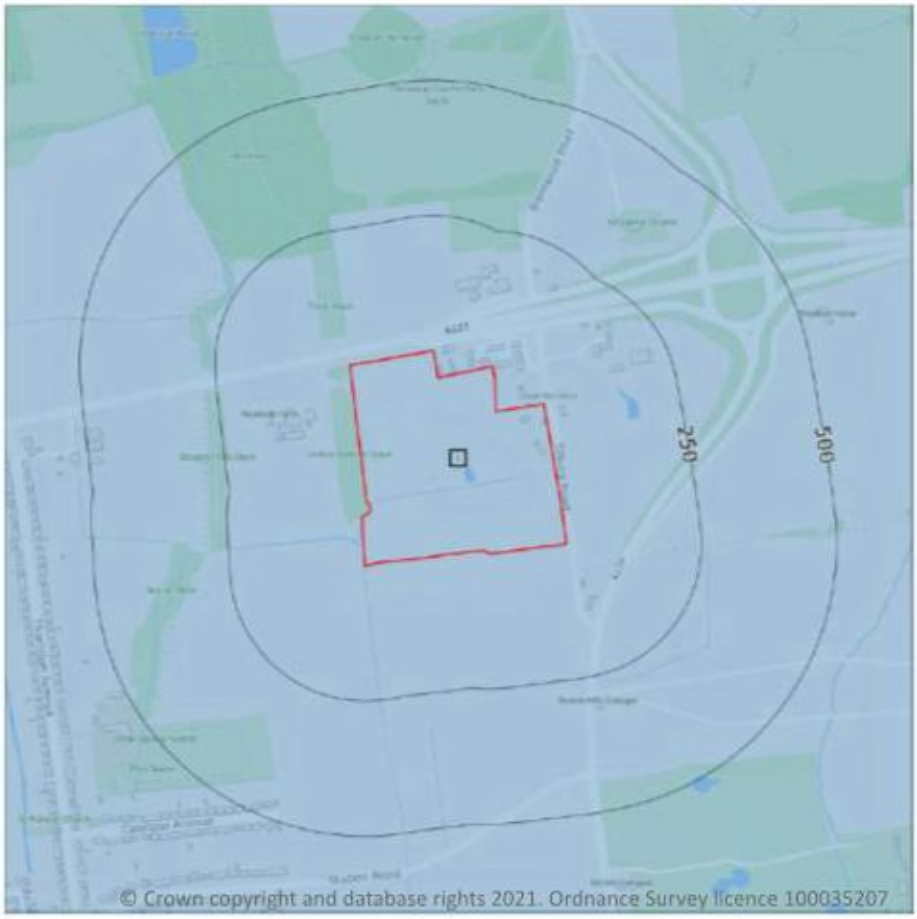
Features are displayed on the Hydrogeology map on **page 29**

ID	Location	Designation	Description
1	On site	Secondary A	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
2	On site	Secondary Undifferentiated	Assigned where it is not possible to attribute either category A or B to a rock type. In general these layers have previously been designated as both minor and non-aquifer in different locations due to the variable characteristics of the rock type

ID	Location	Designation	Description
3	242m W	Secondary A	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
4	373m NE	Secondary Undifferentiated	Assigned where it is not possible to attribute either category A or B to a rock type. In general these layers have previously been designated as both minor and non-aquifer in different locations due to the variable characteristics of the rock type
5	453m N	Secondary Undifferentiated	Assigned where it is not possible to attribute either category A or B to a rock type. In general these layers have previously been designated as both minor and non-aquifer in different locations due to the variable characteristics of the rock type

This data is sourced from the British Geological Survey, the Environment Agency and Natural Resources Wales.

Bedrock aquifer



Site Outline

Search buffers in metres (m)

- Principal
- Secondary A
- Secondary B
- Secondary Undifferentiated
- Unproductive

5.2 Bedrock aquifer

Records within 500m	1

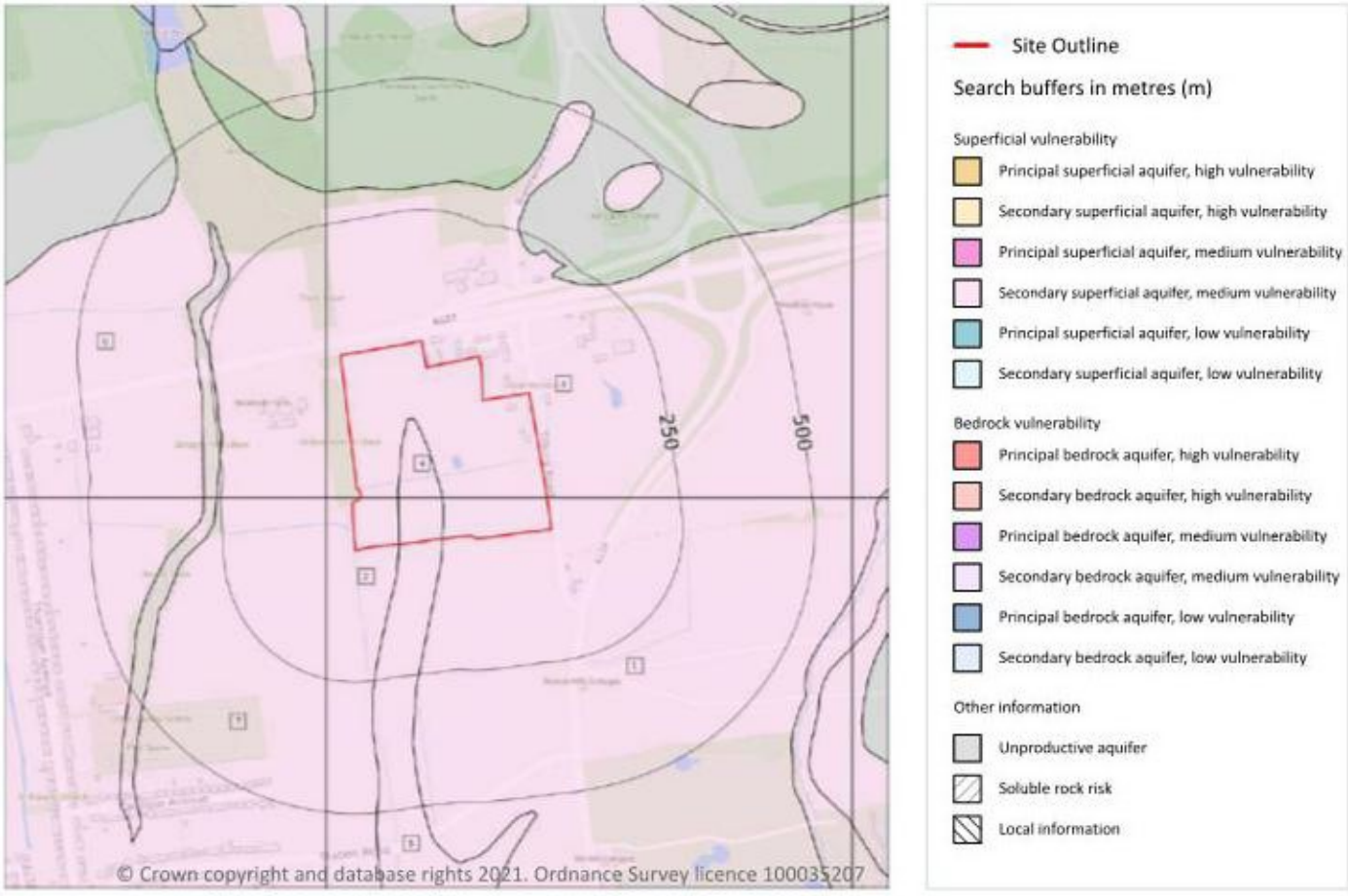
Aquifer status of groundwater held within bedrock geology.

Features are displayed on the Bedrock aquifer map on **page 31**

ID	Location	Designation	Description
1	On site	Unproductive	These are rock layers or drift deposits with low permeability that have negligible significance for water supply or river base flow

This data is sourced from the British Geological Survey, the Environment Agency and Natural Resources Wales.

Groundwater vulnerability



5.3 Groundwater vulnerability

Records within 50m	7

An assessment of the vulnerability of groundwater to a pollutant discharged at ground level based on the hydrological, geological, hydrogeological and soil properties within a one kilometre square grid. Groundwater vulnerability is described as High, Medium or Low as follows:

- High - Areas able to easily transmit pollution to groundwater. They are likely to be characterised by high leaching soils and the absence of low permeability superficial deposits.
- Medium - Intermediate between high and low vulnerability.
- Low - Areas that provide the greatest protection from pollution. They are likely to be characterised by low leaching soils and/or the presence of superficial deposits characterised by a low permeability.

Features are displayed on the Groundwater vulnerability map on **page 32**

ID	Location	Summary	Soil / surface	Superficial geology	Bedrock geology
1	On site	Summary Classification: Secondary superficial aquifer - Medium Vulnerability Combined classification: Unproductive Bedrock Aquifer, Productive Superficial Aquifer	Leaching class: Low Infiltration value: 40-70% Dilution value: <300mm/year	Vulnerability: Medium Aquifer type: Secondary Thickness: <3m Patchiness value: >90% Recharge potential: No Data	Vulnerability: Unproductive Aquifer type: Unproductive Flow mechanism: Mixed
2	On site	Summary Classification: Secondary superficial aquifer - Medium Vulnerability Combined classification: Unproductive Bedrock Aquifer, Productive Superficial Aquifer	Leaching class: Low Infiltration value: 40-70% Dilution value: <300mm/year	Vulnerability: Medium Aquifer type: Secondary Thickness: <3m Patchiness value: >90% Recharge potential: No Data	Vulnerability: Unproductive Aquifer type: Unproductive Flow mechanism: Mixed
3	On site	Summary Classification: Secondary superficial aquifer - Medium Vulnerability Combined classification: Unproductive Bedrock Aquifer, Productive Superficial Aquifer	Leaching class: Low Infiltration value: 40-70% Dilution value: <300mm/year	Vulnerability: Medium Aquifer type: Secondary Thickness: <3m Patchiness value: <90% Recharge potential: No Data	Vulnerability: Unproductive Aquifer type: Unproductive Flow mechanism: Mixed
4	On site	Summary Classification: Secondary superficial aquifer - Medium Vulnerability Combined classification: Unproductive Bedrock Aquifer, Productive Superficial Aquifer	Leaching class: Low Infiltration value: 40-70% Dilution value: <300mm/year	Vulnerability: Medium Aquifer type: Secondary Thickness: <3m Patchiness value: <90% Recharge potential: No Data	Vulnerability: Unproductive Aquifer type: Unproductive Flow mechanism: Mixed
5	On site	Summary Classification: Secondary superficial aquifer - Medium Vulnerability Combined classification: Unproductive Bedrock Aquifer, Productive Superficial Aquifer	Leaching class: Low Infiltration value: 40-70% Dilution value: <300mm/year	Vulnerability: Medium Aquifer type: Secondary Thickness: <3m Patchiness value: >90% Recharge potential: No Data	Vulnerability: Unproductive Aquifer type: Unproductive Flow mechanism: Mixed
6	28m W	Summary Classification: Secondary superficial aquifer - Medium Vulnerability Combined classification: Unproductive Bedrock Aquifer, Productive Superficial Aquifer	Leaching class: Low Infiltration value: 40-70% Dilution value: <300mm/year	Vulnerability: Medium Aquifer type: Secondary Thickness: <3m Patchiness value: <90% Recharge potential: No Data	Vulnerability: Unproductive Aquifer type: Unproductive Flow mechanism: Mixed

ID	Location	Summary	Soil / surface	Superficial geology	Bedrock geology
7	49m W	Summary Classification: Secondary superficial aquifer - Medium Vulnerability Combined classification: Unproductive Bedrock Aquifer, Productive Superficial Aquifer	Leaching class: Low Infiltration value: 40-70% Dilution value: <300mm/year	Vulnerability: Medium Aquifer type: Secondary Thickness: <3m Patchiness value: >90% Recharge potential: No Data	Vulnerability: Unproductive Aquifer type: Unproductive Flow mechanism: Mixed

This data is sourced from the British Geological Survey, the Environment Agency and Natural Resources Wales.

5.4 Groundwater vulnerability- soluble rock risk

Records on site	0

This dataset identifies areas where solution features that enable rapid movement of a pollutant may be present within a 1km grid square.

This data is sourced from the British Geological Survey and the Environment Agency.

5.5 Groundwater vulnerability- local information

Records on site	0

This dataset identifies areas where additional local information affecting vulnerability is held by the Environment Agency. Further information can be obtained by contacting the Environment Agency local Area groundwater team through the Environment Agency National Customer Call Centre on 03798 506 506 or by email on enquiries@environment-agency.gov.uk.

This data is sourced from the British Geological Survey and the Environment Agency.

Abstractions and Source Protection Zones

5.6 Groundwater abstractions

Records within 2000m	0

Licensed groundwater abstractions for sites extracting more than 20 cubic metres of water a day and includes active and historical records. The data may be for a single abstraction point, between two points (line data) or a larger area.

This data is sourced from the Environment Agency and Natural Resources Wales.

5.7 Surface water abstractions

Records within 2000m	9

Licensed surface water abstractions for sites extracting more than 20 cubic metres of water a day and includes active and historical records. The data may be for a single abstraction point, a stretch of watercourse or a larger area.

Features are displayed on the Abstractions and Source Protection Zones map on **page 35**

ID	Location	Details	
A	810m NE	Status: Historical Licence No: 8/37/56/*S/0082 Details: Spray Irrigation - Direct Direct Source: SURFACE WATER SOURCE OF SUPPLY Point: TRIB. OF MARDYKE AT HERONGATE Data Type: Point Name: AMERICAN GOLF (UK) LTD Easting: 563800 Northing: 189900	Annual Volume (m^3): 18000 Max Daily Volume (m^3): 2280 Original Application No: - Original Start Date: 01/03/1995 Expiry Date: - Issue No: 101 Version Start Date: 20/11/1998 Version End Date: -
A	810m NE	Status: Active Licence No: 8/37/56/*S/0082 Details: Spray Irrigation - Storage Direct Source: SURFACE WATER SOURCE OF SUPPLY Point: TRIBUTARY OF MARDYKE AT HERONGATE Data Type: Point Name: First Golf Operations Limited Easting: 563800 Northing: 189900	Annual Volume (m^3): 18,000 Max Daily Volume (m^3): 2,280 Original Application No: - Original Start Date: 06/03/1995 Expiry Date: - Issue No: 104 Version Start Date: 27/02/2020 Version End Date: -
-	1114m S	Status: Active Licence No: 8/37/56/*S/0093/R01 Details: Spray Irrigation - Storage Direct Source: SURFACE WATER SOURCE OF SUPPLY Point: MARDYKE IN BARNARDS FARM Data Type: Point Name: Trustees of the Christabella Charitable Trust Easting: 563200 Northing: 187795	Annual Volume (m^3): 2,500 Max Daily Volume (m^3): 1,000 Original Application No: - Original Start Date: 19/12/2016 Expiry Date: 31/03/2028 Issue No: 1 Version Start Date: 19/12/2016 Version End Date: -
-	1119m S	Status: Historical Licence No: 8/37/56/*S/0093 Details: Spray Irrigation - Storage Direct Source: SURFACE WATER SOURCE OF SUPPLY Point: MARDYKE IN BARNARDS FARM Data Type: Point Name: THE CHRISTABELLA CHARITABLE TRUST Easting: 563200 Northing: 187790	Annual Volume (m^3): 4000 Max Daily Volume (m^3): 1000 Original Application No: - Original Start Date: 30/08/2002 Expiry Date: 30/11/2016 Issue No: 2 Version Start Date: 12/09/2014 Version End Date: -

ID	Location	Details	
-	1667m W	Status: Active Licence No: 8/37/56/*S/0051 Details: Spray Irrigation - Direct Direct Source: SURFACE WATER SOURCE OF SUPPLY Point: NORTH BRANCH OF THE MARDYKE Data Type: Line Name: Childerditch Farms Easting: 561400 Northing: 188700	Annual Volume (m^3): 394,550 Max Daily Volume (m^3): 3,734 Original Application No: - Original Start Date: 01/06/1972 Expiry Date: - Issue No: 101 Version Start Date: 12/09/2016 Version End Date: -
-	1667m W	Status: Active Licence No: 8/37/56/*S/0051 Details: Spray Irrigation - Direct Direct Source: SURFACE WATER SOURCE OF SUPPLY Point: TRIB N BRANCH OF THE MARDYKE Data Type: Line Name: Childerditch Farms Easting: 561300 Northing: 189100	Annual Volume (m^3): 394,550 Max Daily Volume (m^3): 3,734 Original Application No: - Original Start Date: 01/06/1972 Expiry Date: - Issue No: 101 Version Start Date: 12/09/2016 Version End Date: -
-	1800m W	Status: Active Licence No: 8/37/56/*S/0051 Details: Spray Irrigation - Direct Direct Source: SURFACE WATER SOURCE OF SUPPLY Point: NORTH BRANCH OF THE MARDYKE Data Type: Point Name: Childerditch Farms Easting: 561300 Northing: 188500	Annual Volume (m^3): 394,550 Max Daily Volume (m^3): 3,734 Original Application No: - Original Start Date: 01/06/1972 Expiry Date: - Issue No: 101 Version Start Date: 12/09/2016 Version End Date: -
-	1857m W	Status: Active Licence No: 8/37/56/*S/0051 Details: Spray Irrigation - Storage Direct Source: SURFACE WATER SOURCE OF SUPPLY Point: TRIB N BRANCH OF THE MARDYKE Data Type: Point Name: Childerditch Farms Easting: 561200 Northing: 189600	Annual Volume (m^3): 394,550 Max Daily Volume (m^3): 3,734 Original Application No: - Original Start Date: 01/06/1972 Expiry Date: - Issue No: 101 Version Start Date: 12/09/2016 Version End Date: -
-	1921m W	Status: Active Licence No: 8/37/56/*S/0051 Details: Spray Irrigation - Storage Direct Source: SURFACE WATER SOURCE OF SUPPLY Point: NORTH BRANCH OF THE MARDYKE Data Type: Point Name: Childerditch Farms Easting: 561200 Northing: 188400	Annual Volume (m^3): 394,550 Max Daily Volume (m^3): 3,734 Original Application No: - Original Start Date: 01/06/1972 Expiry Date: - Issue No: 101 Version Start Date: 12/09/2016 Version End Date: -

This data is sourced from the Environment Agency and Natural Resources Wales.

5.8 Potable abstractions

Records within 2000m	0

Licensed potable water abstractions for sites extracting more than 20 cubic metres of water a day and includes active and historical records. The data may be for a single abstraction point, a stretch of watercourse or a larger area.

This data is sourced from the Environment Agency and Natural Resources Wales.

5.9 Source Protection Zones

Records within 500m	1

Source Protection Zones define the sensitivity of an area around a potable abstraction site to contamination.

Features are displayed on the Abstractions and Source Protection Zones map on **page 35**

ID	Location	Type	Description
1	469m SE	3	Total catchment

This data is sourced from the Environment Agency and Natural Resources Wales.

5.10 Source Protection Zones (confined aquifer)

Records within 500m	0

Source Protection Zones in the confined aquifer define the sensitivity around a deep groundwater abstraction to contamination. A confined aquifer would normally be protected from contamination by overlying geology and is only considered a sensitive resource if deep excavation/drilling is taking place.

This data is sourced from the Environment Agency and Natural Resources Wales.

6 Hydrology

Site Outline

Search buffers in metres (m)

Water Network (OS MasterMap)

Surface water features (wider than 5m)

Surface water features (narrower than 5m)

WFD River, canal and surface water transfer water bodies

WFD Lake water bodies

WFD Transitional and coastal water bodies

WFD Surface water body catchments boundaries

WFD Groundwater body boundaries

6.1 Water Network (OS MasterMap)

Records within 250m	8

Detailed water network of Great Britain showing the flow and precise central course of every river, stream, lake and canal.

Features are displayed on the Hydrology map on **page 39**

ID	Location	Type of water feature	Ground level	Permanence	Name
A	On site	Inland river not influenced by normal tidal action.	On ground surface	Watercourse contains water year round (in normal circumstances)	-

ID	Location	Type of water feature	Ground level	Permanence	Name
B	**On site**	**Inland river not influenced by normal tidal action.**	**On ground surface**	**Watercourse contains water year round (in normal circumstances)**	**-**
C	5m W	Inland river not influenced by normal tidal action.	On ground surface	Watercourse contains water year round (in normal circumstances)	-
D	34m NE	Inland river not influenced by normal tidal action.	On ground surface	Watercourse contains water year round (in normal circumstances)	-
E	44m N	Inland river not influenced by normal tidal action.	On ground surface	Watercourse contains water year round (in normal circumstances)	-
E	49m N	Inland river not influenced by normal tidal action.	Underground	Watercourse contains water year round (in normal circumstances)	-
F	53m N	Inland river not influenced by normal tidal action.	On ground surface	Watercourse contains water year round (in normal circumstances)	-
G	248m W	Inland river not influenced by normal tidal action.	On ground surface	Watercourse contains water year round (in normal circumstances)	-

This data is sourced from the Ordnance Survey.

6.2 Surface water features

Records within 250m	6

Covering rivers, streams and lakes (some overlap with OS MasterMap Water Network data in previous section) but additionally covers smaller features such as ponds. Rivers and streams narrower than 5m are represented as a single line. Lakes, ponds and rivers or streams wider than 5m are represented as polygons.

Features are displayed on the Hydrology map on **page 39**

This data is sourced from the Ordnance Survey.

6.3 WFD Surface water body catchments

Records on site	1

The Water Framework Directive is an EU-led framework for the protection of inland surface waters, estuaries, coastal waters and groundwater through river basin-level management planning. In terms of surface water, these basins are broken down into smaller units known as management, operational and water body catchments.

Features are displayed on the Hydrology map on **page 39**

ID	Location	Type	Water body catchment	Water body ID	Operational catchment	Management catchment
A	**On site**	**River WB catchment**	**Mardyke (East Tributary)**	**GB106037028070**	**Mardyke**	**South Essex**

This data is sourced from the Environment Agency and Natural Resources Wales.

6.4 WFD Surface water bodies

Records identified	**1**

Surface water bodies under the Directive may be rivers, lakes, estuary or coastal. To achieve the purpose of the Directive, environmental objectives have been set and are reported on for each water body. The progress towards delivery of the objectives is then reported on by the relevant competent authorities at the end of each six-year cycle. The river water body directly associated with the catchment listed in the previous section is detailed below, along with any lake, canal, coastal or artificial water body within 250m of the site. Click on the water body ID in the table to visit the EA Catchment Explorer to find out more about each water body listed.

Features are displayed on the Hydrology map on **page 39**

ID	Location	Type	Name	Water body ID	Overall rating	Chemical rating	Ecological rating	Year
-	555m SE	River	Mardyke (East Tributary)	GB106037028070	Moderate	Good	Moderate	2016

This data is sourced from the Environment Agency and Natural Resources Wales.

6.5 WFD Groundwater bodies

Records on site	**1**

Groundwater bodies are also covered by the Directive and the same regime of objectives and reporting detailed in the previous section is in place. Click on the water body ID in the table to visit the EA Catchment Explorer to find out more about each groundwater body listed.

Features are displayed on the Hydrology map on **page 39**

ID	Location	Name	Water body ID	Overall rating	Chemical rating	Quantitative	Year
1	**On site**	**Essex Gravels**	**GB40503G000400**	**Poor**	**Poor**	**Good**	**2015**

This data is sourced from the Environment Agency and Natural Resources Wales.

7 River and coastal flooding

7.1 Risk of Flooding from Rivers and Sea (RoFRaS)

Records within 50m	0

The chance of flooding from rivers and/or the sea in any given year, based on cells of 50m. Each cell is allocated one of four flood risk categories, taking into account flood defences and their condition; Very low (less than 1 in 1000 chance in any given year), Low (less than 1 in 100 but greater than or equal to 1 in 1000 chance), Medium (less than 1 in 30 but greater than or equal to 1 in 100 chance) or High (greater than or equal to 1 in 30 chance).

This data is sourced from the Environment Agency and Natural Resources Wales.

7.2 Historical Flood Events

Records within 250m	0

Records of historic flooding from rivers, the sea, groundwater and surface water. Records began in 1946 when predecessor bodies started collecting detailed information about flooding incidents, although limited details may be included on flooding incidents prior to this date. Takes into account the presence of defences, structures, and other infrastructure where they existed at the time of flooding, and includes flood extents that may have been affected by overtopping, breaches or blockages.

This data is sourced from the Environment Agency and Natural Resources Wales.

7.3 Flood Defences

Records within 250m	0

Records of flood defences owned, managed or inspected by the Environment Agency and Natural Resources Wales. Flood defences can be structures, buildings or parts of buildings. Typically these are earth banks, stone and concrete walls, or sheet-piling that is used to prevent or control the extent of flooding.

This data is sourced from the Environment Agency and Natural Resources Wales.

7.4 Areas Benefiting from Flood Defences

Records within 250m	0

Areas that would benefit from the presence of flood defences in a 1 in 100 (1%) chance of flooding each year from rivers or 1 in 200 (0.5%) chance of flooding each year from the sea.

This data is sourced from the Environment Agency and Natural Resources Wales.

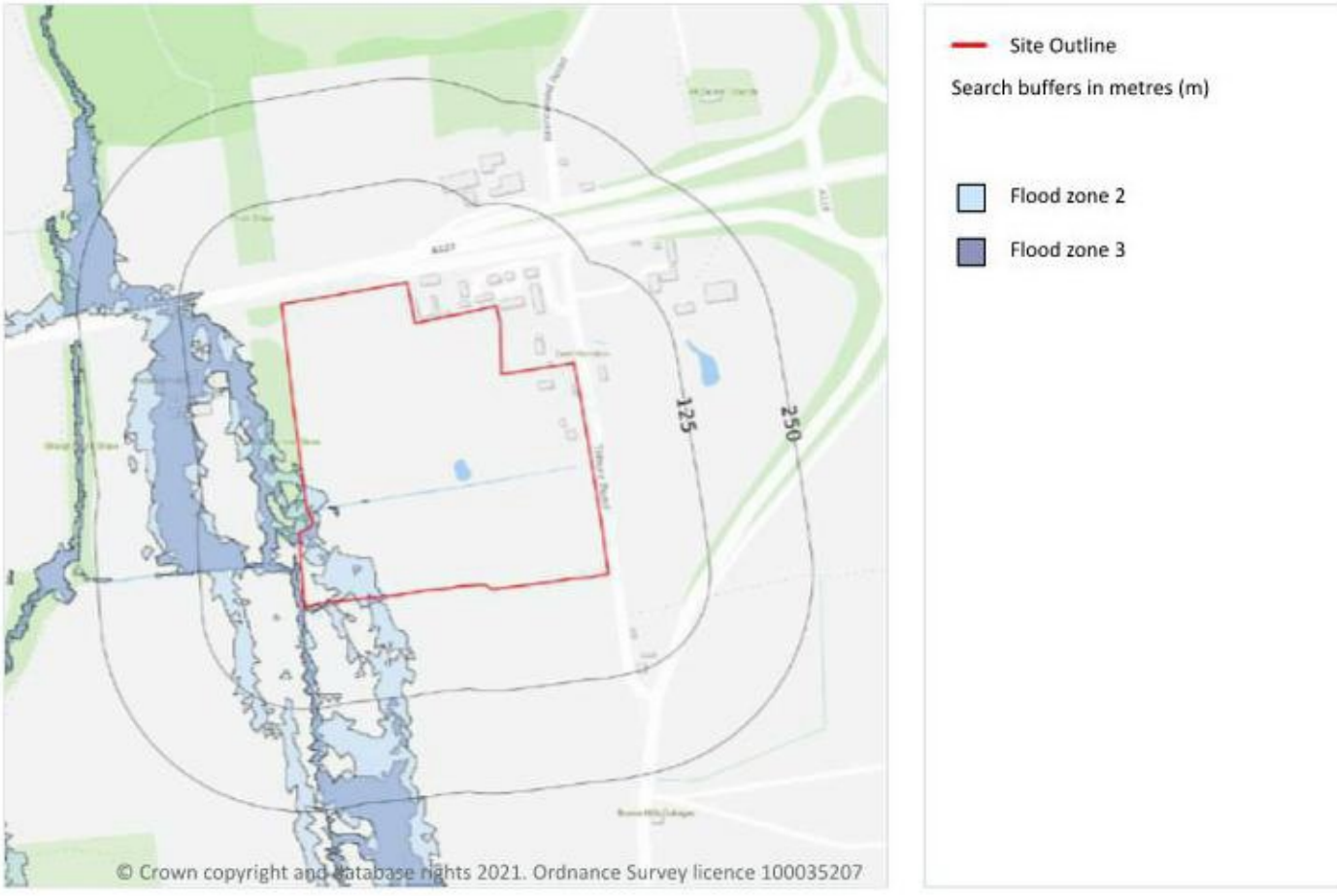
7.5 Flood Storage Areas

Records within 250m	0

Areas that act as a balancing reservoir, storage basin or balancing pond to attenuate an incoming flood peak to a flow level that can be accepted by the downstream channel or to delay the timing of a flood peak so that its volume is discharged over a longer period.

This data is sourced from the Environment Agency and Natural Resources Wales.

River and coastal flooding - Flood Zones



7.6 Flood Zone 2

Records within 50m	1

Areas of land at risk of flooding, when the presence of flood defences are ignored. Covering land between Flood Zone 3 (see next section) and the extent of the flooding from rivers or the sea with a 1 in 1000 (0.1%) chance of flooding each year.

Features are displayed on the River and coastal flooding map on **page 42**

Location	Type
On site	**Zone 2 - (Fluvial /Tidal Models)**

This data is sourced from the Environment Agency and Natural Resources Wales.

7.7 Flood Zone 3

Records within 50m	1

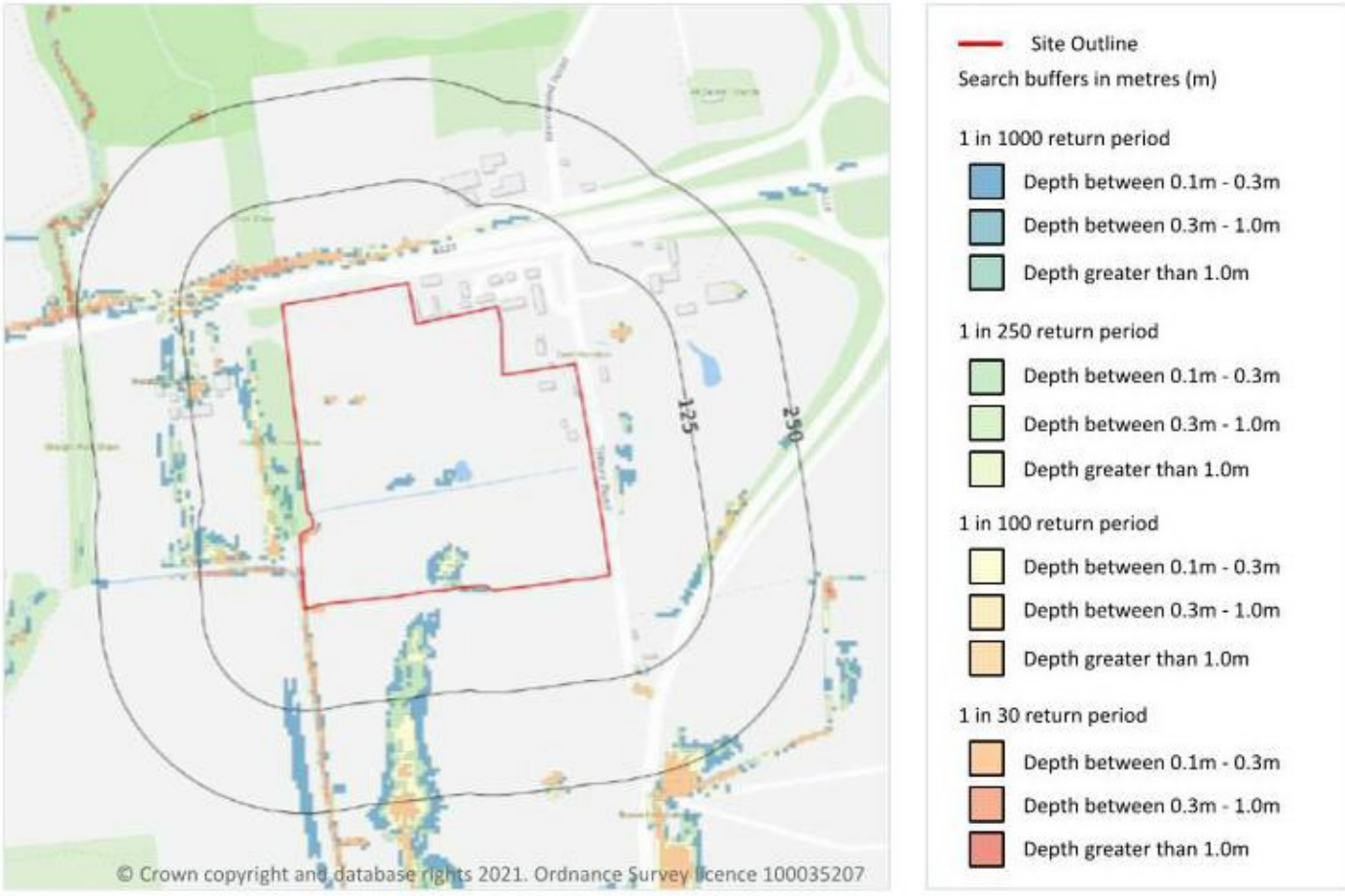
Areas of land at risk of flooding, when the presence of flood defences are ignored. Covering land with a 1 in 100 (1%) or greater chance of flooding each year from rivers or a 1 in 200 (0.5%) or greater chance of flooding each year from the sea.

Features are displayed on the River and coastal flooding map on **page 42**

Location	Type
On site	**Zone 3 - (Fluvial Models)**

This data is sourced from the Environment Agency and Natural Resources Wales.

8 Surface water flooding



8.1 Surface water flooding

Highest risk on site	**1 in 30 year, 0.3m - 1.0m**
Highest risk within 50m	**1 in 30 year, 0.3m - 1.0m**

Ambiental Risk Analytics surface water (pluvial) FloodMap identifies areas likely to flood as a result of extreme rainfall events, i.e. land naturally vulnerable to surface water ponding or flooding. This data set was produced by simulating 1 in 30 year, 1 in 100 year, 1 in 250 year and 1 in 1,000 year rainfall events. Modern urban drainage systems are typically built to cope with rainfall events between 1 in 20 and 1 in 30 years, though some older ones may flood in a 1 in 5 year rainfall event.

Features are displayed on the Surface water flooding map on **page 46**

The data shown on the map and in the table above shows the highest likelihood of flood events happening at the site. Lower likelihood events may have greater flood depths and hence a greater potential impact on

a site. The table below shows the maximum flood depths for a range of return periods for the site.

Return period	Maximum modelled depth
1 in 1000 year	Between 0.3m and 1.0m
1 in 250 year	Between 0.3m and 1.0m
1 in 100 year	Between 0.3m and 1.0m
1 in 30 year	Between 0.3m and 1.0m

This data is sourced from Ambiental Risk Analytics.

9 Groundwater flooding

9.1 Groundwater flooding

Highest risk on site	**Low**
Highest risk within 50m	**Low**

Groundwater flooding is caused by unusually high groundwater levels. It occurs when the water table rises above the ground surface or within underground structures such as basements or cellars. Groundwater flooding tends to exhibit a longer duration than surface water flooding, possibly lasting for weeks or months, and as a result it can cause significant damage to property. This risk assessment is based on a 1 in 100 year return period and a 5m Digital Terrain Model (DTM).

Features are displayed on the Groundwater flooding map on **page 48**

This data is sourced from Ambiental Risk Analytics.

10 Environmental designations

10.1 Sites of Special Scientific Interest (SSSI)

Records within 2000m	2

Sites providing statutory protection for the best examples of UK flora, fauna, or geological or physiographical features. Originally notified under the National Parks and Access to the Countryside Act 1949, SSSIs were re-notified under the Wildlife and Countryside Act 1981. Improved provisions for the protection and management of SSSIs were introduced by the Countryside and Rights of Way Act 2000 (in England and Wales) and (in Scotland) by the Nature Conservation (Scotland) Act 2004 and the Wildlife and Natural Environment (Scotland) Act 2010.

Features are displayed on the Environmental designations map on **page 49**

ID	Location	Name	Data source
5	223m N	Thorndon Park	Natural England

ID	Location	Name	Data source
-	1925m NW	Thorndon Park	Natural England

This data is sourced from Natural England, Natural Resources Wales and Scottish Natural Heritage.

10.2 Conserved wetland sites (Ramsar sites)

Records within 2000m	0

Ramsar sites are designated under the Convention on Wetlands of International Importance, agreed in Ramsar, Iran, in 1971. They cover all aspects of wetland conservation and wise use, recognizing wetlands as ecosystems that are extremely important for biodiversity conservation in general and for the well-being of human communities. These sites cover a broad definition of wetland; marsh, fen, peatland or water, whether natural or artificial, permanent or temporary, with water that is static or flowing, fresh, brackish or salt, and even some marine areas.

This data is sourced from Natural England, Natural Resources Wales and Scottish Natural Heritage.

10.3 Special Areas of Conservation (SAC)

Records within 2000m	0

Areas which have been identified as best representing the range and variety within the European Union of habitats and (non-bird) species listed on Annexes I and II to the Directive. SACs are designated under the EC Habitats Directive.

This data is sourced from Natural England, Natural Resources Wales and Scottish Natural Heritage.

10.4 Special Protection Areas (SPA)

Records within 2000m	0

Sites classified by the UK Government under the EC Birds Directive, SPAs are areas of the most important habitat for rare (listed on Annex I to the Directive) and migratory birds within the European Union.

This data is sourced from Natural England, Natural Resources Wales and Scottish Natural Heritage.

10.5 National Nature Reserves (NNR)

Records within 2000m	0

Sites containing examples of some of the most important natural and semi-natural terrestrial and coastal ecosystems in Great Britain. They are managed to conserve their habitats, provide special opportunities for scientific study or to provide public recreation compatible with natural heritage interests.

This data is sourced from Natural England, Natural Resources Wales and Scottish Natural Heritage.

10.6 Local Nature Reserves (LNR)

Records within 2000m	0

Sites managed for nature conservation, and to provide opportunities for research and education, or simply enjoying and having contact with nature. They are declared by local authorities under the National Parks and Access to the Countryside Act 1949 after consultation with the relevant statutory nature conservation agency.

This data is sourced from Natural England, Natural Resources Wales and Scottish Natural Heritage.

10.7 Designated Ancient Woodland

Records within 2000m	12

Ancient woodlands are classified as areas which have been wooded continuously since at least 1600 AD. This includes semi-natural woodland and plantations on ancient woodland sites. 'Wooded continuously' does not mean there is or has previously been continuous tree cover across the whole site, and not all trees within the woodland have to be old.

Features are displayed on the Environmental designations map on **page 49**

ID	Location	Name	Woodland Type
1	**On site**	**Unknown**	**Ancient & Semi-Natural Woodland**
2	**On site**	**Unknown**	**Ancient & Semi-Natural Woodland**
4	44m N	Mill Wood	Ancient & Semi-Natural Woodland
6	242m W	Round Shaw	Ancient & Semi-Natural Woodland
7	242m W	Unknown	Ancient & Semi-Natural Woodland
8	748m E	Unknown	Ancient & Semi-Natural Woodland
10	1097m NE	Eastlands Spring	Ancient & Semi-Natural Woodland
11	1223m N	Barn Wood	Ancient & Semi-Natural Woodland
12	1301m NE	Barn Wood	Ancient & Semi-Natural Woodland
13	1400m E	Friern Manor Wood	Ancient & Semi-Natural Woodland
14	1667m NE	Unknown	Ancient & Semi-Natural Woodland
-	1925m NW	The Forest	Ancient & Semi-Natural Woodland

This data is sourced from Natural England, Natural Resources Wales and Scottish Natural Heritage.

10.8 Biosphere Reserves

Records within 2000m	0

Biosphere Reserves are internationally recognised by UNESCO as sites of excellence to balance conservation and socioeconomic development between nature and people. They are recognised under the Man and the Biosphere (MAB) Programme with the aim of promoting sustainable development founded on the work of the local community.

This data is sourced from Natural England, Natural Resources Wales and Scottish Natural Heritage.

10.9 Forest Parks

Records within 2000m	0

These are areas managed by the Forestry Commission designated on the basis of recreational, conservation or scenic interest.

This data is sourced from the Forestry Commission.

10.10 Marine Conservation Zones

Records within 2000m	0

A type of marine nature reserve in UK waters established under the Marine and Coastal Access Act (2009). They are designated with the aim to protect nationally important, rare or threatened habitats and species.

This data is sourced from Natural England, Natural Resources Wales and Scottish Natural Heritage.

10.11 Green Belt

Records within 2000m	3

Areas designated to prevent urban sprawl by keeping land permanently open.

Features are displayed on the Environmental designations map on **page 49**

ID	Location	Name	Local Authority name
3	**On site**	**London**	**Brentwood**
9	887m S	London	Thurrock
-	1788m E	London	Basildon

This data is sourced from the Ministry of Housing, Communities and Local Government.

10.12 Proposed Ramsar sites

Records within 2000m	0

Ramsar sites are areas listed as a Wetland of International Importance under the Convention on Wetlands of International Importance especially as Waterfowl Habitat (the Ramsar Convention) 1971. The sites here supplied have a status of 'Proposed' having been identified for potential adoption under the framework.

This data is sourced from Natural England.

10.13 Possible Special Areas of Conservation (pSAC)

Records within 2000m	0

Special Areas of Conservation are areas which have been identified as best representing the range and variety within the European Union of habitats and (non-bird) species listed on Annexes I and II to the Directive. SACs are designated under the EC Habitats Directive. Those sites supplied here are those with a status of 'Possible' having been identified for potential adoption under the framework.

This data is sourced from Natural England and Natural Resources Wales.

10.14 Potential Special Protection Areas (pSPA)

Records within 2000m	0

Special Protection Areas (SPAs) are areas designated (or 'classified') under the European Union Wild Birds Directive for the protection of nationally and internationally important populations of wild birds. Those sites supplied here are those with a status of 'Potential' having been identified for potential adoption under the framework.

This data is sourced from Natural England.

10.15 Nitrate Sensitive Areas

Records within 2000m	0

Areas where nitrate concentrations in drinking water sources exceeded or was at risk of exceeding the limit of 50 mg/l set by the 1980 EC Drinking Water Directive. Voluntary agricultural measures as a means of reducing the levels of nitrate were introduced by DEFRA as MAFF, with payments being made to farmers who complied. The scheme was started as a pilot in 1990 in ten areas, later implemented within 32 areas. The scheme was closed to further new entrants in 1998, although existing agreements continued for their full term. All Nitrate Sensitive Areas fell within the areas designated as Nitrate Vulnerable Zones (NVZs) in 1996 under the EC Nitrate Directive (91/676/EEC).

This data is sourced from Natural England.

10.16 Nitrate Vulnerable Zones

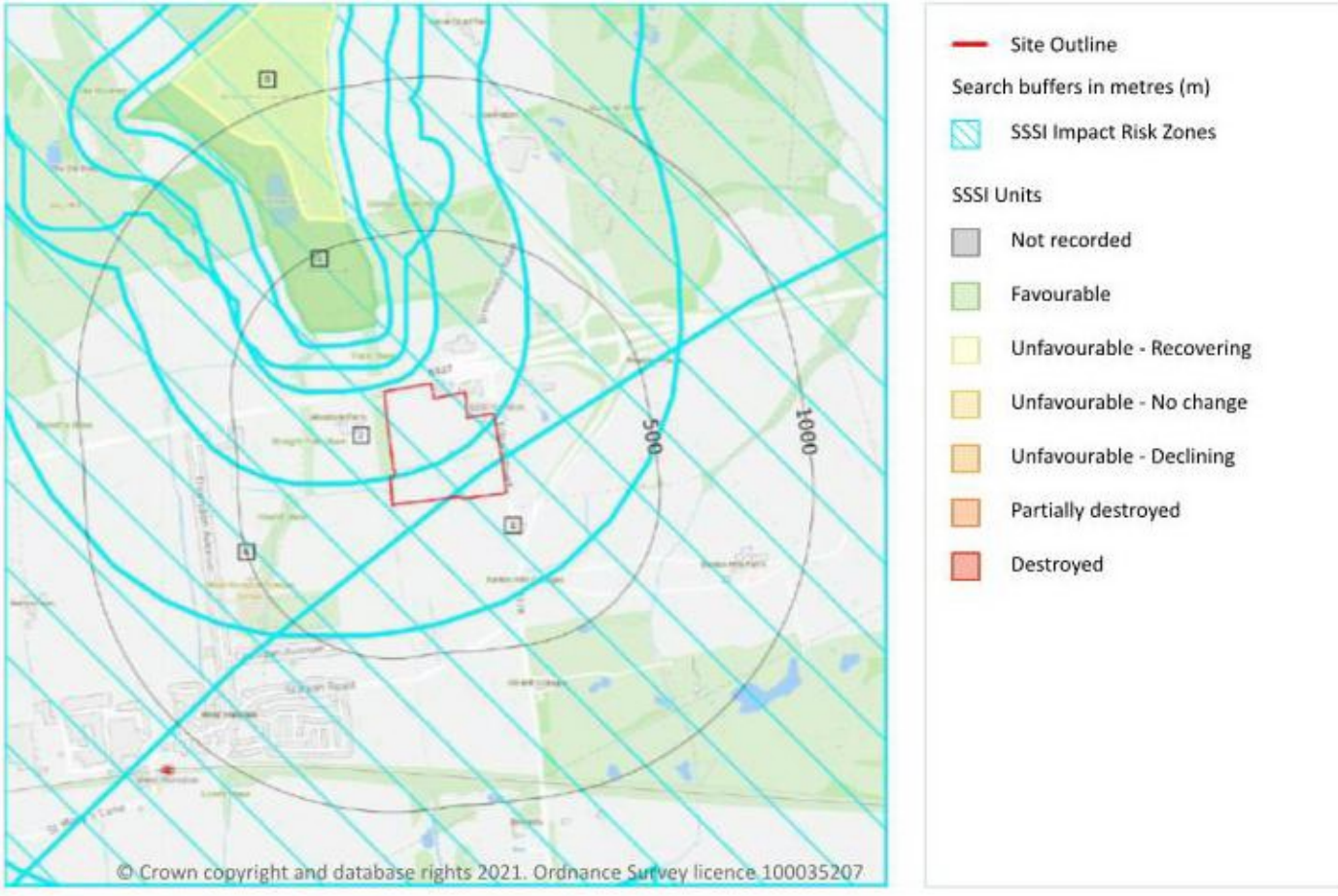
Records within 2000m	4

Areas at risk from agricultural nitrate pollution designated under the EC Nitrate Directive (91/676/EEC). These are areas of land that drain into waters polluted by nitrates. Farmers operating within these areas have to follow mandatory rules to tackle nitrate loss from agriculture.

Location	Name	Type	NVZ ID	Status
On site	**Mardyke NVZ**	**Surface Water**	**S442**	**Existing**
664m SE	Mardyke NVZ	Surface Water	S442	Existing
1815m N	River Chelmer NVZ	Surface Water	S428	Existing
1978m E	Crouch NVZ	Surface Water	S425	Existing

This data is sourced from Natural England and Natural Resources Wales.

SSSI Impact Zones and Units



10.17 SSSI Impact Risk Zones

Records on site	3

Developed to allow rapid initial assessment of the potential risks to SSSIs posed by development proposals. They define zones around each SSSI which reflect the particular sensitivities of the features for which it is notified and indicate the types of development proposal which could potentially have adverse impacts.

Features are displayed on the SSSI Impact Zones and Units map on **page 55**

ID	Location	Type of developments requiring consultation
1	On site	Infrastructure - Pipelines, pylons and overhead cables. Any transport proposal including road, rail and by water (excluding routine maintenance). Airports, helipads and other aviation proposals Minerals, Oil and Gas - Planning applications for quarries, including: new proposals, Review of Minerals Permissions (ROMP), extensions, variations to conditions etc. Oil & gas exploration/extraction. Residential - Residential development of 100 units or more. Rural residential - Any residential development of 50 or more houses outside existing settlements/urban areas. Air pollution - Any industrial/agricultural development that could cause AIR POLLUTION (incl: industrial processes, livestock & poultry units with floorspace > 500m², slurry lagoons > 200m² & manure stores > 250t). Combustion - General combustion processes >20MW energy input. Incl: energy from waste incineration, other incineration, landfill gas generation plant, pyrolysis/gasification, anaerobic digestion, sewage treatment works, other incineration/ combustion Waste - Landfill. Incl: inert landfill, non-hazardous landfill, hazardous landfill. Composting - Any composting proposal with more than 500 tonnes maximum annual operational throughput. Incl: open windrow composting, in-vessel composting, anaerobic digestion, other waste management. Discharges - Any discharge of water or liquid waste of more than 20m³/day to ground (ie to seep away) or to surface water, such as a beck or stream (NB This does not include discharges to mains sewer which are unlikely to pose a risk at this location) Water supply - Large infrastructure such as warehousing / industry where net additional gross internal floorspace is > 1,000m² or any development needing its own water supply
2	On site	Infrastructure - Pipelines, pylons and overhead cables. Any transport proposal including road, rail and by water (excluding routine maintenance). Airports, helipads and other aviation proposals Minerals, Oil and Gas - Planning applications for quarries, including: new proposals, Review of Minerals Permissions (ROMP), extensions, variations to conditions etc. Oil & gas exploration/extraction. Residential - Residential development of 100 units or more. Rural residential - Any residential development of 50 or more houses outside existing settlements/urban areas. Air pollution - Any development that could cause AIR POLLUTION (incl: industrial/commercial processes, livestock & poultry units, slurry lagoons/manure stores). Combustion - All general combustion processes. Incl: energy from waste incineration, other incineration, landfill gas generation plant, pyrolysis/gasification, anaerobic digestion, sewage treatment works, other incineration/ combustion. Waste - Mechanical and biological waste treatment, inert landfill, non-hazardous landfill, hazardous landfill, household civic amenity recycling facilities construction, demolition and excavation waste, other waste management Composting - Any composting proposal. Incl: open windrow composting, in-vessel composting, anaerobic digestion, other waste management. Water supply - Large infrastructure such as warehousing / industry where net additional gross internal floorspace is > 1,000m² or any development needing its own water supply

ID	Location	Type of developments requiring consultation
A	On site	**Infrastructure - Pipelines, pylons and overhead cables. Any transport proposal including road, rail and by water (excluding routine maintenance). Airports, helipads and other aviation proposals Minerals, Oil and Gas - Planning applications for quarries, including: new proposals, Review of Minerals Permissions (ROMP), extensions, variations to conditions etc. Oil & gas exploration/extraction. Residential - Residential development of 100 units or more. Rural residential - Any residential development of 50 or more houses outside existing settlements/urban areas. Air pollution - Any industrial/agricultural development that could cause AIR POLLUTION (incl: industrial processes, livestock & poultry units with floorspace > 500m², slurry lagoons > 200m² & manure stores > 250t). Combustion - General combustion processes >20MW energy input. Incl: energy from waste incineration, other incineration, landfill gas generation plant, pyrolysis/gasification, anaerobic digestion, sewage treatment works, other incineration/ combustion Waste - Landfill. Incl: inert landfill, non-hazardous landfill, hazardous landfill. Composting - Any composting proposal with more than 500 tonnes maximum annual operational throughput. Incl: open windrow composting, in-vessel composting, anaerobic digestion, other waste management. Water supply - Large infrastructure such as warehousing / industry where net additional gross internal floorspace is > 1,000m² or any development needing its own water supply**

This data is sourced from Natural England.

10.18 SSSI Units

Records within 2000m	3

Divisions of SSSIs used to record management and condition details. Units are the smallest areas for which Natural England gives a condition assessment, however, the size of units varies greatly depending on the types of management and the conservation interest.

Features are displayed on the SSSI Impact Zones and Units map on **page 55**

ID: 3
Location: 223m N
SSSI name: Thorndon Park
Unit name: 12
Broad habitat: Broadleaved, Mixed And Yew Woodland - Lowland
Condition: Favourable
Reportable features:

Feature name	Feature condition	Date of assessment
Invert. assemblage A1 arboreal canopy	Favourable	23/04/2009
Invert. assemblage A2 wood decay	Favourable	23/04/2009
Lowland mixed deciduous woodland	Favourable	23/04/2009

ID: 8
Location: 573m N
SSSI name: Thorndon Park
Unit name: Menagerie
Broad habitat: Broadleaved, Mixed And Yew Woodland - Lowland
Condition: Unfavourable - Recovering
Reportable features:

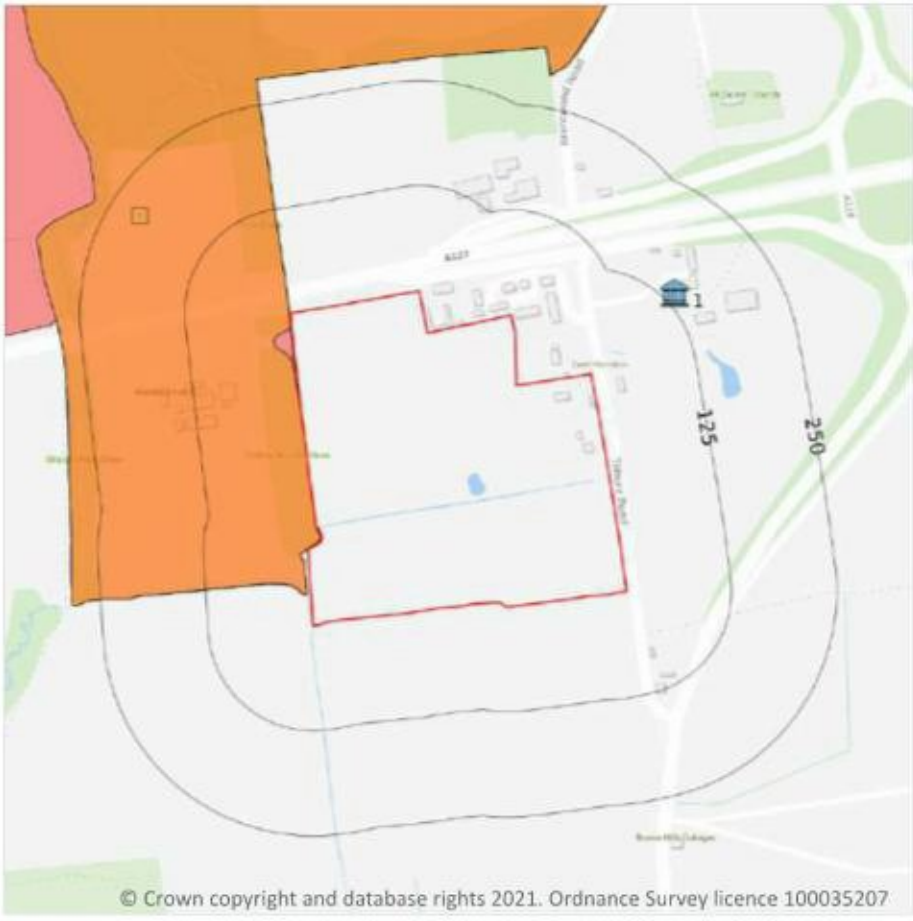
Feature name	Feature condition	Date of assessment
Invert. assemblage A1 arboreal canopy	Not Recorded	01/01/1900
Invert. assemblage A2 wood decay	Not Recorded	01/01/1900
Lowland mixed deciduous woodland	Not Recorded	01/01/1900

ID: -
Location: 1925m NW
SSSI name: Thorndon Park
Unit name: 10
Broad habitat: Broadleaved, Mixed And Yew Woodland - Lowland
Condition: Unfavourable - Recovering
Reportable features:

Feature name	Feature condition	Date of assessment
Invert. assemblage A1 arboreal canopy	Unfavourable - Recovering	15/04/2010
Invert. assemblage A2 wood decay	Unfavourable - Recovering	15/04/2010
Lowland mixed deciduous woodland	Unfavourable - Recovering	15/04/2010

This data is sourced from Natural England and Natural Resources Wales.

11 Visual and cultural designations



Site Outline

Search buffers in metres (m)

Listed buildings

Conservation areas

Conservation areas - no data

National Parks

Areas of Outstanding Natural Beauty

Registered parks and gardens

Scheduled Monuments

World Heritage Sites

11.1 World Heritage Sites

Records within 250m	0

Sites designated for their globally important cultural or natural interest requiring appropriate management and protection measures. World Heritage Sites are designated to meet the UK's commitments under the World Heritage Convention.

This data is sourced from Historic England, Cadw and Historic Environment Scotland.

11.2 Area of Outstanding Natural Beauty

Records within 250m	0

Areas of Outstanding Natural Beauty (AONB) are conservation areas, chosen because they represent 18% of the finest countryside. Each AONB has been designated for special attention because of the quality of their flora, fauna, historical and cultural associations, and/or scenic views. The National Parks and Access to the Countryside Act of 1949 created AONBs and the Countryside and Rights of Way Act, 2000 added further regulation and protection. There are likely to be restrictions to some developments within these areas.

This data is sourced from Natural England, Natural Resources Wales and Scottish Natural Heritage.

11.3 National Parks

Records within 250m	0

In England and Wales, the purpose of National Parks is to conserve and enhance landscapes within the countryside whilst promoting public enjoyment of them and having regard for the social and economic well-being of those living within them. In Scotland National Parks have the additional purpose of promoting the sustainable use of the natural resources of the area and the sustainable social and economic development of its communities. The National Parks and Access to the Countryside Act 1949 established the National Park designation in England and Wales, and The National Parks (Scotland) Act 2000 in Scotland.

This data is sourced from Natural England, Natural Resources Wales and the Scottish Government.

11.4 Listed Buildings

Records within 250m	1

Buildings listed for their special architectural or historical interest. Building control in the form of 'listed building consent' is required in order to make any changes to that building which might affect its special interest. Listed buildings are graded to indicate their relative importance, however building controls apply to all buildings equally, irrespective of their grade, and apply to the interior and exterior of the building in its entirety, together with any curtilage structures.

Features are displayed on the Visual and cultural designations map on **page 59**

ID	Location	Name	Grade	Reference Number	Listed date
1	138m NE	East Horndon Hall, West Horndon, Brentwood, Essex, CM13	II	1197257	20/08/1975

This data is sourced from English Heritage, Cadw and Historic Environment Scotland.

11.5 Conservation Areas

Records within 250m	1

Local planning authorities are obliged to designate as conservation areas any parts of their own area that are of special architectural or historic interest, the character and appearance of which it is desirable to preserve or enhance. Designation of a conservation area gives broader protection than the listing of individual buildings. All the features within the area, listed or otherwise, are recognised as part of its character. Conservation area designation is the means of recognising the importance of all factors and of ensuring that planning decisions address the quality of the landscape in its broadest sense.

Features are displayed on the Visual and cultural designations map on **page 59**

ID	Location	Name	District	Date of designation
A	**On site**	**Thorndon Park**	**Brentwood**	**22/07/1993**

This data is sourced from English Heritage, Cadw and Historic Environment Scotland.

11.6 Scheduled Ancient Monuments

Records within 250m	0

A scheduled monument is an historic building or site that is included in the Schedule of Monuments kept by the Secretary of State for Digital, Culture, Media and Sport. The regime is set out in the Ancient Monuments and Archaeological Areas Act 1979. The Schedule of Monuments has c.20,000 entries and includes sites such as Roman remains, burial mounds, castles, bridges, earthworks, the remains of deserted villages and industrial sites. Monuments are not graded, but all are, by definition, considered to be of national importance.

This data is sourced from English Heritage, Cadw and Historic Environment Scotland.

11.7 Registered Parks and Gardens

Records within 250m	1

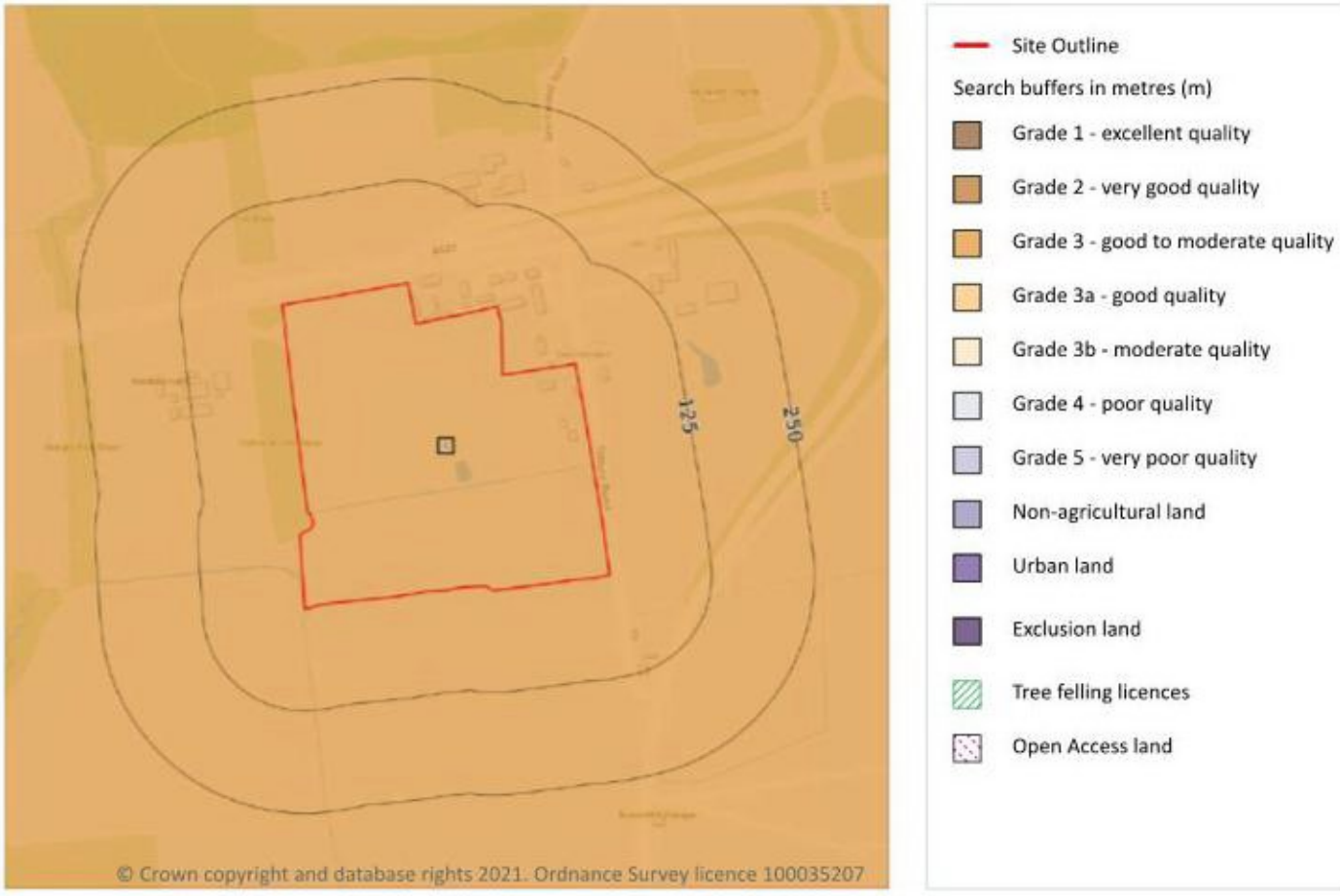
Parks and gardens assessed to be of particular interest and of special historic interest. The emphasis being on 'designed' landscapes, rather than on planting or botanical importance. Registration is a 'material consideration' in the planning process, meaning that planning authorities must consider the impact of any proposed development on the special character of the landscape.

Features are displayed on the Visual and cultural designations map on **page 59**

ID	Location	Name	Grade
A	**On site**	**Thorndon Hall**	**II***

This data is sourced from English Heritage, Cadw and Historic Environment Scotland.

12 Agricultural designations



12.1 Agricultural Land Classification

Records within 250m	1

Classification of the quality of agricultural land taking into consideration multiple factors including climate, physical geography and soil properties. It should be noted that the categories for the grading of agricultural land are not consistent across England, Wales and Scotland.

Features are displayed on the Agricultural designations map on **page 62**

ID	Location	Classification	Description
1	On site	Grade 3	**Good to moderate quality agricultural land. Land with moderate limitations which affect the choice of crops, timing and type of cultivation, harvesting or the level of yield. Where more demanding crops are grown yields are generally lower or more variable than on land in Grades 1 and 2.**

This data is sourced from Natural England.

12.2 Open Access Land

Records within 250m	0

The Countryside and Rights of Way Act 2000 (CROW Act) gives a public right of access to land without having to use paths. Access land includes mountains, moors, heaths and downs that are privately owned. It also includes common land registered with the local council and some land around the England Coast Path. Generally permitted activities on access land are walking, running, watching wildlife and climbing.

This data is sourced from Natural England and Natural Resources Wales.

12.3 Tree Felling Licences

Records within 250m	0

Felling Licence Application (FLA) areas approved by Forestry Commission England. Anyone wishing to fell trees must ensure that a licence or permission under a grant scheme has been issued by the Forestry Commission before any felling is carried out or that one of the exceptions apply.

This data is sourced from the Forestry Commission.

12.4 Environmental Stewardship Schemes

Records within 250m	2

Environmental Stewardship covers a range of schemes that provide financial incentives to farmers, foresters and land managers to look after and improve the environment.

Location	Reference	Scheme	Start Date	End date
193m NE	AG00300104	Higher Level Stewardship	01/02/2010	31/01/2021
224m N	AG00300104	Higher Level Stewardship	01/02/2010	31/01/2021

This data is sourced from Natural England.

12.5 Countryside Stewardship Schemes

Records within 250m	0

Countryside Stewardship covers a range of schemes that provide financial incentives to farmers, foresters and land managers to look after and improve the environment. Main objectives are to improve the farmed environment for wildlife and to reduce diffuse water pollution.

This data is sourced from Natural England.

13 Habitat designations

Site Outline

Search buffers in metres (m)

Priority Habitat Inventory
Open Mosaic Habitat
Limestone Pavement Orders

Habitat Networks
Primary Habitat
Restorable Habitat
Associated Habitats
Habitat Restoration-Creation
Network Enhancement Zone 1
Network Enhancement Zone 2

13.1 Priority Habitat Inventory

Records within 250m	8

Habitats of principal importance as named under Natural Environment and Rural Communities Act (2006) Section 41.

Features are displayed on the Habitat designations map on **page 64**

ID	Location	Main Habitat	Other habitats
1	**On site**	**Deciduous woodland**	**Main habitat: DWOOD (INV > 50%)**
2	**On site**	**Deciduous woodland**	**Main habitat: DWOOD (INV > 50%)**
3	**On site**	**Deciduous woodland**	**Main habitat: DWOOD (INV > 50%)**
4	44m N	Deciduous woodland	Main habitat: DWOOD (INV > 50%)

ID	Location	Main Habitat	Other habitats
5	180m NE	Deciduous woodland	Main habitat: DWOOD (INV > 50%)
6	218m N	Deciduous woodland	Main habitat: DWOOD (INV > 50%, ENSIS L1)
A	242m W	Deciduous woodland	Main habitat: DWOOD (INV > 50%)
A	249m W	Deciduous woodland	Main habitat: DWOOD (INV > 50%)

This data is sourced from Natural England.

13.2 Habitat Networks

Records within 250m	0

Habitat networks for 18 priority habitat networks (based primarily, but not exclusively, on the priority habitat inventory) and areas suitable for the expansion of networks through restoration and habitat creation.

This data is sourced from Natural England.

13.3 Open Mosaic Habitat

Records within 250m	0

Sites verified as Open Mosaic Habitat. Mosaic habitats are brownfield sites that are identified under the UK Biodiversity Action Plan as a priority habitat due to the habitat variation within a single site, supporting an array of invertebrates.

This data is sourced from Natural England.

13.4 Limestone Pavement Orders

Records within 250m	0

Limestone pavements are outcrops of limestone where the surface has been worn away by natural means over millennia. These rocks have the appearance of paving blocks, hence their name. Not only do they have geological interest, they also provide valuable habitats for wildlife. These habitats are threatened due to their removal for use in gardens and water features. Many limestone pavements have been designated as SSSIs which affords them some protection. In addition, Section 34 of the Wildlife and Countryside Act 1981 gave them additional protection via the creation of Limestone Pavement Orders, which made it a criminal offence to remove any part of the outcrop. The associated Limestone Pavement Priority Habitat is part of the UK Biodiversity Action Plan priority habitat in England.

This data is sourced from Natural England.

14 Geology 1:10,000 scale - Availability

Site Outline

Search buffers in metres (m)

Full coverage

Partial coverage

No coverage

14.1 10k Availability

Records within 500m	1

An indication on the coverage of 1:10,000 scale geology data for the site, the most detailed dataset provided by the British Geological Survey. Either 'Full', 'Partial' or 'No coverage' for each geological theme.

Features are displayed on the Geology 1:10,000 scale - Availability map on **page 66**

ID	Location	Artificial	Superficial	Bedrock	Mass movement	Sheet No.
1	On site	Full	Full	Full	Full	TQ68NW

This data is sourced from the British Geological Survey.

Geology 1:10,000 scale - Artificial and made ground

14.2 Artificial and made ground (10k)

Records within 500m	8

Details of made, worked, infilled, disturbed and landscaped ground at 1:10,000 scale. Artificial ground can be associated with potentially contaminated material, unpredictable engineering conditions and instability.

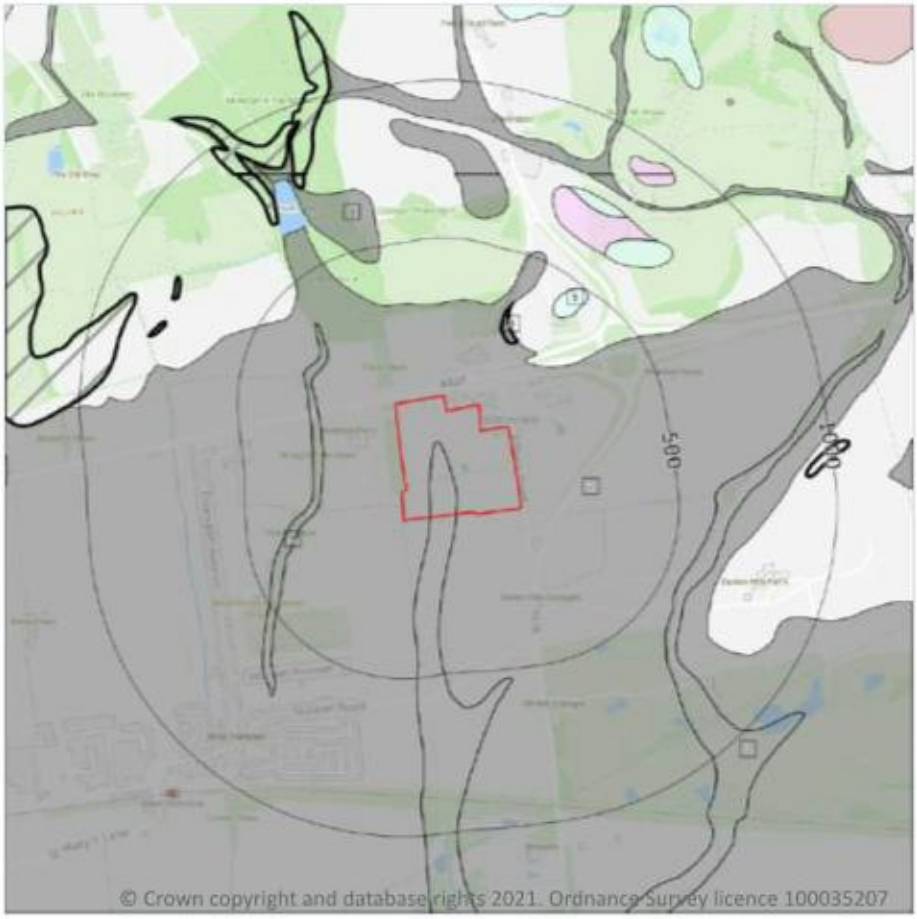
Features are displayed on the Geology 1:10,000 scale - Artificial and made ground map on **page 67**

ID	Location	LEX Code	Description	Rock description
1	**On site**	**WMGR-UKNOWN**	**Infilled Ground**	**Unknown/unclassified Entry**
2	1m N	MGR-UKNOWN	Made Ground (Undivided)	Unknown/unclassified Entry
3	102m E	MGR-UKNOWN	Made Ground (Undivided)	Unknown/unclassified Entry
4	152m S	MGR-UKNOWN	Made Ground (Undivided)	Unknown/unclassified Entry

ID	Location	LEX Code	Description	Rock description
5	221m N	WMGR-UKNOWN	Infilled Ground	Unknown/unclassified Entry
6	224m S	WMGR-UKNOWN	Infilled Ground	Unknown/unclassified Entry
7	312m NE	MGR-UKNOWN	Made Ground (Undivided)	Unknown/unclassified Entry
8	396m NW	MGR-UKNOWN	Made Ground (Undivided)	Unknown/unclassified Entry

This data is sourced from the British Geological Survey.

Geology 1:10,000 scale - Superficial



Site Outline

Search buffers in metres (m)

Landslip (10k)

Superficial geology (10k)
Please see table for more details.

14.3 Superficial geology (10k)

Records within 500m	5

Superficial geological deposits at 1:10,000 scale. Also known as 'drift', these are the youngest geological deposits, formed during the Quaternary. They rest on older deposits or rocks referred to as bedrock.

Features are displayed on the Geology 1:10,000 scale - Superficial map on **page 69**

ID	Location	LEX Code	Description	Rock description
1	**On site**	**ALV-Z**	**Alluvium - Silt (unlithified Deposits Coding Scheme)**	**Silt**
2	**On site**	**HEAD-C**	**Head - Clay (unlithified Deposits Coding Scheme)**	**Clay**
4	242m W	ALV-Z	Alluvium - Silt (unlithified Deposits Coding Scheme)	Silt
5	373m NE	TILL-DMTN	Till - Diamicton	Diamicton

ID	Location	LEX Code	Description	Rock description
6	454m N	HEAD-C	Head - Clay (unlithified Deposits Coding Scheme)	Clay

This data is sourced from the British Geological Survey.

14.4 Landslip (10k)

Records within 500m	1

Mass movement deposits on BGS geological maps at 1:10,000 scale. Primarily superficial deposits that have moved down slope under gravity to form landslips. These affect bedrock, other superficial deposits and artificial ground.

Features are displayed on the Geology 1:10,000 scale - Superficial map on **page 69**

ID	Location	LEX Code	Description	Rock description
3	219m NE	SLIP-UKNOWN	Landslide Deposits	Unknown/unclassified Entry

This data is sourced from the British Geological Survey.

Geology 1:10,000 scale - Bedrock

Site Outline

Search buffers in metres (m)

Bedrock faults and other linear features (10k)

Bedrock geology (10k)
Please see table for more details.

14.5 Bedrock geology (10k)

Records within 500m	1

Bedrock geology at 1:10,000 scale. The main mass of rocks forming the Earth and present everywhere, whether exposed at the surface in outcrops or concealed beneath superficial deposits or water.

Features are displayed on the Geology 1:10,000 scale - Bedrock map on **page 71**

ID	Location	LEX Code	Description	Rock age
1	On site	LC-CLAY	London Clay Formation - Clay	Eocene Epoch

This data is sourced from the British Geological Survey.

14.6 Bedrock faults and other linear features (10k)

Records within 500m	0

Linear features at the ground or bedrock surface at 1:10,000 scale of six main types; rock, fault, fold axis, mineral vein, alteration area or landform. Features are either observed or inferred, and relate primarily to bedrock.

This data is sourced from the British Geological Survey.

15 Geology 1:50,000 scale - Availability

Site Outline

Search buffers in metres (m)

Geological map tile

15.1 50k Availability

Records within 500m	1

An indication on the coverage of 1:50,000 scale geology data for the site. Either 'Full' or 'No coverage' for each geological theme.

Features are displayed on the Geology 1:50,000 scale - Availability map on **page 73**

ID	Location	Artificial	Superficial	Bedrock	Mass movement	Sheet No.
1	On site	Full	Full	Full	Full	EW257_romford_v4

This data is sourced from the British Geological Survey.

Geology 1:50,000 scale - Artificial and made ground

Site Outline

Search buffers in metres (m)

- Made ground
- Worked ground
- Infilled ground
- Disturbed ground
- Landscaped ground

15.2 Artificial and made ground (50k)

Records within 500m	5

Details of made, worked, infilled, disturbed and landscaped ground at 1:50,000 scale. Artificial ground can be associated with potentially contaminated material, unpredictable engineering conditions and instability.

Features are displayed on the Geology 1:50,000 scale - Artificial and made ground map on **page 74**

ID	Location	LEX Code	Description	Rock description
1	1m N	MGR-ARTDP	MADE GROUND (UNDIVIDED)	ARTIFICIAL DEPOSIT
2	90m E	MGR-ARTDP	MADE GROUND (UNDIVIDED)	ARTIFICIAL DEPOSIT
3	152m S	MGR-ARTDP	MADE GROUND (UNDIVIDED)	ARTIFICIAL DEPOSIT
4	318m NE	MGR-ARTDP	MADE GROUND (UNDIVIDED)	ARTIFICIAL DEPOSIT

ID	Location	LEX Code	Description	Rock description
5	396m NW	MGR-ARTDP	MADE GROUND (UNDIVIDED)	ARTIFICIAL DEPOSIT

This data is sourced from the British Geological Survey.

15.3 Artificial ground permeability (50k)

Records within 50m	**1**

A qualitative classification of estimated rates of vertical movement of water from the ground surface through the unsaturated zone of any artificial deposits (the zone between the land surface and the water table).

Location	Flow type	Maximum permeability	Minimum permeability
1m NE	Mixed	Very High	Low

This data is sourced from the British Geological Survey.

Geology 1:50,000 scale - Superficial

Site Outline

Search buffers in metres (m)

Landslip (50k)

Superficial geology (50k)
Please see table for more details.

15.4 Superficial geology (50k)

Records within 500m	5

Superficial geological deposits at 1:50,000 scale. Also known as 'drift', these are the youngest geological deposits, formed during the Quaternary. They rest on older deposits or rocks referred to as bedrock.

Features are displayed on the Geology 1:50,000 scale - Superficial map on **page 76**

ID	Location	LEX Code	Description	Rock description
1	**On site**	**ALV-XCZSV**	**ALLUVIUM**	**CLAY, SILT, SAND AND GRAVEL**
2	**On site**	**HEAD-XCZSV**	**HEAD**	**CLAY, SILT, SAND AND GRAVEL**
4	242m W	ALV-XCZSV	ALLUVIUM	CLAY, SILT, SAND AND GRAVEL

ID	Location	LEX Code	Description	Rock description
5	373m NE	LOFT-DMTN	LOWESTOFT FORMATION	DIAMICTON
6	453m N	HEAD-XCZSV	HEAD	CLAY, SILT, SAND AND GRAVEL

This data is sourced from the British Geological Survey.

15.5 Superficial permeability (50k)

Records within 50m **2**

A qualitative classification of estimated rates of vertical movement of water from the ground surface through the unsaturated zone of any superficial deposits (the zone between the land surface and the water table).

Location	Flow type	Maximum permeability	Minimum permeability
On site	**Mixed**	**High**	**Very Low**
On site	**Intergranular**	**High**	**Very Low**

This data is sourced from the British Geological Survey.

15.6 Landslip (50k)

Records within 500m **1**

Mass movement deposits on BGS geological maps at 1:50,000 scale. Primarily superficial deposits that have moved down slope under gravity to form landslips. These affect bedrock, other superficial deposits and artificial ground.

Features are displayed on the Geology 1:50,000 scale - Superficial map on **page 76**

ID	Location	LEX Code	Description	Rock description
3	219m NE	SLIP-XCZS	LANDSLIDE DEPOSITS	CLAY, SILT AND SAND

This data is sourced from the British Geological Survey.

15.7 Landslip permeability (50k)

Records within 50m **0**

A qualitative classification of estimated rates of vertical movement of water from the ground surface through the unsaturated zone of any landslip deposits (the zone between the land surface and the water table).

This data is sourced from the British Geological Survey.

Geology 1:50,000 scale - Bedrock

Site Outline

Search buffers in metres (m)

.... Bedrock faults and other linear features (50k)

Bedrock geology (50k)
Please see table for more details.

15.8 Bedrock geology (50k)

Records within 500m	1

Bedrock geology at 1:50,000 scale. The main mass of rocks forming the Earth and present everywhere, whether exposed at the surface in outcrops or concealed beneath superficial deposits or water.

Features are displayed on the Geology 1:50,000 scale - Bedrock map on **page 79**

ID	Location	LEX Code	Description	Rock age
1	On site	LC-XCZS	LONDON CLAY FORMATION - CLAY, SILT AND SAND	YPRESIAN

This data is sourced from the British Geological Survey.

15.9 Bedrock permeability (50k)

Records within 50m	1

A qualitative classification of estimated rates of vertical movement of water from the ground surface through the unsaturated zone of bedrock (the zone between the land surface and the water table).

Location	Flow type	Maximum permeability	Minimum permeability
On site	**Mixed**	**Moderate**	**Very Low**

This data is sourced from the British Geological Survey.

15.10 Bedrock faults and other linear features (50k)

Records within 500m	0

Linear features at the ground or bedrock surface at 1:50,000 scale of six main types; rock, fault, fold axis, mineral vein, alteration area or landform. Features are either observed or inferred, and relate primarily to bedrock.

This data is sourced from the British Geological Survey.

16 Boreholes

Site Outline

Search buffers in metres (m)

- Confidential
- 0 - 10m
- 10 - 30m
- 30m+
- Unknown

16.1 BGS Boreholes

Records within 250m	7

The Single Onshore Boreholes Index (SOBI); an index of over one million records of boreholes, shafts and wells from all forms of drilling and site investigation work held by the British Geological Survey. Covering onshore and nearshore boreholes dating back to at least 1790 and ranging from one to several thousand metres deep.

Features are displayed on the Boreholes map on **page 81**

ID	Location	Grid reference	Name	Length	Confidential	Web link
1	7m S	563270 188920	EAST HORNDON ST.W ABANDONMENT BH36	10.5	N	697716
2	10m E	563420 189060	EAST HORNDON ST.W ABANDONMENT BH37	10.0	N	697717

ID	Location	Grid reference	Name	Length	Confidential	Web link
3	13m E	563410 189140	EAST HORNDON ST.W ABANDONMENT BH38	10.15	N	697718
4	144m NE	563410 189350	EAST HORNDON JUNCTION A128/7 JN 222	3.04	N	697669
5	182m S	563150 188730	EAST HORNDON ST.W ABANDONMENT BH35	10.15	N	697715
6	212m NE	563450 189410	A128 127 JUNCTION EAST HORNDON 212	3.04	N	697659
7	217m NE	563520 189370	EAST HORNDON JUNCTION A128/7 JN 221	4.57	N	697668

This data is sourced from the British Geological Survey.

17 Natural ground subsidence - Shrink swell clays

Site Outline

Search buffers in metres (m)

- No data
- Negligible
- Very low
- Low
- Moderate
- High

17.1 Shrink swell clays

Records within 50m	1

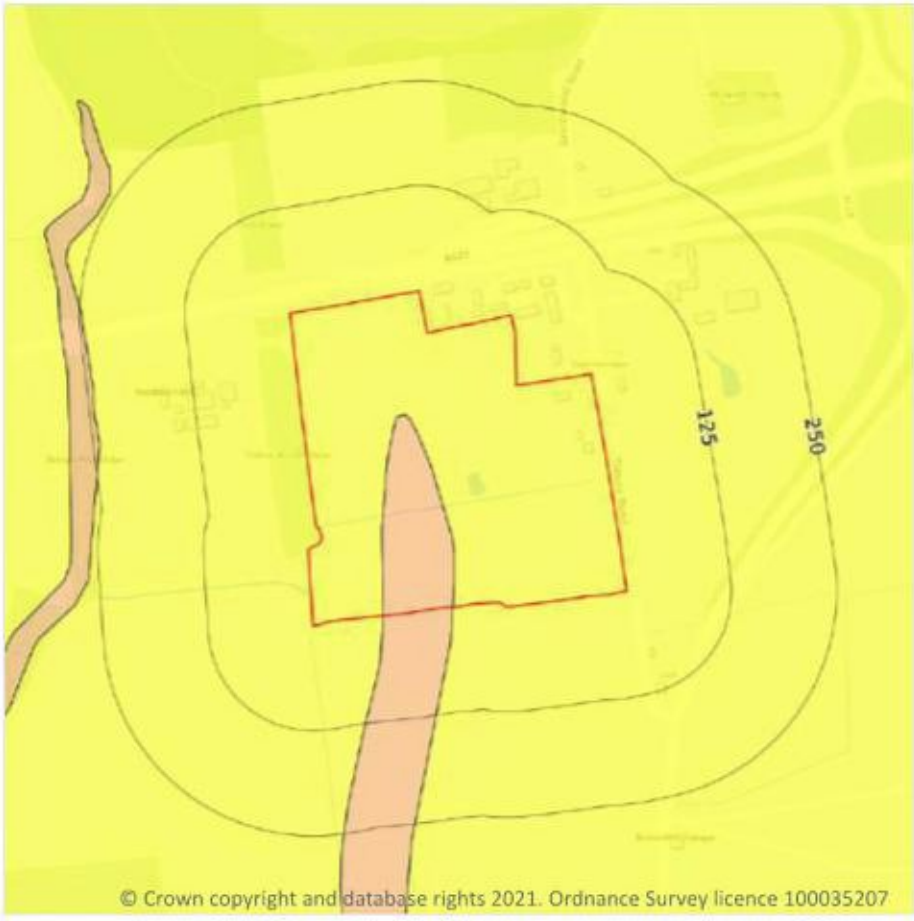
The potential hazard presented by soils that absorb water when wet (making them swell), and lose water as they dry (making them shrink). This shrink-swell behaviour is controlled by the type and amount of clay in the soil, and by seasonal changes in the soil moisture content (related to rainfall and local drainage).

Features are displayed on the Natural ground subsidence - Shrink swell clays map on **page 83**

Location	Hazard rating	Details
On site	**Moderate**	**Ground conditions predominantly high plasticity.**

This data is sourced from the British Geological Survey.

Natural ground subsidence - Running sands



Site Outline

Search buffers in metres (m)

- No data
- Negligible
- Very low
- Low
- Moderate
- High

17.2 Running sands

Records within 50m	2

The potential hazard presented by rocks that can contain loosely-packed sandy layers that can become fluidised by water flowing through them. Such sands can 'run', removing support from overlying buildings and causing potential damage.

Features are displayed on the Natural ground subsidence - Running sands map on **page 84**

Location	Hazard rating	Details
On site	**Very low**	**Running sand conditions are unlikely. No identified constraints on land use due to running conditions unless water table rises rapidly.**

Location	Hazard rating	Details
On site	**Low**	**Running sand conditions may be present. Constraints may apply to land uses involving excavation or the addition or removal of water.**

This data is sourced from the British Geological Survey.

Natural ground subsidence - Compressible deposits

Site Outline

Search buffers in metres (m)

- No data
- Negligible
- Very low
- Low
- Moderate
- High

17.3 Compressible deposits

Records within 50m	3

The potential hazard presented by types of ground that may contain layers of very soft materials like clay or peat and may compress if loaded by overlying structures, or if the groundwater level changes, potentially resulting in depression of the ground and disturbance of foundations.

Features are displayed on the Natural ground subsidence - Compressible deposits map on **page 86**

Location	Hazard rating	Details
On site	**Negligible**	**Compressible strata are not thought to occur.**
On site	**Moderate**	**Compressibility and uneven settlement hazards are probably present. Land use should consider specifically the compressibility and variability of the site.**

Location	Hazard rating	Details
1m N	Very low	Compressibility and uneven settlement problems are not likely to be significant on the site for most land uses.

This data is sourced from the British Geological Survey.

Natural ground subsidence - Collapsible deposits

Site Outline

Search buffers in metres (m)

- No data
- Negligible
- Very low
- Low
- Moderate
- High

17.4 Collapsible deposits

Records within 50m	2

The potential hazard presented by natural deposits that could collapse when a load (such as a building) is placed on them or they become saturated with water.

Features are displayed on the Natural ground subsidence - Collapsible deposits map on **page 88**

Location	Hazard rating	Details
On site	**Negligible**	**Deposits with potential to collapse when loaded and saturated are believed not to be present.**
On site	**Very low**	**Deposits with potential to collapse when loaded and saturated are unlikely to be present.**

This data is sourced from the British Geological Survey.

Natural ground subsidence - Landslides

Site Outline

Search buffers in metres (m)

- No data
- Negligible
- Very low
- Low
- Moderate
- High

17.5 Landslides

Records within 50m	1

The potential for landsliding (slope instability) to be a hazard assessed using 1:50,000 scale digital maps of superficial and bedrock deposits, combined with information from the BGS National Landslide Database and scientific and engineering reports.

Features are displayed on the Natural ground subsidence - Landslides map on **page 89**

Location	Hazard rating	Details
On site	**Very low**	**Slope instability problems are not likely to occur but consideration to potential problems of adjacent areas impacting on the site should always be considered.**

This data is sourced from the British Geological Survey.

Natural ground subsidence - Ground dissolution of soluble rocks

Site Outline

Search buffers in metres (m)

- No data
- Negligible
- Very low
- Low
- Moderate
- High

17.6 Ground dissolution of soluble rocks

Records within 50m	1

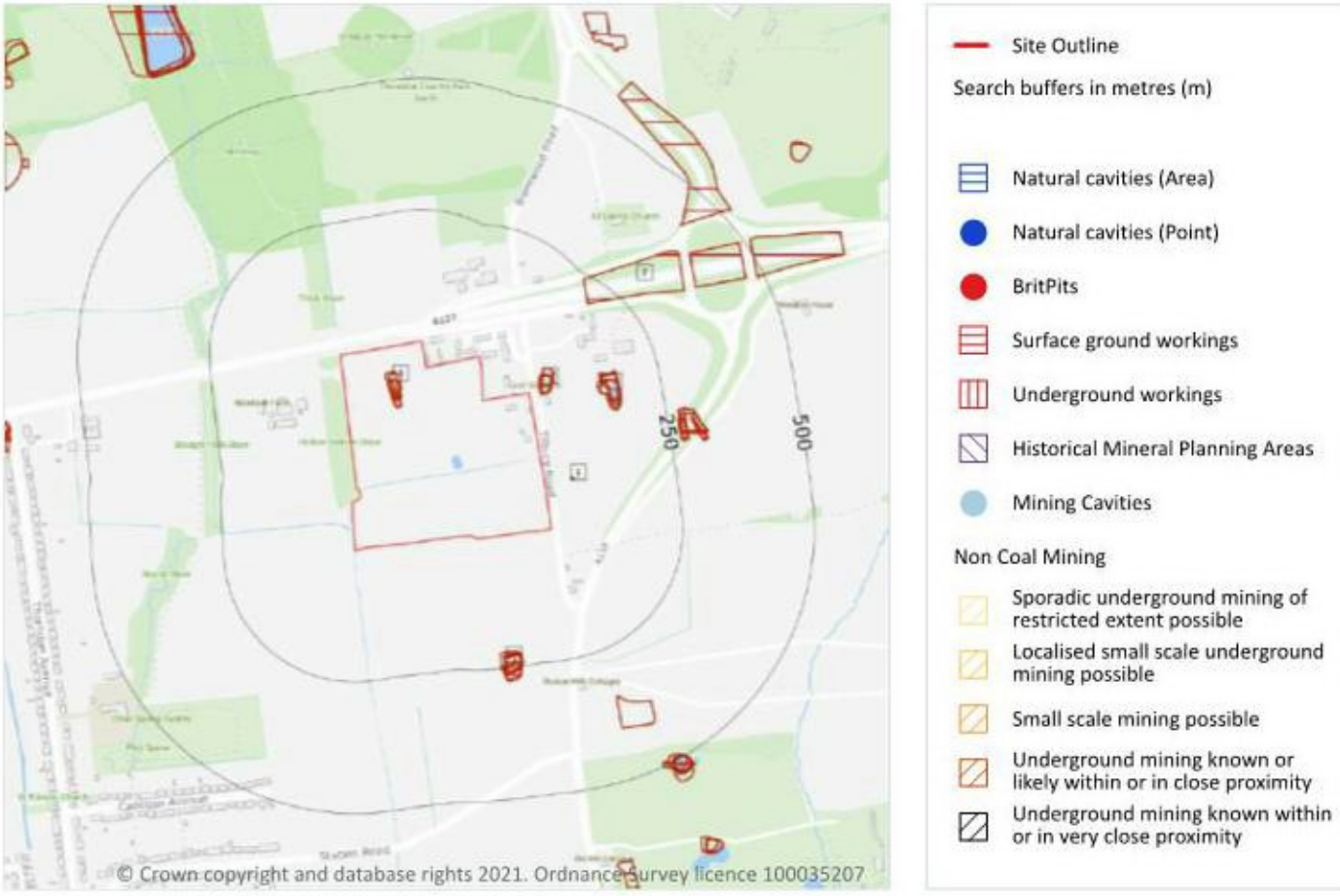
The potential hazard presented by ground dissolution, which occurs when water passing through soluble rocks produces underground cavities and cave systems. These cavities reduce support to the ground above and can cause localised collapse of the overlying rocks and deposits.

Features are displayed on the Natural ground subsidence - Ground dissolution of soluble rocks map on **page 90**

Location	Hazard rating	Details
On site	**Negligible**	**Soluble rocks are either not thought to be present within the ground, or not prone to dissolution. Dissolution features are unlikely to be present.**

This data is sourced from the British Geological Survey.

18 Mining, ground workings and natural cavities



18.1 Natural cavities

Records within 500m	0

Industry recognised national database of natural cavities. Sinkholes and caves are formed by the dissolution of soluble rock, such as chalk and limestone, gulls and fissures by cambering. Ground instability can result from movement of loose material contained within these cavities, often triggered by water.

This data is sourced from Peter Brett Associates (PBA).

18.2 BritPits

Records within 500m	0

BritPits (an abbreviation of British Pits) is a database maintained by the British Geological Survey of currently active and closed surface and underground mineral workings. Details of major mineral handling sites, such as wharfs and rail depots are also held in the database.

This data is sourced from the British Geological Survey.

18.3 Surface ground workings

Records within 250m	25

Historical land uses identified from Ordnance Survey mapping that involved ground excavation at the surface. These features may or may not have been subsequently backfilled.

Features are displayed on the Mining, ground workings and natural cavities map on **page 92**

ID	Location	Land Use	Year of mapping	Mapping scale
A	**On site**	**Pond**	**1921**	**1:10560**
A	**On site**	**Pond**	**1866**	**1:10560**
A	**On site**	**Pond**	**1915**	**1:10560**
A	**On site**	**Pond**	**1895**	**1:10560**
A	**On site**	**Pond**	**1938**	**1:10560**
B	21m E	Pond	1938	1:10560
B	23m E	Pond	1915	1:10560
B	28m NE	Pond	1921	1:10560
1	53m E	Saw Pit	1874	1:10560
C	129m E	Pond	1938	1:10560
C	133m E	Pond	1915	1:10560
C	137m E	Pond	1921	1:10560
C	138m E	Pond	1976	1:10000
C	138m E	Pond	1960	1:10560
C	142m E	Pond	1895	1:10560
2	204m NE	Cuttings	1976	1:10000
D	219m S	Pond	1895	1:10560

ID	Location	Land Use	Year of mapping	Mapping scale
D	222m S	Pond	1976	1:10000
D	222m S	Pond	1960	1:10560
D	226m S	Pond	1866	1:10560
D	228m S	Pond	1898	1:10560
D	228m S	Pond	1898	1:10560
D	229m S	Pond	1921	1:10560
D	240m S	Pond	1938	1:10560
D	243m S	Pond	1915	1:10560

This is data is sourced from Ordnance Survey/Groundsure.

18.4 Underground workings

Records within 1000m	0

Historical land uses identified from Ordnance Survey mapping that indicate the presence of underground workings e.g. mine shafts.

This is data is sourced from Ordnance Survey/Groundsure.

18.5 Historical Mineral Planning Areas

Records within 500m	0

Boundaries of mineral planning permissions for England and Wales. This data was collated between the 1940s (and retrospectively to the 1930s) and the mid 1980s. The data includes permitted, withdrawn and refused permissions.

This data is sourced from the British Geological Survey.

18.6 Non-coal mining

Records within 1000m	0

The potential for historical non-coal mining to have affected an area. The assessment is drawn from expert knowledge and literature in addition to the digital geological map of Britain. Mineral commodities may be divided into seven general categories - vein minerals, chalk, oil shale, building stone, bedded ores, evaporites and 'other' commodities (including ball clay, jet, black marble, graphite and chert).

This data is sourced from the British Geological Survey.

18.7 Mining cavities

Records within 1000m	0

Industry recognised national database of mining cavities. Degraded mines may result in hazardous subsidence (crown holes). Climatic conditions and water escape can also trigger subsidence over mine entrances and workings.

This data is sourced from Peter Brett Associates (PBA).

18.8 JPB mining areas

Records on site	0

Areas which could be affected by former coal mining. This data includes some mine plans unavailable to the Coal Authority.

This data is sourced from Johnson Poole and Bloomer.

18.9 Coal mining

Records on site	0

Areas which could be affected by past, current or future coal mining.

This data is sourced from the Coal Authority.

18.10 Brine areas

Records on site	0

The Cheshire Brine Compensation District indicates areas that may be affected by salt and brine extraction in Cheshire and where compensation would be available where damage from this mining has occurred. Damage from salt and brine mining can still occur outside this district, but no compensation will be available.

This data is sourced from the Cheshire Brine Subsidence Compensation Board.

18.11 Gypsum areas

Records on site	0

Generalised areas that may be affected by gypsum extraction.

This data is sourced from British Gypsum.

18.12 Tin mining

Records on site	0

Generalised areas that may be affected by historical tin mining.

This data is sourced from Mining Searches UK.

18.13 Clay mining

Records on site	0

Generalised areas that may be affected by kaolin and ball clay extraction.

This data is sourced from the Kaolin and Ball Clay Association (UK).

19 Radon

Site Outline

Search buffers in metres (m)

- Greater than 30%
- Between 10% and 30%
- Between 5% and 10%
- Between 3% and 5%
- Between 1% and 3%
- Less than 1%

19.1 Radon

Records on site	1

Estimated percentage of dwellings exceeding the Radon Action Level. This data is the highest resolution radon dataset available for the UK and is produced to a 75m level of accuracy to allow for geological data accuracy and a 'residential property' buffer. The findings of this section should supersede any estimations derived from the Indicative Atlas of Radon in Great Britain. The data was derived from both geological assessments and long term measurements of radon in more than 479,000 households.

Features are displayed on the Radon map on **page 97**

Location	Estimated properties affected	Radon Protection Measures required
On site	**Less than 1%**	**None****

This data is sourced from the British Geological Survey and Public Health England.

20 Soil chemistry

20.1 BGS Estimated Background Soil Chemistry

Records within 50m **10**

The estimated values provide the likely background concentration of the potentially harmful elements Arsenic, Cadmium, Chromium, Lead and Nickel in topsoil. The values are estimated primarily from rural topsoil data collected at a sample density of approximately 1 per 2 km². In areas where rural soil samples are not available, estimation is based on stream sediment data collected from small streams at a sampling density of 1 per 2.5 km²; this is the case for most of Scotland, Wales and southern England. The stream sediment data are converted to soil-equivalent concentrations prior to the estimation.

Location	Arsenic	Bioaccessible Arsenic	Lead	Bioaccessible Lead	Cadmium	Chromium	Nickel
On site	**15 - 25 mg/kg**	**No data**	**100 mg/kg**	**60 mg/kg**	**1.8 mg/kg**	**90 - 120 mg/kg**	**30 - 45 mg/kg**
On site	**15 - 25 mg/kg**	**No data**	**100 mg/kg**	**60 mg/kg**	**1.8 mg/kg**	**90 - 120 mg/kg**	**30 - 45 mg/kg**
On site	**15 - 25 mg/kg**	**No data**	**100 mg/kg**	**60 mg/kg**	**1.8 mg/kg**	**90 - 120 mg/kg**	**30 - 45 mg/kg**
On site	**15 mg/kg**	**No data**	**100 mg/kg**	**60 mg/kg**	**1.8 mg/kg**	**90 - 120 mg/kg**	**30 - 45 mg/kg**
On site	**15 mg/kg**	**No data**	**100 mg/kg**	**60 mg/kg**	**1.8 mg/kg**	**90 - 120 mg/kg**	**30 - 45 mg/kg**
On site	**15 mg/kg**	**No data**	**100 mg/kg**	**60 mg/kg**	**1.8 mg/kg**	**90 - 120 mg/kg**	**30 - 45 mg/kg**
On site	**15 mg/kg**	**No data**	**100 mg/kg**	**60 mg/kg**	**1.8 mg/kg**	**90 - 120 mg/kg**	**30 - 45 mg/kg**
On site	**15 mg/kg**	**No data**	**100 mg/kg**	**60 mg/kg**	**1.8 mg/kg**	**90 - 120 mg/kg**	**30 - 45 mg/kg**
28m NW	15 mg/kg	No data	100 mg/kg	60 mg/kg	1.8 mg/kg	90 - 120 mg/kg	30 - 45 mg/kg
50m SW	15 mg/kg	No data	100 mg/kg	60 mg/kg	1.8 mg/kg	90 - 120 mg/kg	30 - 45 mg/kg

This data is sourced from the British Geological Survey.

20.2 BGS Estimated Urban Soil Chemistry

Records within 50m	0

Estimated topsoil chemistry of Arsenic, Cadmium, Chromium, Copper, Nickel, Lead, Tin and Zinc and bioaccessible Arsenic and Lead in 23 urban centres across Great Britain. These estimates are derived from interpolation of the measured urban topsoil data referred to above and provide information across each city between the measured sample locations (4 per km^2).

This data is sourced from the British Geological Survey.

20.3 BGS Measured Urban Soil Chemistry

Records within 50m	0

The locations and measured total concentrations (mg/kg) of Arsenic, Cadmium, Chromium, Copper, Nickel, Lead, Tin and Zinc in urban topsoil samples from 23 urban centres across Great Britain. These are collected at a sample density of 4 per km^2.

This data is sourced from the British Geological Survey.