Land East of Rayleigh Road, Thundersley

Phase 1 Ground Conditions Assessment (Desk Study)

On behalf of **This Land Development Limited**

Project Ref: 332210105/350| R-GEO-001 | Rev: 02 | November 2022

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For and on behalf of Stantec UK Limited				

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1 Introduction

1.1 Preamble

1.1.1 Stantec UK Limited has been instructed by This Land Development Limited (the Client), to prepare a Phase 1 Ground Conditions Assessment report and some preliminary ground investigation works in support of an outline planning application for the proposed development of a 27.89 hectare (ha) site off Rayleigh Road, Thundersley, Essex. The site's location is illustrated in attached **Figure 1**.

1.1.2 The development of up to 455 new homes, a multi-use community hall, land for the provision of a healthcare facility, land for a stand-alone early years and childcare nursery, new vehicular/pedestrian access points from Stadium Way in the north and Daws Heath Road in the south, new greenways and green links, multi-functional open space, green infrastructure, surface water attenuation, landscaping and associated infrastructure. All matters reserved except access.

1.1.3 This report presents the findings of desk study research carried out together with the observations from a reconnaissance walkover. A preliminary Conceptual Model (CM) has been developed and a qualitative land contamination Tier 1 Preliminary Risk Assessment (PRA) (qualitative) conducted. In addition, a land instability appraisal is also presented.

1.1.4 It should be noted that this report is for a land condition assessment and does not purport to be an ecological, flood risk, agricultural land quality assessment, archaeological survey etc. and as such, additional surveys may be required to support a planning application. Guidance for readers of this report is presented in **Section 7**.

1.2 Objective

1.2.1 The objective of this report is to identify the likely ground conditions and environmental setting using published and publicly available information (see **Section 1.4** below for sources of information) that might have associated environmental liabilities or land stability hazards that may require management (remediation or mitigation).

1.2.2 The primary aim of this assessment is to meet the requirements of the National Planning Policy Framework (NPPF, MHCLG, 2021) and the requirements in Clauses 174 (e) & (f) and 183. As per Clause 178, planning policies and decisions should ensure that "*a site is suitable for its proposed use taking account of ground conditions and any risks arising from land instability and contamination*".

1.2.3 To support planning applications an appropriate risk assessment of contamination, ground and slope stability is required (NPPF Glossary Annex 2 Site Investigation Information). A PRA forms the first stage of this risk assessment process and is generally considered to be the minimum requirement to support any planning application.

1.3 Methodology & Report Format

Assessment of Ground Conditions – Contamination

1.3.1 The Stantec methodology for ground condition assessment (contamination) is presented in **Appendix A**.

1.3.2 In order to meet the requirements of the NPPF, the assessment has been carried out in accordance with 'established procedures' using current UK good practice and guidance as given in British Standard 10175:2011 +A2:2017, Land Contamination: Risk Management (EA, 2020) and NHBC Standards (NHBC, 2020).

1.3.3 The principal components of this assessment are generally as described in the Environment Agency's Land Contamination: Risk Management (LC:RM) guidance, published on 08 October 2020 and available through the www.gov.uk website. LC:RM sets out a risk management process based on a tiered risk assessment with an increasing level of detail required to progress through the tiers.

- Tier 1 – "Preliminary Risk Assessment (PRA)" – a qualitative assessment forming part of a Phase 1 report,
- Tier 2 – "Generic Quantitative Risk Assessment" - a quantitative assessment using published criteria to screen site specific ground condition data forming part of a Phase 2 report and
- Tier 3 – "Detailed Quantitative Risk Assessment" – a quantitative assessment involving the generation of site-specific assessment criteria (SSAC).

1.3.4 The underlying principle is the evaluation of pollutant linkages in order to assess whether the presence of a source of contamination could potentially lead to harmful consequences. A pollutant linkage consists of the following three elements:

- A source of contamination or hazard that has the potential to cause harm or pollution;
- A pathway for the hazard to move along / generate exposure; and
- A receptor which is affected by the hazard.

1.3.5 For each potential pollutant linkage identified, the risk is estimated through consideration of the magnitude of the potential consequences and the likelihood or probability of an event occurring.

Assessment of Ground Conditions – Land Instability

1.3.6 Planning Authorities are required (NPPF paragraphs 174 & 183) to consider if land instability poses a potentially unacceptable risk to development. In paragraph 183, the requirement to take account of potential hazards arising from natural hazards (such as natural cavities) or former activities such as mining is outlined.

1.3.7 The preliminary land instability appraisal methodology adopted by Stantec follows the guidance given in the Planning Practice Guidance for Land Stability (MHCLG, 2021) accessed from https://www.gov.uk/guidance/land-stability. The guidance states that *"Preparation of a slope stability risk assessment report will vary according to location but is likely to involve at least a comprehensive desk study examination and a site visit."*

1.3.8 The preliminary land instability appraisal includes for example, where relevant, a review of geological hazards for the Site such as natural and man-made (mining) cavities, landslide, collapsible and compressible soils, running sand, and subsidence and heave due to volumetric change in the ground.

1.4 Sources of Information

1.4.1 The following publicly available sources of information were used in the preparation of this report:

- A walkover survey was undertaken by a Stantec engineer on 29 April 2021 to observe existing conditions both on the site and surrounding land. Photographs are presented in **Appendix B**.

- Groundsure was commissioned to provide a Groundsure Insight Report (GIR) (report ref GS-7743152) including historical maps and environmental data searches, and this information is presented in its entirety in **Appendix C**.
- Geology maps and borehole records held by the British Geological Survey (BGS) accessed via their website and Geological Survey of England and Wales 1:63,360/1:50,000 geological map series.
- BGS historical borehole scans for actual ground conditions onsite and in the immediate vicinity (**Appendix D**).
- Defra's MAGIC website and the UK Government's data website for information on surface and groundwater quality.
- Defra's MAGIC website for significant environmental features and historic structures.
- Communication with the Contaminated Land Officer (CLO) from Castle Point Borough Council and an environmental enquiry on groundwater and contaminated land information to the Environment Agency. Correspondence with regulators is in **Appendix E**.

1.5 Previous Investigations

1.5.1 Stantec has not been made aware of any desk-based or ground investigations having been carried out at the Site previously. However, three BGS historical borehole scans are available within and immediately outside of the study area boundary, suggesting that some intrusive work has been undertaken in the past. The borehole scans are summarised in **Section 3.2** below.

2 Site Setting

2.1 Site Location

2.1.1 The Site is located within the town of Thundersley, to the east of Rayleigh Road (hereafter referred to as “the Site”) and covers approximately 27.89ha. It currently comprises largely open agricultural fields, laid to grass with some horse grazing paddocks, associated stables and a fishing lake.

2.1.2 The Site is centred at the approximate grid reference 580680, 188798 with an approximate postcode of SS7 3NL. A study area location plan is presented as **Figure 1**.

2.2 Site Location and Description

2.2.1 A Site walkover inspection was undertaken by Stantec on 29 April 2021. Photographs taken during the walkover are presented in **Appendix B**.

2.2.2 The site comprises an irregular shaped piece of land that is located due north of Daws Heath Road and due east of Rayleigh Road in Rayleigh Essex.

2.2.3 At present the site is owned by two separate landowners. The land generally located within the central and eastern areas of the site is known as Cook’s Land and the land to the west is currently owned by the Barbers. The current division of land ownership is illustrated on attached **Figure 2**.

2.2.4 There are two access routes located off Daws Heath Road. Cook’s Land is accessed via a private driveway next to a residential bungalow, which provides access to Oak Lodge fishing lake and private stables beyond. The second access is located opposite Napier Gardens and comprises a track to SPM Granite industrial units and a breakers yard.

Onsite

2.2.5 The area of the site currently known as Cook’s Land comprises a large open grass field, with a fishing lake located in the eastern section and horse stables and paddocks to the south. Ground levels along the access point to this area of land were noted to drop from the road, with a gentle but significant gradient towards the north. This drop in gradient ceased where the access track turns east towards the fishing lake (photo 12).

2.2.6 Before reaching the stables, a large open facing barn used to store hay is located just east of the trackway. The materials used in the construction of the barn mainly comprise corrugated cement sheeting possibly containing asbestos fibres (photo 3). Vehicles including caravans and horse trailers were parked on the opposite side of the track to the barn (photo 2).

2.2.7 The horse stables and paddocks are located within the south eastern area of the site, with the stable buildings comprising wooden structures and occupying a relatively small area just north east of the larger open barn structure. The tracks and pathways around the stables were noted to be covered with a crushed shell shingle (photos 5 and 7).

2.2.8 The paddocks were occupied by horses at the time of the site visit. Each paddock had a lockable gate at the access point and electric fencing was in use to keep the animals segregated (photos 8 to 11). A series of pathways between the paddocks arranged in a crossroads layout provided access to these areas for the horses and their owners.

2.2.9 The fishing lake is located to the north of the paddocks. This area included a gravel covered parking area for anglers and it was noted that a pile of cut grass/hay was being temporarily stored within the parking area (photo 14).

2.2.10 A small watercourse runs from the southern tip along the boundary of the Cook's Land towards the fishing lake in an east-north easterly direction before diverting around the fishing lake to the south and existing the study area boundary in the far north eastern extent. From inspection, the watercourse feeds the fishing lake via a pump located adjacent to the fishing lake access road.

2.2.11 The fishing lake is located at a higher level to the surrounding land (photo 13) and is encompassed by a raised bund.

2.2.12 A few overgrown and dilapidated shed type structures were noted in the undergrowth just south of the access track leading to the fishing pond (photo 17). These were located close to some badger setts that had been marked out on site by the project ecologists.

2.2.13 The remainder of this area of the site was largely occupied by open grassland (photos 15, 18, 20 and 21). Ground levels generally increased travelling westwards away from the fishing lake. Farm vehicle tracks were identified around the periphery and central areas of the open land. On occasion, flexible surfacing/tarmac mats were visible at surface on the tracks (photo 19).

2.2.14 The boundary between Cook's Land and Barber's land comprised a line of tall well-established trees. Along this boundary in the north western area of Cook's Land a concreted storage area was identified, in use for the storage of manure/fertiliser (photo 22).

2.2.15 A small ground depression, possibly a backfilled pond, was noted just north of the manure storage area (photo 16).

2.2.16 The western area of the site that falls under Barber's land at present has two small metal clad industrial units and a breakers yard located within the southern portion of the site. The access route into the site was in constant use by visitors to the SPM granite industrial units and numerous cars and vehicles were parked along this area (photos 24, 25 and 26).

2.2.17 The SPM granite units comprised two metal clad small warehouse units. Operations were in use at the time of the site visit and appeared to include cutting and grinding of granite materials. A waste skip and waste materials were noted to be located around the buildings photo 26). These buildings fall outside of the proposed development area.

2.2.18 The breakers yard at the northern end of the access track was also in use at the time of the site visit. Numerous cars were parked/being stored within the yard area and there was a small pickup truck in use to transport the vehicles.

2.2.19 A small metal cladded building was located within the yard for storage and some storage units, including a large metal storage container was located within this area. The far northern part of the breakers yard was occupied by several mini-buses and larger vans.

2.2.20 waste materials associated with the activities on site were noted around the yard including blue plastic storage drums, old car parts, old fuel tanks, packaging materials and construction waste in the form of wooden planks and pallets of bricks (photo 27).

2.2.21 The remainder of the site was largely occupied by open grassland and mature trees. Ground levels in this area of the site typically increased to the north. Close to the central area of this land parcel was a small collection of mature trees (photo 30).

2.2.22 Well-trodden pedestrian routes were noted around the periphery of the site and during the visit several members of the public were encountered using these pathways to walk their dogs (photos 34 and 35).

2.2.23 A small wooded area was noted in the far northern area of this part of the site providing the boundary between the site and Stadium Way (road) to the north. It was in this area that there

was evidence of a small garden. Empty bags of compost were present and a very localised area of the site had been planted. a make-shift fire pit was identified next to the small garden that appeared to have been used to heat water in a small metal container (photo 33).

2.2.24 Fly-tipping was noted in isolated locations around the periphery of the site, mainly along the far western study area boundary boundary that segregates the site from the adjoining residential estate. Some small piles of tipped construction rubble and general household waste materials had been left just off the access paths created from the estate onto the site (photo 32).

2.2.25 Information provided by the ecologist involved in the site project identified the presence of badger setts in various areas of the site. Several of these potential setts were noted during the site walkover, mainly along the current boundary that transects the site between the current land-owners land parcels. **Figure 4** illustrates the locations of the Badger setts as recorded by Southern Ecological Solutions Limited.

2.2.26 A summary of the on-site land uses is provided in Table 2.1 below.

Table 2.1 Summary of Current On-Site Land Uses

Area ID	Description
Cook's Land	Open barn. Stables and paddocks. Fishing lake. Parking areas associated with stables and fishing lake. Open farmland/grassland.
Barber's Land.	Breakers Yard. Open farmland/grassland.

Off site

2.2.27 The local setting around the Site comprises a mix of land uses. The industrial area of Stadium Trading Estate (STE) bounds the study area to the north. Predominantly residential properties with private gardens are present to the west and south.

2.2.28 The A129 Rayleigh Road is located immediately west of the Site and the A127 Southend Arterial Road runs west to east approximately 250m to the north at the closest point. Agricultural land is generally found to the east and a Hospice is located at approximately 250m.

2.2.29 During the site visit a number of above ground tanks were identified to the back of the residential bungalow whose driveway provided access into the stables and fishing lake. One of these appeared to potentially be a metal water tank (photo 4), but the larger tank looked to be used for refuelling of vehicles (photo 1).

2.2.30 A summary of the off-site land uses is present in Table 2.2 below.

Table 2.2 Summary of of-site Land Uses

Direction	Land Use
North	Industrial trading estate – including Sainsburys, car dealers, Rayleigh fire station, commercial units (home furniture, DIY supplies and trading merchants).

Direction	Land Use
	Southend Arterial Road (A127).
South	Residential housing. Open farmland/grassland. Above ground tanks (fuel and water) associated with neighbouring residential bungalow. SPM Granite – granite cutting
East	Open farmland. Little Haven Nature Reserve. Little Havens Hospice.
West	Residential housing estate. Rayleigh Road (A129)

2.3 Topography

2.3.1 Ground levels across the site vary, with levels typically increasing from east to west across the northern part of Cook's Land. Here levels increase from approximately 60m AOD in the far north eastern corner to approximately 70m AOD close to the current land-owner boundary with neighbouring Barbers land.

2.3.2 The southern section of Cook's Land, to the south of the watercourse, rises from the low point around the water course towards the Daws Heath Road.

2.3.3 The western area of the site (Barber's Land) typically rises in ground levels from the north (approximately 65m AOD) up to the southern part of the site, where there is a high point of just over 80m AOD north of the SPM Granite Industrial units.

2.4 Historical Land Use

On Site

2.4.1 The historical land use of the Site and surrounding area has been obtained from reviewing historical OS maps supplied within the GIR, which are presented in **Appendix C**. Extracts of relevant mapping are in **Extract 1** below.

2.4.2 The earliest available OS historical maps from the mid to late 1800s generally show the Site to be open fields through until present day. The earliest map dated 1876 shows onsite buildings (Claydons Farm) and a small pond, both in the south western corner. A narrow field track leads northward from Claydons farm, through the Site, eventually joining with the northern study area boundary.

2.4.3 By 1923 some outbuildings associated with an offsite bungalow (land parcel 595) were noted within the southern area of the study area boundary. The number and shape/layout of these buildings changed between 1923 and 1971.

2.4.4 No further onsite significant changes were observed until 1992. Claydons Farm buildings are absent on the 1992 mapping and the fishery reservoir is now shown onsite in the north eastern corner. Stables within the onsite south eastern corner are also present on this map, see **Extract 1** below. The small pond associated with Claydons Farm is shown as absent on 2021 mapping. No further onsite significant changes were observed up to present day.

Off Site

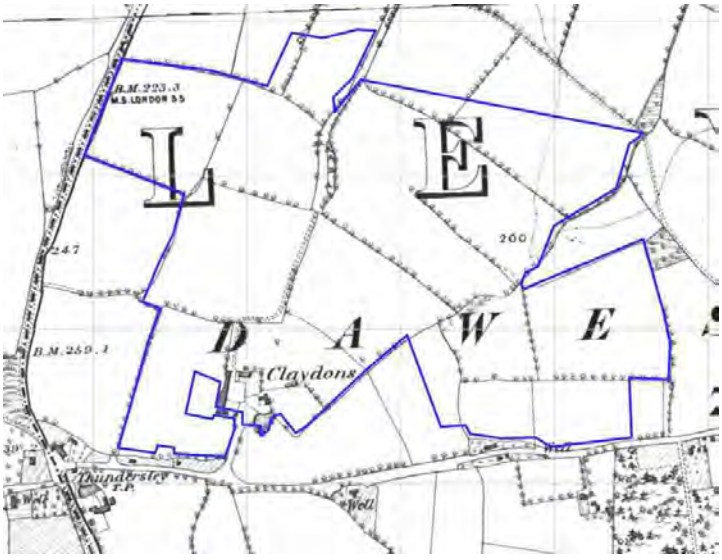
2.4.5 The earliest available OS historical maps from the mid to late 1800s generally shows the offsite surrounding land use to be fields. Three wells are marked along the road trending east to west, bounding the Site to the south and a Chapel was located adjacent to the south eastern study area boundary. During the 1920s, residential properties with private gardens are shown offsite to the west and allotment gardens are present offsite to the east.

2.4.6 Mapping dated 1954 shows the beginnings of industrial land, the Stadium Trading Estate (STE), offsite to the north. These comprise a Plastics Adhesives Factory, Engineering Works and a Wood Carving Factory all located approximately 250m north. Rayleigh Weir Stadium is shown offsite at approximately 100m to the north, see **Extract 1** below. A Printing Works is also shown offsite, approximately 140m to the north on 1954 mapping.

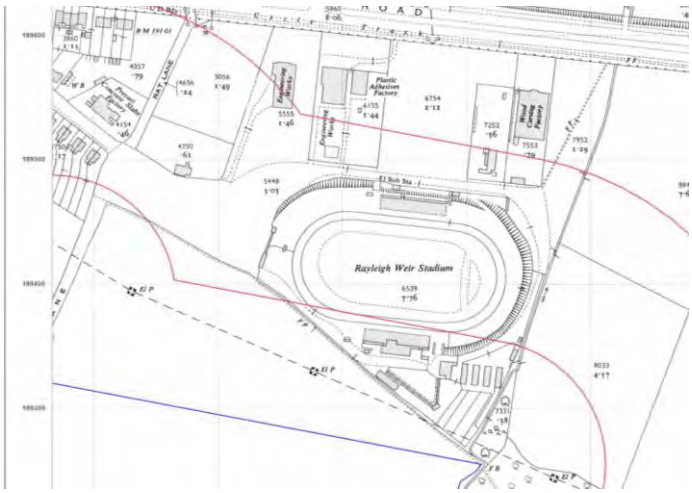
2.4.7 During the late 1950s, early 1960s, a depot appears offsite to the west of the Claydons Farm buildings. The offsite allotments to the east are no longer shown during on the 1960 mapping, see **Extract 1** below. The Engineering Works within the STE on 1970 mapping are qualified as Light Engineering Works and Marine Engineering works. Furthermore, a Stone Works and travelling cranes situated within the STE, are shown approximately 250m north of the Site. A scrap metal yard approximately 90m to the south east is shown on mapping dated c. 1970.

2.4.8 Mapping dated 1980 shows a Clothing Factory with Vehicle Body Works building to the east of it and a Precast Concrete Slabs Factory, all found offsite to the north between 100m and 250m within the confines of the STE. Further development of the STE in the 1980s shows a series of depots, warehouses, a supermarket and works buildings bounding the Site to the north, still in place through to present day. These are all shown in **Extract 1** below.

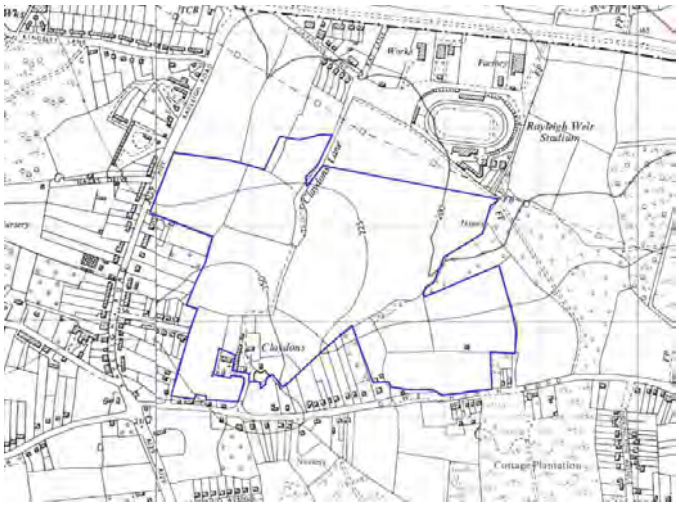
2.4.9 More industrial/commercial buildings are shown within STE on 1992 mapping, some of which have replaced the Rayleigh Weir Stadium as it is no longer shown. Extensive residential properties with private gardens are shown offsite to the west on 1992 mapping as well, see **Extract 1** below. The 1992 map shows a change in use of the scrap metal yard to a timber yard. An offsite Hospice is shown on 2001 mapping, located approximately 250m to the east. No further significant offsite changes were observed through to present day.



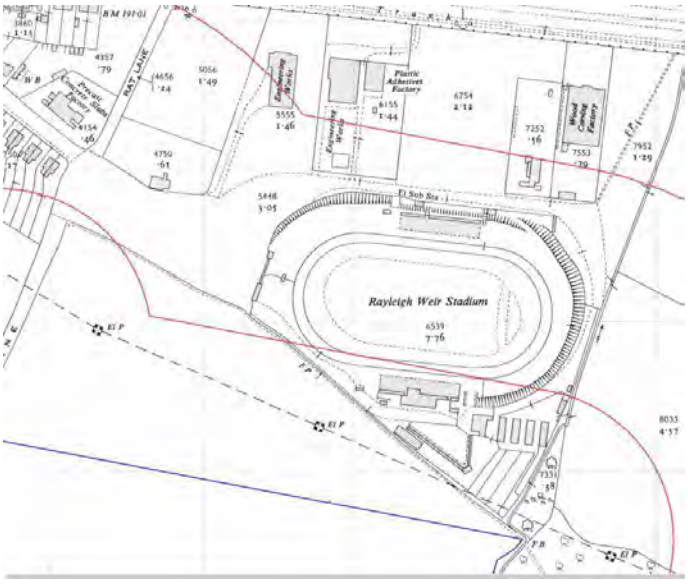
1:10,560 scale, 1876 map showing land use and offsite wells close to southern boundary



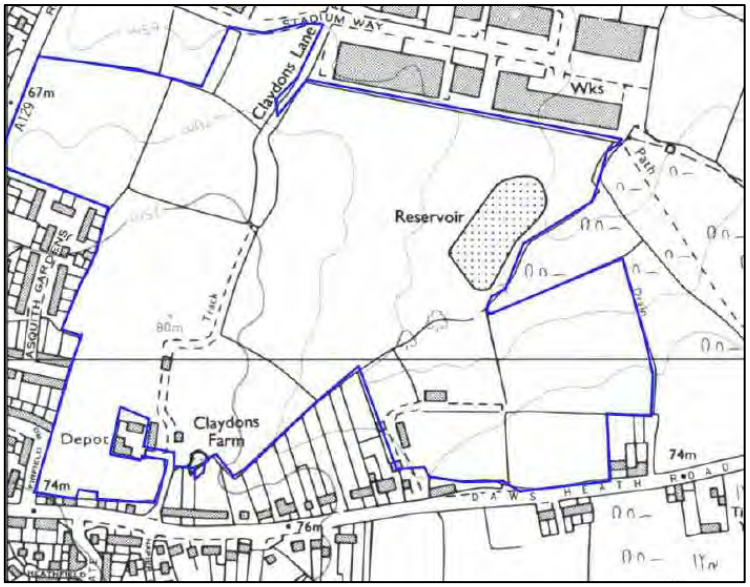
1:2,500 scale, 1954 map showing beginnings of Stadium Trading Estate (STE)



1:10,560 scale, 1960 map showing depot west of Claydons and the Rayleigh Weir Stadium



1:1,250 scale, 1980 map showing industrial buildings to the north located offsite between 100m and 250m



1:10,000 scale, 1992 map showing Claydons' Farm, the Reservoir and the Stables. Stadium Trading Estate is shown offsite to the immediate north.

Extract 1: Historical maps (source: Groundure Insight Report, 2021)

2.5 Review of Historical Imagery on Google Earth

2.5.1 Google Earth aerial images, available from 1999 to 2020, have been reviewed and summarised as follows.

2.5.2 What appears to be a temporary compound located within the far north western area of the site is shown in aerial imagery dated 2017. Imagery shows topsoil is absent and the area used for external storage of storage containers and other items.

2.5.3 An area of what appears to be hard standing is shown close to the central area of the Site. Stockpiles of material of unknown origin and composition are shown. These images are considered likely to coincide with the concrete covered storage area noted during the site walkover on the boundary between Cook's Land and Barber's Land that is used for the storage of fertiliser/manure.

2.6 Archaeological Setting and Property – Building Effect

2.6.1 A preliminary appraisal of readily available sources of information has been undertaken to determine whether archaeological settings and property requires consideration within the ground condition assessment. It should be noted the statement regarding the archaeological setting does not purport to be an archaeological risk assessment which might require a separate commission.

2.6.2 There are no designated battlefields, listed buildings, scheduled monuments, park/gardens, conservation areas or world heritage sites within the study area boundary. The nearest feature to the Site is a Grade II listed building approximately 100m to the south east called 96 and 98 Daws Heath Road (ref 1170144) listed in 1986 which is not considered to be at risk from the proposed development.

2.7 Review of Database Searches

2.7.1 The results of the database searches relating to land-use are summarised in the following table and discussed in the following sections.

Table 2.3 Summary of Environmental Database Searches

Data Type	Number on Site (1)	Number within 250 m of Site (1)
Waste Regulation		
Landfill Sites	0 (0)	0 (0)
Historical Waste Sites	0 (0)	1 (0)
Licensed Waste Management Facilities	0 (0)	0 (0)
Statutory Permits/Authorisations		
Pollution Prevention and Control(2)	0 (0)	0 (0)
Radioactive Substance Authorisations	0 (0)	0 (0)
Planning Hazardous Substances	0 (0)	0 (0)
COMAH Sites(3)	0	0
NIHHS Sites(4)	0	0
Recorded Pollution / Potential Pollution		
Substantiated Pollution Incidents	0	3
Contaminated Land (5)	0	0
Potential Contaminative Uses		
Fuel Stations	0	1
Trade Directory or Recent industrial land uses	0	56

Note: 1) Numbers in brackets denotes number of authorisations, licenses or permits that are lapsed, revoked, cancelled, superseded, defunct, surrendered, not applicable, inactive, withdrawn or not yet started.
2) Includes Integrated Pollution Controls, Integrated Pollution Prevention and Control, Local Authority Integrated Pollution Prevention and Control and Local Authority Pollution Prevention and Control permits.
3) COMAH denotes Control of Major Accident Hazards
4) NIHHS denotes Notification of Installations Handling Hazardous Substances
5) Sites determined as Contaminated Land under Part 2A of the Environmental Protection Act

2.8 Industrial Setting

Landfill and Waste Sites

2.8.1 There are no registered landfill sites on Site or within 250m of the Site. However, there are two on site waste exemption records. Waste exemption activities involve the treatment, storage, use or disposal of waste that are exempt from needing a permit. These exemptions do have specific limits and conditions that must be adhered to. Both records relate to Claydons Farm. The first is for the deposit of waste from dredging of inland waters and the second is for burning waste in the open. No further details were available.

2.8.2 Further waste exemption records are held relating to Claydons Farm, but these are situated approximately 10m off-site to the south. Again, the exemptions related to the deposit of waste from dredging of inland waters and the burning of waste in the open.

2.8.3 Four waste exemption records are held for a property 30m north of the Site. These exemptions relate to the storage of waste in secure containers and the storage of waste in a secure place. No further details are given.

Petrol Stations

2.8.4 Three fuel stations are identified as being present within 500m of the study area boundary. The closest currently operational site is Sainsbury's petrol station located off-Site, approximately 200m to the north.

Pollution Incidents

2.8.5 Three pollution incidents within 250m have been identified that took place off-Site at a location within the STE, approximately 230m to the north. The pollutants were recorded as Atmospheric Pollutants (smoke) and Specific Waste Materials. The incidents were categorised as having minor impact to land and air.

Trade Directory Entries or Recent Industrial Land Uses

2.8.6 The GIR shows that there are 56 records within 250m of the Site, all are off-Site.

2.8.7 There are six electrical substations within 100m, the closest of which is shown approximately 10m to the north. A depot is located approximately 10m to the west of Claydons Farm. Hughes Trade (electronic equipment/industrial products) and another depot are both situated approximately 30m to the north.

2.8.8 Davmet Trading Co. Ltd (fish, meat, and poultry products) is located approximately 40m to the south east and Essex Auto Group (car sales) is situated approximately 60m north west. Essex Plastic Ltd is shown approximately 100m north.

2.8.9 The remaining records comprise a mixture of commercial suppliers, transportation services, car dealerships and tool hire for trades. An entry for 'Tank' is recorded approximately 140m north east.

2.9 Consultation with Regulators

2.9.1 A request for environmental information has been submitted to Castle Point Borough Council and the Environment Agency (EA). At the time of writing no response has been received.

2.9.2 Requests for information and responses from the Environment Agency are included in **Appendix E**. No response was received from Castle Point Borough Council at the time this report was issued.

2.9.3 The information supplied by the Environment Agency mainly related to groundwater data which has been included in the following subsections where relevant. Their response did make reference to two potential contamination issues recorded on the Castle Point Borough Council Planning website where the Environment Agency had provided comment and review on associated documents.

2.9.4 The first reference is CPT/457/04/FUL which was associated with the construction of the retail park and car parking areas to the north of the site. The Environment Agency documentation available for review under this planning application indicated that a Remediation Strategy (RS) had been approved for the site and the development had been carried out in accordance with the RS. Some detail was provided, which indicated contaminated soils had been removed from site and replaced with validated clean materials.

2.9.5 The second reference was associated with a previous planning application made for the redevelopment of the western area of the subject site, comprising what is referenced as 'Barber's land' in this report.

2.9.6 A desk study and ground investigation was undertaken identifying potential contamination sources on site in 2009. The site conceptual site model identified potential contamination sources in the form of made ground, localised hydrocarbon spillages from vehicles and possible tanks, burnt out buildings and trees, fly-tipped materials and backfilled materials to reduce the size of the pond in the southern part of the site.

2.9.7 The ground investigation works undertaken did identify the presence of cement bound asbestos within the backfilled pond area at depth.

2.10 Review of Unexploded Bomb Risk Map

2.10.1 A preliminary unexploded ordnance (UXO) identification has been undertaken through review of the Unexploded Bomb (UXB) risk map (Zetica, undated). The map indicates the potential for Unexploded Bombs (UXB) to be present as a result of World War Two (WWII) aerial bombing.

2.10.2 The map shows the Site to be in an area designated as 'Moderate' where Moderate is defined as "Areas indicated as having a bombing density of 15 to 49 bombs per 1000acre." A UXO has been found off-Site at approximately 450m.

2.10.3 Based on the above, there is a Moderate likelihood that UXOs could be a hazard during ground investigations and future development and further assessment/mitigation should be undertaken.

3 Environmental Setting

3.1 Introduction

3.1.1 The information from published and publicly available information sources is summarised below and is used to provide context for the ground stability appraisal in **Section 5** and identify potential receptors in the Tier 1 PRA presented in **Section 4**.

3.2 Geological Setting

3.1.2 The following sources have been reviewed to provide information on the geological setting.

Review of Published Geology

3.1.3 The 1:50,000 series Geological Survey of England and Wales Sheet 258/259 (BGS, 1976) and BGS GeoIndex (onshore) (BSG, 2021) indicate the following geological sequence underlying the Site.

Superficial Deposits

3.1.4 Superficial deposits are shown to be largely absent from the Site, particularly in the centre, west and south suggesting that the bedrock is shallow in these areas. The north east and centre of the Site is underlain by Head, described by the BGS as 'poorly sorted and poorly stratified, angular rock debris and or clayey hillwash and soil creep, mantling a hillslope and deposited by solifluction and gelifluction processes. Polymict deposit comprises gravel, sand and clay depending on upslope source and distance from source. Locally with lenses of silt, clay or peat and organic material'.

3.1.5 Glaciofluvial Deposits, Mid Pleistocene – Sand and Gravel underlie the south east study area boundary. No description has been provided by the BGS.

3.1.6 A small area of Sand and Gravel of (Uncertain Age and Origin) is recorded in the south west of the Site adjacent to Asquith Avenue. No description has been provided by the BGS.

Solid Geology

3.1.7 The Site is underlain by two bedrock formations which roughly divide the Site north and south. The Claygate Member – Clay, Silt and Sand is located across the north and centre (east) of the Site and described as 'dark grey clays with sand laminae, passing up into thin alternations of clays, silts and fine-grained sand, with beds of bioturbated silt. Ferruginous concretions and septarian nodules occur in places.'

3.1.8 Beneath the south and centre (west) of the Site is the Bagshot Formation – Sand, described as 'pale yellow-brown to pale grey or white, locally orange or crimson, fine- to coarse-grained sand that is frequently micaceous and locally clayey, with sparse glauconite and sparse seams of gravel. The sands are commonly cross-bedded but some are laminated. Thin beds and lenses of laminated pale grey to white sandy or silty clay or clay ('pipe-clay') occur sporadically, becoming thicker towards the top of the formation. A thick clay bed, the Swinley Clay Member, is included at the top. In places, there is a basal bed of gravelly coarse-grained sand'.

Historical BGS Boreholes

3.1.9 The BGS borehole record viewer (BGS, 2021) was reviewed. The borehole scans are delivered under the Open Government Licence, subject to the following acknowledgement accompanying any reproduced BGS materials: "Contains British Geological Survey materials © UKRI [2020]".

3.1.10 Several historical boreholes are shown offsite to the north and a single borehole is within the study area boundary. The onsite log (BGS ref TQ88NW130) is for a trial pit named by the BGS as 'Rayleigh Stadium TP 1' and dated 1973. Topsoil is recorded from the ground level to 0.18m below ground level (bgl) which is underlain by firm brown and grey mottled silty sandy CLAY to 0.61m bgl where the excavation ends.

3.1.11 The remaining exploratory holes are for boreholes undertaken in 1973 and 1998 to a maximum depth of 15.2m bgl. The salient ground conditions are summarised below:

- Topsoil/made ground from ground level up to 1.1m bgl;
- Soft to firm brown and grey mottled sandy silty CLAY from 0.18m to 3.3m bgl.
- Firm and sometimes stiff brown and grey fine stoned silty CLAY from 3.3m to 7.0m bgl;
- Firm to stiff fissured grey silty clay with partings of find sand (London Clay) from 3.3m to 15m bgl.

3.2 Ground Investigation Data

3.2.1 A limited ground investigation was undertaken in May 2021 by Stantec comprising the drilling of 6 window sample boreholes and the excavation of twelve infiltration test pits and subsequent soakage testing. Full information is presented in technical notes 332210105/350.001- TN-GEO-01 and TN-GEO-02

3.2.2 The investigation found the following geological profile beneath the site:

Table 3.1 Summary of Encountered Geology

Formation	Top Depth Range (bgl)	Base Depth Range (bgl)
Topsoil	Ground Level	0.20 - 0.50m
Made Ground	0.10m	0.50m
Head Deposits	0.20m – 0.50m	1.5m – 5.6m
Claygate Member	1.1m - 5.6m	2.0m – 6.0m

3.2.3 Groundwater was recorded as follows in the installed monitoring wells:

Table 3.2 Summary of Standing Groundwater Levels in Monitoring Wells

Location	Ground Levels (m AOD)	Groundwater Depth			
		25 May 2021		9 June 2021	
		m bgl	m AOD	m bgl	m AOD
WS101	66.0	3.21	62.8	0.91	65.1
WS102	66.2	0.85	65.4	1.23	64.9
WS103	58.1	0.77	57.3	0.91	57.2
WS104	66.8	1.31	65.5	1.34	65.5
WS105	78.0	1.60	76.4	1.71	76.3
WS106	70.1	0.61	69.5	0.75	69.4

3.3 Geomorphological Setting

3.3.1 Geodiversity can be defined as "The natural range (diversity) of geological (rocks, minerals, fossils), geomorphological (landforms, topography, physical processes), soil and hydrological features. It includes their assemblages, structures, systems and contributions to landscapes" (Gray, 2013). Geodiversity of sites may be specifically protected by various mechanisms including geological Sites of Special Scientific Interest (SSSIs), National Nature Reserves (NNRs) and Local Geology Sites (formerly known as RIGS - Regionally Important Geological and Geomorphological Sites).

3.3.2 No such features have been identified on-site or within 100m, which is generally considered the likely extent of influence.

3.4 Hydrogeological Setting

3.4.1 The following table summarises information regarding hydrogeology and groundwater vulnerability based on available information including previous onsite investigations.

Table 3.3 Summary of Hydrogeology and Groundwater Vulnerability Related Information

Item and *Source*	Details
Aquifer Classification *MAGIC map (Defra, 2021), GIR*	**Superficial** • No superficial aquifer present across the majority of the Site • Secondary A aquifer (Sand and Gravels) in the south west. 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 • Secondary Undifferentiated aquifer (Head) in the north east. Undifferentiated is 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 **Bedrock** • Secondary A aquifer (Claygate Member and Bagshot) across the Site
Water Framework Directive (WFD) *GIR*	The Essex Gravels have been given a quantitative rating of Good, a chemical rating of Poor and an overall rating of Poor in 2015.
Depth to Groundwater *BGS, Environment Agency*	BGS historical borehole scans for boreholes immediately north of the Site indicate water strikes at between 2.1m and 0.6m bgl in the Head and 14.3m bgl in the clays. Information from the Environment Agency's Essex Regional Groundwater Model estimates the water table to be between 58mAOD and 72mAOD (seasonal variation) across the site. During the preliminary ground investigation works (reported under separate cover) groundwater was recorded perched within the Head deposits standing between 0.75 and 3.21m bgl.
Groundwater Flow Direction* *Environment Agency*	Groundwater flow direction information was provided by the Environment Agency using their Essex Regional Groundwater Model.

Item and *Source*	Details
	Within the superficial deposits across the site, general groundwater flow is anticipated to be towards the north east. General groundwater flow direction with the deeper bedrock is anticipated to be towards the east.
Groundwater Abstraction *GIR, Local Authority, EA*	There are no groundwater abstractions onsite or within 500m of the Site.
Groundwater Vulnerability *GIR*	The onsite the groundwater vulnerability is recorded as being High for both the superficial and bedrock aquifers. 'High' is defined as 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.
Groundwater Flood Risk** *GIR*	The highest risk onsite is **Low**. Within 125m offsite to the east the highest risk is **Moderate**.
Nitrate Vulnerable Zones (NVZ) *GIR*	Within the River Roach, Nobles Ditch and Eastwood Brook NVZ.
Source Protection Zone (SPZ) *MAGIC map (Defra, 2021), GIR*	The are no SPZs within 500m of the Site.
* Groundwater information provided by the Environment Agency is presented in **Appendix E**. ** The scope of this report does not include a flood risk assessment. Please refer to the Flood Risk Assessment separately to this report.	

3.5 Hydrological Setting

3.5.1 The following table summarises the information regarding hydrology.

Table 3.4 Summary of Surface Water Related Information

Item and *Source*	Description
Surface Water Feature *GIR*	An unnamed watercourse (or possible field drain) runs along part of the eastern study area boundary, entering the Site in the east adjacent to the reservoir then flowing through the centre of the Site before existing in the south. A rectangular shaped reservoir is located in the north eastern portion of the site. It is approximately 130m by 50m wide and used as a fisher lake. The aforementioned unnamed watercourse runs close to the eastern edge of the reservoir and was noted to feed the reservoir via a pump.
Catchment and WFD *https://environment.data.gov.uk/catchment-planning/*	• River Basin District – Anglian • Management Catchment – Essex Combined • Operational Catchment – Crouch and Roach Most of the Site lies within the Eastwood Brook river catchment and the south west corner of the Site is within the Prittle Brook river catchment. The Eastwood Brook is located ~470m NE and has been given an ecological rating of Moderate, a chemical rating of Poor and an overall rating of Moderate in 2016. The Prittle Brook is ~585m S and has been given an ecological rating of Moderate, a chemical rating of Good and an overall rating of Moderate in 2016.

Item and *Source*	Description
	A tributary to the River Roach is located approximately 270m north which flows eastward adjacent to Brook Road.
Surface Water Abstractions *GIR and Local Authority*	One historical abstraction within the study area boundary (south) for spray irrigation – storage for the annual abstraction of 3660m^2 (licence ref 8/37/44/*S/0058). No other recorded abstractions within 500m.
Discharge Consents *GIR*	There are 10 entries for discharge consents to surface water, the closest being ~20m S of the Site for the discharge of 'miscellaneous' to 'Trib' (a possible abbreviation for tributary) although the revocation date is 1993 so the discharge activities should have ceased. Another discharge consent is recorded ~170m NE at Rayleigh Stadium for the discharge of 'miscellaneous' to Eastwood Brook.
Pollution Incidents and Substantiated Pollution Incidents to Controlled Waters *GIR*	There are four entries for pollution incidents with 500m of the Site but none of these recorded an impact to water features.
River Flood Risk* *GIR*	Some localised surface water flooding is shown in the north east corner of the Site.
* The scope of this report does not include a flood risk assessment.	

3.6 Ecological Setting and Property – Animal or Crop Effect

3.6.1 A preliminary appraisal of readily available sources of information has been undertaken to determine whether ecology as a resource requires consideration within a ground condition assessment. It should be noted the statement regarding ecological systems does not purport to be an ecological risk assessment which might require a separate commission.

3.6.2 There are no statutory designated Special Protection Areas or Special Area of Conservation onsite or within the immediate (<100m) of the Site. The Site is shown to be within the green belt. The Thundersley Great Common (North Slope) SSSI is located 179m northwest of the site, extending to the Southern Plateau 556m to the west.

3.6.3 No other Statutory Designated sites of ecological significance were identified within 1000m of the study area.

3.6.4 Little Haven Nature Reserve[1], a Local Wildlife Site) is managed by Essex Wildlife Trust (EWT). The Reserve abuts the eastern boundary of the Site. The EWT manages Little Haven Woods for their partners Havens Hospices as part of the Little Haven Hospice grounds. The woods form part of the historical woodlands of the Daws Heath area. The Reserve was selected in 1992 on a range of criteria and is an England Biodiversity Action Plan (BAP) Priority Habitat.

3.6.5 It is noted that there are a number of badger setts located on site. Further ecological assessment of the site is being conducted by others.

[1] Little Haven Nature Reserve, available at: Little Haven Nature Reserve | Essex Wildlife Trust, accessed 27 April 2021

3.7 Ground Gases

Natural Soil Gas – Alluvium and Radon

3.7.1 The Groundsure Insight Report (GIR) and HPA/BGS Indicative Atlas of Radon in England and Wales (BGS, 2007) indicates the Site is in an area where the property is in a low probability radon area, as less than 1% of homes are above the action level. Radon protection measures are not required for the construction of new dwellings or extensions. Radon is not identified as a potential human health hazard.

3.7.2 The superficial geology (described above) is not considered to generate ground gases.

Made Ground and Landfills

3.7.3 The GIR dataset does not identify recorded landfill sites onsite or within 500m of the Site. The dataset does not identify historical recorded waste sites onsite but there is a record for an historical scrap metal and/or timber yard located offsite at approximately 90m to the south east.

3.7.4 The GIR dataset identifies no records of artificial or made ground within 500m of the Site. However, a small onsite pond associated with the historical Claydons Farm is shown as absent on 2021 mapping. A second pond located approximately 15m south west of the Site, is shown on historical mapping within the GIR. It is inferred that these ponds have potentially been infilled with material of unknown origin and composition (made ground).

3.7.5 Made ground is likely to be present associated with the narrow field track that leads from Claydons Farm northwards through the Site, eventually joining with the Sites' northern boundary at Stadium Way road. Further made ground is likely to be present associated with the fisheries access tracks and the hardstanding area (approximately 500 sq. m) towards the centre of the Site.

3.7.6 Previous ground investigation conducted in 2009 identified an area of made ground that contained asbestos to a depth of approximately 2.3m bgl (associated with an infilled pond in proximity to Claydons Farm.

3.8 Geochemical Setting

BGS Estimated Soil Chemistry

3.8.1 The GIR states that the estimated background and urban soil chemistry on the Site (based on rural and urban soil and sediment samples) to be as follows:

Table 3.5 Summary of BGS Estimated/Measured Soil Chemistry

Element	Estimated Background (mg/kg)	Estimated Urban (mg/kg)	Measured Urban (mg/kg)
Arsenic	15	7 – 13	8.8
Arsenic (bioavailable)	No data	1.2 – 2.3	No data
Lead:	100	36 – 99	No data
Lead (bioavailable)	60	30 – 68	No data
Cadmium	1.8	0.4 – 0.5	0.4
Chromium	Between 60 – 90 mg/kg and 90 – 120	58 – 101	101
Copper	No data	8 – 32	29.3

Element	Estimated Background (mg/kg)	Estimated Urban (mg/kg)	Measured Urban (mg/kg)
Nickel	15 – 30	7 – 18	68.7
Tin	No data	3 – 13	7.6

3.8.2 None of the estimated metal concentrations noted above have the potential to exceed published evaluation criteria for the most conservative land use scenario (residential with the consumption of home grown produce), as presented in **Appendix A**. Note that the BGS estimated soil chemistry data assume that the soils present are 'natural'.

4 Tier 1 Preliminary Risk Assessment

4.1 Introduction

4.1.1 The methodology developed and adopted by Stantec for the assessment of land contamination is presented in **Appendix A**. In accordance with guidance presented in the EA's LC:RM guidance we adopt a staged approach to risk assessment and this report presents a Tier 1 Preliminary Risk Assessment.

4.1.2 The underlying principle to ground condition assessment is the identification of pollutant linkages to evaluate whether the presence of a source of contamination could potentially lead to harmful consequences.

4.2 Conceptual Model

4.2.1 The Tier 1 Preliminary Risk Assessment includes the development of a Conceptual Model (CM). The CM describes the types and locations of potential contamination sources, the identification of potential receptors and the identification of potential transport/migration pathways.

4.2.2 For a pollutant linkage to be identified a connection between all three elements (source-pathway-receptor) is required.

4.3 Potential Pollutant Linkages

4.3.1 Potential pollutant linkages have been identified using the information on potential sources (hazards), receptors and exposure pathways.

Potential Sources (Hazards) and Contaminants of Concern

4.3.2 This section presents a review of various sources of information and identifies historical and current land uses on and immediately adjacent to the Site. Land use is used to inform the hazard identification element of the Tier 1 PRA (contamination).

4.3.3 The sources of potential contamination (SPCs) identified and associated contaminants of concern (COC) are presented in **Table 4.1** below.

Table 4.1 Sources of Potential Contamination

SPC Reference	Origin(s)	Onsite/ Offsite	Description and (Hazard Score)*	Contaminants of Concern (COC)
1	Historical	Onsite	Claydons Farm (demolished buildings, made ground, waste exemption for the deposit of waste from dredging of inland waters and for burning waste in the open, and potentially infilled pond with unknown materials) (2)	Asbestos, heavy metals, inorganics, polycyclic aromatic hydrocarbons (PAHs), petroleum hydrocarbons, sulphates, and ground gases (carbon dioxide and methane)
2	Contemporary	Onsite and offsite	Depot (main buildings of situated offsite but with yard area spreading onto Site) (2)	Generally, asbestos, heavy metals, acids, inorganics, PAHs, petroleum hydrocarbons and sulphates.

SPC Reference	Origin(s)	Onsite/ Offsite	Description and (Hazard Score)*	Contaminants of Concern (COC)
3	Historical	Onsite	Site Compound as per 2017 aerial imagery (3)	Generally, asbestos, heavy metals, inorganics, PAHs, petroleum hydrocarbons, MTBE, BTEX, and sulphates.
4	Contemporary	Onsite and offsite	Agricultural land (1)	Pesticides and fertilizers, hydrocarbons, vehicle movements - mineral oil (plant leaks and spills)
5	Historical	Onsite	Hard standing area (with stockpiled materials of unknown origin and composition) (2)	Generally, asbestos, heavy metals, inorganics, PAHs, petroleum hydrocarbons and sulphates.
6	Historical	Onsite/ Offsite	Made Ground associated with the infilling of the ponds, located in the southern area of the site (2)	Asbestos, heavy metals, inorganics, PAHs, petroleum hydrocarbons and ground gases
7	Contemporary	Onsite	Stockpiled material close to Stables (material of unknown origin and composition) (2)	Generally, asbestos, heavy metals, inorganics, PAHs, petroleum hydrocarbons and sulphates.
8	Contemporary	Offsite	Scrap metal yard/ timber yard (3)	Generally, heavy metals, inorganics, Polychlorinated Biphenyls (PCBs), acids, PAHs, petroleum hydrocarbons and sulphates),
9	Contemporary and historical	Offsite	Stadium Trading Estate – area comprising a range of potentially contaminative industrial and commercial uses including electrical substations, petrol station, fire station etc (4)	Heavy metals, inorganics, PCBs, PAHs, petroleum hydrocarbons and sulphates
10	Contemporary and historical	Offsite	Above ground storage tanks associated with the residential bungalow next to the Cook's Land entrance in the south of the site.	Petroleum hydrocarbons, volatiles, PAH, BTEX

*hazard score from the methodology in **Appendix A**

4.3.4 The hazard scores used in the table above are based on the contaminative potential of these land uses as established in Table 1 of the Methodology in **Appendix A**.

4.4 Hazard Assessment

4.4.1 To determine whether the identified hazards pose a risk it is necessary to identify the presence of potential receptors and pathways by which these receptors can be exposed to the hazard.

Identification of Potential Pathways

4.4.2 Potential hazards require a pathway connecting the source (if present) to potential receptors to impact upon the receptors. These pathways are capable of conveying the potential contaminants identified. Pathways may be anthropogenic (artificial) or natural.

4.4.3 Anthropogenic pathways are artificial routes capable of conveying contaminants and include such routes as surface water drains, high permeability backfill materials, poorly consolidated Made Ground, foundations, and persons disturbing contamination sources in such a way as to liberate contaminants.

4.4.4 Table 3 of the methodology presented in **Appendix A** describes the possible pathways for each receptor type.

Receptor Identification

4.4.5 Potential receptors identified by this assessment and determination of the sensitivity/value are presented in **Table 4.2** below. The assessment of the sensitivity of the receptors is guided by the Stantec Methodology as presented in **Appendix A**.

Table 4.2 Potential Receptors

Receptor	Comment	Receptor/Sensitivity
Human Health - Current Users	Yes – transient users of the stables, fishing lake and industrial units/yard	4
Human Health – Future Users	Yes – residential users with gardens for homegrown produce	5
Human Health - Neighbours	Yes – residential users with gardens for homegrown produce	5
Human Health - Construction Workers	Yes – temporarily present during construction phase	4
Water Environment (Groundwater)	Yes – Secondary A and Secondary B aquifers. Groundwater recorded as having high vulnerability.	2
Water Environment (Surface Water)	Yes – onsite fishery pond	4
Property – Buildings onsite	Yes – future residential development and/or existing buildings associated with the stables	4
Property – Buildings offsite	Yes – residential dwellings and commercial/industrial area of STE	4
Property – Animals and crops	Yes – Site comprises open fields with hedge/tree rows and fishery pond	1
Ecological Systems	Yes – Little Haven Nature Reserve forming the eastern boundary of the Site	2

4.5 Risk Estimation

4.5.1 When there is a pollutant linkage (and therefore some measure of risk) it is necessary to determine whether the risk matters and therefore whether further action is required.

4.5.2 Risk estimation involves predicting the likely consequence (what degree of harm the receptor might suffer) and the probability that the consequences will arise (how likely the outcome is given the likely scale of contamination and the probability of exposure).

4.5.3 Preliminary risk estimation is based the evaluation of available data (which has been summarised and presented in this report). Without actual data from physical site investigation works, there is always a degree of uncertainty regarding the actual presence of potentially harmful contamination. A Risk Estimation Table is presented in **Appendix F**.

4.5.4 Based on the information available, the estimated risks have been designated with further comments in the sections below. A summary of the estimated risks is presented in **Table 4.3** below.

Table 4.3 Worst-Case-Risk-Estimation

Receptor	Estimated Risk Classification
Human Health – On-Site Current Users	Low
Human Health – On-Site Future Users	Low
Human Health – Off-Site	Low
Human Health – Construction/ Maintenance Workers	Low
Surface Water	Very Low
Groundwater	Very Low
Buildings	Low
Ecological Systems	Low
Animal & Crop	Very Low

4.5.5 Based on the current and known historical land uses, the potential for the Site as a whole to be affected by contamination or ground gas is considered to be **Low.**

4.5.6 The potential for isolated areas of the Site to be affected by contamination is **Moderate**.

4.6 Risk Evaluation

4.6.1 Possible pollutant linkages are determined using professional judgement. If a linkage is considered plausible with some associated risk, even if estimated to be low, it is considered that this represents a potentially 'unacceptable risk' and therefore requires further consideration. Risk reduction can be achieved through implementation of remediation or mitigation measures or through further tiers of assessment following collection of site-specific data.

4.6.2 In the absence of mitigation, possible pollutant linkages have been identified for human health (current site users, construction workers, future users, off-Site users), surface water, groundwater, property and buildings, ecological and animal and crops. The Tier 1 Risk Assessment has shown that the estimated risks are generally **Low** but locally **Moderate** in the following areas of the Site.

- The temporary site compound in the north western corner where former compound / storage land uses have occurred. The possibility exists for contaminants to be present in soils and groundwater as a result of temporary historical activities from fill material of unknown composition and containers holding unknown materials having been placed on the Site. Furthermore, this north western corner area is bounded by an offsite electrical substation, a Fire Station and a Ford Car dealership, which are possible sources of potential contamination. Collectively, these land uses have elevated the worst-case-overall risk to **Moderate** in this part of the site.

- The former Claydons Farm area (demolished buildings) in the south western corner with potentially infilled pond of materials of unknown origin and composition and adjoining offsite depot in the south western corner whose yard (containing scrap vehicles) spreads onto the Site. The likelihood for migration of contaminants from the neighbouring depot site is considered to be **Low**, however, there is potential that localised chemical spills

have taken place across the depot yard where it spreads onto the Site. Moreover, former Claydons Farm has been demolished and the historical pond infilled. Waste exemption records exist for the farm regarding the deposit of waste from dredging of inland waters and for burning waste in the open. Collectively, these have elevated the worst-case-overall risk to **Moderate** in this south western corner area of the Site.

- Historical Made Ground likely associated with the narrow field track that leads from Claydons Farm northwards through the Site, around the fisheries pond and underlying the associated access tracks. The possibility exists for contaminants to be present in soils and groundwater associated within these anticipated localised areas of Made Ground of unknown origin, depth and composition. This has elevated the worst-case-overall risk to **Moderate** in these distinct areas.

- The possibility exists for hydrocarbon impacts from off-site above ground storage tanks identified to the back of a residential property along the southern study area boundary. One of the identified tanks appeared to be a fuel tank that had been in operation for some time and considered likely to have been used to refuel farm machinery. A potential **Moderate** risk has been identified for the land located adjacent to the tanks in this area.

- The potential exists for contaminants to be present in soils and groundwater along the northern study area boundary as the adjoining land use is the STE. This industrial area has been shown to have a number of possibly contaminative sources within it. Therefore, the overall-worse-case risk along the northern study area boundary is considered to be elevated to **Moderate**. This industrial estate is down topographic gradient, therefore, the risk maybe diminished following appropriate information gained through ground investigation and gas monitoring.

4.6.3 The potential exists for contaminants to migrate from the up topographic gradient scrap metal/timber yard. Given the distance from the study area boundary the likelihood of this risk being realised is estimated to be **Low**. Land East o

5 Ground Stability Appraisal

5.1 Introduction

5.1.1 This study utilises the guidance given in NHBC Standards Chapter 4.1 Land Quality – Managing Ground Conditions. A preliminary assessment of potential ground instability issues has been undertaken based on walkover information and readily available published geological information together with data acquired from public databases which equate to the NHBC Initial Assessment (desk study).

5.1.2 An assessment of potential geological hazards that may give rise to instability or adverse foundation or construction conditions as supplied by the British Geological Survey (BGS) from their National Geoscience Information Service (NGIS) is presented in the GIR reproduced in **Appendix C**. The information contained in the GIR has been reviewed and where considered necessary, reassessed considering the specific information available for the Site.

5.2 Mining (Past, Present and Proposed)

Preliminary Coal Mining Assessment

5.2.1 The GIR records no areas affected by coal mining past, current or future on-Site. Given that the Site is located outside a coal mining region, a coal mining risk assessment is not considered necessary.

Non-Coal Mining

5.2.2 A review of the non-coal mining plans[2] shows that there are no plans available for the Site nor within 1km. The GIR dataset shows that no natural cavities, underground workings nor mining cavities are present onsite or within at least 500m.

5.2.3 Brine and gypsum areas as well as tin and clay mining areas are shown by the GIR dataset to not be present onsite.

5.2.4 The GIR dataset shows surface ground workings are recorded onsite dating back to as early as 1867 for the pond associated with Claydons Farm. The latest record for the Claydons Farm pond is 1965. Moreover, within the GIR dataset, there is a 1988 surface ground workings record for the larger fishing lake / reservoir found onsite up to present day.

5.2.5 An offsite surface ground workings record of further ponds, located approximately 15m to the south west, is contained within the GIR dataset. Where the excavated material was placed/taken is not clear and no further details are given.

Natural and Man Made (Mining) Cavity Records

5.2.6 The National Natural and Mining (non-coal) Cavities Databases, maintained by Stantec, have been searched for relevant natural and mining cavity records.

5.2.7 **Natural Cavities:** No natural cavity records were identified within 1km of the site. The nearest record was for three solution pipes located approximately 14km to the south west of the site.

5.2.8 **Mining Cavities:** No mining cavity records were identified within 1km of the site. The closest mining cavity record was for a series of possible deneholes located approximately 14.7km to the south west of the site.

[2] BGS Non-coal mining plans, available at: Non-coal mining plans - bgs.ac.uk, accessed 26 April 2021

5.2.9 A copy of the cavities database search is presented in **Appendix G**.

5.3 Potential for Collapsible Ground Stability Hazards

5.3.1 The GIR records that, presuming natural materials are present, the on-Site collapsible ground stability hazard will be **Very Low**. Stantec generally concurs with this assessment.

5.4 Potential for Compressible Ground Stability Hazards

5.4.1 The GIR records that, assuming natural materials are present, the onsite compressible ground stability hazard potential will be **Negligible**. Head deposits are reported to lie beneath the central and north eastern portions of the Site. These can have local lenses of silt, clay or peat and organic material. On this basis Stantec recommends a **Low** hazard potential for compressible natural ground is adopted for the areas underlain by Head deposits.

5.5 Potential for Running Sand Stability Hazards

5.5.1 The GIR records the overall onsite potential for running sands stability hazards to be **Low**. Where present, areas of Head deposits (generally clay, silt, sand, and gravel) and sands and gravels are classified by the GIR as having **Very Low** potential. On the presumption that the Head deposits underly the north eastern portion of the Site, Stantec concurs with this assessment.

5.5.2 However, Stantec does not agree with the **Very Low** assessment of the circular area of sands and gravels shown in the south western corner of the Site. The BGS record these sands and gravels deposits to be of uncertain age and origin. As a consequence, the onsite potential for running sands hazard in this specific area should be raised to **Low**.

5.5.3 The GIR records the overall onsite potential for running sands stability hazards to be **Low** i.e. '*No identified constraints on land use due to running conditions unless water table rises rapidly*." Superficial deposits are shown to be largely absent from the Site, particularly in the centre, west and south suggesting that the bedrock is shallow in these areas. Stantec generally concurs with this assessment.

5.6 Potential Shrinking or Swelling Clay Stability Hazards

5.6.1 The GIR records the onsite shrinking or swelling clay stability hazard potential to be **Moderate**. On the presumption that these hazard potentials relate to the Head Deposits and Claygate, Stantec concurs with this assessment.

5.7 Potential for Ground Dissolution Stability Hazards

5.7.1 The GIR records the onsite ground dissolution stability hazard potential as **Negligible**. Stantec concurs with this assessment as dissolution features are unlikely to be present.

5.8 Potential for Landslide Ground Stability Hazards

5.8.1 The GIR records the on-Site landslide ground stability hazard potential as **Very Low**. Stantec concurs with this assessment, based on the current site topography and geological setting.

6 Conclusions and Recommendations

6.1 Conclusions

General

6.1.1 The Site is located within the town of Thundersley, to the east of Rayleigh Road and covers approximately 28ha. It currently comprises largely open agricultural fields, laid to permanent grass, with some horse grazing paddocks, associated stables and a fishing lake/ reservoir.

6.1.2 The local setting around the Site comprises a mix of land uses. Bounding the study area to the north is the industrial area of the Stadium Trading Estate (STE). To the south and west are mainly residential properties with private gardens. The A129 Rayleigh Road is immediately west of the Site and the A127 Southend Arterial Road runs west to east approximately 250m to the north at the closest point. Agricultural land is generally found to the east as is a Hospice, located at approximately 250m.

6.1.3 During the site visit a number of above ground tanks were identified at the back of a residential bungalow whose driveway provided access into the stables and fishing lake. One of these appeared to potentially be a metal water tank, but the larger tank appeared to have been used for refuelling of agricultural vehicles.

6.1.4 Superficial deposits were shown to be largely absent from the Site on the geological map for the area, particularly in the centre, west and south suggesting that the bedrock was shallow in these areas. The north east and centre of the Site was shown underlain by Head Deposits.

6.1.5 The limited investigation works undertaken suggests that the superficial Head Deposits are present across the majority of the site, as their presence was recorded in all of the exploratory holes excavated/drilled on site.

6.1.6 The bedrock geology recorded beneath the site was considered largely to represent the Claygate Member. Fine sand layers were identified within the Claygate Member at depth. Little evidence was found to support the presence of the Bagshot Formation.

6.1.7 The information presented within this report is considered sufficient to support an outline planning application and to facilitate determination of said application. It is anticipated that future ground investigations can be secured and delivered via an appropriately worded planning condition. The Site is considered to be readily developable.

Preliminary Geotechnical Assessment

6.1.8 The BGS hazard ratings for ground stability have been defined as **Negligible** to **Moderate**. A **Moderate** stability hazard potential for shrinking or swelling clays has been assigned and Stantec considers that a **Low** stability hazard potential for compressible natural ground be adopted for areas underlain by Head Deposits and the Claygate Member.

6.1.9 A shallow water table is inferred in the north of the Site within the Head deposits as BGS (offsite to the immediate north) borehole records record shallow water strikes in this deposit. Site specific data obtained during the limited investigation works has confirmed the presence of a shallow water table (<1m deep) in half of the monitoring well locations installed on site.

6.1.10 Ground conditions are such that traditional shallow foundations could be considered suitable for use as part of the development, but alternative foundation options and/or ground improvement techniques may need to be considered if unsuitable bearing strata is identified by further investigation work or shallow bedrock is encountered. The design of foundations should take into consideration future planting proposed and be in accordance with BRE and NHBC guidance.

6.1.11 Groundwater control measures are likely to be necessary as part of future construction excavations.

6.1.12 Further assessment of geotechnical conditions can be delivered through further ground investigation and potential risks, if present, likely addressed through design. It is considered that this should not preclude securing planning consent.

Geoenvironmental

6.1.13 With respect to geoenvironmental risks at the Site, historically, the majority of the Site has remained undeveloped and is considered to be **Very Low** to **Low** risk. The likelihood for contaminants to be present in soils and groundwater due to agricultural land use is considered to be **Low**.

6.1.14 However, there are a number of specific areas within this large Site where the estimated worst-case-risk of contamination within soils and groundwater has been elevated to **Moderate**. Moderate risk in this instance relates to the potential to cause harm to human health during construction and to future end users. These identified areas within the Site include: -

- The south western corner where there is an adjoining depot and former onsite Claydons Farm (with infilled pond) which has waste exemption records for the deposit of waste from dredging of inland waters and burning waste in the open.
- The north western corner where a temporary site compound was identified on historical aerial photography. Furthermore, the neighbouring land uses comprise an electrical substation, fire station and car dealership.
- The entire northern boundary area with the contemporary Stadium Trading Estate (industrial and commercial land use).
- Anticipated historical Made Ground of unknown origin (and depth) underlying access tracks, an area of hard standing in the central northern part of the Site, and Made Ground surrounding the fishery reservoir.
- Stockpiled materials or unknown origin and composition located on the central northern hard standing area and east of the Stables.
- Off-site above ground fuel tank associated with a neighbouring bungalow located just south of the site, next to the access track to the stables and fishing lake.

6.1.15 It is considered that the information presented in this report provides a good understanding of the likely ground conditions and enables identification of potential risks and that the risks identified will not preclude the redevelopment of the Site. However, further detailed intrusive investigation is required to appropriately quantify the identified risks.

6.1.16 It is anticipated that potential risks identified can be appropriately mitigated through appropriately worded planning conditions.

6.2 Uncertainties and Data Gaps

6.2.1 Whilst noting that the ground condition data used in this report is mainly qualitative in nature (and that historical mapping is never a complete record of the potential changes in land use), it is considered that there is a reasonable level of confidence that the information presented in this report provides a good understanding of the likely ground conditions and enables identification of potential risks.

6.2.2 There is uncertainty about the purpose of the temporary site compound with storage containers shown on it that appeared on aerial photographs taken around 2017.

6.2.3 Future re-grading or cut and fill work for development of the Site is not known at this time.

6.3 Recommendations

6.3.1 Based on the finding so this Phase 1 ground conditions assessment and the limited investigation works completed to date, it is recommended that further investigations work be undertaken to: -

- Provide greater information on the ground conditions and inform the detailed design of the proposed structures including foundations, infrastructure and drainage.
- Provide more detail on groundwater levels across the site.
- Obtain information on the extent of possible contamination present within both the soils and groundwater beneath the Site to enable risk assessment and, where necessary, allow remedial/mitigation measures to be defined as necessary. In particular, confirmation of conditions across the former compound storage area in the north western corner of the Site, the south western area around Claydons Farm/depot, the northern boundary area with the Stadium Trading Estate, identified stockpiles and isolated areas of anticipated Made Ground will be necessary, and assessment of any impact from the off-site above ground fuel tank.

7 Essential Guidance for Report Readers

7.1.1 This report has been prepared within an agreed timeframe and to an agreed budget that will necessarily apply some constraints on its content and usage. The remarks below are presented to assist the reader in understanding the context of this report and any general limitations or constraints. If there are any specific limitations and constraints, they are described in the report text.

7.1.2 The opinions and recommendations expressed in this report are based on statute, guidance, and best practice current at the time of its publication. Stantec UK does not accept any liability whatsoever for the consequences of any future legislative changes or the release of subsequent guidance documentation, etc. Such changes may render some of the opinions and advice in this report inappropriate or incorrect and the report should be returned to us and reassessed if required for re-use after one year from date of publication. Following delivery of the report, Stantec has no obligation to advise the Client or any other party of such changes or their repercussions.

7.1.3 Some of the conclusions in this report may be based on third party data. No guarantee can be given for the accuracy or completeness of any of the third-party data used. Historical maps and aerial photographs provide a “snapshot” in time about conditions or activities at the site and cannot be relied upon as indicators of any events or activities that may have taken place at other times.

7.1.4 The conclusions and recommendations made in this report and the opinions expressed are based on the information reviewed and/or the ground conditions encountered in exploratory holes and the results of any field or laboratory testing undertaken. There may be ground conditions at the site that have not been disclosed by the information reviewed or by the investigative work undertaken. Such undisclosed conditions cannot be taken into account in any analysis and reporting.

7.1.5 It should be noted that this report is a land condition assessment and does not purport to be an ecological, flood risk or archaeological survey and additional specific surveys may be required.

7.1.6 This report has been written for the sole use of the Client stated at the front of the report in relation to a specific development or scheme. The conclusions and recommendations presented herein are only relevant to the scheme or the phase of project under consideration. This report shall not be relied upon or transferred to any other party without the expressed written authorisation of Stantec. Any such party relies upon the report at its own risk.

7.1.7 The interpretation carried out in this report is based on scientific and engineering appraisal carried out by suitably experienced and qualified technical consultants based on the scope of our engagement. We have not taken into account the perceptions of, for example, banks, insurers, other funders, lay people, etc., unless the report has been prepared specifically for that purpose. Advice from other specialists may be required such as the legal, planning and architecture professions, whether specifically recommended in our report or not.

7.1.8 Public or legal consultations or enquiries, or consultation with any Regulatory Bodies (such as the Environmental Agency or Local Planning Authorities) have taken place only as part of this work where specifically stated.

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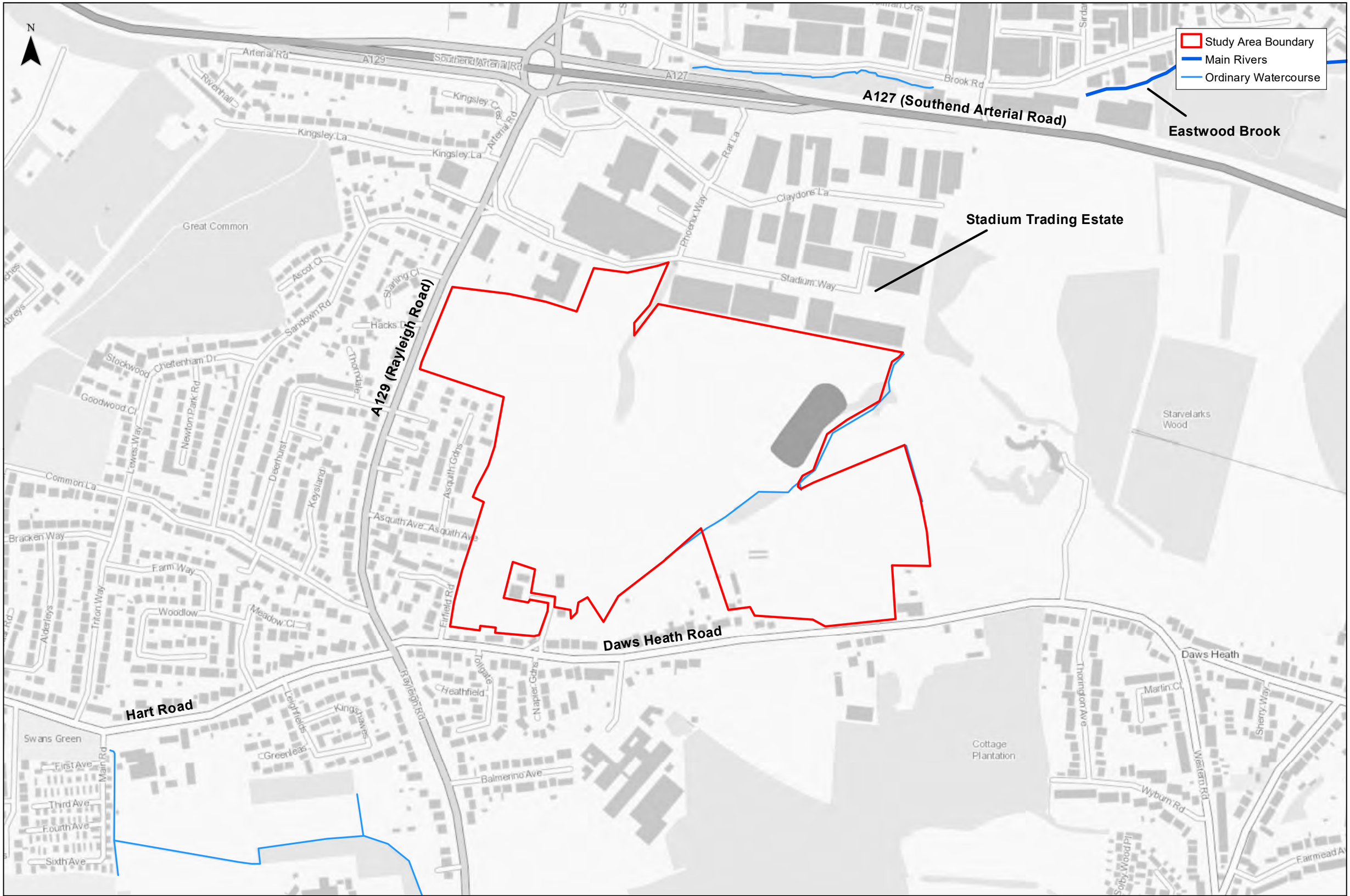
Figures



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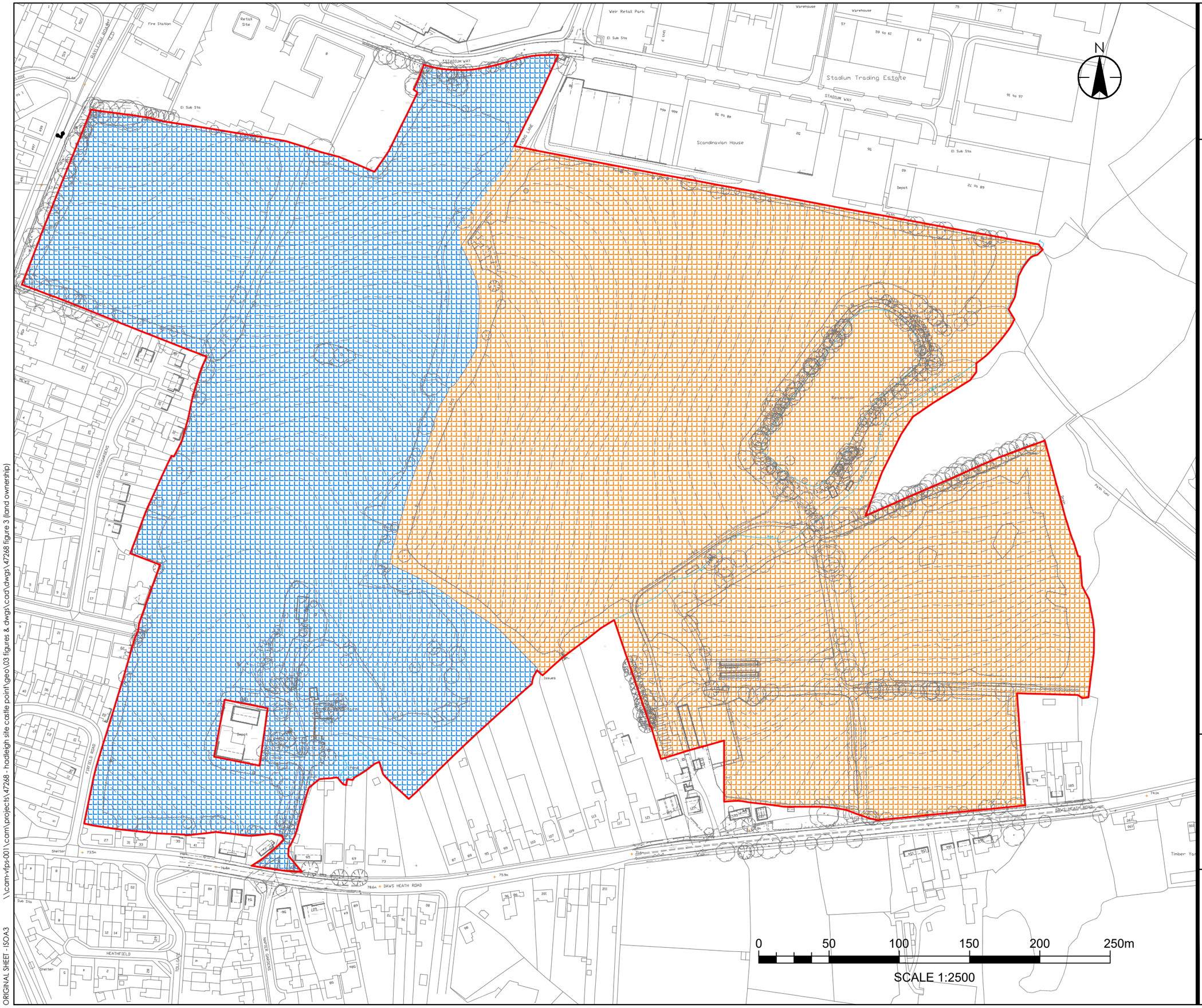

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Key

- Barber Owned Land
- Cook Owned Land

Client/Project: this Land.™

Land East of Rayleigh Road, Thundersley

Prepared:	Checked:	Date:
davco	JC	2021.05.27

Title

Land Ownership Plan

Revision: 0

Figure 2

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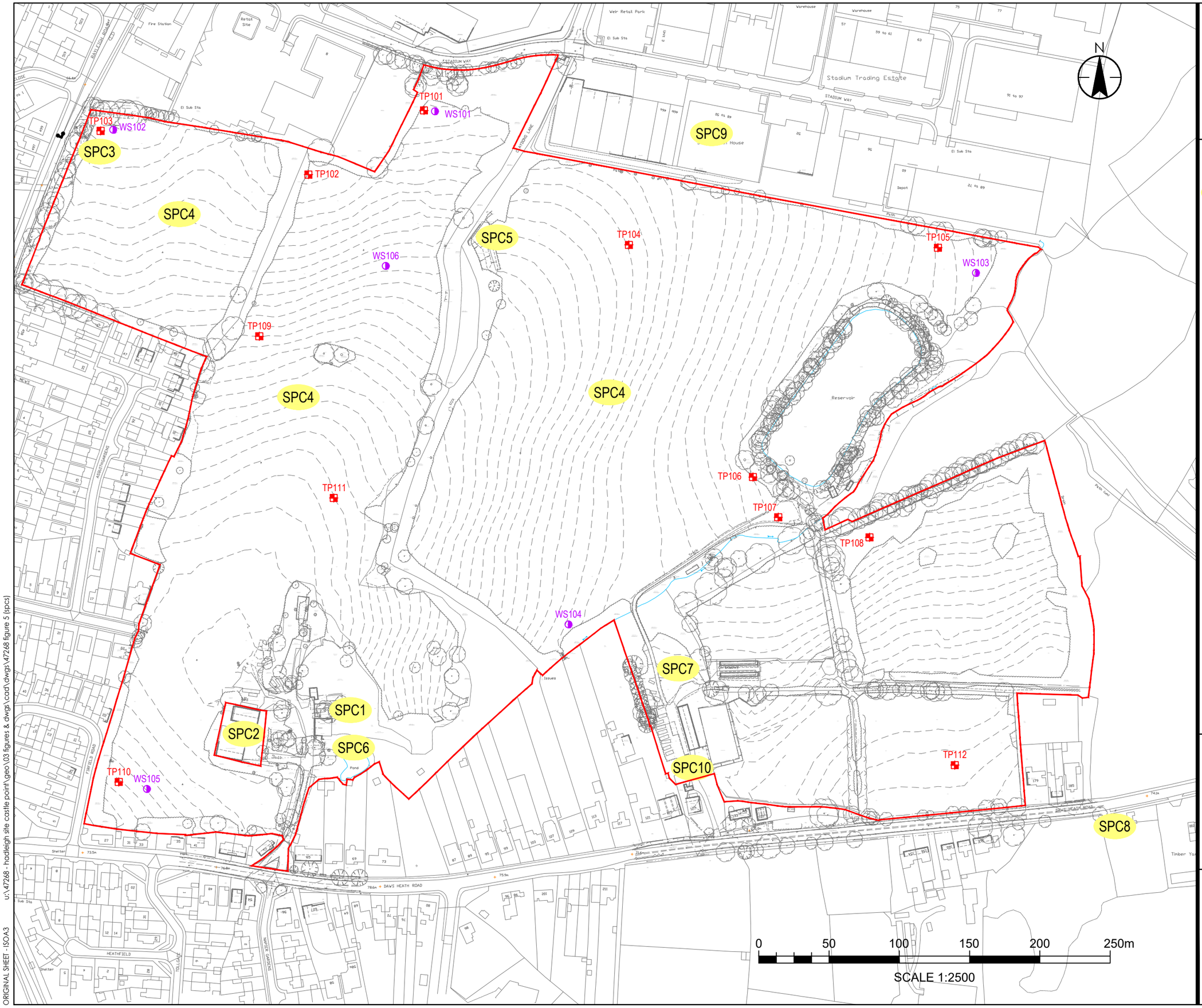

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Key

SPC_ Sources of Potential Contamination (SPC)

Proposed Trial Pit Locations

Proposed Window Sample Locations

Client/Project:

this Land.™

Land East of Rayleigh Road, Thundersley

Prepared:	Checked:	Date:
davco	JC	2021.06.30

Title

Sources of Potential Contamination (SPC) and Ground Investigation Locations for Drainage Assessment

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Appendix A Stantec Methodology for Assessment of Land Contamination (England) and Rationale for Selection of GAC

Stantec Guide: Methodology for Assessment of Land Contamination (England)

1 INTRODUCTION

This document defines the approach adopted by Stantec in relation to the assessment of land contamination in England. The aim is for the approach to (i) be systematic and objective, (ii) provide for the assessment of uncertainty and (iii) provide a rational, consistent, transparent framework.

When preparing our methodology, we have made reference to various technical guidance documents and legislation referenced in Section 7 of which the principal documents are (i) Contaminated Land Statutory Guidance (Defra 2012), (ii) online guidance Land Contamination: Risk Management (LC:RM) accessed from GOV.UK which is expected to replace Contaminated Land Research (CLR) Report 11: Model Procedures for the Management of Contamination (EA 2004). It should be noted that LCRM is currently due to be revised following consultation and CLR 11 is archived, (iii) Contaminated land risk assessment: A guide to good practice (C552) (CIRIA 2001) (iv) National Planning Policy Framework (NPPF, 2019) (v) BS 10175 Investigation of potentially contaminated sites - Code of Practice (BSI 2017) and (vi) The series of British Standards on Soil Quality BS 18400.

2 DEALING WITH LAND CONTAMINATION

Government policy on land contamination aims to prevent new contaminated land from being created and promotes a risk-based approach to addressing historical contamination. For historical contamination, regulatory intervention is held in reserve for land that meets the legal definition and cannot be dealt with through any other means, including through planning. Land is only considered to be "*contaminated land*" in the legal sense if it poses an unacceptable risk.

UK legislation on contaminated land is principally contained in Part 2A of the Environmental Protection Act, 1990 (which was inserted into the 1990 Act by section 57 of the Environment Act 1995). Part 2A was introduced in England on 1 April 2000 and provides a risk-based approach to the identification and remediation of land where contamination poses an unacceptable risk to human health or the environment.

The Model Procedures for the Management of Land Contamination (CLR 11), were developed to provide the technical framework for applying a risk management process when dealing with land affected by contamination. 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. The approach, concepts and principles for land contamination management promoted by LC:RM (and its predecessor CLR 11) are applied to the determination of planning applications. The guidance given in LC:RM follows the same principles.

Other legislative regimes may also provide a means of dealing with land contamination issues, such as the regimes for waste, water, environmental permitting, and environmental damage. Further, the law of statutory nuisance may result in contaminants being unacceptable to third parties whilst not attracting action under Part 2A or other environmental legislation.

2.1 Part 2A

The Regulations and Statutory Guidance that accompanied the Act, including the Contaminated Land (England) Regulations 2006, has been revised with the issue of The Contaminated Land (England) (Amendment) Regulations 2012 (SI 2012/263) and the Contaminated Land Statutory Guidance for England 2012.

Part 2A defines contaminated land as "*land which appears to the Local Authority in whose area it is situated to be in such a condition that, by reason of substances in, on or under the land that significant harm is being caused, or there is a significant possibility that such significant harm (SPOSH) could be caused, or significant pollution of controlled waters is being caused, or there is a significant possibility of such pollution (SPOSP) being caused*".

Harm is defined as "*harm to the health of living organisms or other interference with the ecological systems of which they form part, and in the case of man, includes harm to his property*".

Part 2A provides a means of dealing with unacceptable risks posed by land contamination to human health and the environment, and under the guidance enforcing authorities should seek to find and deal with such land. It states that "*under Part 2A the starting point should be that land is not contaminated land unless there is reason to consider otherwise. Only land where unacceptable risks are clearly identified, after a risk assessment has been undertaken in accordance with the Guidance, should be considered as meeting the Part 2A definition of contaminated land*". Further, the guidance makes it clear that *"regulatory decisions should be based on what is reasonably likely, not what is hypothetically possible".*

The overarching objectives of the Government's policy on contaminated land and the Part 2A regime are:

"(a) To identify and remove unacceptable risks to human health and the environment.

(a) To seek to ensure that contaminated land is made suitable for its current use.

(b) To ensure that the burdens faced by individuals, companies and society as a whole are proportionate, manageable and compatible with the principles of

sustainable development".

The enforcing authority may need to decide whether and how to act in situations where decisions are not straight forward, and where there is uncertainty. "*In so doing, the authority should use its judgement to strike a reasonable balance between: (a) dealing with risks raised by contaminants in land and the benefits of remediating land to remove or reduce those risks; and (b) the potential impacts of regulatory intervention including financial costs to whoever will pay for remediation, health and environmental impacts of taking action, property blight, and burdens on affected people".*

The authority is required to "*take a precautionary approach to the risks raised by contamination, whilst avoiding a disproportionate approach given the circumstances of each case".* The aim is "*that the regime produces net benefits, taking account of local circumstances*".

The guidance recognises that *"normal levels of contaminants in soils should not be considered to cause land to qualify as contaminated land, unless there is a particular reason to consider otherwise".* Normal levels are quoted as:

"a) *natural presence of contaminants'* such as from underlying geology *'that have not been shown to pose an unacceptable risk to health and the environment*

b) *…low level diffuse pollution, and common human activity…"*

Similarly the guidance states that significant pollution or significant possibility of significant pollution of controlled waters is required for land to be considered contaminated and the "*fact that substances are merely entering water"* or "*where discharge from land is not discernible at a location immediately downstream"* does not constitute contaminated land.

To help achieve a more targeted approach to identifying and managing contaminated land in relation to the risk (or possibility) of harm to human health, the revised Statutory Guidance presented a new four category system for considering land under Part 2A, ranging from Category 4, where there is no risk that land poses a significant possibility of significant harm (SPOSH), or the level of risk is low, to Category 1, where the risk that land poses a significant possibility of significant harm (SPOSH) is unacceptably high.

For land that cannot be readily placed into Categories 1 or 4 further assessment is required. If there is sufficient concern that the risks could cause significant harm or have the significant possibility of significant harm the land is to be placed into Category 2. If the concern is not met land is considered Category 3.

The technical guidance clearly states that the currently published Soil Guidance Values (SGV's) and Generic Assessment Criteria (GAC's) represent *"cautious estimates of level of contaminants in soils"* which should be considered *"no risk to health or, at most, a minimal risk"*. These values do not represent the boundary between categories 3 and 4 and "*should be considered to be comfortably within Category 4".*

At the end of 2013 technical guidance in support of Defra's revised Statutory Guidance (SG) was published and then revised in 2014 (CL: AIRE 2014) which provided:

- A methodology for deriving C4SLs for four generic land-uses comprising residential, commercial, allotments and public open space; and

- A demonstration of the methodology, via the derivation of C4SLs for six substances – arsenic, benzene, benzo(a)pyrene, cadmium, chromium (VI) and lead.

For controlled waters, the revised Statutory Guidance states that the following types of pollution should be considered to constitute significant pollution of controlled waters:

"(a) Pollution equivalent to "environmental damage" to surface water or groundwater as defined by The Environmental Damage (Prevention and Remediation) Regulations 2009, but which cannot be dealt with under those Regulations.

(b) Inputs resulting in deterioration of the quality of water abstracted, or intended to be used in the future, for human consumption such that additional treatment would be required to enable that use.

(c) A breach of a statutory surface water Environment Quality Standard, either directly or via a groundwater pathway.

(d) Input of a substance into groundwater resulting in a significant and sustained upward trend in concentration of contaminants (as defined in Article 2(3) of the Groundwater Daughter Directive (2006/118/EC)".

The guidance also states that, in some circumstances, significant concentrations at a compliance point (in groundwater or surface water) may constitute pollution of controlled waters.

As with SPOSH for human health, the revised Statutory Guidance presents a four-category system for Significant Pollution of controlled waters. Category 1 covers land where there is a strong and compelling case for SPOSP, for example where significant pollution would almost certainly occur if no action was taken to avoid it. Category 4 covers land where there is no risk or the risk is low, for

example, where the land contamination is having no discernible impact on groundwater or surface water quality. Category 2 is for land where the risks posed to controlled waters are not high enough to consider the land as Category 1 but nonetheless are of sufficient concern to constitute SPOSP, Category 3 is for land where the risks posed to controlled waters are higher than low but not of sufficient concern to constitute SPOSP.

2.2 Planning

The Local Planning Authority (LPA) is responsible for the control of development, and in doing so it has a duty to take account of all material considerations, including contamination.

The principal planning objective is to ensure that any unacceptable risks to human health, buildings and other property and the natural and historical environment from the contaminated condition of the land are identified so that appropriate action can be considered and taken to address those risks.

The National Planning Policy Framework (NPPF, 2019), includes the following.

Paragraph 118 states that planning policies and decisions should "*(c) give substantial weight to the value of using suitable brownfield land within settlements for homes and other identified needs, and support appropriate opportunities to remediate despoiled, degraded, derelict, contaminated or unstable land*."

Paragraph 179 states "*Where a site is affected by contamination or land stability issues, responsibility for securing a safe development rests with the developer and/or landowner*".

Paragraph 170 states "*planning policies and decisions should contribute to and enhance the natural and local environment by:*

(e) preventing new and existing development from contributing to, being put at unacceptable risk from, or being adversely affected by, unacceptable levels of soil, air, water or noise pollution or land instability. Development should, wherever possible, help to improve local environmental conditions such as air and water quality, taking into account relevant information such as river basin management plans; *and*

(f) remediating and mitigating despoiled, degraded, derelict, contaminated and unstable land, where appropriate."

Paragraph 178 describes the policy considerations the Government expects LPA's to have in regard to land affected by contamination when preparing policies for development plans and in taking decisions on applications.

Paragraph 178 states "*planning policies and decisions should ensure that:*

(a) a site is suitable for its proposed use taking account of ground conditions and any risks arising from land instability and contamination. This includes risks arising from natural hazards or former activities such as mining, and any proposals for mitigation including land remediation (as well as potential impacts on the natural environment arising from that remediation);

(b) after remediation, as a minimum, land should not be capable of being determined as contaminated land under Part IIA of the Environmental Protection Act 1990; and

c) adequate site investigation information, prepared by a competent person, is available to inform these assessments."

Paragraph 183 states "*The focus of planning policies and decisions should be on whether proposed development is an acceptable use of land, rather than the control of processes or emissions (where these are subject to separate pollution control regimes). Planning decisions should assume that these regimes will operate effectively. Equally, where a planning decision has been made on a development, the planning issues should not be revisited through the permitting regimes operated by pollution control authorities.*"

The Glossary in Annex 2 provides the following:

***Brownfield land registers**: Registers of previously developed land that local planning authorities consider to be appropriate for residential development, having regard to criteria in the Town and Country Planning (Brownfield Land Registers) Regulations 2017. Local planning authorities will be able to trigger a grant of permission in principle for residential development on suitable sites in their registers where they follow the required procedures.*

***Competent person (to prepare site investigation information)**: A person with a recognised relevant qualification, sufficient experience in dealing with the type(s) of pollution or land instability, and membership of a relevant professional organisation.*

***Previously developed land**: Land which is or was occupied by a permanent structure, including the curtilage of the developed land (although it should not be assumed that the whole of the curtilage should be developed) and any associated fixed surface infrastructure. This excludes: land that is or was last occupied by agricultural or forestry buildings; land that has been developed for minerals extraction or waste disposal by landfill, where provision for restoration has been made through development management procedures; land in built-up areas such as residential gardens, parks, recreation grounds and allotments; and land that was previously developed but where the*

remains of the permanent structure or fixed surface structure have blended into the landscape.

***Site investigation information**: Includes a risk assessment of land potentially affected by contamination, or ground stability and slope stability reports, as appropriate. All investigations of land potentially affected by contamination should be carried out in accordance with established procedures (such as BS10175 Investigation of Potentially Contaminated Sites – Code of Practice).*

Stantec adopt the principle that a Preliminary Investigation (Desk Study and Site Reconnaissance) and Preliminary Risk Assessment (see below) is the minimum assessment requirement to support a planning application.

The level at which contamination is deemed to be unacceptable, or, gives rise to adverse effects under a planning context has not been identified but is envisaged to be more precautionary than the level required to determine land as contaminated under Part 2A.

2.3 Building Control

The building control department of the local authority or private sector approved inspectors are responsible for the operation and enforcement of the Building Regulations (DCLG 2010) to protect the health, safety and welfare of people in and around buildings. Approved Document C requires the protection of buildings and associated land from the effects of contamination, to be applied (non-exclusively) in all changes of use from commercial or industrial premises, to residential property.

3 APPROACH

As with CLR11 the guidance given in LC:RM presents three stages of risk management: -

(a) Stage 1 - Risk Assessment;

(b) Stage 2 - Options Appraisal; and

(c) Stage 3 - Remediation.

Each stage has three tiers. The three tiers of Stage 1 Risk Assessment are: -

- Tier 1 - Preliminary Risk Assessment (PRA) - first tier of RA that develops the outline conceptual model (CM) and establishes whether there are any potentially unacceptable risks.

- Tier 2 - Generic Quantitative Risk Assessment (GQRA) - carried out using generic assessment criteria and assumptions to estimate risk.

- Tier 3 - Detailed Quantitative Risk Assessment (DQRA) - carried out using detailed site-specific information to generate Site Specific Assessment Criteria (SSAC) as risk evaluation criteria.

For each tier of a Stage 1 - Risk Assessment you must:

1. Identify the hazard - establish contaminant sources.

2. Assess the hazard - use a source-pathway-receptor (S-P-R) pollutant linkage approach to find out if there is the potential for unacceptable risk.

3. Estimate the risk - predict what degree of harm or pollution might result and how likely it is to occur.

4. Evaluate the risk - decide whether a risk is unacceptable.

A Stantec Preliminary Investigation report normally comprises a desk study, walkover site reconnaissance and preliminary risk assessment (PRA). The project specific proposal defines the actual scope of work which might include review of ground investigation data in which case the report includes a GQRA.

Risk estimation involves identifying the magnitude of the potential consequence (taking into account both the potential severity of the hazard and the sensitivity of the receptor) and the magnitude of the likelihood i.e. the probability (taking into account the presence of the hazard and the receptor and the integrity of the pathway). This approach is promoted in current guidance such as R&D 66 (NHBC 2008).

For a PRA, Stantec's approach is that if a pollution linkage is identified then it represents a potentially unacceptable risk which either (1) remediation / direct risk management or (2) progression to further tiers of risk assessment (GQRA and GQRA) requiring additional data collection and enabling refinement of the CM using the site specific data.

4 IDENTIFICATION OF POLLUTANT LINKAGES AND DEVELOPMENT OF A CONCEPTUAL MODEL (CM)

For all Tiers of a Stage 1 Risk Assessment, the underlying principle to ground condition assessment is the identification of *pollutant linkages* in order to evaluate whether the presence of a source of contamination could potentially lead to harmful consequences. A pollutant linkage consists of the following three elements: -

- A source/hazard – a substance or situation which has the potential to cause harm or pollution;
- A pathway – a means by which the hazard moves along / generates exposure; and
- A receptor/target – an entity which is vulnerable to the potential adverse effects of the hazard.

The *Conceptual Model* identifies the types and locations of potential contaminant sources/hazards and potential receptors and potential migration/transportation pathway(s). The CM is refined through progression to further tiers of risk assessment (GQRA and GQRA) requiring additional data collection.

4.1 Hazard Identification

A hazard is a substance or situation that has the potential to cause harm. Hazards may be chemical, biological or physical.

In a PRA the potential for hazards to be present is determined from consideration of the previous or ongoing activities on or near to the site in accordance with the criteria presented in the **Table 1**.

Based on the land use information Contaminants of Potential Concern (COPC) are identified. The COPC direct the scope of the collection of site-specific data and the analytical testing selected for subsequent Tiers.

At Tier 2 the site-specific data is evaluated using appropriate published assessment criteria (refer to Stantec document entitled Rationale for the Selection of Evaluation Criteria for a Generic Quantitative Risk Assessment (GQRA)). In general, published criteria have been developed using highly conservative assumptions and therefore if the screening criterion is not exceeded (and if enough samples from appropriate locations have been analysed) then the COPC is eliminated as a potential Hazard. It should be noted that exceedance does not necessarily indicate that a site is contaminated and/or unsuitable for use only that the COPC is retained as a potential Hazard. Published criteria are generated using models based on numerous and complex assumptions. Whether or not these assumptions are appropriate or sufficiently protective requires confirmation on a project by project basis. Manipulation of the default assumptions would normally form part of a Tier 3 Detailed Quantitative Risk Assessment (DQRA).

When reviewing or assessing site specific data Stantec utilise published guidance on comparing contamination data with a critical concentration (CL:AIRE/CIEH 2008) which presents a structured process for employing statistical techniques for data assessment purposes.

4.2 Receptor and Pathway Identification

For all Tiers the potential receptors (for both on site and adjoining land) that will be considered are:

- Human Health – including current and future occupiers, construction and future maintenance workers, and neighbouring properties/third parties;
- Ecological Systems; [1]
- Controlled Waters [2] – Under section 78A(9) of Part 2A the term "pollution of controlled waters" means the entry into controlled waters of any poisonous, noxious or polluting matter or any solid waste matter. The term "controlled waters" in relation to England has the same meaning as in Part 3 of the Water Resources Act 1991, except that "ground waters" does not include waters contained in underground strata but above the saturation zone.
- Property - Animal or Crop (including timber; produce grown domestically, or on allotments, for consumption; livestock; other owned or domesticated animals; wild animals which are the subject of shooting or fishing rights); and
- Property - Buildings (any structure or erection, and any part of a building including any part below ground level, but does not include plant or machinery comprised in a building, or buried services such as sewers, water pipes or electricity cables including archaeological sites and ancient monuments).

If a receptor is taken forward for further assessment it will be classified in terms of its sensitivity, the criteria for which are presented in **Table 2**. Table 2 has been generated using descriptions of environmental receptor importance/value given in various guidance documents including R&D 66 (NHBC 2008), EA 2017 and Transport Analysis Guidance (based on DETR 2000). Human health and buildings classifications have been generated by Stantec using the attribute description for each class. Surface water sensitivity is classified using the Water Framework Directive (WFD) status for the River Basin obtained from: https://environment.data.gov.uk/catchment-planning/

[1] International or nationally designated sites (as defined in the statutory guidance (Defra Circular 04/12)) "*in the local area*" will be identified as potential ecological receptors. A search radius of 1, 2 or 5km will be utilised depending on the site-specific circumstances (see also pathway identification). The Environment Agency has published an ecological risk assessment framework (EA 2008) which promotes (as opposed to statutorily enforces) consideration of additional receptors to include locally protected sites and protected or notable species. These additional potential receptors will only be considered if a Phase 1 habitat survey, undertaken in accordance with guidance (JNCC 1993), is commissioned and the data provided to Stantec. It should be noted that without such a survey a Land Contamination risk assessment may conclude that the identification of potential ecological receptors is inconclusive (refer to Stantec Specification for a Preliminary Investigation (Desk Study and Site Reconnaissance).

[2] The definition of "pollution of controlled water" was amended by the introduction of Section 86 of the Water Act 2003. For the purposes of Part 2A groundwater does not include waters above the saturated zone and our assessment does not therefore address perched water other than where development causes a pathway to develop.

The exposure pathway and modes of transport that will be considered are presented in **Table 3**.

4.3 Note regarding Ecological Systems

The Environment Agency (EA) has developed an ecological risk assessment framework which aims to provide a structured approach for assessing the risks to ecology from chemical contaminants in soils (EA 2008). In circumstances where contaminants in water represent a potential risk to aquatic ecosystems then risk assessors will need to consider this separately.

The framework consists of a three-tiered process: -

- Tier 1 is a screening step where the site soils chemical data is compared to a soil screening value (SSV)
- Tier 2 uses various tools (including surveys and biological testing) to gather evidence for any harm to the ecological receptors
- Tier 3 seeks to attribute the harm to the chemical contamination

Tier 1 is preceded by a desk study to collate information about the site and the nature of the contamination to assess whether pollutant linkages are feasible. The framework presents ten steps for ecological desk studies and development of a conceptual model as follows.

1. Establish Regulatory Context
2. Collate and Assess Documentary Information
3. Summarise Documentary Information
4. Identify Contaminants of Potential Concern
5. Identify Likely Fate Transport of Contaminants
6. Identify Potential Receptors of Concern
7. Identify Potential Pathways of Concern
8. Create a Conceptual Model
9. Identify Assessment and Measurement Endpoints
10. Identify Gaps and Uncertainties

The information in a standard PRA report covers Steps 1 to 4 inclusive. Step 5 considers fate and transport of contaminants and it should be noted that our standard report adopts a simplified approach considering only transport mechanisms. A simplified approach has also been adopted in respect of Steps 6 and 7 receptors (a detailed review of the ecological attributes has not been undertaken) and pathways (a food chain assessment has not been undertaken). Step 9 is outside the scope of our standard PRA report.

It should be noted that the PRA report will present an assessment for ecological systems (where identified as a receptor for a land contamination assessment) considering the viability of the mode of transport given the site-specific circumstances and not specific pathways. The PRA may conclude that the risk to potential ecological receptors is inconclusive.

4.4 Note regarding controlled waters

Controlled waters are rivers, estuaries, coastal waters, lakes and groundwaters, but not perched waters.

The EU Water Framework Directive (WFD) 2000/60/EC provides for the protection of sub-surface, surface, coastal and territorial waters through a framework of river basin management. The EU Updated Water Framework Standards Directive 2014/101/EU amended the EU WFD to update the international standards therein; it entered into force on 20 November 2014 with the requirements for its provisions to be transposed in Member State law by 20 May 2016. Other EU Directives in the European water management framework include:

- the EU Priority Substances Directive 2013/39/EU;
- EU Groundwater Pollutants Threshold Values Directive 2014/80/EU amending the EU Groundwater Directive 2006/118/EC; and
- EU Biological Monitoring Directive 2014/101/EU.

The Ground Water Daughter Directive (GWDD) was enacted by the Groundwater Regulations (2009), which were subsumed by the Environmental Permitting Regulations (2010) which provide essential clarification including on the four objectives specifically for groundwater quality in the WFD: -

Achieve ‘Good’ groundwater chemical status by 2015, commonly referred to as ‘status objective’;
Achieve Drinking Water Protected Area Objectives;
Implement measures to reverse any significant and sustained upward trend in groundwater quality, referred to as ‘trend objective’; and

Prevent or limit the inputs of pollutants into groundwater, commonly referred to as ‘prevent or limit’ objectives

The Water Act 2003 (Commencement No.11) Order 2012 amends the test for 'contaminated land' which relates to water pollution so that pollution of controlled waters must now be "significant" to meet the definition of contaminated land.

The Water Framework Directive (WFD) requires the preparation, implementation and review of River Basin Management Plans (RBMP) on a six-year cycle. River basins are made up of lakes, rivers, groundwaters, estuaries and coastal waters, together with the land they drain. River Basin Districts (RBD) and the WFD Waterbodies that they comprise are important spatial management units, regularly used in catchment management studies. River Basin Management Plans (RBMP) have been developed for the 11 River Basin Districts in England and Wales.

These were released by Defra in 2009 (Defra 2009) and updated in 2015.

These RBMP's establish the current status of waters within the catchments of the respective Districts and the current status of adjoining waters identified. As part of a Tier 2 risk assessment water quality data is screened against the WFD assessment criteria. Comparison with the RBMP's current status of waters for the catchment under consideration would form part of a Tier 3 assessment.

5 RISK ESTIMATION

Risk estimation classifies what degree of harm might result to a receptor (defined as consequence) and how likely it is that such harm might arise (probability).
At Tier 1 the consequence classification is generated by multiplying the hazard classification score and the receptor sensitivity score. This approach follows that presented in the republished R&D 66 (NHBC 2008).

The criteria for classifying probability are set out in **Table 4** and have been taken directly from Table 6.4 CIRIA C552 (CIRIA 2001). Probability considers the integrity of the exposure pathway.

The consequence classifications detailed in **Table 5** have been adapted from Table 6.3 presented in C552 and R&D 66 (Annex 4 Table A4.3).

The Tier 1 risk classification is estimated for each pollutant linkage using the matrix given in **Table 6** which is taken directly from C552 (Table 6.5).

Subsequent Tiers refine the CM through retention or elimination of potential hazards and pollutant linkages.

6 RISK EVALUATION

Evaluation criteria are the parameters used to judge whether harm or pollution needs further assessment or is unacceptable. The evaluation criteria used will depend on:

- the reasons for doing the RA and the regulatory context such as Part 2A or planning;
- the CM and pollutant linkages present;
- any criteria set by regulators;
- any advisory requirements such as from Public Health England;
- the degree of confidence and precaution required;
- the level of confidence required to judge whether a risk is unacceptable;
- how you've used or developed more detailed assessment criteria in the later tiers of RA;
- the availability of robust scientific data;
- how much is known - for example, about the pathway mechanism and how the contaminants affect receptors; and
- any practical reasons such as being able to measure or predict against the criteria.

In order to put the Tier 1 risk classification into context the likely actions are described in **Table 7** which is taken directly from Table 6.6 of C552 (CIRIA 2001).

REFERENCES

BSI 2017 BS 10175:2011+A2:2017 Investigation of potentially contaminated sites - Code of Practice

BSI 2019 BS 8485:2015+A1:2019 Code of practice for the design of protective measures for methane and carbon dioxide ground gases for new buildings

CIRIA 2001: Contaminated land risk assessment – a guide to good practice C552.

CIRIA 2008: Assessing risks posed by hazardous ground gases to buildings C655

CL: AIRE/CIEH 2008 Guidance on Comparing Soil Contamination Data with a Critical Concentration. Published by Contaminated Land: Applications in Real Environments (CL: AIRE) and the Chartered Institute of Environmental Health (CIEH)

CL: AIRE 2013 SP1010 – Development of Category 4 Screening Levels for Assessment of Land Affected by Contamination. Final Project Report published by Contaminated Land: Applications in Real Environments (CL: AIRE) 20th December 2013

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and Tweed, Southeast, Thames, Western Wales) December 2009

EA 2004: Contaminated Land Research (CLR) Report 11: The Model Procedures for the Management of Land Contamination CRL 11 by the Environment Agency (EA).

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EA 2017 New groundwater vulnerability mapping methodology in England and Wales Report – SC040016/R Environment Agency (EA) September 2017

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National Planning Policy Framework (February 2019 revised), published by the Ministry of Housing, Communities and Local Government (MHCLG) at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/810197/NPPF_Feb_2019_revised.pdf

Stantec Methodology for Assessment of Land Contamination (England)

Table 1: Criteria for Classifying Hazards / Potential for Generating Contamination

Classification/Score	Potential for generating contamination/gas based on land use
Very Low 1	Land Use: Residential, retail or office use, agriculture Contamination: Limited. Gas generation potential: Soils with low organic content
Low 2	Land Use: Recent small scale industrial and light industry Contamination: locally slightly elevated concentrations. Gas generation potential: Soils with high organic content (limited thickness)
Moderate 3	Land Use: Railway yards, collieries, scrap yards, engineering works. Contamination: Possible widespread slightly elevated concentrations and locally elevated concentrations. Gas generation potential: Dock silt and substantial thickness of organic alluvium/peat
High 4	Land Use: Heavy industry, non-hazardous landfills. Contamination: Possible widespread elevated concentrations. Gas generation potential: Shallow mine workings Pre 1960s landfill
Very High 5	Land Use: Hazardous waste landfills, gas works, chemical works, Contamination: Likely widespread elevated concentrations. Gas generation potential: Landfill post 1960

"Greenfield" is land which has not been developed and there has been no use of agrochemicals

Table 2: Criteria for Classifying Receptor Sensitivity/Value

Classification	Definition
Very Low 1	Receptor of limited importance • Groundwater: Unproductive strata (Strata with negligible significance for water supply or river baseflow) (previously Non-aquifer), Secondary B (water-bearing parts of non-aquifers), Secondary undifferentiated (previously minor or non-aquifer, but information insufficient to classify as secondary A or B) • Surface water: WFD Surface Water status Bad • Ecology: No local designation • Buildings: Replaceable • Human health: Unoccupied/limited access
Low 2	Receptor of local or county importance with potential for replacement • Groundwater: Secondary A aquifer • Surface water: WFD Surface Water status Poor • Ecology: local habitat resources • Buildings: Local value • Human health: Minimum score 4 where human health identified as potential receptor
Moderate 3	Receptor of local or county importance with potential for replacement • Groundwater: Principal aquifer • Surface water: WFD Surface Water status Moderate • Ecology: County wildlife sites, Areas of Outstanding Natural Beauty (AONB) • Buildings: Area of Historic Character • Human health: Minimum score 4 where human health identified as potential receptor
High 4	Receptor of county or regional importance with limited potential for replacement • Groundwater: Source Protection Zone 2 or 3 • Surface water: WFD Surface Water status Good • Ecology: SSSI, National or Marine Nature Reserve (NNR or MNR) • Buildings: Conservation Area • Human health: Minimum score 4 where human health identified as potential receptor
Very High 5	Receptor of national or international importance • Groundwater: Source Protection Zone (SPZ) 1 • Surface water: WFD Surface Water status High • Ecology: Special Areas of Conservation (SAC and candidates), Special Protection Areas (SPA and potentials) or wetlands of international importance (RAMSAR) • Buildings: World Heritage site • Human health: Residential, open spaces and uses where children are present

Table 3: Exposure Pathway and Modes of Transport

Receptor	Pathway	Mode of transport
Human health	Ingestion	Fruit or vegetable leaf or roots
		Contaminated water
		Soil/dust indoors
		Soil/dust outdoors
	Inhalation	Particles (dust / soil) – outdoor
		Particles (dust / soil) - indoor
		Vapours – outdoor - migration via natural or anthropogenic pathways
		Vapours - indoor - migration via natural or anthropogenic pathways
	Dermal absorption	Direct contact with soil
		Direct contact with waters (swimming / showering)
		Irradiation
Groundwater	Leaching	Gravity / permeation
	Migration	Natural – groundwater as pathway Anthropogenic (e.g. boreholes, culverts, pipelines etc.)
Surface Water	Direct	Runoff or discharges from pipes
	Indirect	Recharge from groundwater
	Indirect	Deposition of windblown dust
Buildings	Direct contact	Sulphate attack on concrete, hydrocarbon corrosion of plastics
	Gas ingress	Migration via natural or anthropogenic paths
Ecological systems	See Notes	Runoff/discharge to surface water body
	See Notes	Windblown dust
	See Notes	Groundwater migration
	See Notes	At point of contaminant source
Animal and crop	Direct	Windblown or flood deposited particles / dust / sediments
	Indirect	Plants via root up take or irrigation. Animals through watering
	Inhalation	By livestock / fish - gas / vapour / particulates / dust
	Ingestion	Consumption of vegetation / water / soil by animals

Table 4: Classification of Probability

Classification	Definition
High likelihood	There is a pollution linkage and an event either appears very likely in the short-term and almost inevitable over the long-term, or there is already evidence at the receptor of harm / pollution.
Likely	There is a pollution linkage and all the elements are present and in the right place, which means that it is probable that an event will occur. Circumstances are such that an event is not inevitable, but possible in the short-term and likely over the long-term.
Low likelihood	There is a pollution linkage and circumstances are possible under which an event could occur. However, it is by no means certain that even over a longer period such event would take place, and is less likely in the shorter-term.
Unlikely	There is a pollution linkage, but circumstances are such that it is improbable that an event would occur even in the very long-term.

Table 5: Classification of Consequence (score = magnitude of hazard and sensitivity of receptor)

Classification / Score	Examples
Severe **17-25** **(3 out of 25 outcomes)**	Human health effect - exposure likely to result in "significant harm" as defined in the Defra (2012) Part 2A Statutory Guidance [1]. Controlled water effect - short-term risk of pollution (note: Water Resources Act contains no scope for considering significance of pollution) of sensitive water resource. Equivalent to EA Category 1 incident (persistent and/or extensive effects on water quality leading to closure of potable abstraction point or loss of amenity, agriculture or commercial value. Major fish kill. Ecological effect - short-term exposure likely to result in a substantial adverse effect. Catastrophic damage to crops, buildings or property
Medium **10-16** **(7 out of 25 outcomes)**	Human health effect - exposure could result in "significant harm" [1]. Controlled water effect - equivalent to EA Category 2 incident requiring notification of abstractor Ecological effect - short-term exposure may result in a substantial adverse effect. Damage to crops, buildings or property
Mild **5-9** **(7 out of 25 outcomes)**	Human health effect - exposure may result in "significant harm" [1]. Controlled water effect - equivalent to EA Category 3 incident (short lived and/or minimal effects on water quality). Ecological effect - unlikely to result in a substantial adverse effect. Minor damage to crops, buildings or property. Damage to building rendering it unsafe to occupy (for example foundation damage resulting in instability).
Minor **1-4** **(8 out of 25 outcomes)**	No measurable effect on humans. Protective equipment is not required during site works. Equivalent to insubstantial pollution incident with no observed effect on water quality or ecosystems. Repairable effects to crops, buildings or property. The loss of plants in a landscaping scheme. Discolouration of concrete.

[1] Significant harm includes death, disease, serious injury, genetic mutation, birth defects or impairment of reproductive function. The local authority may also consider other health effects to constitute significant harm such as physical injury; gastrointestinal disturbances; respiratory tract effects; cardio-vascular effects; central nervous system effects; skin ailments; effects on organs such as the liver or kidneys; or a wide range of other health impacts. Whether or not these would constitute significant harm would depend on the seriousness of harm including impact on health, quality of life and scale of impact.

Table 6: Classification of Risk (Combination of Consequence Table 5 and Probability Table 4)

	Consequence			
Probability	***Severe***	***Medium***	***Mild***	***Minor***
High likelihood	Very high	High	Moderate	Low
Likely	High	Moderate	Moderate/	Low
Low likelihood	Moderate	Moderate	Low	Very low
Unlikely	Low	Low	Very low	Very low

Table 7: Description of Risks and Likely Action Required

Risk Classification	Description
Very high risk	There is a high probability that severe harm could arise to a designated receptor from an identified hazard, OR, there is evidence that severe harm to a designated receptor is currently happening. This risk, if realised, is likely to result in a substantial liability. Urgent investigation (if not undertaken already) and remediation is likely to be required in the short term.
High risk	Harm is likely to arise to a designated receptor from an identified hazard. Realisation of the risk is likely to present a substantial liability. Urgent investigation (if not undertaken already) is required and remedial works may be necessary in the short-term and are likely over the longer-term.
Moderate risk	It is possible that harm could arise to a designated receptor from an identified hazard. However, it is either relatively unlikely that any such harm would be severe, or if any harm were to occur it is more likely that the harm would be relatively mild. Investigation (if not already undertaken) is normally required to clarify the risk and to determine the potential liability. Some remedial works may be required in the longer-term.
Low risk	It is possible that harm could arise to a designated receptor from an identified hazard, but it is likely that this harm, if realised, would at worst normally be mild.
Very low risk	There is a low possibility that harm could arise to a receptor. In the event of such harm being realised it is not likely to be severe.

Stantec/UK/I&B: Evaluation Criteria for Generic Quantitative Risk Assessment (England)

1 INTRODUCTION

The aim of this document is to present an explanation for the selection of the evaluation criteria routinely used by Stantec UK Ltd when undertaking a land contamination Tier 2 Generic Quantitative Risk Assessment (GQRA).

A GQRA uses published criteria to screen the site-specific contamination testing data and identify potential hazards to specific receptors. Generic criteria are typically conservative in derivation and exceedance does not indicate that a site is statutorily contaminated and/or unsuitable for use in the planning context. These criteria are used to identify situations where further assessment and/or action may be required. This document is divided into general introductory text and sections on soils, waters and gases.

2 GENERAL NOTES

This document should be read in conjunction with another entitled "Stantec Methodology for Assessment of Land Contamination" which summarises the legislative regime and our approach to ground contamination and risk assessment.

Any Stantec interpretation of contamination test results is based on a scientific and engineering appraisal. The perceptions of, for example, banks, insurers, lay people etc are not taken into account.

Any tables included in this document are produced for ease of reference to the criteria, they do not in any way replace the documents of origin (which are fully referenced) and which should be read to ensure appropriate use and interpretation of the data.

Generic criteria provide an aid to decision-making, but they do not replace the need for sound professional judgement in risk assessment (EA, 2006). The criteria are based on numerous and complex assumptions. The appropriateness of these assumptions in a site-specific context requires confirmation on a project by project basis. Our interpretative report will comment on the appropriateness of the routine criteria for project objectives or ground conditions. In some cases the published criteria whilst typically conservative may in some circumstances not be suitable for the site being assessed, either because they do not address the identified pollutant linkages or because they may not be sufficiently precautionary in the context of the site. Under these circumstances it may be necessary to recommend deriving site-specific assessment criteria. Any deviation from the routine criteria and/or selection of criteria for parameters not covered in this document will be described in the report text.

3 CRITERIA FOR EVALUATING SOIL RESULTS

3.1 Potential Harm to Human Health

The criteria used by Stantec UK Ltd to assess the potential for harm to human health are:-

- Category 4 Screening Levels (C4SLs) (Phase 1 substances DEFRA, 2014 and Phase 2 substances CLAIRE, 2021).
- Suitable 4 Use Levels (S4ULs) (Nathanail *et al*, 2015).
- CL:AIRE/EIC/AGS Generic Assessment Criteria (GAC) (CL:AIRE, 2010).
- Soil Guideline Values (SGVs) (EA, 2009a).

These criteria have been generated using the Contaminated Land Exposure Assessment model (CLEA) and supporting technical guidance (EA, 2009b, 2009c, 2009d, 2009e). The CLEA model uses generic assumptions about the fate and transport of chemicals in the environment and a generic conceptual model for site conditions and human behaviour to estimate child and adult exposures to soil contaminants for those potentially living, working, and/or playing on contaminated sites over long time periods (EA, 2009c).

The S4ULs, SGVs and GACs are all based on use of minimal/tolerable risk Health Criteria Values (HCVs) as the toxicological benchmark whereas the C4SL are based on use of a "low level of toxicological concern" (LLTC) as the toxicological benchmark. The LLTC represents a slightly higher level of risk than the HCV.

An update to the software (1.071) was published on 04/09/2015 (the handbook (EA 2009f) referring to version 1.05 is still valid). The update includes the library data sets from the DEFRA research project SP1010 (Development of Category 4 Screening Levels for assessment of land affected by contamination).

The CLEA model uses ten exposure pathways (Ingestion (outdoor soil, indoor dust, homegrown vegetables and soil attached to homegrown vegetables), Dermal Contact (outdoor soil and indoor dust) and Inhalation (outdoor dust, indoor dust, outdoor vapours and indoor vapours)). There are exposure pathways not included in the CLEA model such as the permeation of organics into plastic water supply pipes.

The presence and/or significance of each of the potential exposure pathways is dependent on the land use being considered. The model uses standard land use scenarios as follows:-

Residential – habitation of a dwelling up to two

storeys high with various default material and design parameters, access to either private or nearby community open space with soil track back to form indoor dust. Assumes ingestion of homegrown produce.

Allotments – the model has default parameters for use and consumption of vegetables but not animals or their products (eggs).

Industrial/Commercial – assumes office or light physical work in a permanent three storey structure with breaks taken outside and that the site is NOT covered in hardstanding.

Public Open Space – two public open space (POS) scenarios are considered: POS_{resi} is shared communal space within a residential development where tracking back of soil into the home is assumed to occur. POS_{park} is intended for a public park sufficiently distant from housing (i.e. not adjacent to housing) such that tracking back of soil into the home is negligible. Note that the POS assessment criteria may not be appropriate for assessing sports fields.

The assessment criteria generated using CLEA can be used as a conservative starting point for evaluating long-term risks to human health from chemicals in soil.

It is important to note that the model does not assess all the potential exposure scenarios, for example risk to workers in excavations (short term exposure) or diffusion of contaminants through drinking water pipes.

Recent guidance (DEFRA 2012) introduces a four stage classification system where Category 1 sites are clearly contaminated land and Category 4 sites are definitely not contaminated land as defined by EPA 1990. Outside of these categories further specific risk assessment is required to determine if the site should fall into Category 2 (contaminated land) or Category 3 (not contaminated land). Category 4 screening values are considered to be more pragmatic than the current published SGV/GAC criteria but still strongly precautionary with the aim of allowing rapid identification of sites where the risk is above minimal but still low/acceptable.

Category 4 Screening Levels (C4SLs)

At the end of 2013, technical guidance in support of DEFRA's revised Statutory Guidance (SG) was published and then revised in 2014 (CL:AIRE 2014) which provided:

- A methodology for deriving C4SLs for the standard land-uses and two new public open space scenarios using the updated assumptions relating to the modelling of human exposure to soil contaminants; and
- A demonstration of the methodology, via the derivation of C4SLs for six substances – arsenic, benzene, benzo(a)pyrene, cadmium, chromium (VI) and lead.

Following issue of an Erratum in December 2014, a Policy Companion Document was published (DEFRA 2014).

A letter from Lord de Mauley dated 3rd September 2014 provides more explicit direction to local authorities on the use of the C4SL in a planning context. The letter identifies four key points:

1) that the screening values were developed expressly with the planning regime in mind

2) their use is recommended in DCLG's planning guidance

3) soil concentrations below a C4SL limit are considered to be 'definitely not contaminated' under Part IIA of the 1990 Environmental Protection Act and pose at most a 'low level of toxicological concern' and,

4) exceedance of a C4SL screening value does not mean that land is definitely contaminated land, just that further investigation may be warranted.

Stantec use the C4SLs as the Tier 2 soil screening criteria protective of human health for substances with C4SL available. Table 1 summarises the C4SL for each of the published substances.

Note that, with the exception of benzene, the DEFRA published C4SL are not dependent on soil organic matter content (SOM) ("*Given that BaP is non volatile and that empirical soil to plant concentration factors have been used, soil organic matter content has a negligible influence on the C4SLs for this chemical"*). The DEFRA published C4SL for benzene is based on an SOM of 6%. Stantec has used the CLEA model (v1.071) to derive C4SL for benzene for 1% and 2.5% SOM which are also shown in Table 1.

Note that an industry led project to derive C4SL for a further 20 substances has commenced (CL:AIRE, 2018). The project is being project managed by CL:AIRE and is funded by the Soil and Groundwater Technology Association (SAGTA), the Society of Brownfield Briefing (SoBRA) and others. A dedicated steering group, made up of representatives from SAGTA, DEFRA, Welsh Government, Public Health England, Environment Agency, Natural Resources Wales, Food Standards Agency, Homes England and further Land Forum representatives, has been set up to oversee the project. The new C4SL will be added to this document as they are published.

Suitable 4 Use Levels (S4ULs)

In July 2009, Generic Assessment Criteria (GACs)

for 82 substances were published (LQM and CIEH, 2009) using the then current version of the CLEA software v1.04 and replaced those generated in 2006 using the original version of the model CLEA UK *beta*. In 2015 S4ULs were published by LQM/CIEH (Nathanail *et al*, 2015) to replace the second edition GACs. Table 2 summarises the S4ULs which are reproduced with permission; Publication Number S4UL3202.

Soil Guideline Values (SGVs) and Generic Assessment Criteria (GAC)

In 2009, Soil Guideline Values (SGVs) were published by the Environment Agency for arsenic, cadmium, mercury, nickel, selenium, benzene, toluene, ethyl benzene, xylenes, phenol and dioxins, furans and dioxin-like PCBs. These were derived using the CLEA model for residential, allotments and commercial land-uses.

These SGVs have now largely been superseded by the C4SLs and the S4ULs, with the exception of the SGVs for dioxins, furans and dioxin-like PCBs which are shown in Table 3.

In January 2010, Generic Assessment Criteria (GAC) derived using CLEA were published by CL:AIRE for 35 substances. These GAC are listed in Table 4.

Note that the SGVs for dioxins, furans and dioxin like PCBs and CL:AIRE GAC were derived using an older version of CLEA (v1.06) than used to derive the S4UL and C4SL (v1.07). This older version used slightly more conservative values for some exposure parameters and therefore the derived SGVs/GAC are still considered suitably precautionary for use as screening criteria.

Note on Mercury, Chromium and Arsenic

The analytical testing routinely undertaken by Stantec determines total concentration, however, the toxicity depends on the form of the contaminant.

If a source of Mercury, Chromium or Arsenic is identified or the total concentration exceeds the relevant worst case speciated criteria it will be desirable/necessary to undertake additional speciated testing and further assessment.

Note on Polycyclic Aromatic Hydrocarbons

Polycyclic Aromatic Hydrocarbons (PAHs) are a family of hundreds of different congeners whose chemical structures contain two or more fused aromatic rings. Whilst it is recognised that there is an ongoing debate on the most appropriate method to assess health effects of PAH mixtures, in 2010 the Health Protection Agency recommended the use of benzo[a]pyrene (BaP) as a surrogate marker approach in the assessment of carcinogenic risks posed by PAHs in soils (HPA, 2010).

In most cases, BaP is chosen as the surrogate marker (SM) due to its ubiquitous nature and the vast amount of data available and has been used by various authoritative bodies to assess the carcinogenic risk of PAHs in food. The SM approach estimates the carcinogenic toxicity of a mixture of PAHs in an environmental matrix by using toxicity data for a PAH mixture for which the composition is known.

Exposure to the SM is assumed to represent exposure to all PAHs in that matrix therefore the toxicity of the SM represents the toxicity of the mixture. The SM approach relies on a number of assumptions (HPA, 2010).

- The SM (BaP) must be present in all the samples.
- The profile of the different PAH relative to BaP should be similar in all samples.
- The PAH profile in the soil samples should be sufficiently similar to that used in the pivotal toxicity study on which HBGV was based i.e. the Culp study (Culp et al. (1998)).

In order to justify the use of a surrogate marker assessment criterion (C4SL for benzo(a)pyrene and S4UL coal tar) the LQM PAH Profiling Tool is used by Stantec to assess the similarity of the PAH profile in a soil sample to that of the toxicity study. The spreadsheet calculates the relative proportions of the genotoxic PAHs and plots them relative to the composition of the two coal mixtures used by Culp et al. Provided that the relative proportions are within an order of magnitude of those from the Culp Study (as suggested by HPA) Stantec will use the C4SL for benzo(a)pyrene as a surrogate marker for the carcinogenic PAHs, i.e. benzo(a)pyrene, benzo(a)anthracene, chrysene, benzo(b)fluoranthene, benzo(k)fluoranthene, dibenzo(ah)anthracene, indeno(123-cd)pyrene and benzo(ghi)perylene. For projects where this approach is appropriate the results will be assessed using the Coal Tar criterion (BAP C4SL) and the criteria for non-carcinogenic PAHs (S4ULs), i.e. naphthalene, acenaphthylene, acenaphthene, fluorene, phenanthrene, anthracene, fluoranthene and pyrene.

Note on Total Petroleum Hydrocarbons

The S4UL for Total Petroleum Hydrocarbon (TPH) fractions are based on ‘threshold’ health effects. In accordance with Environment Agency guidance (EA, 2005) and the S4UL report (Nathanail *et al*, 2015) the potential for additivity of toxicological effects between fractions should be considered. Practically, to address this issue the hazard quotient (HQ) for each fraction should be calculated by dividing the measured concentration of the fraction by the GAC. The HQs are then added to form a hazard index (HI) for that sample. An HI greater than 1 indicates an exceedance.

Note on Dioxins, Furans and Dioxin-like PCBs

The SGVs for dioxins, furans and dioxin-like PCBs are based on an assumed congener profile for urban soils. The total measured concentration of dioxin, furan and dioxin-like PCB congeners listed in the SGV report (EA, 2009a) should be compared with the SGVs to make an initial assessment of risk. A more accurate assessment can be made using the Environment Agency's site specific worksheet for dioxins, furans and dioxin like PCBs available from https://www.claire.co.uk/useful-government-legislation-and-guidance-by-country/77-risk-assessment-info-ra/199-dioxins-site-specific-worksheets.

Note on Asbestos

Asbestos in soil and made ground is currently under review by a number of bodies. There are no current published guidance values for asbestos in soil other than the waste classification values given in the EA's Technical Guidance WM3, Hazardous Waste – Interpretation of the definition and classification of hazard waste (EA, 2015). This guidance is only appropriate for soils that are being discarded as waste.

Testing for asbestos will be carried out on selected samples of made ground encountered during investigation, initially samples will be subjected to an asbestos screen and, if asbestos is found to be present, subjected to quantification depending on the project specific requirements. The reader is directed to the report text for guidance on the approach adopted in respect to any asbestos found to be present.

Further guidance is also available in publication C733, Asbestos in soil and made ground: a guide to understanding and managing risks (CIRIA 2014).

Note on Soil Saturation Concentration

The soil saturation concentration is the concentration of an organic constituent in soil at which either the pore water or soil vapour has theoretically become saturated with the substance, i.e. the substance concentration has reached its maximum aqueous solubility or vapour pressure. The soil saturation concentration is related to the properties of the substance as well as the properties of the soil (including soil organic matter content).

The soil saturation concentrations are shown in Table 2 in brackets where exceeded by the assessment criteria and in Table 4 for all substances. Measured concentrations in excess of the soil saturation concentration have various potential implications as discussed below.

Firstly, where measured concentrations exceed the soil saturation concentration, the risk from vapour inhalation and/or consumption of produce may be limited. The CLEA model calculates the soil saturation concentration but it does not limit exposure where this concentration is exceeded. This adds an additional level of conservatism for CLEA derived assessment criteria where these exceed the calculated soil saturation concentration. Secondly, the soil saturation concentration is sometimes used to flag the potential presence of non-aqueous phase liquid (NAPL, a.k.a. free phase) in soil. The presence of NAPL is an important consideration in the Tier 2 assessment because, where present, the risks from NAPL may need to be considered separately. Theoretically, where a measured concentration exceeds the soil saturation concentration NAPL could be present. However, using theoretical saturation values is not always reliable for the following reasons: The soil saturation concentration is based on the aqueous solubility and vapour pressure of a pure substance and not a mixture, of which NAPLs are often comprised; and

The soil saturation concentration does not account for the sorption capacity of the soil. As a result, exceedance of the soil saturation concentration does not necessarily imply that NAPL is present. This is particularly the case for longer chain hydrocarbons such as PAHs which have low solubility and vapour pressure and hence a low soil saturation concentration but that are strongly sorbed to soil.

The measured concentrations will be compared to the soil saturation concentrations shown in Tables 2 and 4. Where exceeded Stantec will use additional lines of evidence (such as visual evidence and concentration of total TPH) to determine whether or not NAPL is likely to be present. If the presence of NAPL is deemed plausible the implications will be considered in the risk assessment.

3.2 Potential Harm to the Built Environment

Land contamination can pose risks to buildings, building materials and services (BBM&S) in a number of ways. Volatile contaminants and gases can accumulate and cause explosion or fire. Foundations and buried services can be damaged by corrosive substances and contaminants such as steel slags can create unstable ground conditions through expansion causing structural damage.

Stantec use the following primary guidance to assess the significance of soil chemistry with respect to its potential to harm the built environment.

i) Approved Document C - Site Preparation and Resistance to Contaminants and Moisture. (DCLG, 2013);
ii) Concrete in aggressive ground SD1 (BRE 2005);
iii) Guidance for the selection of water supply pipes to be used in brownfield sites (UK WIR 2011);

iv) Protocols published by agreement between Water UK and the Home Builders Federation providing supplementary guidance which includes the Risk Assessment for Water Pipes (the 'RA') (Water UK 2014).
v) Performance of Building Materials in Contaminated Land report BR255 (BRE 1994).
vi) Risks of Contaminated Land to Buildings, Building Materials and Services. A Literature Review - Technical Report P331 (EA, 2000).
vii) Guidance on assessing and managing risks to buildings from land contamination - Technical Report P5 035/TR/01 (EA, 2001).

3.3 Potential to Harm Ecosystems, Animals, Crops etc

The criteria routinely used by Stantec as Tier 2 screening values to assess the potential of soil chemistry to harm ecosystems are taken from the following guidance and are summarised in Table 5.

i) Derivation and Use of Soil Screening Values for assessing ecological risks (EA, 2017a);
ii) The Restoration and Aftercare of Metalliferous Mining Sites for Pasture and Grazing (ICRCL 70/90, 1990);
iii) Sewage sludge on farmland: code of practice for England, Wales and Northern Ireland (DEFRA, 2018); and
iv) BS 3882:2015 Specification for topsoil and requirements for use (BSI, 2015).

Unless stated in the report the assessment is solely for phytotoxic parameters and additional assessment is required to determine suitability as a growing medium.

4 CRITERIA FOR EVALUATING LIQUID RESULTS

4.1 Potential Harm to Human Health via Ingestion

The Tier 2 water screening values routinely adopted by Stantec for assessing the potential for harm to human health via ingestion (presented as Table 6) are taken from The Water Supply (Water Quality) Regulations (S.I. 2018/647) unless otherwise indicated.

It should be noted that some of the prescribed concentrations listed in the Water Supply Regulations have been set for reasons other than their potential to cause harm to human health. The concentrations of iron and manganese are controlled because they may taint potable water with an undesirable taste, odour or colour or may potentially deposit precipitates in water supply pipes.

4.2 Potential Harm to Human Health via Inhalation of Vapours

The Tier 2 water screening values adopted by Stantec for assessing the potential for chronic human health risk from the inhalation of vapours from volatile contaminants in groundwater are presented in Table 7. These generic assessment criteria have been taken from a report published by the Society of Brownfield Risk Assessment (SoBRA) (SoBRA, 2017). The methodology adopted in their generation is considered compatible with the UK approach to deriving GAC and adopts a precautionary approach. As with all published GAC the suitability for use on the site being assessed has to be decided by the assessor based on a thorough understanding of the methodology and assumptions used in their derivation. Note, that the SoBRA groundwater vapour GAC are not intended for assessing risks to ground workers from short-term exposure.

Note that Table 7 shows the theoretical maximum aqueous solubility for each contaminant and indicates the GAC that exceed solubility. Measured concentrations in excess of solubility may be an indication that NAPL is present. As for the assessment of soils, if the presence of NAPL is deemed plausible the implications will be considered in the risk assessment.

4.3 Potential to Harm Controlled Waters

When assessing ground condition data and the potential to harm Controlled Waters Stantec uses the approach presented in the groundwater protection position statements published 14.03.17 (EA, 2017b) which describe the Environment Agency's approach to managing and protecting groundwater. They update and replace Groundwater Protection: principles and practice (GP3). Controlled Waters are rivers, estuaries, coastal waters, lakes and groundwaters. Water in the unsaturated zone is not groundwater but does come within the scope of the term "ground waters" as used and defined in the Water Resources Act 1991. It will continue to be a technical decision for the Environment Agency to determine what is groundwater in certain circumstances for the purposes of the Regulations. As discussed in our Methodology for Assessment of Land Contamination perched water is not considered a receptor in Stantec assessments.

The EU Water Framework Directive (WFD) 2000/60/EC provides for the protection of sub-surface, surface, coastal and territorial waters through a framework of river basin management.

The EU Updated Water Framework Standards Directive 2014/101/EU amended the EU WFD to update the international standards therein; it entered into force on 20 November 2014 with the requirement for its provisions to be transposed in Member State law by 20 May 2016.

Member States are required under the EU WFD to update their river basin management plans every six years. The first river basin management plans for England and Wales, Scotland and Northern Ireland were published in December 2009, and these were updated in 2015.

Other EU Directives in the European water management framework include:

- the EU Priority Substances Directive 2013/39/EU;
- EU Groundwater Pollutants Threshold Values Directive 2014/80/EU amending the EU Groundwater Daughter Directive (GWDD) 2006/118/EC; and
- the EU Biological Monitoring Directive 2014/101/EU.

The Priority Substances Directive set environmental quality standards (EQS) for the substances in surface waters (river, lake, transitional and coastal) and confirmed their designation as priority or priority hazardous substances (PS), the latter being a subset of particular concern. Environmental Quality Standards for PS are determined at the European level and apply to all Member States. Member States identify and develop standards for 'Specific Pollutants'. Specific Pollutants (SP) are defined as substances that can have a harmful effect on biological quality.

The Water Framework Directive (Standards and Classification) Directions (England and Wales) (DEFRA, 2015) were issued to the Environment Agency as an associated document of the Water Environment (WFD) (England and Wales) Regulations 2015 (S.I. 2015/1623) and provide directions for the classification of surface water and groundwater bodies. Schedule 3 parts 2 and 3 relate to surface water standards for specific pollutants in fresh or salt water bodies and priority substances in inland (rivers, lakes and related modified/artificial bodies) or other surface waters respectively. Although Schedule 5 presents threshold values for groundwater the Direction specifically excludes their use as part of site-specific investigations.

Table 6 presents the criteria routinely used by Stantec as Tier 2 screening values. This table only presents a selection of the more commonly analysed parameters and the source documents should be consulted for other chemicals. For screening groundwater the criteria selected are the standards for surface water and/or human consumption as appropriate together with the following:-

For a **hazardous substance** Stantec adopts the approach that, if the concentration in a discharge to groundwater is less than the Minimum Reporting Value (MRV), the input is regarded as automatically meeting the Article 2 (b) 'de-minimus' requirement of exemption 6 (3) (b) of the GWDD. Stantec has selected hazardous substances from the latest list published by the Joint Agencies Groundwater Directive Advisory Group (JAGDAG, 2018). MRV is the lowest concentration of a substance that can be routinely determined with a known degree of confidence, and may not be equivalent to limit of detection. MRVs have been identified from DEFRA's guidance on Hazardous Substances to Groundwater: Minimum Reporting Values (DEFRA, 2017), and are shown in Table 6.

Note that for land contamination assessments, where hazardous substances have already entered groundwater, remediation targets would typically be based on achieving appropriate water quality standards (e.g. drinking water standard or EQS) at a compliance point rather than an MRV. For this reason, when assessing measured groundwater or soil leachate concentrations, the values for human consumption, fresh water and salt water shown in Table 6 (whichever is appropriate for the context of the site) will be used as the Tier 2 assessment criteria rather than MRV. For hazardous substances with no water quality standard the laboratory method detection limit will be used as the assessment criteria.

For **non-hazardous substances** the GWDD requires that inputs be limited to avoid deterioration. UKTAG guidance equates deterioration with pollution. Non-hazardous substances are all substances not classified as hazardous. For Stantec assessments the values for human consumption, fresh water and salt water shown in Table 6 (whichever is appropriate for the context of the site) are used as the assessment criteria for non-hazardous substances.

Note on Copper, Lead, Manganese, Nickel and Zinc

$EQS_{bioavailable}$ have been developed for UK Specific Pollutants copper, zinc and manganese and the EU priority substances lead and nickel. An EQS is the concentration of a chemical in the environment below which there is not expected to be an adverse effect on the specific endpoint being considered, e.g. the protection of aquatic life.

It is very difficult to measure the bioavailable concentration of a metal directly. The UK has developed simplified Metal Bioavailability Assessment Tool (M-BAT) for copper, zinc, nickel and manganese which uses local water chemistry data, specifically pH, dissolved organic carbon (DOC) (mg/L) and Calcium (Ca) (mg/L).

Where the recorded total dissolved concentration exceeds the screening criteria for these parameters ($EQS_{bioavailable}$) further assessment will be undertaken using the tools downloaded from http://www.wfduk.org/resources/rivers-lakes-metal-bioavailability-assessment-tool-m-bat

The models calculate a risk characterisation ratio

(RCR) and where this is greater than 1 this indicates the bioavailable concentration is above the EQS and the parameter is then identified as a potential hazard. The report will discuss this identified hazard noting that the pH, calcium and, in particular, the dissolved organic carbon (DOC) in groundwater may be quite different to the receiving water (e.g. due to the presence to leaf litter or organic sediments dissolving in the water).

5 CRITERIA FOR EVALUATING GAS RESULTS

Stantec use the following primary guidance on gas monitoring methods and investigation, the assessment of risk posed by soil gases (including Volatile Organic Compounds (VOCs)) and mitigation measures/risk reduction during site development.

i) BS 8576:2013 – Guidance on Ground Gas Investigations: Permanent gases and Volatile Organic Compounds (VOCs) (BSI, 2013);
ii) TB18 Continuous Ground-Gas Monitoring and the Lines of Evidence Approach to Risk Assessment CL:AIRE Technical Bulletin TB18 (CL:AIRE 2019)
iii) RB17 A pragmatic approach to Ground Gas Risk Assessment. CL:AIRE Research Bulletin RB17 (Card et al, 2012);
iv) The VOCs Handbook. C682 (CIRIA, 2009).
v) Assessing risks posed by hazardous gases to buildings C665 (CIRIA, 2007);
vi) Guidance on evaluation of development proposals on sites where methane and carbon dioxide are present. (NHBC, 2007); and
vii) BS 8485:2015+A1:2019- Code of practice for the design of protective measures for methane and carbon dioxide ground gases for new buildings (BSI, 2019).

Gas and borehole flow data are used to obtain the gas screening value (GSV) for methane and carbon dioxide. The GSV is used to establish the characteristic situation and to make recommendations for gas protection measures for buildings if required.

Radon

Stantec use the following primary guidance to assess the significance of the radon content of soil gas.

i) Radon: guidance on protective measures for new dwellings. Report BR211 (BRE, 2015); and
ii) Indicative Atlas of Radon in England and Wales (HPA & BGS, 2007).

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Table 1: Category 4 Screening Levels (C4SL)

	Allotments	Residential (with home-grown produce)	Residential (without home-grown produce)	Commercial	Public Open Space 1	Public Open Space 2
Arsenic	49	37	40	640	79	170
Benzene - 1% SOM* - 2.5% SOM* - 6% SOM	 0.039 0.081 0.18	 0.20 0.41 0.87	 0.89 1.6 3.3	 27 50 98	 140 140 140	 190 210 230
Benzo(a)pyrene (as a surrogate marker for carcinogenic PAHs)	5.7	5.0	5.3	77	10	21
Cadmium	3.9	22	150	410	220	880
Chromium VI	170	21	21	49	21	250
Lead	80	200	310	2300	630	1300
Vinyl Chloride/ Chloroethene/ Chloroethylene, (CAS No. 75-01-4)	 0.0017 0.0031 0.0058	 0.0064 0.010 0.017	 0.015 0.019 0.029	 1.1 1.4 2.2	 7.8 7.8 7.8	 18 19 19
Trichloroethene / Trichloroethylene/ TCE or 'Trike' (CAS No. 79-01-06)	 0.032 0.072 0.16	 0.0093 0.020 0.043	 0.0097 0.020 0.045	 0.73 1.5 3.4	 76 78 79	 41 54 69
Tetrachloroethene/ Tetrachloroethylene/ Perchloroethylene, PCE or 'perc', (CAS No. 127-18-4)	 2.0 4.8 11.0	 0.31 0.70 1.60	 0.32 0.71 1.60	 24 55 130	 3,200 3,300 3,400	 1,400 1,900 2,500

Units mg/kg dry weight

Values taken from SP1010: Development of Category 4 Screening Levels for Assessment of Land Affected by Contamination – Policy Companion Document (Department for Environment, Food and Rural Affairs December 2014), unless stated otherwise

Public Open Space 1 – for grassed area adjacent to residential housing

Public Open Space 2 - Park Type Public Open Space Scenario

Based on a sandy loam as defined in SR3 (Environment Agency, 2009b)

Note that, with the exception of benzene, these C4SL are not SOM dependent

* - Stantec derived C4SL using CLEA v1.071

Table 2: Suitable 4 Use Levels (S4UL)

Determinand	Allotment	$R_{\underline{W}}HP$	$R_{\underline{WO}}HP$	Commercial/ Industrial	POSresi	POSpark
Metals						
Arsenic (**Inorganic**)[a, b, c]	43	37	40	640	79	170
Beryllium [a, b, d, e]	35	1.7	1.7	12	2.2	63
Boron [a, b, d]	45	290	11000	240000	21000	46000
Cadmium (**pH6-8**) [a, b, d, f]	1.9	11	85	190	120	560
Chromium (trivalent) [a, b, d, g]	18000	910	910	8600	1500	33000
Chromium (hexavalent) [a, b, c]	1.8[h]	6[i]	6[i]	33[i]	7.7[i]	220[i]
Copper [a, b, c]	520	2400	7100	68000	12000	44000
Mercury (elemental) [a, b, c, j]	21	1.2	1.2	58[vap] (25.8)	16	30[vap] (25.8)
Mercury (inorganic) [a, b, c]	19	40	56	1100	120	240
Methylmercury [a, b, c]	6	11	15	320	40	68
Nickel [a, b, c]	53[k]	130[e]	180[e]	980[e]	230[e]	800[k]
Selenium [a, b, c]	88	250	430	12000	1100	1800
Vanadium [a, b, c, i, j]	91	410	1200	9000	2000	5000
Zinc [a, b, c]	620	3700	40000	730000	81000	170000
BTEX Compounds (SOM 1%/ 2.5%/ 6%)						
Benzene [a, b, l, m]	0.017/0.034/ 0.075	0.087/0.17/ 0.37	0.38/0.7/1.4	27 / 47 / 90	72 / 72 / 73	90 / 100 / 110
Toluene [a, b, l, m]	22 / 51 / 120	130 / 290 / 660	880[vap] (869) /1900/3900	56000[vap] (869) / 110000[vap] (1920)/ 180000[vap] (4360)	56000 / 56000 / 56000	87000[vap](869)/ 95000[vap](1920)/ 100000[vap](4360)
Ethylbenzene [a, b, l, m]	16 / 39 / 91	47 / 110 / 260	83 / 190 / 440	5700[vap] (518) / 13000[vap] (1220) / 27000[vap] (2840)	24000 / 24000 / 25000	17000[vap] (518) / 22000[vap](1220) / 27000[vap] (2840)
O – Xylene [a, b, l, m, n]	28 / 67 / 160	60 / 140 / 330	88 / 210 / 480	6600[sol] (478) / 15000[sol] (1120) / 33000[sol] (2620)	41000 / 42000 / 43000	17000[sol] (478) / 24000[sol] (1120) / 33000[sol] (2620)
M – Xylene [a, b, l, m, n]	31 / 74 / 170	59 / 140 / 320	82 / 190 / 450	6200[vap] (625) / 14000[vap] (1470) / 31000[vap] (3460)	41000 / 42000 / 43000	17000[vap] (625) / 24000[vap](1470) / 32000[vap] (3460)
P – Xylene [a, b, l, m, n]	29 / 69 / 160	56 / 130 / 310	79 / 180 / 430	5900[sol] (576) / 14000[sol] (1350) / 30000[sol] (3170)	41000 / 42000 / 43000	17000[sol] (576) / 23000[sol] (1350) / 31000[sol] (3170)

Determinand	Allotment	R_WHP	R_{WO}HP	Commercial/ Industrial	POSresi	POSpark
Total xylenes [t]	28 / 67 / 160	56 / 130 / 310	79 / 180 / 430	5900[sol] (576) / 14000[sol] (1350) / 30000[sol] (3170)	41000 / 42000 / 43000	17000[sol] (576) / 23000[sol] (1350) / 31000[sol] (3170)
Polycyclic Aromatic Hydrocarbons (SOM 1%/ 2.5%/ 6%) [a, b, l, p]						
Acenaphthene	34 / 85 / 200	210 / 510 / 1100	3000[sol](57.0)/ 4700[sol] (141)/ 6000[sol] (336)	84000[sol] (57.0)/ 97000[sol] (141)/ 100000	15000 / 15000 / 15000	29000/ 30000/ 30000
Acenaphthylene	28 / 69 / 160	170 / 420 / 920	2900[sol](86.1)/ 4600[sol] (212)/ 6000[sol] (506)	83000[sol] (86.1)/ 97000[sol] (212)/ 100000	15000 / 15000 / 15000	29000 / 30000 / 30000
Anthracene	380 / 950 / 2200	2400 / 5400 / 11000	31000[sol](1.17) /35000/ 37000	520000/ 540000/ 540000	74000 / 74000 / 74000	150000 / 150000 / 150000
Benzo(a)anthracene	2.9 / 6.5 / 13	7.2 / 11 / 13	11 / 14 / 15	170 / 170 / 180	29 / 29 / 29	49 / 56 / 62
Benzo(a)pyrene (Bap) [u]	0.97 / 2.0 / 3.5	2.2 / 2.7 / 3.0	3.2 / 3.2 / 3.2	35 / 35 / 36	5.7 / 5.7 / 5.7	11 / 12 / 13
Benzo(b)fluoranthene	0.99 / 2.1 / 3.9	2.6 / 3.3 / 3.7	3.9 / 4.0 / 4.0	44 / 44 / 45	7.1 / 7.2 / 7.2	13 / 15 / 16
Benzo(g,h,i)perylene	290 / 470 / 640	320 / 340 / 350	360 / 360 / 360	3900 / 4000 / 4000	640 / 640 / 640	1400 / 1500 / 1600
Benzo(k)fluoranthene	37 / 75 / 130	77 / 93 / 100	110 / 110 / 110	1200 / 1200 /1200	190 / 190 / 190	370 / 410 / 440
Chrysene	4.1 / 9.4 / 19	15 / 22 / 27	30 / 31 / 32	350 / 350 / 350	57 / 57 / 57	93 / 110 / 120
Dibenzo(ah)anthracene	0.14 / 0.27 / 0.43	0.24 / 0.28 / 0.3	0.31 / 0.32 / 0.32	3.5 / 3.6 / 3.6	0.57 / 0.57 / 0.58	1.1 / 1.3 / 1.4
Fluoranthene	52 / 130 / 290	280 / 560 / 890	1500 / 1600 / 1600	23000 / 23000 / 23000	3100 / 3100 / 3100	6300 / 6300 / 6400
Fluorene	27 / 67 / 160	170 / 400 / 860	2800[sol] (30.9) /3800[sol] (76.5) /4500[sol] (183)	63000[sol] (30.9) / 68000 / 71000	9900 / 9900 / 9900	20000 / 20000 / 20000
Indeno(1,2,3-cd)pyrene	9.5 / 21 / 39	27 / 36 / 41	45 / 46 / 46	500 / 510 / 510	82 / 82 / 82	150 / 170 / 180
Naphthalene [q]	4.1 / 10 / 24	2.3 / 5.6 / 13	2.3 / 5.6 / 13	190[sol] (76.4) / 460[sol] (183) / 1100[sol] (432)	4900/ 4900/ 4900	1200[sol] (76.4) / 1900[sol] (183) / 3000
Phenanthrene	15 / 38 / 90	95 / 220 / 440	1300[sol](36.0) / 1500 / 1500	22000 / 22000 / 23000	3100 / 3100 / 3100	6200 / 6200 / 6300
Pyrene	110 / 270 / 620	620 / 1200 / 2000	3700 / 3800 / 3800	54000 / 54000 / 54000	7400 / 7400 / 7400	15000 / 15000 / 15000
Coal Tar (Bap as surrogate marker) [u]	0.32 / 0.67 / 1.2	0.79 / 0.98 / 1.1	1.2 / 1.2 / 1.2	15 / 15 / 15	2.2 / 2.2 / 2.2	4.4 / 4.7 / 4.8
Explosives [a, b, l, p]						
2, 4, 6 Trinitrotoluene	0.24 / 0.58 / 1.40	1.6 / 3.7 / 8.0	65 / 66 / 66	1000 / 1000 / 1000	130 / 130 / 130	260 / 270 / 270
RDX (Royal Demolition Explosive $C_3H_6N_6O_6$)	17 / 38 / 85	120 / 250 / 540	13000 / 13000 / 13000	210000 / 210000 / 210000	26000 / 26000 / 27000	49000[sol] (18.7) / 51000 / 53000
HMX (High Melting Explosive $C_4H_8N_8O_8$)	0.86 / 1.9 / 3.9	5.7 / 13 / 26	6700 / 6700 / 6700	110000 / 110000 / 110000	13000 / 13000 / 13000	23000[vap] (0.35) /23000[vap] (0.39) /24000[vap] (0.48)
Petroleum Hydrocarbons (SOM 1%/ 2.5%/ 6%) [a, b, l, m]						
Aliphatic EC 5-6	730 / 1700 / 3900	42 / 78 / 160	42 / 78 / 160	3200[sol] (304) / 5900[sol] (558) / 12000[sol] (1150)	570000[sol](304) 590000 / 600000	95000[sol] (304) / 130000[sol] (558)/ 180000[sol](1150)
Aliphatic EC >6-8	2300 / 5600 / 13000	100 / 230 / 530	100 / 230 / 530	7800[sol] (144) / 17000[sol] (322) / 40000[sol] (736)	600000 / 610000 / 620000	150000[sol] (144) 220000[sol] (322)/ 320000[sol] (736)
Aliphatic EC >8-10	320 / 770 / 1700	27 / 65 / 150	27 / 65 / 150	2000[sol] (78) / 4800[vap] (190) / 11000[vap] (451)	13000 / 13000 / 13000	14000[sol] (78) / 18000[vap] (190) / 21000[vap] (451)
Aliphatic EC >10-12	2200 / 4400 / 7300	130v[ap] (48) / 330[vap] (118) / 760[vap] (283)	130v[ap] (48) / 330[vap] (118) / 770[vap] (283)	9700[sol] (48) / 23000[vap] (118) / 47000[vap] (283)	13000 / 13000 / 13000	21000[sol] (48) / 23000[vap] (118) / 24000[vap] (283)
Aliphatic EC >12-16	11000 / 13000 / 13000	1100[sol] (24) / 2400[sol] (59) / 4300[sol] (142)	1100[sol] (24) / 2400[sol] (59) / 4400[sol] (142)	59000[sol] (24) / 82000[sol] (59) / 90000[sol] (142)	13000 / 13000 / 13000	25000[sol] (24) / 25000[sol] (59) / 26000[sol] (142)
Aliphatic EC >16-35 °	260000 / 270000 / 270000	65000[sol](8.48 92000[sol] (21) 110000	65000[sol] (8.48 92000[sol] (21) 110000	1600000 / 1700000 / 1800000	250000 / 250000 / 250000	450000 / 480000 / 490000
Aliphatic EC >35-44 °	260000 / 270000 / 270000	65000[sol](8.48 92000[sol] (21) / 110000	65000[sol](8.48 92000[sol] (21) 110000	1600000 / 1700000 / 1800000	250000 / 250000 / 250000	450000 / 480000 / 490000
Aromatic EC 5-7 (benzene)	13 / 27 / 57	70 / 140 / 300	370 / 690 / 1400	26000[sol] (1220) / 46000[sol] (2260) / 86000[sol] (4710)	56000 / 56000 / 56000	76000[sol] (1220) /84000[sol](2260)/ 92000[sol] (4710)
Aromatic EC >7-8 (toluene)	22 / 51 / 120	130 / 290 / 660	860 / 1800 / 3900	56000[vap] (869)/ 110000[sol] (1920)/ 180000[vap] (4360)	56000 / 56000 / 56000	87000[vap](869) / 95000[sol] (1920)/ 100000[vap](4360)
Aromatic EC >8-10	8.6 / 21 / 51	34 / 83 / 190	47 / 110 / 270	3500[vap] (613) / 8100[vap] (1500) / 17000[vap] (3580)	5000 / 5000 / 5000	7200[vap](613) / 8500[vap] (1500) / 9300[vap] (3580)

Determinand	Allotment	$R_{W}HP$	$R_{WO}HP$	Commercial/ Industrial	POSresi	POSpark
Aromatic EC >10-12	13 / 31 / 74	74 / 180 / 380	250 / 590 / 1200	16000[sol] (364) / 28000[sol] (899) / 34000[sol] (2150)	5000 / 5000 / 5000	9200[sol] (364) / 9700[sol] (899) / 10000
Aromatic EC >12-16	23 / 57 / 130	140 / 330 / 660	1800 / 2300[sol] (419) / 2500	36000[sol] (169) / 37000 / 38000	5100 / 5100 / 5000	10000 / 10000 / 10000
Aromatic EC >16-21 °	46 / 110 / 260	260 / 540 / 930	1900 / 1900 / 1900	28000 / 28000 / 28000	3800 / 3800 / 3800	7600 / 7700 / 7800
Aromatic EC >21-35 °	370 / 820 / 1600	1100 / 1500 / 1700	1900 / 1900 / 1900	28000 / 28000 / 28000	3800 / 3800 / 3800	7800 / 7800 / 7900
Aromatic EC >35-44 °	370 / 820 / 1600	1100 / 1500 / 1700	1900 / 1900 / 1900	28000 / 28000 / 28000	3800 / 3800 / 3800	7800 / 7800 / 7900
Aliphatic + Aromatic EC >44-70 °	1200 / 2100 / 3000	1600 / 1800 / 1900	1900 / 1900 / 1900	28000 / 28000 / 28000	3800 / 3800 / 3800	7800 / 7800 / 7900
Chloroalkanes & Chloroalkenes (SOM 1%/ 2.5%/ 6%) [a, b, l, p]						
1,2-Dichloroethane	0.0046 / 0.0083 / 0.016	0.0071 / 0.011 / 0.019	0.0092 / 0.013 / 0.023	0.67 / 0.97 / 1.7	29 / 29 / 29	21 / 24 / 28
1,1,1 Trichloroethane (TCA)	48 / 110 / 240	8.8 / 18 / 39	9.0 / 18 / 40	660 / 1300 / 3000	140000 / 140000 / 140000	57000[vap](1425) 76000[vap](2915)/ 100000[vap](6392)
1,1,1,2 Tetrachloroethane	0.79 / 1.9 / 4.4	1.2 / 2.8 / 6.4	1.5 / 3.5 / 8.2	110 / 250 / 560	1400 / 1400 / 1400	1500 / 1800 / 2100
1,1,2,2 Tetrachloroethane	0.41 / 0.89 / 2.0	1.6 / 3.4 / 7.5	3.9 / 8.0 / 17	270 / 550 / 1100	1400 / 1400 / 1400	1800 / 2100 / 2300
Tetrachloromethane (Carbon Tetrachloride)	0.45 / 1.0 / 2.4	0.026 / 0.056 / 0.13	0.026 / 0.056 / 0.13	2.9 / 6.3 / 14	890 / 920 / 950	190 / 270 / 400
Trichloromethane (Chloroform)	0.42 / 0.83 / 1.7	0.91 / 1.7 / 3.4	1.2 / 2.1 / 4.2	99 / 170 / 350	2500 / 2500 / 2500	2600 / 2800 / 3100
Phenol & Chlorophenols [a, b, l, p]						
Phenol	23 / 42 / 83	120 / 200 / 380	440 / 690 / 1200	440[dir] (26000) / 690[dir] (30000) / 1300[dir] (34000)	440[dir] (10000)/ 690[dir](10000) 1300[dir](10000)	440[dir] (7600) / 690[dir] (8300) / 1300[dir] (93000)
Chlorophenols (excluding PCP) [r]	0.13[s] / 0.3 / 0.7	0.87[s] / 2.0 / 4.5	94 / 150 / 210	3500 / 4000 / 4300	620 / 620 / 620	1100 / 1100 / 1100
Pentachlorophenol (PCP)	0.03 / 0.08 / 0.19	0.22/ 0.52 / 1.2	27[vap] (16.4) / 29 / 31	400 / 400 / 400	60 / 60 / 60	110 / 120 / 120
Other [a, b, l, p]						
Carbon Disulphide	4.8 / 10 / 23	0.14 / 0.29 / 0.62	0.14 / 0.29 / 0.62	11 / 22 / 47	11000 / 11000 / 12000	1300 / 1900 / 2700
Hexachlorobutadiene (HCBD)	0.25 / 0.61 / 1.4	0.29 / 0.7 / 1.6	0.32 / 0.78 / 1.8	31 / 66 / 120	25 / 25 / 25	48 / 50 / 51
Pesticides (SOM 1%/ 2.5%/ 6%) [a, b, l, p]						
Aldrin	3.2 / 6.1 / 9.6	5.7/ 6.6 /7.1	7.3 / 7.4 / 7.5	170 / 170 / 170	18 / 18 / 18	30 / 31 / 31
Atrazine	0.5 / 1.2 / 2.7	3.3 / 7.6 / 17.4	610 / 620 / 620	9300 / 9400 / 9400	1200 / 1200 / 1200	2300 / 2400 / 2400
Dichlorvos	0.0049 / 0.010 / 0.022	0.032 / 0.066 / 0.14	6.4 / 6.5 / 6.6	140 / 140 / 140	16 / 16 / 16	26 / 26 / 27
Dieldrin	0.17/0.41/0.96	0.97/ 2 / 3.5	7.0 / 7.3 / 7.4	170 / 170 / 170	18 / 18 / 18	30 / 30 / 31
Alpha - Endosulfan	1.2 / 2.9 / 6.8	7.4 / 18 / 41	160[vap] (0.003)/ 280[vap] (0.007)/ 410[vap] (0.016)	5600[vap] (0.003) / 7400[vap] (0.007) / 8400[vap] (0.016)	1200 / 1200 / 1200	2400 / 2400 / 2500
Beta - Endosulfan	1.1 / 2.7 / 6.4	7.0 / 17 / 39	190[vap](0.00007) /320[vap](0.0002) /440[vap](0.0004)	6300[vap](0.00007) /7800[vap](0.0002) / 8700	1200 / 1200 / 1200	2400 / 2400 / 2500
Alpha-Hexachlorocyclohexane	0.035/0.087/ 0.21	0.23/0.55 / 1.2	6.9 / 9.2 / 11	170 / 180 / 180	24 / 24 / 24	47 / 48 / 48
Beta - Hexachlorocyclohexane	0.013 / 0.032 / 0.077	0.085 / 0.2 / 0.46	3.7 / 3.8 / 3.8	65 / 65 / 65	8.1 / 8.1 / 8.1	15 / 15 / 16
Gamma – Hexachlorocyclohexane	0.0092 / 0.023 / 0.054	0.06 / 0.14 / 0.33	2.9 / 3.3 / 3.5	67 / 69 / 70	8.2 / 8.2 / 8.2	14 / 15 / 15
Chlorobenzenes [a, b, l, p]						
Chlorobenzene	5.9 / 14 / 32	0.46 / 1.0 / 2.4	0.46 / 1.0 / 2.4	56 / 130 / 290	11000 / 13000 / 14000	1300[sol](675)/ 2000[sol](1520)/ 2900
1,2-dichlorobenzene (1,2-DCB)	94 / 230 / 540	23 / 55 / 130	24 / 57 / 130	2000[sol] (571) / 4800[sol] (1370) / 11000[sol] (3240)	90000 / 95000 / 98000	24000[sol] (571) / 36000[sol] (1370) /51000[sol] (3240)
1,3-dichlorobenzene (1,3-DCB)	0.25 / 0.6 / 1.5	0.4 / 1.0 / 2.3	0.44 /1.1 / 2.5	30 / 73 / 170	300 / 300 / 300	390 / 440 / 470
1-4-dichlorobenzene (1,4-DCB)	15[i] / 37[i] / 88 [i]	61[q] / 150[q] /350 [q]	61[q] / 150[q] / 350[q]	4400[vap,q] (224) / 10000[vap,q] (540) / 25000[vap,q] (1280)	17000[i] / 17000[i] / 17000[i]	36000[vap,i] (224) 36000[vap, i](540)/ 36000[vap,i](1280)
1,2,3-Trichlorobenzene	4.7 / 12 / 28	1.5 / 3.6 / 8.6	1.5 / 3.7 / 8.8	102 / 250 / 590	1800 / 1800 / 1800	770[vap] (134) / 1100[vap] (330) / 1600[vap] (789)
1,2,4- Trichlorobenzene	55 / 140 / 320	2.6 / 6.4 / 15	2.6 / 6.4 / 15	220 / 530 / 1300	15000 / 17000 / 19000	1700[vap] (318) / 2600[vap] (786) / 4000[vap] (1880)

Determinand	Allotment	R_WHP	$R_{WO}HP$	Commercial/ Industrial	POSresi	POSpark
1,3,5- Trichlorobenzene	4.7 / 12 / 28	0.33 / 0.81 / 1.9	0.33 / 0.81 / 1.9	23 / 55 / 130	1700 / 1700 / 1800	380^{vap} (36.7) / 580^{vap} (90.8) / 860^{vap} (217)
1,2,3,4-Tetrachlorobenzene	4.4 / 11 / 26	15 / 36 / 78	24 / 56 / 120	1700^{vap} (122) / 3080^{vap} (304) / 4400^{vap} (728)	830 / 830 / 830	1500^{vap} (122) / 1600 / 1600
1,2,3,5- Tetrachlorobenzene	0.38 / 0.90 / 2.2	0.66 / 1.6 / 3.7	0.75 / 1.9 / 4.3	49^{vap} (39.4) / 120^{vap} (98.1) / 240^{vap} (235)	78 / 79 / 79	110^{vap} (39.4) / 120 / 130
1,2,4,5- Tetrachlorobenzene	0.06 / 0.16 / 0.37	0.33 / 0.77 / 1.6	0.73 / 1.7 / 3.5	42^{sol} (19.7) / 72^{sol} (49.1) / 96	13 / 13 / 13	25 / 26 / 26
Pentachlorobenzene (P_ECB)	1.2 / 3.1 / 7.0	5.8 / 12 / 22	19 / 30 / 38	640^{sol} (43.0) / 770^{sol} (107) / 830	100 / 100 / 100	190 / 190 / 190
Hexachlorobenzene (HCB)	0.47 / 1.1 / 2.5	1.8^{vap} (0.20) / 3.3^{vap} (0.5) / 4.9	4.1^{vap} (0.20) / 5.7^{vap} (0.5) / 6.7^{vap} (1.2)	110^{vap} (0.20) / 120 / 120	16 / 16 / 16	30 / 30 / 30

Units are mg/kg Dry Weight

R_WHP Residential with homegrown produce
$R_{WO}HP$ Residential without homegrown produce
POSresi public open spaces near residential housing
POSpark public open space for recreational use but not dedicated sports pitches
SOM Soil Organic Matter – ***the S4UL for all organic compounds will vary according to SOM***

a Based on a sandy loam soil as defined in SR3 (Environment Agency, 2009b) and 6% soil organic matter (SOM)
b Figures rounded to two significant figures
c Based only on a comparison of oral and dermal soil exposure with oral Index Dose
d The background ADE is limited to being no larger than the contribution from the relevant soil ADE
e Based on comparison of inhalation exposure with inhalation TDI only
f Based on a lifetime exposure via the oral, dermal and inhalation pathways
g Based on localised effects comparing inhalation exposure with inhalation ID only
h Based on comparison of inhalation exposure with inhalation ID
i Based on comparison of oral and dermal exposure with oral TDI
j Based on comparison of oral, dermal and inhalation exposure with inhalation TDI
k Based on comparison of all exposure pathways with oral TDI
l S4ULs assume that free phase contamination is not present
m S4ULs based on a sub-surface soil to indoor air correction factor of 10
n The HCV applied is based on the intake of total Xylene and therefore exposure should not consider an isomer in isolation
o Oral, dermal and inhalation exposure compared with oral HCV
p S4ULs based on a sub-surface soil to indoor air correction factor of 1
q Based on a comparison of inhalation exposure with the inhalation TDI for localised effects
r Based on 2,4-dichlorophenol unless otherwise stated
s Based on 2,3,4,6-tetrachlorophenol
t Based on lowest GAC for all three xylene isomers
u Measured concentrations of benzo(a)pyrene should be compared to the S4UL for benzo(a)pyrene as a single compound and to the S4UL for benzo(a)pyrene as a surrogate marker of genotoxic PAHs.

vap S4UL presented exceeded the vapour saturation limit, which is presented in brackets
sol S4UL presented exceeds the solubility saturation limit, which is presented in brackets
dir S4ULs based on a threshold protective of direct skin contact, guideline in brackets based on the health effects following long term exposure provided for illustration only

Table 3: Soil Guideline Values (SGVs) for dioxins, furans and dioxin like PCBs

Determinand	Allotments	Residential with consumption of homegrown produce	Residential without consumption of homegrown produce	Commercial
Sum of PCDDs, PCDFs and dioxin-like PCBs	0.008	0.008	0.008	0.24

Units are mg/kg Dry Weight

Table 4: EIC/AGS/CL:AIRE Generic Assessment Criteria (GAC)

	Allotments	Residential with consumption of homegrown produce	Residential without consumption of homegrown produce	Commercial	Soil Saturation Concentration
Metals					
Antimony	ND	ND	550	7500	NA
Barium	ND	ND	1300	22000	NA
Molybdenum	ND	ND	670	17000	NA
Organics (SOM 1%/ 2.5%/ 6%)					
1,1,2 Trichloroethane	0.28 / 0.61 / 1.4	0.6 / 1.2 / 2.7	0.88 / 1.8 / 3.9	94 / 190 / 400	4030 / 8210 / 18000
1,1-Dichloroethane	9.2 / 17 / 35	2.4 / 3.9 / 7.4	2.5 / 4.1 / 7.7	280 / 450 / 850	1830 / 2960 / 5600
1,1-Dichloroethene	2.8 / 5.6 / 12	0.23 / 0.4 / 0.82	0.23 / 0.41 / 0.82	26 / 46 / 92	2230 / 3940 / 7940
1,2,4-Trimethylbenzene	0.38 / 0.93 / 2.2	0.35 / 0.85 / 2	0.41 / 0.99 / 2.3	42 / 99 / 220	557 / 1360 / 3250
1,2-Dichloropropane	0.62 / 1.2 / 2.6	0.024 / 0.042 / 0.084	0.024 / 0.042 / 0.085	3.3 / 5.9 / 12	1190 / 2110 / 4240
2,4-Dimethylphenol	3.1 / 7.2 / 17	19 / 43 / 97	210 / 410 / 730	16000 / 24000 / 30000	1380 / 3140 / 7240
2,4-Dinitrotoluene	0.22 / 0.49 / 1.1	1.5 / 3.2 / 7.2	170 / 170 / 170	3700 / 3700 / 3800	141 / 299 / 669
2,6-Dinitrotoluene	0.12 / 0.27 / 0.61	0.78 / 1.7 / 3.9	78 / 84 / 87	1900 / 1900 / 1900	287 / 622 / 1400
2-Chloronaphthalene	40 / 98 / 230	3.7 / 9.2 / 22	3.8 / 9.3 / 22	390 / 960 / 2200	114 / 280 / 669
Biphenyl	14 / 35 / 83	66 / 160 / 360	220 / 500 / 980	18000 / 33000 / 48000	34.4 / 84.3 / 201
Bis (2-ethylhexyl) phthalate	47 / 120 / 280	280 / 610 / 1100	2700 / 2800 / 2800	85000 / 86000 / 86000	8.68 / 21.6 / 51.7
Bromobenzene	3.2 / 7.6 / 18	0.87 / 2 / 4.7	0.91 / 2.1 / 4.9	97 / 220 / 520	853 / 1970 / 4580
Bromodichloromethane	0.016 / 0.032 / 0.068	0.016 / 0.03 / 0.061	0.019 / 0.034 / 0.07	2.1 / 3.7 / 7.6	1790 / 3220 / 6570
Bromoform	0.95 / 2.1 / 4.6	2.8 / 5.9 / 13	5.2 / 11 / 23	760 / 1500 / 3100	2690 / 5480 / 12000
Butyl benzyl phthalate	220 / 550 / 1300	1400 / 3300 / 7200	42000 / 44000 / 44000	940000 / 940000 / 950000	26.3 / 64.7 / 154
Chloroethane	110 / 200 / 380	8.3 / 11 / 18	8.4 / 11 / 18	960 / 1300 / 2100	2610 / 3540 / 5710
Chloromethane	0.066 / 0.13 / 0.23	0.0083 / 0.0098 / 0.013	0.0085 / 0.0099 / 0.013	1 / 1.2 / 1.6	1910 / 2240 / 2990
Cis 1,2 Dichloroethene	0.26 / 0.5 / 1	0.11 / 0.19 / 0.37	0.12 / 0.2 / 0.39	14 / 24 / 47	3940 / 6610 / 12900
Dichloromethane	0.1 / 0.19 / 0.34	0.58 / 0.98 / 1.7	2.1 / 2.8 / 4.5	270 / 360 / 560	7270 / 9680 / 15300
Diethyl Phthalate	19 / 41 / 94	120 / 260 / 570	1800 / 3500 / 6300	150000 / 220000 / 290000	13.7 / 29.1 / 65
Di-n-butyl phthalate	2 / 5 / 12	13 / 31 / 67	450 / 450 / 450	15000 / 15000 / 15000	4.65 / 11.4 / 27.3
Di-n-octyl phthalate	940 / 2100 / 3900	2300 / 2800 / 3100	3400 / 3400 / 3400	89000 / 89000 / 89000	32.6 / 81.5 / 196
Hexachloroethane	0.27 / 0.67 / 1.6	0.2 / 0.48 / 1.1	0.22 / 0.54 / 1.3	22 / 53 / 120	8.17 / 20.1 / 48.1
Isopropylbenzene	32 / 79 / 190	11 / 27 / 64	12 / 28 / 67	1400 / 3300 / 7700	390 / 950 / 2250
Methyl tert-butyl ether (MTBE)	23 / 44 / 90	49 / 84 / 160	73 / 120 / 220	7900 / 13000 / 24000	20400 / 33100 / 62700
Propylbenzene	34 / 83 / 200	34 / 82 / 190	40 / 97 / 230	4100 / 9700 / 21000	402 / 981 / 2330
Styrene	1.6 / 3.7 / 8.7	8.1 / 19 / 43	35 / 78 / 170	3300 / 6500 / 11000	626 / 1440 / 3350
Total Cresols (2-, 3- and 4-methylphenol)	12 / 27 / 63	80 / 180 / 400	3700 / 5400 / 6900	160000 / 180000 / 180000	15000 / 32500 / 73300
Trans 1,2 Dichloroethene	0.93 / 1.9 / 4	0.19 / 0.34 / 0.7	0.19 / 0.35 / 0.71	22 / 40 / 81	3420 / 6170 / 12600
Tributyl tin oxide	0.042 / 0.1 / 0.24	0.25 / 0.59 / 1.3	1.4 / 3.1 / 5.7	130 / 180 / 200	41.3 / 101 / 241

Units are mg/kg Dry Weight

Table 5: Tier 2 Criteria for the Assessment of Soils – Protection of Flora and Fauna

Parameter	ICRCL 70/90 [a]		SSVs [b]	Code of Practice for Agricultural Use of Sewage Sludge [c]	BS 3882:2015 Specification for topsoil and requirements for use
	Maximum				Phytotoxic contaminants
	Livestock	Crop Growth			
	mg/kgDW	mg/kgDW	mg/kgDW	mg/kgDW	mg/kgDW
Antimony			37		
Arsenic	500	1000		50	
Cadmium	30	50	0.6	3	
Chromium				400	
Cobalt			4.2		
Copper	500	250	35.1	80/ 100/ 135/ 200 [d]	<100/<135/<200 [e]
Fluoride	1000			500	
Lead	1000			300	
Mercury				1	
Molybdenum			5.1	4	
Nickel			28.2	50/ 60/ 75/ 110 [d]	<60/<75/<110 [e]
Selenium				3	
Silver			0.3		
Vanadium			2.0		

Parameter	ICRCL 70/90 [a]		SSVs [b]	Code of Practice for Agricultural Use of Sewage Sludge [c]	BS 3882:2015 Specification for topsoil and requirements for use
	Maximum				Phytotoxic contaminants
	Livestock	Crop Growth			
	mg/kgDW	mg/kgDW	mg/kgDW	mg/kgDW	mg/kgDW
Zinc	3000	1000	35.6	200/200/200/300 [d]	<200/<200/<300 [e]
Benzo(a)pyrene			0.15		
Bis(2-ethylhexyl) phthalate			13		
Hexachlorobenzene			0.002		
Pentachlorobenzene					
Pentachlorophenol			0.6		
Perfluorooctanoic acid			0.022		
Perfluorooctane sulfonate			0.014		
Polychlorinated alkanes medium chain			11.9		
Tetrachloroethene					
Toluene					
Triclosan			0.13		
Tris(2-chloroethyl)phosphate			1.1		
Tris(2-chloro-1-methylethyl) phosphate			1.8		

a. Interdepartmental Committee on the Redevelopment of Contaminated Land (ICRCL) 70/90 Restoration and Aftercare of Metalliferous Mining Sites for Pasture and Grazing 1st edition 1990.
b. Soil screening values for assessing ecological risks, EA 2017a Report – ShARE id26
c. Maximum permissible concentration of potentially toxic elements for Arable land from the Sewage sludge in agriculture: code of practice.. There are also criteria for Grassland which are higher than for Arable.
d. Where four values are presented, concentrations are for soils with pH values 5.0-5.5/ 5.5-6.0/ 6.0-7.0/ >7.0 (and the soils contain more than 5% calcium carbonate)
e. Where three values are presented, concentrations are for soils with pH values <6.0/ 6.0-7.0/ >7.0

Table 6: Tier 2 Criteria for Screening Liquids

	Screening Concentration (mg/l)			
	Minimum Reporting Value	Human Consumption	Fresh Water/Inland	Salt Water/Other
Arsenic SP	-	0.01	0.05 (2)	0.025 (2)
Boron	-	1	-	-
Cadmium PS	0.0001	0.005	≤0.00008, 0.00008, 0.00009, 0.00015, 0.00025 (14)	0.0002
Chromium (total)	-	0.05	-	-
Chromium (III) SP	-	-	0.0047	-
Chromium (VI) SP	-	-	0.0034	0.0006
Copper SP	-	2	0.001 bioavailable	0.00376 bioavailable
Iron SP	-	0.2	1	1
Lead PS	-	0.01	0.0012 bioavailable	0.0013 bioavailable
Mercury compounds PS	0.00001	0.001	0.00007 max	0.00007 max
Manganese SP	-	0.05	0.123 bioavailable	-
Nickel PS	-	0.02	0.004 bioavailable	0.0086 bioavailable
Selenium	-	0.01	-	-
Zinc SP	-	5(3)	0.0109bioavailable(13)	0.0068bioavailable (13)
Chlorinated Compounds				
C10-13 chloroalkanes PS short chain chlorinated paraffins	-	-	0.0004	0.0004
Dichloromethane PS	-	-	0.02	0.02
1,2-Dichloroethane PS	0.001	0.003	0.01	0.01

	Screening Concentration (mg/l)			
	Minimum Reporting Value	Human Consumption	Fresh Water/Inland	Salt Water/Other
Trichloroethene PS	0.0001	0.01[5]	0.01	0.01
1,1,1-Trichloroethane	0.0001	-	-	-
1,1,2-Trichloroethane	0.0001	-	-	-
Trichloromethanes PS	-	0.1[1]	0.0025	0.0025
1, 2, 4-Trichlorobenzene	0.00001			
Tetrachloroethene PS	0.0001	0.01[5]	0.01	0.01
Tetrachloromethane/ Carbon tetrachloride PS	0.0001	0.003	0.012	0.012
Tetrachloroethane SP	-		0.140	
Vinyl chloride	-	0.0005	-	-
Trichlorobenzene (TCB) PS	-	-	0.0004	0.0004
Chloroform	0.0001			
Chloronitrotoluenes(CNT)[11]	0.001	-	-	-
Hexachlorobutadiene PS	0.000005	-	0.0006 max	0.0006 max
Hexachlorocyclohexanes (HCH) PS	0.000001	-	0.00002	0.000002
Polycyclic Aromatic Hydrocarbons				
Acenaphthene	-	-	-	-
Acenaphthylene	-	-	-	-
Anthracene PS	-	-	0.0001	0.0001
Benzo(a)anthracene	-	-	-	-
Benzo(b)fluoranthene PS	-	0.0001 [10]	0.000017 max [12]	0.000017 max [12]
Benzo(a)pyrene PS	-	0.00001	0.00000017	0.00000017
Benzo(k)fluoranthene PS	-	0.0001 [10]	0.000017 max [12]	0.000017 max [12]
Benzo(g,h,i)perylene PS	-	0.0001 [10]	0.0000082 max [12]	0.00000082 max [12]
Indeno(1,2,3-cd)pyrene PS	-	0.0001 [10]	- [12]	- [12]
Chrysene		-	-	-
Dibenzo(a,h)anthracene		-	-	-
Fluoranthene PS	-	-	0.0000063	0.0000063
Fluorene	-	-	-	-
Phenanthrene	-	-	-	-
Pyrene	-	-	-	-
Naphthalene PS	-	-	0.002	0.002
Polycyclic Aromatic Hydrocarbons		0.0001[10]		
Petroleum hydrocarbons				
Petroleum hydrocarbons/Mineral oil	-	0.01[3]	-	-
Benzene PS	0.001	0.001	0.01	0.008
Toluene SP	0.004	0.7[9]	0.074	0.074
Ethylbenzene	-	0.3[9]	-	-
Xylenes	0.003[4]	0.5[9]		
Methyl tert-butyl ether (MTBE)	-	0.015[7]	-	-
Pesticides and Herbicides				
Alachlor PS	-	-	0.0003	0.0003
Aldrin PS	0.000003	0.00003	0.00001[8]	0.000005[8]
Dieldrin PS	0.000003	0.00003		
Endrin PS	0.000003	0.0006[9]		
Isodrin	0.000003	-	-	-
2,4 dichlorophenol SP	0.0001	-	0.0042	0.00042
2,4 D ester SP	0.0001	-	0.0003	0.0003
op and pp DDT (each) PS	0.000002	0.001[6]	0.000025 [6]	0.000025 [6]
op and pp DDE (each)	0.000002			
op and pp TDE (each)	0.000002			
Dimethoate SP	0.00001	-	0.00048	0.00048
Endosulfan PS	0.000005	-	0.000005	0.0000005
Hexachlorobenzene PS	0.000001		0.00005 max	0.00005 max
Permethrin SP	0.000001	-	0.000001	0.0000002
Atrazine PS	0.00003	-	0.0006	0.0006
Simazine PS	0.00003	-	0.001	0.001
Linuron SP	-	-	0.0005	0.0005
Mecoprop SP		-	0.018	0.018
Trifluralin PS	0.00001	-	0.00003	0.00003
Total pesticides	-	0.0005		

	Screening Concentration (mg/l)			
	Minimum Reporting Value	Human Consumption	Fresh Water/Inland	Salt Water/Other
Miscellaneous				
Ammoniacal nitrogen (as NH4+)	-	0.5	0.26 [16] 0.39 [17]	-
Ammoniacal nitrogen (as N)	-	0.39	0.2 [16] 0.3 [17]	-
Unionised Ammonia (NH3) SP	-	-	-	0.021
Chloride	-	250		
Chlorine SP			0.002	0.01 max
Cyanide SP (hydrogen cyanide)	-	0.05	0.001	0.001
Nitrate (as NO_3)	-	50	-	-
Nitrite (as NO_2)	-	0.1	-	-
Phenol SP	-	0.005 [(3)]	0.0077	0.0077
Pentachlorophenol PS	0.0001	-	0.0004	0.0004
PCBs (individual congeners)	0.000001	-	-	-
Sodium	-	200	-	-
Sulphate	-	250		-
Tributyl and triphenyl tin compounds (each) PS	0.000001	-	0.0000002	0.0000002
Di(2-ethylhexyl)-phthalate PS	-	-	0.0013	0.0013

Substances highlighted in yellow are hazardous substances, PS = Priority Substances, SP = Specific Pollutants, '-' screening concentration is not available, 'max' – maximum allowable concentration used where no annual average provided

Notes:

1. Concentration for trihalomethanes is the sum of chloroform, bromoform, dibromochloromethane and bromodichloromethane.
2. Concentration is the dissolved fraction of a water sample obtained by filtration through a 0.45um filter.
3. Concentration is taken from Statutory Instrument 1989 No. 1147. The Water Supply (Water Quality) Regulations 1989, as amended.
4. Concentration for xylenes is 0.003mg/l each for o-xylene and m/p xylene.
5. Concentration is the Sum of TCE and PCE.
6. Concentration is for Total DDT. Para DDT on its own has a target concentration of 0.00001mg/l.
7. Concentration for MTBE is taken from Environment Agency guidance, dated 2006.
8. Concentration is the sum of aldrin, dieldrin, endrin.
9. Concentration is taken from WHO (2004) guidelines for drinking-water quality.
10. Sum of benzo(b)fluoranthene, benzo(k)fluoranthene, benzo(ghi)perylene, indeno(1,2,3-cd)pyrene
11. Concentration is for 2,6-CNT, 4,2-CNT, 4,3-CNT, 2,4-CNT, 2,5-CNT
12. BAP can be considered as a marker of the other PAHs for comparison with the annual average
13. Concentration plus ambient background concentration (dissolved)
14. For cadmium and its compounds the EQS depends on the hardness of the water (Class 1: < 40 mg CaCO3/l, Class 2: 40 to < 50 mg CaCO3/l, Class 3: 50 to < 100 mg CaCO3/l, Class 4: 100 to < 200 mg CaCO3/l and Class 5: ≥ 200 mg CaCO3/l).
15. Manufactured and used in industrial applications, such as flame retardants and plasticisers, as additives in metal working fluids, in sealants, paints, adhesives, textiles, leather fat and coatings. Persistent, bioaccumulate and toxic to aquatic life (carcinogen in rat studies). Candidate Persistent Organic Pollutant (POP).
16. Acceptable 90th percentile concentration for a freshwater lake/river with "High" chemical quality standard and alkalinity (as mg/l CaCO3) < 50 mg/L or alkalinity < 200 mg/L where river elevation > 80 m above Ordnance Datum (mAOD). See the Water Framework Directive (Standards and Classification) Directions (England and Wales) 2015 for further details.
17. Acceptable 90th percentile concentration for a freshwater lake/river with "High" chemical quality standard and alkalinity (as mg/l CaCO3) ≥ 50 mg/L where river elevation < 80 m mAOD or > 200 mg/l where river elevation > 80 mAOD. See the Water Framework Directive (Standards and Classification) Directions (England and Wales) 2015 for further details.

Table 7: Tier 2 Criteria for Screening Groundwater Vapour Generation Hazard

Chemical	CAS	GAC_{gwvap}(µg/l)[1,2]		Aqueous Solubility (µg/l)
		Residential	Commercial	
Petroleum Hydrocarbons				
1,2,4-Trimethylbenzene	95-63-6	24	2,200	559,000
Benzene [3]	71-43-2	210	20,000	1,780,000
Ethylbenzene [3]	100-41-4	10,000	*960,000 (sol)*	180,000
Isopropylbenzene	98-82-8	850	*86,000 (sol)*	56,000
Propylbenzene	103-65-1	2,700	*240,000 (sol)*	54,100
Styrene	100-42-5	8,800	*810,000 (sol)*	290,000
Toluene [3]	108-88-3	230,000	*21,000,000 (sol)*	590,000
TPH Aliphatic EC5-EC6 [3]		1,900	*190,000 (sol)*	35,900
TPH Aliphatic >EC6-EC8 [3]		1,500	*150,000 (sol)*	5,370
TPH Aliphatic >EC8-EC10 [3]		57	*5,700 (sol)*	427
TPH Aliphatic >EC10-EC12 [3]		37	*3,600 (sol)*	34
TPH Aromatic >EC5-EC7 [2,3]		210,000	*20,000,000 (sol)*	1,780,000
TPH Aromatic >EC7-EC8 [3]		220,000	*21,000,000 (sol)*	590,000
TPH Aromatic >EC8-EC10 [3]		1,900	*190,000 (sol)*	64,600
TPH Aromatic >EC10-EC12 [3]		6,800	*660,000 (sol)*	24,500
TPH Aromatic >EC12-EC16 [3]		39,000	*3,700,000 (sol)*	5,750
meta-Xylene [3,5]	108-38-3	9,500	*940,000 (sol)*	200,000
ortho-Xylene [3,5]	95-47-6	12,000	*1,100,000 (sol)*	173,000
para-Xylene [3,5]	106-42-3	9,900	*980,000 (sol)*	200,000
Polycyclic Aromatic Hydrocarbons (PAH)				
Acenaphthene	83-32-9	*170,000 (sol)*	*15,000,000 (sol)*	4,110
Acenaphthylene	208-96-8	*220,000 (sol)*	*20,000,000 (sol)*	7,950
Fluorene	86-73-7	*210,000 (sol)*	*18,000,000 (sol)*	1,860
Naphthalene	91-20-3	220	*23,000 (sol)*	19,000
Pesticides				
Aldrin	309-00-2	*47 (sol)*	*3,700 (sol)*	20
alpha-Endosulfan	959-98-8	*7,400 (sol)*	*590,000 (sol)*	530
beta-Endosulfan	33213-65-9	*7,500 (sol)*	*600,000 (sol)*	280
Halogenated Organics				
1,1,1,2-Tetrachloroethane	79-34-5	240	22,000	1,110,000
1,1,1-Trichloroethane	71-55-6	3,000	290,000	1,300,000
1,1,2,2-Tetrachloroethane	79-35-4	1,600	150,000	2,930,000
1,1,2-Trichloroethane	79-00-5	520	49,000	4,491,000
1,1-Dichloroethane	75-34-3	2,700	260,000	3,666,000
1,1-Dichloroethene	75-35-4	160	1,6000	3,100,000
1,2,3,4-Tetrachlorobenzene	634-66-2	240	*31,000 (sol)*	7,800
1,2,3,5-Tetrachlorobenzene	634-90-2	7.0	*600*	3,500
1,2,3-Trichlorobenzene	87-61-7	35	3,100	21,000
1,2,4,5-Tetrachlorobenzene	95-94-3	8.1	*700 (sol)*	600
1,2,4-Trichlorobenzene	120-82-1	68	7,200	41,400
1,2-Dichlorobenzene	95-50-1	2,000	*220,000 (sol)*	133,000
1,2-Dichloroethane	107-06-2	8.9	850	8,680,000
1,2-Dichloropropane	78-87-5	22	2,600	2,050,000
1,3,5-Trichlorobenzene	108-70-3	7.4	660	6,000
1,3-Dichlorobenzene	541-73-1	31	2,800	103,000
1,4-Dichlorobenzene	106-46-7	5,000	*460,000 (sol)*	51,200
Bromobenzene	108-86-1	220	20,000	388,040
Bromodichloromethane	75-27-4	17	1,600	3,000,000
Bromoform (Tribromomethane)	75-25-2	3,100	400,000	3,000,000
Chlorobenzene	108-90-7	98	15,000	387,000
Chloroethane	75-00-3	10,000	1,000,000	5,742,000
Chloroethene (Vinyl Chloride)	75-01-4	0.62	63	2,760,000
Chloromethane	74-87-3	14	1,400	5,350,000
cis-1,2-Dichloroethene	156-59-2	130	13,000	7,550,000
Dichloromethane	75-09-2	3,300	370,000	20,080,000
Hexachlorobenzene	118-74-1	*16 (sol)*	*1,400 (sol)*	10
Hexachlorobutadiene	87-68-3	1.7	230	4,800
Hexachloroethane	67-72-1	8.5	740	49,900

Chemical	CAS	GAC_{gwvap}(µg/l)[1,2]		Aqueous Solubility (µg/l)
		Residential	Commercial	
Pentachlorobenzene	608-93-5	140	*12,000 (sol)*	500
Tetrachloroethene	127-18-4	34	4,600	225,000
Tetrachloromethane (Carbon Tetrachloride)	56-23-5	5.3	770	846,000
trans-1,2-Dichloroethene	156-60-5	160	16,000	5,250,000
Trichloroethene	79-01-6	5.7	530	1,370,000
Trichloromethane (Chloroform)	67-66-3	790	85,000	8,950,000
Others (organic and inorganic)				
2-Chloronaphthalene	91-58-7	160	*14,000 (sol)*	11,700
Biphenyl (Lemonene)	92-52-4	*15,000 (sol)*	*1,300,000 (sol)*	4,060
Carbon Disulphide	75-15-0	56	5,600	2,100,000
Mercury, elemental	7439-97-6	1.1	*95 (sol)*	56
Methyl tertiary butyl ether (MTBE)	1634-04-4	83,000	7,800,000	48,000,000

Notes

1. GAC in *italics* with (sol) exceed aqueous solubility.
2. GAC rounded to two significant figures.
3. The GAC for these petroleum hydrocarbon contaminants have been calculated using a sub-surface soil to indoor air correction factor of 10 in line with the physical-chemical data sources.
4. The GAC for TPH fractions do not account for genotoxic mutagenic effects. Concentrations of TPH Aromatic >EC5-EC7 should therefore also be compared with the GAC for benzene to ensure that such effects are also assessed.
5. The Health Criteria Value used for each xylene isomer was for total xylene. If site specific additivity assessments are not completed, as a conservative measure the sum of isomer concentrations should be compared to the lowest xylene GAC (as is the case for soil GAC).

Appendix B Site Walkover Photographs

Photo 1 – Tank located behind residential bungalow.

Photo 2 – Access driveway onto Cook's Land.

Photo 3 – Suspected cement bound asbestos cladding on barn behind residential bungalow on Cook's Land.

Photo 4 – Small metal tank (possibly water) located behind residential bungalow on Cook's Land.

Stantec	Client: this Land™ A DEVELOPMENT BUSINESS	**Photographs from Site Visit on 29 April 2021.**	Date	29/04/21
			Scale	NTS
			Drawn	JEC
			Checked	OB
		Land East of Rayleigh Road, Thundersley 332210105/350/R01	Page 1	
3rd Floor, 50-60 Station Road, Cambridge, CB1 2JH				

Photo 5 – Horse stables and adjoining paddock in southern part of Cook's Land.

Photo 6 – Horse trailers and directions to the stables and fishing lake near site entrance.

Photo 7 – Driveway access to the stables.

Stantec	Client: this Land™ A DEVELOPMENT BUSINESS	**Photographs from Site Visit on 29 April 2021.**	Date	29/04/21
			Scale	NTS
			Drawn	JEC
			Checked	OB
			Page 2	
3rd Floor, 50-60 Station Road, Cambridge, CB1 2JH		**Land East of Rayleigh Road, Thundersley** 332210105/350/R01		

Photo 8 – Horse field in the southern area of site.

Photo 9 – Horse field in southern area of the site looking back towards the site entrance.

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Photo 10 – Horse field in the far south eastern corner.

Photo 11 – Larger horse field to the south of the fishing lake.

Stantec	Client: this Land™ A DEVELOPMENT BUSINESS	**Photographs from Site Visit on 29 April 2021.**	Date	29/04/21
			Scale	NTS
			Drawn	JEC
			Checked	OB
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3rd Floor, 50-60 Station Road, Cambridge, CB1 2JH		**Land East of Rayleigh Road, Thundersley** 332210105/350/R01		

Photo 12 – Track access to fishing lake.

Photo 13 – Pedestrian access to fishing lake.

Photo 14 – Piles of cut grass in car park area for the fishing lake.

Photo 15 – Grassed open space area to the north west of the fishing lake.

Stantec	Client: this Land™ A DEVELOPMENT BUSINESS	**Photographs from Site Visit on 29 April 2021.**	Date	29/04/21
			Scale	NTS
			Drawn	JEC
			Checked	OB
			Page 4	
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Photo 16 – Potential backfilled pond feature along central boundary of the site between Cook's and Barber's land.

Photo 17- Ruins of old shelter/shed like structures along track to fishing lake, close to identified Badger setts.

Stantec	Client: this Land™ A DEVELOPMENT BUSINESS	**Photographs from Site Visit on 29 April 2021.**	Date	29/04/21
			Scale	NTS
			Drawn	JEC
			Checked	OB
		Land East of Rayleigh Road, Thundersley 332210105/350/R01	Page 5	
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Photo 18 – Open land to the west of the fishing lake, looking westwards.

Photo 19 – Flexible surfacing/tarmac matting was noted at surface level on some of the farm tracks.

Stantec	Client: this Land™ A DEVELOPMENT BUSINESS	**Photographs from Site Visit on 29 April 2021.** **Land East of Rayleigh Road, Thundersley** 332210105/350/R01	Date	29/04/21
			Scale	NTS
			Drawn	JEC
			Checked	OB
			Page 6	
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Photo 20 – Open grassland looking north on Cook's land.

Photo 21 – Open grassland looking north east on Cook's land.

Photo 22 – Fertiliser storage area along central boundary between Cook's and Barbers land.

Photo 23 – Private gardens from neighbouring properties backing onto the south of Cook's land.

Stantec	Client: this Land™ A DEVELOPMENT BUSINESS	**Photographs from Site Visit on 29 April 2021.**	Date	29/04/21
			Scale	NTS
			Drawn	JEC
			Checked	OB
			Page 7	
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Photo 24 – Access drive into Barber's land.

Photo 25 – Breakers yard at the end of access driveway.

Photo 26 – Small scale industrial/commercial units for granite/quartz cutting.

Photo 27 – Back of the breakers yard leading out into open grassed area.

Stantec	Client: this Land™ A DEVELOPMENT BUSINESS	**Photographs from Site Visit on 29 April 2021.**	Date	29/04/21
			Scale	NTS
			Drawn	JEC
			Checked	OB
		Land East of Rayleigh Road, Thundersley 332210105/350/R01	Page 8	
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Photo 28 – Open grassland area to the west of the breakers yard.

Photo 29 – Looking northwards across the open grassland from the back of the breakers yard.

Stantec	Client: this Land™ A DEVELOPMENT BUSINESS	**Photographs from Site Visit on 29 April 2021.**	Date	29/04/21
			Scale	NTS
			Drawn	JEC
			Checked	OB
		Land East of Rayleigh Road, Thundersley 332210105/350/R01	Page 9	
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Photo 30 – Looking north westwards towards a small cluster of trees in the centre of the open grassland on Barber's land.

Photo 31 – Looking northwards across the open grassed area south of the industrial/commercial units on Barber's land.

Stantec	Client: this Land™ A DEVELOPMENT BUSINESS	**Photographs from Site Visit on 29 April 2021.**	Date	29/04/21
			Scale	NTS
			Drawn	JEC
			Checked	OB
		Land East of Rayleigh Road, Thundersley 332210105/350/R01	Page 10	
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Photo 32 – Track and fly tipped materials from neighbouring residential estate to the west of. the site.

Photo 33 – A small allotment garden with fruit and vegetable plants and a make-shift fire pit in the far northern area of Barber's land.

Photo 34 – Periphery track around the southern area of open grassland.

Photo 35 – Well trodden track leading into the far north western area of the site.

Stantec	Client: this Land™ A DEVELOPMENT BUSINESS	**Photographs from Site Visit on 29 April 2021.**	Date	29/04/21
			Scale	NTS
			Drawn	JEC
			Checked	OB
		Land East of Rayleigh Road, Thundersley 332210105/350/R01	Page 11	
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Appendix C Groundsure Insight Report

Groundsure LOCATION INTELLIGENCE

Enviro+Geo Insight

Hadleigh Site Castle Point , SS7 3NL

Order Details

Date: 13/04/2021

Your ref: PO_001794

Our Ref: GS-7743153

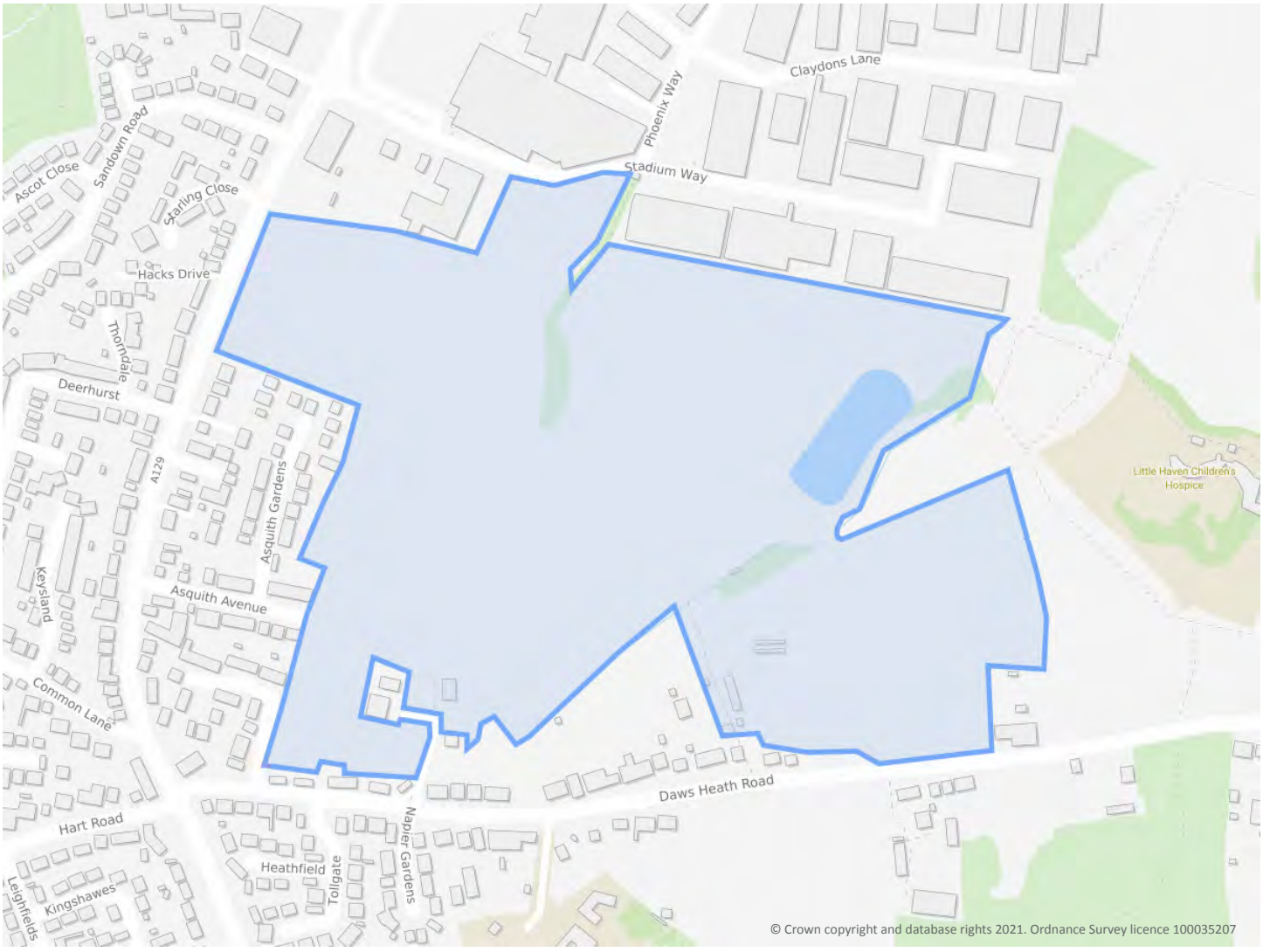
Client: Stantec UK Ltd

Site Details

Location: 580345 189125

Area: 27.75 ha

Authority: Castle Point Borough Council



Contact us with any questions at:
info@groundsure.com
08444 159 000

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	2	1	13	18	-
15	1.2	Historical tanks	0	0	1	6	-
15	1.3	Historical energy features	0	0	8	21	-
17	1.4	Historical petrol stations	0	0	0	0	-
17	1.5	Historical garages	0	0	8	10	-
18	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
19	2.1	Historical industrial land uses	3	1	16	23	-
21	2.2	Historical tanks	0	0	2	8	-
22	2.3	Historical energy features	0	0	18	44	-
24	2.4	Historical petrol stations	0	0	0	0	-
24	2.5	Historical garages	0	0	10	15	-
Page	Section	Waste and landfill	On site	0-50m	50-250m	250-500m	500-2000m
26	3.1	Active or recent landfill	0	0	0	0	-
26	3.2	Historical landfill (BGS records)	0	0	0	0	-
27	3.3	Historical landfill (LA/mapping records)	0	0	0	0	-
27	3.4	Historical landfill (EA/NRW records)	0	0	0	0	-
27	3.5	Historical waste sites	0	0	2	0	-
28	3.6	Licensed waste sites	0	0	0	5	-
29	3.7	Waste exemptions	2	8	1	15	-
Page	Section	Current industrial land use	On site	0-50m	50-250m	250-500m	500-2000m
32	4.1	Recent industrial land uses	0	6	50	-	-
36	4.2	Current or recent petrol stations	0	0	1	2	-
36	4.3	Electricity cables	0	0	0	0	-
36	4.4	Gas pipelines	0	0	0	0	-
37	4.5	Sites determined as Contaminated Land	0	0	0	0	-

37	4.6	Control of Major Accident Hazards (COMAH)	0	0	0	0	-
37	4.7	Regulated explosive sites	0	0	0	0	-
37	4.8	Hazardous substance storage/usage	0	0	0	0	-
37	4.9	Historical licensed industrial activities (IPC)	0	0	0	0	-
38	4.10	Licensed industrial activities (Part A(1))	0	0	0	0	-
38	**4.11**	**Licensed pollutant release (Part A(2)/B)**	0	1	4	4	-
39	4.12	Radioactive Substance Authorisations	0	0	0	0	-
39	**4.13**	**Licensed Discharges to controlled waters**	0	1	3	6	-
41	4.14	Pollutant release to surface waters (Red List)	0	0	0	0	-
41	4.15	Pollutant release to public sewer	0	0	0	0	-
41	4.16	List 1 Dangerous Substances	0	0	0	0	-
42	**4.17**	**List 2 Dangerous Substances**	0	1	0	2	-
42	**4.18**	**Pollution Incidents (EA/NRW)**	0	0	3	1	-
43	4.19	Pollution inventory substances	0	0	0	0	-
43	4.20	Pollution inventory waste transfers	0	0	0	0	-
43	4.21	Pollution inventory radioactive waste	0	0	0	0	-

Page	Section	Hydrogeology	On site	0-50m	50-250m	250-500m	500-2000m
44	**5.1**	**Superficial aquifer**	Identified (within 500m)				
46	**5.2**	**Bedrock aquifer**	Identified (within 500m)				
48	**5.3**	**Groundwater vulnerability**	Identified (within 50m)				
50	5.4	Groundwater vulnerability- soluble rock risk	None (within 0m)				
50	5.5	Groundwater vulnerability- local information	None (within 0m)				
52	5.6	Groundwater abstractions	0	0	0	0	0
53	**5.7**	**Surface water abstractions**	1	0	0	0	4
54	5.8	Potable abstractions	0	0	0	0	0
54	5.9	Source Protection Zones	0	0	0	0	-
54	5.10	Source Protection Zones (confined aquifer)	0	0	0	0	-

Page	Section	Hydrology	On site	0-50m	50-250m	250-500m	500-2000m
55	**6.1**	**Water Network (OS MasterMap)**	4	4	0	-	-

56	6.2	Surface water features	1	1	0	-	-
56	6.3	WFD Surface water body catchments	2	-	-	-	-
57	6.4	WFD Surface water bodies	0	0	0	-	-
57	6.5	WFD Groundwater bodies	1	-	-	-	-

Page	Section	River and coastal flooding	On site	0-50m	50-250m	250-500m	500-2000m
58	7.1	Risk of Flooding from Rivers and Sea (RoFRaS)	None (within 50m)				
58	7.2	Historical Flood Events	0	0	0	-	-
58	7.3	Flood Defences	0	0	0	-	-
58	7.4	Areas Benefiting from Flood Defences	0	0	0	-	-
59	7.5	Flood Storage Areas	0	0	0	-	-
60	7.6	Flood Zone 2	None (within 50m)				
60	7.7	Flood Zone 3	None (within 50m)				

Page	Section	Surface water flooding	
61	8.1	Surface water flooding	1 in 30 year, Greater than 1.0m (within 50m)

Page	Section	Groundwater flooding	
63	9.1	Groundwater flooding	Moderate (within 50m)

Page	Section	Environmental designations	On site	0-50m	50-250m	250-500m	500-2000m
64	10.1	Sites of Special Scientific Interest (SSSI)	0	0	1	0	4
65	10.2	Conserved wetland sites (Ramsar sites)	0	0	0	0	0
65	10.3	Special Areas of Conservation (SAC)	0	0	0	0	0
65	10.4	Special Protection Areas (SPA)	0	0	0	0	0
66	10.5	National Nature Reserves (NNR)	0	0	0	0	0
66	10.6	Local Nature Reserves (LNR)	0	0	0	0	2
66	10.7	Designated Ancient Woodland	0	0	1	0	6
67	10.8	Biosphere Reserves	0	0	0	0	0
67	10.9	Forest Parks	0	0	0	0	0
67	10.10	Marine Conservation Zones	0	0	0	0	0
67	10.11	Green Belt	1	0	1	1	0
68	10.12	Proposed Ramsar sites	0	0	0	0	0

68	10.13	Possible Special Areas of Conservation (pSAC)	0	0	0	0	0
68	10.14	Potential Special Protection Areas (pSPA)	0	0	0	0	0
68	10.15	Nitrate Sensitive Areas	0	0	0	0	0
69	**10.16**	**Nitrate Vulnerable Zones**	1	0	0	0	0
70	**10.17**	**SSSI Impact Risk Zones**	7	-	-	-	-
77	**10.18**	**SSSI Units**	0	0	1	0	6
Page	Section	Visual and cultural designations	On site	0-50m	50-250m	250-500m	500-2000m
80	11.1	World Heritage Sites	0	0	0	-	-
81	11.2	Area of Outstanding Natural Beauty	0	0	0	-	-
81	11.3	National Parks	0	0	0	-	-
81	**11.4**	**Listed Buildings**	0	0	1	-	-
82	**11.5**	**Conservation Areas**	1	0	0	-	-
82	11.6	Scheduled Ancient Monuments	0	0	0	-	-
82	11.7	Registered Parks and Gardens	0	0	0	-	-
Page	Section	Agricultural designations	On site	0-50m	50-250m	250-500m	500-2000m
83	**12.1**	**Agricultural Land Classification**	Urban (within 250m)				
84	**12.2**	**Open Access Land**	0	0	3	-	-
84	**12.3**	**Tree Felling Licences**	0	0	5	-	-
85	**12.4**	**Environmental Stewardship Schemes**	1	0	1	-	-
85	12.5	Countryside Stewardship Schemes	0	0	0	-	-
Page	Section	Habitat designations	On site	0-50m	50-250m	250-500m	500-2000m
86	**13.1**	**Priority Habitat Inventory**	5	1	15	-	-
87	**13.2**	**Habitat Networks**	1	0	1	-	-
88	13.3	Open Mosaic Habitat	0	0	0	-	-
88	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
89	**14.1**	**10k Availability**	Identified (within 500m)				
90	14.2	Artificial and made ground (10k)	0	0	0	0	-
91	14.3	Superficial geology (10k)	0	0	0	0	-

91	14.4	Landslip (10k)	0	0	0	0	-
92	14.5	Bedrock geology (10k)	0	0	0	0	-
92	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
93	**15.1**	**50k Availability**	Identified (within 500m)				
94	15.2	Artificial and made ground (50k)	0	0	0	0	-
94	15.3	Artificial ground permeability (50k)	0	0	-	-	-
95	**15.4**	**Superficial geology (50k)**	3	0	0	0	-
96	**15.5**	**Superficial permeability (50k)**	Identified (within 50m)				
96	15.6	Landslip (50k)	0	0	0	0	-
96	15.7	Landslip permeability (50k)	None (within 50m)				
97	**15.8**	**Bedrock geology (50k)**	2	0	0	1	-
98	**15.9**	**Bedrock permeability (50k)**	Identified (within 50m)				
98	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
99	**16.1**	**BGS Boreholes**	1	5	11	-	-
Page	Section	Natural ground subsidence					
101	**17.1**	**Shrink swell clays**	Moderate (within 50m)				
102	**17.2**	**Running sands**	Low (within 50m)				
104	**17.3**	**Compressible deposits**	Negligible (within 50m)				
105	**17.4**	**Collapsible deposits**	Very low (within 50m)				
106	**17.5**	**Landslides**	Very low (within 50m)				
107	**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
109	18.1	Natural cavities	0	0	0	0	-
110	**18.2**	**BritPits**	0	0	0	2	-
110	**18.3**	**Surface ground workings**	5	2	0	-	-
111	18.4	Underground workings	0	0	0	0	0
111	**18.5**	**Historical Mineral Planning Areas**	0	0	0	1	-

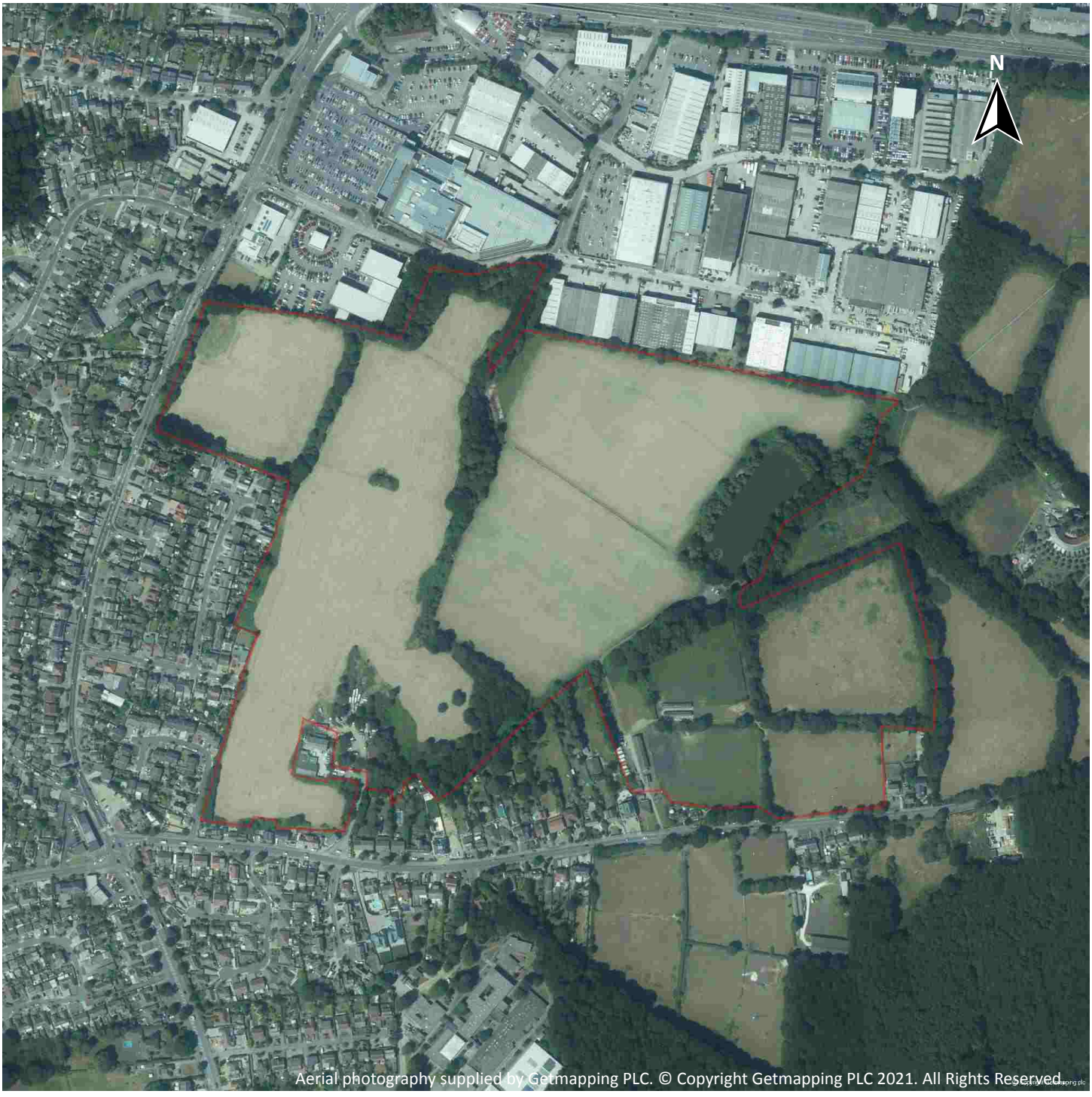
111	18.6	Non-coal mining	0	0	0	0	0
112	18.7	Mining cavities	0	0	0	0	0
112	18.8	JPB mining areas	None (within 0m)				
112	18.9	Coal mining	None (within 0m)				
112	18.10	Brine areas	None (within 0m)				
112	18.11	Gypsum areas	None (within 0m)				
113	18.12	Tin mining	None (within 0m)				
113	18.13	Clay mining	None (within 0m)				

Page	Section	Radon	
114	**19.1**	**Radon**	Less than 1% (within 0m)

Page	Section	Soil chemistry	On site	0-50m	50-250m	250-500m	500-2000m
115	**20.1**	**BGS Estimated Background Soil Chemistry**	22	1	-	-	-
116	**20.2**	**BGS Estimated Urban Soil Chemistry**	45	17	-	-	-
119	**20.3**	**BGS Measured Urban Soil Chemistry**	1	1	-	-	-

Page	Section	Railway infrastructure and projects	On site	0-50m	50-250m	250-500m	500-2000m
120	21.1	Underground railways (London)	0	0	0	-	-
120	21.2	Underground railways (Non-London)	0	0	0	-	-
121	21.3	Railway tunnels	0	0	0	-	-
121	**21.4**	**Historical railway and tunnel features**	0	0	3	-	-
121	21.5	Royal Mail tunnels	0	0	0	-	-
121	21.6	Historical railways	0	0	0	-	-
122	21.7	Railways	0	0	0	-	-
122	21.8	Crossrail 1	0	0	0	0	-
122	21.9	Crossrail 2	0	0	0	0	-
122	21.10	HS2	0	0	0	0	-

Recent aerial photograph



Capture Date: 02/08/2018

Site Area: 27.75ha

Recent site history - 2014 aerial photograph

Capture Date: 24/08/2014

Site Area: 27.75ha

Recent site history - 2012 aerial photograph

Capture Date: 25/05/2012

Site Area: 27.75ha

Recent site history - 2008 aerial photograph

Capture Date: 20/09/2008

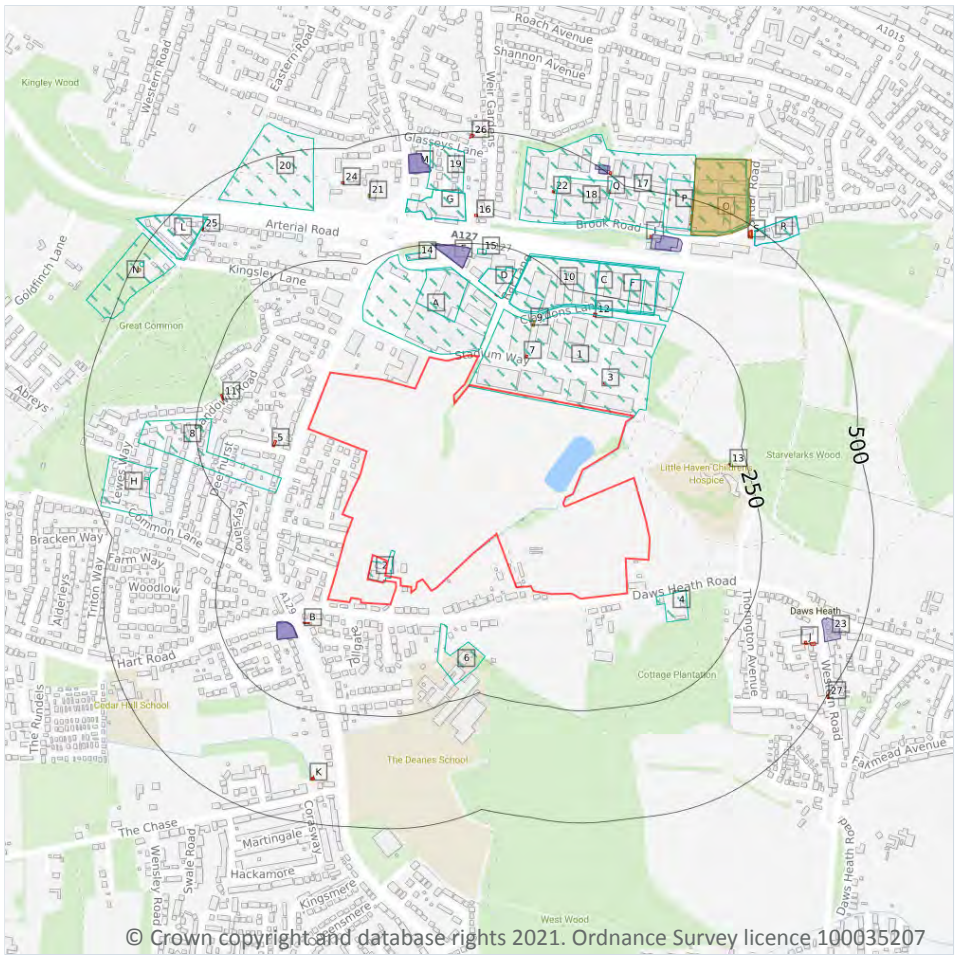
Site Area: 27.75ha

Recent site history - 1999 aerial photograph

Capture Date: 26/06/1999

Site Area: 27.75ha

1 Past land use



Site Outline

Search buffers in metres (m)

Historical industrial land uses

Historical tanks

Historical energy features

Historical garages

1.1 Historical industrial land uses

Records within 500m	34

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
1	**On site**	**Unspecified Works**	**1988**	**2160036**

ID	Location	Land use	Dates present	Group ID
2	**On site**	**Unspecified Depot**	**1973 - 1988**	**2251607**
A	9m N	Unspecified Commercial/Industrial	1988	2131068
4	65m E	Timber Yard	1988	2130566
6	76m S	Nursery	1960 - 1965	2265049
A	79m N	Unspecified Depot	1973	2147314
8	125m SW	Nursery	1960	2161607
C	136m NE	Unspecified Works	1988	2230444
C	136m NE	Unspecified Works	1973	2187145
D	138m N	Unspecified Commercial/Industrial	1973	2131067
D	138m N	Unspecified Works	1965	2160033
10	164m NE	Unspecified Works	1960 - 1965	2206301
F	219m N	Unspecified Factory	1960 - 1965	2214741
14	220m N	Unspecified Station	1988	2167972
F	222m N	Unspecified Works	1965	2285879
15	227m N	Hospital	1973	2164308
G	300m N	Unspecified Commercial/Industrial	1965	2131069
G	300m N	Unspecified Works	1960	2160032
17	318m N	Industrial Centre	1988	2163958
18	343m NE	Unspecified Warehouse	1973	2138611
H	347m W	Brick and Tile Works	1867	2163170
19	362m N	Garage	1960	2168540
20	363m N	Nurseries	1968	2168302
H	372m W	Unspecified Kiln	1867	2157528
L	411m NW	Unspecified Works	1960 - 1968	2200650
L	414m NW	Unspecified Factory	1973 - 1979	2252325
N	421m NW	Nursery	1960 - 1968	2259975
P	427m N	Unspecified Works	1973	2160031
O	432m N	Unspecified Factory	1960	2151027

ID	Location	Land use	Dates present	Group ID
O	432m N	Unspecified Factories	1965	2289989
O	432m N	Unspecified Factories	1973	2293996
R	467m NE	Unspecified Works	1965	2177364
R	467m NE	Unspecified Works	1973 - 1988	2186524
N	480m NW	Unspecified Tank	1973 - 1979	2292522

This data is sourced from Ordnance Survey / Groundsure.

1.2 Historical tanks

Records within 500m **7**

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'.

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

ID	Location	Land use	Dates present	Group ID
9	138m NE	Unspecified Tank	1981 - 1993	393342
21	380m N	Unspecified Tank	1938	368304
O	423m N	Tanks	1992	389457
P	451m N	Tanks	1992	404943
P	475m N	Tanks	1992	395286
N	480m NW	Unspecified Tank	1938	368306
P	487m N	Tanks	1978	377424

This data is sourced from Ordnance Survey / Groundsure.

1.3 Historical energy features

Records within 500m **29**

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'.

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

ID	Location	Land use	Dates present	Group ID
3	57m N	Electricity Substation	1980 - 1992	271337
B	66m SW	Electricity Substation	1993	246593
5	76m W	Electricity Substation	1993	246464
7	84m N	Electricity Substation	1981 - 1993	283391
D	139m N	Electricity Substation	1985 - 1993	264570
11	200m W	Electricity Substation	1993	246463
12	201m N	Electricity Substation	1970 - 1998	274603
13	211m E	Electricity Substation	1998	246462
16	310m N	Electricity Substation	1985 - 1993	258827
J	392m SE	Electricity Substation	1972 - 1993	287582
K	397m S	Electricity Substation	1996	255191
K	397m S	Electricity Substation	1993	256517
K	398m S	Electricity Substation	1980	256632
K	398m S	Electricity Substation	1980	256633
K	398m S	Electricity Substation	1980	256634
I	398m N	Electricity Substation	1978 - 1992	272948
K	399m S	Electricity Substation	1991	252762
K	399m S	Electricity Substation	1983	253188
22	400m NE	Electricity Substation	1978 - 1992	276833
J	405m SE	Electricity Substation	1971	246594
24	421m N	Electricity Substation	1985 - 1993	277093
25	425m NW	Electricity Substation	1995	246475
P	444m N	Electricity Substation	1978 - 1992	269457
Q	466m NE	Electricity Substation	1978 - 1992	282608
S	473m NE	Electricity Substation	1954	262158
S	475m NE	Electricity Substation	1978 - 1992	275599

ID	Location	Land use	Dates present	Group ID
26	484m N	Electricity Substation	1985 - 1993	269450
27	499m SE	Electricity Substation	1971 - 1993	287446
Q	499m NE	Electricity Substation	1978 - 1992	258589

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	**18**

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
B	99m SW	Garage	1993	76904
B	99m SW	Garage	1970	78777
B	99m SW	Garage	1971	79012
B	99m SW	Garage	1985 - 1986	84630
B	100m SW	Garage	1960	76700
E	195m N	Garage	1971	74299
E	195m N	Garage	1954	79431
E	196m N	Garage	1961 - 1970	80309

ID	Location	Land use	Dates present	Group ID
I	374m N	Garage	1970 - 1971	84513
I	375m N	Garage	1961	79333
23	409m E	Garage	1971 - 1972	84777
M	412m N	Garage	1954	77077
M	412m N	Garage	1971	79391
M	413m N	Garage	1961 - 1970	83206
M	413m N	Garage	1985	76640
Q	488m NE	Garage	1971	77594
Q	489m NE	Garage	1970	77580
Q	492m NE	Garage	1978 - 1992	84203

This data is sourced from Ordnance Survey / Groundsure.

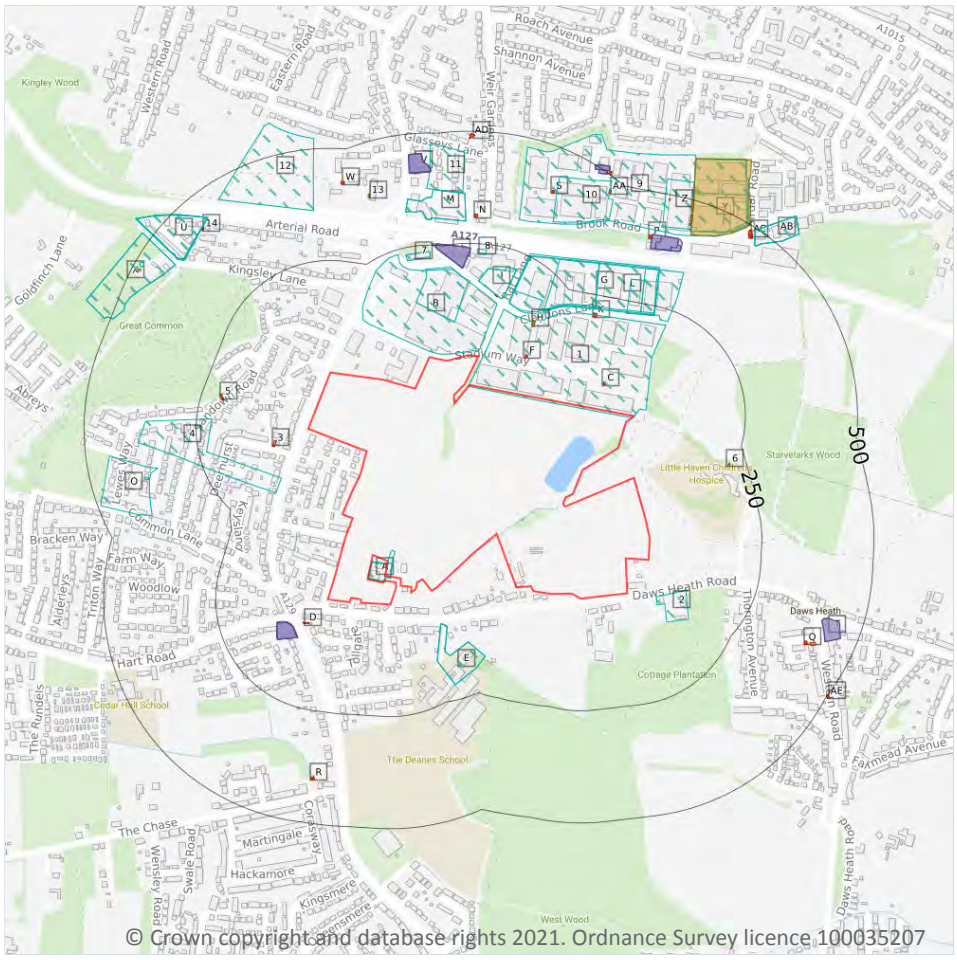
1.6 Historical military land

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 tanks

Historical energy features

Historical garages

2.1 Historical industrial land uses

Records within 500m	43

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 19**

ID	Location	Land Use	Date	Group ID
1	**On site**	**Unspecified Works**	**1988**	**2160036**
A	**On site**	**Unspecified Depot**	**1988**	**2251607**
A	**On site**	**Unspecified Depot**	**1973**	**2251607**

ID	Location	Land Use	Date	Group ID
B	9m N	Unspecified Commercial/Industrial	1988	2131068
2	65m E	Timber Yard	1988	2130566
E	76m S	Nursery	1960	2265049
E	76m S	Nursery	1965	2265049
B	79m N	Unspecified Depot	1973	2147314
4	125m SW	Nursery	1960	2161607
G	136m NE	Unspecified Works	1988	2230444
G	136m NE	Unspecified Works	1973	2187145
I	138m N	Unspecified Commercial/Industrial	1973	2131067
I	138m N	Unspecified Works	1965	2160033
G	164m NE	Unspecified Works	1960	2206301
G	175m NE	Unspecified Works	1965	2206301
L	219m N	Unspecified Factory	1960	2214741
7	220m N	Unspecified Station	1988	2167972
L	222m N	Unspecified Works	1965	2285879
L	226m N	Unspecified Factory	1965	2214741
8	227m N	Hospital	1973	2164308
M	300m N	Unspecified Works	1960	2160032
M	300m N	Unspecified Commercial/Industrial	1965	2131069
9	318m N	Industrial Centre	1988	2163958
10	343m NE	Unspecified Warehouse	1973	2138611
O	347m W	Brick and Tile Works	1867	2163170
11	362m N	Garage	1960	2168540
12	363m N	Nurseries	1968	2168302
O	372m W	Unspecified Kiln	1867	2157528
U	411m NW	Unspecified Works	1968	2200650
U	411m NW	Unspecified Works	1960	2200650
U	414m NW	Unspecified Factory	1979	2252325

ID	Location	Land Use	Date	Group ID
U	414m NW	Unspecified Factory	1973	2252325
X	421m NW	Nursery	1968	2259975
X	421m NW	Nursery	1960	2259975
Z	427m N	Unspecified Works	1973	2160031
Y	432m N	Unspecified Factory	1960	2151027
Y	432m N	Unspecified Factories	1973	2293996
Y	432m N	Unspecified Factories	1965	2289989
AB	467m NE	Unspecified Works	1988	2186524
AB	467m NE	Unspecified Works	1973	2186524
AB	467m NE	Unspecified Works	1965	2177364
X	480m NW	Unspecified Tank	1979	2292522
X	480m NW	Unspecified Tank	1973	2292522

This data is sourced from Ordnance Survey / Groundsure.

2.2 Historical tanks

Records within 500m	**10**

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'.

Features are displayed on the Past land use - un-grouped map on **page 19**

ID	Location	Land Use	Date	Group ID
H	138m NE	Unspecified Tank	1993	393342
H	138m NE	Unspecified Tank	1981	393342
13	380m N	Unspecified Tank	1938	368304
Y	423m N	Tanks	1992	389457
Z	451m N	Tanks	1992	404943
Z	451m N	Tanks	1992	404943
Z	475m N	Tanks	1992	395286
Z	475m N	Tanks	1992	395286

ID	Location	Land Use	Date	Group ID
X	480m NW	Unspecified Tank	1938	368306
Z	487m N	Tanks	1978	377424

This data is sourced from Ordnance Survey / Groundsure.

2.3 Historical energy features

Records within 500m	**62**

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'.

Features are displayed on the Past land use - un-grouped map on **page 19**

ID	Location	Land Use	Date	Group ID
C	57m N	Electricity Substation	1980	271337
C	57m N	Electricity Substation	1980	271337
C	57m N	Electricity Substation	1992	271337
D	66m SW	Electricity Substation	1993	246593
3	76m W	Electricity Substation	1993	246464
F	84m N	Electricity Substation	1981	283391
F	84m N	Electricity Substation	1993	283391
I	139m N	Electricity Substation	1985	264570
I	139m N	Electricity Substation	1991	264570
I	139m N	Electricity Substation	1993	264570
5	200m W	Electricity Substation	1993	246463
K	201m N	Electricity Substation	1980	274603
K	201m N	Electricity Substation	1980	274603
K	201m N	Electricity Substation	1992	274603
K	202m N	Electricity Substation	1971	274603
K	202m N	Electricity Substation	1970	274603
K	202m N	Electricity Substation	1998	274603
6	211m E	Electricity Substation	1998	246462

ID	Location	Land Use	Date	Group ID
N	310m N	Electricity Substation	1985	258827
N	310m N	Electricity Substation	1991	258827
N	310m N	Electricity Substation	1993	258827
Q	392m SE	Electricity Substation	1972	287582
Q	392m SE	Electricity Substation	1993	287582
Q	393m SE	Electricity Substation	1986	287582
R	397m S	Electricity Substation	1996	255191
R	397m S	Electricity Substation	1993	256517
R	398m S	Electricity Substation	1980	256633
R	398m S	Electricity Substation	1980	256634
R	398m S	Electricity Substation	1980	256632
P	398m N	Electricity Substation	1978	272948
P	398m N	Electricity Substation	1992	272948
P	398m N	Electricity Substation	1992	272948
R	399m S	Electricity Substation	1991	252762
R	399m S	Electricity Substation	1983	253188
S	400m NE	Electricity Substation	1978	276833
S	400m NE	Electricity Substation	1992	276833
S	400m NE	Electricity Substation	1992	276833
Q	405m SE	Electricity Substation	1971	246594
W	421m N	Electricity Substation	1985	277093
W	421m N	Electricity Substation	1991	277093
W	421m N	Electricity Substation	1993	277093
14	425m NW	Electricity Substation	1995	246475
Z	444m N	Electricity Substation	1978	269457
Z	444m N	Electricity Substation	1992	269457
Z	444m N	Electricity Substation	1992	269457
AA	466m NE	Electricity Substation	1978	282608

ID	Location	Land Use	Date	Group ID
AA	466m NE	Electricity Substation	1992	282608
AA	466m NE	Electricity Substation	1992	282608
AC	473m NE	Electricity Substation	1954	262158
AC	475m NE	Electricity Substation	1978	275599
AC	475m NE	Electricity Substation	1992	275599
AC	475m NE	Electricity Substation	1992	275599
AD	484m N	Electricity Substation	1985	269450
AD	484m N	Electricity Substation	1991	269450
AD	484m N	Electricity Substation	1993	269450
AE	499m SE	Electricity Substation	1972	287446
AE	499m SE	Electricity Substation	1993	287446
AE	499m SE	Electricity Substation	1986	287446
AA	499m NE	Electricity Substation	1978	258589
AA	499m NE	Electricity Substation	1992	258589
AA	499m NE	Electricity Substation	1992	258589
AE	499m SE	Electricity Substation	1971	287446

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	25

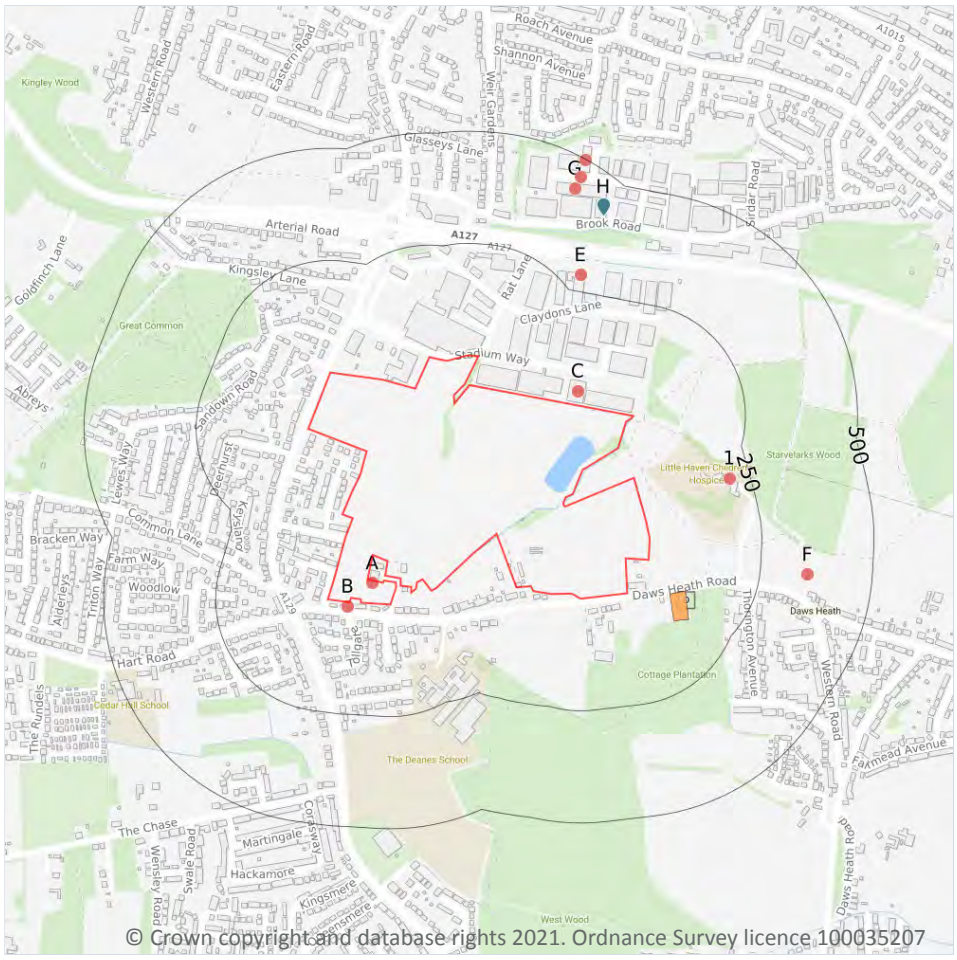
Garages digitised from historical Ordnance Survey mapping at high-detail 1:1,250 and 1:2,500 scale. Any records shown are available intelligently grouped in section 1. Grouped and the original un-grouped features can be cross-referenced across sections 1 and 2 using the 'Group ID'.

Features are displayed on the Past land use - un-grouped map on **page 19**

ID	Location	Land Use	Date	Group ID
D	99m SW	Garage	1993	76904
D	99m SW	Garage	1971	79012
D	99m SW	Garage	1970	78777
D	99m SW	Garage	1985	84630
D	99m SW	Garage	1986	84630
D	100m SW	Garage	1960	76700
J	195m N	Garage	1971	74299
J	195m N	Garage	1954	79431
J	196m N	Garage	1970	80309
J	196m N	Garage	1961	80309
P	374m N	Garage	1971	84513
P	375m N	Garage	1970	84513
P	375m N	Garage	1961	79333
T	409m E	Garage	1972	84777
T	410m E	Garage	1971	84777
V	412m N	Garage	1954	77077
V	412m N	Garage	1971	79391
V	413m N	Garage	1970	83206
V	413m N	Garage	1961	83206
V	413m N	Garage	1985	76640
AA	488m NE	Garage	1971	77594
AA	489m NE	Garage	1970	77580
AA	492m NE	Garage	1978	84203
AA	492m NE	Garage	1992	84203
AA	492m NE	Garage	1992	84203

This data is sourced from Ordnance Survey / Groundsure.

3 Waste and landfill



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	2

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

Features are displayed on the Waste and landfill map on **page 26**

ID	Location	Address	Further Details	Date
D	89m SE	Site Address: N/A	Type of Site: Scrap Metal Yard Planning application reference: N/A Description: N/A Data source: Historic Mapping Data Type: Polygon	1971
D	90m SE	Site Address: N/A	Type of Site: Scrap Metal Yard Planning application reference: N/A Description: N/A Data source: Historic Mapping Data Type: Polygon	1970

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

3.6 Licensed waste sites

Records within 500m	**5**

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

Features are displayed on the Waste and landfill map on **page 26**

ID	Location	Details		
H	432m NE	Site Name: Albany Rental Supply Ltd Site Address: 15, Brook Road, Brook Road Ind Estate, Rayleigh, Essex, SS6 7UT Correspondence Address: Eastwood Boulevard, Westcliff On Sea, Essex, SS0 9XN	Type of Site: Special Waste Transfer Station Size: 25000 tonnes Environmental Permitting Regulations (Waste) Licence Number: ALB001 EPR reference: - Operator: Albany Rental Supply Ltd Waste Management licence No: 71324 Annual Tonnage: 0	Issue Date: 22/10/2003 Effective Date: - Modified:: - Surrendered Date: - Expiry Date: - Cancelled Date: - Status: Issued
H	432m NE	Site Name: Albany Facilities Ltd. Site Address: 15, Brook Road, Brook Road Ind Estate, Rayleigh, Essex, SS6 7UT Correspondence Address: -	Type of Site: Clinical Waste Transfer Station Size: 25000 tonnes Environmental Permitting Regulations (Waste) Licence Number: ALB013 EPR reference: EA/EPR/LP3194NP/T002 Operator: Albany Facilities Ltd Waste Management licence No: 71324 Annual Tonnage: 4999	Issue Date: 22/10/2003 Effective Date: 21/01/2008 Modified:: - Surrendered Date: - Expiry Date: - Cancelled Date: - Status: Transferred
H	432m NE	Site Name: Albany Facilities Ltd. Site Address: 15, Brook Road, Brook Road Ind Estate, Rayleigh, Essex, SS6 7UT Correspondence Address: -	Type of Site: Clinical Waste Transfer Station Size: 25000 tonnes Environmental Permitting Regulations (Waste) Licence Number: ALB013 EPR reference: EA/EPR/LP3194NP/T002 Operator: Personnel Hygiene Services Limited Waste Management licence No: 71324 Annual Tonnage: 4999	Issue Date: 22/10/2003 Effective Date: 21/01/2008 Modified:: - Surrendered Date: - Expiry Date: - Cancelled Date: - Status: Transferred

ID	Location	Details		
H	432m NE	Site Name: Albany Facilities Ltd. Site Address: 15, Brook Road, Brook Road Ind Estate, Rayleigh, Essex, SS6 7UT Correspondence Address: -	Type of Site: Clinical Waste Transfer Station Size: 25000 tonnes Environmental Permitting Regulations (Waste) Licence Number: ALB013 EPR reference: EA/EPR/LP3194NP/S003 Operator: Personal Hygiene Services Limited Waste Management licence No: 71324 Annual Tonnage: 0	Issue Date: 22/10/2003 Effective Date: 21/01/2008 Modified:: - Surrendered Date: 03/11/2011 Expiry Date: - Cancelled Date: - Status: Surrendered
H	432m NE	Site Name: Albany Facilities Ltd. Site Address: 15, Brook Road, Brook Road Ind Estate, Rayleigh, Essex, SS6 7UT Correspondence Address: -	Type of Site: Clinical Waste Transfer Station Size: 25000 tonnes Environmental Permitting Regulations (Waste) Licence Number: ALB013 EPR reference: EA/EPR/LP3194NP/S003 Operator: Personnel Hygiene Services Ltd Waste Management licence No: 71324 Annual Tonnage: 0	Issue Date: 22/10/2003 Effective Date: 21/01/2008 Modified:: - Surrendered Date: Nov 3 2011 12:00AM Expiry Date: - Cancelled Date: - Status: Surrendered

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

3.7 Waste exemptions

Records within 500m **26**

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 26**

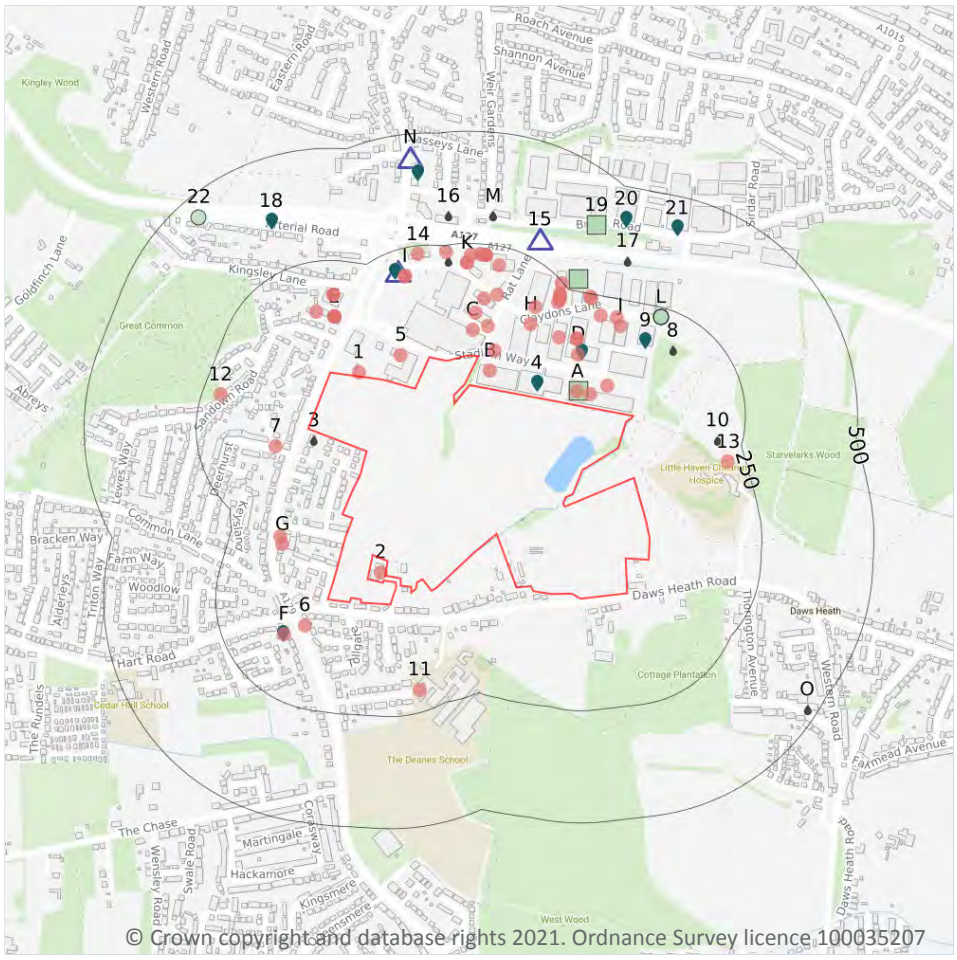
ID	Location	Site	Reference	Category	Sub-Category	Description
A	**On site**	**Claydons Farm Daws Heath Road BENFLEET Essex SS7 3UT**	**EPR/ZE5285EC /A001**	**Disposing of waste exemption**	**Agricultural Waste Only**	**Deposit of waste from dredging of inland waters**
A	**On site**	**Claydons Farm Daws Heath Road BENFLEET Essex SS7 3UT**	**EPR/ZE5285EC /A001**	**Disposing of waste exemption**	**Agricultural Waste Only**	**Burning waste in the open**

ID	Location	Site	Reference	Category	Sub-Category	Description
B	11m S	Claydons Farm, Dawes Heath Road, Thundersley, Benfleet, SS7 3UT	WEX215070	Disposing of waste exemption	On a Farm	Burning waste in the open
B	11m S	Claydons Farm, Dawes Heath Road, Thundersley, Benfleet, SS7 3UT	WEX215070	Disposing of waste exemption	On a Farm	Deposit of waste from dredging of inland waters
B	12m S	Claydons Farm, Dawes Heath Road, Thundersley, Benfleet, SS7 3UT	WEX069325	Disposing of waste exemption	On a farm	Deposit of waste from dredging of inland waters
B	12m S	Claydons Farm, Dawes Heath Road, Thundersley, Benfleet, SS7 3UT	WEX069325	Disposing of waste exemption	On a farm	Burning waste in the open
C	30m N	56, STADIUM WAY, STADIUM TRADING ESTATE, BENFLEET, SS7 3NZ	WEX186897	Storing waste exemption	Not on a farm	Storage of waste in secure containers
C	30m N	56, STADIUM WAY, STADIUM TRADING ESTATE, BENFLEET, SS7 3NZ	WEX186897	Storing waste exemption	Not on a farm	Storage of waste in a secure place
C	30m N	56, STADIUM WAY, STADIUM TRADING ESTATE, BENFLEET, SS7 3NZ	WEX243852	Storing waste exemption	Not on a farm	Storage of waste in secure containers
C	30m N	56, STADIUM WAY, STADIUM TRADING ESTATE, BENFLEET, SS7 3NZ	WEX243852	Storing waste exemption	Not on a farm	Storage of waste in a secure place
1	204m E	DAWS HEATH ROAD, HADLEIGH, BENFLEET, SS7 2LH	WEX141980	Treating waste exemption	Not on a farm	Sorting and de-naturing of controlled drugs for disposal
E	286m N	THAMES HOUSE, ARTERIAL ROAD, RAYLEIGH, SS6 7UQ	WEX130960	Storing waste exemption	Not on a farm	Storage of waste in secure containers
E	286m N	THAMES HOUSE, ARTERIAL ROAD, RAYLEIGH, SS6 7UQ	WEX130960	Storing waste exemption	Not on a farm	Storage of waste in a secure place
E	286m N	THAMES HOUSE, ARTERIAL ROAD, RAYLEIGH, SS6 7UQ	WEX130960	Treating waste exemption	Not on a farm	Sorting mixed waste
E	286m N	THAMES HOUSE, ARTERIAL ROAD, RAYLEIGH, SS6 7UQ	WEX130960	Treating waste exemption	Not on a farm	Recovery of scrap metal
E	286m N	THAMES HOUSE, ARTERIAL ROAD, RAYLEIGH, SS6 7UQ	WEX131034	Treating waste exemption	Not on a farm	Preparatory treatments (baling, sorting, shredding etc)

ID	Location	Site	Reference	Category	Sub-Category	Description
F	355m E	Little Haven Essex SS7 2TP	EPR/KE5982AB/A001	Disposing of waste exemption	Agricultural Waste Only	Deposit of waste from dredging of inland waters
F	355m E	Little Haven Essex SS7 2TP	EPR/KE5982AB/A001	Disposing of waste exemption	Agricultural Waste Only	Burning waste in the open
F	355m E	Little Haven Essex SS7 2TP	EPR/KE5982AB/A001	Treating waste exemption	Agricultural Waste Only	Aerobic composting and associated prior treatment
F	355m E	Little Haven Essex SS7 2TP	EPR/KE5982AB/A001	Treating waste exemption	Agricultural Waste Only	Treatment of waste wood and waste plant matter by chipping, shredding, cutting or pulverising
F	355m E	Little Haven Essex SS7 2TP	EPR/KE5982AB/A001	Using waste exemption	Agricultural Waste Only	Spreading of plant matter to confer benefit
F	355m E	Little Haven Essex SS7 2TP	EPR/KE5982AB/A001	Using waste exemption	Both agricultural and non-agricultural waste	Use of waste in construction
G	431m NE	15, TOTMAN CRESCENT, RAYLEIGH, SS6 7UY	WEX245450	Treating waste exemption	Not on a farm	Sorting mixed waste
G	431m NE	15, TOTMAN CRESCENT, RAYLEIGH, SS6 7UY	WEX103127	Treating waste exemption	Not on a farm	Sorting mixed waste
G	457m NE	15 Totman Crescent RAYLEIGH Essex SS6 7UY	EPR/PF0637JF/A001	Treating waste exemption	Non-Agricultural Waste Only	Sorting mixed waste
G	498m NE	4 Totman Close RAYLEIGH Essex SS6 7UZ	EPR/MH0772BP/A001	Treating waste exemption	Non-Agricultural Waste Only	Recovery of scrap metal

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

4 Current industrial land use



4.1 Recent industrial land uses

Records within 250m	56

Current potentially contaminative industrial sites.

Features are displayed on the Current industrial land use map on **page 32**

ID	Location	Company	Address	Activity	Category
1	9m N	Electricity Sub Station	Essex, SS7	Electrical Features	Infrastructure and Facilities
2	12m W	Depot	Essex, SS7	Container and Storage	Transport, Storage and Delivery
A	30m N	Hughes Trade	56 Stadium Way, Stadium Trading Estate, Benfleet, Essex, SS7 3NZ	Electronic Equipment	Industrial Products

ID	Location	Company	Address	Activity	Category
A	31m N	Depot	Essex, SS7	Container and Storage	Transport, Storage and Delivery
B	37m SE	Davmet Trading Co Ltd	40 Stadium Way, Stadium Trading Estate, Benfleet, Essex, SS7 3NZ	Fish, Meat and Poultry Products	Foodstuffs
B	39m E	Electricity Sub Station	Essex, SS7	Electrical Features	Infrastructure and Facilities
A	56m N	Electricity Sub Station	Essex, SS7	Electrical Features	Infrastructure and Facilities
C	58m N	Electricity Sub Station	Essex, SS7	Electrical Features	Infrastructure and Facilities
5	60m NW	Essex Auto Group	8, Stadium Way, Benfleet, Essex, SS7 3NL	New Vehicles	Motoring
C	70m N	Mast (Communication)	Essex, SS6	Telecommunications Features	Infrastructure and Facilities
6	77m SW	Electricity Sub Station	Essex, SS7	Electrical Features	Infrastructure and Facilities
7	83m SW	Electricity Sub Station	Essex, SS7	Electrical Features	Infrastructure and Facilities
C	96m N	Essex Plastics Ltd	Unit A2, Claydons Lane, Rayleigh, Essex, SS6 7UP	Construction Completion Services	Construction Services
D	113m N	Lexus Southend	59, Stadium Way, Benfleet, Essex, SS7 3TS	New Vehicles	Motoring
E	125m N	Fearnwood Products	533, Rayleigh Road, Benfleet, Essex, SS7 3TN	Garden Goods	Consumer Products
E	125m N	Park Office Consultany	533, Rayleigh Road, Benfleet, Essex, SS7 3TN	Office and Shop Equipment	Industrial Products
E	125m N	Ashton Surgical & Ophthalmic	533, Rayleigh Road, Benfleet, Essex, SS7 3TN	Medical Equipment, Supplies and Pharmaceuticals	Industrial Products
E	125m N	Patient Choice	533, Rayleigh Road, Benfleet, Essex, SS7 3TN	Ambulance and Medical Transportation Services	Health Support Services
F	125m SW	Essex Car Sales	343, Rayleigh Road, Benfleet, Essex, SS7 3XA	Secondhand Vehicles	Motoring
C	129m N	City Beds	B3, Claydon's Trade Park, Claydons Lane, Town Centre, Rayleigh, Essex, SS6 7UP	Beds and Bedding	Consumer Products

ID	Location	Company	Address	Activity	Category
G	132m W	Badlands 777	394, Rayleigh Road, Benfleet, Essex, SS7 3TA	Published Goods	Industrial Products
H	137m NE	Tank	Essex, SS7	Tanks (Generic)	Industrial Features
E	140m N	Electricity Sub Station	Essex, SS7	Electrical Features	Infrastructure and Facilities
G	140m W	H M S Plant Hire	400, Rayleigh Road, Benfleet, Essex, SS7 3TA	Construction and Tool Hire	Hire Services
D	141m N	Warehouse	Essex, SS7	Container and Storage	Transport, Storage and Delivery
C	144m N	Electricity Sub Station	Essex, SS6	Electrical Features	Infrastructure and Facilities
D	145m N	Warehouse	Essex, SS7	Container and Storage	Transport, Storage and Delivery
D	146m N	Houlton Meats Ltd	65 Stadium Way, Stadium Trading Estate, Benfleet, Essex, SS7 3NZ	Fish, Meat and Poultry Products	Foodstuffs
H	168m NE	Nationwide Crash Repair Centres Ltd	Block J 77-81, Stadium Way, Benfleet, Essex, SS7 3BN	Vehicle Repair, Testing and Servicing	Repair and Servicing
E	173m N	Halfords	543-557, Rayleigh Road, Benfleet, Essex, SS7 3TN	Vehicle Parts and Accessories	Motoring
E	173m N	Halfords Autocentre	543-557, Rayleigh Road, Benfleet, Essex, SS7 3TN	Vehicle Repair, Testing and Servicing	Repair and Servicing
I	189m N	Sainsbury's Petrol Station	21, Stadium Way, Benfleet, Essex, SS7 3UB	Petrol and Fuel Stations	Road and Rail
I	189m N	Sainsburys Rayleigh Weir	Rayleigh Road, Claydene Lane, Benfleet, Rayleigh, Essex, SS9 5UU	Vehicle Cleaning Services	Personal, Consumer and Other Services
J	193m N	A P H 3 G Ltd	83, Stadium Way, Benfleet, Essex, SS7 3BN	Industrial Engineers	Engineering Services
11	201m S	Electricity Sub Station	Essex, SS7	Electrical Features	Infrastructure and Facilities
J	206m N	Electricity Sub Station	Essex, SS7	Electrical Features	Infrastructure and Facilities
K	206m N	Rayleigh Motors	2, Claydons Lane, Rayleigh, Essex, SS6 7UP	Vehicle Repair, Testing and Servicing	Repair and Servicing

ID	Location	Company	Address	Activity	Category
K	206m N	Essex Bodies Ltd	Arterial House, Claydons Lane, Rayleigh, Essex, SS6 7UP	Vehicle Bodybuilders	Industrial Products
K	207m N	System Five Controls	Vantage House 6-7, Claydons Lane, Rayleigh, Essex, SS6 7UP	Construction Completion Services	Construction Services
J	210m N	Mast	Essex, SS7	Telecommunications Features	Infrastructure and Facilities
12	210m W	Electricity Sub Station	Essex, SS7	Electrical Features	Infrastructure and Facilities
13	212m E	Electricity Sub Station	Essex, SS7	Electrical Features	Infrastructure and Facilities
J	214m NE	Photomechanical Services Essex Ltd	Unit C Co-ordinated Industrial Estate, Claydons Lane, Rayleigh, Essex, SS6 7UP	Electrical Components	Industrial Products
J	221m NE	Warehouse	Essex, SS6	Container and Storage	Transport, Storage and Delivery
J	224m NE	Warehouse	Essex, SS6	Container and Storage	Transport, Storage and Delivery
K	224m N	My Car Boutique	Sunnycroft House, Arterial Road, Rayleigh, Essex, SS6 7UQ	Secondhand Vehicles	Motoring
K	227m N	Palletfreight Services Ltd	4 Cornhouse Buildings, Claydons Lane, Rayleigh, Essex, SS6 7UP	Distribution and Haulage	Transport, Storage and Delivery
K	227m N	A B S L Logistics Ltd	4 Cornhouse Buildings, Claydons Lane, Rayleigh, Essex, SS6 7UP	Distribution and Haulage	Transport, Storage and Delivery
K	227m N	Cruise Aero Ltd	3 Cornhouse Buildings, Claydons Lane, Rayleigh, Essex, SS6 7UP	Aeroplanes	Industrial Products
K	228m N	Bensons for Beds	Claydons Lane, Rayleigh, Essex, SS6 7UP	Beds and Bedding	Consumer Products
J	229m NE	Warehouse	Essex, SS6	Container and Storage	Transport, Storage and Delivery
14	231m N	Rayleigh Ambulance Station	Claydons Lane, Rayleigh, Essex, SS6 7UP	Ambulance and Medical Transportation Services	Health Support Services
K	235m N	Steven Eagell Toyota Rayleigh	Arterial Road, Rayleigh, Essex, SS6 7UQ	New Vehicles	Motoring

ID	Location	Company	Address	Activity	Category
J	239m N	Works	Essex, SS6	Unspecified Works Or Factories	Industrial Features
J	245m N	Oakenhurst	Claydons Lane, Rayleigh, Essex, SS6 7UP	Aviation Engineers	Engineering Services
J	247m NE	Warehouse	Essex, SS6	Container and Storage	Transport, Storage and Delivery

This data is sourced from Ordnance Survey.

4.2 Current or recent petrol stations

Records within 500m	**3**

Open, closed, under development and obsolete petrol stations.

Features are displayed on the Current industrial land use map on **page 32**

ID	Location	Company	Address	LPG	Status
I	204m N	SAINSBURYS	21, Stadium Way, Rayleigh Road, Benfleet, Rayleigh, Essex, SS7 3UB	No	Open
15	294m NE	SHELL	Arterial Road, Claydone Lane, Rayleigh, Essex, SS6 7UP	Not Applicable	Obsolete
N	448m N	SHELL	High Road, Rayleigh, Essex, SS6 7SL	Yes	Open

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	9

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.

Features are displayed on the Current industrial land use map on **page 32**

ID	Location	Address	Details	
4	32m N	Sainsburys, Stadium Way, Benfleet, Essex, SS7 3AB	Process: Petrol Vapour Recovery Process Status: Historical Permit Permit Type: Part B	Enforcement: No Enforcements Notified Date of enforcement: No Enforcements Notified Comment: No Enforcements Notified
D	118m N	Wh Perry, Stadium Way, Benfleet, Essex, SS7 3NU	Process: Respraying of Road Vehicles Status: Historical Permit Permit Type: Part B	Enforcement: No Enforcements Notified Date of enforcement: No Enforcements Notified Comment: No Enforcements Notified
F	125m SW	Essex Car Sales, 343 Rayleigh Road, Thundersley, Essex, SS7 3XA	Process: Waste Oil Burner Status: New Legislation Applies Permit Type: Part B	Enforcement: No Enforcements Notified Date of enforcement: No Enforcements Notified Comment: No Enforcements Notified
9	170m N	Nationwide Crash Repair Centres Ltd, Unit L, Stadium Way, Benfleet, Essex, SS7 3BN	Process: Respraying of Road Vehicles Status: Current Permit Permit Type: Part B	Enforcement: No Enforcements Notified Date of enforcement: No Enforcements Notified Comment: No Enforcements Notified
I	205m N	Sainsbury's Petrol Filling Station, Rayleigh Weir Stadium Way, Rayleigh Weir, Essex, SS7 3AB	Process: Unloading of Petrol into Storage at Service Stations Status: Current Permit Permit Type: Part B	Enforcement: No Enforcements Notified Date of enforcement: No Enforcements Notified Comment: No Enforcements Notified

ID	Location	Address	Details	
18	362m N	Shell Arterial, A127, Arterial Road, Rayleigh, Essex, SS6 7XJ	Process: Unloading of Petrol into Storage at Service Stations Status: Revoked Permit Type: Part B	Enforcement: No Enforcements Notified Date of enforcement: No Enforcements Notified Comment: No Enforcements Notified
N	412m N	Shell Rayleigh, 113-115 High Road, Rayleigh, SS6 7SJ	Process: Unloading of Petrol into Storage at Service Stations Status: Current Permit Permit Type: Part B	Enforcement: No Enforcements Notified Date of enforcement: No Enforcements Notified Comment: No Enforcements Notified
20	428m N	Balgores Southend on Sea, Accident Repair Centre, 17 Brook Road Industrial Estate, Rayleigh, SS6 7UT	Process: Respraying of Road Vehicles Status: Current Permit Permit Type: Part B	Enforcement: No Enforcements Notified Date of enforcement: No Enforcements Notified Comment: No Enforcements Notified
21	429m N	Fisco Tools Ltd, 21 Brook Road, Rayleigh, SS6 7XL	Process: Coating Processes Status: Current Permit Permit Type: Part B	Enforcement: No Enforcements Notified Date of enforcement: No Enforcements Notified Comment: No Enforcements Notified

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	**10**

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 32**

ID	Location	Address	Details	
3	19m S	EAST OF RAYLEIGH ROAD, THUNDERSLEY, ESSEX	Effluent Type: MISCELLANEOUS DISCHARGES - SURFACE WATER Permit Number: PR2NFE01670 Permit Version: 1 Receiving Water: Trib	Status: PRE NRA LEGISLATION WHERE ISSUE DATE 01-SEP-89 (HISTORIC ONLY) Issue date: 15/03/1970 Effective Date: 15/03/1970 Revocation Date: 24/02/1993
8	169m NE	RAYLEIGH STADIUM, RAYLEIGH, ESSEX	Effluent Type: MISCELLANEOUS DISCHARGES - SURFACE WATER Permit Number: PR2NFE06073 Permit Version: 1 Receiving Water: Eastwood Brook	Status: PRE NRA LEGISLATION WHERE ISSUE DATE 01-SEP-89 (HISTORIC ONLY) Issue date: 17/05/1973 Effective Date: 17/05/1973 Revocation Date: 04/03/1993
10	195m E	RES. DEVLPT AT BRAMBLE ROAD, OFF RAYLEIGH ROAD, EASTWOOD	Effluent Type: MISCELLANEOUS DISCHARGES - SURFACE WATER Permit Number: PR2NFE13068 Permit Version: 1 Receiving Water: Eastwood Brook	Status: PRE NRA LEGISLATION WHERE ISSUE DATE 01-SEP-89 (HISTORIC ONLY) Issue date: 23/09/1968 Effective Date: 23/09/1968 Revocation Date: 25/02/1993
K	214m N	ROAD CONSTRUCTION WORKS AT CLAYDON, THUNDERSLEY, ESSEX	Effluent Type: MISCELLANEOUS DISCHARGES - SURFACE WATER Permit Number: PR2NFE06771 Permit Version: 1 Receiving Water: Trib Eastwood Brook	Status: PRE NRA LEGISLATION WHERE ISSUE DATE 01-SEP-89 (HISTORIC ONLY) Issue date: 24/06/1971 Effective Date: 24/06/1971 Revocation Date: 04/03/1993
16	313m N	RAYLEIGH ROAD, A129 & CLAYDONS LANE, STH OF ARTERIAL RD, BENFLEET.	Effluent Type: MISCELLANEOUS DISCHARGES - SURFACE WATER Permit Number: AW2NFE10067 Permit Version: 1 Receiving Water: Eastwood Brook	Status: PRE NRA LEGISLATION WHERE ISSUE DATE 01-SEP-89 (HISTORIC ONLY) Issue date: 13/06/1967 Effective Date: 13/06/1967 Revocation Date: -
M	313m N	RAYLEIGH BOOSTER STN, ARTERIAL ROAD, RAYLEIGH, ESSEX	Effluent Type: UNSPECIFIED Permit Number: PR2NFE04462 Permit Version: 1 Receiving Water: -	Status: PRE NRA LEGISLATION WHERE ISSUE DATE 01-SEP-89 (HISTORIC ONLY) Issue date: 20/06/1962 Effective Date: 20/06/1962 Revocation Date: 19/05/1992
M	313m N	RAYLEIGH BOOSTER STN, ARTERIAL ROAD, RAYLEIGH, ESSEX	Effluent Type: MISCELLANEOUS DISCHARGES - SURFACE WATER Permit Number: PR2NFE03662 Permit Version: 1 Receiving Water: -	Status: PRE NRA LEGISLATION WHERE ISSUE DATE 01-SEP-89 (HISTORIC ONLY) Issue date: 24/04/1962 Effective Date: 24/04/1962 Revocation Date: -

ID	Location	Address	Details	
17	337m N	SOUTHEND ARTERIAL RD, PLOT 675A, RAYLEIGH	Effluent Type: MISCELLANEOUS DISCHARGES - SURFACE WATER Permit Number: PR2NFE09470 Permit Version: 1 Receiving Water: Eastwood Brook	Status: PRE NRA LEGISLATION WHERE ISSUE DATE 01-SEP-89 (HISTORIC ONLY) Issue date: 03/08/1970 Effective Date: 03/08/1970 Revocation Date: 28/09/2007
O	477m SE	33 EASTERN ROAD, HADLEIGH, ESSEX	Effluent Type: MISCELLANEOUS DISCHARGES - SURFACE WATER Permit Number: PR2NFE04874 Permit Version: 1 Receiving Water: Trib Prittle Brook	Status: PRE NRA LEGISLATION WHERE ISSUE DATE 01-SEP-89 (HISTORIC ONLY) Issue date: 16/04/1974 Effective Date: 16/04/1974 Revocation Date: 19/05/1992
O	477m SE	33 EASTERN ROAD, HADLEIGH, ESSEX	Effluent Type: MISCELLANEOUS DISCHARGES - SURFACE WATER Permit Number: PR2NFE04774 Permit Version: 1 Receiving Water: Trib Prittle Brook	Status: PRE NRA LEGISLATION WHERE ISSUE DATE 01-SEP-89 (HISTORIC ONLY) Issue date: 16/03/1974 Effective Date: 16/03/1974 Revocation Date: 04/03/1993

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	3

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.

Features are displayed on the Current industrial land use map on **page 32**

ID	Location	Name	Status	Receiving Water	Authorised Substances
A	32m N	Rayleigh Cold Store Ltd	Not Active	Na	pH
J	277m N	Thames Card Technology Limited	Not Active	Na	pH
19	393m NE	Albany Rental Supply Ltd	Not Active	Na	pH

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

4.18 Pollution Incidents (EA/NRW)

Records within 500m	4

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 32**

ID	Location	Details	
L	228m N	Incident Date: 03/12/2002 Incident Identification: 124368 Pollutant: Atmospheric Pollutants and Effects:Specific Waste Materials Pollutant Description: Smoke:Commercial Waste	Water Impact: Category 4 (No Impact) Land Impact: Category 3 (Minor) Air Impact: Category 3 (Minor)
L	228m N	Incident Date: 03/12/2002 Incident Identification: 124368 Pollutant: Specific Waste Materials Pollutant Description: Commercial Waste	Water Impact: Category 4 (No Impact) Land Impact: Category 3 (Minor) Air Impact: Category 3 (Minor)
L	228m N	Incident Date: 03/12/2002 Incident Identification: 124368 Pollutant: Atmospheric Pollutants and Effects Pollutant Description: Smoke	Water Impact: Category 4 (No Impact) Land Impact: Category 3 (Minor) Air Impact: Category 3 (Minor)
22	454m NW	Incident Date: 10/12/2001 Incident Identification: 47504 Pollutant: Specific Waste Materials Pollutant Description: Household Waste	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.

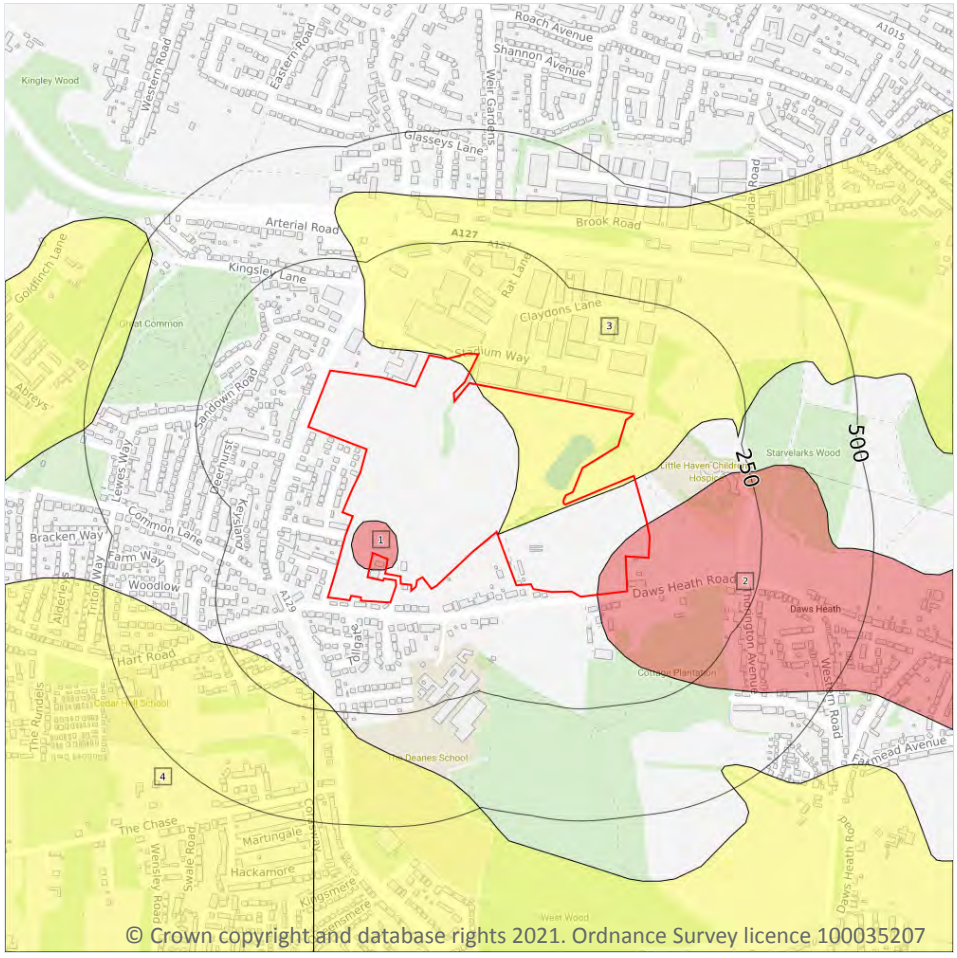
4.21 Pollution inventory radioactive waste

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



Site Outline

Search buffers in metres (m)

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

5.1 Superficial aquifer

Records within 500m	4

Aquifer status of groundwater held within superficial geology.

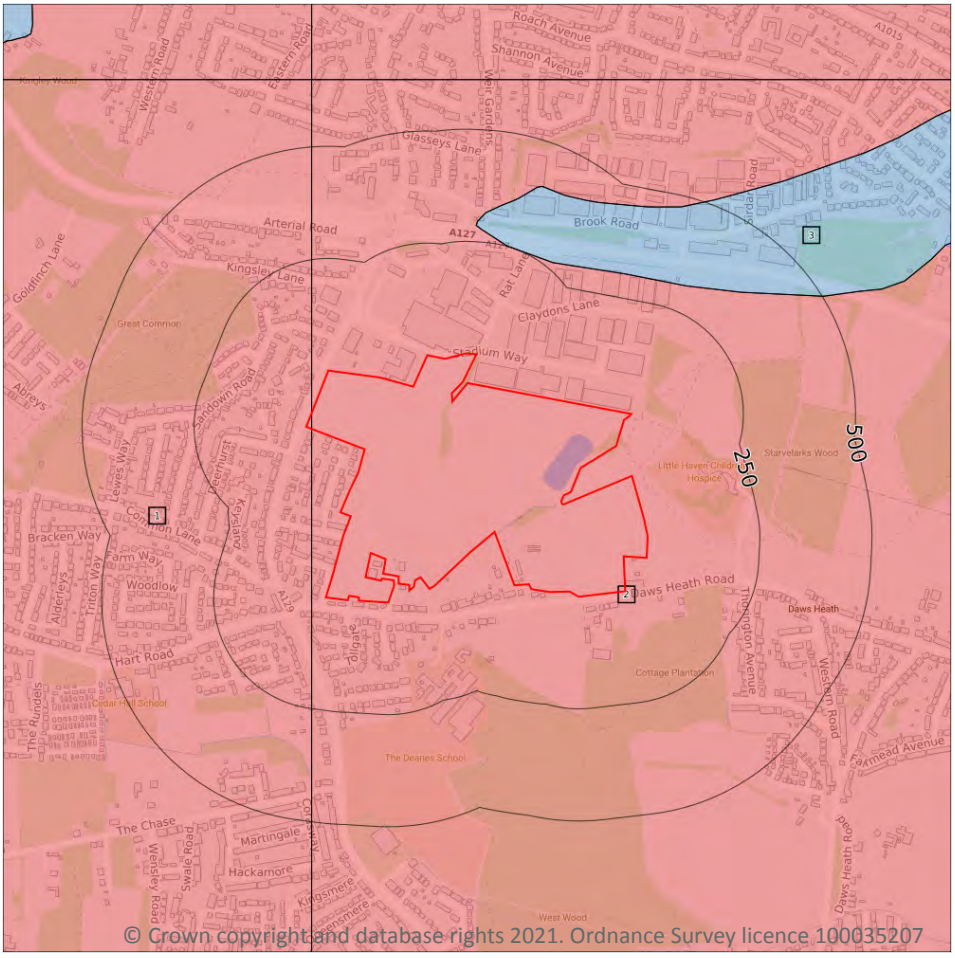
Features are displayed on the Hydrogeology map on **page 44**

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 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

ID	Location	Designation	Description
3	**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**
4	188m SW	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	3

Aquifer status of groundwater held within bedrock geology.

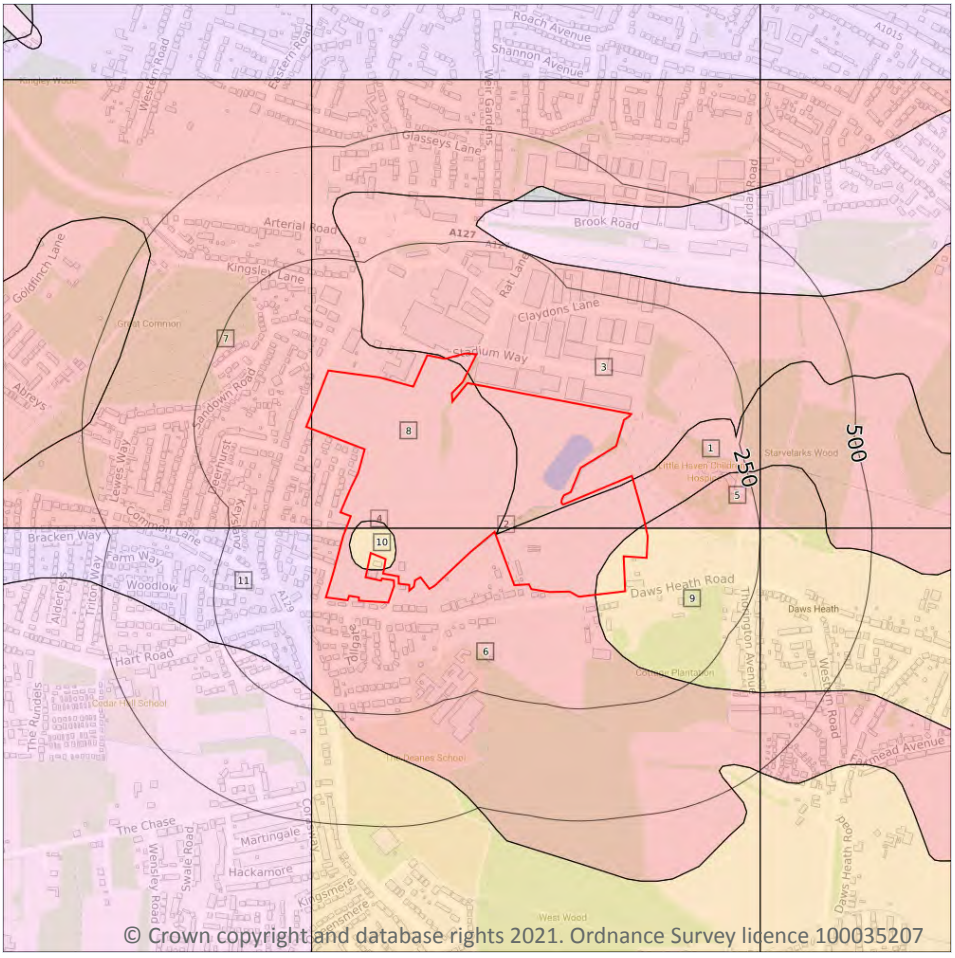
Features are displayed on the Bedrock aquifer map on **page 46**

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 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

ID	Location	Designation	Description
3	250m N	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



Site Outline

Search buffers in metres (m)

Superficial vulnerability

- Principal superficial aquifer, high vulnerability
- Secondary superficial aquifer, high vulnerability
- Principal superficial aquifer, medium vulnerability
- Secondary superficial aquifer, medium vulnerability
- Principal superficial aquifer, low vulnerability
- Secondary superficial aquifer, low vulnerability

Bedrock vulnerability

- Principal bedrock aquifer, high vulnerability
- Secondary bedrock aquifer, high vulnerability
- Principal bedrock aquifer, medium vulnerability
- Secondary bedrock aquifer, medium vulnerability
- Principal bedrock aquifer, low vulnerability
- Secondary bedrock aquifer, low vulnerability

Other information

- Unproductive aquifer
- Soluble rock risk
- Local information

5.3 Groundwater vulnerability

Records within 50m	11

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 48**

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

ID	Location	Summary	Soil / surface	Superficial geology	Bedrock geology
8	**On site**	**Summary Classification: Secondary bedrock aquifer - High Vulnerability Combined classification: Productive Bedrock Aquifer, No Superficial Aquifer**	**Leaching class: Intermediate Infiltration value: 40-70% Dilution value: <300mm/year**	**Vulnerability: - Aquifer type: - Thickness: <3m Patchiness value: <90% Recharge potential: No Data**	**Vulnerability: High Aquifer type: Secondary Flow mechanism: Mixed**
9	**On site**	**Summary Classification: Secondary superficial aquifer - High Vulnerability Combined classification: Productive Bedrock Aquifer, Productive Superficial Aquifer**	**Leaching class: Intermediate Infiltration value: >70% Dilution value: <300mm/year**	**Vulnerability: High Aquifer type: Secondary Thickness: <3m Patchiness value: <90% Recharge potential: No Data**	**Vulnerability: High Aquifer type: Secondary Flow mechanism: Mixed**
10	**On site**	**Summary Classification: Secondary superficial aquifer - High Vulnerability Combined classification: Productive Bedrock Aquifer, Productive Superficial Aquifer**	**Leaching class: Intermediate Infiltration value: >70% Dilution value: <300mm/year**	**Vulnerability: High Aquifer type: Secondary Thickness: <3m Patchiness value: <90% Recharge potential: No Data**	**Vulnerability: High Aquifer type: Secondary Flow mechanism: Mixed**
11	31m W	Summary Classification: Secondary bedrock aquifer - Medium Vulnerability Combined classification: Productive Bedrock Aquifer, No Superficial Aquifer	Leaching class: Low Infiltration value: 40-70% Dilution value: <300mm/year	Vulnerability: - Aquifer type: - Thickness: <3m Patchiness value: <90% Recharge potential: No Data	Vulnerability: Medium Aquifer type: Secondary 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.

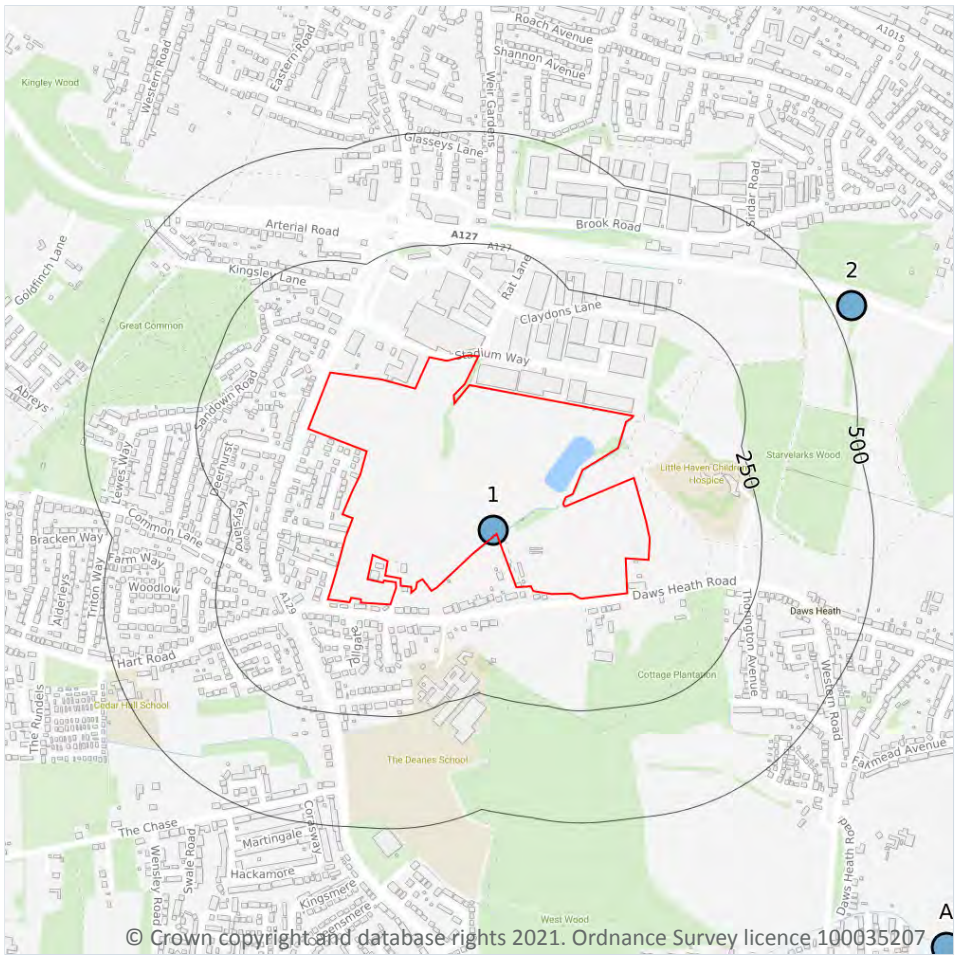
5.5 Groundwater vulnerability- local information

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



Site Outline

Search buffers in metres (m)

- Source Protection Zone 1 — Inner catchment
- Source Protection Zone 2 — Outer catchment
- Source Protection Zone 3 — Total catchment
- Source Protection Zone 4 — Zone of Special Interest
- Source Protection Zone 1c — Inner catchment - confined aquifer
- Source Protection Zone 2c — Outer catchment - confined aquifer
- Source Protection Zone 3c — Total catchment - confined aquifer
- Drinking water abstraction licences
- Drinking water abstraction licences — Polygon features
- Drinking water abstraction licences — Linear features
- Groundwater abstraction licence (point)
- Groundwater abstraction licence (area)
- Groundwater abstraction licence (linear)
- Surface Water Abstractions (point)
- Surface Water Abstractions (area)
- Surface Water Abstractions (linear)

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	**5**

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 52**

ID	Location	Details	
1	**On site**	**Status: Historical** **Licence No: 8/37/44/*S/0058** **Details: Spray Irrigation - Storage** **Direct Source: SURFACE WATER SOURCE OF SUPPLY** **Point: TRIB. EASTWOOD BK. THUNDERSLEY** **Data Type: Point** **Name: P COOK & SONS** **Easting: 580400** **Northing: 189000**	**Annual Volume (m^3): 3660** **Max Daily Volume (m^3): 3660** **Original Application No: -** **Original Start Date: 01/04/1975** **Expiry Date: -** **Issue No: 100** **Version Start Date: 01/09/1998** **Version End Date: -**
2	545m NE	Status: Historical Licence No: 8/37/44/*S/0078 Details: Make-Up or Top Up Water Direct Source: SURFACE WATER SOURCE OF SUPPLY Point: DITCH TRIBUTARY OF RIVER ROACH & CANVEY CATCHMENT Data Type: Point Name: ESSEX WILDLIFE TRUST Easting: 581200 Northing: 189500	Annual Volume (m^3): - Max Daily Volume (m^3): - Original Application No: - Original Start Date: - Expiry Date: 31/03/2016 Issue No: 1 Version Start Date: 19/02/2002 Version End Date: -
A	1062m SE	Status: Historical Licence No: 8/37/44/*S/0075 Details: Make-Up Or Top Up Water Direct Source: SURFACE WATER SOURCE OF SUPPLY Point: PRITTLE BROOK AT HADLEIGH Data Type: Point Name: ARMITAGE Easting: 581410 Northing: 188070	Annual Volume (m^3): 500 Max Daily Volume (m^3): 500 Original Application No: - Original Start Date: 01/11/1998 Expiry Date: 31/03/2018 Issue No: 100 Version Start Date: 01/03/1999 Version End Date: -
-	1069m SE	Status: Historical Licence No: 8/37/44/*S/0075 Details: Make-Up Or Top Up Water Direct Source: SURFACE WATER SOURCE OF SUPPLY Point: PRITTLE BROOK AT HADLEIGH Data Type: Point Name: ARMITAGE Easting: 581431 Northing: 188080	Annual Volume (m^3): 500 Max Daily Volume (m^3): 500 Original Application No: - Original Start Date: 01/11/1998 Expiry Date: 31/03/2018 Issue No: 100 Version Start Date: 01/03/1999 Version End Date: -

ID	Location	Details	
-	1069m SE	Status: Active Licence No: 8/37/44/*S/0075/R01 Details: Make-Up Or Top Up Water Direct Source: SURFACE WATER SOURCE OF SUPPLY Point: PRITTLE BROOK AT HADLEIGH Data Type: Point Name: ARMITAGE Easting: 581431 Northing: 188080	Annual Volume (m^3): 500 Max Daily Volume (m^3): 500 Original Application No: - Original Start Date: 01/04/2018 Expiry Date: 31/03/2028 Issue No: 1 Version Start Date: 01/04/2018 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	0

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

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

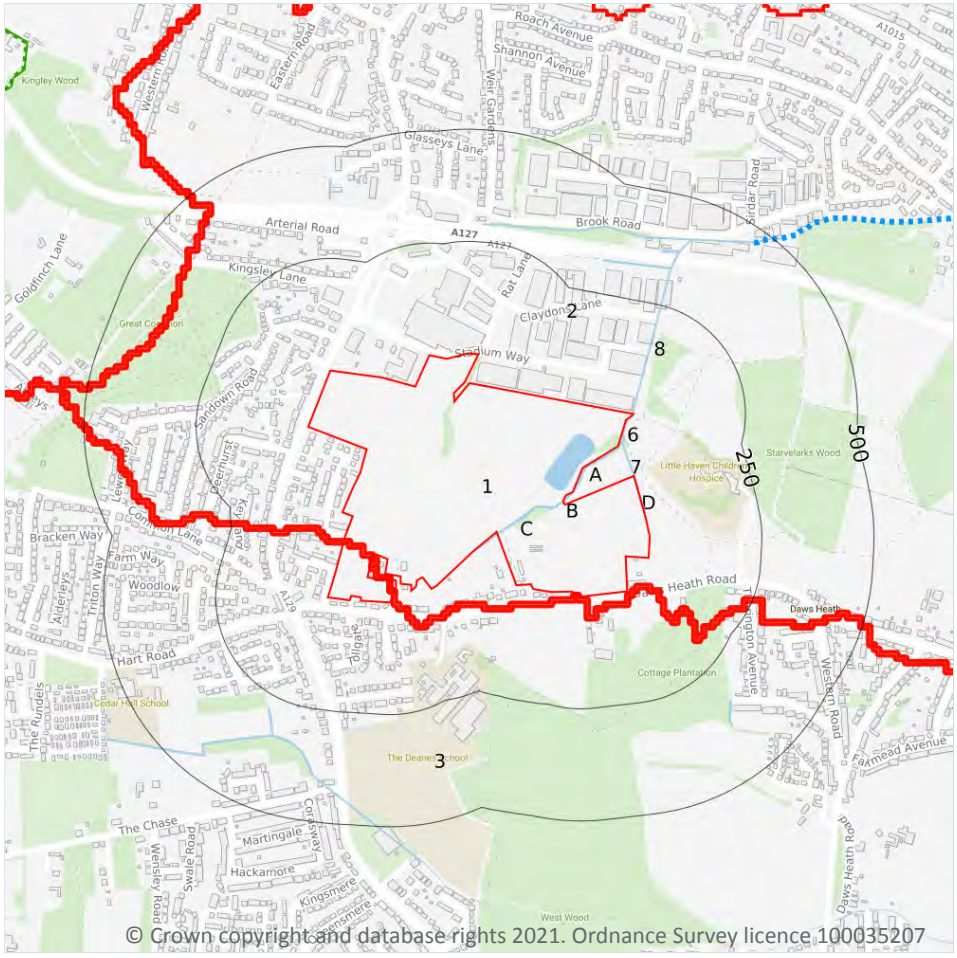
5.10 Source Protection Zones (confined aquifer)

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 55**

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)**	**-**
B	**On site**	**Inland river not influenced by normal tidal action.**	**On ground surface**	**Watercourse contains water year round (in normal circumstances)**	**-**
C	**On site**	**Inland river not influenced by normal tidal action.**	**On ground surface**	**Watercourse contains water year round (in normal circumstances)**	**-**
D	**On site**	**Inland river not influenced by normal tidal action.**	**On ground surface**	**Watercourse contains water year round (in normal circumstances)**	**-**
6	**On site**	**Inland river not influenced by normal tidal action.**	**On ground surface**	**Watercourse contains water year round (in normal circumstances)**	**-**
7	**On site**	**Inland river not influenced by normal tidal action.**	**Not provided**	**Watercourse contains water year round (in normal circumstances)**	**-**
8	3m N	Inland river not influenced by normal tidal action.	Not provided	Watercourse contains water year round (in normal circumstances)	-

This data is sourced from the Ordnance Survey.

6.2 Surface water features

Records within 250m	2

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 55**

This data is sourced from the Ordnance Survey.

6.3 WFD Surface water body catchments

Records on site	2

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 55**

ID	Location	Type	Water body catchment	Water body ID	Operational catchment	Management catchment
2	**On site**	**River WB catchment**	**Eastwood Brook**	**GB105037028741**	**Crouch and Roach**	**Combined Essex**
3	**On site**	**River WB catchment**	**Prittle Brook**	**GB105037028730**	**Crouch and Roach**	**Combined Essex**

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

6.4 WFD Surface water bodies

Records identified	**2**

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 55**

ID	Location	Type	Name	Water body ID	Overall rating	Chemical rating	Ecological rating	Year
16	468m NE	River	Eastwood Brook	GB105037028741	Moderate	Fail	Moderate	2016
-	584m S	River	Prittle Brook	GB105037028730	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 55**

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	0

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.

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

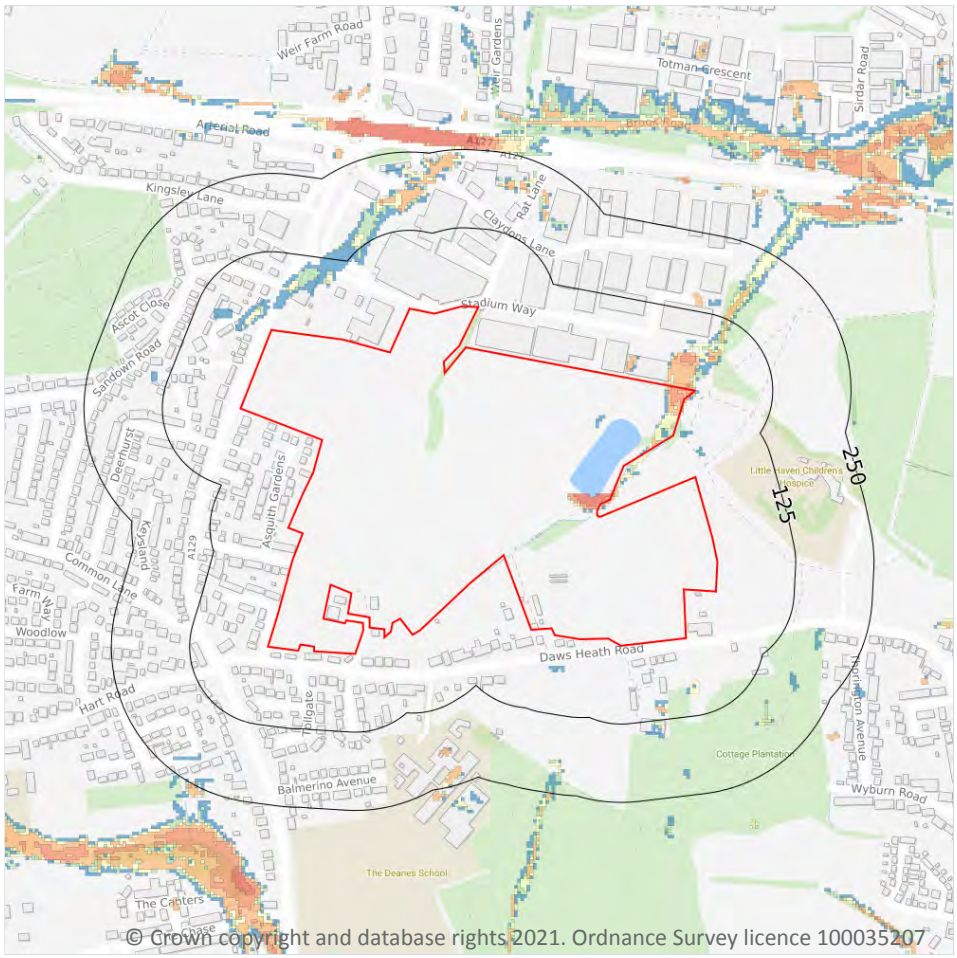
7.7 Flood Zone 3

Records within 50m	0

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.

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

8 Surface water flooding



Site Outline

Search buffers in metres (m)

1 in 1000 return period
- Depth between 0.1m - 0.3m
- Depth between 0.3m - 1.0m
- Depth greater than 1.0m

1 in 250 return period
- Depth between 0.1m - 0.3m
- Depth between 0.3m - 1.0m
- Depth greater than 1.0m

1 in 100 return period
- Depth between 0.1m - 0.3m
- Depth between 0.3m - 1.0m
- Depth greater than 1.0m

1 in 30 return period
- Depth between 0.1m - 0.3m
- Depth between 0.3m - 1.0m
- Depth greater than 1.0m

8.1 Surface water flooding

Highest risk on site	**1 in 30 year, Greater than 1.0m**
Highest risk within 50m	**1 in 30 year, Greater than 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 61**

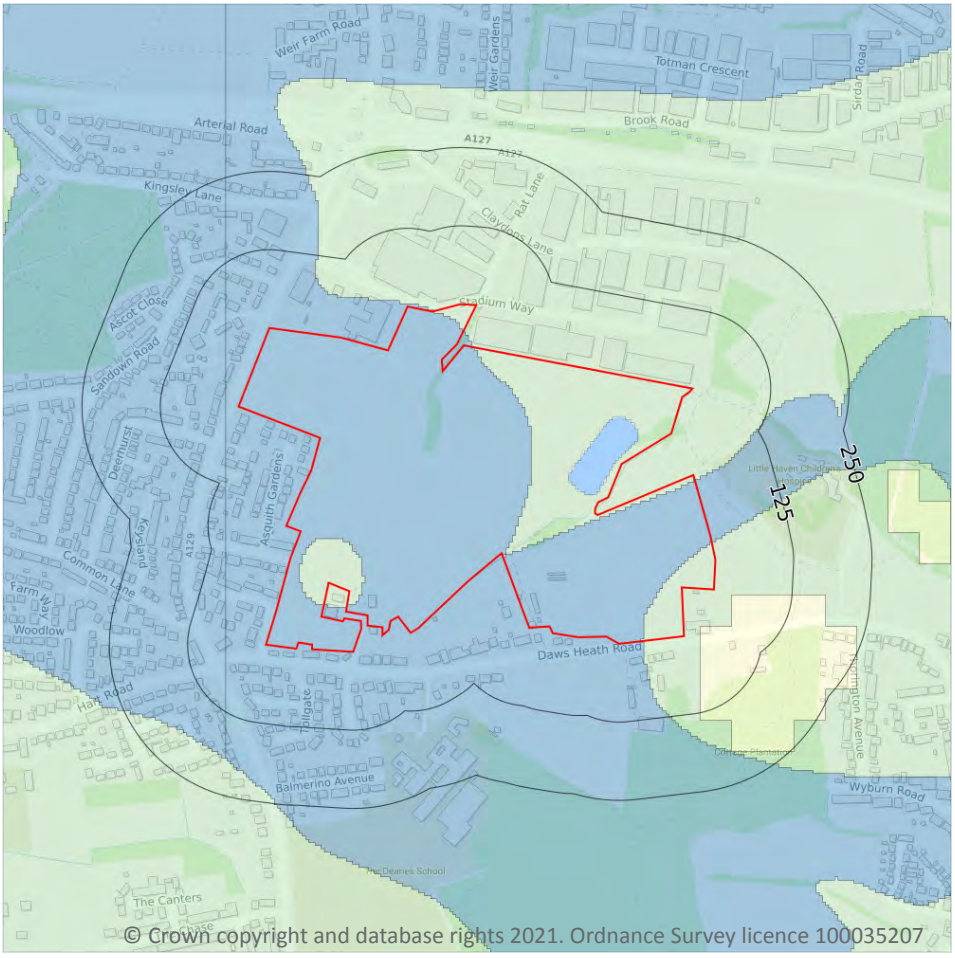
The data shown on the map and in the table above shows the highest likelihood of flood events happening at the site. Lower likelihood events may have greater flood depths and hence a greater potential impact on a site.

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	Greater than 1.0m
1 in 250 year	Greater than 1.0m
1 in 100 year	Greater than 1.0m
1 in 30 year	Greater than 1.0m

This data is sourced from Ambiental Risk Analytics.

9 Groundwater flooding



Site Outline

Search buffers in metres (m)

- High
- Moderate - High
- Moderate
- Low
- Negligible

9.1 Groundwater flooding

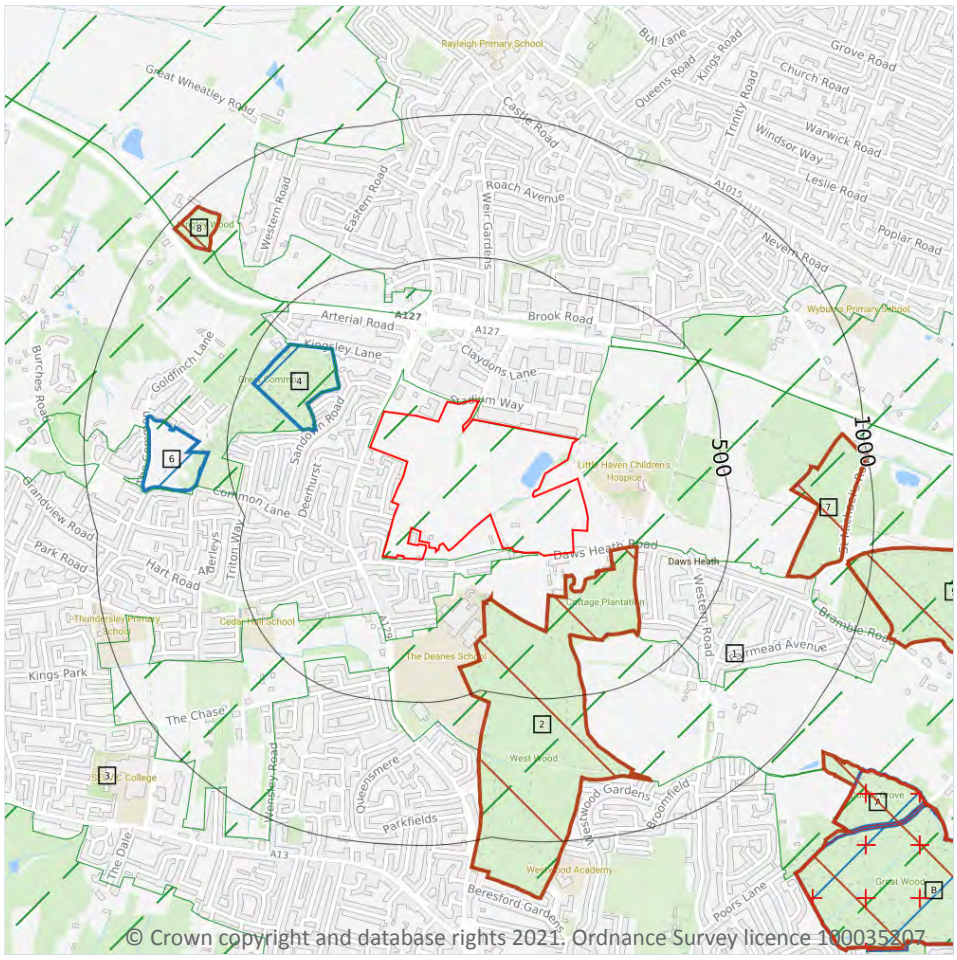
Highest risk on site	**Low**
Highest risk within 50m	**Moderate**

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 63**

This data is sourced from Ambiental Risk Analytics.

10 Environmental designations



Site Outline

Search buffers in metres (m)

Sites of Special Scientific Interest (SSSI)

Local Nature Reserves (LNR)

Designated Ancient Woodland

Green Belt

10.1 Sites of Special Scientific Interest (SSSI)

Records within 2000m	5

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 64**

ID	Location	Name	Data source
4	179m NW	Thundersley Great Common	Natural England

ID	Location	Name	Data source
6	566m W	Thundersley Great Common	Natural England
A	1265m SE	Great Wood & Dodd's Grove	Natural England
B	1352m SE	Great Wood & Dodd's Grove	Natural England
-	1544m E	Garrold's Meadow	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	2

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.

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

ID	Location	Name	Data source
A	1265m SE	Belfairs	Natural England
B	1352m SE	Belfairs	Natural England

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

10.7 Designated Ancient Woodland

Records within 2000m	7

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 64**

ID	Location	Name	Woodland Type
2	78m S	West Wood	Ancient & Semi-Natural Woodland
7	717m E	Pound Wood	Ancient & Semi-Natural Woodland
8	831m NW	Kingley Wood	Ancient & Semi-Natural Woodland
9	918m E	Pound Wood	Ancient & Semi-Natural Woodland
10	1118m SE	Great Wood And Dodd`s Grove	Ancient & Semi-Natural Woodland

ID	Location	Name	Woodland Type
-	1553m S	Shipwrights Wood	Ancient & Semi-Natural Woodland
-	1620m W	Coombe Wood	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 64**

ID	Location	Name	Local Authority name
1	**On site**	**London**	**Castle Point**

ID	Location	Name	Local Authority name
3	179m NW	London	Castle Point
5	338m NW	London	Rochford

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

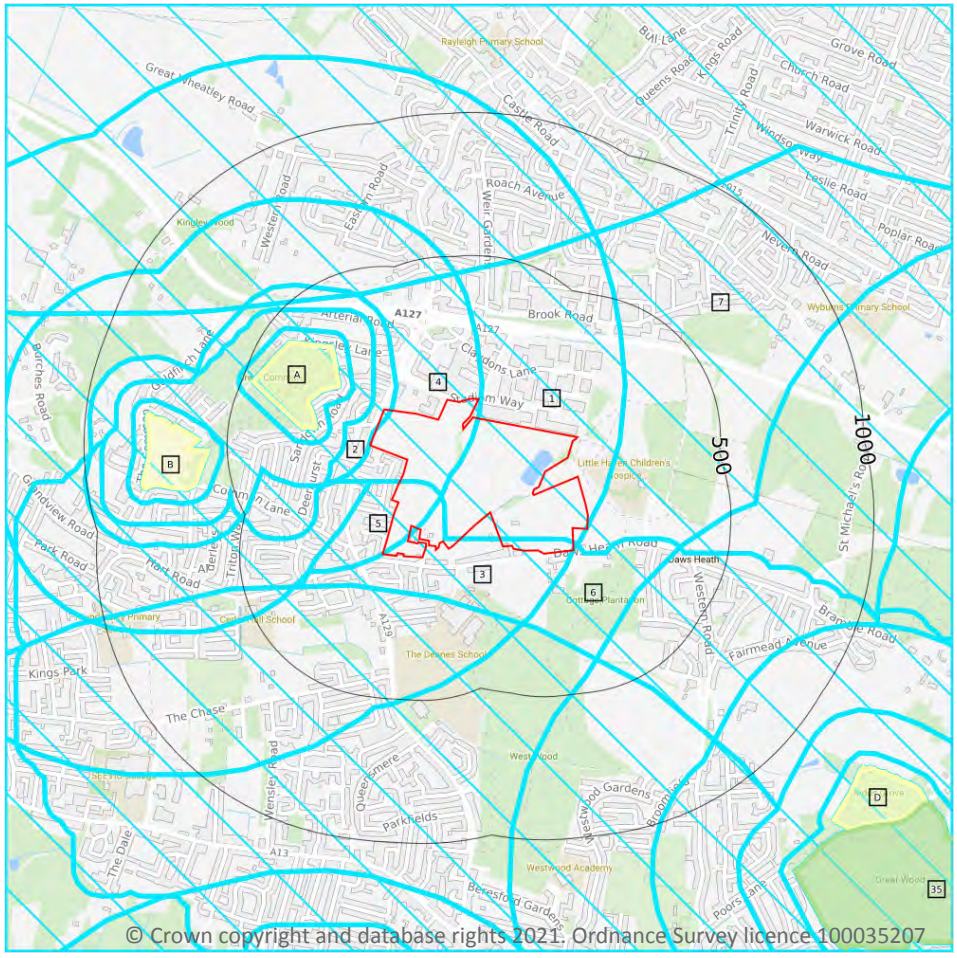
Records within 2000m	**1**

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	**River Roach, Nobles Ditch and Eastwood Brook NVZ**	**Surface Water**	**S427**	**Existing**

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

SSSI Impact Zones and Units



Site Outline

Search buffers in metres (m)

SSSI Impact Risk Zones

SSSI Units

- Not recorded
- Favourable
- Unfavourable - Recovering
- Unfavourable - No change
- Unfavourable - Declining
- Partially destroyed
- Destroyed

10.17 SSSI Impact Risk Zones

Records on site	7

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 70**

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** **Wind and Solar - Solar schemes with footprint > 0.5ha, all wind turbines** **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** **Notes: For new residential development in this area, consideration is required in terms of the emerging Essex Coast Recreational disturbance Avoidance and Mitigation Strategy (RAMS). Contact the Local Planning Authority for further advice.**

ID	Location	Type of developments requiring consultation
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** **Wind and Solar - Solar schemes with footprint > 0.5ha, all wind turbines** **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 50 units or more.** **Rural residential - Any residential development of 10 or more houses outside existing settlements/urban areas.** **Air pollution - Any development that could cause AIR POLLUTION or DUST either in its construction or operation (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.** **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** **Notes: For new residential development in this area, consideration is required in terms of the emerging Essex Coast Recreational disturbance Avoidance and Mitigation Strategy (RAMS). Contact the Local Planning Authority for further advice.**

ID	Location	Type of developments requiring consultation
3	**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** **Wind and Solar - Solar schemes with footprint > 0.5ha, all wind turbines** **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.** **Rural non-residential - Large non residential developments outside existing settlements/urban areas where footprint exceeds 1ha.** **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 5m³/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** **Notes: For new residential development in this area, consideration is required in terms of the emerging Essex Coast Recreational disturbance Avoidance and Mitigation Strategy (RAMS). Contact the Local Planning Authority for further advice.**

ID	Location	Type of developments requiring consultation
4	**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** **Wind and Solar - Solar schemes with footprint > 0.5ha, all wind turbines** **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.** **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** **Notes: For new residential development in this area, consideration is required in terms of the emerging Essex Coast Recreational disturbance Avoidance and Mitigation Strategy (RAMS). Contact the Local Planning Authority for further advice.**

ID	Location	Type of developments requiring consultation
5	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 Wind and Solar - Solar schemes with footprint > 0.5ha, all wind turbines 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. Rural non-residential - Large non residential developments outside existing settlements/urban areas where footprint exceeds 1ha. 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. Discharges - Any discharge of water or liquid waste of more than 5m³/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 Notes: For new residential development in this area, consideration is required in terms of the emerging Essex Coast Recreational disturbance Avoidance and Mitigation Strategy (RAMS). Contact the Local Planning Authority for further advice.**

ID	Location	Type of developments requiring consultation
6	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 Wind and Solar - Solar schemes with footprint > 0.5ha, all wind turbines 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. Rural non-residential - Large non residential developments outside existing settlements/urban areas where footprint exceeds 1ha. Residential - Residential development of 100 units or more. Rural residential - Any residential development of 100 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 75000 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 5m³/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 total net additional gross internal floorspace following development is 1,000m² or more. Notes: For new residential development in this area, consideration is required in terms of the emerging Essex Coast Recreational disturbance Avoidance and Mitigation Strategy (RAMS). Contact the Local Planning Authority for further advice.**

ID	Location	Type of developments requiring consultation
7	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 Wind and Solar - Solar schemes with footprint > 0.5ha, all wind turbines 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 100 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 75000 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 total net additional gross internal floorspace following development is 1,000m² or more. Notes: For new residential development in this area, consideration is required in terms of the emerging Essex Coast Recreational disturbance Avoidance and Mitigation Strategy (RAMS). Contact the Local Planning Authority for further advice.**

This data is sourced from Natural England.

10.18 SSSI Units

Records within 2000m	**7**

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 70**

ID:	A
Location:	179m NW
SSSI name:	Thundersley Great Common
Unit name:	North-Facing Slope
Broad habitat:	Dwarf Shrub Heath - Lowland
Condition:	Unfavourable - Recovering
Reportable features:	

Feature name	Feature condition	Date of assessment
Lowland dry heath	Unfavourable - Recovering	20/07/2010
Lowland wet heath	Unfavourable - Recovering	20/07/2010

ID: B
Location: 566m W
SSSI name: Thundersley Great Common
Unit name: Southern Plateau
Broad habitat: Dwarf Shrub Heath - Lowland
Condition: Unfavourable - Recovering
Reportable features:

Feature name	Feature condition	Date of assessment
Lowland dry acid grassland (U1b,c,d,f)	Unfavourable - Recovering	16/07/2010
Lowland dry heath	Unfavourable - Recovering	16/07/2010

ID: D
Location: 1265m SE
SSSI name: Great Wood & Dodd's Grove
Unit name: Dodds Wood
Broad habitat: Broadleaved, Mixed And Yew Woodland - Lowland
Condition: Unfavourable - Recovering
Reportable features:

Feature name	Feature condition	Date of assessment
Lowland mixed deciduous woodland	Unfavourable - Recovering	16/06/2011
Population of nationally rare butterfly species - Mellicta athalia, Heath Fritillary	Unfavourable - Recovering	16/06/2011

ID: 35
Location: 1352m SE
SSSI name: Great Wood & Dodd's Grove
Unit name: Great Wood
Broad habitat: Broadleaved, Mixed And Yew Woodland - Lowland
Condition: Favourable
Reportable features:

Feature name	Feature condition	Date of assessment
Lowland mixed deciduous woodland	Favourable	16/06/2011
Population of nationally rare butterfly species - Mellicta athalia, Heath Fritillary	Favourable	16/06/2011

ID: -
Location: 1544m E
SSSI name: Garrold's Meadow
Unit name: Upper Southern Pasture
Broad habitat: Neutral Grassland - Lowland
Condition: Unfavourable - Recovering
Reportable features:

Feature name	Feature condition	Date of assessment
Lowland neutral grassland (MG5)	Unfavourable - Recovering	27/07/2012

ID: -
Location: 1577m E
SSSI name: Garrold's Meadow
Unit name: Lower Northern Damp Field
Broad habitat: Neutral Grassland - Lowland
Condition: Unfavourable - Recovering
Reportable features:

Feature name	Feature condition	Date of assessment
Lowland neutral grassland (MG5)	Unfavourable - Recovering	27/07/2012

ID: -
Location: 1617m E
SSSI name: Garrold's Meadow
Unit name: Encroached Gorse Block
Broad habitat: Neutral Grassland - Lowland
Condition: Unfavourable - Recovering
Reportable features:

Feature name	Feature condition	Date of assessment
Lowland neutral grassland (MG5)	Unfavourable - Recovering	27/07/2012

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 80**

ID	Location	Name	Grade	Reference Number	Listed date
2	100m SE	96 And 98, Daws Heath Road, Victoria, Castle Point, Essex, SS7	II	1170144	22/07/1986

This data is sourced from Historic England, 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 80**

ID	Location	Name	District	Date of designation
1	**On site**	**The Local Authority for this area have not supplied conservation area data.**		**-**

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

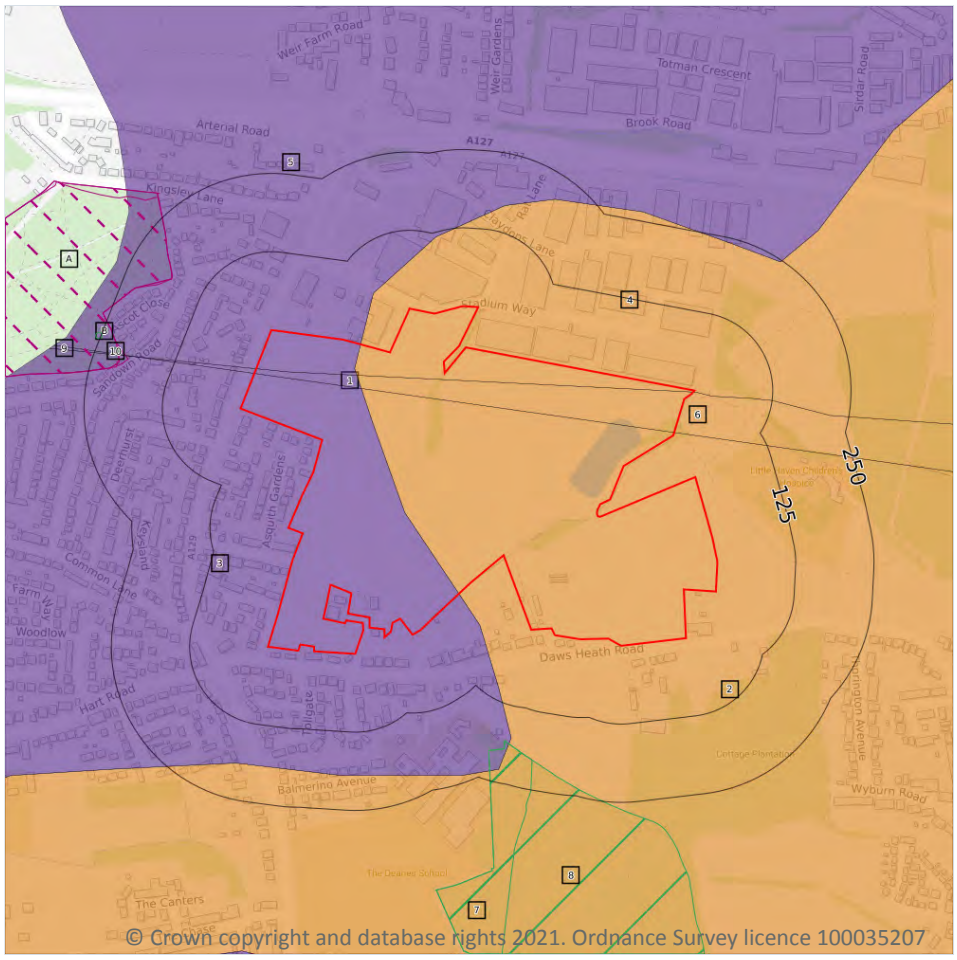
11.7 Registered Parks and Gardens

Records within 250m	0

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.

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

12 Agricultural designations



Site Outline

Search buffers in metres (m)

- Grade 1 - excellent quality
- Grade 2 - very good quality
- Grade 3 - good to moderate quality
- Grade 3a - good quality
- Grade 3b - moderate quality
- Grade 4 - poor quality
- Grade 5 - very poor quality
- Non-agricultural land
- Urban land
- Exclusion land
- Tree felling licences
- Open Access land

12.1 Agricultural Land Classification

Records within 250m	7

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 83**

ID	Location	Classification	Description
1	On site	Urban	-
2	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.

ID	Location	Classification	Description
3	**On site**	**Urban**	**-**
4	**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.**
5	**On site**	**Urban**	**-**
6	**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.**
9	185m W	Urban	-

This data is sourced from Natural England.

12.2 Open Access Land

Records within 250m	**3**

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.

Features are displayed on the Agricultural designations map on **page 83**

ID	Location	Name	Classification	Other relevant legislation
A	179m NW	Thundersley Great Common	Section 15 Land	1899 CA
A	179m NW	Great Common	Section 15 Land	S.193 - Urban Borough District
A	179m NW	Great Common	Section 4 Conclusive Registered Common Land	-

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

12.3 Tree Felling Licences

Records within 250m	**5**

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.

Features are displayed on the Agricultural designations map on **page 83**

ID	Location	Description	Reference	Application date
7	182m S	Selective Fell/Thin (Conditional)	017/150/14-15	08/09/2014
8	182m S	Selective Fell/Thin (Conditional)	017/308/17-18	28/11/2017
10	214m W	Single Tree	017/168/08-09	07/01/2009
B	243m W	Single Tree	017/168/08-09	07/01/2009
B	248m W	Single Tree	017/168/08-09	07/01/2009

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. The schemes identified may be historical schemes that have now expired, or may still be active.

Location	Reference	Scheme	Start Date	End date
On site	**AG00283299**	**Entry Level plus Higher Level Stewardship**	**01/02/2009**	**31/01/2021**
179m NW	AG00267689	Higher Level Stewardship	01/08/2008	31/07/2018

This data is sourced from Natural England.

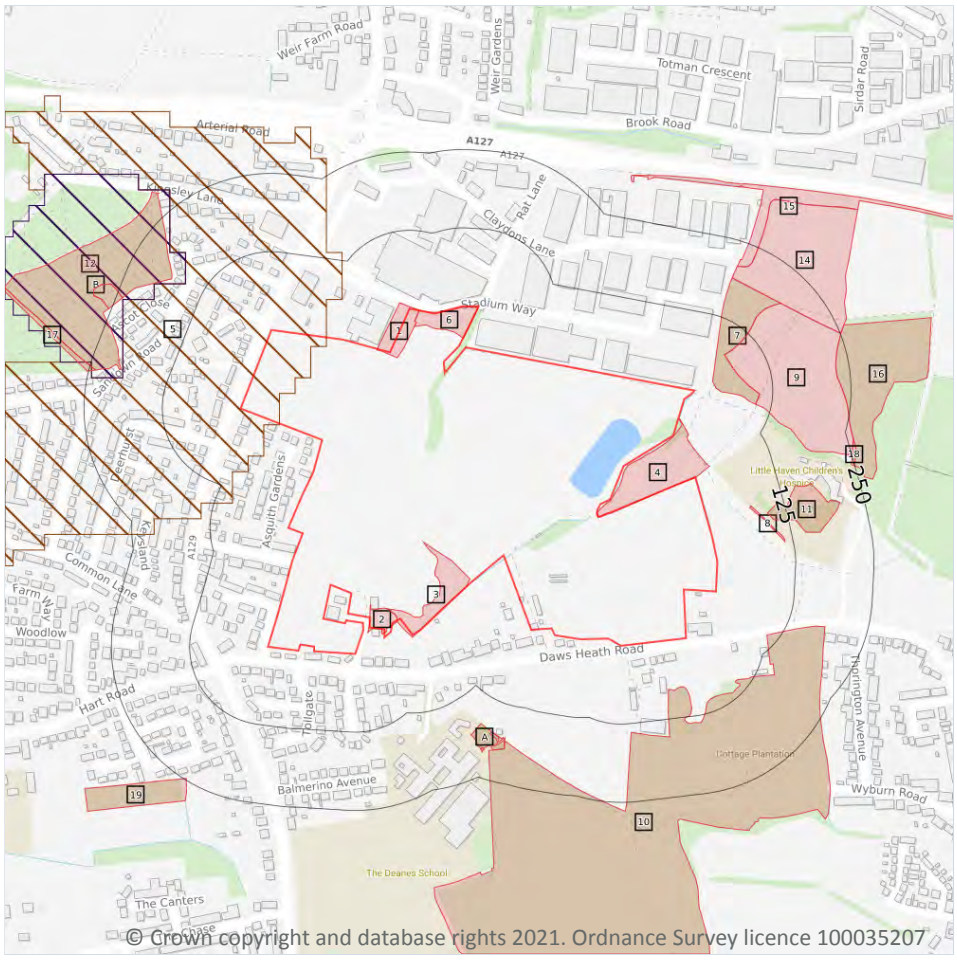
12.5 Countryside Stewardship Schemes

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	21

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 86**

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	On site	Good quality semi-improved grassland	Main habitat: GQSIG (FEP + HLS)

ID	Location	Main Habitat	Other habitats
6	**On site**	**Deciduous woodland**	**Main habitat: DWOOD (INV > 50%)**
7	32m NE	Deciduous woodland	Main habitat: DWOOD (INV > 50%)
8	70m E	Deciduous woodland	Main habitat: DWOOD (INV > 50%)
9	71m NE	No main habitat but additional habitats present	Additional: GQSIG (FEP 50%)
10	76m S	Deciduous woodland	Main habitat: DWOOD (INV > 50%)
11	95m E	No main habitat but additional habitats present	Main habitat: DWOOD (INV > 50%)
A	170m SW	Deciduous woodland	Main habitat: DWOOD (INV > 50%)
13	178m S	Deciduous woodland	Main habitat: DWOOD (INV > 50%)
B	179m NW	Lowland heathland	Main habitat: LHEAT (INV > 50%, ENSIS L1, FEP + HLS); DWOOD (INV > 50%)
14	187m NE	Good quality semi-improved grassland	Main habitat: GQSIG (FEP + HLS)
A	205m S	Deciduous woodland	Main habitat: DWOOD (INV > 50%)
15	210m N	Deciduous woodland	Main habitat: DWOOD (INV > 50%)
16	228m E	Deciduous woodland	Main habitat: DWOOD (INV > 50%)
17	240m W	Deciduous woodland	Main habitat: LHEAT (INV > 50%, FEP + HLS); DWOOD (INV > 50%)
B	240m W	Lowland heathland	Main habitat: LHEAT (INV > 50%, ENSIS L1, FEP + HLS)
18	245m E	Deciduous woodland	Main habitat: DWOOD (INV > 50%)
19	247m SW	No main habitat but additional habitats present	Main habitat: DWOOD (INV > 50%)

This data is sourced from Natural England.

13.2 Habitat Networks

Records within 250m **2**

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.

Features are displayed on the Habitat designations map on **page 86**

ID	Location	Type	Habitat
5	**On site**	**Network Enhancement Zone 2**	**Not specified**

ID	Location	Type	Habitat
12	156m NW	Primary Habitat	Lowland heathland

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 89**

ID	Location	Artificial	Superficial	Bedrock	Mass movement	Sheet No.
1	**On site**	**No coverage**	**No coverage**	**No coverage**	**No coverage**	**NoCov**

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	0

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.

This data is sourced from the British Geological Survey.

Geology 1:10,000 scale - Superficial

14.3 Superficial geology (10k)

Records within 500m	0

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.

This data is sourced from the British Geological Survey.

14.4 Landslip (10k)

Records within 500m	0

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.

This data is sourced from the British Geological Survey.

Geology 1:10,000 scale - Bedrock

14.5 Bedrock geology (10k)

Records within 500m	0

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.

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 93**

ID	Location	Artificial	Superficial	Bedrock	Mass movement	Sheet No.
1	**On site**	**Full**	**Full**	**Full**	**Full**	**EW258_259_southend_and_foulness_v4**

This data is sourced from the British Geological Survey.

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

15.2 Artificial and made ground (50k)

Records within 500m	0

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.

This data is sourced from the British Geological Survey.

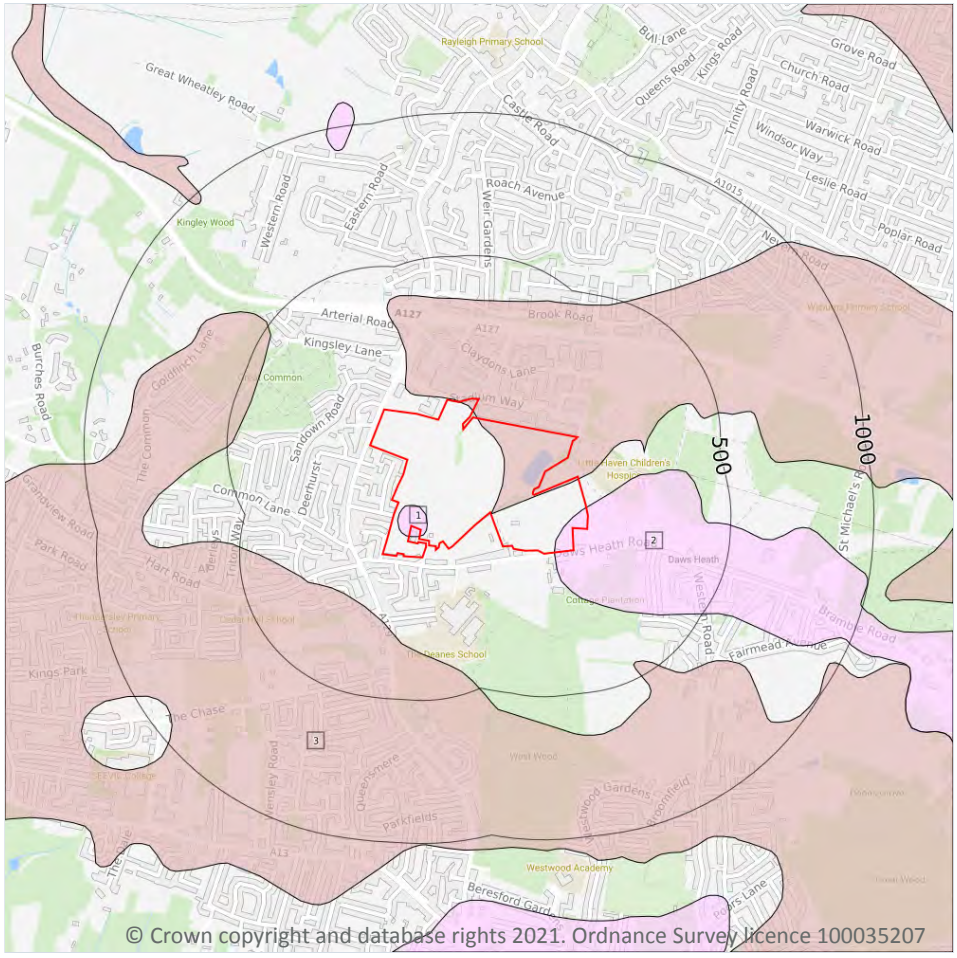
15.3 Artificial ground permeability (50k)

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 artificial 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 - 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 **3**

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 95**

ID	Location	LEX Code	Description	Rock description
1	On site	SUPD-XSV	SUPERFICIAL DEPOSITS	SAND AND GRAVEL
2	On site	GFDMP-XSV	GLACIOFLUVIAL DEPOSITS, MID PLEISTOCENE	SAND AND GRAVEL
3	On site	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	3

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	**Intergranular**	**Very High**	**High**
On site	**Intergranular**	**Very High**	**High**
On site	**Mixed**	**High**	**Very Low**

This data is sourced from the British Geological Survey.

15.6 Landslip (50k)

Records within 500m	0

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.

This data is sourced from the British Geological Survey.

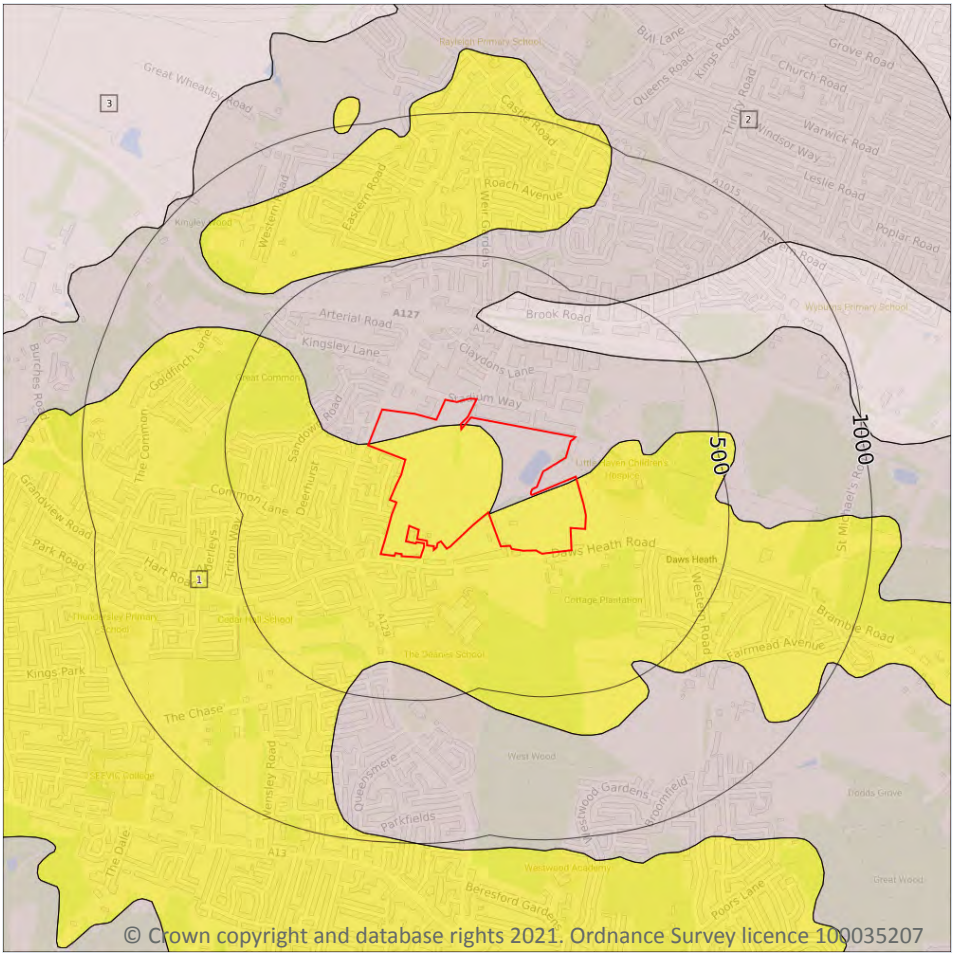
15.7 Landslip permeability (50k)

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	3

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 97**

ID	Location	LEX Code	Description	Rock age
1	**On site**	**BGS-S**	**BAGSHOT FORMATION - SAND**	**YPRESIAN**
2	**On site**	**CLGB-XCZS**	**CLAYGATE MEMBER - CLAY, SILT AND SAND**	**YPRESIAN**
3	250m N	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	4

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	**Intergranular**	**High**	**High**
On site	**Intergranular**	**High**	**High**
On site	**Mixed**	**High**	**Very Low**
On site	**Mixed**	**High**	**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	17

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.

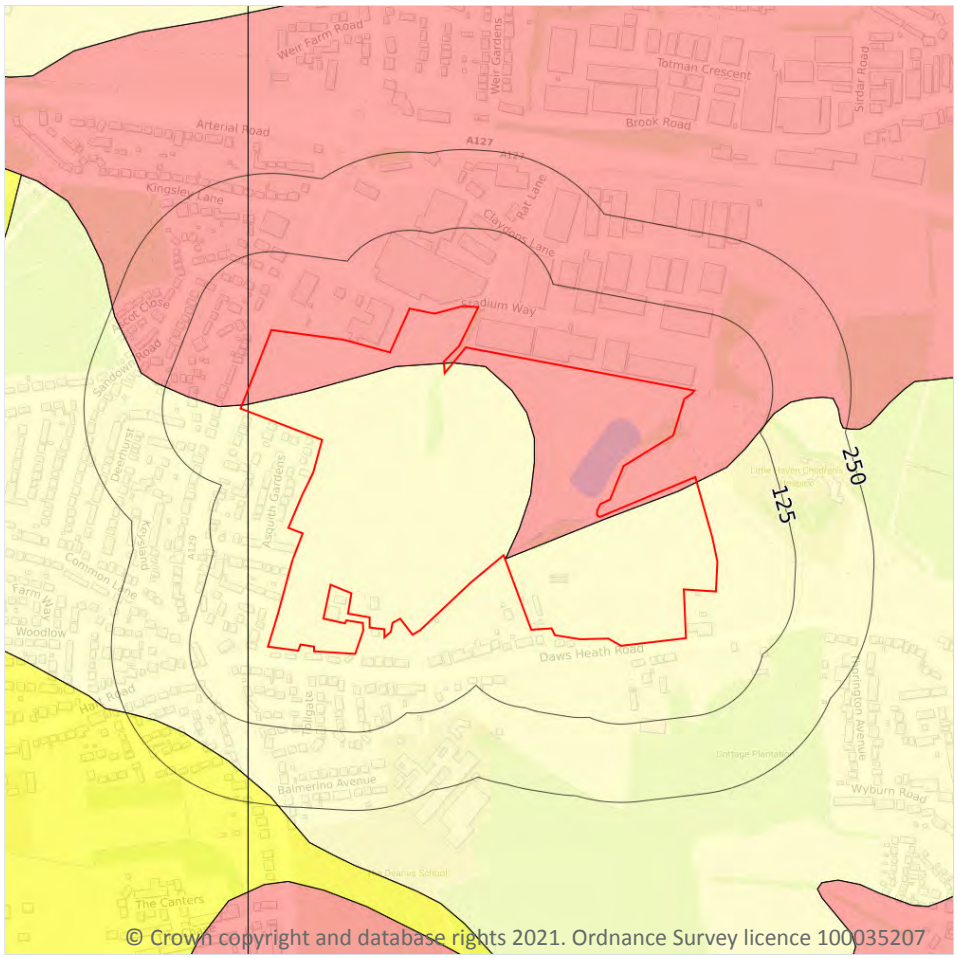
Features are displayed on the Boreholes map on **page 99**

ID	Location	Grid reference	Name	Length	Confidential	Web link
1	**On site**	**580340 189370**	**TAYLEIGH STADIUM TP 1**	**0.61**	**N**	**742284**
2	3m N	580700 189260	TAYLEIGH STADIUM 6	15.24	N	742278
3	15m SE	580360 189340	TAYLEIGH STADIUM 1	15.24	N	742273

ID	Location	Grid reference	Name	Length	Confidential	Web link
4	18m NW	580238 189386	ESX 0122 STADIUM TRADING ESTATE 1	8.0	N	20235548
5	30m N	580290 189410	TAYLEIGH STADIUM TP 2	0.61	N	742285
6	43m N	580490 189340	TAYLEIGH STADIUM 2	9.14	N	742274
7	63m N	580600 189340	TAYLEIGH STADIUM 7	9.14	N	742279
8	68m SE	580760 188830	FOULNESS PROJECT,HADLEIGH TQ88NW/A	11.0	N	742187
9	87m N	580730 189340	TAYLEIGH STADIUM 10	9.14	N	742282
10	89m NE	580420 189460	TAYLEIGH STADIUM 9	15.24	N	742281
11	107m N	580520 189400	TAYLEIGH STADIUM 8	15.24	N	742280
12	114m N	580610 189390	TAYLEIGH STADIUM 3	9.14	N	742275
13	165m N	580620 189440	TAYLEIGH STADIUM 11	9.14	N	742283
14	170m N	580700 189430	TAYLEIGH STADIUM 4	9.14	N	742276
15	199m N	580750 189450	TAYLEIGH STADIUM 5	9.14	N	742277
16	238m N	580420 189620	A127 (RAYLEIGH WEIR) 25	7.65	N	742203
17	241m N	580340 189630	A127 (RAYLEIGH WEIR) 23	6.0	N	742201

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	2

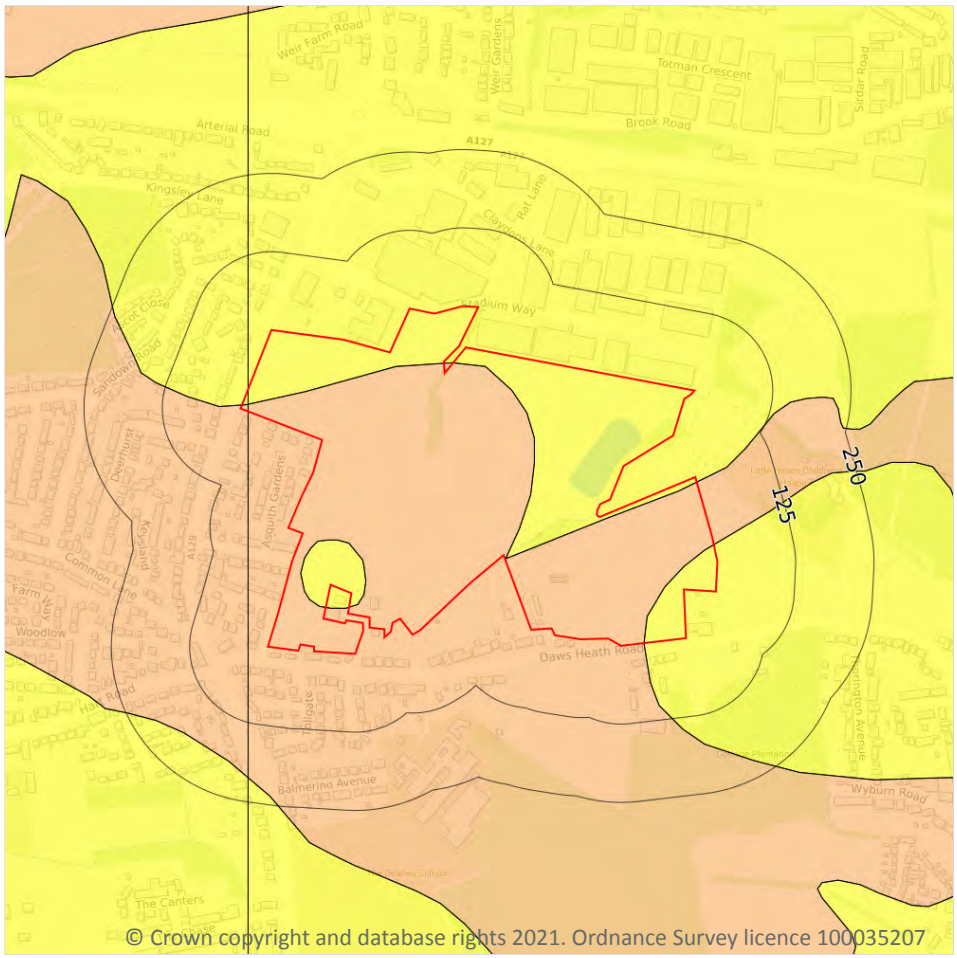
The potential hazard presented by soils that absorb water when wet (making them swell), and lose water as they dry (making them shrink). This shrink-swell behaviour is controlled by the type and amount of clay in the soil, and by seasonal changes in the soil moisture content (related to rainfall and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

Features are displayed on the Natural ground subsidence - Shrink swell clays map on **page 101**

Location	Hazard rating	Details
On site	**Negligible**	**Ground conditions predominantly non-plastic.**
On site	**Moderate**	**Ground conditions predominantly high plasticity.**

This data is sourced from the British Geological Survey.

Natural ground subsidence - Running sands



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.

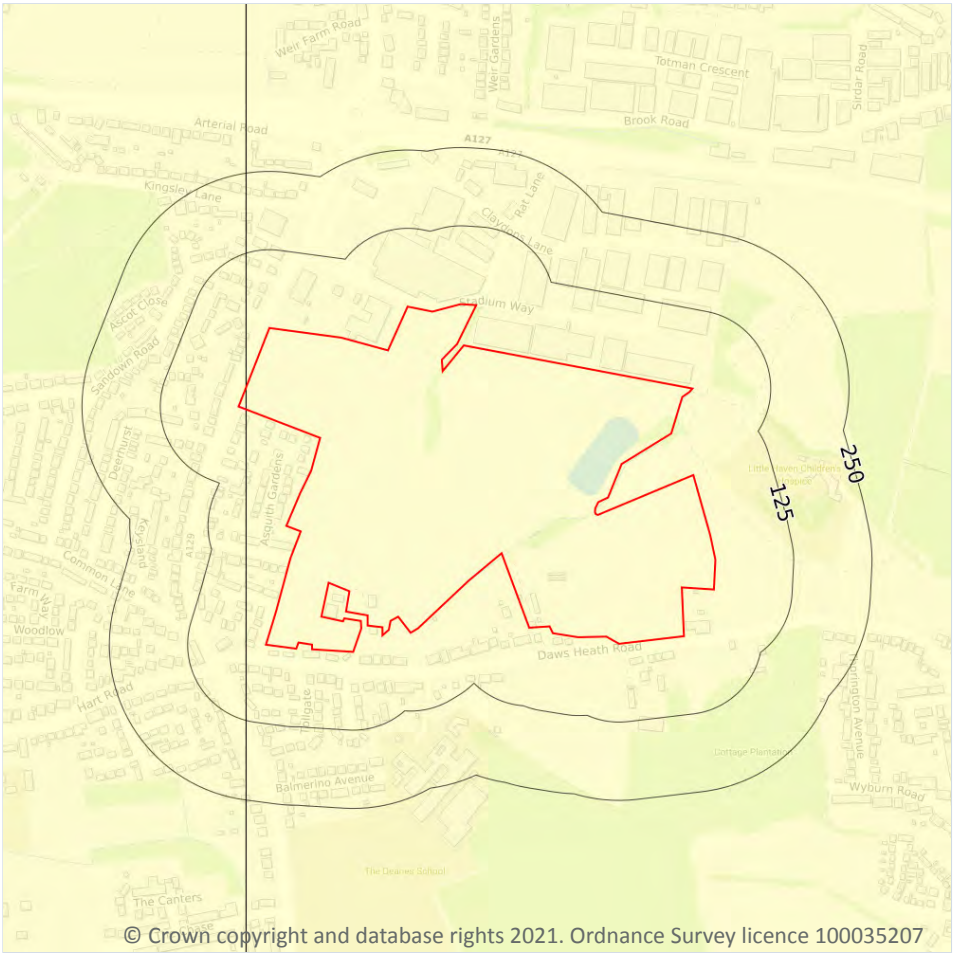
Features are displayed on the Natural ground subsidence - Running sands map on **page 102**

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	1

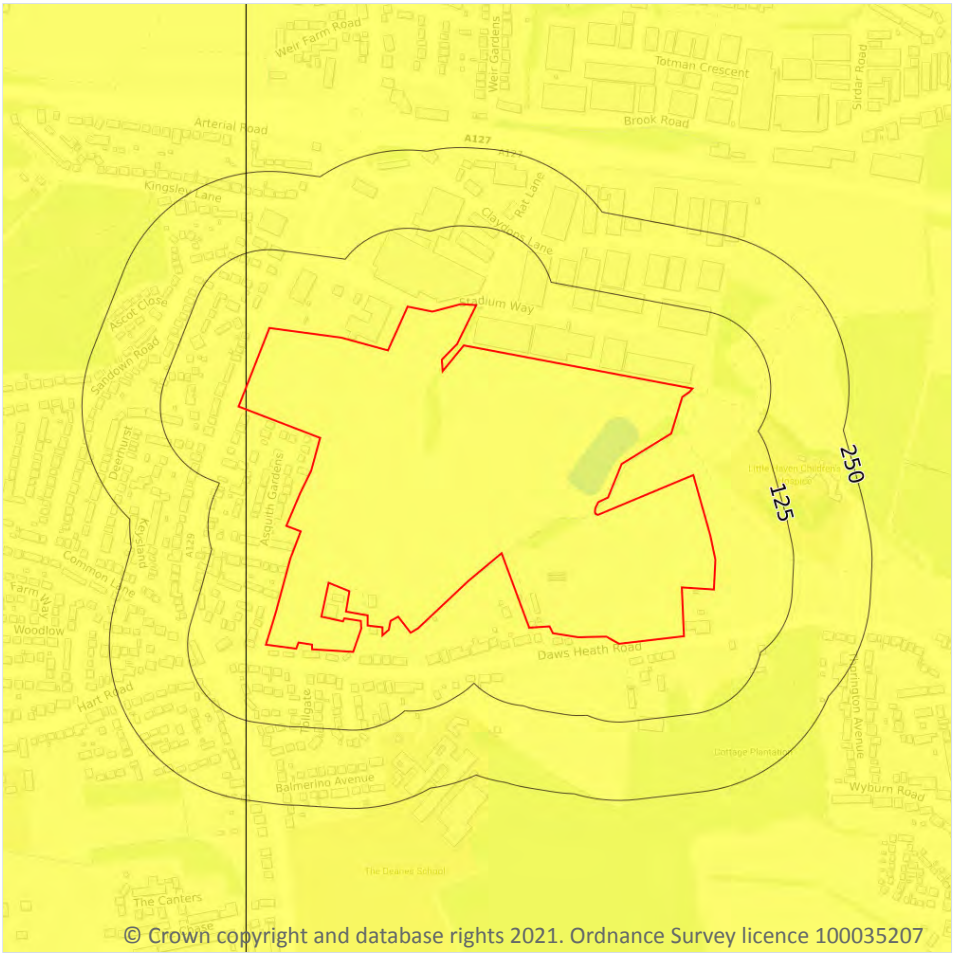
The potential hazard presented by types of ground that may contain layers of very soft materials like clay or peat and may compress if loaded by overlying structures, or if the groundwater level changes, potentially resulting in depression of the ground and disturbance of foundations.

Features are displayed on the Natural ground subsidence - Compressible deposits map on **page 104**

Location	Hazard rating	Details
On site	**Negligible**	**Compressible strata are not thought to occur.**

This data is sourced from the British Geological Survey.

Natural ground subsidence - Collapsible deposits



17.4 Collapsible deposits

Records within 50m	1

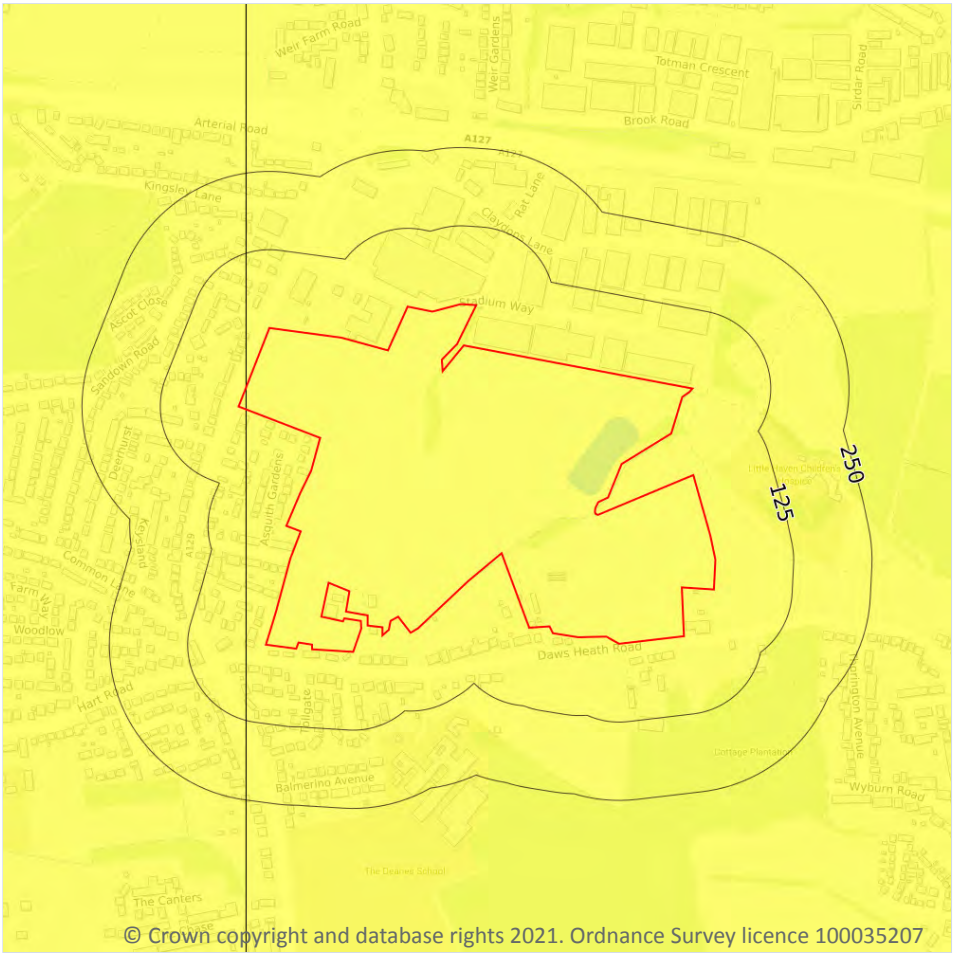
The potential hazard presented by natural deposits that could collapse when a load (such as a building) is placed on them or they become saturated with water.

Features are displayed on the Natural ground subsidence - Collapsible deposits map on **page 105**

Location	Hazard rating	Details
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



17.5 Landslides

Records within 50m	1

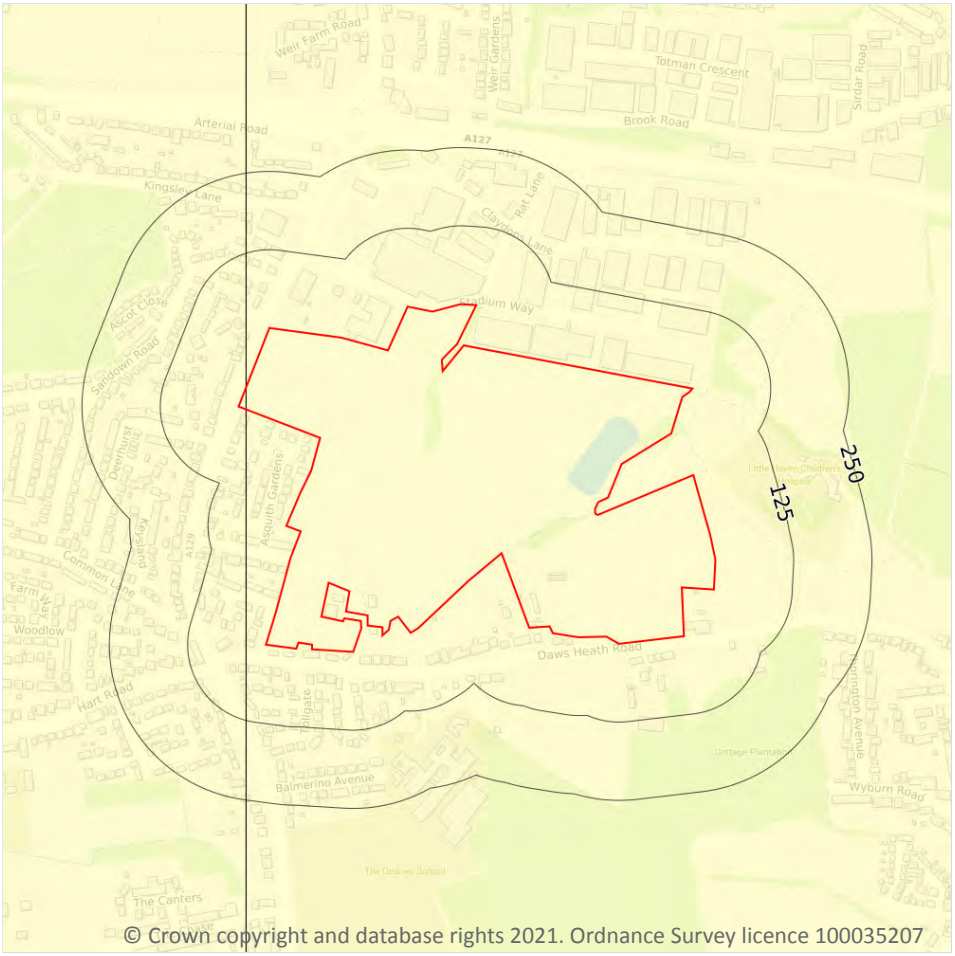
The potential for landsliding (slope instability) to be a hazard assessed using 1:50,000 scale digital maps of superficial and bedrock deposits, combined with information from the BGS National Landslide Database and scientific and engineering reports.

Features are displayed on the Natural ground subsidence - Landslides map on **page 106**

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

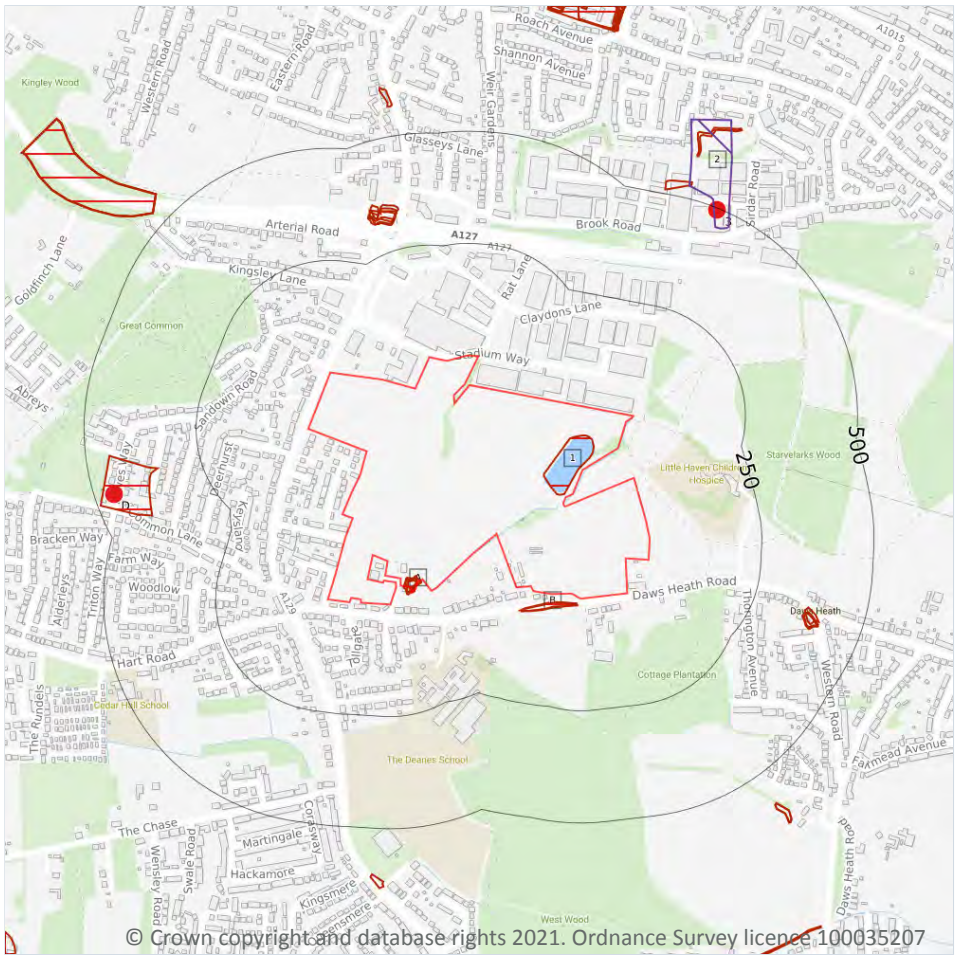
The potential hazard presented by ground dissolution, which occurs when water passing through soluble rocks produces underground cavities and cave systems. These cavities reduce support to the ground above and can cause localised collapse of the overlying rocks and deposits.

Features are displayed on the Natural ground subsidence - Ground dissolution of soluble rocks map on **page 107**

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



Site Outline

Search buffers in metres (m)

- Natural cavities (Area)
- Natural cavities (Point)
- BritPits
- Surface ground workings
- Underground workings
- Historical Mineral Planning Areas
- Mining Cavities

Non Coal Mining

- Sporadic underground mining of restricted extent possible
- Localised small scale underground mining possible
- Small scale mining possible
- Underground mining known or likely within or in close proximity
- Underground mining known within or in very close proximity

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 Stantec UK Ltd.

18.2 BritPits

Records within 500m	2

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.

Features are displayed on the Mining, ground workings and natural cavities map on **page 109**

ID	Location	Details	Description
D	457m W	Name: Thundersley Brick and Tile Works Address: Thundersley, BENFLEET, Essex Commodity: Clay & Shale Status: Ceased	Type: A surface mineral working. It may be termed Quarry, Sand Pit, Clay Pit or Opencast Coal Site Status description: Site which, at date of entry, has ceased to extract minerals. May be considered as Closed by operator. May be considered to have Active, Dormant or Expired planning permissions by Mineral Planning Authority
3	497m N	Name: Weir Brickworks Address: RAYLEIGH, Essex Commodity: Clay & Shale Status: Ceased	Type: A surface mineral working. It may be termed Quarry, Sand Pit, Clay Pit or Opencast Coal Site Status description: Site which, at date of entry, has ceased to extract minerals. May be considered as Closed by operator. May be considered to have Active, Dormant or Expired planning permissions by Mineral Planning Authority

This data is sourced from the British Geological Survey.

18.3 Surface ground workings

Records within 250m	7

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 109**

ID	Location	Land Use	Year of mapping	Mapping scale
1	**On site**	**Reservoir**	**1988**	**1:10000**
A	**On site**	**Pond**	**1867**	**1:10560**
A	**On site**	**Pond**	**1923**	**1:10560**
A	**On site**	**Pond**	**1938**	**1:10560**
A	**On site**	**Pond**	**1965**	**1:10560**
B	14m SW	Ponds	1938	1:10560

ID	Location	Land Use	Year of mapping	Mapping scale
B	15m SW	Ponds	1923	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	1

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.

Features are displayed on the Mining, ground workings and natural cavities map on **page 109**

ID	Location	Site Name	Mineral	Type	Planning Status	Planning Status Date
2	459m NE	Weir Brickworks	Brick clay	Surface mineral working	Valid	4/55

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 Stantec UK Ltd.

18.8 JPB mining areas

Records on site	0

Areas which could be affected by former coal and other 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

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 114**

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	23

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 km^2. 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 km^2; 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 mg/kg	No data	100 mg/kg	60 mg/kg	1.8 mg/kg	90 - 120 mg/kg	15 mg/kg
On site	15 mg/kg	No data	100 mg/kg	60 mg/kg	1.8 mg/kg	90 - 120 mg/kg	15 mg/kg
On site	15 mg/kg	No data	100 mg/kg	60 mg/kg	1.8 mg/kg	60 - 90 mg/kg	15 mg/kg
On site	15 mg/kg	No data	100 mg/kg	60 mg/kg	1.8 mg/kg	90 - 120 mg/kg	15 mg/kg
On site	15 mg/kg	No data	100 mg/kg	60 mg/kg	1.8 mg/kg	90 - 120 mg/kg	15 - 30 mg/kg
On site	15 mg/kg	No data	100 mg/kg	60 mg/kg	1.8 mg/kg	90 - 120 mg/kg	15 - 30 mg/kg
On site	15 mg/kg	No data	100 mg/kg	60 mg/kg	1.8 mg/kg	60 - 90 mg/kg	15 mg/kg
On site	15 mg/kg	No data	100 mg/kg	60 mg/kg	1.8 mg/kg	60 - 90 mg/kg	15 mg/kg
On site	15 mg/kg	No data	100 mg/kg	60 mg/kg	1.8 mg/kg	90 - 120 mg/kg	15 mg/kg
On site	15 mg/kg	No data	100 mg/kg	60 mg/kg	1.8 mg/kg	90 - 120 mg/kg	15 mg/kg
On site	15 mg/kg	No data	100 mg/kg	60 mg/kg	1.8 mg/kg	90 - 120 mg/kg	15 - 30 mg/kg
On site	15 mg/kg	No data	100 mg/kg	60 mg/kg	1.8 mg/kg	90 - 120 mg/kg	15 - 30 mg/kg
On site	15 mg/kg	No data	100 mg/kg	60 mg/kg	1.8 mg/kg	90 - 120 mg/kg	15 mg/kg
On site	15 mg/kg	No data	100 mg/kg	60 mg/kg	1.8 mg/kg	90 - 120 mg/kg	15 - 30 mg/kg
On site	15 mg/kg	No data	100 mg/kg	60 mg/kg	1.8 mg/kg	90 - 120 mg/kg	15 mg/kg
On site	15 mg/kg	No data	100 mg/kg	60 mg/kg	1.8 mg/kg	90 - 120 mg/kg	15 mg/kg
On site	15 mg/kg	No data	100 mg/kg	60 mg/kg	1.8 mg/kg	60 - 90 mg/kg	15 mg/kg
On site	15 mg/kg	No data	100 mg/kg	60 mg/kg	1.8 mg/kg	60 - 90 mg/kg	15 mg/kg

Location	Arsenic	Bioaccessible Arsenic	Lead	Bioaccessible Lead	Cadmium	Chromium	Nickel
On site	**15 mg/kg**	**No data**	**100 mg/kg**	**60 mg/kg**	**1.8 mg/kg**	**90 - 120 mg/kg**	**15 - 30 mg/kg**
On site	**15 mg/kg**	**No data**	**100 mg/kg**	**60 mg/kg**	**1.8 mg/kg**	**60 - 90 mg/kg**	**15 mg/kg**
On site	**15 mg/kg**	**No data**	**100 mg/kg**	**60 mg/kg**	**1.8 mg/kg**	**90 - 120 mg/kg**	**15 mg/kg**
On site	**15 mg/kg**	**No data**	**100 mg/kg**	**60 mg/kg**	**1.8 mg/kg**	**90 - 120 mg/kg**	**15 mg/kg**
32m W	15 mg/kg	No data	100 mg/kg	60 mg/kg	1.8 mg/kg	90 - 120 mg/kg	15 mg/kg

This data is sourced from the British Geological Survey.

20.2 BGS Estimated Urban Soil Chemistry

Records within 50m	**62**

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).

Location	Arsenic (mg/kg)	Bioaccessible Arsenic (mg/kg)	Lead (mg/kg)	Bioaccessible Lead (mg/kg)	Cadmium (mg/kg)	Chromium (mg/kg)	Copper (mg/kg)	Nickel (mg/kg)	Tin (mg/kg)
On site	**10**	**1.8**	**75**	**52**	**0.4**	**95**	**26**	**13**	**8**
On site	**10**	**1.8**	**66**	**45**	**0.4**	**101**	**26**	**14**	**7**
On site	**10**	**1.8**	**68**	**47**	**0.5**	**93**	**22**	**14**	**8**
On site	**10**	**1.8**	**64**	**44**	**0.5**	**81**	**17**	**12**	**8**
On site	**10**	**1.8**	**58**	**40**	**0.4**	**99**	**21**	**15**	**6**
On site	**10**	**1.8**	**50**	**34**	**0.5**	**98**	**16**	**15**	**6**
On site	**10**	**1.8**	**62**	**43**	**0.5**	**92**	**18**	**12**	**7**
On site	**10**	**1.8**	**48**	**33**	**0.5**	**94**	**15**	**14**	**6**
On site	**10**	**1.8**	**77**	**53**	**0.4**	**101**	**30**	**14**	**7**
On site	**10**	**1.8**	**48**	**33**	**0.5**	**97**	**16**	**15**	**6**
On site	**10**	**1.8**	**69**	**47**	**0.4**	**101**	**27**	**15**	**7**
On site	**10**	**1.8**	**47**	**32**	**0.5**	**96**	**15**	**15**	**6**
On site	**11**	**1.9**	**83**	**57**	**0.4**	**98**	**30**	**15**	**7**

Location	Arsenic (mg/kg)	Bioaccessible Arsenic (mg/kg)	Lead (mg/kg)	Bioaccessible Lead (mg/kg)	Cadmium (mg/kg)	Chromium (mg/kg)	Copper (mg/kg)	Nickel (mg/kg)	Tin (mg/kg)
On site	11	1.9	83	57	0.5	93	28	15	10
On site	11	1.9	81	56	0.4	94	29	14	9
On site	12	2.1	86	59	0.4	98	30	16	7
On site	12	2.1	84	58	0.5	91	27	17	13
On site	12	2.1	87	60	0.5	91	28	16	11
On site	13	2.3	99	68	0.4	93	32	18	9
On site	7	1.2	36	25	0.4	58	8	7	3
On site	8	1.4	46	32	0.4	77	11	9	4
On site	8	1.4	43	30	0.4	73	10	9	4
On site	8	1.4	41	28	0.4	71	10	9	4
On site	8	1.4	48	33	0.4	80	12	9	4
On site	8	1.4	41	28	0.4	70	10	10	4
On site	8	1.4	40	27	0.4	66	8	8	3
On site	8	1.4	43	30	0.5	73	9	8	4
On site	8	1.4	44	30	0.5	76	9	8	4
On site	9	1.6	51	35	0.4	84	15	11	5
On site	9	1.6	72	49	0.4	100	29	13	8
On site	9	1.6	68	47	0.4	98	26	12	7
On site	9	1.6	56	38	0.4	91	19	12	6
On site	9	1.6	47	32	0.4	83	13	11	5
On site	9	1.6	46	32	0.5	85	13	12	5
On site	9	1.6	66	45	0.4	100	26	12	7
On site	9	1.6	71	49	0.4	101	29	13	8
On site	9	1.6	65	45	0.4	96	23	12	7
On site	9	1.6	69	47	0.4	101	29	12	8
On site	9	1.6	50	34	0.5	90	16	12	6
On site	9	1.6	68	47	0.4	101	28	12	7

Location	Arsenic (mg/kg)	Bioaccessible Arsenic (mg/kg)	Lead (mg/kg)	Bioaccessible Lead (mg/kg)	Cadmium (mg/kg)	Chromium (mg/kg)	Copper (mg/kg)	Nickel (mg/kg)	Tin (mg/kg)
On site	**9**	**1.6**	**55**	**38**	**0.4**	**88**	**18**	**11**	**6**
On site	**9**	**1.6**	**67**	**46**	**0.4**	**100**	**27**	**12**	**7**
On site	**9**	**1.6**	**70**	**48**	**0.4**	**101**	**29**	**14**	**7**
On site	**9**	**1.6**	**45**	**31**	**0.5**	**86**	**13**	**12**	**5**
On site	**9**	**1.6**	**54**	**37**	**0.5**	**78**	**13**	**10**	**5**
1m SE	6	1	33	23	0.4	53	7	7	3
5m NE	11	1.9	63	43	0.4	100	23	17	7
11m N	11	1.9	77	53	0.3	103	30	17	7
15m N	10	1.8	76	52	0.3	103	30	17	7
16m NW	14	2.5	100	69	0.4	94	31	18	7
20m W	13	2.3	98	67	0.4	92	32	18	11
24m NE	11	1.9	57	39	0.4	99	20	16	6
32m SW	13	2.3	98	67	0.6	93	40	22	18
34m SW	10	1.8	65	45	0.5	80	17	13	8
35m N	11	1.9	76	52	0.3	103	29	19	7
39m SW	13	2.3	92	63	0.6	91	30	20	16
42m NE	10	1.8	52	36	0.5	98	18	16	6
45m S	9	1.6	51	35	0.5	77	11	9	5
46m W	13	2.3	99	68	0.5	91	33	19	14
47m SE	6	1	30	21	0.3	46	6	6	2
47m SE	7	1.2	37	25	0.4	63	7	7	3
49m NW	12	2.1	90	62	0.4	99	30	18	7

This data is sourced from the British Geological Survey.

20.3 BGS Measured Urban Soil Chemistry

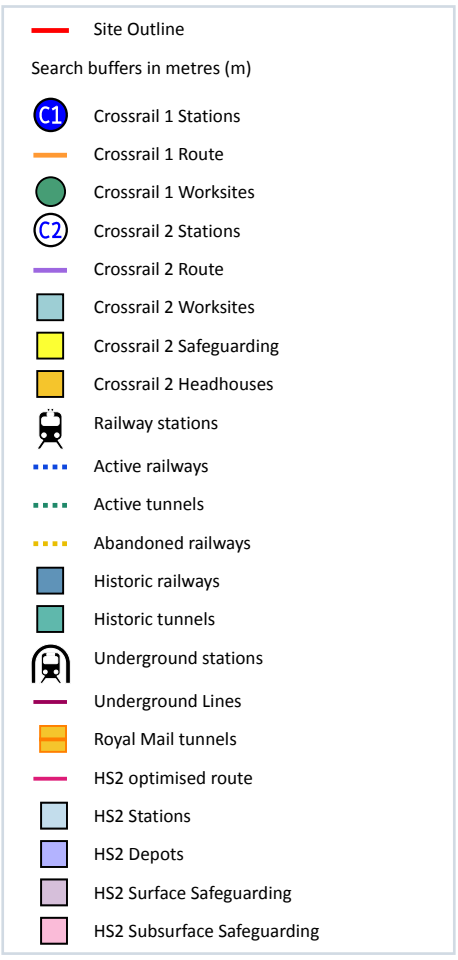
Records within 50m	**2**

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.

Location	Arsenic (mg/kg)	Cadmium (mg/kg)	Chromium (mg/kg)	Copper (mg/kg)	Nickel (mg/kg)	Lead (mg/kg)	Tin (mg/kg)	Sample Type
On site	**8.8**	**0.4**	**101.0**	**29.3**	**12.0**	**68.7**	**7.6**	**Topsoil**
37m E	10.4	0.5	97.3	15.3	14.9	47.5	6.1	Topsoil

This data is sourced from the British Geological Survey.

21 Railway infrastructure and projects



21.1 Underground railways (London)

Records within 250m	0

Details of all active London Underground lines, including approximate tunnel roof depth and operational hours.

This data is sourced from publicly available information by Groundsure.

21.2 Underground railways (Non-London)

Records within 250m	0

Details of the Merseyrail system, the Tyne and Wear Metro and the Glasgow Subway. Not all parts of all systems are located underground. The data contains location information only and does not include a depth assessment.

This data is sourced from publicly available information by Groundsure.

21.3 Railway tunnels

Records within 250m	0

Railway tunnels taken from contemporary Ordnance Survey mapping.

This data is sourced from the Ordnance Survey.

21.4 Historical railway and tunnel features

Records within 250m	3

Railways and tunnels digitised from historical Ordnance Survey mapping as scales of 1:1,250, 1:2,500, 1:10,000 and 1:10,560.

Features are displayed on the Railway infrastructure and projects map on **page 120**

Location	Land Use	Year of mapping	Mapping scale
120m SE	Railway Sidings	1897	2500
158m N	Railway Sidings	1961	2500
188m N	Railway Sidings	1961	2500

This data is sourced from Ordnance Survey/Groundsure.

21.5 Royal Mail tunnels

Records within 250m	0

The Post Office Railway, otherwise known as the Mail Rail, is an underground railway running through Central London from Paddington Head District Sorting Office to Whitechapel Eastern Head Sorting Office. The line is 10.5km long. The data includes details of the full extent of the tunnels, the depth of the tunnel, and the depth to track level.

This data is sourced from Groundsure/the Postal Museum.

21.6 Historical railways

Records within 250m	0

Former railway lines, including dismantled lines, abandoned lines, disused lines, historic railways and razed lines.

This data is sourced from OpenStreetMap.

21.7 Railways

Records within 250m	0

Currently existing railway lines, including standard railways, narrow gauge, funicular, trams and light railways.

This data is sourced from Ordnance Survey and OpenStreetMap.

21.8 Crossrail 1

Records within 500m	0

The Crossrail railway project links 41 stations over 100 kilometres from Reading and Heathrow in the west, through underground sections in central London, to Shenfield and Abbey Wood in the east.

This data is sourced from publicly available information by Groundsure.

21.9 Crossrail 2

Records within 500m	0

Crossrail 2 is a proposed railway linking the national rail networks in Surrey and Hertfordshire via an underground tunnel through London.

This data is sourced from publicly available information by Groundsure.

21.10 HS2

Records within 500m	0

HS2 is a proposed high speed rail network running from London to Manchester and Leeds via Birmingham. Main civils construction on Phase 1 (London to Birmingham) of the project began in 2019, and it is currently anticipated that this phase will be fully operational by 2026. Construction on Phase 2a (Birmingham to Crewe) is anticipated to commence in 2021, with the service fully operational by 2027. Construction on Phase 2b (Crewe to Manchester and Birmingham to Leeds) is scheduled to begin in 2023 and be operational by 2033.

This data is sourced from HS2 ltd.

Data providers

Groundsure works with respected data providers to bring you the most relevant and accurate information. To find out who they are and their areas of expertise see https://www.groundsure.com/sources-reference.

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