



# **Maldon District Council**

## **Report on Local Geological Sites**



**Prepared for Maldon District Council by**

**Jeff Saward    Chair, GeoEssex**

**Ros Mercer    Secretary, GeoEssex**

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### *Cover photographs:*

Above: Derived rocks and Roman bricks in the wall of St. Giles Hospital, Maldon

Below: The London Clay cliff between Burnham-on-Crouch and Althorne



## 1. Introduction

The rocks beneath the Essex landscape are a record of the county's prehistory. They provide evidence for ancient volcanoes, deserts, glaciers and deep seas. Some rocks also contain remarkable fossils, from subtropical sharks and crocodiles to Ice Age hippos and mammoths. The geology of Essex is a story that stretches back over 100 million years.

### GeoEssex

GeoEssex is the primary source of information about the geology and physical landscape of Essex. The GeoEssex team, or 'Steering Group', consists of professional and amateur geologists, representatives from local authorities, geological and natural history societies, and from Natural England, the Government's nature conservation body.

GeoEssex promotes geology in all its aspects, from quarries, cliffs and boulders to spas, springs and building stones. The fascinating and often magical world of geology is all around us, if only we know where to look.

A primary task of GeoEssex is to identify the best places in Essex to find out about the Earth's distant past and the landscape processes going on today. These sites are called Local Geological Sites, or LoGS (formerly called Regionally Important Geological Sites or RIGS).

GeoEssex aims to advocate and represent geodiversity in planning processes and other initiatives.



*Spectacular chalk cliff at Chafford Gorges Nature Park, Thurrock. The cliff represents a section through an ancient sea floor that existed across England about 80 million years ago. The Chalk is present beneath the whole of Essex, appearing at the surface only in the north and south of the county.*

## Geodiversity

### What is geodiversity and why is it important?

Geodiversity is an integral part of the natural environment. It is the variety of rocks, fossils, minerals, landforms and soil, and all the natural processes that shape the landscape.

The only record of the history of our planet lies in the rocks beneath our feet. Here, and only here, can we trace the cycles of change that have shaped the Earth in the past, and that will continue to do so in the future. This is particularly true in Essex, where the record of climate change during the Ice Age is preserved in our quarries and coastal cliffs. The record is unique and much of it is surprisingly fragile.

Apart from the obvious benefits of providing mineral resources such as sand, gravel, chalk and clay, the diversity of the geology is what shapes the landscape, influencing soils, and in turn influencing all of our habitats and species. Geodiversity also has a cultural role to play, influencing the character of our built environment through building stones, providing inspiration to art, and helping to define where we live and our 'sense of place'. It is the link between geology, landscape, nature and people.

And, of course, it must not be forgotten that *almost everything we know about the Earth's distant past has been learnt by studying geological sites.*

## Local and national Geodiversity Action Plans

The UK Geodiversity Action Plan (UKGAP) sets out a shared framework for geodiversity action across the UK. It establishes a common aim, themes and targets which link national, regional and local activities. It encompasses how geodiversity can inspire people and what needs to happen to conserve Britain's geodiversity. The Plan for Essex has been drawn up within this framework.

A Local Geodiversity Action Plan (LGAP) has been produced for Essex. It sets out a framework for geodiversity action in Essex. It is an essential document to conserve the County's geodiversity.

The Essex Local Geodiversity Action Plan aims to:

- *Identify, conserve and enhance the best sites that represent the geological history of an area in a scientific, educational, recreational and cultural setting.*
- *Promote geological sites and make geoconservation relevant to people.*
- *Provide a local geodiversity audit (an audit of sites and skills).*
- *Influence local planning policy.*





## 2. The Geology of Essex

Compared to most other parts of Britain the rocks of Essex and adjoining counties are young in geological terms. Even the oldest surface rock in Essex (the Chalk) is only about 80 million years old. Much older rocks are, however, present at depth. We have some idea about these ancient rocks because of the records of boreholes that have been sunk in search of coal and oil.

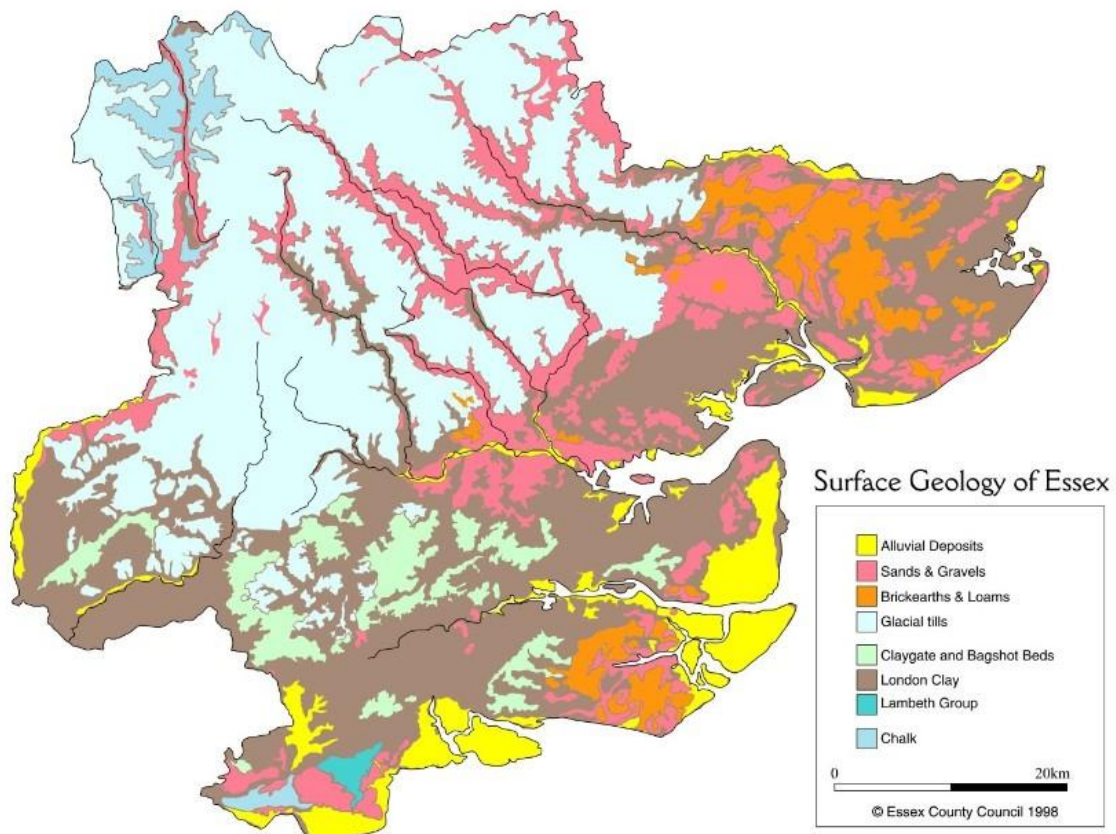
The surface rocks of Essex that were formed before the Ice Age (from the Chalk to the Red Crag) are described as the 'bedrock' or 'solid' geology. Much of this bedrock geology is concealed beneath the deposits left behind by glaciers and rivers during the Ice Age. The material laid down during the Ice Age is known as 'Superficial' or 'drift' deposits.

Era	Period or Epoch		Approx. age in millions of years	Geological formations in Essex
Caenozoic	Quaternary Ice Age	Holocene	0.01	Recent peat and alluvium
		Pleistocene	0.45  1  2.4	River terrace deposits and brickearth (loess)
				Boulder clay (till) and glacial gravel
				Kesgrave (Thames) sands and gravels
				Norwich Crag (Chillesford Sand)
				Red Crag
	Pliocene		10	<i>No evidence of rocks of this age in Essex but derived Miocene and Pliocene fossils are found in the Red Crag</i>
	Miocene			
	Oligocene		20	
	Eocene		50	Bagshot Sand Claygate Beds London Clay (includes the Harwich Formation)
	Palaeocene		55	Lambeth Group (Woolwich and Reading Beds) Thanet Sand
	Mesozoic	Cretaceous		80 100
Jurassic		150	<i>No evidence of rocks of these ages beneath Essex with the exception of Jurassic Oxford Clay in a graben (a sunken part of the crust bordered by faults) beneath East Tilbury.</i>	
Triassic		220		
Palaeozoic		Permian		250
	Carboniferous		300	
	Devonian		400	Shales and mudstones dating from these periods occur at depth (about 300 meters) beneath Essex
	Silurian		420	
	Ordovician		450	
	Cambrian		500	<i>No evidence beneath Essex, however, boreholes have not been drilled deep enough to confirm.</i>
Pre-Cambrian	Precambrian	Age of Earth 4,600		

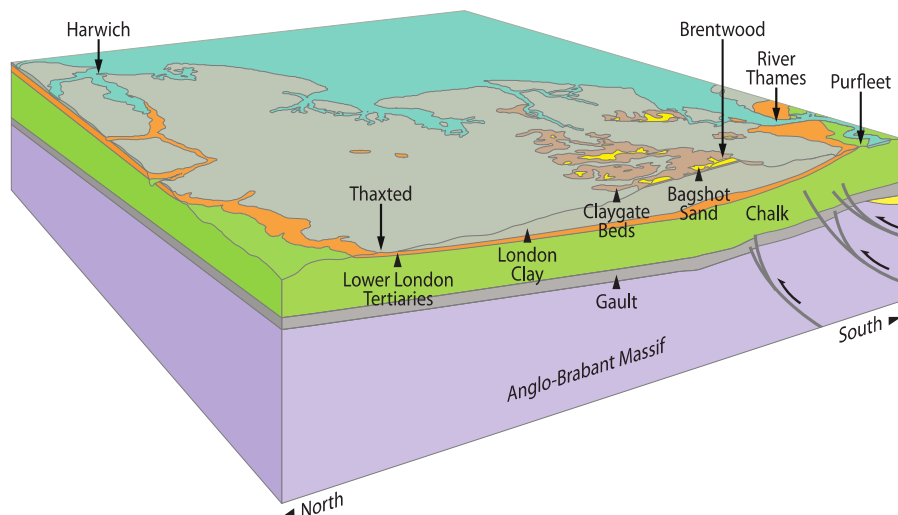


## Map of Essex Geology

Geological map of Essex showing all the rocks exposed at the surface, bedrock and superficial deposits. An example of a superficial deposit is boulder clay or glacial till left behind by the Anglian Ice Sheet during the Ice Age (shown in pale blue). Map courtesy of the British Geological Survey.



## Cross-section through the bedrock of Essex





## Essex through geological time

It is difficult to know where to begin with our geological story but the earliest evidence we have is the hard rocks deep beneath Essex that were formed some 400 million years ago in the Silurian and Devonian periods (part of the Palaeozoic era) and form what is known as the 'Palaeozoic basement' of Essex.

### *Deserts to Dinosaurs*

- For a very long time (and before the age of the dinosaurs) these hard Silurian and Devonian rocks formed the surface of the land that was eventually to become Essex. During the Permian and Triassic periods Essex was a desert upland in the middle of a vast continent known as Pangea.
- By 200 million years ago, at the start of the Jurassic period, tropical seas had spread around this land forming a dinosaur-infested, forested island.

### *Buried Island*

- If you could dig down 1000 feet (300 metres) under Essex you would reach the hard rocks of that dinosaur island.
- All trace of forests and animals from this time have been swept away from the eroded surface of the island, so there are no dinosaur fossils in Essex.
- By 100 million years ago, in the Cretaceous period, the sea flooded across the island to spread **Gault Clay** and **Greensand**. The sea then deepened to deposit hundreds of metres of soft white limestone known as **Chalk** all over the island as well as much of what is now Britain.

### *Pebbles and Clay*

- The North Atlantic Ocean, which did not previously exist, began to open out to the west, the land of Essex lifted, chalk hills were worn down and flints were eroded out. Billions of these flints were tumbled on beaches to form layers of sand and beautifully rounded pebbles across our area.
- Around 50 million years ago, in the Eocene period, a deep sea fed by muddy rivers spread across what is now Essex and London depositing a great thickness of clay, the **London Clay**, on the sea floor, together with the remains of many plants such as palms and cinnamon, and animals including birds, sharks, turtles, and tiny horses. Atlantic volcanoes poured their ash into this sea.

### *The Alps and the Thames*

- Colliding continents pushed up south and mid-Essex, bending the crust to form the vale of the Thames river system through mid-Essex. About 2.4 million years ago offshore sandbanks formed red shelly sandstone layers across north Essex known as the **Red Crag**.
- Global cooling led to the Ice Age (the Pleistocene epoch), with many warm periods such as the one we are in right now, which is known as the Holocene. As the sea retreated, the ancestral River Thames spread a succession of flint-rich river gravels across the middle of Essex, through Harlow, Chelmsford and Colchester, and out across the area where the North Sea is now.

### *Ice and people cover Essex*

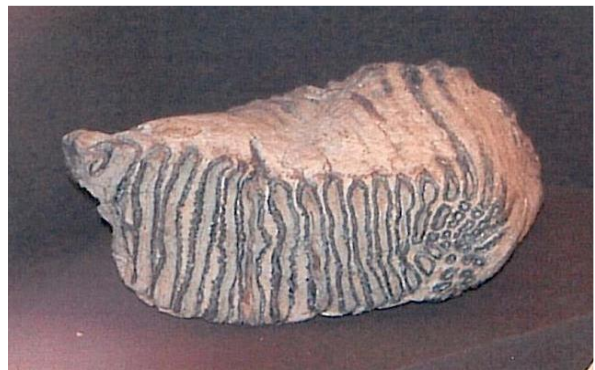
- During an exceptionally cold stage 450,000 years ago a gigantic ice sheet covered most of Britain and Essex as far south as Hornchurch. The moving ice diverted the Thames towards its present-day course and dumped its load of boulder clay, or glacial till, on top of these old Thames gravels.
- During the past million years of the Ice Age, there have been numerous cold and warm stages (right now we are in a warm period known as the Holocene) and humans have migrated to and from Essex, together with the animals they have hunted. They have left thousands of flint tools and tool-making debris on the banks of the ever-changing Thames and its tributaries.

## 3. Background to Geological Site designation in Maldon

### What is special about Essex Geodiversity?

Essex is an area of predominantly subdued relief with gentle slopes, the result of its underlying geology of soft, relatively young rocks. These generally yield fertile soils. The result is an attractive 'lived in' landscape dominated by arable agriculture, but still retaining forested and heathland areas, particularly where gravels and sands, many of glacial and fluvial origin, have yielded poorer soils.

Although lacking the more dramatic geology and landforms of many 'hard rock' areas, Essex geology and geomorphology is still of great interest, possessing abundant evidence of the huge environmental and biodiversity changes that our area has witnessed over the last 100 million years. Among the key themes are dramatic and sometimes long-lasting changes in the distribution of land and sea, major shifts in climate, and mass species extinctions. Many of these phenomena are of great relevance today, and so an understanding of our past is essential in interpreting the challenges to come.



*A mammoth tooth from Essex*

### Geodiversity's influence on Essex's development

Essex's geodiversity has exerted a major influence on land use, agriculture and landscape.

The distribution of less fertile ancient river and glacial gravels has been a major influence on historical land use, resulting in the preservation through to the present day of extensive tracts of woodland and to a lesser extent heathland, in a predominantly arable county. These are of great significance both for biodiversity and recreation.

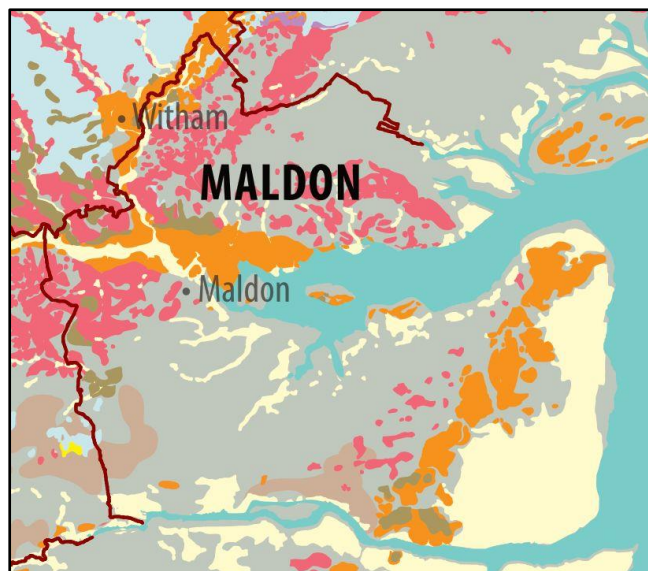
The chalky boulder clay, or glacial till, found north and west of Chelmsford is highly suitable for cereal cultivation, especially wheat. London Clay outcrops south and east of Chelmsford, especially on the Dengie peninsula, providing soils less suitable for arable agriculture and more suited to pasture. The brickearth of the Tendring district is the basis of the rich agricultural land of this peninsula.

In earlier times rivers penetrating deep inland, together with proximity to the Continent, provided a succession of invaders and colonisers – from Palaeolithic peoples, through to Roman, Viking and Saxon – with easy access.

The deposits of the ancestral Thames and its tributaries and associated glacial outwash deposits have provided Essex with a source of gravel and sand for construction since Roman times. A special kind of gravel naturally cemented by iron called ferricrete was used extensively as a building stone and is found in many medieval churches, notably at St. Andrew's, Heybridge.



## The Geology of the Maldon Area



	Recent alluvium	
	Coversand/Brickearth	Ice Age deposits 2.58 million to 11,700 years ago
	Post-Anglian river deposits	
	Glacial Till	
	Kesgrave sand and gravel	
	London Clay	Eocene 54 - 52 million years ago

The pre-Ice Age (bedrock) geology of the district is London Clay which is seen at the surface in much of the south of the area, especially around the Blackwater Estuary and to the west of Burnham-on-Crouch on the River Crouch. It was laid down on the floor of a subtropical sea 54 - 52 million years ago and forms characteristic heavy soils and muddy river foreshores and is renowned for its well-preserved fossils. In the south of the area, on the higher ground as at Purleigh and Althorne, the London Clay is overlain by Claygate Beds.

After a long period for which we have no geological record, about 2.5 million years ago in the early stages of the Ice Age, an ancient course of the Thames flowed across central Essex, north of the Maldon District, and an early course of the Medway crossed eastern Essex, parallel with the present coastline. Later, during the Anglian cold stage, about 450,000 years ago, an ice sheet reached as far south as the high ground around Wickham Bishops and Braxted, though a lobe was able to extend through a gap, now occupied by the River Blackwater, to Maldon and it was thick enough to lay down some outwash gravels on the higher ground.

The ice radically changed the landscape by diverting the early Thames into its present valley and it flowed to the Southend area where it joined the early Medway to continue northward to the Clacton area, about 400,000 to 300,000 years ago. The ribbon of flooded gravel pits stretching across the Dengie Peninsula from Burnham-on-Crouch to Bradwell-on-Sea mark this former route of the Thames-Medway. At broadly the same time, in the Maldon area, the Blackwater and Chelmer were established laying down sands and gravels, which can be traced to Tollesbury and Clacton. At lower levels, these sands and gravels were extensively worked in the extraction pits around Heybridge, Great Totham and Chigborough Farm.

Along the coast, the extensive marshland built up over the last 20,000 years, with interesting shell banks in the Bradwell area, known as cheniers.



## Geodiversity and National Planning Policy

The importance of geodiversity as an integral part of nature conservation and the planning system is reflected in The National Planning Policy Framework (NPPF), and in legislation – Wildlife & Countryside Act 1981 and Countryside and Rights of Way Act 2000.

The NPPF states that:

“Planning policies and decisions should contribute to and enhance the natural and local environment by protecting and enhancing valued landscapes, sites of biodiversity or geological value and soils” (Paragraph 174).

“Plans should protect and enhance biodiversity and geodiversity” (Paragraph 179).

The current Maldon District Local Development Plan (Policy N2 – Natural Environment, Geodiversity and Biodiversity), approved in July 2017, states that:

“The Council will seek to protect and enhance the biodiversity, geodiversity and recreational value of any identified sites of local importance such as Local Wildlife Sites (LWS), Regionally Important Geological Sites (RIGS), Local Geological Sites (LoGS), Local Nature Reserves (LNR), and any other sites of potential ecological value.” (Policy Clarifications 6.18, page 104)

## Site designations

The most important geodiversity sites have been declared as **Sites of Special Scientific Interest** (SSSIs) which are statutorily protected for their scientific importance.

The next tier of geodiversity sites are known as **Local Geological Sites** (LoGS) These have replaced the earlier ‘Regionally Important Geological Sites’ (RIGS) terminology in line with government guidance.



*A typical Local Geological Site – Great Totham Jubilee Recreation Grounds – showing exposed gravels from the early Ice Age.*

*Sites like these are valuable for research and education but can easily be obscured or destroyed.*



Local Geological Sites (LoGS) are broadly equivalent to Local Wildlife (species and habitats) Sites ('LoWS') but have a broader remit as they can be designated for their scientific, educational, historical and recreational benefits. Typical Essex LoGS include quarries, pits, walls, boulders, cliffs, springs, and river meanders. Local Wildlife Sites and Local Geological Sites are both designed to provide a system of locally valued, non-statutory sites.

Most importantly, the NPPF gives Local Geological Sites a weighting equal to Local Wildlife Sites, and both are collectively referred to as 'Local Sites'. However, in actuality the attention and priority afforded to the designation and management of LoGS has historically lagged, and continues to lag, well behind that of LoWS.

## 4. Objectives of current report

### Supporting Local Planning Authorities

Biodiversity protection is familiar to planning authorities but geodiversity less so. This report will assist planning authorities in meeting their obligations under the National Planning Policy Framework and helping them identify potential development impacts on LoGS.

GeoEssex is therefore seeking to help Local Planning Authorities fulfil their responsibilities with respect to geodiversity.

*"Local and neighbourhood plans and planning decisions have the potential to affect biodiversity or geodiversity outside as well as inside designated areas of importance for biodiversity or geodiversity"* (extract from: [www.gov.uk/guidance/natural-environment](http://www.gov.uk/guidance/natural-environment))

Further guidance on statutory obligations is given in Circular 06/2005 (*Biodiversity and Geological Conservation*). Geodiversity should be therefore included alongside biodiversity in local authorities' Local Plans. Identifying these non-statutory sites therefore helps local authorities to meet their obligations.

LoGS can also contribute to *sustainability* programmes by providing information about a key element of the environment that contributes to our natural heritage. In addition, the *awareness raising* and *education* function fits well with the principle of community involvement and enabling people to regain their sense of place.



*The Goldhanger village well, a rare example of an artesian well with a wheel pump, drilled in 1921 to a depth of 60 metres into the water-bearing chalk deep below the village.*

## 5. Site selection

### Site Selection and Notification to Planning Authorities

LoGS in Essex are identified by **GeoEssex**, a largely voluntary group composed of representatives from the major Essex geological and conservation bodies and supported by the Essex Field Club, Essex Rock & Mineral Society, Essex Wildlife Trust, Natural England and Essex County Council (Place Services). The site selection process is based on clearly defined criteria (see below) and includes scientific, educational, historical, and aesthetic values. When selecting sites GeoEssex aims to gain the support of landowners whenever possible. The majority of LoGS are on private land and site selection does not infer any right of access.

Like LoWS, proposed LoGS are presented to the Local Sites Partnership for endorsement and then passed to local authorities for inclusion in their Local Plans. Local authorities receive a citation and boundary map.

The sites selected as LoGS in the Maldon district are summarised below, together with a list of other sites which are potential LoGS. Other sites may be identified in the future, occasioned by housing or other development and restoration following mineral extraction.

### Site protection

Like their biodiversity counterparts, LoGS have no statutory protection and the conservation and management of individual sites relies heavily on the support of landowners. Inclusion within local plans also forms a vital role in the protection of LoGS. An example of a comprehensive natural environment policy incorporating geodiversity can be provided on request.

It is recommended that the Local Sites Partnership should be consulted if any development is proposed that would affect a LoGS.

### Site Assessment Criteria

The assessment criteria used for identifying LoGS are based on DEFRA document *Local Sites: Guidance on their identification, selection and site management* (2006). The guidance states that assessment is a matter of judgement but must be based on an understanding of geological principles and processes, and the distribution and abundance of the resource (national, regional and local). Those sites selected must be 'of substantive importance to the geodiversity of the local area.'

There are four value categories: scientific, educational, historical, and aesthetic. A site qualifies for notification as a Local Geological Site if it fulfils the criteria under one or more of these categories. Each site is also given a site assessment score. This score is not a measure of the site's value or importance but a relative assessment of the usefulness of the site in promoting geodiversity.

### Land Ownership Notification

Where the landowner is identified as a public body e.g. a local authority, Forestry Commission etc., notification is by letter to that authority. For sites under private ownership, where the landowner can be identified, they will be informed by letter.



## 6. Additional Sources of Information

### Scientific literature

If a LoGS has been referred to in the scientific literature some of these references are given in this document. If a site has been referred to in the scientific literature this means that the site is of historical interest and some of these sites will have potential for research.

### Site interpretation

If a site is accessible or simply visible to the general public, it is the aim of GeoEssex to provide interpretive information where possible and practical. This could be in the form of interpretive boards or leaflets. Such interpretation will be with the cooperation of landowners and other interested parties.

### Other organisations

#### British Geological Survey - [www.bgs.ac.uk](http://www.bgs.ac.uk)

Other geological resources, maps and borehole information are available on the website of the British Geological Survey.

#### Essex Field Club - [www.essexfieldclub.org.uk](http://www.essexfieldclub.org.uk)

The Essex Field Club, founded in 1880, exists to promote the study of the county's natural history, and geology. The club has a centre for Biodiversity and Geodiversity in Wat Tyler Country Park at Pitsea, near Basildon, with extensive collections. It is open to the public most weekends. Their website provides comprehensive data on a large number of wildlife and geological sites which can be searched in a number of ways. Details of several hundred geological sites across Essex can be found here which includes LoGS and potential LoGS.

#### Earth Heritage Magazine - [www.earthheritage.org.uk](http://www.earthheritage.org.uk)

Earth Heritage magazine is produced for the geological and landscape community by Natural England, Scottish Natural Heritage, the Countryside Council for Wales.

#### Essex Rock & Mineral Society - [www.erms.org](http://www.erms.org)

The Essex Rock and Mineral Society, founded in 1967, is the club for Essex geological enthusiasts.

### GeoEast

GeoEast is the East of England Geodiversity Partnership. It is a partnership of organisations active in conserving and promoting Earth heritage in this region.

#### GeoEssex - [www.geoessex.org.uk](http://www.geoessex.org.uk)

*Background geological information for Essex, together with a selection of sites in each district (SSSIs and public accessible sites) can be found on the GeoEssex website*

#### Geologists' Association - [www.geologistsassociation.org.uk](http://www.geologistsassociation.org.uk)

The Geologists' Association, founded in 1858, is Britain's largest society for amateur geologists.

#### Quaternary Research Association - <https://www.qra.org.uk>

The Quaternary Research Association researches 'Ice Age' geology, palaeobiology and Palaeolithic archaeology and has published several field guides covering many sites in southern and eastern Essex.

## Books and articles relating to Essex geology and geoconservation

- ALLEN, P., CHESHIRE, D.A. AND WHITEMAN, C.A. 1991. **The glacial deposits of southern East Anglia**. In: EHLERS, J., GIBBARD, P.L., AND ROSE, (eds) **Glacial Deposits in Great Britain and Ireland**. Balkema, Rotterdam, pp. 255-278.
- ALLEN, P. 1999. **The Anglian cold stage in Essex – a review**. Essex Naturalist. 16 (New series): 83-100.
- ALLEN, P., BAIN, D.R., BRIDGLAND, D.R., BUISSON, P. AND 20 OTHERS. 2022. **Mid-Late Quaternary Fluvial Archives near the Margin of the MIS 12 Glaciation in Southern East Anglia, UK: Amalgamation of Multi-Disciplinary and Citizen-Science Data Sources**. Quaternary 22, 5 (3), 37. (On-line, open access)
- BRIDGLAND, D.R. 1994. **The Quaternary of the Thames**. Chapman and Hall. Geological Conservation Review Series.
- CLAYTON, K. 1960. **The landforms of parts of southern Essex**. Transactions of the Institute of British Geographers, 28, 55-74.
- ELLISON, R.A. 2004. **Geology of London**. Special Memoir for 1:50,000 Geological sheets 256 (North London), 257 (Romford), 270 (South London) & 271 (Dartford). British Geological Survey.
- GIBBARD, P.L. 1994. **Pleistocene History of the Lower Thames Valley**. Cambridge University Press.
- HOSE, T.A. (ed). 2016. **Geoheritage and Geotourism: A European perspective**. The Boydell Press.
- LUCY, G. 1999. **Essex Rock: A look beneath the Essex landscape**. Essex Rock and Mineral Society.
- MERCER, I. & MERCER, R. 2022. **Essex Rock: Geology beneath the landscape** (2<sup>nd</sup> edition updated and greatly expanded).
- PROSSER, C., MURPHY, M. and LARWOOD, J. 2006. **Geological Conservation: A Guide to Good Practice**. English Nature.
- SUMBLER, M.G. 1996. **British regional geology: London and the Thames valley**. British Geological Survey. Fourth edition. HMSO.
- WHITAKER, W. 1889. **The Geology of London and of Part of the Thames Valley**. Memoirs of the Geological Survey. HMSO.
- WHITEMAN, C.A., BRIDGLAND, D.R., ALLEN, P. AND CHESHIRE, D.A. 1995. **Maldon Cutting (TQ 842067)**. In: Bridgland, D.R., Allen, P. and Haggart, B.A. (eds), **The Quaternary of the Lower Reaches of the Thames, Field Guide**. Quaternary Research Association, pp. 247-254.

## A selection of scientific books and papers, etc. relating to the Maldon area

- COLLINS, J. S. H. and SAWARD, J. 2006. **Three new genera and species of crabs from the Lower Eocene London Clay of Essex, England**. Bulletin of the Mizunami Fossil Museum, 33: 67-76.
- GEORGE, W. and VINCENT, S. 1976. **Some river exposures of London Clay in Suffolk and Essex**. Tertiary Research, 1(1): 25-28.
- GEORGE, W. AND VINCENT, S. 1977. **A foreshore exposure of London Clay at Steeple, Essex**. Tertiary Research, 1(4): 105-108.
- GEORGE, W. & VINCENT, S. 1982. **An exposure of London Clay at Maylandsea (Lawling Creek), Essex**. Tertiary Research, 4(2): 39-43.
- RAYNER, D., MITCHELL, T., RAYNER, M. & CLOUTER, F. 2009. **London Clay Fossils of Kent and Essex**. Medway Fossil and Mineral Society.
- SAWARD, J. 2015. **Fossil Crustaceans from the London Clay of Essex**. Essex Naturalist, 32 (New Series): 274-282.
- TSHUDY, D. & SAWARD, J. 2012. **Dinocheilus steeplensis, a New Species of Clawed Lobster (Nephropidae) from the London Clay (Eocene) of England**. Journal of Crustacean Biology, 32, no.1: 67-79.



## 7. List of Sites

The following is a representative list of geological sites in the district. For completeness it includes geological SSSIs, but these sites are statutory sites and do not form part of this report.

The list gives an idea of the range of sites that can qualify as Local Geological Sites (LoGS).

**Note:** *Not all the sites described here are accessible, some are on private land and can only be viewed from footpaths that pass through or alongside the site. Inclusion of a site on this list does not, therefore, imply any right of access.*

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### Sites of Special Scientific Interest (SSSIs)

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**Bradwell Chenier Ridges (part of Dengie SSSI)**  
**Goldsands Road Pit SSSI**  
**Lofts Farm Pit**  
**Maldon Cutting**  
**Maylandsea Foreshore (part of Blackwater Estuary SSSI)**  
**The Cliff SSSI**

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### Local Geological Sites (LoGS)

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*Proposed LoGS to be agreed by Local Sites Partnership.*

**Chantry Wood Boulder - proposed**  
**Goldhanger Village Well - proposed**  
**Jubilee Recreation Ground proposed**  
**St Giles Leper Hospital (remains of) - proposed**  
**Stansgate Abbey Farm Foreshore - proposed**  
**Steeple Bay Foreshore - proposed**  
**West Maldon Landslip - proposed**  
**Woodrolfe Creek Saltmarsh - proposed**

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### Other sites of geological interest in the district

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*For completeness, the following sites also contribute to the geodiversity of the district.*

**Asheldham Pit - former gravel pit, now overgrown with no access possible**  
**Chigborough Lakes Nature Reserve - former gravel pit, now a nature reserve lake**  
**Great Braxted Church - church walls with interesting locally sourced rocks**  
**Northey Island Foreshore - former London Clay exposure, but now obscured**  
**Osea Island Foreshore - London Clay exposure and overlying gravels**  
**St Andrew's Church, Heybridge - church walls with interesting locally sourced rocks**  
**St Margaret's Church, Woodham Mortimer - church walls with interesting locally sourced rocks**

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**END OF REPORT**

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# LOCAL GEOLOGICAL SITES

## MALDON DISTRICT



### Chantry Wood Boulder, Wickham Bishops

**Site location:** in Chantry Wood, near Wickham Bishops. Situated in private woodland, in the SW corner of a part of the wood named Cornerstone Wood, at a junction between rides.

**Grid Reference:** TL 8432 1290

**Status:** Proposed LoGS

#### **Summary of the geological interest:**

Sarsens are not uncommon in central Essex, but this is a fairly large example and one of the few known so far in the Maldon district. The boulder is 114 cm by 75 cm in size.



**Site Assessment.** Local Geological Sites (LoGS) in Essex are assessed using criteria based on DEFRA guidance. An assessment form is used which asks key questions under four value categories: scientific, educational, historical and aesthetic. This site has been assessed and qualifies under these criteria.

#### **Scientific interest and site importance**

Sarsens are extremely hard boulders of sandstone formed during the Eocene, around 55 million years ago, when the climate of Britain was hot and a layer of sand beneath the surface of the ground became cemented with quartz. They are very resistant to erosion. This sarsen would have originated in Eocene sands west of Essex and was likely carried into the county by the early Thames and subsequently moved to its current location by glacial outwash during the Ice Age.





Close up and wider view of the Chantry Wood Sarsen Stone.  
Photos: June 2023.





# LOCAL GEOLOGICAL SITES

## MALDON DISTRICT



### Goldhanger Village Well

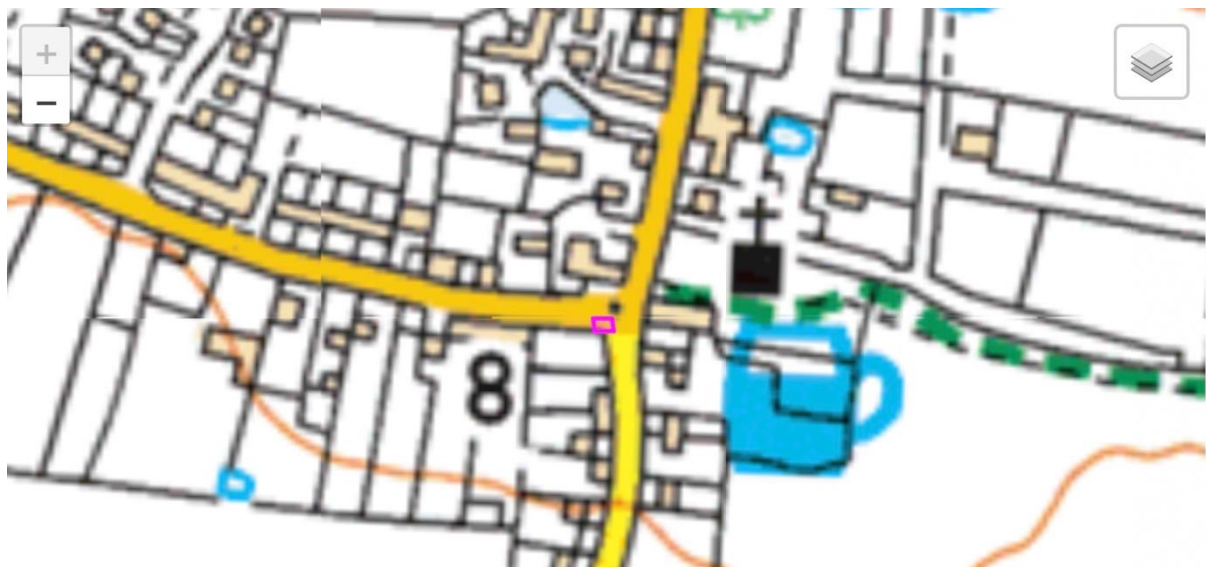
**Site location:** Goldhanger Village, junction in front of The Chequers Inn

**Grid Reference:** TL 9043 0882

**Status:** Proposed LoGS

#### **Summary of the geological interest:**

The Goldhanger village pump is a rare example of a wheel pump. The pump housing has a bronze plaque stating that the well was dug during the hot Summer of 1921 and is 25 metres (70 feet) deep with a further 35 metres (100 feet) of artesian bore. This total depth would take the well and borehole through the mostly impervious London Clay and Lower London Tertiaries into the water-bearing Chalk. The pump is a listed building.



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#### **Scientific interest and site importance**

Many wells in Essex were artesian, which means that water fills the entire well or borehole and overflows at the surface. Due to the shape of the London Basin, water in the permeable Chalk beneath Essex (originally rain water that has fallen on the North Downs and the Chilterns) is confined under pressure beneath the London Clay and when released rises to the surface forming an artesian well.



Goldhanger Village Well. Photo: June 2023.



# LOCAL GEOLOGICAL SITES

## MALDON DISTRICT



### Jubilee Recreation Ground, Great Totham

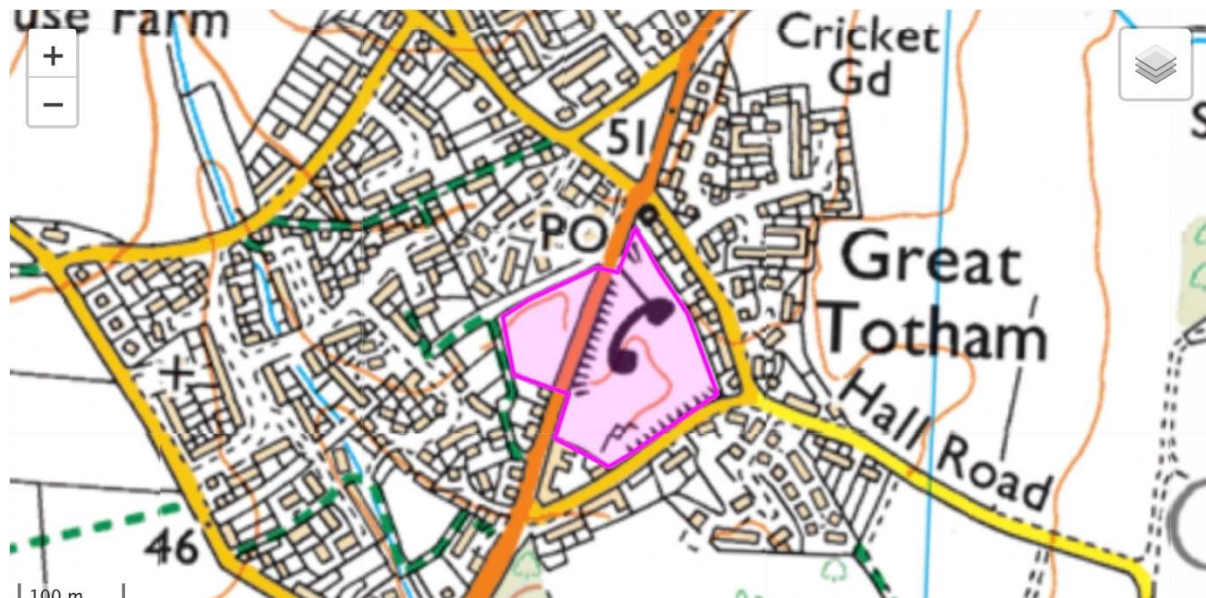
**Site location:** either side of Maldon Road, Great Totham

**Grid Reference:** TL 856 116 to TL 858 115

**Status:** Proposed LoGS

#### **Summary of the geological interest:**

Former gravel pits adjacent to the Maldon to Tiptree Road in Great Totham, now in use as a recreation ground. Surrounding the ground are steeply wooded banks of glacial outwash gravels. It is a site of great educational value because of its accessibility. Pebbles from the gravel can still be collected at the base of the slopes, especially in the pit to the west of Maldon Road which is in use for cycle scrambling.



**Site Assessment.** Local Geological Sites (LoGS) in Essex are assessed using criteria based on DEFRA guidance. An assessment form is used which asks key questions under four value categories: scientific, educational, historical and aesthetic. This site has been assessed and qualifies under these criteria.

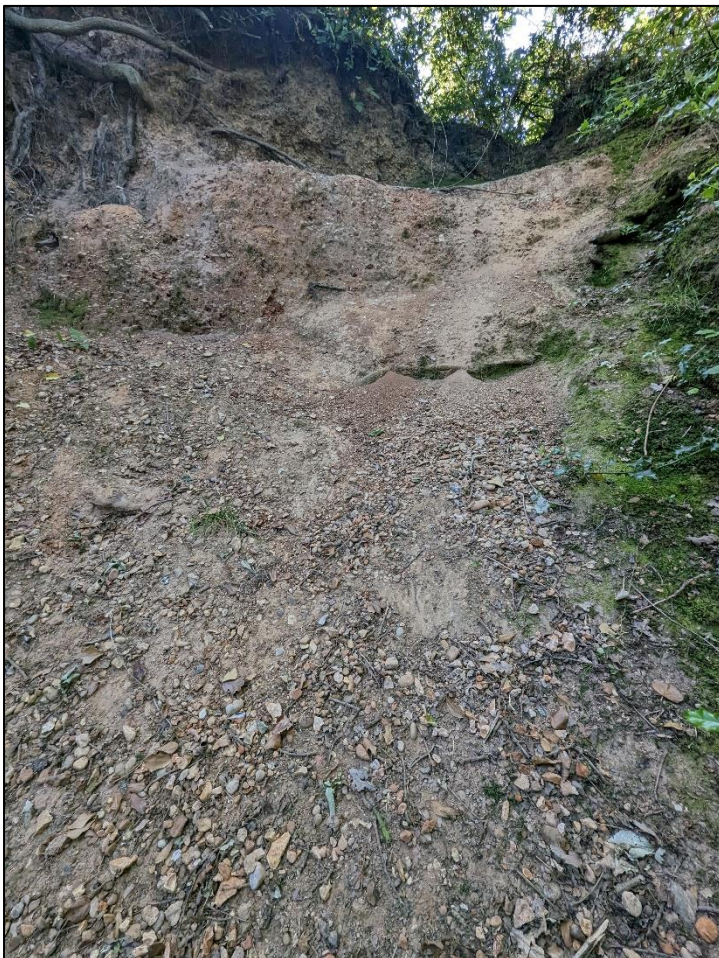
#### **Scientific interest and site importance**

These gravels were laid down about 450,000 years as outwash from a glacier that was halted by the high ground of Wickham Bishops, Braxted and Tiptree. As the ice decayed, meltwater flowed down the backslope of the high ground. The gravels were mostly reworked from, and therefore are similar to those deposited by an early course of the Thames that crossed central Essex, but include some new types brought in by the glacier. This is an important site for learning about the Ice Age history of the area and vegetation clearance could provide a small section through the gravels.





Part of the eastern Jubilee Recreation Ground field, showing steep vegetated sides



Exposed gravel in the side of the western pit.

Photos June 2023.



# LOCAL GEOLOGICAL SITES

## MALDON DISTRICT



### St. Giles Leper Hospital, Maldon

**Site location:** Spital Road, Maldon

**Grid Reference:** TL 8433 0648

**Status:** Proposed LoGS

#### **Summary of the geological interest:**

Ruins of 12th century leper hospital with a great variety of rock types in the walls, many of them erratics, presumably gathered locally. A Grade 1 listed building and scheduled ancient monument. The grounds of the building are normally locked but permission for access can be obtained from Maldon Town Council and a key is kept at the nearby Queen Victoria public house.



**Site Assessment.** Local Geological Sites (LoGS) in Essex are assessed using criteria based on DEFRA guidance. An assessment form is used which asks key questions under four value categories: scientific, educational, historical and aesthetic. This site has been assessed and qualifies under these criteria.

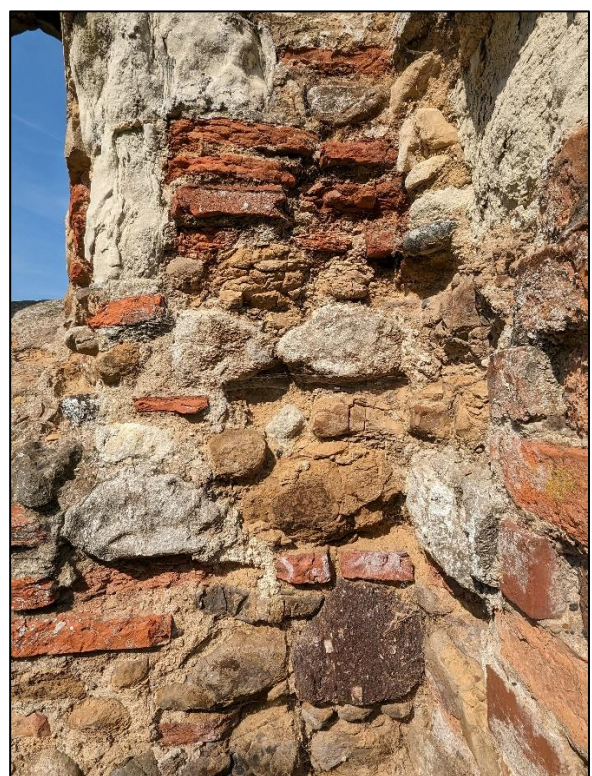
#### **Scientific interest and site importance**

Many of the stones and other building materials are assumed to have been gathered locally, including London Clay cement stones, various erratics and Roman bricks. A brief description of the stones in the building is contained in the *Essex Naturalist* (Vol. 29 (1952-56), page 123) following a field visit to Maldon in 1952. A comprehensive survey of the geology of the building would be worthwhile.





General view of the ruins



Close ups of wall details

Photos: June 2023



# LOCAL GEOLOGICAL SITES

## MALDON DISTRICT



### Stansgate Foreshore, Stansgate

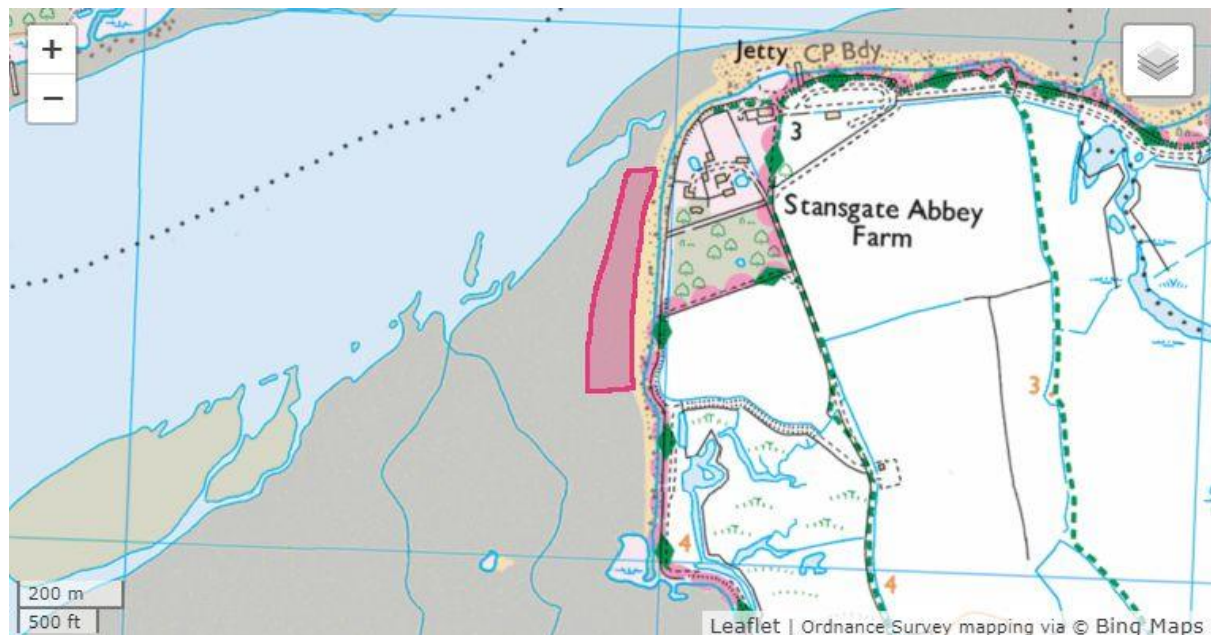
**Site location:** foreshore adjacent to Stansgate Abbey Farm

**Grid Reference:** TL 929 054 to 929 057

**Status:** Proposed LoGS

#### **Summary of the geological interest:**

The foreshore in front of Stansgate Abbey Farm exposes a platform of London Clay, revealed at low tide, containing fossils of various species of crustacea, crinoids, molluscs and occasional fish and marine vertebrates.



**Site Assessment.** Local Geological Sites (LoGS) in Essex are assessed using criteria based on DEFRA guidance. An assessment form is used which asks key questions under four value categories: scientific, educational, historical and aesthetic. This site has been assessed and qualifies under these criteria.

#### **Scientific interest and site importance**

An exposure of London Clay, a continuation of the exposure at nearby Steeple Bay, revealing the deeper water Division B deposits laid down during the Eocene period, around 53 million years ago. Although prone to silting, gradual erosion of the foreshore has allowed numerous fossils to be recovered, especially lobsters, crabs, shark teeth and crinoid stem fragments.





The London Clay exposure on the foreshore in front of Stansgate Abbey Farm.  
Photo: 2014.

# LOCAL GEOLOGICAL SITES

## MALDON DISTRICT



### Steeple Bay Foreshore, Steeple

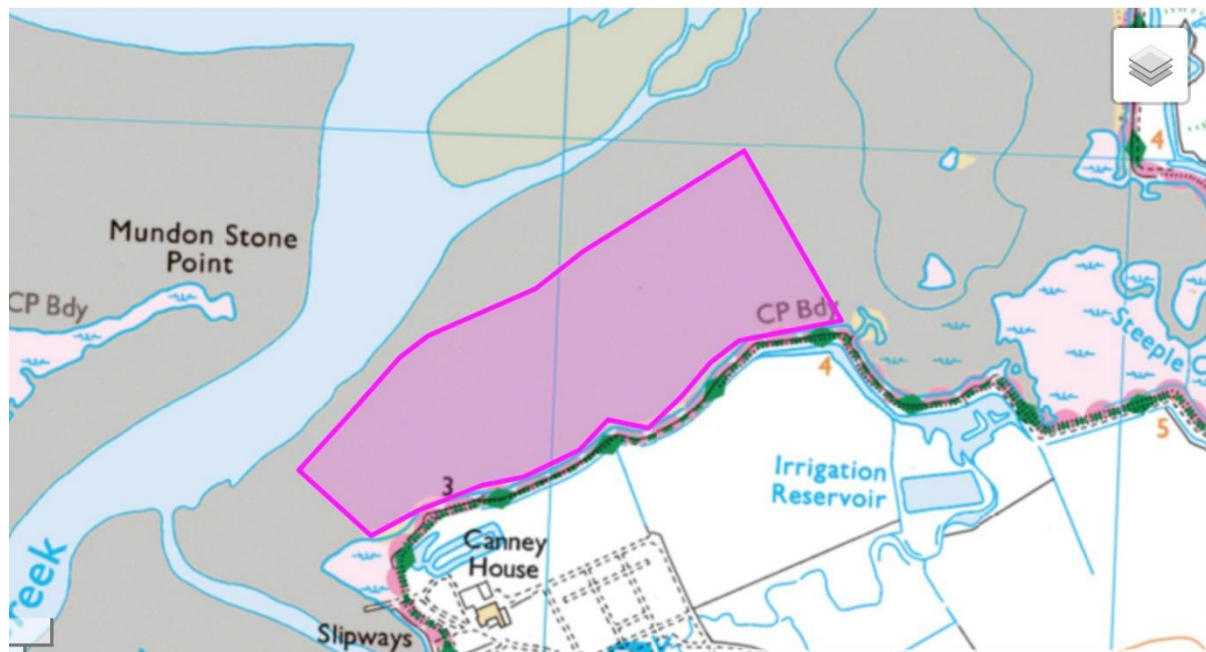
**Site location:** foreshore adjacent to Steeple Bay Holiday Park

**Grid Reference:** TL 916 043 to 924 047

**Status:** Proposed LoGS

#### **Summary of the geological interest:**

At Steeple Bay an impressive platform of London Clay is revealed at low tide containing fossils of various species of crustacea, crinoids, molluscs, shark teeth and occasional fish and marine vertebrates. The site is also of historical interest as a document exists in the Essex Record Office recording the sale, in 1828, of London Clay nodules (cement stones) from the shore for the purpose of manufacturing cement at Sheerness.



**Site Assessment.** Local Geological Sites (LoGS) in Essex are assessed using criteria based on DEFRA guidance. An assessment form is used which asks key questions under four value categories: scientific, educational, historical and aesthetic. This site has been assessed and qualifies under these criteria.

#### **Scientific interest and site importance**

An extensive exposure of London Clay, revealing the deeper water Division B deposits laid down during the Eocene period, around 53 million years ago. Although prone to silting, gradual erosion of the foreshore has allowed numerous fossils to be recovered, especially lobsters and crabs. Neolithic and Bronze Age flint tools also occasionally weather out of the mash clay at the western end of the site.





The London Clay exposure on the foreshore at Steeple Bay, with Mundon Stone Point In the background. Photo: January 2023.



A fossil *Hoploparia gammaroides* lobster in situ in the clay foreshore. Photo: December 2022.



# LOCAL GEOLOGICAL SITES

## MALDON DISTRICT



### West Maldon Landslip, Maldon

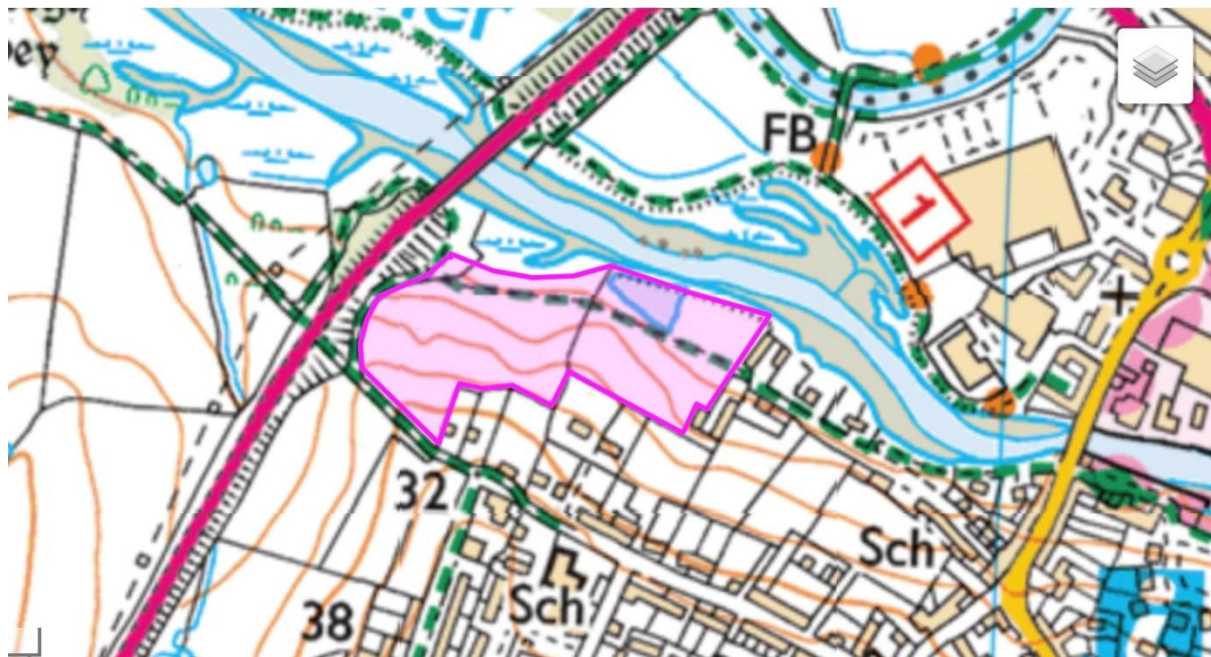
**Site location:** south bank of the River Chelmer, Maldon

**Grid Reference:** TL 8442 0742 to TL 8471 0737

**Status:** Proposed LoGS

**Summary of the geological interest:**

A good example of a London Clay landslip can be seen on the north-facing slope adjacent to the River Chelmer at Maldon. The site is also a Local Wildlife Site and is traversed by a public footpath.



**Site Assessment.** Local Geological Sites (LoGS) in Essex are assessed using criteria based on DEFRA guidance. An assessment form is used which asks key questions under four value categories: scientific, educational, historical and aesthetic. This site has been assessed and qualifies under these criteria.

**Scientific interest and site importance**

There are three landslips on the north-facing river cliff of the Chelmer at Maldon. The middle and most obvious slip is referred to as the West Maldon Landslip (Bristow 1985, Hutchinson 1965). It is formed of successive rotational slips in the bedrock of London Clay which is trying to reach a stable angle. Most of the slips are grassed over but small fresh scars indicate that there is still instability. The most active land slipping presumably took place when the river was directly eroding the toes of the landslips. The presence of saltings indicate that erosion has not taken place for a number of years (Bristow 1985).



References:

- BRISTOW, C.R. 1985. **Geology of the country around Chelmsford**. Geological Survey Memoir. British Geological Survey. HMSO.
- HUTCHINSON, J.N. 1965. **A Survey of the Coastal Landslides of Essex and South Suffolk**. Building Research Station Note No. EN 36/65. Ministry of Technology.



View of the West Maldon landslide looking south in 1968. The site has now been largely covered with trees and shrubs. Photo: British Geological survey (P210814). The surface of the landslide ground is characteristically hummocky and covered with brambles. This could be clearly seen from the Maldon By-pass (see photograph) but trees have now largely covered the slope. A public footpath traverses the landslide, appropriately called Hilly Fields Wildlife Site.



The West Maldon landslide, June 2023

# LOCAL GEOLOGICAL SITES

## MALDON DISTRICT



### Woodrolfe Creek Saltmarsh, Tollesbury

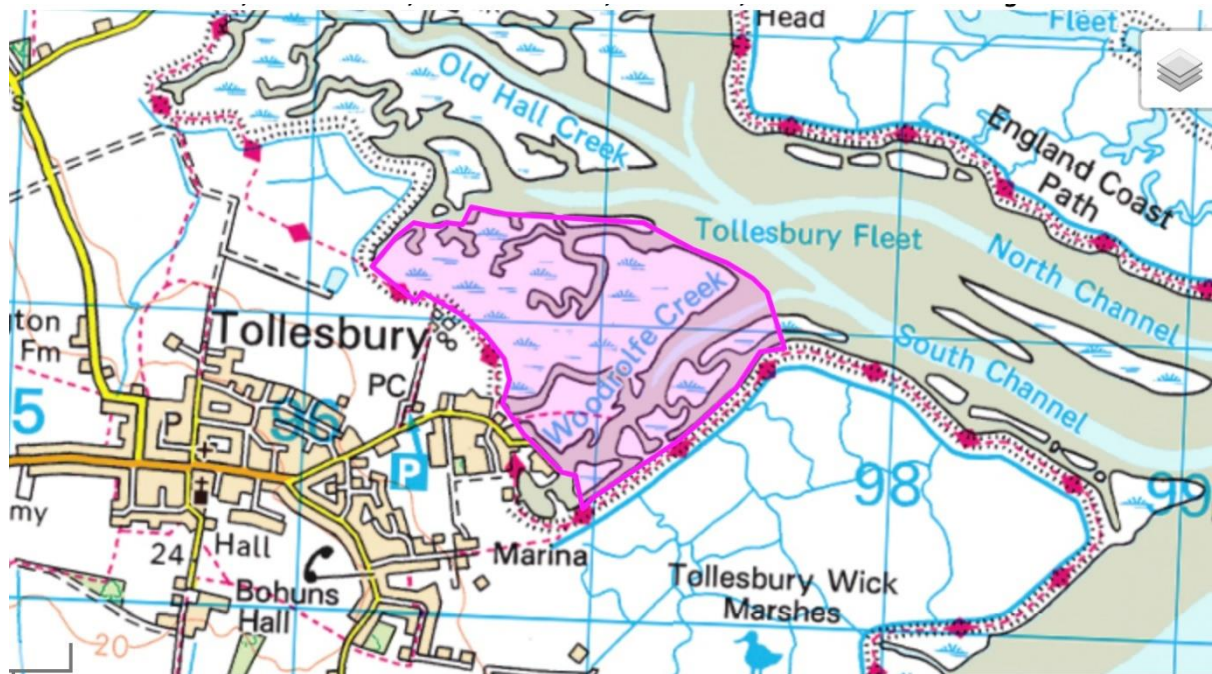
**Site location:** between Tollesbury village and Tollesbury Fleet

**Grid Reference:** TL 969 105

**Status:** Proposed LoGS

**Summary of the geological interest:**

Probably the best and safest place to see saltmarsh in Essex is at Tollesbury, where the marsh at Woodrolfe Creek is criss-crossed by paths to enable boat owners to reach their vessels.



**Site Assessment.** Local Geological Sites (LoGS) in Essex are assessed using criteria based on DEFRA guidance. An assessment form is used which asks key questions under four value categories: scientific, educational, historical and aesthetic. This site has been assessed and qualifies under these criteria.

**Scientific interest and site importance**

Saltmarshes and their fronting mudflats are one of the few natural wilderness areas left in the UK. They are formed by silt and mud being deposited in sheltered locations and colonised by salt-tolerant plants. The surface of the marsh is dissected by a system of drainage channels (creeks) and often pitted with occasional pools (salt pans). Essex is especially important for this habitat - our coast has a larger area of salt marsh than any other county.

Radiocarbon dating of plant remains at a depth of 3.5 metres in recent borehole at the edge of the saltmarsh at Tollesbury has produced a date of almost 5,000 years. It was concluded that the growth rate of the saltmarsh has been nearly constant with an accretion of about 1.5 millimetres per year.



Woodrolfe Creek salt marshes from the air. Photo: Essex County Council.