GeoEssex

Promoting the geology and landscape of Essex

Southend-on-Sea City Council
Report on Local Geological Sites

Prepared for Southend-on-Sea City Council by

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Contents

Cover photographs:

Above: Cliff slump repairs, Western Esplanade, Southend, 2012
Middle: Hand axe from North Shoebury, in Southend Museum
Below: Fossil *Zanthopsis* crab from the London Clay foreshore at Shoeburyness

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

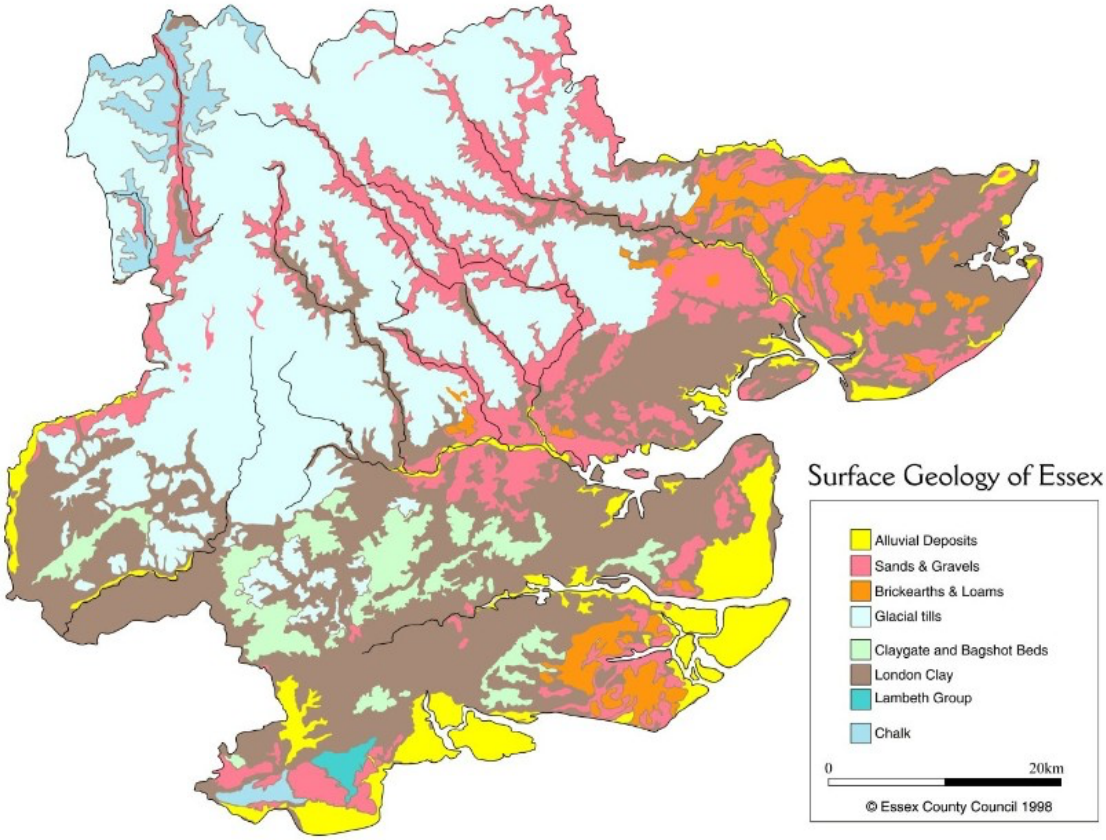
Compared to most other parts of Britain the rocks of Essex and adjoining counties are young in geological terms. Even the oldest surface rock in Essex (the Chalk) is only about 80 million years old. Much older rocks are, however, present at depth. We have some idea about these ancient rocks because of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

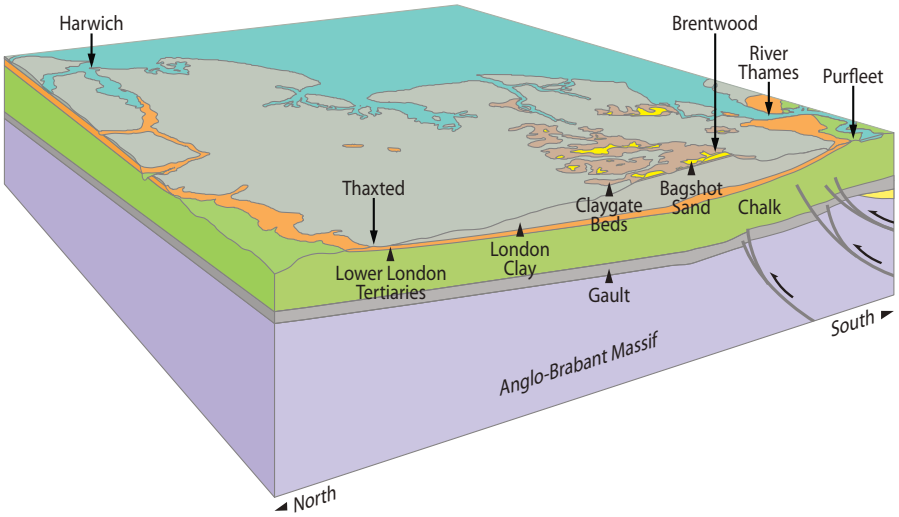
Era	Period or Epoch		Approx. age in millions of years	Geological formations in Essex
Caenozoic	Quaternary Ice Age	Holocene	0.01	Recent peat and alluvium
		Pleistocene	0.45	River terrace deposits and brickearth (loess)
				Boulder clay (till) and glacial gravel
			1	Kesgrave (Thames) sands and gravels
				Norwich Crag (Chillesford Sand)
			2.4	Red Crag
	Pliocene		10	*No evidence of rocks of this age in Essex but derived Miocene and Pliocene fossils are found in the Red Crag*
	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	Chalk
			100	Gault and Upper Greensand (Beneath Essex)
	Jurassic		150	*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.*
	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	*No evidence beneath Essex, however, boreholes have not been drilled deep enough to confirm.*
	Cambrian		500	
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 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 called 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 and hundreds of metres of soft white limestone, the **Chalk** were deposited 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, 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 the Alpine mountain chain, 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, the **Red Crag**.
- Global cooling led to the present Ice Age, with many warm periods such as the one we are in right now. 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 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 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 Southend

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.

A mammoth tooth from Essex

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.

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, e.g. in the Danbury area. These are of great significance both for biodiversity and recreation.

London Clay outcrops south of Chelmsford, providing fertile soils for arable agriculture, especially wheat. The chalky till found in north and west of Chelmsford eg. the Pleshey Plateau, is also highly suitable for cereal cultivation. and east especially on the Dengie peninsula, at

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.

The Geology of the Southend 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, laid down on the floor of a subtropical sea 54 - 52 million years ago, which was formerly exposed in the sea cliffs between Leigh and Southend, and also at Shoeburyness. Prone to erosion, the cliffs were stabilised by the creation of the promenade along the seafront during the mid-19th century, but occasional landslips and erosion of sea defences still reveal a few of the fossils and distinctive septarian nodules that were once collected from the cliffs and foreshore for the manufacture of Roman cement at the works situated at Leigh-on-Sea.

Southend lies in a critical position in the geological history of both the River Thames and the Medway. An ancient course the Thames flowed across central Essex and crossed the East Anglian coast at various points as it shifted its course southwards. At the same time the Medway flowed across the higher ground in the western part of the Southend District and then ran parallel to the present coast, to join the early Thames. Immediately prior to the Anglian Glaciation, c.450,000 years ago, the early Thames crossed what is now the coast in the region of Clacton, but the glacier blocked the Thames, diverting it into its present valley to join the early Medway in the Southend District, which then flowed as the 'Thames-Medway' to the Clacton area where it rejoined its old course.

Unfortunately, currently there are no significant exposures to demonstrate these courses in the Southend District, but a struck flint was found in an excavation into the gravels (the Canewdon Gravel) of the early Medway at Westcliff High school for Girls, indicating the presence of humans there at a very early stage, about 600,000 or more years ago. Flint artefacts (two hand-axes and some flakes) were found in the gravel (Southchurch Gravel) of the Thames-Medway at Roots Hall Pit, now the site of Southend United football ground. The position of the pit on the gravel indicates that this spot was originally on the left bank of the Thames-Medway about 380,000 years ago and the flint tools may have been lost or discarded by Neanderthal hunters while pursuing the local wildlife which then would have consisted of large mammals such as elephant and early mammoth. Thus, there is significant potential for other finds and there is a need to monitor future developments that might expose gravels.

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:

(1) "the planning system should contribute to and enhance the natural and local environment by protecting and enhancing valued landscapes, geological conservation interests and soils" (Paragraph 1094).

(2) "local planning authorities should set criteria-based policies against which proposals for any development on or affecting protected wildlife or geodiversity sites or landscape areas will be judged" (Paragraph 113); and

(3) "to minimise impacts on biodiversity and geodiversity, planning policies should aim to prevent harm to geological conservation interests" (Paragraph 117). 9

The South Essex Strategic Green and Blue Infrastructure Study, prepared on behalf of the Association of South Essex Local Authorities, including the (then) Southend on Sea Borough Council (Vol.2 appendix, Resilient by Nature) in July 2020, states that:

> "Development proposals will be assessed on the potential to enhance and/or protect geodiversity and biodiversity, including Green Infrastructure." (Natural Resources 2.4, page 24)

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, central Essex – 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

"*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)

Biodiversity protection is familiar to planning authorities but geodiversity less so. This report will assist planning authorities in meeting their obligations under the National Policy Planning 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.

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.

In Leigh-on-Sea High Street is an early nineteenth century brick structure at the bottom of a conduit carrying water from a cliff top spring. A cast iron plaque dated 1846 records the reinstatement of the well head in 1825. The spring no doubt issued from the junction of the Thames terrace gravels with the underlying London Clay. A stone, originally placed at the well head in Rectory Grove in 1712, is now also installed at the same location.

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 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 Southend 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. The fact that a site has been referred to in the scientific literature means that the site is of historical interest and some of these sites will have potential for future research.

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.

GeoEssex - 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

Essex Field Club - www.essexfieldclub.org.uk
The Essex Field Club, founded in 1880, exists to promote the study of the county's natural history, and includes geology amongst its many activities. The club has a centre for Biodiversity and Geodiversity in Wat Tyler Country Park at Pitsea, near Basildon. 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.

British Geological Survey - www.bgs.ac.uk
Other geological resources, maps and borehole information are available on the website of the British Geological Survey.

Essex Rock & Mineral Society - www.erms.org
The Essex Rock and Mineral Society, founded in 1967, is the club for Essex amateur 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 the six counties of the region (including Essex).

Earth Heritage Magazine - www.earthheritage.org.uk
Earth Heritage magazine is produced twice a year for the geological and landscape community by Natural England, Scottish Natural Heritage, the Countryside Council for Wales and The Wildlife Trusts.

Geologists' Association - www.geologistsassociation.org.uk
The Geologists' Association, founded in 1858, is Britain's largest society for amateur geologists.

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A selection of scientific books and papers, relating to the Southend area

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LAKE, R.D., ELLISON, R.A., HENSON, M.R. & CONWAY, B.W. 1986. **Geology of the country around Southend and Foulness**. Memoir British Geological Survey, Sheets 258 & 259.

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7. List of Sites

The following is a representative list of geological sites in the district. For completeness it can include 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.*

Sites of Special Scientific Interest (SSSIs)

There are no geological SSSIs in the district.

Local Geological Sites (LoGS)

Sites agreed by Local Sites Partnership to date

SoG1 - St Laurence & All Saints Church, Eastwood

Grade I listed 11th century church with a large sarsen stone, 65 cm long, set in the floor at the base of the pillar where the south aisle meets the chancel. The church is normally locked, but visitors are currently welcomed on Tuesday mornings.

Other sites of geological interest in the district

Eastwood Pumping Station – borehole for water supply
In the nineteenth century the Southend Waterworks Company was formed to supply Southend with fresh water. One of these is the No. 3 well at Eastwood Pumping Station which was constructed between 1888 and 1890. The well is 871 feet (265 metres) deep, the first 247 feet (75 metres) beneath the well house floor is an 8 foot (2.5 metre) diameter shaft and below that it is bored. Old water company records provide information about the geology. Beneath 40 feet of terrace sand and gravel the well passes into London Clay (240 feet thick) below which is sand and clay of the Lower London Tertiaries (146 feet thick) and at the base the well penetrated 439 feet of Upper Chalk with its characteristic flints. Very little water was obtained from the Chalk but water from the Lower London Tertiaries rose up the shaft to within 66 feet of the surface.

Friars Park - former brick pits, now a nature reserve lake
The former Shoebury brickfields produced spectacular fossils of Ice Age mammals. Fossils from Shoebury in Southend Museum include the bones of mammoth, elephant, bison, giant deer and brown bear. Much of this land is now occupied by housing and retail development but some abandoned pits are still visible as lakes. Some of these are in the wildlife reserve known as Friars Park. Of historical interest only.

Leigh Cement Works – site of early 19th century Roman cement works
In the early nineteenth century, before any of the modern sea defences were constructed along the northern shore of the Thames estuary, the cliffs of London Clay were subject to extensive coastal erosion. As a result, the hard septarian nodules that are contained in the London Clay accumulated on the foreshore in considerable quantities. In the past, particularly in the Roman period, these nodules were a useful source of building stone but in the early nineteenth century they were used for the manufacture of Roman cement which was very popular before the invention of Portland cement in 1850.

Leigh Spring - site of former fresh water supply for Leigh
In the High Street is a19th century brick structure at the bottom of a conduit carrying water from a cliff top spring. There is a cast iron plaque dated 1846. The spring no doubt issued from the junction of the Thames terrace gravels with the underlying London Clay. A stone in Rectory Grove, not now in its original position, was placed at the well head in 1712.

Roots Hall Gravel Pit – Palaeolithic stone tools from former gravel pit
Southend United's football ground was built in the 1950s on the site of a former gravel pit known as Roots Hall Pit. It was an ideal location as the long period of gravel extraction had led to a bowl-shaped site. The gravel, known as Southchurch Gravel, was originally deposited as a terrace of the northward- flowing Thames-Medway River during the middle of the Ice Age. In Southend Central Museum are two flint hand-axes and some flint flakes that came from this pit. The hand-axes were found in 1914 and 1935.

Shoeburyness Foreshore - former exposure of London Clay, now largely obscured
A foreshore platform of London Clay has sometimes been visible at low tide at various points between Southend and Shoeburyness. Until sea defences were built, fossils could be found here such as sharks' teeth and fruits and seeds preserved in pyrite.

Thorpe Bay Brickworks – site of former brick works
In the late nineteenth and early twentieth centuries the present residential area of Thorpe Bay was the site of several brickworks. The largest of these included the site now occupied by Thorpedene Junior School (TQ 924 853) and shown on the 1923 Ordnance Survey map. The brick pits were exploiting the same large expanse of brickearth, or loess, that was being worked at North Shoebury (see separate site record) and similar fossils were most likely found. The public open space north of the railway at the junction of Maplin Way and Bishopsteignton (TQ 922 857) was also a brick pit.

Westcliff High School for Girls – playing field find site of 600,000 year old flint tool in 2005
In 2005 excavations on the games fields at Westciff High School for Girls revealed evidence for a very early human occupation of Britain. The evidence came from gravel that underlies the school known as Canewdon Gravel, which was laid down by the River Medway when it flowed north across East Essex about 600,000 years ago.

Southend Cliffs – occasional landslips revealing London Clay and overlying Ice Age gravels
A classic area for demonstrating the problems of landslips in London Clay slopes. Movement of the ground along much of the Southend coastline is still a constant issue for the Council engineers, the most serious landslips occurring at The Cliffs, a section of coast just over a kilometre (approximately ¾ mile) long between the Cliffs Pavilion and Southend Pier. See also Hadleigh Castle (Castle Point District).

Landslips on the cliffs at Southend in 2002. Photo © T. Greensmith