GLNP
GREATER LINCOLNSHIRE
NATURE PARTNERSHIP

Building stones of Greater Lincolnshire

Lincolnshire Limestone at another famous Lincoln landmark

The rocks on which we stand

The geology of Greater Lincolnshire (encompassing the county of Lincolnshire and the unitary authorities of North and North East Lincolnshire) comprises rocks and sediments of Late Triassic (the oldest rocks) in the west to Quaternary (the most recent sediments) in the east.

In general, the rocks dip gently eastwards towards the North Sea coast forming a tilted sandwich. The area can be divided into several topographically and geologically distinct regions: in the west are the Trent Valley and the Isle of Axholme which are underlain by the Triassic rocks. To the east are two north-south ridges of higher ground forming the Lincoln Edge or Cliff (of Jurassic limestone) and the Lincolnshire Wolds (of Cretaceous chalk). The remainder of the area forms part of the low-lying drainage basin of the Humber Estuary (or Humber Levels) in the north while the southern limit of the Wolds is obscured by a thickening cover of sediments that forms the area of south Lincolnshire known as the fenland. Both the Humber Levels and the fenland have a series of Quaternary sediments.

The geology of Greater Lincolnshire

Ironstone village and churches common in this area

Bricks once manufactured here

Clay tiles still produced here

Occasional chalk farm buildings in the Wolds

Tealby limestone village and church

Spilsby sandstone churches common in this area

Bricks once manufactured in this area

Disused sand and gravel workings re-used as nature reserve

Lincolnshire limestone still quarried for building stone in this area

Marlstone villages common in this area

Extensive use of Lincolnshire limestone and collyweston slate

BARTON UPON HUMBER
SCUNTHORPE
GRIMSBY
EPWORTH
MARKET RASEN
LOUTH
LINCOLN
HORNCASTLE
BOSTON
GRANTHAM
STAMFORD

- Quaternary: Alluvium
- Upper Cretaceous (Chalk Group) - finegrained limestone
- Lower Cretaceous (Spilsby & Tealby Series) including Spilsby Sandstone and Tealby Limestone together with mudstones and ironstones
- Upper Jurassic (Ancholme Clay Group) - mostly mudstones and rare sandstones
- Quaternary: Sands & Gravels
- Middle Jurassic (Lincolnshire Limestone Group) including Lincolnshire Limestone together with mudstones and sandstones
- Lower Jurassic (Scunthorpe and Coleby Mudstone Formations) including the Frodingham Ironstone and the Marlstone together with mudstones and limestones
- Triassic - mudstones and siltstones

The Lincolnshire Limestone

This rock is by far the best known of the area's building stones. It is a creamy white to yellow-orange rock made up of oolites and fossil fragments.

It outcrops across the whole of the Greater Lincolnshire area and forms the Lincoln Edge or Cliff and has been quarried to a greater or lesser extent along its entire outcrop. The quarrying began in Roman times and continues to the present day. The limestone is thinner and of lower quality in the north as in the Kirton in Lindsey area but further south it is thicker and of very high quality. This is particularly true of the Ancaster and Heydour areas where the quarries produce good quality blocks. The rock can also be carved. There are fewer buildings constructed of the Lincolnshire Limestone in the north of the area because of the poorer quality of the stone.

There can be few important buildings in the area where the Lincolnshire Limestone has not been used and the prime example of this is Lincoln Cathedral. Various different beds in the series of limestone beds show different characteristics, with some used for decorative purposes and it can be polished. Many churches use the Lincolnshire Limestone for ashlar (stone masonry of regular blocks) at corners of buildings for example or for mouldings around window and door frames. The town of Stamford shows extensive use of the Lincolnshire Limestone and this has led to its use for film and TV. Other important buildings that use the Lincolnshire Limestone include Lincoln Castle, The Boston 'Stump' and Belton House.

Ashlar – carved rectangular blocks of stone laid in regular courses almost seamlessly
© Lincolnshire County Council

Harlaxton village uses Marlstone

St Lawrence's Church

The Ironstones

There are two main ironstones found in Greater Lincolnshire, the Frodingham Ironstone and the Marlstone.

Coursed rubblestone - irregular blocks of stone laid in layers (courses) © Fran Hitchinson

The Lower Jurassic Frodingham Ironstone has been used as a building stone in the north west of the county. It forms a ridge from Winterton in the north to Messingham in the south with its greatest thickness in the Scunthorpe area. It has been used to build ironworkers cottages in Scunthorpe and is also used as coursed rubblestone in some of the local churches such as St Lawrence in Scunthorpe – often with Lincolnshire Limestone dressings and mouldings. The rock is an iron-rich oolitic limestone (oolites are spherical grains of calcium carbonate) which has a greenish colour when fresh but weathers to an orange-tinged colour. It is poorly bedded and jointed and often contains fossils. The thickness of the beds of rock and the spacing and regularity of joints determine how easily the rock can be worked for building stone purposes

Marlstone develops a distinctive orange tinge over time. © Fran Hitchinson

The Marlstone is another ironstone of broadly similar age to the Frodingham Ironstone which is better developed to the south of Lincoln where it forms a prominent ridge and has been widely used for building purposes. The rock is variable in character; sometimes oolitic and at other times more sandy in composition. Like the Frodingham Ironstone it weathers to an orange-tinged colour. The rock occurs in thin beds and is reasonably well jointed which enabled it to be used in courses within buildings. One of the most effective uses, for decorative effect can be seen in churches – where it is often used in conjunction with Lincolnshire Limestone e.g. St Vincent in Caythorpe. There are also a number of villages, such as Harlaxton and Barkston, where the Marlstone has been widely used as a coursed rubblestone.

Imported limestone and local bricks were used to build this stately gatehouse

Imported stones

Greater Lincolnshire does not have a wide range of building stones so there is a long history of importing stone into the area.

Imports include the Permian Magnesian Limestone, possibly from the Tadcaster area in Yorkshire, which has been used in church buildings in the north of the area. For example the gatehouse of Thornton Abbey, where it is used in conjunction with locally produced bricks.

Slate is another imported rock which is widely used as a building material throughout the area. The distribution of this was initially by boat to the various ports in the area but the construction of the railways allowed for even wider distribution in the 19th century. For example, Victorian terraces in Lincoln are often roofed with Welsh slates.

In the south west of the area there is another 'slate' in use. This is the Middle Jurassic Collyweston Slate which comes from nearby Leicestershire. It isn't a true slate at all but a thinly bedded limestone which can be quarried and split into thin sheets suitable for roofing materials. This roofing material is extensively used on older buildings in Stamford

More exotic building materials can be found in many of the churches in Greater Lincolnshire. One excellent example is the use of Purbeck marble from Dorset in the construction of the columns in Lincoln Cathedral. Other examples can be found in graveyards and cemeteries; many modern gravestones are constructed of rocks imported into the UK.

In an entirely different way, some exotic rocks were transported by ice sheets during the last Ice-Age. Some of these rocks, known as erratics, have been incorporated into cottages and farm buildings, particularly in the eastern part of the area.

Many older buildings are built of local brick and tile such as this one at Barton-upon-Humber

Bricks & tiles

Local tiles in Lincoln
© Lincolnshire County Council

Much of the geological succession in Greater Lincolnshire is made up of clays so it is not surprising that bricks and tiles have been manufactured for use as building materials. Clays of different periods were used in different areas however. The Triassic mudstones of the Isle of Axholme were worked for brick clays at Crowle, Belton and Owston Ferry and many of the older buildings in the town of Epworth are constructed of local bricks.

Brickworks were a feature of the landscape in the area around Lincoln where bricks were manufactured at Waddington and below Cross O'Cliff Hill for example. The mudstones worked here were of Lower Jurassic age and the bricks were widely used during the growth of Lincoln during the 19th and early 20th centuries.

Estuarine Quaternary clays were extracted in the Barton-upon-Humber area in the north and both bricks and tiles were manufactured. Although bricks are no longer manufactured, tiles continue to be made using locally quarried clays including the pantiles which are a distinctive feature of the buildings in that area. Many of the older buildings in Barton are also constructed of local bricks including the Ropewalk.

There were numerous other local brickworks scattered across the area and these are often now the sites of fishing lakes or nature reserves but there are no longer any working brickworks.

Restored chalk church

Ruins of St Andrews Church, Calceby

The Chalk

The Upper Cretaceous of Lincolnshire is overwhelmingly dominated by beds of white to pale grey fine grained chalk – which is a form of limestone. These rocks form the Wolds, an upland area which covers much of the eastern Lincolnshire area. The Chalk is not a good building stone but has been used in the area in the absence of other suitable materials.

The lower parts of the Chalk succession of eastern Lincolnshire do include some harder beds, which were widely quarried and used locally for building stone along the outcrop. Some of these beds are the equivalent of the Totternhoe Stone – a building stone known from further south in Cambridgeshire and Hertfordshire.

Around Louth, for example, chalk is seen in the churches at Legbourne and Haugh. Blocks of white chalk also occur in the construction of many farm buildings across the whole outcrop of the Chalk. In many instances chalk is used in association with other building stones or brick. One of the best known locations where chalk is used is in the church of the deserted medieval village of Calceby. Here the white Chalk contrasts with the green Spilsby Sandstone blocks

The Chalk also contains flint, which is a hard silica-rich material. The flint in this part of the country is not easily fashioned into a usable building material, a process known as knapping, so it is not widespread in its use.

Tealby church built of Tealby Limestone

Spilsby Sandstone as used in Somersby Church

The Spilsby Sandstone & Tealby Limestone

Spilsby Sandstone develops a distinctive green tinge over time © Fran Hitchinson

Within the Upper Jurassic and Lower Cretaceous succession of Greater Lincolnshire area is a series of sandstones and limestones. Of these only the harder and better-cemented beds have proved suitable for use as local building stone. These rocks are found along the western edge of the Wolds and the rocks are commonly used in churches and other buildings in this area.

One of the most important of these rocks is the lime-rich Spilsby Sandstone, whose distinctive green colouration is the result of the presence of the green iron mineral glauconite. The Spilsby Sandstone also contains fossils and bands of pebbles. The sandstone is relatively soft and is often the subject of attack by masonry bees. This has posed some problems for repairs to churches as there are currently no quarries working the Spilsby Sandstone. The churches in Horncastle, Tetford and Alford are all constructed using this distinctive sandstone.

Above the Spilsby Sandstone is a series of iron-rich limestones, some of which have been exploited as ironstones. The Tealby Limestone is one which has been exploited locally as a building stone and weathers to a distinctive orange colour. This is best seen in the village of Tealby where the church and many of the cottages are built of Tealby Limestone rubble. Again there are no active quarries so repairs are often made using Lincolnshire Limestone.

Whisby nature reserve created from gravel workings

Sand & gravels

The principal construction materials found within Greater Lincolnshire are the extensive sand and gravel deposits distributed across the area.

These deposits are interglacial and post-glacial in age and relate to the courses of both modern and ancient rivers. The deposits to the west of Lincoln relate to both an ancient course of the River Trent and the river terraces associated with its present course. To the east of Lincoln there are further sands and gravels associated with the River Bain. The sands and gravels are still worked in some areas and disused quarries have been converted into nature reserves, sailing lagoons or fishing lakes. The sands and gravels are used as aggregate – that is they are mixed with cement to create mortars and concrete for the construction industry.

Sand quarry in operation.
© Lincolnshire Wildlife Trust

Find out more

Books

The Geology of Lincolnshire, HH Swinnerton and PE Kent, Lincolnshire Naturalists' Union, 2nd edition 1975, ISBN 09500353 5 1

Online resources

- Geology of Lincolnshire: ***http://en.wikipedia.org/wiki/Geology_of_Lincolnshire***
- English Heritage county building stone atlases: ***www.bgs.ac.uk/mineralsuk/buildingStones/StrategicStoneStudy/EH_atlases.html***

These county building stone atlases cover:

1. East Yorkshire & North & North East Lincolnshire
2. Lincolnshire (current county boundary)

For each there is a summary of the geological information in pdf format and Excel spreadsheets containing

- Known building stones used within the county
- Examples of stone buildings and villages constructed using these stones
- Known building stone quarries

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This leaflet is produced by the Geodiversity Group of the Greater Lincolnshire Nature Partnership (GLNP). Thanks go to Malcolm Fry for writing the text and to everyone who has contributed images. The GLNP is a Partnership of 48 organisations working to achieve more for nature across Greater Lincolnshire. For more on who we are and what we do please visit **glnp.org.uk**