Historic England

Northumberland

Building Stones of England

The Building Stones of England

England's rich architectural heritage owes much to the great variety of stones used in buildings and other structures. The building stones commonly reflect the local geology, imparting local distinctiveness to historic towns, villages and rural landscapes.

Historic England and the British Geological Survey (BGS), working with local geologists and historic buildings experts, have compiled the Building Stones Database for England to identify important building stones, where they came from and potential alternative sources for repairs and new construction.

Drawing on this research, plus BGS publications and fieldwork, guides like this one have been produced for each English county. The guides are aimed at mineral planners, building conservation advisers, architects and surveyors, and those assessing townscapes and countryside character. The guides will also be of interest if you want to find out more about local buildings, natural history, and landscapes.

This guide is based on original research and text by Andy King (Geckoella Ltd).

First published by English Heritage May 2012 and republished by Historic England in 2017. This edition published by Historic England May 2023.

Front cover: Stone farm buildings above Crag Lough. Alston Formation limestones. © Andrew Findlay / Alamy Stock Photo.

Please refer to this guide as:

Historic England 2023 *Northumberland. Building Stones of England*. Swindon. Historic England.

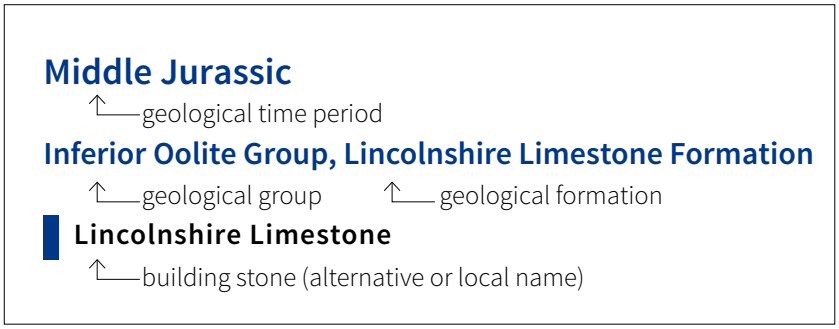
HistoricEngland.org.uk/advice/technical-advice/

How to Use this Guide

Each guide describes the local building stones in their geological timescale order, starting with the oldest layers through to the youngest. The guide ends with examples of other notable building stones from other parts of England and further afield.

Geological time periods, groups, formations and building stones

Each building stone is listed under the relevant geological timescale, group and formation. A formation may be divided into members and where relevant these are referenced in individual building stone sections.



Bedrock geology map and stratigraphic table

To help you with the geology of the area, there is a bedrock geology map and a stratigraphic table which shows the layers of rocks and the associated building stones in this geological timescale, group, formation order.

Page numbers for each building stone are included in the stratigraphic table for ease of reference. The page numbers are inverted to correspond with the geological age order.

Contents list

If you click on the page number for a building stone in the Contents list, you will go straight to the relevant section in the guide.

Building stone sources and building examples

A companion spreadsheet to this guide provides:

- More examples of buildings. Information is included on building type, date, architectural style, building stone source, and listed/ scheduled status
- A list of known (active and ceased) building stone sources such as quarries, mines, pits and delphs
- Additional information on building stones including lithology, grain size, sedimentary structures, key identification features, and notes on failure/weathering, and use.

The Building Stone GIS map allows you to search the Building Stones Database for England for:

- A building stone type in an area
- Details on individual mapped buildings or stone sources
- Potential sources of building stone sources within a given proximity of a stone building or area
- Buildings or stone sources in individual mineral planning authority area.

Further Reading, Online Resources and Contacts

The guide includes geological and building stone references for the area. A separate guide is provided on general Further Reading, Online Resources and Contacts.

Glossary

The guides include many geological terms. A separate Glossary explaining these terms is provided to be used alongside the guides.

The guides use the BGS lexicon of named rock units.

Mineral and local planning authorities

This guide covers the mineral planning and local planning authority areas of Northumberland County Council and the Northumberland National Park.

Contents

1 Introduction

The solid geology of Northumberland is dominated by Carboniferous sediments that stretch across the whole county, from Berwick-upon-Tweed in the north to Allenheads in the south, and from Wark Forest in the west to Blyth in the east. These strata generally become younger from north-west to south-east. An extensive belt of Lower Carboniferous limestones and sandstones extends south from the Scottish border to a line from Greenhead to Howick. South-east of this lie large tracts of Upper Carboniferous 'grits' and sandstones. Coal Measures strata are confined mainly to the south-east corner of Northumberland, extending from near Derwent Reservoir to Hartley, with small outliers lying between Lambley and Hexham.

The Carboniferous sediments have been intruded by a number of distinct igneous rocks. In north-west Northumberland, the Cheviot Hills and surrounding countryside are formed of Cheviot Granite and associated volcanic lavas and andesites. The Great Whin Sill complex underlies much of north-east England, and within Northumberland it crops out as a topographically high, semi-continuous ridge from Fenwick and Bamburgh, which then extends through south-central Northumberland from Kirkwhelpington to Greenhead. The outcrops of the Great Whin Sill give rise to some of the best-known and most dramatic landscape features of Northumberland. Cross-cutting the Carboniferous sediments is a series of broadly east–west trending dolerite dykes of Tertiary (Palaeogene) age. Much of this bedrock geology, especially in the lower-lying areas, is masked by extensive Quaternary drift deposits.

Carboniferous sandstones and limestones have been quarried extensively for building purposes throughout Northumberland, and their use in vernacular architecture contributes much to the variety of the local built heritage and landscape. In its report on Otterburn and Elsdon in 1887, the British Geological Survey noted that the area was '... remarkable for the abundance of excellent building-stone existing in the freestones and grits of the Carboniferous Formation. There is scarcely an estate in which quarries might not be opened.'

The earliest organised quarrying and shaping of building stone in Northumberland was probably associated with the construction of Iron Age forts. Extraction on a larger scale commenced during the Roman occupation, with the building of Hadrian's Wall and its associated forts and gate towers. Despite the wall running partially along the outcrop of the Great Whin Sill, the Romans selected sandstone as the main construction material and avoided using the very hard, intractable dolerite. Together with limestone for

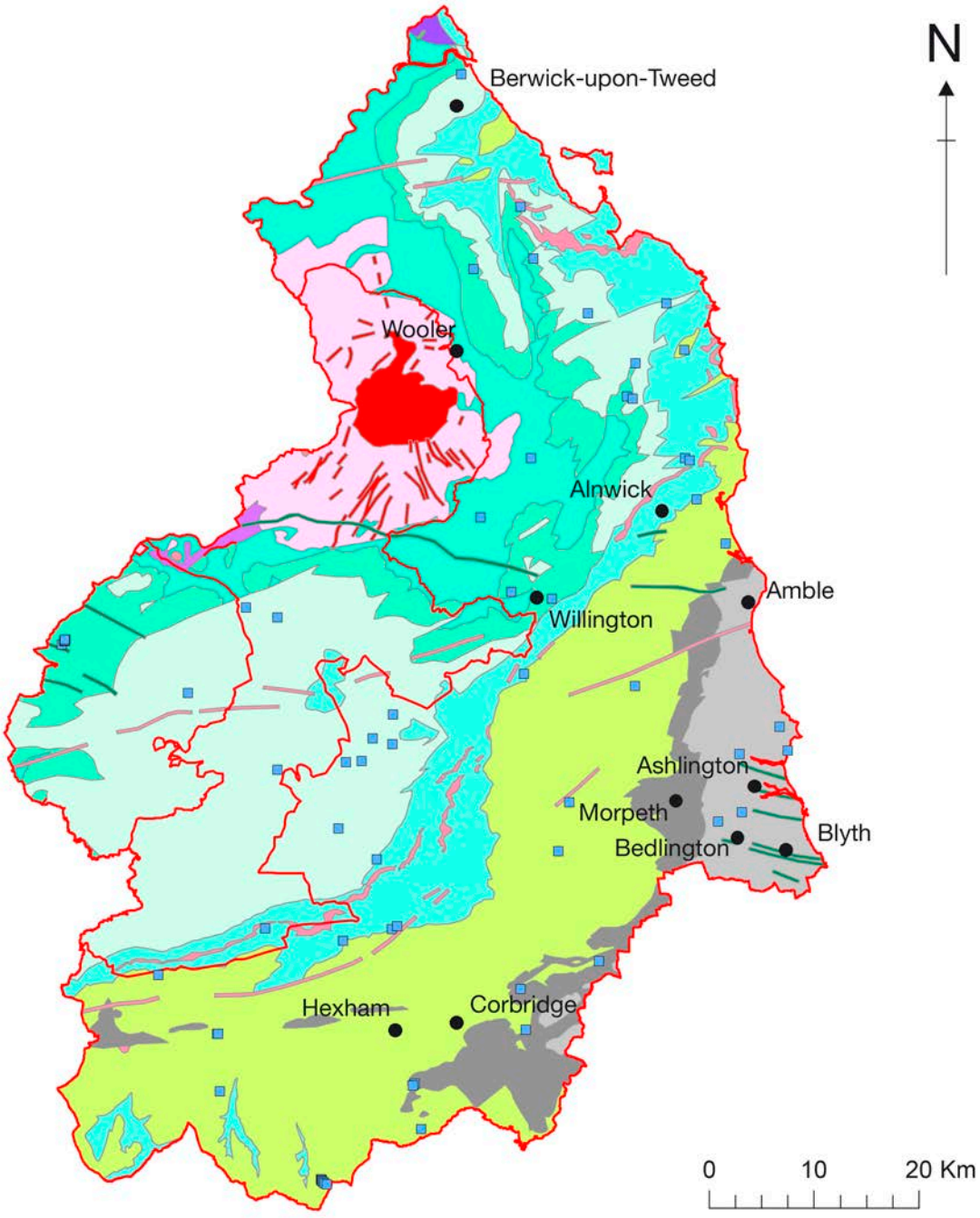
making lime mortar, the sandstone was obtained from various quarries along the course of the wall, although only a few, such as those near Chollerford, can today be identified as being of Roman origin. After the Romans departed, Hadrian's Wall provided a ready source of building stone, and the distinctive squared blocks produced by the Roman masons are today recognisable in a range of structures, including castles, churches, farm buildings and even drystone walls.

Many of Northumberland's sandstones have long been a major source of good freestone, and as workings were often on a relatively modest scale, extensive stone reserves remain in place. Small old quarries, now largely infilled or built over, are particularly numerous in urban areas. Production continues, however, at numerous sites for building and repair work. The many sandstone beds that have been worked for building stone include those in the higher part of the Stainmore Formation, the lower part of the Pennine Lower Coal Measures Formation and particular units in the Pennine Middle Coal Measures Formation, such as the Low Main Post, High Main Post, Seventy Fathom Post and Grindstone Post sandstones.

Some sandstones were worked formerly to provide stone for use both within and outside the county. For example, a Pennine Middle Coal Measures sandstone formerly quarried at Hartford Bridge is thought to have provided stone for repairs to the Houses of Parliament and two London bridges, and Pennine Lower Coal Measures sandstones worked at Heddon-on-the-Wall were used in the construction of Newcastle Central station.

Figure 1: Abbey and Moot Hall, Hexham. Yoredale Group sandstones.

Bedrock Geology Map



Key

Building stone sources

Bedrock Geology Dykes

Unnamed igneous intrusion, Palaeogene — mafic igneous rock

Unnamed igneous intrusion, Carboniferous to Permian — dolerite and tholeiitic basalt

Unnamed igneous intrusion, late Silurian to early Devonian — felsic rock

Unnamed igneous intrusion, late Silurian to early Devonian — mafic igneous rock

Unnamed igneous intrusion, Cambrian to Ordovician — mafic igneous rock

Bedrock Geology — main

Pennine Middle Coal Measures Formation and South Wales Middle Coal Measures Formation (undifferentiated)

Pennine Lower Coal Measures Formation and South Wales Lower Coal Measures Formation (undifferentiated)

Yoredale Group — limestone, argillaceous rocks and subordinate sandstone, interbedded

Yoredale Group — limestone with subordinate sandstone and argillaceous rocks

Yoredale Group — limestone, sandstone, siltstone and mudstone

Border Group — sandstone with subordinate argillaceous rocks and limestone

Inverclyde Group — sandstone, siltstone and mudstone

Unamed Extrusive Rocks, Dinantian — mafic lava and mafic tuff

Stratheden Group — sandstone and conglomerate, interbedded

Stratheden Group — sandstone and conglomerate, interbedded

Unamed Extrusive Rocks, Silurian to Devonian — mafic lava and mafic tuff

Reston Group — conglomerate and [subequal/subordinate] sandstone, interbedded

Riccarton Group — wacke

Hawick Group — wacke

Stratigraphic Table

Geological timescale	Group	Formation	Building stone	Page
Tertiary (Palaeogene)	North Britain Palaeogene Dyke Suite	Mull Dyke Swarm	Dolerite Dyke Rock	20
Permo-Carboniferous	Whin Sill Complex	Great Whin Sill	Whinstone	18
Carboniferous	Pennine Coal Measures Group	Pennine Middle Coal Measures Formation	Grindstone Post Sandstone Seventy Fathom Post Sandstone Woodhorn Sandstone High Main Post Sandstone Low Main Post Sandstone Seaton Sluice Sandstone	16
		Pennine Lower Coal Measures Formation	Lower Coal Measures Sandstone	15
	Yoredale Group	Stainmore Formation	Second Grit First Grit Grindstone Sill Grit Sills (Shaftoe Grit, Rothley Grit) Firestone Sill	13 13 13 13 13
		Alston Formation (including the Great Limestone Member)	Great Limestone Four Fathom Limestone Three Yard Limestone Eelwell (Five Yard) Limestone Shotto Wood (Cockleshell) Limestone Maize Beck Limestone Colwell (Tynebottom) Limestone Oxford (Jew) Limestone Bankhouses (Smiddy) Limestone Low Tipalt (Peghorn) Limestone	11
		Tyne Limestone Formation	Tyne Formation Sandstone Tyne Formation Limestone Scremerston Sandstone Blaxter Sandstone	9
	Border Group	Fell Sandstone Formation	Fell Sandstone Harbottle Grit	8
	Inverclyde Group	Ballagan Formation	Ballagan Formation Sandstone	7
Devonian	Igneous Intrusions	Cheviot Granite Pluton	Cheviot Granite	6
		Cheviot Volcanic Formation	Cheviot Volcanic Rock	6

Building stones in geological order from the oldest through to the youngest layers.

2 Local Building Stones

Devonian

Igneous intrusions, Cheviot Granite Pluton, Cheviot Volcanic Formation

Cheviot Volcanic Rock, Cheviot Granite

These igneous rocks occur in north-west Northumberland, within the Cheviot Hills and surrounding area. The Cheviot Granite Pluton occupies the central part of the hills and consists mainly of coarse-grained granite, containing reddish-grey and pinkish-grey feldspar, with black and yellowish micas, and interstitial pale grey quartz. Clinopyroxene (augite) is also present.

The Cheviot Volcanic Formation crops out around the main granite pluton and it stretches from Netherton (on the southern edge of the Cheviot Hills) to Wooler, Akeld, Kirknewton, Kilham and Flodden (north of the Cheviot Granite). The rocks comprise dark greenish to bluish-grey andesitic lavas and trachytes, which contain phenocrysts of plagioclase, hypersthene, augite, ilmenite and apatite.

These rocks are used very locally as a general walling stone, for example in farm hamlets in the eastern Cheviot Hills, such as at Hartside and Greensidehill, near Ingram. In both these examples, some of the igneous rocks present occur as rounded boulders and they may have been collected as loose ‘moor stones’.

Figure 2: Farm buildings, Hartside. Cheviot volanic moor stones and Ballagan Sandstone.

Figure 3: Greenside Hill, near Ingram. Cheviot volanic moor stones and Ballagan Sandstone.

Carboniferous

Inverclyde Group, Ballagan Formation

Ballagan Formation Sandstone

The Ballagan Formation has a wide outcrop area centred on the southern flank of the Cheviot Hills, mainly around Netherton, Rothbury, Whittingham, Eglingham and Powburn, and extending northwards in a belt along the eastern side of the Cheviot Hills, taking in Akeld, Milfield and Crookham. The formation then runs along the northern border of Northumberland, stretching from Cornhill-on-Tweed via Norham to Berwick-upon-Tweed.

The formation comprises a sequence of interbedded, grey, fine-grained sandstones, mudstones and siltstones, with nodules and beds of argillaceous dolostones (cement stones). The thicker sandstone horizons yield excellent building stones and have been used locally wherever they crop out, for example in civic buildings such as the former police station and house, Whittingham. Even the thinner bedded and close-jointed sandstones yield small blocks suitable for sheepfolds and drystone walls. Some blocks of local Ballagan Sandstone are also used in buildings in the Cheviot Hills.

Figure 4: Former police station and house, Whittingham. Ballagan Sandstone and Fell Sandstone.

Ballagan Formation sandstones have been worked for building and dimension stone at quarries near Greenlaw and Wirchet.

Border Group, Fell Sandstone Formation

Fell Sandstone, Harbottle Grit

The Fell Sandstone Formation crops out in a discontinuous band from west to north-east Northumberland, extending from west Wark Forest and Kielder, close to the border with Scotland, along the southern flank of the Cheviot Hills, then continuing in a north–south trending belt as faulted blocks from Rothbury to Tweedmouth, via Eglingham, Doddington and Ford. The formation is lithologically varied and it is represented by cyclical sequences of sandstones, siltstones, mudstones and distinctive thin algal limestones, with localised dolomitic cement stones, seatearths and thin coals. The sandstones are mainly fine grained and often pale grey or pale yellow in colour, although pinkish varieties also occur. Coarser, gritty sandstones or even conglomerates are locally developed.

Fell Sandstone often makes a good freestone and it is employed locally as a building stone where it crops out. It is used especially for bridge building and other work requiring strong ashlar, for example in the railway bridges between Alnwick and Cornhill. It has been worked at Hazeldean Quarry (north-west of Alnwick), Belford Quarry (Fenwick) and in the Rothbury area.

The Fell Sandstone from Doddington Quarries, near Wooler, has a distinctive pinkish hue. This is clearly seen in many local buildings, such as the Church of St Mary at Wooler.

Figure 5: Church of St Mary, Wooler. Fell Sandstone.

The Harbottle Grit is a pale grey, coarser grained variety of Fell Sandstone that occurs in the Harbottle Hills area, on the eastern edge of the Northumberland National Park, west of Rothbury. This gritstone has been worked at several localities in the Harbottle area, including Ash Bank Quarry and Sealburn Quarry.

Yoredale Group, Tyne Limestone Formation

Tyne Formation Limestone, Tyne Formation Sandstone, Scremerston Sandstone, Blaxter Sandstone

This formation crops out in central and western Northumberland, occupying an area bounded by Rochester, Elsdon, Bellingham, Simonburn and Falstone, and including the Wark Forest, Kielder Forest and Kielder Reservoir areas.

The Tyne Limestone Formation comprises a range of lithologies, including sandstones, siltstones, mudstones and seatearths, with thin limestones and, locally, thin coals. The sandstones are typically pale grey or buff coloured, fine grained, flaggy to massive and often cross-bedded, although medium-grained and (rarely) coarse-grained pebbly sandstones also occur. The limestones are impure, dark grey-coloured biomicrites, with abundant fossil bryozoan and crinoid debris, and they contain sandy and argillaceous material. They typically exhibit ferruginous weathering and are poorly laminated and sporadically bioturbated.

The formation's sandstones have provided good quality building stone in abundance, and many small quarries opened to work freestone. The stones were (and in some cases still are) quarried at Little Bell Crags, Cairnglastenhope, Cop Crag (near Byrness), West Woodburn, High Nick and Milknock. The formation's limestones have also been worked as building stones. They were quarried on a small scale at several locations, including Green Carts Quarry and Sweet Rigg Quarry (on Haughton and Henshaw moors), and also at Rowantree Cleugh (Swinhope Moor) where a sandy limestone facies is developed.

Figure 6: Elsdon Tower. Tyne Limestone.

The Scremerston Coal Member contains a similar range of lithologies to the Tyne Limestone Formation, and it occurs in a linear strip of faulted blocks in north-east Northumberland, near Scremerston, Doddington, Belford, Ellingham and Alnwick. Some of the sandstones make good building and dimension stones, and these have been worked at Twizell (House) Quarry, Warenford, and Brownieside Quarry, near Alnwick.

Blaxter Sandstone is a characteristically buff or honey-coloured, fine to medium-grained sandstone that is slightly micaceous and non-calcareous. It exhibits cross-bedding and is a durable, hard-wearing sandstone that is not affected by acid rain or air pollution, although it shows some susceptibility to salt damage in coastal locations.

The Blaxter Sandstone is an excellent building and dimension stone and it has been quarried since the 1890s from the Otterburn area, where both active and abandoned workings are found, including Blaxter Quarry. It is used both within Northumberland and outside the county, notably in Newcastle-upon-Tyne and Edinburgh, for prestigious buildings and conservation projects.

Figure 7: Elsdon bridge. Tyne Limestone.

Figure 8: Town Hall, Bellingham. Tyne Limestone.

Yoredale Group, Alston Formation

Low Tipalt (Peghorn) Limestone, Bankhouses (Smiddy) Limestone, Oxford (Jew) Limestone, Colwell (Tynebottom) Limestone, Maize Beck Limestone, Shotto Wood (Cockleshell) Limestone, Eelwell (Five Yard) Limestone, Three Yard Limestone, Four Fathom Limestone, Great Limestone

The Alston Formation of Asbian to Pendleian age crops out in an arcuate belt stretching from north-east to south-central Northumberland, extending from Ancroft and Holy Island, via Rennington, Chollerton and Newbrough to Greenhead. Small outliers also occur near the southern border of the county, along the Rivers West Allen and East Allen (near Carrshield and Allenheads, respectively), and also south of Slaggyford. The formation consists of a succession of regular, well-developed Yoredale-type cyclothems, comprising bioclastic (biomicritic) limestones, sandstones, mudstones, siltstones and rare coals.

Limestones are the most widespread and consistent of the lithologies. They are often bituminous and generally dark grey to almost black in colour. They show an overall upward change from massive, fine-grained wackestones with a notable algal component, to current-bedded crinoidal packstones and grainstones. Most of the limestones are less than 5m thick (with the exception of the Great Limestone) and they are laterally persistent over many kilometres, enabling reliable correlations to be made with equivalent limestones in adjoining counties. The individual limestone beds have been named by quarrymen and miners, and their general sequence within the Alston Formation.

The Alston Limestone has been worked commercially at Barrasford Quarry (Oxford limestone horizon) and as a building and dimension stone at Denwick Quarry, near Alnwick. For building purposes, the limestone is

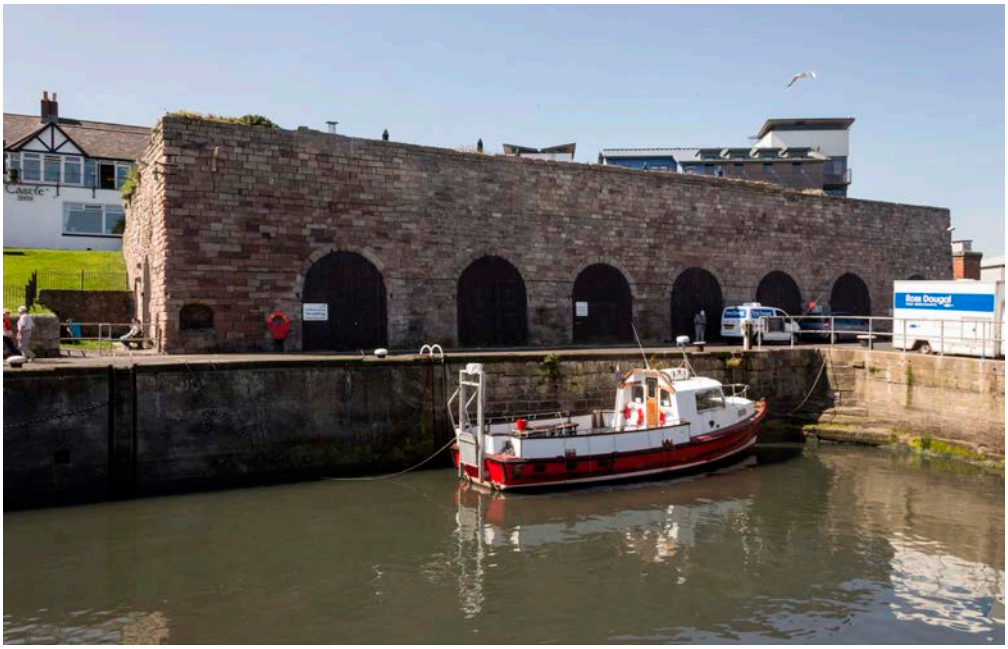


Figure 9: Limekilns, Seahouses harbour. Alston Formation.

typically used in a roughly to well-dressed, squared fashion, as seen in the post office at Bamburgh and the limekilns at Seahouses harbour. More sandy facies of the Alston Formation, including sandy limestones and sandstones, were used in the construction of Bamburgh Castle, which sits atop the Great Whin Sill, and in Evans Almshouses at Humshaugh.

The Great Limestone of Pendleian age is up to 16m thick and it occurs at the top of the Alston Formation. It comprises bluish-grey, slightly bituminous, bioclastic limestones (packstones), in which small fragments of crinoids are usually abundant. Complete or fragmentary shells of brachiopods and bivalves are locally conspicuous, and, in places, solitary and colonial corals are common.

The member is typically developed as thick limestone beds (known to local quarrymen and miners as 'posts'), which vary from a few centimetres to almost 2m in thickness. The uppermost 4.5m of the member comprise well-marked posts of limestone, separated by persistent dark grey shales or mudstone interbeds of up to 0.6m in thickness. Shelly sandstone units also occur and are useful as correlative horizons.

As one of the thickest and most widespread limestones within the Carboniferous succession, the Great Limestone has been quarried extensively along its outcrop for building stone and aggregate, at Whitehouse Quarries, for example. It is fairly durable, but is susceptible to dissolution and, at outcrop, prominent lines of sink or shake holes clearly mark the top of the member along many hillsides. Quarries at Brunton, Cocklaw and Fourstones formerly produced large tonnages of building stone from the Great Limestone, a proportion of which was burnt for lime.

Figure 10: Village buildings and castle, Bamburgh. Alston Formation Limestone.

Yoredale Group, Stainmore Formation

Firestone Sill, Grit Sills (Shaftoe Grit, Rothley Grit), Grindstone Sill, First Grit, Second Grit

The Stainmore Formation crops out mainly in the south and south-east of Northumberland, in a broad belt (fringing the Pennine Coal Measures Group) extending from Longhoughton on the north coast, via Stamfordham and Hexham, to a southern area bounded by Greenhead, Slaggyford, Allenheads, Blanchland and Riding Mill. The strata also crop out within a line of small, fault-bounded outliers in north-east Northumberland near Cheswick, Newton-by-the-Sea and Embleton.

The formation comprises a cyclical succession of thin limestones, sandstones, siltstones, mudstones and thin coals, which share similarities with the lithologies of the underlying Alston Formation. Like the Alston Formation limestones, the Stainmore Formation limestones are medium-grey biomicrites and biosparites, in which scattered shell and crinoid fragments are locally common and often visible on weathered surfaces. Stainmore Formation limestones, however, contain a greater proportion of clay and silt than those from the underlying Alston Formation.

A significant proportion of the Stainmore Formation is made up of sandstones. Most are fine to medium grained and slightly feldspathic. They typically weather to a distinctive yellow-brown colour and show cross-bedding. Local quarrymen or miners often referred to the thicker sandstone units as ‘sills’ or ‘grits’. Within the Morpeth district, the Stainmore Formation is distinguished by the occurrence of a few coarser grained, locally pebbly sandstones called the Shaftoe and Rothley Grits. A number of limestone and sandstone beds lying within the Stainmore Formation have been named, for example, Newton Limestone and Grindstone Sills.

Figure 11: Quarry garden, Belsay Hall. Stainmore Formation sandstone.

Stainmore Formation sandstones have been quarried extensively for building and dimension stone across their entire outcrop. Notable examples include quarries at Belsay, Black Pasture Quarry near Chollerford, Spylaw Quarry at Bilton, Fell House Quarry (Whitfield), and Heddon House and Botany Bay Plantation quarries at Heddon-on-the-Wall. Grindstone Sill sandstones have been worked from Doddend Quarries near Allenheads, and the Newton Limestone was worked at Gallowhill.

Typical examples of buildings constructed from Stainmore Formation sandstones include the Old Schoolhouse at Stamfordham and Netherwitton Mill. Sandstones from this formation were also used extensively in the construction of parts of Hadrian's Wall, exemplified in the section near Haltwhistle.

Figure 12: The Old Schoolhouse, Stamfordham. Stainmore Formation sandstone.

Figure 13: Netherwitton Mill. Stainmore Formation sandstone.

Figure 14: Hadrian's Wall near Haltwhistle. Stainmore Formation sandstone.

Pennine Coal Measures Group, Pennine Lower Coal Measures Formation

Lower Coal Measures Sandstone

The Pennine Lower Coal Measures Formation crops out in south-east Northumberland, in a belt extending from Amble in the north, via Morpeth and Stannington, to Derwent Reservoir. The strata also crop out within a series of small, fault-bounded outliers extending approximately east to west from Lambley to near Hexham.

The sequence includes grey to yellow-brown-coloured sandstones, siltstones, mudstones and coals (the last become thicker in the upper parts of the sequence). The sandstones vary from massive or thick bedded to flaggy, but they are typically medium to coarse grained and cross-bedded. They are often micaceous and carbonaceous, and occasionally contain elongate ferruginous concretions or mudstone clasts. The basal parts of sandstone units are sometimes conglomeratic or feldspathic. Many of the sandstones are tough and durable and they make excellent building stones; some are extremely hard and quartzitic and ganister-like in nature.

Figure 15: Old station buildings, Morpeth. Lower Coal Measures Sandstone.

Lower Coal Measures sandstones were quarried extensively for building and dimension stone, albeit usually on a relatively small scale. They have been worked at several quarries at Heddon-on-the-Wall (including Heddon Common), Stannington, Amble, Morpeth and Slaley (Ladycross Quarry).

Figure 16: The Old Vicarage, Stannington. Lower Coal Measures Sandstone.

Figure 17: Morpeth Castle. Lower Coal Measures Sandstone.

Pennine Coal Measures Group, Pennine Middle Coal Measures Formation

Seaton Sluice Sandstone, Low Main Post Sandstone, High Main Post Sandstone, Woodhorn Sandstone, Seventy Fathom Post Sandstone, Grindstone Post Sandstone

The Pennine Middle Coal Measures Formation crops out in south-east Northumberland, in a roughly triangular-shaped area bounded by Amble in the north, Prudhoe in the west and Hartley in the east. Some of the best and most extensive exposures occur along the Northumberland coast.

Figure 18: Seghill Vicarage, Cramlington. Middle Coal Measures Sandstone.

The formation consists of pale grey, brownish-grey to pinkish or yellowish-grey sandstones, with mudstones, siltstones and coal seams. Beds of mudstone containing marine fossils are found at intervals. The sandstones occur as relatively thin (<5m thick), laterally extensive, sheet sandstones or as thicker (10 to 50m thick) channel sandstones. Often, these channel sandstones exhibit variable grain size, in places becoming coarse grained or even pebbly. Virtually all the sandstones are cross-bedded, and they are commonly ripple marked. Channel sandstones often occupy washout structures, which may cut down several metres into underlying strata and contain mudstone, ironstone or coalified pebbles (locally called ‘scars’ or ‘scares’).

Local quarrymen or miners have named a number of the sandstone units within the Pennine Middle Coal Measures Formation. These include (from the lower part of the sequence upwards) Low Main Post Sandstone and Seaton Sluice Sandstone, High Main Post Sandstone, Woodhorn Sandstone, Seventy Fathom Post Sandstone and Grindstone Post Sandstone.

Middle Coal Measures sandstones are generally tough, durable and quartzitic. They have been worked extensively as building and dimension stones from several quarries at Ashington, Bedlington, Hartford Bridge, Cramlington, Stannington and Newbiggin Moor. The Seventy Fathom Post Sandstone was worked at Spital Point Quarry and North Seaton Quarry, near Newbiggin-by-the-Sea. As its name implies, the Grindstone Post Sandstone was formerly used in the manufacture of grindstones, with the bulk of production coming from quarries near Wrekenton (Tyne and Wear), including Eighton Banks and Springwell. Woodhorn Sandstone was quarried from the Woodhorn area and it was widely used as a building stone and for the making of grindstones, many of which were exported to Norway and Sweden.

Figure 19: St Bartholomew's Church, Newbiggin-by-the-Sea. Middle Coal Measures Sandstone.

Permo-Carboniferous

Whin Sill Complex, Great Whin Sill

Whinstone

The Great Whin Sill is intruded into the Alston Formation and crops out in Northumberland as a discontinuous ridge, extending from the north-east corner of the county (Fenwick, Belford, Bamburgh), via coastal areas (Beadnell, Embleton, Craster), to near Longhoughton and south of Alnwick. The sill runs in a near-continuous belt through south-central Northumberland, stretching from Kirkwhelpington westwards (north of Hallington, Humshaugh and Newbrough) to Greenhead. The outcrop of the Great Whin Sill is typically represented by a linear topographic high, and this produces dramatic settings for the several prestigious structures built upon it, such as Bamburgh Castle.

Figure 20: Bamburgh Castle, built on top of the Whin Sill.

The sill rocks (Whinstone) comprise dark grey-black to black, fine to medium-grained, weakly porphyritic, quartz-dolerites, with grains up to 2mm in diameter. The rock contains small phenocrysts of plagioclase feldspar, with pyroxene (mainly augite, hypersthene and pigeonite) set in a dark grey, fine-grained groundmass. Significant amounts of opaque iron oxides and pyrite are also present. Many rocks have interstitial quartz-alkali feldspar intergrowths. There is a marked decrease in grain size at the margins of the sill, where the rock comprises a very fine-grained tachylite. In the upper half of the sill, the dolerite is locally cut by flat-lying sheets, veins and segregations of coarse-grained pegmatitic dolerite (with crystals up to 20mm in length).

Figure 21: The Blue Bell Inn, Embleton. Whinstone.

Figure 22: The Victoria Hotel, Bamburgh. Whinstone with Stainmore Formation sandstone dressings and quoins.

Whinstone has been employed only occasionally as a local building stone (at Bamburgh and Embleton, for example) and in stone walling near accessible outcrops. However, its hardness and resistance to erosion make it an excellent roadstone and aggregate. Whinstone was quarried from several locations at Embleton, Bamburgh, Belford and Craster, and it was worked for concrete, roadstone, aggregate and building stone at Kirkwhelpington (East White Hill Quarry), Divet Hill Quarry and Keepershield Quarry. It was also extracted from large quarries at Barrasford and Colwell (Swinburne Quarry), although these were worked mainly for roadstone and aggregate.

Figure 23: Cottage, Embleton. Whinstone with Stainmore Formation sandstone dressings and quoins.

Tertiary

North Britain Palaeogene Dyke Suite, Mull Dyke Swarm

Dolerite Dyke Rock

A series of north-west to south-east trending dolerite dykes occur in the south-east coastal area of Northumberland between Morpeth and Hartley. Elsewhere, a major dyke cross-cuts central Northumberland from the southern edge of the Cheviot Hills to near Broomhill, and smaller but related dykes occur in the Kielder area of west Northumberland.

Lithologically, these dyke rocks are very dark, grey-black to black, fine to medium-grained, tholeiitic basalts and dolerites. The coarser grained varieties exhibit a mottled texture, with dark pyroxene (and sometimes olivine) crystals interlocking with pale feldspar (anorthite) phenocrysts. The matrix is glassy, commonly devitrified or microcrystalline. These dolerites may be distinguished from those of the Whin Sill by their more porphyritic character.

These Palaeogene dyke rocks have not really been employed as a building stone, except locally in stone walling near accessible outcrops, because of their very hard, intractable nature and restricted occurrence. They are used principally as roadstone and aggregate. Small quarries were formerly worked south of Bedlington and on the south bank of the River Wansbeck, east of Morpeth.

3 Further Reading

The Further Reading, Online Resources and Contacts guide provides general references on:

- Geology, building stones and mineral planning
- Historic building conservation, architecture and landscape.

There is also a separate glossary of geological terms.

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5 Acknowledgements

The Building Stones of England series was developed by Geckoella Ltd (Andy King), the British Geological Survey (Don Cameron, Graham Lott, and Stephen Parry), and Historic England (Clara Willett).

Historic England and the British Geological Survey developed the Building Stone Database for England with advice from many local geologists and historic building experts and all these individuals are thanked for their contributions.

The Department for Levelling Up, Housing and Communities supported the development of the Building Stones of England database project.

Figures

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Product code: HEBSE32
Publication date: 2017
Reissue date: May 2023
Design: Historic England