

STRATEGIC STONE STUDY

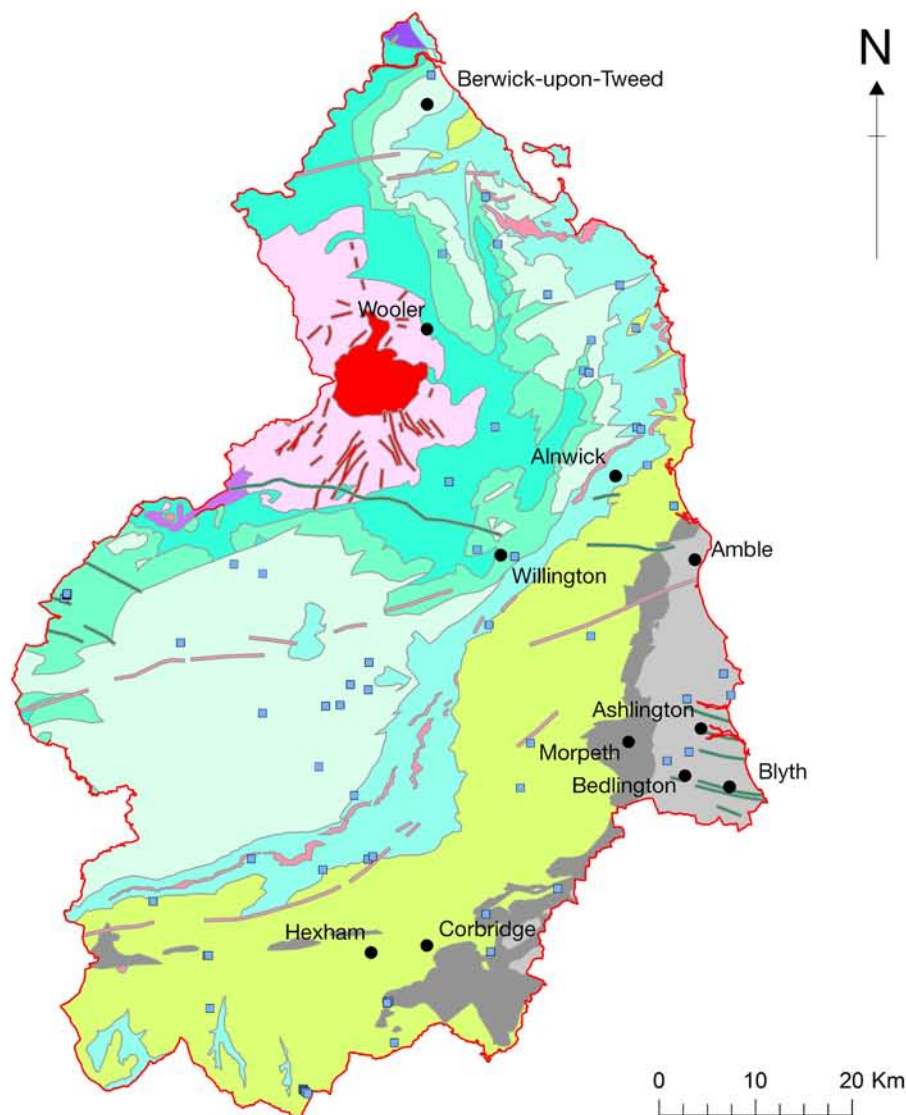
A Building Stone Atlas of NORTHUMBERLAND

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ENGLISH HERITAGE

Northumberland Bedrock Geology



■ BUILDING STONE SOURCES

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- UNNAMED IGNEOUS INTRUSION, CARBONIFEROUS TO PERMIAN - DOLERITE AND THOLEIITIC BASALT
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- RICCARTON GROUP - WACKE
- HAWICK GROUP - WACKE

Click on this link to visit Northumberland's geology and their contribution to known building stones, stone structures and building stone quarries (Opens in new window <http://maps.bgs.ac.uk/buildingstone?County=Northumberland>)

Introduction

The solid geology of Northumberland is dominated by Carboniferous sediments which 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 are 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 his report on Otterburn and Elsdon, Miller (1887, p. 122) 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 the Iron Age forts. Extraction on a larger scale commenced during the Roman occupation, with the construction of Hadrian's Wall (begun in AD 122), and its associated forts and gate towers. Despite running partially along the outcrop of the Great Whin Sill, the Romans selected sandstone as the main construction material and avoided use of 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 today, only a few - such as those near Chollerford - can be identified as being of Roman origin). Following the departure of the Romans, 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. Old, small 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 formerly worked 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.

Useful accounts of the geology and use of Northumberland's building stones are provided within the relevant memoirs of the British Geological Survey. The geological succession is summarised in Figure 1 below, with specific emphasis being given to those stratigraphic units worked for building stone.

Sedimentary rocks

UPPER CARBONIFEROUS	Pennine Coal Measures Group	Pennine Upper Coal Measures Formation
		Pennine Middle Coal Measures Formation
		Pennine Lower Coal Measures Formation
LOWER CARBONIFEROUS	Yoredale Group	Stainmore Formation
		Alston Formation (including the Great Limestone Member)
		Tyne Limestone Formation (including the Scremerston Coal Member)
	Border Group	Fell Sandstone Formation
	Inverclyde Group	Ballagan Formation

Intrusive igneous rocks

PALAEOGENE	Tholeiitic dykes	North Britain Palaeogene Dyke Suite Mull Dyke Swarm
LATE CARBONIFEROUS – EARLY PERMIAN	Quartz dolerite sills and dykes	Great Whin Sill Complex
DEVONIAN	Cheviot granite	Cheviot Pluton
	Cheviot lavas, trachytes and rhyolites	Cheviot Volcanic Formation

Figure 1. Geological succession in Northumberland (showing building stones only)

SEDIMENTARY ROCKS

The stratigraphic nomenclature relating to the Carboniferous sedimentary rocks has undergone a number of revisions over the years, and several different names have been applied to the various stratigraphic units. For convenience, a summary of the 'old' and 'modern' terminology is provided in Figure 2 below.

FORMER GROUP DIVISIONS	MODERN STRATIGRAPHIC TERMINOLOGY	
'COAL MEASURES' (Upper, Middle and Lower Coal Groups)	Pennine Upper Coal Measures Formation	PENNINE COAL MEASURES GROUP
	Pennine Middle Coal Measures Formation	
	Pennine Lower Coal Measures Formation	
STAINMORE GROUP	Stainmore Formation	YOREDALE GROUP
UPPER LIDDISDALE GROUP	Alston Formation	
LOWER LIDDISDALE GROUP SCREMERSTON COAL GROUP (UPPER BORDER GROUP)	Tyne Limestone Formation	
FELL SANDSTONE GROUP (MIDDLE AND LOWER BORDER GROUPS)	Fell Sandstone Formation	BORDER GROUP
CEMENTSTONE GROUP	Ballagan Formation	INVERCLYDE GROUP

Figure 2. Former and modern stratigraphic divisions of Carboniferous strata in Northumberland

LOWER CARBONIFEROUS

Inverclyde Group

Ballagan Formation

The Ballagan Formation has a wide outcrop area centred on the southern flank of the Cheviot Hills (mainly around Netherton, Rothbury, Whittingham, Eldingham and Powburn) and extending northwards in a belt along the eastern side of the Cheviot Hills (taking in Akeld, Millfield 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** (cementstones). 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 Northumbria Police Expedition Centre, Whittingham (image below). Even the thinner-bedded and close-jointed sandstones yield small blocks suitable for sheepfolds and drystone walls.

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



Border Group

Fell Sandstone Formation

The Fell Sandstone Formation crops out in a discontinuous band from west to north-east Northumberland, extending from west Walk 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 is represented by cyclical sequences of sandstones, siltstones, mudstones and distinctive thin algal limestones, with localised dolomitic cementstones, seatearths and thin coals. The sandstones are mainly fine-grained and often pale grey or pale yellow coloured, although pinkish varieties also occur. Coarser, gritty sandstones or even conglomerates are locally developed.

Fell Sandstone often makes a good freestone and is used 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 Alswick and Cornhill. It has been worked at Hazeldean Quarry (NW of Alnwick), Belford Quarry (Fenwick) and in the Rothbury area.

The Fell Sandstone from Doddington quarries (near Wooler) has a distinctive pinkish hue which is clearly seen in many local buildings, such as the Church of St Mary in Wooler (right image).

Harbottle Grit

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

Yoredale Group

Tyne Limestone Formation

This formation crops out in central and western Northumberland, occupying an area bounded by Rochester, Elsdon, Bellingham, Simonsburn 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 contain sandy and argillaceous material. They typically exhibit **FERRUGINOUS** weathering, and are poorly laminated and sporadically bioturbated.



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

Typical examples of buildings constructed from sandstones and limestones belonging to the Tyne Limestone Formation are provided by the Town Hall in Bellingham (upper right image), Elsdon Rectory (lower right image) and Elsdon bridge (image below).

SCREMERSTON COAL MEMBER

Scremerston Sandstone

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

Blaxter Sandstone

Blaxter Sandstone is a characteristically buff or honey coloured, fine- to medium-grained sandstone which is slightly **MICACEOUS** and non-calcareous. It exhibits cross-bedding and is a durable, hard-wearing sandstone which 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 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.

Alston Formation

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 Newborough to Greenhead. Small outliers also occur out near the southern border of the county, along the Rivers West Allen and East Allen (near Carr Shield 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.



GREAT LIMESTONE MEMBER

Great Limestone

The Great Limestone (of Pendleian age) is up to 16 metres thick and 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 up to almost 2 metres in thickness. The uppermost 4.5 metres comprise well-marked 'posts' of limestone separated by persistent dark grey shales or mudstone interbeds, of up to 0.6 metres 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 extensively quarried along its outcrop for building stone and aggregate (for example, at Whitehouse). 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. Bruton, Cocklaw and Fourstones quarries formerly produced large tonnages from the Great Limestone, a proportion of which was burnt for lime in addition to being used as a building stone.

UPPER CARBONIFEROUS

Yoredale Group

Stainmore Formation

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 of 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. The thicker sandstone units were often referred to by local quarrymen or miners 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, Grindstone Sill) and these are shown in Figure 4 below.

----- MB ----- MB -----	Subcrenatum (Quarterburn) Marine Band					STAINMORE FORMATION
.....	'SECOND GRIT'					
.....	'FIRST GRIT'					
	WHITEHOUSE LIMESTONE					
	NEWTON (GRINDSTONE) LIMESTONE					
.....	GRINDSTONE SILL					
	THORNBOROUGH (UPPER FELTOP) LIMESTONE					
	CORBRIDGE (LOWER FELTOP) LIMESTONE					
○ ○ ○ ○ ○		LIMESTONE				
○ ○ ○ ○ ○		BELSAY DENE LIMESTONE				
SHAFTOE and ROTHLEY GRITS		'GRIT SILLS'				
		OAKWOOD (CRAG) LIMESTONE				
		FIRESTONE SILL				
		LITTLE LIMESTONE				

Figure 4. Main sandstone 'sills', grit and limestone units within the Stainmore Formation in Northumberland (not to scale)

Stainmore Formation sandstones have been extensively quarried for building and dimension stone across their entire outcrop. Notable locations include Cragg Bank (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 are provided by the Old School House at Stamfordham (top right image), and Netherwitton Mill (middle right image). Sandstones from this formation were also used extensively in the construction of parts of Hadrian's Wall, as exemplified by the section near Haltwhistle (bottom right image).

Pennine Coal Measures Group

Pennine Lower Coal Measures Formation

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-west from Lambley to near Hexham.

The sequence includes grey to yellow-brown coloured sandstones, siltstones, mudstones and coals (the latter become thicker in the upper parts of the sequence). The sandstones vary from massive or thick-bedded to flaggy, but 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 make excellent building stones – some are extremely hard and quartzitic (and ganister-like in nature).

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-by-the-Sea, Morpeth and Slaley (Ladycross Quarry).





Typical examples of buildings constructed from Lower Coal Measures sandstones are provided by the Castle (image below) and old station buildings in Morpeth (left image), and Stannington vicarage (image above).



Pennine Middle Coal Measures Formation

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 (to the east). Some of the best and most extensive exposures occur along the Northumberland coast.

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 (<5 metre thick), laterally extensive 'sheet sandstones' or as thicker (10-50 metre thick) 'channel sandstones'. Often, these 'channel sandstones' exhibit variable grain-size, in places becoming coarse-grained, evenly pebbly. Virtually all the sandstones are cross-bedded and they are frequently 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').

A number of the sandstone units (or 'Posts') within the Pennine Middle Coal Measures Formation have been named by local quarrymen or miners. These include (from the lower part of the sequence upwards): Low Main Post and Seaton Sluice sandstones, High Main Post Sandstone, Woodhorn Sandstone, Seventy Fathom Post Sandstone, and Grindstone Post Sandstone. The position of these sandstone units in relation to the Middle Coal Measures Marine Bands (used for correlation) is shown in Figure 5, top right.

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

Seghill Vicarage in Cramlington (top image) and St Bartholemew's church, Newbiggin-by-the-Sea (bottom image), provide typical examples of buildings constructed from Middle Coal Measures sandstones. The sandstones used in St Bartholemew's church include those from the Seventy Fathom Post bed.

---- MB ----	<i>Cambriense (Down Hill) Marine Band</i>	PENNINE MIDDLE COAL MEASURES FORMATION
.....	GRINDSTONE POST SANDSTONE (Grindstone Post Member)	
---- MB ----	<i>Aegiranum (Ryhope) Marine Band</i>	
.....	SEVENTY FATHOM POST SANDSTONE (Seventy Fathom Post Member)	
---- MB ----	<i>Sutton (Hylton) Marine Band</i>	
.....	WOODHORN SANDSTONE	
---- MB ----	<i>Haughton (Kirkby's) Marine Band</i>	
---- MB ----	<i>Maltby (High Main) Marine Band</i>	
.....	HIGH MAIN POST SANDSTONE (High Main Post Member)	
.....	LOW MAIN POST and SEATON SLUICE SANDSTONES	
---- MB ----	<i>Vanderbecke (Harvey) Marine Band</i>	

Figure 5. Main sandstone units within the Pennine Middle Coal Measures Formation in Northumberland (not to scale)



INTRUSIVE IGNEOUS ROCKS

DEVONIAN

Cheviot Granite Pluton & Cheviot Volcanic Formation

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 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 that 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 (bottom image) and Greensidehill, near Ingram (image below). In both these examples, some of the igneous rocks present, occur as rounded boulders and may have been collected as loose 'moor stones'. Some blocks of sandstone (probably local Ballagan Sandstone) are also used in these buildings.



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LATE CARBONIFEROUS — EARLY PERMIAN

GREAT WHIN SILL (WHIN SILL COMPLEX)

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), then via coastal areas (Beadnell, Embleton, Craster) to near Longhoughton and south of Alnwick. The sill continues in a near continuous belt through south-central Northumberland, stretching from Kirkwhelpington westwards (north of Hallington, Humshaugh and Newborough) to Greenhead. The outcrop of the Great Whin Sill is typically represented by a linear topographic high and this produces dramatic settings for the location of several prestigious structures built upon it, such as Bamburgh Castle (see p. 16).

Sill rocks (called '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 and 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 2cm in length).

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

Typical examples of buildings constructed from roughly dressed and squared Whinstone are the Bluebell Inn (top image), Embleton Cottage in Embleton (middle image), and the Victoria Hotel, Bamburgh (bottom image) (the last two buildings have dressings and quoins of Stainmore Formation sandstone).



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TERTIARY (PALAEOGENE)

Dolerite dykes (North Britain Palaeogene Dyke Suite, Mull Dyke Swarm)

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 virtue of their more porphyritic character.

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

The below image is of Bamburgh Castle, which is built on top of the Whin Sill.



Glossary

Carbonaceous: Consisting of, containing, relating to, or yielding carbon.

Conglomerate: A sedimentary rock made up of rounded pebbles (>2mm), cobbles and boulders of rock set within a finer-grained matrix.

Dolerite: Medium-grained basic igneous rock commonly found as small to medium sized intrusions.

Dolostone: A sedimentary rock composed of more than 90 percent of the mineral dolomite (calcium magnesium carbonate).

Facies: A term describing the principal characteristics of a sedimentary rock that help describe its mode of genesis e.g. dune sandstone facies, marine mudstone facies.

Ferruginous: Containing iron minerals usually in the form of an iron oxide which gives the rock a 'rusty' stain.

Flaggy: A finely laminated, sedimentary rock that splits into thin sheets when exposed to weathering.

Freestone: Term used by masons to describe a rock that can be cut and shaped in any direction without splitting or failing.

Granite: Coarsely crystalline igneous rock, composed primarily of quartz, feldspars and micas, with crystal sizes greater than 3 mm.

Igneous rock: Rocks formed when molten magma cools and solidifies. The term encompasses extrusive rocks erupted from volcanoes (e.g. basalt) and intrusive rocks that cool beneath the Earth's surface (e.g. granite, gabbro, granodiorite, dolerite).

Ironstone: Sedimentary rock which is composed of more than 50% iron-bearing minerals.

Limestone: A sedimentary rock consisting mainly of calcium carbonate (CaCO_3) grains such as ooids, shell and coral fragments and lime mud. Often highly fossiliferous.

Micaceous: Applied to a rock which contains a significant proportion of mica, usually muscovite and/or biotite.

Mudstone: A fine-grained sedimentary rock composed of a mixture of clay and silt-sized particles.

Phenocryst: A relatively large and usually conspicuous crystal, surrounded by smaller crystals that form the main fabric of an igneous rock.

Sandstone: A sedimentary rock composed of sand-sized grains (i.e. generally visible to the eye, but less than 2 mm in size).

Seatearth: The layer of sedimentary rock underlying a coal seam.

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