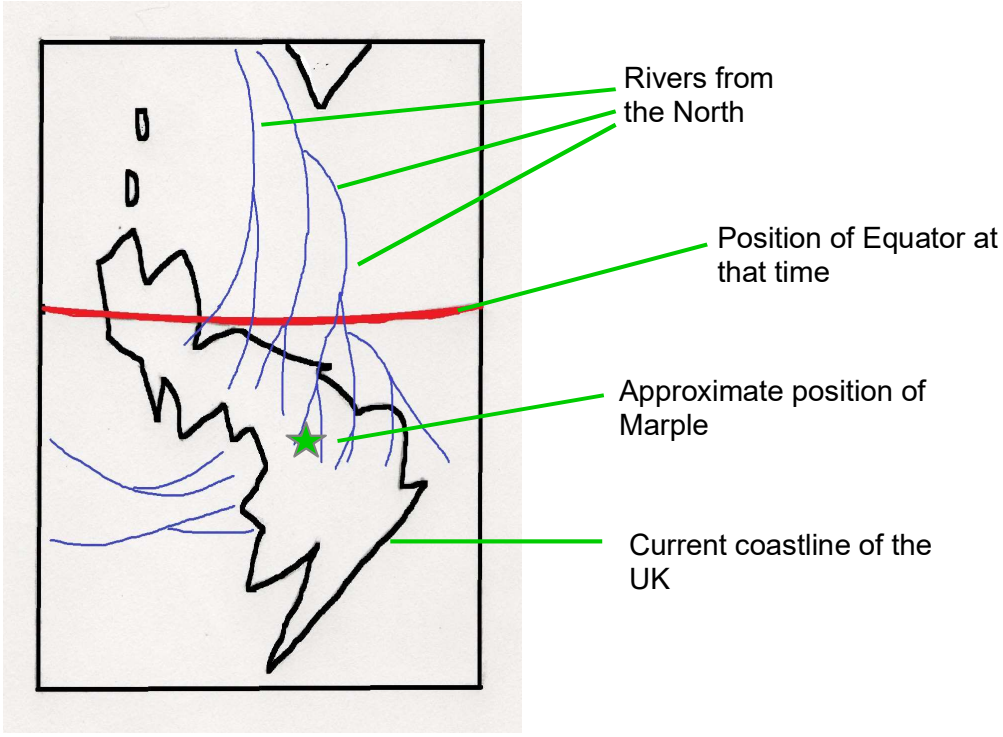
The Geology Around Marple: Why Samuel Oldknow thought it was a good idea to build his mill in the Goyt Valley near Marple Bridge

Samuel Oldknow built his Mill at Mellor because of the natural resources the site offered him. These natural resources were the product of millions of years of geological history. This short account explains how they formed.

The current countryside looks green/yellow/red/brown. There are many trees and other vegetation. There are hills and rivers. A long time ago – well before the dinosaurs roamed the earth – about 315 million years ago (Ma), the land probably also looked green. However, there were no houses, no telegraph poles though it was probably cloudy. And it would have been a lot warmer because Britain was located somewhere round the equator on a tectonic plate which was moving northwards. This was towards the end of the Carboniferous period (which stretched from 359Ma to 299Ma), at a time known in the UK as the Namurian/Westphalian boundary. The Namurian epoch used to be called the Millstone Grit and the Westphalian called the Coal Measures which reflect the types of rock found in each.

So how it might the area have looked?

There was an enormous braided river (a river made up of many channels not just one as the River Goyt is now), one of many covering a huge area of northern 'Britain', flowing like the Mississippi/Amazon/Ganges/Indus and Nile do now only bigger. It was flowing roughly southwards. It started life in a huge range of mountains far to the north and east – where Scotland and Norway are now – or even further away. It was flowing south to the sea which was probably somewhere beyond Ashbourne/Staffordshire (and is known as the Widmerpool Basin). The river carried huge amounts of sediment: sands and muds which had been eroded from the mountains.



Cartoon Map Showing Rivers Flowing from the North and North East (and West) during Namurian Times

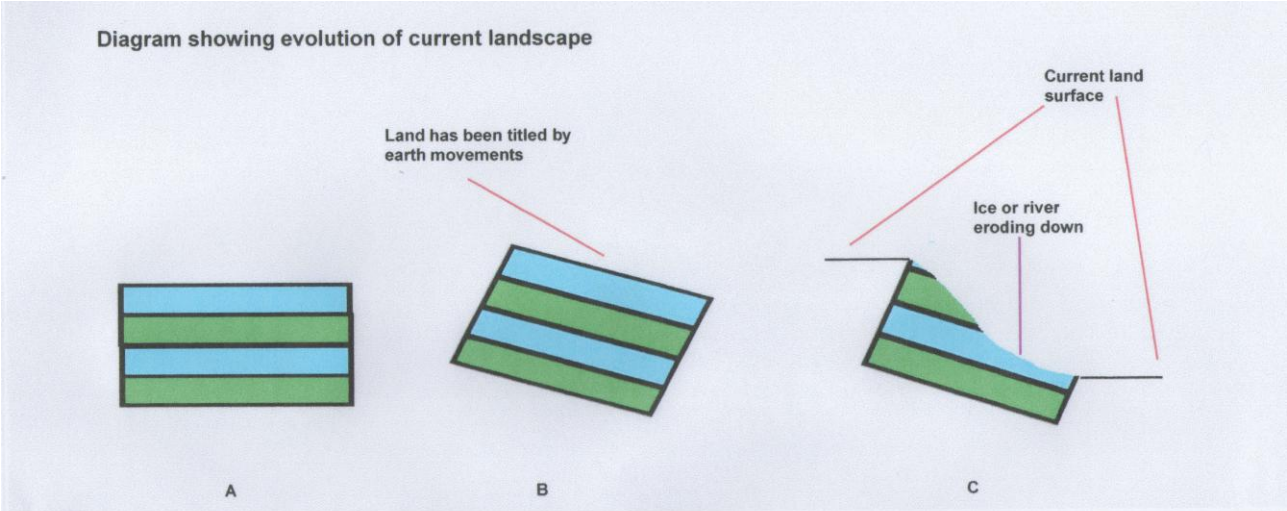
The faster a river flows, the more sediment it can carry and also the larger or heavier each piece of material can be. This river was very powerful and brought a great deal of material over a very long period of time. Its flow was variable: sometimes it moved quickly, sometimes slowly rather as rivers do today, depending on volume of water and rainfall/snow melt further upstream. As the flow slowed, sediment was deposited onto the river bed, or if the river had burst its banks during a flood

then onto the areas between the 'braids'. The heavier grains would be dropped first and then as the water flow slowed, the lighter material would land on the river bottom, forming muddy layers.

Islet in River Goyt

Over time, the material which the river brought down rose above the surface of the water. This still happens today and there is an example of this in the River Goyt near the Metal Bridge in Brabyns Park.

The hills we see are made of coarser material, sandstone. Marple Ridge, Werneth Low and Kinder Plateau are examples. Where there is a valley between the hills, it is often because there are the mudstone/shale layers which erode more easily and water will follow the line of least resistance. But this is only because, after the various layers of sands and muds had been deposited horizontally, compacted (or lithified as it is known) and buried, these layers were tilted by earth movements. The diagram below shows this process.

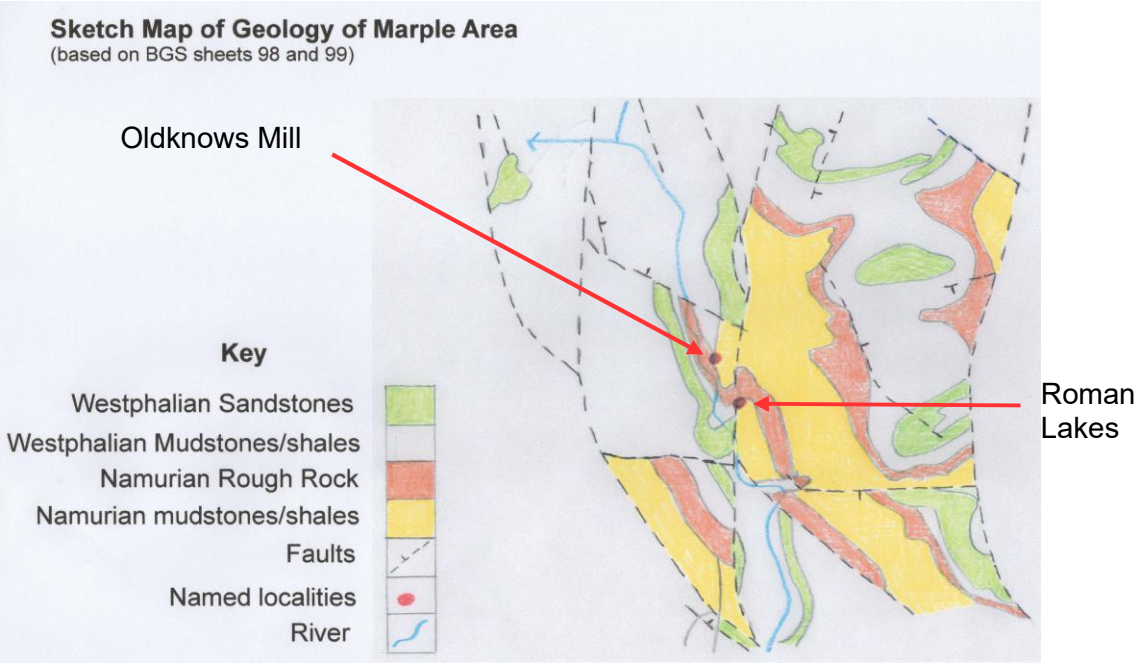


A: Sediment is laid down by rivers in an ocean basin or an existing large valley. In this diagram, green represents sandstone (coarser material) and blue represents shales and mudstones (finer material). This is buried to depth as more and more layers are deposited. Youjngest rocks are on top.

B: Over millions of years the local land mass has been tilted (and folded too).

C: In more modern times (say the last 2 million years minimum), ice sheets and rivers have eroded the landscape so that earlier deposits are now at the surface.

The whole of the north of England has been folded and faulted over time resulting in the bands of sands and mudstones now being at an angle not horizontal. The geological sketch map below shows how complicated it is around Marple and Marple Bridge.

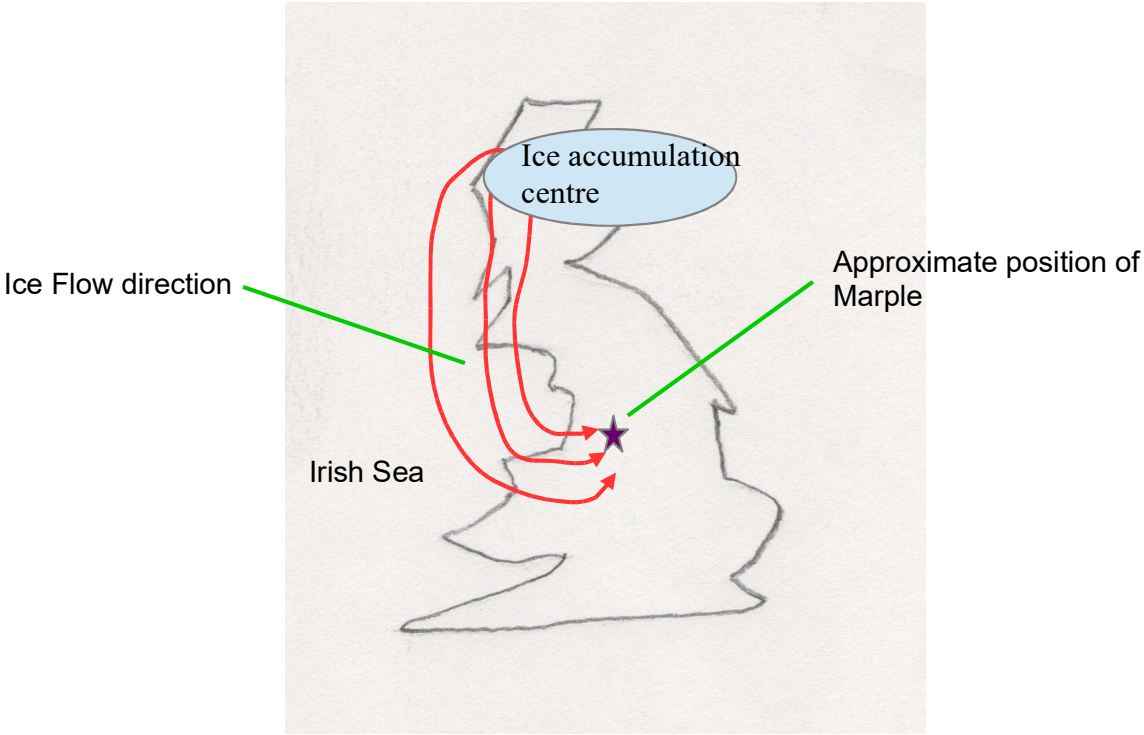


On the land between the ribbons of water, there were trees – but not as we know them. They did not flower like most deciduous trees today do. They were often enormous: ones which are relatives of today's horsetails were up to 30m tall. One type of plant called lycopod had a 1m trunk. The living relative of this today is a club moss which is very tiny. When these trees died, they were buried by sediment as the rivers changed course and/or sea level changes which meant the rivers dropped different weights of sediment at different times. Over millions of years, they became buried deeper and deeper and finally formed the coal which is found locally.

There were very few land creatures: no mammals, no birds. There were insects: dragonflies with two foot (60cm) wingspan, mayflies, cockroaches, grasshoppers, crickets, scorpions and millipedes 30cm long. The reason for their often huge size was that there was more oxygen in the atmosphere than there is now (perhaps as much as 35% compared with 21% now). They “breathe” by absorbing oxygen through their skin not through lungs. Higher oxygen levels meant they could grow bigger. Oxygen levels have changed over time but the Carboniferous period was the highest.

The current landscape is the result of the last Ice Age. For 2 million years, the UK was covered by ice. It waxed and waned and the last Glacial Maximum was only 18,000 years ago. By 10,000 years ago, most of it had gone – certainly from round Marple. However, the landscape had been changed for ever. As the ice sheets came and went, they eroded the land underneath which, having practically no vegetation during very cold periods, meant that rock was ground away. Rivers which still flowed (either under the ice or during ice-free periods) eroded down into the weathered surface to form deep valleys which were later filled with sediment. When the land was ice-free, there were animals such as wolves, extinct steppe bison, woolly mammoth and so forth ranging across Britain. When the ice finally disappeared 10,000 years ago, what was left was rather as it is today.

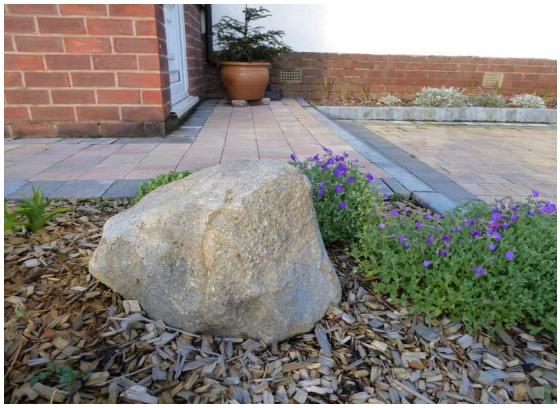
The area was covered by ice in the last glaciation, not from the Pennines but from a westerly direction. It came down the Irish Sea from the north, turned left and across what is now Snowdonia and the Mersey valley. The diagram below illustrates this.



Cartoon Map Showing the Direction of the Last Ice Advance

It continued eastwards until it reached approximately New Mills. So the very tops of the Pennines locally were not fully ice covered on this last occasion though they had been in earlier ones. Under the ice during the various ice ages, rivers were probably still running and eroding and changing course. When the last glaciation finished, the ice melted on the slopes first then the rest in situ. As it melted, because water can't flow uphill, it found a way through lines of weakness, possibly faults, and cut gorges when it couldn't follow the pre-Ice Age course. The rivers reworked ice-carried sediment and there were some ice margin channels on hillsides – a bit like the canal. Sometimes the river has cut down so you can see the bedrock.

The sediments deposited by the ice sheets or by the meltwater rivers are what cover the area now. These deposits are known as boulder clay or glacial till. In most gardens locally, digging down below the top soil will bring rocks to the surface which look like they don't belong: like granite and slates. These are called glacial erratics and were what the ice sheets carried with them either on their tops (having fallen from mountains) or in their bases (which they had plucked from the ground the ice flowed over). Around here, they are probably from the Lake District or North Wales!



Granite erratic dug up from the garden

Sandstone erratic found at the mill

The rivers 10,000 years ago were bigger than they are now which is why looking across the Goyt valley, there is smallish river in a very large valley. There is an image below showing how flat the valley is and the river seems very small. River terraces indicating differing river levels can be made out.

Note how wide the valley is: there is almost as much distance behind the photographer as in front

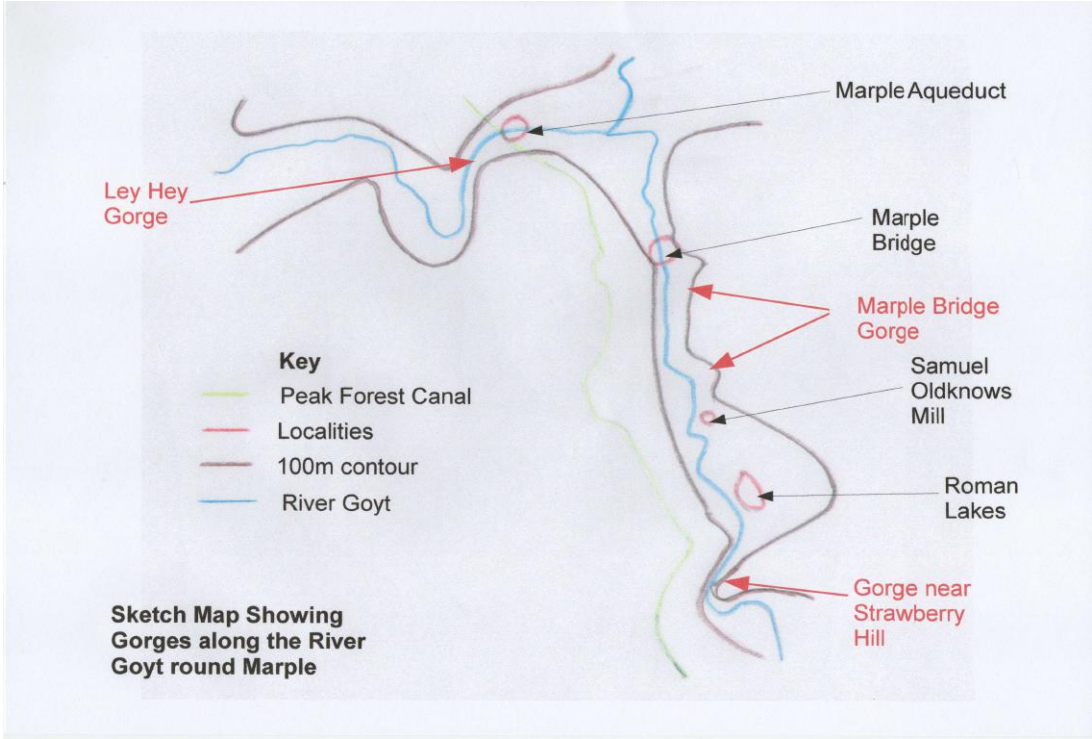
Flat Valley bottom

River Terrace showing how river has moved and eroded down

Flat River Valley and River Terraces (view looking towards Compstall from Brabbyns Park

Once the ice had disappeared, the source of water for the rivers became rain water. Everything got warmer and vegetation grew. Man moved into the area and started to change the landscape. Peat began to form on the moors once the tree cover had gone and the forests reduced in size especially when farming took off.

As the River Goyt approaches the site of Oldknow's Mill near Roman Lakes, it is in a small gorge. The river has come from New Mills where it passes through The Torrs which was cut through the solid rock by meltwater, then along a wider valley past Hague Bar before going into another small gorge leading to the Roman Lakes area. The sketch map below shows the gorges around Marple.



Sketch Map Showing Gorges along the River Goyt round Marple

The water now has cut down to bedrock which can be seen sometimes if the water is low. The river by Roman Lakes, near where there is a water takeoff point built by Samuel Oldknow, is generally smooth flowing before it pours over the weir.

Water Take Off Point

Further upstream, near the Roman Bridge, the water is much more turbulent. That water is shallower and it shows the effect the weir has had on the depth of the water – it is much deeper by the weir.

The river's course at this point is moving left to curve round the valley edge. This is not the course it was followed when Oldknow started the mill. It would have been meandering across the middle of the valley probably. It seems that once Oldknow realised that he needed water for his water wheels, he arranged for the river to be 'diverted' to its present course. The road between the river and Roman Lakes is actually a dam that was built to form the reservoirs. The 'old' course of the river is probably what is now used as the leat (water channel bringing the water to the Mill).

Oldknows Dam and the Goyt Valley

River Goyt course now

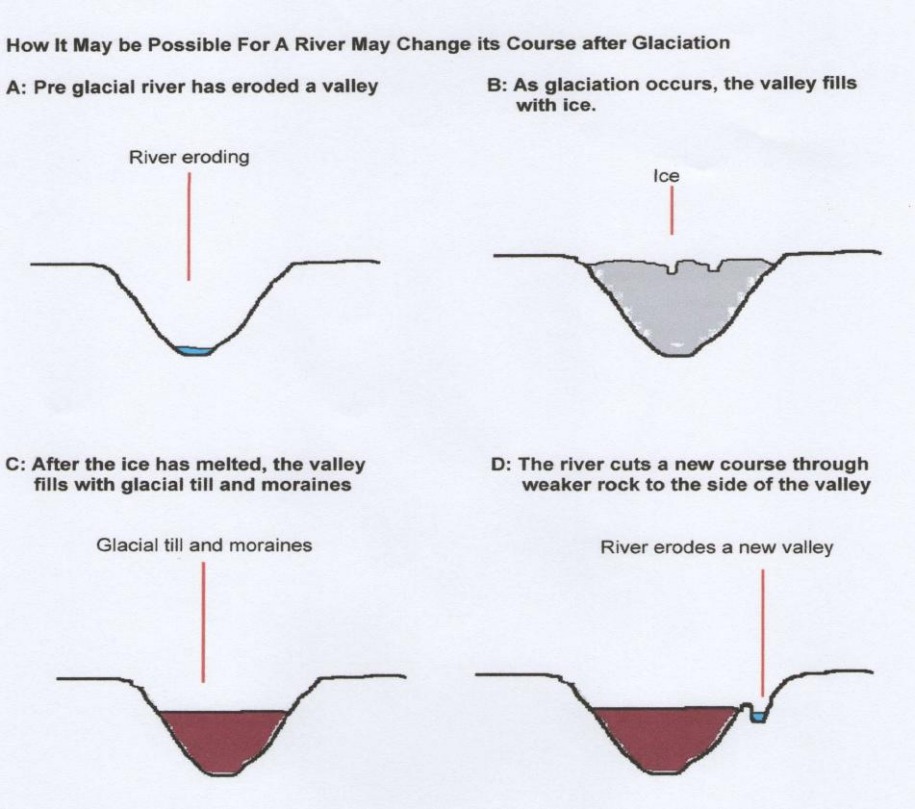
Dam (now used as a road)

This would have been some undertaking. It was built in 1788/89 before the main Mill building was started: after all, Oldknow would want to start up the mill as soon as it was built and not wait for the water supply to be connected later!!

The land to the left of the road, ie below the dam, was lower. Beyond that, the river has also incised itself to reach bedrock – the valley floor would have been covered in glacial till. The valley here is steep-sided on both sides, although the Ridge side is steeper than that going to Mellor. This probably reflects the dip of the rock. It is also probable that the valley is in less resistant rock layers which would be easy to erode. The river has now reached the resistant rock layers of Marple Ridge and also the rock layer at the bottom of the till so it probably won't move much further.

Whilst it is not obvious now, apparently before the Ice Ages, (over 2Ma ago), the river went the other side of Marple Bridge village. There is a theory that glacial deposits filled up the original

valley after an earlier glacial period. When the ice melted after the last glacial period, the river could not follow its original course. See the diagram below:



So the huge volume of meltwater cut a new course: gorges like the Torrs, Marple Bridge Gorge and Ley Hey Gorge (by the Aqueduct) are examples. On the geological map for Marple Bridge, there is a large area of glacial till which goes 'up the hill' and round the back of Marple Bridge: unlikely as water does not move uphill. So perhaps the till is in fact extremely thick having filled in the original river valley.

Marple Bridge Gorge lookingupstream from the bridge

When the Mill was built, the builders would use locally sourced materials. The cobbles of the area in front of the Mill ruins are not 'manufactured' cobbles or setts as they are properly known. They are stones which the Mill builders would have found lying around.

Cobbles formed by glacial erratics at the Mill

These are examples of glacial erratics: pieces of rock which were brought by the ice sheets from as far away as Scotland although most of what we see will have come from the Lake District, North Wales and possibly from round New Mills, having been brought by post-glacial river flow. There are pieces of granite, Permian sandstone (from round Stockport and younger than the Carboniferous), volcanic rock, slate and Carboniferous sandstone. The large size of some and the square-ish shape shows that they have not travelled that far in water where the method of transport results in the edges being knocked off. The smaller rounder stones were probably picked up from river beds the ice went across. They will have been eroded into shape during their time in the rivers.

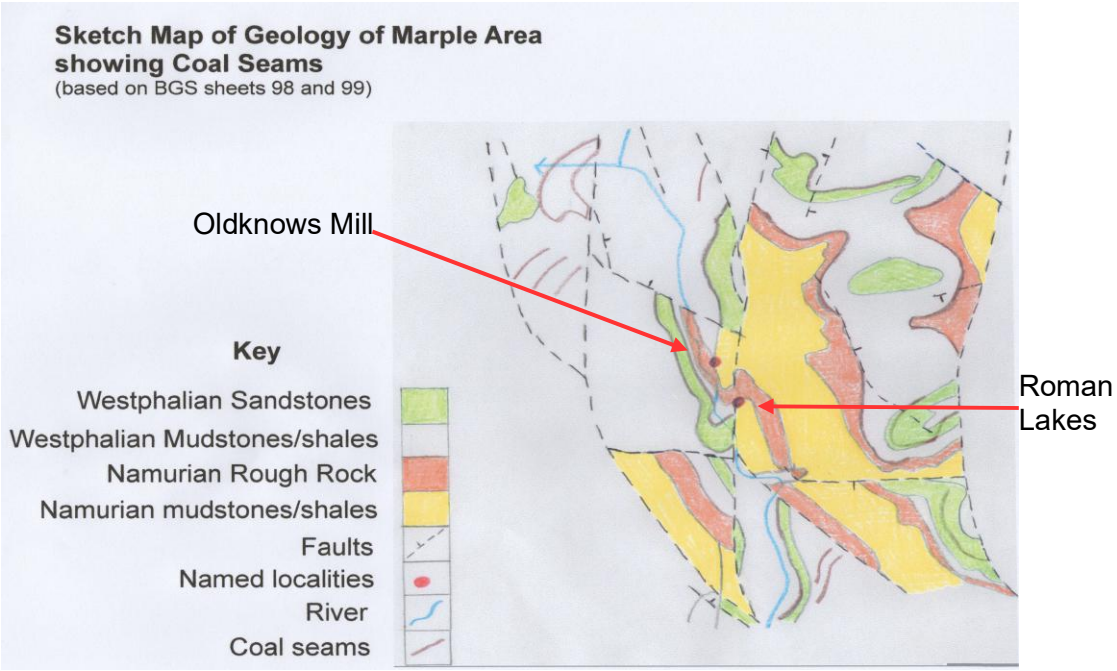
Close up of some of the cobbles: the book mark is over a piece of slate probably from North Wales. Notice how square some of these are.

The large flag stones, also forming part of the front area, and the rock used for the mill is what used to be known as Millstone Grit and came from a quarry on Cobden Edge which Oldknow also owned.

Gritstone flagstones at the front of the Mill – notice also the way the cobbles surround them

The Mill builders also manufactured their own bricks using the mudstones found either in the glacial cover or deeper in between the layers of sandstone.

Steam power became more common in the mid-19th century and eventually on the 1850s, the Mill moved from water to steam. The Oldknow family also had access to coal as they owned mines round Marple. The coal is found locally, particularly in Marple Ridge and the Goyt Valley. There were coal mines all the way along the river from Marple Bridge to Compstall as well as at Marple itself: near Memorial Park for example. Marple Library has old maps which show the extent of the mining. The map below gives an indication of the location of some of these coal seams.



So, as can be ascertained from the above, Samuel Oldknow built his Mill in the 18th century in the Goyt Valley because of the natural resources of the area: a reliable water supply for power, stone and rock for the buildings, mudstones for bricks and later coal for steam power. He did have to import some items such as limestone for lime mortar. But this did not have to come far, only from Whaley Bridge on the canal which he built. The climate of the area was probably similar to today: often damp which helped in the spinning as it prevented the threads from breaking too often. The rain also kept the river flow topped up.

Samuel Oldknow and his Mill near Roman Lakes at Marple is just one example of how the geology and geographical situation of Manchester and its hinterland provided raw materials for the industrial development of the region over the last three centuries.