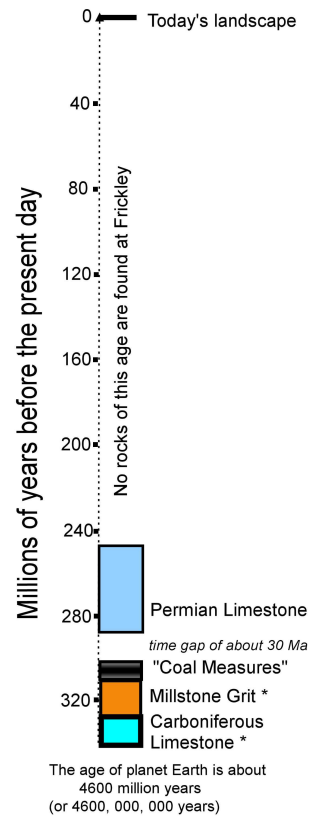


## Geological Timeline for Frickley

\* means these rocks are buried too deep to be seen



## THE STORY FROM THE ROCKS NEAR FRICKLEY

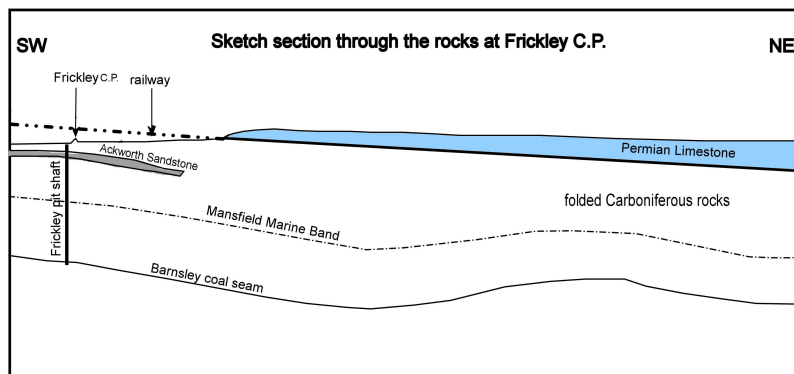
**There are no younger beds** from the last 250 million years or so below the soil in this area. They were once deposited, but have long since been uplifted and eroded away. During the Anglian ice maximum, about 500 thousand years ago, ice would have moved over the area, but no deposits from it remain today. The most recent deposits are the soft muds and sands being deposited along the river valleys during flood times over the last few hundreds of years.

**The Permian Limestone** was deposited in a shallow and very saline sea, about 280 million years ago, which had flooded across a low-land made up of folded "Coal Measure" rocks. The area was close to the Tropic of Cancer, and the climate was hot enough to evaporate the sea and make it, at times, too salty for many animals to live in it. It also altered the beds of calcite to dolomite, by adding magnesium from the evaporating sea water. The very rare cyano-bacterial (stromatolite) reefs found in the South Elmsall quarry were able to survive only because there was nothing to feed on them. These limestone beds have now been gently tilted towards the North Sea Basin. At Frickley the limestone has been eroded away from the top of the "Coal Measures" leaving the coalfield exposed. More coal lies concealed below the limestone to the east, for example at Selby.

**The 30 Million Year Time Gap** was caused by earth pressures forming the Variscan fold mountains across Europe and the English Southwest, and further north. The large mountains in our area were immediately attacked by erosion and eventually worn down, leaving a large gap in the rock record between the eroded top of the "Coal Measures" and the bottom of the Permian limestone. The coal was only preserved where the folds and faults had dropped it below the level of erosion- that's why there isn't any coal in Ireland.

**The "Coal Measures"** formed eastwards across Europe as far as the Ukraine, and westwards into Pennsylvania USA, which at this time was part of a giant continent, along with Europe, Greenland and Russia. (There was no Atlantic Ocean.) Our area lay across the equator and had a hot and very wet climate conducive to rapid plant growth – and very large rivers, a little like the Ganges and Brahmaputra river deltas in Bangladesh today. Occasionally the sea flooded in depositing a layer called a **marine band**, but otherwise the beds laid down were part of large muddy and sandy deltas. On the top grew tall non-flowering plants like tree ferns, club mosses and horsetails, growing in waterlogged soils between the large river channels. When these plants fell into the stagnant waters of the swamps, they only partially decayed away to gases like methane and carbon dioxide, leaving carbon rich layers which became compressed to form coal seams between the layers of mud. Where the plants grew for longest they formed the thickest seams. In the North Sea basin, the methane given off formed the gas fields, where they became trapped and concentrated in the rocks.

**Below the "Coal Measures"** and far too deep to see here are the Millstone Grit beds, deposited in sandy deltas, and the limestones of the Pennines and Peak District, full of marine fossils because they were laid down in a well oxygenated sea with normal salinity.



## A GEOLOGICAL WALK THROUGH FRICKLEY COUNTRY PARK

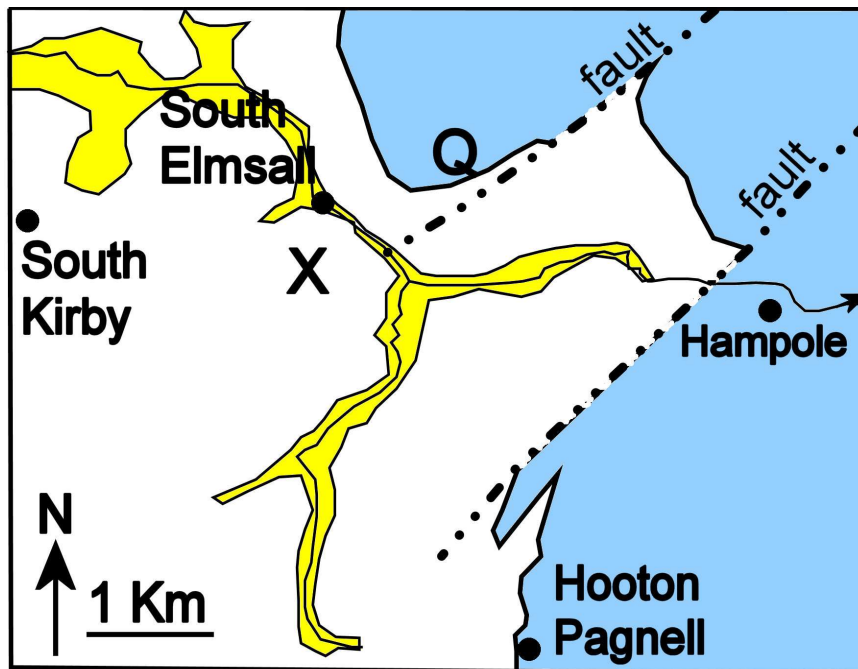
Parking available at  
Doncaster Road (B 6422)  
car park

### THE LANDSCAPE NEAR FRICKLEY

The higher ground to the east of Frickley is underlain by more resistant limestone (blue colour on the map) deposited during the Permian period, about 280 million years ago. The "Coal Measure" mudstones (white colour) are much softer and have been eroded to lower and flatter ground. The stretch of low ground running to the northeast of Frickley is caused by two ancient faults which have moved the rocks bringing the softer and more resistant rocks together. Weathering and erosion have lowered the mudstones more than the limestone. Erosion and deposition is continuing today as shown by the formation of river alluvium (yellow).

### KEY TO MAP

X = Frickley Country Park    Q = South Elmsall Quarry



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