
Spireslack Locality 3: Fault zone with relay ramps in McDonald Limestone

NGR: [274579 630434] [NS 74579 30434]

Key category of interest	Rarity	Quality
1. Structural geology	4	5
2. Mineralisation	4	5
3. Sedimentary rocks	1	5
4. Palaeontology	2	5

Access: Good access, easily accessible from roadway.

Current safety: Little evidence of recent falling blocks observed on limestone pavement, uneven surfaces.

Measures to enhance site: Clean up loose scree and level surface around the site.

Key categories in order of interest (1 = primary interest); Rarity, 5 = only example in Spireslack, 1 = many examples in Spireslack; Quality 5 = exceptional preservation in Spireslack, easy access/viewing potential 1 = average preservation in Spireslack, difficult access/viewing potential

Photograph overview with polygon boundary

(Overview of Locality 3). Site boundary includes key rock exposures, a buffer zone around the exposures to place the fault in context, to include the damage zone of the fault in the limestone pavement and to allow room for viewpoints at the base of the site.

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Site description

Geology

An exceptionally well exposed fault zone cuts the McDonald Limestone pavement at this locality, offsetting it sinistrally by around 5 m. The fault zone displays textbook examples of relay ramp structures (precursors to fault linkage and important for fluid flow migration and understanding fault growth), and highlights that faults are not simple planar structures as is commonly assumed. The fault zone comprises many curvi-linear fault planes with excellent preservation. Each fault plane, where it cuts limestone, also contains spectacular sub-horizontal slickenlines, and the fault planes themselves are extensively mineralised by multiple generations of calcite. Other faults within Spireslack are not typically mineralised. Where the fault cuts mudstones underlying limestone, slickenlines are not preserved and the mudstone is shattered.

This is also a good locality to study the McDonald Limestone pavement's natural joint sets and palaeontology. At this locality trilobite fossils have been found (rare across the Spireslack site) and trace fossils that litter the limestone pavement are well exposed here.

Access and enhancement suggestions

The fault zone is easily accessible on foot from existing roadways and would provide hands on access as a teaching locality. Textbook examples of classic fault structures exhumed in 3 dimensions are relatively rare nationally, and particularly on this scale. These examples are of the highest quality. A viewing platform at the base of the structure would provide an excellent vista along the trace of the fault.

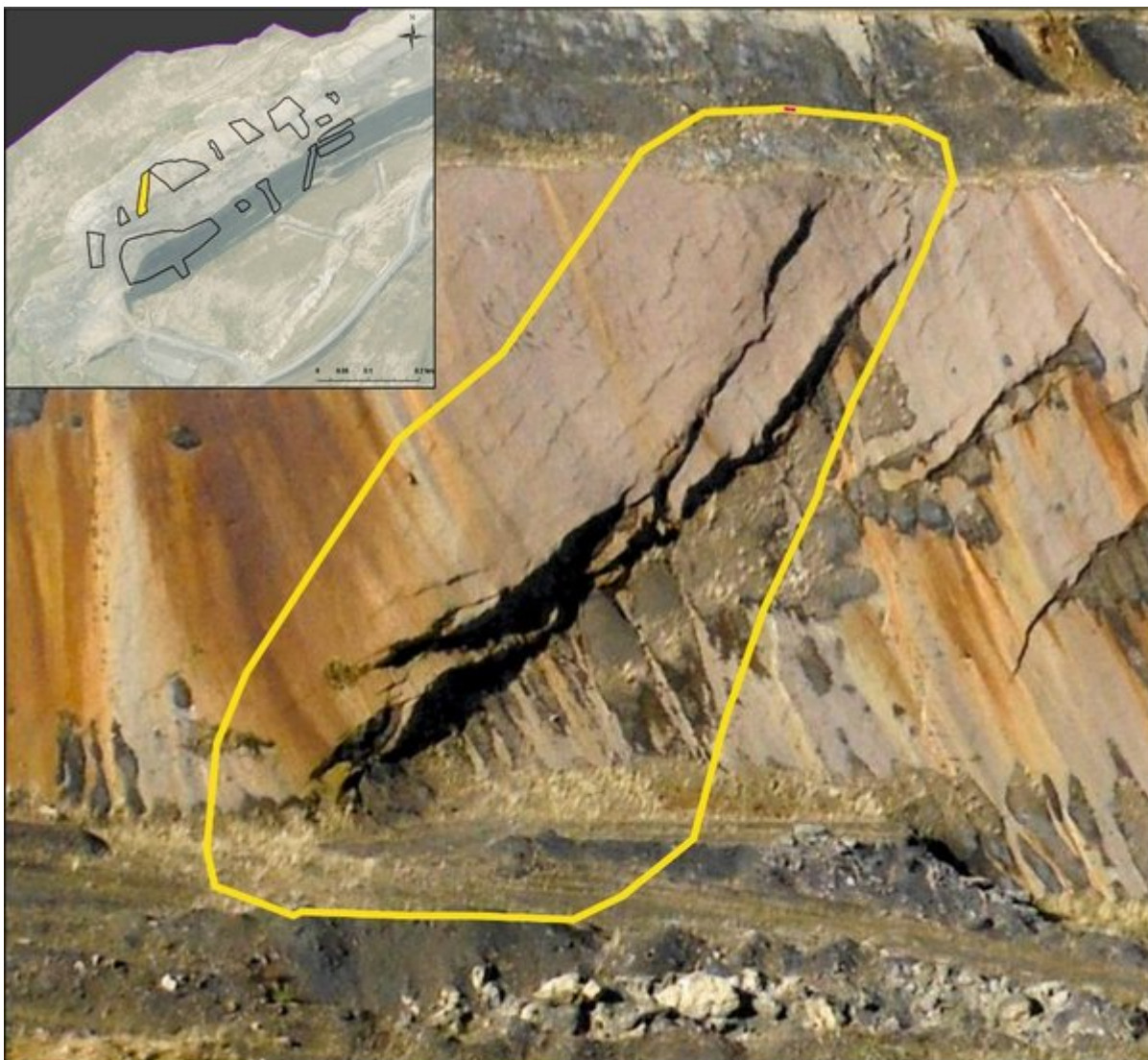
Site photographs

(Spireslack_3 P1): The fault zone and associated relay ramp structures are spectacularly exposed, highlighting important fault architecture components such as displacement length profiles (important for predicting how long fault traces are and where their maximum displacement is), relay ramp evolution (geometries of these are important for modelling fluid migration across rock volumes) and damage zone features associated with a 5 m displacement fault. Looking up-slope, toward the north-east. © BGS, NERC

(Spireslack_3 P2): Detail of mineralised slip surface along fault plane. Calcite veining is extensive across the fault planes, and has also been polished by fault movement (evidenced by development of slickenlines). Multiple generations of calcite are found at the site suggesting multiple phases of faulting. © BGS, NERC

(Spireslack_3 P3): Trilobite (*Paladin* sp.) seen on the McDonald Limestone pavement but no longer present due to erosion of the flaky surface. © BGS, NERC

References



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(Spireslack_3 P2) Detail of mineralised slip surface along fault plane. Calcite veining is extensive across the fault planes, and has also been polished by fault movement (evidenced by development of slickenlines). Multiple generations of calcite are found at the site suggesting multiple phases of faulting.© BGS, NERC



(Spireslack_3 P3) Trilobite (Paladin sp.) seen on the McDonald Limestone pavement but no longer present due to erosion of the flaky surface.© BGS, NERC