Geodiversity Audit of Spireslack and Mainshill Wood Surface Coal Mines

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(Front cover)

Spireslack SCM main void © BGS/NERC

Mainshill Wood SCM © BGS/NERC

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Foreword

The Spireslack and Mainshill Wood surface coal mines (SCM) in Scotland reveal spectacular exposures of Carboniferous strata on a scale not seen anywhere else in the United Kingdom. In order to recognise and protect the wide range of geological features across each mine, and to assess their status as National Assets, the Scottish Mines Restoration Trust (SMRT) commissioned the British Geological Survey (BGS) to audit and assess the geodiversity of each of these sites.

This report, produced by the BGS, is a systematic inventory and evaluation of geodiversity sections and sites within Spireslack and Mainshill Wood SCMs. This audit has the potential to help inform future development and planning decisions of each site, in particular with respect to the protection of each site's geodiversity. It also provides an information resource to support education, and management activities that promote the preservation of geodiversity sites and geological resources.

Acknowledgements

The authors wish to express their thanks to Robin Caldow and Kenny Ewart (both acting on behalf of SMRT) for access to the sites for field auditing, Mike Browne (Honorary Research Associate, BGS) for sharing his in-depth and insightful knowledge of the geology of the sites, and to Diarmad Campbell (BGS) for his advice and input to this report.

Maps and diagrams have been prepared by the authors, except where stated.

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Summary

This report describes a geodiversity audit of the Spireslack and Mainshill Wood surface coal mines (SCM) carried out by the British Geological Survey (BGS) on behalf of the Scottish Mines Restoration Trust (SMRT).

For the present study, in order to place the geodiversity of the two SCMs in context, BGS records and published sources of the surrounding geology were reviewed, including digital geological maps and historic field slips, digital aerial photography, and published papers, memoirs and reports. Documentation for nearby sites already recognised as Sites of Special Scientific Interest (SSSI) and/or Geological Conservation Review (GCR) sites was also reviewed.

Field assessments of sections within Spireslack were conducted in August 2015. Due to flooding restrictions, access to Mainshill Wood was not possible. Therefore, data from previous field visits and photography by BGS geologists are used within this report to document sites of geodiversity value there. Geoscientific merit of individual sites within Spireslack was evaluated in terms of the rarity and quality of the key features displayed at the site, according to well- established procedures.

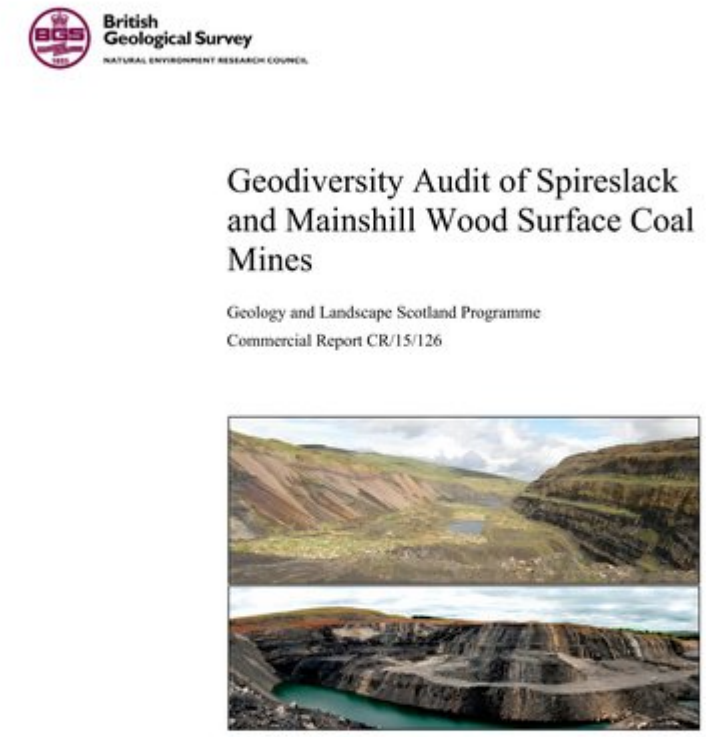
Spireslack and Mainshill Wood SCMs provide spectacular exposures of Carboniferous strata not otherwise seen naturally on anything approaching the same scale or completeness across the whole of Scotland, or further afield in the UK. As such, they are of national significance. A total of 18 sections were identified as candidates for recognition and protection as local geodiversity sections within Spireslack, whilst the whole of the remaining void within the south-western corner of Mainshill Wood is presented as a geodiversity site worthy of protection. The sections selected include the best examples of geological features within each surface mine and are considered to be representative of the diverse range of geological strata and structures that characterise the geology of these sites and the wider surrounding area. It is recommended that these sections within Spireslack and Mainshill Wood should be protected and preserved during any subsequent development of the surface mine workings.

Many of the identified sections of local geodiversity value have the potential to be enhanced through interpretation on site to inform visitors and students at all levels about geology, and the links they have with the local economic and cultural heritage within East Ayrshire and South Lanarkshire, and the Central Belt of Scotland as a whole. These sites also offer

opportunities to the research community, to generate a wide spectrum of internationally significant teaching and strategic research activity.

Whilst Spireslack and Mainshill can be considered as 'flagship' sites in terms of their spectacular exposures of complete stratigraphic sequences and unique structural geology preserved within them, they also form part of a subset of inactive and active surface mine sites across East Ayrshire and South Lanarkshire. Collectively, and in the longer term, this network could form the basis for a potential Geopark across the south-western Central Belt of Scotland.

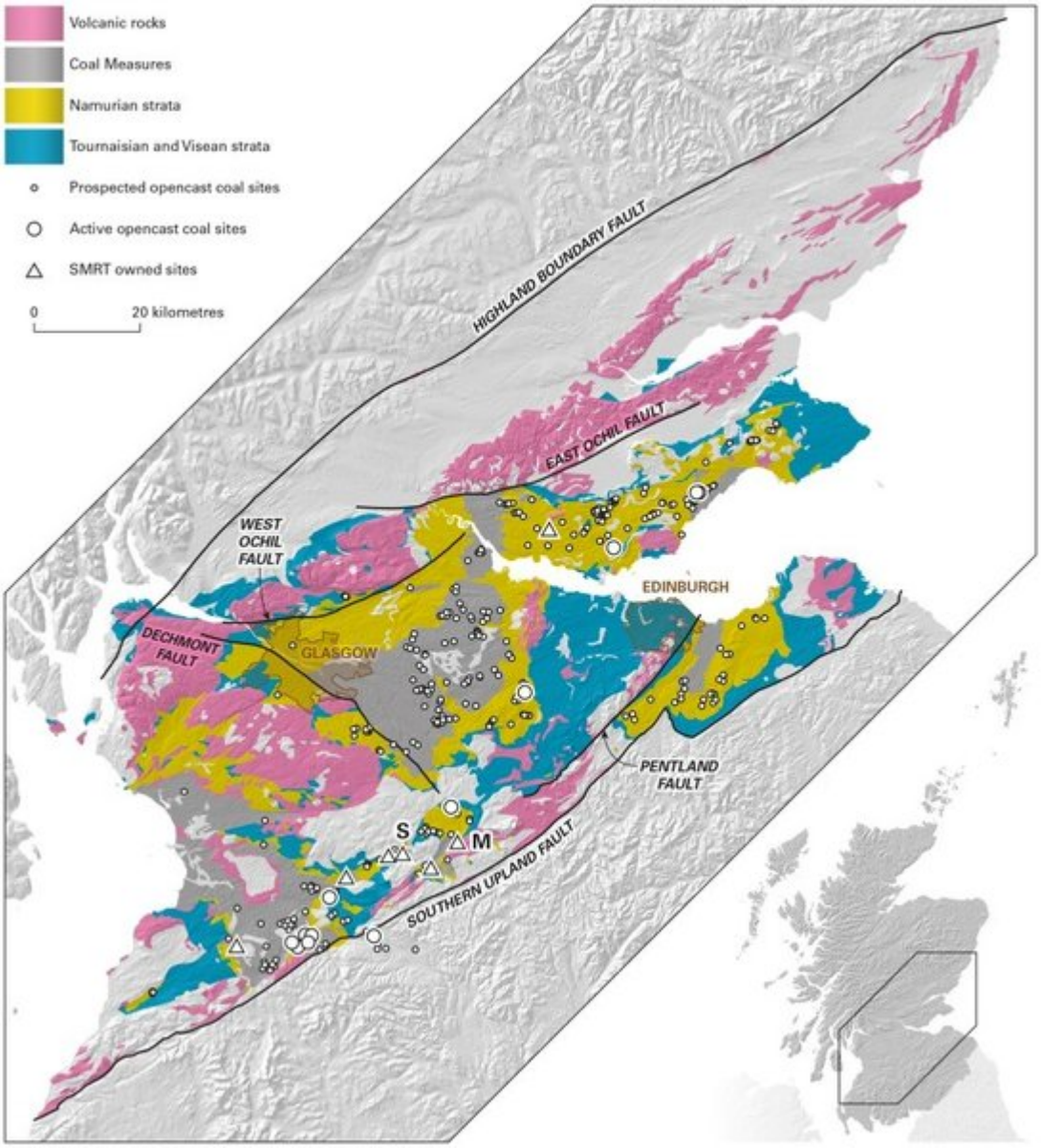
References



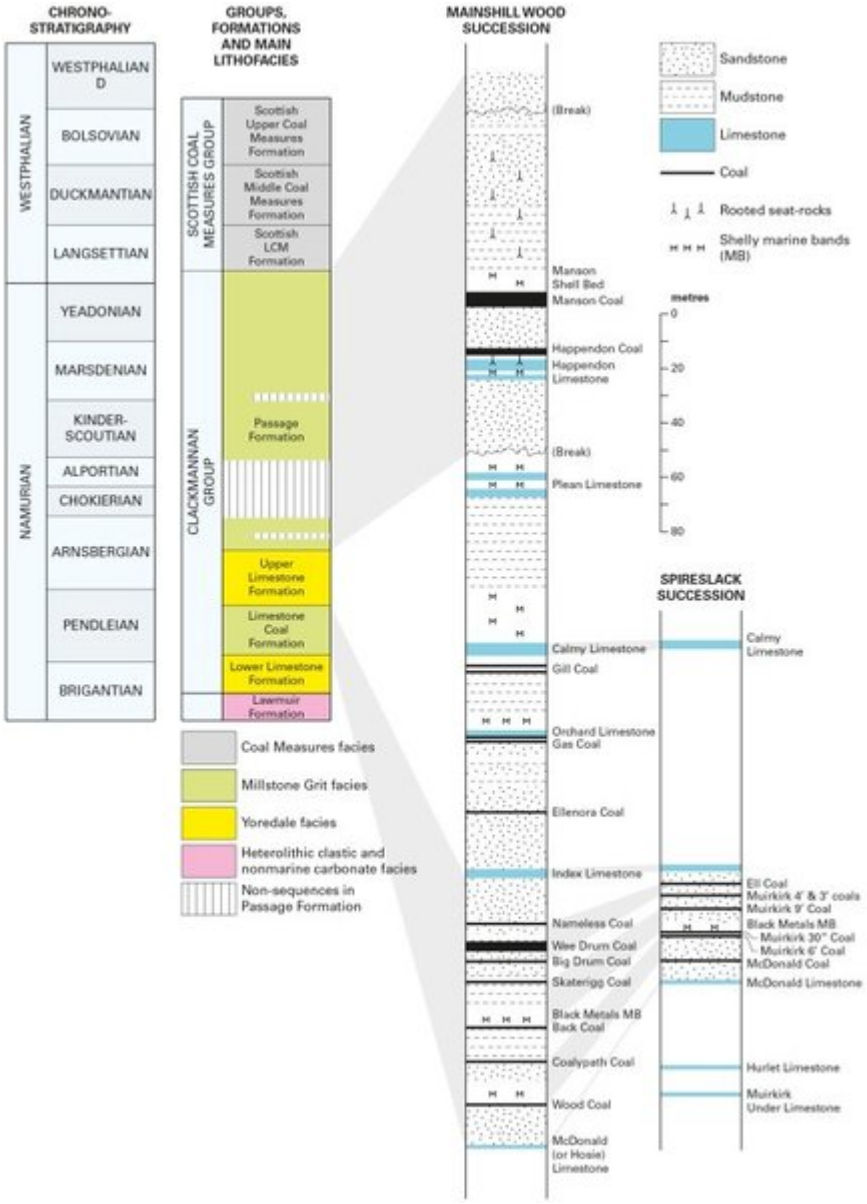
(Front cover)

(Cover photo 1) Spireslack SCM main void. © BGS/NERC

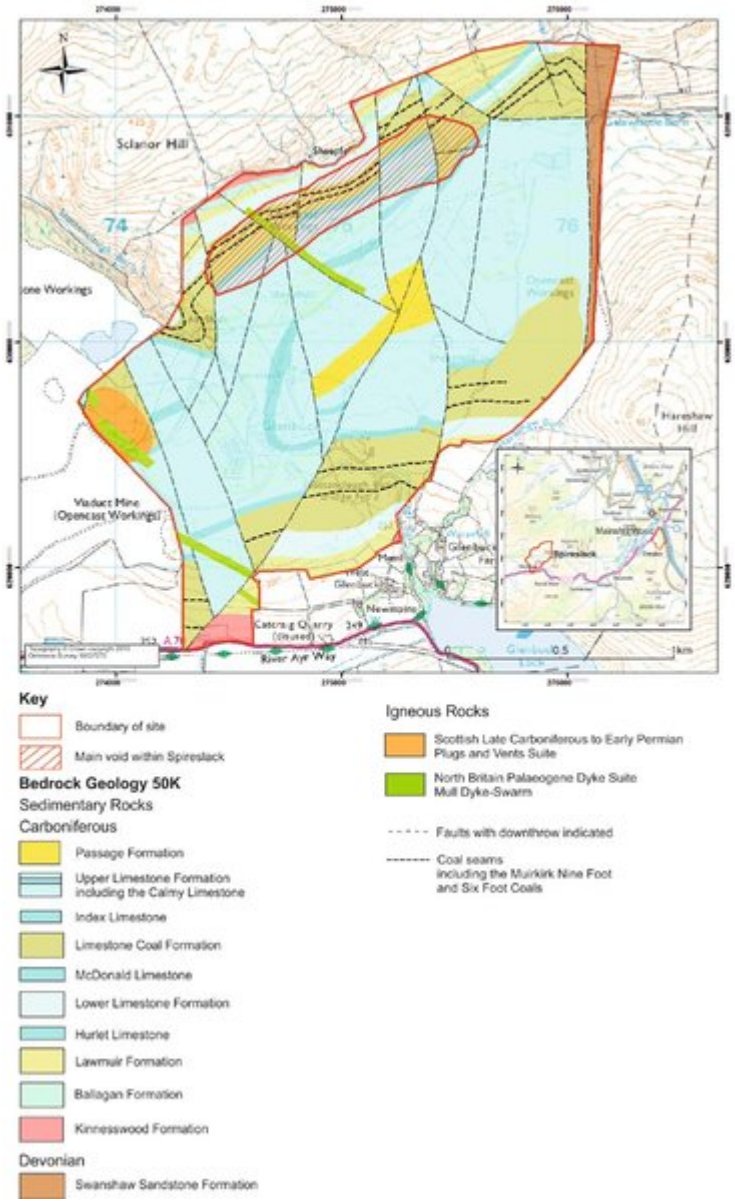
(Cover photo 2)Mainshill Wood SCM © BGS/NERC



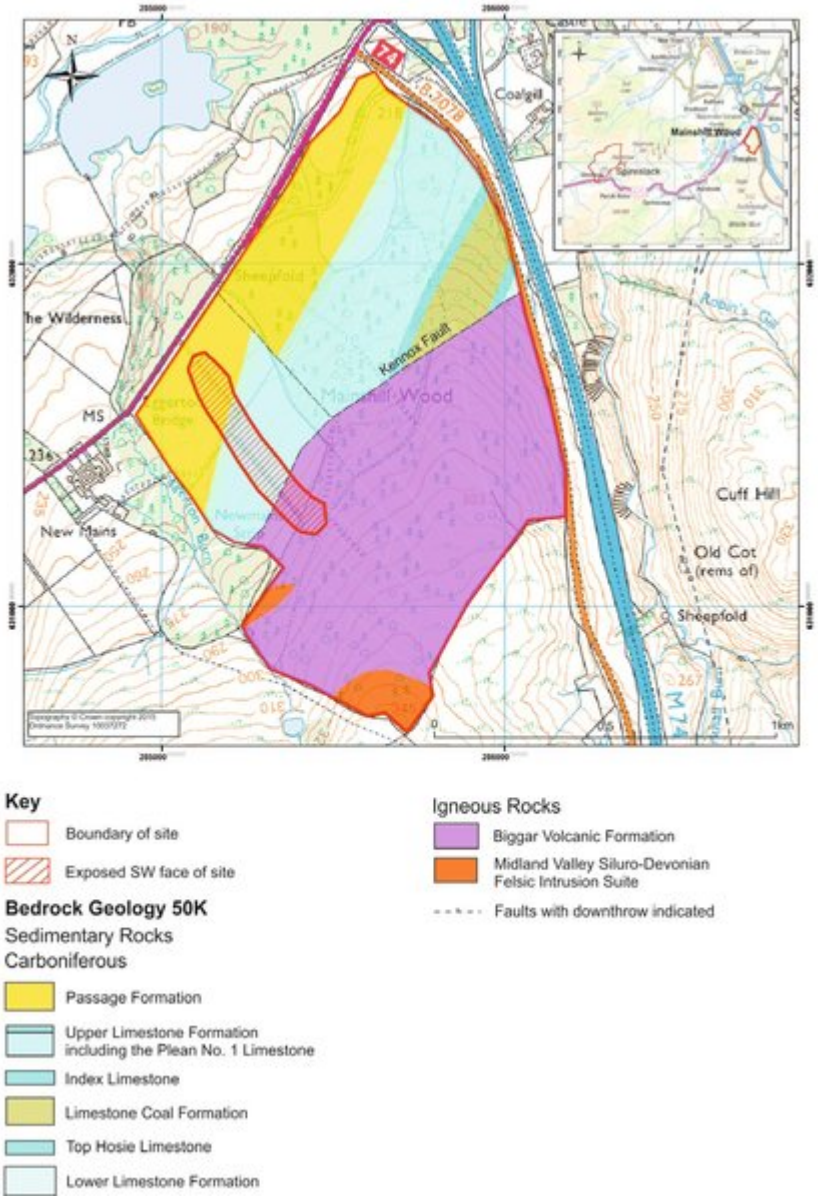
(Figure 1) Generalised Carboniferous geology of the Midland Valley of Scotland, showing the major faults that bound the Midland Valley. The map also shows the locations of prospected and active surface coal mines in Carboniferous strata. Sites owned by the Scottish Mines Restoration Trust (SMRT) are also indicated, with the locations of Spireslack (S) and Mainshill Wood (M) SCMs highlighted.



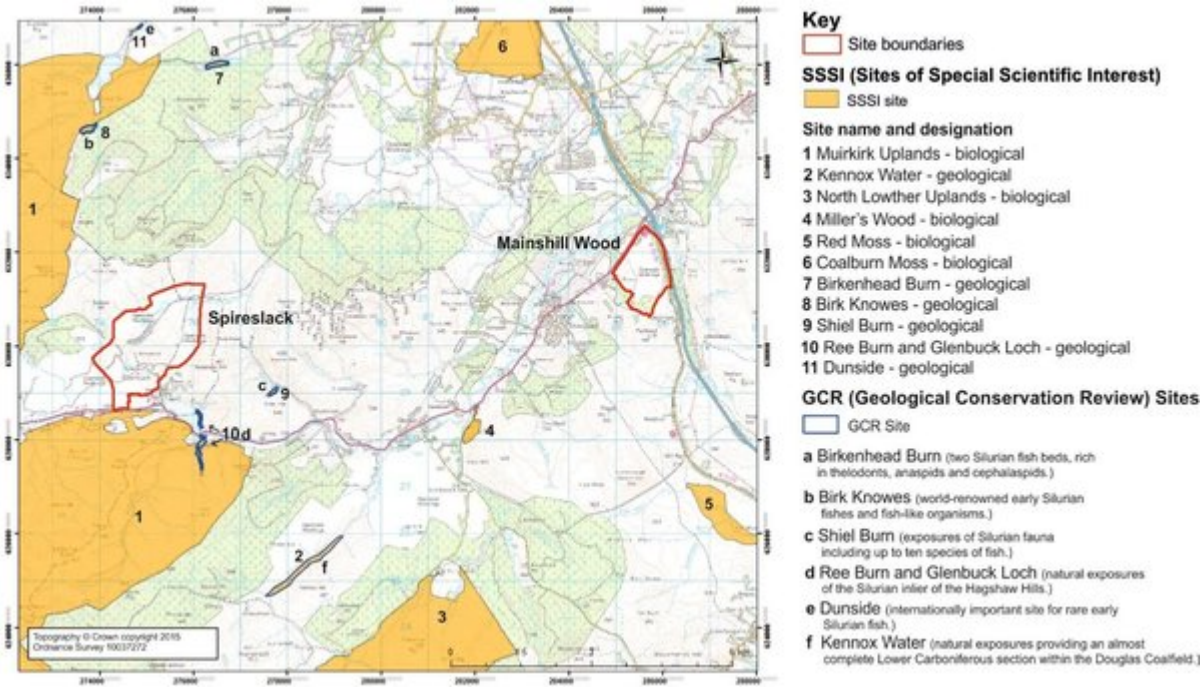
(Figure 2) Stratigraphical framework for coal-bearing strata at Mainshill Wood and Spireslack SCMs. The key coal units and lithological markers referred to in this audit are highlighted in the more detailed columns.



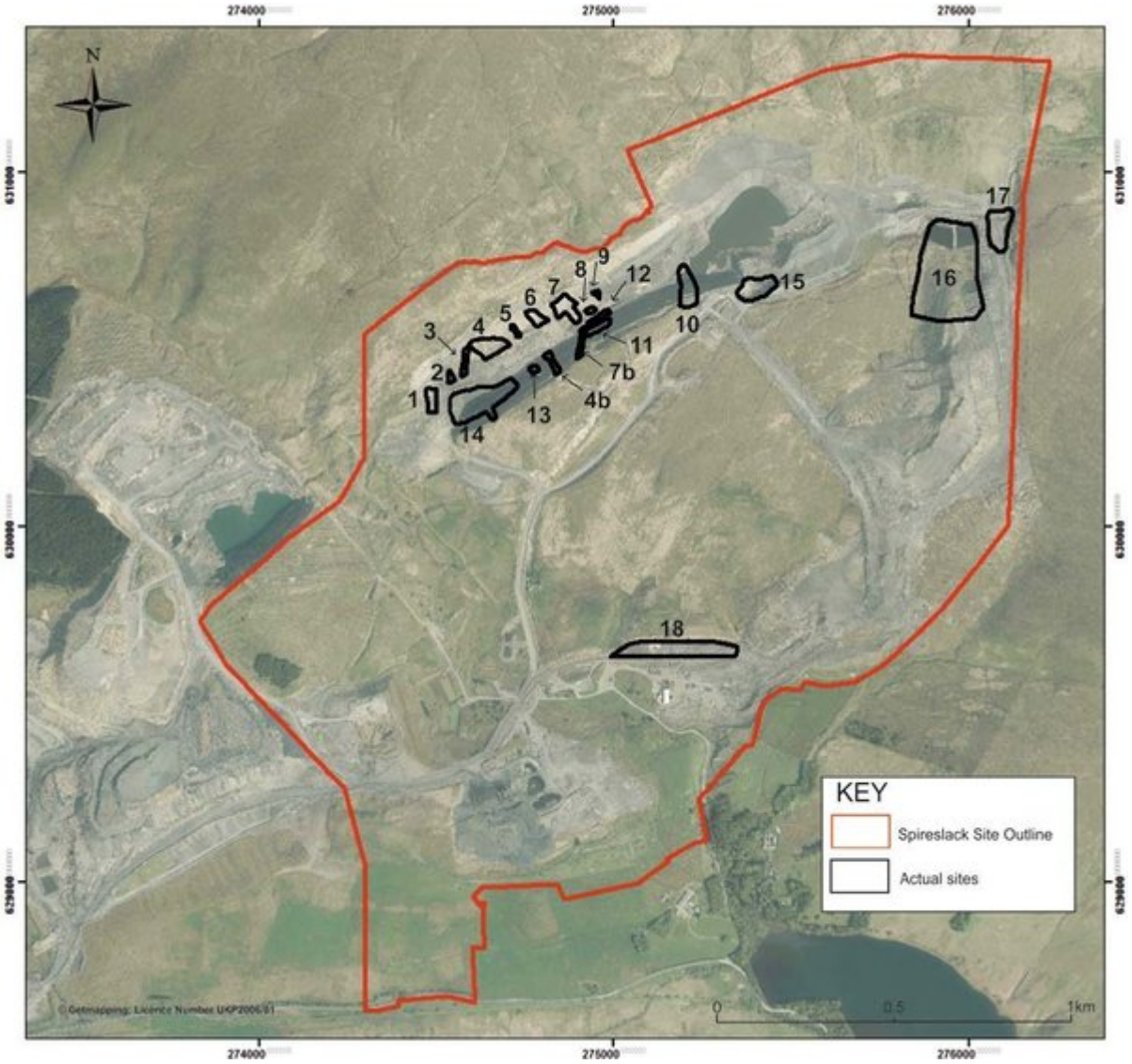
(Figure 3) 1:50 000-scale geological map within the Spireslack SCM site area. The oldest rocks within the site are exposed at the far east of the site boundary, and are sandstones belonging to the Swanshaw Formation (Devonian in age). These rocks are separated from the Carboniferous rocks by a major north-trending fault. The Carboniferous strata have been folded into a broad north-easterly syncline across the site, with the strata offset by many faults with a dominant north to north-north-easterly trend.



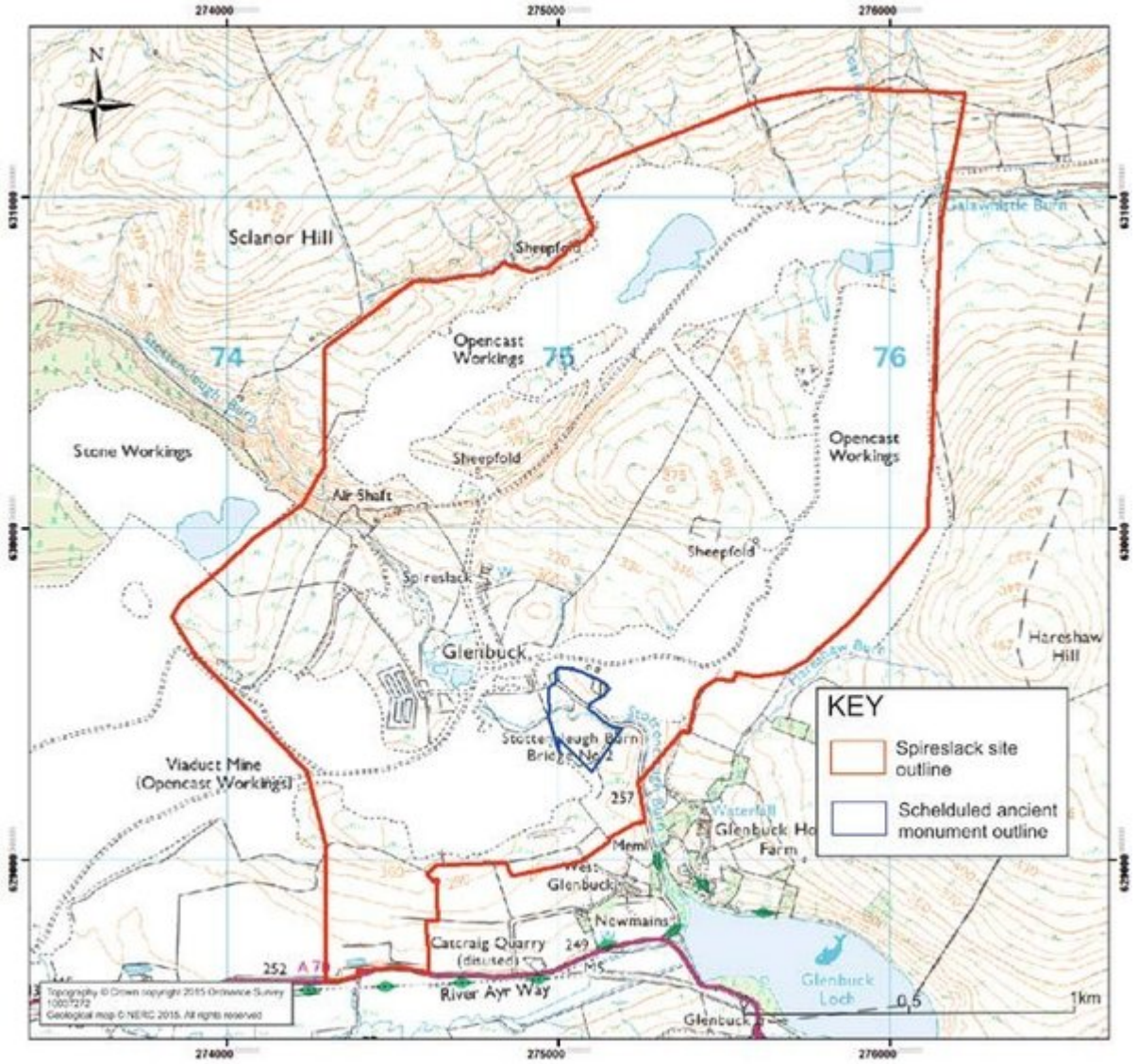
(Figure 4) 1:50 000-scale geological map within the Mainshill Wood SCM site area. The oldest rocks within the site belong to the Devonian age Biggar Volcanic Formation, situated to the south of the Kennox Fault in the southern portion of the site. The Carboniferous strata lie to the north of the Kennox Fault where they are sub-vertically arranged. The rocks become younger towards the north.



(Figure 5) Map showing locations of nearby SSSI and GCR sites in the areas neighbouring Spireslack and Mainshill Wood SCMs.



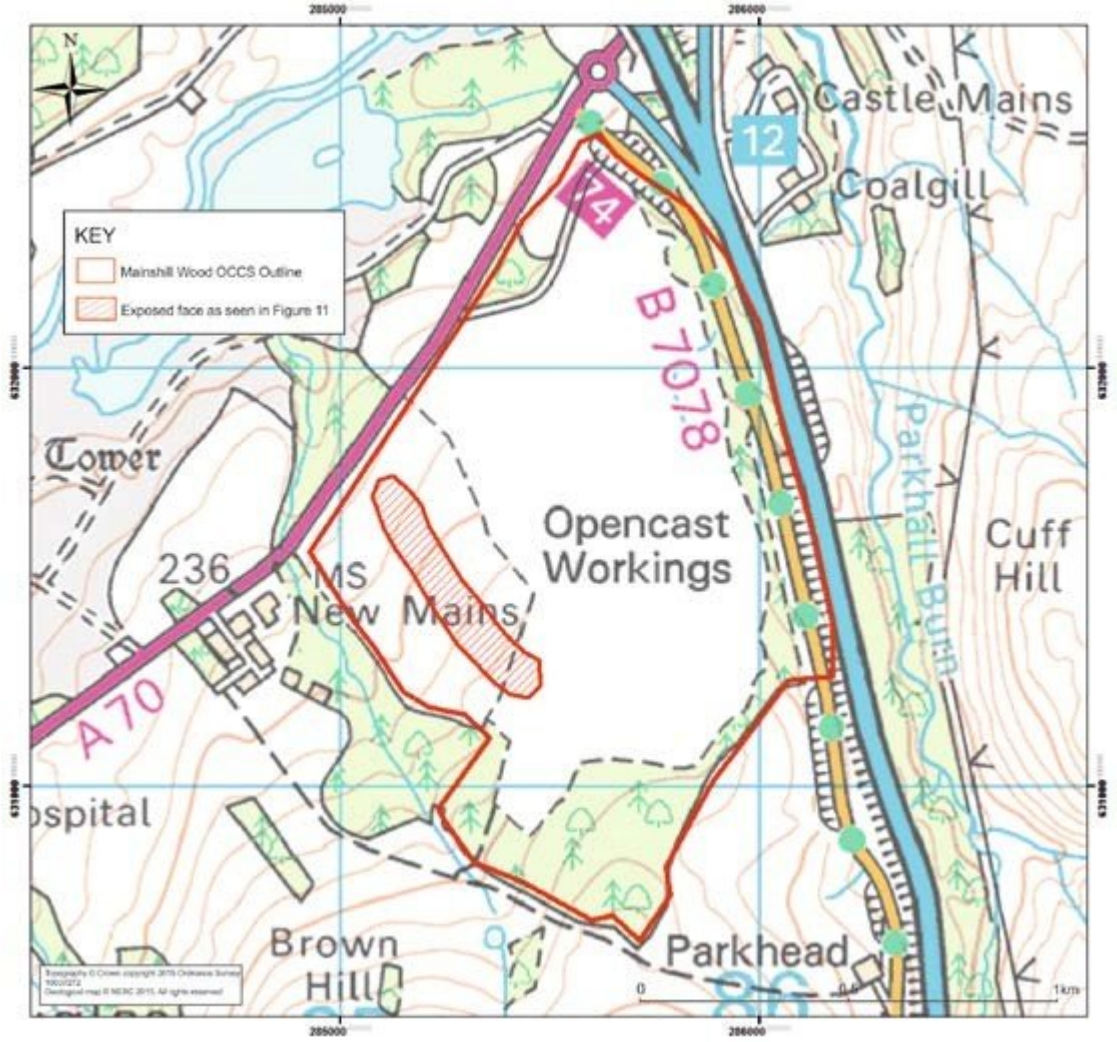
(Figure 6) Aerial view of Spireslack SCM, showing locations of the audited geodiversity sections within the mine. The number of the site corresponds with the equivalent audited site described in the report.



(Figure 7) Location map of the Glenbuck Ironworks Scheduled Ancient Monument site. © BGS, NERC

(Figure 8) Bell-pits at southern edge of Spireslack SCM. View looking toward the south-west. These disused bell-pits were historically associated with ironstone and limestone mining. © BGS, NERC

(Figure 9) The ruins of the Glenbuck Ironworks Furnace are visible at the base of the tree in the centre left of the photo. The furnace has been buried by later generations of mine waste. Photo copyright Mike Browne.



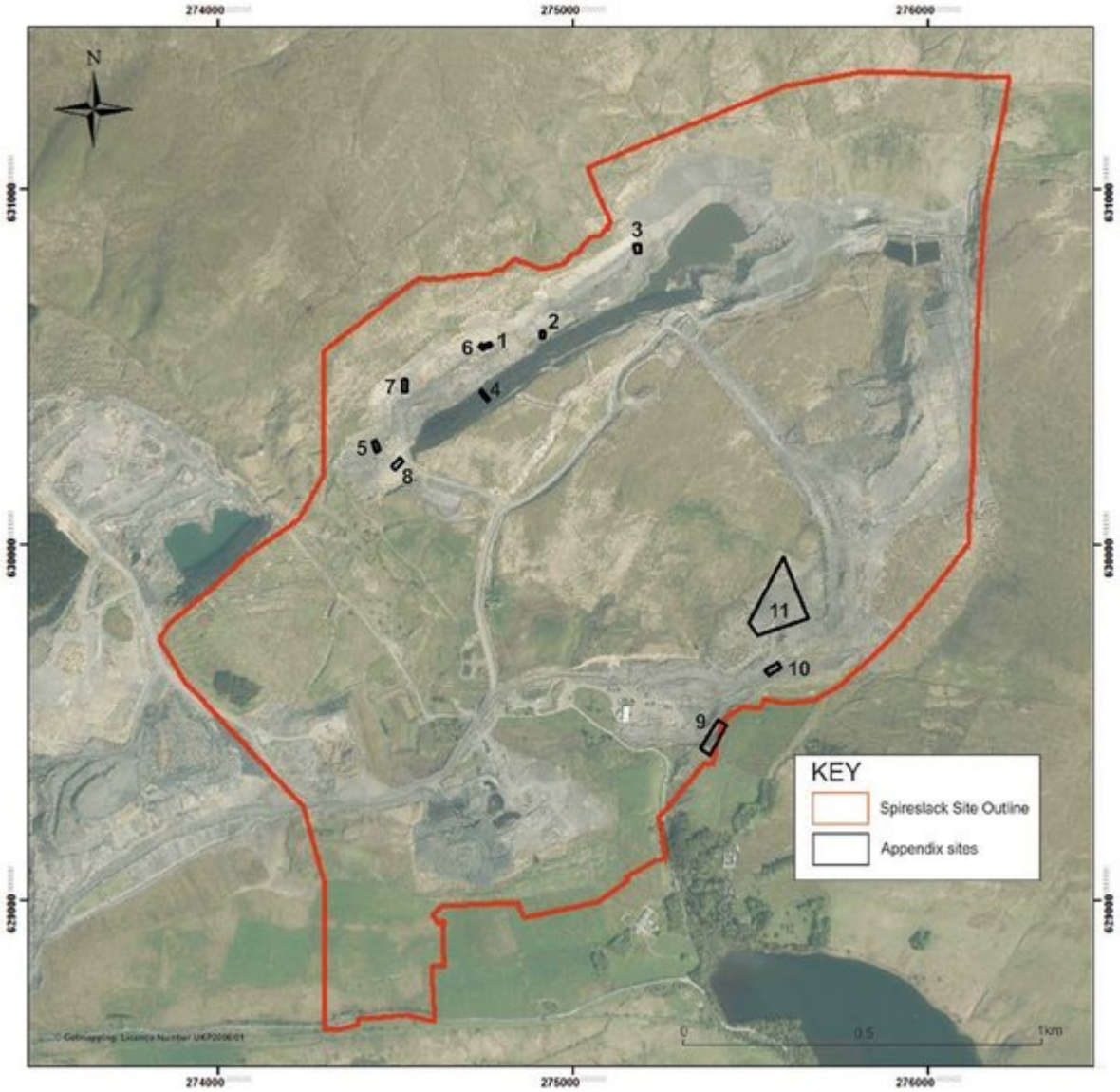
(Figure 10) Outline of Mainshill Wood SCM, with extent of exposed face digitised in western sector.

(Figure 11) Panoramic photograph towards the south-western corner of Mainshill Wood SCM, revealing spectacular sub-vertically dipping Carboniferous strata. The dark layers are coal seams and mudstones, whilst lighter layers are sandstones and limestones. The rocks are increasingly younger toward the right of the photo (toward the north). Note 4x4 vehicle for scale. Photo taken September 2013 before main void was significantly flooded by groundwater. © BGS, NERC

(Figure 12) Main face of Mainshill Wood SCM showing the sub-vertical strata. The darker layers visible in the mined face are coal seams (the Manson Coals in the centre of the image), whilst the lighter layers are sandstones and limestones. Note high water level restricting access to base of exposures. Photo taken June 2014. © BGS, NERC

(Figure 13) View toward the south-west corner of the Mainshill Wood SCM main face, revealing the flower structure related to the Kennox Fault. The flower structure is the area of folded and faulted strata to the left of the inclined strata in the photo. © BGS, NERC

(Figure 14) The Manson Coals seen in the main face at Mainshill Wood SCM. From left to right, the Lower, Middle and Upper Manson Coal seams. The Manson Coals are not seen elsewhere in natural sections; therefore Mainshill Wood SCM provides the only opportunity to study these coals. © BGS, NERC



(Figure 15) Location of sites within Appendix 1 at Spireslack SCM.