

## **Figures 3 – 14**

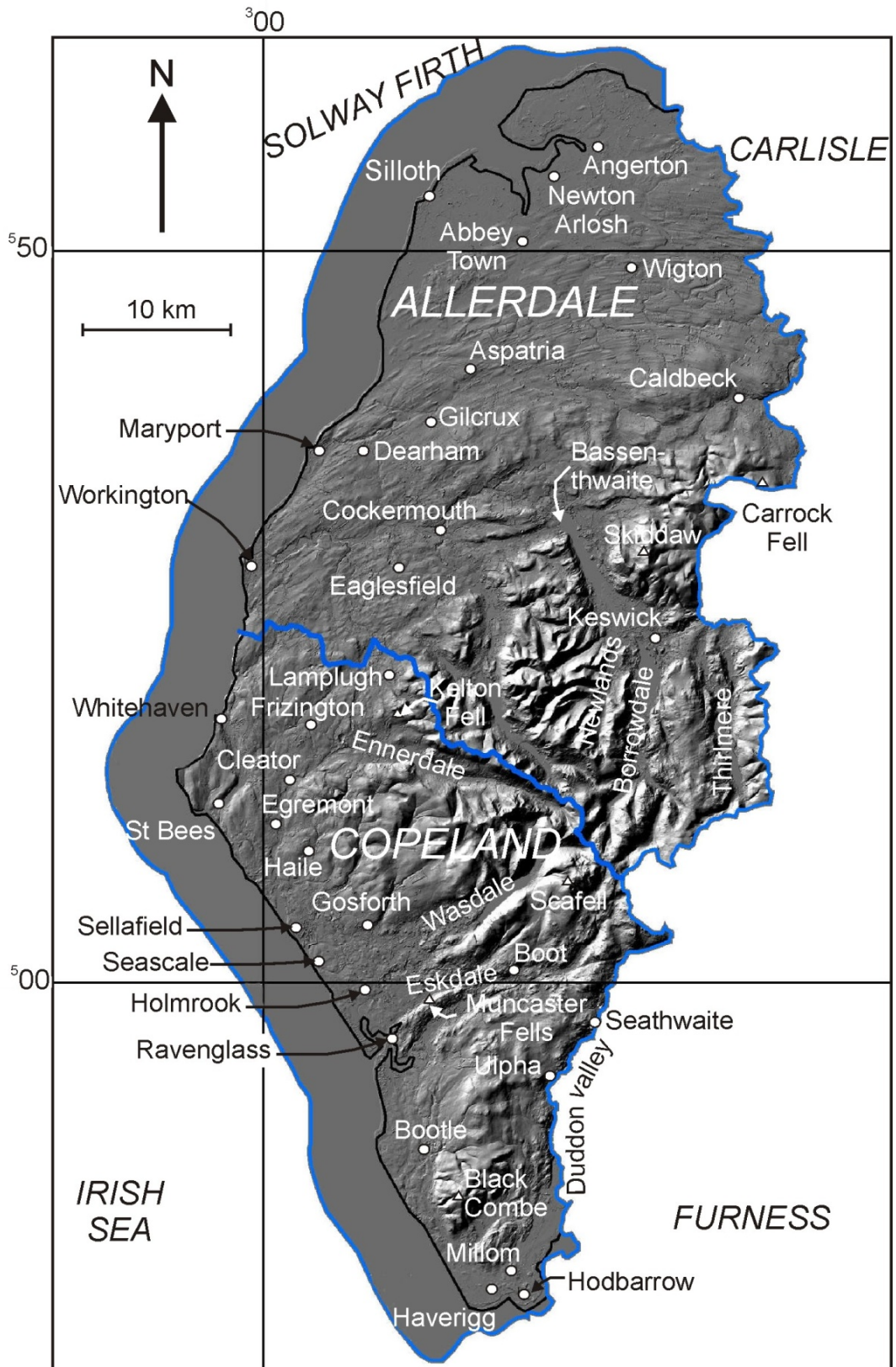


Figure 3. Major place names referred to in the report. The background is a digital elevation model showing the topography and main geographical features of the area using shaded relief illuminated from the north-west. NEXTMap Britain elevation data from Intermap Technologies.

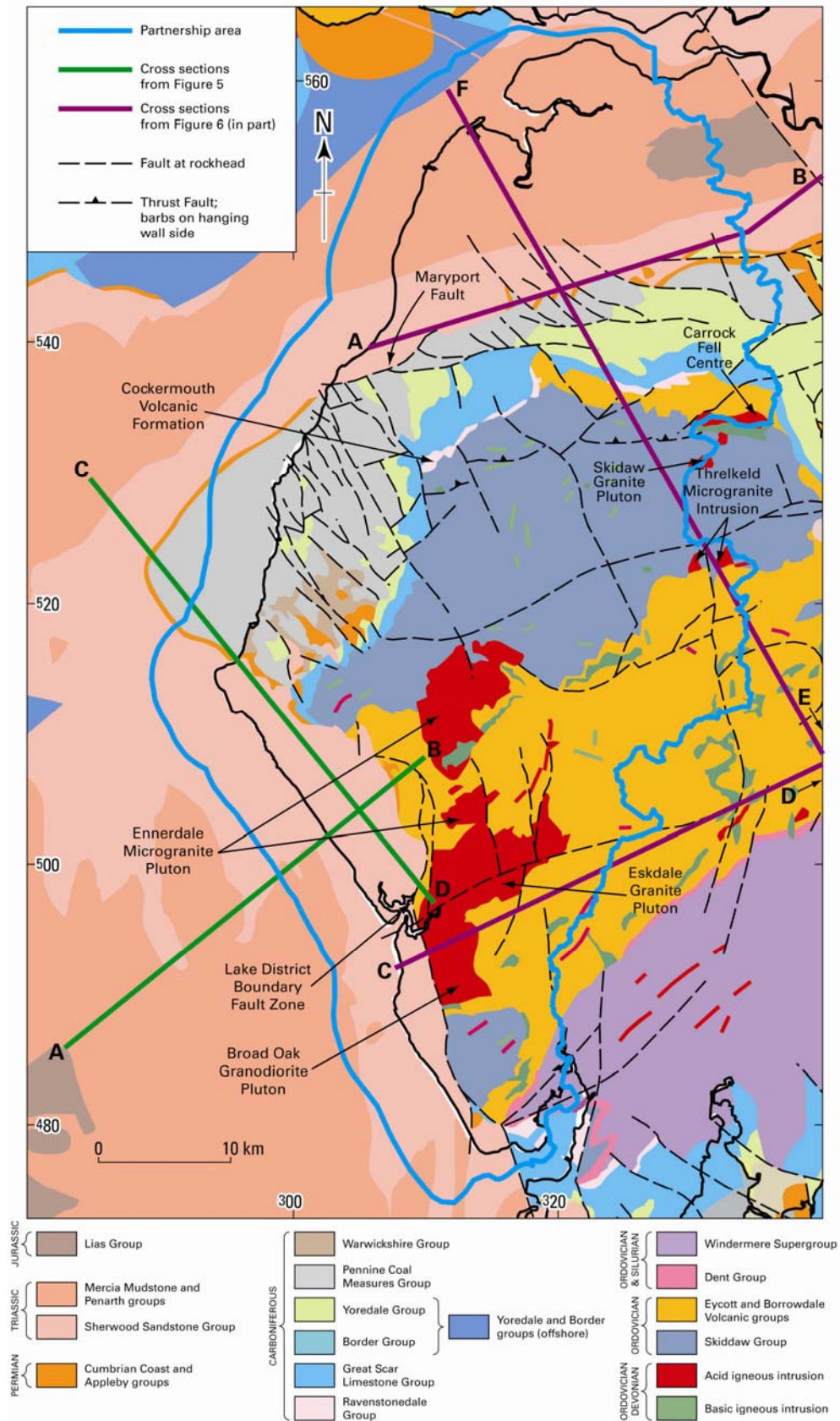


Figure 4. Generalised bedrock geology of the West Cumbria Partnership area, onshore, and up to 5 km offshore. Onshore bedrock geology is based on the BGS 1:625 000 scale bedrock geological map (BGS 2007a); offshore bedrock geology is based on the BGS 1:250 000 scale bedrock geological map (BGS, 1980). The location of geological cross-sections in Figure 5 of this report are shown A-B and C-D, and those for Figure 6 are also shown.

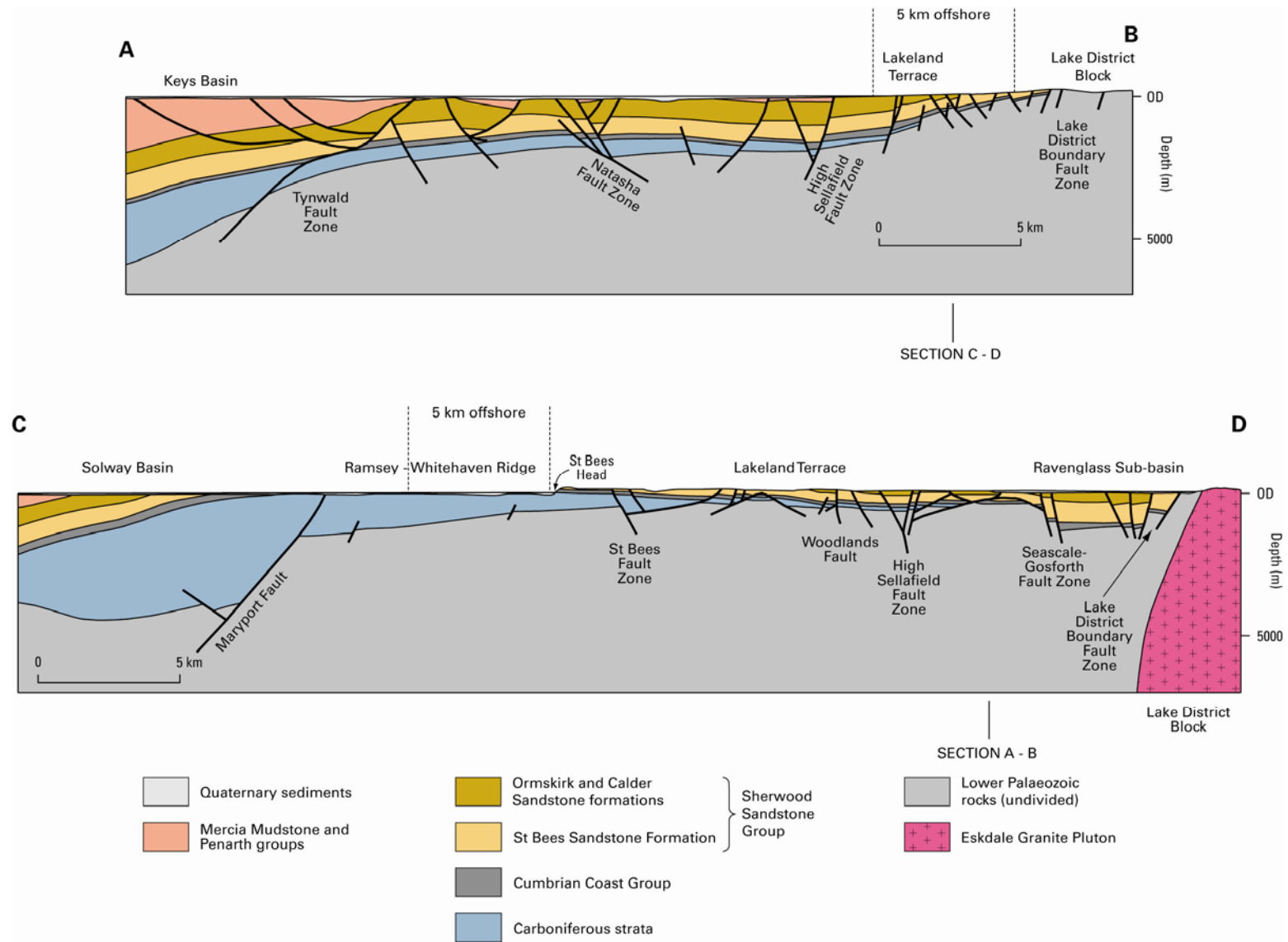


Figure 5. Regional geological cross-sections illustrating the general bedrock geology of the Partnership area and adjacent areas offshore. The 5 km limit of the Partnership area, offshore, is shown by a dashed line. The locations of cross-sections A-B and C-D are shown in Figure 4. After Akhurst et al., (1997, fig. 7) and Nirex (1995).



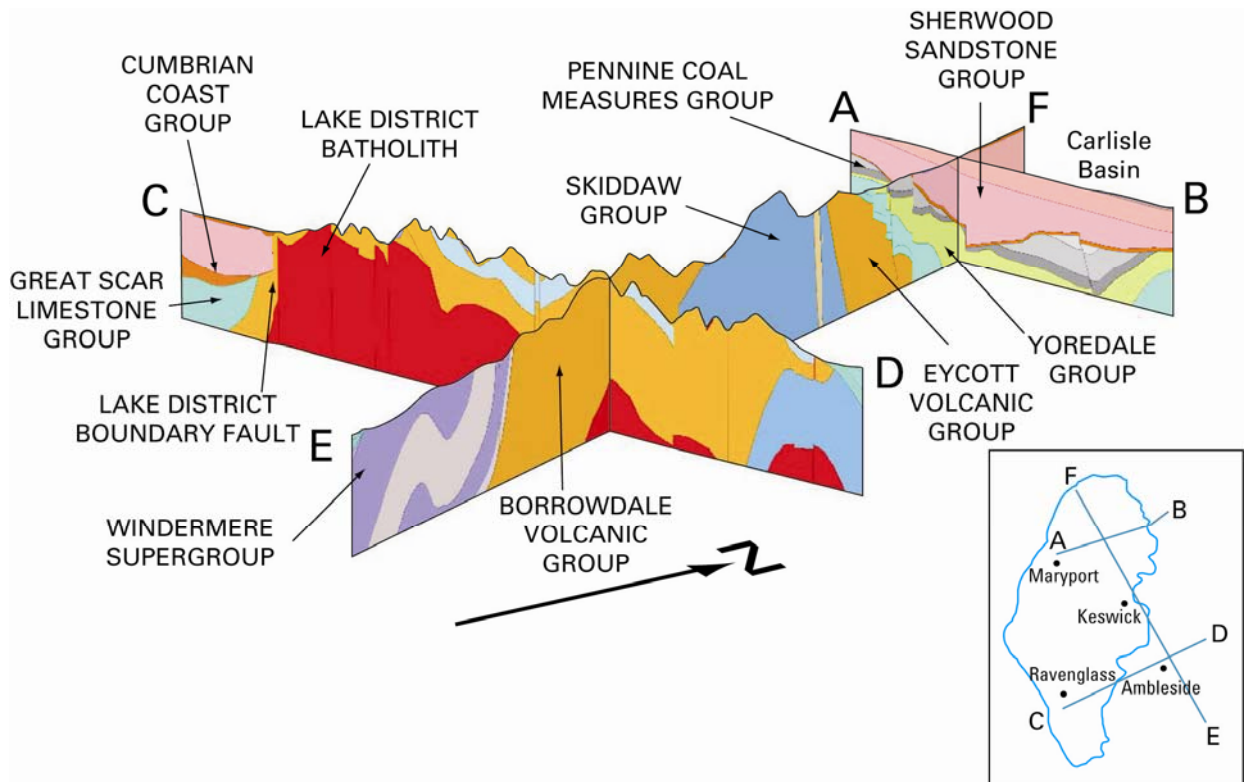


Figure 6. Three-dimensional 'fence diagram' of cross-sections illustrating the generalised regional geology of Cumbria, including the West Cumbria Partnership area. The vertical scale is exaggerated, so that the topography and dip (inclination) of the rocks appear exaggerated. Depth of the sections is approximately 1500 m below Ordnance Datum. Inset map shows the line of the cross-sections in relation to the Partnership area. Based on Schofield et al., (in press).

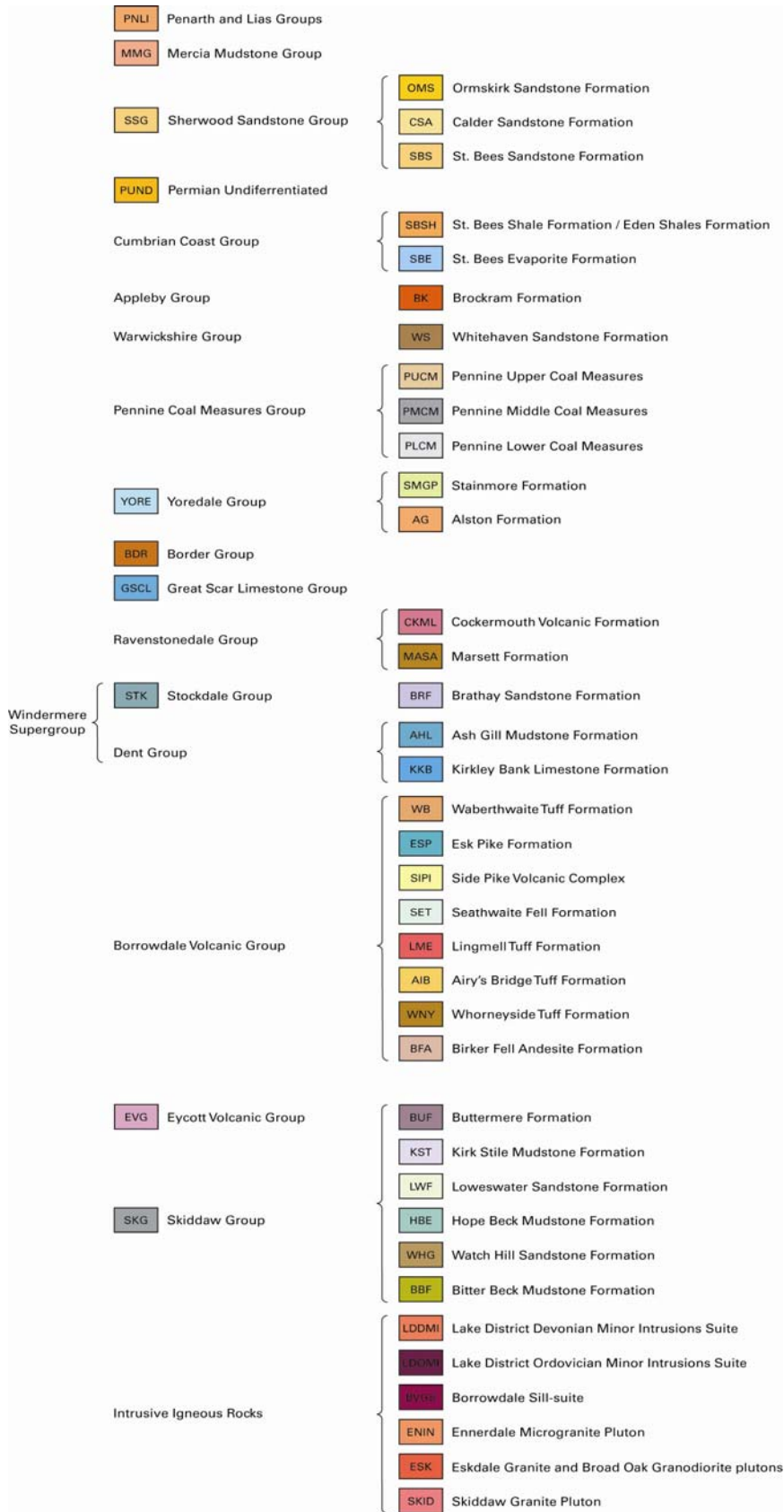


Figure 7. Key for the geological map (Figure 8) and geological cross-sections (Figure 9) based on BGS DiGMapGB 1:50 000 scale. Letter codes refer to rock units shown in the cross-sections on Figure 9. Full definitions of these rock units are available from the BGS Lexicon of Named Rock Units at [www.bgs.ac.uk/lexicon/home.cfm](http://www.bgs.ac.uk/lexicon/home.cfm)

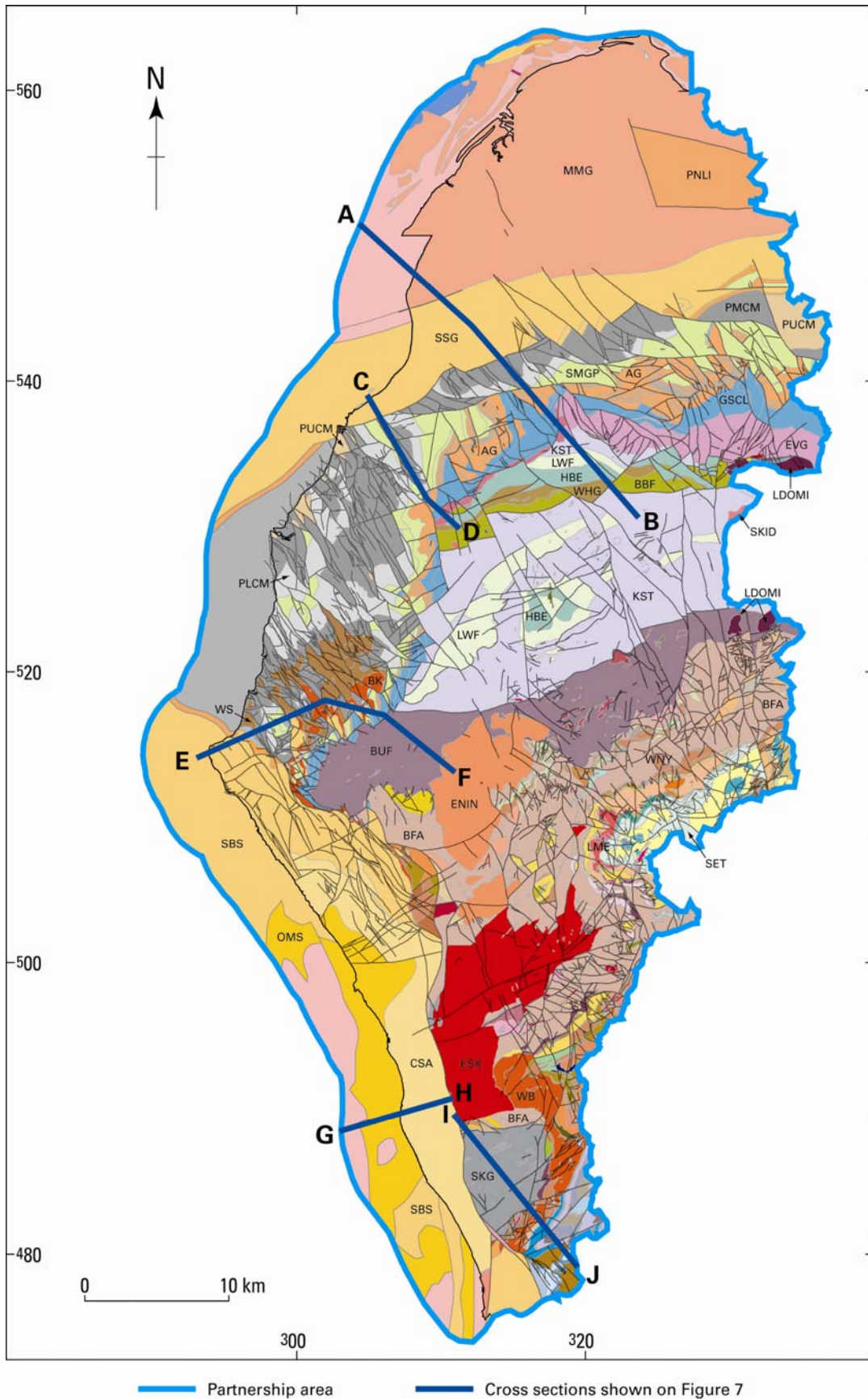


Figure 8. Geological map of the West Cumbria Partnership area based on BGS DiGMapGB 1:50 000 scale. The lines of cross-sections A-B, C-D, E-F, G-H and I-J (Figure 9) are shown. See Figure 7 for key. For clarity, some small areas of Lower Palaeozoic strata are not shown in the key (Figure 7).





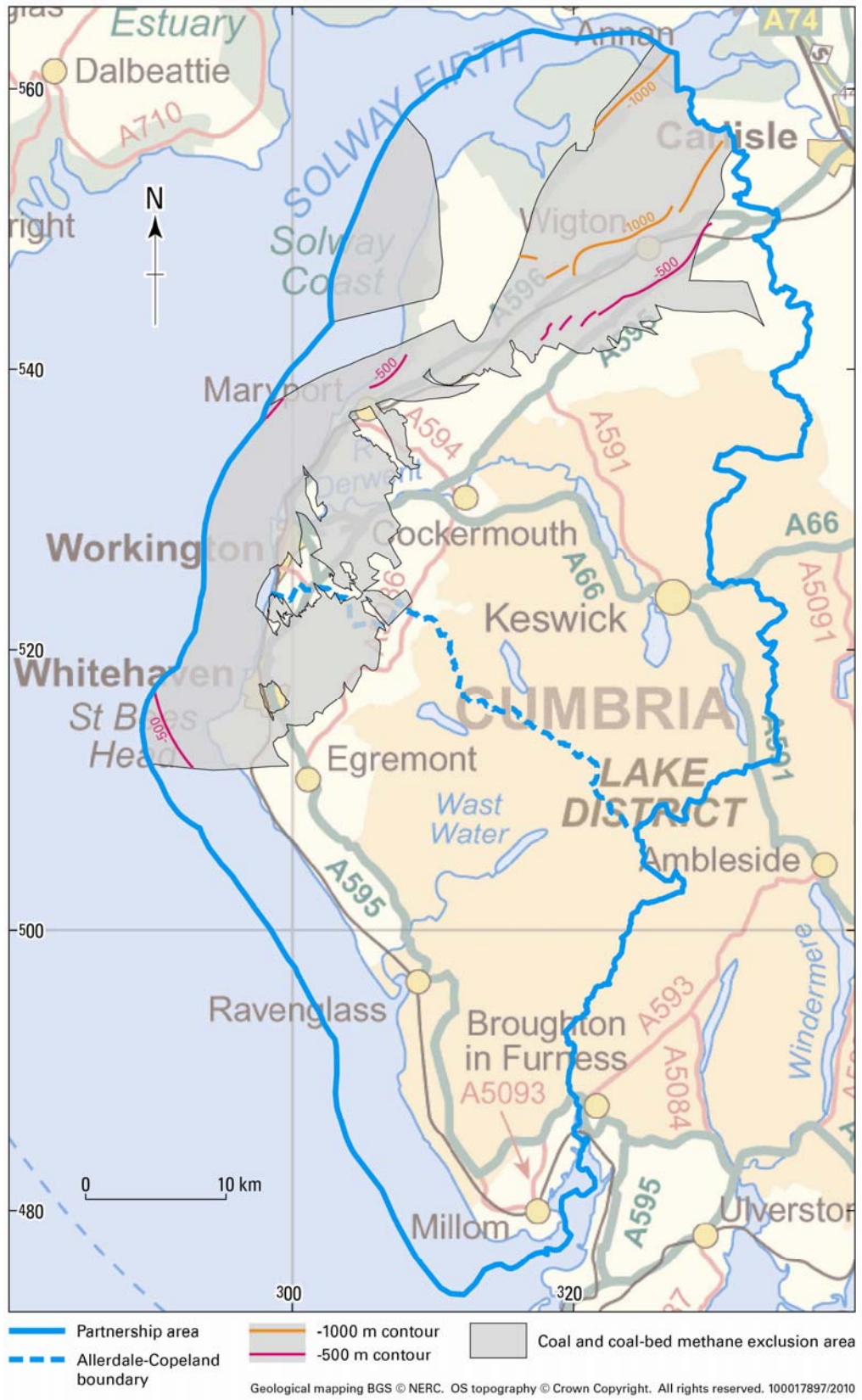
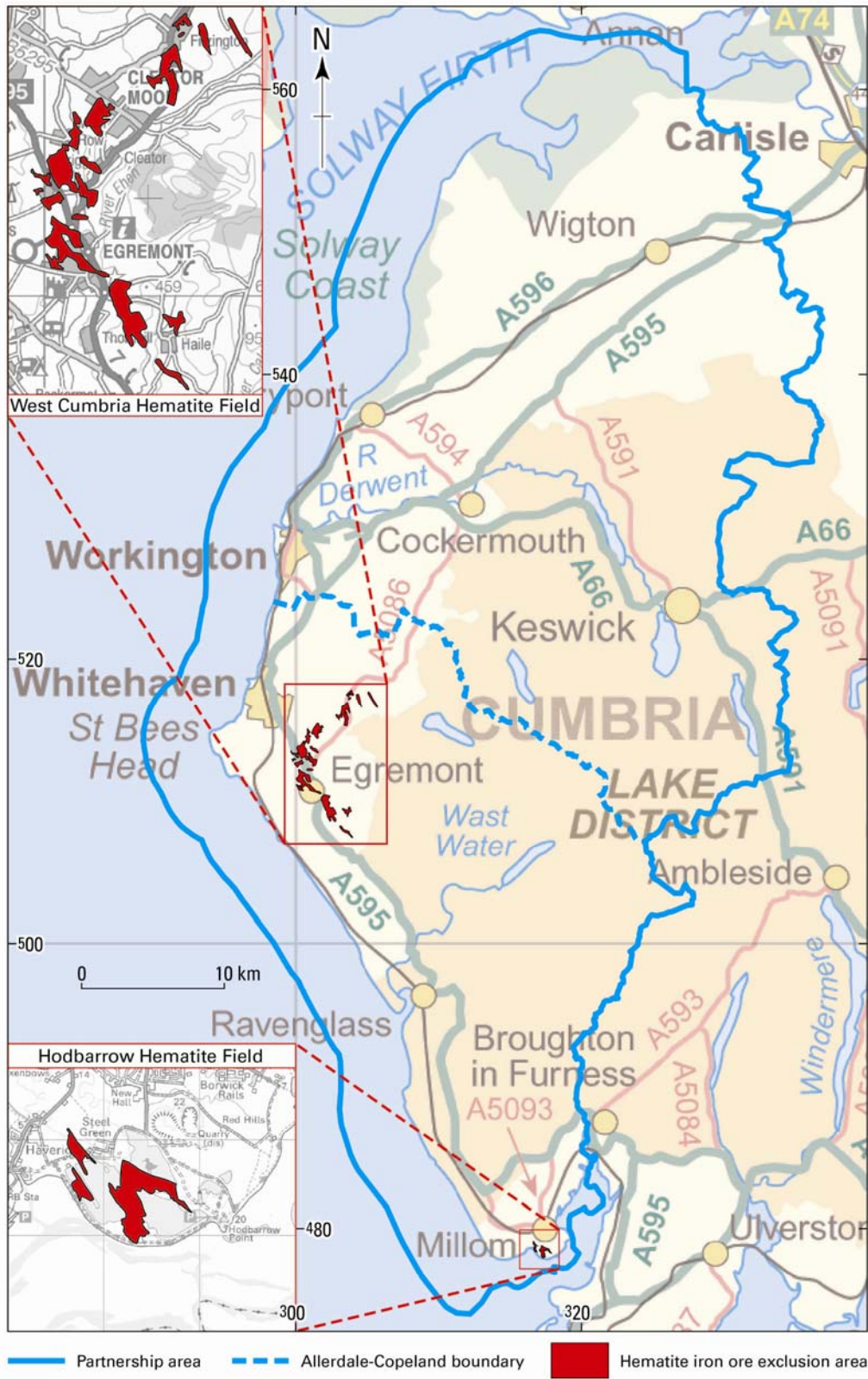


Figure 10. Map showing the exclusion areas for coal and coal-bed methane (possible intrusion risk at depth). Based on data listed in Section 4.1.1. Contours (relative to OD) on the base of Pennine Coal Measures Group (Chadwick et al., 1995) show the regional dip of the coal-bearing succession. Topographical base is OS topography © Crown Copyright. All rights reserved. 100017897/2010.



Figure 11. Map showing the location of oil and gas boreholes and current (2010) oil and gas licence areas (DECC, 2010) in the north of the Partnership area. Topographical base is OS topography © Crown Copyright. All rights reserved. 100017897/2010.





Geological mapping BGS © NERC. OS topography © Crown Copyright. All rights reserved. 100017897/2010

Figure 12. Map showing the exclusion areas for hematite iron ore (possible intrusion risk at depth). Only known areas of orebodies below 100 m depth are shown excluded. Inset maps show details of the location of the two hematite ore fields. Based on data listed in Section 4.1.4.1. Topographical base is OS topography © Crown Copyright. All rights reserved. 100017897/2010.

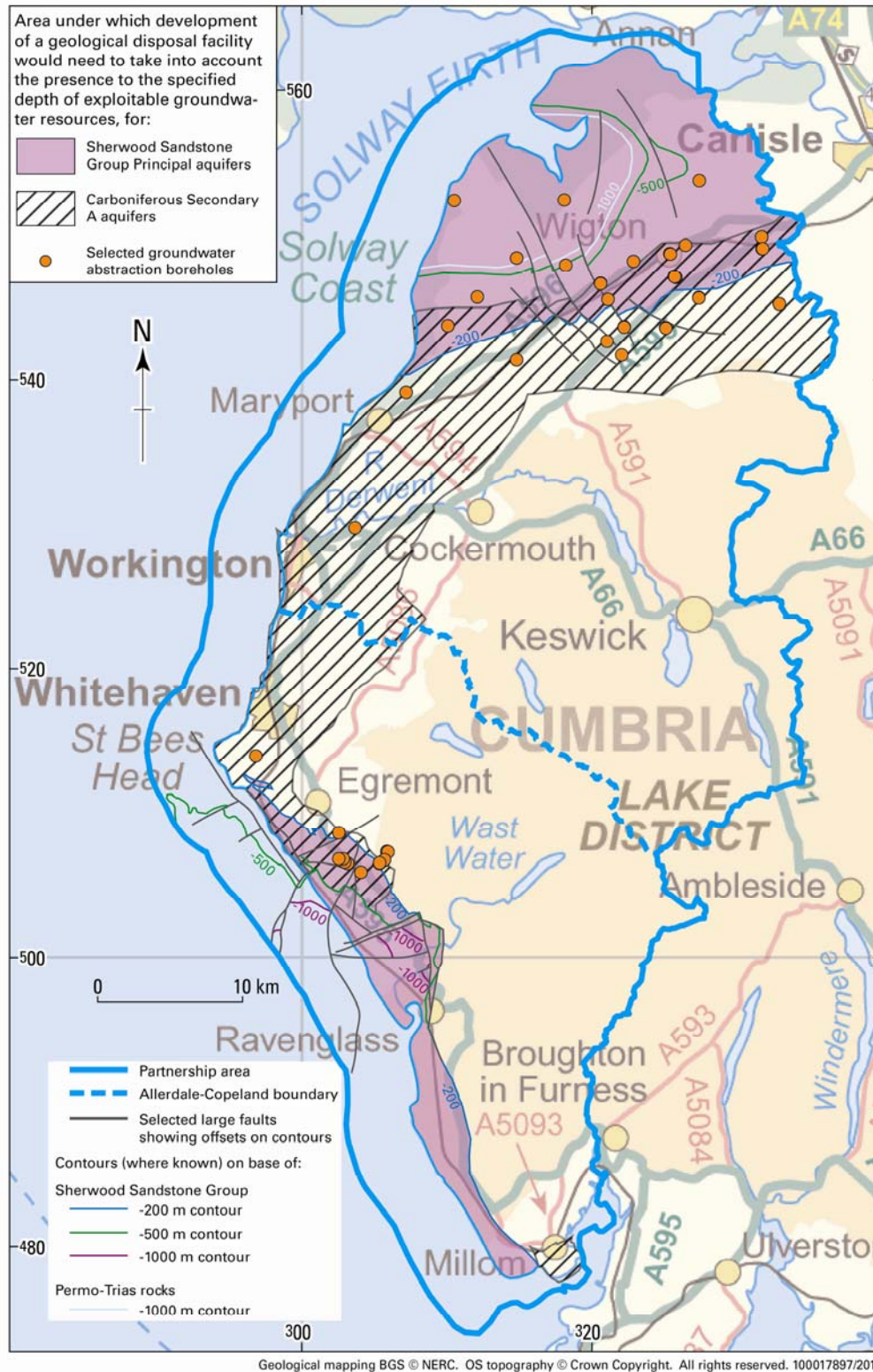


Figure 13. Map illustrating the Principal and Secondary A aquifers (exploitable groundwater resources) in the Partnership area. The Sherwood Sandstone Group (Principal aquifer) is shown where present below 200 m depth OD (west Cumbria coastal aquifer and Solway Basin). Structural contours on the base of the Sherwood Sandstone Group are shown, where known, at -200 m, -500 m and -1000 m OD to indicate the general direction of dip, offshore. The hatched area represents the presence of Carboniferous aquifers (Secondary A aquifers) onshore, between -200 m and -500 m depth. Between -200 m and -500 m OD the Principal and Secondary A aquifer rock volumes are excluded. Below about -500 m OD the groundwater is assumed to be saline and, therefore, is not an exploitable groundwater resource. Offshore, the groundwater (marine) is saline and, therefore, the rock volume is not an aquifer. Selected EA licenced groundwater abstraction wells are shown for Primary and Secondary A aquifers. Based on data listed in Section 4.2 (including EA, 2010 and Nirex, 1995). Topographical base is OS topography © Crown Copyright. All rights reserved. 100017897/2010.



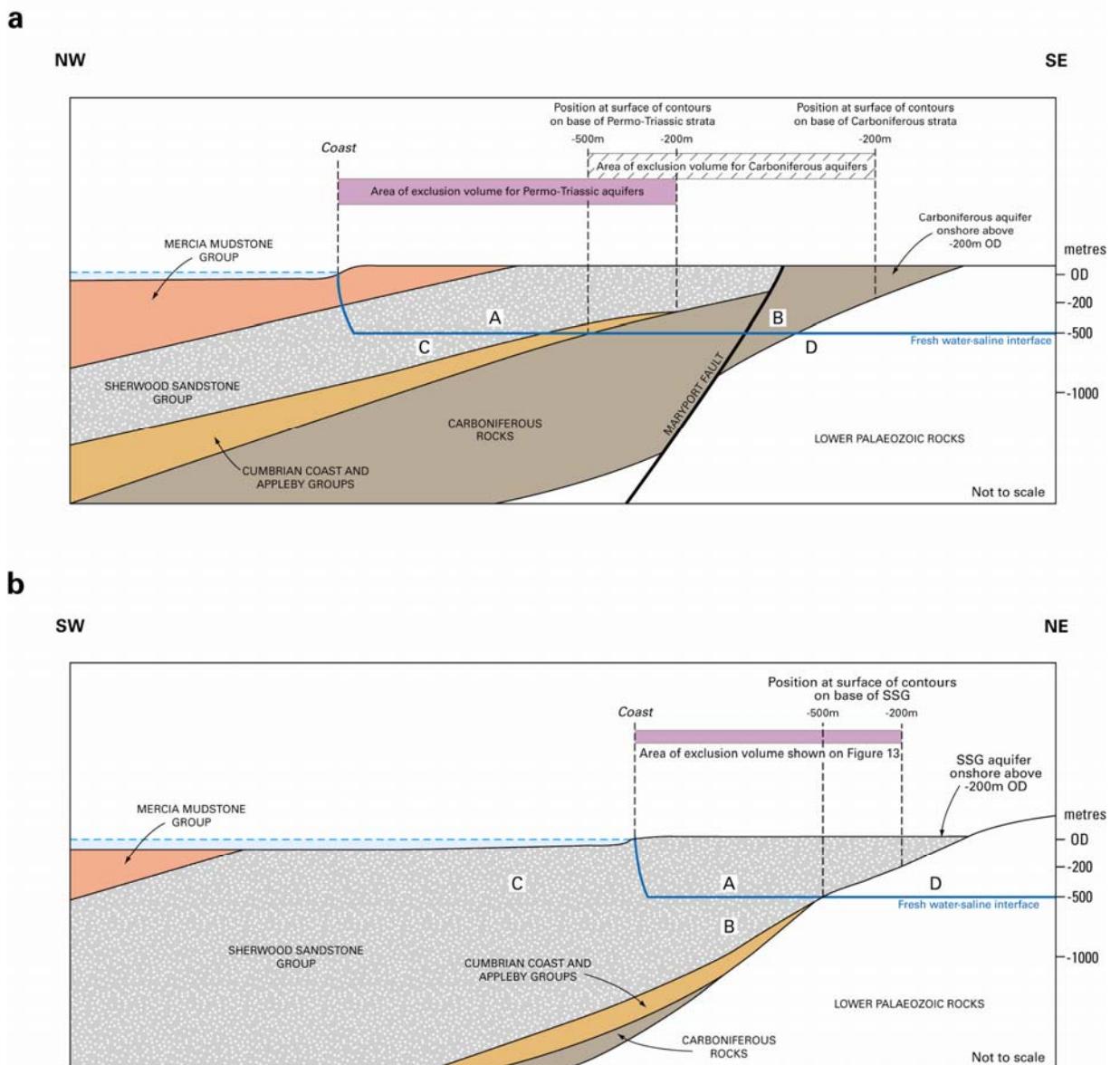


Figure 14. Simplified diagrammatic cross-sections of the Principal and Secondary aquifers in the Partnership area (see Figure 13).

(a) Solway lowlands; A, B, C, D illustrate hypothetical locations, at depth, below -200 m OD. 'A' lies within the Sherwood Sandstone Group Principal aquifer above the fresh water-saline interface and, therefore, would be an excluded rock volume. 'B' lies within the Carboniferous Secondary A aquifer but above the fresh water-saline interface and, therefore, would be an excluded rock volume. 'C' lies within the Sherwood Sandstone Group, but below the fresh-saline water interface and, therefore, is not an aquifer and does not represent an excluded rock volume. 'D' lies within the Lower Palaeozoic rocks and, therefore, is not an excluded rock volume. Not to scale.

(b) west Cumbria coastal plain; A, B, C, D illustrate hypothetical locations, at depth, below -200 m OD. 'A' lies within the Sherwood Sandstone Group Principal aquifer above the fresh-saline water interface and, therefore, would be an excluded rock volume. 'B' is within the Sherwood Sandstone Group but below the fresh water-saline interface and, therefore, is not an aquifer and does not represent an excluded rock volume. 'C' lies within the Sherwood Sandstone Group, but the groundwater offshore is likely to be saline or brine, and therefore does not represent an excluded rock volume. 'D' lies within the Lower Palaeozoic rocks and, therefore, is not an excluded rock volume. Not to scale.