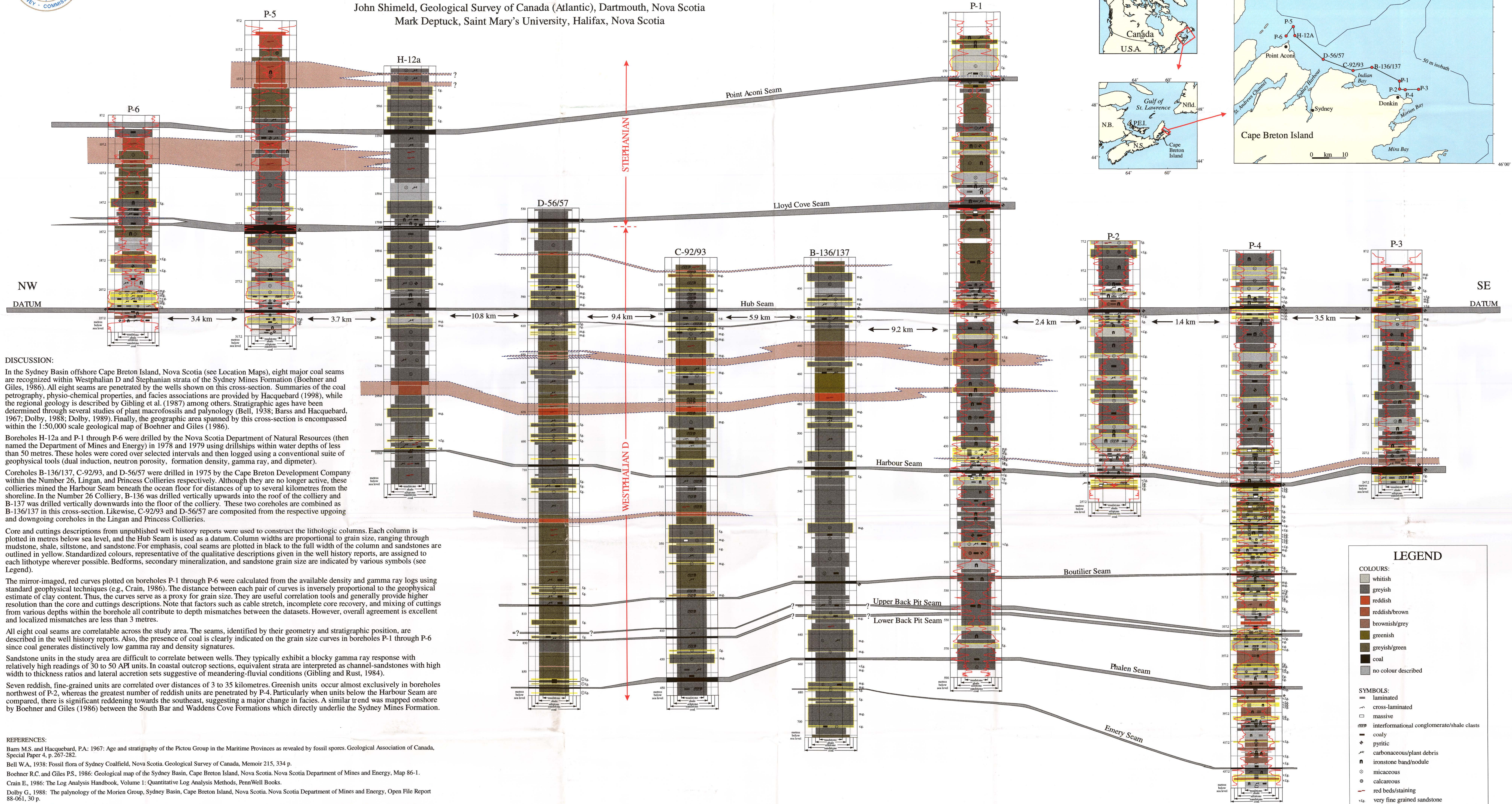
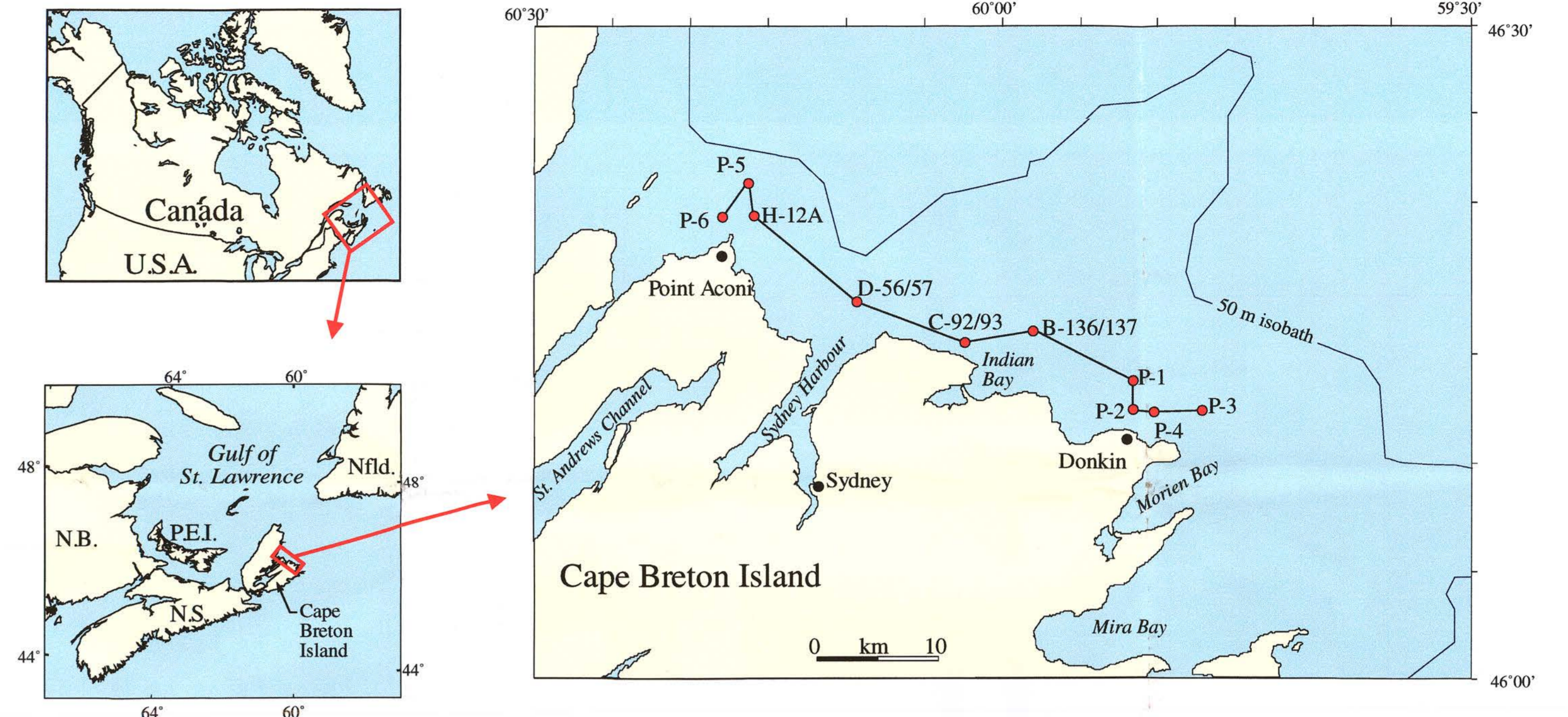




Lithostratigraphic Correlation of the Upper Sydney Mines Formation in the Sydney Basin (Donkin to Point Aconi), Northeastern Nova Scotia

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DISCUSSION:
 In the Sydney Basin offshore Cape Breton Island, Nova Scotia (see Location Maps), eight major coal seams are recognized within Westphalian D and Stephanian strata of the Sydney Mines Formation (Boehner and Giles, 1986). All eight seams are penetrated by the wells shown on this cross-section. Summaries of the coal petrography, physio-chemical properties, and facies associations are provided by Hacquebard (1998), while the regional geology is described by Gibling et al. (1987) among others. Stratigraphic ages have been determined through several studies of plant macrofossils and palynology (Bell, 1938; Barss and Hacquebard, 1967; Dolby, 1988; Dolby, 1989). Finally, the geographic area spanned by this cross-section is encompassed within the 1:50,000 scale geological map of Boehner and Giles (1986).

Boreholes H-12a and P-1 through P-6 were drilled by the Nova Scotia Department of Natural Resources (then named the Department of Mines and Energy) in 1978 and 1979 using drills within water depths of less than 50 metres. These holes were cored over selected intervals and then logged using a conventional suite of geophysical tools (dual induction, neutron porosity, formation density, gamma ray, and dipmeter).
 Coreholes B-136/137, C-92/93, and D-56/57 were drilled in 1975 by the Cape Breton Development Company within the Number 26, Lingan, and Princess Collieries respectively. Although they are no longer active, these collieries mined the Harbour Seam beneath the ocean floor for distances of up to several kilometres from the shoreline. In the Number 26 Colliery, B-136 was drilled vertically upwards into the roof of the colliery and B-137 was drilled vertically downwards into the floor of the colliery. These two coreholes are combined as B-136/137 in this cross-section. Likewise, C-92/93 and D-56/57 are composed from the respective upgoing and downgoing coreholes in the Lingan and Princess Collieries.

Core and cuttings descriptions from unpublished well history reports were used to construct the lithologic columns. Each column is plotted in metres below sea level, and the Hub Seam is used as a datum. Column widths are proportional to grain size, ranging through mudstone, shale, siltstone, and sandstone. For emphasis, coal seams are plotted in black to the full width of the column and sandstones are outlined in yellow. Standardized colours, representative of the qualitative descriptions given in the well history reports, are assigned to each lithotype wherever possible. Bedforms, secondary mineralization, and sandstone grain size are indicated by various symbols (see Legend).

The mirror-imaged, red curves plotted on boreholes P-1 through P-6 were calculated from the available density and gamma ray logs using standard geophysical techniques (e.g., Crain, 1986). The distance between each pair of curves is inversely proportional to the geophysical estimate of clay content. Thus, the curves serve as a proxy for grain size. They are useful correlation tools and generally provide higher resolution than the core and cuttings descriptions. Note that factors such as cable stretch, incomplete core recovery, and mixing of cuttings from various depths within the borehole all contribute to depth mismatches between the datasets. However, overall agreement is excellent and localized mismatches are less than 3 metres.

All eight coal seams are correlatable across the study area. The seams, identified by their geometry and stratigraphic position, are described in the well history reports. Also, the presence of coal is clearly indicated on the grain size curves in boreholes P-1 through P-6 since coal generates distinctively low gamma ray and density signatures.

Sandstone units in the study area are difficult to correlate between wells. They typically exhibit a blocky gamma ray response with relatively high readings of 30 to 50 API units. In coastal outcrop sections, equivalent strata are interpreted as channel-sandstones with high width to thickness ratios and lateral accretion sets suggestive of meandering-fluvial conditions (Gibling and Rust, 1984).

Seven reddish, fine-grained units are correlated over distances of 3 to 35 kilometres. Greenish units occur almost exclusively in boreholes northwest of P-2, whereas the greatest number of reddish units are penetrated by P-4. Particularly when units below the Harbour Seam are compared, there is significant reddening towards the southeast, suggesting a major change in facies. A similar trend was mapped onshore by Boehner and Giles (1986) between the South Bar and Waddens Cove Formations which directly underlie the Sydney Mines Formation.

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LEGEND

COLOURS:

- whitish
- greyish
- reddish
- reddish/brown
- brownish/grey
- greenish
- greyish/green
- coal
- no colour described

SYMBOLS:

- laminated
- cross-laminated
- massive
- interformational conglomerate/shale clasts
- coaly
- pyritic
- carbonaceous/plant debris
- ironstone band/nodule
- micaceous
- calcareous
- red beds/staining
- very fine grained sandstone
- fine grained sandstone
- medium grained sandstone
- coarse grained sandstone
- very coarse grained sandstone

