

Sequence Stratigraphy of a Large Tide-Influenced Deltaic System: The Middle Triassic Hawkesbury Sandstone of the Sydney Basin, Australia

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The Middle Triassic Hawkesbury Sandstone covers an area of over 10,000 km² of the Sydney Basin in New South Wales, Australia. The formation is up to 280 m thick and is made up predominantly of quartz-rich sandstone with less than 5 percent of the formation consisting of finer-grained siliciclastic sediments.

The predominant facies are 4 to 15 m thick sandstone units, with erosional bases, that consist mainly of planar tabular cross-beds with some trough cross-beds. Many planar tabular cross-beds are large and set thicknesses over 2 m are common. Compound cross bed-sets, bundle sequences, double mud-drapes, sigmoidal bedding, and multiple reactivation surfaces provide abundant evidence of deposition within a strong tidal regime. Paleocurrent measurements have a wide dispersion. The facies are interpreted as the deposits of meandering tidal channels during highstands. Channels were apparently dominated by large sand waves.

A less common facies are complex channel-fill units up to 30 m thick. Units contain trough cross-bedded sandstones with paleocurrent directions having a narrow dispersion. These cross-beds are interpreted to be deposited within fluvial systems. At one location, however, the facies fines upwards into flaser and lenticular bedding containing synaeresis cracks and ichnofacies, suggesting an upward transition to brackish water conditions. Large-scale inclined heterolithic strata are also found within the channel-fill units. The complex channel-fill units are interpreted to be deposited during transgression within incised valleys that were cut at lowstands.

The third facies consists of fine-grained strata with wavy and lenticular bedding. Units of this facies have sharp bases and are mostly less than 2 m thick. They contain ichnofacies indicative of a restricted marine setting. The facies are interpreted as transgressive systems tracts, deposited over ravinement surfaces.

In contrast to earlier interpretations of a braided river deposit, the Hawkesbury Sandstone is reinterpreted as the deposit of a large tide-influenced delta with stratal geometry controlled by changes in relative sea level. The absence of terrigenous deposits may be due to low rates of creation of accommodation. Although the Sydney Basin is interpreted as a foreland basin, subsidence rates were low during the Middle Triassic.