

Subtidal origin of the Hawkesbury Sandstone, Middle Triassic, Sydney Basin

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The Hawkesbury Sandstone of the Sydney Basin is widely regarded as the deposit of a large sandy braided river system. A detailed examination of the sedimentary facies suggests, however, that most, if not all, of the sediments were deposited in a subtidal environment. Common sedimentary features include double mud-drapes, multiple reactivation surfaces, bundle sequences and bidirectional cross-beds, indicating that the sandstones were deposited by a wide variety of sand-waves under semi-diurnal tidal currents.

The Hawkesbury Sandstone is 100–280 m thick, has a sharp base and overlies fluvial and estuarine strata of the upper Narrabeen Group. Erosion surfaces within the Hawkesbury Sandstone are commonly overlain by massive sandstones with mudstone rip-up clasts. These are overlain by cross-bedded medium to coarse-grained sandstone units that are generally 5–15 m thick. Planar

cross-beds are volumetrically more significant than trough cross-beds. The large planar cross-beds (up to 7.5 m thick) indicate very strong tidal currents, but it is unclear whether these currents were the product of a macrotidal regime or a function of the geometry of the basin. Fine-grained sediments are rare within the Hawkesbury Sandstone but generally consist of wavy and lenticular bedding. Shales within the formation contain ichnofossils indicating brackish water conditions.

Rather than a braided river complex, the facies of the Hawkesbury Sandstone may be better interpreted as the deposits of a complex estuarine system. The base of the formation represents a major sequence-boundary, whereas many of the internal scour surfaces may be minor sequence-boundaries reflecting smaller-scale fluctuations in relative sea level. This reinterpretation has strong implications for both predicting the geometry of Triassic sandstone bodies in eastern Australia and for the use of the Hawkesbury Sandstone as an analogue for sandstone architecture elsewhere in the world.

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