

Stratigraphy of the Chichester Range – Implications for BIF Deposition in the Hamersley Province

Luiz Ferreira* and Matthew Crowe

BHP Billiton Iron Ore, Perth, Western Australia 6000

*E-mail, luiz.ferreira@bhpbilliton.com

Exploration has been occurring in the Chichester Range since the 1960s, initially for manganese and later leading to the discovery of significant areas of iron enrichment. The Chichester Range is located on the northern side of the Fortescue Valley in the Pilbara region of Western Australia. The stratigraphy of the Chichester has been an area of controversy for some time with interpretations ranging from thinned sequences of the Marra Mamba Iron Formation (MMIF) to the complete absence of particular members.

Data collected by BHP Billiton exhibits a strong correlation with the MMIF stratigraphy observed to the south of the Fortescue Valley, suggesting the whole sequence of MMIF was deposited in the area, but displays minor variations from the “standard” MMIF occurring in the Hamersley Province. This interpretation is based on 50+ holes drilled by BHP Billiton on its Roy Hill (part of the Chichester) and Marillana (southern side of the Fortescue Valley) projects, as well as publicly available holes drilled in the Fortescue Valley.

Geochemistry in a number of drill holes from the Roy Hill project has revealed elevated occurrences of Na, U, and V, often spatially associated with high-grade hematite enrichment of both BIF and shale. This overprint correlates with areas of destruction of the natural gamma signature of the rocks and has likely contributed to some of the controversy surrounding the interpretation of stratigraphy in the Chichester Range. The genesis of this overprint is not yet completely understood but it is interpreted as hydrothermal. Where overprinting is not evident, drill holes typically display slight variations in natural gamma response, lithology and stratigraphic thickness from the standard MMIF to the south. However, through comparison of gamma profiles, geochemistry, and petrography a positive correlation of the stratigraphy can be made, indicating the full sequence of MMIF exists in the area. Identification of the full MMIF sequence in the Chichester Range suggests deposition occurred when the region was relatively flat, with no major barriers to sedimentation. Following deposition of the MMIF and basal Wittenoom Formation, the regional scale Poonda fault became active, resulting in numerous carbonate debris flows in the Hamersley Group to the south (e.g., Mindy, Packsaddle), and a “depositional divide” was created in the basin. South of the fault sedimentation occurred in relatively deeper water that facilitated deposition of the Brockman Iron Formation and the remainder of the Hamersley Group, while to the north a shallower water environment resulted in deposition of a thick carbonate sequence, often stromatolitic, seen in the Fortescue Valley.

Interpretation of the stratigraphic and depositional history of the region has implications for exploration, through to resource estimation and mining. A thorough understanding of the MMIF in the Chichester Range, especially the causes and characteristics of the identified overprint could lead to further discoveries of valuable iron ore resources in the future.