The depositional stratigraphy of within-channel deposits in sandy braided rivers is dominated by a variety of barforms (both singular ‘unit’ bars and complex ‘compound’ bars), as well as the infill of individual channels (herein termed ‘channel fills’). The deposits of bars and channel fills define the key components of facies models for braided rivers and their within-channel heterogeneity, knowledge of which is important for reservoir characterization. However, few studies have sought to address the question of whether the deposits of bars and channel fills can be readily differentiated from each other. This paper presents the first quantitative study to achieve this aim, using aerial images of an evolving modern sandy braided river and geophysical imaging of its subsurface deposits. Aerial photographs taken between 2000 and 2004 document the abandonment and fill of a 1.3 km long, 80 m wide anabranch channel in the sandy braided South Saskatchewan River, Canada. Upstream river regulation traps the majority of very fine sediment and there is little clay (<1%) in the bed sediments. Channel abandonment was initiated by a series of unit bars that stalled and progressively blocked the anabranch entrance, together with dune deposition and stacking at the anabranch entrance and exit. Complete channel abandonment and subsequent fill of up to 3 m of sediment took ca 2 years. Thirteen kilometres of ground-penetrating radar surveys, coupled with 18 cores, were obtained over the channel fill and an adjacent 750 m long, 400 m wide, compound bar, enabling a quantitative analysis of the channel and bar deposits. Results show that, in terms of grain-size trends, facies proportions and scale of deposits, there are only subtle differences between the channel fill and bar deposits which, therefore, renders them indistinguishable. Thus, it may be inappropriate to assign different geometric and sedimentological attributes to channel fill and bar facies in object-based models of sandy braided river alluvial architecture.