CHAPTER 9: CRONOSTRATIGRAPHIC MODELLING

9.1 Methodology

This model (Fig. 9.1) has been constructed using a correlation of the target area data listed below and a number of studies within this reach of the Trent largely from the Hemington area.

Target Area Data Sources	Data Sources Outside the Target Area
LiDAR – GPS altitude map	Hemington Bridges pit Report and maps
LiDAR intensity palaeochannel map	Hemington Western Extension chronostratigraphic model (Brown, in press)
Geomorphological map	Hemington Eastern Extension chronostratigraphic model (Brown, in press)
Geological map (BGS)	Dating of other palaeochannels (e.g. A6, Sawley)
GPR transects	Geological mapping (BGS)
Coring transects	MFT1, T1T1, T1T2, T2T1

Tab 9.1: Data sources used in the chronostratigraphic modelling

The palaeochannels segment the area into a series of levels:

High 38.7m OD
Middle 34.0m OD
Low 28.2m OD

It is apparent from flood photography that high magnitude floods within the contemporary flood frequency-magnitude distribution can inundate both the lower and middle levels but not the high surfaces of the Devensian terrace 2. The high level is also seen to correlate to the south and southwest with the large area of Beeston terrace as mapped by the BGS. However, both the LiDAR and GPR show broad shallow channels excavated into the surface of the terraces and by analogy elsewhere (Fyfe *et al*. 2004) these are most likely channels formed during the final stages of gravel deposition during the Lateglacial. There are, however, in this reach some deeper narrower channels that bisect the terraces and have been shown to be of early to mid Holocene age (Brown and Salisbury in press). The middle level is characterised by gravel overlain by a variable thickness of overbank sandy silts and clays. It correlates with similar floodplain parcels to the east including meander cores at Hemington. It also has later Prehistoric and Roman archaeology on its surface. It is bisected and eroded into by the southerly of the two major palaeo-Trent meander loops traversing the target area. The complex form of this palaeochannel, its significant depth of sediment and its truncation of later Roman channels all suggest a late prehistoric age. The series of scroll bars on its inner (northerly) floodplain suggest that over time it moved in a southwesterly direction and on this basis the meander core is also ascribed to the late Prehistoric period. This palaeochannel and floodplain is truncated by the large partially water-filled Trent palaeochannel. There are many similarities in altitude, form and location between this channel and the medieval channels associated with the Old Trent at Hemington. The width of the meander belt and its sinuosity are similar to the Sawley palaeochannel that is of Roman-6th Century age but a correlation cannot be proven. Closer to the channel there are a number of old channels sub-parallel to the modern Trent. In some cases the connections are only severed by an artificial levee. This zone also contains engineered river sections and channels such as the Sawley Cut and straightened sections of the Soar.

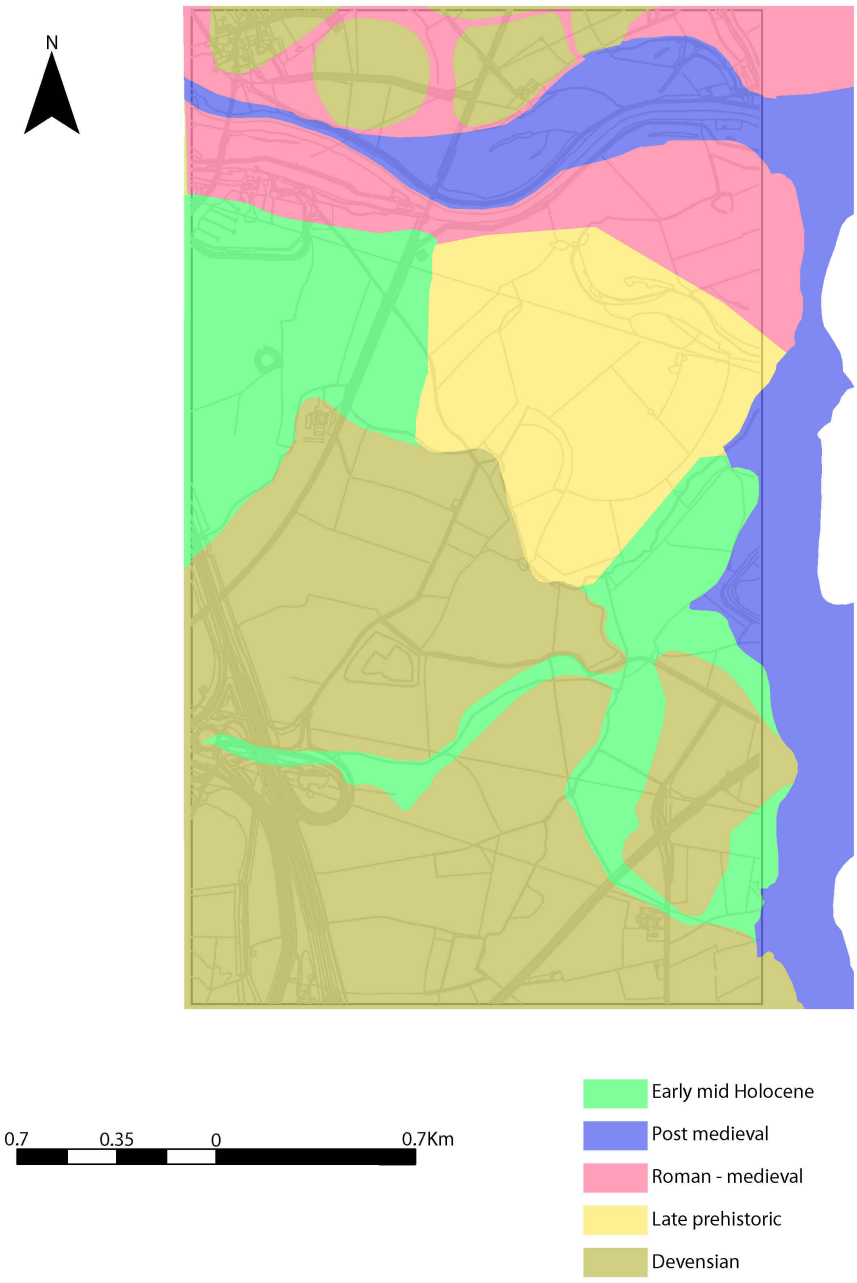

Fig 9.1: Chronostratigraphic model map of the Trent-Soar Junction.

9.2 The Chronostratigraphic Cross-section

This hypothesized cross-section (Fig. 9.2) has been based on the topography and estimated dating provided by the surface model. Sub-surface is generalized following stratigraphic and sedimentological observations at Hemington (including both the east and western extensions), the current Lafarge quarry at Sawley, faces exposed at Aston and earlier quarries as well as borehole records.

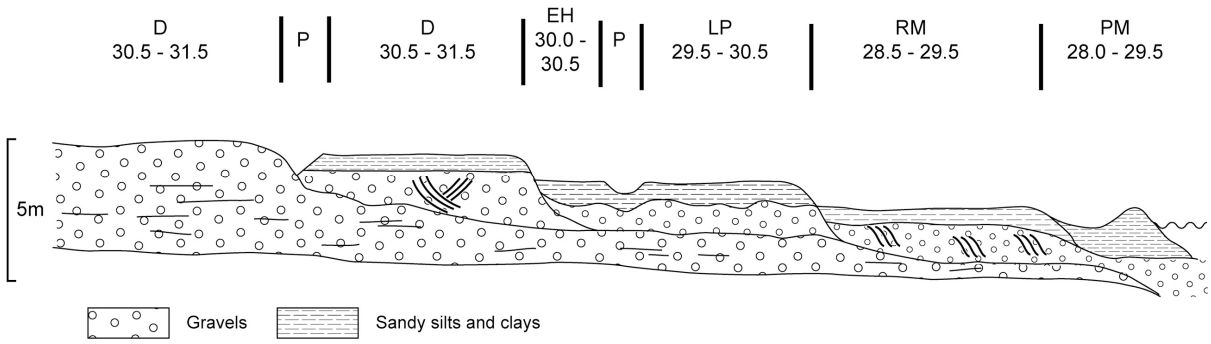

Fig 9.2: Hypothesised cross section across the study area.

The key question of archaeological significance is the depth of the Holocene sand and gravel and whether it overlies Devensian gravels. The fundamental problem is that the Devensian and Holocene gravels are very similar in grain size, clast lithology, shape and even fabric due to the derivation of the later from the former. This means that it is rarely possible to differentiate them from borehole records. It is possible from quarry faces due to the presence of archaeology, a different colour (due to Fe staining) and sometimes a different sedimentary structure. From the observations at Hemington it is hypothesized that the Devensian gravels underlie all the later phases of floodplain sedimentation with the exceptions of areas of scour near the present channel.

The testing of these models and their refinement forms a principal component of Phase II of this project.