Advances in archaeological prospection: the geoarchaeological shift

Clive WADDINGTON, Archaeological Research Services Ltd, UK
David G. PASSMORE, University of Toronto, Canada

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Understanding the Problem

Finding rapid, cost-efficient ways to effectively evaluate large land parcels for archaeological and palaeoenvironmental remains in advance of development, and particularly large construction and infrastructure schemes, forms a key challenge for archaeologists. It is widely accepted that no single archaeological prospection technique can provide the answers we need, despite an over-reliance on geophysical survey in some cases. Rather, a spectrum of techniques is required to assess the seen and 'unseen' potential of any given landscape.

In order to get the best out of these techniques and to know where and when each technique can contribute effectively to the analysis of any given study area or landscape unit within it, a 'way in' to the landscape is required. The starting point is some form of sampling and it is self-evident that the effectiveness of a sampling strategy is directly related to the distribution of that which is being sampled. The archaeologist is therefore faced with a dilemma: the distribution of that which is being sampled remains unknown until it is sampled: this is known as the 'sampling paradox'. So how do we overcome the burden of the 'onerous sampling strategy', and structure the investigation of landscape and the application of archaeological techniques? It all starts with understanding the mosaic of landforms that form any given study area and through geoarchaeological mapping, sediment sampling and characterisation a scheme of landforms or 'landform elements' can be produced that encompass the full variation of landscape facies constituting the study area (see Passmore and Waddington 2009; 2012; Jackson et al. 2013; Carey et al. 2017).

A geoarchaeologically-driven solution

For those areas where there is little pre-existing remote sensing data or which have geologies/soils/ground conditions unfavourable to crop or soil mark formation, and/or have restricted scope for geophysical survey, other approaches to drive evaluation of these areas need to be found. Following an in-depth study in the Till-Tweed basin (Passmore and Waddington 2009; 2012) a geoarchaeological methodology has been devised, termed the 'Landform Element' approach, whereby the evaluation of a given land parcel is initially geoarchaeologically mapped, cored/trenched and surveyed in order to partition the landscape of interest into a series of discrete landforms. For each

of these landforms their geological character is ascribed, together with the dominant geomorphic/taphonomic process, together with known archaeological associations, and implications of the geomorphology for the types of methods most appropriate to their geoarchaeological evaluation (see for example landform element initial classification chart in Passmore and Waddington 2009, 267, Figure 6.1).

Case study: Killerby Quarry

This paper outlines the real-world application of this approach to a new 'super quarry' that was applied from its earliest planning stages, through 'Environmental Impact Assessment', planning determination, site construction and now its operation. The site is called Killerby Quarry and it is located in North Yorkshire, UK, and lies immediately east of the A1M motorway. Together with the adjoining Ellerton extension the site extends over c. 200 ha. The site straddles a range of landforms including the so-called 'Leeming moraine' which is characterised by a variety tills and deglaciation features such as kettle holes, enclosed basins and a palsa bog which form an undulating landscape of low lying wetland basins surrounded by steep bluffs and ridges formed from glaciofluvial sands and gravels with organic sediments, peats and paleosols surviving in the wetlands and kettle hole fills as well as sealed below colluvium at the base of the bluffs.

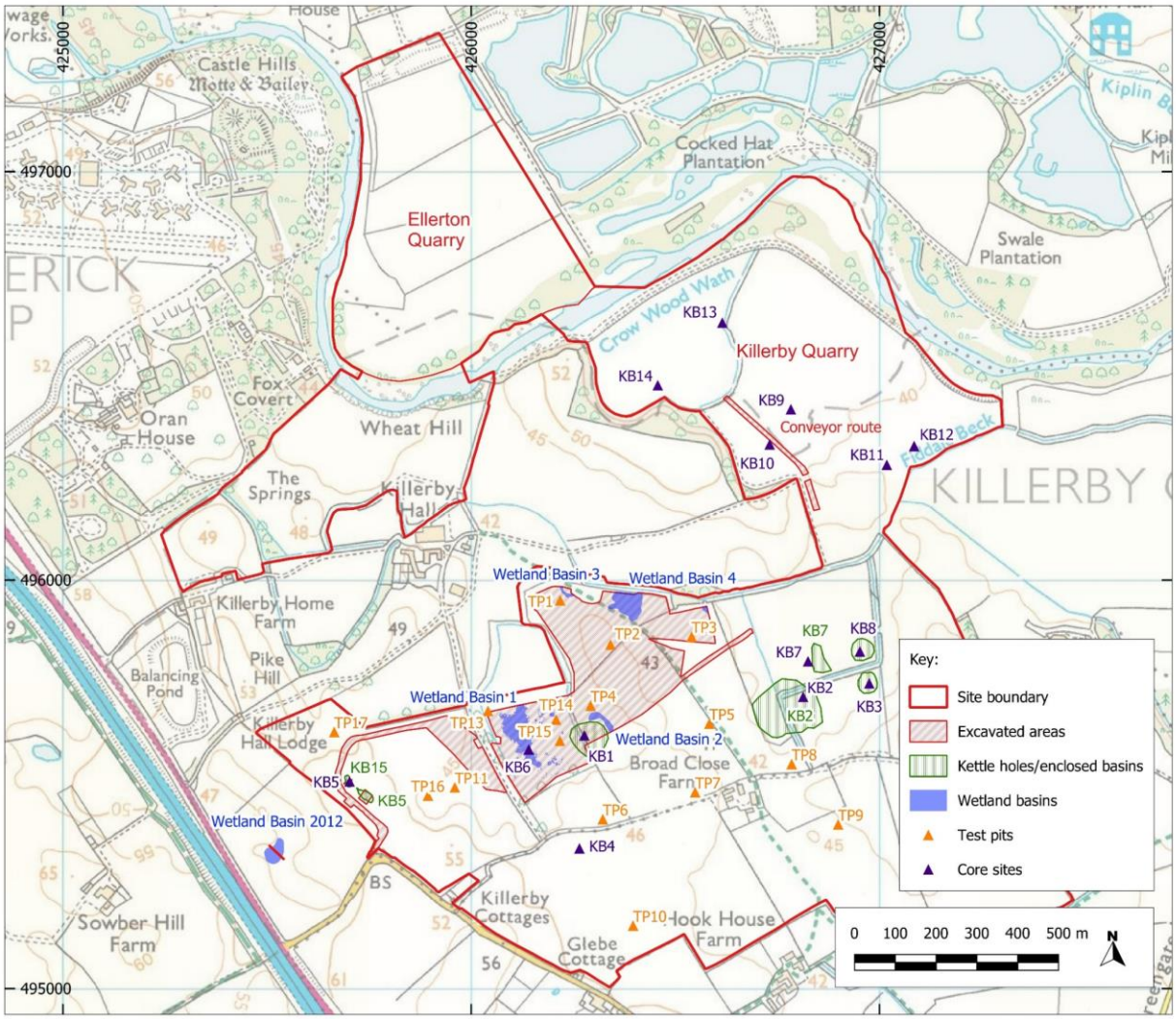

Fig. 1. Map showing detail of archaeological works within Killerby Quarry.

The geoarchaeological 'landform element' approach was selected for use on this project as it provided an appropriate method for rapidly and accurately assessing a large land parcel in advance of large-scale development that required a high level of information to inform the planning decision and to give confidence to the developer of the scale and cost of the post-permission mitigation that might be required. It also meant that there was minimal impact on surviving sub-surface archaeology during the evaluation phase.

The results from the mitigation excavations that have taken place between 2018 – 2021 have been stunning and have added genuinely new knowledge and data to our understanding of the Late Glacial and Early Holocene in northern Britain. This has included the discovery of three Early Mesolithic pond-side camps with the structural timbers of the tepee-like dwellings, one with an internal hearth, surviving in remarkable condition despite dating to the 91st century cal BC. A substantial Late Mesolithic timber platform dating to c.5,500 cal BC was discovered extending out into a small pond inside the kettle hole KB5 and this had evidence for cattle teeth, chipped flints, a stone rubbing tool, as well as posts, postholes and other features that have led to its interpretation as a platform for processing animal skins and potentially curing hides in the pond. This site also had successive occupation in the Neolithic and Bronze Age stratified above the Mesolithic remains. In both cases these well-preserved archaeological remains also had preserved alongside them a continuous palaeoenvironmental sequence of deposits rich in environmental proxies that could be linked to landscape development and human activity in the immediately surrounding landscape. Elsewhere on the site archaeological remains form the Late Iron Age, Romano-British and early medieval periods was also discovered.

Fig. 2. View of one of the well-preserved Early Mesolithic camps with long poles for a tepee-like structure collapsed over the fireplace and radiocarbon dated to the 91st century cal BC, directly contemporary with Star Carr also in North Yorkshire.

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Conflict of Interests Disclosure

There are no conflicts of interest.

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