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1. Introduction

The Early Historic site of Tilaurakot, in Nepal’s southern Terai, represents one of the best preserved fortified Early Historic settlements in South Asia. However, despite excavations in the 1960s (Mitra 1972) and 1970s (Rijal 1979; Mishra 1977), our understanding of the site’s chronological and cultural sequence is relatively limited. Following a season of geophysical survey in 1997 in order to better map and define the archaeological remains (Schmidt et al. 2011), a team of archaeologists were invited to conduct a preliminary archaeological excavation at the site in 1999 in order to support the preparation of a nomination for the site as part of a serial nomination of UNESCO World Heritage Sites associated with the life of the historic Buddha, Siddartha Gautama. Selected for study on account of its strong textual and archaeological links with the nearby UNESCO World Heritage site of Lumbini, the 1999 excavations were funded by UNESCO’s World Heritage Centre and saw two trenches excavated at Mound V in order to define the chronological and cultural sequence of the site. In particular, the excavations were geared towards the production of an independent chronometrically dated sequence for the site as there was some debate concerning its antiquity with Indian archaeologist Debala Mitra suggesting a date of “not earlier than the third-second century BC” (1972: 15) whilst Nepali archaeologists B.K. Rijal stated that “the beginning of the occupation at the site may go back to circa 8th-7th century BC” (1979: 62)

2. The 1999 Excavations at Mound V

The trenches were located in an area that would enable the excavation of a near complete sequence of the site’s occupation. With this aim in mind, a trench was located next to one of Rijal’s (1979) old trenches on Mound V, which had been sited at one of the highest points of the mounded site, some 3.5 metres above the surrounding fields (ibid.: 35) (Figure 1). The sequence from Rijal’s earlier sondage suggested that the site's sequence went back to the first half of the first millennium BCE (ibid.). Being adjacent to the earlier trench also enabled a clear view of the sequence in section by cleaning the backfill out and using it as a vertical test trench. As noted above, the trenches were designed with one main objective in mind, to recover sufficient charcoal samples to allow the construction of an absolute chronology for the site. In meeting this aim, the trench was set out in order to be large enough to identify stratigraphic phases in addition to mixed deposits, well digging and other intrusive features - but also small enough to be covered by a roof to protect the excavation (and excavators) from the sun and rain and, of course, being small enough to finish within a single six-week season. The result was two cardinally oriented trenches, TLK99 Trench I and II cut into Mound V, and covering an area of 24.5 square metres - Trench I measuring four by 3.5 metres and Trench II four by 3.5 metres. The trenches were fully linked with one another and distinguished separately only for the labelling of finds. Due to the presence of a very well-preserved brick pavement close to the surface in the eastern trench, it was decided to concentrate the deeper part of the trench in the western half of the exposed area. At the depth of two metres, it became necessary to reduce the size of the trench to a size of one by one metres in order to facilitate the removal of spoil.

During the season of excavation, Trenches I and II on Mound V were excavated according to the context system down to natural soil at a depth of four metres below the present surface (Figures 2 and 3). Each differentiated archaeological feature or deposit (e.g. posthole,
posthole filling, pit, pit filling etc.) was given a unique context number. The results of the
evacuation were divided into a sequence of 8 structural periods, I - VIII. The following
description is given in reverse order of excavation, with the earliest structural period
described first.

2.1 Structural Period I

Above the natural soil, the earliest in situ evidence of human occupation in the immediate
location of Mound V's trenches I and II was represented by the deposition of a thick clay
layer. This context contained numerous flecks of charcoal as well as seven special finds,
including slag, an unidentified terracotta object, 37 sherds of Grey Ware (some of which
have a black slip) and three sherds of Painted Grey Ware (PGW). Whilst one of these was a
small sherd with a single stroke of black paint running across one edge (Figure 4), two other
sherds fit together and form a large section of the base of a grey ware tali-shaped vessel.
Although the exterior or base of the vessel was undecorated, the interior was treated with a
series of long angular strokes, some of which were double. It is interesting to note how this
angular decoration differs from the more angular style on the bases of PGW vessels from
Hastinapura (Lal 1955: 37 and 41). The presence of Painted Grey Ware sherds, Grey Ware
sherds and Grey Ware sherds with a black slip compares closely to the assemblages from
Period II of Kausambi 1957-59 (Sharma 1960: 58), Period I of Kausambi 1949-50 (Sharma
1969: 128) and Period II of Hastinapura (Lal 1955: 32). The calibrated measurement of a
charcoal sample from this deposit suggests an occupation date between the fifth century
and first half of the third century BCE. This measurement compares favourably with the
calibrated dates of a number of radiocarbon samples associated with PGW such as Period III
at Atranjikhera (Possehl 1994:12) and Period II at Hastinapura (ibid.: 42). This evidence
indicates that the associated cultural complex of Structural Period I belongs to the later end
of the early Iron Age traditions of the middle Ganga with a radiocarbon boundary of the fifth
century BCE.
2.2 Structural Period II

The features of Structural Period I were sealed, thus starting a repetitive sequence of what has been interpreted as the deposition of a clay palaeosurface, followed by the construction and subsequent destruction of a metal-working furnace or oven construction. The ceramics from structural period II included 30 sherds of Grey Ware, three sherds of grey ware vessels with bands of black paint along the edge of both sides of the rim and a sherd of a red slipped ware. Cord Impressed Ware (CIW) ceramics were also identified contexts within this early phasing of the sequence (Figure 5), which were also identified at Gotihawa (Verardi 2007) and in the earliest levels of the village mound at Lumbini (Strickland et al. in press a). Other special finds included grinding stones, slag, a fragment of a terracotta figurine, a clay sealing, a crucible and an unidentifiable iron object. Four radiocarbon samples were measured and gave calibrated dates of between the fourth and second century BCE. It is interesting to note that the earlier of the dates compare very favourably with those from Period III at Narhan, which also possesses similar cord impressed red wares (Singh 1994: 25-6). Another measurement, however, gave a much earlier date than surrounding contexts, indeed, calibrating to between either 760 and 690 BCE, or between 540 and 370 BCE, at 95% confidence. In view of the large quantities of grey ware within this context and its earlier date, it is thought likely that this context contains redeposited material from earlier contexts. Indirectly, it also suggests that there are some much earlier areas of occupation in the immediate vicinity of Mound V - which were then redeposited several centuries later. Indeed, such a hypothesis is supported by our recalibration of two earlier radiocarbon dates from Tilaurakot published by Possehl (1994: 116) and in Radiocarbon volume 11.

2.3 Structural Period III

There is relatively little information available concerning Structural Period III as it yielded few finds – none of which were diagnostic. Those finds included sherds of Grey Ware, an agate bangle, a damaged stone bead, a damaged terracotta bead and slag. No samples for radiocarbon measurements were available for this structural period.
2.4 Structural Period IV

The most complete structure encountered during the excavation was exposed during the excavation of the features of Structural Period IV. The structures of period III were sealed by clay floors with a timber superstructure, represented by postholes, erected - complete with adjacent fireplace, furnace and ring well (Figure 6). Special finds from this period included terracotta beads, terracotta bangles, clay sealings, a spindle whorl, a horn stylus (Figure 7), some residual sherds of very coarse grey ware, a copper alloy object, an iron object, glass fragments, an oil lamp, grinding stones, decorated sherds, slag and a single sherd of Northern Black Polished Ware (NBPW). Of these special finds, a number are fairly diagnostic such as a stamped red ware sherd which has similarities with stamped wheels, spokes and dots from early levels of Period III at Hastinapura, between the early sixth century and third centuries BCE (Lal 1955: 57). A single sherd of NBPW was recovered but layers across India with such sherds have variously produced radiocarbon dates stretching from eighth century BCE to the first century CE (Possehl 1994). A radiocarbon sample from levelling debris produced a date of between the first and second century BCE - a date range that would agree with the later part of Erdosy's late NBP dates (1995: 105).

2.5 Structural Period V

Structural Period V was, like Structural Period III, a single structural episode. An old land surface was deposited and a deep pit cut into it, which was then subsequently filled. Despite being limited in terms of activities, the contexts of Structural Period V yielded a total of 23 special finds, including terracotta beads, iron objects, a rounded sherd, a terracotta animal, a glass bead, a copper object and decorated sherds. These included a red ware sherd with a black linear painted decoration on its exterior, a type found in the levels of Mitra's Period I (1972: 22) and sherds with triangular notches incised below circular rings around the neck of the vessel, also identified by Mitra (1972, 22). Better dated analogies may also be found from the excavations at Hastinapura where Lal identified decorated...
sherds within Period IV dated to between the early second century BCE and the late third century CE (Lal 1955: 12A). A single radiocarbon sample from the fill of a pit in this period provided a date of between the first century BCE and the second century CE and corresponds to Lal's broad dating range.

2.6 Structural Period VI

Structural period VI contains the final distinct structural activities on Mound V and has been divided into three sub-phases, A, B and C. Whilst the first two relate to the initial construction of a brick structure and its subsequent remodelling, the final phase represents the digging of postholes into its brick pavement (Figure 8). Special finds included slag, terracotta beads, rounded sherds, a grinding stone and decorated sherds and a stamped sherd appears to be very similar to the stamped varieties from Hastinapura Period IV (Lal 1955: 63) - suggesting that there is continuity through the upper part of the sequence at Mound V. Two radiocarbon samples from Structural Period VI were measured, one from the foundations of the original brick structure and the other from the fill of a posthole cut into the raised brick pavement - providing a date range of between the first century BCE and the third century CE.

2.7 Structural Period VII

The composite brick and post structure of Structural Period VI was abandoned and a thin sandy clay humus built up above it. This thin humus contained 18 special finds including slag, a grinding stone, glass, stone and terracotta beads. The most diagnostic artefact recovered was a small handmade female terracotta head which is stylistically similar to examples identified as Kushan by Rijal (1979: 46). As it was recovered from a position directly on the brick pavement, it is probable that we may assign the abandonment of Mound V to the Kushan period.
2.8 Period VIII

The final period of activity consists of the twentieth century archaeological activities of the Department of Archaeology, Government of Nepal. B.K. Rijal cut a trench into Mound V during his excavation seasons of 1974 and 1975. The eroded edges of his trench were clearly visible within our own trench and we even recovered one of his trench pegs (Sf 90), which was in an extremely well-preserved state. From a mixed deposit, a sherd of Grey Ware was also recovered, originating from the base of the sequence. The sherd belongs to a well-levigated tali-shaped vessel with a diameter of 14 centimetres, has band of black paint along the edge of both sides of the rim and is similar to those published by Mitra (1972: 23).

3. Metal-work analysis

In addition to excavations, specimens of metal-working debris were submitted to the Ancient metallurgy Research Group, Department of Archaeological Sciences, Bradford University, UK, for identification. The slags were visually examined and the classification was solely based on morphology where diagnostic slags and non-diagnostic residues were identified. Some samples were also subjected to X-ray Fluorescence (XRF) analysis. Diagnostic slags can be attributed to a particular industrial process; these comprise the iron-working slags, i.e. smelting or smithing slags, and non-ferrous working debris. The second group, the non-diagnostic residues, could have been generated by a number of different processes but show no diagnostic characteristic that can identify the process. In many cases, the non-diagnostic residues e.g. hearth or furnace lining, may be ascribed to a particular process through archaeological association. Residues from non-ferrous metal-working was also examined and analysed.

3.1 Iron-Working Residues
It is generally assumed that iron-working slag recovered from an excavation is smithing slag unless proved otherwise but some forms of smelting slag are difficult to distinguish from smithing slag. However, despite this problem no iron smelting slag was identified at TLK99 and therefore, there were two types of iron-working slag identified in the Tilaurakot assemblage:

**Smithing Slag (Slag)** - randomly shaped pieces of silicate slag generated by the smithing process. These slag pieces are not typical of other iron smithing slags, and require further study to confirm their identification.

**Hammer Scale (HS)** - Spheroidal droplets of slag or iron scale (i.e. oxidised iron) formed during the smithing process. Indicative of fire welding, i.e. welding two pieces of iron (or e.g. steel) together.

There were also two types of non-diagnostic residues present:

**Hearth Lining (HL)** - the vitrified clay lining of a hearth or furnace. It is normally formed in the tuyere, air-inlet, zone.

**Cinder (CIN)** - a high silica slag that can either be formed by high temperature reaction between silica and ferruginous material. It can be ascribed to either the non-diagnostic slags or the diagnostic slags depending on its iron content and morphology.

3.2 Other Residues
A single crucible fragment from Tilaurakot indicated that copper alloys were melted, presumably to cast objects but there is no evidence for the smelting of these metals. Secondary copper (alloy) working requires a hearth with bellows to melt the alloys, the melting point depends on the alloy composition, but is of the order of 900-1000°C. The unmelted metal or alloy was placed in a crucible, probably sealed with charcoal to stop oxidation of the metal, heated until melted and then poured into a mould. Crucible fragments can survive but moulds are temporary artefacts, made of sand or poorly fired clay and therefore do not normally survive well in the archaeological record. Thus, there is often very little evidence for the type of artefact being produced.

3.3 Summary

A preliminary examination of the Tilaurakot metal-working debris assemblage indicates that iron smithing and copper alloy-working had been practised on the site. The material classified as smithing slag only occurs as small fragments, and has uncharacteristic vitrified surfaces. The material identified as non-diagnostic cinder, represents the largest proportion of materials by mass and count. It cannot be associated with any particular industrial activity and may sometimes be considered to be an ‘accidental’ product of pyrotechnology, or accidental high temperature fires. Some of this material was examined by XRF to assess the presence of non-ferrous metals but nothing significant was detected. The only definite evidence for non-ferrous working, the crucible fragment, was also analysed by XRF and copper was detected as the major non-ferrous element and a small amount of tin was detected. This probably suggests the casting of low tin bronzes. In conclusion the quantity of material is small, possibly indicating that this material represents a background scatter of metal-working debris deriving from metal-working activities occurring elsewhere on the site and not in the areas excavated. The metal-working within the fortified area of Tilaurakot is in stark contrast to that without, where at the southern industrial mound a high density of metal-working activity occurred, including the presence of possible smelting furnaces (Strickland et al. in press b).
4. Conclusion

To summarise, we may identify the following characteristics of the sequence excavated in the vicinity of Mound V at the site of Tilaurakot. Firstly, we may suggest that although the in situ occupation at Trenches I and II dates to the early fifth century BCE, there is redeposited evidence from Structural Period II, which suggests an earlier occupation comfortably into the first half of the first millennium BCE. This is supported by the sequence at the southern industrial mound, where we find evidence of cultural activity before the sixth century BCE creation of a low artificial mound. The cultural characteristics of the earliest in situ occupation in the Mound V sequence includes a number of fine, well-levigated well-fired Grey Ware sherds, some of which are decorated with black paint. It is important to note that these sherds all have thin section walls and are fine; thus being quite different to the coarse grey wares reported from layers usually associated with NBPW such as at Hastinapura Period III. Indeed, the decoration on the two joining sherds is different from those PGW sherds described by Mitra as being "indifferently-painted" (1972: 23). It is clear that Mitra’s statements that "the possibility of finding classic examples of Painted Grey Ware or of isolating its pre-N.B.P. phase elsewhere, if not on the site, cannot be entirely ruled out" (ibid.) has now been met with such a clear example. Although the Tilaurakot decoration is far from Hastinapura's concentric ring decorations (Lal 1955: 41), it does have parallels with Atranjikhera's sets of parallel lines converging and intersecting on bases (Gaur 1983: Figure 42).

The other cultural characteristics shared with Hastinapura's Period II, the PGW levels, include the absence of burnt brick but the presence of copper and iron-working slag and sherds of black-slipped grey wares (Lal 1955: 12A). As also mentioned above, the range of radiocarbon measurements between the early fifth century and the fourth century BCE conform favourably with other measurements for levels associated with PGW from Atranjikhera Period III and Hastinapura Period II (Possehl 1994: 12 and 42). Around the same time, fourth to third centuries BCE, iron-smelting activity to the south of the ancient city intensified, with greater quantities of slag being dumped, and the further raising of the surface level of the mound. It may thus be stated that we have in situ evidence for
occupation at Mound V by the fifth century BCE, and even earlier in the light of the re-calibrated radiocarbon date from TLK VI with dates of c. 550 BCE and the beginning of the first millennium BCE. As a result, we may firmly refute Mitra’s statement that occupation at the site "is certainly not earlier than the third century BCE and is most probably not later than the second century BCE." (1972: 18).

Occupation in the vicinity of the trench continued without the flood and conflagration noted at Hastinapura by Lal (1955, 12A), providing clear artefactual continuity into our second structural period. Affinities between the Cord Impressed Wares from Tilaurakot, Gotihawa and Narhan have already been made, which again support the radiocarbon dating for the sequence. The next significant cultural characteristic noted are the terracotta ring wells dug into Structural Period III and IV. Classed by Allchin as "typically Gangetic" (1995: 131), they are commonly associated with Northern Black Polished ware and copper coins (ibid.: 136) and form one of the key features of Hastinapura's Period III (Lal 1955: 12A). Structural periods V, VI and VII are typified by the presence of stamp-impressed ceramics, the use of fired bricks, a terracotta wheel and a Kushan-style terracotta head. All these cultural objects are key features of Period IV at Hastinapura which was dated by Lal to between the early second century BCE and the late third century CE (ibid.).

This range compares well with those from the trench itself, which ranges between the first century BCE and the third century CE. This date for the abandonment of the site also compares well with the date of the third century CE proposed by Mitra (1972: 15). It should also be noted, however, that a further re-calibrated radiocarbon date from earlier excavations at the site has provided a date of between 780 and 1220 CE at 95% confidence, suggesting an intermittent survival of occupation into the medieval period. It is notable that the younger element of this date range is almost contemporary with the pilgrimage of King Ripu Mala of western Nepal, who left an inscription in Tilaurakot's vicinity at Niglihawa and another at Lumbini itself demonstrating an understanding of the Buddhist sanctity of the area in the fourteenth century CE.
In conclusion, it may be stated that the excavations at Mound V at Tilaurakot have refuted Mitra’s statement that there was no occupation earlier than the second or third century BCE. Direct evidence from TLK99 attests occupation of the early fifth century BCE and the indirect evidence indicates a date as early as the sixth or even eighth century BCE. Furthermore, the re-calibrated dates from earlier excavations at the site have provided additional support with one date of c. 550 cal BCE and another of the beginning of the first millennium BCE. This is further supported by early dates of the sixth and fifth centuries BCE for the two phases of wooden palisade and early occupation sequences at the northern rampart of Tilaurakot, excavated in 2013 and 2014 (Davis et al. in press) as well as the presence of levels at the base of Mound I with dates of the seventh century BCE from our excavations in 2015.

In addition to the chronological evidence, the artefactual record from this area of Tilaurakot is of further interest in discussions of the urban morphology of the city. Whilst earlier geophysical survey at the site had suggested the presence of cardinally-orientated streets across the city (Schmidt et al. 2011), later geophysical survey conducted between 2013 and 2016 has confirmed this patterning, with the further identification of a large walled complex at the centre of the site (Coningham et al. 2015). Unbeknown at the time of excavations in 1999, the TLK99 trenches are located within the south-west corner of this large monumental compound. Whilst the evidence from these excavations highlights Tilaurakot’s cultural affinity with sites within the Gangetic plain and Early Historic world, it is also of note the quality and character of some of the artefacts recovered during these excavations. For instance, the discovery of a stylus of antler may suggest the potential for administrative functions in this central area of the site and further excavations are required within this part of the site to further elucidate the nature of human activity, from its earliest occupation through to the later phases of the site.
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6. References


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7. Figures

Figure 1: Location of Trenches I and II, TLK99.
Figure 2: Working shot of the excavations at Trench TLK99
Figure 3: South facing section of TLK99 Trenches I and II.

Figure 4: SF185 Painted Grey Ware from Context 69
Figure 5: SF277 Cord Impressed Ware from context 60
Figure 6: Postholes cut into occupation surfaces in Structural Period IV
Figure 7: SF100 polished antler stylus from context 25.

Figure 8: Postholes cut into paving in upper surfaces of TLK99