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Mapping 'Flemish' settlements in South Wales: electromagnetic induction (EMI) survey at the villages of Wiston (Pembrokeshire) and Whitson (Monmouthshire)

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Around 1112, a Fleming called Wizo settled in Wiston, a village in mid-Pembrokeshire. Together with other Flemings, he is believed to have influenced the morphology of settlements in South Wales. An in-depth morphological and metrical comparison with similar settlements in the medieval County of Flanders has not yet been attempted however. In order to allow such a study, a large-scale frequency domain multi-receiver EMI survey has been conducted in Wiston (Pembrokeshire) and Whitson (Monmouthshire), mapping former field-boundaries. This paper presents the results of the geophysical survey and first interpretation of the data in order to reconstruct these settlements' morphologies.

INTRODUCTION

> *Hunc locum [qui Dungledin uocatur] a tempore Henrici regis ex ipsius dono Flandrenses incolunt, horum princeps quidam nominee Wizo fuit, qui primus ad predictum locum possidendum de Flandria ueniens, transitum per Wigornam fecit.*
>
> This place, which is called Dungledin, is inhabited by the Flemings since the time of King Henry's gift. The chief of these was a certain man called Wizo, who passed through Worcester on his way to the same place, coming from Flanders. (Darlington 1968, 134)

In this letter to the archbishop of Canterbury, Gilbert earl of Pembroke described how a Fleming called Wizo passed through Worcester on his travels from Flanders to Wales.[1] Wizo is thereby described as a *princeps*, on his way to take possession of his lands in Dungleddy, a lordship in south-west Wales (Darlington 1968, 134; Toorians 1990, 99–100). Although the letter is dated between 1139 and 1148, Toorians (1990, 100) places Wizo's arrival before 1112, shortly after the forced migration of Flemings to South West Wales by King Henry I (Jones 1952, 27–8; Mynors *et al.* 1998, 727; Arnold 2012, 245). Together with other Flemings, Wizo is considered as one of the *locatores* who were responsible for both planting new settlements and attracting colonists (Kissock 1990, 59; Rowlands 1981, 148; Toorians 1990, 111). In this context, the village of Wiston has received much attention as one of the newly planted settlements, supposedly with a planned row morphology, in central and southern Pembrokeshire where Kissock notes Templeton, Angle and Letterston as particularly clear instances (Beresford 1967, 570; Kissock 1990; 1997; Lilley 1995, 80–4; Murphy 1997; Roberts 1987, 199–200; Soulsby 1983, 269; Weeks 2002, 27–8). A highly similar morphology can be attested in the village of Whitson on the Gwent Levels in Monmouthshire. For this specific settlement, Rippon (1996, 86; 2000b, 215–19; 2008, 220–1) has suggested strong comparisons with reclamation settlements in the Low Countries, such as Assendelft

(Besteman and Guiran 1987) and the Cope reclamations on the Holland-Utrecht plain (van der Linden 1982). Historical and landscape archaeological research for the medieval county of Flanders, however, has shown how this settlement morphology would have been equally important in the context of intensified landscape reclamations during the high medieval period (Verbrugghe 2019; Verbrugghe *et al.* in press; Verhulst 1991; 1995).

As argued by Kissock (1990; 1997) and Roberts (1987, 199–200), a Flemish influence in these settlement morphologies can offer one explanation for the appearance and origin of nucleated rural settlements in South West Wales. Until recently and in contrast to Pembrokeshire, however, no clear Flemish presence had been attested in Whitson. An interesting link between Wiston and Whitson was nonetheless presented by Crouch, who pointed out that both settlements would have been held by Ralph Bloet/Bluet (III, died 1198×99), steward of Chepstow Castle in the late twelfth century (Crouch 1990, 198–9; Rippon 2008, 221). Recent historical and place name research by Coplestone-Crow (forthcoming), however, strongly suggests a Flemish origin for Whitson. He states that Whitson is derived from *Widonis*, which is the Latin form of the Old French name *Wido*, *Guido* or *Guy*. The English *Wideston* or Whitson would therefore mean 'the vill of Guy'. Coplestone-Crow (forthcoming) considers it to be related to a Guy fitzTice, who came to Wales in the early twelfth century, and whose grandfather had come to England with Eustace, Count of Boulogne.

Archaeological, geophysical and historical-geographical research on both Wiston (Lilley 1995, 80–4; Murphy 1995, 97–9) and Whitson (Rippon 1996, 84) has offered several theses regarding their morphology. To date, however, their former layout is still unclear, not allowing a comparative study to similar Flemish contexts, let alone to confirm their assumed planned row settlement morphology. Through a large-scale frequency-domain multi-receiver electromagnetic induction (EMI) survey, supported by lidar data, this research therefore aims to map former field-systems in and around the modern-day settlements of Wiston and Whitson, thus furthering the research on the village morphology and allowing comparison of their morphology with similar row settlements in the former County of Flanders.

MORPHOLOGICAL HYPOTHESES

Wiston

The village of Wiston is located on top of an east–west running ridge to the north-east of Haverfordwest in Pembrokeshire. The ridge's steep south flank runs into Fenton Brook. The first mention of a settlement at Wiston dates to 1220, when the destruction of the town and Wizo's castle is described in the *Brut Y Tywysogion* (Murphy 1997, 145): 'And thereupon he [Llywelyn prince of Gwynedd] destroyed Wizo's Castle and he burned the town' (Jones 1952, 97).

Today, the village consists of several larger farms, St Mary's Church and modern housing developments. The ruins of a motte and bailey castle, one of the finest examples of its kind in Wales, dominates the settlement landscape (Murphy 1995, 71; Turner 1996). Several archaeological investigations and watching briefs have been undertaken in and around the village (Fig. 1), which have been described by Murphy (1995) for the period until 1995.

More recently, major geophysical and archaeological interventions took place in the context of the South Wales Gas Pipeline Project in 2006 and 2007 (Hart 2013; 2014; Hart and Busby 2014; Leonard 2013), at the site of a Roman fort to the north-east of the village centre in 2012–14 (Meek 2017) as well as aerial surveys by the RCAHMW which identified an Iron Age defended enclosure at Conkland Hill in 2013.[2] Features of this enclosure were excavated during the 2006 and 2007 investigations. Although most ditches were undated by finds, radiocarbon dating indicated late Iron Age or Roman-period activity.

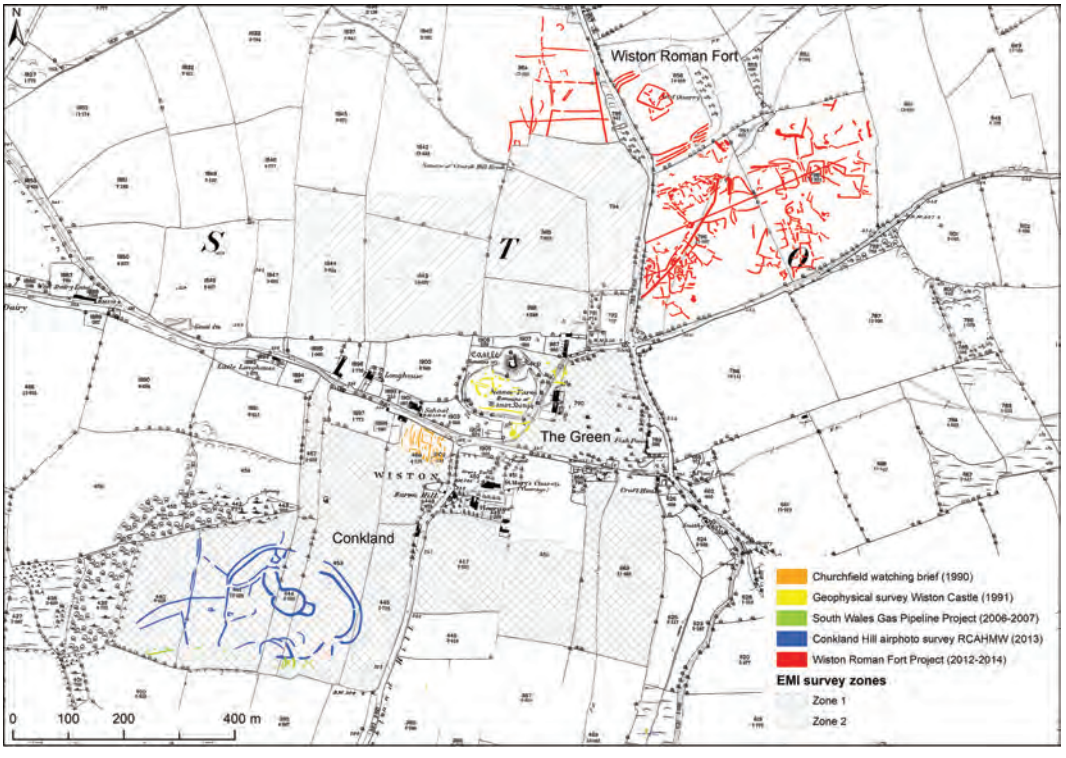

Fig. 1. Overview of previous archaeological research in Wiston (Pembs.) with indication of electromagnetic induction (EMI) survey zones.

Moreover, limited Early Bronze Age activity as well as a possible early medieval sunken-floored building, metal-working and crop-processing were attested, with several seventh- to eleventh-century AD radiocarbon dates (Hart 2014). Of principal interest for the study of the medieval settlement morphology are, however, the archaeological excavation in Church Field (1990), the geophysical survey within the bailey of the castle (1991) and an earthwork survey of The Green (1995). The investigations at Church Field were initially prompted by a planning application, with geophysical prospection offering indications of parcellation. A follow-up through trial excavation revealed features of ditches, pits and buildings, and suggestions of a regular division into plots (Murphy 1995, 83–5 and 98). The 1991 geophysical survey on the motte and bailey castle, executed by Geophysical Surveys of Bradford, did not however offer clear indications of a regular division into plots. Multiple circular and irregular anomalies were attested in three zones in and around the castle, but their character is unclear (Ovenden 1991).

Based on his own earthwork survey in the village and on The Green, Murphy (1995, 97–8) identified several building platforms indicating former house plots along the road. He ascribes a formal layout to the original borough after a possible initial phase of location within the castle bailey. By the thirteenth century it would have extended around the exterior of the castle, following a planned morphology of burgage plots along the roads (Fig. 2). The lack of later and post medieval archaeological material as well as documentary records suggests the abandonment of burgage plots and the decline of the borough by the end of the fourteenth century, although its borough status was retained well into the nineteenth century despite a strong rural and scarcely populated character (Beresford 1967, 570; Murphy 1995; Soulsby

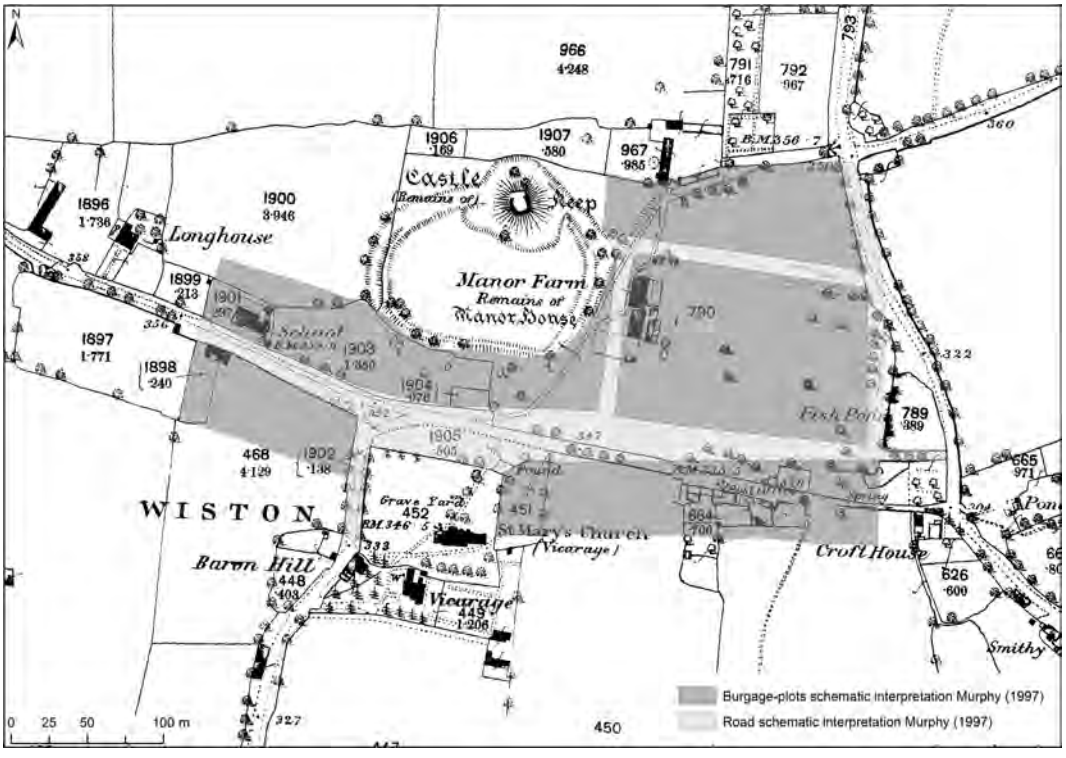

Fig. 2. Schematic interpretation of settlement morphology in Wiston (Pembs.) following Murphy (1995, 98) on the first edition OS map.

1983, 269; Weeks 2002, 27–8). Murphy (1995, 98) supports his hypothesis by referring to the 1577 purchase of twelve burgage plots in the village by John Wogan, who is considered to have consolidated them in order to create a garden on The Green next to Manor House. Lilley (1995, 80–4), on the other hand, has another vision on Wiston's morphology, based on his research on Norman town morphologies. He envisages a north–south orientation of burgage plots to the south of the church and castle between existent Conkland Hill road and a footpath, which would have been part of the road system (Fig. 3).

Whitson

The village of Whitson is located on the Caldicot Levels along the Severn estuary in Monmouthshire. This embanked area of former coastal marshland and mudflats forms the eastern part of the Gwent Levels on either side of the river Usk (Allen 2000; 2001; Allen and Fulford 1986). As part of the Cadw-funded 'Gwent Levels Historic Landscape Study', Rippon (1996, 84–7) studied the historic settlement landscape of Whitson and thereby highlighted the distinctively planned row morphology of the village. Offering a model for its development, using the Ordnance Survey (OS) first edition 6-inch maps of 1881–82, he describes the settlement landscape as: 'consisting of a block of very long narrow fields, running perpendicular to a funnel-shaped common. Though longitudinally these strips extend for some 1km, they are divided laterally by three boundaries, at least one of which was formerly a lane' (Rippon 1996, 84).

Before its medieval reclamations, the Caldicot Levels would have been characterised by coastal saltmarshes, tidal creeks and estuarine alluvial deposits (Bell 1994; Locock 1998; Locock and Walker

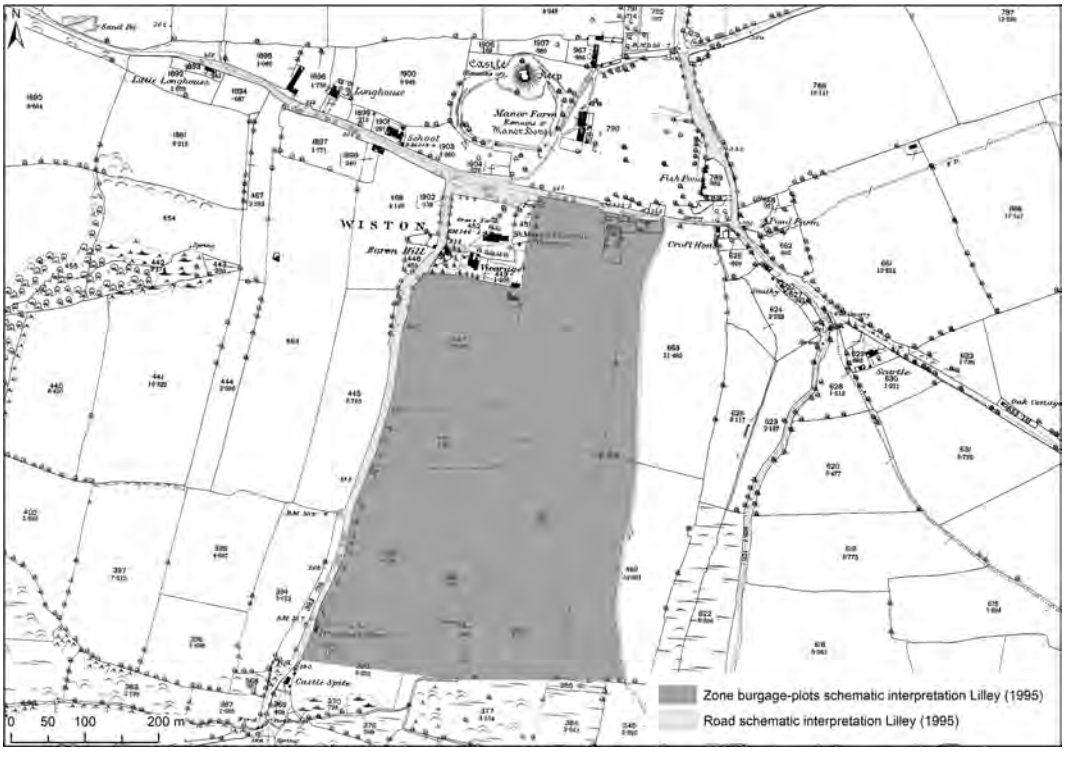

Fig. 3. Schematic interpretation of settlement morphology in Wiston (Pembs.) following Lilley (1995, 80–2) on the first edition OS map.

1998). The modern-day landscape, however, finds its origin in the reclamation and embankment from the early medieval period onwards (Kissock 2008; Rippon 2008, 213). Given that the history of these reclamations has been elaborated on elsewhere by Rippon (1996; 2000a; 2008), our focus lies on the context of the planned landscape of Whitson. Generally, the earliest structural interventions in the coastal landscape would have been oval-shaped enclosures to protect small infields, possibly as local and individual initiatives (Rippon 2000a, 153). The origins of the first extensive sea wall at the Caldicot Levels, however, are unclear. Rippon (1996, 81; 2000a, 153) dates it to the early twelfth century since a 1113 foundation grant of Goldcliff Priory refers to a church and chapel on the levels. He considers it to be unlikely that such buildings would be constructed on an intertidal saltmarsh. The first part of the Caldicot Levels to have been subsequently reclaimed would have been the higher grounds along the estuary and to the west of Monksditch. In a sixteenth-century copy of a thirteenth-century deed, this watercourse is mentioned in the context of Goldcliff Priory, suggesting that it was embanked by the monks in order to avoid flooding of their lands at Goldcliff (Rippon 1996, 69–71). Settlement would have expanded around the already existing infields, forming focal points for settlement interlinked by a network of streets and droveways. The latter also linked the common pasture lands in the backfen with the settlements on the higher lands along the estuary (Rippon 2000a, 153–5). An exception to this was the land around the hamlet of Porton, to the south of Whitson. Based on its regular landscape, Rippon's model (1996, 66 and 83) links the embankment in this area to the first stages of the further reclamation of the backfen. The oldest mention of Porton dates to 1245, when its church was granted to Goldcliff

Priory by William de Burgh, bishop of Llandaff (Bradney 1932, 275). There is uncertainty about the location of this church. Local folklore speaks of it as being submerged, for which no archaeological indications can be found. Another thesis is that Whitson church used to be part of Porton. This leaves the discussion of where the church of Whitson would then have been (Bradney 1932, 275; Rippon 1996, 83). The sequence of reclamation between Porton and Whitson is unclear. Both settlements are located on the edge of the backfen, though, and can be considered as first initiatives to reclaim these low-lying fenlands. Rippon (1996, 84) recognises at least four phases in the development of the settlement at Whitson. Initial habitation would have been located on the higher grounds along the eastern edge of the funnel shaped common, which can be considered as one of the above mentioned droveways. Perpendicular to the common, narrow plots extended into the low lying backfen ending at a back lane, which is preserved in today's landscape as two perpendicular narrow ditches. The narrow plots would have been extended eastwards in consecutive phases, eventually reaching the modern-day extent (Fig. 4).

Two recent projects have induced more archaeological research on Whitson: the planning of a new M4 motorway and the planning of the Gwent Farmers' Community Solar Scheme (Beddoe 2018; Cooke 2010; Wessex Archaeology 2011). Using lidar in 2007–08, Cooke (2010) was able to locate multiple creeks and 52 ditched sites on the Gwent Levels, five of which lie in the constraints of the village of Whitson. His research offered the first indications of the huge potential of the application of lidar data on the levels. However, little attention was given to former field boundaries related to the layout of Whitson. Eight years later, in 2016, in the context of a planning application for a large solar farm, partly located in Whitson, Stratascan conducted a magnetometry survey but this showed no archaeological anomalies. Mainly modern and physical features could be detected, added with the grip system on the levels (Davies 2016). These grips constitute a rectangular network of small and shallow open ditches for carrying of water into the field ditches.[3] Neither study added to Rippon's interpretations.

SURVEY AREA AND METHODOLOGY

The morphological hypotheses presented by Murphy (1995), Lilley (1995) and Rippon (1996) for Wiston and Whitson, offer both solutions and further questions. In Wiston, the two models are contradictory, and the village's modern-day topography does not yield further insights. Given this unclear morphology, the fields surrounding the village were selected for further survey in order to locate former field-boundaries (Fig. 5). The intention was to reconstruct the settlement's former morphology, assumed to be that of a planned row settlement, and compare its morphological and metrical characteristics to similar row settlements in the County of Flanders.

In Whitson, however, the survey area has been based on two considerations that can be added to Rippon's 1996 model. First, to the north of Crab Tree Reen (Figs 4 and 6) the OS map does not show long narrow plots, but rather large blocks (zone 1 on Fig. 6). It therefore can be questioned whether this area was part of the original reclamation settlement. Second, to the south of the village in Rippon's model and in the extension of Half Acre Lane, the third suggested extension phase of the narrow plots does not seem to have taken place (zone 2 on Fig. 6). Instead, the lane and reen (drainage channel) avoid a square plot of land and shift to the north, suggesting the presence of a feature that did not allow the straight continuation of the system. In order to clarify these two observations, these two zones were selected for further survey (Fig. 6).

The methodological approach of this research considers two datasets. The main aspect is a large-scale frequency domain multi-receiver EMI survey, which extends over 45 hectare in Wiston and 20 hectare in Whitson. A DUALEM-421S soil sensor was used, allowing both the apparent electrical conductivity

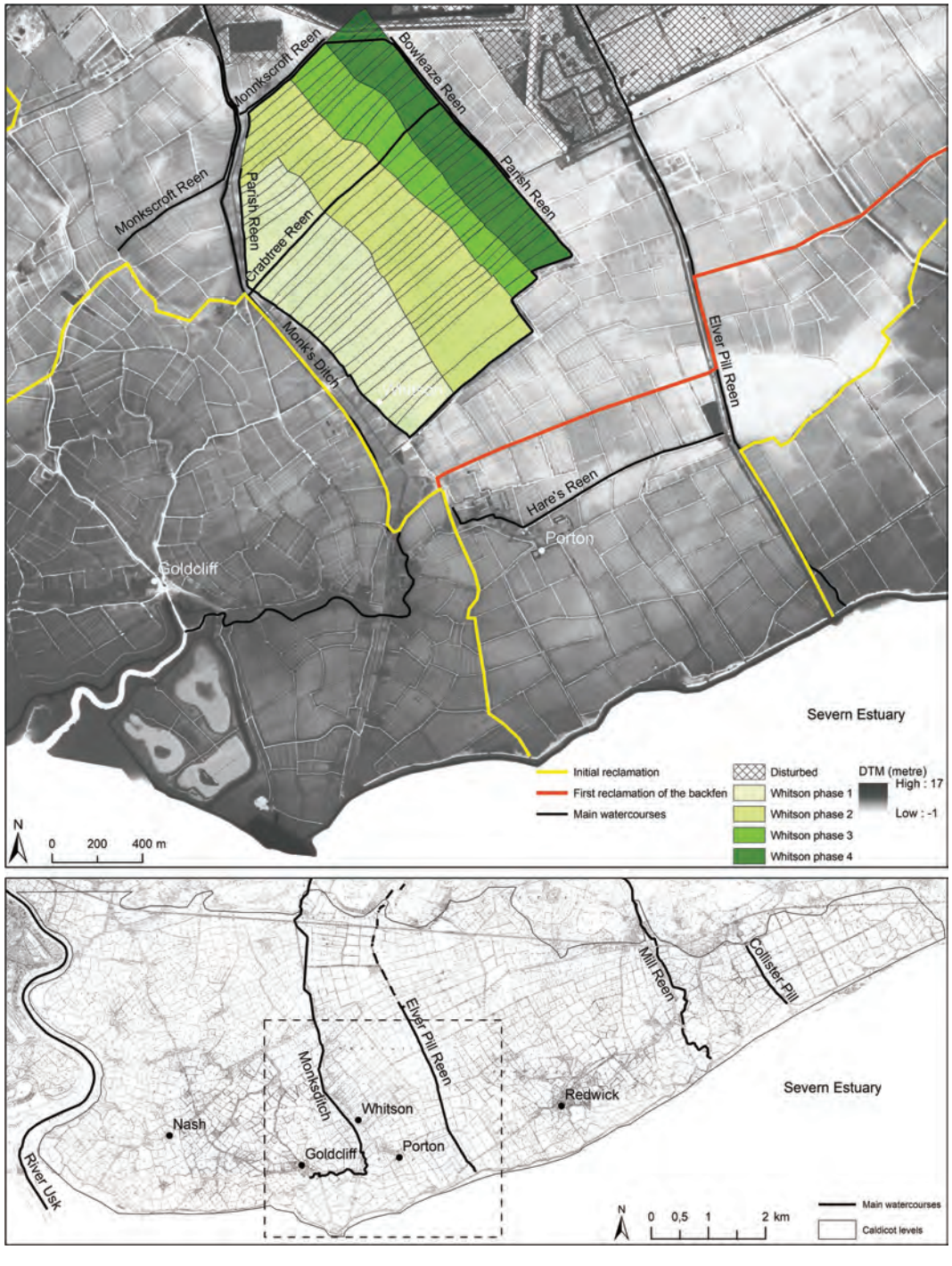

Fig. 4. Schematic interpretation of the reclamation phases of Whitson (Mons.) following Rippon (1996, 84).

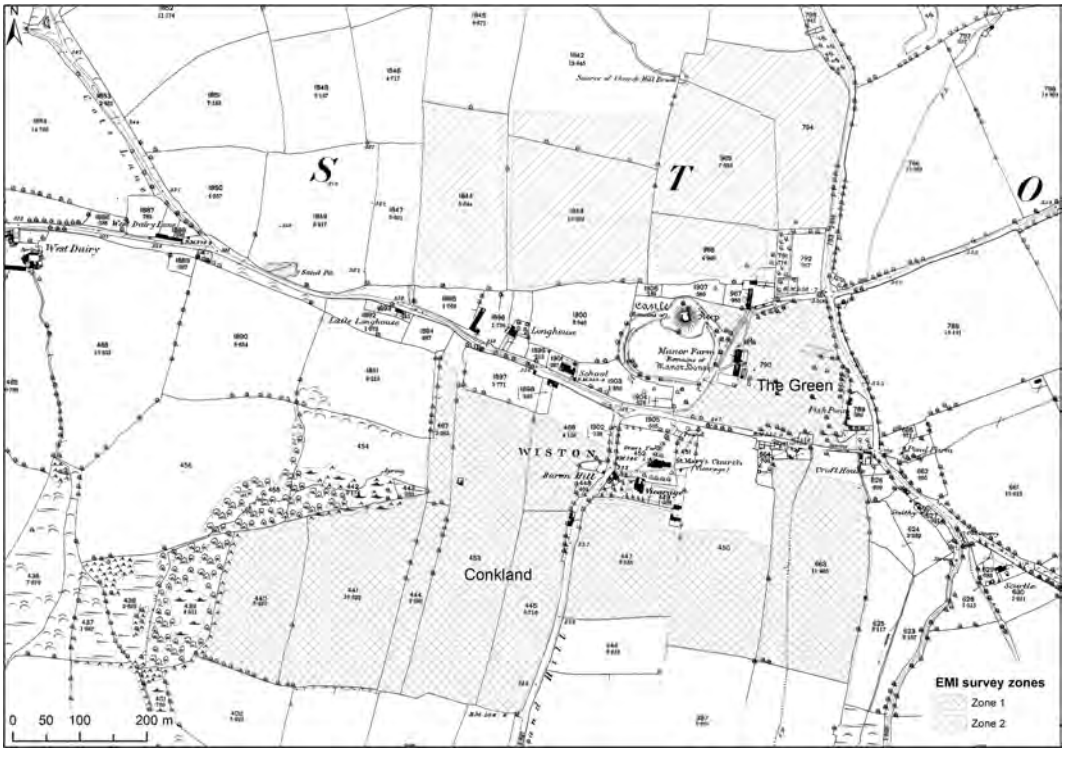

Fig. 5. Electromagnetic induction (EMI) survey zones in Wiston (Pembs.).

(ECa) and apparent magnetic susceptibility (MSa) of the bulk soil to be obtained (Everett and Weiss 2002; Tabbagh 1986). The sensor was pulled at a height of 0.12m above the ground surface behind an all-terrain vehicle at a speed of about 6–10 kilometres per hour, crossing the field at parallel lines 1.0m apart, with measurement intervals at 0.2m within lines. The vehicle track was georeferenced by a Trimble RTK-GPS with an accuracy of approximately 1–2cm. All measurements were corrected for the offset between the GPS antenna and the instrument (centre between transmitter and receiver coils) and corrected for measurement drift (Delefortrie *et al*. 2014).

The DUALEM-421S instrument consists of one transmitter coil and six receiver coils, located at distances of 1.0, 1.1, 2.0, 2.1, 4.0 and 4.1m from the transmitter coil. The 1.0m, 2.0m and 4.0m transmitter-receiver pairs form a vertical dipole mode (1HCP, 2HCP and 4 HCP), while the 1.1m, 2.1m and 4.1m pairs form a perpendicular dipole mode (1PRP, 2PRP and 4PRP). Both the distance between transmitter and receiver coils and the orientation of the receiver coil compared to the transmitter coil determine the depth and weighting response pattern of the signal. The PRP configurations have a higher sensitivity at shallow depths, while HCP pairs have a higher sensitivity in deeper soil layers. Consequently, depth of exploration (DOE or the depth at the 70% cumulative response) values are 0.5m, 1.0m, 2.0m, 1.6m, 3.2m and 6.4m for the 1PRP, 2PRP, 4PRP, 1HCP, 2HCP and 4HCP coil configurations, respectively (Saey *et al*. 2013; Verbrugghe *et al*. 2020).

This survey was supported by 2m resolution lidar data for Wiston and 1m resolution lidar data for Whitson. This difference is caused by the highly variable availability of high resolution lidar data in

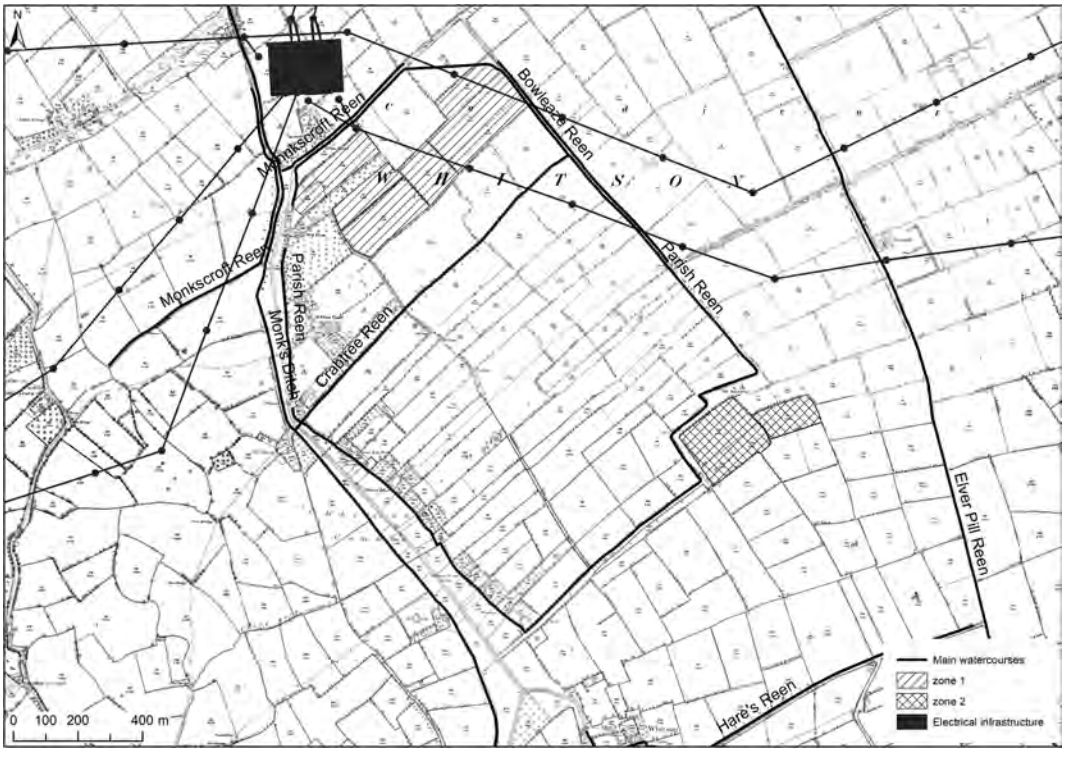

Fig. 6. Electromagnetic induction (EMI) survey zones in Whitson (Mons.).

Wales, both in geographical dispersal and resolution. Natural Resources Wales offers data covering 70% of Wales, ranging from 25cm to 2m resolutions,[4] the lowest resolution only being available for areas prone to flooding. Given that Whitson is located along the Severn Estuary, a higher resolution is available than for Wiston, which is located on an inland hilltop.

RESULTS

The results of the EMI survey in both Wiston and Whitson are presented as greyscale images. Zones with high electrical conductivity or magnetic susceptibility are thereby visualised in black, while zones with lower values are shown as shades of grey running to white (lowest electrical conductivity or magnetic susceptibility). The first edition OS maps for Wiston and Whitson (1880s), the oldest available maps for the whole settlements and their surrounding landscapes as complete coverage by sheet areas rather than parish boundaries, are used as base maps to visualise the interpretations of the survey data. In contrast to the available maps dating to the early nineteenth century, their coverage by sheet areas allow a continuous visualisation in GIS without fitting together georeferenced maps of individual parishes. Nevertheless, it should be noted that the slightly older Tithe maps (1844 for Wiston and 1845 for Whitson) and the 1830 Commissioners of Sewers map for Whitson were both used for the interpretation of the EMI survey data.[5]

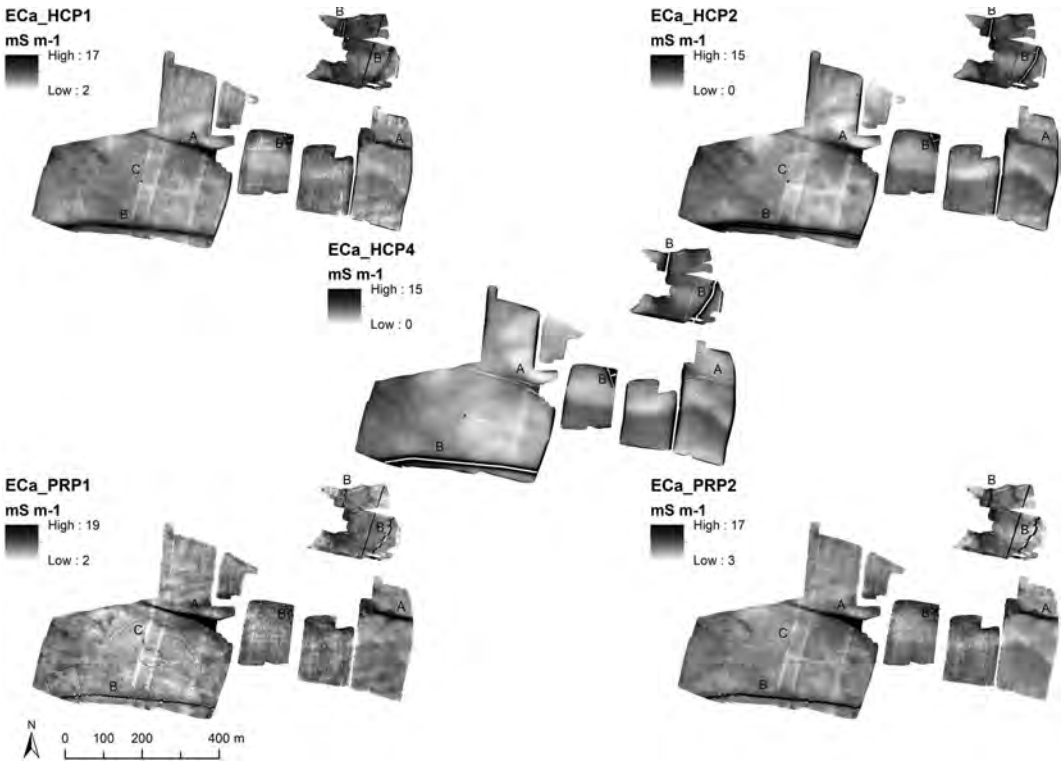

Fig. 7. Apparent electrical conductivity (ECa) data plots for survey zone 1 in Wiston (Pembs.). A = wet depression, B = modern infrastructure, C = micro-topographic field-boundaries

Wiston

The different ECa plots for Wiston indicate limited variation in the overall electrical conductivity of the soils. Two soil types occur in and around the village.[6] The core is build up from freely draining slightly acid loamy soils, while slowly permeable seasonally wet acid loam and clayey soils cover the surrounding fields. The zones with a strikingly high electrical conductivity correspond to wet depressions in the landscape (A on Figs 7 and 8) and modern infrastructure, such as a gas pipeline and water drain (B on Figs 7 and 8). These infrastructure related features are also clearly visible on the different MSa plots (B on Figs 9 and 10). Several linear traces that are characterised by a low electrical conductivity and a high magnetic susceptibility can all be attested in the micro-topography on the lidar 2m DTM as slight elevations (C on Figs 7 to 10). Most of the anomalies on the ECa and MSa data plots can be found in survey zone 1, to the south of the modern-day village (Fig. 11). The most noticeable of these corresponds with the Iron Age defended enclosure that was attested via oblique aerial photography on Conkland Hill[7] and excavation in the context of the South Wales Gas Pipeline Project (Hart 2014; Leonard 2013). The ditches related to this structure are most clearly visible through the shallow ECa-PRP1 (depth of 0.5m) and MSa-HCP2 (depth of 0.8m) configurations, while only faint on the MSa-HCP1 (depth of 0.4m), ECa-PRP2 (depth of 1m) and deeper configurations (Figs 6 and 8). This indicates that these features are shallow but mainly located underneath the plough soil. To the north and east of this structure, multiple

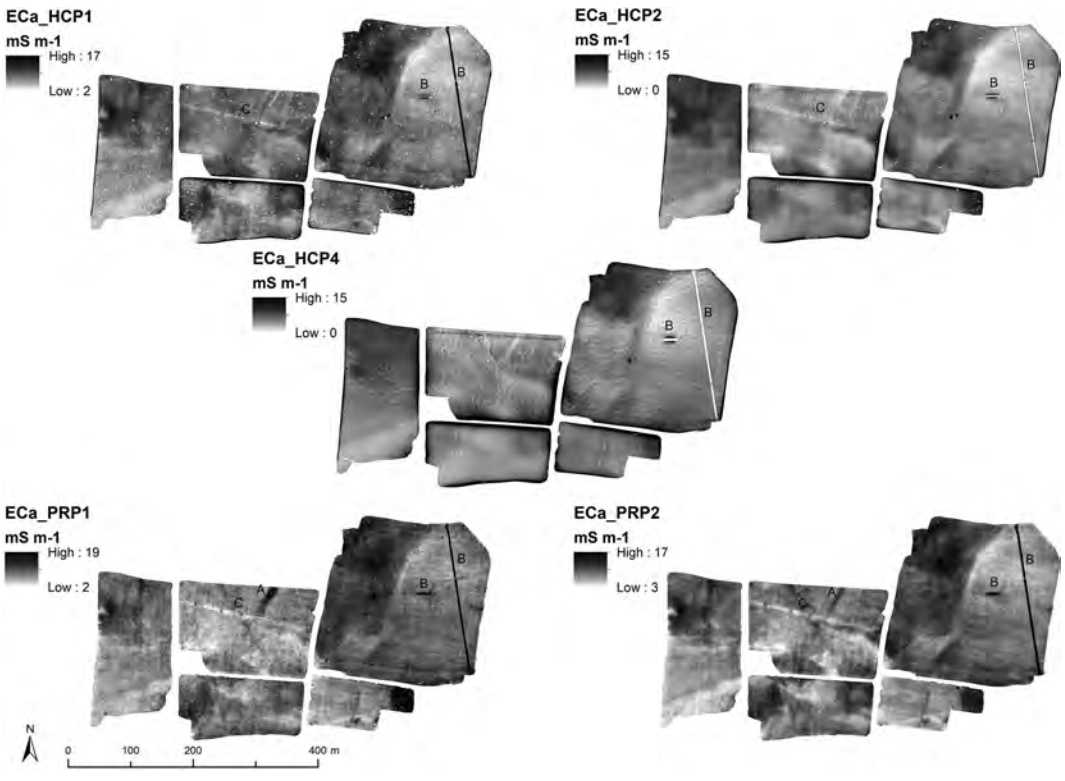

Fig. 8. Apparent electrical conductivity (ECa) data plots for survey zone 2 in Wiston (Pembs.). A = wet depression, B = modern infrastructure, C = micro-topographic field-boundaries.

curvilinear ditches run towards it, following the topography of the hillside. Together with the fact that several segments of the main structure are incomplete and most likely continue in the southern field, this suggests that the Iron Age and early medieval landscape to the south of Wiston was even more extensive and complex than aerial photography and excavation suggest. Based on the EMI survey data, it has not been possible to identify or differentiate early medieval features from the large Iron Age structures, as was achieved during excavation (Hart 2014).

The features to the north of the village are more scarce and cannot clearly be interpreted due to fragmentation (Figs 8, 10 and 12). Those to the east of zone 2 may be related to the Roman fort that was surveyed and partly excavated between 2012 and 2014 (Meek 2017).

The highest density of anomalies can be found on The Green to the east of Manor Farm. This zone is transacted by a water drain, continuing in zone 2 towards the north. Close to the main road through the village, several concentrations of building material can be found on the MSa data plots. These correspond to a building platform that was attested during an earthwork survey by Murphy (1995, 78). Furthermore, parallel linear features occur dispersed across The Green. One of these can be linked to the suggested former route of the main road (Murphy 1995). The character of the other features is unclear.

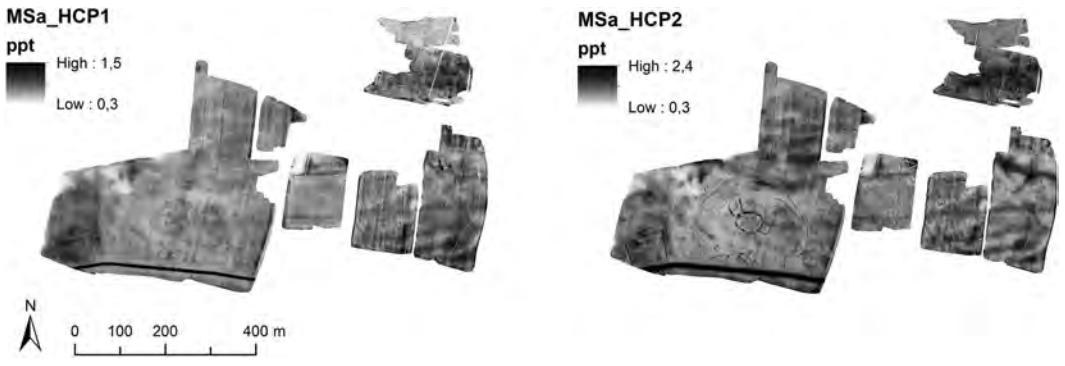

Fig. 9. Apparent magnetic susceptibility (MSa) data plots for survey zone 1 in Wiston (Pembs.). B = modern infrastructure, C = micro-topographic field-boundaries.

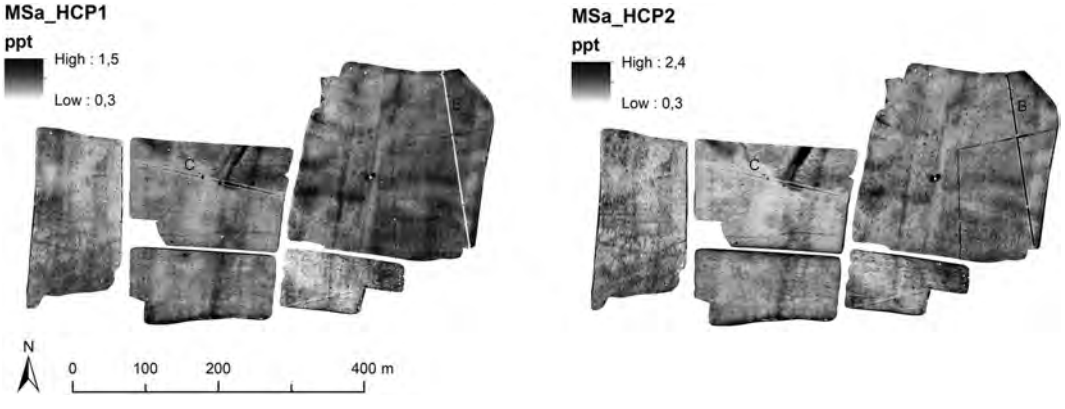

Fig. 10. Apparent magnetic susceptibility (MSa) data plots for survey zone 2 in Wiston (Pembs.). B = modern infrastructure, C = micro-topographic field-boundaries.

Of main interest to this specific research, however, are former field-boundaries that would have structured the landscape surrounding the settlement. Although few were clearly identifiable, some of these features correspond to former field-boundaries indicated on the first edition of the OS maps. These concern the low conductive linear features on Conkland Hill and to the north of the village (C on Figs 7 to 10). Those on Conkland Hill can be linked to the field-boundaries found in the geophysical prospection of Church Field in 1990 (Murphy 1995). Furthermore, some less visible ditch features can be attested to the south of the church and Cawdor House farm, following the same orientation as those features on Conkland Hill. Despite the high amount of anomalies on The Green, no clear remnants of plots could be attested.

Whitson

The different ECa plots north of Crab Tree Reen (Zone 1; Fig. 13) and to the south of the village (Zone 2; Fig. 14) indicate a high variability in soil characteristics.[9] Both zones of the study area are

Fig. 11. Overview of features visible on electromagnetic induction (EMI) data plots for survey zone 1 in Wiston (Pembs.).

thereby described as ‘loamy and clayey’ soils of coastal flats with naturally high groundwater. Several curvilinear features on the ECa plots suggest the presence of former creeks or tidal inlets. Related to the known landscape history of the study area as tidal flats (Allen 2000; 2001; Allen and Haslett 2006; 2007), the large variability in electrical conductivity can be interpreted as representations of past floods, sedimentations of loam and clay and the formation of peat-silt couplets. Furthermore, the shallow ECa measurements of ECa-1PRP (depth of 0.5m) and ECa-2PRP (depth of 1m) show a considerably lower conductivity level than that of the ECa-HCP1 (depth of 1.6m), ECa-HCP2 (depth of 3.2m) and ECa-4HCP (depth of 6.4m) coil-configurations. This can be considered as an indication for a higher amount of organic material, clay or saline aquifer in these deeper horizons as has been attested by Allen (2000). Despite these variations, however, a high number of linear features are visible (Fig. 15). Based on their straight and regular orientation, these are interpreted as artificial. All of these, except a moated site in the north-west corner of survey zone 1, are related to two water management systems known on the levels as ‘gripping’ and ‘ridge and vurrow’ (Rippon 1996, 50–2; Turner 2016, 4 and 7). ‘Grips’, as noted earlier, are small and shallow open ditches, specifically dug for carrying of water into the field-ditches, laid out in a rectangular pattern (Turner 2016, 4). These were dug by hand and were generally around 20m apart (Rippon 1996, 54). This traditional system is being replaced by modern under-drainage systems.[8] ‘Ridge and vurrow’, in contrast (not to be confused with the ‘ridge and furrow’ of medieval agriculture), is created by the dedicated ploughing of ridges for water management, resulting in a grid of smaller ditches within

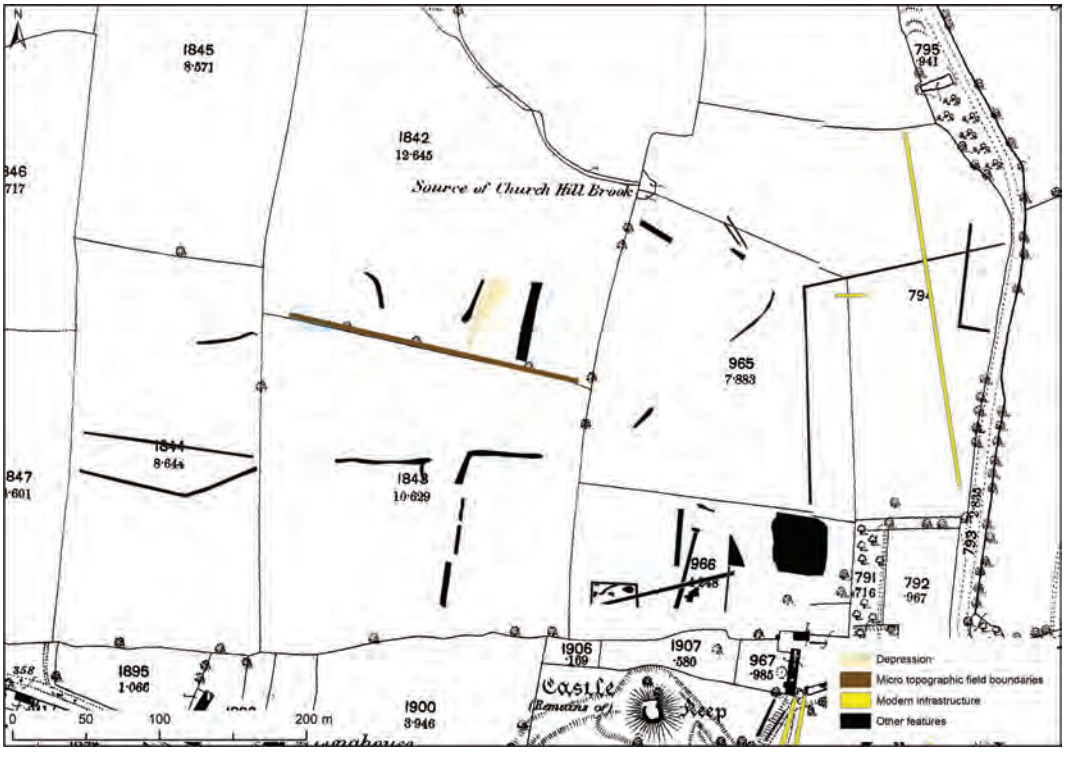

Fig. 12. Overview of features visible on electromagnetic induction (EMI) data plots for survey zone 2 in Wiston (Pembs.).

a grip system (Rippon 1996, 50–2). Besides these smaller ditches and grips, the different ECa and MSa plots (Figs 16 and 17) also reveal larger former field-ditches in both survey zones, indicating a former division of the modern-day plots. These larger ditches are clearly visible in the magnetic susceptibility measurements, which do not indicate other archaeological or physical-geographical features. The ECa-HCP2, ECa-HCP4 and MSa-HCP2 measurements are, however, slightly influenced by the high voltage cables in the north eastern part of survey zone 1, which cause a discordant linear trace in the data.

For the whole of Whitson, the 1m resolution lidar data (Natural Resources Wales 2017) offers further insights in these former field-ditches and water management systems. North of Crab Tree Reen, the longitudinal plots that could be attested in the EMI data plots continue in the surrounding lands as well. Whitson Common and the farms along its eastern side are clearly located on higher ground, while the topography lowers towards the east. Rippon (1996, 86) noticed how the lateral boundary of the first extent of the village in his model was not parallel to the edge of the common or Monksditch, something that might have been expected if one of these was used as an axis for the further planning of the settlement. The lidar data, however, indicates that this first boundary runs along the edge of a slight elevation in the landscape, thereby avoiding the higher grounds. Furthermore, the lidar data suggests a more clear continuation of these lateral ditches towards the south-southeast of Half Acre Lane, than what has been depicted on the OS maps.

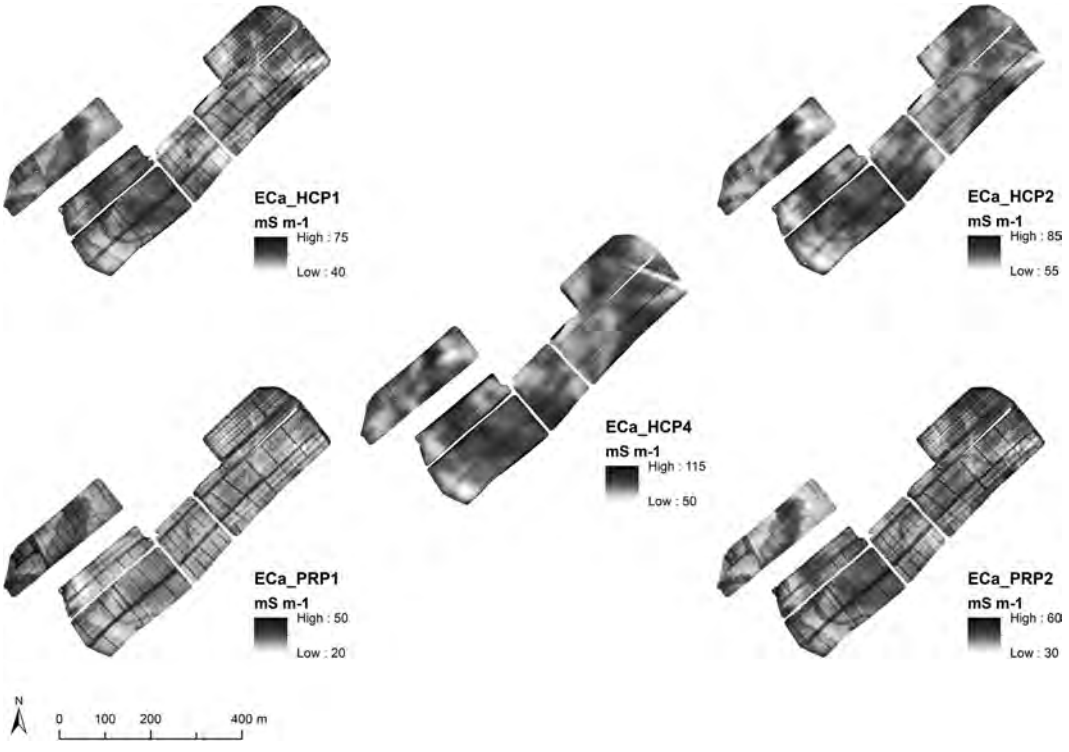

Fig. 13. Apparent electrical conductivity (ECa) data plots for survey zone 1 in Whitson (Mons.), north of Crab Tree Reen.

INTERPRETATION

Morphology of Wiston

Murphy (1995) and Lilley (1995) each had their own interpretation of the settlement morphology of Wiston. Both considered Wiston as a failed borough, based on historical references, and ascribe the characteristic morphology of a Norman town to the former layout of the village (see above). Based on his comparative research on Norman castle-towns in Britain, Lilley (2017, 38) describes this morphology as a composite, consisting of identifiable characteristic aspects which can be arranged differently. These comprise a motte and bailey castle, a market street, planned layout and a strategic topographic position. These can indeed all be attested in Wiston, apart from a clearly identifiable planned layout of burgage plots. Indications of these plots were studied in the 1990 geophysical survey and archaeological excavation of Church Field (Murphy 1995, 83–4). In addition, one of the related field-boundaries could be attested through the large-scale EMI survey on Conkland Hill. In the same field, other longitudinal anomalies were interpreted as former field-boundaries. All have the same orientation, perpendicular to the road running east–west through the village. Elsewhere around the settlement, however, indications of burgage plots are scarce and seem to be limited to the south of the village. In all these cases the orientation

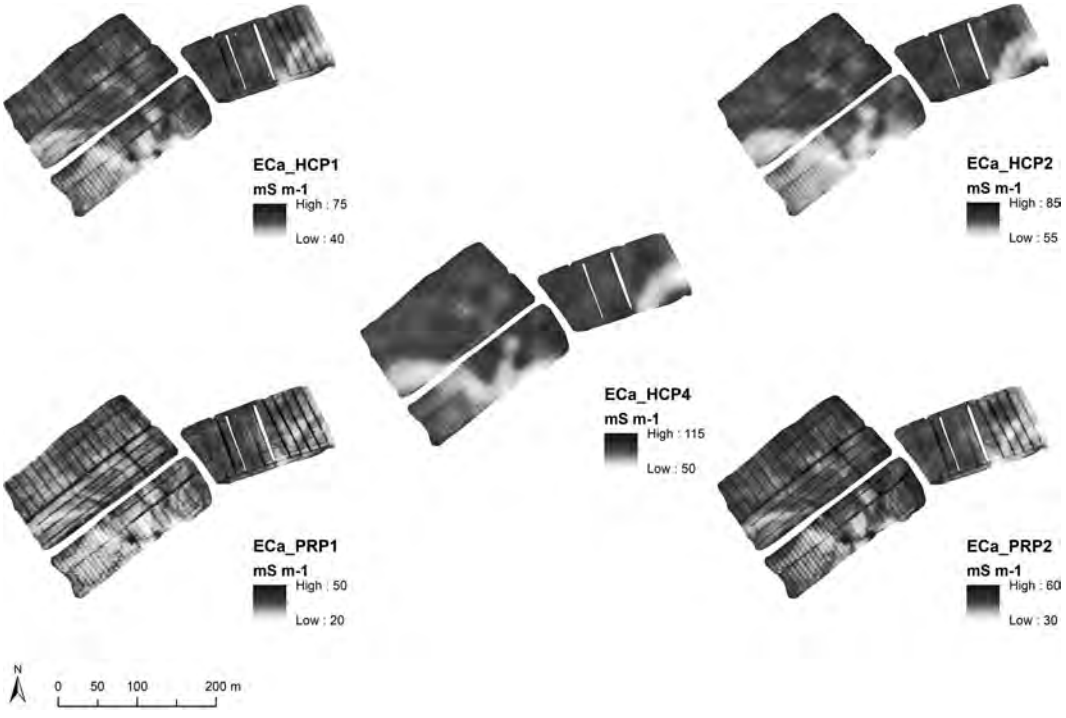

Fig. 14. Apparent electrical conductivity (ECa) data plots for survey zone 2 in Whitson (Mons.), south of the village.

is similarly perpendicular to the main east–west road. This strongly supports Murphy's 1995 model, although no clear indications for field-boundaries could be attest through EMI on The Green.

Using these findings, a schematic interpretative model of the field-boundaries in Wiston was mapped in GIS in order to allow further morphological and metrical analysis of the settlement layout (Fig. 18).

Development of Whitson

Based on the EMI survey and lidar, a revised phasing for Whitson can be proposed following Rippon's 1996 model (Fig. 19). As in Rippon's model, the first phase of reclamation would have been located along the edge of the funnel shaped common. The first back lane would have run along slight elevations in the landscape, which provides an explanation for Rippon's (1996, 86) observation that it does not run parallel to the edge of the common or Monksditch. Furthermore, this reclamation would have extended further south of Half Acre Lane than Rippon (1996) proposed. In consecutive phases, the narrow plots of lands would have extended further east, for which at least five phases can be recognised. Although the overall lateral boundaries show a phased extension, minimal deviations from these lateral axes might suggests that plots were extended individually rather than strictly systematically. Considering that the reclamation would have extended further south as well, this places the village closer to Whitson Church. However, there remains a distance of *circa* 200m between them, which does not permit further clarification of why this church is so far from the village and whether it was originally indeed Whitson Church.

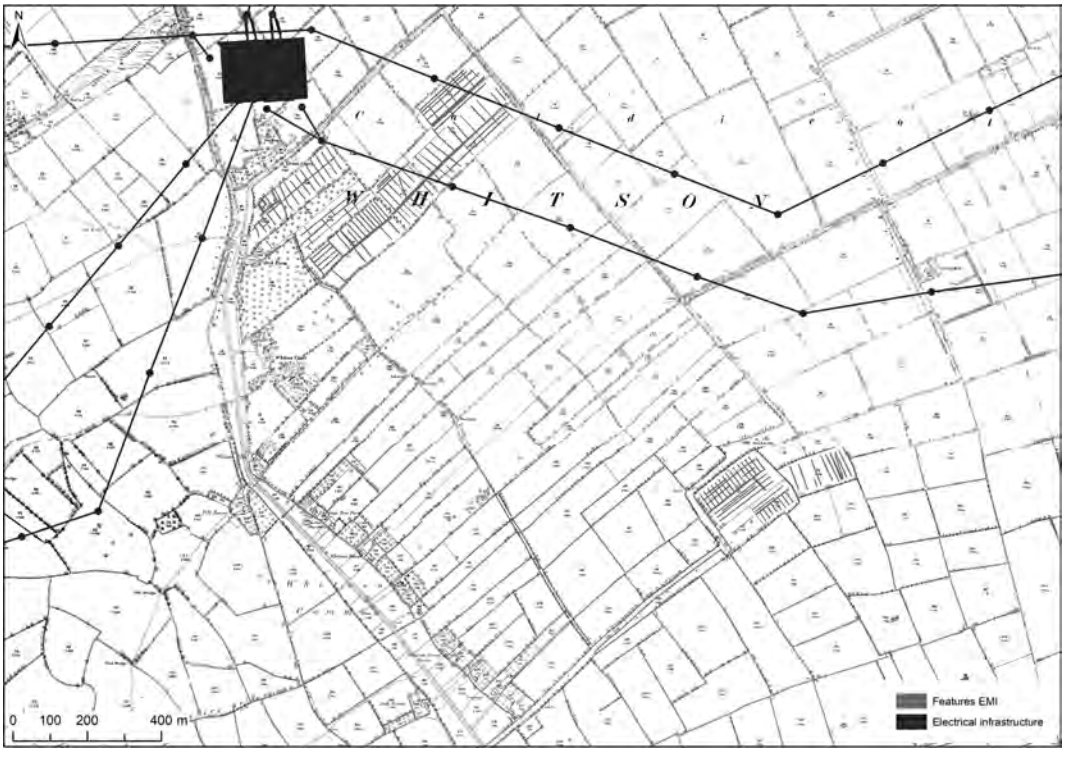

Fig. 15. Overview of main ditch features visible on electromagnetic induction (EMI) data plots for Whitson (Mons.).

Based on these findings, an interpretative model of the field-boundaries in Whitson was mapped in GIS in order to allow further morphological and metrical analysis of the settlement layout.

CONCLUSION

Through the application of large-scale frequency-domain multi-receiver EMI and lidar data at the settlements of Wiston (Pembrokeshire) and Whitson (Monmouthshire), this study contributes to the morphological analysis of planned rural settlements with a supposed Flemish origin in Wales. An extra benefit has been to extend knowledge of the preceding Iron Age and early medieval landscape at Wiston. The identification and mapping of former field-boundaries has allowed a partial confirmation and further development of existing morphological hypotheses for both settlements. Several distinct features of a Norman town morphology can be ascribed to Wiston, despite its status as a failed borough. The motte and bailey castle dominates the site, while the main east–west road through the village would have been used as a main axis for the settlement layout. The identification of burgage plots within the modern-day village core was, however, not possible. At Whitson, despite the absence of a castle site and borough status, morphological similarity to Wiston’s layout can be attested. Plots of land are oriented perpendicular to the main road, and this study has identified a further southward extension of the settlement, adding to the

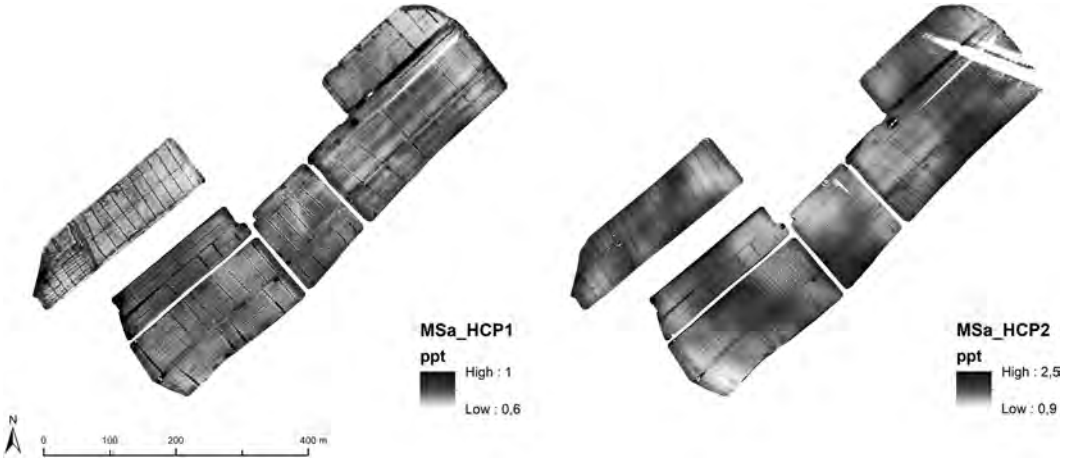

Fig. 16. Apparent magnetic susceptibility (MSa) data plots for survey zone 1 in Whitson (Mons.).

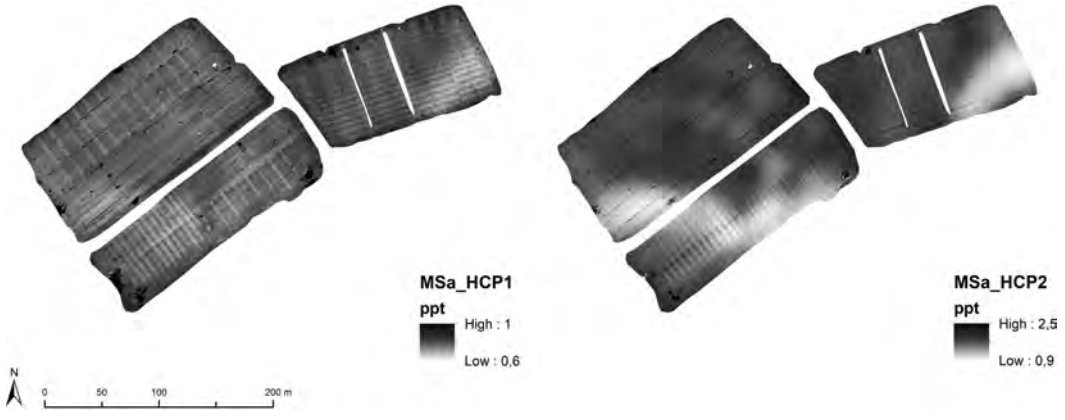

Fig. 17. Apparent magnetic susceptibility (MSa) data plots for survey zone 2 in Whitson (Mons.).

existing development model. The presence of a funnel-shaped common (which has been identified by Rippon (1996, 47) as one of several droveways on the levels) in contrast to the small open space along the main east–west road in Wiston (which had been identified as a market street/place by Murphy 1995, 98), suggests a different socio-economic origin to Wiston. While the latter is understood to have been a borough with market rights (Murphy 1995, 75), Whitson would have been a planned rural settlement aimed at extending the reclaimed backfens on the alluvial levels. The lack of any references to a market supports the impression that Whitson was a lower-status settlement than Wiston. Despite these differences, the basic system of a row settlement can be attested in both settlements. This offers the potential for further comparative analysis with other 'Flemish' settlements in Wales and similar settlements in the County of Flanders.

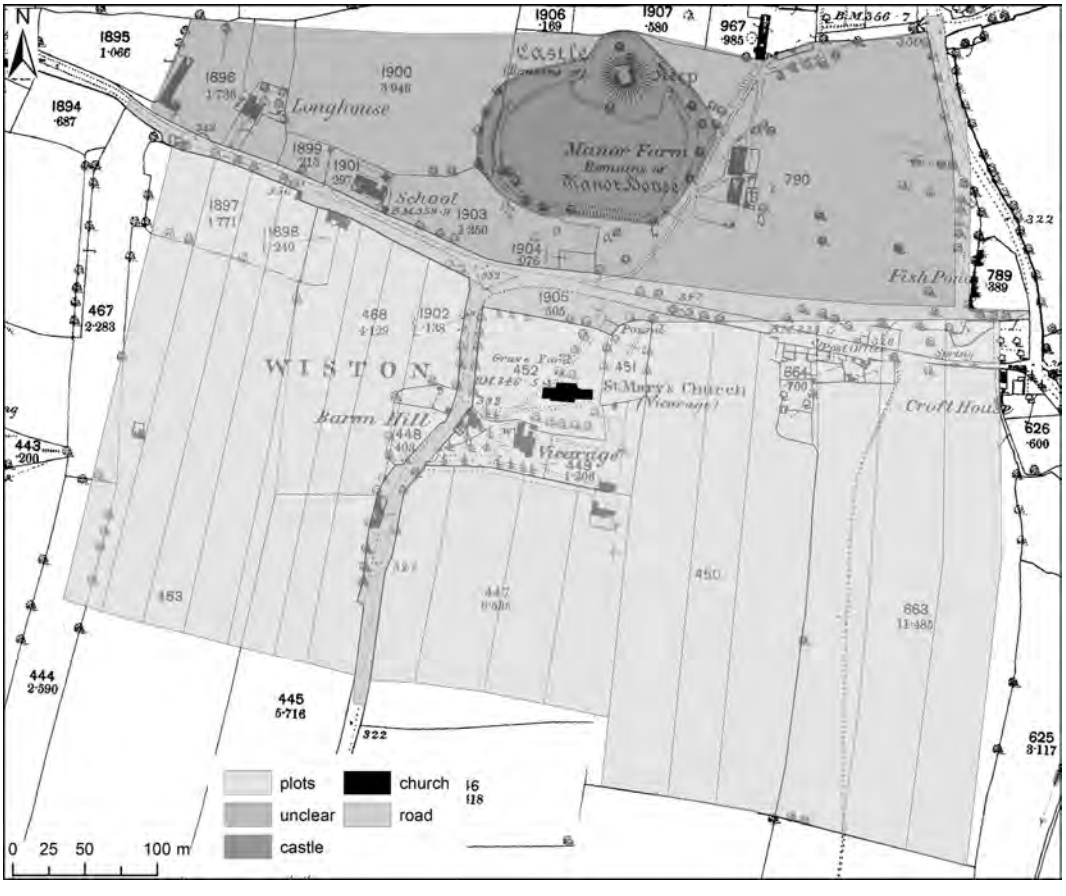

Fig. 18. Schematic interpretative model of settlement morphology in Wiston (Pembs.).

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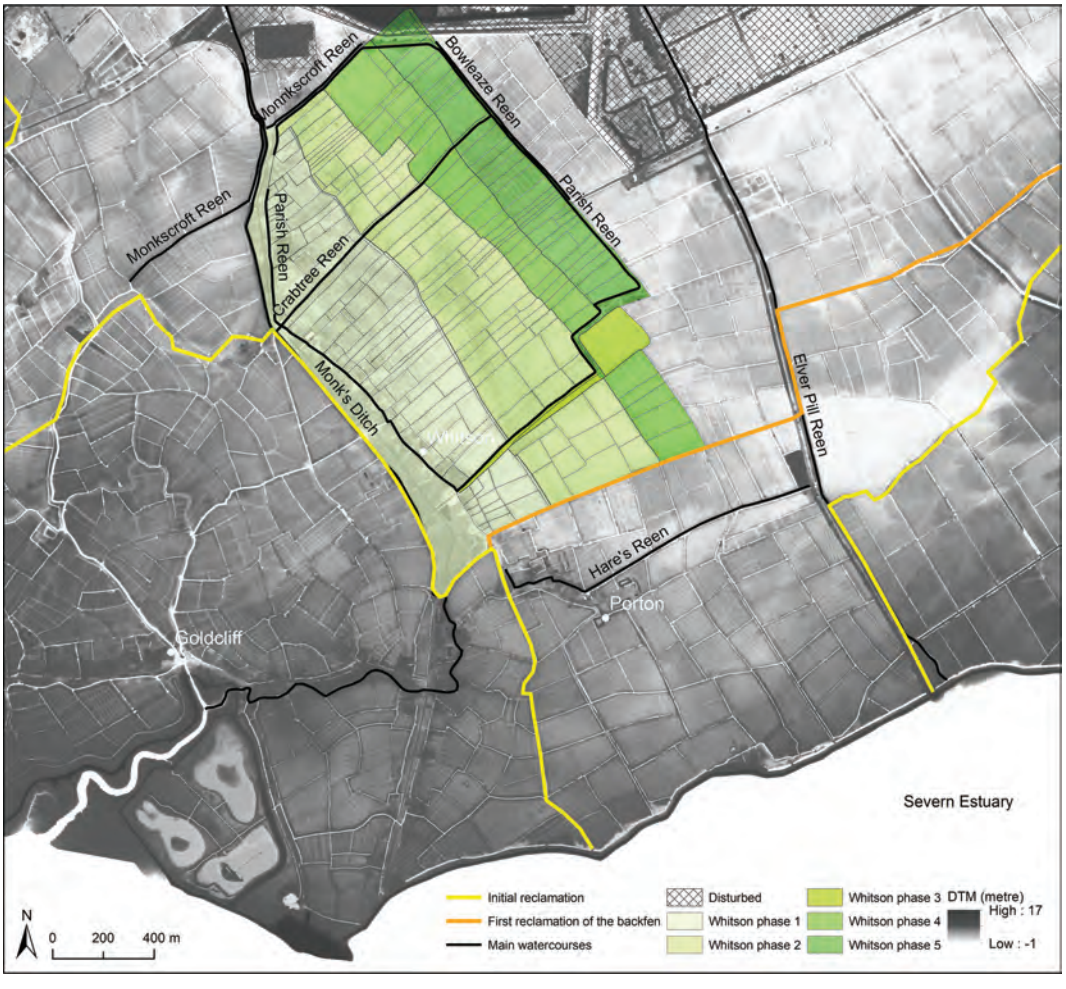

Fig. 19. Revised interpretation of Rippon's 1996 model for the development of Whitson (Mons.).

NOTES

1. The medieval County of Flanders covered the modern-day Belgian provinces of West and East Flanders, the southern parts of the Dutch province of Zeeland and parts of the French departments le Nord and Pas-de-Calais. It should be considered, however, to what extent this mentioning of Flanders specifically referred to the County of Flanders itself. As stated by Toorians (1996, 659), it is most likely that 'Fleming' or 'Flanders' was loosely used in Britain, referring to areas such as Artois, Cambrai, Hainault, Brabant, Zeeland and Holland.
2. See T. Driver, 2013, 2014, 'Conkland Hill, Wiston, concentric defended enclosure', available at <https://coflein.gov.uk/en/site/419630/details/conkland-hill-wiston-concentric-defended-enclosure>.

3. Rick Turner, 'Levels Lingo: Words and terms used in the Gwent Levels historically and today', unpublished manuscript, 2016.
4. Natural Resources Wales, 'LiDAR composite dataset', available at <http://lle.gov.wales/Catalogue/Item/LidarCompositeDataset/>.
5. Gwent Record Office, D2282/1, T. Morris, 'Commissioniers of Sewers: Whitson', 1830; Whitson Tithe map, 1845.
6. Cranfield Soil and Agrifood Institute, 'Soilscapes', available at <http://www.landis.org.uk/soilscapes/>.
7. See note 2.
8. This variability is not represented on either the national Soilscapes map (see note 5) or on the British Geological Survey's 'Geology of Britain', available at <http://www.bgs.ac.uk/discoveringGeology/geologyOfBritain/viewer.html>.
9. D. Waters pers. comm. about traditional grip systems being replaced by under-drainage systems on the land of The Grange farm (Goldcliff) in Whitson.

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