The Archaeology of the A30 Bodmin to Indian Queens Road Scheme

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The archaeology of the A30 Bodmin to Indian Queens road scheme

by

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Introduction

Between July and December 2005, prior to the construction of the A30 Bodmin to Indian Queens road improvement scheme, an extensive programme of archaeological investigations was carried out along its 11.5 km route. The most significant discoveries resulting from this work (Figs. 1 and 2) were a late Neolithic hengiform monument at Royalton, early to middle Bronze Age evidence for tin processing associated with an unusual arrangement of pits, a hearth and a semicircular ditch at Belowda, two adjacent early Bronze Age pit circles, perhaps originally timber circles, at Lane End, and two Iron Age to Roman roundhouses, one at Belowda and the other at Lower Trenoweth. A range of other sites, including a possibly Mesolithic pit and medieval and post-medieval tin prospecting pits were also investigated. A pollen sequence obtained from a palaeochannel provides evidence for the environmental history of the area from the middle Bronze Age to the modern period. The quantity of artefacts recovered, especially from the Neolithic and Bronze Age sites, was extremely limited, and particular stress has thus been placed upon soil micromorphology, soil chemistry and the analysis of charred plant remains to aid in the interpretation of the sites.

Background to the project

The scheme (Fig. 1) involved the construction of a new dual carriageway running between the Indian Queens and Bodmin Bypasses. The route begins near the bridge over the Par-Newquay railway. It then turns to the north and runs 400 m to 500 m from the previous route of the A30, passing to the north of the candidate Special Area of Conservation (cSAC) at Goss Moor and Tregoss Moor. The scheme passes to the north of Victoria, and then continues to the south of the previous line of the A30, apart from a short section near Roche Lane. It joins the Bodmin Bypass to the east of Innis Downs.

Geology, topography and land use

The road corridor (Fig. 2) marks the transition between the gently undulating plateau of the Cornish Killas, which comprises much of central Cornwall, and the upland mass of Hensbarrow Down to the south. The underlying geology consists of folded and faulted slate, siltstone and sandstone of the Devonian period.

The upland mass of Hensbarrow Down, including Fraddon Down and the two gentle upland beacons, are igneous intrusions of granite thrusting through the softer Devonian rocks. These have subsequently been eroded away to expose the white china clay deposits which, through the subsequent working for the clay mineral Kaolin, have given this area its unique industrial character.

From Victoria the western section of the previous A30 corridor descended onto Goss Moor, the lowest part of the area at 125 m aOD. Numerous streams converge into the Goss Moor basin to form the River Fal which flows out of the basin to the south-west. From Goss Moor the land rises up to Fraddon Down (212 m aOD) to the west, the former A30 crossing this ridge at approximately 150 m aOD. The Goss Moor area is thus enclosed by the high ground at Fraddon Down to the west, Hensbarrow Down and the china clay workings to the south, the upland beacons of Castle-an-Dinas and Belowda Beacon to the north, and the settlement of Victoria to the east.

The eastern section of the former A30, between Innis Downs and Victoria, followed a flat ridge of relatively high ground, which reached its highest point (180 m aOD) at the settlement of Victoria. The land falls away immediately to the north of Victoria into the 'U'-shaped Brynn valley. A number of small interlinked valleys with tree cover lie north and south of the previous A30 to the east of Victoria.

Modern land use in this area is predominantly agricultural, but there are also extensive areas of moorland. Agriculture is at best marginal, given over mainly to pasture which is enclosed within Cornish hedges. Moorland that has been enclosed and reclaimed for agricultural use is gradually reverting to moorland. An example of this process can be seen to the north of the former A30 between Providence and Belowda. Field patterns vary widely, ranging from long narrow strips made from earlier open fields around hamlets, to intricate irregular patterns found around mining communities on the edges of the uplands, and the rectilinear patterns of larger fields created as a result of 18th century enclosure. The distinctive, smaller, narrow, irregularly shaped medieval field patterns of anciently enclosed land can be found around the hamlets of Tregoss and Belowda, in the valley below, and to the east of Belowda Beacon, at Retire Common and in the Criggan Moors area. The larger, more regular field pattern created by 18th and 19th century enclosure can be found on and to the south of Castle Downs and along the ridge running from Roche, through Victoria, to Innis Downs. Many of these fields are only enclosed with fences.

The moorland areas, especially the Goss and Tregoss Moors, provide a sharp visual contrast with the adjoining farmlands, especially with the pattern of small fields at Tregoss, Belowda and St Dennis, and with the St Austell china clay workings to the south. The moorlands vary in character and appearance from the wet heath and mire communities of Goss Moor and Criggan Moors, often accompanied by extensive areas of willow colonisation and associated oak woodland, to the drier heaths on the thin soil at Tregoss Moor, Tregonetha Downs, Belowda Beacon and the upper areas of Criggan Moors

and Retire Common. The drier areas are being invaded by gorse and broom. Moorland areas are designated sites of Great Scientific Value and are all Cornwall Nature Conservation Sites. Goss/Tregoss Moor is an NNR, a cSAC and SSSI. Tregonetha Downs, Retire Common and the River Camel Valley and Tributaries (the area to the north of Victoria) are all SSSIs. The River Camel Valley and its tributaries is also a cSAC. All of these areas are in transition due to the decline of, and changes in, the traditional management practices of grazing, cutting and controlled burning. This has resulted in excessive colonisation by species such as willow, gorse and broom.
Settlements outside the main small communities of St Dennis, Indian Queens, Roche and Victoria are sparse and scattered, with smaller groupings at Belowda, Tregoss, Providence/Royalton and Higher Town. They are linked by narrow winding lanes which are contained by Cornish hedges. The older buildings are mostly built of granite with slate roofs. The Cornish hedges are also built of granite. Farmsteads and scattered cottages are a reminder of the smallholdings that grew up with the mining industries in this area. Goss Moor along the line of the old A30 is characterised by open ponds between ridges of spoil which result from the extensive tin streaming operations which reached a peak of production in the late 19th century and continued into the early 20th century. Disused deep tin mines occupy the southern slopes of Belowda Beacon and Castle-an-Dinas.

Archaeological background

Unsurprisingly, given the scant evidence for Cornwall as a whole in the Palaeolithic, there is no evidence of activity in this period in the vicinity of the road scheme (Berridge and Roberts 1986; Wymer 1999).
Evidence of Mesolithic activity is also slight (Berridge and Roberts 1986). There is none in the immediate vicinity of the road scheme, but during the excavation of six barrows on the St Austell Granite, about 4 km to the south of the scheme, evidence of Mesolithic activity was recovered from both buried

ground surfaces beneath the barrows and as residual material incorporated into the mounds (Miles 1975).

The Neolithic and Bronze Age, in contrast, are much more richly evidenced, albeit largely by a range of probably ritual monuments (Fig. 3). The Neolithic is represented by the ritual complex around Castilly Henge, one of only three henges in Cornwall (Mercer 1986). Although excavation of the henge itself provided little dating information, it did show that only the northern causeway was original, the southern probably having been added in the medieval period (Thomas 1964). Surrounding barrows, a ring cairn (Hooper 1976) and a possible Bronze Age cist burial (Irwin 1976) highlight Castilly Henge's continuing significance in prehistory. Castle-an-Dinas, to the west, may have Neolithic origins and may have been a focal point for activity throughout prehistory (Scott Wilson/Alfred McAlpine 2003a).

The Bronze Age ritual landscape is also evidenced by the extant burial mounds at Saffron Park and Innis Downs as well as by the possible cist burial at Innis Downs (Fig. 3). Further barrows exist to the north of the scheme, on the summit of Belowda Beacon and within the ramparts of Castle-an-Dinas (Nowakowski *et al*. 1997). The remains of these barrows could indicate that, as on Bodmin Moor, Bronze Age and possibly earlier settlement and ritual activity was intense, with extended phases of prehistoric clearance and upland colonisation (CAU 1994).

There is a considerable weight of indirect evidence, from both finds of artefacts and metallurgical studies, that Cornish tin was being extracted from the early Bronze Age. The Goss Moor area, with its rich alluvial tin deposits, must be considered a likely area for such early exploitation (Penhallurick 1986), although there has been no direct archaeological evidence for prehistoric tin extraction or working sites in Cornwall until now (Gerrard 2000).

No evidence of settlement or other Iron Age activities in the immediate vicinity of the road scheme was known prior to the fieldwork reported here (Fig. 3). The multivallate hilltop enclosure at Castle-an-Dinas may have been

used as early as the late Neolithic and was certainly occupied during the Iron Age. A possible roundhouse, associated with Iron Age pottery, has been identified within the enclosure (Wailes 1963, 54). The hill-fort clearly indicates the substantial investment in the landscape made by later prehistoric communities, but it has yet to be determined whether this site was primarily a remote refuge, a strategic fortification, a high status settlement, or combined a range of functions, perhaps changing over time (Scott Wilson/Alfred McAlpine 2003a). Its location above Goss and Tregoss Moors perhaps hints at in involvement with tin extraction.

Cornwall is notably lacking in evidence for romanisation (Fig. 3). There is an apparently short-lived, early fort at Nanstallon, on the south-west edge of Bodmin Moor and two further forts have recently been discovered at Lostwithiel and Calstock, but evidence for villas or 'small towns' is almost nonexistent, apart from a single possible villa site at Magor. Nevertheless, changes in rural settlement do seem to have occurred in the early Roman period, with rounds being particularly characteristic of the period. There is slight evidence for increasing official involvement in the 3rd and 4th centuries AD, perhaps connected with tin production (Holbrook 2006). Occupation of Castle-an-Dinas may have continued during this period. In the wider area, a settlement site was excavated by CAU at Penhale Round on the Indian Queens By-pass (Nowakowski 1998) and other round sites are suspected on the basis of aerial photographic evidence (CAU Heritage Environment Record).

Although the place names Tregoss and Belowda suggest that these settlements had pre-Norman origins (Padel 1985), other than a 5th century brooch found in the Goss Moor area (Penhallurick 1986), there is no physical evidence from the early medieval period (*c* AD 410-1000). It is, however, likely that the Castle-an-Dinas and St. Dennis hill-forts were occupied during this period (Nowakowski *et al. 1997*). By the later medieval period (*c* AD 1000 – 1530) Belowda, Tregoss, Pendeen (now Pendine), Holywell, Colbiggan and Harros were established settlements, with a chapel at Holywell. Earlier this

century Charles Henderson noted the well-preserved holy well at this site and, in assessing the fragments of masonry lying around the farmyard, suggested that the former chapel (no remains of which have survived) was likely to have been at least 15th century in date (Henderson 1930, 427; Nowakowski *et al.* 1997).

The Belowda field system dated originally to the medieval period (Fig. X-Med), although its current form reflects later enclosure. Other features which may date from the medieval period include possible medieval 'ridge and furrow' (the characteristic traces left by open field cultivation) surviving half way between the Iron Bridge and the House on the Common (Tregoss; Nowakowski *et al.* 1997).

Tinners' settlements on Tregoss Moor are historically attested for the first time in the 12th century, and there is documentary evidence that tin-streaming was the major occupation of the community at Ruthvoes, on the western edge of Goss Moor, in 1309 (Henderson 1930, 9; Nowakowski *et al.* 1997). It is likely that the inhabitants of Belowda and Tregoss were also tinners first and farmers second (Scott Wilson/Alfred McAlpine 2003a).

In the post-medieval period more small settlements sprang up, many associated with tin extraction, others with small agricultural holdings (Fig. X-Med). Some have subsequently been deserted. Several, dating from the late 18th to early 20th century, lie immediately alongside the scheme, including deserted settlements at Rosewin, East Griglands and North Griglands. The Par-Newquay railway line was originally a horse-drawn minerals tramway, built in the 1850s, and was converted to locomotive power in the 1870s, before being absorbed into the Great Western Railway in the 1880s (Nowakowski *et al.* 1997; Scott Wilson/Alfred McAlpine 2003a).

Deserted mining features are very obvious in the landscape along the scheme, including the scars of large-scale eluvial streamworks around the headwaters of the Fal, and engine houses on the slopes of Belowda Beacon and Castle-an-Dinas.

Bodmin Radio Station, established near Innis Downs in 1926, was part of the first short-wave radio communications network in the world. It became a listening station in World War II, and, during the cold war, for a time serviced the hotline between Moscow and London. Features from those periods remain in the current complex (Nowakowski *et al.* 1997; Scott Wilson/Alfred McAlpine 2003a).

Previous archaeological work

The archaeological investigations associated with the road scheme proceeded in several phases. Archaeological assessment by the Cornwall Archaeological Unit (CAU) of the proposed improvement began in the 1990s with an initial desk-based assessment (Hartgroves and Bayfield 1994). This was followed by geophysical and walkover surveys and more detailed desk-based assessment (Nowakowski *et al.* 1997). Small scale evaluation trenching was carried out at this stage to test the results of geophysical surveys at Innis Downs and Saffron Park. A Stage 2 Environmental Assessment was undertaken in 2000 (RPS 2000), with the Stage 3 Environmental Assessment (Scott Wilson/Alfred McAlpine 2003a) being presented to a Public Inquiry in January 2004. The scheme was approved in November 2004 and the archaeological fieldwork was started in July 2005 and finished in December 2005.

The CAU assessment of the road scheme (Nowakowski *et al.* 1997) included geophysical surveys of the prehistoric sites at Innis Downs and Saffron Park. Magnetic anomalies in the vicinity of the Saffron Park Barrows indicated the likely presence of buried archaeological features, whilst the Innis Downs survey failed to clearly identify the known barrow sites, although the survey did indicate possible pits and linear features in the vicinity. Further geophysical surveys were carried out during Stage 2 of the assessment. At Deep Tye, towards the western end of the scheme, two geophysical surveys targeted fields whose names indicated the possible presence of barrows, although they produced negative results. In the vicinity of the Saffron Park Barrows three adjacent areas of geophysical survey were undertaken,

identifying probable barrows and other anomalies. To the south of the site of Holywell Chapel, geophysical survey produced negative results (RPS 2001a). Between October and December 2001, ground investigations for the A30 scheme were undertaken, comprising the excavation of 60 test pits which were observed under archaeological watching brief conditions (CAU 2002). An unidentified stone feature within the Belowda field system, a number of field boundaries, possible traces of medieval ridge and furrow, possible mining prospecting pits and a willow mining adit were among the features discovered.

As part of the assessment, topographical surveys of earthworks and other standing remains were also undertaken at three locations. A survey (RPS 2001b) of an area immediately to the south of the ruined house and farm of Rosewin identified a trackway defined by stone walls with hedges running from Rosewin to Coarse Moor. A possible house platform was identified by topographical survey at East Griglands. A topographical survey of the Belowda field system was also undertaken (*ibid.*) but no significant earthworks were identified, beyond the extant boundaries. A separate Historic Landscape Assessment of the Belowda field system, complementary to the topographical survey, was also produced. It included consideration of an alternative route option and recommendations for mitigation in this sensitive area (Scott Wilson/Alfred McAlpine 2003b).

Between May and September 2001 an archaeological evaluation and watching brief was undertaken by Network Archaeology during the construction, by Transco, of a new gas pipeline between Maudlin and Indian Queens. The middle part of this pipeline, between Deep Tye and Mount Pleasant, was on the same alignment as, and in close proximity to, the current scheme. This work has, so far, only been reported in an interim form (Network Archaeology 2002). A number of prehistoric sites were discovered, one of which lay very close to the line of the current scheme. This site, located close to Mount Pleasant, comprised a 'possible turf-built barrow', associated with a pair of concentric rings of pits and postholes. The remaining archaeological

sites of prehistoric date excavated along the pipeline route comprised three post-built structures, a ringditch probably associated with a barrow mound, a pit alignment, a probable Bronze Age cremation, and a small number of pits and ditches containing prehistoric finds.

Research aims

The general objective of the archaeological works was to 'minimise the impact of the Scheme through an appropriate response to any adverse effects on the cultural heritage, as a contribution to the Employer's commitment to Heritage set out in the Highways Agency's Environmental Strategic Plan. The aim of the archaeological work is to investigate and record the significant archaeological features, deposits and artefacts associated with prehistoric, Romano-British, early medieval, medieval and/or post-medieval activities that will be adversely affected by the A30 Bodmin to Indian Queens Improvement, and by so doing to contribute significantly to our understanding of past human activity within the project area, in the context of the historic landscape.' (Highways Agency project brief, RPS 2005, Vol. 2, Appendix M)

Guided by the South-West Archaeological Research Framework (Webster forthcoming), a number of key research aims were identified by the post-excavation assessment (OA 2007). These aims were set as a number of questions for investigation, namely:

- How has environment and land-use in the Goss Moor area changed since the Neolithic period? Are the changes observed a cause or effect of human activity?
- What were the date and function of the Royalton hengiform monument and timber circle and the Lane End timber/pit circles?
- How do the hengiform and pit circles relate to other types of later Neolithic and Bronze Age ritual monuments in the area, such as large scale

henge monuments (eg Castilly Henge), stone circles and barrow cemeteries, and to evidence for prehistoric settlement, both spatially and chronologically?

· What was the nature of the activity undertaken during the Bronze Age at the Belowda pit and hearth group?

· When were the Lower Trenoweth and Belowda roundhouses constructed and used, and what types of activity were carried out there?

· How has understanding of the role of tin extraction in shaping the landscape of Goss Moor and surrounding areas been altered by the A30 excavations?

· How has understanding of the development of the medieval and post-medieval landscape been altered by the A30 excavations, with particular reference to the Belowda area?

The archaeological design

The route of the new A30 was carefully selected to avoid direct impacts on known ancient monuments, and to minimise the indirect effects on the setting and integrity of the area's historic landscape. Residual effects were mitigated through a programme of archaeological recording. A detailed Archaeological Design (Oxford Archaeology 2005a), prepared before the start of fieldwork, provided a flexible framework for landscape investigation and recording, which avoided over-prescribing investigation areas on the basis of insufficient evidence, but provided a clear set of methods for dealing with broadly predictable remains.

The predefined elements of the fieldwork included the early stripping under archaeological control of a 10 m wide strip along the length of the scheme (excluding areas of known modern disturbance) and the full excavation of two sites at Saffron Park and Innis Downs in close proximity to known prehistoric monument groups. In addition, a number of areas were mitigated by targeted watching briefs, sample hedge sections were excavated in the Belowda field system, and a general watching brief was maintained on significant areas not covered by any of the other methods.

Palaeoenvironmental boreholes were initially planned for the Holywell Valley. However, the location proved unsuitable and a hand auger survey and monolith sampling exercise was carried out instead during the excavation of a new culvert in a stream valley to the west of Belowda Lane.
In total, 16.7 ha of the scheme were stripped and mapped under conditions of 'good' or 'very good' visibility. This represents *c* 25% of the total permanent land-take. This work comprised an initial metal detector survey, followed by a controlled mechanical topsoil strip under close archaeological supervision using a toothless ditching bucket. Each stripped area was then mapped using a Global Positioning System and finally sample excavation was carried out to characterise the identified archaeological remains.
All of the boundaries within the Belowda section were sectioned using mechanical plant, with a sample section being hand cleaned and recorded in detail. A two-metre sample length was then excavated by hand across two of the most promising hedges to attempt to recover dating material.
A total of five sites were identified which required detailed excavation, four of which (the Belowda roundhouse, the Lower Trenoweth roundhouse, the Lane End pit circles and the Belowda pit and hearth group) required further stripping under archaeological conditions (OA 2005b), whilst the entirety of the fifth, the Royalton hengiform monument and timber circle, was exposed in the initial topsoil strip.
In total 258 bulk samples of 15 to 60 (normally 40) litres were taken for flotation for carbonized remains from secure contexts where there were indications of good potential for such material, or to recover environmental evidence, artefacts, mineral residues and radiocarbon samples from significant features. Samples were targeted following specialist advice and in accordance with predefined sampling strategies.

Radiocarbon dating

A total of twenty-four radiocarbon dates (Table 1) were obtained from samples selected in line with the research aims (Bayliss and Orton 1994).

Measurements were made using accelerator mass spectrometry (AMS). Full details of the processing methods for the samples is available in the archive.

The radiocarbon results are quoted in accordance with the international standard known as the Trondheim convention (Stuiver and Kra 1986) as conventional radiocarbon ages (Stuiver and Polach 1977). The determinations have been calibrated with OxCal v. 4 (Bronk Ramsey 1995, 2001) using the probability method (Stuiver and Reimer 1986) and the calibration data of Reimer *et al.* (2004). The calibrated date ranges quoted in the text are at 95% confidence, rounded out as appropriate to the errors associated with the dates (Mook 1986). Where possible, using the Bayesian statistical methods implemented in OxCal v. 4, attempts have been used to calculate more precise estimates of dates by combining archaeological information and the radiocarbon determinations. The models used to produce these estimates (posterior density estimates) are specified in the figures showing the dates below (Figs 10 and 12). Full details are available in the site archive. It should be stressed that the estimates provided by these models depend upon archaeological judgements and may change if these judgements are re-evaluated.

The archive

The site archive has been prepared for long-term storage in accordance with *Guidelines for the preparation of excavation archives for longterm storage* (Walker 1990) and *Standards in the museum care of archaeological collections* (Museums and Galleries Commission 1992). The digital archive has been prepared in accordance with *Excavation and fieldwork archiving: guidelines for good practise*, issued by the Archaeology Data Service (ADS 2000), and in accordance with specific requirements of Cornwall County Council Heritage Environment Record. The fully indexed archive of the project, under its accession number, A30BOD.05.3, will go to the Royal Cornwall Museum, Truro, and a microfiche security copy will be deposited with the National Monuments Record. Published reports of the results and suitable GIS datasets will be

lodged with the Cornwall Historic Environment Record. The digital archive will be lodged with the Archaeology Data Service.

The Mesolithic and earlier Neolithic

Very little evidence of Mesolithic or earlier Neolithic activity was found. A radiocarbon date provides some evidence to suggest that a single pit, 230 m to the north-west of Castilly Henge, may date from the Mesolithic. In addition, on technological and morphological grounds a small, redeposited assemblage of flint, found overlying the Belowda roundhouse may also date from this period or from the early Neolithic.

The pit (10010) was circular, and measured 1.2 wide by 0.36 m deep. It had nearly vertical sides and a flat base (Plate 1). The first layer of fill consisted of a black, charcoal-rich deposit which was overlain by a stony, orange brown silty clay. There was no indication of *in situ* burning.

It contained no artefacts, and the only material recovered from it was oak charcoal. A radiocarbon date (NZA 29357: 7687±20 BP; Table 1) was obtained from a fragment of oak heartwood charcoal from the primary fill of the pit. It gives a calibrated range of 6590-6460 cal BC. The quantity of charcoal in the pit was sufficient to suggest that it was contemporary with the filling of the pit, rather than having been stray, intrusive or residual fragments. However, since the age of the heartwood at the time of deposition is unknown, the date can only be regarded as providing a *terminus post quem* for the pit. Although the oak may have been of considerable age before it was burnt and deposited in the pit, even allowing a large offset still suggests that the pit dates from the Mesolithic. A large offset does, however, raise the possibility that the pit dates from considerably later in that period than the radiocarbon date suggests.

This pit was the only non-modern feature identified during the course of the topsoil stripping of an area of 2.7 ha at Innis Downs (Fig. 2). This is a surprising result given the proximity Castilly Henge, the associated barrow

cemetery, and the previously excavated ring cairn and possible cist burial (Hooper 1976; Irwin 1976). However, the notably thin, clinker-rich topsoil hinted that the whole site may have been truncated. It is, therefore, possible that the identified pit was the only survival of a once much richer landscape.

Discussion

Mesolithic pits have been found in the vicinity of Neolithic monuments at a number of other sites. The most well-known are, no doubt, those at Stonehenge, but others have been found at Warren Field, Craithes, Aberdeenshire, Thornborough, Yorkshire, and Bryn Celli Ddu, Anglesey (*British Archaeology* 2007, news). It is, however, difficult to make a connection between the Mesolithic pits and the later monuments. The most significant difficulty is raised by the large spans of time – often in the order of several millennia - which separate the Mesolithic features from very much later monuments. In the case of Innis Downs, even if the pit was very late in the Mesolithic, there would probably still be a gap of over a millennium – and probably closer to two – between it and Castilly Henge. The absence of other remains in the stripped area obviously provides nothing to help bridge that long gap. It is also worth stressing that the Innis Down pit is a very much more modest affair than those found at the other sites just mentioned. It is considerably smaller than many of those at the sites mentioned above (many of which are over 2 m wide). Although charcoal of Mesolithic date has been recovered from a number of smaller features, including postholes, at other sites (see Allen forthcoming), it is often impossible to be certain that the charcoal is not residual). In the case of pit 10010 there is no clear indication, despite the charcoal, that it contained a post, nor any indication of any distinctive kind of deposits. There is thus, at present, no reason to link this feature to the Neolithic monument, nor to believe that it was related to any special form of activity

The only other indication of possibly Mesolithic activity found along the scheme was a small group of flint. This flint was found in a layer (4381) in

the area of, and overlying, the Iron Age roundhouse at Belowda. Examination of the micromorphology of this deposit suggests that rather than having the structure of a naturally formed soil, it derives from turf which had collapsed from a bank or wall associated with the Iron Age structure. It is possible that the flint assemblage was transported to the site in this turf. As well as the flint, the turf also contained fine charcoal and burned mineral and soil inclusions which suggest that it derives from grassland which was managed with fire. The flint itself was not burnt and need not be contemporary with this burning.

The assemblage consisted of 19 pieces: nine flakes, five blades, three blade-like flakes, and two chips. In the absence of any chronologically diagnostic types it can be dated only generally to the Mesolithic or early Neolithic, and, given its stratigraphic position, was clearly in a secondary context.

The late Neolithic: the Royalton hengiform monument

Activity in the late Neolithic was evidenced by a hengiform monument at Royalton (Fig. 4; Plate 2) . The site was located at 133 m aOD at the base of a south-facing slope which forms part of the basin of one of the headwaters of the River Fal. It was defined by a circle of pits which enclosed a possibly subsequently constructed timber circle. No artefacts were associated with this structure, the only find being an intrusive medieval sheep/goat tooth. The features associated with the monument were intensively sampled and the analysis of pollen and charred plant remains from, and micromorphology of, the samples provides the basis for the interpretation of the monument.

A pair of parallel ditches defining a post-medieval field boundary cut through the monument on a NE-SW alignment. They appear to have removed a posthole from the north-eastern area of the timber circle and to have partly truncated four pits and three postholes, although these features survived to sufficient depths to allow their recognition. A posthole which would have formed the western side of the entrance also appears to have been removed

by a further later feature. The remainder of the pits and postholes, however, were unaffected and survived to a significant depth, all being sealed by shallow topsoil.

Phasing and chronology

The monument consists of two elements: a penannular arrangement of postholes which may have been related to a timber circle, and a penannular arrangement of pits. It is clear from the positioning of the postholes at the gaps between the pits (discussed further below) that the pits were still extant when the timber circle was constructed. However, differences in the primary fills of the pits and postholes suggest that the timber circle was constructed some time after the pits. The middle fill of the pit (1064) which was selected for detailed analysis consisted of a brown soil which was the naturally occurring soil at the time of construction. The higher fill, in contrast, consisted of a more humic soil, rich in charcoal, which had been affected by podzolisation. The primary fill of the posthole (1123) which was selected for detailed analysis included fragments of soil which indicate that podzolisation had already commenced at the time the feature began to fill. The primary fill of the posthole is thus likely to be contemporary or later than the upper fill of the pit, and the pit thus earlier than the posthole. Since the primary fill of the postholes lies below the postpipe, the possibility that the difference in the fills of the pits and postholes simply reflects the difference in the processes of filling between the pits - which were left open and thus probably began to fill soon after they were cut - and the postholes - which only began to fill after the post had rotted - can be ruled out. It is, nonetheless, impossible, on the basis of this evidence, to give a precise estimate of the likely difference in date between the two. Observations at experimental earthworks (Bell *et al*. 1996) – albeit constructed in differing environments – suggest that primary fills may accumulate quite quickly, and it is thus possible that only a few years separated the pit circle and the timber circle.

No material suitable for radiocarbon dating was recovered from the postholes of the timber circle. Three samples from the pit circle were submitted for radiocarbon dating (Table 1). One of these was a sheep/goat tooth from the primary fill (1178) of pit 1179. It gave a date of 780-980 cal AD (OxA-16125: 1142±25 BP) and was clearly intrusive. The remaining two samples suggest a date in the earlier part of the late Neolithic. Both samples were from primary fills: hazel from pit 1128 (fill 1131) and apple, pear or hawthorn (Maloideae) from pit 1154 (fill 1173). The two dates obtained - 2890-2620 cal BC for the hazel and 2910-2660 cal BC for the Maloideae (NZA-29340: 4175±45 BP and NZA-29302: 4208±40 BP) – are statistically consistent. Unfortunately, the relationship between the samples and the construction and use of the monument is uncertain. The charcoal does not derive from large dumps which could be assumed to be contemporary with the pits. Although charcoal was found in most of the pits, sometimes in appreciable quantities, no other *Maloideae* charcoal was identified, and hazel was not common. It is unlikely that such charcoal derives from structural timbers – there being no evidence that the pits contained posts anyway. The most likely source of the charcoal then is either clearance of the surrounding landscape or fires associated with the use of the monument. The possibility that the charcoal derives from an earlier phase of activity cannot, however, be excluded. Whatever the case, the date they suggest is consistent with dates obtained from similar monuments elsewhere, and perhaps can be taken as supporting the obvious suggestion that the monument was related, in some way, to the varied class of circular late Neolithic monuments which includes henges, timber and stone circles, and smaller monuments such as this example which are often referred to as hengiform monuments.

The pit circle

The first phase of the monument, then, probably consisted of a penannular arrangement of ten pits (or a penannular ditch in ten segments). The diameter of the circle measured 10.6 m to the outer edge of the pits, and 7.8 m to the

inner. There was a gap, about 6 m wide, presumably defining the entrance, facing just to the west of south.

The pits varied in plan. Most were roughly subrectangular or oval, with the width being greatest along the circumference of the circle (between about 1.5 and 2 times the width across the circle). Pit 1179 was kidney-shaped, the curve again following the circumference of the circle. The pits were between 1.3 and 2.05 m long, along the circumference of the circle, and from 0.76 m to 1.2 m wide (means = 1.7 m and 1.0 m respectively; Table 2). The length was generally quite consistent. All but two of the pits were between about 1.55 and 1.8 m. Only pit 1156 - 1.3 m across - was appreciably smaller, and only pit 1986 – 2.05 m long – appreciably bigger. It is noticeable that the smaller of these (1156) lies opposite the entrance (although given that there is an even number of pits it is not precisely in the middle of the ring), and the largest, adjacent to the entrance. However, the pit on the other side of the entrance (1063) was only of average size, and there is little other evidence that the size of the features varied systematically around the ring.

The depth of the pits does not seem to provide any indications of intentional variation. It varied from 0.28 m to 0.48 m. Most of the deepest pits lay on the west side of the circle (from 1063 to 1128), the shallowest on the east (from 1183 to 1086), although pit 1179 was also amongst the deepest. Overall, the depth seems to reflect the degree of truncation of the pits rather than any intentional differences in their form.

Not surprisingly, given the truncation of the site, no indication of a bank was found. Given the location of the postholes any such bank would have to have lain either inside the timber circle, or, more likely on the basis of comparisons with similar monuments, outside the pits.

The timber circle

The second phase of the monument was marked by the construction of a penannular setting of postholes. Assuming that two postholes were completely removed by the later ditch cutting across the monument, the ring

would originally have consisted of eleven postholes. The positioning of the postholes makes it quite clear that they were laid out in relation to the pits (assuming that the interpretation of the chronology of the monument based on the soil micromorphology is correct). Each posthole was placed opposite one of the causeways between the pits except for the most southerly (1158) which lay just to the east of the pit (1086) which defined the western edge of the entrance. Assuming that the arrangement of postholes was originally symmetrical, it seems likely that the corresponding posthole on the other side of the 'entrance' has been completely removed by the later ditch that cuts through the monument.

The circle of postholes had a diameter of 6.4 m, measured internally, and 7.8 m externally. The circle defined by the postholes was more or less concentric with the pit circle, and the postholes mostly lay about 0.5 m or more inside the pits. Only posthole 1095 lay markedly nearer to the pits, but this may be due to the collapse of the edge of the adjacent pit (1089) rather than to the original positioning of the posthole.

The postholes were all more or less circular in plan. Their diameters varied from 0.55 m to 0.80 m, mostly being around 0.60 m across (Table 2). The deepest postholes, with depths between 0.38 m and 0.54 m, were on the northern side of the monument (1139 to 1200). The depths of those on the southern side varied from 0.15 m to 0.34 m. This pattern mirrors that of the depths of the pits and is more likely to reflect the more severe truncation of the southern side of the monument than any original differences between parts of the monument.

Postpipes were preserved in five of the postholes. In each case, there was a small deposit at the base of the posthole which may have been added to level the tops of the posts. The postpipes varies in width from 0.27 m to 0.56 m, most being around 0.45 m, suggesting the use of large, but not monumental posts.

Analysis of the pit and postholes fills: the environment of the monument

The pits were filled with a fairly uniform very dark brown or black humic soil. Analysis of the micromorphology of the upper and middle fill of pit 1064 showed that the lower fill was a brown soil which would have occurred naturally in the area. The upper fill, however, consisted of a humic deposit, probably deriving from silting and *in situ* soil formation which contained a high proportion of charcoal from the roots and twigs of shrubs. This charcoal may reflect the secondary clearance of the area using fire. The deposit had been affected by podzolisation, a complex process which involves the leaching of iron and other components of the soil.

The postholes contained similar very dark brown or black humic fills. Analysis of the micromorphology of the fill of posthole 1123 showed that the primary fill (1122) again contained much charcoal and further indications of podzolisation. The indications of burning from the fill of the postpipe (1122) were even more striking, including not just charcoal but also a large proportion of burnt stones and sand.

The results of the pollen analysis of a monolith in pit 1064 were consistent with the results of the soil micromorphological analyses in suggesting secondary clearance. Pollen was not well preserved, especially in the lower part of the sequence. The relative quantities of pollen from different species may also have been affected by differential preservation. Very high levels of bracken and fern spores which are very resistant to decay were recorded from throughout the sequence. It is, then, perhaps not surprising that arboreal pollen was not well represented. There was, however, sufficient to suggest that hazel, birch and oak woodland existed nearby. What was most striking, however, was that whilst the proportion of hazel and alder pollen remained more or less constant, the proportion of oak declined, from around 15% in the lower part of the sequence to just a few grains in the upper part.

Herbaceous pollen were also not well represented, but again the presence of species such as Ribwort plantain, greater/hoary plantain, common sorrel, common knapweed and gentians suggest the existence of disturbed grassland

or pasture. Strikingly, however, the presence of sundew and occasional sphagnum moss and clubmoss spores in the upper part of the sequence suggest the development of acid, peaty conditions. Again, this is consistent with the indications of podzolisation provided by the soil micromorphology. Very few charred plant remains were recovered from samples associated with the hengiform monument. The few that were recovered were all from wild species, including species which suggest the existence of rough and disturbed ground - Black Bindweed, Common Knotweed, Campion species, cabbage/mustard family and Corn Spurrey-type - and plants from wet ground - Sedge species and rush family.

Only pit 1128 and posthole 1095 contained appreciable quantities of charcoal, although smaller quantities were recovered from four other features (Table 2). All of the samples except one were dominated by Oak. A high proportion of probable broom or gorse charcoal was recovered from pit 1154. There was no indication of any patterning in the distribution of the charcoal, nor any clear indications that the oak charcoal derives from the burning of a structure associated with the postholes. Like the gorse, it is just as likely to have derived from the use of the wood as fuel. Given the paucity of oak pollen, the predominance of oak is, nonetheless, striking, and suggests that oak was being selected deliberately and was possibly brought to the site from some distance.

Discussion

The environmental evidence associated with the hengiform monument suggests that it was constructed in a changing environment. Assigning a time scale to the sequence of construction of the monument, and to the accompanying changes in the environment, is difficult. The change is most clearly indicated in the contrast between the brown earth lower and middle fills of the segmented ditch or pits, and the indications of podzolisation in the upper fills of the same features and in the fills of the postholes . In the case of the earlier site of Carn Brea, where brown soils where transformed into

podzols during the period in which the site was in use (Macphail 1990; Mercer, 1981), a timescale involving decades or centuries was suggested. At Royalton, given that the pits must still have been clear features at the time the postholes were cut, a timescale at the shorter end of this spectrum seems most plausible.

Although pollen was not well-preserved, analysis of what did survive is consistent with the micromorphological analysis, notably in the decline in oak pollen towards the top of the fill, the high proportion of bracken and fern spores, and the presence of sundew, sphagnum most and clubmoss spores in the upper part of the sequence.

The presence of the charcoal, burnt stones and sand detected by micromorphological analysis in the upper fills of the pits and in the postholes is consistent with the idea that podzolisation was a product of the management of the landscape by fire. A similar suite of evidence, consisting of micromorphological evidence, pollen and charcoal seems to be associated with rapid acidification of the soil at Neolithic sites in Brittany (Gebhardt 1993; Macphail 1990; Dimbleby 1962; Duchaufour 1982).

Overall, the environmental evidence at Royalton seems consistent with that recovered from Bodmin Moor, where, although there were indications of earlier, small-scale clearances, the first clear signs of human impact on the environment occur in the middle Neolithic on the moors and during the later Neolithic in the valleys and lower slopes (Geary *et al*. 2000a, and 2000b).

In contrast to the pollen, the identifiable macro-charcoal associated with the monument is dominated by oak. It seems unlikely that this charcoal was derived from the burning of any timber structure associated the monument, but the dominance of oak nonetheless suggests that this species had been specially selected and brought to the site. There was also a notable proportion of broom or gorse in one pit which is more in keeping with the other environmental evidence.

The micromorphological evidence for a change in the character of the soil during the period over which the monument was constructed also

provides tantalising chronological evidence which is relevant to the understanding of the form of the monument. It seems that in its first phase the monument consisted of a pit circle or a segmented ditch with an entrance facing just to the west of south. No trace of a bank was found, but the positioning of the later postholes just within the pits suggests that any such bank would have been external. Analysis of the variation in the size and shape of the pits does not provide any indications of systematic differences at different points around the circle. The site had suffered from significant truncation which may have masked any subtle differences. What variation there was in the pits seems, in fact, to have been related to the degree of truncation rather than any deliberate design.

The positioning of the probably later postholes at the gaps between the pits indicates that the pits must still have been clear features, even if they were probably at least partially silted up, at the time that the postholes were cut. The soil micromorphological evidence nonetheless suggests that there must have been an appreciable gap between the two phases of construction. Thus, rather than the pits and postholes having belonged to two phases of construction of a single, preconceived monument, it seems more accurate to suggest that the monument was originally constructed as a simple pit circle, and that the postholes represent a subsequent elaboration of that pre-existing monument.

The radiocarbon dates from two of the pits suggest that the first phases of the monument dates from the period 2900-2600 cal BC, placing it, like many more or less comparable monuments, in the earlier part of the late Neolithic. Since it seems unlikely that many centuries would have passed between the construction of these two phases, the timber circle is probably not much later and may well have been constructed within the period covered by these dates.

The sequence of construction at Royalton appears to be the opposite of that which occurs at most other sites where the timber circles usually appear to have belonged to the first, or at least an early phase of the monuments

(Gibson 2005), as, for example, at Arminghall and North Mains and probably Millfield North and Woodhenge (Clark 1936; Barclay 1983; Gibson 1994). There are, however, a number of exceptions. At Oddendale and Ogden Down 3, for example, the timber circles appear to be 'closing' the site (*ibid.*). Cornwall appears more generally to represent an exception to this rule, with timber circles often being a late component on sites (Jones and Gossip 2007, 37).

Whilst the association of such standing elements, either posts or stones, and negative features, either ditches or pits, is, of course, well known, it can also be seen as marking a striking change in the form of the monument.

The evidence for the original form of the monument is rather slight. The absence of any indication of a bank has already been noted, and there is no evidence other than the truncated pits themselves for the original form of the monument.

The evidence for the form of the timber circle is only slightly better. The depth of the postholes varied between 0.25 m and 0.54 m. The reconstruction of the Sarn-y-bryn-caled timber circle (Gibson 1994; 2005) suggested that a ratio of 1:3.5 between the depth of the posthole and the height of the post above ground was reasonable. The timbers at Royalton, then, would have been around 1.9 m tall, possibly more depending on the degree of truncation by modern agriculture, with an entrance to the south.

Gibson (2005) notes that whilst free-standing posts convey little idea of circularity from outside the concept of which may have been of importance to the monument builders the addition of lintels makes the circularity of the monument much clearer. The use of lintels appears to be hinted at by Stonehenge, which, with its mortice and tenon joints, appears to be a fossilised timber circle, which presumably had precursors in timber (*ibid.*). Lintels would also strengthen the structure, allowing larger posts to be used (*ibid.*). However, if the timber circle was designed to symbolically reproduce the surrounding countryside, as appears to be the case with some stone circles

(Bradley 1998), with posts of different heights and materials, then lintels may have been impractical.

There is evidence from a number of sites that timber planks were used to fill the space between timber uprights and enclose the central space of monuments (Gibson 2005), particularly in the case of the well preserved timber circle at Holme-next-the-Sea (Brennand and Taylor 2003). Again, this may have been the case at Royalton, but obviously any indications of such a structure are unlikely to have survived.

There are as number of comparable sites, consisting of both pit and timber circles, or both, more or less close to Royalton which allow us to begin to place it within a tradition of monuments.

Excavations ahead of the Dorchester bypass (Smith *et al.* 1997) at the Conygar Hill site revealed a close parallel. Pit-ring 52100 comprised a continuous timber circle of eight postholes set within a segmented ditch comprising eight pits. The postholes were located opposite the gaps between pits, as at the Royalton hengiform, although the Conygar Hill monument had no obvious entrance. No direct dating evidence was forthcoming for this monument, although it was dated to the later Neolithic by comparison with a similar monument, Pit-ring 52118, located nearby, which was associated with Grooved Ware. This latter monument also consisted of a broadly circular segmented ditch which, however, was far less uniform than the other and did not have an internal timber circle. The two segmented ditches had diameters of 15 m and 17 m respectively, whilst the timber circle was just over 10 m in diameter.

A hengiform monument at High Cank in Dorset (Harding and Lee 1987), known from aerial photographs, comprises a circular ditch 2 m wide and up to 0.4 m deep enclosing an area up to 10 m in diameter. The ditch is accompanied by an outer bank of flint nodules, 3 m wide and up to 0.4 m high. On the eastern side there is a break in the bank with a corresponding causeway through the ditch.

The Highgate ritual enclosure (Nowakowski 1993, 149), located just under 3 km to the south-west of the Royalton hengiform, was a segmented ditch enclosure, measuring 12 m by 10 m in plan, with an urned Bronze Age cremation burial at its centre. It was located close to Little Gaverigan Barrow and a cluster of large pits; a cup-marked slate was also found nearby. Little Gaverigan Barrow had a number of phases of use, and if this was also the case for the Highgate enclosure, then the segmented ditch may have been related to an early phase of activity and thus possibly contemporary with the Royalton hengiform.

Along side these ditched and pit sites, there are a number of parallels for the timber circle at Royalton which were not associated with pits or ditches. At Cocksbarrow an irregular double ring of posts (46 in the inner and 43 in the outer) was identified with an entranceway to the south-east (Miles and Miles 1971). A number of the posts were sealed by the stones of a later cairn ring, although the rest of the posts may have been incorporated within the ring (*ibid.*).

A roughly circular arrangement of eight postholes was identified outside the kerb of a ring mound at Caerloggas I, whilst at Caerloggas III two of the phases of bank, which surrounded the highest point of the tor, contained a ring of posts, projecting from the bank top (Miles 1975). Cocksbarrow and Caerloggas I and II were all located on the St Austell granite, to the south of the A30, and were later covered by a mound.

A timber circle *c* 10 m in diameter associated with pits and Grooved Ware was identified Beneath Site 22 at Davidstow (Christie 1988). A radiocarbon date from this site was almost identical to those from the Royalton hengiform.

Excavation at Stannon Site 6 (Jones forthcoming, cited in Jones and Gossip 2007) identified a timber circle within an earlier ring cairn, whilst a second possible timber circle was identified within Stannon Site 9 (*ibid.*). A timber circle, approximately 8 m in diameter, was found at Bosmaugan, enclosing a central pit containing Trevisker pottery (*ibid.*, 33).

Excavation at Tremough (*op. cit.*) revealed the remains of five circular timber structures, one of them consisting of a pair of concentric rings. One of the timber circles was heavily truncated and another was not fully excavated. These timber circles varied in diameter between 6 m and 8 m, making them broadly the same size as the Royalton timber circle. Three of the circles had a probable entrance to the south-east, whilst two of them had central features.

A number of stake circles of various diameter are also known from Cornwall, predominantly associated with barrows. The barrow at Cernon/Carnon Downs had a ring of stakeholes, *c* 11 m in diameter (Dudley 1968), whilst on Davidstow Moor a circle of stakes *c* 21 m in diameter was noted around the barrow (Christie 1988). Excavation of the Otterham Barrow revealed two concentric stake circles, one *c* 4 m in diameter, the other *c* 24 m in diameter (Dudley 1961), whilst another pair of stake hole circles, *c* 4 m and 7m in diameter, was revealed at Tregulland Barrow (Ashbee 1958). Further stake circles were revealed at Carvinack Barrow, Trelowthas and on Goonhilly Down (Dudley 1964; Jones and Nowakowski 1997; Smith 1984). These stakehole circles highlight the importance of the circle in Cornish prehistory and provide some parallels for the more substantial timber circles. This broad similarity should, however, not be overstressed.

Having so far stressed more or less local sites, it is also worth noting that there are also much more distant parallels. Excavations in the vicinity of Ferrybridge Henge, West Yorkshire (Roberts 2005), for example, revealed a number of monuments which were interpreted as hengiforms. One in particular, Hengiform 162, which measured 14 m in diameter, bears particular resemblance to the Royalton hengiform. This monument comprised a segmented ditch of pits, with an entrance to the north-west.

The monument at Royalton clearly belongs within this diffuse tradition of circular monuments. It has long been apparent that the categories, such as 'hengiform monument', which are often used to classify the monuments involved do not do justice to the variations within this tradition. It is difficult, for example, to adequately reflect sequences of change, such as those

evidenced at Royalton and some of the other sites discussed above, within such classifications. However, the major difficulty with such classifications, from an interpretative point of view, is that they are purely formal, and there is no clear indication of how, or indeed if, the variation in the form of the monuments corresponds to variation in the way they were used. The term hengiform monument has been retained here only because it provides a convenient shorthand which gives some idea of the form of the site. It is not taken to carry any implications about the relationship of such sites to henges or other classes of monuments. The Royalton hengiform is perhaps better seen as an interpretation of certain themes, such as segmented ditches and circularity, rather than as the construction of a standard type of monument.

At its widest, the tradition to which Royalton belongs is characterised by more or less circular monuments often defined by a range of more or less ambiguous or counterintuitive boundaries. These qualities are well exemplified at Royalton. The pit circle, for example, defined a clear boundary using features, pits and perhaps a bank, which would have been physically difficult to cross, but then undermined that boundary by leaving numerous gaps within it. If there was a bank, it seems likely that it would have been external and thus look as though it was intended to keep something in, even though most of the users of the monument must have approached it from without. Similarly, the post circle may have consisted of free-standing posts rather than a complete, walled structure (although this latter possibility cannot be ruled out), and thus formed an incomplete upstanding structure which provided no shelter or privacy. It is curious features such as this which continue to attract attention to such monuments. They are, however, often explained away by the suggestion that, in the context of the contemporary beliefs associated with the monuments, they would have made sense. Recent work in the anthropology of ritual, however, suggests that it may be precisely the counter-intuitive and ambiguous qualities of ritual and ritual sites which makes them compelling (Boyer 2001; Sperber 1996). Leach (2000), for example, argued that the elaborate carvings associated with medieval church doors

were used to create a sense of confusion associated with the boundary they marked, rather than to express a clearly defined message. In this respect, the view of monuments such as that as Royalton as ritual sites seems warranted.

It is, then, perhaps not surprising that it is difficult to make sense of the variation in such monuments and of the sequences of change which they underwent. One element, however, may merely reflect the raw materials available. The stone circles of Cornwall fall into two principal groups, one on Bodmin Moor and the other in West Penwith (Mercer 1986, fig. 1). It is notable that many of the timber circles within Cornwall are located within the central area, between the two areas of stone circles, with a particular concentration in the vicinity of the A30 road scheme, perhaps suggesting that the concept of a circle (or oval) of uprights was simply being realised in timber here rather than stone.

Other elements of variation, however, may have been more significant. For example, the addition of the timber circle to the monument at Royalton could be seen just as the elaboration of a pre-existing monument, the function and status of which remained unchanged. It is also possible, however, that the addition of posts to the pits was intended to subvert the earlier monument. The contrast itself could, no doubt, have been subject to considerable symbolic elaboration, playing on the contrast between subterranean features cut into the soil, and others, projecting upwards from the ground. Evidently, however, there is too little evidence at Royalton, or indeed, most other comparable monuments, to suggest which of the innumerable possible interpretations is closest to the truth.

Although structured deposits have been recovered from a number of similar sites, the lack of finds associated with the hengiform and timber circle is not unusual. The hengiform at Barrow Hills, Radley, which was similar in size and shape, albeit without an entrance, had a placed deposit of antler and cattle limbs in its primary fill (Barclay and Halpin 1999, 35), whilst at Maxey 69 the hengiforms produced animal bones, including a cattle skull, antler fragments featuring incised linear decoration and traces of red colouring, and

a red deer rib with incised decoration and red and black colouring (Simpson 1981). This sort of deposit, or indeed any organic deposits, may well have left no trace in the highly acidic soils at the Royalton site. Any burial within the monument would probably not have survived, although it appears that even though burials are often found within timber circles, they are generally later than the construction of the monument (Gibson 2005).

It is equally difficult to be certain of the significance of other possible relationships. The possibility of lunar and solar alignments for stone circles has also been investigated for a number of sites, with the Hurlers on Bodmin Moor demonstrating a WSW alignment (Burl 1976) seen at a number of other Cornish stone circles, such as Trippet Stones and Boscawen-Un; this appears to align on the setting of the sun in early November (Burl 2005, 41). The alignment of the Royalton hengiform, being almost exactly north/south closely matches that of Castilly Henge and Castlewitch (Thomas 1964; Fox 1952) and would thus appear not to be related to any solar or lunar alignment.

It has been suggested that a number of stone circles had sight-lines focused on prominent hills (Burl 2005). The gap in the Royalton hengiform and timber circle faces south, towards the Iron Age hillfort of St. Dennis, which may have been visible from the site (given an absence of tree cover which is consistent with the associated environment evidence, at least for the later phases of the monument). The importance of hill tops in prehistory is well evidenced in the area, with the summits of nearby hills frequently having been the focus for ritual activity (Miles and Miles 1971; Miles 1975). Further afield, tor enclosures, such as Carn Brea and Helman Tor (Mercer 1981, 1997) emphasise the importance of notable hilltops, which may have had a symbolic importance for the local population (Tilley 1995). The particular hilltop perhaps being referenced from this site, Castle-an-Dinas, had certainly been in use in the Bronze Age, as two barrows were located within it (Thurley and Preston-Jones 1990), and it may even have had its origin in the Neolithic. One of its three ramparts is significantly smaller than the other two and has several gaps within its course. It is possible that this represents the remains of

a Neolithic causewayed enclosure (*ibid.*), although any such monument is likely to have been rather earlier in date than the hengiform monument. Outlying stones, larger stones within the circles and conspicuous gaps may have been used at other sites to provide reference to the observer, and one, or more, of these could have been used to provide reference from the timber circle at Royalton, although the depth of the postholes provides no clear evidence of significant variation in the size of the posts.

It is equally difficult to be determine how the monument might have fitted into the wider development of the broad class of monuments to which it belongs. The most obvious relationships are with other sites such as those at Conygar Hill, Ferrybridge and the Highgate ritual enclosure. It may also have been a remote ancestor to the possible early Bronze Age timber circles described below. More distant links, however, are more problematical. It has, for example, recently been suggested (Bradley 2007, 81) that, rather than looking towards henges, we should see the hengiform, with its causewayed ditch, as miniature versions of causewayed enclosures. It seems unlikely in the case of Royalton that any such link would be very direct. There are no confirmed causewayed enclosures in Cornwall, and recent research into the chronology of causewayed enclosures suggests that many of them were in use for only relatively brief periods, at least half a millennium before the monument at Royalton was created.

The early Bronze Age: the Lane End pit circles

A pair of adjacent pit circles to the south of Lane End Farm (NGR SW 9751 6155) provide the only evidence for activity in the early Bronze Age which was found along the route of the road scheme (Fig. 5; Plate 3). The two circles lay only 2.4 m apart and were both around 20 m across. Although the circles are too severely truncated for the presence of posts to be demonstrated, it seems likely that the circles were originally related to two timber circles.

In the western circle, twelve pits survived, defining a circle with a diameter of 19.4 m. It seems likely that a thirteenth pit on the south-west of the circle has been removed by a later, unrelated feature. The pits were quite regularly spaced, typically 3.0 - 3.75 m apart. Most of the postholes were roughly circular in plan. They varied only slightly in size: the width from 0.76 m to 1.25 m, and the depth from 0.08 to 0.25 m (Table 3). Most only survived as shallow, more or less bowl-shaped features and the variation in size is more likely to reflect the degree to which they have been truncated than differences in their original size. The upper fill of all of the pits consisted of a soft, dark organic deposit. The lower fills almost always consisted of light grey silty clay deposits, although in a few cases deposits of this kind were missing and the whole pit was filled with dark, organic material.

In the eastern circle thirteen pits survived, defining an only slightly larger circle with a diameter of 20.4 m. It seems likely that two pits had been removed by a drainage ditch which lay to the north. The pits were slightly more closely spaced than those in the western circle, the intervals between them varying from 2.2 m to 2.4 m apart. They were, again, more or less circular in plan, with diameters similar to those of the pits in the eastern circle, varying from 0.95 m to 1.42 m (Table 3). Although they also survived only as quite shallow, bowl-shaped features, they were preserved to a greater depth than those in the eastern circle, the depth varying from 0.16 m to 0.40 m (Table 3). Again, the differences in the size are more likely to reflect the degree of truncation rather than original differences in size.

The pattern of fills was similar to that in the western circle, generally consisting of lighter, greyish silty clay lower fills below dark, organic upper fills, although again, in a few cases, the lighter, lower deposits were absent.

Most of the pits were so severely truncated that it is not surprising that no postpipes survived nor that there is no sign, such as disturbance to the sides of the features, to indicate that posts have been removed. This means that it is impossible to exclude the possibility that originally the monuments consisted of nothing more the circles of pits. However, given the size and

layout of the pits, it is perhaps most plausible to suggest that the features were related to timber circles. The width of the pits suggests that any such posts would have been quite large.1

No finds were recovered from any of the pits other than charcoal (Table 3). The charcoal from the nine pits from both circles which were analysed consisted almost entirely of oak charcoal, often consisting of heartwood. More charcoal was recovered from the eastern pit circle than from the west, but most of this came from pits on the eastern side of the circle. There was little charcoal in the pits on the western side of the circle. The only identified charcoal recovered which was not oak was a little hazel from pits 4249 and 4283 and some Maloideae (apple, pear, hawthorn etc) from pit 4272 (Table 3).

Radiocarbon dates were obtained from four samples (Table 1), two from each of the circles. Given that the oak charcoal was unsuitable for dating because of the possible offset caused by potentially old wood, there was very little material suitable for dating. Two fragments of hazel charcoal from the upper fill (4247) of pit 4249 in the western circle were dated (NZA 26253: 3460±30 BP and NZA 29360: 3403±15 BP) as was one fragment of hazel charcoal (NZA 26254: 3328±30 BP) and a fragment of charcoal from a twig of unidentified species (NZA 29342: 162±40 BP) from the upper and middle fills (4284 and 4285) respectively of pit 4283 in the eastern circle. It is impossible to be certain that these fragments of charcoal were contemporary with the filling of the pits. Although the presence of appreciable amounts of oak charcoal, possibly deriving from posts associated with the pits, could be taken to suggest that it is unlikely that the charcoal is intrusive, the very fact that the charcoal which was dated was not oak, and is perhaps unlikely to have been part of the structure, can be taken to suggest that the dated charcoal is unlikely to be directly related to the pits. The uncertainty surrounding the relationship between the dated material and the pits is underlined by the fact that whilst three of the samples produced dates in the early Bronze Age, the fourth (NZA-29342: 162±40 BP), on the unidentified twig charcoal from the

middle fill (4285) of pit 4283 in the eastern circle, produced a result of 1660-1890 cal AD (78.4% probable) or 1910-1950 cal AD (17.0% probable). Although no evidence for disturbance to the deposit was noted during excavation, the sample evidently consists of intrusive, modern material. The other date from the eastern circle was obtained from Hazel charcoal from the upper fill of the same pit, and there must be considerable doubt about its association with the pit.

Even though they give plausible early Bronze Age dates, the uncertainty surrounding the association of the remaining samples with the pits makes their interpretation problematical. The two samples from the western pit circle, both on Hazel charcoal from pit 4249, are very similar: 1780-1640 cal BC and 1880-1680 cal BC. A chi-squared test on these two dates shows that they could have been contemporary (df=1 T=2.9 (5% 3.8); Ward and Wilson 1978). If the determination from the eastern circle is included with the two dates from the western circle, the chi-squared test fails (df=2 T=9.778 (5% 6.0); Ward and Wilson 1978), and it is clear that although the very edges of the ranges of the date from the eastern circle (NZA-26254) and the later of the two dates from the western circle (NZA-29360) overlap, it is highly likely that the material from the eastern circle was later in date than that from the western. This result raises the possibility that the eastern circle was later in date than the western circle, perhaps even a replacement for it. Unfortunately, because of the uncertainty surrounding the association of the dated material with the circles, this suggestion remains no more than speculation.

Discussion

Many of the comments made with reference to the Royalton hengiform could also be applied to the Lane End pit circles. The discussion here will, therefore, be confined to the form of the site itself and questions concerning its chronology. The evidence for the original form of the monument or monuments associated with the pit circles is very slight. There were no postpipes definitely confirming the presence of posts, and it is thus uncertain

whether the circles were related to timber circles or were nothing more than simple circles of pits. The fact that the charcoal is dominated by oak, including much heartwood, is striking, and certainly indicates that the wood was deliberately selected for some purpose. However, whilst it is possible that the oak charcoal derives from a wooden structure associated with the pits, there is no clear indication that that was the case. The circles fit well with Gibson's (1994, Fig 40) plot of timber circle diameter against date. Both fall firmly within the diameter range for circles dating from 2000-1000 BC. It is thus quite possible, despite the lack of clear evidence, that the pits were related to timber circles.

The direct evidence for the chronology of the monument is, however, equally ambiguous. Whilst three of the four radiocarbon dates fall within the early Bronze Age, the fourth, falling in the modern period, was clearly intrusive. It is the lack of a secure association between the dated material and the use or construction of the pit circles, exemplified by the intrusive sample, which reduces the value of the dates. This is unfortunate because, intriguingly, the dates that were obtained suggest that the eastern circle may have been slightly later in date than the western circle. This raises the possibility that the eastern circle was either a replacement for the western circle or a later addition to it.

These possibilities have important implications for our understanding of the monuments. It is, perhaps, usually assumed that such monuments were used over relatively long periods. This assumption has certainly been made in the interpretation of the much earlier causewayed enclosures. The recent application of Bayesian modelling to radiocarbon dates from causewayed enclosures suggests that at least some of them were, in fact, in use for quite short periods, in the order of a few decades (Bayliss 2008; see Whittle *et al. forthcoming*). The dates from the Lane End circles are clearly insufficient to produce an estimate of the period over which they were used. It is, however, worth noting that the porch posts of a reconstruction of an Iron Age roundhouse at Butser Ancient Farm had rotted away at ground level

after only eight years, and those of the inner post ring, which had been protected by the thatched roof, after 15 years (Reynolds 1995). The structure of the roundhouse was such that the house remained sturdy despite this decay. A free-standing ring of posts would not have fared so well. Whilst this suggests that timber circles would have had quite short lives, if there were further elements binding the uprights into a cylinder, the structure might, nevertheless, have had a much longer life.

It is also worth asking not only whether timber circles would have been durable monuments, but also whether they would have been regarded a such. No clear answer can be given to these questions. On the one hand, a timber circle may well have been seen as subject to decay, and thus temporary in relation to other kinds of monuments, such as stone circles. On the other hand, most of the rituals described by social anthropologists (eg Van Gennep 1960; Turner 1969) are carried out either in and around non-ritual structures such as houses or in temporarily marked out spaces. In relation to such temporary spaces, a timber circle might have been viewed as a durable structure.

These perspectives imply that the site would have been used repeatedly. It is, however, also possible that the circles were related to specific events, part of which may have included their construction. They may subsequently have stood for a period and acted as a commemoration of that event, but their ongoing maintenance, of which there is no indication at Lane End, need not have been important. Such a short period of use would be consistent with the paucity of finds which is characteristic of Lane End and many other comparable sites, although of course it is also possible that whatever activity did take place there simply did not lead to the incorporation of durable material in the archaeological record.

There are a number of sites both in Cornwall and more widely where multiple timber circles have been found which could be understood as having been formed as a sequence of short-term monuments rather than as the

elaboration of a durable site. Unfortunately the chronological evidence from these others sites is as slight as that that at Lane End, or even more so.

The features located near Mount Pleasant during the works associated with the construction of the Maudlin to Indian Queens pipeline (Network Archaeology 2002, fig 9), offer a possible local comparison. These comprised a possible barrow, associated with a pair of concentric semicircles of pits and postholes, described as being filled with peat (*op. cit.* 20). The possible barrow was seen in section and the semicircles of pits and postholes may well have been just sections of full circles, with their southern halves remaining unexcavated. The fill of these features seems similar to the upper fill in the Lane End pits, and although the dimensions of the circles, at *c* 15 m and 11 m, are smaller than that of the Lane End Pit circles, and the constituent features are also smaller, averaging *c* 0.7 m by 0.5 m in plan, they do bear some resemblance. No datable artefacts were recovered from any of these features (*ibid.*) and no samples suitable for radiocarbon dating were recovered (R Moore pers. comm.).

A brief summary of other Cornish timber circles has already been given above. Of these, the double ring of posts from Cocksbarrow (Miles and Miles 1971) appears similar to the Mount Pleasant site. The site at Tremough (Gossip and Jones 2007) revealed five timber circles, broadly in a line, although there was significantly more distance between the closest circles than was seen at the Lane End site.

A close parallel, in terms of form, if not geographically, is provided by the adjacent timber circles located at Ferrybridge, known as Ferrybridge North and Ferrybridge South (Roberts *et al.* 2005). Here the timber circles were approximately 25 m apart and were slightly smaller in diameter than the Lane End circles. The Ferrybridge circles, however, remain undated, although their almost identical forms, with central posts, certainly suggests that they were close in date. These circles, like the Lane End circles contain no obvious entrance.

The late Neolithic/early Bronze Age and middle Bronze Age: tin production at the Belowda pit and hearth group

An unusual arrangement of pits, a hearth and a ditch, located within the Belowda field system (NGR SW 9725 6154), have a special significance because evidence for tin production, probably dating from the middle Bronze Age, was recovered from one of the pits (Fig. 6; Plate 4). However, evidence for the date of this group of features was recovered from only two features, one of which appears to date from the late Neolithic/early Bronze Age whilst the other dates from the middle Bronze Age. Unfortunately, the evidence for tin ore processing was recovered from a pit which lacked any direct chronological evidence, and it is suggested that it relates to the middle Bronze Age activity only on the basis of the spatial relationships between features and because the date of the late Neolithic/early Bronze Age activity would be early, albeit perhaps not impossibly so, for the use of tin.

The evidence for tin ore processing

The evidence for tin ore processing was recovered from a shallow pit (4428). It was retrieved through analysis of the micromorphology of the pit fills which included microprobe analysis for a wide range of elements, including tin, and quantitative grid analysis of two tin rich areas. The lower fill of pit 4428 contained a large proportion of material indicative of the action of heat: fine and coarse charcoal fragments, rubefied material, possible fused soil and a large, apparently heat-fractured fragment of vesicular slag or of a crucible. It also contained grains of the tin ore cassiterite. These grains were subrounded indicating that they probably derive from alluvial deposits.

The fill above this (4432) contained a similar range of material: charcoal, burnt minerals, slag, and tin ore. Microprobe mapping and quantitative analysis of subsamples from this layer found points of very high concentrations of tin which probably correspond to grains of cassiterite identified in the micromorphological thin sections. The materials identified in

these layers are highly suggestive of tin ore processing and possibly of tin smelting. Only traces of copper were found and there is thus no indication that bronze was being produced.

A hearth (4455) near to pit 4428 was also tested for tin residues with negative results.

The features

The shallow pit from which the evidence for tin ore processing came (4428) formed part of a small group of further features (Fig. 6; Plate 4; Table 4). The pit itself lay just within the arc described by a gully to the east (4439=4455=4439). To the west lay a very rough alignment of further pits and a hearth (4451). The pits varied considerably in shape and size. The pit containing the evidence for tin ore processing (4428) was oval in plan, had a flat base, and may originally have had vertical sides. It measured 2.05 m by 1.40 m across and was 0.48 m deep. A much smaller and shallower pit (4436), just 0.70 m across and 0.52 m deep, just to the north had been partially truncated by a more recent feature. To the west lay a group of three larger pits (4421, 4158 and 4414), trapezoidal, irregular and oval in shape, between 2.50 and 2.70 m across and from 0.35 to 0.70 m deep. The hearth (4451) lay just to the north of one of these pits, and was roughly circular in plan, measuring 1.00 m across but only 0.12 m deep. It was lined with stone. Further to the west lay two further smaller, shallower, roughly circular pits (4172 and 4136), 1.25 to 1.65 m across and 0.34 to 0.37 m deep.

The east-north-east - west-south-west alignment of these features roughly defines an axis which runs through the centre of the arced gully (4439=4455=4446) which lies to their east. The gully described an arc, around 12.5 m long, and was bowl-shaped in section (0.35 m deep). There was a further gully (4166=4169) which ran in a roughly straight north-south line for 4.70 m to the south of one of the large pits (4414). In profile, this ditch had a rounded base and steep, concave sides.

Chronological evidence

Whilst the alignment of the features in relation to the arced gully suggests that they were related and may have belonged to the same phase of activity, the limited chronological evidence suggests at least two phases of activity, with a considerable interval, probably of some 800 to 1000 years between the two.

A single sherd of Trevisker pottery - a flat-topped rim with external expansion and cord-impressed decoration typical of Trevisker pottery - was recovered from the northern terminus, 4439, of the arced ditch. The rim is from a large storage jar, of Parker-Pearson's (1990, 9) Style 1, with a diameter over 0.35 m (Woodward and Cane 1991). The decoration, consisting of a horizontal line below the rim with a chevron below, is severely abraded but it is clear that the impressions were made with a double line of cord with alternate twist (so-called plaited cord). The fabric is also typical of Trevisker assemblages, and consists primarily of Lizard gabbroic clay to which dolerite fragments, probably derived from the Lizard, have been added.

A radiocarbon date (NZA-25411: 3226±35 BP; Table 1) was obtained from *Maloideae* (apple family) charcoal from the same context as the pottery. As discussed below, all of the features in this complex contained large quantities of charcoal, and although oak dominated, most features contained an appreciable proportion of *Maloideae* charcoal. Given the quantity of charcoal present it is reasonable to assume that the dated charcoal was not residual. The calibarated result - 1610-1420 cal BC - is consistent with the accepted early to middle Bronze Age chronology for Trevisker pottery.

Pottery was also recovered from the western-most pit (4136). The sherds include a clumsily modelled base angle from one vessel and a few body sherds from another. They were in a fabric containing a range of granite-derived inclusions which suggest that the self-tempered clay came from a local source, possibly from alluvial deposits at Tregoss. No parallels for the use of this clay are known (Parker-Pearson 1990) but the use of a local fabric is more suggestive of the early Bronze Age than of the middle.

The earlier date for this feature suggested by the pottery is supported by a radiocarbon date (NZA-29359: 3893±20 BP; Table 1) obtained from hazel charcoal from the same pit. Hazel charcoal occurred in varying quantities in almost all of the sampled features in this group, and it is thus reasonable to assume, given the generally large quantities of charcoal they contained, that the charcoal is intrusive. When calibrated, this date is, however, considerably earlier than that from obtained by the ditch: 2470-2290 cal BC (95.4% probability), suggesting a date in the late Neolithic/early Bronze Age.

Unfortunately, there is very little indication of which of the other features might have belonged to which of these phases. The only other artefact recovered from group of features was a saddle quern from the western-most pit (4136). This type is more typical of middle Bronze Age contexts, but is not sufficiently diagnostic to demonstrate that the charcoal and pottery were residual. The quern lay with its grinding surface uppermost at the base of the upper fill of the pit. It is very narrow and has an unusual oblong shape which suggests that it may not have been used to grind cereals. It is unlikely to have been used to grind tin ore since the ore used on the site is likely to have come from an alluvial source which would have required little processing. Although any peck marks to the quern's surface have been removed, the grinding surface is still almost flat and it is clear that the quern was not much used before it was deposited. It appears to be made from an extremely micaceous sandstone.

The only other material recovered from the features in this group was charcoal the composition of which, despite the apparent divergences in chronology, was very similar in all of the features sampled. Oak predominated in all of the samples and was usually accompanied by greater or lesser proportions of Hazel and apple family charcoal as well as, occasionally, other species. The charcoal includes, in all samples, a high proportion of roundwood.

Discussion

The discovery of a tin processing site and the apparent use of alluvial cassiterite in contexts of Bronze Age date is of considerable interest. For the early Bronze Age, tin bronzes were probably exclusively produced in Britain from cassiterite from the south-west (Northover 1982), and despite the widely-held belief that Cornish tin must have been important throughout the Bronze Age (*ibid.*; Tylecote *et al.* 1989), finds relating to its extraction and processing are rare (Pollard forthcoming; Fitzpatrick forthcoming).

Evidence for the extraction of tin in the Bronze Age includes an oak-lined shaft, extending from the surface to the base of the tin ground, which was discovered at Wheal Virgin streamworks, Pentewan in the nineteenth century, with a bronze chisel and middle Bronze Age socketed spearhead found at its base (Penhallurick 1986, 166). Numerous artefacts, such as antler picks, bronze age metalwork, and a jet object, as well as burials were found by later tinners in various streamworks across Cornwall (*ibid.*). Evidence for the Bronze Age processing and smelting of tin is, however, somewhat rarer. A hoard of cassiterite nodules were recovered from a hut at Trevisker, a fragment of slag and a cassiterite pebble were found in a house at Dean Moor, and a hollow at Trenowah was associated with Trevisker style pottery and pits containing a concentration of cassiterite (Fitzpatrick forthcoming; Gerrard 2000). Whatever it's shortcomings, The evidence from the Belowda pit and hearth group thus forms a significant addition to the very slim evidence for tin processing in the Bronze Age.

The interpretation of that evidence is not, however, entirely straightforward, and it is worth making several points involving both the archaeological visibility and recovery of the evidence at Belowda, and the scale of production it suggests, in relation to the scarcity of evidence for tin processing in Cornwall. The first is that the evidence was far from conspicuous and under most circumstances would have been missed. Initially, the effort to detect tin was focused upon the hearth (4455) from which no indications of tin were recovered. It was only due to the use of

microprobe analysis that the evidence for tin processing was noticed. It is quite possible, in the absence of the application of such techniques, that tin processing at other sites has not been identified. It will only be possible to gauge the frequency with which such evidence might have occurred at other sites when such techniques are used more widely. It is, for example, worth noting that excavations of two plots in the vicinity of the Belowda pit and hearth group, Plots 99 and 100, along the Maudlin to Indian Queens pipeline (Network Archaeology 2002) which lay about 35 m north of the current scheme, revealed features interpreted as hearths or fire-pits. Only one of these features revealed evidence of in-situ burning, having burnt natural clay at the base of the fill. The features were either oval or circular in plan, measuring up to 1.5 m in length, which is broadly comparable to the pits in the Belowda pit and hearth group. No finds were recovered from the features, although charred corn spurrey (*spergula arvensis*) seeds, an indicator of rough and disturbed ground, were identified in one of the features. It is worth noting that half a granite saddle quern was found in an unstratified context in Plot 100. Although these features have not yet been dated by radiocarbon assay (R Moore pers comm), it was believed they were probably prehistoric (Network Archaeology 2002). Although these features are at present undated, their proximity and similarity to the Belowda pit and hearth group is notable, and perhaps suggests that the activities being undertaken at the latter group could have been more widespread than is currently apparent.

The second point is that the difficulty of detecting tin processing must also be due to the fact that it may leave very little trace. The processing of the alluvial tin itself would have been relatively straightforward, with perhaps limited crushing of the cassiterite and washing of the resultant material, followed by smelting in simple furnaces (Fitzpatrick forthcoming; Gerrard 2000; Penhallurick 1986).

The interpretation of the features at Belowda is not immediately obvious. Part of that difficulty evidently relates to the fact that not all of the features were contemporary. The radiocarbon evidence suggests that the site

consists of a palimpsest of features from at least two phases. The length of the hiatus between the two phases suggests that the association of the two phases is just coincidental. There is, unfortunately, no clear way, beyond the radiocarbon dates themselves, to determine which features belong to which phase.

Despite the evidence of tin ore processing and possibly smelting, and the presence of significant quantities of charcoal, the pits did not exhibit clear indications of burning *in-situ*, as one might expect of a furnace, and the positively identified hearth did not contain any tin. The absence of charred cereal remains, or other material which one might expect to find on a domestic site, suggests that the site might have been a small scale, perhaps only briefly occupied tin processing site.

The final point worth making about the evidence for tin processing at Belowda, then, is that the tin production seems to have been small scale. It is impossibly to estimate how much tin might have been extracted, given that what is preserved cannot have been more than a fraction of what was originally present. Clearly, also, it must be borne in mind that only small quantities of tin and needed to produce bronze. Even so, the contrast between the scale of production suggested at Great Orme Head (Timberlake 2002) and that at Belowda is striking. The implications of this contrast are, at present, difficult to define. On the one hand, if the Belowda site was typical of tin production sites, then we should expect such sites to be quite common, and only the difficulties of identifying tin processing might help explain which such evidence has not been identified more widely. On the other hand, it may be that Belowda is not representative of tin processing sites, and that production was indeed carried out elsewhere on a larger scale. This latter possibility would, of course, again raise the question of why these other sites - which should be more conspicuous than Belowda in terms of archaeological detection - have not been found, and would imply that we still lack evidence from typical tin processing sites in Cornwall. Neither of these possibilities is perhaps very appealing, but only further fieldwork, including the use of

microprobe or similarly detailed analysis of sediments, will allow us to decide between them.

The palaeochannel: the environment from the middle Bronze Age to the present day

The environmental evidence recovered from a pollen sequence from a palaeochannel in the valley to the south-west of Belowda Lane (NGR SW 9562 6157; Fig. 2) extends from the middle Bronze Age up to the present day. The channel was around 10 m wide and 0.50 m deep, and was filled with a sequence of layers: sandy silts and peats (2005) at the base, layers of natural sandy gravel (2006) and sand with areas of redeposited organic material (2004) in the middle, and a further deposit of sand and gravel at the top (Fig. 7). There was no indication of any significant break in the sequence of deposits.

The pollen sequence derived from these deposits has been divided into four zones which can be approximately dated on the basis of five radiocarbon dates obtained from organic material in the channel fills (Figs 8 and 9; Table 1). Since these dates form a stratigraphic sequence, an attempt has been made to refine them using the Bayesian statistics implemented in OxCal (Fig. 10; Table 1). However, the five dates are so widely spread across a period of nearly 4,000 years that the dates estimated by the model (the posterior density estimates) are almost the same as the unmodelled dates (Table 1). The number of dates is also insufficient for the model to provide a meaningful estimate of the start of deposition. The first date (SUERC 10873: 3115±35), from near to the base of the sequence, and belonging to Zone 1, gives a calibrated range in the middle Bronze Age: 1490-1290 cal BC (94.7% probability). The beginning of Zone 2 is dated to the middle Iron Age: 390-200 cal BC (SUERC 16076: 2220±35 BP). Zone 1 thus probably extends from the early or middle Bronze Age (given that the middle Bronze Age radiocarbon date is not from the very bottom of the sequence) into the early Iron Age. A date of cal AD 980-1160

was obtained from nearer the top of Zone 2 (SUERC 16074: 995±35 BP). The beginning of Zone 3, however, is dated (SUERC 16075: 200±35 BP) only very vaguely to between 1640 and the present day (1950 in terms of radiocarbon dating). It thus seems likely that Zone 2 covers a long period, from the middle of the Iron Age up to roughly the end of the medieval period. The date obtained from the beginning of Zone 4 was very similar to that obtained from Zone 3 (SUERC 10872: 250±35 BP): cal AD 1510 to the present day. It is thus clear that whilst Zones 3 and 4 cover the last four hundred years, the radiocarbon dates obtained are insufficient to specify the date of the transition between them.

The results of the pollen analysis suggest that throughout the period represented the landscape was predominantly open grassland with some areas of hazel and oak woodland.

The herbaceous pollen in Zone 1, extending from the early or middle Bronze Age up to the middle Iron Age, is dominated by grass (Poaceae) and sedge (Cyperaceae) pollen. They were accompanied by a large range of less well represented taxa. Cereal pollen grains, of barley or wild grass type, and wild or cultivated oats or wheat suggest some cultivation was being carried out nearby. The quantity of cereal pollen declines towards the end of the period represented by this zone. The arboreal pollen is dominated by alder and hazel-type pollen. Birch was also represented alongside very small quantities of oak and heather. Not surprisingly, given that the pollen comes from a palaeochannel bed, a number of aquatic taxa, such as pondweed lesser bulrush/bur-reed, are recorded throughout the sequence.

The pollen from the long period represented from Zone 2, stretching from the late Iron Age to the end of the medieval period was very similar to that from Zone 1. The period is, however, marked by several minor fluctuations in the proportions of herbaceous and arboreal pollen.

The most striking change in the pollen occurs in Zone 3, which probable dates from a period spanning something like the 17th and 18th centuries. The quantity of arboreal pollen, and in particular Alder and Hazel,

declines whilst heathland taxa such as heather, cross-leaved heather, sedge and bracken, increases. The quantity of microscopic charcoal also declined in the lower part of this zone, perhaps indicating that the landscape was less affected by fire in this period.

In Zone 4, which may cover something like the last two centuries, the pollen values return to levels similar to those in Zones 1 and 2, suggesting a recovery in woodland. In particular, alder and hazel return to their previous levels and heather and pollen levels decline. The deposits associated with this zone, however, contained pockets of redeposited organic material, and it is possible that the contain both contemporary and older pollen mixed.

The later Iron Age and Roman period: roundhouses at Belowda and Lower Trenoweth

The Belowda Roundhouse

The remains of the Belowda roundhouse were located *c* 400 m south-east of the village of Belowda (NGR SW 9692 6148). They comprised a penannular ditch (4059), 1.4 m wide and up to 0.7 m deep, with an external diameter of *c* 14.7 m, enclosing a number of internal features (Fig. 11; Plate 5). The ditch was probably originally a drainage ditch for the roundhouse, with one definite and one possible entrance. The definite entrance faced to the east, and was defined by ditch terminals packed with stone rubble, possibly deriving from the demolition of the roundhouse. This entrance was also marked by a four-post structure (postholes 4080, 4085, 4087 and 4105) which may have formed an internal porch. A hexagonal arrangement of posts, incorporating the two rearmost porch posts, was placed centrally within the pennanular ditch, and probably indicates the position of roof supports. The other possible entrance, located to the north-west, was far less convincing than that to the east. The ditch was extremely shallow in this area and it seems likely that the gap at the north-west was merely the product of truncation. No further

recognisable structural patterns could be discerned from the arrangement of pits and postholes within the ditch. The area within the ditch was, however, marked by a concentration of stone which may derive from the collapse of the walls of the roundhouse, although there were no clear indications from the distribution of the stone that this was the case.

To the north-west of the roundhouse, a pair of curvilinear ditches was recorded (4379 and 4373). The southern ditch (4373) appeared to be the continuation of a substantial ditch (4216=4217) located 12.5 m to the south-west. Together these ditches appear to have formed an entranceway, possibly to a droveway. The ditches are undated, but could represent traces of stock enclosures surrounding the site.

The analysis of the micromorphology of a stony layer of dark soil (4381) that covered the site, provides evidence for the possible use of turf in the roundhouse, either forming the walls, a bank around the roundhouse, or possibly, as roofing material. On the basis of its grain-size, microfabric, phosphate content, lack of humic content and the high proportion of stones, the layer does not appear to have been a naturally formed soil. The fine sandy soil was, instead, turf-like, and it seems likely that it derives from the collapse of a turf-built structure or structures associated with the house. This probable turf also provides information on the landscape history of the area around the roundhouse. It contained charcoal and burnt mineral and soil inclusions which suggests that the local grassland had been managed using fire (cf. the Royalton hengiform monument above). A whetstone and an assemblage of worked flint were also recovered from this layer. Both are likely to have been redeposited when the turf was used as a building material. The whetstone was nothing more than a flat pebble which had been used as a whetstone along one edge. The possibly Mesolithic or early Neolithic flint has already been discussed above (see 'the Mesolithic and early Neolithic').

Two samples in stratigraphic order were selected from the fills (4144 and 4143) of the roundhouse ditch in a single intervention (4145) for radiocarbon dating (Table 1). The samples consisted of charred wheat grains

(*Triticum aestivum/durum*) and hazel charcoal (*Corylus avellana*). Fill 4143 contained large quantities and hazel charcoal, and both fills contained large quantities of other charred plant remains including wheat. There is thus good reason to believe that neither the charcoal nor the charred grain is intrusive or residual. The determinations (NZA-29341: 2131±35 BP and NZA-25410: 2131±40 BP) are very similar and show good agreement when modeled as a sequence (A_{model}=111.1%, $A_{overall}$=109.3%; Fig. 12). They suggest that the house was in use in the period 360-40 cal BC (Table 1).

The only artefact recovered from either the ditch or the internal features was a flint blade from a posthole (4157). The roundhouse ditch did, however, contain large quantities of charred plant remains. The charred plant remains from three contexts, all fills of the roundhouse ditch, and including the two contexts from which the radiocarbon dated material was obtained (4143 and 4144), were analysed in detail (the other sample was from context 4377: see section 4094, Fig. 11). There was little significant variation between the samples, although the sample from context 4134 was considerably richer than the other two.

All of the samples contained cereals, although they make up only a small proportion of each sample. Many of the cereal grains could not be identified but wheat (*Triticum* sp.) and wild or cultivated oats (*Avena* sp.) were identified. Quite large amounts of wheat and oat chaff, including glume bases, spikelet forks, rachis nodes and internodes, awn fragments and floret bases were idenitified in two of the samples (4143 and 4144) but were absent from the third (4377). Some of the wheat chaff was identified as coming from spelt (*Triticum spelta*) and some of the floret bases were identified as definitely coming from wild oats. Some of the wheat grains were atypical, being noticeably short and plump. Whilst this might be taken to indicate the presence of bread wheat (*Triticum aestivum*) the grains also had impressions often found on glume wheat such as spelt (*Triticum spelta*). Some of the chaff also had atypical characteristics, and it is possible that some of the wheat belongs to a rare or extinct species which cannot be identified using standard

methods (Hillman *et al.* 1996). The sample from context 4144 contained a considerable number of detached coeloptiles, although there were no sprouted grains which are often found with coleoptiles. These may reflect the fact that the charred plant remains from this context derive, in part, either from a crop which had begun to germinate but which was too valuable to be disposed of fully or from wild grasses which had germinated whilst being used on the site.

The samples also contained numerous remains of grasses, including culm nodes and bases, some with the rhyzomes attached, as well other rhyzome fragments. These remains, together with those of the cereals, such as the wheat and oat awn fragments, suggest that the remains may represent whole plants rather than crop processing waste.

The abundant and varied weed seeds were dominated by species characteristic of disturbed, waste or open cultivated ground. The most common of these were common chickweed (*Stellaria media*), corn spurry (*Spergula arvensis*), goosefoots or oraches (*Chenopodium* sp./*Atriplex* sp.), hemp-nettles (*Galeopsis* sp.), cleavers (*Galium aparine*), pale persicaria (*Persicaria lapathifolia*) and knotgrass or black bindweed (*Polygonum aviculare*/*Fallopia convulvulus*). The large quantities of grass seeds (Poaceae) and ruderal species, such as ribwort plantain (*Plantago lanceolato*), common sorrel (*Rumex acetosa*), selfheal (*Prunella vulgaris*) and Lady's/hedge bedstraw (*Galium verum/mollugo*-type) indicate the presence of grassland. Wet ground and heathland is suggested by only a very small number of seeds of, for example, common spike rush (*Eleocharis palustris*), sedge (*Carex* sp.) and heather (*Erica* sp./*Calluna vulgaris*).

Particularly in the case of the rich samples from context 4143, the very abundant charred plant remains, including uprooted plants, may derive primarily from flooring, bedding or land clearance rather than crop processing, and the cereal remains may derive from either relic crops or the waste from very limited crop processing.

Lower Trenoweth Roundhouse

The remains of the Lower Trenoweth roundhouse were located *c* 800 m west of the Belowda roundhouse (NGR SW 9613 6145). They consisted of a pair of concentric penannular ditches and a series of internal features, mostly interpreted as postholes (Fig. 13; Plate 6). The internal ditch (3263) had an external diameter of 11 m and a clearly defined entrance to the east. The external ditch (3237) closely followed the internal ditch for most of its circumference, being roughly circular with an external diameter of 14.6 m, but to the north it curved towards the north-east, forming an extended entranceway or small enclosure. A recut (3504) was observed in the outer ditch which had been made after both this and the internal ditch had undergone a fair degree of silting.

It seems likely that this site represents a roundhouse, with the internal ditch representing the foundation trench for the wall of the roundhouse, and the external ditch representing an eaves-drip gully. There was a large amount of stone spread across the area defined by the ditches, which was notably absent outside the ditches.

Within the inner ditch a number of postholes were observed, including a group of four (3457, 3461, 3498 and 3511) which probably formed an internal porch structure. A number of further postholes, were observed in the interior of the roundhouse. Some of them were rather indistinct, but there are definite suggestions of a hexagonal arrangement of roof supports, comparable to that seen at the Belowda roundhouse. No features were observed outside the roundhouse. The area within the outer ditch was, however, marked by a spread of stone which did not extend beyond the ditch. The stone may derive from the collapsed walls of the roundhouse.

Pottery was recovered from the inner ditch (context 11026) and from the terminus of the northern extension of the outer ditch (3438), which was possibly a recut of the original extension. All of the sherds from the inner ditch appear to have come from a single vessel. The vessel was a Cordoned Ware Type D/E cooking pot (Threipland 1956), belonging to the first or

second phases of Cordoned Ware, with a possible date range of first century BC through to mid-second century AD (Quinnell 2004, 110). The sherds were in a well-made gabbroic fabric, well mixed and fired with an exterior burnish. The inclusions indicate the gabbroic clays on the Lizard (cf D F Williams in Quinnell 2004, 108) as a source of the raw material.

The pottery from the outer ditch was also probably all from one vessel, a larger and coarser version of the form present in the inner ditch with the same likely date range. Thin section analysis of the fabric revealed that it contained moderate to common inclusions generally > 1 mm but occasionally > 4 mm, poorly worked with a smoothed exterior. The inclusions again indicate that Lizard gabbroic clays provided the raw material.

The charcoal from this site was generally sparse and highly comminuted, with large quantities of roots and other contaminants in the flots. Only three samples merited full analysis; one from one of the postholes at the entrance to the roundhouse (3457), and two from the ditch termini (3269 and 3439) in the outer ring ditch. The radiocarbon dates obtained from some of the charcoal and charred plant remains suggest that they were not contemporary with the house, and there must, therefore, be a question mark over the integrity of the sample of charcoal and its relevance as an indicator of the environment at the time the roundhouse was in use. The charcoal from the posthole was entirely dominated by oak, consisting of heartwood and a couple of small roundwood fragments. This assemblage may well have come from structural wood remains, particularly since many of the other samples produced more mixed assemblages. Indeed this site produced the most taxonomically diverse assemblages of the project and the majority contained a notable component of diffuse porous species, albeit in small quantities. It is interesting, therefore, that the ditch samples at The Lower Trenoweth roundhouse are so different: that from 3439 is dominated by oak, whilst that from ditch 3269 was composed of small roundwood fragments from a range of species, including a large quantity of alder. The presence of alder and willow/poplar indicates the exploitation of wetland resources. In addition to

the heathland component (gorse/broom and heather), this suggests a decline in the availability of oak. Certainly, neither alder nor willows are the best choice for fuelwood (Edlin 1949).

Two samples were selected for radiocarbon dating, one a charred oat grain or Brome seed (*Avena/Bromus*) from the inner ditch (NZA-29325: 322±40 BP), and one on gorse or brome charcoal (*Ulex/Cystisus*) from the outer ditch (NZA-29326: 1027±40 BP; Table 1). Although the morphology of the site and the pottery suggest an Iron Age date, the radiocarbon determinations both fall into the historic period. NZA-29325 dates to the medieval period - cal AD 1470-1650 - whilst NZA-29326 dates to the early medieval or medieval period - cal AD 890-1160. The discrepancy between these dates and the likely date of the roundhouse suggests that the dated samples, despite coming from rich assemblages of charred remains were intrusive. The implications of this for the interpretation of the charred plant remains and charcoal in relation to the environment of the house have already been discussed.

Discussion

The remains of the two roundhouses were similar, both including a deep external ditch of similar diameter (14.6 m and 14.7 m) and similar arrangements of postholes, suggesting the existence of a porch and an internal post ring. These features fit well within the pattern of Iron Age houses in Cornwall (Quinnell 1986, 117; Gossip forthcoming). For example, recent excavations at Higher Besore and Truro College (Gossip forthcoming), about 25 km south-west of the present scheme, revealed a number of roundhouses, constructed around 100 BC, which provide close parallels for those at Lower Trenoweth and Belowda. They were very similar in size and shape. House 4, in particular, was remarkably similar to the Lower Trenoweth roundhouse, with two concentric ditches, an extended entranceway, and a similar arrangement of internal postholes. Indeed, a number of the structures at Higher Besore appear to have had similar internal arrangements of postholes.

The walls of the roundhouses appear to have been stone-faced earth banks (*ibid.*) as they may have been at Belowda and Lower Trenoweth (see below).

The pottery from the Lower Trenoweth roundhouse and the radiocarbon dates from the Belowda roundhouse are consistent, and suggest that the two structures were broadly contemporaneous. The two radiocarbon dates from the Lower Trenoweth roundhouse, however, are not consistent with either this evidence or each other. The two dates, one medieval, the other post-medieval, are so out of keeping with the character of the structure and the pottery that they must be rejected as having being obtained from intrusive material.

Large amounts of stone covered the area within the ditches at both roundhouses. Since stone was almost entirely absent outside the roundhouse ditches, it seems likely that this stone derives from the walls of the roundhouses. There was no obvious pattern in the distribution of the stone. None of it appeared to be *in situ*, making it difficult to reconstruct the form of the walls. There was also no evidence to indicate whether the roundhouses had fallen into disrepair and collapsed or had been dismantled. The soil micromorphology of layer 4381 at the Belowda roundhouse suggests that it derived in part from turf, which may well itself have derived from a collapsed wall or bank. This suggests that the roundhouses were constructed with stone-faced turf walls. As has already been noted with respect to Higher Besore, roundhouses associated with stone-faced banks have been found at a number of other sites in Cornwall (see also Castle Dore and Penhale Point: Radford 1951; Smith 1988).

It seems likely that at the Lower Trenoweth roundhouse the outer ditch was an eaves drip gully and the inner a foundation trench. A similar arrangement was found associated with a smaller roundhouse (diameter = *c* 6.5 m) during excavations across the ramparts of the Rumps promontory fort, St Minver (Brooks 1974). In this case the outer ditch led to a possible sump and was much deeper than the inner ditch. The lack of an internal foundation trench at the Belowda roundhouse could be explained by the truncation that

appears to have affected this site, particularly in the north-western corner, although it is entirely possible that the wall was constructed without a foundation trench.

No intact floor surfaces survived in either the Lower Trenoweth or Belowda roundhouses, even though stone floors are known from a number of sites, such as Trevisker Round and Castle Dore (ApSimon and Greenfield 1972; Radford 1951) and could have existed also at Lower Trenoweth and Belowda.

The internal arrangements of postholes were probably related to the main roof supports for the structures. In both cases, these postholes formed a broadly hexagonal arrangement of six postholes in the centre of each roundhouse, with two further postholes extending towards the entrance, presumably to form a porch. The charcoal evidence from the Belowda roundhouse was very poor, but one of the postholes (3457) produced an assemblage dominated by oak which might derive from a post. Internal postholes which probably held posts used to support the roof are known from many Cornish roundhouses, such as those at Killibury, Carn Brea and Carn Euny (Miles 1977; Mercer 1981; Christie 1978) and even occur on sites, such as Bodrifty (Dudley 1956), where it appears the thickness of the walls would not have necessitated further support. The specific pattern found at the Belowda and Lower Trenoweth roundhouses, consisting of hexagonal rings of posts with two further posts forming the porch, is known from a number of other Cornish sites, such as Castle Dore and possibly Carn Euny (Radford 1951; Christie 1978).

In the case of the Belowda roundhouse, either the turf, evidenced in layer 4381, or the uprooted grasses, weeds and cereals could have represented the remains of the roofing material. It is, however, equally possible that the charred plant remains derived from bedding, fodder or clearance waste, and that the turf was used to construct the walls or a bank.

It is interesting to note that a common building tradition persists for roundhouses, even when they are found in markedly different circumstances.

Some of the roundhouses at Higher Besore and Truro College are almost identical to the Lower Trenoweth and Belowda roundhouses, even though the former site was clearly a planned settlement comprising multiple buildings, whilst the latter appear to represent small, isolated, temporarily inhabited shelters. Equally, the roundhouses at Higher Besore and Truro College and Threemilestone Round appear to share a similar architectural style (Gossip forthcoming; Schweiso 1976).

The interpretation of the use and status of the roundhouses is slight and sometimes ambiguous. There are, however, some indications that they may not have been ordinary, domestic structures, but rather may have played a more specialised role.

The Gabbroic pottery is typical of the period, and generally occurs on settlement sites in larger quantities than were recovered from the Lower Trenoweth roundhouse (and Belowda, where no pottery was recovered; cf St Mawgan-in-Pydar, Threipland 1956). The site at Higher Besore and Truro College, for example, produced far more pottery than the Lower Trenoweth and Belowda roundhouses, much of which was high status, including elaborately decorated South Western Decorated Wares and fragments of amphorae imported from Italy (Gossip forthcoming). The quantity recovered at Belowda and Lower Trenoweth is so limited as to require some explanation. It is possible, for example, that the structures were in use for only a short period, or that they were not used as permanent dwellings. Given the evidence for possible stock enclosures near to the Belowda roundhouse, and the almost complete absence of any other finds at either roundhouse, it is tempting to suggest that the roundhouses were temporary shelters, either for animals or humans, which formed part of a system of transhumance, rather than a permanent settlement. This is in agreement with the evidence of the soil micromorphology, which suggests that the Belowda roundhouse may have been associated with livestock. The charred plant remains, possibly representing bedding or fodder, are also consistent with the suggestion that some form of pastoralism is represented. A roundhouse at Trevisker Round

(ApSimon and Greenfield 1972) contained three internal drains, and it was suggested that this might have been to allow livestock to be brought into the roundhouse (*ibid.*).

The location of the roundhouses suggests another possible element of their economy. Goss Moor, with its rich alluvial tin deposits, has been considered a highly likely area for early exploitation of tin (Penhallurrick 1986), and it is possible, although unproven, than the inhabitants of the Belowda and Lower Trenoweth roundhouses were practising a sort of mixed economy based partly on tin streaming.

The palaeoenvironmental evidence suggests that the roundhouses were not primarily involved in arable farming. The indications of cultivation are limited and open to other interpretations. There were just a few wheat grains and spelt wheat chaff fragments, found with abundant weeds of disturbed, waste or cultivated ground, to suggest that cultivation had taken place fairly nearby. It is possible that oats were also being cultivated. There is evidence for their cultivation at the late Iron Age/Romano British site at Scarcewater (Jones forthcoming), but the lack of floret bases from the Belowda roundhouse means that this cannot be proven. It appears equally likely that the wild oats, grasses and herbs of disturbed/waste and cultivated ground represent material growing in the fields surrounding the site which consisted of areas that had once been under cultivation. A strikingly similar assemblage of weed seeds was recorded at Scarcewater where the grassland component was interpreted as representing either ungrazed grassland or neglected agricultural habitats (Jones forthcoming).

The absence of barley (*Hordeum* sp.) from rich assemblages of charred plant remains at the Belowda Roundhouse is striking - since this species has been recorded at the few other Bronze Age, Iron Age and Romano-British sites in Cornwall (Jones forthcoming) - but also difficult to interpret. Its absence lends some support to the idea that the material represents a non-arable assemblage. The limited material from the Lower Trenoweth roundhouse, however, does suggest the cultivation of barley.

It seems likely, therefore, combining the evidence of the charred plant remains with that of the pollen, that the Belowda and Lower Trenoweth roundhouses were constructed in a landscape that had formerly been under arable farming which had subsequently reverted to disturbed grassland and pasture.

Previous settlement studies have focussed on prominent enclosures, such as rounds, rather than on the less easily detected unenclosed settlements (Fitzpatrick forthcoming). However, recent evidence from West Penwith and the area around the Camel Estuary have suggested that more open settlements existed than had previously been thought. In the light of this, the relationship between sites such as Threemilestone Round, which was near to, and contemporary with, Higher Besore and Truro College (Dudley 1960; Schweiso 1976; Gossip forthcoming) can begin to be examined. The contrasts between these very different yet contemporary sites may be explained by differences in economies or social status. To elucidate these relationships more clearly, however, will require the investigation of more unenclosed settlements.

The relationship between the Lower Trenoweth and Belowda roundhouses and Castle-an-Dinas (Wailes 1963, 54) perhaps needs to be examined along these lines, despite the chronological uncertainties. The sites appear to have been broadly contemporary, however, and it seems likely that some interaction would have taken place between them. Whether that interaction involved the simple movement of animals, the control of tin extraction or, as seems more likely, a far more complex set of relationships, it is at present impossible to infer. The evidence from Belowda and Lower Trenoweth is simply insufficient, and there are, as yet, few parallels.

The early medieval period

The evidence from the early medieval period period was limited, comprising just a ditch, three unstratified sherds of pottery, and the intrusive sheep/goat tooth from the Royalton hengiform monument already discussed above.

The ditch (3355) was located in the Belowda area. The ditch had steep sides and a regular base, and contained seven fills, consisting of alternating layers of light and dark brown silt clays, one of which (3360) in the middle of the sequence contained a high proportion of charcoal. Charcoal was present in much smaller quantities in the some of the other layers.

Radiocarbon dates were obtained from two stratigraphically related samples (Table 1). The first, NZA 29324: 1640±40 BP, was obtained from charred oat or brome grain from the lower fill (3361); the second, NZA 29358: 1301±15 BP, from willow (*Salyx*) or poplar (*Populus*) roundwood charcoal in the fill (3360) immediately above. Both of these fills contained appreciable quantities of charcoal in which willow/poplar and broom were well represented. There is thus reason to believe that the charcoal is neither residual nor intrusive.

After modelling (Fig. 15), the lower fill was dated to cal AD 330-550, and was associated with a very abraded sherd Samian, probably from a Dr37 bowl. Although the vessel itself is likely to have dated from the late 2nd or early 3rd century, such sherds were often curated and have been found in contexts dating up to the 6th century (Quinnell 2004, 5.3.1). Its occurrence in this context is thus quite consistent with the radiocarbon date.

The fill above was dated to cal AD 660-720. The dates thus suggest that the ditch was open for at least a hundred years, and possibly for a far longer period, potentially starting towards the end of the Roman period and finally infilling much later in the early medieval period.

The only other material recovered from the ditch was charcoal and charred plant remains from the contexts from which the radiocarbon dated samples were obtained. Oak made up an appreciable proportion of both

samples, but willow or poplar, hazel, and broom or gorse were also well respresented. Charred cereal grains and weed seeds were also present.

Three unstratified sherds of medieval pottery were also identified, from topsoil (4060) at the Belowda roundhouse and from a natural silt deposit (4176) in the Belowda area. A single featureless bodysherd was recovered from the roundhouse site, and, from the silt, two grass-marked sherds from the flat base of a platter, jar or bar-lug vessel, probably dating from the 7th to the 11th century. The petrology of the minerals from all three sherds shows that they derive from the gabbro of the Lizard.

The later medieval and post-medieval period

A wide range of later medieval and post-medieval period features were investigated. These comprise a ditch associated with Lostwithiel pottery near Belowda village, four groups of prospecting pits, Cornish hedges and other field boundaries and features, and the sites of several possible streamworks.

The ditch and pit to the south of Belowda village

A shallow ditch (4179) was identified to the south of the village of Belowda, lying in an area characterised by a build up of silts, suggesting it had previously been marshy. This ditch produced a significant concentration of medieval pottery. The assemblage from the uppermost fill (4181) was notable for containing numerous unweathered sherds, suggesting proximity to a settlement, although it is impossible to know whether the unweathered sherds came from the hamlet of Belowda itself (*c* 300 m to the north) or an unknown farmstead site closer to the ditch.

The pottery consisted of unglazed, handmade coarse wares with much muscovite probably made at Lostwithiel (cf. Miles 1976; 1979; Allan forthcoming; Taylor and Allan 1998–9). Petrological and chemical studies (O'Mahoney 1989a; 1989b) show that such pottery was widely distributed throughout eastern Cornwall. The petrology of most of the sherds from the

ditch is consistent with that of Lostwithiel pottery, although two sherds stand out and may either come from other Cornish sources or be variations on the Lostwithiel fabrics. The Lostwithiel pottery cannot be very precisely dated. Pottery production at Lostwithiel had probably began by the mid 13th century (Douch 1969), and since most of the pottery from the ditch is handmade it must predate the introduction of wheel-thrown vessels in the 15th century. The fill of the ditch probably dates from some time in the period *c* 1200-1400.

A circular, steep-sided pit (4358), 1.1 m wide and 0.32 m deep, probably later in date than the ditch, was found *c* 25 m west of the ditch. It contained fifteen sherds of Lostwithiel type pottery dating to the 16th to early 17th century.

Pit groups

A total of four groups (Figs 14 and 16; Plate 7) of broadly similar pits, probably prospecting pits, were recorded along the scheme, three widely distributed around the lower slopes of Belowda Beacon and the fourth a little further east, near Victoria business park.

The earliest comprised a loose group of 22 oval pits, located near Lane End Farm, to the east of Belowda. All were broadly similar in shape, being roughly oval with a distinct squaring of the ends. They varied in size between 2 m and 3 m in length and between 1 m and 1.5 m in width. Several of the pits were excavated, revealing steep sides and flat bases, with an average depth of *c* 1 m. The pits exhibited a very similar pattern of fills, comprising alternating fills of redeposited natural and dark organic-rich material.

No artefacts were recovered from any of the pits. A radiocarbon date (NZA-26255: 580±40 BP; Table 1) was, however, obtained from twig charcoal, not identified more specifically. The result suggests that the pit dates from cal AD 1290-1430. Given the similarities between the pits in this group it seems reasonable to assume a similar date for all of them. It seems likely that these features were prospecting pits (see discussion below).

All of the pits appear to have been finally deliberately backfilled with redeposited natural at some stage, presumably to level the area. A number of the pits also had a dark organic fill down their edges, and samples were taken from two of them (pits 4388 and 4310) to examine the processes which had lead to the formation of this deposit. The samples suggest that the pit edge deposits were formed from topsoil which had washed into a void formed by the shrinkage of the original sub-soil derived fill.

The second group of pits consisted of just two oval examples to the north of Victoria Business Park, approximately 100 m west of the area of the crossing of the old A30 by the new road. These pits were very similar in size and shape to the previous group, but had very different fills which contained a very high proportion of apparently deliberately placed stone. One of the pits contained a residual flint endscraper. A radiocarbon date (NZA 29356: 326±15 BP; Table 1) obtained on a charred tuber from this pit suggests that the pit was filling in the period cal AD 1490-1640.

A further loose group of ten oval pits which were broadly similar in size and shape to those in the other groups was identified at Saffron Park (Plate 7). One of the pits produced a radiocarbon date of 1660-1950 cal AD (NZA 29361: 190±15 BP; Table 1). Three of the pits, two of them intercutting, were significantly larger than the others, being 3.3 m by 3.0 m in plan and up to 1.0 m deep, perhaps hinting at a different function.

The last group of pits, comprising eight examples, again of broadly similar size and shape to those near Lane End Farm, and with a similar pattern of fills, were found to the east of the B3274 and to the west of Saffron Park. Although no dating evidence was recovered from these pits, it seems reasonable to date them to the medieval or early post-medieval period on the basis of their similarity with the dated examples.

The Belowda strip field system

Fifteen upstanding boundaries within the Belowda field system were recorded in an attempt to uncover evidence about their creation and

subsequent usage (Fig. 14; Plates 8 and 9). It was hoped that the associated buried banks or soil horizons might provide dating evidence for the enclosure of the strip fields. Twelve of the fifteen boundaries were Cornish hedges whilst the remaining three were stony banks. It is possible that the boundaries identified as stony banks may originally have been Cornish hedges which have eroded and collapsed into their present form. All of the boundaries examined were heavily disturbed by both animal burrowing and root action. The stratigraphic evidence gained from the examination of the cut sections was very limited, primarily because of the very high degree of bioturbation. There was more or less clear evidence for earlier banks at two of the boundaries (3280 and 3283). All of the boundaries examined in the Belowda field system were flanked by pairs of parallel ditches.

A linear spread of large stones sealing a dark soil layer (4454) was also revealed within the Belowda field system. This linear arrangement ran parallel to an existing field boundary *c* 10 m to the south, and it seems likely that it represents the northern boundary of a former east-west aligned droveway within the Belowda strip field system. The dark soil appears to represent a buried soil horizon preserved beneath the stones of the dismantled field boundary, which presumably predates the establishment of the Cornish hedges in this area. The dark soil layer (4454) was a dense, layered silt/fine sand deposit. Analysis of the micromorphology of this sample provides evidence of trampling and of it having been compacted when wet which is consistent with it having been subjected to the movement of livestock (Gebhardt and Langohr 1999; Macphail 2003).

Streamworks

Four areas which were shown on the HER as having extant remains relating to streamworks were crossed by the scheme. The streamworks at Falhead Farm (HER 75771) were not investigated on account of the site's recent history as a landfill site. The Goss Moor streamworks (HER 75671) were located in a very wet area next to a stream in an area which was being built up. There was

no excavation in this area, beyond a topsoil strip, and it was not possible to investigate these putative streamworks. Some remains which may have been related to the streamworks at Mount Pleasant (HER 75299) were found, but were highly confused, with later activity obscuring any detail. A ditch (9002), identified by the NMP at the Redtye Streamworks (HER 75268), was identified during the course of the fieldwork, but no trace of the banks apparently associated with it or of the spoil heaps supposedly in the vicinity were revealed. This ditch contained no dating evidence and its form was not particularly suggestive of any aspect of streamworking.

Enclosure period boundaries

A large number of straight, double-ditched boundaries were uncovered at various other points along the scheme. These were identical in form, alignment and construction to the surviving hedge banks characteristic of 19th century enclosures in the area. The majority of them are marked on 1st edition Ordnance Survey maps and were not investigated in detail. Sample sections rarely produced artefacts, but those that did confirmed a post-medieval/modern date.

Discussion

Up until at least the 11th century it seems likely that the Belowda and Tregoss areas were unenclosed moorland, forming part of Goss Moor. There was no evidence for prehistoric enclosure of the landscape. The place name Belowda suggests a pre-Norman origin (Padel 1985), and appears first in documentary sources as *Bellonde* in 1275 (Scott Wilson/Alfred McAlpine 2003).

The pottery-rich ditch, 4179, located about 300 m south of Belowda contained Lostwithiel pottery dating from around 1200-1400, confirming the evidence for occupation in this area at this time. The numerous unweathered sherds recovered from the ditch certainly suggest proximity to a settlement, and this may have been Belowda or another, as yet undiscovered, site.

The establishment of permanent settlements on Goss Moor is likely to have been driven by the same social and economic forces that led to the colonisation of Bodmin Moor, broadly between the 11th and 14th centuries (although dating evidence is extremely limited). This episode is seen as resulting in part from relaxation of rigid manorial control over rights to common grazing on the moors, and in part from population growth and economic expansion in England as a whole during this period (Johnson and Rose 1994). Goss Moor may have been subject to earlier and more stable settlement than Bodmin Moor due to the attraction of the rich tin-bearing deposits, and the relative proximity to agriculturally productive lowland areas.

The strip field patterns preserved at Belowda and Tregoss are dated to the medieval period on the basis of morphological comparisons with relict medieval settlements and their fields recorded in upland areas such as Bodmin Moor (CAU 1994), and by analogy with well-documented examples of strip-cultivation elsewhere in England (Rackham 1986). Gascoyne's map of 1699 implies the presence of a hedged landscape at Belowda, but there is no earlier documentary evidence for the field system (as opposed to the settlement). The presence of hedged boundaries in 1699 would imply that the process of enclosure, and therefore the replacement of communal by individual farming, was complete by that date. The examination of the Cornish hedges in the Belowda field system unfortunately provided no evidence of their date of construction, although a droveway was positively identified, showing the route of animal movement through the field system following its enclosure.

The defining characteristics of medieval strip- or open-field cultivation comprise the division of the land around a nucleated settlement into a multitude of strips, with the strips of each farmer being distributed either regularly or randomly around the fields. The strips were grouped into cropping units (furlongs), and cropping units were grouped into fields which were sown with the same crop in each furlong. Some tasks were shared co-

operatively among groups of farmers. Each field was subject to a system of crop rotation, being left fallow every second, third or fourth year. Fields were used as common grazing when not in cultivation. There were rare hedged boundaries, with few enclosed circuits, to allow free movement of livestock between strips. The strips may originally have been defined by plough action alone (forming ridge and furrow), low banks or other insubstantial boundaries (Rackham 1986). There is evidence that open-field cultivation was a widespread feature of Cornish agricultural practise in the medieval period, up until the late 14th century when major social and economic changes, caused at least in part by the Black Death, led to the replacement of open-field cultivation with individual farms and the gradual enclosure of the open-fields between the 14th and 17th centuries (Johnson and Rose 1994). The reorganised fields were now typically defined with substantial, stock-proof hedged boundaries (Cornish hedges) rather than the earth banks or other insubstantial boundaries characteristic of open-field cultivation. Where this process is documented elsewhere in England, prior to the Enclosure Acts, it was typically achieved by exchanges of strips between individuals to make single blocks of land. In Cornwall the pattern of enclosure varied according to local circumstances. Most commonly, the enclosed fields were coterminous with the cropping units or furlongs (formerly subdivisions of the open-field comprising a bundle of strips, normally on the same alignment).

Streaming for tin is likely to have been at least as important, if not considerably more important than farming, as a source of income for the small-holders of the Belowda and Tregoss settlements. The deposits were continuously worked from at least the 13th century until the early 20th century, leaving a considerable legacy in the landscape.

The strip-field pattern, such as that preserved at Belowda, was most likely to survive where large hamlets had difficulty rearranging complex landholding arrangements (Herring and Rose 1994). This may be a factor contributing to their survival at Belowda, given the small size of tinners' smallholdings and possible complications in landholding arising from

connections with tin-streaming rights. This phase of enclosure occurred earlier than in large areas of the Midlands and Northern England, where open-field cultivation continued until the Enclosure Acts of the 18th and 19th centuries. A similar general sequence may be seen in other areas, such as County Durham and the Sussex coastal Plain, but the use of substantial stone-faced earthen banks (Cornish hedges) as boundaries has contributed to an unusual degree of landscape fossilisation in Cornwall (Rackham 1986).

The 16th to early 17th century pottery recovered from pit 4358, 25m to the west of ditch 4179, suggests continuity of occupation in this area, although again the source of this pottery remains unknown.

The majority of the prospecting pits were located on the lowest slopes of Belowda Beacon, just above a tributary of the River Fal, in the area of Tregoss Moor, which with Goss Moor, formed the largest alluvial tin deposit in Cornwall (Penhallurick 1986, 198). The earthwork evidence of streamworks, to the south of the pits, proves that tin was present in the immediate vicinity. Documentary evidence also highlights the importance of tin to the local economy. An advertisement in the *West Briton* in 1835 mentioned 'no less than five alluvial tin setts in this neighbourhood…the largest of these appears to have been the Mingam Sett, which was stated to have been producing tin for more than 300 years' (Hamilton Jenkin 1964, 57). An 1826 estate map shows three streamworks to the west of the Belowda field system, whilst large expanses of ground in the area were described as streambanks or tin park in the 1839-1840 Tithe Apportionment Schedules.

The radiocarbon dates obtained for the groups of pits identified are 1290-1430 cal AD, 1494-1640 cal AD and 1664-1950 cal AD. Sources from the seventeenth century, such as Richard Carew (1602) and an anonymous writer (Anon 1670, quoted in Gerrard 2000), can therefore be usefully used as a means of comparing the excavated pits with contemporary descriptions of prospecting pits.

In his *Survey of Cornwall* (1602, 90), Carew describes a prospecting pit as being a 'pit of five or six foote in length, two or three foote in breadth, and

seuen or eight foote in depth'. The anonymous writer records them as being 'six-foot long by four-foot broad and as deep as the bedrock' (Gerrard 2000, 28). The pits excavated along the scheme are slightly larger in plan than those described in the sources and slightly shallower than Carew's. The pits in the pit groups were predominantly oval in shape; Gerrard notes that prospecting pits were rectangular or oval (*op. cit*. 27).

The process described in these sources for locating tin begins with the digging of pits to find shoad, material weathered from a nearby lode. Carew states that the prospectors were able to tell from their pits whether the ground had previously been subject to 'the flood' (1602, 90) which would have caused the formation of shoad. Thus, although the pits identified are, mostly, slightly shallower than Carew's description, it remains possible that at this depth the prospectors were confident no shoad would be located, making it pointless to proceed any further.

Gerrard (2000, 27-29) cites a number of sites in Devon and Cornwall where prospecting pits were cut in straight lines at varying intervals up to 25m apart, highlighting the systematic nature of the enterprise. One might expect this pattern - or something like it - to be replicated if the pits located on a site have been correctly interpreted as prospecting pits. Unfortunately the narrow transect afforded by the road scheme made it difficult to identify any linear arrangement.

The interpretation of these features as prospecting pits provides little explanation of their somewhat strange sequence of fills. It seems likely that a repeated cycle, consisting of the inwash of the material excavated from the pit, followed by a period of stabilisation during which organic material built up at the base of the pit, would account for the observed pattern of fills.

The two areas of previously-identified streamworking investigated by this project unfortunately add almost nothing to our knowledge of the sites. Indeed, the form of the sites revealed was such that the features would not have been interpreted as being associated with streamworks were it not for the evidence from the HER.

The enclosure period boundaries investigated along the scheme serve to illustrate the organised enclosure of large areas of upland rough ground during the 19th century, and the subsequent removal of many of the boundaries, mostly in the 20th century, to create larger fields.

The concentration of prehistoric features located within the confines of the Belowda field system is notable: both roundhouses, the Belowda pit and hearth group and the Lane End Pit circles were all located in this area, where no great concentration of Prehistoric activity was expected. Equally notable is the lack of prehistoric activity identified at the sites (Innis Downs and Saffron Park) which were thought likely to have significant prehistoric remains. The possible truncation at Innis Downs has already been noted, but the pattern is perhaps too wide ranging to be accounted for by such localised disturbances. The topsoil within the Belowda field system was noticeably thicker than elsewhere (up to 0.6 m thick), presumably as a result of early enclosure (some time before 1699 on the evidence of Gascoyne's mapping). This perhaps accounts for the better survival of features within the Belowda field system, where they may have been protected from the worst damages of modern farming practices.

Guide to the archive

This article is a synthesised report based upon a number of more technical specialist reports (Table 5) which were commissioned following an initial assessment of the evidence from the scheme (OA 2007). This report and the full specialist reports are freely available online, hosted by the Archaeology Data Service (www.ads.co.uk).

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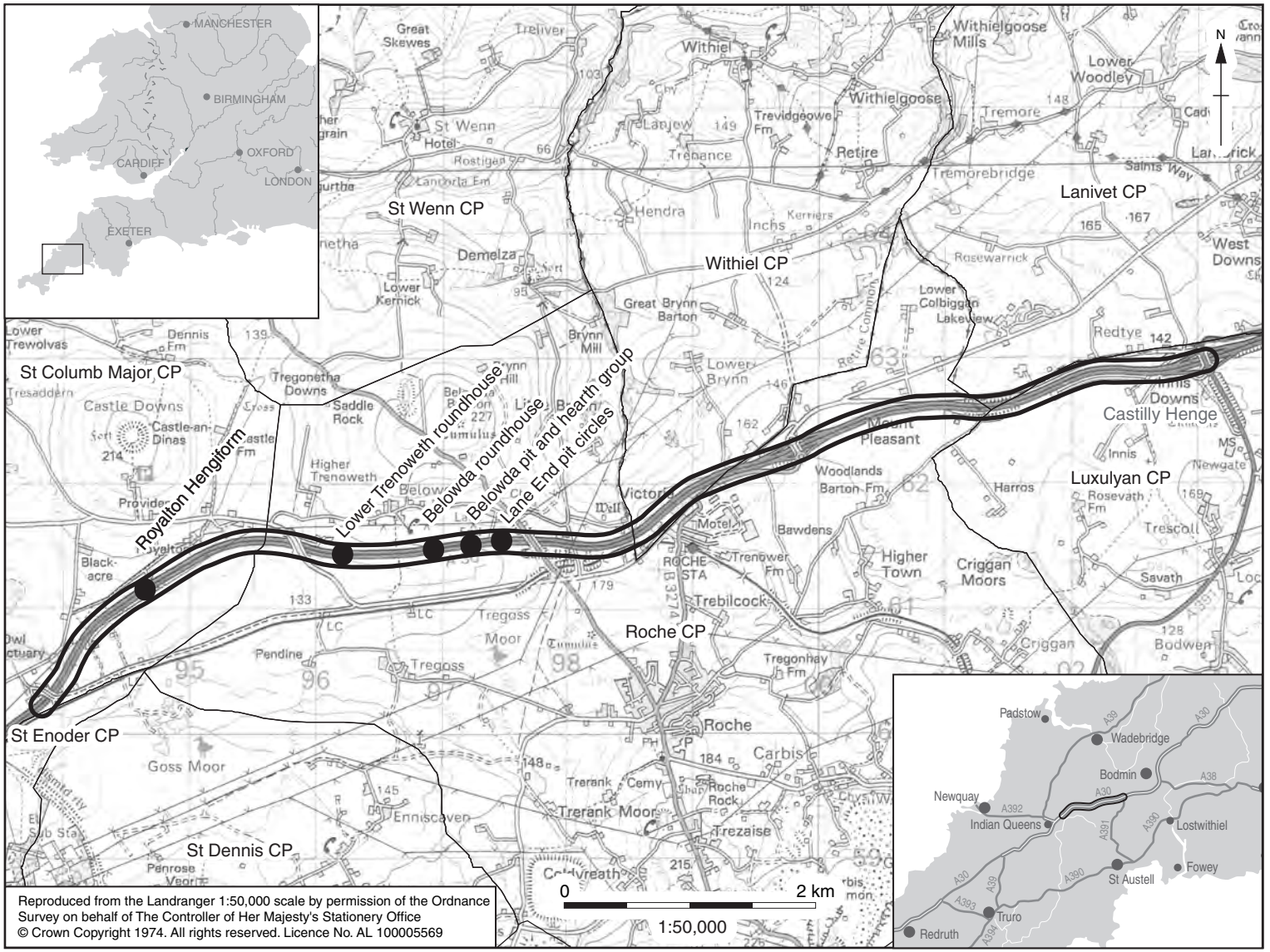

Figure 1: Location map of the road scheme showing the location of major sites along the scheme

Figure 2: Plan of the road corridor showing the location of sites and stripped areas

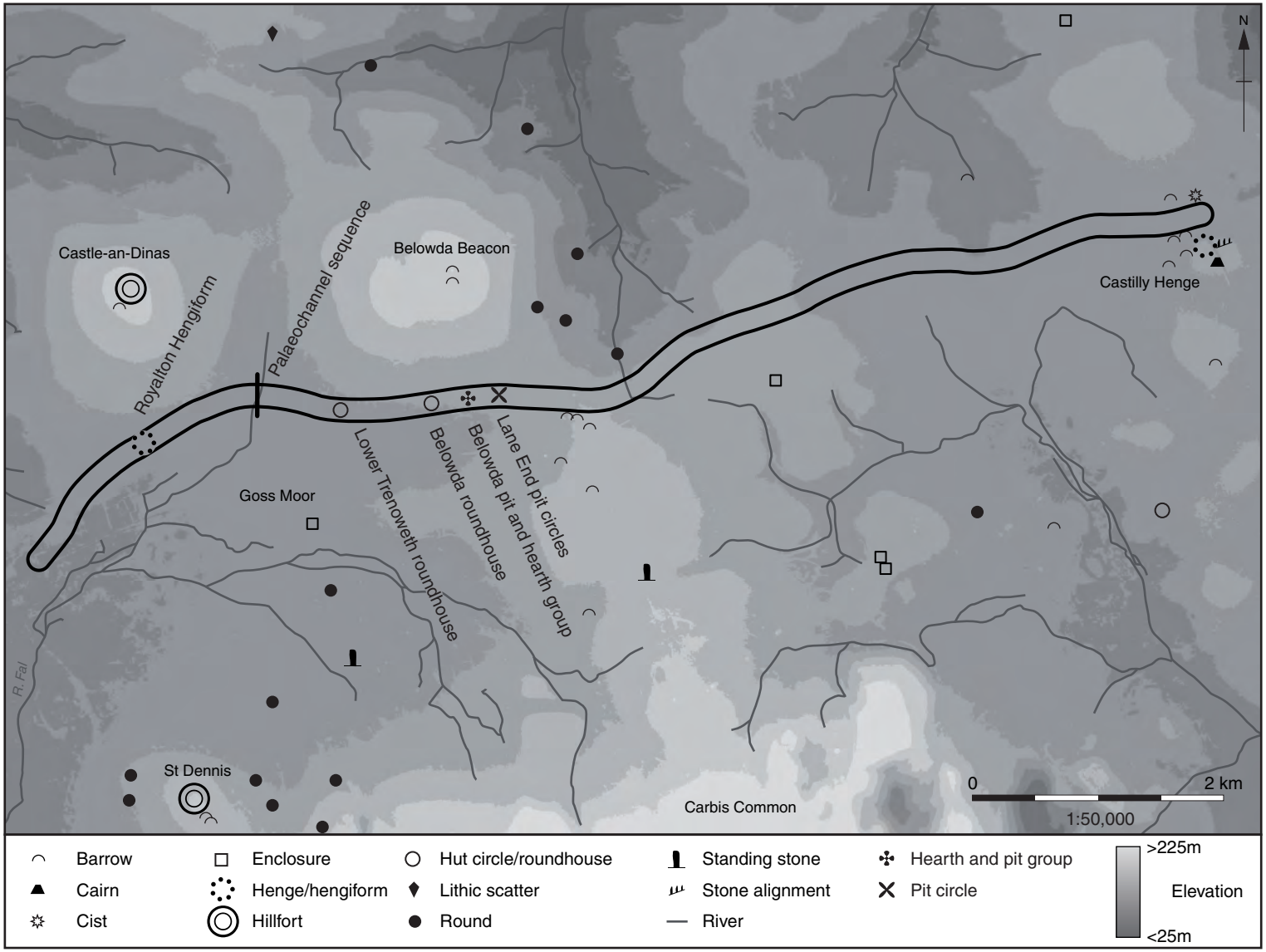

Figure 3: Location of prehistoric and Roman sites along and around the road scheme

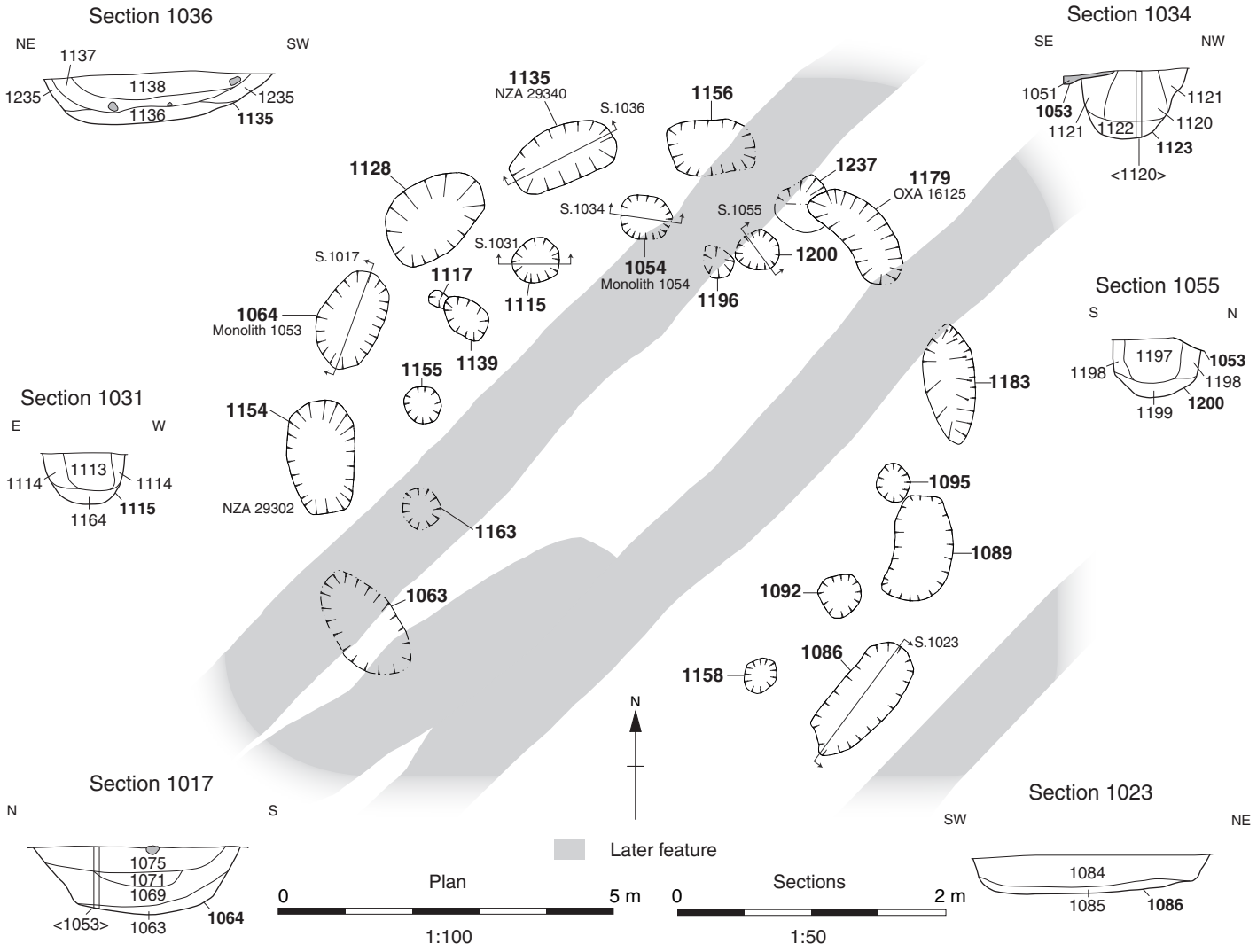

Figure 4: Plan and sections of the Royalton Hengiform Monument

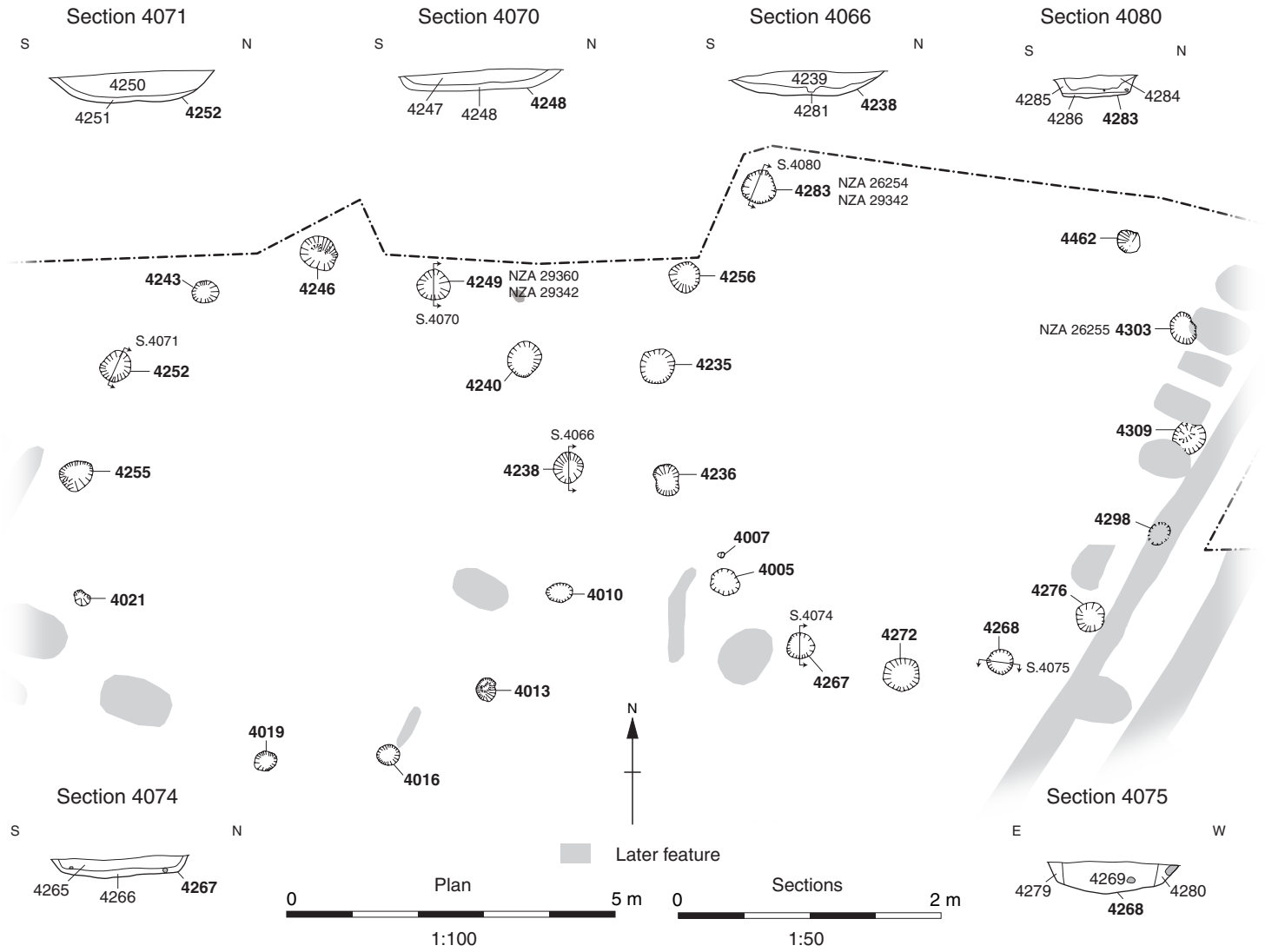

Figure 5: The Lane End pit circles: plan and sections

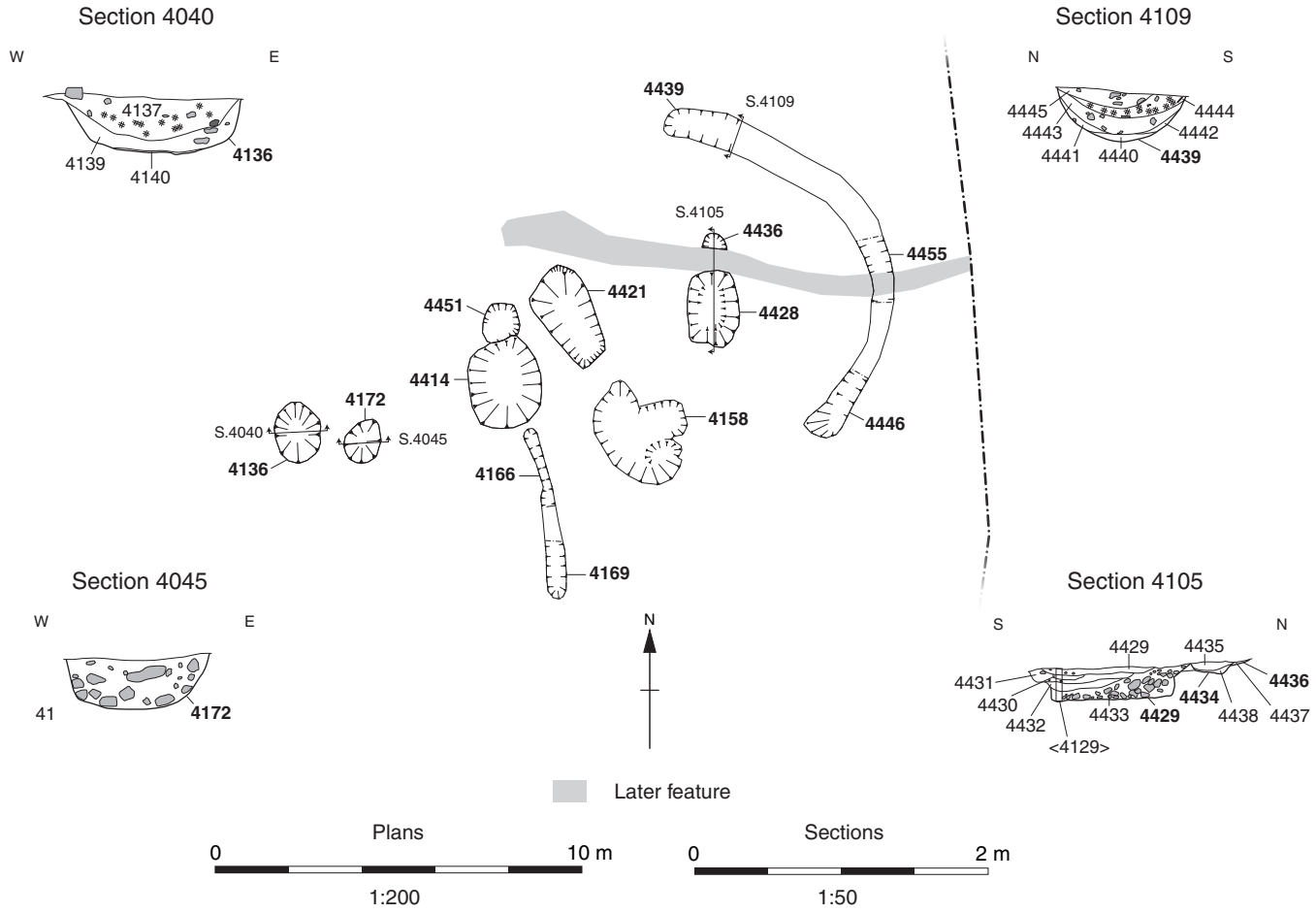

Figure 6: The Belowda pit and hearth group: plan and sections

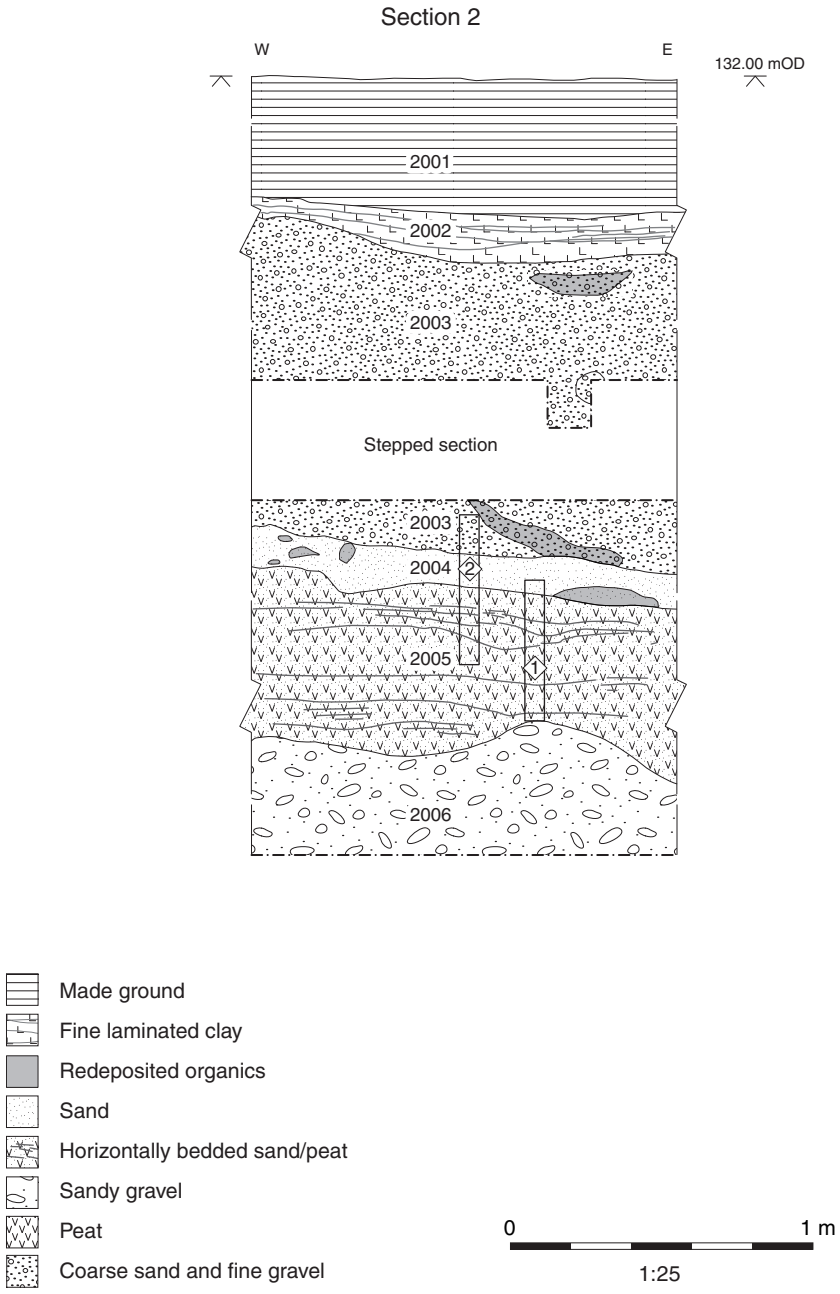

Figure 7: Section through the palaeochannel sequence

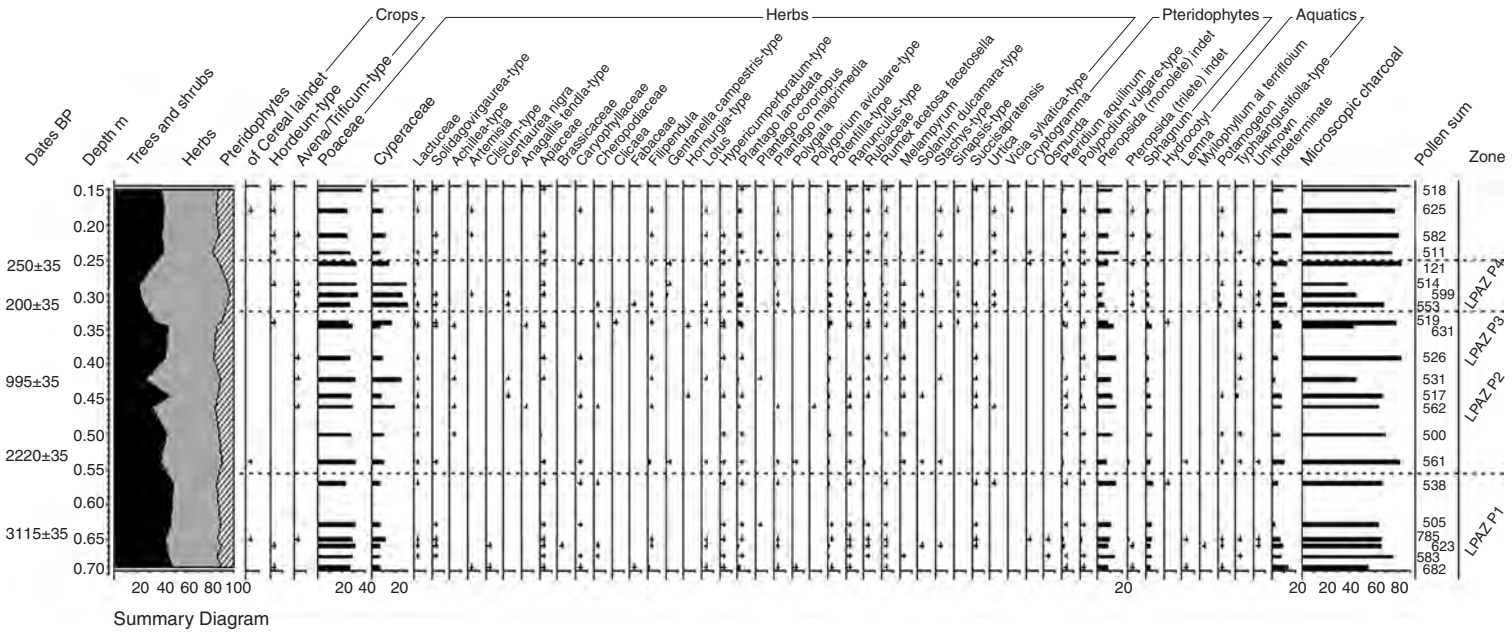

Figure 8: Pollen diagram fot the palaeochannel sequence (non-arboreal pollen)

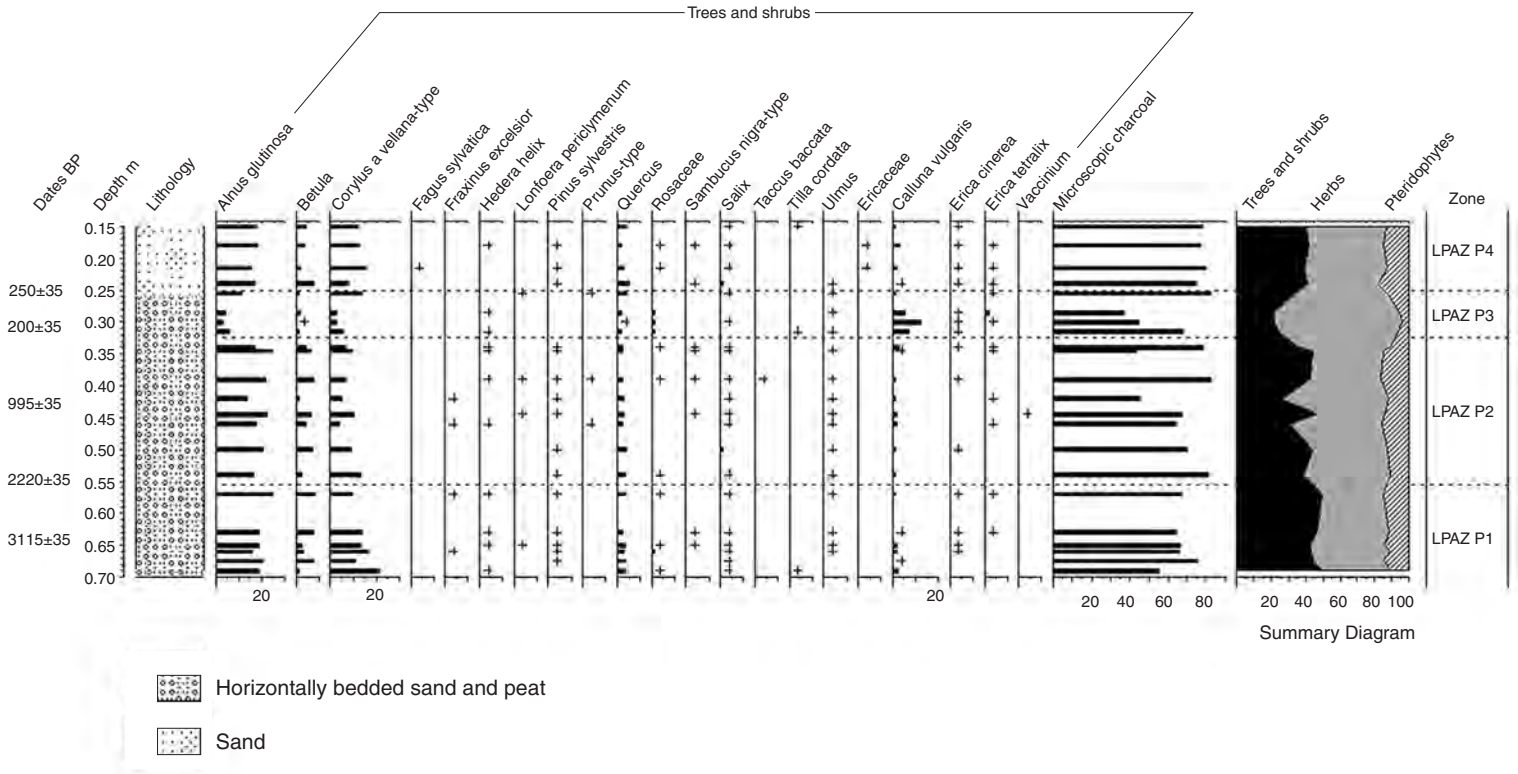

Figure 9: Pollen diagram for the palaeochannel sequence (arboreal pollen)

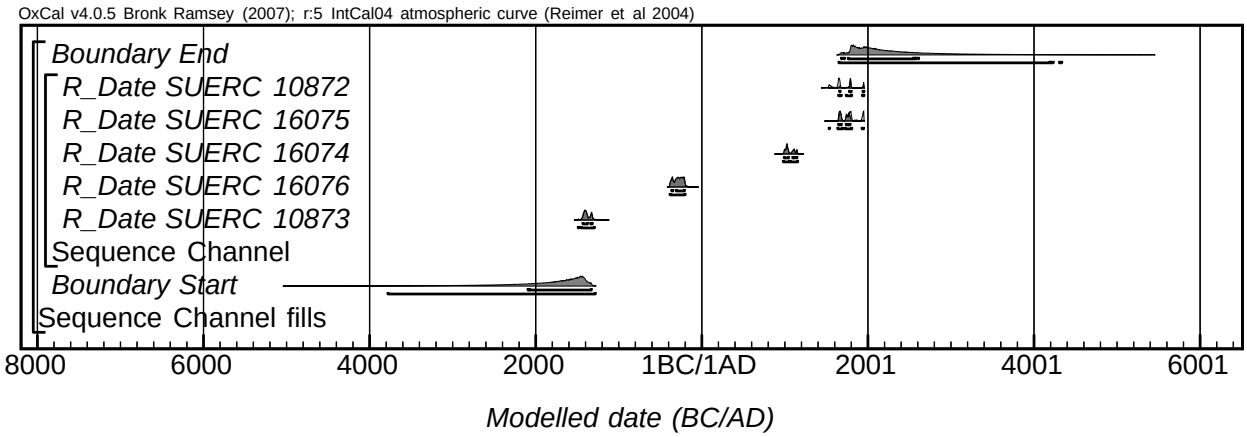

Figure 10: Radiocarbon dates from the palaeochannel sequence: the Bayesian model

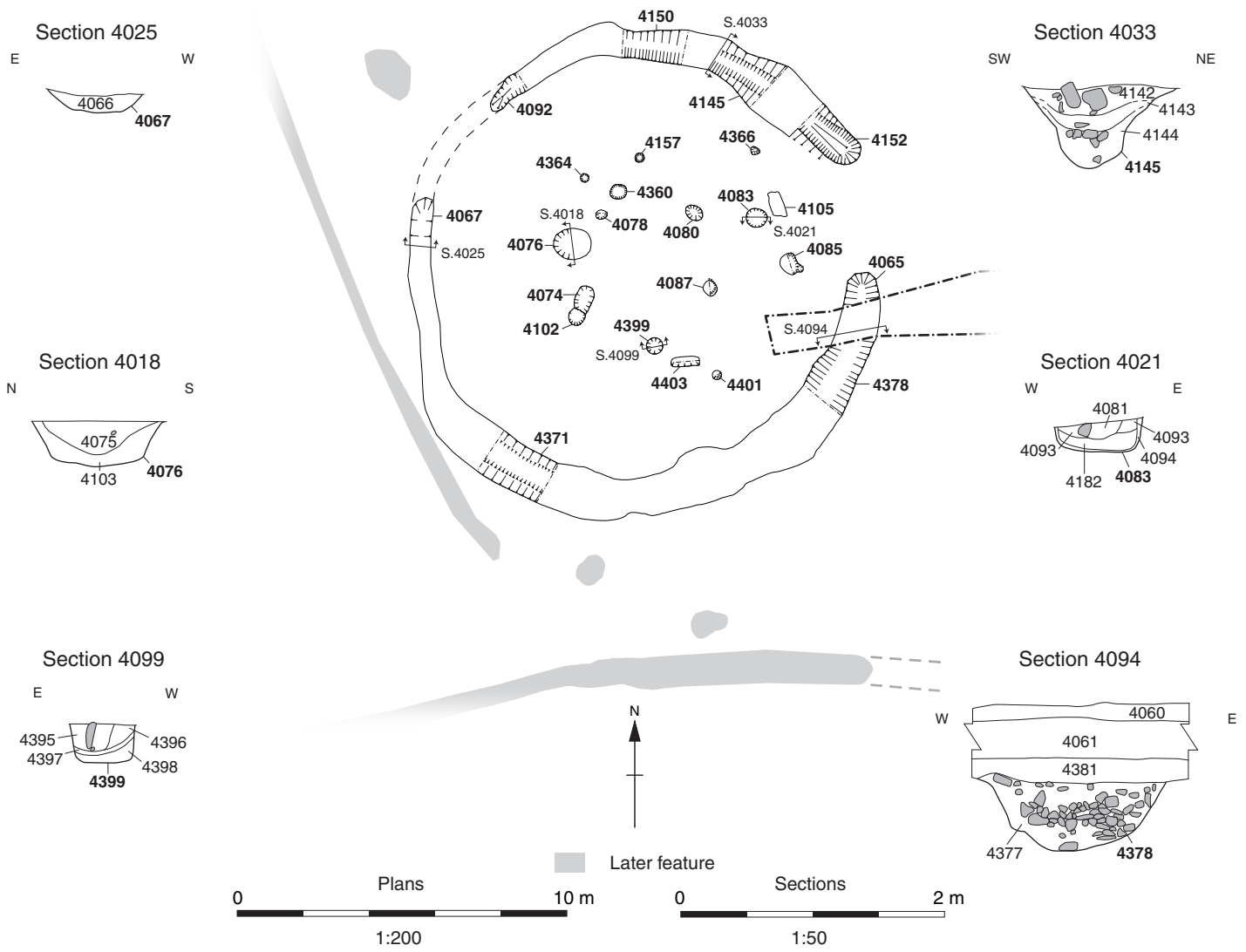

Figure 11: The Belowda roundhouse: plan and sections

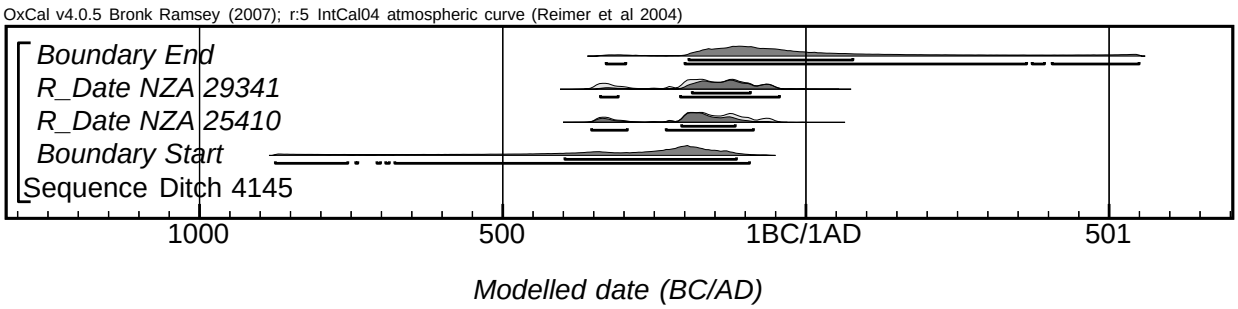

Figure 12: Radiocarbon dates from the Belowda roundhouse: the Bayesian model

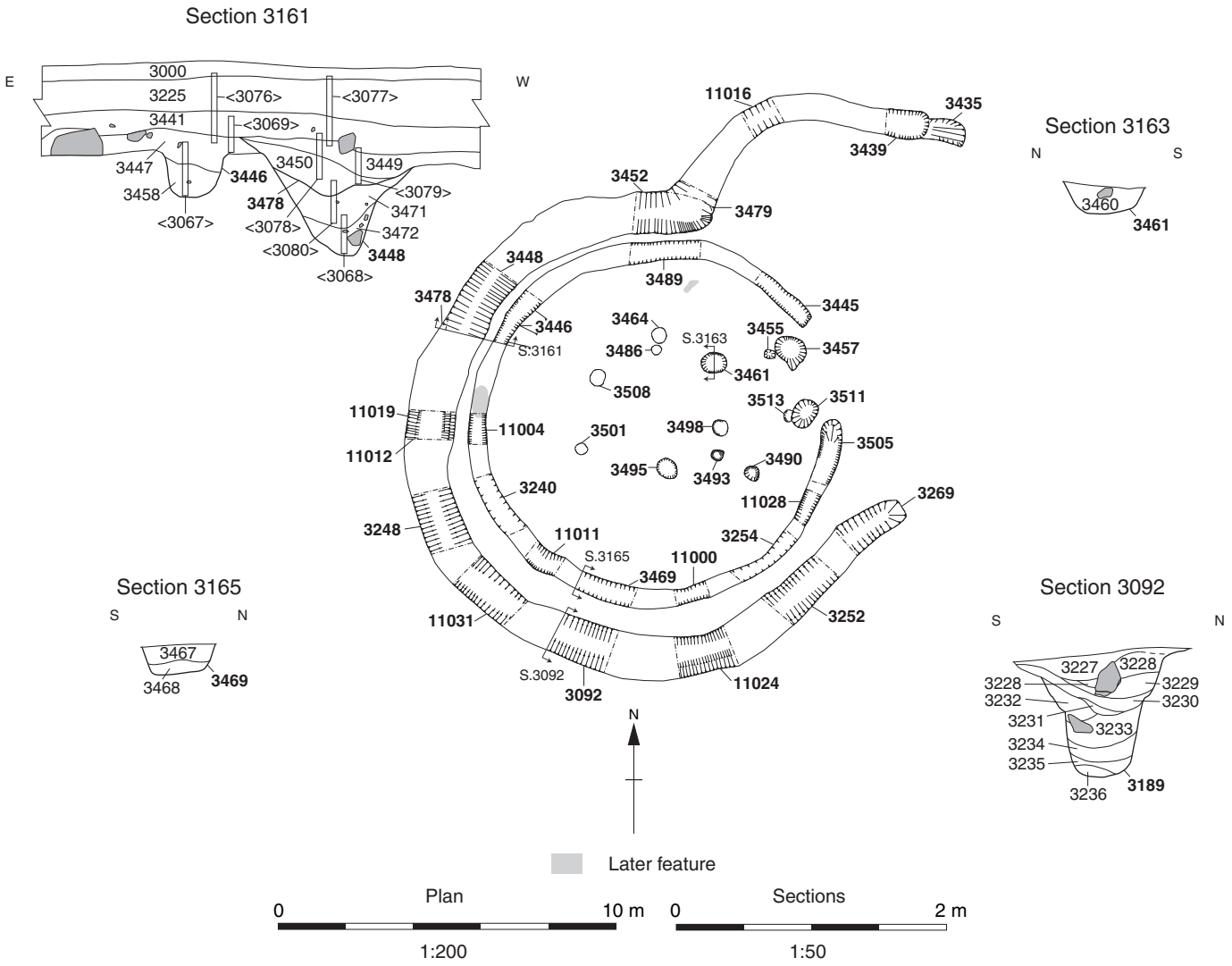

Figure 13: The Lower Trenoweth roundahouse: plan and sections

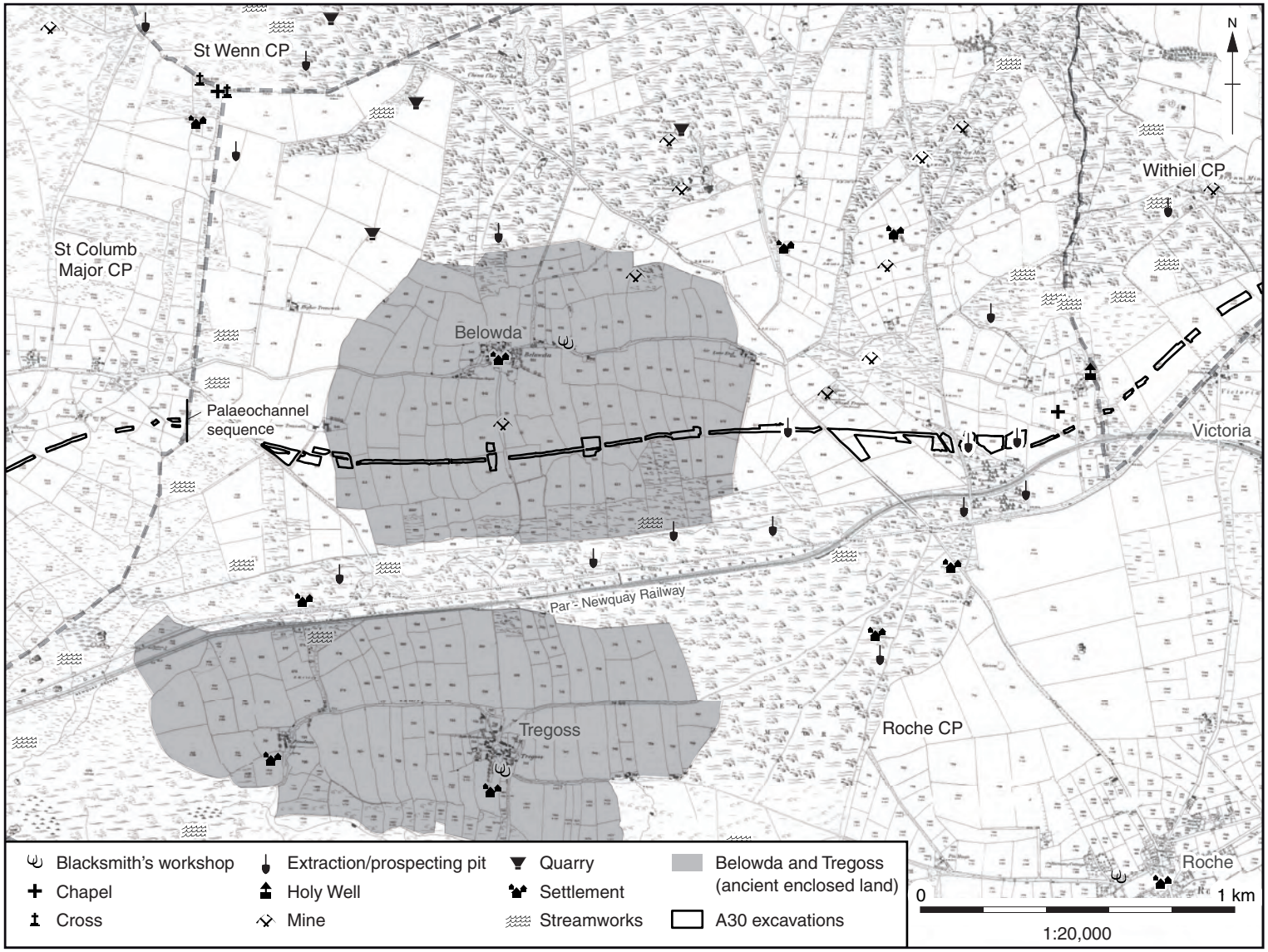

Figure 14: Location of medieval and post-medieval sites along and around the road scheme

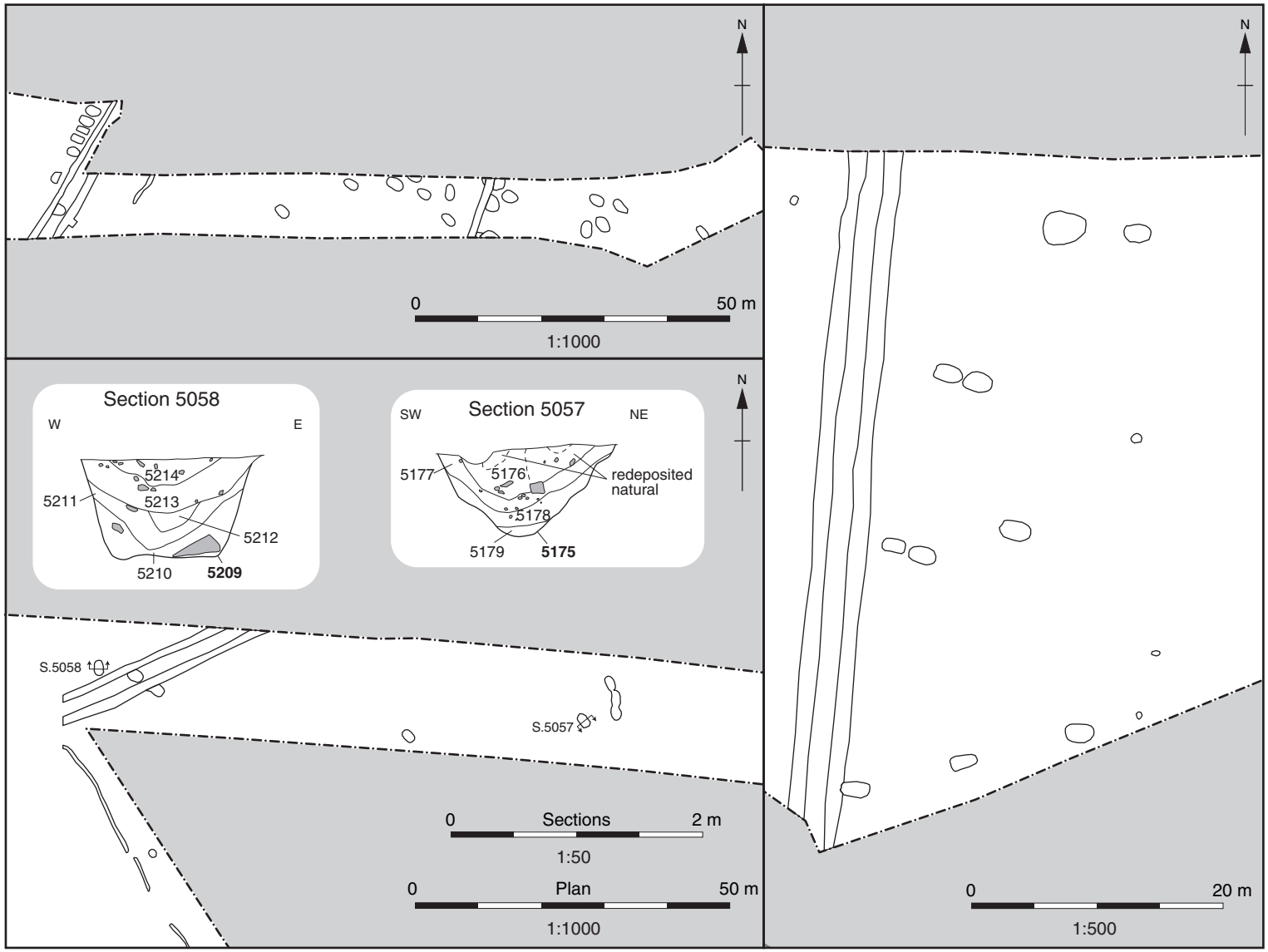

Figure 15: The medieval prospecting pit groups

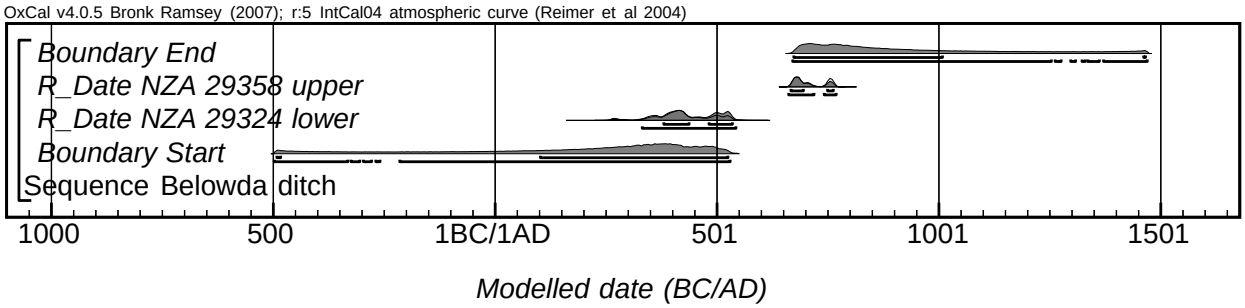

Figure 16: Radiocarbon dates from the medieval ditch (3355) at Belowda