

EAST SOAR, DEVON

AIR PHOTO ASSESSMENT AND SURVEY

Helen Winton and Mark Bowden



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East Soar, Devon: Air Photo Assessment and Survey

Helen Winton and Mark Bowden

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SUMMARY

This report describes an assessment and survey of all archaeological features, visible on air photographs and lidar images, on the National Trust Land at East Soar, South Devon. The survey provides information on the form and location of archaeological remains to aid land management and supplement the Scheduled Monument descriptions.

Documentary research and the air photo survey suggest a number of phases of land division at Soar. Publications and research provide a good synthesis of the World War II military activity associated with RAF Bolt Head, the Hope Cove Ground Control Interceptor (GCI) radar station and subsequent Cold War Rotor site. The 1940s and 1950s air photographs provide an invaluable pictorial record to supplement the record of the wartime structures associated with the important recent history of the area. The transcription also provides an accurate plan of the palimpsest of twentieth century military structures, most of which have been demolished or removed.

It is beyond the remit of this study to carry out detailed documentary research and ground based analysis. This report has recommendations for further research and suggestions for future land management. It is recommended that the area is kept free of damaging vegetation, especially bracken and gorse, for the conservation of the archaeological sites and to enable visual interpretation for visitors and further study.

CONTRIBUTORS

Helen Winton, Aerial Survey and Investigation, English Heritage, carried out the air photo assessment and transcription. Mark Bowden, Archaeological Survey and Investigation, English Heritage, provided advice on landscape analysis and interpretation of the earthworks.

ACKNOWLEDGEMENTS

Thanks to Shirley Blaylock and colleagues at the National Trust for access to and information on the survey area. Thanks to Luke Griffin, Archive Support Team English Heritage, for supplying the air photographs. Graham Tait (Devon County Council) provided information and access to the Devon Historic Environment Record. Caroline Vulliamy (English Heritage) and Cressida Whitton (Devon County Council) provided advice on conservation issues in the area. Many thanks to Mike and Andrew Passmore for information and advice on the historic military aspects of the survey.

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The photograph on the front cover is a general view across East Soar towards Salcombe NMR SX 7036/15 (24679/47) 8th August 2007 © English Heritage.NMR

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DATE OF SURVEY

2008-9

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INTRODUCTION

Shirley Blaylock, National Trust, requested an air photo assessment to provide information on the form and location of archaeological remains at East Soar to inform land management and supplement the Scheduled Monument textual descriptions and polygons. Helen Winton, Aerial Survey and Investigation, English Heritage, carried out the air photo assessment and transcription. Mark Bowden, Archaeological Survey and Investigation, English Heritage, provided advice on landscape analysis and interpretation of the earthworks.

The main sources were air photographs from the National Monuments Record (NMR), the Cambridge University Collection of Air Photos (CUCAP), Devon Historic Environment Record (HER), and lidar images from the Environment Agency. Additional sources included information from the NMR and Devon HER. The 1777 Courtney Estate Survey, reproduced in Thackray's archaeological assessment, proved very useful but further research is required to ascertain how it relates to the field evidence. Two field visits, one for reconnaissance purposes and a later rapid walkover, supported the interpretation of archaeological features. For details of methodology, please see Appendix 3.



Figure 1 General location of the survey area. © Crown Copyright. All rights reserved. English Heritage 100019088. 2009.

SURVEY AREA

Most of the survey area is in Malborough parish, South Hams District, Devon (Figure 1) with a small part in Salcombe parish. It is within the South Devon Area of Outstanding Natural Beauty, includes part of the 'Heritage Coast' designated by Natural England and a section of the South West Coast Path National Trail. The survey area comprises almost four square kilometres including the coastline between Hazel Tor, Soar Mill Cove and Starehole Bay. This includes part of the National Trust Salcombe estate, plus a central area in other ownership, between Higher Soar, Rew and Tor Woods (Figure 2).

The Soars are on the edge of the rolling countryside which characterises much of the South Hams and the land rises up on the seaward edge to impressive cliffs. There is a possibility that the place name Sewer or Soar derives from the herb Sorrel or from 'Sae Ware' (dwellers by the sea) (Thackray 1990, 6). The Reverend M Bawden, in Dean Milles' 1775 Parochial History of Devon, suggests that the place name Soar, or Sewer, is the local word for 'high ground' (Thackray 1990, 6).



Figure 2 Location of survey area (in red) and NT land (in green). OS Base Map © Crown Copyright. All rights reserved. English Heritage 100019088, 2009.

Springs at East Soar and Middle Soar drain into a valley above Starehole Bottom and from Higher Soar, where the flow of water was once presumably sufficient to drive a mill wheel, above Soar Mill Cove. The centre of the survey area is now mainly in arable and the surrounding areas are mainly a mix of pasture fields and rough ground.

SUMMARY OF ARCHAEOLOGICAL FEATURES

Caroline Thackray provides details and a summary of the main archaeological features in her 1990 report and the following descriptions and discussions are intended to supplement this. The survey plan discussed in this report is an accurate and detailed interpretation of the archaeological features visible on the air photographs; however, further analysis of the finer detail of earthworks, and complex relationships between features, will require analytical field survey. Recent clearance of scrub on certain areas was found to be extremely helpful on the second field visit and it is recommended that as much as possible continues to be kept clear; Figures 6, 10 and 14 have suggestions for where this would be beneficial in advance of further survey.

With the exception of a number of prehistoric small finds, the archaeological remains in the survey area comprise relatively large features which are visible above ground as earthworks or structures. It is notable that there are no cropmarks recorded in this area. Many of the earthworks appear to have been abraded since the 1950s by grassland management, possibly chain harrowing. Most of the military buildings or structures recorded on the 1940s and 1950s air photographs have been demolished or removed.

There appear to be no earthworks outside the NT land as the majority of the fields in the hinterland of the survey area are, or were, in arable cultivation; however, it is likely that features survive as sub-surface remains. Most of the earthworks near the cliff tops are parts of field systems and enclosures. It is possible to suggest phases within this pattern and where possible this is included in the description below. The field patterns across the whole of the survey area, including relict and current boundaries, and the buildings scattered amongst them, warrant further work.

More denuded features, such as the supposed prehistoric settlement to the east of Middle Soar (HER 63612), the barrow above West Soar, and the field system at Mousehill Break, could benefit from geophysical survey to determine survival and extent of sub-surface remains.

The record of buildings in the survey area is variable and also requires further research. A study could explore a relative chronology for the barns or small farms at Warren Barn, Middle Soar and above Starehole Bottom. Small structures attached to field walls are depicted on the 1777 Courtney Estate map and some obviously indicate farm buildings and yards while others may represent smaller structures and gates. Any study of the walls and boundaries should consider these structures, including an assessment of survival. Other buildings with interesting associations include the Napoleonic Signal Station to the west of Middle Soar (HER 7031, Listed Building 100728) and the possible instrument house or cable hut for the short lived submarine telegraph station in Starehole Bottom (NT 100,538; HER 51252; NMR 1468986).

Unusual features in the survey area include three long mounds, one by Fir Wood to the east of East Soar Farm (NT 100, 530; HER 70183), another, called the 'Giant's Grave' (NT 100,540; HER 7033), above Starehole Bottom, and finally the large mound by the Warren Wall (NT 100,547; HER 36192) to the south of Middle Soar. Most recent evaluation of these sites agrees that none of these mounds exhibit the form or location usually associated with a Neolithic long barrow. It is possible that all are pillow mounds associated with the warren described by the Reverend M Bawden as 'on the south of the parish ... a large parcel of ground formerly a rabbit warren and still existing' (Thackray 1990, Appendix F). The complexity of the features by the long mound near The Warren Wall, including boundaries, remains of buildings and to the east, other mounds, suggest that further research and analytical field survey could produce useful results. Geophysical survey or even excavation may not guarantee a resolution to the dating of these mounds but should also be considered.

The wreck of the *Herzogin Cecilie*, a German four masted barque, is located in the shallows of Starehole Cove (HER 42487; NMR 832170). She was built in Bremerhaven in 1902 as a German cadet training ship, and spent 12 years with the Norddeutscher Lloyd Company. She was used by the Chilean Navy during World War I, and from 1921 was owned by Gustav Eriksson whose ships won many of the annual 'grain races' between Australia and Europe. The *Herzogin Cecilie* came close to the record for the race during her last voyage. She grounded on Ham Stone Rock in April 1936 and was later refloated and beached at Starehole Bay, where she capsized (Lam and Lam 1995).

The buildings and structures associated with military activity at RAF Bolt Head and the RAF Hope Cove Ground Control Interceptor (GCI) radar station once extended across almost the whole of the survey area. The GCI site was used after the war, as part of the Rotor operation during the Cold War, and some of the associated buildings are now in use as commercial premises. The main structures associated with this military activity lay outside the NT land.

SCHEDULED AREAS AND SITE DESCRIPTIONS

This section will consider the survey area in three parts; the eastern area including East Soar, Starehole Bottom and Bolt Head; the central area including The Warren; and the western area covering Soar Mill Cove and Mousehill Break. There is also a summary of the main features associated with RAF Bolt Head and subsequent post war activity. Each part includes a summary of the main features with particular reference to scheduled areas.

East Soar, Starehole Bottom and Bolt Head

Relict field boundaries extend across Starehole Bottom and South Down (Figure 3). Two unusual mounds, mentioned previously, include the site by Fir wood to the east of East Soar and the 'Giant's Grave' above Starehole Bottom. No traces of beacons were seen on the available air photographs either in 'Beacon Park' or on the cliffs.

Three possible farms are marked on the 1777 Courtney Estate map, one at Barns Park and two just above Starehole Bottom (Figure 3). One of the groups of structures above Starehole Bottom has an illegible name on the 1777 map but is labelled 'East Sewer' on the OS 1886 map. The farm on the other site has listed building status (Listed Building 100762). The 1777 Survey shows no buildings at the location of what is now East Soar Farm and it is first mapped by the OS in 1906. On the 1777 survey, most fields in this eastern part of the survey area have a structure attached to a wall, often in the corner of the field, and it is unclear if these represent small buildings or gates.

This area includes the eastern end of the runway of RAF Bolthead and a scatter of military buildings attached to existing farm/barns to the north of Starehole Bottom, and on South Down. Many of the fields in this area were enlarged in the nineteenth and twentieth century usually by combining two smaller fields. Some boundaries were removed in the 1940s, for the airfield's E-W runway, and some, but not all, were reinstated afterwards.

Post medieval animal pound in Starehole Bottom

(Scheduled area 34886, NT 100, 539, HER 66008, NMR 1368794)

The basic form of the structures, at SX 7203 3667, is visible but no new information is recorded on the air photographs. The building and pound are not marked on the 1777 Courtney Estate Map (Thackray 1990, 55, Plan XIII) but are described as 'Brake and Linhay' on the 1841 tithe map (Thackray 1990, 16).

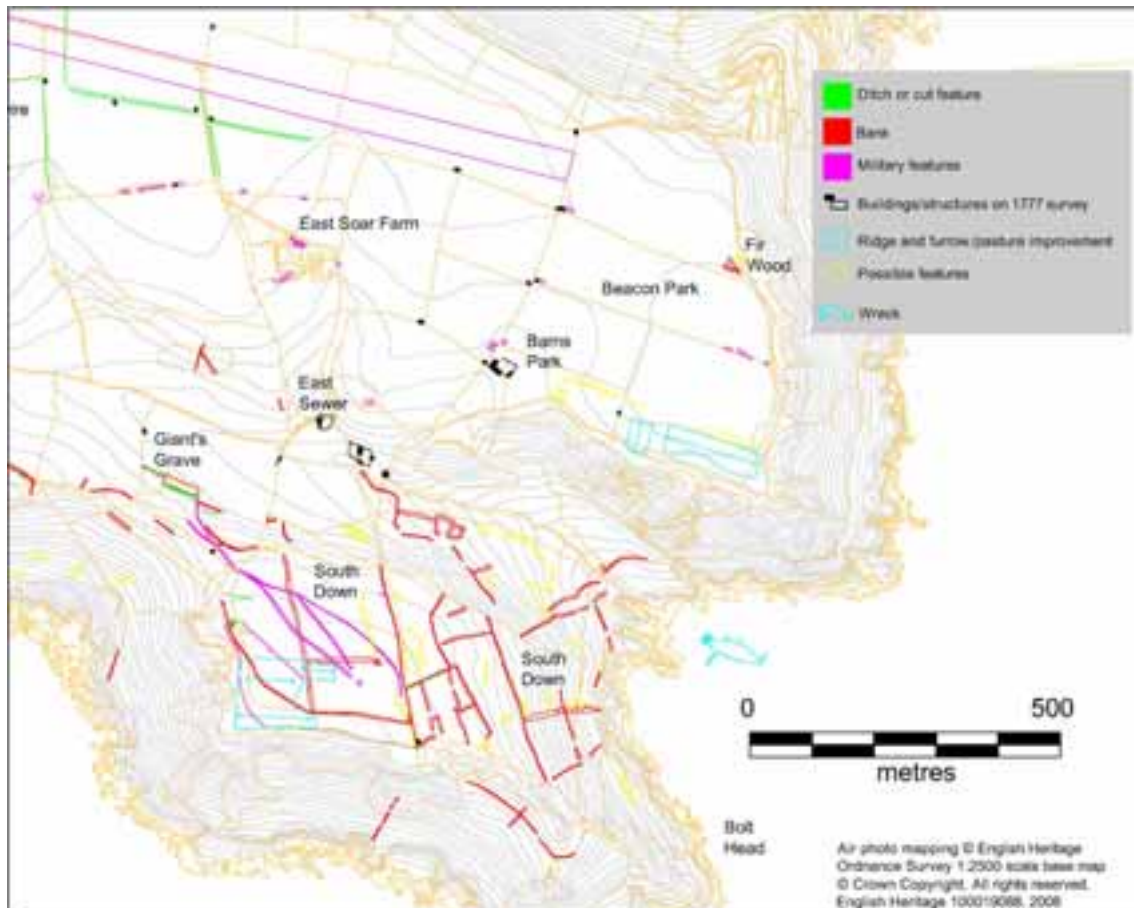


Figure 3 East Soar, Starehole Bottom and Bolt Head

Farm buildings or medieval settlement in Starehole Bottom

(Scheduled area 34887; NT100,533; HER 21574; NMR 444292)

Nothing could be positively identified on air photographs as remains of medieval or earlier settlement in Starehole Bottom. However, there are a number of boundaries, some of which clearly relate to the field systems up on South Down (Figure 3). Some of the boundaries could be parts of enclosures and were recorded from air photographs and lidar. The vegetation covering these remains is now very dense and their function is unclear, as the north facing steep and stony slope seems an unlikely location for settlement but it is likely, as on South Down, that there are a number of phases of land division here. Any further research requires scrub clearance, in a manner sensitive to the underlying archaeology, prior to ground survey.

Harold Fox suggests that amateur antiquarian John Cranch (1799) and the Rev Mark Bawden (Milles, 1775) were both told the same story of a lost settlement in Starehole Bottom by local inhabitants (Fox 2001, 31, 34-5). Fox suggests of Cranch and his companions that 'Unfortunately the romantic nature of the scenery affected their young

imaginations and they saw tumuli and ramparts at every turn...'. Fox also suggests that some sort of shoreline activity may be the cause of increases in rent, and a large rent return, in the 1534-5 manorial account (Fox 2001, 31 & 34-5). If these tax returns are the result of fishing and processing at the relatively poor rough ground by Starehole Bay there may have been cellars, or other buildings, that led to the late 18th century folk memory of a settlement associated with structures in or near Starehole Bottom.

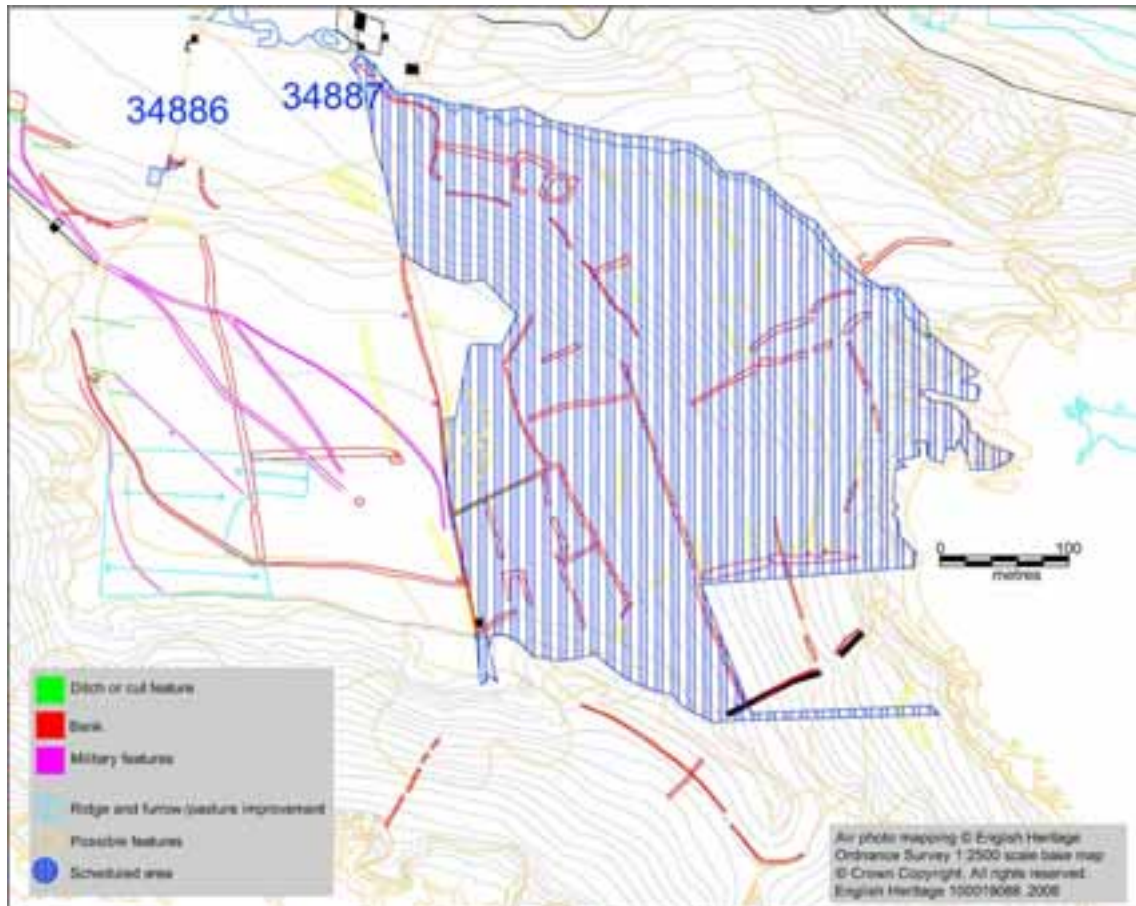


Figure 4 Scheduled areas in and around Starehole Bottom

Field systems Starehole Bottom to South Down

(Scheduled area 34887, NT 100, 539, HER 66008, NMR 1368794)

The field system on South Down includes boundaries which align with the current field pattern (Figure 3). These comprise long N-S boundaries with shorter E-W subdivisions. It is possible that the long N-S boundaries relate to when common land at Soar was being divided (Thackray 1990, Appendix F) with further E-W sub-division during the late 18th century. This does not discount the possibility that the boundaries on South Down originated in the prehistoric period, as suggested for field systems at Deckler's Cliff and elsewhere, but it is difficult to say with any certainty (Newman 2003, 7; Turner 2007, 29).

Above the cliffs on South Down there is an area of smaller fields (A on Figure 5), and this may represent a different, earlier phase of use. There are also possible enclosures in Starehole Bottom (B on Figure 5). Further work, analytical field survey in particular, is required to establish a chronology for the development of these apparently different elements of the field systems on South Down and in Starehole Bottom.

No hut circles were identified on the available air photographs or during the field visits. A circular feature (C on Figure 5, SX 72381 36311) on the southern edge of South Down, is almost certainly not the remains of a hut circle. An area of disturbed ground (marked on Figure 5, SX 7226 3646), includes some sub-circular features, which may be the site of prospecting pits. There is another circular feature further north along the field boundary (D on Figure 5, SX 72236 36553) which may also be the result of mining prospectation. A short period of mining is known on the cliffs on the other side of the Salcombe estuary at Deckler's Cliff (Newman, 2003), and elsewhere along this stretch of coast (Thackray 1990, 36), and it is possible that Bolt Head was also explored for mineral potential in the nineteenth century.

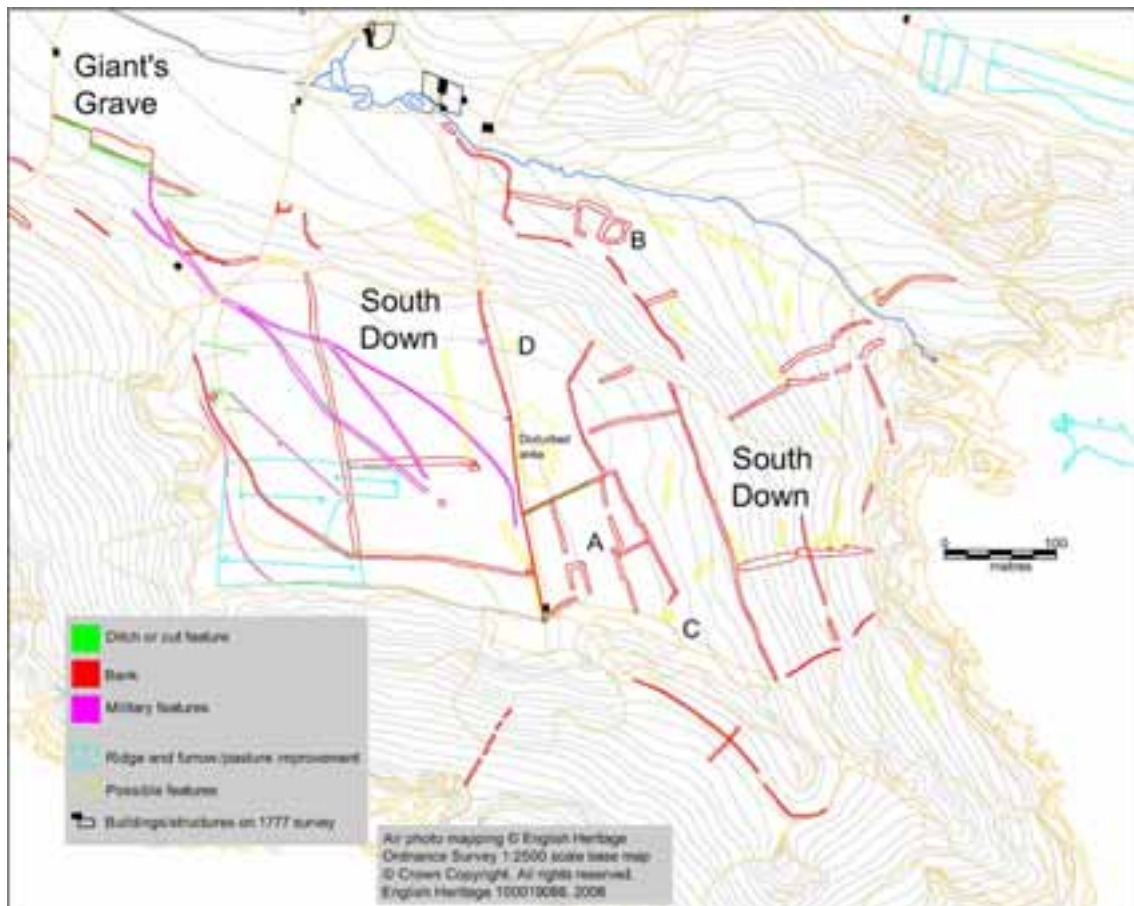


Figure 5 Field systems on South Down

Long mound - Giant's Grave

(NT 100,540; HER 7033; NMR 444283)

The location and basic form of the Giant's Grave have been plotted from air photographs (Figure 3, Figure 5). Norman Quinnell surveyed the mound for the RCHME in 1987, and concluded, 'The whole is quite regular in construction and though its purpose is obscure there is some resemblance to a pillow mound in its shape, though not in the usual cross-contour situation' (NMR Monument Long Description). The width is notable (it measures 62m by 16m) as recent work on rabbit warrens suggests that pillow mounds are generally up to 10m wide (Williamson 2006, 16). Comparison with excavated sites suggests that the construction of the Giant's Grave, from a mix of earth and stone, is not unusual for a pillow mound (Williamson 2006, 19-25). Williamson notes that co-location of pillow mounds with earlier earthworks, often prehistoric, is common (2006, 19) and Quinnell suggests that the Giant's Grave may be sitting on an earlier, possibly prehistoric, field bank (NMR Monument Long Description). Most pillow mounds are found on land that was once common land prior to 18th century enclosure (Williamson 2006, 19). The Reverend M Bawden describes 'Soars or Sewers formerly a common...but divided lately' and on the south side of the parish is a 'large parcel of ground formerly a rabbit warren and still existing' (Thackray 1990, Appendix F). The location of the pillow mound outside the 18th century Warren Wall could indicate that the warren was once more extensive or that the mound was deliberately isolated, perhaps for young or breeding does. The national distribution of pillow mounds suggests a preference for construction in the south-west of England (Williamson 2006, 18). Although the circumstantial evidence is strong, the interpretation of the Giant's Grave as a pillow mound is not conclusive.

Long mound north of Sharp Tor, by Fir Wood and East Soar

(NT 100,530; HER 70183)

The location and basic form of the long mound (SX 72779 37086) have been plotted from air photographs (Figure 3). On the 1946 air photos it appears as a long narrow mound, measuring approximately 30m by 5m, which seems to have a shallow semi-circular depression or scoop to either side. An OS trig point is situated at the junction of field boundaries immediately to the south. The mound is unusual and contains some large stones and appears disturbed (Blaylock pers. Comm.). It is possible that it is a pillow mound but further research and analytical field survey is required.

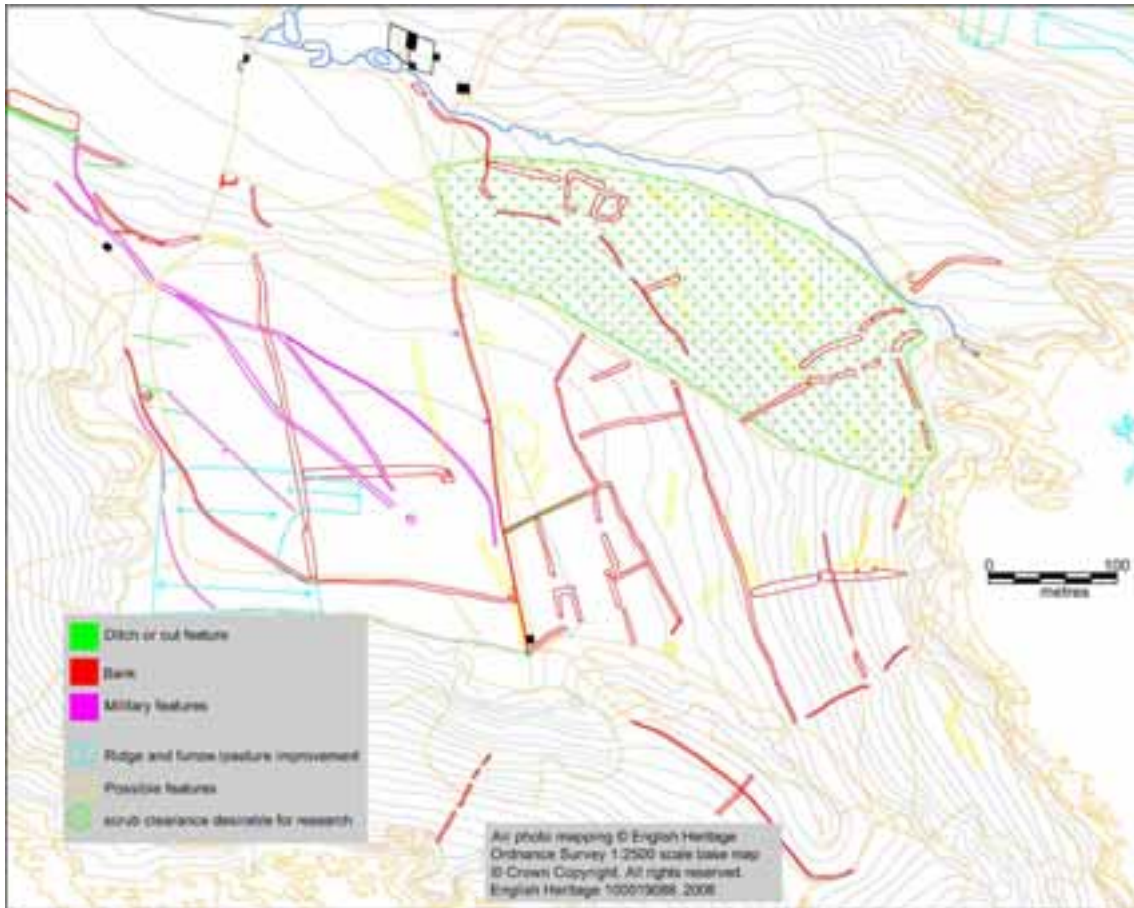


Figure 6 Area recommended for scrub clearance prior to further research

The preservation of the remains within the scheduled areas appears good although in Starehole Bottom everything is obscured by dense vegetation. The areas on the western side of South Down are in improved pasture with the result that preservation appears less good. The military structures (along the western edge of the scheduled area) have been removed. Figure 6 shows the area recommended for scrub clearance.

The Warren and Middle Soar

The most significant archaeological features visible on air photographs by The Warren and Middle Soar are the different phases of relict field systems, similar to those on South Down (Figure 7). The Warren Wall cuts through the field system and this has fortuitously preserved the earthworks to the south in pasture. These appear well preserved on the 1940s and 1950s photography but most are now abraded probably as result of grassland improvement, possibly chain harrowing. The field systems have been described by various sources as prehistoric in date but most appear to relate to the post medieval field pattern. Ridge and furrow extends across The Warren and could represent remains of a phase of arable documented in the 18th century (Thackray 1990, 34). The lidar data suggests that there is reasonably good survival of earthworks in the non-scheduled areas and this was confirmed on a field visit. Also of note is the large mound to the south of Middle Soar next to the Warren Wall, and the remains of the round barrow above West Soar.

Paths marked on the 1886 map indicate multiple access points into The Warren from the east and west but these are not on the 1777 survey. The plan of Middle Soar was not available for this survey but it is probable that a track from Higher Soar provided access to Middle Soar, assuming it was in existence by then, and the central part of the warren. Buildings on the 1777 map include a small structure and yard, now gone, attached to the north of the Warren Wall by the Warren Gate, but not Warren Barn, which is on the 1886 OS map.

This area includes the southern end of the RAF Bolt Head NE-SW runway and a scatter of military buildings along the cliff top fields. Part of the Warren Wall was demolished to accommodate the perimeter fence around the end of the runway (Figure 7). The military buildings and structures have all been removed but there are some remnants visible as earthworks and occasional bits of concrete.

Most of the land to the north of the Warren Wall is in arable, and has been since the 1940s, but despite this, no cropmarks have been recorded, possibly due to lack of appropriate air photography. The only earthworks seen in the area north of the Warren Wall include a lynchet and the supposed prehistoric settlement to the east of Middle Soar (Figure 7).

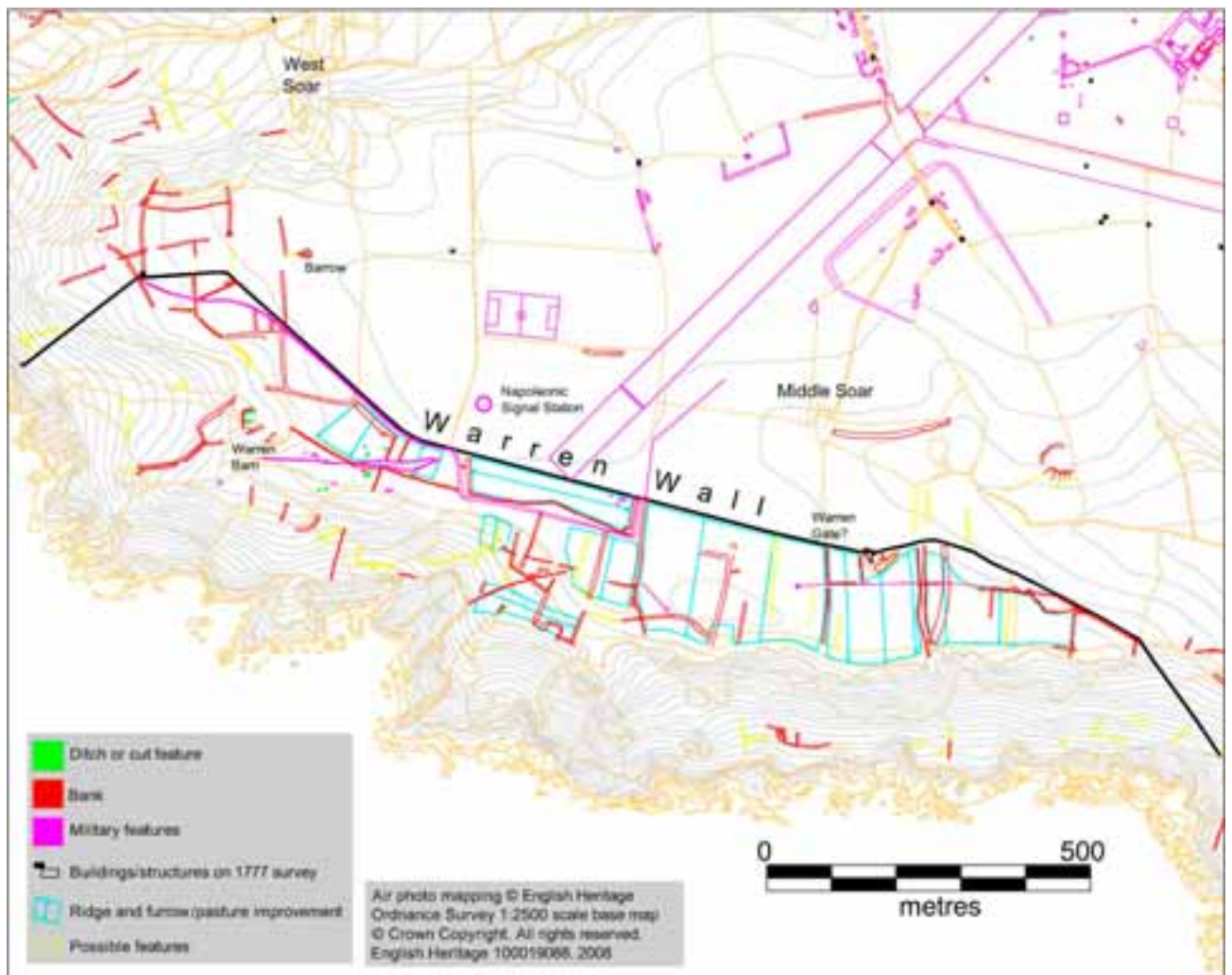


Figure 7 General View of The Warren

Hilltop enclosure 380m east of Middle Soar

(Scheduled Area 33781; HER 63612; NMR 1345011)

The feature interpreted in the scheduling description as a 'hilltop enclosure' appears as a roughly circular level area apparently terraced into the hillside (Figures 7 and 8). However, it is unclear if this is a natural or man-made feature. It is visible as indistinct scarps on 1946 air photographs, but has subsequently been ploughed level. Further work is required, perhaps geophysical survey, to ascertain the nature and extent of any possible archaeological features in this area.

Medieval farmstead, long mound, field system, south east of Middle Soar

(Scheduled Area 34885; NT 100, 547-9,535; HER 22807, 36192; NMR 1369319, 444317, 444335)

The 1777 Courtney Estate survey depicts a building and yard immediately to the north of the Warren Wall with the yard, or pinfold, abutting a kink in the wall; there is no trace of either of these features on the 1886 OS map or the available air photographs. The 1777 survey and the 1886 OS map both depict the farmstead, the mound and boundaries south of the wall. Quinnell suggests that the estate map indicates the location of the Warren Gate but Thackray does not reproduce the 1777 estate map for Middle Soar. Quinnell may have assumed the location from field evidence or it may be annotated on the 'missing' estate map.

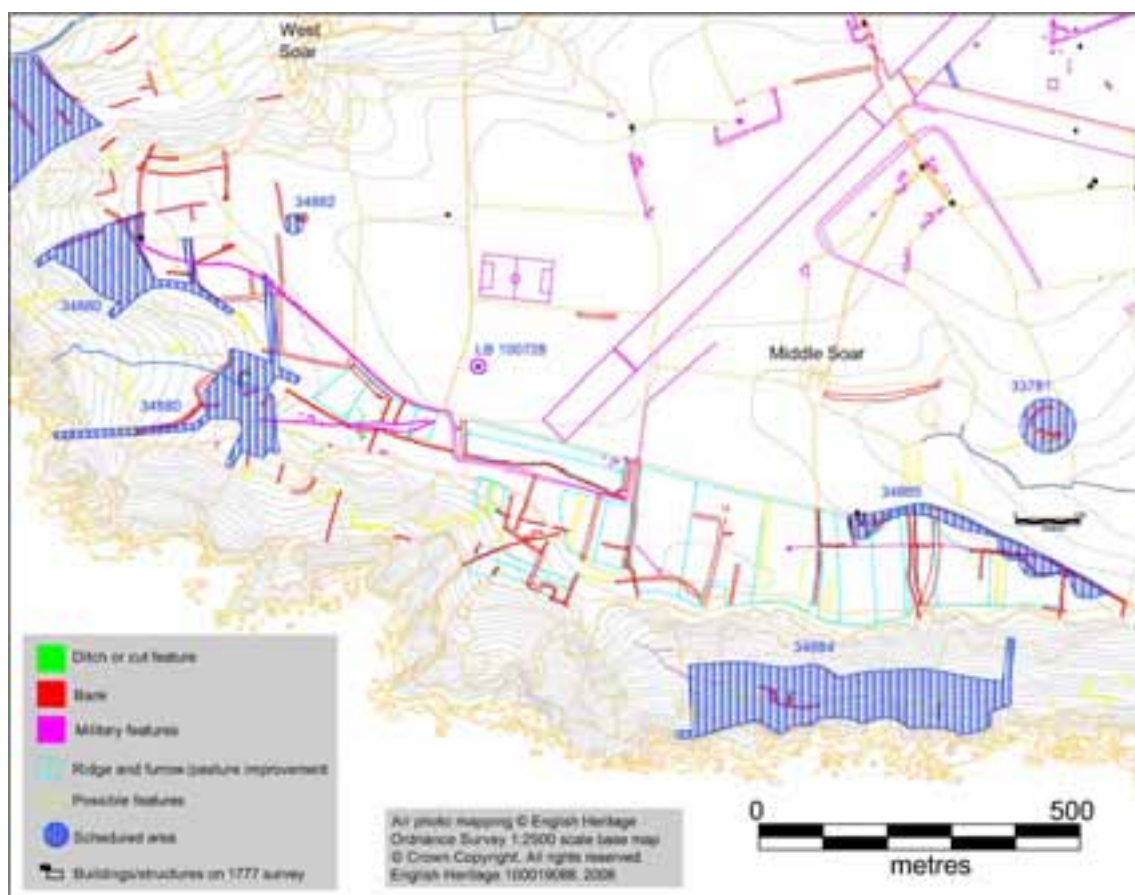


Figure 8 Scheduled areas at The Warren and Middle Soar

Most field boundaries in this area appear to relate to the post medieval field pattern and the scheduled areas include some of the best preserved elements (Figures 8 and 9). This area would benefit from further survey as analysis of the relationships between features could provide a relative chronology for land use in this area. For example, the double boundary (A on Figure 9) could mark the edge of two properties on the cliff top, as it

does not seem to mark a routeway as it leads directly to a precipice. Next to this is a broad curving boundary (B on Figure 9) which could represent an early boundary. There are also two interesting kinks (C on Figure 9) and an intersection of boundaries (D on Figure 9) which could indicate the sites of former structures. The area is covered in scrub and the two mounds identified by Norman Quinnell (E and F on Figure 9; HER 36181-2 NMR 444338; NT 100,534-5) were indistinct on the air photographs. A World War II cable trench (in pink on Figure 9) cuts through the boundaries and finishes at a circular depression, the site of a hexagonal structure recorded on 1946 photographs. This whole area, especially the Scheduled Monuments, would benefit from scrub clearance (Figure 10).

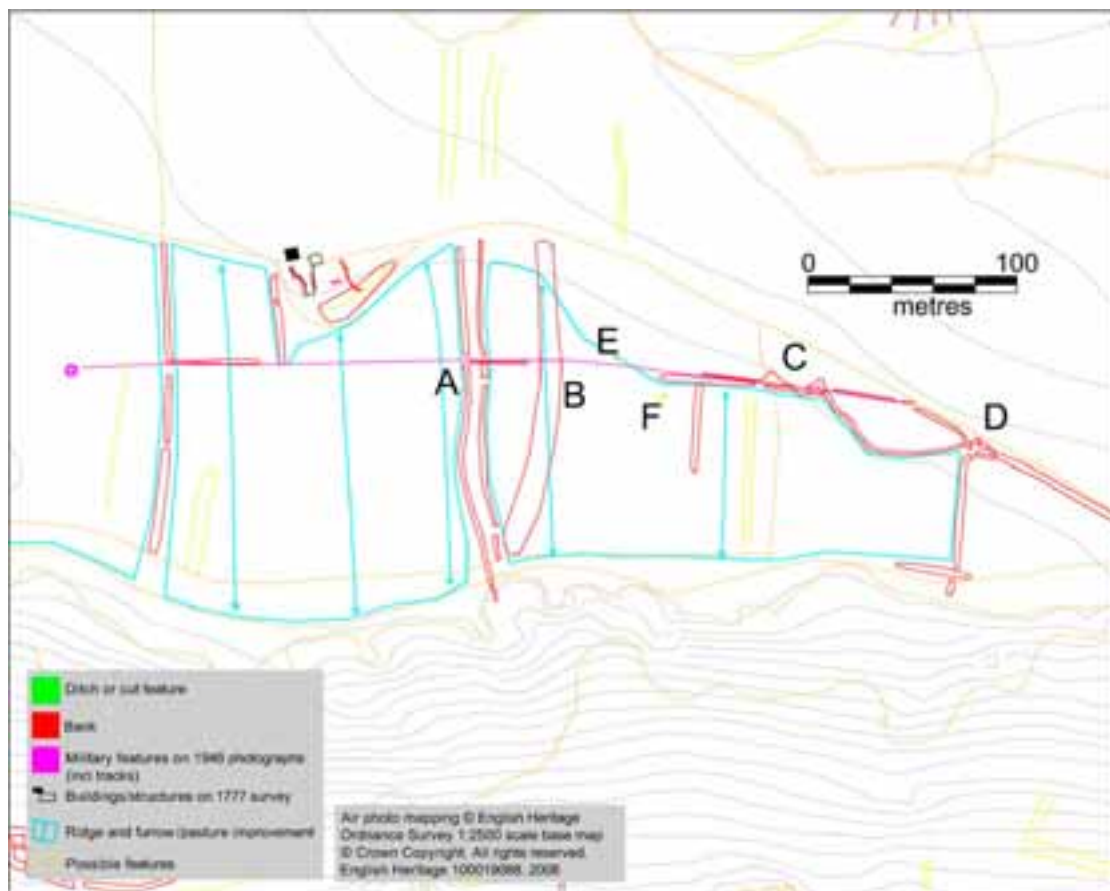


Figure 9 Detail of the central Warren

Field systems, hut circles and four beacons, 510m south of Middle Soar

(Scheduled area 34884; HER 66010; NMR 1368826)

Parts of enclosures of unknown date and function were recorded on the 'shelf' of the cliff (Figures 7 and 10). These have a different character to the post medieval field boundaries on top of the cliff and so may have earlier origins. The cliff tops were used for seasonal grazing in the post medieval period, and possibly earlier, and so the enclosures may be

related to stock management (Turner 2007, 97). The hut circles and beacons were not visible on the available air photographs nor were they discovered by rapid field investigation. This area would benefit from scrub clearance.

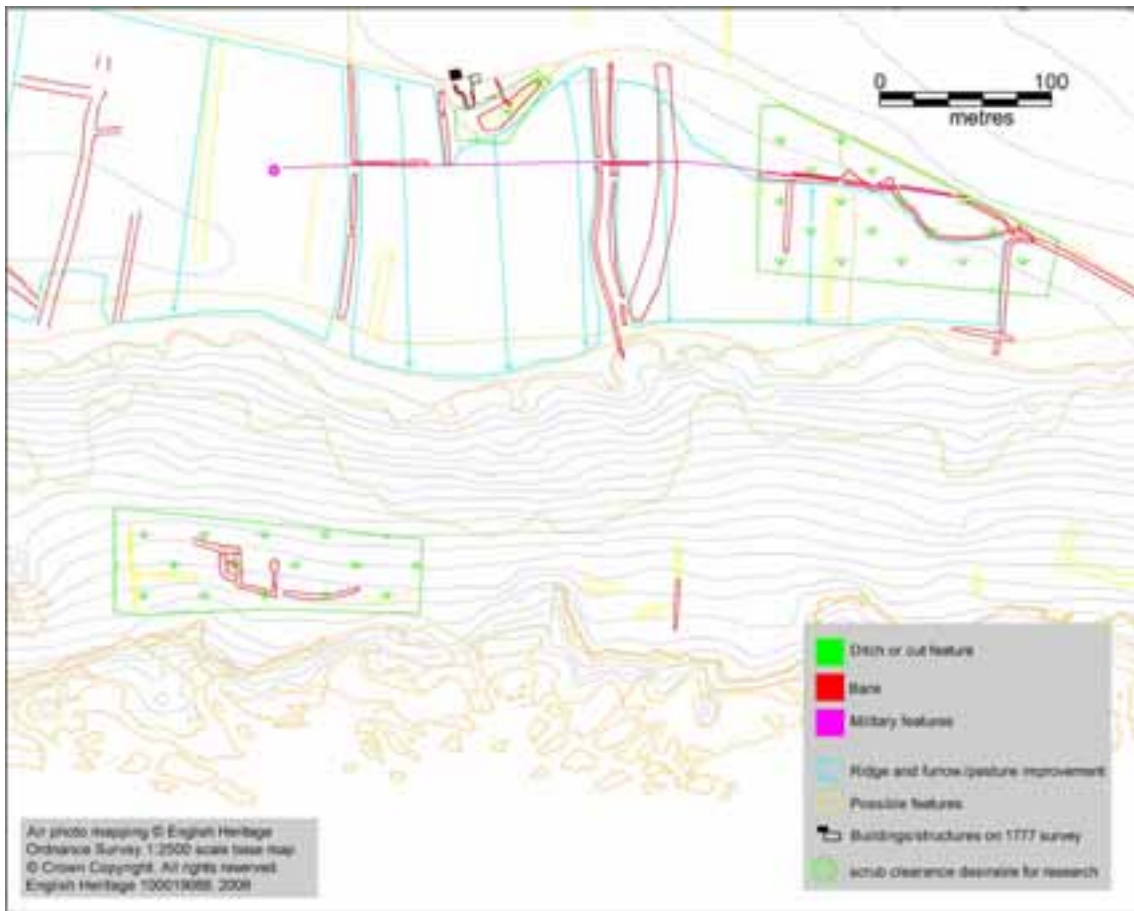


Figure 10 Areas recommended for scrub clearance at The Warren

Regular aggregate field system south west of West Soar

(Scheduled area 34880; HER 66002, 70189; NMR 1369288)

The scheduling description for 34880 covers part of the extensive remains of field systems to the south of West Soar, west of The Warren and around Warren Barn (Figures 8 and 11). Some elements appear to relate to the post medieval enclosure boundaries. As at Bolt Head there are less clearly defined lynchets which could have earlier, medieval or even prehistoric, origins. A pillow mound in the scheduling description was not identified but may be a misinterpretation of one of the field banks. The area immediately around and to the west of Warren Barn was difficult to see on the air photographs due to heavy shadow. Survival and preservation of the earthworks is variable and not surprisingly appears better in the areas no longer in improved grassland, but lidar indicates that there is some survival in those areas too.

Bowl barrow 210m south of West Soar

(Scheduled area 34882; HER 66011; NMR 1368983)

The basic outline of the barrow was drawn from air photographs (Figures 7 and 11). It appears as a spread of material, measuring approximately 21m by 14m, with a depression in the centre measuring 6m across. A field visit confirmed that the barrow survives as a large stony mound.

The Signal Station

(Listed Building 100728; HER 7031)

The signal station is a square stone tower at SX 7064 3710, measuring approximately 3.0m across. It has a pyramidal stone roof with a small flat platform top, the roof pierced by three small apertures facing E, S and W. There was an upper floor with a window to the S. The ground floor has a blocked window to the E and doors to the N and W. The W door, now blocked, was an internal opening to an outshot with a single pitch (or flat) roof. At some time this outshot was replaced by a building with a gabled roof. There was an enclosed yard to the S.

This tower was built c1795, one of a series designed to observe shipping movements, to warn merchant ships of enemy movements, and to inform the militia in case of an attempted enemy landing. Each station was manned by a lieutenant, a midshipman and two seamen, with two dragoons attached to carry messages. The towers were equipped with a mast and gaff to hoist signals and a beacon for night signals, though in some cases these were replaced with telegraphs in 1812 (Lavery 1989, 263-4).

Soar Mill Cove and Mousehill Brake

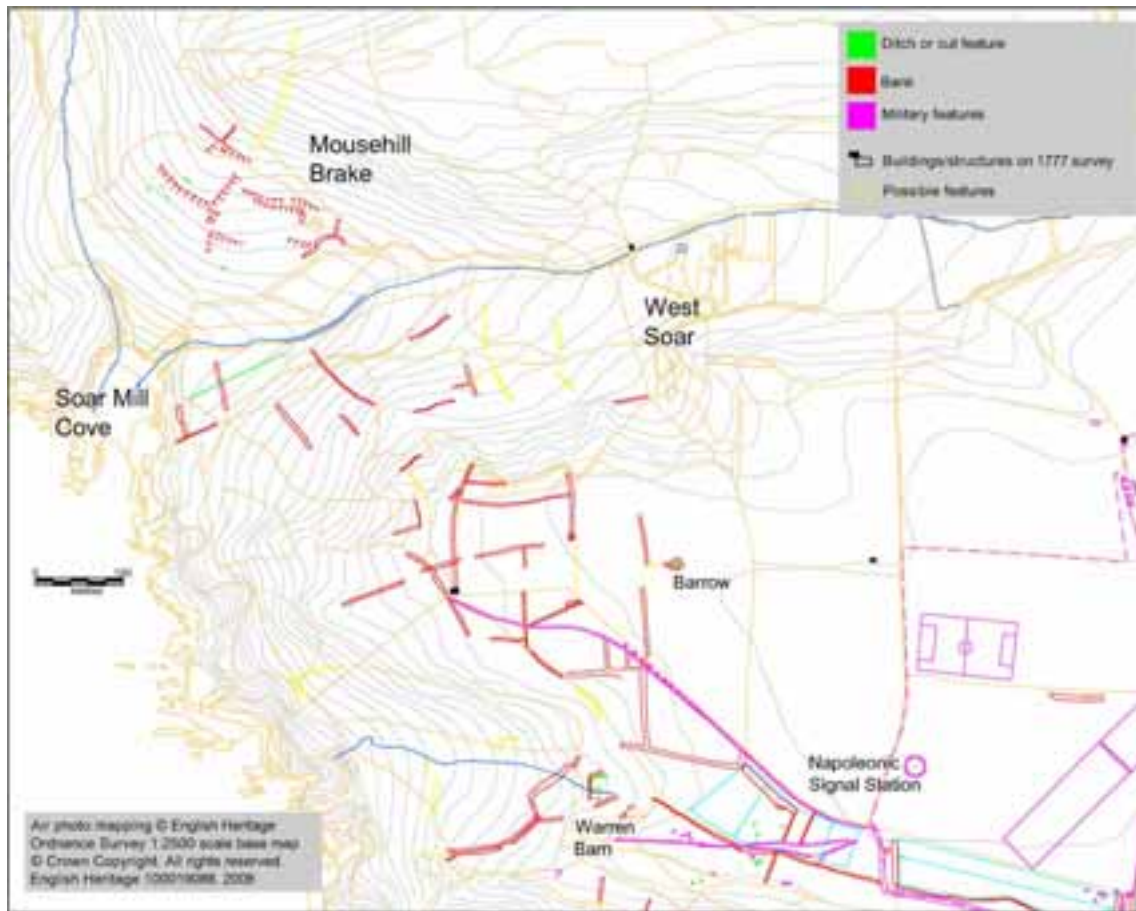


Figure 11 Soar Mill Cove and Mousehill Brake

Field system east of Soar Mill Cove

(Scheduled area 34888; NT 100,536; HER 66002; NMR 1368756)

Parts of boundaries are visible on air photographs on the north facing slopes above Soar Mill Cove (Figure 11). This area is often in shadow, or is covered in dense vegetation, on the available air photographs and lidar images. The character of the boundaries is similar to those found on the more level ground above West Soar, at the west end of The Warren. It is possible that they form part of the same system of boundaries. Removal of the scrub in this area is required before any ground based study (Figure 13).

Two hut circles, associated field systems, and an enclosure at Mousehill Brake

(Scheduled area 34883; NT 100,536; HER 36200, 66003; NMR 1368989)

The scheduling description refers to two hut circles associated with the field systems at Mousehill Brake but none were identified on the air photographs or during a field visit. The enclosure, referred to as 'D' shaped in the NMR and HER, may be a fortuitous arrangement of the scarps and lynchets, which divide the slope below Mousehill Brake. These are comparable to prehistoric or Roman fields found elsewhere in the south of England (Figure 11) but could be medieval or later features. The field system at Mousehill Brake appears to be different to those between Soar Mill Cove and Bolt Head which are mainly defined by narrower and longer banks. Further work, including analytical field survey, is required to understand the archaeological features in this area as the descriptions in the Scheduled Monument Description and NMR and HER records do not tally with the evidence on the air photographs.

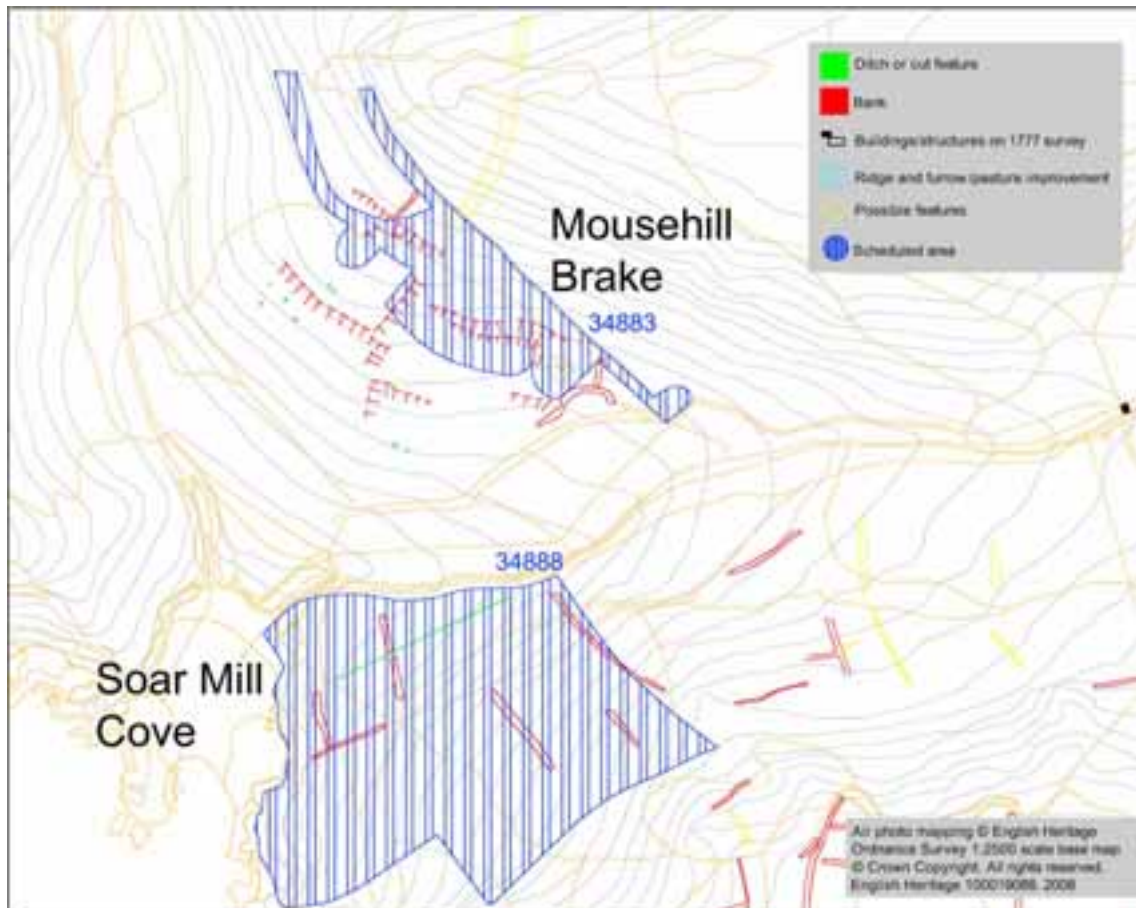


Figure 12 Scheduled areas at Soar Mill Cove and Mousehill Brake

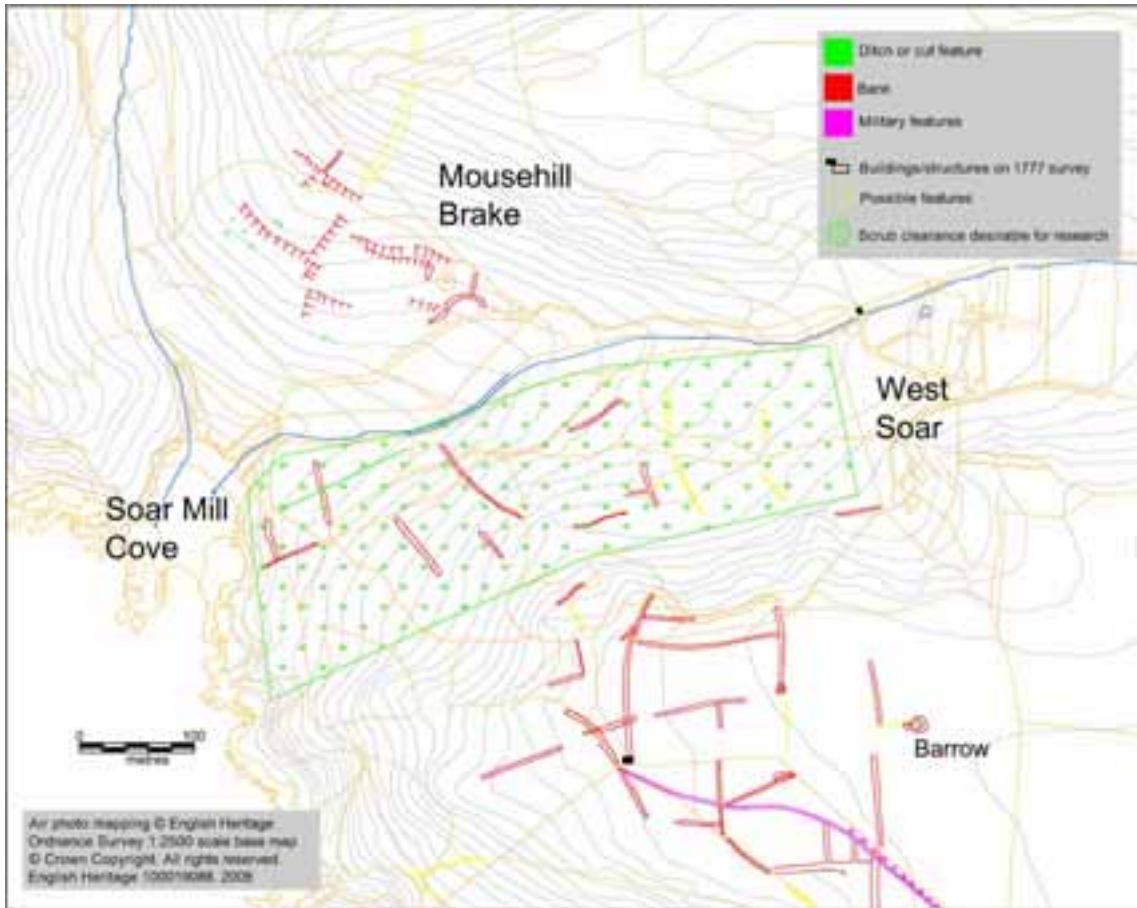


Figure 13 Areas recommended for scrub clearance at Soar Mill Cove

DISCUSSION OF FIELD SYSTEMS

Domesday Book records that Soar was owned by Algar, one of the major landowners in the South Hams and that he, and his successor, had high numbers of sheep and goats, and correspondingly low numbers of plough teams at Soar (Faith 2004). In the later medieval period, the South Hams is thought to have been an area of mixed farming with a range of arable crops grown in open fields which were enclosed relatively late (Turner 2007, 114). Also, although there was less 'rough ground' in the South Hams than elsewhere in Devon, stock were grazed on the cliffs or taken up to Dartmoor in the summer months (Turner 2007, 97).

Documentary evidence and the scatter of barns and lincays suggest that most of Soar, except the cliff, was used for arable at some point from at least the 18th century (Thackray, 1990 34-5). A 1777 estate map shows boundaries dividing The Warren and includes a long boundary along the cliff top annotated with 'arable ground' implying that the steep land below the cliff top was used for grazing. Further possible evidence for arable is the ridge and furrow surviving in most areas to the south of the Warren Wall and in small patches on South Down. This could be the result of grassland improvement or relatively short lived arable.

Caroline Thackray's archaeological assessment includes the 1777 Courtney estate survey plans XI to XIV and XVI to XVIII which cover 'East Sewer' from east to west between Mousehill Break and Starehole Bottom (Thackray 1990, 54-63). It has been suggested that plans XIV and XV are unidentifiable drawings of Coast, Cliff and ships (Ravenhill and Rowe) however, plan XIV actually covers a small area to the east of Higher Soar (Thackray 1990, 56). Thackray does not include the area immediately around Middle Soar, possibly plan XV, presumably because it does not include NT land, or it was not available at the time of her survey.

Despite the small gap in the evidence it appears that the field pattern today is essentially that recorded in the Courtney Estate Survey of 1777 (Thackray, 1990, 54-63). Some boundaries have been removed to enlarge fields and construction of the airfield altered the layout to the north and west of East Soar Farm in particular. By highlighting the longer alignments of boundaries, it is possible to see where the late 18th century field pattern relates to relict field boundaries on South Down and The Warren (Figure 14).

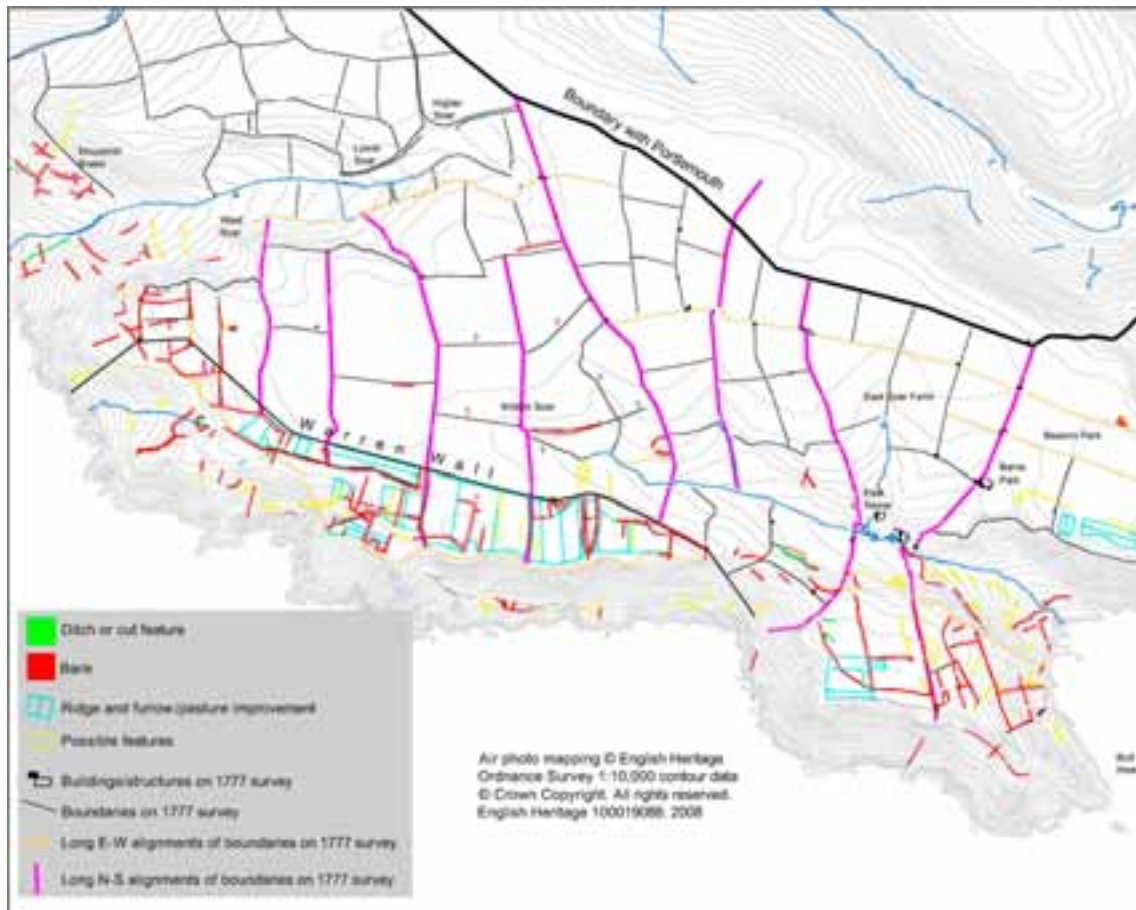


Figure 14 Field systems visible on air photographs and the 1777 Courtney Estate Survey.

Analysis of field patterns can reveal much about the historic character of the landscape but it is often difficult to distinguish the dates of fields in Devon from form alone (Turner 2007). Middle Soar seems to mark a point between small fields on the eastern side of the survey area and larger fields to the west (Figure 14). There are areas with even smaller subdivisions on South Down and in the central and eastern parts of The Warren.

The evidence from air photographs provides some clues to phasing of the range of field types at Soar. For example, the Warren Wall clearly cuts across the late 18th century layout of fields. The ridge and furrow also appears to post date some of the boundaries at The Warren. The smaller fields on South Down and The Warren appear to relate to the 18th century pattern but it is not clear which parts represent the earliest phases. It is possible that the 'cliff shelf' enclosures are for stock management but they could be of any date from the prehistoric onwards. Analytical field survey of earthworks in selected areas could establish a relative chronology for the boundaries, and other features including buildings, and it is recommended that this, and further documentary research, form the basis of any future work at Soar.

In the 1775 Dean Milles parish survey of Malborough, the Reverend M Bawden described Soars as being 'on the south or south-east side of the parish, adjoining to which on the

south...' is a '...large parcel of ground formerly a rabbit warren but still existing'[. This sounds very much like the area between Higher Soar and Bolt Head. Bawden also noted that 'Soars or Sewers formerly a common between several people according their right extending according to their leases, but divided lately' (Thackray 1990, Appendix F). The field names also suggest enclosure at Soar in the 18th century (Thackray 1990, 34). It is therefore possible that the field pattern at Soar derives from the division of common land, perhaps resulting in the long curving alignments of boundaries which define broad strips of land extending to the coast. These seem to have been subdivided with short straight boundaries, possibly the 'divided lately' referred to by Bawden.

The weight of evidence suggesting an essentially 18th century layout does not rule out earlier origins for some of the field boundaries. A survey at Deckler's Cliff, on the other side of the Salcombe estuary, found a once extensive prehistoric field system which was reused in the medieval period (Newman 2003). The field system at Deckler's Cliff consists of collapsed stony banks and very large lynchets (Turner 2007, fig 88). In contrast, most of the field boundaries in the pasture along the cliff tops between Soar Mill Cove and Starehole Bottom are relatively narrow earthen banks. There are larger and stonier banks in places but nothing as substantial as the lynchets at Deckler's Cliff. North of the Warren Wall there are a number of the boundaries which contain large orthostats, for example to the east of East Soar Farm or above West Soar. The neat dry stone walling of the Warren Wall is another boundary type to be found in the survey area. The 1777 estate survey also records small structures attached to walls throughout the survey area but none of these seem to have survived. A recent boundary survey at Soar (S Blaylock and C Whitton, pers comms) identified six types of walled or embanked boundaries. There therefore seems to be a complex, but very hard to date, sequence of enclosure at Soar which requires further research.

RAF BOLT HEAD AND HOPE COVE GCI

RAF Bolt Head airfield and the RAF Hope Cove Ground Control Intercept (GCI) radar station were established in different phases between 1941 and 1942. The airfield was decommissioned in 1947 and the GCI continued until 1957. The site was subsequently used as a South West Regional Seat of Government until it was sold in the early 1990s.

The air photographs provide a good pictorial record of the main structures associated with the airfield and GCI radar station, and subsequent activity at the GCI as part of the Rotor operation during the Cold War. A number of publications describe the history of the military in this area (Ashworth 1982, Clamp 1992, Delve 2006, Passmore and Passmore forthcoming) so this report will briefly outline the contribution of air photographs to the story.

The influx of people and the alterations to the landscape had a tremendous impact on the local population and those stationed in the area record the hospitality provided (Clamp 1992). The record of reminiscences of those stationed at the airfield and GCI includes photographs of people, aircraft and local accommodation (Clamp 1992) but, perhaps not surprisingly, do not usually include records of military structures. Little remains of these military installations and the air photographs supplement the documentary and oral history sources.

A number of phases of use, or changes in the main structures, are recorded on air photographs taken in 1942 and 1944, when the airfield was active, and in 1946 and 1947 during the final stages of use (Figure 15). Air photographs taken in 1949, 1954 and 1958 also provide general views and details of the GCI buildings and radars in the post war period.

Evidence of World War II remains

The south coast location provided proximity to the continent and RAF Bolt Head was established as a basic airfield in 1941 and expanded in 1942 (Clamp 1992, Delve 2006). Various squadrons flew out of RAF Bolt Head using Spitfires, Lysanders, Typhoons and Supermarine Walrus Air Sea Rescue flying boats amongst other craft (Delve 2006, 39). The airfield was at its peak in the build up to D-day in 1944, reverted to care and maintenance in 1945, and closed in 1947.

Air photographs taken in 1942, 1944 and 1946 record the main WWII structures associated with the airfield (Figures 16-19). The 1942 photographs illustrate the early phases of the site and those taken in March 1944 record the site in the year of peak activity. The 1946 air photographs show the airfield as it is being dismantled and the location of many of the buildings, especially on the periphery of the airfield and along the runways, is indicated by a hard standing or a cleared area.

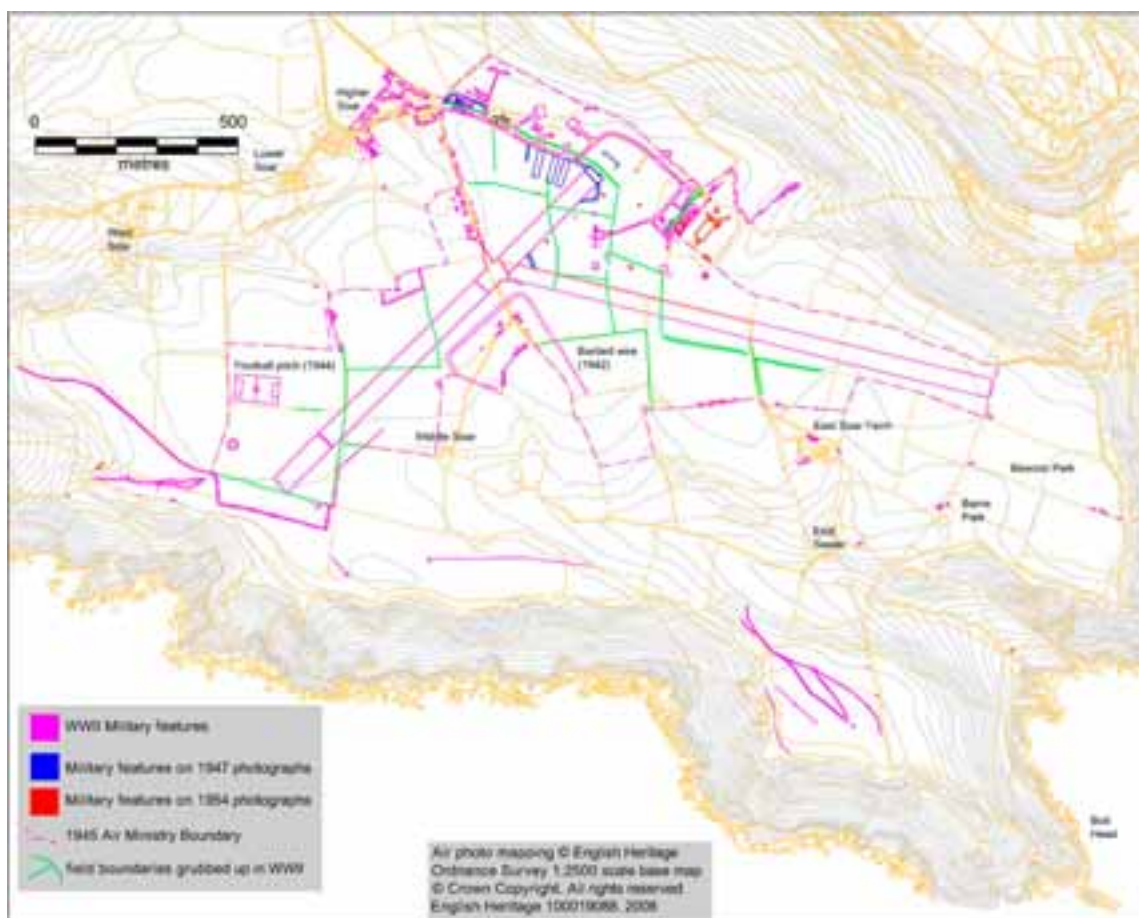


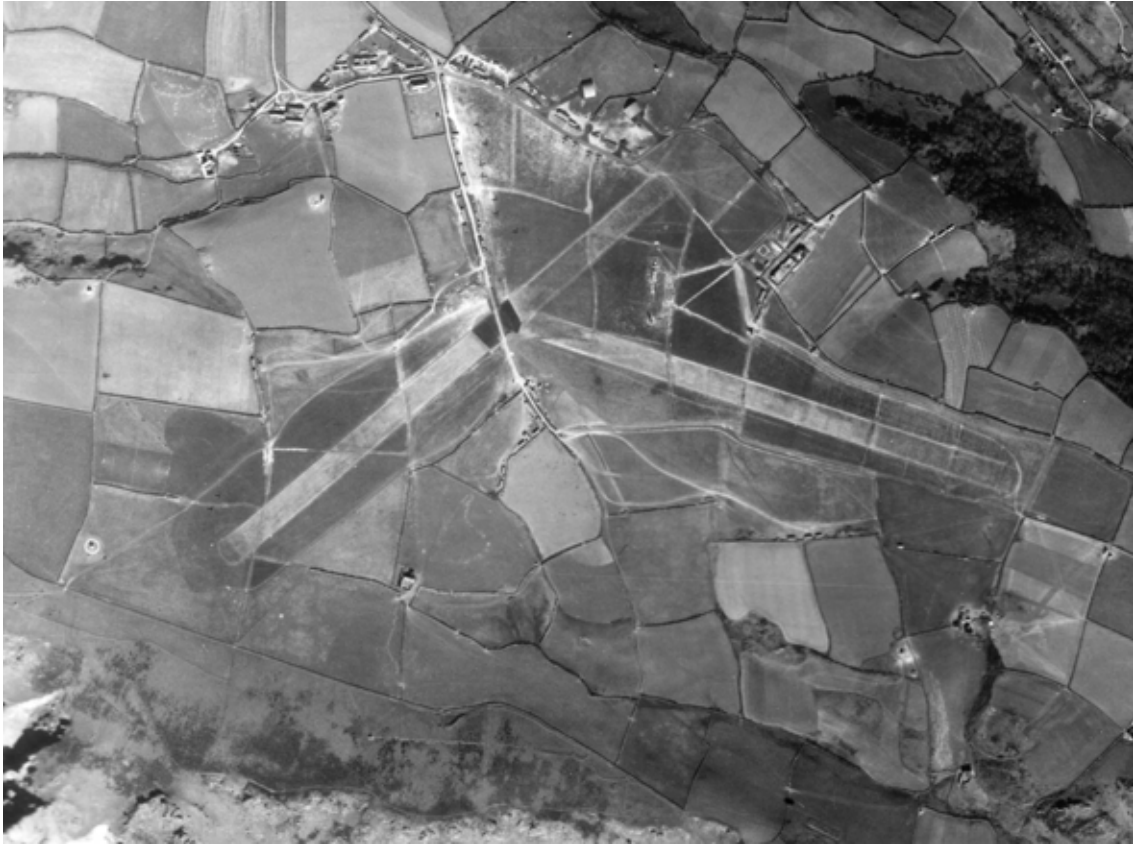
Figure 15 General view of RAF Bolt Head, Hope Cove GCI and other military features at East Soar

Annotated Air Ministry plans from 1941/2, 1943 and 1944/5 (available from the RAF Museum at Hendon) provide information on the location and type of structures associated with RAF Bolt Head and RAF Hope Cove CGI (see also Clamp 1992). Figure 18 indicates the location of some of the main buildings. The air photographs supplement the 1945 plan and recorded structures outside the perimeter of the airfield. Air photographs also recorded adaptations to the airfield illustrating, for example, the lengthening of the runway after March 1944. The air photographs recorded more ephemeral features such as the barbed wire enclosure in the centre of the airfield in 1942 or the football pitch near the NE-SW runway in 1944. Also of interest is the snapshot these photographs provide of the airfield while it was operational recording, for example, parked aircraft (Figure 17).



*Figure 16 The airfield and GCI in 1942 RAF HLA 535 Frame 6020 7th May 1942
English Heritage (NMR) RAF Photography*

Features on the periphery of the airfield, probably associated with cliff top gun sites, are included in some of the scheduled areas. For example the demolished structures and tracks at Bolt Head, the cable trench running through the field systems at The Warren, and the possible bomb craters, trackways and demolished structures above Steeple Cove.



*Figure 17 The airfield and GCI in 1944 CT 89 541 Frame 3063 8th March 1944
English Heritage (NMR) RAF Photography*

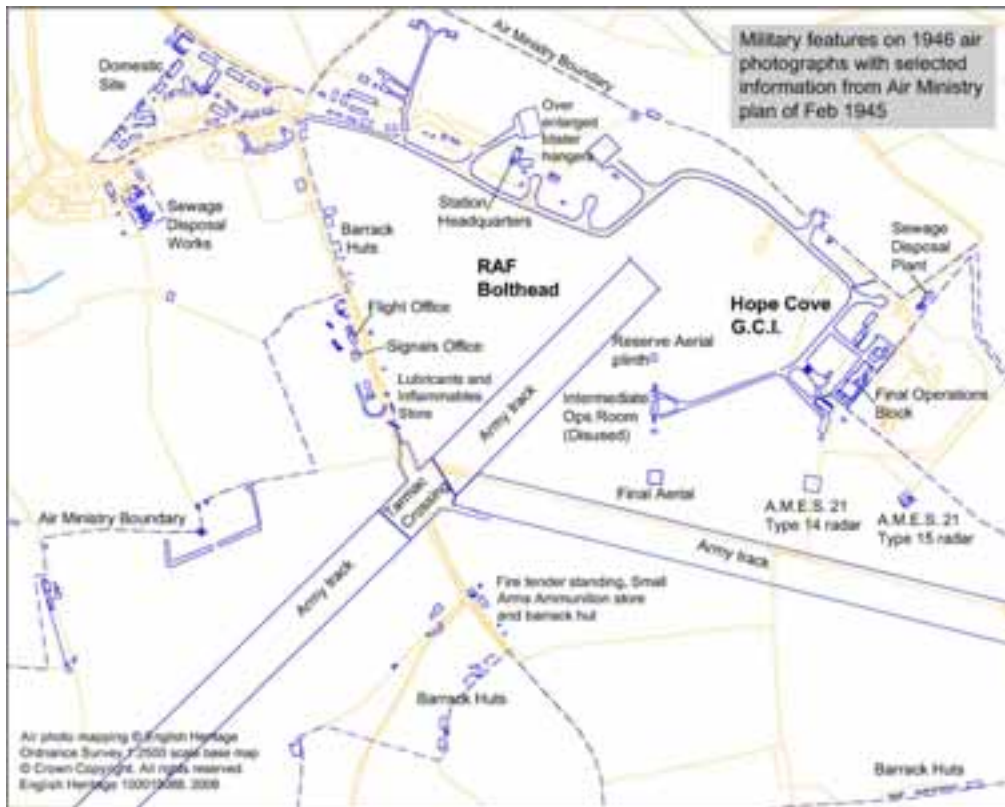


Figure 18 Military Features on air photographs with selected information from the Air Ministry map of 1945

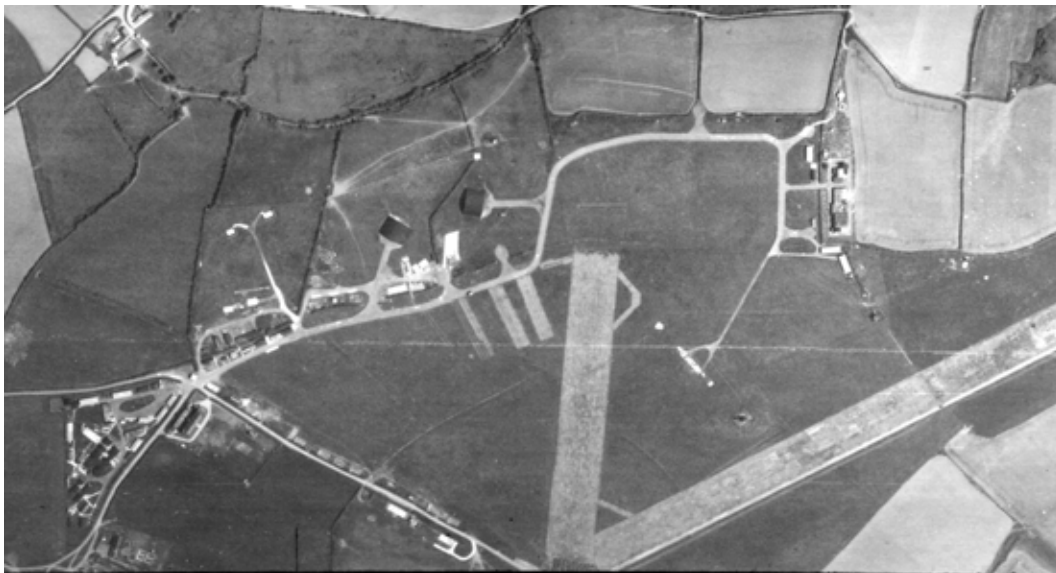


Figure 19 The main structures remaining at the airfield and GCI in 1947. RAF CPE/UK/2105 Frame 4121 28th May 1947 English Heritage (NMR) RAF Photography

The GCI in World War II and the Cold War

The GCI radar station was established and developed in 1941-2 (Passmore and Passmore forthcoming; Clamp 1992) to provide interception and control to supplement the Chain Home and Chain Home Low radar air defence system (www.radarpages.co.uk). It continued in use as a radar station in the post war period but eventually went off air in late 1957. It was sold to the Home Office in 1963 and became the South West Regional Seat of Government, part of the UK civil defence system in anticipation of nuclear attack. The site was sold in the 1990s and is now used as a storage facility.

Information kindly supplied by Mike and Andrew Passmore helped in the identification of the main structures associated with the pre-Rotor and Rotor phases of the Hope Cove GCI. The plinths and masts of the World War II radars are recorded on 1946, 1947 and 1949 air photographs and annotated on the 1945 Air Ministry plan (Figures 17-19). The 1949 air photographs include a close up of part of the GCI and show a Type 7 radar (M Passmore, pers comm) which was retained at some stations and brought back into use during the Rotor period (Figure 20).



*Figure 20 Type 7 radar in use before the Rotor plan
RAF 541/370 frame 0045 31st October 1949 English Heritage (NMR) RAF Photography*

The UK radar stations were run down in the immediate post war period but the perceived threat from the Soviet Union, and the Korean War, prompted the development of a new radar defence system, often using existing infrastructure. RAF Hope Cove was adapted for use as part of the Rotor operation and included an R6 (semi-submerged) operations block as part of the technical site (Passmore and Passmore, forthcoming).



*Figure 21 The main buildings and structures associated with Hope Cove GCI in 1954 (additional information from M Passmore).
RAF 58/1399 frame 0014 30th April 1954 English Heritage (NMR) RAF Photography*

Air photographs taken in 1954 and 1958 record Hope Cove GCI during the Rotor period . The 1954 vertical photograph (Figure 21) records a mix of World War II and later buildings and includes a large number of radars, with rough tracks between. It is difficult to positively identify all the individual radar types on the photographs but the tower (and shadow) of the Type 54 can be seen on the northeast edge of the site and there would have been a mix of Types 13 and 14 (M Passmore pers comm) .

By the end of 1958, the GCI was effectively closed and photographs taken in September 1958 show the site, including the Modulator building, in its final days (Figure 22). Most of the structures associated with the GCI have been removed, except some of the main buildings.



*Figure 22 The main buildings and structures associated with Hope Cove GCI in 1958
RAF 58/2555 frame 173 1st September 1958 English Heritage (NMR) RAF Photography*

The air photographs illustrate the layout of the site and some details but an appreciation of the composition of the structures can only really be made by comparing them to surviving remains found at other stations such as the Royal Air Force Station at Exminster (Passmore and Passmore 2004).

REFERENCES

- Ashworth C 1990 *Action stations, 5 : Military Airfields of the South-west*
Wellingborough: Patrick Stephens
- Clamp L 1992 *The Hope Cove Area During the Second World War*
Plymouth: P.D.S Printers
- Delve K 2006 *The Military Airfields of South-Western England*
Marlborough: Crowood Press
- Faith R 2004 Cola's tun: Rural Social Structure in Late Anglo-Saxon
Devon in *Lordship and Learning: Studies in memory of*
Trevor Aston R Evans (Ed.) Woodbridge: Boydell
- Fox H 2001 *The Evolution of the Fishing Village: Landscape and*
Society along the South Devon Coast
Oxford: Leopard's Head Press
- Lam R 1995 *Shipwreck index of the British Isles, volume 1:*
and Lam B *Isles of Scilly, Cornwall, Devon, Dorset*
London: Tor Mark Press

- Lavery, B 1989 *Nelson's Navy: The Ships, Men and Organisation
1793-1815* Conway: Conway Maritime Press
- Passmore A 2004 *Radar on the Marshes A Brief History and
and Passmore M Archaeology of Royal Air Force Station Exminster
Exeter : M. Passmore*
- Passmore A 2008 *Royal Air Force Air-Defence Radar Stations
and Passmore M In Devon: The Second World War and Beyond
Exeter : M.J,Passmore*
- Ravenhill 2002 *Devon maps and map-makers: manuscript maps
and Rowe before 1840* Devon & Cornwall Record Society
new series; Volumes 43 and 45
- Thackray C 1990 *National Trust Archaeological Survey of
The Salcombe Estuary: West, Devon*
- Turner S 2007 *Ancient Country: The Historic Character
of Rural Devon* Exeter: Devon Archaeological Society
- Williamson T 2006 *The Archaeology of Rabbit Warrens,
Shire Archaeology No. 88
Princes Risborough: Shire Archaeology*

APPENDIX I SOURCES FOR AIR PHOTO SURVEY

All available air photographs from the collections of the NMR and the Cambridge University Collection of Air Photos (CUCAP) were consulted and supplemented with lidar data from the Environment Agency and other information from the NMR and the Devon Historic Environment Record (HER).

203 NMR vertical photographs were consulted . These were taken for a variety of non-archaeological purposes. These comprise RAF sorties from the 1940s and 1954. The RAF photographs are supplemented by Ordnance Survey mapping sorties from 1969 and 1983. CUCAP has nine verticals from 1975 which cover the survey area but these are relatively small scale and did not provide anything of archaeological use which was not already recorded on the NMR prints. Devon HER hold copies of the 1946 sorties and a run of colour prints taken by Geonex in 1992.

The NMR has 93 oblique photographs of the area taken for archaeological and non-archaeological purposes. These include 1949 and 1958 RAF photographs as well as Harold Wingham, Devon County Council and English Heritage specialist archaeological photographs. CUCAP has five oblique photographs of the area which added a small amount of detail in one area.

Web based air photo sources (Google Earth and Microsoft Livelocal) were also consulted.

The air photo sources were supplemented by Scheduled Monument, Monument and Event information from the NMR and Devon HER. As well as readily available published material. The survey of East Soar carried out by Caroline Thackray in 1990 (Thackray 1990), and the World War II research of Arthur Clamp (Clamp 1992) and Andrew and Mike Passmore (Passmore and Passmore forthcoming) provided valuable information.

The following tables list the vertical and oblique photographs consulted.

Table I List of NMR Vertical photographs consulted

NMR Vertical Sortie	Start Frame	Finish Frame	Date	Scale
RAF/HLA/535	6017	6022	07/05/1942	1:23000
RAF/HLA/535	6024	6027	07/05/1942	1:23000
RAF/FNO/29	6038	6038	30/06/1942	1:8500
RAF/CT/89/541	3054	3070	08/03/1944	1:21000
RAF/CT/89/541	4055	4069	08/03/1944	1:21000
RAF/CT/92/541	3083	3086	19/03/1944	1:19000
RAF/CT/92/541	4071	4072	19/03/1944	1:19000
RAF/CT/93/541	3001	3005	24/03/1944	1:17000
RAF/CT/93/541	4101	4109	24/03/1944	1:17000
US/7PH/GP/LOC292	1003	1003	20/04/1944	1:60000
US/7PH/GP/LOC292	5004	5004	20/04/1944	1:15000
RAF/3G/TUD/T/17	6040	6042	03/08/1945	1:30000
RAF/I06G/UK/967	4089	4090	01/11/1945	1:10300
RAF/CPE/UK/1890	2019	2027	20/04/1944	1:9840
RAF/CPE/UK/1890	3009	3014	10/12/1946	1:9840
RAF/CPE/UK/2105	4121	4123	10/12/1946	1:10000

RAF/541/419	3001	3011	28/05/1947	I:4800
RAF/541/419	3012	3019	19/12/1949	I:4800
RAF/541/419	3020	3028	19/12/1949	I:4800
RAF/541/419	4001	4011	19/12/1949	I:4800
RAF/541/419	4012	4019	19/12/1949	I:4800
RAF/541/419	4021	4028	19/12/1949	I:4800
RAF/541/419	4031	4032	19/12/1949	I:4800
RAF/58/1399	12	15	19/12/1949	I:8000
RAF/58/1399	16	16	30/03/1954	I:8000
RAF/540/1278	24	28	30/03/1954	I:8000
OS/83125	14	34	05/04/1954	I:10800
OS/83125	56	63	04/07/1983	I:10800
OS/83125	141	157	04/07/1983	I:10800

Table 2 List of NMR Oblique photographs consulted

NMR Oblique Index Number	Film	Frame	Date
SX6937/4-7	RAF 30139	PSFO-P2 0163-66	01/09/1958
SX6937/8-9	NMR 24679	42-3	08/08/2007
SX7036/1	RAF 30139	PSFO-P2 0167	01/09/1958
SX7036/2-5	NMR 24679	32-35	08/08/2007
SX7036/6	NMR 24679	45	08/08/2007
SX7036/7	NMR 24679	47	08/08/2007
SX7036/8-12	RAF 30139	PSFO-P2 0168-0172	01/09/1958
SX7036/13-15	NMR 24679	29-31	08/08/2007
SX7037/1	RAF 30131	PSFO 0240	22/08/1958
SX7037/2-5	NMR 24679	38-41	08/08/2007
SX7037/6	NMR 24679	44	08/08/2007
SX7037/7	NMR 24679	46	08/08/2007
SX7136/1	DAP 13295	10	23/12/1986
SX7136/2-3	NMR 24679	27-28	08/08/2007
SX7136/4-5	NMR 24679	36-7	08/08/2007
SX7136/6	DAP 13295	11	23/12/1986
SX7136/7-11	RAF 30139	PSFO-P2 0173-0177	01/09/1958
SX7136/12-13	NMR 24679	25-26	08/08/2007
SX7137/1	RAF 30087	PO 0045	31/10/1949
SX7137/2	RAF 30087	PO 0046	31/10/1949
SX7137/3	NMR 24679	24	08/08/2007
SX7236/1	HAW 9392	24	21/07/1959
SX7236/2	RAF 30139	PSFO-P2 0182	01/09/1958
SX7236/3	NMR 23652	18	23/07/2004
SX7236/4-13	NMR 24679	7-14	08/08/2007
SX6937/14	HAW 9392	25	21/07/1959
SX6937/15	NMR 24679	15	08/08/2007
SX7036/16	NMR 24679	18	08/08/2007
SX7036/17-18	NMR 24679	20-21	08/08/2007
SX7036/19-21	HAW 9392	26-28	21/07/1959
SX7036/22-25	RAF 30139	PSFO-P2 0178-0181	01/09/1958
SX7036/26	HAW 9392	22	21/07/1959
SX7036/27	NMR 24679	17	08/08/2007
SX7036/28	NMR 24679	19	08/08/2007
SX7036/29	NMR 24679	22	08/08/2007

SX7036/30	NMR 24679	23	08/08/2007
SX7037/8	HAW 9392	23	21/07/1959
SX7037/9-14	NMR 24679	1-6	08/08/2007
SX7136/14	NMR 24679	16	08/08/2007
SX7136/15	RAF 30139	PSFO-P2-0183	01/09/1958
SX7136/16-19	NMR 23652	19-21	23/07/2004
SX7136/19	NMR 1457	241-242	01/03/1979
SX7136/20-23	NMR 23558	13-16	02/06/2004
SX7136/24-26	NMR 23479	8-10	02/06/2004
SX7137/4	NMR 23479	15	02/06/2004
SX7137/5	NMR 23558	4	02/06/2004

Table 3 Cambridge University Collection air photographs

Print Number	Date
AFG39	08/06/1962
BFG34-37	03/05/1971
RC8AV 224-227	24/04/1975
RC8AV235-239	24/04/1975

Table 4 Devon CC collection air photographs

Sortie	Print number	Date
Geonex 15892 Run 31	114-116, 128-30	15/10/1992

APPENDIX 2 QUALITY AND COVERAGE OF AIR PHOTOGRAPHS

The 1946 RAF sorties were the key source for mapping the field systems, and other features, along the cliff edge and are the main source for the World War II features associated with the RAF Bolt Head airfield (Figures 23). They were carried out in December, which provides good conditions for archaeological survey as the vegetation is relatively low and the oblique light at this time of year is good for highlighting the earthworks. These sorties contained the most archaeological information and together they cover the whole of the survey area.



Figure 23 The Warren

RAF CPE/UK/1890 Frame 3012 10th Dec 1946 English Heritage (NMR) RAF Photography

However, the project area is in places awkwardly divided between the two 1946 sorties and it was sometimes a problem getting enough control information (detail on the OS map and photo) for rectification of the photographs. The lack of control and the differing terrain across the survey area meant that multiple rectifications of relatively small areas were required to ensure accuracy and details of the archaeological mapping.

Little can be seen in the areas in shadow, on the south side of Starehole Bottom and on the East side of Mill Cove, because of the quality of the NMR copies (probably the original prints) of both 1946 sorties. However, the Devon HER prints are better quality and the Environment Agency lidar provided good supplementary information in these areas.

RAF sorties in December 1949 were carried out in very good lighting conditions and the photographs are at a slightly larger scale than the 1946 sorties. These would be the ideal photographs for the survey but frustratingly only show small parts of the survey area; for

example, they are one of the few photo runs that show the ridge and furrow across The Warren (Figure 24)..

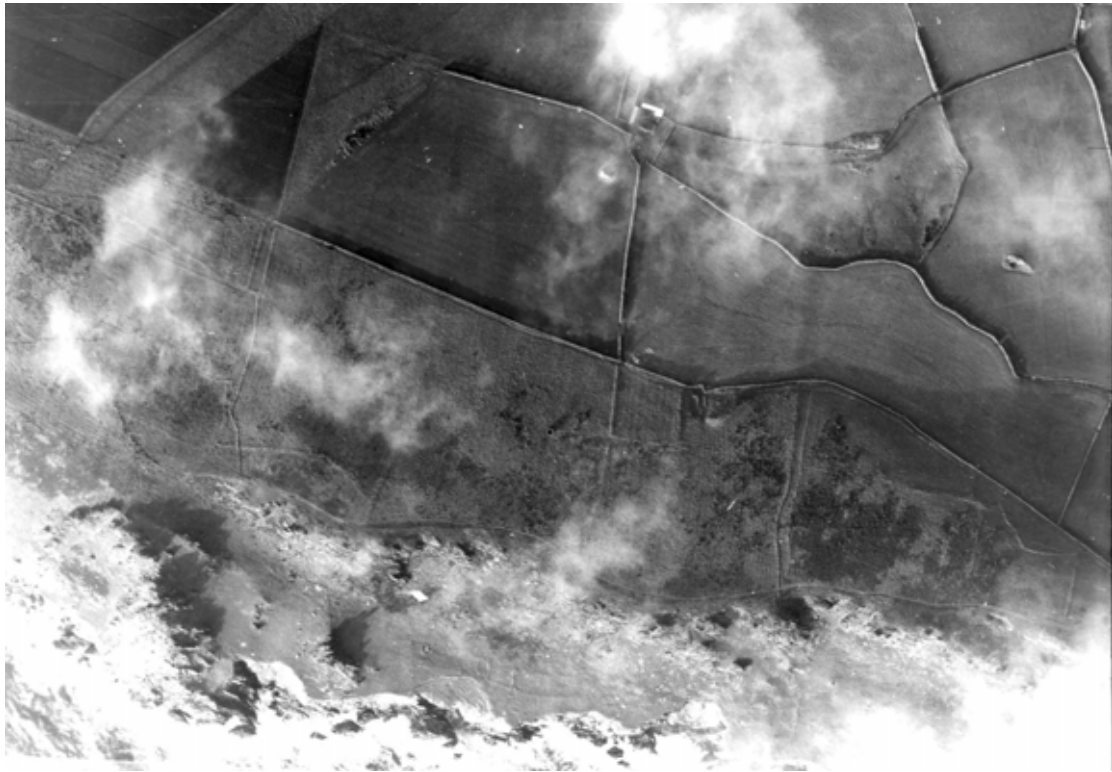


Figure 24 Well preserved earthworks at The Warren, including ridge and furrow

RAF 541/419 Frame 3011 19th Dec 1949 English Heritage (NMR) RAF Photography

The lidar data was an excellent complementary source for the field systems and other earthworks in the fields along the cliff edge and confirmed the accuracy of the mapping from air photographs. Cover was provided as standard Environment Agency coloured and shaded jpegs at 1m and 2m resolution and provided information on the surviving earthworks within the project area. Manipulating the original data in 3d modelling software is likely to provide further information but this was beyond the remit of this project. The jpegs will also provide an opportunity to test their use as a conservation tool at East Soar. Field visits will test the lidar data in areas with heavy vegetation, and on steep slopes. Comparison with the air photographs suggests that they are good basic record of the preservation.

The oblique coverage provided different information for the project area. The 1958 RAF sortie which looks from the sea inland is of limited value for archaeological survey but the photographs are a fantastic record (especially when viewed in stereo) of the Cold

War masts at RAF Bolt Head and the surrounding countryside. The 1959 photographs from the Harold Wingham collection were the only source for the wreck, presumed to be the *Herzogin Cecilie*, which went down in 1936 and now a popular diving site in Starehole Bay. A 1962 CUCAP oblique provided vital detail on field boundaries in Starehole Bottom which were only indistinctly visible on the vertical photographs. The English Heritage 2007 oblique photographs were taken during a summer reconnaissance flight and were therefore an opportunistic record of the area rather than as a planned programme of recording Scheduled Monuments (D Grady pers comm.). They are not therefore taken at an ideal time of year to record the earthworks but they are the only oblique photographs which systematically cover all the scheduled areas and buildings with close ups and general views. In particular, they provide a good record of the extensive vegetation cover in 2007 (Figure 25). They also provide a snapshot of the preparation prior to the removal of the Coastguard lookout, established in World War II, at Bolt Head.



Figure 25 General view of Starehole Bottom illustrating the vegetation cover

NMR SX 7236/12 (24679/07) 8th August 2007 © English Heritage. (NMR)

APPENDIX 3 METHODOLOGY FOR AIR PHOTO SURVEY

All readily available photographs were consulted and examined stereoscopically where possible. The best photographs for specific information were selected for rectification.

The air photo transformations were carried out using the University of Bradford Aerial5 photo rectification program. Control information was taken from the digital copies of current OS 1:2500 scale maps. All digital transformations are therefore accurate to within circa 5m of true ground position, and typically less than 2m to the base map. The 1m resolution lidar data from the Environment Agency confirmed that accuracy was within 2m of ground position, usually better.

The transcription was produced in AutoCAD by tracing the archaeology from the transformed and georeferenced aerial images. There were some difficulties with the rectification/transformation as some of the control points are obscured by vegetation and boundaries have been removed and altered since some of the key photographs were taken. There are also major height differences across the area but these were compensated for by using a digital terrain model derived from OS landline 5m interval contours. Control was also derived from intersections of paths to enable an even spread of control across the contours and the archaeology. The 'match' of the AP transcription with the lidar survey indicates that the photo transformations were accurate.

Most of the archaeological features at East Soar were transcribed from 1940s RAF vertical stereo pairs printed at circa 1:10,000 scale. As the features are millimetres across on the print there are implications for detail that can be transcribed. However use of a stereoscope to view stereo pairs of air photographs (which allows features to be viewed in 3D and can exaggerate the height of features) means that far more detail can be seen and understood than when viewing single photographs. The lidar data also provides a good basic guide to surviving earthworks and location information to sub-metre accuracy.



ENGLISH HERITAGE RESEARCH DEPARTMENT

English Heritage undertakes and commissions research into the historic environment, and the issues that affect its condition and survival, in order to provide the understanding necessary for informed policy and decision making, for sustainable management, and to promote the widest access, appreciation and enjoyment of our heritage.

The Research Department provides English Heritage with this capacity in the fields of buildings history, archaeology, and landscape history. It brings together seven teams with complementary investigative and analytical skills to provide integrated research expertise across the range of the historic environment. These are:

- * Aerial Survey and Investigation*
- * Archaeological Projects (excavation)*
- * Archaeological Science*
- * Archaeological Survey and Investigation (landscape analysis)*
- * Architectural Investigation*
- * Imaging, Graphics and Survey (including measured and metric survey, and photography)*
- * Survey of London*

The Research Department undertakes a wide range of investigative and analytical projects, and provides quality assurance and management support for externally-commissioned research. We aim for innovative work of the highest quality which will set agendas and standards for the historic environment sector. In support of this, and to build capacity and promote best practice in the sector, we also publish guidance and provide advice and training. We support outreach and education activities and build these in to our projects and programmes wherever possible.

We make the results of our work available through the Research Department Report Series, and through journal publications and monographs. Our publication Research News, which appears three times a year, aims to keep our partners within and outside English Heritage up-to-date with our projects and activities. A full list of Research Department Reports, with abstracts and information on how to obtain copies, may be found on www.english-heritage.org.uk/researchreports

For further information visit www.english-heritage.org.uk

