St. Catherine's Chapel, Abbotsbury

Geophysical and Topographical Survey Report

Produced for Abbotsbury Heritage Reseach Project

ABB051

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Mapping Our Heritage

Non-Technical Summary

ArchaeoPhysica was commissioned to undertake a geophysical and topographical survey of the hilltop around and within St. Catherine's Chapel, Abbotsbury, to explore the origins of the site. Radar survey was chosen as the primary technique as this would function well within the chapel and also outside and the 3D nature of the result would considerably assist interpretation.

Between the two methods enough has been found to suggest the site to have been a single phase, founded as an ecclesiastical complex within the 1300s as a separate element of St. Peter's abbey at the foot of the hill.

Primary findings include the discovery that the chapel sits off centre within an oval enclosure that seems from the outset to have been intended to support its use as a burial ground. This enclosure has been created by levelling the top of the hill to provide a flat area on which the chapel was built. There would appear to have been a cross standing outside the south porch, the base of which was discovered in the radar data. Again, this points towards the abbey creating a fully-fledged ecclesiastical complex on the hilltop.

It would seem that the platform was originally intended to fill the oval enclosure but for some reason was never completed, leaving a raised area with the southern end of the enclosure.

All elevation data in this report is from original survey by ArchaeoPhysica and represents the first accurate 3D model (to Ordnance Survey OSTN02 and OSGM02) of the hilltop known to the project. It includes most of the lynchets or strip fields on the northern, eastern and western flanks of Chapel Hill. An overview is provided below,

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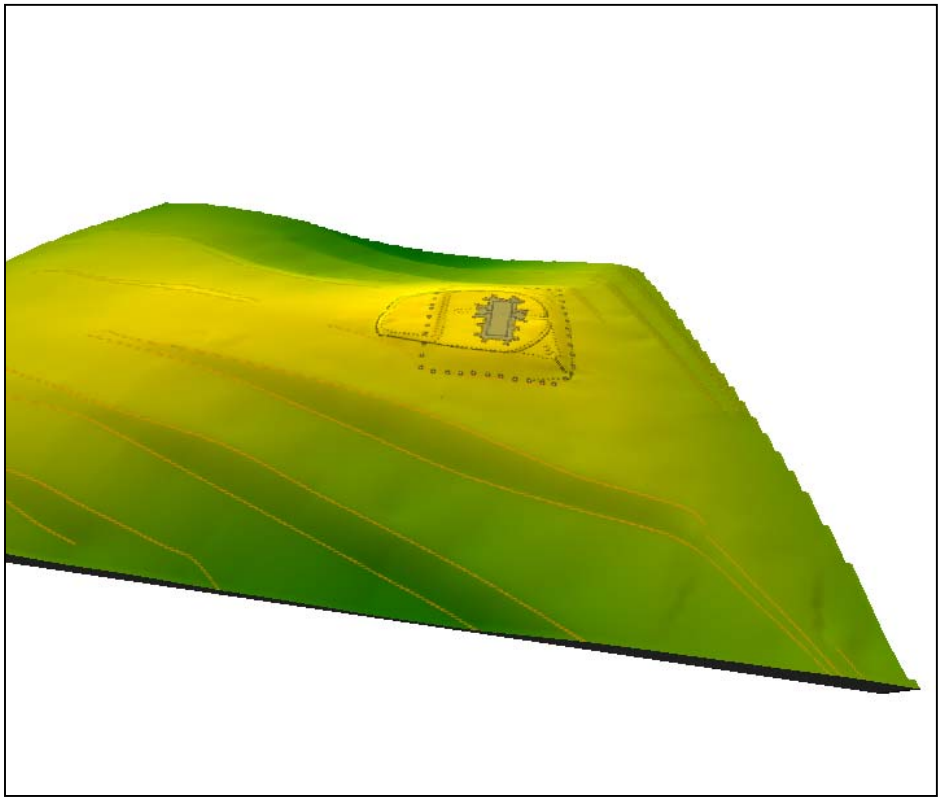

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1 Introduction

Location

Country	England
County	Dorset
Nearest Town	Abbotsbury
Landholding	St. Catherine's Chapel, Chapel Hill
Central Co-ordinates	35726 84790

1.1 St. Catherine's Chapel is situated south of Abbotsbury on the very summit of Chapel Hill. The monument can be seen clearly from high ground inland from several kilometres away. It is a Scheduled Ancient Monument, number 29045 and is in the care of the State as a Guardianship site. The Scheduled Area encompasses the entire hill top, including the quarries and field systems and also Chapel Coppice.

Parties involved

1.2 The Abbotsbury Local Heritage Group (ALHG) commissioned the survey as part of their investigation of a number of sites in the area.

1.3 Acknowledgements are due to various members of the ALHG for their assistance, in particular Peter and Barbara Laurie, to the Ilchester Estate for access and to Claire Pinder, Senior Archaeologist, Dorset County Council for provision of information from the county HER. Thanks are offered to Francesca Radcliffe for permission to photograph her 1825 Will Daniells painting of the chapel.

Summary of methodology

Rationale

1.4 The project specification was discussed with Peter Laurie of the ALHG, who oversaw commissioning the survey. The primary objective was to establish whether the chapel was associated with below-ground remains and whether any of these might predate the building and hint at a pre-Christian origin. The site is a Scheduled Ancient Monument and hence the only realistic means of exploration is by non-invasive means so it was decided to combine a radar survey with detailed topographic mapping to examine the ground in and around the chapel.

1.5 A separate electromagnetic survey was undertaken of an area of the hilltop away from the site of the chapel and this is reported on separately.

Topographic Survey (3D)	Total Station off RTK GPS stations
Ground Penetrating Radar Reflection Survey	GSSI SIR-2000

1.6 Full technical details of the specification for these can be found in the appendices to this report.

Instruments & survey resolution

1.7 The total station was used both to set out a grid and secondary control points for the radar surveys and also to collect 3D data for the topographic survey. Primary 3D control was provided by a set of temporary stations established using post-corrected RTK GPS measurements. A sufficient number of points were measured so that a 3D model of the land could be obtained, including the former cultivation terraces around all sides of the chapel.

1.8 The radar survey was undertaken within the chapel, covering the whole floor and also the entire southern part of the platform outside.

Constraints & variations

1.9 The slightly higher area to the south of the chapel was not surveyed due to long vegetation impeding access by the radar in particular. The presence of the steel fence crossing the area also prevented geophysical survey. Survey was, however, conducted as close as possible to this and it was mapped in detail during the topographic survey. It is very unlikely that structures suitable for detection by radar or other geophysical means exist within this higher area.

2 Context

Known features

2.1 Although the hilltop chapel is visited by thousands and is a Scheduled Ancient Monument and Guardianship site very little would appear to be known about it apart from the obvious architectural details. There has never been any survey or excavation and apparently no systematic study of the monument, although adhesive survey targets left on the interior wall faces suggest that English Heritage has commissioned fabric surveys in the past (although no notification or report for this has been lodged with the Dorset HER).

Cartographic sources

2.2 No cartographic sources earlier than the Ordnance Survey mapping are known. The earliest editions of this depict the monument as it is today, minus the Ministry of Works fencing.

Documentary sources

2.3 The following sources were examined during this project:

- St. Catherines Chapel Scheduled Ancient Monument description as revised 1997
- Dorset Historic Environment Record, entries for St. Catherines Chapel and Chapel Hill
- Royal Commission for Historic Monuments (now English Heritage) St. Catherines Chapel description. The plan from this served as a basis for the plan view used in this report after revision and accurate geolocation by ArchaeoPhysica
- Aerial photographs by Francesca Radcliffe assisted interpretation of the topography and landscape setting
- Victoria County History (Dorset) provided background historical information
- "A Particular Survey of the County of Dorset", written originally in the 1620s, provides a brief reference to the chapel "in noe other Use than for a Sea Marke", confirming the latter purpose and probable original function of the turret
- An undated photograph of the the late 1800s or early 1900s
- John Allen's "Images of Dorset" website for terrestial photographs
- A painting dated 1825 by Will Daniells depicts the chapel in an arcadian setting which, however, does hint at the existence of an oval enclosure.

2.4 In addition, those listed below provide much needed information about St. Catherine and the cult surrounding her:

- "St. Catherine and the Rouen Connection" author Peter Laurie, used to provide historical context for St. Catherine
- Balliol College Oxford's website "History of St. Catherine of Alexandria" provided background information about the medieval cult and its antiquity
- The "paintedchurch" website was helpful in identifying mediaeval examples St. Catherine related iconography
- Lambeth Palace Library has information on the Abbotsbury Breviary, only found in 2004 and thought to be part of the dedication for St. Catherine's chapel itself.

Field observations

2.5 A good many observations were made during field survey, most of which were of no great import but useful to the interpretation. They were mainly confined to the topography of the hillside and chapel platform.

2.6 A key observation, however, is the presence of two accumulations of stone rubble. One occurs as a fairly thinly distributed deposit in the highest part of the summit, left un-terraced by the chapel platform. The other, potentially of greater import, is a substantial spread eroding from the south west corner of the platform where the slope is steepest. Although this was not known

at the time it would appear now that this material is part of the construction of the chapel platform and may infill an old quarry or similar depression in the natural slope.

Landscape setting

2.7 The topographic setting is rather varied; Chapel Hill has been substantially modified in the past by the creation of large cultivation terraces across the entire hillside. These are common locally and in the past must have supported the bulk of arable production in the area. The hill is prominent from both land and sea though is dwarfed by the chalk Downs immediately inland. At the foot of the hill is the Fleet while inland the village of Abbotsbury nestles in the valley between it and the Downs. The abbey, almost integral to the village, occupies a separate valley passing seawards at the base of the hill, in which mills have long been present.

2.8 The steepness of the hillside means that even with artificial terraces it is free-draining although as would be expected the ground tends to be wetter on the south western seaward side. The hilltop is essentially flat though this is again due to terracing in part and prone to drying out in Summer. The seaward flanks tend to enjoy their own microclimate through greater exposure to moisture laden air. It is interesting to observe that cultivation terraces also exist on these more exposed flanks.

2.9 There are several different geological contexts in the area, of which Chapel and Chesters hills form one. The solid geology here forms part of the Middle Oolite Series of limestones with the Upper, Middle and Lower Series exposed in bands between the chalk Downs and the coast. Rock is at a variable distance from the surface and in some places is deeply buried beneath wind blown sand, especially further east where large relict dunes exist parallel to Chesil Beach and the Fleet. The colour of the limestone seems to vary largely with that at Chapel Hill a rich brown colour whereas pale grey examples occur along the coast from Chesters Hill eastwards.

Historical setting

Ecclesiastical context

2.10 The early history of the chapel is not known except that it is thought on the basis of its architecture to have been constructed in the second half of the 1300s. This implies it was built by either Abbot Henry de Thorpe or Abbot William Cerne, both of St. Peter's Abbey and Priory. There are several known associations between Benedictine abbeys and St. Catherine and at least two others are known from the Dorset and South Wiltshire area.

2.11 However, the depiction on the seal of Abbot Walter (1348 – 1354) of him kneeling before St. Catherine makes it clear that the cult of St. Catherine was well established by this date though whether there was a chapel or altar dedicated to her in the Abbey precinct is not currently known. This particular abbot was subject to sanction first by the bishop in 1353 and later by the king due to unprincipled practices engaged in by himself and the monks, resulting in what was effectively the bankruptcy of the abbey and sequestration of its material assets into the hands of administrators appointed by the king.

2.12 Abbot Walter was replaced but not before his supporters had stolen the abbey seal and misused it in conjunction with various land purchases etc, plunging the establishment into even greater debt. The situation was eventually resolved by the abbot's death in 1354, leaving the abbey with over £800 of debt and the community living in one house in poverty. The situation had not improved by 1361 and was not resolved until Pope Boniface IX awarded a grant in 1390 and the livings of several local parishes were renewed. Even in the 1400s decrees against the abbey were being issued by the bishop for improper behaviour and the inappropriate award of grants.

2.13 In 1386 Pope Urban VI received a petition from the abbey and issued instruction for the parish church of Tolpuddle to be used for the benefit of the brethren as the abbey was unable to sustain attacks by Spanish and French invaders and the expense of counter-initiatives by its defenders.

2.14 Against the context of this it is difficult to see how the abbey could have supported the construction of the chapel and the associated works at any time in the second half of the 1300s, especially as this was a time of economic difficulties across England after the ravishes of the Black Death from 1348 – 1350 and the subsequent Peasants' Revolt in the 1880s.

2.15 It is not known whether the popularity of St. Catherine waned after the death of Abbot Walter in 1354 or whether the cult continued but if the chapel was constructed after his death it must have been one of the largest projects undertaken by an impoverished establishment. Was the abbey in fact trying to create a new source of income, creating a place of pilgrimage to earn revenue?

2.16 The alternative is that the established dating of the chapel is incorrect and rather than post-dating Abbot Walter it actually predates or is contemporary with him. This would be more in keeping with the sort of megalomaniacal reputation that the abbey seems to have cultivated by the time of Abbot Walter and provides a reason for Abbot Walter to depict St. Catherine on his seal rather than the abbey's own patron, St. Peter. It might also be one of the reasons why the debts of the abbey were so large by the 1350s.

Quarries and fields

2.17 The Scheduled Monument description for Chapel Hill is not specific about dates except to state that it is assumed that the field system, quarries, the abbey and the village are an interrelated contemporary context and to some extent that makes sense. This is, however, in many respects pure speculation and the finding of a possible Roman water mill in the village illustrates the potential for a far more complex development. It also does not address the issues of date and purpose surrounding the founding of the chapel.

2.18 The quarries are mostly small and have been assumed to have been the source of stone for the abbey, though in reality they could be of any date considering the number of stone buildings in the area. The discovery (radar data – this project) of another possible example below the chapel platform is of course rather interesting in this context as it may be the first dateable example assuming the identification to be correct.

2.19 There is one misconception in the Scheduled Monument description that needs to be corrected and it seems to have propagated to other summaries. It is stated that the cultivation terraces run parallel to the natural slope whereas the topographic survey conducted as part of this project has demonstrated that they in fact run uphill and effectively into the slope.

St. Catherine

2.20 ArchaeoPhysica has not been able to find any particular cult practices that would influence the architecture of a chapel dedicated to St. Catherine or its immediate surroundings although it is evident from the building on Chapel Hill that there was some sort of north south axis defined by the two substantial porches. This, however, is common to many dedications.

2.21 A hilltop setting is, however, associated with her and also with St. Michael, another saint with chapels on exposed headlands and islands.

2.22 Of St. Catherine of Alexandria little is known and the lack of historical reference was why she was demoted from sainthood by the Catholic Church. She is reported to have lived from AD 287 to 305 when she was martyred on a wheel. The earliest structures dedicated to her are the Monastery of the Transfiguration on Mount Sinai which is where her body miraculously appeared and was taken into the monastery. From there her relics spread far and wide though a hand and a fragment of her skull are apparently kept on Mount Sinai still.

2.23 It has been suggested that she was invented as a Christian homologue to Hypatia of Alexandria, a woman to whom very similar skills and abilities are attributed.

2.24 The cult itself seems to have originated in the 1000s in Rouen after three finger bones taken there from Sinai became associated with miracles.

2.25 In 1100 the first documented miracle play in her honour, written by a monk named Gorran, was performed in Dunstable but the first life of St. Catherine in English did not appear until the 1300s.

2.26 By the high Middle Ages the cult seems to have enjoyed widespread support across the whole of Europe and St. Catherine seems to have become one of the most venerated female saints alongside Mary, though they are both examples of a wider cult of the virgin female saint. She is one of the saints reputed to have spoken to Joan of Arc for example.

2.27 In England, the largest example of a painted life of St. Catherine is in Sporle church, Norfolk and apparently dates from around 1400. A more intact version, apparently the second largest, is in Pickering church, North Yorkshire.

3 Discussion

Detailed topography

Results

3.1 The flat platform is clearly artificial and was apparently created by levelling the existing hill top and dumping the material predominantly along the eastern edge where the topographic survey demonstrates a lateral swelling of the hilltop. This operation did not, however, encompass the whole hill top and a small area of higher ground was left to the south. On the eastern side the sharp transition between the unaltered slope below this area and that below the platform is especially marked whereas to the west there is no topographic change (although the radar data hints at an area of fill along the southwest edge).

3.2 The slight settling of the chapel at the east end may also reflect the presence of fill material at this side of the platform.

3.3 The relation of these slopes to the cultivation terraces or lynchets is fairly clear in that the unaltered section of the eastern slope remains parallel and of similar size to the lynchets below. To the west the steeper slope would appear wholly natural down to the first lynchet some 10m away. It would appear therefore that construction of the platform involved modification of a hilltop already partly modified for cultivation, especially on the eastern side.

3.4 A significant discovery is that the platform itself is essentially an architectural feature supporting the chapel. On the north side, where the platform is widest due to the natural form of the hill a curving bank was built around the chapel, on top of the platform and continuing its curving shape from further south to form the characteristic medieval oval enclosure. This includes the whole of the southern half of the platform and also the higher ground to the south. The intention was probably to level this as the abrupt change in height along an apparently arbitrary straight line suggests unfinished work.

3.5 In plan it is clear that the higher ground falls within the enclosure and this is demonstrated on the ground by the artificial scarp that runs right round the southern edge of this higher area and continues the oval circuit. Whether this was added later to demarcate the enclosure or whether this is in fact the remains of a setting-out work is open to debate; either way it should be viewed as part of the same monument.

3.6 It is likely, considering the relatively close proximity of the chapel to the northern edge and the presence of perhaps unfinished work to the south, that the site was set out from the north side, probably because the hill top was already broad enough at this location to support the chapel. There would appear to have been a desire to avoid a change in height between the sides of the chapel, i.e., it was not acceptable for the south door to be higher than the north or for access to be via steps. The implication is that the builders regarded the hilltop as virgin territory and were building a complex of chapel and enclosure from the start, rather than adding the building to an existing enclosure or *vice versa*.

3.7 Why was this levelling operation never finished? It could simply be because sufficient ground had been removed to permit level transit through the porches of the chapel and thus sufficient to permit the necessary rites. Alternatively, perhaps the turbulent history of the abbey during the 1300s meant that there were insufficient resources to warrant completion of what was probably a very minor element of the overall construction project.

3.8 On both sides of the chapel there are the remains of eroded paths continuing the north – south alignment through the two doors of the chapel and these presumably represent the remains of a processional route. To the south there is an entrance through the scarp defining the enclosure but to the north later landscaping has removed any signs of a continuation.

3.9 The orientation of the chapel is interesting because the builders were clearly not constrained by the long axis of the hilltop and hence the oval enclosure. The chapel sits at a slight angle to this axis which implies its orientation was set by something other than the topography but the

lack of features to seaward rather limits the choices of suitable landmark. This may support the hypothesis that some churches were set out according to the height of the sun, perhaps its highest point in the sky being taken as south?

3.10 As is probably inevitable with a site of this age and status there are signs of later alterations to the hilltop, all apparently cosmetic and probably relating to the increased popularity of the site as a place of recreation rather than devotion. The most obvious is the pronounced northeast beak projecting beyond the mediaeval enclosure and facing towards Abbotsbury centre and the abbey. The function is not entirely clear but it may have been to enlarge the relatively small area available within the mediaeval oval enclosure to support its reuse as a viewing platform over the abbey etc. It is now the access into the site from the kissing gate but the steepness of the slope down to this later feature could imply this was not always the case and perhaps people entered through the original north entrance of the enclosure. This is still evident as a gap in the low earthworks of the oval bank but the latter is considerably obscured by the addition of this later mass of material. Where this material came from is hard to say but it is tempting to suggest it relates in some way to the restoration works carried out in the 1700s by Lady Ilchester.

3.11 Other later features include of course the Ministry of Works fence and perhaps some tidying of the slopes below the northwest corner of the platform where several changes in angle are evident. In addition ploughing has all but levelled the lynchets to the north of the platform and along with them any indications of the old path down to the abbey or village from the north porch. It is possible that geophysical survey could map these features quite well should the need arise.

3.12 Finally, there are signs of stone rubble in two locations to the south of the chapel. In neither case can they be related to known structural features but they could be left over from the 1700s restoration perhaps. The most extensive area is below the southwest corner of the level platform where loose stone is eroding out of the slope. There is also a small amount of rubble eroding out of the higher area of ground within the southern end of the enclosure. Alternatively, both could be the product of grave digging.

Concluding remarks

3.13 The conclusions are therefore that the hilltop already supported cultivation terraces prior to the construction of the chapel, based on the form and mutual alignment of the surviving earthworks. This places the lynchets prior to the mid 1300s and means that the construction of the chapel would have had an impact upon the agrarian development of the area.

3.14 The construction of the chapel platform exploited the existing topography and was to create a horizontal enclosure within which the chapel would sit. In addition, the discovery of the remains of a boundary curving right round the northern side of the building and built upon this platform demonstrates the overall objective was to create the characteristic medieval oval enclosure upon the hilltop. It is not the case that the chapel sits on an artificial mound.

3.15 The situation of the chapel is therefore planned rather than incidental and the presence of the remaining higher section of ground within the southern end of the enclosure is perhaps accidental. It is clear, however, that later generations recognised this area as within the curtiledge of the chapel because the oval shape remained bounded at this end by an artificial scarp. The site is therefore a typical religious complex of chapel and enclosure, presumably all dating to the 1300.

3.16 There seems to have been a strong north – south axis through the chapel which perhaps reflects processional rites during worship. This axis is continued on the south and north sides by entrances through the enclosure, however, the southern is not aligned perhaps due to the steepness of the slope below, although if the enclosure predates the church then this could again be a reason for non-alignment.

3.17 The presence of the large and ornate chapel within the enclosure tends to reinforce the impression that it was to be regarded as a full church rather than simply an isolated chapel. This may further be strengthened by the off-centre position of the building which would allow space for burials on the southern side, considered more holy than the north in mediaeval times.

Radar results

3.18 In the light of the topographic data certain questions can be asked of the radar data, e.g., is there evidence for burials south of the chapel, are there any signs of earlier (Christian) structures, or structures in general? Can the radar reveal anything about the construction of the mound?

3.19 Throughout the following discussion green numbers in the text refer to drawings DWG 05 and 06. For an overview please consult DWG 04 which contains an image of each individual time (depth) slice. There are four example slices presented in drawings DWG 05 and 06 and these contain areas of reflective or absorbent ground apparent in the rest of the slices. Each of the four may contain features already described.

Slice 4-5 ns, depth 0.17 (RDP 5)– 0.26m (RDP 10)	
Label	Description
1	Reflection from the sleeper wall beneath the outer doorway of the north porch. This seems to have very little depth extent
2	Reflection from the sleeper wall beneath the inner doorway of the north porch and a continuation of the footings of the north wall of the nave continuing down beyond reach of the survey and probably to bedrock
3	A slightly peculiar rectangular area of radar absorption centrally placed within the west end of the nave. It persists through all slices to the bottom of the survey, i.e., there is no reflection from the bottom or top of the feature. It does not appear to be an artefact of the survey and its uniform nature implies a uniform fill. There are no obvious reflections from the edges of the feature either
4	Edge of a zone of amorphous reflectors associated with former floor deposits. The RCHM (now English Heritage) drawings show the central region of the floor to be deeply hollowed whereas it has now been raised and levelled
5	Amorphous erosion hollow leading in from the north porch. It is possible that the depth of this feature is due to animal hooves
6	Amorphous erosion hollow leading in from the south porch and as for 6 it is possible that hooves are partly to blame. Perhaps the building was used as an animal shelter post Reformation?
7	Another deep hollow, this time centrally within the building. It is possible that it once contained a support for some post Reformation internal structure though it could simply be erosion again
8	It is difficult to be see what this reflection might be caused by, erosion seems likely but the situation out of any direct line of access is a little strange. It is not evident in deeper slices so a surface affect is the most likely explanation
9	There is a noticeable step change in the reflection texture about a diagonal line across the nave. Most of the erosion damage seems to be west of this line while to the east there is more uniform material. There is a similar change perpendicular to this near the north wall of the nave and it is evident that this is nearly parallel with the edge of reflection 10. Whether this is significant or not is hard to tell but, if so, the alignment makes it unlikely to be associated with the present structure. It is also unlikely to be natural judging by the shape of the hilltop
10	Another deep hollow, this time extending into the nave from the embrasure of the southern nave window. The window here is too high to see out which mitigates against this erosion being due to repeated human activity so again this may imply the damage was done by animals penned within the building
11	Another strong reflector, again probably material within an erosion hollow, exists immediately outside the south porch in the line of an eroded path continuing due south across the platform.
12	This is probably part of 11 or a continuation into 11 from 13

13	A very strong linear reflector at least 6m long and 0.3m wide passes northwest across the platform towards the south porch. It has a depth which apparently nears or just exceeds 1m but is unlikely in this situation to be a wall. It might be the fill of a drain, especially as the intensity of reflection decreases and then abruptly increases again with depth, typical of a void or silted layer within stone like a culvert. It is not clear why this should pass from the south porch but this is perhaps just a coincidence and it really connects with a 'Roman' drain inserted around the walls to collect water from the eaves. If so, it is likely to date from one of the phases of restoration, e.g., the 1700s or early 1900s

3.20 Most of these features are limited to shallow depths and are likely to be the result of disuse of the building followed by the restoration efforts of the Ministry of Works. An immediate consequence of this is that there are probably no remains of earlier floor materials or traces of any internal layout.

3.21 The reflections are caused by a myriad of changes in material within the various fills of hollows, each change reflecting some proportion of the radio wave back to the receiving antenna. The material in which a hollow has formed is in this case much more homogeneous and therefore does not significantly reflect the wave. The fill material is likely to be stony or rich in gravel.

3.22 The change in texture about 9 is reflected in deeper slices, e.g. the next one presented below (at 16 and perhaps 14-15) but it does not have the transition at the same plan location at each depth. It seems to move westwards with increasing depth which would imply that the more homogenous material (i.e., more uniform texture) has the less homogenous material above it. This would suggest that the material north and west of this interface, i.e., near and perhaps below the north porch, is an artificial deposit.

3.23 The radar absorber 3 would nominally be within natural ground rather than the fill postulated above.

Slice 11-12 ns, depth 0.50 (RDP 5)– 0.72m (RDP 10)	
Label	Description
14	A thin linear reflector passes diagonally from near the door into the turret to a point just west of the north – south axis through the porches. It is evidently very thin and is perhaps the interface between two materials rather than a discrete feature. It could also have been an eroded path to the turret door although the depth makes this less likely. Another interpretation could be that it is part of an earlier structure buried partly beneath the present building but it must be particularly ephemeral if so
15	Another section of 14, with a probable almost perpendicular junction with 16
16	This may be another part of 14, in which case interpretation as a path becomes unlikely. This reflection may be a transition or interface similar to the parallel example 9 at a higher level
17	A strong reflection that would appear to be associated with the west angle buttress of the south porch, perhaps a foundation (or drain?)
18	A strong reflection that would appear to be associated with the east angle buttress of the south porch, perhaps a foundation (or drain?)
19	This reflector would appear to be a masonry foundation beneath or adjacent to the southeast corner of the chapel and continues vertically for around 1m depth. It may be associated with a stony area immediately east of the southeast gable buttress and could be later material introduced to underpin this corner although it may also be a drain
20	A particularly strong and persistent reflector lays almost beneath the path from the south porch and measures up to a metre in diameter. It seems to disappear below perhaps 1.5m but must be a substantial object above this depth. Could this be the foundation of a cross base south of the church? This would be a fairly typical position for a tall mediaeval 'preaching' cross for example and would also be at the highest point of the platform
21	One of a set of extremely strong reflectors that would suggest the presence of stone though a masonry structure is not evident. It could simply be bedrock but if so it is anomalously high so perhaps it is stone rubble filling a hollow perhaps? Is this perhaps material dumped to create the west side of the platform?
22	One of a set of extremely strong reflectors that would suggest the presence of stone though a

	masonry structure is not evident. It could simply be bedrock but if so it is anomalously high so perhaps it is stone rubble filling a hollow perhaps? Is this perhaps material dumped to create the west side of the platform?
23	If the regions 21 and 22 each side of this are stone by definition this is not and would imply that any stony fill material did not need to be continuous along the west side of the platform. Could the fill therefore be within discrete hollows, perhaps small quarries?
24	This region is perhaps one of the more interesting discoveries as it seems to be bounded by less homogeneous regions to the north, west and at depth to the south. It seems quite likely that this marks the extent of a burial ground south of the chapel (and ending neatly at the suggested location of a churchyard cross). There are no actual burials visible in the time slices though weak hyperbola in the deepest parts of the survey suggest ephemeral features probably exist, most likely the base of individual graves if this was a burial ground. The relatively homogenous appearance devoid of strong reflectors would presumably be due to the removal of natural strata, large stones and possibly local deepening of the soil, etc.
25	A band of reflecting material appears and then disappears between 6 and 10 ns and is about 0.8m wide. This may have been the base or lower fill of an enclosure ditch, perhaps truncated by construction of the chapel platform. It is not apparent on the west side and any northwards continuation will have been obscured by the east wall of the chapel

3.24 The rectangular absorber 3 in the west end of the nave persists at this depth as a homogeneous region and as before it is difficult to offer any interpretation for this. Its physical form has to be a volume of homogeneous material and not masonry and it must continue almost to the present surface as there is no reflection from the top of it. This would put the top into the near-field zone, between 0.1m and 0.2m thick.

3.25 Reflections 14 – 16 and transition 9 at a higher level between them imply a strong diagonal element within the material below the chapel. This is unlikely to relate to the chapel itself due to the radically different alignment so it could perhaps predate the building; a post-Reformation context is unlikely.

Slice 21-22 ns, depth 0.93 (RDP 5)– 1.37m (RDP 10)	
Label	Description
26	This rectangular reflector measures about 1.2m north south and about 1.0m east west and has a suitable position to be the base of an altar, however, its top is too deeply buried to make this a likely interpretation. It also continues downwards for at least another 0.5m. It may be part of the foundations but if so it is interesting that it should only occupy one internal corner of the chapel, meanwhile it is too small to be a tomb
27	The intensity of the reflection from this feature suggests a high contrast, probably stone within soil. It is possible that this a buried structure of some unidentifiable sort
28	A large reflector in the middle of the south door may be significant, however its depth and lack of presence in shallower slices suggests it is not an element of the path for example. Its position may be fortuitous and it is possibly a lateral reflection from the sleeper wall beneath the porch door
29	This reflector, like 19 adjacent to it, seems to be centred on one of the buttresses of the south wall and may represent foundations or later underpinning. It is also possible that all these anomalies along the south wall are sections of a stone-filled drain to take water away from the eaves drip
30	These are all lengths of strong reflector, especially along the southern edge of the platform. It is tempting to suggest that this may be caused by a dipping interface between the soil and the rock or stony subsoil beneath the platform. If so, this could also be evidence for an increase in soil depth within the platform, again potentially evidence for its use as a burial ground
31	
32	

3.26 At this depth there is a fairly large proportion of instrument noise due to the weak signal being returned to the antenna and this means that features rapidly loose definition. Where there is a clear geometric form, e.g. 26, the problem is eased but thinner or more irregular features are difficult to resolve.

3.27 The only significant anomalies at this depth are the absorber 3 and the reflector 26 and unfortunately there is no easy interpretation for either of them.

3.28 At this depth it would appear that reflectors 17 – 19 and 28 – 29 could be sections of a drain running round the walls of the chapel.

Slice 30-31 ns, depth 1.3m and greater (limit of penetration)	
Label	Description
33	This seems to be the same feature as suggested by reflection 27 and has the character of a thin masonry structure extending west from the south porch. If so, it is deeply buried and identification as of archaeological interest is tentative at best
34	A pair of intense reflectors may be the bases of pits cut into bedrock

3.29 Signal noise and striping effects are predominant at this depth and hence identification of features has to be tentative. That said, 33 does not look like a stripe so is perhaps a real feature. It could perhaps be an outflow from a drain running around the base of the walls.

Concluding remarks

3.30 The radar survey has enabled us to examine depths of a little over a meter throughout the chapel and southern platform but has not detected much in the way of structure. Within the chapel only two features can be identified as being sealed beneath the eroded surface, beneath the later fill material forming the present floor. Both are enigmatic, one being the absorber 3 (i.e., totally homogenous and devoid of structure) and the other the rectangular structure in the southeast corner, 26. It seems unlikely that further information will become available about either.

3.31 Above these there is about 0.3m, perhaps a little more in places, of unsorted fill, presumably to level the floor and repair the damage sustained by erosion. The concentration of erosion between doorways and in the central part of the nave would suggest that human or animal feet are responsible and it is tempting to suggest that post-Reformation the structure had been used as a byre.

3.32 The various strong reflectors around the outside of the chapel next to or at least close to the wall suggest that one of the phases of restoration may have included installation of a drain. The presence of stone in the ground at the east and west ends of the south wall could imply that there was some degree of underpinning of foundations as well.

3.33 There are no indications of tombs inside the chapel but that was expected as the lined graves detectable by radar are usually of post-Reformation date. Anyone important enough to warrant a stone coffin would presumably have been buried at the abbey not up at the chapel. It remains possible that un-coffined skeletal remains do exist as these would not be detected by radar in normal conditions.

3.34 No actual burials are evident in time sliced data from outside the chapel although there are hints in profile data that some graves may exist, probably cut slightly into the underlying rock. There is a large area of ground south of the chapel and constrained within the platform that shows signs of modification as well as reflections from what appear to be an edge around the southern and eastern sides. Considered together it seems very likely that a burial ground does exist south of the chapel and this is further reinforced by the plan of the complex with the chapel off-centre to the north within the enclosure.

3.35 Within the platform and south of the south porch there is a prominent reflector 20 that from its size and position may well have been a cross base.

3.36 There are no signs of any earlier masonry building anywhere within the platform and little sign of any earlier structure in general.

3.37 It seems likely that the strong radar reflections 21 and 22 along the southwest edge of the survey are from stone rubble used to create the platform on this side. Reflection 22 corresponds with a spread of stone eroding from the steep bank immediately below. The presence of the less reflective region 23 between them implies that this fill is discontinuous and therefore within hollows in the former ground level. It is possible that there were small quarries cut into the west slope that had to be filled before the platform could be created – there are signs of similar features elsewhere on the hilltop.

3.38 Below the chapel there are weak diagonal reflections 14 – 16 which may represent the edges of a former structure. In addition there is the suggestion of a truncated narrow ditch fill 25 running along the eastern side of the hilltop which seems to have been terminated by the construction of the chapel.

4 Conclusion

Significant results

Earlier structures

4.1 Neither the topographic nor the radar surveys have revealed evidence for any significant structures predating the chapel and its associated platform, however, the hilltop like others nearby may have been associated with Bronze Age barrows. It is too small, however, to have been likely to support an Iron Age fortification.

4.2 The presence of an oval enclosure on the hilltop is of interest as although it would appear to be part of the same episode of construction as the chapel the form is associated with earlier Christian sites as well and hence the possibility of some sort of earlier ecclesiastical activity on the hilltop cannot be entirely discounted.

4.3 There are four structures within the radar data that would appear to predate at least the chapel and in one case, the platform. This latter is the evidence for in-filled hollows 21 and 22 below the southwest edge of the platform, fairly small and apparently filled with stone, some of which is now eroding out of the slope below. These may be small quarries, perhaps associated with others on the hillside, perhaps not.

4.4 Another is the angled interface 14 – 16 apparent below the chapel and showing only at medium depths in the data. This seems unlikely to be natural due to the straightness of the edge and the presence of a near perpendicular corner. What this might be is not known but its sharp angle to the chapel demonstrates its earlier nature.

4.5 The fourth structure is the possible ditch bottom 25 that is apparently overlaid or truncated by the east end of the chapel. Again, there is no apparent purpose for this except that it would appear to be too narrow to have had defensive value.

Development of site

4.6 Overall, it would probably be correct to regard the chapel complex as being of one primary phase preceded by an episode of cultivation and perhaps quarrying. The remains of the original hilltop seem to be a logical extension of the cultivation terraces below and the topographic data shows these to have continued right to the top of the hill. In other words, the hilltop itself was probably another terrace.

4.7 The oval enclosure seems to sit upon the chapel platform on the north side but to surround the remaining non-levelled part of the hill on the south. The fact that parts of the circuit of the enclosure are formed by the edge of the platform would suggest the two to be contemporary and that there was no oval enclosure before the chapel platform was created.

4.8 This fits with the observation that the chapel seems to sit within a designed environment, e.g. its doors are at equal height and therefore the ground level could not have sloped. It would also appear that there was an intention to provide a burial ground as the chapel is clearly off-centre within the oval and to the north, freeing land on the south side of the building which was a favoured location for burial in the mediaeval period.

4.9 There is also the discovery of the possible cross base 20 on the same north to south alignment as the porches and again in a favoured location directly outside the south porch, a suitable distance away to allow people to congregate. This again suggests a designed environment as a cross could have been erected anywhere within the enclosure.

4.10 The fact that the platform does not extend the full way to the southern edge of the oval enclosure is probably by accident not design as there is a sharp junction between the two levels as if this was in fact work in progress. If the interpretation of the cross base is correct it is clear that sufficient ground had already been levelled for the abbey's purpose.

4.11 The chapel has subsided towards the east since it was built, in keeping with the radar and topographic result which suggests the platform to have been created on the east side by enlarging the hilltop with spoil from the levelling elsewhere. It is possible that some of the strong radar reflectors observed within and outside the east end represent an attempt to underpin the structure but without excavation this could not be confirmed.

4.12 There would appear to have been a drain inserted around at least the southern wall as there are numerous radar reflectors associated with the base of the masonry that are not just lateral reflections from the foundations. It is impossible to be sure how old this is but it seems likely to have been created during one of the phases of restoration.

Structure of chapel

4.13 No evidence was found through either examination of the fabric or through radar survey of any significant alterations to the structure.

The enclosure

4.14 There are four observations to be made concerning the oval enclosure itself. First, it is oval, a favoured shape for ecclesiastical foundations, especially rural parish churches. It is also common on earlier Christian sites and this may have been an association the abbey wanted to promote, even if there was no history of an earlier foundation here.

4.15 The fact that the enclosure has been made level, with the chapel dominant within it is significant in that, as noted above, it demonstrates intent to create an entire environment for the building and whatever liturgical practices were to be conducted within and around it.

4.16 Entrance into the enclosure was from the north and south where traces of paths and gaps in the earthworks survive. It is not clear how access to the northern one was gained from outside as there is a steep slope down to the field below. However, later landscaping combined with agriculture which has reduced the height of the lynchets on this side may be obscuring something. Alternatively, it is possible that the northern entrance had no day to day function and was simply there for liturgical purposes.

4.17 Finally, the beak-shaped projection does not appear to have been built with access in mind although the modern path climbs the edge of this feature. The topographic survey shows this to have been added, probably as a post-medieval viewing platform over the abbey ruins. It is tempting to associate this with Lady Ilchester's restoration in the 1700s as part of the site's conversion to recreational use.

Burials

4.18 There has been no direct detection of burials although enough indicators exist to indicate the strong likelihood that a burial ground did exist on the south side of the chapel. The off centre position of the church is an excellent indicator on its own. The discovery by radar of a zone of modified ground within the southern half of the platform with signs of disturbance into stony ground or rock at depth tends to confirm the impression. Although these haven't been explored in detail in this report there are also hyperbola in the radar data from deep narrow sources at the bottom of this zone which might just be reflections from the bases of individual graves although this is far from certain.

4.19 There are two rectangular features below the chapel floor but neither are likely to be tombs. It is possible, however, that burials do exist in the soil below the floor but radar survey would not be expected to detect these if they lack coffins or grave goods.

5 Appendices

Survey metadata

Project information

Project Name	St. Catherine's Chapel, Abbotsbury
Project Code	ABB051
Client	Abbotsbury Local Heritage Group
Fieldwork Dates	20-22/07/06
Personnel	Martin Roseveare, Anne Roseveare, Guillaume Hulin
Final Report Date	November 2006

Location

Country	England
County	Dorset
Nearest Town	Abbotsbury
Landholding	Ilchester Estate, Chapel Hill
Central Co-ordinates	35726 84790
Co-ordinate System	UK OS National Grid

Environmental data

Geology – Soil	Sandy, light soils
Geology – Parent	Middle Oolite Series
Topography	Pronounced knoll overlooking the sea above Chesil Beach
Hydrology	Free draining
Current Land Use	Pasture
Historic Land Use	Arable, later on, pasture
Vegetation Cover	Grass
Sources of Interference	Visitors' mobile phones and steel fencing around the chapel

Geodetic data

Projection	Orthographic
Co-ordinate System	OSTN02
Bearing	Zero
Precision	0.05m
Instrument Used	Leica RTK GPS
Reference Points	Set in by Mercedes Planas
References Definition	Mercedes Planas

Process documentation

Ground penetrating radar

Measured Variable	Reflected electromagnetic wave
Instrument	GSSI SIR-200 Radar
Survey	Orthogonal 0.5m spaced unidirectional traverses
Configuration	900 MHz central frequency shielded antennae 512 samples per scan 40 scans per metre 35ns range (time window)
QA Procedure	Field observation
QA Result	Normal
Data Source Format	GSSI proprietary binary

5.1 All profiles were subjected to simple smoothing through use of a 3x3 cell running average or boxcar filter. This was simply to reduce noise in the deepest levels of the survey to prevent its propagation and subsequent distortion of later processes.

5.2 As no significant horizontal reflectors were expected (the floor of the chapel having long since been removed) a background removal filter 200 traces long was applied to reduce the data to reflections from non-laminar features, simplifying 3D analysis.

5.3 Hyperbola migration was not carried out but a Hilbert transform was applied to remove the affect of signal phase and reduce the data to a simple measure of reflected intensity.

5.4 Horizontal slicing of the Hilbert amplitude data was to a specification of 0.1m horizontally with 35 overlapping slices each 16 samples thick (1.09ns) from 3ns to 451ns. Slices were then interpolated to 0.1m grid.

Topographic survey

Measured Variable	Elevation from OS Datum Newlyn
Instrument	TopCon 220 Series GPS
Configuration	Working via 3D distance resection from stations established with known OSTN02 and OSGM02 co-ordinates using post-processed RTK GPS data.
QA Procedure	Field observation of known station
QA Result	Normal
Data Source Format	Comma-separated ASCII data

Archive data

Introduction

5.5 ArchaeoPhysica maintains an archive for all its projects, access to which is permitted for research purposes. Copyright and intellectual property rights are retained by ArchaeoPhysica on all material it has produced, the client having full licence to use such material as benefits their project.

5.6 Access is by appointment only. Some content is restricted and not available to third parties. There is no automatic right of access to this archive by members of the public. Some material retains commercial value and a charge may be made for its use. An administrative charge may be made for some enquiries, depending upon the exact nature of the request.

General description

5.7 The archive contains all survey and project data, communications, field notes, reports and other related material including copies of third party data (e.g., CAD mapping, etc.) in digital form. Many are in proprietary formats while report components are available in PDF format.

5.8 In addition, there are paper elements to some project archives, usually provided by the client. Nearly all elements of the archive that are generated by ArchaeoPhysica are digital.

File types

Extension	Associated Software or Format Information	Example Content
.bin	Geometrics MagMap2000 (version specific)	Magnetometer downloads
.csv	ASCII comma-separated data	Various data files
.dat	Generic ASCII data (may not be human readable)	Magnetometer downloads
.doc	Microsoft Word document (Office 97 and newer)	Report documents
.dwg	Autodesk AutoCAD format (version specific)	Plans & digitised maps
.dxf	ASCII Drawing eXchange format	Plans & digitised maps
.grd	Golden Software Surfer 7 binary or ASCII grid	Survey data
.html	ASCII HyperText Markup Language file	Report files, web pages
.man	Manifold GIS 6.5 (version specific)	Project data
.mdb	Microsoft Access document (Office 97 and newer)	Database files
.pdf	Adobe Acrobat Format (version 6 and newer)	Report files
.r15	Geoscan Research RM15 download (sequential ASCII)	Data files
.srf	Golden Software Surfer document (version 8)	Project data
.stn	Geometrics MagMap2000 ASCII data	Processed magnetic data
.txt	Generic human readable ASCII data	Notes etc.
.xls	Microsoft Excel document (Office 97 and newer)	Spreadsheet files
.xml	AP System or Manifold GIS	Logs, palettes, MS .NET files

5.9 The files listed above represent the usual content of digital archives held by ArchaeoPhysica.

Dissemination

5.10 It is the client's responsibility to ensure that reports are distributed to all parties with a necessary interest in the project, e.g., local government offices, including the HER where present. ArchaeoPhysica reserves the right to display data from projects on its website and in other marketing or research publications, usually with the consent of the client. Information that might locate the project is normally removed unless otherwise authorised by the client.

Background information

Introduction to geophysics

5.11 Geophysics is the application of measurements of the physical properties of materials to further our understanding of the Earth. As such it is a broad and diverse discipline with specialisms ranging from deep core and mantle studies through petroleum exploration to "shallow earth" environmental geophysics of which archaeological survey is just one example. The diversity and complexity of many archaeological features makes it one of the most difficult and arguably least well understood, branches of geophysics.

The role of the geophysical contractor

5.12 Within archaeology, there is a tendency for a narrow range of instrumentation to be used on a routine basis, to the possible detriment of the archaeological resource. Every site has its own physical and archaeological micro-environment and to maximise returns and cost-effectiveness every survey needs to be designed from the ground up. In some cases, this may call for the use of so-called 'novel' technologies, in other cases the old favourites may suffice. Whatever the scenario, the choice of instrumentation, configuration, survey resolution and sampling need to be assessed against the agreed project objectives.

5.13 This needs to be done by, or under the direct supervision of, a qualified and experienced geophysicist due to the wide range of parameters to be considered, not least, cost-effectiveness. It is probably fair to say that there are very few circumstances where geophysics is unable to contribute something of benefit, but the means may not be immediately obvious. All surveys by ArchaeoPhysica are tailor-made, even where working to a third party brief. This is because we feel our experience and knowledge must be brought to bear upon the survey design to avoid unnecessary failure later. In many cases, this is simply to fulfil an educational role.

5.14 For similar reasons as already outlined, it is essential that interpretation of the geophysical data be undertaken by an experienced geophysicist rather than an archaeologist. Geophysical data is, as discussed in an earlier section, an indirect indicator of archaeological features and to correctly process, analyse and image such data requires specialist knowledge that is not usually available to an archaeologist. In the simplest terms, geophysics is not archaeology and therefore requires the attention of specialist understanding in its own right, in the same manner as analysis of botanical or faunal assemblages.